

Library of Set Points for PVIGPS....M

Factory settings for Intelipro PV

Basic Settings			
Set Point	Default	Step	Range
Mains CT Ratio [A/5A]	400 A/5A	1A/5A	25000A/5A
Mains CT Polar	Forward	Forward	Reverse
EF CT Ratio [A/5A]	400 A/5A	1A/5A	8000A/5A
Mains PT Ratio [V/V]	1.0 V/V	0.01 V/V	500.00 V/V
Gen PT Ratio [V/V]		0.1 V/V	500.0 V/V
NomVolts Ph-N [V]	240V	1 V	80 - 23094 V
NomVolts Ph-Ph [V]	416V	1 V	80 - 40000 V
Nominal Freq [Hz]	50 Hz	1 Hz	45 - 65 Hz
Nominal Power [kW]	26 kW	1 kW	0 - 32000 kW
NominMainsCurr [A]	63A	1 A	0 - 32000 A
Voltage Setup [Ph To N/Ph To Ph]	Ph to N	Ph To N	Ph To Ph
CB1 Prot Timer [s]	0 s	1 s	1 - 60 s
CB2 Prot Timer [s]	0 s	1 s	1 - 60 s
Start Trip	Enabled	DISABLED	ENABLED

Comms Settings			
Contr.Addr	1		1 - 32
COM1 Mode [DIRECT/MODEM/MODBUS]	DIRECT	DIRECT/MODEM/ MODBUS	DIRECT/MODEM/ MODBUS
COM2 Mode [DIRECT/MODEM/MODBUS]	DIRECT	DIRECT/MODEM/ MODBUS	DIRECT/MODEM/ MODBUS
ModbusComSpeed [9600/19200/38400/57600 bps]	9600 bps	9600 bps	57600 bps
CAN Bus Mode [32C / 8C]	32C	8C	32C

General			
Set Point	Default	Step	Range
ProtActiv Del [s]	2.0 s	0.1 s	0 - 30 s
Backup Trp Del	0.00	0.01 s	0 - 10.00 s

Comm Trp Del	0.0 s	0.0 s	20.0 s
Comm Trp Len	1.0 s	0.1 s	20.0 s
Auto FR	DISABLED F = Del	DISABLED/ ON DEACT/ CB1+CB2=0/ NOFAULT+DEL	DISABLED/ ON DEACT/ CB1+CB2=0/ NOFAULT+DEL
Auto FR Del [s]	10 s	1 s	0 - 3600 s
Aux >V [V]	36V	0.1V	Aux <V 40 V
Aux <V [V]	18V	0.1 V	8 - Aux >V
Aux V Del [s]	1 s	1 s	0 - 600 s

V <>			
Set Point	Default	Step	Range
V>	257V 270 V	1V	1- 34000 V
V> Del	5.00 s 2 s	1s	0 - 600.00 s
V>>	0V	1V	1- 34000 V
V>> Del	0s	1s	0 - 600.00 s
V<	200 V	1V	1- 34000 V
V< Del	2.50 s 2 s	1s	0 - 600.00 s
V<< [V]	0V	1V	1- 34000 V
V<< Del [s]	0s	1s	0 - 600.00 s
RST V	+/- 0% V >	+/- 0% V <>	+/- 4% V <>
AVG V >	0V	1 v	0 - 34000 V
V Trp BO	None	Trp 1 /Trp 2 / Trp 1+2 / None	Trp 1 /Trp 2 / Trp 1+2 / None

V Unb			
Set Point	Default	Step	Range
V Unb [%Un]	20%	1% Nom.V	0 - 150% Nom.V
V < POS	1.0%	0.1% Un	0 - 100%Un
V > NEG	1.0%	0.1% Un	0 - 100%Un
V Unb Del [s]	5.00s	0.01s	0 - 600 s
V Unb Trp BO [Trp 1/Trp2/Trp	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

1+2/None)			
PhaseRotation [CW/CCW/ANY]	CW	CW / CCW / ANY	CW / CCW / ANY
Ph Rot Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

Dyn Volt

Set Point	Default	Step	Range
V Lim 1	30% Un	1%Un	0 - 100%Un
V Lim 2	70% Un	1%Un	0 - 100%Un
V Lim 3 [% Un]	90% Un	1%Un	0 - 100%Un
Delay 1	0.15 s	0.01s	10.00s
Delay 2	0.70 s	0.01s	10.00s
Delay 3 [s]	1.50 s	0.01s	10.00s
Reset Time [s]	2.00 s	0.01s	0 - 10.00s
DynVoltBlockB1	None		
DynVoltTrpBO	None	Trp 1/Trp 2 / Trp 1+2 / None	Trp 1/Trp 2 / Trp 1+2 / None

QU			
Set Point	Default	Step	Range
V< [%Un]	85% Un	1%Un	80 - 90%Un
Rst V< [%Un]	95% Un	1%Un	90-100%Un
I Min [%In]	10% In	1%In	2 - 20%In
Q Min [%S]	5% s	%S	<-10.0; 10.0> %S
QU Del 1 [s]	0.50 s	0.01s	0 - 1.00s
QU Del 2 [s]	1.50 s	0.01s	0 - 2.00s
QU Trp Gen [Trp 1/Trp 2/Trp 1+2/None]	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None
QU Trp Mns [Trp 1/Trp 2/Trp 1+2/None]	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

f<>			
Set Point	Default	Step	Range
f>	52.5 Hz 50 Hz	0.01Hz	0 - 70.00Hz
f>>	53 Hz disabled	0.01Hz	0 - 70.00Hz
f<	47.5 Hz 48 Hz	0.01Hz	0 - 70.00Hz
f<< [Hz]	47 Hz disabled	0.01Hz	0 - 70.00Hz
f> del	5.00	0.01s	0 - 600.00s
f>> del	0.5 s	0.01s	0 - 600.00s
f< del	5.00 s	0.01s	0 - 600.00s
f<< del [s]	0.5 s	0.01s	0 - 600.00s
RST F <	100% f <	100% f< / +0,2% f< / 47,5 Hz	100% f< / +0,2% f< / 47,5 Hz
RST f >	100% f >	100% f>/ - 0,2% f> / 50,05 Hz	100% f>/ - 0,2% f> / 50,05 Hz
f Trp BO [Trp 1/Trp 2/Trp 1+2/None]	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

LOM			
Set Point	Default	Step	Range
Vs Lim [⁰]	12⁰ 8 deg.	1°	1 - 50°
ROCOF [Hz/s]	0.4 Hz/s 0.9	0.01Hz	0 - 10.00Hz
ROCOF filt [-]	50	1	100
LOM Init Del [s]	2 s	0.01s	0 - 600.00s
LOM Trip Del [s]	2 s	0.01s	1 - 3600.00s
LOM Trp BO [Trp 1/Trp 2/Trp 1+2/None]	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

l>			
Set Point	Default	Step	Range
l>	200%	1%	0 - 1000%In
l>> [%In]			
l> Del	0.00s	0.01s	0 - 10.00s
l>> Del [s]			
l Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

l>T			
Set Point	Default	Step	Range

I> T Del [s]	1.0s	0.1s	20.00s
I> T Curve	IDMT	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv
I> T Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

I>V			
Set Point	Default	Step	Range
I> V Del [s]	1.0s	0.1s	20.00s
I> V Curve	IDMT	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv
I> V Control	200%	0.1%	1 – 200%
I> V Restraint	Disabled	Disabled	Enabled
I> V Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

I Unb			
Set Point	Default	Step	Range
I Unb [%In]	50%	1%	0 - 200%In
IMinDiffEval [%In]	0%	1%In	0 - 100%In
I Unb Del [s]	5.0 s	0.1s	0 - 600s
I> V Trip BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

DOC			
Set Point	Default	Step	Range
NominGenCurr [A]	288A	1A	1 – 32000A
DOC> [%In]	0%	1%In	0 - 150%In
DOC> Del [s]	5.0 s	0.1s	0 - 30s
DOC Test [DISABLED/ENABLED]	DISABLED	DISABLED	ENABLED
DOC Trp BO	NONE	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

EFC			
Set Point	Default	Step	Range
EFC> Lim [%In]	0%	1%In	300%In
EFC> Del [s]	10 s	0.1s	0 - 600.00s
EFC> T Lim [%In]	10%	1%In	0 - 300%In
EFC> T Del [s]	1.0s	0.1s	0.1 - 20.00s
EFC> T Curve	IDMT	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECEExtInv

EFC Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None
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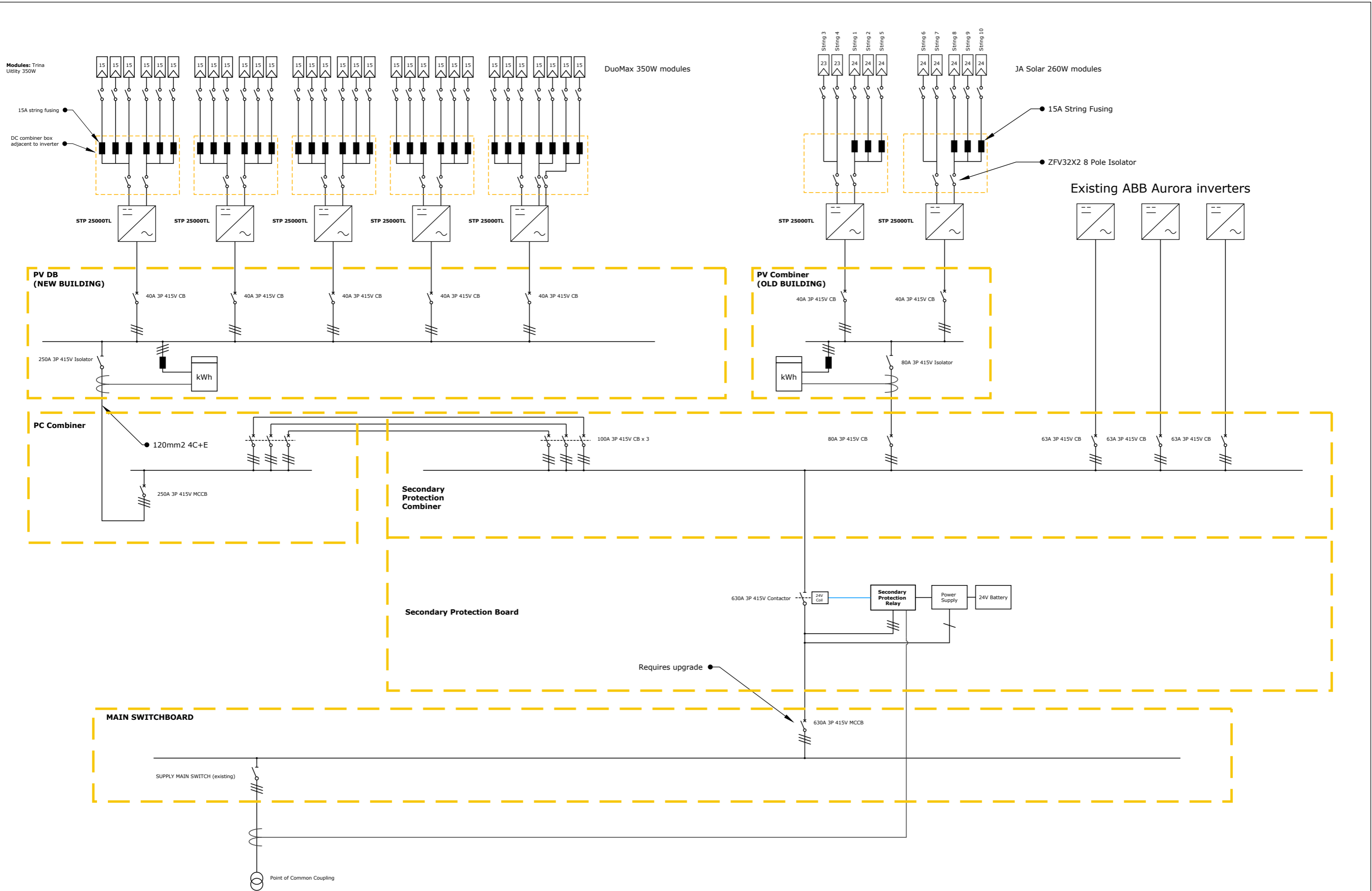
IGS			
Set Point	Default	Step	Range
IGS> Lim [mA]	0 mA	0.1mA	0 - 100.0mA
IGS> Del [s]	10 s	0.1s	0 - 600.00s
IGS> T Lim [mA]	10 mA	0.1mA	0 - 50.0mA
IGS> T Del [s]	1.0 s	0.1s	0.1 - 20.00s
IGS> T Curve	IDMT	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECExtInv	IDMT/Mod Inv/Very Inv/Ext Inv/IECInv/IECVerInv/IECExtInv
IGS Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

