IMO

The World's Finest

Solar Product Range

Bright Solutions

IMO is at the forefront of control component technology specifically developed for the renewable energy market and in particular solar energy. Whether meeting the demands of safe and efficient DC switching or delivering tracking solutions that help to maximise solar energy conversion rates, you can be sure that IMO products have been developed to meet the highest technical and commercial standards.

Contents

IMO Solar Guide

Abbreviations

AC	Alternating Current
DC	Direct Current
I_e	Rated Operational Current
IMO	IMO Precision Controls
I_{sc}	Short-Circuit Current
I_{th}	Themal Current
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
V_{oc}	Open-Circuit Voltage

References

BS 7671	Requirements for Electrical Installations
EN 60364-7-712	Low-voltage electrical installations. Part 7-712: Requirements for special installations or locations. Photovoltaic (PV) power systems
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
EN 60947-1	Low-voltage switchgear and controlgear. Part 1: General rules
EN 60947-3	Low-voltage switchgear and controlgear. Part 3: Switches, disconnectors, switch-discon nectors and fuse-combination units
IEC EN 61215	Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval
IEC EN 61646	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval
Nema 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
UL 94	Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 508	Industrial Control Equipment
UL 508i	Manual Disconnect Switches intended for use in Photovoltaic Systems
DTI/Pub URN 06 /1972	Photovoltaics in Buildings, Guide to the installation of PV systems 2nd Edition

Guide to Installation of PV Systems – 3rd Edition

Other Relevant References

G83/1-1	Recommendations for Connection of Small-scale Embedded Generators (Up to 16A per Phase) in Parallel with Public Low-Voltage Distribution Networks
G59/2	Recommendations for the Connection of Generating Plant to the Distribution Systems of Licensed Distribution Network Operators
NFPA70 2014	National Electrical Code

What is a PV System?

A Photovoltaic (PV) power system primarily converts sunlight directly into electricity using a photovoltaic cell array. The conversion of the solar radiation into electric current is carried out using the photoelectric effect found when some semiconductors that are suitably "doped" generate electricity when exposed to solar radiation.

As an individual PV-cell gives a relatively low output, a number of PV-cells are connected in series to supply higher voltages and connected in parallel in order to offer higher current capability. These cell arrays are referred to as PV-panels, and a number of inter-connected panels are referred to as PV-strings. If there is a requirement for increased capacity then a larger system can be constructed whereby the PV-strings are connected in parallel to form a PV-array that gives a DC output current equivalent to the sum of all the PV-string outputs.

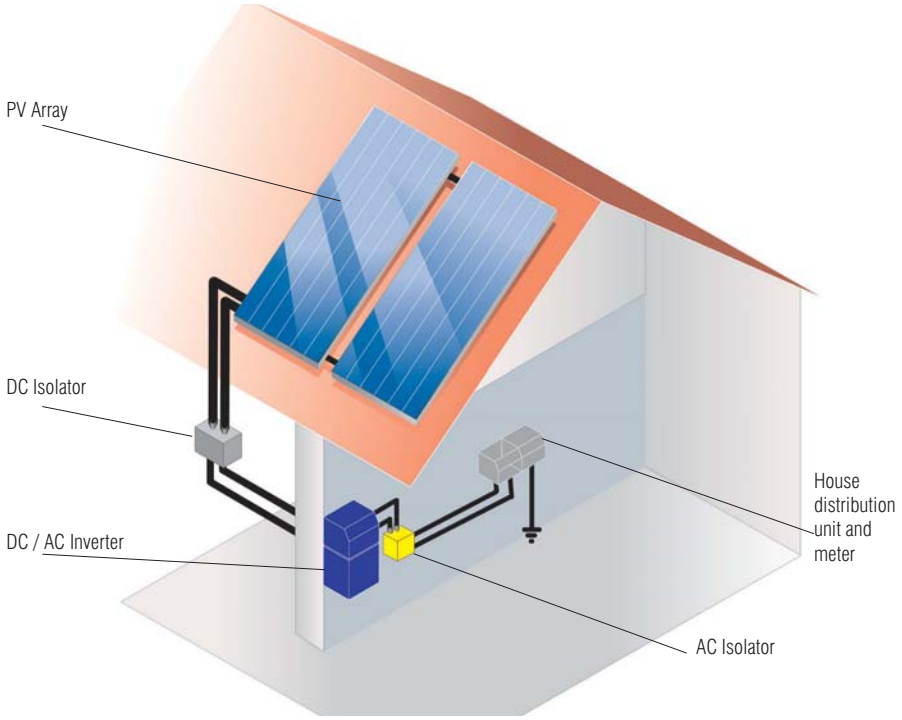
The main advantages of photovoltaic (PV) electricity generation are as follows:

- no fossil fuel usage and subsequent emission of pollution
- no nuclear fuel usage and disposal or storage of radioactive materials
- local distributed generation where needed
- installed system reliability and extended life
- reduced operating and maintenance costs
- ease of upgrading and replacement if necessary due to modularity of installation

When considering PV panels it is important to ensure that the units comply with all relevant standards for both electrical performance and for building requirements. It is recommended that, where possible, they comply with either IEC 61215 or IEC 61646, depending upon the structure of the cells. Once chosen the panels should be mounted in a location that maximises their exposure to sunlight for as long as possible and limits the possibility of shading, or future potential shading.

An inverter should be chosen to match the overall power capacity of the PV array, and like the arrays, it should operate as efficiently as possible. When considering the inverter, one using a Maximum Power Point Tracking (MPPT) system is preferential as this is a technique that grid connected inverters use to get the maximum possible power from one or more photovoltaic devices.

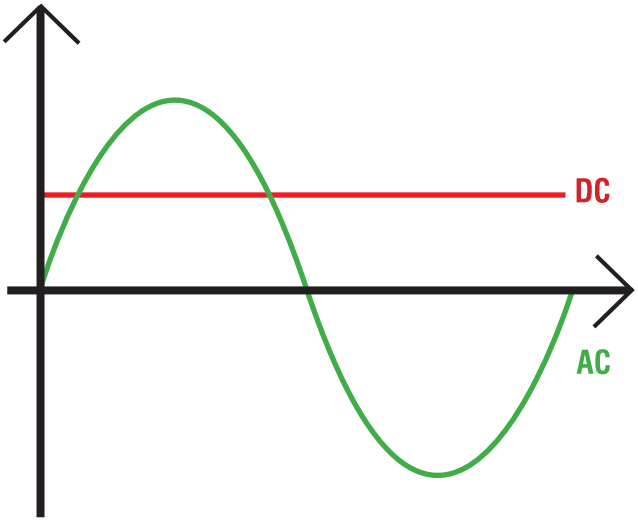
Where the PV installation is tied into the domestic grid system then the rules and procedures designated in G83 should be referred to and followed by a competent installer who is associated with a suitable accreditation scheme such as MCS.



AC vs DC Safe Switching

As any electrician is aware the nature of DC switching has to be considered with care because on disconnection an arc can occur that is more arduous than that produced with an AC load because there is no zero point on DC. The nature of this arc means that design considerations have to be made within the switch in order to quench this phenomenon; that not only includes significant contact gaps with high speed of operation, but also thermal transmissive materials.

What must be considered is that any AC isolator is predominantly designed with materials chosen such that the load will be AC. This means that the load supply will be a 50/60Hz sine wave, whether it be 230VAC or 400VAC, etc. When switching AC it should be remembered that the nature of the load supply will always pass through ØVAC twice in every cycle and therefore although loads can be arduous in type the supply is self-extinguishing. By that we mean that even if the isolator switches at peak load and an arc is formed between contacts, the action of the supply reducing to ØV means that the load will tend to zero and the arc will be extinguished.



DC load, on the other hand, is always there and unless the load becomes zero, the power being pulled through the contacts will always be the same. So if the load is 500VDC 25A it will be 500V 25A now, in 1s , in 1min, in 1hour – that is constant. In this case, unlike the AC above if you switch "OFF" on load you will also be switching "ON" on load; DC does not go through a 0V level unless there is system supply failure (or some other fault).

So if switching a loaded DC circuit, especially at the high voltages that can be found in PV installations (up to 1000V or more), current will continue to flow over the opening contact gap due to the partial breakdown of the air between the contacts. This phenomenon is viewed as an arc between the contacts and it will only stop when the distance between the contacts, and so the air gap, becomes large enough to prevent the continued electrical breakdown.

In order to replicate in DC, the self-extinguishing nature of AC, then switching OFF the load should occur quickly and in a switch that is designed with a contact system that allows enough distance to break the DC arc and dissipate the arc energy present during such a switching operation. Therefore, in order to perform such switching safely a fast operating ***switch-disconnector*** is necessary.

What is a Switch and what is a Switch-Disconnector?

We are all familiar with a switch. In its basic form we all know it as having one or more sets of electrical contacts that are connected to a load and manually operated to either close or open the contacts in order to make them conducting or non-conducting.

However, there is a European standard covering switches and switch-disconnectors which is EN 60947-3, and in this document there are definitions of industrial switches.

A ***switch*** is a mechanical switching device used for making and breaking current in an electrical circuit within certain operational conditions.

A ***disconnector*** is a mechanical switching device used for carrying current in an electrical circuit under normal conditions and for providing off-load isolation, therefore it is only intended to be used for isolation once the current flow is negligible or has been interrupted by another device.

A ***switch-disconnector*** is a mechanical switching device that meets the requirements for utilisation as both a switch and a disconnector, so it can be used to make and break current whilst also giving on-load isolation.

Electrical installations, whether it be residential or industrial, normally follow a set of regulations in order to ensure a safe living or working environment. In the UK these rules are specified in the IET wiring regulations BS 7671. Within these regulations Chapter 53 Section 537 covers the requirement for Isolation and Switching, whilst Section 712 contains specific requirements relating to the installation of PV power supply systems including those with AC modules.

If a switch is not rated or classified as a disconnector or switch-disconnector then BS 7671 does not allow for its use in an electrical circuit as safety isolation switch.

EN 60947-3 is listed in BS 7671 Table 53.2 as an appropriate standard covering product isolation, emergency switching and functional switching; and as IMO designs and manufactures its range of switch-disconnectors (more commonly referred to as isolators) to this European Standard our range of Solar Isolators therefore meet the requirements stipulated under BS 7671.

Utilisation Categories

Utilisation Categories as are covered in European Standard EN 60947-1 and define an equipment's intended application. The list of both AC and DC categories for low-voltage switchgear and controlgear are stated in EN 60947-1 Annex A along with the relevant product standards.

Manufacturers of both switchgear and controlgear should include in their technical product data all the operational ratings for the utilisation categories for which a product is designed and as such this should remove the confusion for users and designers in their selection of the correct product.

If we consider PV installations where there are requirements for switchgear being used on both the DC and AC side then the system falls typically within two categories below (for which the relevant standard is EN 60947-3)

AC-21 – Switching of resistive loads, including moderate overloads
AC-22 – Switching of mixed resistive and inductive loads, including moderate overloads

DC-21 – Switching of resistive loads, including moderate overloads
DC-22 – Switching of mixed resistive and inductive loads, including moderate overloads

Compliance to the EN60947-3 utilisation categories involves the products completing a number of tests, these include the "Making and Breaking Capacity" (section 7.2.4.1) and "Operational Performance" (section 7.2.4.2). Verification of the rated making and breaking capacities are stated by reference to the rated operational voltage and rated operational current according to Table 3 (see extract below).

Utlilisation categories	Rated operational categories	Making			Breaking			Number of operating cycles
		I/I_e	U/U_e	L/R ms	I_c/I_e	U_r/U_e	L/R ms	
DC-20A - DC-20B	All values	-	-	-	-	-	-	
DC-21A - DC-21B	All values	1,5	1,05	1	1,5	1,05	1	5
DC-22A - DC-22B	All values	4	1,05	2,5	4	1,05	2,5	5
DC-23A - DC-23B	All values	4	1,05	15	4	1,05	15	5

I=making current I_c=breaking current I_e=rated operational current
U=applied voltage U_e=rated operational voltage U_r=operational frequency or d.c recovery voltage

The designation of utilisation categories is completed by the suffix A or B according to whether the intended application requires frequent or infrequent operation and such operational performance is verified by the product completing the tests as detailed in EN60947-3 Table 4 (see extract below) based upon the test parameters from Table 5 (extract after).

Rated operational current I_e	Number of operating cycles per hour	Number of operating cycles					
		AC and DC A categories			AC and DC B categories		
		Without current	With current	Total	Without current	With current	Total
$0 < I_e \leq 100$	120	8,500	1,500	10,000	1,700	300	2,000
$100 < I_e \leq 315$	120	7,000	1,000	8,000	1,400	200	1,600
$315 < I_e \leq 630$	60	4,000	100	5,000	8,700	200	1,000
$630 < I_e \leq 2,500$	20	2,500	500	3,000	500	100	600
$2,500 < I_e$	10	1,500	500	2,000	300	100	400

Utilisation categories	Rated operational categories	Making			Breaking		
		I/I_e	U/U_e	L/R ms	I_c/I_e	U_r/U_e	L/R ms
DC-21A - DC-21B	All Values	1	1	1	1	1	1
DC-22A - DC-22B	All Values	1	1	2	1	1	2
DC-23A - DC-23B	All Values	1	1	7,5	1	1	7,5

I=making current I_c=breaking current I_e=rated operational current
U=applied voltage U_e=rated operational voltage U_r=operational frequency or d.c recovery voltage

Table entries identified by being highlighted in yellow, are those relevant to the IMO Solar Isolators.

Utilisation categories with the suffix B are appropriate for devices which, due to design or application, are only intended for infrequent operation. This could apply, for example, to disconnectors or switch-disconnectors normally operated to provide isolation for maintenance work, and this is the situation for many isolators used in DC applications.

The IMO Solar Isolators have also been tested for switching operations appropriate for category A which allows them to be used in areas where more frequent operation is required; or applications where an extended operational lifetime would be necessary.

PV Installation Isolation

PV installations consist of the DC side, the Inverter and the AC side with isolation required for both the PV-array to the inverter and for the AC supply from the load, particularly where the system is connected to the Distributed Network, this is a stipulation in G83/1. In some instances the "Guide to Installation of PV Systems" allows inverter and DC string isolation to be provided by the same device, for example the PV plug and socket connectors, but this is only deemed suitable for smaller systems and the connectors must be labelled appropriately. Generally IMO would always recommend the use of a suitably rated DC isolator.

DC Isolator Selection

BS 7671 states that a method of isolation must be provided on the DC side of a PV installation and this can be provided by a switch-disconnector as classified under EN 60947-3 this is also covered by "Guide to the installation of PV systems". The Guide also stipulates that the switch must isolate all live conductors (typically double pole to isolate PV array positive and negative conductors).

BS 7671 specifies that isolators that are in compliance with EN 60947-3 are appropriate for use in PV systems

The isolator rating must consider the maximum voltage and current of the PV string being switched and these parameters then adjusted in accordance with the safety factors stipulated in current standards. This should then be the minimum required rating of the isolator.

$$\text{Voltage} = N_S \times V_{OC} \times 1.15$$
$$\text{Current} = N_P \times I_{SC} \times 1.25$$

N_S - Number of panels connected in series
N_P - Number of strings connected in parallel
V_{OC} – Open-Circuit Voltage (from module manufacturer's data)
I_{SC} – Short-Circuit Current (from module manufacturer's data)

The isolator should also be suitable for use in the appropriate application which in PV installations is normally considered to be either DC-21A, DC-21B, DC-22A or DC-22B. Normally isolation of the DC supply from the inverter would not be a regular occurrence and therefore generally ratings for DC-21B or DC-22B would, as a minimum, be necessary; although category A types (as previously covered in Utilisation Categories) would be advantageous due to their capability of a higher number of switching operations, and therefore a longer guaranteed life.

AC Isolator Selection

AC Isolators are used in both stand-alone grid or network distributed systems.

If connected to the distributed network then G83/1 stipulates the PV system must be connected directly to an isolation switch that is wired so as to isolate both the live and neutral conductors, capable of being secured in the "OFF" position and in an accessible location within the installation.

In a stand-alone system IMO recommend that a lockable OFF isolation switch is similarly used within the installation.

BS 7671 specifies that isolators that are in compliance with EN 60947-3 are appropriate for use in PV systems.

Unlike a DC isolator that is required to switch both the positive and negative conductors, an AC isolator should be chosen with regards to the supply being single phase, which is typically found in domestic installations or three phase, which is typical for commercial or industrial installations. Ideally for single phase a 2pole isolator should be used to switch the live and neutral line (earth constantly connected) whilst a 4pole isolator would be used to switch the 3 voltage lines and neutral (earth constantly connected).

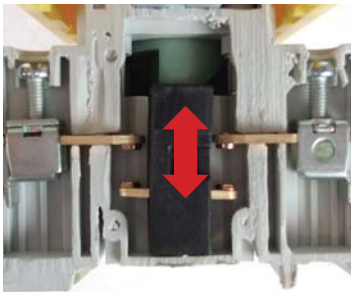
The isolator rating should be based on the inverter output which is normally specified per phase, that is line to neutral, and for example maybe shown as 20A at 230VAC; if this output is from a three phase unit then the AC isolator must be rated to for the line-to-line voltage which would typically be 415VAC.

With both AC and DC isolators the ambient temperature of the environment in which the switch is mounted must be considered as most industrial switches are nominally rated for use in 35°C. However, if the isolator is to be used in an area where solar activity is prevalent, thereby making more efficient use of the installation and greater yield, or in an enclosed space such as a loft or that of an inverter enclosure, then an isolator capable of handling the elevated temperatures should be selected.

All IMO Solar Isolators are capable of being installed in areas where high ambient temperatures of up to +45°C can be found. In installations of higher temperatures, our open style product can be used up to +65°C, however, you should ensure safe operating conditions and correct mounting of the product.

Why use an IMO Solar Isolator?

IMO Precision Controls offers a range of True DC Isolators specifically designed for use in Solar PV installations in accordance with EN 60364-7-712. The IMO design incorporates a user independent switching action so as the handle is moved it interacts with a spring mechanism which, upon reaching a set point, causes the contacts to "SNAP" over thereby ensuring a very fast break/make action. This mechanism means that the disconnection of the load circuits and suppression of the arc, produced by a constant DC load, is normally extinguished in a maximum of 5ms using the specific pole suppression chambers incorporated within the design.



