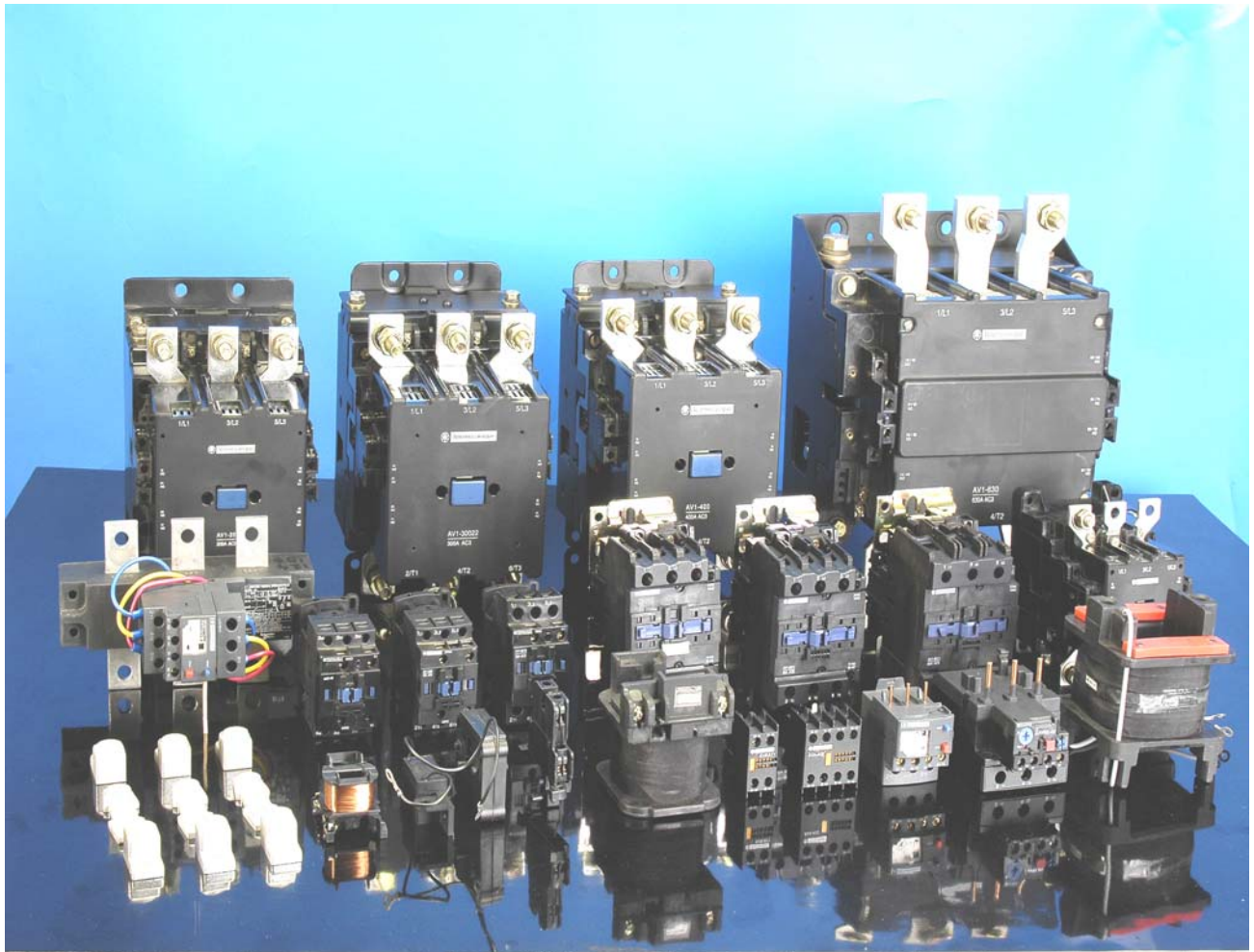


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Application Document for Activa Contactors



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Technical Data

Standards

IEC 947-1 Low-voltage switchgear and control gear – Part 1: General rules.

IEC 947-4-1 Low-voltage switchgear and control gear – Part 4: Contactors and motor starters.

EN 50 003 Low-voltage switchgear and control gear for industrial use - Dimensions - Motor contactor fixing holes.