NVD			
Set Point	Default	Step	Range
NVD> [V]	0V	1v	0 - 150 v
NVD Del	60 s	1s	0 - 300s
NVD >>	50V	1v	0 - 500 v
NDV >> Del	60s	1s	0 - 300s
RST NVD	+/- 0%	+/- 0%	+/- 4%
NVD Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None
NVD >> Trp BO	None		

P<>			
Set Point	Default	Step	Range
P>,P>> [%Pn]	10.00%	0.01%Pn	-300 - 300%
P> Del, P>> Del [s]	5.00 s	0.01s	0 -150.00s
P> Direction, P>> Direction	Over	Under	Over
Filter Delay	5s	0.1s	0 - 300s
Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None
Mains Power 1 % Pn	0	1%Pn	100%Pn
Mains Power 2 % Pn	0	1%Pn	100%Pn
Mains Power 3 % Pn	0	1%Pn	100%Pn
Mains Power 4 % Pn	0	1%Pn	100%Pn
Mains Power 5 % Pn	0	1%Pn	100%Pn
Mains Power 6 % Pn	0	1%Pn	100%Pn
Mains Power 7 % Pn	0	1%Pn	100%Pn
Mains Power 8 % Pn	0	1%Pn	100%Pn

PF			
Set Point	Default	Step	Range
Ind PF limit [-]	0.95	0.01	0. - 1
Ind PF Del [s]	1s	0.1s	0 - 60.0s
Cap PF limit	0.95	0.01s	0 - 1.00
Cap PF Del	1s	0.1s	0 - 60.0s
PF Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None

MaxParallTime			
Set Point	Default	Step	Range
MaxParallTime [s]	300.0s	0.1s	1800.0s
MaxPT Trp BO	None	Trp 1 / Trp 2 / Trp 1+2 / None	Trp 1 / Trp 2 / Trp 1+2 / None



Drawing Number:	P494-SLD001 - R05
Drawn By:	
Drawing Date:	24/01/2017

Revisions	No.	Description	Date
	03	DB board set up. Protection relay design	6/03/2017
	02	Changed connection, protection relay and metering	24/02/2017
	01	Changed modules on old bld. rearrangement of metering and sub boards	8/02/2017



Project Name:	
Project Number:	P494
Project Address:	

RJ Series Slim Power Relays

Compact and rugged power relays. Large switching capacity.

- Compact housing only 12.7-mm wide.
Large contact rating
RJ1 (1-pole): 16A (UL general use rating @250V AC)
RJ2 (2-pole): 8A
- Non-polarized LED indicator available on blade type. IDEC's unique light guide structure enables high visibility of coil status from any direction.
- Excellent electrical and mechanical life.
Electrical life: 200,000 operations (AC load)
Mechanical life: 30 million operations (AC coil)
- RoHS directive compliant (EU directive 2002/95/EC). Contains no lead, cadmium, mercury, hexavalent chromium, PBB or PBDE).
- Diode model:
Diode reverse withstand voltage: 1000V
- UL recognized, CSA certified, EN compliant.



UL508
UL File No. E55996



CSA C22.2 No. 14
1608322
CSA File No. LR35144





EN61810-1
VDE (REG.-Nr B312)



EN61810-1
EC Low Voltage Directive

Part Number Selection

	Terminal	Contact	Model	Part Number	Coil Voltage Code (Standard Stock in bold)
	Blade	SPDT	Standard	RJ1S-C-	A24 , A110, A120 , A220, A240 , D12, D24 , D48, D100
			with LED	RJ1S-CL-	D12, D24 , D48, D100
			with Surge Suppression Diode	RJ1S-CD-	
			with LED & Surge Suppression Diode	RJ1S-CLD-	
		DPDT	Standard	RJ2S-C-	A24 , A110, A120 , A220, A240 , D12, D24 , D48, D100
			with LED	RJ2S-CL-	D12, D24 , D48, D100
			with Surge Suppression Diode	RJ2S-CD-	
			with LED & Surge Suppression Diode	RJ2S-CLD-	
	PCB	SPDT	Standard	RJ1V-C-	A24 , A110, A120 , A220, A240 , D5, D6, D12, D24 , D48, D100
			High Capacity	RJ1V-CH-	
		SPST-NO	Standard	RJ1V-A-	
			High Capacity	RJ1V-AH-	
		DPDT	Standard	RJ2V-C-	
		DPST-NO	Standard	RJ2V-A-	

Ordering Information

When ordering, specify the Part No. and coil voltage code:

(example) **RJ1S-C-** **A120**
Part No. Coil Voltage Code

Coil Voltage Table

Coil Voltage Code	A12	A24	A110	A120	A220	A240	D5	D6	D12	D24	D48	D100
Coil Rating	12V AC	24V AC	110V AC	120V AC	220V AC	240V AC	5V DC	6V DC	12V DC	24V DC	48V DC	100-110V DCV DC

Switches & Pilot Lights

Display Lights

Relays & Sockets




Timers

Terminal Blocks

Circuit Breakers

Sockets

	Relays	Standard DIN Rail Mount	Finger-safe DIN Rail Mount	PCB Mount
Blade Models	RJ1S (Std)	SJ1S-05B	SJ1S-07L	SJ1S-61
	RJ2S (Std)	SJ2S-05B	SJ2S-07L	SJ2S-61
PCB Models	RJ1V (Std)	—	SQ1V-07B*	SQ1V-63*
	RJ1V (HC) RJ2V	—	SQ2V-07B*	SQ2V-63*

*Hold-down clip or spring must be removed to use with RJ PCB relays.



Replacement Hold Down Springs

Part Number	Used With Socket
SJ9Z-C1	SJ1S-05B, SJ1S-07L, SJ2S-05B, SJ2S-07L
SQ9Z-C	SQ1V-07B, SQ2V-07B
SQ9Z-C63	SQ1V-63, SQ2V-63

Jumpers for SJ Sockets

Poles	Part Number	Quantity
2	SJ9Z-JF2	Must purchase in quantities of 10.
5	SJ9Z-JF5	
8	SJ9Z-JF8	
10	SJ9Z-JF10	

Accessories

Description	Appearance	Use with	Part No.	Remarks
Aluminum DIN Rail (1 meter length)		All DIN rail sockets	BNDN1000	IDEC offers a low-profile DIN rail (BNDN1000). The BNDN1000 is designed to accommodate DIN mount sockets. Made of durable extruded aluminum, the BNDN1000 measures 0.413 (10.5mm) in height and 1.37 (35mm) in width (DIN standard). Standard length is 39" (1,000mm).
DIN Rail End Stop		DIN rail	BNL5	9.1 mm wide.

Specifications

Model		RJ1	RJ2
Number of Poles		1-pole	2-pole
Contact Configuration		SPDT	DPDT
Contact Material		Silver-nickel alloy	
Degree of Protection		IP40	
Contact Resistance (initial value) (*1)		50 mΩ maximum	
Operate Time (*2)		15 ms maximum	
Release Time (*2)		10 ms maximum (with diode: 20 ms maximum)	
Dielectric Strength	Between contact and coil	5000V AC, 1 minute	5000V AC, 1 minute
	Between contacts of the same pole	1000V AC, 1 minute	1000V AC, 1 minute
	Between contacts of different poles	—	3000V AC, 1 minute
Vibration Resistance	Operating extremes	10 to 55 Hz, amplitude 0.75 mm	
	Damage limits	10 to 55 Hz, amplitude 0.75 mm	
Shock Resistance	Operating extremes	NO contact: 200 m/s ² , NC contact: 100 m/s ²	
	Damage limits	1000 m/s ²	
Electrical Life (rated load)		AC load: 200,000 operations minimum (operation frequency 1800 operations per hour) DC load: 100,000 operations minimum (operation frequency 1800 operations per hour)	
Mechanical Life (no load)		AC coil: 30,000,000 operations minimum (operation frequency 18,000 operations per hour) DC coil: 50,000,000 operations minimum (operation frequency 18,000 operations per hour)	
Operating Temperature (*3)		-40 to +70°C (no freezing)	
Operating Humidity		5 to 85% RH (no condensation)	
Weight (approx.)		19g (blade type), 17g (PCB form C type), 16g (PCB form A type)	

Note: Above values are initial values.
 1. Measured using 5V DC, 1A voltage drop method.
 2. Measured at the rated voltage (at 20°C), excluding contact bounce time.
 3. 100% rated voltage.

Switches & Pilot Lights

Display Lights

Relays & Sockets

Timers

Terminal Blocks

Circuit Breakers

Coil Ratings

Rated Voltage			Coil Voltage Code	Rated Current (mA) ±15% (at 20°C)				Coil Resistance (ohms)±10% (at 20°C)	Operating Characteristics ²			Power Consumption	
				Without LED ¹		With LED ¹			Pickup Voltage	Dropout Voltage	Maximum Allowable Voltage ³		
				50Hz	60Hz	50Hz	60Hz						
AC	Blade & PCB Models	24V	A24	43.9	37.5	47.5	41.1	243	80% max	30% min	140%	0.9VA (60Hz)	
		120V	A120	8.8	7.5	8.7	7.4						6,400
		240V	A240	4.3	3.7	4.3	3.7						25,570
Rated Voltage			Coil Voltage Code	Rated Current (mA) ±15% (at 20°C)				Coil Resistance (ohms)±10% (at 20°C)	Operating Characteristics ²			Power Consumption	
				Without LED ¹		With LED ¹			Pickup Voltage	Dropout Voltage	Maximum Allowable Voltage ³		
				50Hz	60Hz	50Hz	60Hz						
DC	Blade Models	12V	D12	44.2		48.0		271	70% max	10% min	170%	0.53W	
		24V	D24	22.1		25.7		1,080					
		48V	D48	11.0		10.7		4,340					
		100-110V	D100	5.3 - 5.8		5.2 - 5.7		18,870			160%		
	PCB Models	5V	D5	106		-		47.2	70% max	10% min	170%		
		6V	D6	88.3		-		67.9					
		12V	D12	44.2		-		271					
		24V	D24	22.1		-		1,080					
		48V	D48	11.0		-		4,340					
		100-110V	D100	5.3 - 5.8		-		18,870			160%		

1. LED Indicator is only available on Blade relays.
 2. Operating characteristics are at 20°C.
 3. The maximum allowable voltage is the maximum value which can be applied to the relay coils.