Many alternative solutions, particularly those based upon an AC isolator designs which use bridge contacts, have been modified and rated for DC operation. These types of product have a switching speed that is directly linked to operator speed therefore, slow operation of the handle results in slow contact separation of the contacts which can produce arcing times of 100ms or more. Also in these switches the contact surface is also the surface upon which arcs tend to form; therefore, any surface damage or sooting caused by the arcing is likely to have a detrimental effect on the isolator's contact resistance and its longevity.

The IMO DC Isolator range is offered in a number of configurations all rated for installation and use as switch-disconnects and all with options allowing for "LOCKABLE OFF" operation. Although able to offer the industry standard two position 90° handle operation from LOCKABLE OFF-ON, IMO have also introduced a **SAFE-LOCK** patented handle that allows for three rotational positions relating to ON-OFF-LOCK. The facility offered by this design gives a LOCK position that is removed from the OFF setting ensuring the handle can be placed in its own unique position when locked. When this design is used within the IMO enclosed Solar Isolators it ensures that engineering access can only be attained to the enclosure when the handle is in the OFF position; whilst the "LOCK" position ensures secure power isolation combined with non-access to the enclosure (when isolator block is secured with supplied screws) and thereby significantly reducing the risks of tampering when maintenance/repair is carried out on equipment in-line after the isolator, **SAFE-LOCK**. Once any work has been undertaken the locking mechanism can then be removed from the handle and the isolator returned to its normal operational mode.

IMO Solar Isolators use a rotary "knife contact" mechanism so when the unit is operated the handle movement gives a double make/break per contact set. As DC load switching creates arcing the design is such that this only occurs on the corners of the switching parts meaning that the main contact is made on an area where no arcing has occurred. The rotary contact mechanism methodology used in the IMO Solar Isolators means that, when the isolator is operated, a self-cleaning action occurs on the arcing points and contact surfaces thereby producing good high vibration resistant contact integrity, with reduced contact resistance. This IMO contact system ensures that power loss per pole is kept as low as possible and consistent over the life of the product unlike conventional style isolators where entrapment of contaminants, and then subsequent compression on lateral operation, can lead to variable and increasing contact resistance and hence per pole losses.

As indicated in the section about **Utilisation Categories,** the IMO product is satisfactory for use in installations classified as either DC-21A, DC-21B or DC-22A, and also suitable for a high number of "off load" operations (without current) and also a high number of operating cycles "on load" (with current).

DC-21A = test current of 1,5 x I_{th} for 300 operating cycles
DC-21B = test current of 1,5 x I_{th} for 1500 operating cycles
DC-22B = test current of 4 x I_{th} for 300 operating cycles

A further advantage of the IMO contact mechanism is that, in the event of the supply to earth failure, the high short circuit current pulls the contacts together thereby giving a high short circuit withstand current of up to 1700A (product dependent).

Currently the upper limit of PV residential installations is 1000V (600V in USA) however, IMO Solar Isolators already have the capability to operate up to 1500VDC.

In the move towards safer installations of PV systems, whether it be in a domestic or industrial environment, consideration has to often be given to the materials and the risk of fire hazard that they pose. Ratings referred to under the UL 94 category are deemed generally acceptable for compliance with this requirement as this cover tests for flammability of polymeric materials used for parts in devices and appliances. Although there are 12 flame classifications specified in UL 94, there are 6 which relate to materials commonly used in manufacturing enclosures, structural parts and insulators found in consumer electronic products. These are 5VA, 5VB, V-0, V-1, V-2 and HB.

It is because of this that the IMO Solar Isolator range is constructed of materials that significantly reduce the risk of a fire hazard and in particular our enclosed installation style products for which the main plastic enclosure is rated at UL 94V-0 and the handles are UL 94V-2 rated. The classification criteria for each of these ratings is found in of the UL 94 Table 8.1 (see extract below).

Criteria conditions	V-0	V-1	V-2
Afterflame time for each individual specimen t1 or t2	≤10s	≤10s	≤30s
Total afterflame time for any condition set (t1 plus t2 for the 5 specimens	≤50s	≤250s	≤250s
Afterflame puts afterglow time for each individual specimen after the second flame application (t2+t3)	≤30s	≤60s	≤60s
Afterflame or afterglow of any specimen up to the holding clamp	No	No	No
Cotton indicator ignited by flaming particles or drops	No	No	Yes

The installation requirements and environments of PV systems can vary significantly and the IMO Solar Isolator has been designed such that it can offer a wide range of configurations depending upon the users' requirement. Also the IMO Solar Isolator range includes models that, when mounted in accordance with their respective instructions and with the appropriate IMO handle, offer suitable protection up to IP66 (EN 60529) and NEMA 3R (Nema 250, UL508).

With the advent of more worldwide installations and the requirements laid down in many country's national wiring publications for the use of DC switches in PV installations, the IMO Solar Isolators have also been assessed and tested under the latest UL standard UL508i which has been specifically written to cover the use of "Manual Disconnect Switches intended for use in Photovoltaic Systems". This standard specifically covers switches rated up to 1500 V that are intended for use in an ambient temperatures of -20°C to +60°C, and that are suitable for use on the load side of PV branch protection devices and as such the utilisation test is

test current of 2 x I_{th} for 50 operating cycles at +60°C

The IMO DC Isolator has successfully attained certification under the UL508i standard and as such is suitable for use as a disconnection method for the isolation of the output of DC PV array where it is to be connected to a DC/AC inverter.

Examples of Typical PV Installations

Single String System – 3kW Output Single Phase

Consider two potential configurations for a typical 3kW system which would supply 13A at 230VAC:

System 1

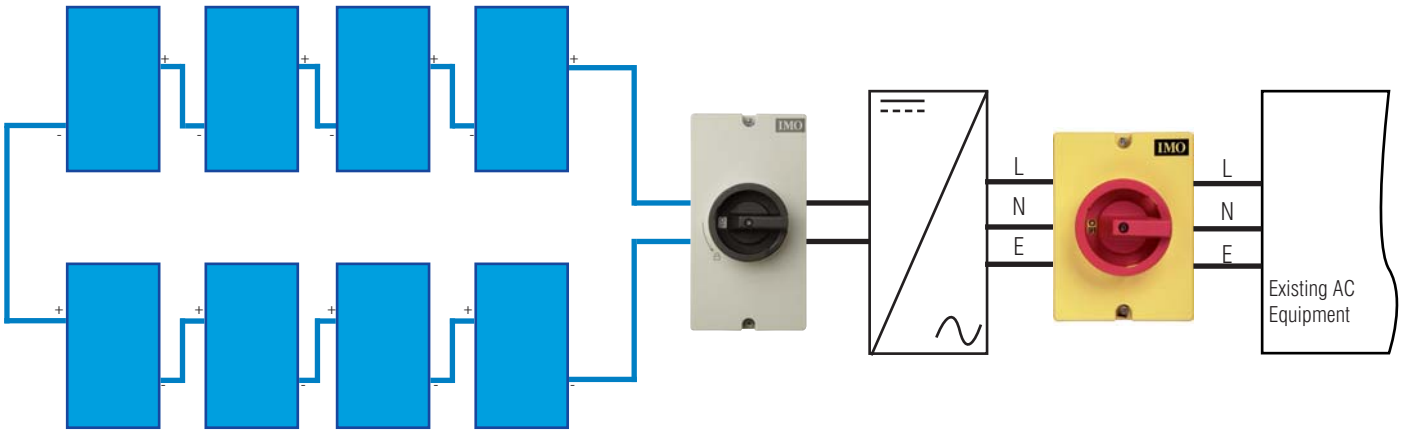
Inverter:	Input: 600VDC (V_{OC}), 16A (I_{DC}), 32A ($I_{DC\ max}$)	Output - 230VAC (V_{AC}), 13A (I_{AC}), 17.2A ($I_{AC\ max}$)
Solar Panel:	64.9V (V_{OC}), 6.46A (I_{SC}), 5.98A (I_{mpp}), 327Wp (P_{nom})	
No. of panels:	8	
Calculation:	V = 8 x 64.9 x 1.15 = 597.08V I = 6.46 x 1.25 = 8.08A	

For this configuration, the IMO SI16-PEL64R-2 rated at 16A for 700VDC is suitable for the DC switch and the PE69-3020 rated at 20A is suitable for the AC switch.

System 2

Inverter:	Input: 750VDC (V_{OC}), 15A (I_{DC}), 28A ($I_{DC\ max}$)	Output - 230VAC (V_{AC}), 13A (I_{AC}), 16A ($I_{AC\ max}$)
Solar Panel:	64.9V (V_{OC}), 6.46A (I_{SC}), 5.98A (I_{mpp}), 327Wp (P_{nom})	
No. of panels:	10	
Calculation:	V = 10 x 64.9 x 1.15 = 746.35V I = 6.46 x 1.25 = 8.08A	

For this configuration, the IMO SI25-PEL64R-2 rated at 16A for 900VDC is suitable for the DC switch and the PE69-3020 rated at 20A is suitable for the AC switch.



PV Array | DC Isolator | Inverter 3kW | AC Isolator

600V: SI16-PEL64R-2
750V: SI25-PEL64R-2

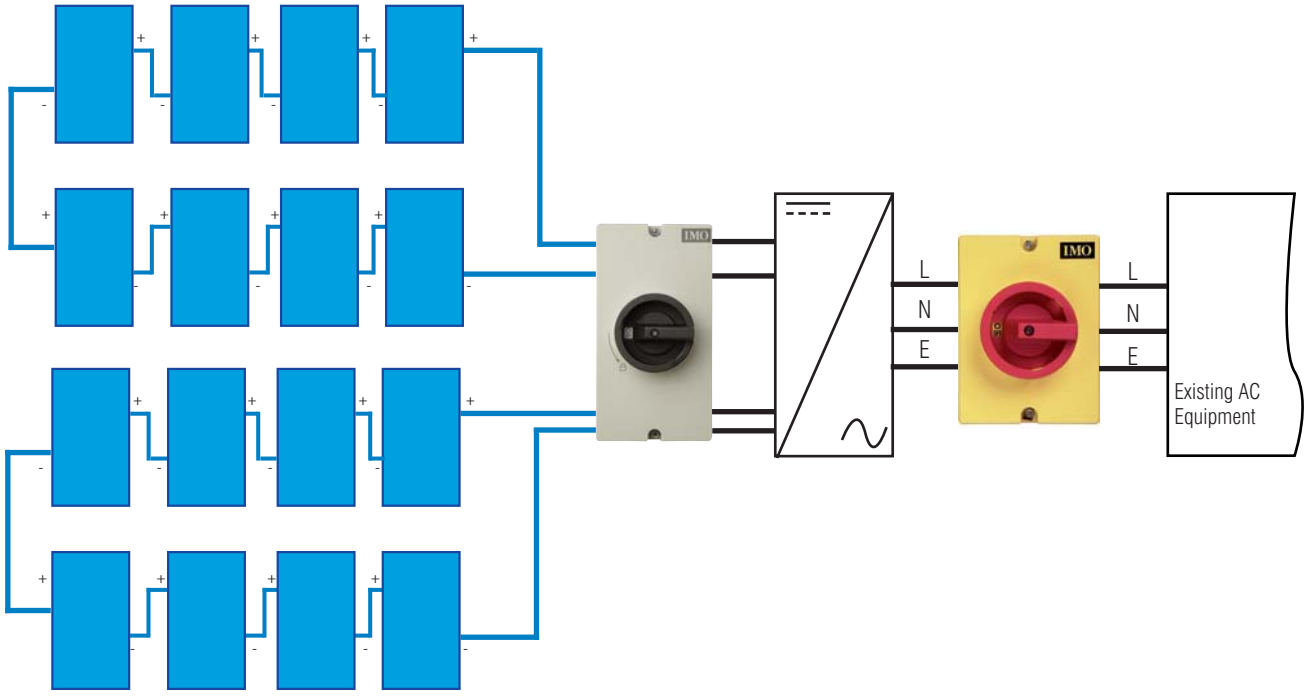
PE69-3020
PE69-3020

Dual String System – 5kW Output Single Phase

Consider a typical 5kW system which would supply 22A at 230VAC:

Inverter:	Input (per string): 600VDC (V_{OC}), 18A (I_{DC}), 36A ($I_{DC\ max}$)	Output - 230VAC (V_{AC}), 25A ($I_{AC\ max}$)
Solar Panel:	64.9V (V_{OC}), 6.46A (I_{SC}), 5.98A (I_{mpp}), 327Wp (P_{nom})	
No. of panels:	8 per string	
Calculation:	V = 8 x 64.9 x 1.15 = 597.08V	I = 6.46 x 1.25 = 8.08A

For this configuration, each string is to be switched at these levels so the IMO SI16-PEL64R-4 rated at 16A for 700VDC per string is suitable for the DC switch and the PE69-3025 rated at 25A is suitable for the AC switch.



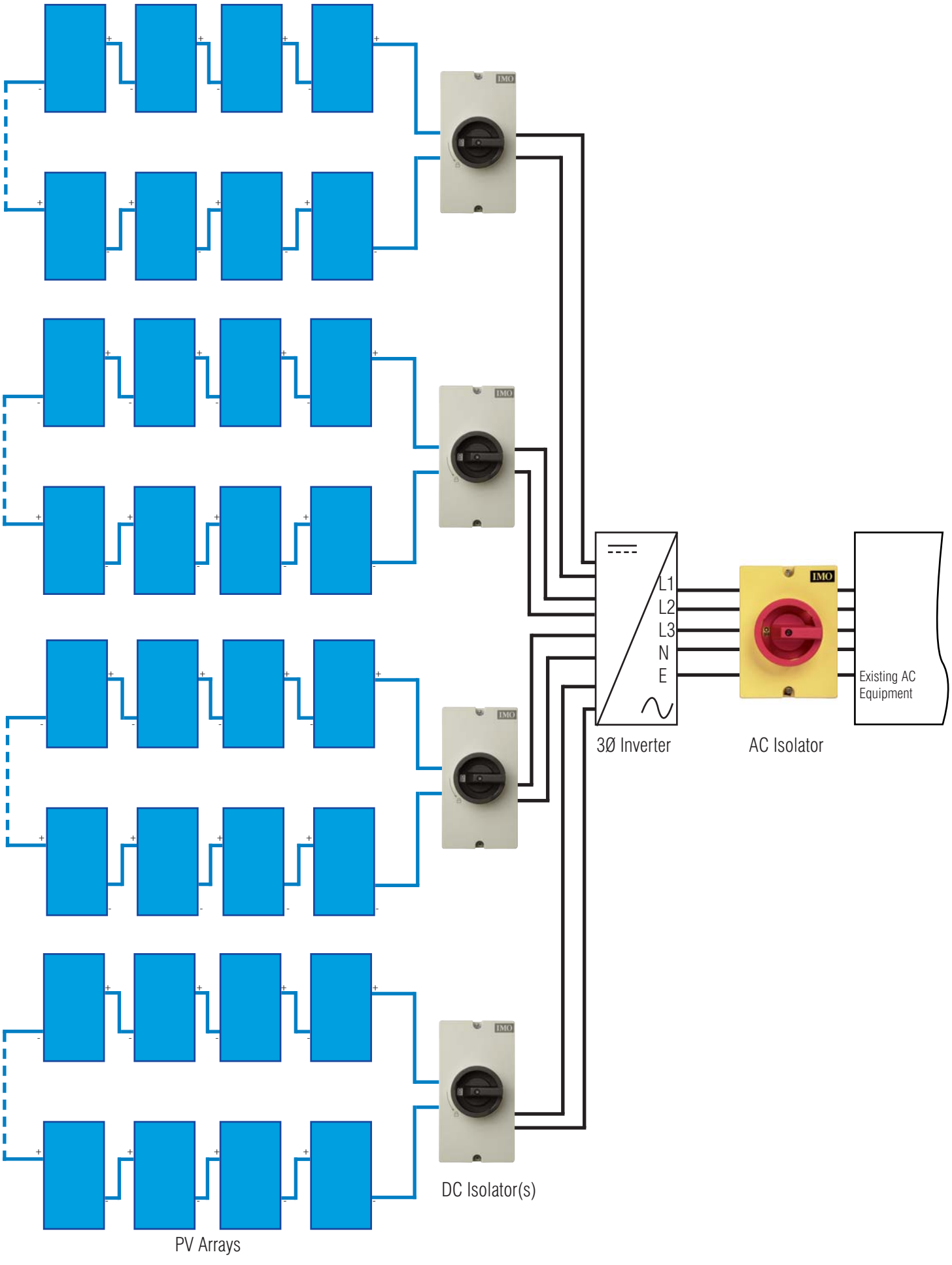
PV Arrays DC Isolator Inverter AC Isolator

High Voltage Multi-string System – 12.5kW Output Three Phase

Inverter:	Input (per string): 900VDC (V_{OC}), 18A (I_{DC}), 36A ($I_{DC\ max}$)	Output - 4000VAC (V_{AC}), 20A ($I_{AC\ max}$)
Solar Panel:	64.9V (V_{OC}), 6.46A (I_{SC}), 598A (I_{mpp}), 327Wp (P_{nom})	
No. of panels:	12 per string	
Calculation:	V = 12 x 64.9 x 1.15 = 895.62V	I = 6.46 x 1.25 = 8.08A

For this system there are several options to consider. If each string is to be switched individually then the SI25-PEL64R-2 rated at 11A for 1000VDC is suitable for the DC switch. If there is a requirement to isolate the strings as pairs then the SI25-PEL64R-4 is suitable. If all strings are to be isolated using one DC isolator then the IMO SI25-PEL64R-8 is suitable. The PE69-3025 rated at 25A is suitable for the AC switch in each case.

Alternatively, if the requirement is to still have the capability of isolating each string individually whilst retaining a single housing unit, then an IMO distribution box populated with SI25-DBL-2 is suitable. These devices use the same switch block as the SI25-PEL64R-2 so have the same rating of 11A at 1000VDC.


