

TECHNICAL INFORMATION

FOR PANEL AND PCB SWITCHES

SPECIFICATIONS

Dimensions, specifications and data shown in this catalog are subject to change without notice. Consequently, they are not contractual in any way. Electrical, mechanical and endurance specifications are based upon in-house tests made by APEM. These tests are conducted using internationally recognized procedures. In the event of a product being used under different conditions, the user must ensure the products suitability for use under those conditions. Incorrect storage, handling, operation or application of the product may result in damage to the product or equipment. The negative value indicated under "Operating temperature" is given for normal usage conditions (products free of moisture, which could generate frost or ice and block the mechanism).

The specifications give the technical performances of the switches. If the equipment on which our products are mounted is submitted to safety standards, the customer should select approved models or models conforming to the standards (marked CE only). Consult factory for details of models that can be marked CE.

DRAWINGS

Products are shown with their standard actuator (for other actuators, see options).

Scale : drawings in this catalog are to different scales: request data sheet if you need other dimensions for a specific part number.

TOLERANCES

Unless otherwise specified, the general tolerance for dimensions in this catalog is $\pm 0,3$ (.012).

Overall dimension tolerance is $\pm 0,5$ (.020).

Request data sheet for further information.

SOLDERING CONDITIONS

Recommendation concerning the conditions of hand soldering with lead-free alloy solder wire type SAC 305 (flux amount 2,2%): temperature 337-381°C.

An application time too long can damage the parts of the product in contact with the soldering lug. Standard application time is 3s.

SEALING OF TERMINALS

Due to the new generations of active flux, epoxy sealing of terminals is preferred to prevent any risk of switch contamination.

ROHS II COMPLIANCE

The RoHS directive 2011/65/EC of the European parliament and of the Council of June 8, 2011 restricts the use of certain hazardous substances in electrical and electronic equipment: Mercury (Hg), Cadmium (Cd), Hexavalent Chrome (Cr+6), Polybrominated biphenyls (PBB) and Polybrominated diphenyl ethers (PBDE including decaBDE), Lead (Pb). There is no change of part number for RoHS compliant products. Some specific products or options can still be supplied in non-RoHS version with customer's agreement.

Standard products manufactured by APEM are already and will remain in compliance with the restriction of the marketing and use of the above mentioned substances imposed by such directive.

Switches for printed circuit boards with tin/lead plated terminals (SnPb) have been replaced by components with pure tin plating.

For specific options using LED illumination, wires are soldered with lead-free solder.

TECHNICAL INFORMATION

Contacts and ratings

CONTACT MATERIALS

Several contact technologies are available depending on models :

FOR MINIATURE SWITCHES

A	- End contacts : silver. - Center contacts and terminals : brass, silver plated. - For high ratings at 125VAC - 250VAC or over 0,1A 30VDC (levels III and IV).
AD	- End contacts : silver with gold plating over nickel barrier. - Center contacts and terminals : brass, gold plated. - For low level applications (levels I and II). - Can be used for high ratings (level IV), the gold layer being considered only as a protection against oxidation during storage.
CD or LD	- Contacts and terminals : brass with gold plating over nickel barrier. - For low level applications up to 20mA 20VDC or 80mA 5VDC (levels I and II).
X780	Silver rivet, gold plated (11000 and 12000 series).

FOR INDUSTRIAL SWITCHES

A	- End contacts : silver rivet or silver inlay. - If not specified in model number, the contact material is indicated in the specifications of each series.
C	Silver plated copper or brass.

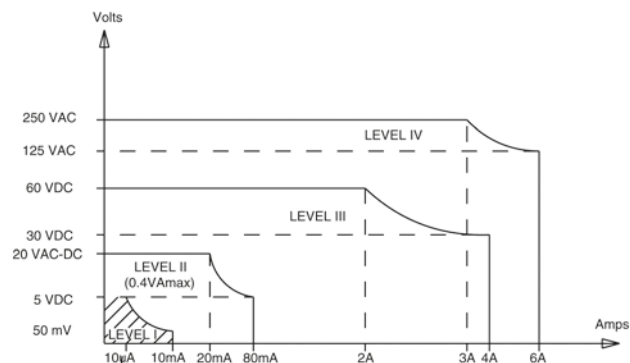
Silver cadmium oxide contacts (S) available on the 4000 - 600H - 600NH and 2600 series, can be replaced by silver tin oxide contacts.

HIGH INRUSH CURRENTS

Special contact materials and switch constructions allow particularly high inrush currents to be taken by some models of the 5000, 11000 and 12000 series.