Contact Ratings

Model		Contact	Allowable Contact Power		Rated Load			Allowable Switching Current	Allowable Switching Voltage	Minimum Applicable Load	
			Resistive Load	Inductive Load	Voltage	Resistive Load	Inductive Load cosφ=0.3 L/R=7ms				
Blade Models	1 pole	NO	3000V AC	1875VA	250V AC	12A	7.5A	16A	AC250V	DC5V	
		NC	3000V AC	1875VA	250V AC	12A	7.5A	6A	DC30V	100mA	
	2 poles	NO	2000V AC	1000VA	250V AC	8A	4A	4A	AC250V	DC5V	
		NC	2000V AC	1000VA	250V AC	8A	4A	4A	DC30V	100mA	
PCB Models	1 pole	Standard Type	NO	3000V AC	1875VA	250V AC	12A	7.5A	12A	AC250V	DC5V
			NC	3000V AC	1875VA	250V AC	12A	7.5A			
		High Capacity Type	NO	400V AC	2000VA	250V AC	16A	8A	16A	AC250V	
			NC	400V AC	2000VA	250V AC	16A	8A			
			NO	480W	240W	30V DC	16A	8A	8A	AC250V	
			NC	400V AC	2000VA	250V AC	16A	8A			
	2 poles	NO	2000V AC	1000VA	250V AC	8A	4A	8A	AC250V		
		NC	2000V AC	1000VA	250V AC	8A	4A			4A	DC125V
		NO	240W	120W	30V DC	8A	4A	8A	AC250V		
		NC	2000V AC	1000VA	250V AC	8A	4A			4A	DC125V
NO	120W	60W	30V DC	4A	2A	4A	AC250V				
NC	2000V AC	1000VA	250V AC	8A	4A			4A	DC125V		

Agency Ratings

Voltage	UL				CSA								VDE			
	General Use				Resistive				Inductive				Resistive		AC-15, DC-13*	
	RJ1		RJ2		RJ1		RJ2		RJ1		RJ2		RJ1	RJ2	RJ1	RJ2
250V AC	16A	6A	8A	4A	12A	12A	8A	8A	7.5A	7.5A	4A	4A	12A	8A	6A	3A
30V DC	12A	6A	8A	4A	12A	6A	8A	4A	6A	3A	4A	2A	12A	8A	2.5A	2A

*According to the utilization categories of IEC60947-5-1

Switches & Pilot Lights

Display Lights

Relays & Sockets

Timers

Terminal Blocks

Circuit Breakers

Socket Specifications

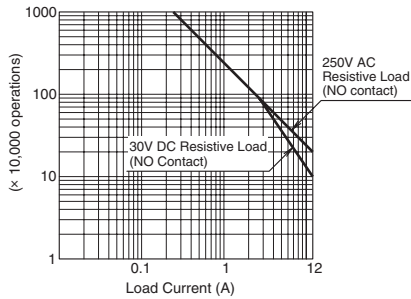
	Socket	Terminal	Electrical Rating	Wire Size	Torque
DIN Rail/ Panel Mount	SJ1S-05B	M3 screw with captive wire clamp	250V, 12A	Maximum up to 2 - #14 AWG	0.6 - 1.0N•m (Maximum 1.2N•m)
	SJ2S-05B	M3 screw with captive wire clamp	250V, 8A	Maximum up to 2 - #14 AWG	0.6 - 1.0N•m (Maximum 1.2N•m)
Finger-safe DIN Rail/ Panel Mount	SJ1S-07L	M3 screw with captive wire clamp, fingersafe	250V, 12A	Maximum up to 2 - #14 AWG	0.6 - 1.0N•m (Maximum 1.2N•m)
	SJ2S-07L	M3 screw with captive wire clamp, fingersafe	250V, 8A	Maximum up to 2 - #14 AWG	0.6 - 1.0N•m (Maximum 1.2N•m)
	SQ1V-07B	M3 screw with box clamp, fingersafe	300V, 12A	Maximum up to 2 - #14 AWG	1.0N•m Maximum
	SQ2V-07B	M3 screw with box clamp, fingersafe	300V, 10A	Maximum up to 2 - #14 AWG	1.0N•m Maximum
PCB Mount	SJ1S-61	PCB mount	250V, 12A	—	—
	SJ2S-61	PCB mount	250V, 8A	—	—
	SQ1V-63	PCB mount	300V, 12A	—	—
	SQ2V-63	PCB mount	300V, 12A	—	—

Switches & Pilot Lights

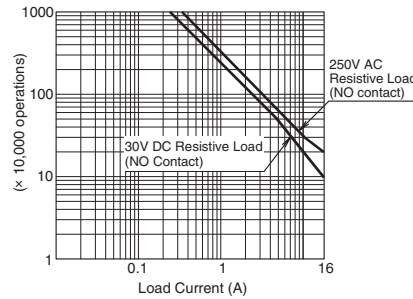
Display Lights

Electrical Life Curve (Resistive Load)

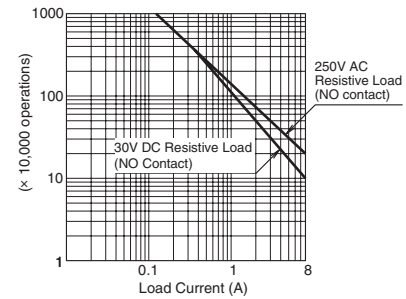
RJ1



RJ1 High Capacity



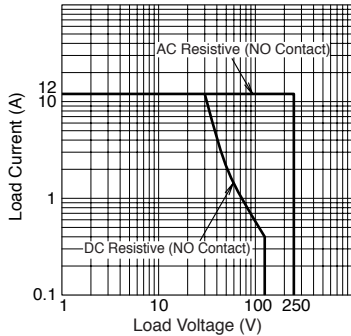
RJ2



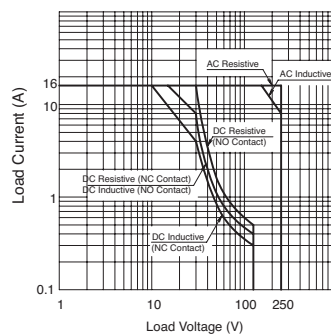
Relays & Sockets

Maximum Switching Capacity (Resistive Load)

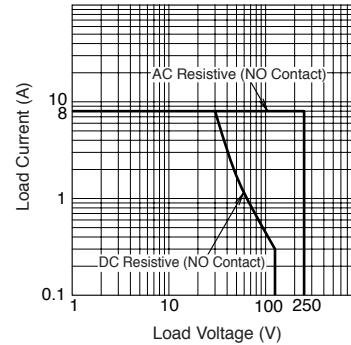
RJ1



RJ1 High Capacity



RJ2



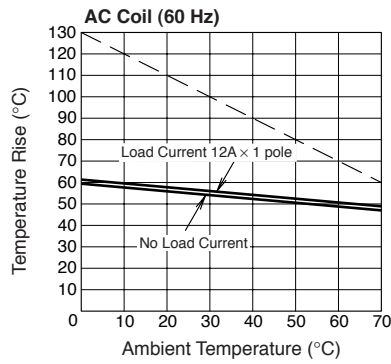
Timers

Terminal Blocks

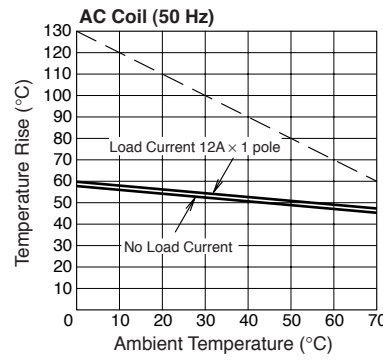
Circuit Breakers

Operating Temperature and Coil Temperature Rise

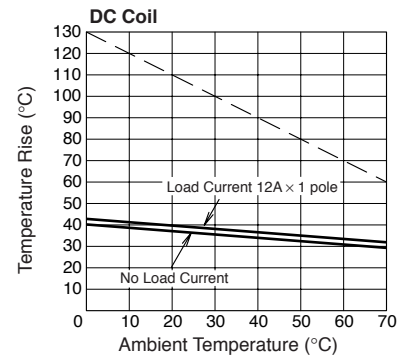
RJ1 (AC Coil, 60 Hz)



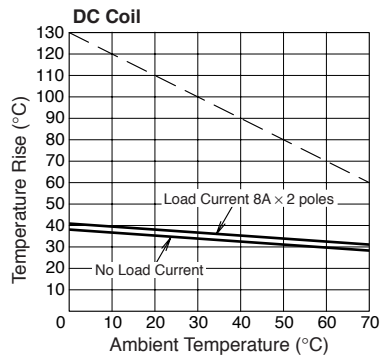
RJ1 (AC Coil, 50 Hz)



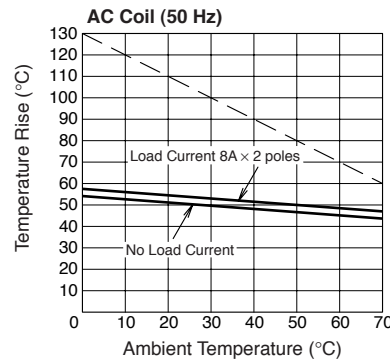
RJ1 (DC Coil)



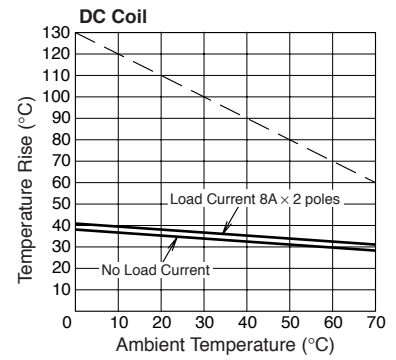
RJ2 (AC Coil, 60 Hz)



RJ2 (AC Coil, 50 Hz)



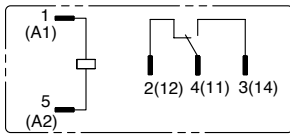
RJ2 (DC Coil)



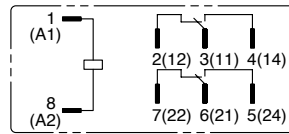
The above temperature rise curves show characteristics when 100% the rated coil voltage is applied. The slanted dashed line indicates allowable temperature rise for the coil at different ambient temperatures.