IMO
L1
L2
L3
N
E
Existing AC Equipment
3Ø Inverter
AC Isolator
DC Isolator(s)
PV Arrays

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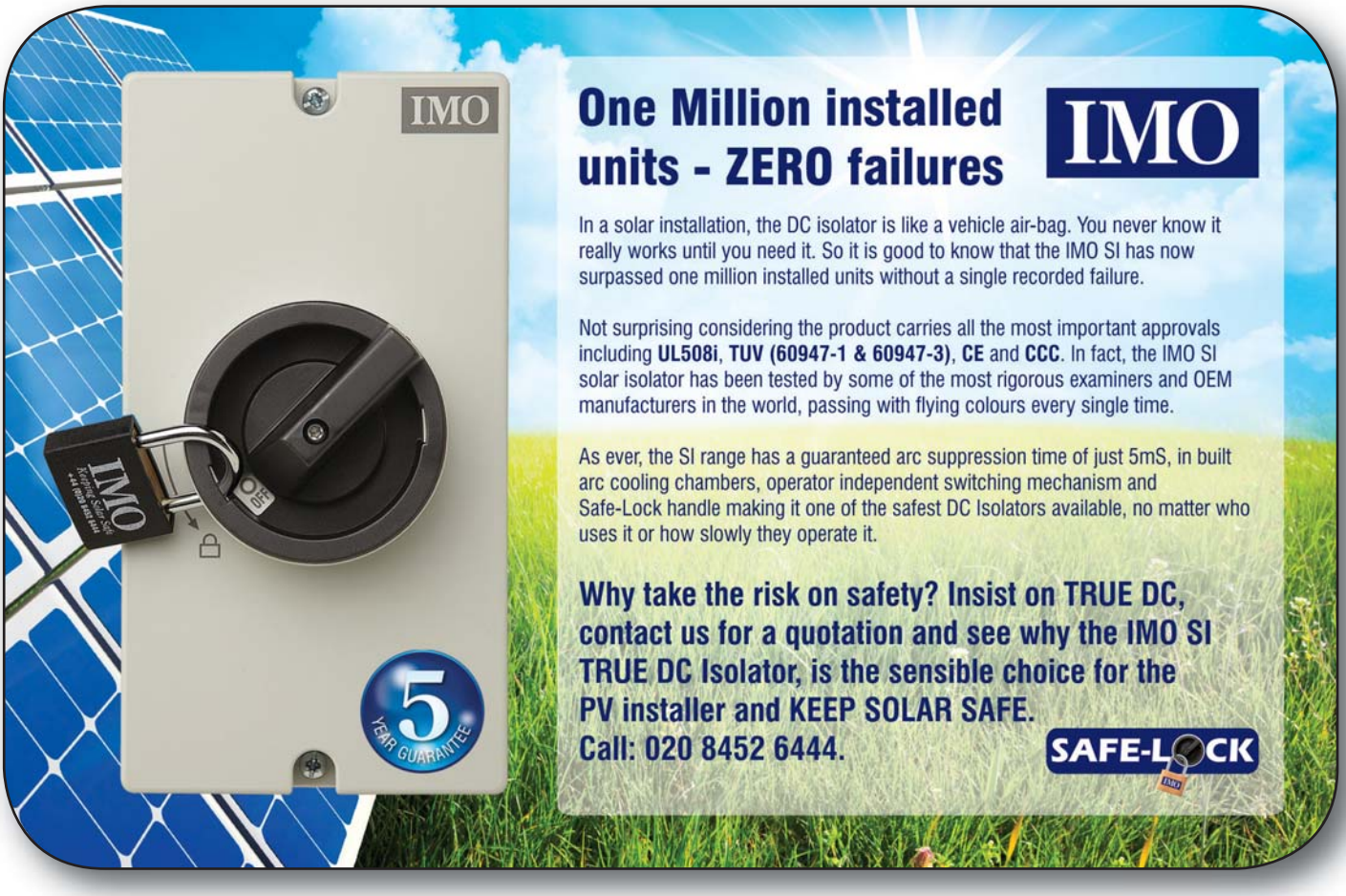
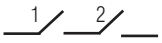
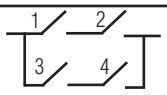
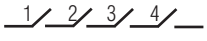
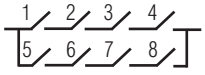
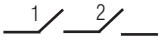
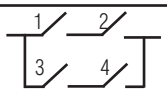
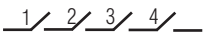
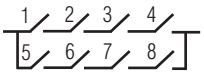
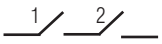
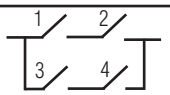
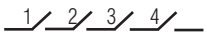
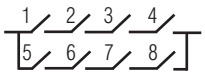


DC Isolators

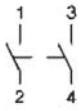
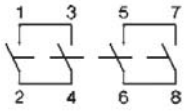
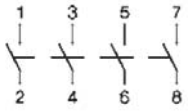
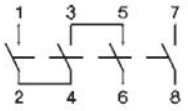
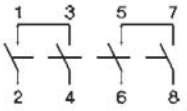
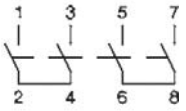
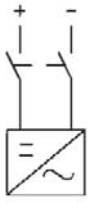
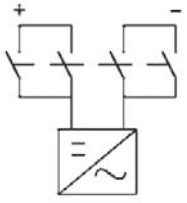
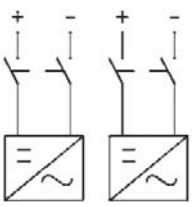
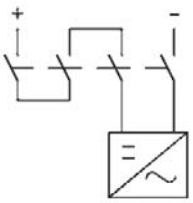
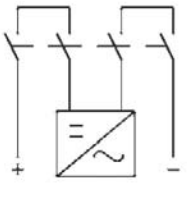
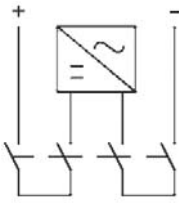
	Lever Actuator				Rotary Actuator				
	Panel Mounting	Single hole mounting Ø22.5mm	Base mounting w. door coupling	Modular switch	Panel Mounting	Single hole mounting Ø22.5mm	Base mounting w. door coupling	Modular switch	Plastic Enclosure
									
SI16	..PM64..	..SHM..	..BMDC64..	..DB..	..PM64R..	..SHML..	..BMDC64R..	..DBL..	..PEL64R..
SI25	..PM64..	..SHM..	..BMDC64..	..DB..	..PM64R..	..SHML..	..BMDC64R..	..DBL..	..PEL64R..
SI32	..PM64..	..SHM..	..BMDC64..	..DB..	..PM64R..	..SHML..	..BMDC64R..	..DBL..	..PEL64R..

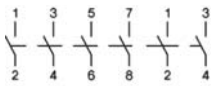
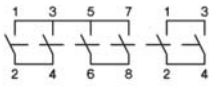
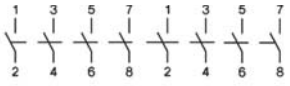
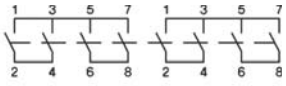
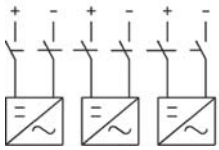
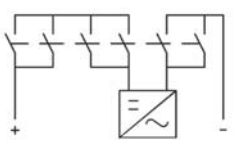
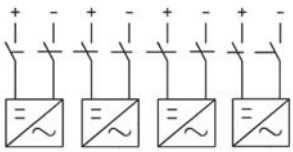
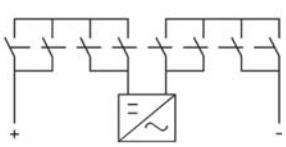
Technical Data for DC according to IEC 60947-3

			DC21B								DC22B			
Type			500V	600V	700V	800V	900V	1000V	1200V	1500V	500V	600V	800V	1000V
SI16		2 poles in series	16A	16A	16A	16A	13A	9A	6A	3A	7A	5.5A	2A	1A
		2 poles in series +2 parallel	29A	29A	16A	16A	13A	9A	6A	3A	-	-	-	-
		4 poles in series	16A	16A	16A	16A	16A	16A	16A	16A	16A	16A	11.5A	8A
		4 poles in series +2 parallel	29A	29A	29A	29A	29A	29A	29A	16A	-	-	-	-
SI25		2 poles in series	25A	25A	23A	20A	16A	11A	8A	4A	8A	6A	2.5A	1.5A
		2 poles in series +2 parallel	45A	45A	23A	20A	16A	11A	8A	4A	-	-	-	-
		4 poles in series	25A	25A	25A	25A	25A	25A	25A	20A	25A	25A	12A	9A
		4 poles in series +2 parallel	45A	45A	45A	45A	45A	45A	45A	20A	-	-	-	-
SI32		2 poles in series	32A	32A	27A	23A	20A	13A	10A	5A	9A	6.5A	3A	2A
		2 poles in series +2 parallel	58A	50A	27A	23A	20A	13A	10A	5A	-	-	-	-
		4 poles in series	32A	32A	32A	32A	32A	32A	32A	23A	32A	27.5A	12.5A	10A
		4 poles in series +2 parallel	58A	58A	58A	58A	58A	58A	50A	23A	-	-	-	-

DC21B Switching of DC-resistive loads including moderate overloads, Time constant L/R≤1ms
DC22B Switching of DC-resistive and inductive loads including moderate overloads, Time constant L/R≤2.5ms

Switching Configurations

Type	2-pole	2-pole 4 Paralleled poles	4-pole	2-pole with Input on top Output bottom	2-pole with Input on top Output bottom	2-pole with Input on top Output bottom
SI16	2	2H	4	4S	4T	4B
SI25	2	2H	4	4S	4T	4B
SI32	2	2H	4	4S	4T	4B
Contacts Wiring diagram						
Switching example						

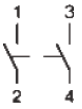
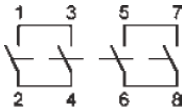
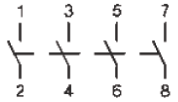
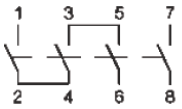
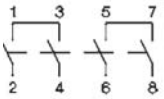
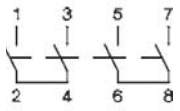
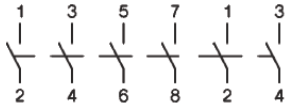
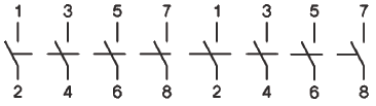
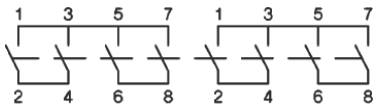
Type	6-pole	2-pole 6 paralleled poles	8-pole	2-pole 6 paralleled poles
SI16	...6	...3H	...8	...4H
SI25	...6	...3H	...8	...4H
SI32	...6	...3H	...8	...4H
Contacts Wiring diagram				
Switching example				

Insulated Jumper SIV-B1 for series and parallel switching of contacts

Type	Pack	Weight
SIV-B1	1	6.6g/pc

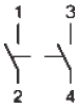
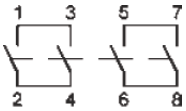
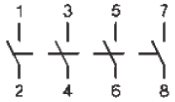
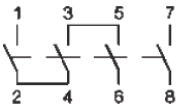
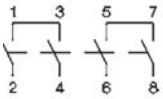
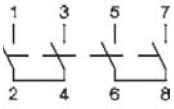
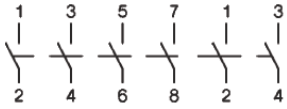
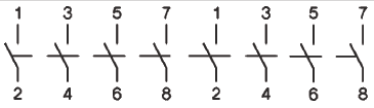
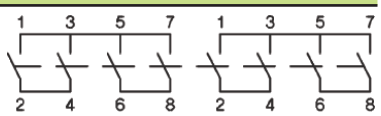
Lever Actuator Switch - Panel Mounting

- Panel Mounting, IP66
- Escutcheon Plate 64mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.20	**SI16 PM64 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.20	**SI25 PM64 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.20	**SI32 PM64 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.25	**SI16 PM64 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.25	**SI25 PM64 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.25	**SI32 PM64 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.23	**SI16 PM64 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.23	**SI25 PM64 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.23	**SI32 PM64 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.24	**SI16 PM64 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.24	**SI25 PM64 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.24	**SI32 PM64 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.24	**SI16 PM64 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.24	**SI25 PM64 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.24	**SI32 PM48 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.24	**SI16 PM64 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.24	**SI25 PM64 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.24	**SI32 PM64 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.36	**SI16 PM64 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.36	**SI25 PM64 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.36	**SI32 PM64 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.41	**SI16 PM64 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.41	**SI25 PM64 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.41	**SI32 PM64 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.46	**SI16 PM64 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.46	**SI25 PM64 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.46	**SI32 PM64 4H**	

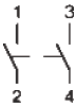
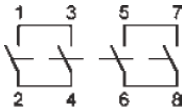
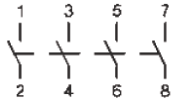
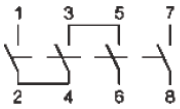
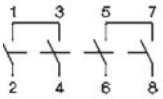
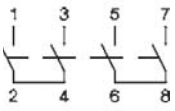
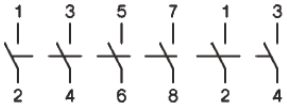
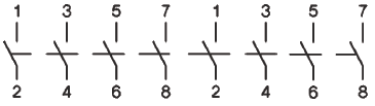
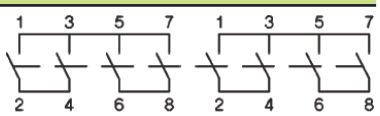
Lever Actuator Switch - Single Hole Mounting

- Single Hole Mounting Ø22mm, IP66
- Escutcheon Plate 48mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.21	**SI16 SHM 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.21	**SI25 SHM 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.21	**SI32 SHM 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.26	**SI16 SHM 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.26	**SI25 SHM 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.26	**SI32 SHM 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.23	**SI16 SHM 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.23	**SI25 SHM 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.23	**SI32 SHM 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHM 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHM 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHM 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHM 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHM 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHM 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHM 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHM 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHM 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.38	**SI16 SHM 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.38	**SI25 SHM 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.38	**SI32 SHM 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.43	**SI16 SHM 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.43	**SI25 SHM 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.43	**SI32 SHM 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.48	**SI16 SHM 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.48	**SI25 SHM 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.48	**SI32 SHM 4H**	

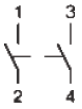
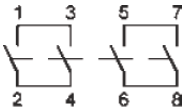
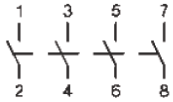
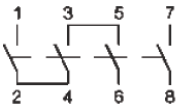
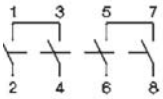
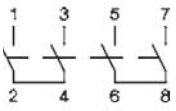
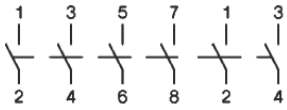
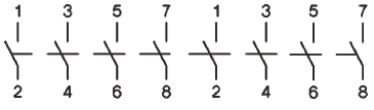
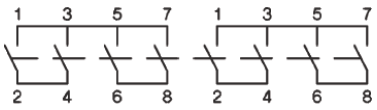
Lever Actuator Switch - Base Mounting, Door Clutch

- Base Mounting, Door Clutch, IP66
- Five point fixing handle mount
- Escutcheon Plate 64mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No, of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.22	**SI16 BMDC64 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.22	**SI25 BMDC64 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.22	**SI32 BMDC64 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.27	**SI16 BMDC64 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.27	**SI25 BMDC64 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.27	**SI32 BMDC64 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.25	**SI16 BMDC64 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.25	**SI25 BMDC64 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.25	**SI32 BMDC64 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.26	**SI16 BMDC64 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.26	**SI25 BMDC64 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.26	**SI32 BMDC64 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.26	**SI16 BMDC64 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.26	**SI25 BMDC64 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.26	**SI32 BMDC64 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.26	**SI16 BMDC64 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.26	**SI25 BMDC64 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.26	**SI32 BMDC64 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.38	**SI16 BMDC64 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.38	**SI25 BMDC64 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.38	**SI32 BMDC64 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.43	**SI16 BMDC64 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.43	**SI25 BMDC64 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.43	**SI32 BMDC64 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.48	**SI16 BMDC64 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.48	**SI25 BMDC64 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.48	**SI32 BMDC64 4H**	

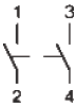
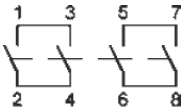
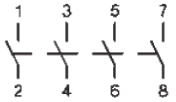
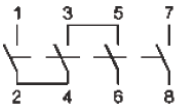
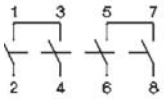
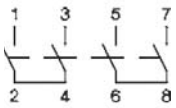
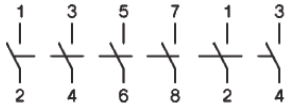
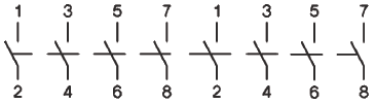
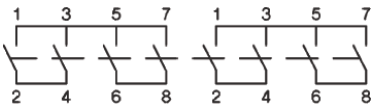
Lever Actuator Switch for Distribution Board

- For Distribution Boards
- NEMA Type 1 Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.19	**SI16 DB 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.19	**SI25 DB 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.19	**SI32 DB 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.24	**SI16 DB 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.24	**SI25 DB 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.24	**SI32 DB 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.22	**SI16 DB 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.22	**SI25 DB 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.22	**SI32 DB 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DB 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DB 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DB 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DB 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DB 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DB 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DB 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DB 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DB 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.35	**SI16 DB 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.35	**SI25 DB 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.35	**SI32 DB 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.40	**SI16 DB 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.40	**SI25 DB 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.40	**SI32 DB 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.43	**SI16 DB 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.43	**SI25 DB 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.43	**SI32 DB 4H**	

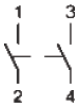
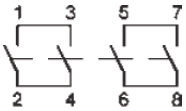
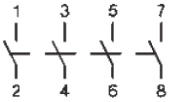
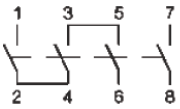
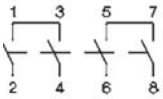
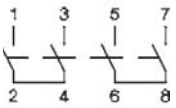
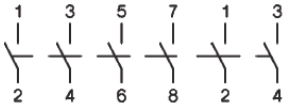
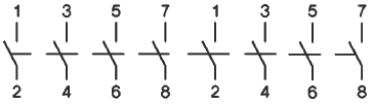
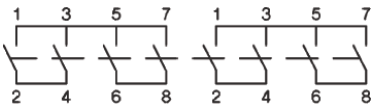
Rotary Actuator Switch - Lockable Off

