IEC IECEE CB SCHEME

Ref. Certif. No.

AT 1529

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC

CB TEST CERTIFICATE
CERTIFICAT D'ESSAI OC

Product Produit	**Motor-Starter**
Name and address of the applicant Nom et adresse du demandeur	**Benedict GmbH** **1220 Wien, Liebigasse 7, Austria**
Name and address of the manufacturer Nom et adresse du fabricant	**Benedict GmbH** **1220 Wien, Liebigasse 7, Austria**
Name and address of the factory Nom et adresse de l'usine	**Benedict GmbH** **1220 Wien, Liebigasse 7, Austria**
Ratings and principal characteristics Valeurs nominales et caractéristiques principales	**AC 690 V; 50-60 Hz; AC1 see page 1 of test reports** **AC 400 V; 50-60 Hz; AC 3 see page 1 of test reports** **AC 240 V; 50-60 Hz; AC15 see page 1 of test reports**
Trademark (if any) Marque de fabrique (si elle existe)	**Ω, Benedikt & Jäger**
Model / Type Ref. Ref. de type	**K1-09Dxx/-K2-09Axx/-12Axx/-16Axx/-23Axx/-30Axx + U12/16xxx** **K85Axx/-110Axx + U85x**
Additional information (if necessary) Information complémentaire (si nécessaire)	**---**
A sample of the product was tested and found to be in conformity with Un échantillon de ce produit a été essayé et a été considéré conforme à la	**IEC 60947-4-1(ed.2);am1**
As shown in the Test Report Ref. No. which forms part of this Certificate Comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce Certificat	**2.03.00356.1.0-K109/B&J, -K209/B&J, -K212/B&J, -K216/B&J, -K223/B&J, -K230/B&J, -K85/B&J, -K110/B&J**

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

AUSTRIAN ELECTROTECHNICAL ASSOCIATION
A-1190 Wien, Kahlenberger Str. 2A

OVE

Dipl.-Ing. W. Martin

Date: 2004-02-25

TEST REPORT
EN 60 947-4-1
Low-voltage switchgear and controlgear
Part 4: Contactors and motor-starters
Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K109/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	K1-09Dxx + U12/16xxx
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 20A 690V 50-60Hz
		AC3/AC4 9A 400V 50-60Hz
		AC15 3A 240V 50-60Hz

Copy of marking plate

Contactor K1-09D
IEC/EN60947-4-1
VDE0660

AC3 9A
400V~

AC1 = I_{th}
690V~ 20A

Made in Austria

AC2, AC3

V~	220 240	380 690
kW	3	4

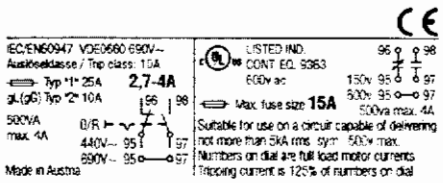
LISTED
IND. CONT.
EQ. 9382
600v ac 15amp.
Aux. Cont.
A600 Q600

v max.	120	240	480	600
hp 3ph	1.5	3	5	7.5
hp 1ph	0.5	1.5	-	-

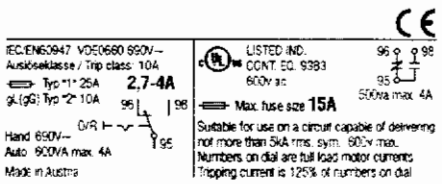
14AWG - 18AWG WIRE
60/75°C Cu only
TIGHT. TORQUE 9 lb.-in.
SUITABLE FOR USE ON
A CIRCUIT OF DELIVE-
RING 5000RMS SYM. AMP.
600 VOLTS AC MAXIMUM
MAX. FUSE SIZE 30 AMP.

Overload Relay

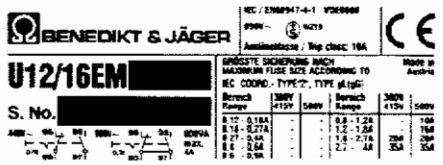
U12/16E 4



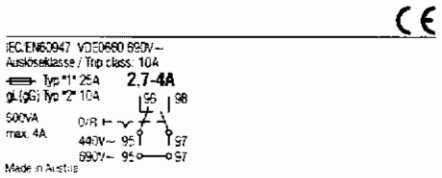
U12/16A 4



U12/16EM



U12/16EQ 4



U12/16U 4

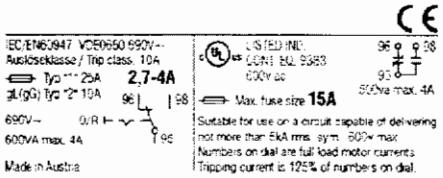
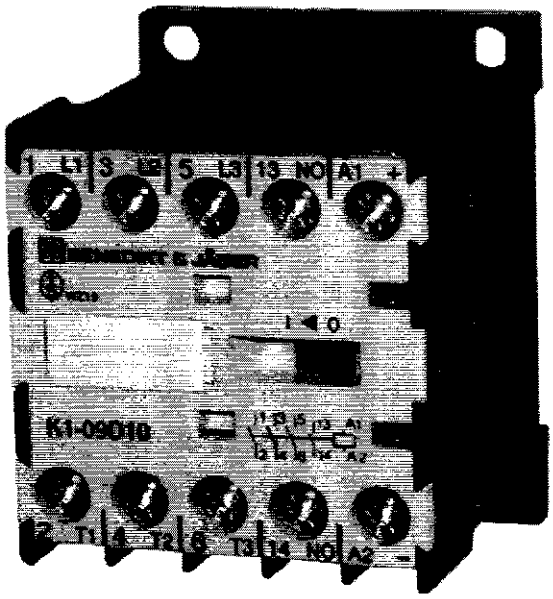
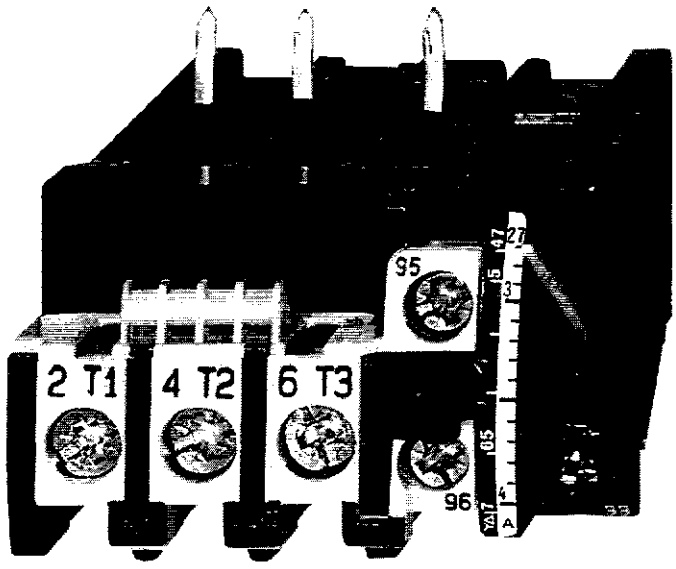


Photo:

K1-09D10



Overload Relay U12/16E



Test item particulars:	
- method of operation .... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V) ..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	20
- conventional enclosed thermal current Ithe (A) ..... :	20
- rated operational current Ie (A) ..... :	20
- rated uninterrupted Iu (A) ..... :	20
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic ..... :	
- rated prospective short-circuit current "r" (kA) ..... :	1
- rated conditional short-circuit current Iq (kA) ..... :	1
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits ..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HK' or 'HKM'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

K1-09D x x

I I >>>: 0, 1 : Number of NC auxiliary contacts

I >>>> : 0, 1 : Number of NO auxiliary contacts

Overload Relay

U12/16 x x x

I I I >>>> : Setting range 0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I 0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I 2,7 – 4 / 4 – 6 / 6 – 9 A
I I

I I >>>> : M ... With additional quick trip up to 4A (optional)

I : Q ... Thermic quick trip up to 14A (optional)

I

I >>>> : U ... Change over auxiliary contacts

: A ... Change over auxiliary contacts with autom. Reset

: E ... 1 NC and 1 NO auxiliary contact

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 20A, 690V AC3 AC4 9A, 400V Contactor AC15 3A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	1 kA Type '1' 25A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 3A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black)	P
	- other: 650°C	Cover (grey)	P
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	—
	- nominal voltage of supply system .....:	400 / 690V	—
	- overvoltage category .....:	IV	—
	- pollution degree .....:	3	—
	- field-in or homogeneous .....:	Inhomogeneous	—
	- minimum clearances (mm) .....:	8	—
	- measured clearances (mm) .....:	≥10	—
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		—
	- Ie .....:		—
	- minimum clearances L-L/L-A (mm) .....:		—
	- measured clearances L-L/L-A (mm) .....:		—
	Creepage distances		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) ..... :	6	—
	diameter of thread (mm) ..... :	M4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) ..... :	0,5	—
	number of conductor of the smallest cross section ..... :	1	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) ..... :	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) ..... :	6	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	1,4	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	80		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test			P
	conductor of the largest and smallest cross-sectional area (mm^2) .....:	2,5 // 0,5	6 // 1,5 flex	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	—
	diameter of bushing hole (mm) .....:	9,5 // 6,4	9,5 // 6,4	—
	height between the equipment and the platen (mm) .....:	279 // 260	279 // 260	—
	mass at the conductor(s) (kg) .....:	0,7 // 0,3	1,4 // 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	50 // 30	80 // 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm^2) .....:	0,75	0,5	—
	maximum cross-sectional area of conductor (mm^2) .....:	6	4	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals: Contactor		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) ..... :	2,5	—
	diameter of thread (mm) ..... :	M 3,5	—
	torque (Nm) ..... :	0,8	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	0,5	—
	number of conductor of the smallest cross section ..... :	2	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) ..... :	2,5	—
	number of conductor of the largest cross-sectional ..... :	2	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	0,7	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	50	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest and smallest cross-sectional area (mm^2) .....:	2,5 0,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 1	—
	diameter of bushing hole (mm) .....:	9,5 6,4	—
	height between the equipment and the platen (mm) .....:	279 260	—
	mass at the conductor(s) (kg) .....:	0,7 0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	50 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.1.7.2	Connecting capacity		P
	type of conductors .....:	Rigid Flexible	—
	minimum cross-sectional area of conductor (mm^2) .....:	0,5 0,5	—
	maximum cross-sectional area of conductor (mm^2) .....:	2,5 2,5	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	—
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	—

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise		P
	ambient temperature 10-40 °C .....:	25	—
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		—
	material of enclosure .....:		—
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	10		
	- cable cross-section (mm²) .....:	1,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40		
	Coils and electromagnets, test conditions:	AC	DC	P
	- rated control supply voltage Us (V) .....:	240	24	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 68	≤ 58	
	Starter	Tested with setting range 6 – 9 A		
	test enclosure W x H x D (mm x mm x mm) .....:	None		
	material of enclosure .....:	-		
	Main circuits, test conditions: *Tested with 9A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	9 (20*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	1,5 mm²		
	- temperature rise of main circuit terminals (K) ....:	≤ 62		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		
	- cable cross-section (mm²) .....:	1		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 44		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC	P
	rated control supply voltage Us (V) .....:	240	24	
	frequency (Hz) .....:	50	DC	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	80	74	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	36	27	P
9.3.3.2.2	Relays and releases Setting Range 6 – 9 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. compensated		—
	trip class .....:	10A		—
	current setting ..... I_{set} :	6 A	9 A	—
	ambient temperature (°C) .....:	24		—
	test enclosure W x H x D (mm x mm x mm) .....:	None		—
	cable/busbar cross-section (mm^2) / (mm) .....:	1,5		—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	6,3 A No tripping	9,45 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	7,2 A 1:20	10,8 A 3:40	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	9 A 0:21	13,5 A 0:17	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	43,2 A 5,2	64,8 A 4,6	—

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Clause	Requirement – Test	Result - Remark		Verdict
	Ambient temperature: - 5 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	6,3 A No tripping	9,45 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	7,2 A 0:35	10,8 A 2:40	—
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	9 A 1:10	13,5 A 0:40	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... :	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10s$ tarting from the cold state; test current; tripping time Tp (s) ..... :	43,2 A 5,6	64,8A 4,7	—
	Ambient temperature: + 40 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	6,3 A No tripping	9,45 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	7,2 A 1:10	10,8 A 4:55	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	9 A 0:11	13,5 A 0:27	—

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Clause	Requirement – Test	Result - Remark	Verdict
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N	—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$ starting from the cold state; test current; tripping time Tp (s) .....:	43,2 A 64,8 A 5 4,8	—
	Limits of operation of three-pole thermal overload relays energized on two poles:		P
	ambient temperature (°C) .....:	24	—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	6 A / 5,4 A 9 A / 8,1 A No tripping No tripping	—
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	6,9 A / 0 A 10,35 A / 0 A 1:25 0:40	—
9.3.3.2.2	Relays and releases Setting Range 1,8 – 2,7 A *** Q ***		P
	Conditions for thermal and time-delay magnetic overload relays only:		p
	type of time-delay overload relay .....:	Thermal, Temp. compensated	—
	trip class .....:	10A	—
	current setting ..... I_{set} :	1,8A 2,7 A	—
	ambient temperature (°C) .....:	24	—
	test enclosure W x H x D (mm x mm x mm) .....:	None	—
	cable/busbar cross-section (mm^2) / (mm) .....:	1,0	—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	1,89 A 2,84 A No tripping No tripping	—

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Clause	Requirement – Test	Result - Remark		Verdict
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	2,16 A 1:45	3,24 A 3:25	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	2,7 A 0:17	4,05 A 0:28	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	12,96 A 3,2	19,44 A 3,0	—
	Ambient temperature: - 5 °C .....:			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	1,89 A No tripping	2,84 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	2,16 A 5:20	3,24 A 4:55	—
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	2,7 A 0:25	4,05 A 0:52	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10s tarting from the cold state; test current; tripping time Tp (s) ..... :	12,96 A 3,3	19,44A 3,1	—
	Ambient temperature: + 40 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	1,89 A No tripping	2,84 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	2,16 A 0:30	3,24 A 0:45	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	2,7 A 0:07	4,05 A 0:22	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... :	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10 starting from the cold state; test current; tripping time Tp (s) ..... :	12,96 A 3,1	19,44 A 2,9	—
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) ..... :	23		—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state ..... :	1,8 A / 1,62 A No tripping	2,7 A / 2,43 A No tripping	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	2,07 A / 0 A 3,11 A / 0 A 2:45 1:05	—
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	—
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		—
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	—
	rated operational voltage Ue (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	20A	—
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 730 L2: 729 L3: 729	—
	- test current I/Ie = 1,5 (A) .....:	L1: 38 L2: 38 L3: 38,5	—
	- power factor/time constant .....:	L1: 0,78 L2: 0,78 L3: 0,79	—

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Clause	Requirement – Test	Result - Remark	Verdict
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	9,8	—
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) .....:	AC4	—
	rated operational voltage Ue (V) .....:	400V	—
	rated operational current Ie (A) or power (kW) ....:	9A	—
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 420 L2: 421 L3: 421	—
	- test current I/Ie = (A) .....:	L1: 108 L2: 110 L3: 108	—
	- power factor/time constant .....:	L1: 0,45 L2: 0,45 L3: 0,45	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	10	—
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz) .....:	L1: 39 L2: 38 L3: 38	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	—
	rated operational voltage Ue (V) .....:	400	—
	rated operational current Ie (A) or power (kW) ....:	9A	—
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 420 L2: 420 L3: 420	—
	- test current I/Ie = (A) .....:	L1: 54,5 L2: 55 L3: 55	—
	- power factor/time constant .....:	L1: 0,47 L2: 0,47 L3: 0,47	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	4	—
	- number of make/break operations .....:	6000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		
	Measured oscillatory frequency (kHz) .....:	L1: 34 L2: 33,5 L3: 34	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	
	rated operational voltage (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	20A	
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 730 L2: 728 L3: 730	
	test current (A) .....:	L1: 38 L2: 38 L3: 38,5	
	power factor/time constant .....:	L1: 0,78 L2: 0,78 L3: 0,79	
	- on-time (ms) .....:	160	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	- off-time (s) .....:	2,3	—
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	—

9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r": U12/16 0,4 -0,6A Represents setting ranges up to 9A		
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD, co-ordination type 1 .....:	25A / 500V	—
	ratings of SCPD, co-ordination type 2 .....:	-	—
	rated operational current Ie (A) AC-3 .....:	9A	—
	prospective current "r" (kA) .....:	1	—
	test voltage (V) .....:	L1: 424 L2: 424 L3: 425	—
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	—
	power factor	0,95	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 1750 A^2s / 807A L2: 2180 A^2s / 887 A L3: 1860 A^2s / 903 A	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 108 A^2s / 270 A L2: 695 A^2s / 586 A L3: 884 A^2s / 601 A	—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		—
	ratings of SCPD, co-ordination type 1 .....:		—
	ratings of SCPD, co-ordination type 2 .....:		—
	rated operational current Ie (A) AC-3 .....:		—
	prospective current "Iq" (kA) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	test voltage (V) .....:	L1: L2: L3:	
	r.m.s. test current (A) .....:	L1: L2: L3:	
	peak current (A) .....:	L1: L2: L3:	
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		-
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	—
	rated operational current Ie (A) max. AC-3 .....:	9	—
	test current (Ie) (A) .....:	72	—
	duration of test: 10 s .....:	10s	—
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
temperature rise dT of part:		**No.**	**dT (K)**	**Required dT (K)**
Main Terminals Contactor (9A)		1	35	65
		3	42	65
		5	38	65
Main Terminal Overload Relay (9A)		2	60	65
		4	61	65
		6	62	65
Auxilixary Terminals Contactor (10A)		13	40	65
		14	40	65
Auxiliary Terminal Overload Relay (4A)		95	44	65
		96	40	65
Coil:	240V 50Hz		68	135
	24V DC		58	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	3	—
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	—
	- power factor/time constant .....:	L1: 0,29 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 61 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 61 L2: - L3: -	—
	- on-time (ms) .....:	300	—
	- operating cycles per minute .....:	6	—
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	3	—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	—
	- power factor/time constant .....:	L1: 0,29 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 61 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 6,5 L2: - L3:	—
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	—
	- operating cycles per minute .....:	15	—
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD .....:	20A / 500V	
	prospective current (kA) .....:	1	
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1010 A^2s / 760A L2: 1010 A^2s / 760 A L3: 950 A^2s / 880 A	
	time interval between test (min. 3 min) .....:		
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1090 A^2s / 710 A L2: 910 A^2s / 850 A L3: 780 A^2s / 710 A	
	time interval between test (min. 3 min) .....:		
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 870 A^2s / 780 A L2: 170 A^2s / 465 A L3: 880 A^2s / 790 A	
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

arsenal research

Ein Unternehmen der Austrian Research Centers.