Internal Connection (View from Bottom)

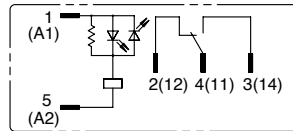
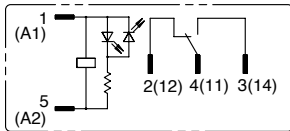
RJ1S-C-* Standard



RJ2S-C-* Standard



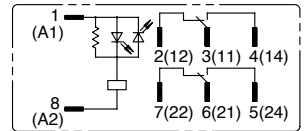
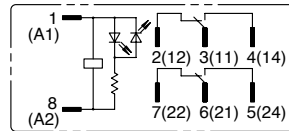
RJ1S-CL-* With LED Indicator



Coil voltage 24V AC/DC and below

Coil voltage greater than 24V AC/DC

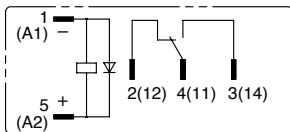
RJ2S-CL-* With LED Indicator



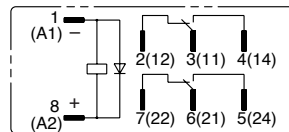
Coil voltage 24V AC/DC and below

Coil voltage greater than 24V AC/DC

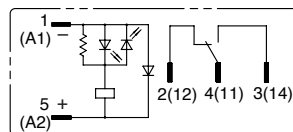
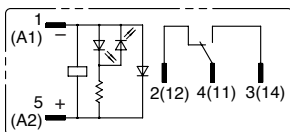
RJ1S-CD-* With Diode



RJ2S-CD-* With Diode



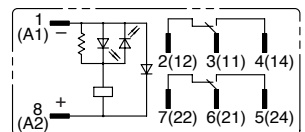
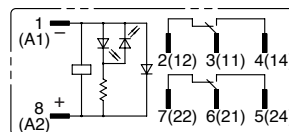
RJ1S-CLD-* With LED Indicator and Diode



Coil voltage 24V DC and below

Coil voltage greater than 24V DC

RJ2S-CLD-* With LED Indicator and Diode



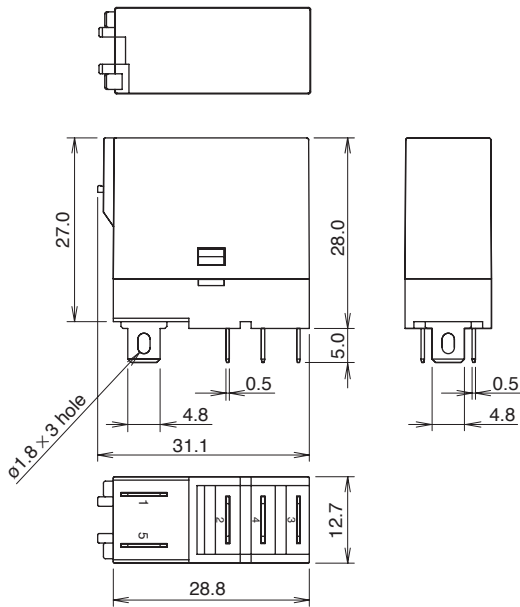
Coil voltage 24V DC and below

Coil voltage greater than 24V DC

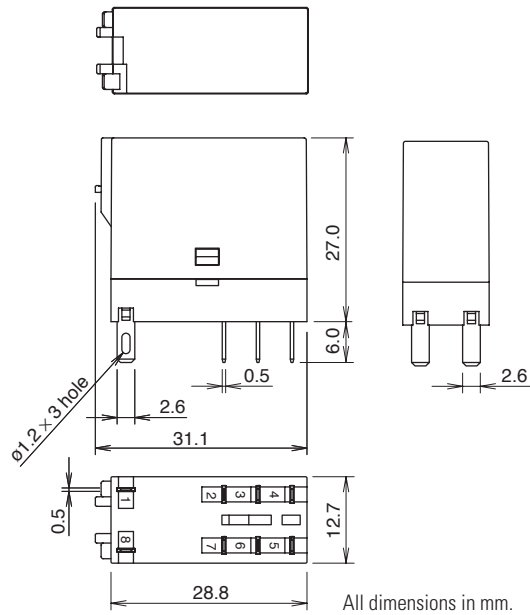
Dimensions (mm)

Blade Relay (mm)

RJ1S



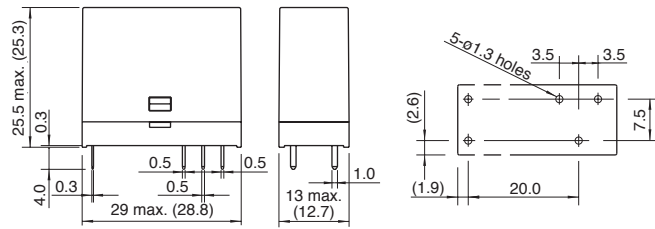
RJ2S



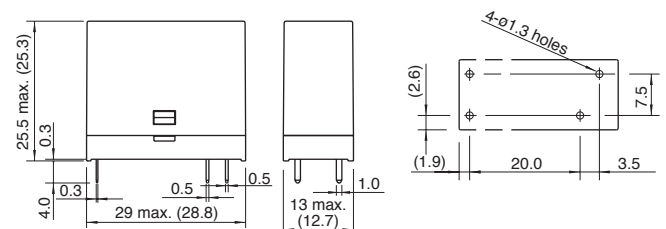
All dimensions in mm.

PCB Relay (mm)

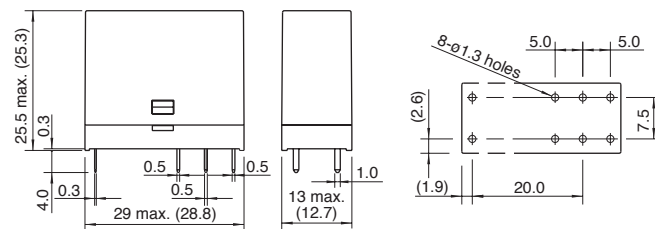
RJ1V-C-*



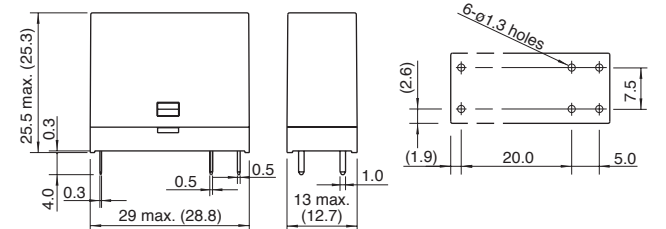
RJ1V-A-*



RJ1V-CH-*/RJ2V-C-*



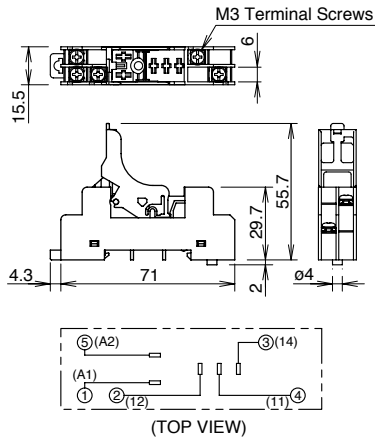
RJ1V-AH-*/RJ2V-A-*



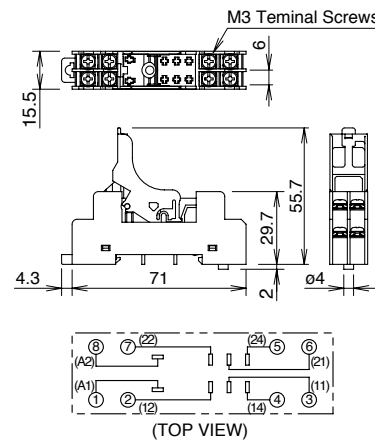
Dimensions con't (mm)

Standard DIN Rail Mount Sockets

SJ1S-05B

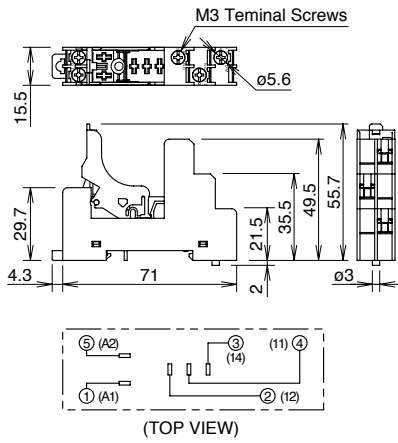


SJ2S-05B

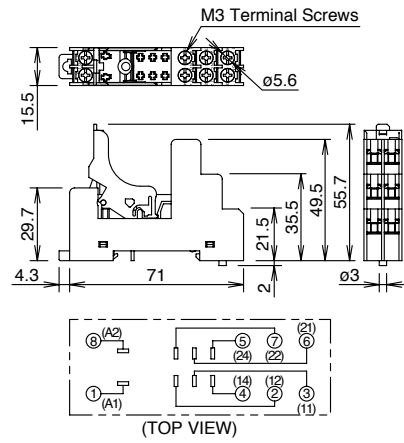


Finger-safe DIN Rail Mount Sockets

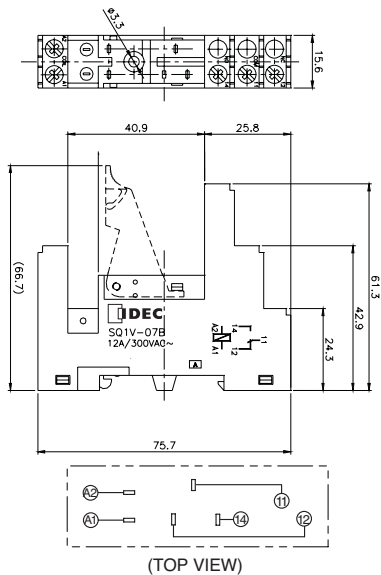
SJ1S-07L



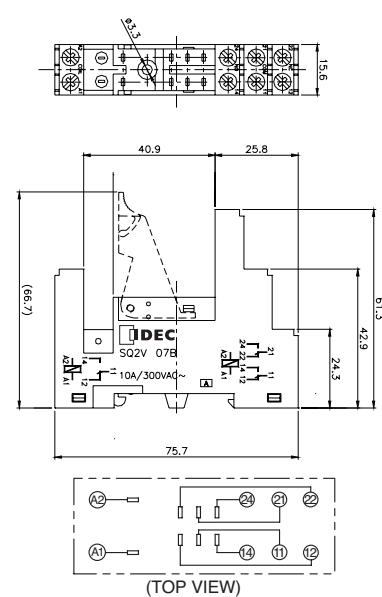
SJ2S-07L



SQ1V-07B



SQ2V-07B



Switches & Pilot Lights

Display Lights

Relays & Sockets

Timers

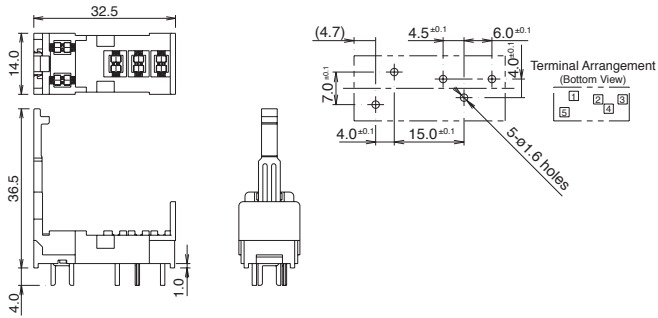
Terminal Blocks

Circuit Breakers

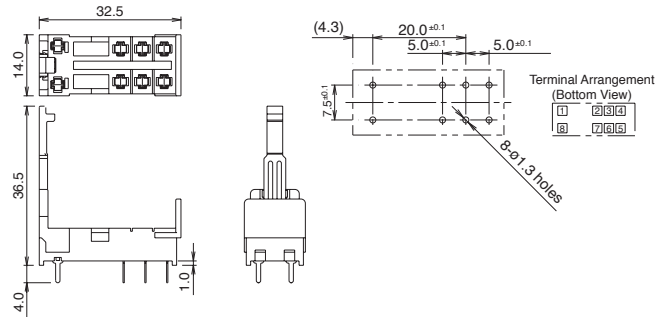
Dimensions con't (mm)

PC Mount Sockets

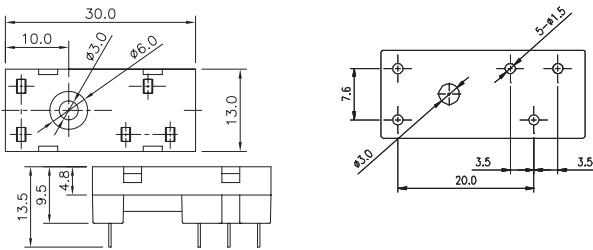
SJ1S-61



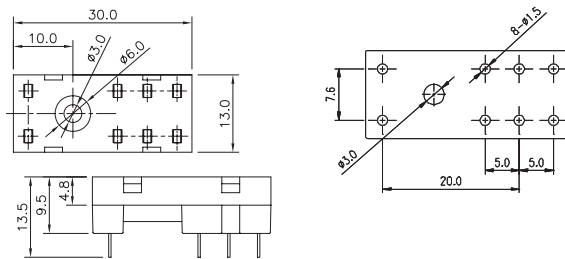
SJ2S-61



SQ1V-63



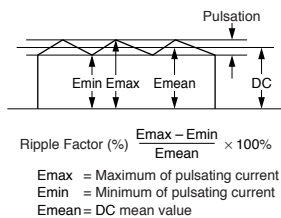
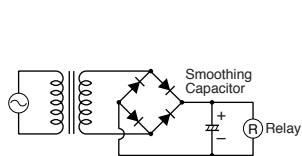
SQ2V-63



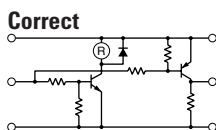
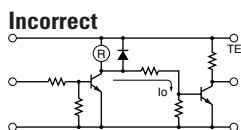
Operating Instructions

Driving Circuit for Relays

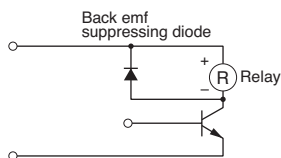
- To ensure correct relay operation, apply rated voltage to the relay coil.
- Input voltage for the DC coil:
A complete DC voltage is best for the coil power to make sure of stable relay operation. When using a power supply containing a ripple voltage, suppress the ripple factor within 5%. When power is supplied through a rectification circuit, the relay operating characteristics, such as pickup voltage and dropout voltage, depend on the ripple factor. Connect a smoothing capacitor for better operating characteristics as shown below.