- Rotary Actuator Switch
- Lockable Off
- Panel Mounting, IP66
- Rotary Handle 64mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.21	**SI16 PM64R 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.21	**SI25 PM64R 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.21	**SI32 PM64R 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.26	**SI16 PM64R 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.26	**SI25 PM64R 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.26	**SI32 PM64R 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.24	**SI16 PM64R 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.24	**SI25 PM64R 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.24	**SI32 PM64R 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 PM64R 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 PM64R 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.24	**SI32 PM64R 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 PM64R 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 PM64R 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.2	**SI32 PM64R 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 PM64R 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 PM64R 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 PM64R 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.37	**SI16 PM64R 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.37	**SI25 PM64R 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.37	**SI32 PM64R 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.42	**SI16 PM64R 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.42	**SI25 PM64R 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.42	**SI32 PM64R 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.47	**SI16 PM64R 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.47	**SI25 PM64R 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.47	**SI32 PM64R 4H**	

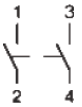
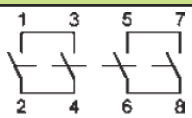
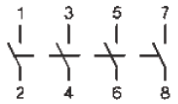
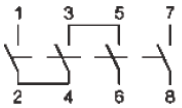
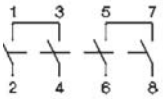
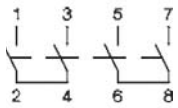
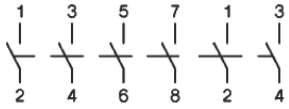
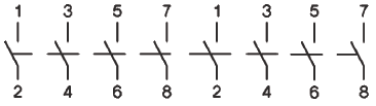
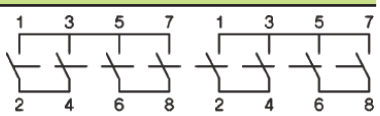
Lever Actuator Switch - Lockable Off

- Lever Actuator Switch
- Lockable Off
- Single Hole Mounting Ø22mm, IP66
- Escutcheon plate 48mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.21	**SI16 SHML 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.21	**SI25 SHML 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.21	**SI32 SHML 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.27	**SI16 SHML 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.27	**SI25 SHML 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.27	**SI32 SHML 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.24	**SI16 SHML 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.24	**SI25 SHML 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.24	**SI32 SHML 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHML 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHML 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHML 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHML 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHML 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHML 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.25	**SI16 SHML 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.25	**SI25 SHML 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.25	**SI32 SHML 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.39	**SI16 SHML 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.39	**SI25 SHML 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.39	**SI32 SHML 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.44	**SI16 SHML 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.44	**SI25 SHML 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.44	**SI32 SHML 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.49	**SI16 SHML 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.49	**SI25 SHML 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.49	**SI32 SHML 4H**	

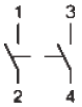
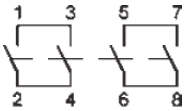
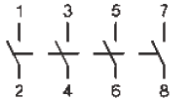
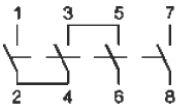
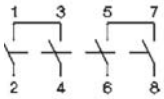
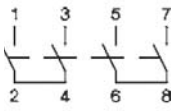
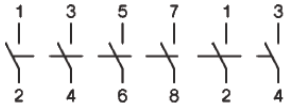
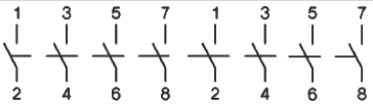
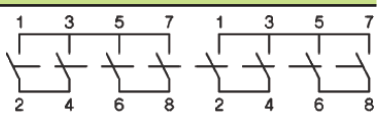
Rotary Actuator Switch - Lockable Off

- Lockable Off
- Base Mounting, Door Clutch, IP66
- Five Point Fixing, Handle Mount
- Rotary Handle 64mm²
- NEMA Type 3R Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.23	**SI16 BMDC64R 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.23	**SI25 BMDC64R 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.23	**SI32 BMDC64R 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.28	**SI16 BMDC64R 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.28	**SI25 BMDC64R 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.28	**SI32 BMDC64R 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.26	**SI16 BMDC64R 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.26	**SI25BMDC64R 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.26	**SI32 BMDC64R 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.27	**SI16 BMDC64R 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.27	**SI25 BMDC64R 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.27	**SI32 BMDC64R 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.27	**SI16 BMDC64R 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.27	**SI25 BMDC64R 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.27	**SI32 BMDC64R 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.27	**SI16 BMDC64R 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.27	**SI25 BMDC64R 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.27	**SI32 BMDC64R 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.39	**SI16 BMDC64R 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.39	**SI25 BMDC64R 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.39	**SI32 BMDC64R 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.44	**SI16BMDC64R 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.44	**SI25 BMDC64R 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.44	**SI32 BMDC64R 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.49	**SI16 BMDC64R 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.49	**SI25 BMDC64R 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.49	**SI32 BMDC64R 4H**	

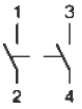
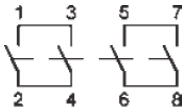
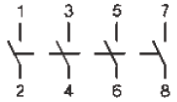
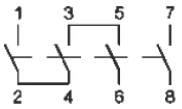
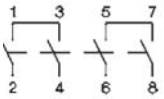
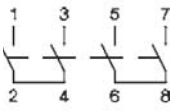
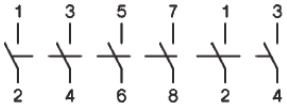
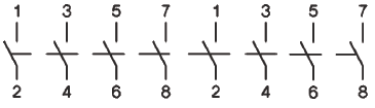
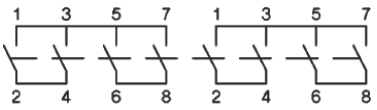
Lever Actuator Switch - Lockable Off for Distribution Boards

- Lockable Off
- For Distribution Boards
- Low Height Handle Also Available
- NEMA Type 1 Handle
- IP40 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.19	**SI16 DBL 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.19	**SI25 DBL 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.19	**SI32 DBL 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.25	**SI16 DBL 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.25	**SI25 DBL 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.25	**SI32 DBL 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.22	**SI16 DBL 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.22	**SI25 DBL 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.22	**SI32 DBL 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DBL 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DBL 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DBL 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DBL 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DBL 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DBL 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.23	**SI16 DBL 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.23	**SI25 DBL 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.23	**SI32 DBL 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	0.36	**SI16 DBL 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	0.36	**SI25 DBL 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	0.36	**SI32 DBL 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	0.41	**SI16 DBL 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	0.41	**SI25 DBL 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	0.41	**SI32 DBL 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	0.46	**SI16 DBL 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	0.46	**SI25 DBL 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	0.46	**SI32 DBL 4H**	

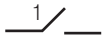
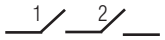
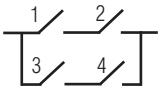
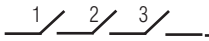
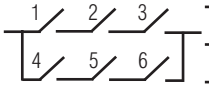
Rotary Actuator Switch - Lockable Off in Plastic Enclosure

- Rotary Actuator Switch
- Lockable Off - Safe-Lock
- Plastic Enclosure
- M25 Cable Gland Entry Option
- NEMA Type 3R Handle
- IP66 Body

DC21B IEC60947-3				UL Ratings UL508i			Poles in series	No. of Strings	Weight Kg/ pcs.	Part Number	Contact Configuration
600V	800V	1000V	1500V	350V	500V	600V					
16A	16A	9A	3A	16A	16A	16A	2	1	0.43	**SI16 PEL64R 2**	
25A	20A	11A	4A	20A	20A	20A	2	1	0.43	**SI25 PEL64R 2**	
32A	23A	13A	5A	25A	25A	25A	2	1	0.43	**SI32 PEL64R 2**	
29A	16A	9A	3A	29A	29A	21A	2	1	0.49	**SI16 PEL64R 2H**	
45A	20A	11A	4A	45A	38A	23A	2	1	0.49	**SI25 PEL64R 2H**	
50A	23A	13A	5A	58A	40A	25A	2	1	0.49	**SI32 PEL64R 2H**	
16A	16A	9A	3A	16A	16A	16A	2	2	0.46	**SI16 PEL64R 4**	
25A	20A	11A	4A	20A	20A	20A	2	2	0.46	**SI25 PEL64R 4**	
32A	23A	13A	5A	25A	25A	25A	2	2	0.46	**SI32 PEL64R 4**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.47	**SI16 PEL64R 4S**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.47	**SI25 PEL64R 4S**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.47	**SI32 PEL64R 4S**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.47	**SI16 PEL64R 4T**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.47	**SI25 PEL64R 4T**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.47	**SI32 PEL64R 4T**	
16A	16A	16A	16A	16A	16A	16A	4	1	0.47	**SI16 PEL64R 4B**	
25A	25A	25A	20A	25A	25A	25A	4	1	0.47	**SI25 PEL64R 4B**	
32A	32A	32A	23A	32A	32A	32A	4	1	0.47	**SI32 PEL64R 4B**	
16A	16A	9A	3A	16A	16A	16A	2	3	1.57	**SI16 PEL64R 6**	
25A	20A	11A	4A	20A	20A	20A	2	3	1.57	**SI25 PEL64R 6**	
32A	23A	13A	5A	25A	25A	25A	2	3	1.57	**SI32 PEL64R 6**	
16A	16A	9A	3A	16A	16A	16A	2	4	1.62	**SI16 PEL64R 8**	
25A	20A	11A	4A	20A	20A	20A	2	4	1.62	**SI25 PEL64R 8**	
32A	23A	13A	5A	25A	25A	25A	2	4	1.62	**SI32 PEL64R 8**	
29A	29A	29A	16A	29A	29A	29A	4	1	1.67	**SI16 PEL64R 4H**	
45A	45A	45A	20A	45A	45A	45A	4	1	1.67	**SI25 PEL64R 4H**	
58A	58A	58A	23A	58A	58A	50A	4	1	1.67	**SI32 PEL64R 4H**	

Technical Data

Data according to IEC 60947-3, VDE 0660, GB14048.3

Main contacts			Type	SI16	SI25	SI32
Rated thermal current I_{the}			A	16	25	32
Rated insulation voltage U_i [1)]			V	1000	1000	1000
Rated insulation voltage U_i [2)]			V	1500	1500	1500
Distance of contacts (per pole)			mm	8	8	8
Rated operational current I_e						
DC21A and DC21B L/R = 1ms	1 Pole 	300V	A	16	23	27
		400V	A	12	14	16
		500V	A	9	11	13
		600V	A	6	8	10
		700V	A	4.5	6	7.5
		800V	A	3	4	5
		900V	A	2.5	3	4
		1000V	A	1.5	2	2.5
DC21B	2 pole in series 	500V	A	16	25	32
		600V	A	16	25	32
		700V	A	16	23	27
		800V	A	16	20	23
		900V	A	13	16	20
		1000V	A	9	11	13
		1200V	A	6	8	10
		1500V	A	3	4	5
	2 poles in series + 2 poles parallel 2H 	500V	A	29	45	58
		600V	A	29	45	50
		700V	A	16	23	27
		800V	A	16	20	23
		900V	A	13	16	20
		1000V	A	9	11	13
		1200V	A	6	8	10
		1500V	A	3	4	5
	3 poles in series 	500V	A	16	25	32
		600V	A	16	25	32
		700V	A	16	25	32
		800V	A	16	25	32
		900V	A	16	25	32
		1000V	A	16	25	32
		1200V	A	12	14	16
		1500V	A	9	11	13
	3 poles in series + 2 poles parallel 3H 	500V	A	29	45	58
		600V	A	29	45	50
		700V	A	29	38	45
		800V	A	29	38	45
		900V	A	29	38	45
		1000V	A	29	38	45
		1200V	A	12	14	16
		1500V	A	9	11	13

1) Suitable at overvoltage category I to III, pollution degree 3 (standard-industry): Uimp = 8kV.
2) Suitable at overvoltage category I to III, pollution degree 2 (min.IP55): Uimp = 8kV.

Technical Data Cont.

Data according to IEC 60947-3, VDE 0660, GB14048.3

Main contacts			Type	SI16	SI25	SI32
Rated thermal current I_{the}			A	16	25	32
Rated insulation voltage U_i [1]			V	1000	1000	1000
Rated insulation voltage U_i [2]			V	1500	1500	1500
Distance of contacts (per pole)			mm	8	8	8
Rated operational current I_e						
DC21A and DC21B	4 poles in series	500V	A	16	25	32
	A4	600V	A	16	25	32
	1 2 3 4	700V	A	16	25	32
		800V	A	16	25	32
		900V	A	16	25	32
L/R = 1ms		1000V	A	16	25	32
		1200V	A	16	25	32
		1500V	A	16	20	23
DC21B	4 poles in series	500V	A	29	45	58
	+2 poles parallel	600V	A	29	45	58
	4H	700V	A	29	45	58
	1 2 3 4 / 5 6 7 8	800V	A	29	45	58
		900V	A	29	45	58
		1000V	A	29	45	58
		1200V	A	29	45	50
		1500V	A	16	20	23
Rated operational current I_e						
AC21B	2,4	U_e max. 440V	A	16	25	32
	2H	U_e max. 440V	A	29	45	58

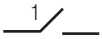
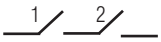
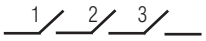
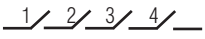
1) Suitable at overvoltage category I to III, pollution degree 3 (standard-industry): Uimp = 8kV.
2) Suitable at overvoltage category I to III, pollution degree 2 (min.IP55): Uimp = 8kV.

Approvals

Country	USA, UL508i	US, Canada, UL508	Europe CE	TUV Rheinland	GOST Russia	IEC CB Europe
SI16	✓	✓	✓	✓	✓	✓
SI25	✓	✓	✓	✓	✓	✓
SI32	✓	✓	✓	✓	✓	✓

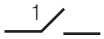
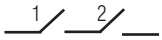
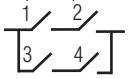
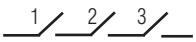
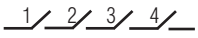
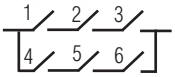
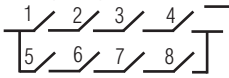
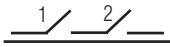
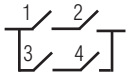
Technical Data Cont.

Data according to IEC 60947-3, VDE 0660, GB14048.3

Main contacts			Type	SI16	SI25	SI32
Rated operational current I_e						
DC22B	1 pole in series	500V	A	1	1.25	1.5
L/R = 1ms		600V	A	0.5	0.75	1
		800V	A	0.3	0.4	0.5
		1000V	A	0.15	0.2	0.25
	2 poles in series	500V	A	7	8	9
		600V	A	5.5	6	6.5
		800V	A	2	2.5	3
		1000V	A	1	1.5	2
	3 poles in series	500V	A	16	25	27
		600V	A	16	23	25
		800V	A	6.5	7	7.5
		1000V	A	5.5	6	6.5
	4 poles in series	500V	A	16	25	32
		600V	A	16	25	27.5
		800V	A	11.5	12	12.5
		1000V	A	8	9	10
Rated conditional short-circuit current			kA_{eff}	5	5	5
Max. fuse size		gL (gG)	A	40	63	80
Mechanical life			$x10^3$	10	10	10
Rated short-time	I_{cw}	2, 4, 6, 8	A	800	900	1000
withstand current (1s)		2H, 3H, 4H	A	1300	1500	1700
Short circuit	I_{cw}	2, 4, 6, 8	A	800	900	1000
Making capacity		2H, 3H, 4H	A	1300	1500	1700
Maximum cable cross sections (incl. jumper SIV/-B1)						
solid or standard			mm^2	4 - 16	4 - 16	4 - 16
flexible			mm^2	4 - 10	4 - 10	4 - 10
flexible (+ multicore cable end)			mm^2	4 - 10	4 - 10	4 - 10
Size of terminal screw				M4 Pz2	M4 Pz2	M4 Pz2
Tightening torque			Nm	1.2 - 1.8	1.2 - 1.8	1.2 - 1.8
Maximum ambient temperature						
Operation	Open		°C		-40 to +65	
	Closed		°C		-40 to +45	
Storage			°C		-50 to + 70	
Power loss per switch $I_{e\,max.}$ DC21B						
2			W	2	5	8
4			W	4	10	16
6			W	6	15	24
8			W	8	20	32
2H			W	3.5	8.5	14
3H			W	5.5	13	21
4H			W	7	17	28

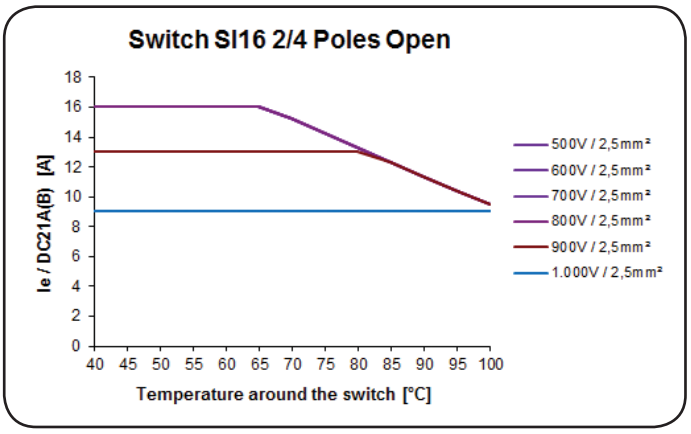
Technical Data Cont.