TEST REPORT

EN 60 947-4-1

Low-voltage switchgear and controlgear

Part 4: Contactors and motor-starters

Section 1: Electromechanical contactors and motor-starters

Report reference No..:	2.03.00356.1.0-K209/B&J
Tested by (+ signature)..... :	Ing.J.Ainetter
Approved by (+ signature) ..... :	Ing.K.Farthofer
Date of issue..... :	02.02.2004
Testing laboratory ..... :	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address..... :	A – 1031 Vienna, Faradaygasse 3
Testing location..... :	as above
Applicant ..... :	Benedict GmbH (Ω Benedikt & Jäger)
Address..... :	A – 1220 Vienna, Lieblgasse 7
Standard ..... :	EN 60 947-4-1:2000-11
Test Report Form No. ..... :	69474-1A
Master TRF ..... :	reference No. 69474-1A, dated 95-07
Copyright blank test report..... :	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure ..... :	CB-scheme
Procedure deviation..... :	N.A.
Non-standard test method ..... :	N.A.
Type of test object ..... :	Motor-Starter
Trademark ..... :	Ω, Benedikt & Jäger
Model/type reference ..... :	Kx2-09Axx + U12/16xxx
Manufacturer..... :	Ω Benedikt & Jäger
Rating ..... :	AC1 20A 690V 50-60Hz
	AC3/AC4 10A 400V 50-60Hz
	AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K2-09A

K2-09A

IEC / EN60947-4-1 AC1 = I_e
VDE0660 AS3947-4-1 690V~ 25A

AC2, AC3	220	380	415		660
V~	240	400	440	500	690
kW	3	4	4,5	5,5	5,5

CE

MADE IN AUSTRIA

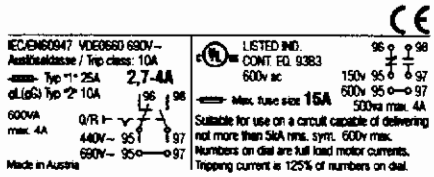
LISTED IND. CONT. EQUIP. 9382
600v ac 25amp A600

max. V	120	200	240	480	600
3ph hp	1.5	2	3	5	7.5
1ph 2p hp	0.5	1	1.5	-	-

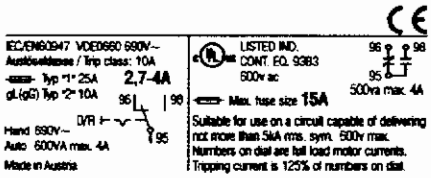
SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 5000 RMS SYMMETRICAL AMPS 600 VOLTS MAX. WHEN PROTECTED BY A FUSE RATED 30AMP.
TIGHTENING TORQUE 8.1 lb.-in.
14AWG-10AWG
WIRE 60°C Cu ONLY

Overload Relay

U12/16E 4

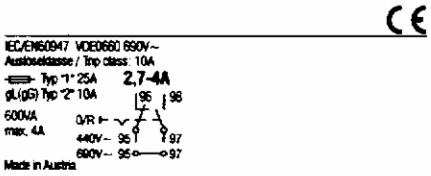


U12/16A 4



U12/16EM

U12/16EQ 4



U12/16U 4

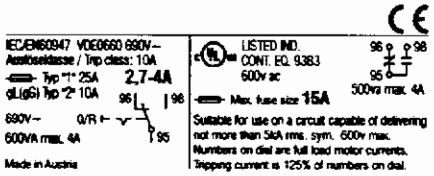
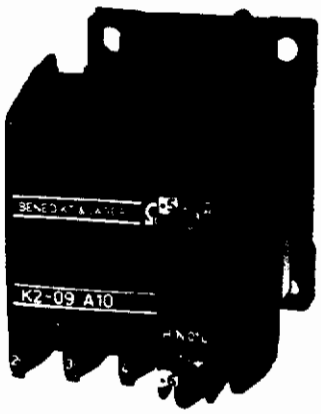


Photo:

K2-09A10 AC-operated

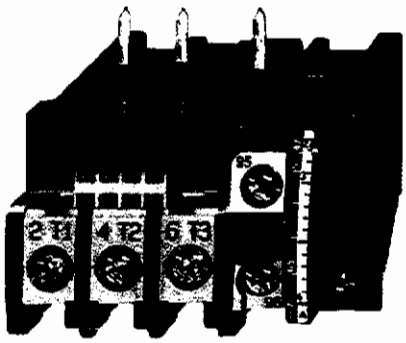
K2-09A10= DC-operated



KG2-09A10

Overload Relay:

U12/16E



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V)..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	20
- conventional enclosed thermal current Ithe (A) ..... :	20
- rated operational current Ie (A) ..... :	20
- rated uninterrupted Iu (A)..... :	20
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic..... :	
- rated prospective short-circuit current "r" (kA)..... :	1
- rated conditional short-circuit current Iq (kA)..... :	1
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse: 25A up to 11A AC3/AC4 63A from 10A AC3/AC4

Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:
"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

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1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HN' or 'HA'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

Kx2-09A x x

I I I >>>	: 0, 1	: Number of NC auxiliary contacts
I I >>>>	: 0, 1	: Number of NO auxiliary contacts
I >>>>	: G	: DC coil supply (optional)

Overload Relay

U12/16 x x x

I I I >>>>	: Setting range	0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I		0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I		2,7 – 4 / 4 – 6 / 6 – 9 / 8 – 11 / 10 – 14 A
I I		
I I >>>>	: M ... With additional quick trip up to 4A (optional)	
I	: Q ... Thermic quick trip up to 14A (optional)	
I		
I >>>>	: U ... Change over auxiliary contacts	
	: A ... Change over auxiliary contacts with autom. Reset	
	: E ... 1 NC and 1 NO auxiliary contact	

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC *

12V up to 24V: Double Winding Coil with Late Break Contact in series to coil.

25V up to 250V: Dropping Resistor with Late Break Contact in series to coil.

KG – type: Without Late Break Contact

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 20A, 690V AC3 AC4 10A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	1 kA Type '1' 63A/25A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black)	P
	- other: 650°C	Cover (grey)	P
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	
	- nominal voltage of supply system .....:	400 / 690V	
	- overvoltage category .....:	IV	
	- pollution degree .....:	3	
	- field-in or homogeneous .....:	Inhomogeneous	
	- minimum clearances (mm) .....:	8	
	- measured clearances (mm) .....:	≥10	
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		
	- Ie .....:		
	- minimum clearances L-L/L-A (mm) .....:		
	- measured clearances L-L/L-A (mm) .....:		
	Creepage distances		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) ....:	6	
	diameter of thread (mm) ....:	M4	
	torque (Nm) ....:	1,2	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) ....:	0,5	
	number of conductor of the smallest cross section ....:	1	
	diameter of bushing hole (mm) ....:	6,4	
	height between the equipment and the platen (mm) ....:	260	
	mass at the conductor(s) (kg) ....:	0,3	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) ....:	30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) ....:	6	
	number of conductor of the largest cross-sectional ....:	1	
	diameter of bushing hole (mm) ....:	9,5	
	height between the equipment and the platen (mm) ....:	279	
	mass at the conductor(s) (kg) ....:	1,4	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	80		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Overload		P
	conductor of the largest and smallest cross-sectional area (mm²) .....:	2,5 // 0,5	6 // 1,5	
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	
	diameter of bushing hole (mm) .....:	9,5 // 6,4	9,5 // 6,4	
	height between the equipment and the platen (mm) .....:	279 // 260	279 // 260	
	mass at the conductor(s) (kg) .....:	0,7 // 0,3	1,4 // 0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	50 // 30	80 // 30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	
	minimum cross-sectional area of conductor (mm²) .....:	0,75	0,5	
	maximum cross-sectional area of conductor (mm²) .....:	6	4	
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	2	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals:	Contactor	
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) .....:	4	
	diameter of thread (mm) .....:	M 3,5	
	torque (Nm) .....:	0,8	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) .....:	0,75	
	number of conductor of the smallest cross section .....:	2	
	diameter of bushing hole (mm) .....:	6,4	
	height between the equipment and the platen (mm) .....:	260	
	mass at the conductor(s) (kg) .....:	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) .....:	30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) .....:	4	
	number of conductor of the largest cross-sectional .....:	2	
	diameter of bushing hole (mm) .....:	9,5	
	height between the equipment and the platen (mm) .....:	279	
	mass at the conductor(s) (kg) .....:	0,9	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Contactor		
	conductor of the largest and smallest cross-sectional area (mm²) .....:	4 // 2,5	1,5 // 0,5	
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	
	diameter of bushing hole (mm) .....:	9,5	6,4	
	height between the equipment and the platen (mm) .....:	279	260	
	mass at the conductor(s) (kg) .....:	0,9 // 0,7	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60 // 50	40 // 30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	
	minimum cross-sectional area of conductor (mm²) .....:	0,75	0,75	
	maximum cross-sectional area of conductor (mm²) .....:	4	2,5	
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	2	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise	Type AC and DC - KG	P
	ambient temperature 10-40 °C .....:	25	
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		
	material of enclosure .....:		
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		
	Coils and electromagnets, test conditions:	AC	DC Type KG	P
	- rated control supply voltage Us (V) .....:	240	220	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 76	≤ 66	
	Starter	Tested with setting range 10 – 14 A		
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		
	material of enclosure .....:	Metal		
	Main circuits, test conditions: *Tested with 14A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	14 (20*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		
	- temperature rise of main circuit terminals (K) ....:	≤ 62		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		
	- cable cross-section (mm²) .....:	1		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 44		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC Type KG	P
	rated control supply voltage Us (V) .....:	240	220	
	frequency (Hz) .....:	50	DC	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	80	81	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	47	23	P
9.3.3.3	Temperature rise	Type DC		P
	ambient temperature 10-40 °C .....:	25		
	Contactor			N
	test enclosure W x H x D (mm x mm x mm) .....:			
	material of enclosure .....:			
	Main circuits, test conditions:			N
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		
	Coils and electromagnets, test conditions:	DC		P
	- rated control supply voltage Us (V) .....:	220	24	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 40	≤ 64	
	Starter	Tested with setting range 10 – 14 A		
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		
	material of enclosure .....:	Metal		
	Main circuits, test conditions: *Tested with 14A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	14 (20*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		

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Clause	Requirement – Test	Result - Remark		Verdict
	- temperature rise of main circuit terminals (K) ....:	≤ 62		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) ....:	4		
	- cable cross-section (mm²) ....:	1		
	- temperature rise of auxiliary circuit terminals (K) ....:	≤ 40		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	DC		P
	rated control supply voltage Us (V) ....:	220	24	
	frequency (Hz) ....:	DC	DC	
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us ....:	69	70	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ....:	31	38	P
9.3.3.2.2	Relays and releases Setting Range 10 – 14 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			P
	type of time-delay overload relay ....:	Thermal, Temp. compensated		
	trip class ....:	10A		
	current setting ....I_{set} :	10 A	14 A	
	ambient temperature (°C) ....:	25		
	test enclosure W x H x D (mm x mm x mm) ....:	175 x 115 x 115		
	cable/busbar cross-section (mm²) / (mm) ....:	2,5		
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current .... min:sec :	12 A 3:55	16,8 A 0:43	

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Clause	Requirement – Test	Result - Remark		Verdict
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:22	21 A 0:08	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	72 A 2,1	100,8 A 2,5	
	Ambient temperature: - 5 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	12 A 22:10	16,8 A 1:45	
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:36	21 A 0:12	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		

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Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10s$ tarting from the cold state; test current; tripping time Tp (s) .....:	72 A 2,1	100,8A 2,0	
	Ambient temperature: + 40 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	12 A 0:50	16,8 A 0:12	
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:08	21 A 0:05	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$ starting from the cold state; test current; tripping time Tp (s) .....:	72 A 2	100,8 A 2,2	
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) .....:	25		
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	10 A / 9 A No tripping	14 A / 12,6 A No tripping	

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Clause	Requirement – Test	Result - Remark	Verdict
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	11,5 A / 0 A 16,1 A / 0 A 1:00 0:24	
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	
	rated operational voltage Ue (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	20A	
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 725 L2: 730 L3: 730	
	- test current I/Ie = 1,5 (A) .....:	L1: 38 L2: 38 L3: 38	
	- power factor/time constant .....:	L1: 0,78 L2: 0,78 L3: 0,79	

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Clause	Requirement – Test	Result - Remark	Verdict
	- on-time (ms) .....:	160	
	- off-time (s) .....:	9,8	
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) .....:	AC4	
	rated operational voltage Ue (V) .....:	400V	
	rated operational current Ie (A) or power (kW) ....:	10A	
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 426 L2: 425 L3: 427	
	- test current I/Ie = (A) .....:	L1: 192 L2: 193 L3: 192	
	- power factor/time constant .....:	L1: 0,4 L2: 0,4 L3: 0,41	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	10	
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		

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Clause	Requirement – Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz) .....:	L1: 47 L2: 48 L3: 48	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	
	rated operational voltage Ue (V) .....:	400	
	rated operational current Ie (A) or power (kW) ....:	10A	
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 427 L2: 425 L3: 428	
	- test current I/Ie = (A) .....:	L1: 60 L2: 60 L3: 60	
	- power factor/time constant .....:	L1: 0,45 L2: 0,45 L3: 0,45	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	4	
	- number of make/break operations .....:	6000	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		
	Measured oscillatory frequency (kHz) .....:	L1: 37,5 L2: 38 L3: 38	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	
	rated operational voltage (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	20A	
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 725 L2: 730 L3: 730	
	test current (A) .....:	L1: 38 L2: 38 L3: 38	
	power factor/time constant .....:	L1: 0,78 L2: 0,79 L3: 0,79	
	- on-time (ms) .....:	160	

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Clause	Requirement – Test	Result - Remark	Verdict
	- off-time (s) .....:	2,3	
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	

9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r": U12/16 0,4 -0,6A Represents setting ranges up to 11A		
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	25A / 500V	
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	10A	
	prospective current "r" (kA) .....:	1	
	test voltage (V) .....:	L1: 424 L2: 423 L3: 425	
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	
	power factor	0,95	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 1750 A^2s / 807A L2: 2180 A^2s / 887 A L3: 1860 A^2s / 903 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 108 A^2s / 270 A L2: 695 A^2s / 586 A L3: 884 A^2s / 601 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N

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Clause	Requirement – Test	Result - Remark	Verdict
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
9.3.4.2.1	Test at de prospective current "r": U12/16 13 -18A Represents setting ranges higher 10A		
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	63A / 500V	
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	10A	
	prospective current "r" (kA) .....:	1	
	test voltage (V) .....:	L1: 424 L2: 423 L3: 425	
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	
	power factor	0,95	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 20,8 kA^2s / 1330 A L2: 19,6 kA^2s / 1283 A L3: 23 kA^2s / 1210 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 22,1 kA^2s / 1260 A L2: 19,5 kA^2s / 1283 A L3: 21,4 kA^2s / 1306 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N

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Clause	Requirement – Test	Result - Remark	Verdict
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		
	ratings of SCPD, co-ordination type 1 .....:		
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:		
	prospective current "Iq" (kA) .....:		
	test voltage (V) .....:	L1: L2: L3:	

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Clause	Requirement – Test	Result - Remark	Verdict
	r.m.s. test current (A) .....:	L1: L2: L3:	
	peak current (A) .....:	L1: L2: L3:	
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N

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Clause	Requirement – Test	Result - Remark	Verdict
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	
	rated operational current Ie (A) max. AC-3 .....:	10	
	test current (Ie) (A) .....:	80	
	duration of test: 10 s .....:	10s	
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
Main Terminals Contactor (14A)		1	51	65
		3	57	65
		5	57	65
Main Terminal Overload Relay (14A)		2	53	65
		4	62	65
		6	57	65
Auxilixary Terminals Contactor (16A)		13	43	65
		14	42	65
Auxiliary Terminal Overload Relay (4A)		95	44	65
		96	40	65
Coil:	240V 50Hz		76	135
	24V + 10% DC		64	135
	220V + 10% DC		40	135
Type: KG	220V DC		66	135

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	
	- operating cycles per minute .....:	15	
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		
	rated operational voltage Ue (V) .....:		

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD .....:	25A / 500V	
	prospective current (kA) .....:	1	
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	
	time interval between test (min. 3 min) .....:		
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	
	time interval between test (min. 3 min) .....:		
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

arsenal research

Ein Unternehmen der Austrian Research Centers.

TEST REPORT

EN 60 947-4-1

Low-voltage switchgear and controlgear

Part 4: Contactors and motor-starters

Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K212/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	Kx2-12Axx + U12/16xxx
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 25A 690V 50-60Hz
		AC3/AC4 12A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K2-12A

K2-12A

IEC / EN60947-4-1 AC1 = I_{th}
VDE0660 AS3947-4-1 690V~ 25A

AC2, AC3	220	380	415		660
Y~	240	400	440	500	690
kW	4	5,5	6	7,5	7,5

CE

MADE IN AUSTRIA

c UL us LISTED IND. CONT. EQUIP. 93B2
600v ac 25amp A600

max. v	120	200	240	480	600
3ph hp	2	3	3	7.5	10
1ph 2p hp	.75	2	2	-	-

SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 5000 RMS SYMMETRICAL AMPS 600 VOLTS MAX. WHEN PROTECTED BY A FUSE RATED 40AMP.
TIGHTENING TORQUE 8.1 lb.-in.
14AWG-10AWG
WIRE 60°C Cu ONLY

Overload Relay

U12/16E 4

CE

IEC/EN60947 VDE0660 690V~
Ausloseklasse / Trip class: 10A
Typ "1" 25A **2,7-4A**
gL(gG) Typ "2" 10A
600VA max. 4A
0/R
440V~
690V~
Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac
150v 600v 500va max. 4A
Max. fuse size **15A**
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

U12/16A 4

CE

IEC/EN60947 VDE0660 690V~
Ausloseklasse / Trip class: 10A
Typ "1" 25A **2,7-4A**
gL(gG) Typ "2" 10A
Hand 690V~
Auto 600VA max. 4A
0/R
Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac
500va max. 4A
Max. fuse size **15A**
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial

U12/16EM

BENEDIKT & JÄGER

CE

U12/16EM [redacted]

S. No. [redacted]

U12/16EQ 4

CE

IEC/EN60947 VDE0660 690V~
Ausloseklasse / Trip class: 10A
Typ "1" 25A **2,7-4A**
gL(gG) Typ "2" 10A
600VA max. 4A
0/R
440V~
660V~
Made in Austria