Thermal O/L Relay Tripping Classes

IEC 947-4-1 defines tripping classes 10 A, 10, 20, and 30. Types 10 A, 10, etc. correspond to the maximum tripping time for a making current at 7.2 times the setting current.

Further, for each class the standard specifies the tripping time for 1.5 times the setting current and sets the non-tripping condition at 1.05 times the setting current.

All these data are summarized in the table below (Extract from IEC 947-4-1):

Tripping class	10 A	20	30
Tripping time for 7.2 times The setting current (s) (Cold state)	2 - 10	6 - 20	9 - 30

Tests

Various tests are carried out in IEC 60947

a) Test sequence 1

(i) Verification of temperature rise

(ii) Verification of operation and operating limits

(iii) Verification of dielectric properties

b) Test sequence 2

(i) Verification of rated making and breaking capacities, change-over ability and Reversibility.

(ii) Verification of conventional operational performance

c) Test sequence 3

Performance under short-circuit conditions

d) Test sequence 4 (applicable to contactors only), verification of ability to withstand overload currents

e) Test sequence 5

(i) Verification of mechanical properties of terminals.

(ii) Verification of degrees of protection of enclosed contactors and starters .



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There shall be no failure in any of the tests.

Co-ordination of Equipment Protections

IEC publication 947-4-1 defines co-ordination types "1" and "2":

- Type "1" co-ordination requires that, in the event of a short-circuit, the contactor or starter does not endanger persons or installations and will not then be able to operate without being repaired or parts being replaced.
- Type "2" co-ordination requires that, in short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts being welded is acceptable. In this case, the manufacturer must stipulate the measures to be taken with respect to maintenance of the equipment.

Type – 2 Coordination chart for DOL Starting

Motor Rating at 415V 3PH ,50HZ			SDF	Fuse		CONTACTOR	OVERLOAD RELAY	
hp	kw	I FLA (A)	UNIT TYPE	Bussmann Type	RATING	REFERENCE	REFERENCE	RANGE(A)
0.5	0.37	1	NX032	6NHCOOG	6	AV1-09	AVR1-06	1~1.7
0.75	0.55	1.5	NX032	6NHCOOG	6	AV1-09	AVR1-06	1~1.7
1	0.75	2	NX032	10NHCOOG	10	AV1-09	AVR1-07	1.6~2.5
2	1.5	3.5	NX032	10NHCOOG	10	AV1-09	AVR1-08	2.5~4
3	2.2	5	NX032	16NHCOOG	16	AV1-09	AVR1-10	4~6
4	3	6.8	NX032	20NHCOOG	20	AV1-09	AVR1-12	5.5~8
5.5	4	8.4	NX032	20NHCOOG	20	AV1-09	AVR1-14	7~10
7.5	5.5	11.2	NX032	25NHCOOG	25	AV1-12	AVR1-16	9~13
10	7.5	14	NX063	35NHCOOG	35	AV1-18	AVR1-21	12~18
12	9	18	NX063	35NHCOOG	35	AV1-18	AVR1-22	16~24
15	11	21	NX063	50NHCOOG	50	AV1-25	AVR1-22	16~24
20	15	28.5	NX063	63NHCOOG	63	AV1-32	AVR1-32	23~32
25	18.5	34	NX080	80NHCOOG	80	AV1-40	AVR1-35	30~38
30	22	42	NX080	80NHCOOG	80	AV1-50	AVR2-57	37~50
40	30	57	NX100	100NHB00G	100	AV1-65	AVR2-61	55~70
50	37	70	NX100	100NHB00G	100	AV1-80	AVR2-63	63~80
60	45	81	NX125	125NH00G	125	AV1-100	AVR3-81	62~99
75	56	100	NX160	160NH00G	160	AV1-115	AVR3-82	84~135
107	80	138	NX200	200NH1G	200	AV1-150	AVR3-83	124~198
120	90	165	NX250	250NH1G	250	AV1-170	AVR3-83	124~198
135	100	182	NX250	250NH1G	250	AV1-200	AVR3-83	124~198
150	110	196	NX315	315NHB2G	315	AV1-200	AVR3-83	124~198
188	140	250	NX400	355NHB2G	355	AV1-300	AVR3-85	174~279
215	160	285	NX400	355NHB2G	355	AV1-300	AVR3-86	208~333
250	180	320	NX400	400NHB2G	400	AV1-400	AVR3-86	208~333
270	200	351	NX400	400NHB2G	400	AV1-400	AVR3-87	259~414
300	220	387	NX400	400NHB2G	400	AV1-400	AVR3-87	259~414
346	257	450	NX630	630NH03	630	AV1-550	AVR3-88	320~513
364	270	460	NX630	630NH03	630	AV1-550	AVR3-88	320~513