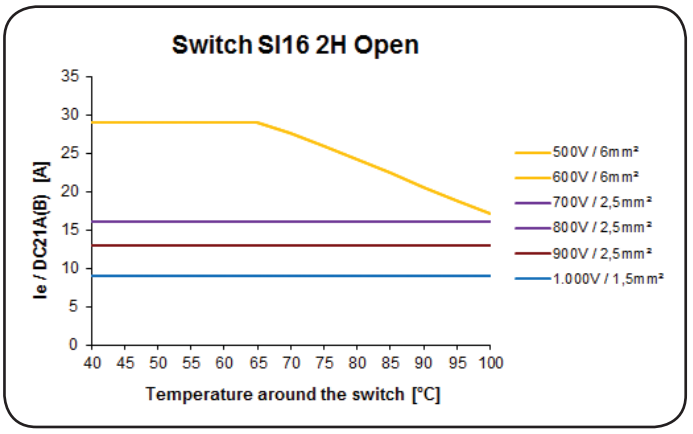
Data according to UL508i File E362605 and UL508 File E146487, Category no.: NRNT2, NRNT8

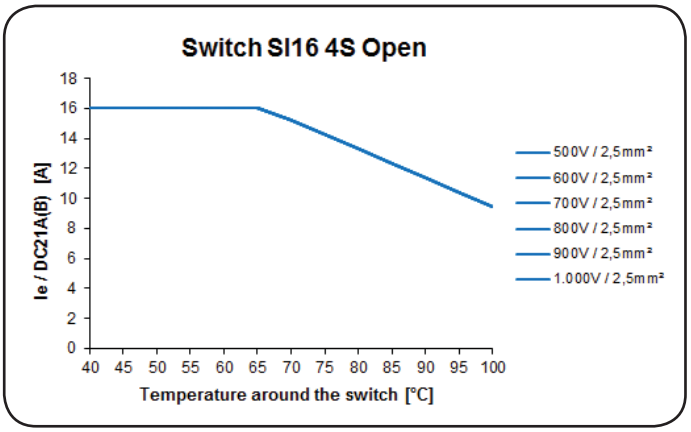
Main contacts		Type	SI16	SI25	SI32
Ampere-Rating "General use"					
1 pole 	350V	A	4	5	6
	500V	A	4	5	6
	600V	A	4	5	6
2 poles in series 	350V	A	16	20	25
	500V	A	16	20	25
	600V	A	16	20	25
2 poles in series + 2 poles parallel 	350V	A	29	45	58
	500V	A	29	38	40
	600V	A	21	23	25
3 poles in series 	350V	A	16	25	32
	500V	A	16	25	32
	600V	A	16	25	32
4 poles in series 	350V	A	16	25	32
	500V	A	16	25	32
	600V	A	16	25	32
3 poles in series + 2 poles parallel 	350V	A	29	45	58
	500V	A	29	38	50
	600V	A	21	38	45
4 poles in series + 2 poles parallel 	350V	A	29	45	58
	500V	A	29	45	58
	600V	A	29	45	50
AC-Rating "General use"					
2 Poles in series 	600V	A	16	25	32
2 poles in series + 2 poles parallel 	277V	A	-	-	50
3 poles parallel	3x480V	A	-	-	32

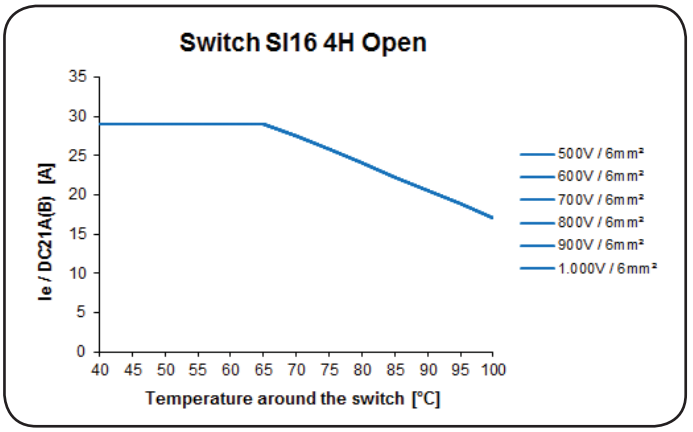
Fuse size (RK5) 5kA / 600V	Industrial Control Switch	A	40	60	80
Maximum cable cross sections (incl. jumper SiV/B1)					
solid or standard		AWG	12 - 10	12 - 10	12 - 10
flexible		AWG	12 - 6	12 - 6	12 - 6
flexible (+ multicore cable end)		AWG	12 - 6	12 - 6	12 - 6
size of terminal screw			M4 Pz2	M4 Pz2	M4 Pz2
Tightening torque		lb.inch	11 - 16	11 - 16	11 - 16

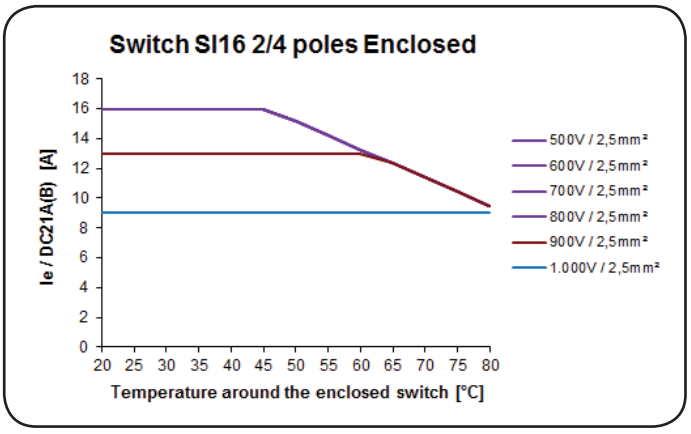
Technical Data Cont.

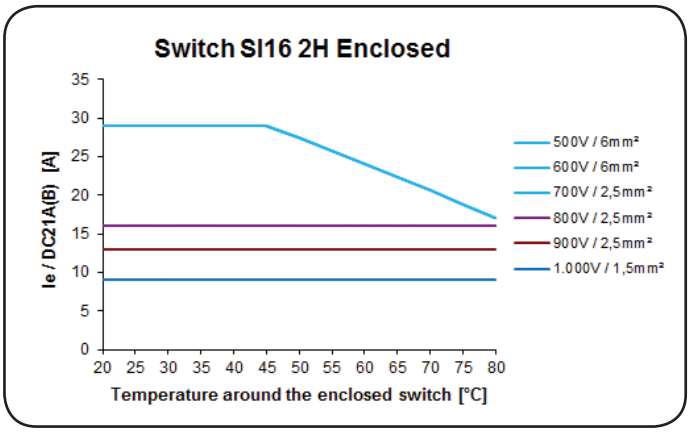


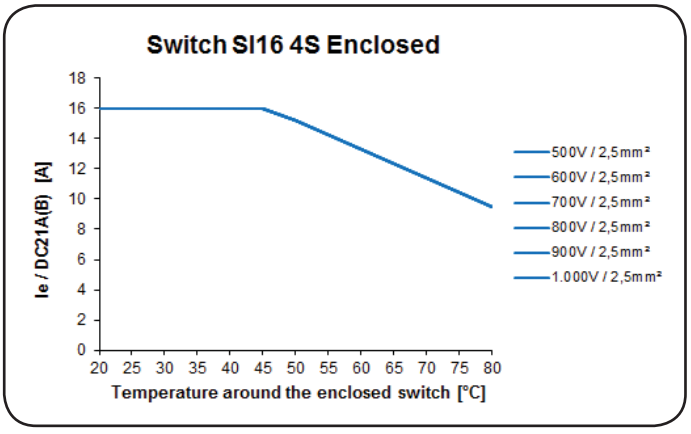


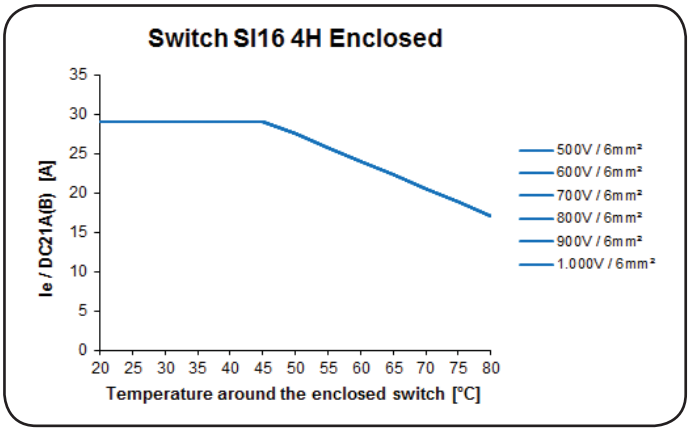




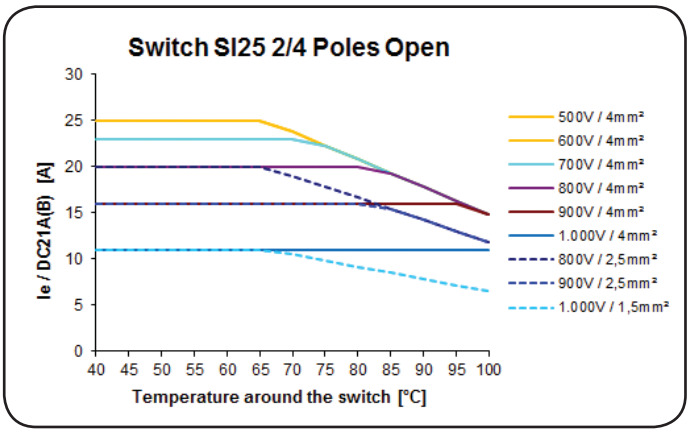


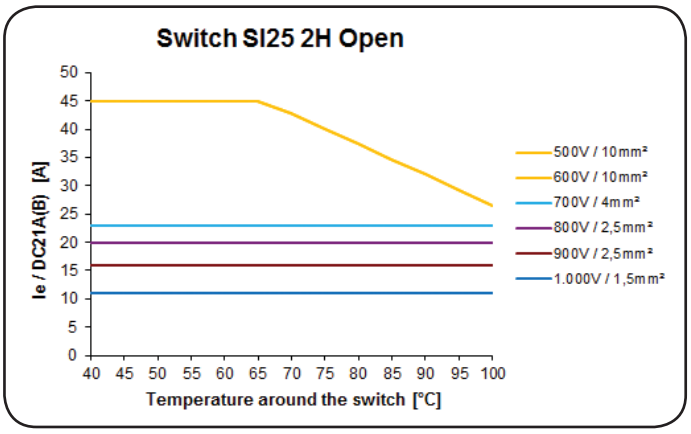


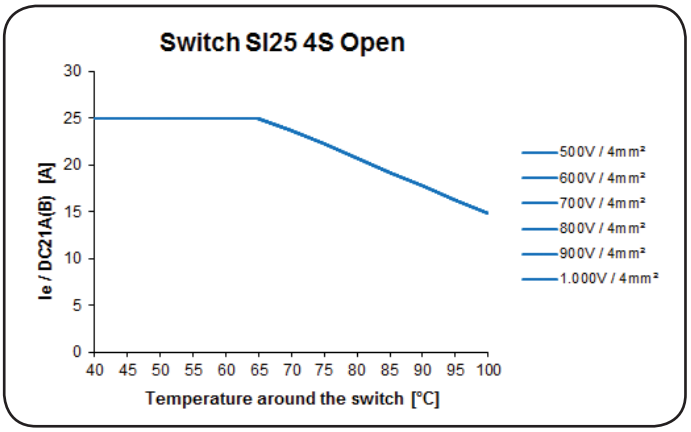


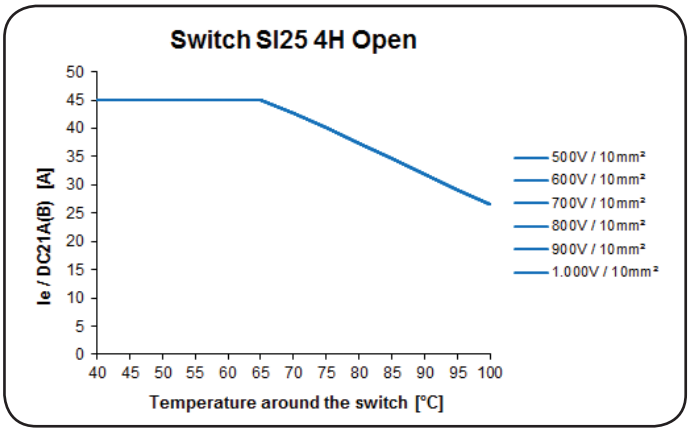


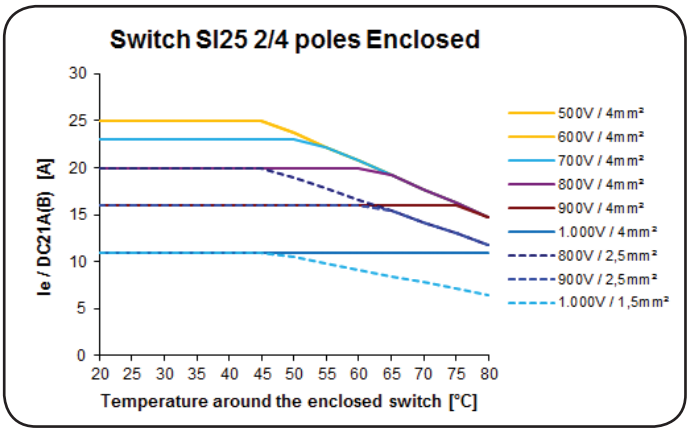
Technical Data Cont.