U12/16U 4

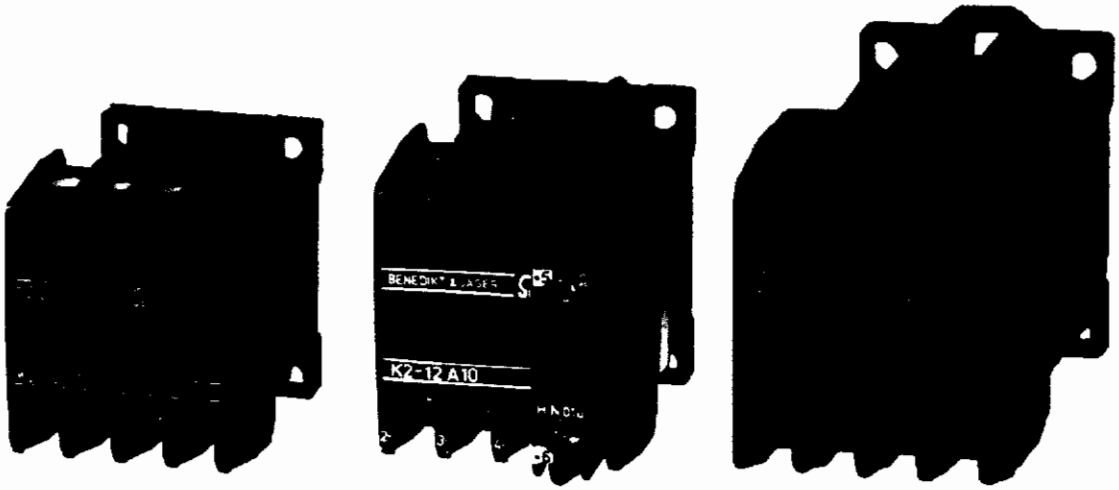
CE

IEC/EN60947 VDE0660 690V~
Ausloseklasse / Trip class: 10A
Typ "1" 25A **2,7-4A**
gL(gG) Typ "2" 10A
690V~
600VA max. 4A
0/R
Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac
500va max. 4A
Max. fuse size **15A**
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial

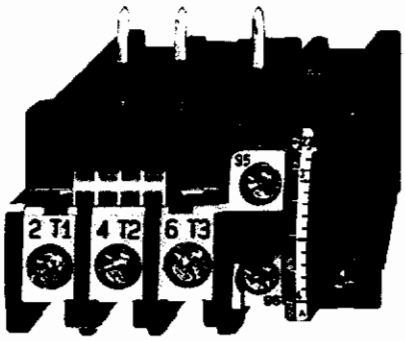
Photo:

K2-12A10 AC-operated K2-12A10= DC-operated KG2-12A10



Overload Relay:

U12/16E



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit ..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V)..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	25
- conventional enclosed thermal current Ithe (A) ..... :	25
- rated operational current Ie (A) ..... :	25
- rated uninterrupted Iu (A) ..... :	25
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic ..... :	
- rated prospective short-circuit current "r" (kA) ..... :	1
- rated conditional short-circuit current Iq (kA) ..... :	1
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits ..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse: 25A up to 11A AC3/AC4 63A higher than 10A AC3/AC4
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

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1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HN' or 'HA'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

Kx2-12A x x

I I I >>>	: 0, 1	: Number of NC auxiliary contacts
I I >>>>	: 0, 1	: Number of NO auxiliary contacts
I >>>>	: G	: DC coil supply (optional)

Overload Relay

U12/16 x x x

I I I >>>>	: Setting range 0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I	0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I	2,7 – 4 / 4 – 6 / 6 – 9 / 8 – 11 / 10 – 14 A
I I	
I I >>>>	: M ... With additional quick trip up to 4A (optional)
I	: Q ... Thermic quick trip up to 14A (optional)
I	
I >>>>	: U ... Change over auxiliary contacts
	: A ... Change over auxiliary contacts with autom. Reset
	: E ... 1 NC and 1 NO auxiliary contact

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC *

12V up to 24V: Double Winding Coil with Late Break Contact in series to coil.

25V up to 250V: Dropping Resistor with Late Break Contact in series to coil.

KG – type: Without Late Break Contact

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 25A, 690V AC3 AC4 12A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	1 kA Type '1' 63A/25A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P

8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: 850 / 960°C	Housing (black)	P
	- other: 650°C	Cover (blue)	P
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	
	- nominal voltage of supply system .....:	400 / 690V	
	- overvoltage category .....:	IV	
	- pollution degree .....:	3	
	- field-in or homogeneous .....:	Inhomogeneous	
	- minimum clearances (mm) .....:	8	
	- measured clearances (mm) .....:	≥10	
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		
	- Ie .....:		
	- minimum clearances L-L/L-A (mm) .....:		
	- measured clearances L-L/L-A (mm) .....:		
	Creepage distances		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) .....:	6	
	diameter of thread (mm) .....:	M4	
	torque (Nm) .....:	1,2	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) .....:	0,5	
	number of conductor of the smallest cross section .....:	1	
	diameter of bushing hole (mm) .....:	6,4	
	height between the equipment and the platen (mm) .....:	260	
	mass at the conductor(s) (kg) .....:	0,3	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) .....:	30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) .....:	6	
	number of conductor of the largest cross-sectional .....:	1	
	diameter of bushing hole (mm) .....:	9,5	
	height between the equipment and the platen (mm) .....:	279	
	mass at the conductor(s) (kg) .....:	1,4	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	80		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Overload		P
	conductor of the largest and smallest cross-sectional area (mm^2) .....:	2,5 // 0,5	6 // 1,5	
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	
	diameter of bushing hole (mm) .....:	9,5 // 6,4	9,5 // 6,4	
	height between the equipment and the platen (mm) .....:	279 // 260	279 // 260	
	mass at the conductor(s) (kg) .....:	0,7 // 0,3	1,4 // 0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) .....:	50 // 30	80 // 30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	
	minimum cross-sectional area of conductor (mm^2) .....:	0,75	0,5	
	maximum cross-sectional area of conductor (mm^2) .....:	6	4	
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	2	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals:	Contactor	
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) .....:	4	
	diameter of thread (mm) .....:	M 3,5	
	torque (Nm) .....:	0,8	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) .....:	0,75	
	number of conductor of the smallest cross section .....:	2	
	diameter of bushing hole (mm) .....:	6,4	
	height between the equipment and the platen (mm) .....:	260	
	mass at the conductor(s) (kg) .....:	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) .....:	30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) .....:	4	
	number of conductor of the largest cross-sectional .....:	2	
	diameter of bushing hole (mm) .....:	9,5	
	height between the equipment and the platen (mm) .....:	279	
	mass at the conductor(s) (kg) .....:	0,9	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Contactor		
	conductor of the largest and smallest cross-sectional area (mm²) .....:	4 // 2,5	1,5 // 0,5	
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	
	diameter of bushing hole (mm) .....:	9,5	6,4	
	height between the equipment and the platen (mm) .....:	279	260	
	mass at the conductor(s) (kg) .....:	0,9 // 0,7	0,4	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60 // 50	40 // 30	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	
	minimum cross-sectional area of conductor (mm²) .....:	0,75	0,75	
	maximum cross-sectional area of conductor (mm²) .....:	4	2,5	
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	 2	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise	Type AC and DC - KG	P
	ambient temperature 10-40 °C .....:	25	
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		
	material of enclosure .....:		
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		
	Coils and electromagnets, test conditions:	AC	DC Type KG	P
	- rated control supply voltage Us (V) .....:	240	220	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 76	≤ 66	
	Starter	Tested with setting range 10 – 14 A		
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		
	material of enclosure .....:	Metal		
	Main circuits, test conditions: *Tested with 14A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	14 (25*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		
	- temperature rise of main circuit terminals (K) ....:	≤ 62		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		
	- cable cross-section (mm²) .....:	1		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC Type KG	P
	rated control supply voltage Us (V) .....:	240	220	
	frequency (Hz) .....:	50	DC	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	80	81	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	47	23	P
9.3.3.3	Temperature rise	Type DC		P
	ambient temperature 10-40 °C .....:	25		
	Contactor			N
	test enclosure W x H x D (mm x mm x mm) .....:			
	material of enclosure .....:			
	Main circuits, test conditions:			N
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		
	Coils and electromagnets, test conditions:	DC		P
	- rated control supply voltage Us (V) .....:	220	24	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 40	≤ 64	
	Starter	Tested with setting range 10 – 14 A		
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		
	material of enclosure .....:	Metal		
	Main circuits, test conditions: *Tested with 14A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	14 (25*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		

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Clause	Requirement – Test	Result - Remark		Verdict
	- temperature rise of main circuit terminals (K) ....:	≤ 62		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) ....:	4		
	- cable cross-section (mm²) ....:	1		
	- temperature rise of auxiliary circuit terminals (K) ....:	≤ 40		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	DC		P
	rated control supply voltage Us (V) ....:	220	24	
	frequency (Hz) ....:	DC	DC	
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us ....:	69	70	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. ....:	31	38	P
9.3.3.2.2	Relays and releases Setting Range 10 – 14 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay ....:	Thermal, Temp. compensated		
	trip class ....:	10A		
	current setting ....I_{set} :	10 A	14 A	
	ambient temperature (°C) ....:	25		
	test enclosure W x H x D (mm x mm x mm) ....:	175 x 115 x 115		
	cable/busbar cross-section (mm²) / (mm) ....:	2,5		
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current .... min:sec :	12 A 3:55	16,8 A 0:43	

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Clause	Requirement – Test	Result - Remark		Verdict
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:22	21 A 0:08	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	72 A 2,1	100,8 A 2,5	
	Ambient temperature: - 5 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	12 A 22:10	16,8 A 1:45	
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:36	21 A 0:12	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		

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Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10s tarting from the cold state; test current; tripping time Tp (s) .....:	72 A 2,1	100,8A 2,0	
	Ambient temperature: + 40 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	10,5 A No tripping	14,7 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	12 A 0:50	16,8 A 0:12	
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	15 A 0:08	21 A 0:05	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10 starting from the cold state; test current; tripping time Tp (s) .....:	72 A 2	100,8 A 2,2	
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) .....:	25		
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	10 A / 9 A No tripping	14 A / 12,6 A No tripping	

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Clause	Requirement – Test	Result - Remark	Verdict
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	11,5 A / 0 A 16,1 A / 0 A 1:00 0:24	
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	
	rated operational voltage Ue (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	25A	
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 725 L2: 730 L3: 730	
	- test current I/Ie = 1,5 (A) .....:	L1: 38 L2: 38 L3: 38	
	- power factor/time constant .....:	L1: 0,78 L2: 0,78 L3: 0,79	

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Clause	Requirement – Test	Result - Remark	Verdict
	- on-time (ms) .....:	160	
	- off-time (s) .....:	9,8	
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) .....:	AC4	
	rated operational voltage Ue (V) .....:	400V	
	rated operational current Ie (A) or power (kW) ....:	12A	
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 426 L2: 425 L3: 427	
	- test current I/Ie = (A) .....:	L1: 192 L2: 193 L3: 192	
	- power factor/time constant .....:	L1: 0,4 L2: 0,4 L3: 0,4	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	10	
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		

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Clause	Requirement – Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz) .....:	L1: 47,5 L2: 48 L3: 48	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	
	rated operational voltage Ue (V) .....:	400	
	rated operational current Ie (A) or power (kW) ....:	12A	
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 430 L2: 429 L3: 430	
	- test current I/Ie = (A) .....:	L1: 99 L2: 101 L3: 99	
	- power factor/time constant .....:	L1: 0,42 L2: 0,42 L3: 0,42	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	4	
	- number of make/break operations .....:	6000	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		
	Measured oscillatory frequency (kHz) .....:	L1: 37,5 L2: 38 L3: 38	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	
	rated operational voltage (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	25A	
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 725 L2: 730 L3: 730	
	test current (A) .....:	L1: 38 L2: 38 L3: 38	
	power factor/time constant .....:	L1: 0,78 L2: 0,79 L3: 0,79	
	- on-time (ms) .....:	160	

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Clause	Requirement – Test	Result - Remark	Verdict
	- off-time (s) .....:	2,3	
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	

9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r": U12/16 0,4 -0,6A Represents setting ranges up to 11A		
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	25A / 500V	
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	12A	
	prospective current "r" (kA) .....:	1	
	test voltage (V) .....:	L1: 424 L2: 423 L3: 425	
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	
	power factor	0,95	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 1750 A^2s / 807A L2: 2180 A^2s / 887 A L3: 1860 A^2s / 903 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 108 A^2s / 270 A L2: 695 A^2s / 586 A L3: 884 A^2s / 601 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
9.3.4.2.1	Test at de prospective current "r": U12/16 13 -18A Represents setting ranges higher 10A		
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	63A / 500V	
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	12A	
	prospective current "r" (kA) .....:	1	
	test voltage (V) .....:	L1: 424 L2: 423 L3: 425	
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	
	power factor	0,95	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 20,8 kA^2s / 1330 A L2: 19,6 kA^2s / 1283 A L3: 23 kA^2s / 1210 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 22,1 kA^2s / 1260 A L2: 19,5 kA^2s / 1283 A L3: 21,4 kA^2s / 1306 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N

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Clause	Requirement – Test	Result - Remark	Verdict
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		
	ratings of SCPD, co-ordination type 1 .....:		
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:		
	prospective current "Iq" (kA) .....:		
	test voltage (V) .....:	L1: L2: L3:	

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Clause	Requirement – Test	Result - Remark	Verdict
	r.m.s. test current (A) .....:	L1: L2: L3:	
	peak current (A) .....:	L1: L2: L3:	
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	
	rated operational current Ie (A) max. AC-3 .....:	12	
	test current (Ie) (A) .....:	96	
	duration of test: 10 s .....:	10s	
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
Main Terminals Contactor (14A)		1	51	65
		3	57	65
		5	57	65
Main Terminal Overload Relay (14A)		2	53	65
		4	62	65
		6	57	65
Auxilixary Terminals Contactor (16A)		13	43	65
		14	42	65
Auxiliary Terminal Overload Relay (4A)		95	44	65
		96	40	65
Coil:	240V 50Hz		76	135
	24V + 10% DC		64	135
	220V + 10% DC		40	135
Type: KG	220V DC		66	135

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	
	- operating cycles per minute .....:	15	
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		
	rated operational voltage Ue (V) .....:		

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Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD .....:	25A / 500V	
	prospective current (kA) .....:	1	
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	
	time interval between test (min. 3 min) .....:		
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	
	time interval between test (min. 3 min) .....:		
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

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TEST REPORT

EN 60 947-4-1

Low-voltage switchgear and controlgear

Part 4: Contactors and motor-starters

Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K216/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	Kx2-16Axx + U12/16xxx
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 25A 690V 50-60Hz
		AC3/AC4 16A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K2-16A

K2-16A

IEC / EN60947-4-1 AC1 = I_{th}
VDE0660 AS3947-4-1 690V~ 25A

AC2, AC3	220	380	415		660
V~	240	400	440	500	690
kW	5	7,5	8,5	10	7,5

CE

MADE IN AUSTRIA

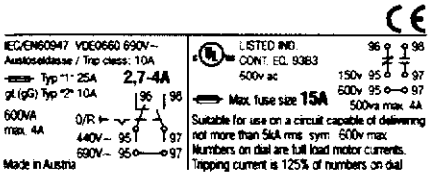
LISTED IND. CONT. EQUIP. 93B2
600v ac 25amp A600

max. v	120	200	240	480	600
3ph hp	2	3	5	10	15
1ph 2p hp	1	2	3	-	-

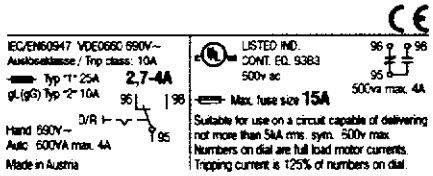
SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 5000 RMS SYMMETRICAL AMPS 600 VOLTS MAX. WHEN PROTECTED BY A FUSE RATED 50AMP.
TIGHTENING TORQUE 8.1 lb.-in.
14AWG-10AWG
WIRE 60°C Cu ONLY

Overload Relay

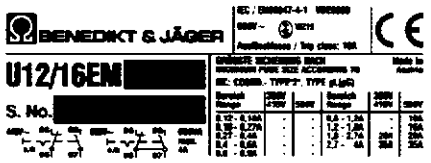
U12/16E 4



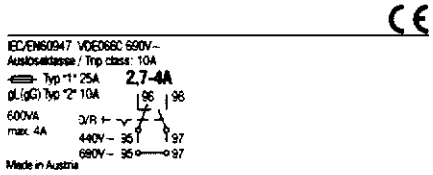
U12/16A 4



U12/16EM



U12/16EQ 4



U12/16U 4

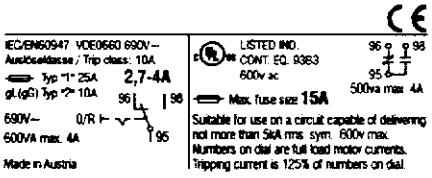
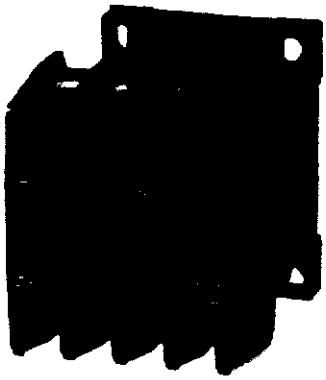
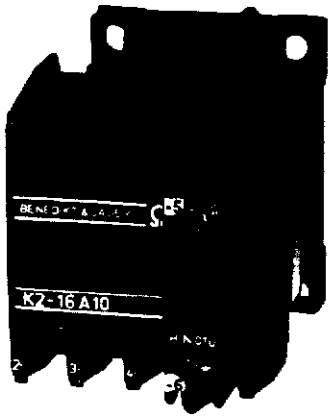


Photo:

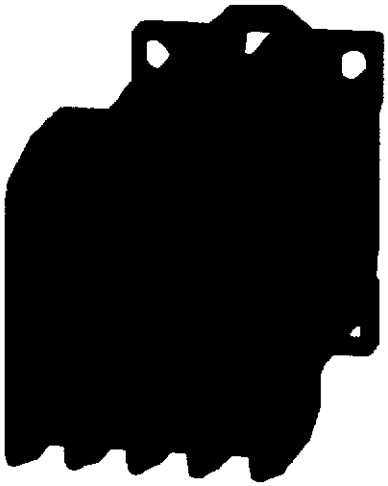
K2-16A10 AC-operated



K2-16A10= DC-operated

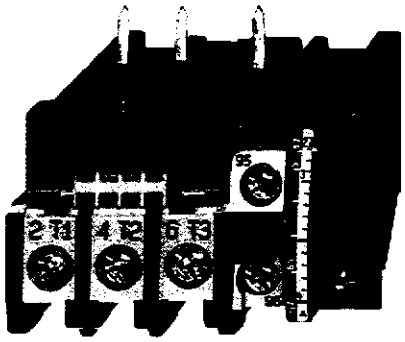


KG2-16A10



Overload Relay:

U12/16E



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V)..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	25
- conventional enclosed thermal current Ithe (A) ..... :	25
- rated operational current Ie (A) ..... :	25
- rated uninterrupted Iu (A)..... :	25
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic..... :	
- rated prospective short-circuit current "r" (kA) ..... :	1
- rated conditional short-circuit current Iq (kA) ..... :	1
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse: 25A up to 11A AC3/AC4 63A higher than 10A AC3/AC4
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

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1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HN' or 'HA'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

Kx2-16A x x

I I I >>>	: 0, 1	: Number of NC auxiliary contacts
I I >>>>	: 0, 1	: Number of NO auxiliary contacts
I >>>>	: G	: DC coil supply (optional)

Overload Relay

U12/16 x x x

I I I >>>>	: Setting range 0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I	0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I	2,7 – 4 / 4 – 6 / 6 – 9 / 8 – 11 / 10 – 14 / 13 – 18 A
I I	
I I >>>>	: M ... With additional quick trip up to 4A (optional)
I	: Q ... Thermic quick trip up to 14A (optional)
I	
I >>>>	: U ... Change over auxiliary contacts
	: A ... Change over auxiliary contacts with autom. Reset
	: E ... 1 NC and 1 NO auxiliary contact

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC *

12V up to 24V: Double Winding Coil with Late Break Contact in series to coil.