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502	375	610	NX630	630NH03	630	AV1-630	AVR3-89	394~630
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Type – 2 Coordination chart for Star Delta Starting

Motor Rating (3 Ph, 415V, 50/60 Hz kW)	I phase(A)	SDF (NX Range) Frame Reference	Bussmann HRC Fuse_DIN gG (NH Range)	Fuse Rating - A	Star Contactor Activa Reference AC3 Rating(A)	AC3- A	Main / Delta Contactor Activa Reference AC3 Rating(A)	AC3- A	Overload Relay (Activa) Reference	Overload Relay (Activa) Range (A)
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1.5	2.3	NX032	10NHC00G	10	AV1-09	9	AV1-09	9	AVR1-02	1.6-2.5
2.2	3	NX032	10NHC00G	10	AV1-09	9	AV1-09	9	AVR1-08	2.5-4
3	4	NX032	10NHC00G	10	AV1-09	9	AV1-09	9	AVR1-08	2.5-4
4	5	NX032	16NHC00G	16	AV1-09	9	AV1-09	9	AVR1-10	4-6
5.5	6	NX032	20NHC00G	20	AV1-09	9	AV1-09	9	AVR1-12	5.5-8
7.5	9	NX032	20NHC00G	20	AV1-09	9	AV1-09	9	AVR1-14	7-10
9	10	NX032	20NHC00G	20	AV1-09	9	AV1-12	9	AVR1-14	7-10
11	12	NX032	25NHC00G	25	AV1-12	12	AV1-12	12	AVR1-16	9-13
15	16	NX063	35NHC00G	35	AV1-18	18	AV1-18	18	AVR1-21	12-18
22	24	NX063	50NHC00G	50	AV1-25	25	AV1-25	25	AVR1-32	23-32
30	33	NX063	63NHC00G	63	AV1-40	40	AV1-40	40	AVR2-55	30-40
45	47	NX125	100NH00G	100	AV1-40	40	AV1-50	50	AVR2-57	37-50
55	58	NX125	125NH00G	125	AV1-40	40	AV1-65	65	AVR2-59	48-65
80	80	NX160	160NH00G	160	AV1-80	80	AV1-100	100	AVR2-63	63-80
100	105	NX200	200NH1G	200	AV1-100	100	AV1-115	115	AVR3-82	84~135
110	113	NX200	200NH1G	200	AV1-100	100	AV1-115	115	AVR3-82	84~135
140	144	NX250	250NH1G	250	AV1-150	150	AV1-150	150	AVR3-83	124~198
160	165	NX315	315NHB2G	315	AV1-170	170	AV1-170	170	AVR3-83	124~198
220	225	NX400	400NHB2G	400	AV1-300	300	AV1-300	300	AVR3-85	174~279
257	260	NX630	500NH3G	500	AV1-400	400	AV1-400	400	AVR3-86	208-333
270	265	NX630	500NH3G	500	AV1-400	400	AV1-400	400	AVR3-86	208-333
375	352	NX630	630NH3G	630	AV1-400	400	AV1-630	630	AVR3-87	259~414

Note : This table is defined for motors of 3-phase motors, 4-pole having **starting time up to 10 s.**



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Selection Criteria

Selection of a contactor depends on the application, Hence while selecting following Factors are to be taken care:

- Mains Voltage and Frequency
- Load Characteristics
- Duty Requirements
- Environmental Conditions

Transformer Application

Factors: Large currents (inrush currents) flow in Primary Circuit when the transformer is energized. These currents can be as high as 20-30 times the rated primary current value of the transformer.