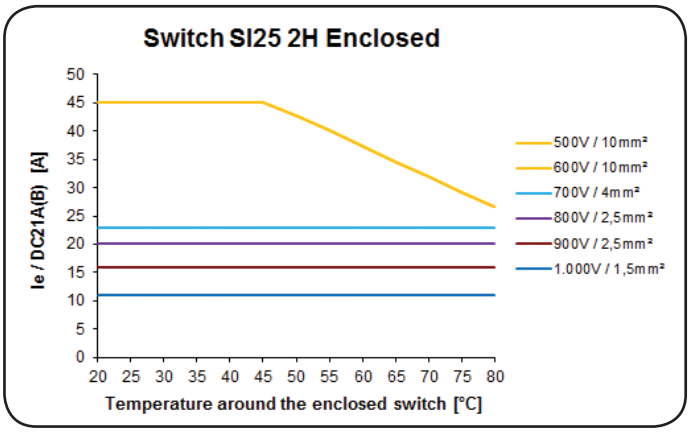


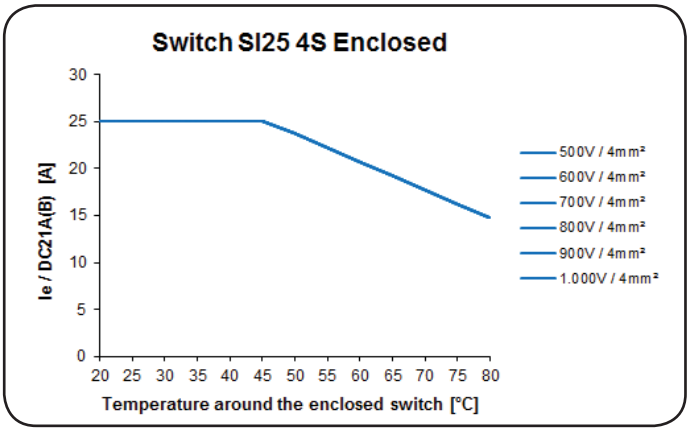


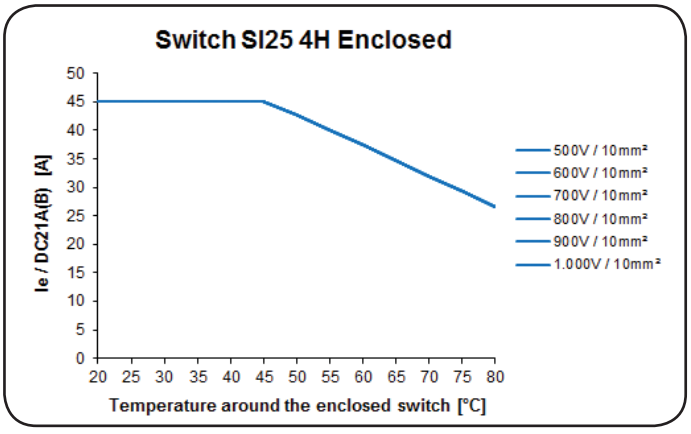




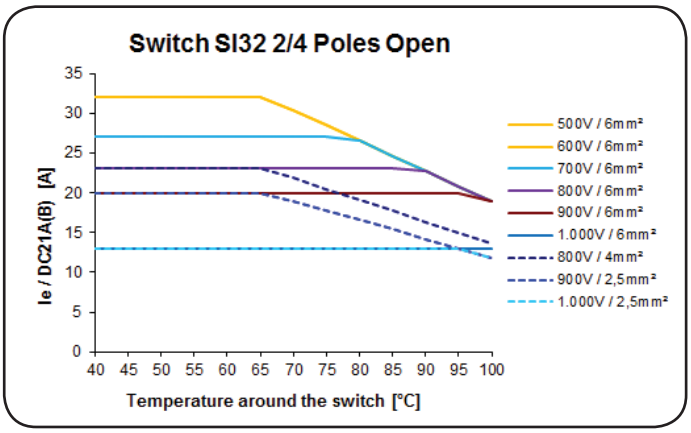


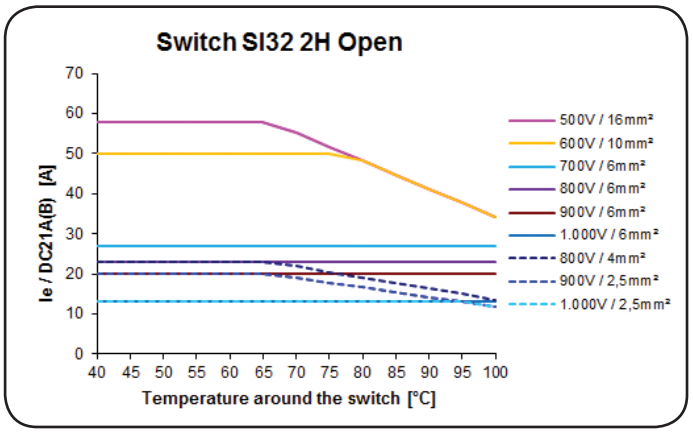


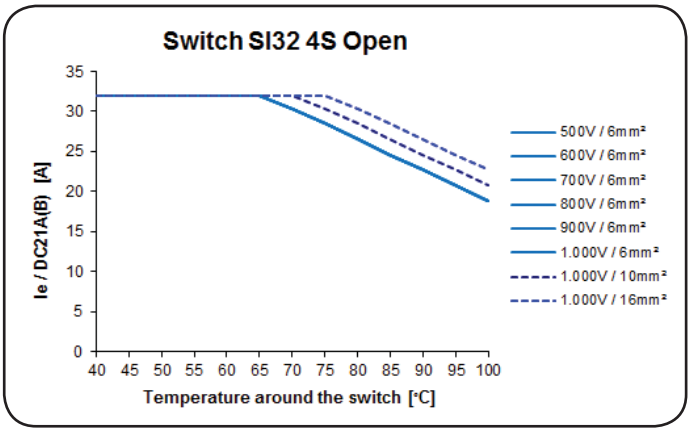


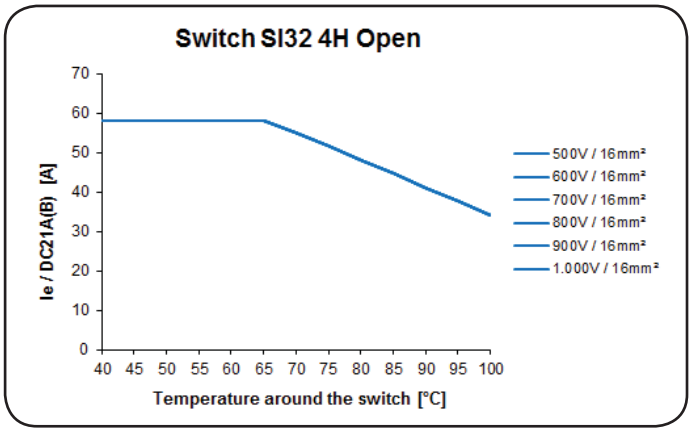


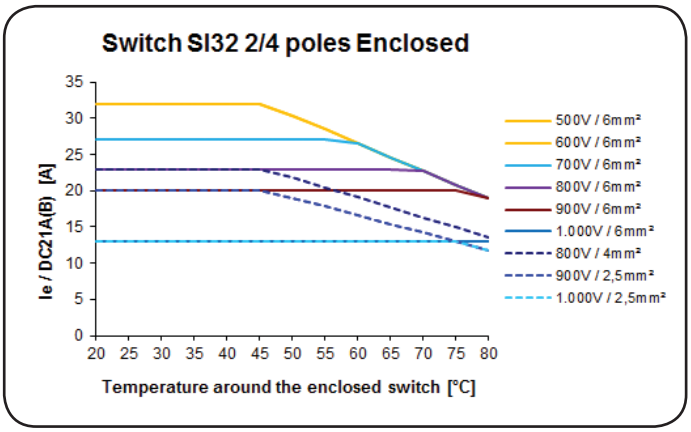
Technical Data Cont.

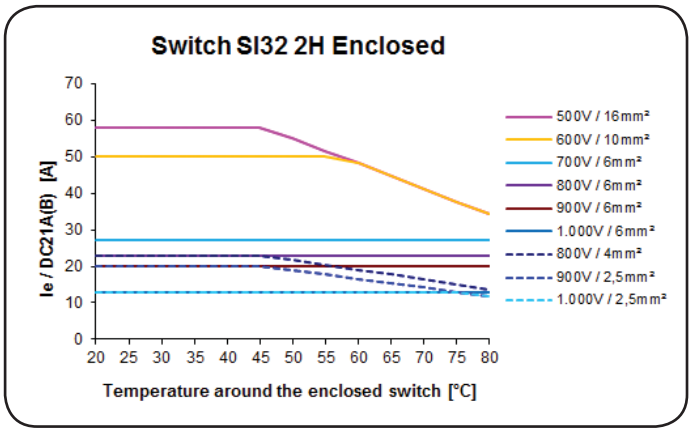


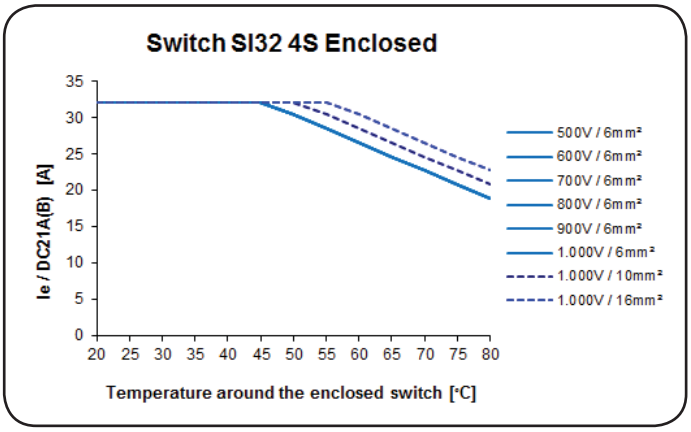


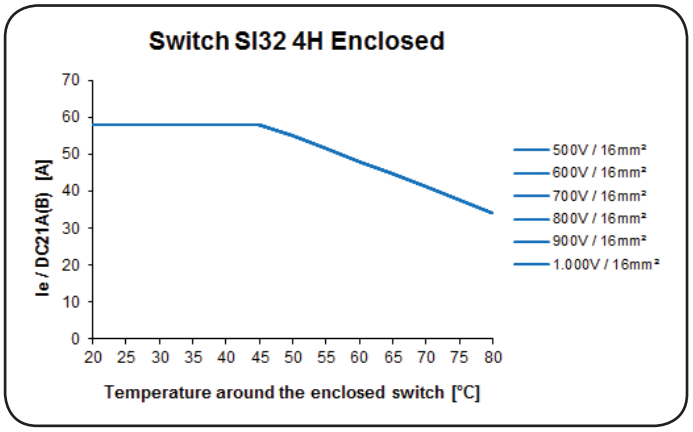






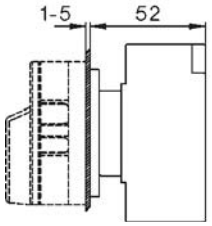




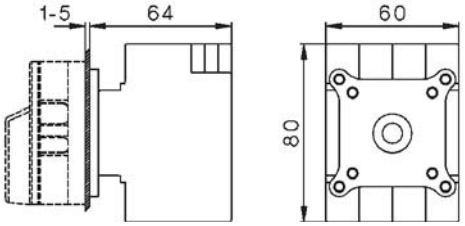


Dimensions

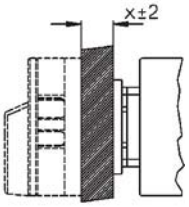
SI16PM/SI25PM/SI32PM
2



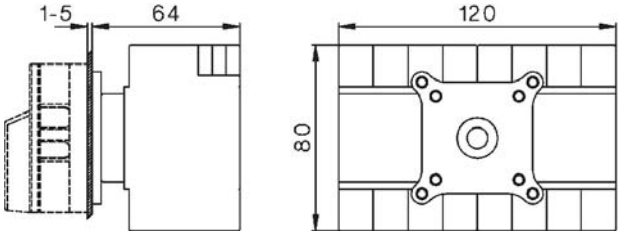
4,2H



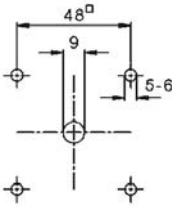
SI + X "Y"
Extended Switch Shaft



SI16PM/SI25PM/SI32PM
6, 8, 4H

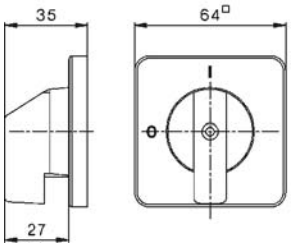


Mounting holes

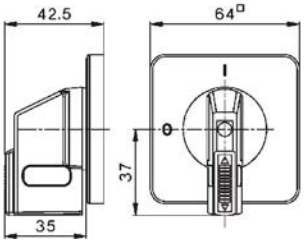


Escutcheon Plate 64

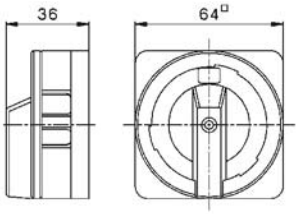
Lever



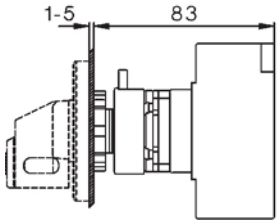
Lockable Lever

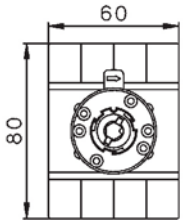


Lockable Rotary

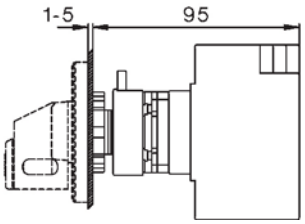


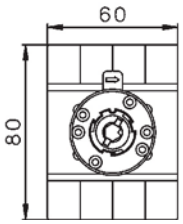
SI16SHM(L)/SI25SHM(L)/SI32SHM(L)
2



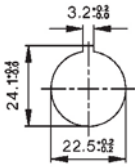


4, 2H

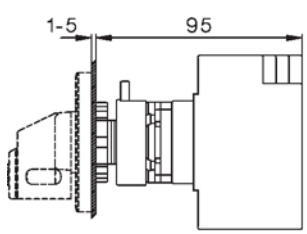


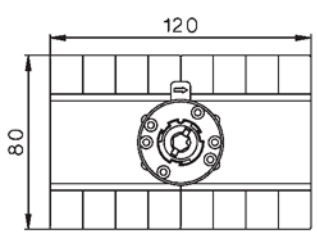


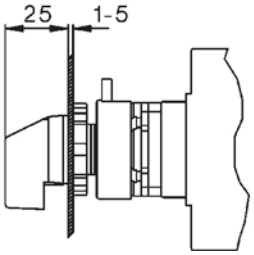
Mounting hole

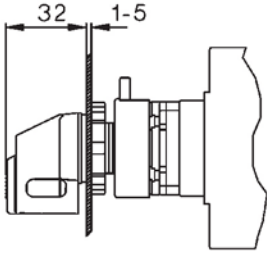


SI16SHM(L)/SI25SHM(L)/SI32SHM(L)
6,8,4H

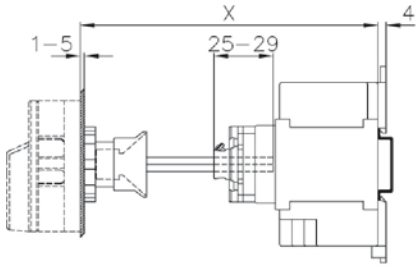


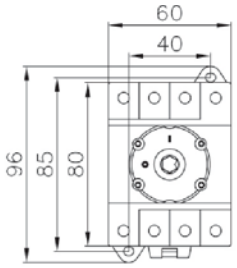






SI16BMDC/SI25BMDC/SI32BMDC
2, 4, 2H





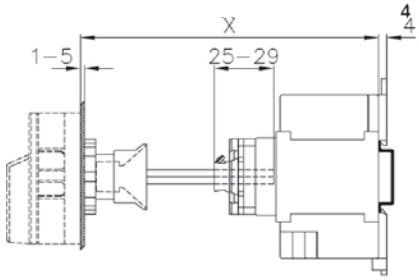
L = X - 44±3 at..A2+2, 00A4.
L = X - 32±3 at..A2

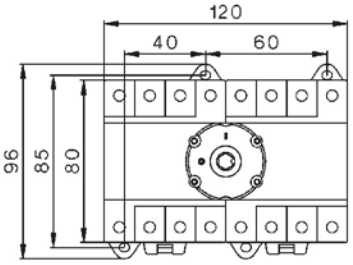
delivered with: 4,2H
$X_{max.}$ = 194, L = 150
($X_{min.}$ = 89)

delivered with: 2
$X_{max.}$ = 182, L = 150
($X_{min.}$ = 77)

Greater X-Dimensions on request

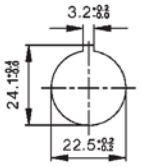
SI16BMDC/SI25BMDC/SI32BMDC
6, 8, 4H





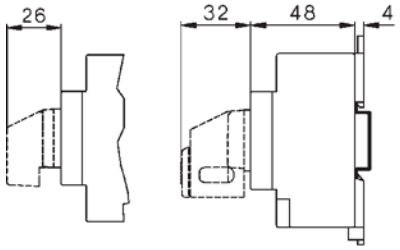
delivered with: 6,8,4H
$X_{max.}$ = 194, L = 150
($X_{min.}$ = 95)

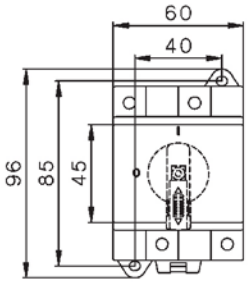
Mounting holes



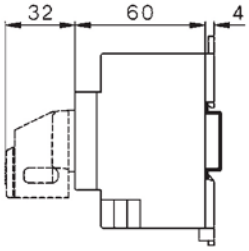
L = X - 44±3

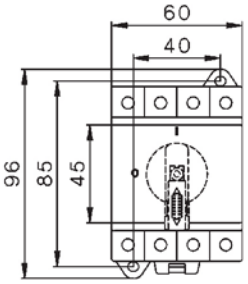
SI16DB(L)/SI25 DB(L)/SI32DB(L)
2



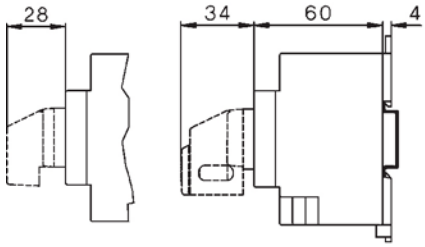


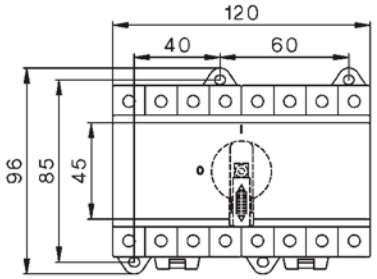
4,2H





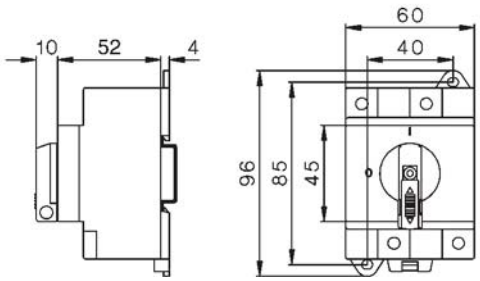
SI16DB(L)/SI25 DB(L)/ SI32DB(L)
6,8,4H



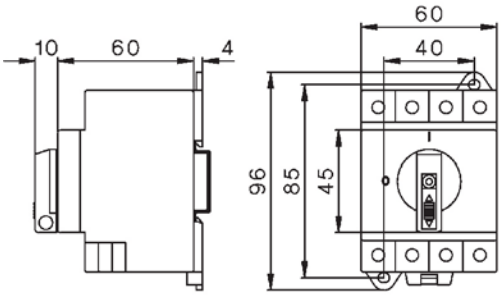


Dimensions

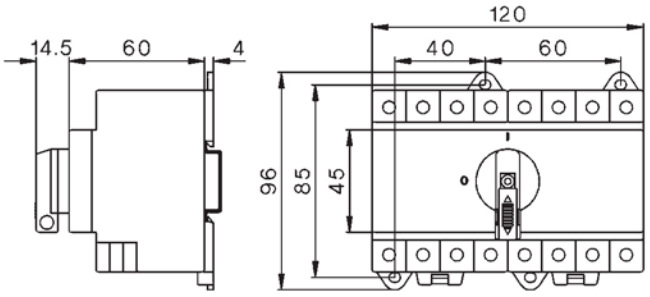
SI16DBL/SI25DBL/SI32DBL With Low Height Handle
2



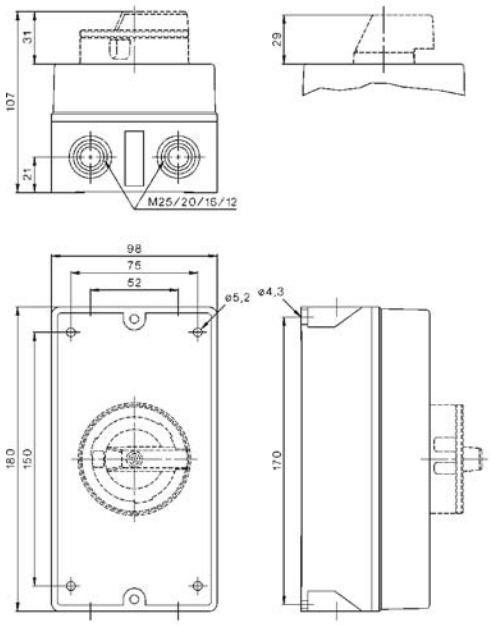
4,2,H



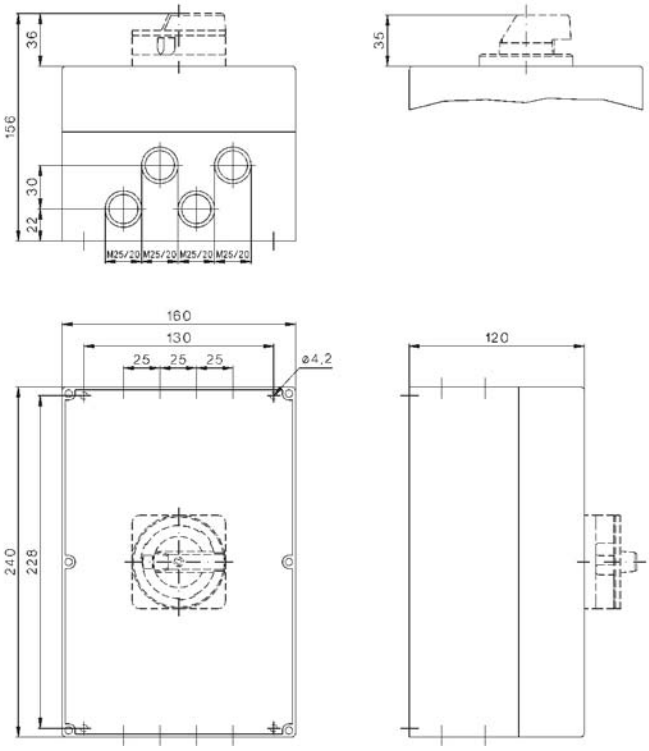
6,8,4H



SI16PEL/SI25PEL/SI32PEL
2,4,2H
Main-Switch (Lockable)