25V up to 250V: Dropping Resistor with Late Break Contact in series to coil.

KG – type: Without Late Break Contact

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 25A, 690V AC3 AC4 16A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	1 kA Type '1' 63A/25A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

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Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P

8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black)	P
	- other: 650°C	Cover (grey)	P
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	
	- nominal voltage of supply system .....:	400 / 690V	
	- overvoltage category .....:	IV	
	- pollution degree .....:	3	
	- field-in or homogeneous .....:	Inhomogeneous	
	- minimum clearances (mm) .....:	8	
	- measured clearances (mm) .....:	≥10	
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		
	- Ie .....:		
	- minimum clearances L-L/L-A (mm) .....:		
	- measured clearances L-L/L-A (mm) .....:		
	Creepage distances		

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Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

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Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) ..... :	6	—
	diameter of thread (mm) ..... :	M4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) ..... :	0,5	—
	number of conductor of the smallest cross section ..... :	1	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) ..... :	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) ..... :	6	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	1,4	—

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Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	80		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Overload		P
	conductor of the largest and smallest cross-sectional area (mm^2) ..... :	2,5 // 0,5	6 // 1,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional ..... :	1 // 1	1 // 1	—
	diameter of bushing hole (mm) ..... :	9,5 // 6,4	9,5 // 6,4	—
	height between the equipment and the platen (mm) ..... :	279 // 260	279 // 260	—
	mass at the conductor(s) (kg) ..... :	0,7 // 0,3	1,4 // 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	50 // 30	80 // 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors ..... :	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm^2) ..... :	0,75	0,5	—
	maximum cross-sectional area of conductor (mm^2) ..... :	6	4	—
	number of conductors simultaneously connectable to the terminal ..... :	Acc. Manuf. Instr. 2	 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals: Contactor		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) .....:	4	—
	diameter of thread (mm) .....:	M 3,5	—
	torque (Nm) .....:	0,8	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) .....:	0,75	—
	number of conductor of the smallest cross section .....:	2	—
	diameter of bushing hole (mm) .....:	6,4	—
	height between the equipment and the platen (mm) .....:	260	—
	mass at the conductor(s) (kg) .....:	0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) .....:	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) .....:	4	—
	number of conductor of the largest cross-sectional .....:	2	—
	diameter of bushing hole (mm) .....:	9,5	—
	height between the equipment and the platen (mm) .....:	279	—
	mass at the conductor(s) (kg) .....:	0,9	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Contactor		
	conductor of the largest and smallest cross-sectional area (mm^2) .....:	4 // 2,5	1,5 // 0,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1	1 // 1	—
	diameter of bushing hole (mm) .....:	9,5	6,4	—
	height between the equipment and the platen (mm) .....:	279	260	—
	mass at the conductor(s) (kg) .....:	0,9 // 0,7	0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) .....:	60 // 50	40 // 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors .....:	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm^2) .....:	0,75	0,75	—
	maximum cross-sectional area of conductor (mm^2) .....:	4	2,5	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2	 2	—

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Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

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Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

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Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	—
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	—

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise	Type AC and DC - KG	P
	ambient temperature 10-40 °C .....:	25	—
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		—
	material of enclosure .....:		—
	Main circuits, test conditions:		N

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Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			—
	- conventional enclosed thermal current Ithe (A) .:			—
	- cable/busbar cross-section (mm²) / (mm) .....:			—
	- temperature rise of main circuit terminals (K) ....:	<		—
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		—
	- cable cross-section (mm²) .....:	2,5		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		—
	Coils and electromagnets, test conditions:	AC	DC Type KG	P
	- rated control supply voltage Us (V) .....:	240	220	—
	- Class of insulating material .....:	F	F	—
	- temperature rise of coil and electromagnets (K) :	≤ 76	≤ 66	—
	Starter	Tested with setting range 13 – 18 A		
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		—
	material of enclosure .....:	Metal		—
	Main circuits, test conditions: *Tested with 16A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	16 (25*)		—
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		—
	- temperature rise of main circuit terminals (K) ....:	≤ 59		—
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		—
	- cable cross-section (mm²) .....:	1		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		—
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC Type KG	P
	rated control supply voltage Us (V) .....:	240	220	—
	frequency (Hz) .....:	50	DC	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	80	81	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	47	23	P
9.3.3.3	Temperature rise Type DC			P
	ambient temperature 10-40 °C .....:	25		—
	Contactor			N
	test enclosure W x H x D (mm x mm x mm) .....:			—
	material of enclosure .....:			—
	Main circuits, test conditions:			N
	- conventional thermal current Ith (A) .....:			—
	- conventional enclosed thermal current Ithe (A) .:			—
	- cable/busbar cross-section (mm²) / (mm) .....:			—
	- temperature rise of main circuit terminals (K) ....:	<		—
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		—
	- cable cross-section (mm²) .....:	2,5		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		—
	Coils and electromagnets, test conditions: DC			P
	- rated control supply voltage Us (V) .....:	220	24	—
	- Class of insulating material .....:	F	F	—
	- temperature rise of coil and electromagnets (K) :	≤ 40	≤ 64	—
	Starter Tested with setting range 13 – 18 A			
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		—
	material of enclosure .....:	Metal		—
	Main circuits, test conditions: *Tested with 16A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	16 (25*)		—
	- cable/busbar cross-section (mm²) / (mm) .....:	2,5 mm²		—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- temperature rise of main circuit terminals (K) ....:	≤ 59		—
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		—
	- cable cross-section (mm²) .....:	1		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 43		—
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	DC		P
	rated control supply voltage Us (V) .....:	220	24	—
	frequency (Hz) .....:	DC	DC	—
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	69	70	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	31	38	P
9.3.3.2.2	Relays and releases Setting Range 13 – 18 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. compensated		—
	trip class .....:	10A		—
	current setting ..... I_{set} :	13 A	18 A	—
	ambient temperature (°C) .....:	25		—
	test enclosure W x H x D (mm x mm x mm) .....:	175 x 115 x 115		—
	cable/busbar cross-section (mm²) / (mm) .....:	2,5		—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	13,65 A No tripping	18,9 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	15,6 A 4:05	21,6 A 2:45	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	19,5 A 0:31	27 A 0:18	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	93,6 A 2,5	129,6 A 2,3	—
	Ambient temperature: - 5 °C .....:			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	13,65 A No tripping	18,9 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	15,6 A 28:35	21,6 A 2:25	—
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	19,5 A 1:07	27 A 0:27	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10s tarting from the cold state; test current; tripping time Tp (s) ..... :	93,6 A 3,1	129,6A 2,6	—
	Ambient temperature: + 40 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	13,65 A No tripping	18,9 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	15,6 A 1:10	21,6 A 1:15	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	19,5 A 0:15	27 A 0:10	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... :	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 2 < Tp ≤ 10 starting from the cold state; test current; tripping time Tp (s) ..... :	93,6 A 2,9	129,6 A 2,1	—
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) ..... :	25		—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state ..... :	13 A / 11,7 A No tripping	18 A / 16,2 A No tripping	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	14,95 A / 0 A 20,7 A / 0 A 1:55 0:23	—
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	—
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		—
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	—
	rated operational voltage Ue (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	25A	—
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 725 L2: 730 L3: 730	—
	- test current I/Ie = 1,5 (A) .....:	L1: 38 L2: 38 L3: 38	—
	- power factor/time constant .....:	L1: 0,78 L2: 0,78 L3: 0,79	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	- on-time (ms) ....:	160	—
	- off-time (s) ....:	9,8	—
	- number of make/break operations ....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) ....:	AC4	—
	rated operational voltage Ue (V) ....:	400V	—
	rated operational current Ie (A) or power (kW) ....:	16A	—
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) ....:	L1: 426 L2: 425 L3: 427	—
	- test current I/Ie = (A) ....:	L1: 192 L2: 193 L3: 192	—
	- power factor/time constant ....:	L1: 0,4 L2: 0,4 L3: 0,4	—
	- on-time (ms) ....:	100	—
	- off-time (s) ....:	10	—
	- number of make operations ....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) ....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz) .....:	L1: 47 L2: 48 L3: 48	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	—
	rated operational voltage Ue (V) .....:	400	—
	rated operational current Ie (A) or power (kW) ....:	16A	—
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 430 L2: 429 L3: 430	—
	- test current I/Ie = (A) .....:	L1: 99 L2: 101 L3: 99	—
	- power factor/time constant .....:	L1: 0,42 L2: 0,42 L3: 0,42	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	4	—
	- number of make/break operations .....:	6000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 38 L2: 38 L3: 39	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	—
	rated operational voltage (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	25A	—
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 725 L2: 730 L3: 730	—
	test current (A) .....:	L1: 38 L2: 38 L3: 38	—
	power factor/time constant .....:	L1: 0,78 L2: 0,79 L3: 0,79	—
	- on-time (ms) .....:	160	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	- off-time (s) ..... :	2,3	
	- number of operating cycles ..... :	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) ..... :	2380	

9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r": U12/16 0,4 -0,6A Represents setting ranges up to 11A		
	type of SCPD ..... :	Siemens Diazed gL / gG	
	ratings of SCPD, co-ordination type 1 ..... :	25A / 500V	
	ratings of SCPD, co-ordination type 2 ..... :	-	
	rated operational current Ie (A) AC-3 ..... :	16A	
	prospective current "r" (kA) ..... :	1	
	test voltage (V) ..... :	L1: 424 L2: 423 L3: 425	
	r.m.s. test current (A) ..... :	L1: 1053 L2: 1087 L3: 1062	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	—
	power factor	0,95	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 1750 A^2s / 807A L2: 2180 A^2s / 887 A L3: 1860 A^2s / 903 A	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 108 A^2s / 270 A L2: 695 A^2s / 586 A L3: 884 A^2s / 601 A	—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	—
9.3.4.2.1	Test at de prospective current "r": U12/16 13 -18A Represents setting ranges higher 10A		
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD, co-ordination type 1 .....:	63A / 500V	—
	ratings of SCPD, co-ordination type 2 .....:	-	—
	rated operational current Ie (A) AC-3 .....:	16A	—
	prospective current "r" (kA) .....:	1	—
	test voltage (V) .....:	L1: 424 L2: 423 L3: 425	—
	r.m.s. test current (A) .....:	L1: 1053 L2: 1087 L3: 1062	—
	peak current (A) .....:	L1: 1457 L2: 1457 L3: 1378	—
	power factor	0,95	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 20,8 kA^2s / 1330 A L2: 19,6 kA^2s / 1283 A L3: 23 kA^2s / 1210 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 22,1 kA^2s / 1260 A L2: 19,5 kA^2s / 1283 A L3: 21,4 kA^2s / 1306 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		—
	ratings of SCPD, co-ordination type 1 .....:		—
	ratings of SCPD, co-ordination type 2 .....:		—
	rated operational current Ie (A) AC-3 .....:		—
	prospective current "Iq" (kA) .....:		—
	test voltage (V) .....:	L1: L2: L3:	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	r.m.s. test current (A) .....:	L1: L2: L3:	—
	peak current (A) .....:	L1: L2: L3:	—
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	—
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	—
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	—
	rated operational current Ie (A) max. AC-3 .....:	16	—
	test current (Ie) (A) .....:	128	—
	duration of test: 10 s .....:	10s	—
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
temperature rise dT of part:		No.	dT (K)	Required dT (K)
Main Terminals Contactor (16A)		1	51	65
		3	54	65
		5	58	65
Main Terminal Overload Relay (16A)		2	59	65
		4	54	65
		6	51	65
Auxilixary Terminals Contactor (16A)		13	43	65
		14	42	65
Auxiliary Terminal Overload Relay (4A)		95	44	65
		96	40	65
Coil:	240V 50Hz		76	135
	24V + 10% DC		64	135
	220V + 10% DC		40	135
Type: KG	220V DC		66	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	12	—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	—
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	—
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	—
	- operating cycles per minute .....:	15	—
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD .....:	25A / 500V	—
	prospective current (kA) .....:	1	—
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	—
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	—
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	—
	time interval between test (min. 3 min) .....:		—
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	—
	time interval between test (min. 3 min) .....:		—
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	—
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

arsenal research

Ein Unternehmen der Austrian Research Centers.

TEST REPORT

EN 60 947-4-1

Low-voltage switchgear and controlgear

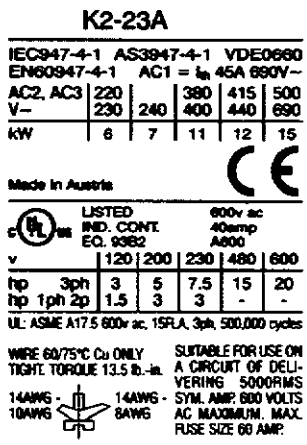
Part 4: Contactors and motor-starters

Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K223/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	K2-23Axx + U12/16xxx
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 45A 690V 50-60Hz
		AC3/AC4 23A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

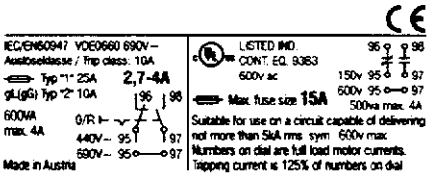
Copy of marking plate

Contactor K2-23A

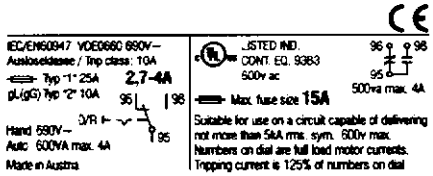


Overload Relay

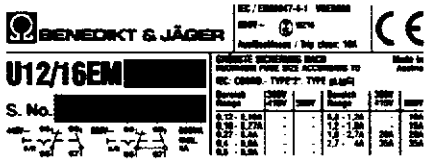
U12/16E 4



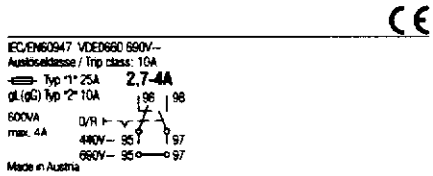
U12/16A 4



U12/16EM



U12/16EQ 4



U12/16U 4

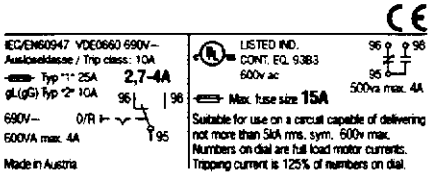
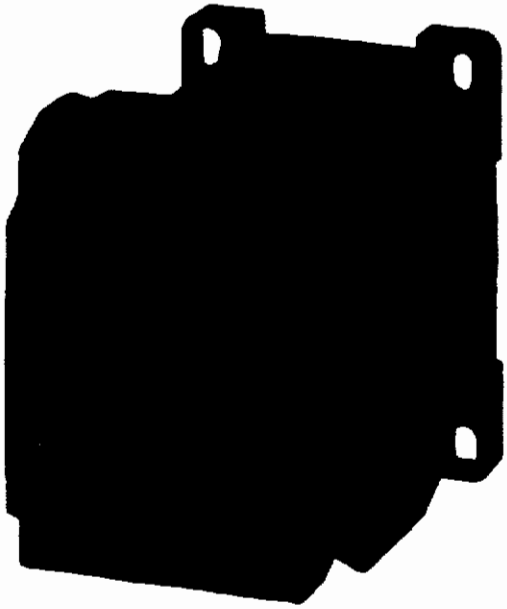
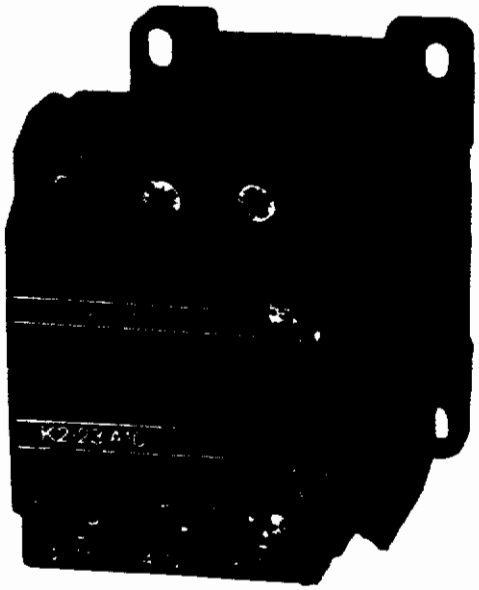


Photo:

K2-23A10 AC-operated

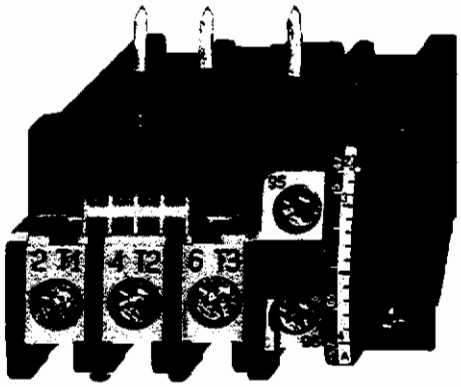


K2-23A10= DC-operated



Overload Relay:

U12/16E



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V)..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	45
- conventional enclosed thermal current Ithe (A) ..... :	45
- rated operational current Ie (A) ..... :	45
- rated uninterrupted Iu (A)..... :	45
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic..... :	
- rated prospective short-circuit current "r" (kA) ..... :	3
- rated conditional short-circuit current Iq (kA) ..... :	3
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits ..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:
"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

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1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HN' or 'HA'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

K2-23A x x

I I I >>>	: 0, 1	: Number of NC auxiliary contacts
I I >>>>	: 0, 1	: Number of NO auxiliary contacts

Overload Relay

U12/16 x x x

I I I >>>>	: Setting range 0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I	0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I	2,7 – 4 / 4 – 6 / 6 – 9 / 8 – 11 / 10 – 14 / 13 – 18 /
I I	17 – 23 / 22 – 30 A
I I	
I I >>>>	: M ... With additional quick trip up to 4A (optional)
I	: Q ... Thermic quick trip up to 14A (optional)
I	
I >>>>	: U ... Change over auxiliary contacts
	: A ... Change over auxiliary contacts with autom. Reset
	: E ... 1 NC and 1 NO auxiliary contact

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC

With Late Break Contact in series to coil.