FRAME	Ie(AC3)	Ie(AC6-b)	Transformer KVA	
			1ph/240V	3Ph/415V
AV1-09	9	4.05	1.0	8
AV1-12	12	5.40	1.3	8
AV1-18	18	8.10	1.9	8
AV1-25	25	11.25	2.7	9
AV1-32	32	14.40	3.5	14
AV1-40	40	18	4.3	17
AV1-50	50	22.50	5.4	28
AV1-65	65	29.25	7.0	32
AV1-80	80	36	8.6	36
AV1-115	115	51.75	12.4	37
AV1-150	150	67.5	16.2	49
AV1-170	170	76.5	18.4	55
AV1-200	200	90	21.6	65
AV1-300	300	135	32.4	97
AV1-400	400	180	43.2	129
AV1-550	550	247.50	59.4	178
AV1-630	630	283.50	68.0	204



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DC Application

Factors:

1. Control Circuit is AC and power circuit is DC.
2. The arc switching on d.c. is more difficult than on a.c.
3. For selecting a contactor it is essential to determine the current, the voltage, the L/R time constant and type of Load.
4. For information, typical time constant values are given: non inductive loads such as resistance furnaces (L/R 1 ms), inductive loads Such as shunt motors (L/R 2.5 ms) or series motors (L/R 15 ms).
5. Figures in Brackets indicate Poles to be connected in Series.

TYPE	A	DC1 LOAD						DC5 LOAD					
		24V (1)	48V (1)	48V (2)	110V (2)	110V (3)	220V (3)	24V (1)	48V (2)	48V (3)	110V (2)	110V (3)	220V (3)
AV1-09	9	15	15	15	15	15	15	15	15	15	15	15	8
AV1-12	12	15	15	15	15	15	15	15	15	15	15	15	8
AV1-18	18	20	20	20	20	20	20	20	20	20	15	20	8
AV1-25	25	25	25	25	25	25	25	25	25	25	15	25	8
AV1-32	32	32	32	32	32	32	32	32	32	32	32	32	32
AV1-40	40	40	40	40	40	40	40	40	40	40	40	40	40
AV1-50	50	50	50	50	50	50	50	50	50	50	50	50	50
AV1-65	65	65	65	65	65	65	65	65	65	65	65	65	65
AV1-80	80	65	65	65	65	65	65	65	65	65	65	65	65
AV1-100	100	120	120	120	120	120	120	40	60	90	40	80	40
AV1-115	115	120	120	120	120	120	120	40	60	90	40	80	40
AV1-150	150	170	170	170	170	170	170	60	80	120	60	100	60
AV1-170	170	170	170	170	170	170	170	60	80	120	60	100	60
AV1-200	200	220	220	220	220	220	220	110	125	185	110	160	85
AV1-300	300	300	300	300	300	300	300	150	150	200	150	200	100
AV1-400	400	400	400	400	400	400	400	200	200	220	200	200	135
AV1-550	550	550	550	550	550	550	550	300	300	300	300	300	200
AV1-630	630	630	630	630	630	630	630	300	300	300	300	300	200



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Lamp Application

Factors: Contactor selection for control of lighting circuits depends on following:

- Type, power rating and number of lamps
- Connection mode
- Current values on closing and in steady state
- Power factor
- Presence of correction capacitors

INCANDESCENT LAMPS

SUPPLY VOLTAGE : 230V AC

pf=0.95 TYPE	PERMISSIBLE NUMBER OF LAMPS					
	40W	60W	100W	250W	500W	1000W
AV1-09	49	33	20	8	4	2
AV1-12	66	44	26	10	5	3
AV1-18	98	66	39	16	8	4
AV1-25	137	91	55	22	11	5
AV1-32	175	117	70	28	14	7
AV1-40	219	146	87	35	17	9
AV1-50	273	182	109	44	22	11
AV1-65	355	237	142	57	28	14
AV1-80	437	291	175	70	35	17
AV1-100	546	364	219	87	44	22
AV1-115	628	419	251	101	50	25
AV1-150	819	546	328	131	66	33
AV1-170	929	619	371	149	74	37
AV1-200	1093	728	437	175	87	44
AV1-300	1639	1093	656	262	131	66
AV1-400	2185	1457	874	350	175	87
AV1-550	3004	2003	1202	481	240	120
AV1-630	3441	2294	1377	551	275	138



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MERCURY VAPOUR SODIUM VAPOUR & HALOGEN LAMP LOADS
SUPPLY VOLTAGE : 230V AC