SI16PEL/SI25PEL/SI32PEL
6,8,4H
Main-Switch (Lockable)



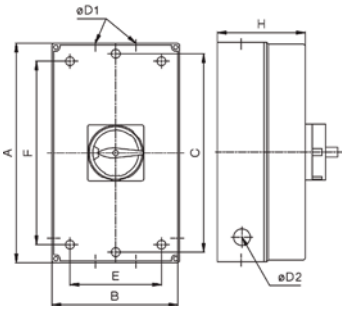
Enclosed AC Isolator - PE69

- 3, 4, 6 and 8 pole versions available
- On load 20A - 100A
- Red/Yellow
- 3 Padlock positions
- IP65
- IP66 taller enclosure available
- Aux. Contacts available

		Rating @ 3~400V			
Part number	Number of poles	AC21/Amps	AC3/kW	AC23/Amps	AC23/kW
PE69-3020	3	20	5.5	16	7.5
PE69-3025	3	25	7.5	20	10
PE69-3032	3	32	11	25	12.5
PE69-3040	3	40	15	32	16
PE69-3063	3	63	18.5	45	22
PE69-3080	3	80	18.5	45	22
PE69-30100	3	100	30	72	37
PE69-4020	4	20	5.5	16	7.5
PE69-4025	4	25	7.5	20	10
PE69-4032	4	32	11	25	12.5
PE69-4040	4	40	15	32	16
PE69-4063	4	63	18.5	45	22
PE69-4080	4	80	18.5	45	22
PE69-40100	4	100	30	72	37
PE69-6020	6	20	5.5	16	7.5
PE69-6025	6	25	7.5	20	10
PE69-6032	6	32	11	25	12.5
PE69-6060	6	40	15	32	16
PE69-6063	6	63	18.5	45	22
PE69-6080	6	80	18.5	45	22
PE69-8020	8	20	5.5	16	7.5
PE69-8025	8	25	7.5	20	10
PE69-8032	8	32	11	25	12.5
PE69-8080	8	40	15	32	16
PE69-8063	8	63	18.5	45	22
PE69-8080	8	80	18.5	45	22

Dimensions (mm)

Type	Pole	A	B	C	D1	D2	E	F	H
PE69..20-40	3, 4	130	98	121	2x25,5/20,5	-	75	100	77
PE69..63-100	3, 4	200	120	-	40,5/32,5 +16,5	-	95	165	86
PE69..20-40	6	200	120	-	40,5/32,5 + 16,5	-	95	165	86
PE69..20-40	8	240	160	-	40,5/32,5	-	130	228	120
PE69..63-80	6, 8	240	160	-	40,5/32,5	-	130	228	120



Contactors for DC-Switching

In most Photovoltaic-installations, the DC switch is either integrated in the DC/AC-inverter or installed next to it. So the DC wires between solar-panels and inverter are continuously under voltage.

In case of fire these wires needs to be switch off as close as possible from the Photovoltaic panels and fire brigade needs an easy access to this switch off device.

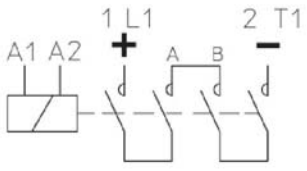
For this purpose, IMO contactors for DC switching, used as a fire protection defeat device, can switch off the Photovoltaic-installation with a remote controlled fire brigade Emergency-Stop button.

AC Operated

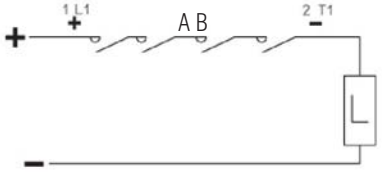
Rated Operational Current DC1			Additional Aux.		Pack	Weight	
600V	1000V	1200V	Contacts	Type	pcs.	kg/pc.	Wiring Diagram
20A	-	-	2 MCAA11 +1 MCAT	MDC20-S-00*	1	0.45	
48A	-	-		MDC48-S-00*	1	0.45	
80A	35A	-	2 MCA11 +1 MCAT	MDC80-S-00*	1	1.17	
100A	-	-		MDC100-S-00*	1	1.8	
12A	12A	6A	2 MCAA11 2 MCAT	MPV12-S-00*	1	0.8	
30A	30A	-	2 MCAA11 +2 MCAT	MPV30-S-00*	1	0.9	
60A	60A	-		MPV60-S-00*	1	0.9	
80A	80A	-	2 MCAA11 +1 MCAT	MPV80-S-00*	1	1.35	
100A	100A	-		MPV100-S-00*	1	2.3	
150A	150A	-	2 MCA11 +1 MCAT	MPV150-S-00*	1	5	
200A	200A	-		MPV200-S-00*	1	5	
240A	240A	-		MPV240-S-00*	1	5	
300A	300A	-	2 MCAA11 +1 MCAT	MPV300-S-00*	1	7.5	
400A	400A	-		MPV400-S-00*	1	7.5	
450A	450A	-		MPV450-S-00*	1	7.5	

* Coil voltage available in 24, 110, 230, 400VAC

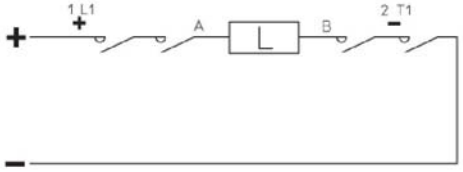
Switch diagram (4 contacts)



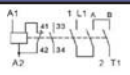
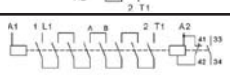
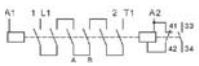
Connection diagram 1-pole



For using as two -poles contactor remove connection A-B



DC Operated

Type	Aux. Contacts build in NO	NC	Additional Aux. Contacts	Pack pcs.	Weight kg/pc.	Wiring Diagram
MDC20-S-10*	1	-	1 MCAA11 +1 MCAT	1	0.5	
MDC48-S-10*	1	-		1	0.5	
MDC100-S-00*	-	-	1 MCAA11 +1 MCAT	1	1.8	
MPV12-S-10*	1	-	1 MCAA11 +2 MCAT	1	0.85	
MPV30-S-10*	1	-	1 MCAA11 +2 MCAT	1	0.95	
MPV60-S-10*	1	-		1	0.95	
MPV100-S-00*	-	-	2 MCAA11 +1 MCAT	1	2.3	
MPV150-S-00*	-	-	2 MCAA11 +1 MCAT	1	5	
MPV200-S-00*	-	-		1	5	
MPV240-S-00*	-	-		1	5	
MPV300-S-00*	-	-	2 MCAA11 +1 MCAT	1	7.5	
MPV400-S-00*	-	-		1	7.5	
MPV450-S-00*	-	-		1	7.5	

* Coil voltage available in 24, 48, 110, 230 VDC






Auxiliary Contact Blocks for contactors MDC-.. & MPV-..

Rated Operational Current AC15 230V A	AC15 400V A	AC1 690V A	For contactors	Type	Pack pcs.	Weight Kg/pc.	Wiring diagram
3	2	10	MDC/MPV-.. Front	MCAT11	1	0.04	
3	2	10	MDC/MPV-.. Front	MCAT22	1	0.05	
3	2	10	MDC/MPV-.. Side	MCAA11	1	0.05	


Accessories

	Type	Pack pcs.	Weight Kg/pc.	Wiring diagram
Fire Brigade-Emergency stop Key operated button Ø40mm, according to EN418, unlock by key	BG10P44S3-11-SK	1	0.22	

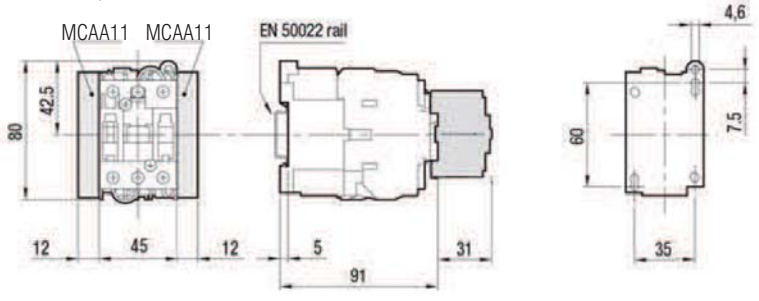
Technical Data

Data according to IEC 60947-3, VDE 0660

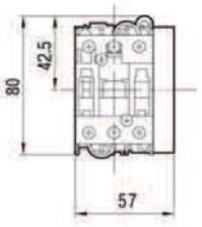
Type		MDC 20..	MDC 48..	MDC 80..	MDC 100..	MPV 12..	MPV 30..	MPV 60..	MPV 80..	MPV 100..	MPV 150..	MPV 200..	MPV 240..	MPV 300..	MPV 400..	MPV 450..
Rated insulation voltage	V=	600	600	1000	600	1200	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
U_{imp}	kV	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Poles in Series		3	3	3	3	8	6	6	4	4	3	3	3	3	3	3
DC1 600V dc I_e	A	20	48	80	100	12	30	60	80	100	150	200	240	300	400	450
DC1 1000V dc I_e	A	-	-	35	100	12	30	60	80	100	150	200	240	300	400	450
DC1 1200V dc I_e	A	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-
Main poles resistance	mOhm	2.5	2.3		3	13	8.5	8.5		4	1.5	1.5	1.5	0.85	0.85	0.85
Mechanical life	10^6	10		10			10		10			10			8	
Protection degree		IP20		IP20			IP20		IP20			IP00 IP20 w. terminal lug.			IP00 IP20 w. terminal lug.	
Weight	kg	0.45		1.17	1.8		0.9		1.35	2.3		5			7.5	
Main poles																
Cable cross-sections	mm^2	2 x 1.5 - 10		2.5-35	4 - 35 +4-50	2x 1.5- 2.5	2 x 1.5-10		2.5-35	4-35 +4-50		busbar 18 x 4 screw M8			busbar 25 x 6 screw M10	
Tightening torque	Nm	2.3		5	8	1.4	2.3		5	8		17			35	
Mounting		DIN-rail or Screw			Screw		DIN-rail or Screw						Screw			
Operating range of coils	U_c	0.85 - 1.1														
Power consumption of coils																
AC Inrush	VA	90		250			200		250			350			360	
Hold	VA/W	9 / 4		18 / 6.3			18 / 8		18 / 6.3			5 / 5			5 / 5	
DC Inrush	W	120		230			230		230			350			360	
Hold	W	2		4			4		4			5			5	
Switching time at voltage																
Make time	ms	10 - 25		15 - 50			10 - 25		15 - 50			30 - 60			40 - 60	
Release time	ms	6 - 18		30 - 80			6 - 18		30 - 80			30 - 60			40 - 60	

Dimensions (mm)

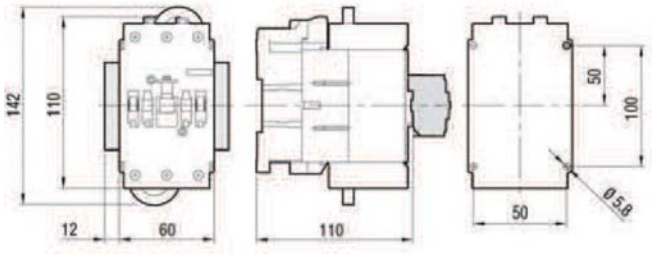
MDC20-S-00, MDC48-S-00



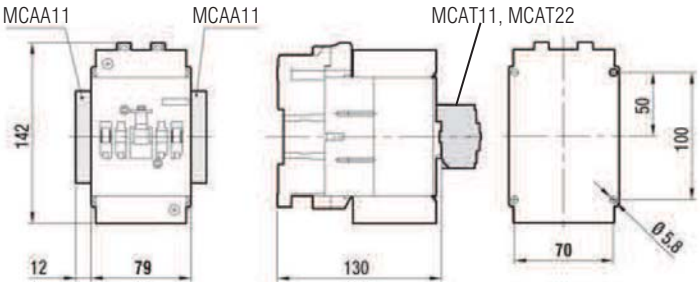
MDC20-S-10, MDC48-S-10



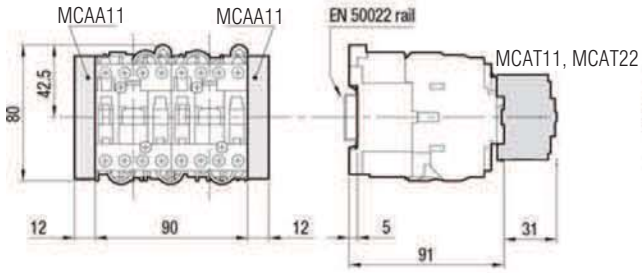
MDC80-S-00 (=)



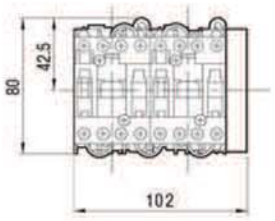
MDC100-S-00 (=)



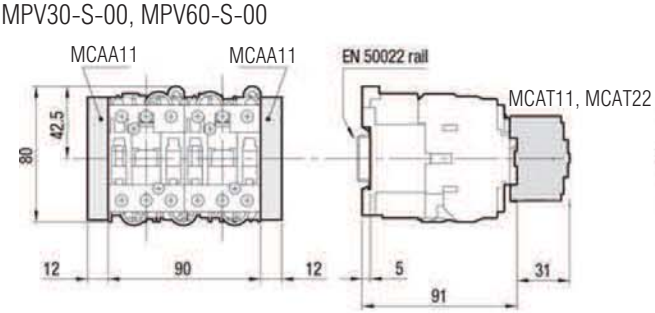
MPV12-S-00



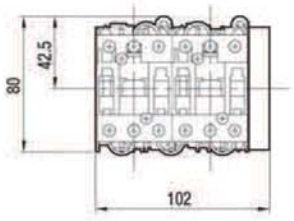
MPV12-S-10=



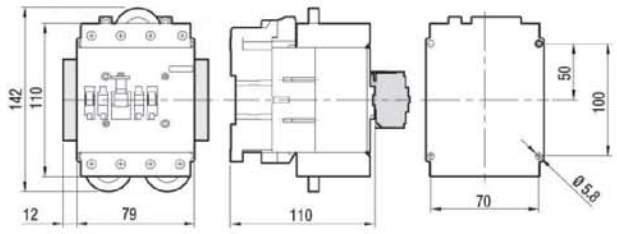
MPV30-S-00, MPV60-S-00



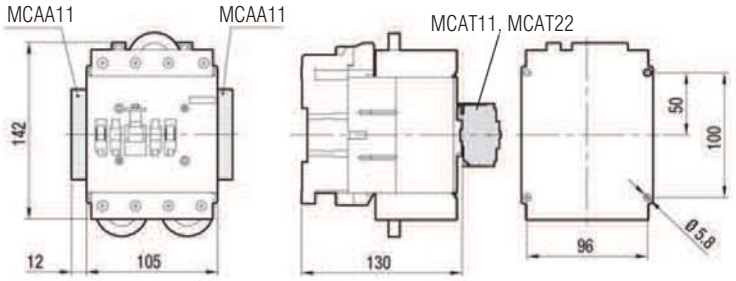
MPV30-S-10=, MPV60-S-10=



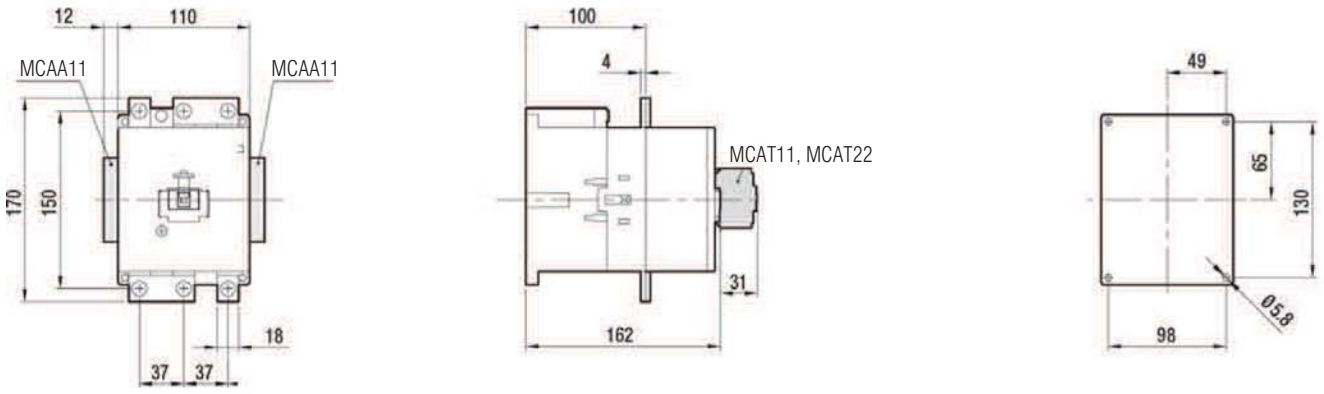
MPV80-S-00



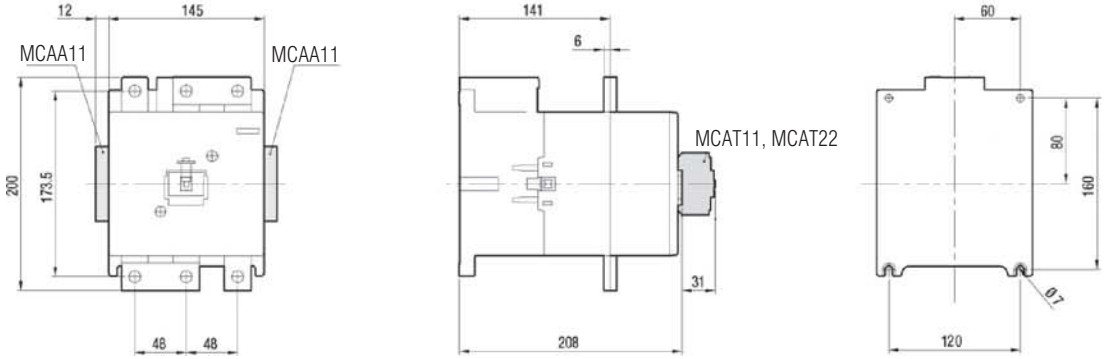
MPV100-S-00



MPV150-S-00(=), MPV200-S-00(=), MPV240-S-00(=)



MPV300-S-00(=), MPV400-S-00(=), MPV450-S-00(=)



Solar Connectors

Mobile connectors are used to connect PV panels in series. They also link lengths of cabling and allow connection to Branch and Panel connectors.