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 45A, 690V AC3 AC4 23A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	3 kA Type '1' 80A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black)	P
	- other: 650°C		N
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	
	- nominal voltage of supply system .....:	400 / 690V	
	- overvoltage category .....:	IV	
	- pollution degree .....:	3	
	- field-in or homogeneous .....:	Inhomogeneous	
	- minimum clearances (mm) .....:	8	
	- measured clearances (mm) .....:	≥10	
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		
	- Ie .....:		
	- minimum clearances L-L/L-A (mm) .....:		
	- measured clearances L-L/L-A (mm) .....:		
	Creepage distances		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) ..... :	6	—
	diameter of thread (mm) ..... :	M4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) ..... :	0,5	—
	number of conductor of the smallest cross section ..... :	1	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) ..... :	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) ..... :	6	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	1,4	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	80		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Overload		P
	conductor of the largest and smallest cross-sectional area (mm²) ..... :	2,5 // 0,5	6 // 1,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional ..... :	1 // 1	1 // 1	—
	diameter of bushing hole (mm) ..... :	9,5 // 6,4	9,5 // 6,4	—
	height between the equipment and the platen (mm) ..... :	279 // 260	279 // 260	—
	mass at the conductor(s) (kg) ..... :	0,7 // 0,3	1,4 // 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	50 // 30	80 // 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors ..... :	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm²) ..... :	0,75	0,5	—
	maximum cross-sectional area of conductor (mm²) ..... :	6	4	—
	number of conductors simultaneously connectable to the terminal ..... :	Acc. Manuf. Instr. 2	 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals: Contactor		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) ..... :	10	—
	diameter of thread (mm) ..... :	M 4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	1,5	—
	number of conductor of the smallest cross section ..... :	2	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	40	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) ..... :	10	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	2	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) ..... :	90		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Contactor		
	conductor of the largest and smallest cross-sectional area (mm^2) ..... :	10 // 2,5	6 // 1,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional ..... :	1 // 1	1 // 1	—
	diameter of bushing hole (mm) ..... :	9,5	9,5 / 6,4	—
	height between the equipment and the platen (mm) ..... :	279	279 / 260	—
	mass at the conductor(s) (kg) ..... :	2 // 0,7	1,4 / 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			
	force (N) ..... :	90 // 50	80 // 40	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors ..... :	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm^2) ..... :	2,5	1,5	—
	maximum cross-sectional area of conductor (mm^2) ..... :	10	6	—
	number of conductors simultaneously connectable to the terminal ..... :	Acc. Manuf. Instr. 2	 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	—
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	—

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise Type AC DC		P
	ambient temperature 10-40 °C .....:	24	—
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		—
	material of enclosure .....:		—
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 37		
	Coils and electromagnets, test conditions:	AC	DC	P
	- rated control supply voltage Us (V) .....:	240	24	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 71	≤ 55	
	Starter	Tested with setting range 22 – 30 A		
	test enclosure W x H x D (mm x mm x mm) .....:	Open Type		
	material of enclosure .....:	None		
	Main circuits, test conditions: *Tested with 30A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	30 (45*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	6 mm²		
	- temperature rise of main circuit terminals (K) ....:	≤ 65		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		
	- cable cross-section (mm²) .....:	1		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC	P
	rated control supply voltage Us (V) .....:	240	24	
	frequency (Hz) .....:	50	DC	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	76	64	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	53	33	P
9.3.3.2.2	Relays and releases Setting Range 22 – 30 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. compensated		
	trip class .....:	10A		
	current setting ..... I_{set} :	22 A	30 A	
	ambient temperature (°C) .....:	24		
	test enclosure W x H x D (mm x mm x mm) .....:	None		
	cable/busbar cross-section (mm²) / (mm) .....:	6		
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	23,1 A No tripping	31,5 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 7:15	36 A 2:30	
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 0:45	45 A 0:15	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	158,4 A 2,3	216 A 2,1	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	Ambient temperature: - 5 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	23,1 A No tripping	31,5 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 25:10	36 A 1:20	—
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 1:04	45 A 0:20	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... :	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10s$ tarting from the cold state; test current; tripping time Tp (s) ..... :	158,4 A 2,8	216A 2,1	—
	Ambient temperature: + 40 °C ..... :			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	23,1 A No tripping	31,5 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 3:40	36 A 3:20	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 0:20	45 A 0:28	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N	—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$ starting from the cold state; test current; tripping time Tp (s) .....:	158,4 A 216 A 2,2 2,4	—
	Limits of operation of three-pole thermal overload relays energized on two poles:		P
	ambient temperature (°C) .....:	25	—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	22 A / 19,8 A 30 A / 27 A No tripping No tripping	—
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	25,3 A / 0 A 34,5 A / 0 A 0:20 0:11	—
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	—
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		—
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	—
	rated operational voltage Ue (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	45A	—
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 740 L2: 740 L3: 738	—
	- test current I/Ie = 1,5 (A) .....:	L1: 78 L2: 77 L3: 78	—
	- power factor/time constant .....:	L1: 0,83 L2: 0,82 L3: 0,83	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	9,8	—
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) .....:	AC4	—
	rated operational voltage Ue (V) .....:	400V	—
	rated operational current Ie (A) or power (kW) ....:	23A	—
	Conditions, make operations AC3/AC4 only:		P

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Clause	Requirement – Test	Result - Remark	Verdict
	- test voltage U/Ue = 1,05 (V) .....:	L1: 425 L2: 424 L3: 425	—
	- test current I/Ie = (A) .....:	L1: 364 L2: 364 L3: 363	—
	- power factor/time constant .....:	L1: 0,45 L2: 0,44 L3: 0,45	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	10	—
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 53 L2: 54 L3: 53	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	—
	rated operational voltage Ue (V) .....:	400	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) ....:	23A	—
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) ....:	L1: 424 L2: 422 L3: 425	—
	- test current I/Ie = (A) ....:	L1: 180 L2: 181 L3: 180	—
	- power factor/time constant ....:	L1: 0,4 L2: 0,4 L3: 0,4	—
	- on-time (ms) ....:	100	—
	- off-time (s) ....:	4	—
	- number of make/break operations ....:	6000	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) ....:		—
	Measured oscillatory frequency (kHz) ....:	L1: 45,5 L2: 46 L3: 46	
	Factor y ....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	utilization category .....:	AC1	—
	rated operational voltage (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	45A	—
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 725 L2: 730 L3: 730	—
	test current (A) .....:	L1: 52 L2: 53 L3: 53	—
	power factor/time constant .....:	L1: 0,82 L2: 0,81 L3: 0,80	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	2,3	—
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	—

9.3.4	**TEST SEQUENCE III**	
	Performance under short-circuit conditions	
9.3.4.2.1	Test at de prospective current "r": U12/16 22 -30A	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type of SCPD .....:	Siemens NH00 gL / gG	—
	ratings of SCPD, co-ordination type 1 .....:	80A / 500V	—
	ratings of SCPD, co-ordination type 2 .....:	-	—
	rated operational current Ie (A) AC-3 .....:	23A	—
	prospective current "r" (kA) .....:	3	—
	test voltage (V) .....:	L1: 545 L2: 543 L3: 545	—
	r.m.s. test current (A) .....:	L1: 3040 L2: 3090 L3: 3110	—
	peak current (A) .....:	L1: 4350 L2: 4360 L3: 3910	—
	power factor	0,9	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 20,1 kA^2s / 2930A L2: 23,6 kA^2s / 2930 A L3: 20,0 kA^2s / 3450 A	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 18,6 kA^2s / 2850 A L2: 23,5 kA^2s / 2850 A L3: 21,3 kA^2s / 3445 A	—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		—
	ratings of SCPD, co-ordination type 1 .....:		—
	ratings of SCPD, co-ordination type 2 .....:		—
	rated operational current Ie (A) AC-3 .....:		—
	prospective current "Iq" (kA) .....:		—
	test voltage (V) .....:	L1: L2: L3:	—
	r.m.s. test current (A) .....:	L1: L2: L3:	—
	peak current (A) .....:	L1: L2: L3:	—
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	—
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	—
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N

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Clause	Requirement – Test	Result - Remark	Verdict
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		P
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	—
	rated operational current Ie (A) max. AC-3 .....:	23	—
	test current (Ie) (A) .....:	184	—
	duration of test: 10 s .....:	10s	—
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
temperature rise dT of part:		**No.**	**dT (K)**	**Required dT (K)**
Main Terminals Contactor (30A)		1	60	65
		3	60	65
		5	65	65

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

Main Terminal Overload Relay (30A)			2	63	65
			4	63	65
			6	63	65
Auxilixary Terminals Contactor (16A)			13	48	65
			14	48	65
Auxiliary Terminal Overload Relay (4A)			95	40	65
			96	35	65
Coil:	240V	50Hz		71	135
	24V + 10%	DC		55	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	12	—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	—
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	—
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	—
	- operating cycles per minute .....:	15	—
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD .....:	25A / 500V	—
	prospective current (kA) .....:	1	—
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	—
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	—
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	—
	time interval between test (min. 3 min) .....:		—
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	—
	time interval between test (min. 3 min) .....:		—
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	—
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

TEST REPORT
EN 60 947-4-1
Low-voltage switchgear and controlgear
Part 4: Contactors and motor-starters
Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K230/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Liebigasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	K2-30Axx + U12/16xxx
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 50A 690V 50-60Hz
		AC3/AC4 30A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K2-30A

K2-30A

IEC947-4-1 AS3947-4-1 VDE0660
EN60947-4-1 AC1 = I_e 50A 690V~

AC2, AC3	220		380	415	500
V~	230	240	400	440	690
kW	8,5	9	15	18	18,5

Made in Austria

c UL us LISTED IND. CONT. EQ. 93B2 600v ac 40amp A600

v	120	200	230	480	600
hp 3ph	5	7,5	10	20	25
hp 1ph 2p	2	3	5	-	-

ASME A17.5 600v ac. 22FLA, 3ph, 500,000 cycles

WIRE 60/75°C Cu ONLY
TIGHT. TORQUE 13.5 lb.-in.
14AWG - 10AWG
14AWG - 8AWG

SUITABLE FOR USE ON A CIRCUIT OF DELIVERING 5000RMS SYM. AMP. 600 VOLTS AC MAXIMUM. MAX. FUSE SIZE 110 AMP.

Overload Relay

U12/16E 4

IEC/EN60947 VDE0660 690V~
Auslöseklasse / Trip class: 10A
Typ "1" 25A 2,7-4A
gL(gG) Typ "2" 10A
600VA max. 4A
0/R
440V~ 95 97
690V~ 95 97
Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac
Max. fuse size 15A
96 98
150v 95 97
600v 95 97
500va max. 4A
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

U12/16A 4

IEC/EN60947 VDE0660 690V~
Auslöseklasse / Trip class: 10A
Typ "1" 25A 2,7-4A
gL(gG) Typ "2" 10A
Hand 690V~
Auto 600VA max. 4A
0/R
96 98
95
Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac
Max. fuse size 15A
96 98
95
500va max. 4A
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

U12/16EM

BENEDIKT & JÄGER
U12/16EM
S. No.

U12/16EQ 4

IEC/EN60947 VDE0660 690V~
Auslöseklasse / Trip class: 10A
Typ "1" 25A 2,7-4A
gL(gG) Typ "2" 10A
600VA max. 4A
0/R
96 98
440V~ 95 97
690V~ 95 97
Made in Austria

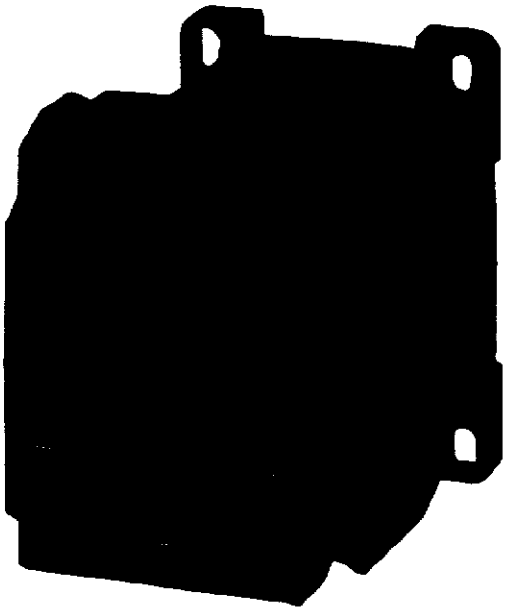
U12/16U 4

IEC/EN60947 VDE0660 690V~
Auslöseklasse / Trip class: 10A
Typ "1" 25A 2,7-4A
gL(gG) Typ "2" 10A
690V~
600VA max. 4A
0/R
96 98
95
Made in Austria

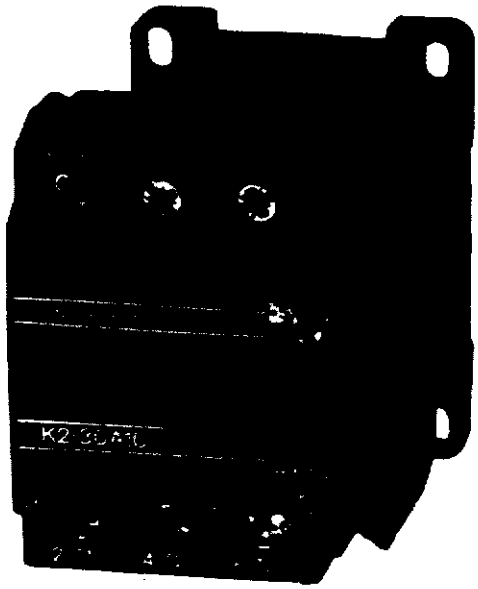
c UL us LISTED IND. CONT. EQ. 93B3
600v ac
Max. fuse size 15A
96 98
95
500va max. 4A
Suitable for use on a circuit capable of delivering not more than 5kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

Photo:

K2-30A10 AC-operated

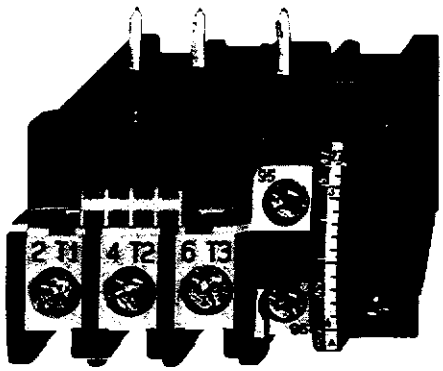


K2-30A10= DC-operated



Overload Relay:

U12/16E



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 1 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit ..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V) ..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	50
- conventional enclosed thermal current Ithe (A) ..... :	50
- rated operational current Ie (A) ..... :	50
- rated uninterrupted Iu (A) ..... :	50
- utilization category..... :	AC1, AC3, AC4
Short-circuit characteristic ..... :	
- rated prospective short-circuit current "r" (kA) ..... :	3
- rated conditional short-circuit current Iq (kA) ..... :	3
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits ..... :	1
- number and kind of contact elements ..... :	1 NO or 1 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:
"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

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1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) Relevant tests have been performed with or without 'snap on auxiliary contact block' Typ 'HN' or 'HA'.

3) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

K2-30A x x

I	I I >>>	: 0, 1	: Number of NC auxiliary contacts
I	I >>>>	: 0, 1	: Number of NO auxiliary contacts

Overload Relay

U12/16 x x x

I I I >>>>	: Setting range	0,12 – 0,18 / 0,18 – 0,27 / 0,27 – 0,4 / 0,4 – 0,6 /
I I		0,6 – 0,9 / 0,8 – 1,2 / 1,2 – 1,8 / 1,8 – 2,7 /
I I		2,7 – 4 / 4 – 6 / 6 – 9 / 8 – 11 / 10 – 14 / 13 – 18 /
I I		17 – 23 / 22 – 30 A
I I		
I I >>>>	: M ... With additional quick trip up to 4A (optional)	
I	: Q ... Thermic quick trip up to 14A (optional)	
I		
I >>>>	: U ... Change over auxiliary contacts	
	: A ... Change over auxiliary contacts with autom. Reset	
	: E ... 1 NC and 1 NO auxiliary contact	

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC

With Late Break Contact in series to coil.

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 50A, 690V AC3 AC4 30A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC4, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	3 kA Type '1' 80A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black)	P
	- other: 650°C		N
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	—
	- nominal voltage of supply system .....:	400 / 690V	—
	- overvoltage category .....:	IV	—
	- pollution degree .....:	3	—
	- field-in or homogeneous .....:	Inhomogeneous	—
	- minimum clearances (mm) .....:	8	—
	- measured clearances (mm) .....:	≥10	—
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		—
	- Ie .....:		—
	- minimum clearances L-L/L-A (mm) .....:		—
	- measured clearances L-L/L-A (mm) .....:		—
	Creepage distances		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Uimp is given as:	8 kV	
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Overload	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4.2	Mechanical strength of terminals		P
	maximum cross-sectional area of conductor (mm²) ..... :	6	—
	diameter of thread (mm) ..... :	M4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		P
	conductor of the smallest cross-sectional area (mm²) ..... :	0,5	—
	number of conductor of the smallest cross section ..... :	1	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,3	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		P
	force (N) ..... :	30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		P
	conductor of the largest cross-sectional area (mm²) ..... :	6	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	1,4	—

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	80		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Flexion test	Overload		P
	conductor of the largest and smallest cross-sectional area (mm^2) ..... :	2,5 // 0,5	6 // 1,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional ..... :	1 // 1	1 // 1	—
	diameter of bushing hole (mm) ..... :	9,5 // 6,4	9,5 // 6,4	—
	height between the equipment and the platen (mm) ..... :	279 // 260	279 // 260	—
	mass at the conductor(s) (kg) ..... :	0,7 // 0,3	1,4 // 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit			P
	Pull-out test			P
	force (N) ..... :	50 // 30	80 // 30	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit			P
8.1.7.2	Connecting capacity			P
	type of conductors ..... :	Rigid	Flexible	—
	minimum cross-sectional area of conductor (mm^2) ..... :	0,75	0,5	—
	maximum cross-sectional area of conductor (mm^2) ..... :	6	4	—
	number of conductors simultaneously connectable to the terminal ..... :	Acc. Manuf. Instr. 2	 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.2.4	Mechanical properties of terminals: Contactor		
8.2.4.2	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm²) ..... :	10	—
	diameter of thread (mm) ..... :	M 4	—
	torque (Nm) ..... :	1,2	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	1,5	—
	number of conductor of the smallest cross section ..... :	2	—
	diameter of bushing hole (mm) ..... :	6,4	—
	height between the equipment and the platen (mm) ..... :	260	—
	mass at the conductor(s) (kg) ..... :	0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	40	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) ..... :	10	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	90	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test	Contactor	
	conductor of the largest and smallest cross-sectional area (mm^2) .....:	10 // 2,5 6 // 1,5	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 // 1 1 // 1	—
	diameter of bushing hole (mm) .....:	9,5 9,5 / 6,4	—
	height between the equipment and the platen (mm) .....:	279 279 / 260	—
	mass at the conductor(s) (kg) .....:	2 // 0,7 1,4 / 0,4	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	90 // 50 80 // 40	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.1.7.2	Connecting capacity		P
	type of conductors .....:	Rigid Flexible	—
	minimum cross-sectional area of conductor (mm^2) .....:	2,5 1,5	—
	maximum cross-sectional area of conductor (mm^2) .....:	10 6	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 2T1, 4T2, 6T3 95-96, 97-98, 13-14, 21-22, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	—
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	—
9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise Type AC DC		P
	ambient temperature 10-40 °C .....:	24	—
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:		—
	material of enclosure .....:		—
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:			
	- conventional enclosed thermal current Ithe (A) .:			
	- cable/busbar cross-section (mm²) / (mm) .....:			
	- temperature rise of main circuit terminals (K) ....:	<		
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		
	- cable cross-section (mm²) .....:	2,5		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 37		
	Coils and electromagnets, test conditions:	AC	DC	P
	- rated control supply voltage Us (V) .....:	240	24	
	- Class of insulating material .....:	F	F	
	- temperature rise of coil and electromagnets (K) :	≤ 71	≤ 55	
	Starter	Tested with setting range 22 – 30 A		
	test enclosure W x H x D (mm x mm x mm) .....:	Open Type		
	material of enclosure .....:	None		
	Main circuits, test conditions: *Tested with 30A because of max. Power consumption of Overload Relay			P
	- conventional thermal current Ith (A) .....:	30 (45*)		
	- cable/busbar cross-section (mm²) / (mm) .....:	6 mm²		
	- temperature rise of main circuit terminals (K) ....:	≤ 65		
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		
	- cable cross-section (mm²) .....:	1		
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40		
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC	P
	rated control supply voltage Us (V) .....:	240	24	
	frequency (Hz) .....:	50	DC	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	76	64	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	53	33	P
9.3.3.2.2	Relays and releases Setting Range 22 – 30 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. compensated		
	trip class .....:	10A		
	current setting .....I_{set} :	22 A	30 A	
	ambient temperature (°C) .....:	24		
	test enclosure W x H x D (mm x mm x mm) .....:	None		
	cable/busbar cross-section (mm²) / (mm) .....:	6		
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	23,1 A No tripping	31,5 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 7:15	36 A 2:30	
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 0:45	45 A 0:15	
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$, starting from the cold state; test current; tripping time Tp (s) .....:	158,4 A 2,3	216 A 2,1	