- Leakage current while relay is off:
When driving an element at the same time as the relay operation, special consideration is needed for the circuit design. As shown in the incorrect circuit below, leakage current (I_0) flows through the relay coil while the relay is off. Leakage current causes coil release failure or adversely affects the vibration resistance and shock resistance. Design a circuit as shown in the correct example.



- Surge suppression for transistor driving circuits:
When the relay coil is turned off, a high-voltage pulse is generated, causing a transistor to deteriorate and sometimes to break. Be sure to connect a diode to suppress the back electromotive force. Then, the coil release time becomes slightly longer. To shorten the coil release time, connect a Zener diode between the collector and emitter of the transistor. Select a Zener voltage slightly higher than the power voltage.



Protection for Relay Contacts

- The contact ratings show maximum values. Make sure that these values are not exceeded. When an inrush current flows through the load, the contact may become welded. If this is the case, connect a contact protection circuit, such as a current limiting resistor.
- Contact protection circuit:
When switching an inductive load, arcing causes carbides to form on the contacts, resulting in increased contact resistance. In consideration of contact reliability, contact life, and noise suppression, use of a surge absorbing circuit is recommended. Note that the release time of the load becomes slightly longer. Check the operation using the actual load. Incorrect use of a contact protection circuit will adversely affect switching characteristics. Four typical examples of contact protection circuits are shown in the following table:

RC		<p>This protection circuit can be used when the load impedance is smaller than the RC impedance in an AC load power circuit.</p> <ul style="list-style-type: none"> R: Resistor of approximately the same resistance value as the load C: 0.1 to 1 μF
Diode		<p>This protection circuit can be used for DC load power circuits. Use a diode with the following ratings.</p> <p>Reverse withstand voltage: Power voltage of the load circuit x 10</p> <p>Forward current: More than the load current</p>
Varistor		<p>This protection circuit can be used for both AC and DC load power circuits.</p> <p>For a best result, when using a power voltage of 24 to 48V AC/DC, connect a varistor across the load.</p> <p>When using a power voltage of 100 to 240V AC/DC, connect a varistor across the contacts.</p>

- Do not use a contact protection circuit as shown below:

	<p>This protection circuit is very effective in arc suppression when opening the contacts. But, the capacitor is charged while the contacts are opened. When the contacts are closed, the capacitor is discharged through the contacts, increasing the possibility of contact welding.</p>
	<p>This protection circuit is very effective in arc suppression when opening the contacts. But, when the contacts are closed, a current flows to charge the capacitor, causing contact welding.</p>

Generally, switching a DC inductive load is more difficult than switching a DC resistive load. Using an appropriate arc suppressor, however, will improve the switching characteristics of a DC inductive load.

Soldering

- When soldering the relay terminals, use a soldering iron of 30 to 60W, and quickly complete soldering (within approximately 3 seconds).
- Use a non-corrosive rosin flux.

Switches & Pilot Lights

Display Lights

Relays & Sockets

Timers

Terminal Blocks

Circuit Breakers

Operating Instructions con't

Other Precautions

1. General notice:
To maintain the initial characteristics, do not drop or shock the relay.

The relay cover cannot be removed from the base during normal operation. To maintain the initial characteristics, do not remove the relay cover.

Use the relay in environments free from condensation, dust, sulfur dioxide (SO₂), and hydrogen sulfide (H₂S).

Make sure that the coil voltage does not exceed applicable coil voltage range.
2. UL and CSA ratings may differ from product rated values determined by IDEC.
3. Do not use relays in the vicinity of strong magnetic field, as this may affect relay operation.

Safety Precautions

- Turn off the power to the relay before starting installation, removal, wiring, maintenance, and inspection of the relays. Failure to turn power off may cause electrical shock or fire hazard.
- Observe specifications and rated values, otherwise electrical shock or fire hazard may be caused.
- Use wires of the proper size to meet voltage and current requirements. Tighten the terminal screws on the relay socket to the proper tightening torque.
- Surge absorbing elements on AC relays with RC or DC relays with diode are provided to absorb the back electromotive force generated by the coil. When the relay is subject to an excessive external surge voltage, the surge absorbing element may be damaged. Add another surge absorbing provision to the relay to prevent damage.

Precautions for the RU Relays

- Before operating the latching lever of the RU relay, turn off the power to the RU relay. After checking the circuit, return the latching lever to the original position.
- Do not use the latching lever as a switch. The durability of the latching lever is a minimum of 100 operations.
- When using DC loads on 4PDT relays, apply a positive voltage to terminals of neighboring poles and a negative voltage to the other terminals of neighboring poles to prevent the possibility of short circuits.
- DC relays with a diode have a polarity in the coil terminals. Apply the DC voltage to the correct terminals.

Utilisation categories according to IEC 947-4-1

Standard utilisation categories AC

Category	Typical applications
AC-1	Non-inductive or slightly loads. Resistance furnaces
AC-2	Slip-ring motors: starting, plugging
AC-3	Squirrel-cage motors (1): starting, switching off motors during running.
AC-4	Squirrel-cage motors: starting, plugging, inching.
AC-5 a	Discharge lamps
AC-5 b	Incandescent lamps
AC-6 a	Transformers
AC-6 b	Cos φ capacitors
AC-7 a	Slightly inductive loads for domestic applications
AC-7 b	Motors in domestic applications
AC-8 a	Drive motors for cooling compressors (2) with manual reset and thermal overload relay
AC-8 b	Drive motors for cooling compressors (2) with manual reset and automatic reset

Standard utilisation categories DC

Category	Typical applications
DC-1	Non-inductive or slightly inductive loads. Resistance furnaces
DC-3	Shunt motors: starting, plugging, inching
DC-5	Series motors: starting, plugging, inching
DC-6	Incandescent lamps

- (1) Category AC-3 can be used for accidental not continuous short period service, while mounting and testing machines. The number of operations shall not be greater than 5 per minute or 10 per 10 minutes.
- (2) The drive motor of a hermetic cooling compressor is an assembly of a motor and compressor in the same housing, without any axle; the motor is working in the cooling liquid.
- (3) Making conditions in alternating current are expressed by effective value. Moreover the asymmetrical current high value, referred to cos φ, can assume a higher value.
- (4) Tolerance for cos φ = ± 0.05
- (5) Tolerance for L/R = ± 15%

Making and breaking capacity

IEC 947-4-1

Values given for closing and opening by intermittent use

Cat.	Rated current	Closing (3)			Opening		
		Ic/Ie	Ur/Ue	cosφ(4)	Ic/Ie	Ur/Ue	cosφ (4)
AC-1	All values	1.5	1.05	0.80	1.5	1.05	0.80
AC-2	All values	4	1.05	0.65	4	1.05	0.65
AC-3	Ie ≤ 100A	10	1.05	0.45	8	1.05	0.45
	Ie > 100A	10	1.05	0.35	8	1.05	0.35
AC-4	Ie ≤ 100A	12	1.05	0.45	10	1.05	0.45
	Ie > 100A	12	1.05	0.35	10	1.05	0.35

Cat.	Rated current	Closing			Opening		
		Ic/Ie	Ur/Ue	L/R(5) (ms)	Ic/Ie	Ur/Ue	L/R(5) (ms)
DC-1	All values	1.5	1.05	1	1.5	1.05	1
DC-3	All values	4	1.05	2.5	4	1.05	2.5
DC-5	All values	4	1.05	15	4	1.05	15

Electrical endurance

IEC 947-4-1

Values given for closing and opening intermittent use

Cat.	Rated current	Closing (3)			Opening		
		Ic/Ie	Ur/Ue	cosφ(4)	Ic/Ie	Ur/Ue	cosφ(4)
AC-1	All values	1	1	0.95	1	1	0.95
AC-2	All values	2.5	1	0.65	2.5	1	0.65
AC-3	Ie ≤ 17A	6	1	0.65	1	0.17	0.65
	Ie > 17A	6	1	0.35	1	0.17	0.35
AC-4	Ie ≤ 17A	6	1	0.65	6	1	0.65
	Ie > 17A	6	1	0.35	6	1	0.35

Cat.	Rated current	Closing			Opening		
		Ic/Ie	Ur/Ue (ms)	L/R(5)	Ic/Ie	Ur/Ue (ms)	L/R(5)
DC-1	All values	1	1	1	1	1	1
DC-3	All values	2.5	1	2	2.5	1	2
DC-5	All values	2.5	1	7.5	2.5	1	7.5

Ue	Rated operational voltage
Ie	Rated operational current
Ur	Feed-back voltage
Ic	Current made or broken

Utilisation category AC-1

Three pole contactors

Type		MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL06	CL07	CL08	CL09	CL10
Max. operat. current at ambient temp. of:	40°C (A)	20	20	20	25	25	32	45	45	60	60	90	110	110	140	140
	55°C (A)	20	20	20	25	25	32	45	45	60	60	90	110	110	140	140
(for all voltages)	70°C (A)	16	16	16	20	20	25	32	32	48	48	72	88	88	110	110
Max. operat. power	230/220V (kW)	7.5	7.5	7.5	9.5	9.5	12	17	17	22.5	22.5	30	42	42	53	53
Three-phase resistors	400/380V (kW)	13	13	13	16.5	16.5	22	29	29	39.5	39.5	55	72.5	72.5	92	92
	440/415V (kW)	15	15	13	18	18	23	32	32	43	43	57	79	79	100	100
	500V (kW)	17	17	17	21.5	21.5	27.5	39	39	52	52	69	95	95	121	121
	690/660V (kW)	22.5	22.5	22.5	28.5	28.5	38	51	51	68.5	68.5	95	125	125	160	160
Cable size	(mm ²)	2.5	2.5	2.5	4	4	6	10	10	16	16	35	35	35	50	50
Percentage of the max. operational current at	120 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	300 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	600 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	1200 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	80	80
	3000 ops./h (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	40	40