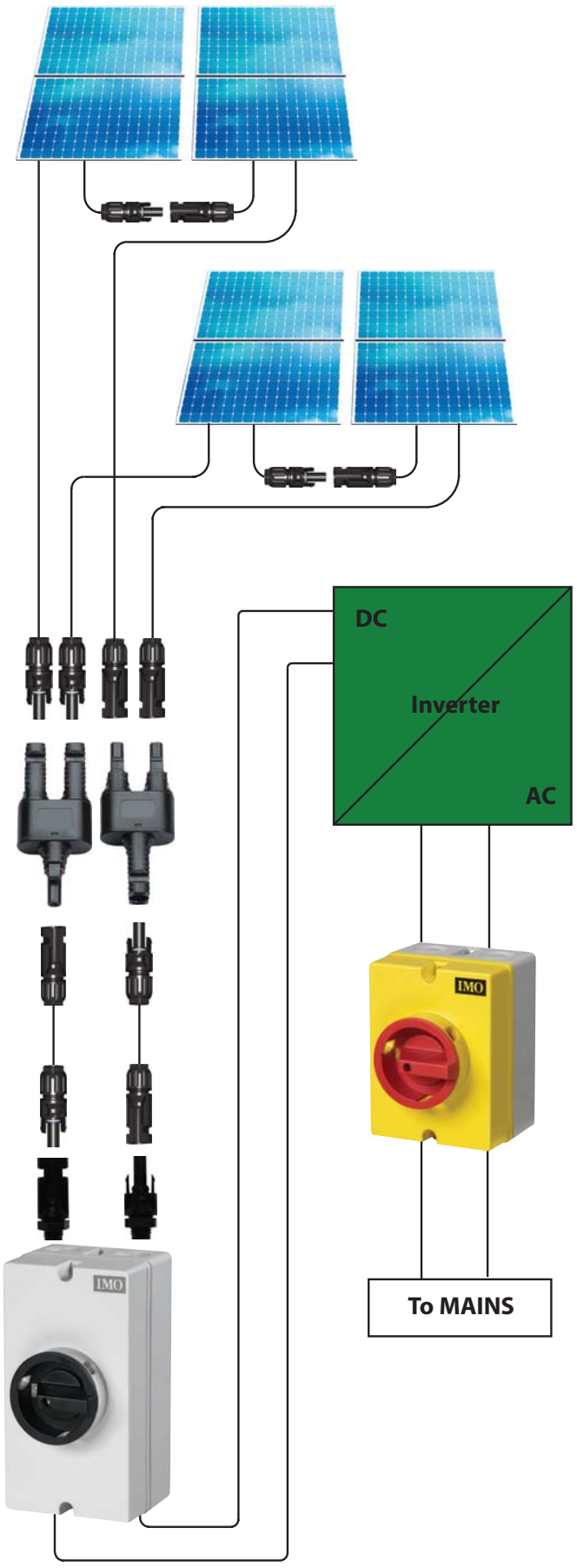
Branch connectors are used to link multiple strings together allowing, for example, a 2 pole (single string) DC isolator to switch both strings at the same time.

Panel connectors mount on solar string boxes, enclosed DC isolators and any other enclosed DC switching device allowing easy connection to the rest of the PV system.

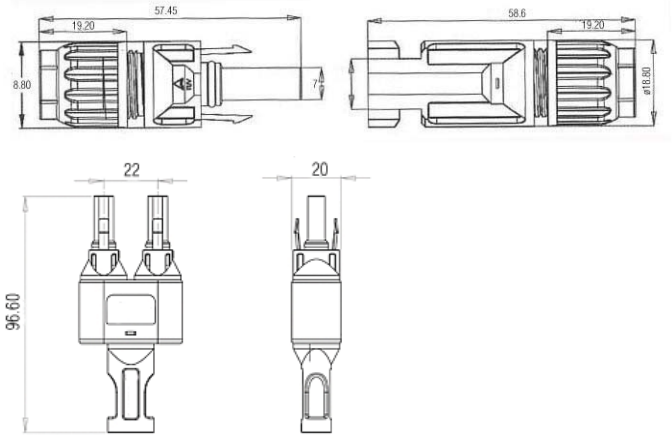
- 1000V DC 30A Rated
- For 4-6mm^2 Cables
- Secure Easy Clip & Release System
- IP67 Protection
- UL94-5VA Fire Protection
- Class 2 Protection
- Operating Temperature: -40°C ~ +85°C

Part Number	Description	Park Quality
SIC-M-4M*	Male mobile connector	100
SIC-M-4F*	Female mobile connector	100
SIC-P-4M	Male panel connector	100
SIC-P-4F	Female panel connector	100
SIC-B-4PAIR	1xMFF + 1xFMM branch connectors	1 Pair
SIC-I-4M	Male connector metal insert (spare)	100
SIC-I-4F	Female connector metal insert (spare)	100

* TUV Approved



Dimensions



DIN Rail Terminals

- 1000V Rated up to 175A
- Up to 95mm^2 wiring capacity
- UL94V-0 Materials
- Various colours available
- Labelling options
- UR/cUR approved (E244285)

	ER16V	ER50V	ER70V	ER35PV	ER70PV
General Product Information					
Insulating material	PA 66	PA 66	PA 66	PA 66	PA 66
Inflammability class acc. to UL 94	V0	V0	V0	V0	V0
Dimensions					
Width	12 mm	20 mm	22 mm	16 mm	22 mm
Length	50 mm	80 mm	74.0 mm	52.8 mm	80.0 mm
Height (MR 35x7,5)	55.5mm	84.7mm	67.5 mm	58.7 mm	88.7 mm
IEC Technical Data					
Nominal Voltage	1000 V	1000 V	750 V	1000 V	1000 V
Nominal Current	76 A	150 A	192 A	115 A	232 A
Wire Cross Section	16 mm^2	50 mm^2	70 mm^2	35 mm^2	70 mm^2
UR / cUR Technical Data					
Nominal Voltage	1000 V*	1000 V	1000 V	1000 V	1000 V
Nominal Current	85 A*	150 A	175 A	115 A	175 A
Wire Cross Section	12 - 4 AWG	6-1/0 AWG	6-2/0 AWG	12-2 AWG	6-2/0 AWG
Connection Data					
Minimum solid strand cross section	2.5 mm^2	16 mm^2	10 mm^2	1.5 mm^2	25 mm^2
Maximum solid Strand cross section	25 mm^2	70 mm^2	70 mm^2	35 mm^2	95 mm^2
Minimum fine Strand cross section	4 mm^2	16 mm^2	16 mm^2	1.5 mm^2	35 mm^2
Maximum fine strand cross section	25 mm^2	50 mm^2	70 mm^2	35 mm^2	95 mm^2
AWG Conductor Range	12 - 4	6 - 0	6 - 0	12-2	2 - 4
Connection Type	screw (1,0x5,5)	hexagonal socket screw S5 (DIN 6911)	hexagonal socket screw S6 (DIN 6911)	screw (1.2x6,5)	hexagonal socket screw S6 (DIN 6911)
Insulation Stripping length	16 mm	24 mm	24 mm	18 mm	24 mm
Tightening torque	1,2 - 2,0 Nm	6,0 - 10 Nm	6,0 - 12 Nm	2,5 - 3,5 Nm	6,0 - 12 Nm

* Pending UL approval

Distribution Boxes

- 4 to 24 poles
- High thermal stability - ASA plastic
- Transparent door
- UV stabilized
- Current rating 63A
- IP65 rating - Inside / Outside use
- Earth & neutral bars included
- Suitable for Photovoltaic applications
- Optional Key Lock (E-Lock)

Technical Data

Protection class	IP65
Isolation class	II ⧈
Impact kit	IK07
Normal voltage	400V
Temperature range	-25°C to 60°C
Colour	RAL 7035
IEC capability	60670-25 CE

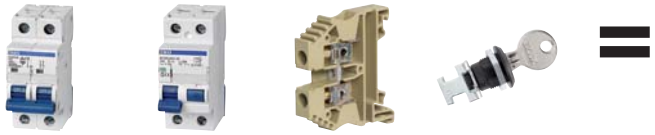
Type	Description	Number of terminals PE/N	Dimensions H x W x D (mm)
E-04W	4 Module Enclosure	4/4	200 x 127 x 120
E-08W	8 Module Enclosure	8/8	200 x 200 x 120
E-12W	12 Module Enclosure	12/12	258 x 318 x 142
E-24W	24 Module Enclosure	24/24	383 x 318 x 142

Type	Cable Entries
E-04W	4 x M20 4 x M25/M32
E-08W	8 x M20 6 x M25 /M32
E-12W	12 x M20 10 x M25/M32 4 x M32/M40 2 x side knockout 90 x 37mm
E-24W	12 x M20 10 x M25/M32 4 x M32/M40 4 x side knockout 90 x 37mm

Step 1 - Select your box:

Step 2 - Select your isolator:

Step 3 - Select your accessories:



Solar Relays

Model	DYA	PHY	PEY
			
Features	- High voltage direct current relay - 10A, 20A, 40A, 80A, 120A, 200A, 300A switch capability - 10A, 20A, 40A: No specific polarity requirements for connection - 300A; Switching power up to 750kVA - 2.5kV dielectric strength (between coil & contacts)	- 30A switching capability - 4kV dielectric strength - Class F insulation - 3.00mm contact gap	- 30A switching capability - 4kV dielectric strength - Class F insulation - 3.0mm contact gap
Contact Form	1A	1A, 2A	1A, 2A
Contact Material	Alloy	$AgSnO_2$	$AgSnO_2$
Max. Switching Voltage	450VDC	277VAC	277VAC
Max. Switching Power	30-750kW	8310VA / 6925VA	8310VA / 6925VA
Rated Load (Resistive Load)	10A 450VDC - 300A 450VDC	1A: 30A 240VAC/30A 277VAC 2A: 25A 240VAC/25A 277VAC	1A: 30A 240VAC/30A 277VAC 2A: 25A 240VAC/25A 277VAC
Rated Voltage	12, 24VDC	6 to 220/240VAC, 3 to 200VDC	6 to 220/240VAC, 3 to 200VDC
Ambient Temperature	-40°C to + 85°C	-55°C to + 70°C	-55°C to + 70°C
Mechanical Life (min.)	2 x 10^5 ops	1 x 10^7 ops	1 x 10^7 ops
Electric Life (min.)	7.5 x 10^4 ops	1 x 10^5 ops	1 x 10^5 ops
Terminal Type	QC, Screw	PCB, QC	Screw

Model	PRW	PRR	PQY
			
Features	- 31A switching capability - Applicable to inverter used for photovoltaic power generation systems - Ideal for UPS - 1.5mm contact gap - Clearance between contact & coil is greater than 6.4mm - Creepage distance > 8mm	- 10A switching capability - 5kV dielectric strength - 1.5mm contact gap - Sealed and dust protected versions available	- 10A switching capability - 1.5kV dielectric strength - 2.00mm contact gap - Plug-in and PCB versions available
Contact Form	1A	2A	2C
Contact Material	$AgSnO_2$	$AgSnO_2$	AgCe
Max. Switching Voltage	277VAC	30VDC / 250VAC	30VDC / 250VAC
Max. Switching Power	7750VA	240W / 2500VA	300W / 2500VA
Rated Load (Resistive Load)	Resistive: 26A 250VAC Inductive: 31A 250VAC	10A 250VAC / 8A 30VDC	10A 30VDC / 250VAC
Rated Voltage	9 to 24VDC	3 to 60VDC	6 to 240VAC, 5 to 220VDC
Ambient Temperature	-40°C to + 85°C	-40°C to + 85°C	-40°C to + 70°C
Mechanical Life (min.)	1 x 10^6 ops	5 x 10^5 ops	1 x 10^7 ops
Electric Life (min.)	3 x 10^4 ops	1 x 10^5 ops	1 x 10^5 ops
Terminal Type	PCB, QC	PCB	PCB, QC

Solar Cube

The IMO Solar Cube has been developed as a ground breaking, easy to set up solar tracking and measurement controller with the flexibility to adapt to any installation.

The Solar Cube is an off the shelf controller designed for use on either one or two axis solar panel installations to track the sun's movement and provide optimum panel (or array)positioning . The sun's position is calculated using the local time and date comparing this with the longitude and latitude location of the solar array. From this data the Solar Cube calculates the 'zenith angle' and the 'azimuth angle', which together exactly specify the position of the sun in the sky to within 0.010.

To position the array the Solar Cube uses feedback from an electronic compass device connected via RS232 or RS485 which then activates the solar array's actuators until the correct position is reached. The compass is mounted directly on the array frame to give accurate positioning information.

With the option of GPS positioning or manual inputting of the array's location, the Solar Cube is easy to setup anywhere in the world. The Solar Cube is a competitive solution for controlling each array or it can be configured to control up to 4 arrays from one controller providing additional savings. Options for feedback and control from a single control station or via a web server are also available.

Solar Cube also offers data logging facilities using its own internal Micro SD card. Power output can be logged continually to produce daily, monthly and yearly figures. Revenues can be calculated along with CO_2 reduction figures.

Solar Cube Key Features

- 3.5" Monochrome Touch Screen
- 5 Pre-programmed function keys
- Built-in sun positioning algorithm
- 3D Compass input for accurate positioning
- Automatic location and clock updates with GPS
- MicroSD card for data logging
- Password security for all settings
- Error based adjustment with configurable error values for each axis
- Configurable minimum and maximum adjustment angles
- Configurable safety cut-out system
- Configurable twilight settings (returns to morning position automatically)
- Single Axis supports Azimuth or Zenith tracking
- Supports custom inverter serial communications
- GPRS and Ethernet Remote Access options available
- Emergency Stop input
- Manual Jog function
- Manual Override key
- Optional Ice and Wind Sensor inputs
- Four motor outputs (For 2 Axis Control)
- Limit Switch inputs for safety cut out
- Optional Washer Control output
- Analog input for power output measurement (CT Connection)
- Optional analog input for light level sensing
- IP65 (NEMA4) CE, cUL, UL
- 10-30VDC supply

Solar Cube Data Logging

- Total kWh produced to date
- Total kWh produced today
- Current Power Output graph (kW against time)
- Yesterday's Power Output graph
- Yield Values for last 31 days (kWh against days)
- Yield Values for last 12 months (kWh against months)
- Specific Annual Yield

Part Numbers

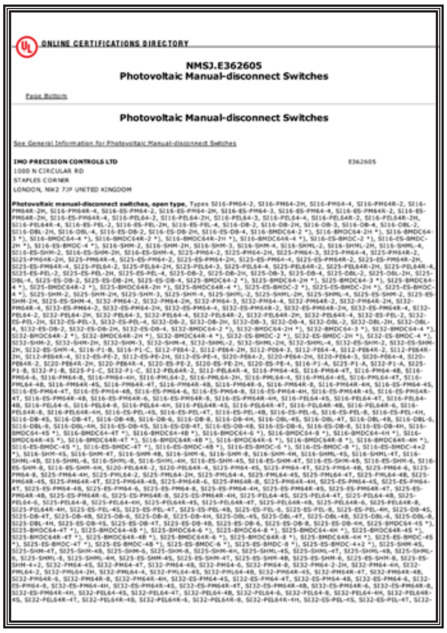
Single Array

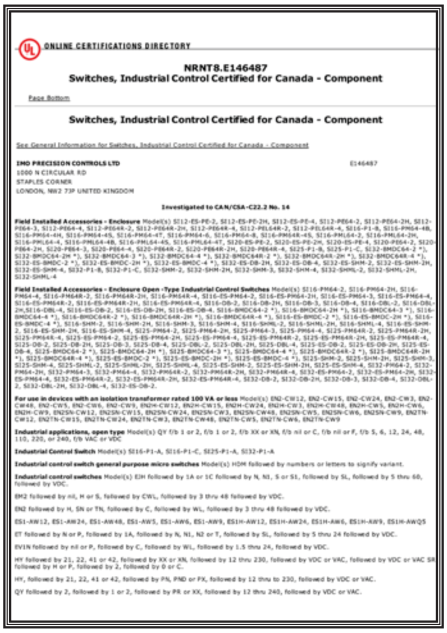
Part Number	Description
SOLARCUBE-1A	Single Array Solar Tracker, 1 or 2 axis configurable
COMPASS-485	3D Positional Compass
OEM GPS RECEIVER	RS232 GPS Receiver

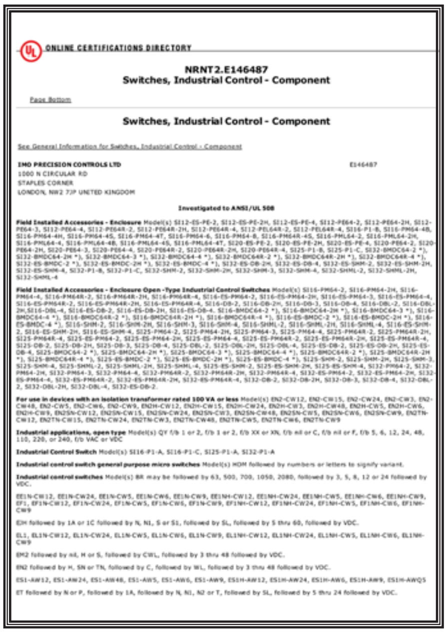
Four Array

Part Number	Description
SOLARCUBE-4A	Four Array Solar Tracker, 1 or 2 axis configurable
SMT-CD-R20-V3 (x3)	Slave Array I/O Repeater
COMPASS-485 (x4)	3D Positional Compass
OEM GPS RECEIVER	RS232 GPS Receiver

Certifications







UL508i Certificate

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