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	Ambient temperature: - 5 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	23,1 A No tripping	31,5 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 25:10	36 A 1:20	—
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 1:04	45 A 0:20	—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N		—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10s$ tarting from the cold state; test current; tripping time Tp (s) .....:	158,4 A 2,8	216A 2,1	—
	Ambient temperature: + 40 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	23,1 A No tripping	31,5 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	26,4 A 3:40	36 A 3:20	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	33 A 0:20	45 A 0:28	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time .....:	N	—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $2 < Tp \leq 10$ starting from the cold state; test current; tripping time Tp (s) .....:	158,4 A 216 A 2,2 2,4	—
	Limits of operation of three-pole thermal overload relays energized on two poles:		P
	ambient temperature (°C) .....:	25	—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	22 A / 19,8 A 30 A / 27 A No tripping No tripping	—
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	25,3 A / 0 A 34,5 A / 0 A 0:20 0:11	—
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		P
	- verification by measurement of clearances instead of testing		N
	- rated impulse withstand voltage (V) .....:	8000	—
	- test Uimp main circuits (kV) .....:	9,8 / 7	P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V) .....:		—
	- main circuits, test voltage for 1 min (V) .....:		N
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	—
	rated operational voltage Ue (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	50A	—
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 740 L2: 740 L3: 738	—
	- test current I/Ie = 1,5 (A) .....:	L1: 78 L2: 77 L3: 78	—
	- power factor/time constant .....:	L1: 0,83 L2: 0,82 L3: 0,83	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	9,8	—
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P
	utilization category (AC-3 or AC-4) .....:	AC4	—
	rated operational voltage Ue (V) .....:	400V	—
	rated operational current Ie (A) or power (kW) ....:	30A	—
	Conditions, make operations AC3/AC4 only:		P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	- test voltage U/Ue = 1,05 (V) .....:	L1: 425 L2: 424 L3: 425	—
	- test current I/Ie = (A) .....:	L1: 364 L2: 364 L3: 363	—
	- power factor/time constant .....:	L1: 0,45 L2: 0,44 L3: 0,45	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	10	—
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 53 L2: 54 L3: 53	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC4	—
	rated operational voltage Ue (V) .....:	400	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	rated operational current Ie (A) or power (kW) ....:	30A	—
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 424 L2: 422 L3: 425	—
	- test current I/Ie = (A) .....:	L1: 180 L2: 181 L3: 180	—
	- power factor/time constant .....:	L1: 0,4 L2: 0,4 L3: 0,4	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	4	—
	- number of make/break operations .....:	6000	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 45,5 L2: 46 L3: 46	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	utilization category .....:	AC1	—
	rated operational voltage (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	50A	—
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 725 L2: 730 L3: 730	—
	test current (A) .....:	L1: 52 L2: 53 L3: 53	—
	power factor/time constant .....:	L1: 0,82 L2: 0,81 L3: 0,80	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	2,3	—
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	—

9.3.4	**TEST SEQUENCE III**	
	Performance under short-circuit conditions	
9.3.4.2.1	Test at de prospective current "r": U12/16 22 -30A	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type of SCPD .....:	Siemens NH00 gL / gG	—
	ratings of SCPD, co-ordination type 1 .....:	80A / 500V	—
	ratings of SCPD, co-ordination type 2 .....:	-	—
	rated operational current Ie (A) AC-3 .....:	30A	—
	prospective current "r" (kA) .....:	3	—
	test voltage (V) .....:	L1: 545 L2: 543 L3: 545	—
	r.m.s. test current (A) .....:	L1: 3040 L2: 3090 L3: 3110	—
	peak current (A) .....:	L1: 4350 L2: 4360 L3: 3910	—
	power factor	0,9	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 20,1 kA^2s / 2930A L2: 23,6 kA^2s / 2930 A L3: 20,0 kA^2s / 3450 A	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 18,6 kA^2s / 2850 A L2: 23,5 kA^2s / 2850 A L3: 21,3 kA^2s / 3445 A	—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		—
	ratings of SCPD, co-ordination type 1 .....:		—
	ratings of SCPD, co-ordination type 2 .....:		—
	rated operational current Ie (A) AC-3 .....:		—
	prospective current "Iq" (kA) .....:		—
	test voltage (V) .....:	L1: L2: L3:	—
	r.m.s. test current (A) .....:	L1: L2: L3:	—
	peak current (A) .....:	L1: L2: L3:	—
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	—
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	—
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	—
	rated operational current Ie (A) max. AC-3 .....:	30	—
	test current (Ie) (A) .....:	240	—
	duration of test: 10 s .....:	10s	—
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			**P**
temperature rise dT of part:		**No.**	**dT (K)**	**Required dT (K)**
Main Terminals Contactor (30A)		1	60	65
		3	60	65
		5	65	65

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

Main Terminal Overload Relay (30A)			2	63	65
			4	63	65
			6	63	65
Auxilixary Terminals Contactor (16A)			13	48	65
			14	48	65
Auxiliary Terminal Overload Relay (4A)			95	40	65
			96	35	65
Coil:	240V	50Hz		71	135
	24V + 10%	DC		55	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	12	—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	—
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	—
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	—
	- operating cycles per minute .....:	15	—
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD .....:	25A / 500V	—
	prospective current (kA) .....:	1	—
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	—
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	—
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	—
	time interval between test (min. 3 min) .....:		—
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	—
	time interval between test (min. 3 min) .....:		—
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	—
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

arsenal research
Ein Unternehmen der Austrian Research Centers.

TEST REPORT
EN 60 947-4-1
Low-voltage switchgear and controlgear
Part 4: Contactors and motor-starters
Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K85/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	K85Axx + U85x
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 150A 690V 50-60Hz
		AC3/AC4 85A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K85A

1 L1 3 L2 5 L3

K85

IEC/EN60947-4-1
VDE0660

AC1 I_e 150A U_i 850V~
AC2, AC3

220 - 230V~	25kW
240V~	27kW
380 - 400V~	45kW
415 - 440V~	49kW
500V~	55kW
660 - 690V~	55kW

Made in Austria

WIRE 75°C Cu ONLY
TIGHTENING TORQUE 162 lb.-in.
3 AWG - 0 AWG SINGLE
SUITABLE FOR USE ON A CIRCUIT
CAPABLE OF DELIVERING NOT
MORE THAN 10000 RMS
SYMMETRICAL AMPERES,
600 VOLTS MAXIMUM
WHEN PROTECTED BY A
FUSE RATED 300 AMP.

LISTED IND. CONT. EQ. 9382

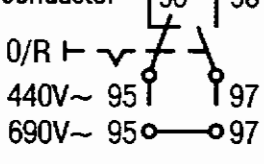
c UL us	Motor load 3ph ac	1ph ac
115 v	15 hp	8 hp
230 v	35 hp	20 hp
460 v	65 hp	-
575 v	85 hp	-

600v 125 amp
Aux. cont. A600

2 T1 4 T2 6 T3

Overload Relay U85 90

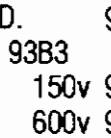
IEC/EN60947 VDE0660 750V~
Auslöseklasse / Trip class: 10A
entspr. Leitung **60-90A**
adequate to conductor



600VA
max. 4A

Made in Austria

c UL us LISTED IND. CONT. EQ. 93B3
600v ac 150v 95 97
Fuse size 600v 95 97
max. **300A** 500va max. 4A

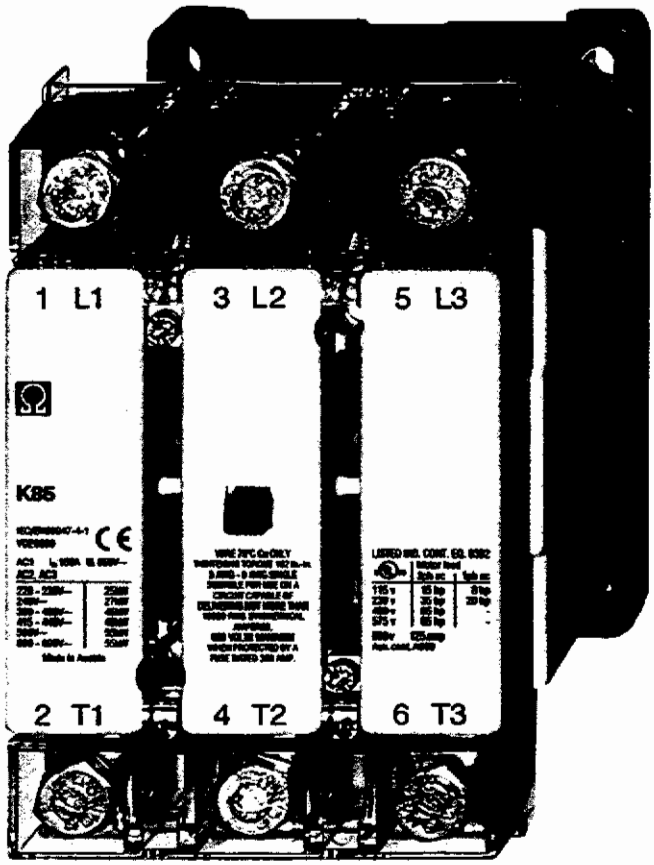


Suitable for use on a circuit capable of delivering not more than 10kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

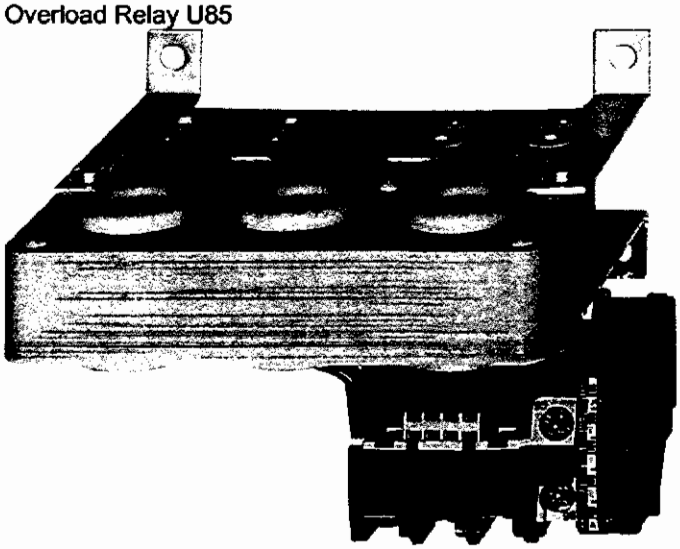
ME20

Photo:

Contactor K85



Overload Relay U85



Test item particulars:	
- method of operation	: Magnetic
- switching positions	: ON-OFF
- number of poles.....Contactor:	3 Main 4 Aux
- kind of current	: AC
- number of phases	: 3
- rated frequency (Hz)	: 50-60
- number of positions of main contacts	: 2
Rated and limiting values, main circuit	:
- rated operational voltage Ue (V)	: 690
- rated insulation voltage Ui (V)	: 690
- rated impulse withstand voltage Uimp (kV)	: 8
- conventional free air thermal current Ith (A)	: 150
- conventional enclosed thermal current Ithe (A)	: 150
- rated operational current Ie (A)	: 150
- rated uninterrupted Iu (A)	: 150
- utilization category	: AC1, AC3
Short-circuit characteristic	:
- rated prospective short-circuit current "r" (kA)	: 5
- rated conditional short-circuit current Iq (kA)	: 5
Rated and limiting values, auxiliary circuits	: For Contactor
- rated operational voltage (V)	: 240
- rated frequency (Hz)	: 50-60
- number of circuits	: Max. 4
- number and kind of contact elements	: 2 NO and 2 NC
Co-ordination of short-circuit protective devices	: Type "1"
- kind of protective device	: Fuse
Possible test case verdicts:	
- test case does not apply to the test object	: N(.A.)
- test object does meet the requirement	: P(ass)
- test object does not meet the requirement	: F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

K85A x x x

I I I >>>>	: =	: DC Supply (optional)
I I >>>>	: 0, 1, 2, 3, 4	: Number of NC auxiliary contacts
I >>>>	: 0, 1, 2, 3, 4	: Number of NO auxiliary contacts

Overload Relay

U85 x

I >>>>	: Setting range	60 – 90 / 80 – 120 A

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC

With Late Break Contact in series to coil.

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 150A, 690V AC3 85A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	5 kA Type '1' 250A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: ~~850~~ / 960°C	Housing (black) Cover (grey)	P
	- other: 650°C		N
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	
	- nominal voltage of supply system .....:	400 / 690V	
	- overvoltage category .....:	IV	
	- pollution degree .....:	3	
	- field-in or homogeneous .....:	Inhomogeneous	
	- minimum clearances (mm) .....:	8	
	- measured clearances (mm) .....:	≥10	
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		
	- Ie .....:		
	- minimum clearances L-L/L-A (mm) .....:		
	- measured clearances L-L/L-A (mm) .....:		
	Creepage distances		
	Uimp is given as:	8 kV	

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Clause	Requirement – Test	Result - Remark	Verdict
	- material group or CTI .....:	Min. III b	
	- minimum creepage distances (mm) .....:	10	
	- measured creepage distances (mm) .....:	≥ 12,5	
	Uimp is not given:		N
	- material column a or b .....:		
	- minimum creepage distances (mm) .....:		
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Contactor	
8.2.4.2	Mechanical strength of terminals		

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Clause	Requirement – Test	Result - Remark	Verdict
	maximum cross-sectional area of conductor (mm²) ..... :	70	
	diameter of thread (mm) ..... :	M 8	
	torque (Nm) ..... :	3,5	
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	10	
	number of conductor of the smallest cross section ..... :	1	
	diameter of bushing hole (mm) ..... :	9,5	
	height between the equipment and the platen (mm) ..... :	279	
	mass at the conductor(s) (kg) ..... :	2	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	90	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) ..... :	70	
	number of conductor of the largest cross-sectional ..... :	1	
	diameter of bushing hole (mm) ..... :	19,1	
	height between the equipment and the platen (mm) ..... :	368	
	mass at the conductor(s) (kg) ..... :	14	

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Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	285	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test	Contactor	
	conductor of the largest and smallest cross-sectional area (mm²) .....:	10 70	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 1	—
	diameter of bushing hole (mm) .....:	9,5 19,1	—
	height between the equipment and the platen (mm) .....:	279 368	—
	mass at the conductor(s) (kg) .....:	2 14	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	90 285	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.1.7.2	Connecting capacity		P
	type of conductors .....:	Semi Rigid Flexible	—
	minimum cross-sectional area of conductor (mm²) .....:	10 16	—
	maximum cross-sectional area of conductor (mm²) .....:	70 50	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2 2	—

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Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	- 95-96, 97-98, 13-14, 21- 22, 31-32, 43-44, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

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Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

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Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	

9.3.1.a	**TEST SEQUENCE I**			
9.3.3.3	Temperature rise	Type AC	DC	P
	ambient temperature 10-40 °C .....:	25		
	Contactor			N
	test enclosure W x H x D (mm x mm x mm) .....:	350 x 175 x 145		
	material of enclosure .....:	Metal		
	Main circuits, test conditions: * Tested with 170A			N

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Clause	Requirement – Test	Result - Remark	Verdict
	- conventional thermal current Ith (A) .....:	150	
	- conventional enclosed thermal current Ithe (A) .:	150	
	- cable/busbar cross-section (mm²) / (mm) .....:	50 / 70*	
	- temperature rise of main circuit terminals (K) ....:	≤ 60	
	Auxiliary circuit, test conditions:		P
	- rated operation current Ie (A) .....:	16	
	- cable cross-section (mm²) .....:	2,5	
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 42	
	Coils and electromagnets, test conditions:	AC DC	P
	- rated control supply voltage Us (V) .....:	240 24	
	- Class of insulating material .....:	F F	
	- temperature rise of coil and electromagnets (K) :	≤ 70 ≤ 60	
	Starter	Tested with setting range 60 – 90 A	
	test enclosure W x H x D (mm x mm x mm) .....:	Open Type	
	material of enclosure .....:	None	
	Main circuits, test conditions: *AC1 rating 150A tested with 170A		P
	- conventional thermal current Ith (A) .....:	150 *	
	- cable/busbar cross-section (mm²) / (mm) .....:	50 / 70* mm²	
	- temperature rise of main circuit terminals (K) ....:	≤ 60 Temp. Rise on Contactor terminals only. Worst Case AC1 150A (Tested with 170A) istead of AC3 85A	
	Overload relay, auxiliary circuit, test conditions:		P
	- rated operation current Ie (A) .....:	4	
	- cable cross-section (mm²) .....:	1	
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40	
9.3.3.2	Operating limits		
9.3.3.2.1	Power-operated equipment:	AC DC	P

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Clause	Requirement – Test	Result - Remark		Verdict
	rated control supply voltage Us (V) .....:	240	24	—
	frequency (Hz) .....:	50	DC	—
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	76	65	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	57	25	P
9.3.3.2.2	Relays and releases Setting Range 60 – 90 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. Compensated with current Transformer		—
	trip class .....:	20		—
	current setting ..... I_{set} :	60 A	90 A	—
	ambient temperature (°C) .....:	24		—
	test enclosure W x H x D (mm x mm x mm) .....:	None		—
	cable/busbar cross-section (mm²) / (mm) .....:			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	63 A No tripping	94,5 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	72 A 1:55	108 A 1:15	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	90 A 0:15	135 A 0:11	—