Type		CK75C	CK08C	CK85B	CK09B	CK95B	CK10C	CK11C	CK12B	CK13B						
Max. operat. current at ambient temp. of:	40°C (A)	250	250	315	315	450	600	700	1000	1250						
	55°C (A)	200	200	252	252	382	510	546	736	1125						
(for all voltages)	70°C (A)	155	155	195	195	300	402	468	680	1060						
Max. operat. power	230/220V (kW)	90	90	114	114	170	191	234	289	450						
Three-phase resistors	400/380V (kW)	155	155	196	196	310	329	406	500	780						
	440/415V (kW)	180	180	227	227	343	329	470	578	904						
	500V (kW)	200	200	259	259	389	415	533	657	1027						
	690/660V (kW)	270	270	341	341	537	572	705	867	1354						
	1000V (kW)	400	400	517	517	780	866	1060	1314	2054						
Cable size	(mm ²)	120	120	185	185	2x (30X5)	2x (30X8)	2x (30X8)	2x (30X10)	2x (30X10)						
Percentage of the max. operational current at	120 ops./h (%)	100	100	100	100	100	100	100	100	100						
	300 ops./h (%)	100	100	100	100	100	100	100	100	90						
	600 ops./h (%)	100	100	100	100	100	80	80	80	70						
	1200 ops./h (%)	80	80	80	80	80	-	-	-	-						
	3000 ops./h (%)	40	40	40	40	-	-	-	-	-						

Four pole contactors

Type		MC0	MC1	MC2	CL01	CL02	CL03	CL04	CL05	CL07	CL08(1)	CL09(2)
Max. operat. current at ambient temp. of:	40°C (A)	20	20	20	25	32	45	60	90	110	110	140
	55°C (A)	20	20	20	25	32	45	60	90	110	110	140
(for all voltages)	70°C (A)	16	16	16	20	25	32	48	72	88	88	110
Max. operat. power	230/220V (kW)	7.5	7.5	7.5	9.5	12	17	22.5	30	42	42	53
Three-phase resistors	400/380V (kW)	13	13	13	16.5	22	29	39.5	55	72.5	72.5	92
	440/415V (kW)	15	15	15	18	23	32	43	57	79	79	100
	500V (kW)	17	17	17	21.5	27.5	39	52	69	95	95	121
	690/660V (kW)	22.5	22.5	22.5	28.5	38	51	68.5	95	125	25	160
Cable size	(mm ²)	2.5	2.5	2.5	4	6	10	16	35	35	35	50
Percentage of the max. operational current at	120 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100
	300 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100
	600 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100
	1200 ops./h (%)	100	100	100	100	100	100	100	100	100	100	80
	3000 ops./h (%)	50	50	50	50	50	50	50	50	50	50	40

Type		CK07B	CK08B	CK09B	CK95B	CK10C	CK11C	CK12B	CK13B			
Max. operat. current at ambient temp. of:	40°C (A)	200	325	400	500	600	700	1000	1250			
	55°C (A)	170	260	320	425	510	546	736	1125			
(for all voltages)	70°C (A)	140	201	272	335	402	468	680	1060			
Max. operat. power	230/220V (kW)	76	123	152	191	228	266	381	476			
Three-phase resistors	400/380V (kW)	131	214	263	329	395	460	658	822			
	440/415V (kW)	143	233	287	359	431	503	719	898			
	500V (kW)	173	281	346	415	519	606	866	1082			
	690/660V (kW)	228	371	457	572	686	800	1143	1428			
	1000V (kW)	-	562	692	866	1039	1212	1732	2165			
Cable size	(mm ²)	95	185	2x (25X5)	2x (30X5)	2x (30X8)	2x (30X8)	2x (30X10)	2x (40X10)			
Percentage of the max. operational current at	120 ops./h (%)	100	100	100	100	100	100	100	100			
	300 ops./h (%)	100	100	100	100	100	100	100	90			
	600 ops./h (%)	100	100	100	100	80	80	80	70			
	1200 ops./h (%)	80	80	80	80	-	-	-	-			
	3000 ops./h (%)	40	40	40	40	-	-	-	-			

Increase in maximum operational current through connection poles in parallel:
 - 2 poles in parallel: $I_e \times 1.8$
 - 3 poles in parallel: $I_e \times 2.4$
 - 4 poles in parallel: $I_e \times 3.2$

(1) Only types (2NO + 2NC)
 (2) Only types (4NO)



Utilisation category AC-3

Three pole contactors

Types		MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL06	CL07	CL08	CL09	CL10
Operational current Ie for Ue ≤ 400V	(A)	6	9	12	9	12	18	25	25	32	40	50	65	80	95	105
Max. operat. power	230/220V (kW)	1.5	3	3	2.2	3	4	7.5	7.5	9	11	15	18.5	22	25	30
Three-phase motors	(HP)	2	4	4	3	4	5.5	10	10	12	15	20	25	30	34	40
50/60Hz	400/380V (kW)	2.2	4	5.5	4	5.5	7.5	12	12	16	18.5	22	30	37	45	55
	(HP)	3	5.5	7.3	5.5	7.5	10	16	16	22	25	30	40	50	60	75
	440/415V (kW)	2.2	4	5.5	4	5.5	7.5	12	12	16	22	25	37	45	50	55
	(HP)	3	5.5	7.3	5.5	7.5	10	16	16	22	30	34	50	60	68	75
	500V (kW)	3	4	5.5	5.5	7.5	10	15	15	18.5	25	30	40	45	55	65
	(HP)	4	5.5	7.3	7.5	10	13.5	20	20	25	34	40	55	60	75	88
	690/660V (kW)	3	4	5.5	5.5	7.5	10	15	15	18.5	30	35	45	45	55	65
	(HP)	4	5.5	7.3	7.5	10	13.5	20	20	25	40	48	60	60	75	88
Percentage of the max. operational current at	120 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	300 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	600 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	1200 ops./h (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	75	75
	3000 ops./h (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	25	25

Type		CK75C	CK08C	CK85B	CK09B	CK95B	CK10C	CK11C	CK12B	CK13B
Operational current Ie for Ue ≤ 400V	(A)	150	185	205	250	309	420	550	700	825
Max. operat. power	230/220V (kW)	45	55	65	75	90	125	160	220	250
Three-phase motors	(HP)	60	75	88	100	125	170	220	300	340
50/60Hz	400/380V (kW)	75	90	110	132	160	220	280	375	450
	(HP)	100	125	150	180	220	300	380	510	610
	440/415V (kW)	80	100	125	132	185	230	315	400	450
	(HP)	108	135	170	180	250	312	425	540	610
	500V (kW)	100	110	132	160	200	300	400	480	500
	(HP)	135	150	180	220	270	405	540	650	680
	690/660V (kW)	100	132	155	200	250	375	450	500	550
	(HP)	135	180	205	270	335	510	610	680	750
	1000V (kW)	65	100	110	150	200	300	375	450	500
	(HP)	88	135	150	205	270	405	510	610	680
Percentage of the max. operational current	120 ops./h (%)	100	100	100	100	100	100	100	100	100
	300 ops./h (%)	100	100	100	100	100	100	100	80	80
	600 ops./h (%)	100	100	100	100	100	75	75	65	65
	1200 ops./h (%)	75	75	75	75	75	-	-	-	-
	3000 ops./h (%)	25	25	25	25	-	-	-	-	-

Utilisation category AC-4

Three pole contactors

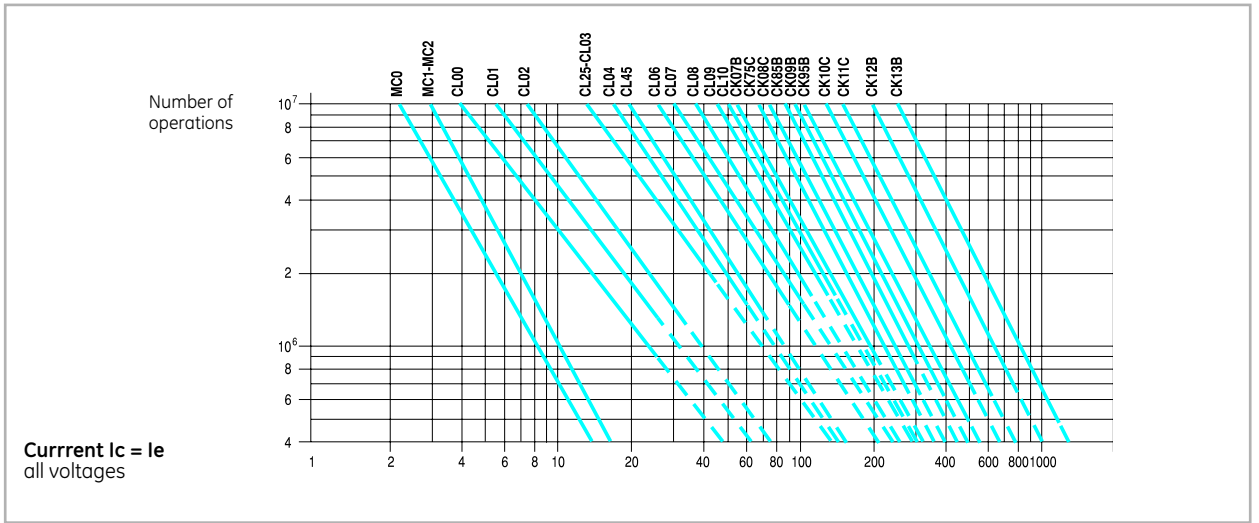
Type		MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL06	CL07	CL08	CL09	CL10
Operational current Ue ≤ 690V	(A)	2.75	3.5	3.5	5	7	8	12	12	16	18.5	23	30	37	44	50
Operational power	230/220V (kW)	0.55	0.75	0.75	1.1	1.5	1.8	3	3	3.7	4	5.5	7.5	10	11	13
(200.000 operations)	(HP)	0.73	1	1	1.5	2	2.4	4	4	5	5.3	7.3	9.7	13	14.6	17.3
	400/380V (kW)	1.1	1.5	1.5	2.2	3	3.7	5.5	5.5	7.5	9	11	15	18.5	22	25
	(HP)	1.5	2	2	3	4	5	7.3	7.3	9.7	12	14.6	20	24.6	29.2	33
	500V (kW)	1.5	2.2	2.2	3	4	5.5	7.5	7.5	10	11	15	18.5	22	25	30
	(HP)	2	3	3	4	5.3	7.3	9.7	9.7	13	14.6	20	24.6	29.2	33	40
	690/660V (kW)	2.2	3	3	4	5.5	7.5	10	10	11	15	18.5	22	25	30	37
	(HP)	3	4	4	5.3	7.3	9.7	13	13	14.6	20	24.6	29.2	33	40	49
Max. operational current ≤ 400V	(A)	6	9	9	9	12	18	25	25	32	40	50	65	80	95	105
(35.000 operations)																
Max. operational power	400/380V (kW)	2.2	4	4	4	5.5	7.5	11	12	16	18.5	22	30	37	45	55

Type		CK75C	CK08C	CK85B	CK09B	CK95B	CK10C	CK11C	CK12B	CK13B
Operational current Ue ≤ 400V	(A)	65	75	90	110	125	150	165	250	350
Operational power	230/220V (kW)	18.5	22	25	33	37	45	50	80	110
Three-phase motors	(HP)	24.6	29.2	33	44	49	60	66.5	106	146
50/60Hz	400/380V (kW)	33	40	45	55	63	80	90	132	165
(200.000 operations)	(HP)	44	53	60	73	83.8	106	119	175	219
	500V (kW)	45	50	63	75	90	100	110	225	250
	(HP)	60	66.5	83.8	100	119	133	146	300	332
	690/660V (kW)	55	63	80	100	110	132	150	250	315
	(HP)	73	83.8	106	133	146	175	200	332	419
Max. operational current ≤ 400V	(A)	150	185	205	250	309	420	550	700	825
(35.000 operations)										
Max. operational power	400/380V (kW)	75	90	110	132	160	220	280	375	450