TYPE	PERMISSIBLE NUMBER OF LAMPS					
	40W	60W	100W	250W	500W	1000W
AV1-09	52	35	21	8	4	2
AV1-12	69	46	28	11	6	3
AV1-18	104	69	41	17	8	4
AV1-25	144	96	58	23	12	6
AV1-32	184	123	74	29	15	7
AV1-40	230	153	92	37	18	9
AV1-50	288	192	115	46	23	12
AV1-65	374	249	150	60	30	15
AV1-80	460	307	184	74	37	18
AV1-100	575	383	230	92	46	23
AV1-115	661	441	265	106	53	26
AV1-150	863	575	345	138	69	35
AV1-170	978	652	391	156	78	39
AV1-200	1150	767	460	184	92	46
AV1-300	1725	1150	690	276	138	69
AV1-400	2300	1533	920	368	184	92
AV1-550	3163	2108	1265	506	253	127
AV1-630	3623	2415	1449	580	290	145



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**MERCURY VAPOUR SODIUM VAPOUR & HALOGEN LAMP
LOADS (WITHOUT COMPENSATION)**

SUPPLY VOLTAGE : 230V AC

TYPE	PERMISSIBLE NUMBER OF LAMPS					
	40W	60W	100W	250W	500W	1000W
AV1-09	25.0	17.0	10.0	4.0	2.0	1.0
AV1-12	34.0	23.0	13.0	5.0	2.0	1.0
AV1-18	51.0	34.0	20.0	8.0	4.0	2.0
AV1-25	71.0	47.0	28.0	11.0	5.0	2.0
AV1-32	92.0	61.0	36.0	14.0	7.0	3.0
AV1-40	115.0	76.0	46.0	18.0	9.0	4.0
AV1-50	143.0	95.0	57.0	23.0	11.0	5.0
AV1-65	186.0	124.0	74.0	29.0	14.0	7.0
AV1-80	230.0	153.0	92.0	36.0	18.0	9.0
AV1-100	287.0	191.0	115.0	46.0	23.0	11.0
AV1-115	330.0	220.0	132.0	52.0	26.0	13.0
AV1-150	431.0	287.0	172.0	69.0	34.0	17.0
AV1-170	488.0	325.0	195.0	78.0	39.0	19.0
AV1-200	575.0	383.0	230.0	92.0	46.0	23.0
AV1-300	862.0	575.0	345.0	138.0	69.0	34.0
AV1-400	1150.0	766.0	460.0	184.0	92.0	46.0
AV1-550	1581.0	1054.0	632.0	253.0	126.0	63.0
AV1-630	1811.0	1207.0	724.0	289.0	144.0	72.0



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Capacitor Application

Factors:

1. Maximum Inrush current does not exceed the making capacity of the Contactor.
2. Reactance equal to 60% of Capacitive Reactance is connected in series to suppress inrush current and distortion of voltage and current due to harmonics.
3. Apart from above points to be considered while switching capacitors are: Restriking Phenomenon, Contact welding to inrush currents and Temperature rise due to harmonic currents.

RATED VOLTAGE	KVAR	A	CONTACTOR TYPE
	@ 415V		
400/415V AC	9	13	AV1-09
	10	14	AV1-12
	11	15	AV1-18
	15	21	AV1-25
	20	28	AV1-32
	25	35	AV1-40
	30	42	AV1-50
	40	56	AV1-65
	40	56	AV1-80
	40	56	AV1-100
	40	56	AV1-115
	60	83	AV1-150
	90	125	AV1-170
	90	125	AV1-200
	150	209	AV1-300
	200	278	AV1-400
250	348	AV1-550	
300	417	AV1-630	



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DG Set Application

AC1 LOAD		AC3 LOAD	
FRAME	KVA	FRAME	KVA
AV1-09	12.5	AV1-09	6
AV1-12	12.5	AV1-12	8.5
AV1-18	18	AV1-18	11.5
AV1-25	23	AV1-25	17.5
AV1-32	28	AV1-32	23
AV1-40	35	AV1-40	28.5
AV1-50	42	AV1-50	36
AV1-65	57.5	AV1-65	45
AV1-80	75	AV1-80	58
AV1-100	62	AV1-100	58
AV1-115	97	AV1-115	82.6
AV1-150	140	AV1-150	107.5
AV1-170	144	AV1-170	122
AV1-200	185	AV1-200	144
AV1-300	251	AV1-300	215
AV1-400	301	AV1-400	287
AV1-550	450	AV1-550	395
AV1-630	503	AV1-630	453



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