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Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 6 < Tp ≤ 20, starting from the cold state; test current; tripping time Tp (s) .....:	432 A 13	648 A 19	
	Ambient temperature: - 5 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	63 A No tripping	94,5 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	72 A 15:40	108 A 2:55	
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	90 0:55	135 A 0:40	
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) 6 < Tp ≤ 20s tarting from the cold state; test current; tripping time Tp (s) .....:	432 A 16	648 A 20	
	Ambient temperature: + 40 °C .....:			
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	63 A No tripping	94,5 A No tripping	
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	72 A 1:20	108 A 1:30	

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Clause	Requirement – Test	Result - Remark		Verdict
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	90 A 0:12	135 A 0:40	
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $6 < Tp \leq 20$ starting from the cold state; test current; tripping time Tp (s) ..... :	432 A 15	648 A 19	
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) ..... :	25		
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state ..... :	64 A / 54 A No tripping	90 A / 81 A No tripping	
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	69 A / 0 A 1:30	103,5 A / 0 A 0:55	
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):			P
	- verification by measurement of clearances instead of testing			N
	- rated impulse withstand voltage (V) ..... :	8000		
	- test Uimp main circuits (kV) ..... :	9,8 / 7		P
	- test Uimp auxiliary circuits (kV) ..... :	9,8 / 7		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):			N
	- rated insulation voltage (V) ..... :			
	- main circuits, test voltage for 1 min (V) ..... :			N

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Clause	Requirement – Test	Result - Remark	Verdict
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N

9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	
	rated operational voltage Ue (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	150A	
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 740 L2: 739 L3: 739	
	- test current I/Ie = 1,5 (A) .....:	L1: 262 L2: 262 L3: 263	
	- power factor/time constant .....:	L1: 0,8 L2: 0,79 L3: 0,8	
	- on-time (ms) .....:	160	
	- off-time (s) .....:	9,8	
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P

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Clause	Requirement – Test	Result - Remark	Verdict
	utilization category (AC-3 or AC-4) .....:	AC3	
	rated operational voltage Ue (V) .....:	400V	
	rated operational current Ie (A) or power (kW) ....:	85A	
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 426 L2: 423 L3: 425	
	- test current I/Ie = (A) .....:	L1: 1115 L2: 1114 L3: 1115	
	- power factor/time constant .....:	L1: 0,32 L2: 0,32 L3: 0,31	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	30	
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		
	Measured oscillatory frequency (kHz) .....:	L1: 67 L2: 68 L3: 67	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC3	
	rated operational voltage Ue (V) .....:	400	
	rated operational current Ie (A) or power (kW) ....:	85A	
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 425 L2: 424 L3: 426	
	- test current I/Ie = (A) .....:	L1: 221 L2: 222 L3: 221	
	- power factor/time constant .....:	L1: 0,32 L2: 0,33 L3: 0,33	
	- on-time (ms) .....:	100	
	- off-time (s) .....:	4	
	- number of make/break operations .....:	6000	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		
	Measured oscillatory frequency (kHz) .....:	L1: 49 L2: 48 L3: 48	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	
	rated operational voltage (V) .....:	690	
	rated operational current Ie (A) or power (kW) ....:	150A	
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 740 L2: 739 L3: 739	
	test current (A) .....:	L1: 172 L2: 172 L3: 173	
	power factor/time constant .....:	L1: 0,81 L2: 0,8 L3: 0,81	
	- on-time (ms) .....:	160	
	- off-time (s) .....:	4,8	
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	
9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r":		
	type of SCPD .....:	Siemens NH2 gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	250A / 500V	
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	85A	
	prospective current "r" (kA) .....:	5	
	test voltage (V) .....:	L1: 421 L2: 421 L3: 423	
	r.m.s. test current (A) .....:	L1: 5010 L2: 5070 L3: 5090	
	peak current (A) .....:	L1: 7440 L2: 7920 L3: 6180	
	power factor	0,7	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 473 kA^2s / 6700A L2: 529 kA^2s / 6570 A L3: 549 kA^2s / 5700 A	
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 474 kA^2s / 6335 A L2: 465 kA^2s / 6730 A L3: 558 kA^2s / 6890 A	
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P

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Clause	Requirement – Test	Result - Remark	Verdict
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		
	ratings of SCPD, co-ordination type 1 .....:		
	ratings of SCPD, co-ordination type 2 .....:		
	rated operational current Ie (A) AC-3 .....:		
	prospective current "Iq" (kA) .....:		
	test voltage (V) .....:	L1: L2: L3:	
	r.m.s. test current (A) .....:	L1: L2: L3:	
	peak current (A) .....:	L1: L2: L3:	
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	

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Clause	Requirement – Test	Result - Remark	Verdict
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		P
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	
	rated operational current Ie (A) max. AC-3 .....:	85	
	test current (Ie) (A) .....:	680	
	duration of test: 10 s .....:	10s	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements			P
[illegible]		[illegible]	[illegible]	[illegible]
Main Terminals Contactor (170A)		1	58	70
		3	59	70
		5	60	70
		4	59	70
Auxilixary Terminals Contactor (16A)		13	41	65
		14	42	65
		43	40	65
Auxiliary Terminal Overload Relay (4A)		95	40	65
		96	35	65
Coil:	240V 50Hz		70	135
	24V + 10% DC		60	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- on-time (ms) .....:	300	
	- operating cycles per minute .....:	6	
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	
	rated operational voltage Ue (V) .....:	240	
	rated operational current Ie (A) or power (kW) ....:	12	
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	
	- operating cycles per minute .....:	15	
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		
	rated operational voltage Ue (V) .....:		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	
	ratings of SCPD .....:	25A / 500V	
	prospective current (kA) .....:	1	
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	
	time interval between test (min. 3 min) .....:		
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	
	time interval between test (min. 3 min) .....:		
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P

arsenal research

Ein Unternehmen der Austrian Research Centers.

TEST REPORT

EN 60 947-4-1

Low-voltage switchgear and controlgear

Part 4: Contactors and motor-starters

Section 1: Electromechanical contactors and motor-starters

Report reference No.	:	2.03.00356.1.0-K110/B&J
Tested by (+ signature)	:	Ing.J.Ainetter
Approved by (+ signature)	:	Ing.K.Farthofer
Date of issue	:	02.02.2004
Testing laboratory	:	Österreichische Forschungs- und Prüfzentrum Arsenal Ges.m.b.H
Address	:	A – 1031 Vienna, Faradaygasse 3
Testing location	:	as above
Applicant	:	Benedict GmbH (Ω Benedikt & Jäger)
Address	:	A – 1220 Vienna, Lieblgasse 7
Standard	:	EN 60 947-4-1:2000-11
Test Report Form No.	:	69474-1A
Master TRF	:	reference No. 69474-1A, dated 95-07
Copyright blank test report	:	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA).
Test procedure	:	CB-scheme
Procedure deviation	:	N.A.
Non-standard test method	:	N.A.
Type of test object	:	Motor-Starter
Trademark	:	Ω, Benedikt & Jäger
Model/type reference	:	K110Axx + U85x
Manufacturer	:	Ω Benedikt & Jäger
Rating	:	AC1 170A 690V 50-60Hz
		AC3/AC4 110A 400V 50-60Hz
		AC15 12A 240V 50-60Hz

Copy of marking plate

Contactor K110A

1 L1 3 L2 5 L3

K110

IEC/EN60947-4-1
VDE0660

AC1 I_{th} 170A U_i 850V~
AC2, AC3

220 - 230V~	33kW
240V~	35kW
380 - 400V~	55kW
415 - 440V~	63kW
500V~	75kW
660 - 690V~	55kW

Made in Austria

WIRE 75°C Cu ONLY
TIGHTENING TORQUE 162 lb.-in.
3 AWG - 0 AWG SINGLE
SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 10000 RMS SYMMETRICAL AMPERES, 600 VOLTS MAXIMUM WHEN PROTECTED BY A FUSE RATED 300 AMP.

LISTED IND. CONT. EQ. 9382

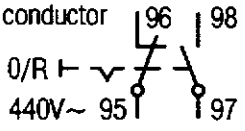
c UL us	Motor load 3ph ac	1ph ac
115 v	-	10 hp
200 v	30 hp	20 hp
230 v	40 hp	20 hp
460 v	75 hp	-
575 v	100 hp	-

600v 125 amp
Aux. cont. A600

2 T1 4 T2 6 T3

Overload Relay U85 90

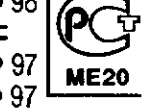
IEC/EN60947 VDE0660 750V~
Auslöseklasse / Trip class: 10A
entspr. Leitung **60-90A**
adequate to conductor



600VA
max. 4A

Made in Austria

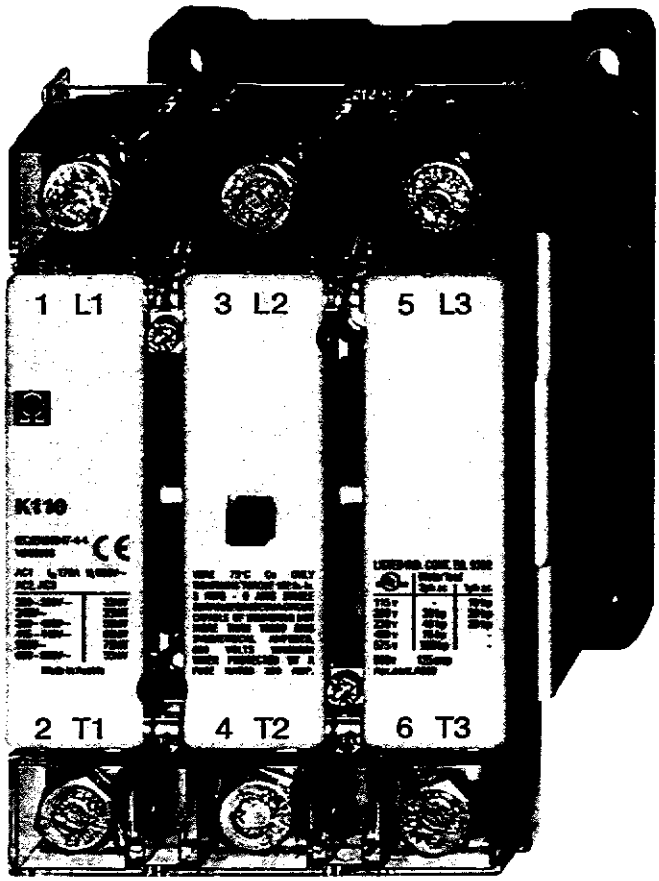
c UL us LISTED IND. CONT. EQ. 93B3
600v ac 150v 95 97
Fuse size 600v 95 97
max. **300A** 500va max. 4A



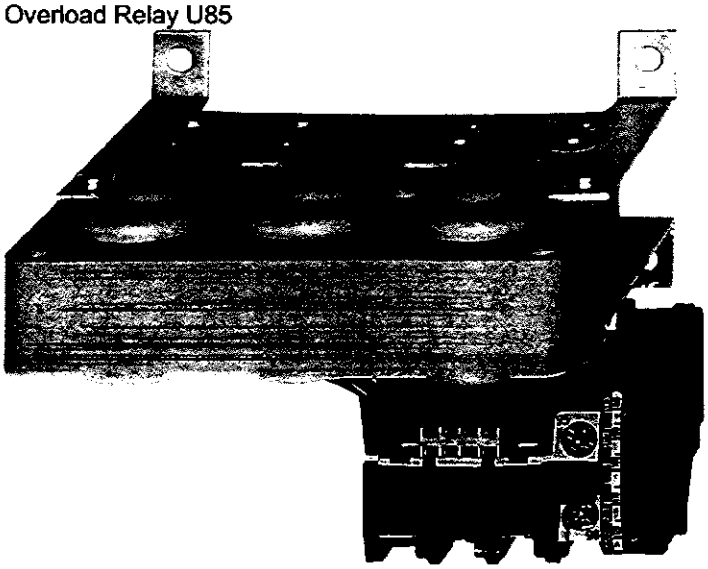
Suitable for use on a circuit capable of delivering not more than 10kA rms. sym. 600v max.
Numbers on dial are full load motor currents.
Tripping current is 125% of numbers on dial.

Photo:

Contactor K110



Overload Relay U85



Test item particulars:	
- method of operation ..... :	Magnetic
- switching positions ..... :	ON-OFF
- number of poles.....Contactor:	3 Main 4 Aux
- kind of current..... :	AC
- number of phases..... :	3
- rated frequency (Hz)..... :	50-60
- number of positions of main contacts..... :	2
Rated and limiting values, main circuit..... :	
- rated operational voltage Ue (V) ..... :	690
- rated insulation voltage Ui (V)..... :	690
- rated impulse withstand voltage Uimp (kV)..... :	8
- conventional free air thermal current Ith (A)..... :	170
- conventional enclosed thermal current Ithe (A) ..... :	170
- rated operational current Ie (A)..... :	170
- rated uninterrupted Iu (A)..... :	170
- utilization category..... :	AC1, AC3
Short-circuit characteristic..... :	
- rated prospective short-circuit current "r" (kA) ..... :	5
- rated conditional short-circuit current Iq (kA) ..... :	5
Rated and limiting values, auxiliary circuits..... :	For Contactor
- rated operational voltage (V)..... :	240
- rated frequency (Hz)..... :	50-60
- number of circuits ..... :	Max. 4
- number and kind of contact elements ..... :	2 NO and 2 NC
Co-ordination of short-circuit protective devices ..... :	Type "1"
- kind of protective device..... :	Fuse
Possible test case verdicts:	
- test case does not apply to the test object..... :	N(.A.)
- test object does meet the requirement..... :	P(ass)
- test object does not meet the requirement..... :	F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

1) Based on the decision of the applicant, some of the tests of Test Sequences I and II may have been performed under more severe conditions than required in the stanard. In case of, relevant values for equipment under test are stated in test report.

2) The test item is corresponding to the requirements of IEC 60947-4-1 Ed. 2.0 (2000-11) + A1 (2002-09).

Ordering key:

Contactor

K110A x x x

I I I >>>>	: =	: DC Supply (optional)
I I >>>>	: 0, 1, 2, 3, 4	: Number of NC auxiliary contacts
I >>>>	: 0, 1, 2, 3, 4	: Number of NO auxiliary contacts

Overload Relay

U85 x

I >>>>	: Setting range	60 – 90 / 80 – 120 A

Control Circiut Voltage:

6 – 550V	50Hz
6 – 600V	60Hz
12 – 250V	DC

With Late Break Contact in series to coil.

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	**MARKING:**		
	Data shall be preferably marked on the equipment:		P
	c - number of this standard (IEC/EN60947-4-1)	IEC947-4-1	P
	k - IP code, in case of an enclosed equipment	-	N
	Data shall be included on the nameplate, or on the equipment, or in the manufacturer's published literature:		
	d - rated operational voltages	690V	P
	e – utilization category and rated operational currents (or rated powers), at the rated operational voltages of the equipment	AC1 170A, 690V AC3 110A, 400V Contactor AC15 12A, 240V	P
	f - either the value of the rated frequency/ies, or the indication d.c. (or symbol) .....:	50-60Hz	P
	g - rated duty with the indication of the class of intermittent duty, if any		N
	Associated values:		
	h - rated marking and breaking capacities (these indications may be replaced, where applicable, by the indication of the utilization category)	AC1, AC3, AC15	P
	Safety an installation:		
	i - rated insulation voltage	690V	P
	j - rated impulse withstand voltage	8 kV	P
	l – pollution degree	3	P
	m - rated conditional short-circuit current and type of co-ordination of contactor or starter and type, current rating and characteristics of the associated SCPD:		P
	m - rated conditional short-circuit current of the combination starter or the protected starter	5 kA Type '1' 250A fuse gL/gG	P
	n – switching overvoltages	≤ 8 kV	P
	Control circuits: Contactor		
	The following information concerning control circuits shall be placed either on the coil or on the equipment:		
	o - rated control circuit voltage (Uc), nature of current and rated frequency	6-550V 50Hz / 6-600V 60Hz 12-250V =	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	p - if necessary, nature of current, rated frequency and rated control supply voltages (Us)	Us = Uc	P
	Auxiliary circuits: Contactor		
	r - ratings of auxiliary circuits	AC15 12A, 240V	P
	Overload relays and releases:		
	s - characteristics according to 5.7	P	P
8.1	**CONSTRUCTION: Overload relay**		
8.1.1	Materials		P
	Resistance to abnormal heat and fire		P
	-parts retain current-carrying parts: 850 / 960°C	Housing (black) Cover (grey)	P
	- other: 650°C		N
8.1.2	Current-carrying parts and their connection		P
8.1.3	Clearances		P
	Uimp is given as:	8kV	P
	- max. value of rated operational voltage to earth :	600V	—
	- nominal voltage of supply system .....:	400 / 690V	—
	- overvoltage category .....:	IV	—
	- pollution degree .....:	3	—
	- field-in or homogeneous .....:	Inhomogeneous	—
	- minimum clearances (mm) .....:	8	—
	- measured clearances (mm) .....:	≥10	—
	Uimp is not given:		N
	- rated insulation voltage Ui (V) .....:		—
	- Ie .....:		—
	- minimum clearances L-L/L-A (mm) .....:		—
	- measured clearances L-L/L-A (mm) .....:		—
	Creepage distances		
	Uimp is given as:	8 kV	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	- material group or CTI .....:	Min. III b	—
	- minimum creepage distances (mm) .....:	10	—
	- measured creepage distances (mm) .....:	≥ 12,5	—
	Uimp is not given:		N
	- material column a or b .....:		—
	- minimum creepage distances (mm) .....:		—
	- measured creepage distances (mm)		
8.1.4	Actuator		N
8.1.4.1	Insulation		N
8.1.4.2	Direction		N
8.1.4.3	Mounting		N
8.1.5	Indication of contact position		N
8.1.5.1	Indication means		N
8.1.5.2	Indication by the actuator		N
8.1.6	Additional safety requirements for equipment with isolating function		N
8.1.7	Terminals		P
8.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	P
8.2.4	Mechanical properties of terminals:	Contactor	
8.2.4.2	Mechanical strength of terminals		