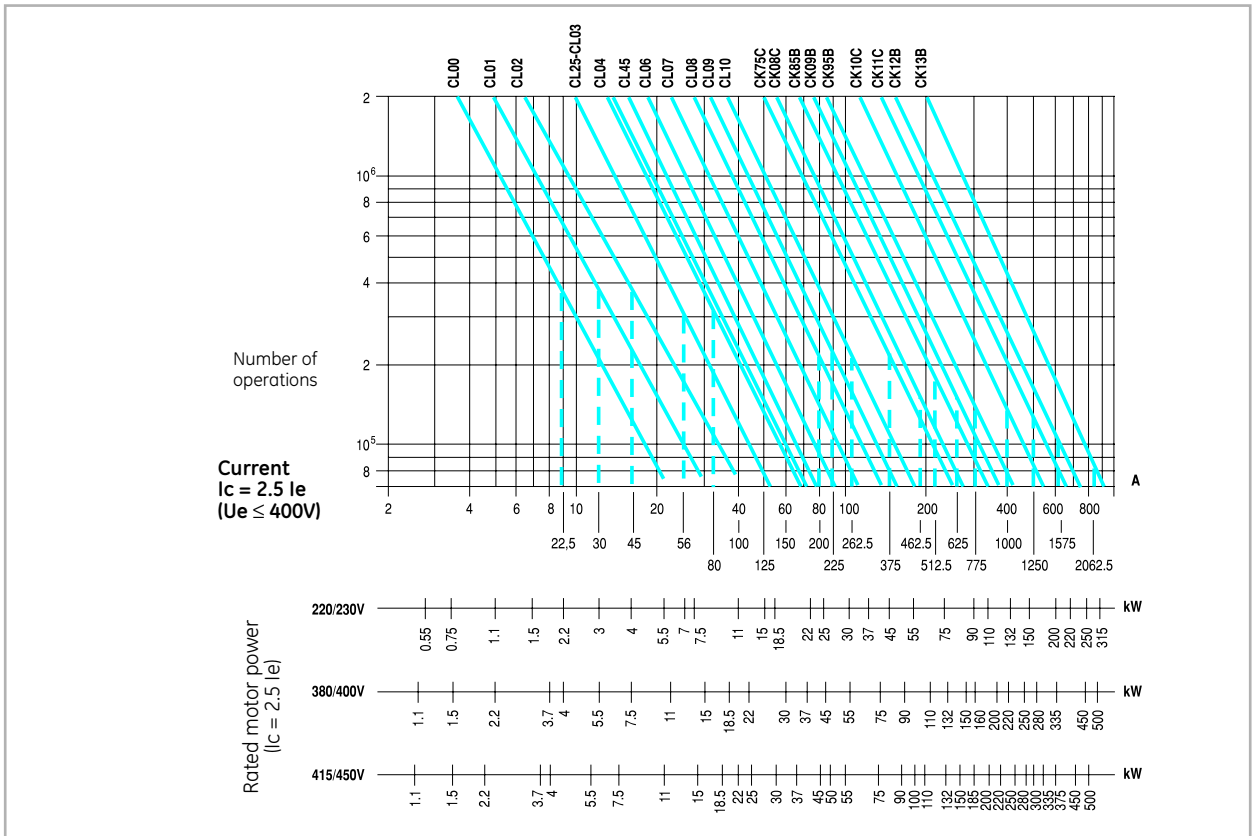


Electrical endurance

Category AC1



Category AC2



Motorstarters

A

B

C

D

E

F

G

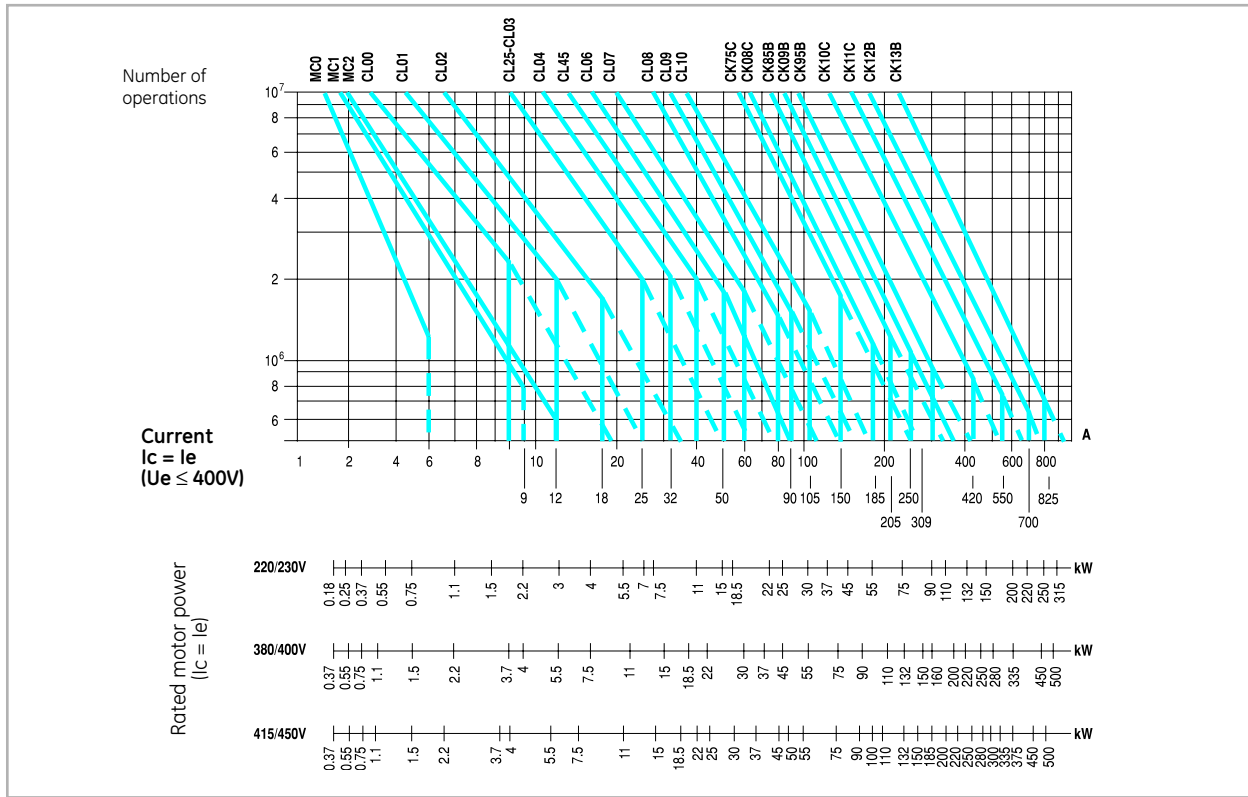
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I

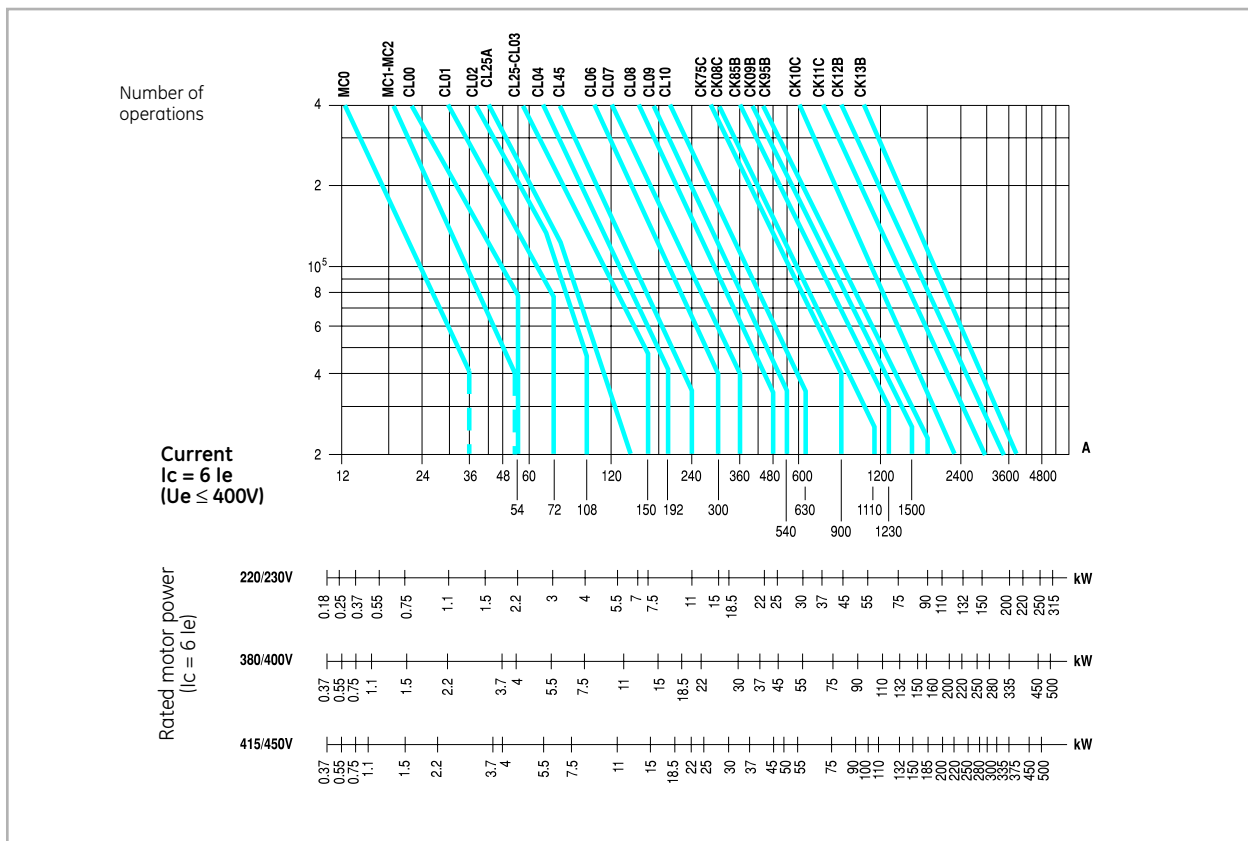
X



Category AC3



Category AC4



Applications

A

B

C

D

E

F

G

H

I

X



Electrical endurance

Mixed category AC2 / AC'2

Graph to determine the coefficient which when multiplied by the contactor electrical endurance in category AC'2, will give the electrical endurance in mixed category AC2/AC'2.

Example:

- % of operations in AC2: 35% (or 65% as AC'2)
- Breaking current $I_c = 2.54 I_e$
- Contactor considered: CK08BA
Resultant coefficient from the graph: 0.35
Electrical endurance in AC'2 for contactor CK085A , to drive a motor of 45kW at 380V:
 $I_e = 85A; 5.5 \times 10^6$ operations.

Resultant electrical endurance for mixed service considered:

$$0.35 \times 5.5 \times 10^6 = 1.92 \times 10^6 \text{ operations.}$$

Mixed category AC4 / AC3

Electrical endurance for mixed category (AC3/AC4) is calculated with the following formula:

$$\text{Electrical endurance (AC3/AC4)} = \frac{\text{Electrical endurance (AC3)}}{1 + \frac{\% \text{ ops. AC4}}{100} \times \left(\frac{\text{Electr. endur. (AC3)}}{\text{Electr. endur. (AC4)}} - 1 \right)}$$

A

B

C

D

E

F

G

H

I

X





Notes

Grid area for notes.