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	maximum cross-sectional area of conductor (mm²) ..... :	70	—
	diameter of thread (mm) ..... :	M 8	—
	torque (Nm) ..... :	3,5	—
	5 times on 2 separate clamping units		P
8.2.4.3	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm²) ..... :	10	—
	number of conductor of the smallest cross section ..... :	1	—
	diameter of bushing hole (mm) ..... :	9,5	—
	height between the equipment and the platen (mm) ..... :	279	—
	mass at the conductor(s) (kg) ..... :	2	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.2.4.4	Pull-out test		
	force (N) ..... :	90	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test		
	conductor of the largest cross-sectional area (mm²) ..... :	70	—
	number of conductor of the largest cross-sectional ..... :	1	—
	diameter of bushing hole (mm) ..... :	19,1	—
	height between the equipment and the platen (mm) ..... :	368	—
	mass at the conductor(s) (kg) ..... :	14	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	285	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Flexion test	Contactor	
	conductor of the largest and smallest cross-sectional area (mm²) .....:	10 70	—
	number of conductor of the smallest cross sectional, number of conductor of the largest cross sectional .....:	1 1	—
	diameter of bushing hole (mm) .....:	9,5 19,1	—
	height between the equipment and the platen (mm) .....:	279 368	—
	mass at the conductor(s) (kg) .....:	2 14	—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) .....:	90 285	—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
8.1.7.2	Connecting capacity		P
	type of conductors .....:	Semi Rigid Flexible	—
	minimum cross-sectional area of conductor (mm²) .....:	10 16	—
	maximum cross-sectional area of conductor (mm²) .....:	70 50	—
	number of conductors simultaneously connectable to the terminal .....:	Acc. Manuf. Instr. 2 2	—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.7.3	Connection		P
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
8.1.7.4	Terminal identification and marking		P
	terminal intended exclusively for the neutral conductor		N
	protective earth terminal		N
	other terminals - Main circuit:: - Auxiliary circuit	 - 95-96, 97-98, 13-14, 21- 22, 31-32, 43-44, A1, A2	P
8.1.8	Additional requirements for equipment provided with a neutral pole		N
	marking of neutral pole		N
	The switched neutral pole shall not break before and shall not make after the other poles		N
	Conventional thermal current of neutral pole		N
8.1.9	Provisions for protective earthing		N
8.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		N
8.1.9.2	The protective earth terminal shall be readily accessible		N
	The protective earth terminal shall be suitably protected against corrosion		N
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
8.1.9.3	Protective earth terminal marking and identification		N
8.1.10	Enclosure for equipment		N
8.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
8.1.10.2	Insulation		N

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
8.1.11	Degree of protection of enclosed equipment		N
	Degree of protection .....:	IP	N
	Test for first characteristic		N
	Test for first numeral .....:	1: 2: 3: 4: 5: 6:	—
	Test for second characteristic		N
	Test for second numeral .....:	1: 2: 3: 4: 5: 6: 7: 8:	—

9.3.1.a	**TEST SEQUENCE I**		
9.3.3.3	Temperature rise Type AC DC		P
	ambient temperature 10-40 °C .....:	25	—
	Contactor		N
	test enclosure W x H x D (mm x mm x mm) .....:	350 x 175 x 145	—
	material of enclosure .....:	Metal	—
	Main circuits, test conditions:		N

EN 60 947-4-1				
Clause	Requirement – Test	Result - Remark		Verdict
	- conventional thermal current Ith (A) .....:	170		—
	- conventional enclosed thermal current Ithe (A) .:	170		—
	- cable/busbar cross-section (mm²) / (mm) .....:	70		—
	- temperature rise of main circuit terminals (K) ....:	≤ 60		—
	Auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	16		—
	- cable cross-section (mm²) .....:	2,5		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 42		—
	Coils and electromagnets, test conditions:	AC	DC	P
	- rated control supply voltage Us (V) .....:	240	24	—
	- Class of insulating material .....:	F	F	—
	- temperature rise of coil and electromagnets (K) :	≤ 70	≤ 60	—
	Starter	Tested with setting range 80 – 120 A		
	test enclosure W x H x D (mm x mm x mm) .....:	Open Type		—
	material of enclosure .....:	None		—
	Main circuits, test conditions:			P
	- conventional thermal current Ith (A) .....:	170		—
	- cable/busbar cross-section (mm²) / (mm) .....:	70 mm²		—
	- temperature rise of main circuit terminals (K) ....:	≤ 60 Temp. Rise on Contactor terminals only. Worst Case AC1 170A istead of AC3 110A		—
	Overload relay, auxiliary circuit, test conditions:			P
	- rated operation current Ie (A) .....:	4		—
	- cable cross-section (mm²) .....:	1		—
	- temperature rise of auxiliary circuit terminals (K) .....:	≤ 40		—
9.3.3.2	Operating limits			
9.3.3.2.1	Power-operated equipment:	AC	DC	P
	rated control supply voltage Us (V) .....:	240	24	—

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Clause	Requirement – Test	Result - Remark		Verdict
	frequency (Hz) .....:	50	DC	—
	limits of close satisfactorily at any value between 85% and 110% of rated control supply voltage Us .....:	73	65	P
	limits of drop out and open fully are: 75% to 20% for a.c. and 75% to 10% for d.c. .....:	57	25	P
9.3.3.2.2	Relays and releases Setting Range 80 – 120 A			P
	Conditions for thermal and time-delay magnetic overload relays only:			p
	type of time-delay overload relay .....:	Thermal, Temp. Compensated with current Transformer		—
	trip class .....:	20		—
	current setting ..... I_{set} :	80 A	120 A	—
	ambient temperature (°C) .....:	24		—
	test enclosure W x H x D (mm x mm x mm) .....:	None		—
	cable/busbar cross-section (mm^2) / (mm) .....:			—
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current .....:	84 A No tripping	126 A No tripping	—
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	96 A 3:20	144 A 2:35	—
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	120 A 0:20	180 A 0:23	—

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Clause	Requirement – Test	Result - Remark		Verdict
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $6 < Tp \leq 20$, starting from the cold state; test current; tripping time Tp (s) ..... :	576 A 10	864 A 14	-
	Ambient temperature: - 5 °C ..... :			-
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	84 A No tripping	126 A No tripping	-
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	96 A 28:00	144 A 3:45	-
	for class 10A overlod relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		-
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	120 1:15	180 A 1:35	-
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $6 < Tp \leq 20s$ tarting from the cold state; test current; tripping time Tp (s) ..... :	576 A 13	864 A 16	-
	Ambient temperature: + 40 °C ..... :			-
	at A (1,05) times of current setting, tripping shall not occur in less than 2 h starting from the cold state; test current ..... :	84 A No tripping	126 A No tripping	-
	When the current is subsequently raised to B (1,2) times the current setting, tripping shall occur in less than 2 h; test current ..... min:sec :	96 A 2:40	144 A 1:45	-

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Clause	Requirement – Test	Result - Remark		Verdict
	for class 10A overload relays energized at C (1,5) times the current, tripping shall occur in less than 2 min, starting from thermal equilibrium at the current setting; test current ..... min:sec :	N		—
	for class 10, 20 or 30 overload relays energized at C times the current, tripping shall occur in less than 2, 8 or 12 min, starting from thermal equilibrium at the current setting; class; test current; tripping time ..... min:sec :	120 A 0:17	180 A 0:55	—
	at D (7,2) times the current setting, tripping shall occur within the tripping time (s) $6 < Tp \leq 20$ starting from the cold state; test current; tripping time Tp (s) .....:	576 A 12	864 A 15	—
	Limits of operation of three-pole thermal overload relays energized on two poles:			P
	ambient temperature (°C) .....:	25		—
	the relay energized on three poles, at A (1 / 0,9) times the current setting, tripping shall not occur in less than 2 h, starting from the cold state .....:	80 A / 72 A No tripping	120 A / 108 A No tripping	—
	when the value of the current flowing in two poles is increased to B (1,15) times the current setting and the third pole deenergized, tripping shall occur in less than 2 h ..... min:sec :	92 A / 0 A 1:45	138 A / 0 A 1:15	—
9.3.3.4	Test of dielectric properties, impulse withstand voltage (Uimp indicated):			P
	- verification by measurement of clearances instead of testing			N
	- rated impulse withstand voltage (V) .....:	8000		—
	- test Uimp main circuits (kV) .....:	9,8 / 7		P
	- test Uimp auxiliary circuits (kV) .....:	9,8 / 7		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):			N
	- rated insulation voltage (V) .....:			—
	- main circuits, test voltage for 1 min (V) .....:			N

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Clause	Requirement – Test	Result - Remark	Verdict
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		N
9.3.3.5	**TEST SEQUENCE II**		
	Making and breaking capacity		
	utilization category .....:	AC1	—
	rated operational voltage Ue (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	170A	—
	Conditions, make/break operations AC-1 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 740 L2: 739 L3: 739	—
	- test current I/Ie = 1,5 (A) .....:	L1: 262 L2: 262 L3: 263	—
	- power factor/time constant .....:	L1: 0,8 L2: 0,79 L3: 0,8	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	9,8	—
	- number of make/break operations .....:	50	P
	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P
	Operational performance capability:		P

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Clause	Requirement – Test	Result - Remark	Verdict
	utilization category (AC-3 or AC-4) .....:	AC3	—
	rated operational voltage Ue (V) .....:	400V	—
	rated operational current Ie (A) or power (kW) ....:	110A	—
	Conditions, make operations AC3/AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 426 L2: 423 L3: 425	—
	- test current I/Ie = (A) .....:	L1: 1115 L2: 1114 L3: 1115	—
	- power factor/time constant .....:	L1: 0,32 L2: 0,32 L3: 0,31	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	30	—
	- number of make operations .....:	50	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 67 L2: 68 L3: 67	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
	Operational performance capability:		
	utilization category .....:	AC3	—
	rated operational voltage Ue (V) .....:	400	—
	rated operational current Ie (A) or power (kW) ....:	110A	—
	Conditions, make/break operations AC3 / AC4 only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 425 L2: 424 L3: 426	—
	- test current I/Ie = (A) .....:	L1: 221 L2: 222 L3: 221	—
	- power factor/time constant .....:	L1: 0,32 L2: 0,33 L3: 0,33	—
	- on-time (ms) .....:	100	—
	- off-time (s) .....:	4	—
	- number of make/break operations .....:	6000	P
	Characteristic of transient recovery voltage for AC-3 and AC-4 only:		P
	oscillatory frequency (kHz) .....:		—
	Measured oscillatory frequency (kHz) .....:	L1: 49 L2: 48 L3: 48	
	Factor y .....:	L1: 1,1 L2: 1,1 L3: 1,1	
	Behaviour and condition during and after the test:		P
	- no permanent arcing	P	P
	- no flash-over between poles	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	- no blowing of the fusible element in the earth circuit	P	P
	- no welding of the contacts	P	P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control	P	P
8.3.3.6	Operational performance capability:		
	utilization category .....:	AC1	—
	rated operational voltage (V) .....:	690	—
	rated operational current Ie (A) or power (kW) ....:	170A	—
	Test conditions for make/break operations AC-1 only:		P
	test voltage (V) .....:	L1: 740 L2: 739 L3: 739	—
	test current (A) .....:	L1: 172 L2: 172 L3: 173	—
	power factor/time constant .....:	L1: 0,81 L2: 0,8 L3: 0,81	—
	- on-time (ms) .....:	160	—
	- off-time (s) .....:	4,8	—
	- number of operating cycles .....:	6000	P
8.3.3.6.6	Behaviour and condition during and after the test:		P
	- no permanent arcing		P
	- no flash-over between poles		P
	- no blowing of the fusible element in the earth circuit		P
	- no welding of the contacts		P
	- the contacts shall operate when the contactor or starter is switched by the applicable method of control		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Dielectric verification:		P
	test voltage (2 Ue + 1000 V) for 1 min (V) .....:	2380	—

9.3.4	**TEST SEQUENCE III**		
	Performance under short-circuit conditions		
9.3.4.2.1	Test at de prospective current "r":		
	type of SCPD .....:	Siemens NH2 gL / gG	
	ratings of SCPD, co-ordination type 1 .....:	250A / 500V	—
	ratings of SCPD, co-ordination type 2 .....:	-	
	rated operational current Ie (A) AC-3 .....:	85A	—
	prospective current "r" (kA) .....:	5	—
	test voltage (V) .....:	L1: 421 L2: 421 L3: 423	—
	r.m.s. test current (A) .....:	L1: 5010 L2: 5070 L3: 5090	—
	peak current (A) .....:	L1: 7440 L2: 7920 L3: 6180	—
	power factor	0,7	
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) /peak current I (A) .....:	L1: 473 kA^2s / 6700A L2: 529 kA^2s / 6570 A L3: 549 kA^2s / 5700 A	—
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit I^2dta (A^2s) /peak current I (A) .....:	L1: 474 kA^2s / 6335 A L2: 465 kA^2s / 6730 A L3: 558 kA^2s / 6890 A	—
	Behaviour of the equipment during the test		P
	Both types of co-ordination (all devices):		P

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Clause	Requirement – Test	Result - Remark	Verdict
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		P
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		P
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		P
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		P
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		P
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation	P	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Type 1 co-ordination (combination and protected starters only):		P
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:	1380	—
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		—
9.3.4.2.2	Test at the rated conditional short-circuit current "Iq" ≤ SCC "r"		N
	type of SCPD .....:		—
	ratings of SCPD, co-ordination type 1 .....:		—
	ratings of SCPD, co-ordination type 2 .....:		—
	rated operational current Ie (A) AC-3 .....:		—
	prospective current "Iq" (kA) .....:		—
	test voltage (V) .....:	L1: L2: L3:	—
	r.m.s. test current (A) .....:	L1: L2: L3:	—
	peak current (A) .....:	L1: L2: L3:	—
	power factor		
	1. one breaking operation of SCPD with all the switching devices closed prior to the test I^2dta (A^2s) .....:	L1: L2: L3:	—

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Clause	Requirement – Test	Result - Remark	Verdict
	2. one breaking operation of SCPD by closing the contactor or starter on to the short-circuit .....:	L1: L2: L3:	
	3. one breaking operation of SCPD by closing the switching device on to the short-circuit .....:	L1: L2: L3:	
	Behaviour of the equipment during the test		N
	Both types of co-ordination (all devices):		N
	A - the fault current has been successfully interrupted by the SCPD or the combination starter and the fuse or fusible element, or solid connection between the enclosure and supply shall not have melted		N
	B - the door or cover of the enclosure has not been blown open and it is possible to open the door or cover		N
	C - there is no damage to the conductors or terminals and the conductors have not been separated from the terminals		N
	D - there is no cracking or breaking of an insulating base to the extent that the integrity of mounting of a live part is impaired		N
	Both types of co-ordination (combination starters and protected starters only):		N
	E - the circuit breaker or the switch is capable of being opened manually by its operating means		N
	F - neither end of the SCPD is completely separated from its mounting means to an exposed conductive part		N
	G - if a circuit breaker with rated ultimate short-circuit breaking capacity less than the rated conditional short-circuit current assigned to the combination or protected starter is employed, the circuit breaker shall be tested to trip:		N

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Clause	Requirement – Test	Result - Remark	Verdict
	1) circuit breaker with instantaneous trip relays or releases, at 120% of the trip current		N
	2) circuit breaker with overload relays or releases, at 250% of the rated current of the circuit breaker		N
	Type 1 co-ordination (all devices):		N
	H - there has been no discharge of parts beyond the enclosure. The starter may be inoperative after each operation		N
	Type 1 co-ordination (combination and protected starters only):		N
	I - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		
	Type 2 co-ordination (all devices):		N
	J - no damage to the overload relay or other parts has occurred, except that welding of contactor or starter contacts is permitted, if they are easily separated without significant deformation		N
	K - the tripping of the overload relay shall be conform to the published tripping characteristics, before and after the test		N
	L - dielectric verification test voltage (2 Ue) for 1 min (V) .....:		

9.3.5	**TEST SEQUENCE IV: (APPLICABLE FOR CONTACTORS ONLY)**		**P**
	Overload current withstand capability of contactors:		P
	ambient temperature (°C) .....:	25	
	rated operational current Ie (A) max. AC-3 .....:	110	
	test current (Ie) (A) .....:	880	
	duration of test: 10 s .....:	10s	

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict
	After the test, the contactor shall be substantially in the same condition as before the test (visual inspection)	P	P

	TABLE: temperature rise measurements				P
temperature rise dT of part:			No.	dT (K)	Required dT (K)
Main Terminals Contactor (170A)			1	58	70
			3	59	70
			5	60	70
			4	59	70
Auxilixary Terminals Contactor (16A)			13	41	65
			14	42	65
			43	40	65
Auxiliary Terminal Overload Relay (4A)			95	40	65
			96	35	65
Coil:	240V	50Hz		70	135
	24V + 10%	DC		60	135

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5.3	Making and breaking capacities of switching elements under abnormal conditions:		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	12	—
	Conditions, make/break operations:		
	- test voltage U/Ue = 1,1 (V) .....:	L1: 266 L2: - L3: -	—
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- on-time (ms) .....:	300	—
	- operating cycles per minute .....:	6	—
	- number of operating cycles .....:	10	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.3.5	**TEST SEQUENCE III**		
8.3.3.5.2	Making and breaking capacities of switching elements under normal conditions		P
	utilization category .....:	AC15	—
	rated operational voltage Ue (V) .....:	240	—
	rated operational current Ie (A) or power (kW) ....:	12	—
	Conditions, make/break operations:		P
	- test voltage U/Ue = 1,1 (V) * 50 operation at 266V ** 6000 operations at 242V .....:	L1: 266* / 242 ** L2: L3:	—
	- power factor/time constant .....:	L1: 0,31 L2: - L3: -	—
	- make operations: test current I/Ie (A) .....:	L1: 123 L2: - L3: -	—
	- break operations: test current I/Ie (A) .....:	L1: 13 L2: - L3:	—
	- on-time (ms) *50 oper. / **6000 oper. .....:	160 * / 300**	—
	- operating cycles per minute .....:	15	—
	- number of operating cycles .....:	6050	P
	Behaviour and condition during and after the test:		P
	- no electrical or mechanical failures		P
	- no contact welding or prolonged arcing		P
	- no blowing of the fusible element in the earth circuit		P
	Dielectric verification:		P
	dielectric test voltage (V) .....:	2000	P
	utilization category .....:		—
	rated operational voltage Ue (V) .....:		—

EN 60 947-4-1			
Clause	Requirement – Test	Result - Remark	Verdict

EN 60 947-5-1			
8.3.4	**TEST SEQUENCE IV**		
	Performance under conditional short-circuit current		P
	type of SCPD .....:	Siemens Diazed gL / gG	—
	ratings of SCPD .....:	25A / 500V	—
	prospective current (kA) .....:	1	—
	test voltage (V) U/Ue = 1,1 (V) .....:	L1: 277 L2: 275 L3: 276	—
	r.m.s. test current (A) .....:	L1: 1010 L2: 1050 L3: 1020	—
	power factor (max. 0,7)	0,7	
	first making operation to closed switching elements: test I^2dta (A^2s) / I_D (A).....:	L1: 1650 A^2s / 770A L2: 2880 A^2s / 830 A L3: 2850 A^2s / 1090 A	—
	time interval between test (min. 3 min) .....:		—
	second making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 1430 A^2s / 700 A L2: 2900 A^2s / 830 A L3: 2860 A^2s / 1080 A	—
	time interval between test (min. 3 min) .....:		—
	third making operation to closed switching elements: test I^2dta (A^2s) / I_D (A) .....:	L1: 2910 A^2s / 1030 A L2: 2540 A^2s / 975 A L3: 830 A^2s / 545 A	—
	Behaviour of the equipment during the test:		P
	switching elements open by the normal actuating system		P
	Dielectric verification:		P
	dielectric test voltage (V)	2000	P