Applications

A
B
C
D
E
F
G
H
I
X



Series M and CL. Max. operational current I_e (A) - DC utilisation categories

Category DC1. $L/R \leq 1ms$

Ue	Poles in serie	MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL05	CL06	CL07	CL08	CL09	CL10
24V	1	6	9	9	18	18	18	25	25	32	40	50	50	65	65	80	80
	2	8	12	12	25	25	32	45	45	60	60	90	90	110	110	140	140
	3	15	20	20	25	25	32	45	45	60	60	90	90	110	110	140	140
	4	15	20	20	-	25	32	-	45	60	-	90	-	110	-	140	-
48V	1	5	7.5	7.5	15	15	15	20	20	25	35	45	45	55	55	70	70
	2	8	12	12	25	25	32	45	45	60	60	90	90	110	110	140	140
	3	12	16	16	25	25	32	45	45	60	60	90	90	110	110	140	140
	4	15	20	20	-	25	32	-	45	60	-	90	-	110	-	140	-
60V	1	4	6	6	12	12	12	18	18	18	32	40	40	50	50	65	65
	2	6	9	9	25	25	32	45	45	60	60	90	90	110	110	140	140
	3	12	16	16	25	25	32	45	45	60	60	90	90	110	110	140	140
	4	15	20	20	-	25	32	-	45	60	-	90	-	110	-	140	-
125V	1	1.6	2.5	2.5	6	6	6	8	8	8	8	16	16	16	16	16	16
	2	4	6	6	18	18	18	25	25	45	45	80	80	90	90	110	110
	3	5	10	10	25	25	25	32	45	60	60	90	90	110	110	140	140
	4	5	10	10	-	25	32	-	45	60	-	90	-	110	-	140	-
220V	1	0.2	0.36	0.36	0.8	0.8	0.8	1	1	1	1	2	2	2	2	2	2
	2	1.7	2.6	2.6	7.5	7.5	7.5	7.5	8	8	8	20	20	20	20	20	20
	3	4	8	8	25	25	25	32	45	50	50	90	90	110	110	140	140
	4	4	8	8	-	25	32	-	45	60	-	90	-	110	-	140	-
440V	1	0.09	0.13	0.13	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.8	0.8	0.8	0.8	0.8	0.8
	2	0.26	0.4	0.4	0.8	0.8	0.8	0.8	1	1	1	2	2	2	2	2	2
	3	0.5	1	1	8	8	8	10	10	10	10	15	15	15	15	15	15
	4	0.5	1	1	-	15	15	-	20	25	-	80	-	90	-	110	-
600V	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	0.4	0.4	0.4	0.4	0.5	0.5	0.5	1	1	1	1	1	1
	3	-	-	-	4	4	4	5	5	5	5	7.5	7.5	7.5	7.5	7.5	7.5
	4	-	-	-	-	8	10	-	12	12	-	50	-	65	-	75	-

Category DC3. $L/R \leq 2.5ms$

Ue	Poles in serie	MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL05	CL06	CL07	CL08	CL09	CL10
24V	1	-	-	-	12	12	12	18	18	25	32	40	40	50	50	65	65
	2	4	9	9	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	8	12	12	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
48V	1	-	-	-	9	9	9	12	12	18	20	30	30	35	35	45	45
	2	3	6	6	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	6	9	9	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
60V	1	-	-	-	7.5	7.5	7.5	10	10	15	15	25	25	30	30	35	35
	2	3	6	6	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	6	9	9	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
125V	1	-	-	-	2	2	2	2	3	3	3	3	3	3	3	3	3
	2	0.85	4.5	4.5	10	10	12	18	18	25	32	50	50	60	60	80	80
	3	1.7	6	6	15	15	18	25	25	32	40	35	35	80	80	105	105
	4	-	-	-	-	15	18	-	25	32	-	35	-	80	-	105	-
220V	1	-	-	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8
	2	0.35	1.2	1.2	2	2	2	2	2	2	7	7	7	7	7	7	7
	3	0.7	2.5	2.5	12	12	12	18	18	25	32	50	50	65	65	95	95
	4	-	-	-	-	15	18	-	32	32	-	65	-	80	-	105	-
440V	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	0.05	0.15	0.15	0.3	0.3	0.3	0.3	0.5	0.5	0.5	1	1	1	1	1	1
	3	0.13	0.3	0.3	1.5	1.5	1.5	1.5	3	3	3	3	3	3	3	3	3
	4	-	-	-	-	6	6	-	6	6	-	50	-	65	-	75	-
600V	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	0.8	0.8	0.8	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	4	-	-	-	-	2.5	2.5	-	2.5	2.5	-	25	-	30	-	35	-

Category DC5. $L/R \leq 15ms$

Ue	Poles in serie	MC0	MC1	MC2	CL00	CL01	CL02	CL25	CL03	CL04	CL45	CL05	CL06	CL07	CL08	CL09	CL10
24V	1	-	-	-	12	12	12	18	18	25	32	40	40	50	50	65	65
	2	3	4.5	4.5	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	6	9	9	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
48V	1	-	-	-	9	9	9	12	12	18	20	30	30	35	35	45	45
	2	2.5	4	4	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	6.5	8	8	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
60V	1	-	-	-	7.5	7.5	7.5	10	10	15	15	25	25	30	30	35	35
	2	2	3	3	18	18	18	25	25	40	40	65	65	80	80	105	105
	3	5	7	7	18	18	18	25	25	40	40	65	65	80	80	105	105
	4	-	-	-	-	18	18	-	25	40	-	65	-	80	-	105	-
125V	1	-	-	-	0.8	0.8	0.8	0.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	2	0.65	1.5	1.5	5	5	5	5	5	5	5	50	50	60	60	85	85
	3	1.3	2	2	15	15	15	20	20	25	32	60	60	70	70	95	95
	4	-	-	-	-	15	18	-	25	32	-	65	-	80	-	105	-
220V	1	-	-	-	-	-	-	-	-	-	-	0.5	0.5	0.5	0.5	0.5	0.5
	2	0.16	0.26	0.26	0.8	0.8	0.8	0.8	0.8	0.8	0.8	3	3	3	3	4	4
	3	0.5	0.8	0.8	3	3	3	3	3	3	3	7	7	7	7	7	7
	4	-	-	-	-	10	10	-	15	15	-	65	-	75	-	95	-
440V	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	0.4	0.1	1.1	0.5	0.5	0.5	0.5	0.7	0.7	0.7	1	1	1	1	1	1
	4	-	-	-	-	2	2	-	4	4	-	40	-	50	-	60	-
600V	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	0.75	0.75	-	2.5	2.5	-	20	-	25	-	30	-

Motorstarters

A

B

C

D

E

F

G

H

I

X



Max. operational current I_e (A) - DC utilisation categories (continued)

Category DC1. $L/R \leq 1ms$

Ue	Poles in serie	CK07	CK75	CK08	CK85	CK09	CK95	CK10	CK11	CK12	CK13
24V	1	150	200	200	250	250	350	500	600	800	1000
	2	200	250	250	315	315	450	600	700	1000	1250
	3	200	250	250	315	315	450	600	700	1000	1250
	4	200	-	250	-	315	450	600	700	1000	1250
48V	1	125	170	170	200	200	295	425	500	600	850
	2	140	175	175	220	220	315	425	480	700	850
	3	200	250	250	315	315	500	600	700	1000	1250
	4	200	-	250	-	315	500	600	700	1000	1250
60V	1	100	140	140	175	175	245	350	420	560	700
	2	140	175	175	220	220	315	425	480	700	850
	3	200	250	250	315	315	500	600	700	1000	1250
	4	200	-	250	-	315	500	600	700	1000	1250
125V	1	20	25	25	30	30	50	60	70	100	125
	2	110	200	200	250	250	300	400	500	600	1000
	3	200	250	250	315	315	500	600	700	1000	1250
	4	200	-	250	-	315	500	600	700	1000	1250
220V	1	-	-	-	-	-	-	-	-	-	-
	2	65	110	110	150	150	200	250	250	300	400
	3	200	250	250	315	315	500	600	700	1000	1250
	4	200	-	250	-	315	500	600	700	1000	1250
440V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	60	120	120	150	150	180	240	300	400	480
	4	110	-	200	-	250	315	400	500	700	800
600V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	32	65	65	80	80	95	130	160	215	250
	4	85	-	100	-	130	170	215	265	375	430

Category DC3. $L/R \leq 2.5ms$

Ue	Poles in serie	CK07	CK75	CK08	CK85	CK09	CK95	CK10	CK11	CK12	CK13
24V	1	105	150	185	205	250	309	420	550	700	825
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
48V	1	70	105	130	140	175	215	290	385	490	575
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
60V	1	55	85	105	110	140	175	230	300	390	460
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
125V	1	20	25	25	30	30	50	60	70	100	125
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
220V	1	-	-	-	-	-	-	-	-	-	-
	2	10	60	70	80	85	95	140	185	225	400
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
440V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	8	50	55	65	70	80	120	150	180	320
	4	80	-	105	-	185	205	250	300	400	700
600V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	4	25	25	30	35	40	60	75	90	165
	4	40	-	50	-	90	100	125	150	200	350

Category DC5. $L/R \leq 15ms$

Ue	Poles in serie	CK07	CK75	CK08	CK85	CK09	CK95	CK10	CK11	CK12	CK13
24V	1	105	150	185	205	250	309	420	550	700	825
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
48V	1	60	90	110	120	150	185	250	330	420	495
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
60V	1	55	85	105	110	140	175	230	300	390	460
	2	105	150	185	205	250	309	420	550	700	825
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
125V	1	15	20	20	25	25	40	50	60	80	100
	2	80	95	105	150	185	205	250	300	400	700
	3	105	150	185	205	250	309	420	550	700	825
	4	105	-	185	-	250	309	420	550	700	825
220V	1	-	-	-	-	-	-	-	-	-	-
	2	8	50	55	65	70	80	120	150	180	320
	3	80	95	105	150	185	205	250	300	400	700
	4	105	-	185	-	250	309	420	550	700	825
440V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	5	40	40	50	50	60	90	100	100	200
	4	65	-	95	-	150	185	205	250	300	400
600V	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	40	45	50	75	90	100	125	150	200	350
	4	35	-	45	-	75	90	100	125	150	200



Vnom	230
Phases	3

AC Voltage Rise Calculation

Project XXXXXXXXXX

From	To	Cable Material	Cable Size (mm2)	Cable Insulation	Cable Length (m)	Current in cable	Number Parallel Cables	Cable Resistance (Am/V%)	Vrise (%)	Vrise (V)
Point of Common Cou	Main Switch Board	Copper	400	PVC	25	400	4	23889.945	0.10%	0.241
Main Switch Board	Sub Board 1	Copper	185	XLPE	130	180	1	16200.474	1.44%	3.322
Sub Board 1	Inverter	Copper	6	PVC	3	36	1	613.130	0.18%	0.405
									1.73%	3.968
Point of Common Cou	Main Switch Board	Copper	400	PVC	25	400	4	23889.945	0.10%	0.241
Main Switch Board	Sub Board 2	Aluminium	35	XLPE	4	72	1	2164.386	0.13%	0.306
Sub Board 2	Inverter	Copper	6	PVC	3	36	1	613.130	0.18%	0.405
									0.41%	0.952

String Voltages

V_mppt A	V_mppt B
248	248

Cable Run	Cable Size (mm2)	Cable Length (m)	Current in cable	Array Voltage	DC Resistance ohm/m	Vdrop%	Vdrop
String Cable	10	18	10	400	0.002	0.17%	0.667

DC