ELECTRICAL LEVELS

STANDARD MINIATURE SWITCHES



Recommended contacts

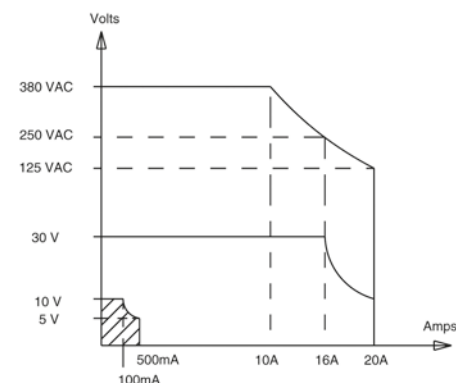
Level I : very low level
Telecommunications
D, AD or CD contacts

Level II : low level
General electronic applications
D, AD or CD contacts

Level III : intermediate level
Low voltage
Electric appliances
A or AD contacts

Level IV :
Mains power supply
A contact

INDUSTRIAL SWITCHES - SILVER CONTACTS



The above curves feature all the ratings available in our product range. Hatched areas show minimum ratings. Maximum ratings are indicated in the specifications of each series. Note that max. current is given for standard life expectancy. For specific applications, higher currents can be applied, resulting in reduced life expectancy and vice-versa. Consult factory.

LOW CURRENT OR DRY CIRCUIT (LEVEL I)

The quality of the gold plating (hardness, porosity, adherence) and the design of the contacts (pressure or sliding contact) allow the use of very low currents down to 10 µA 5V or 10mA 50mV depending on models, measurable according to IEC 512-2, test 2a.

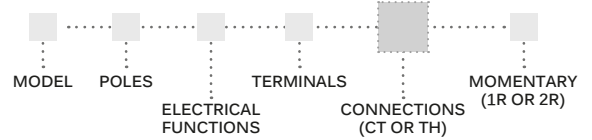
TECHNICAL INFORMATION

Positions and connections for 3-way switches • Function 4

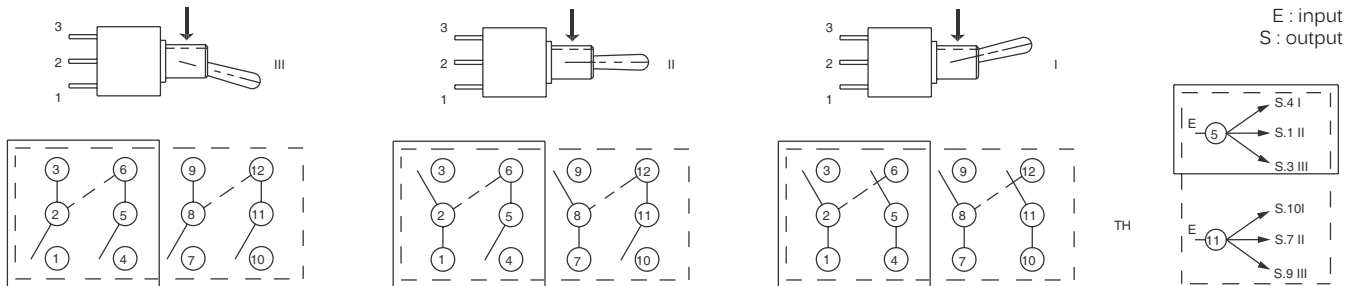
MINIATURE SWITCHES

5000 and 7000 series are available with CT or TH connections.
Desired connections are to be specified in enlarged box of model structure. 12000 and S series are available with TH connections only.

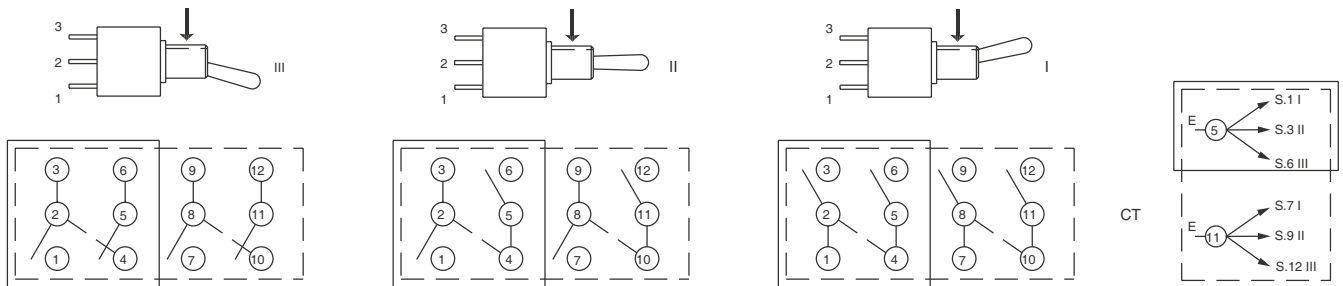
Model structure 5000 and 7000 series



FUNCTION 4 - TYPE TH (PREFERRED) - 5000 - 7000 - 12000 - S - SR SERIES



FUNCTION 4 - TYPE CT (REVERSED) - 5000 - 7000 SERIES

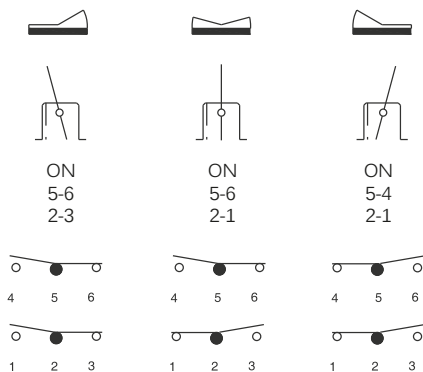


Single pole switches in a double pole case □ SP □ DP
Double pole switches in a four pole case

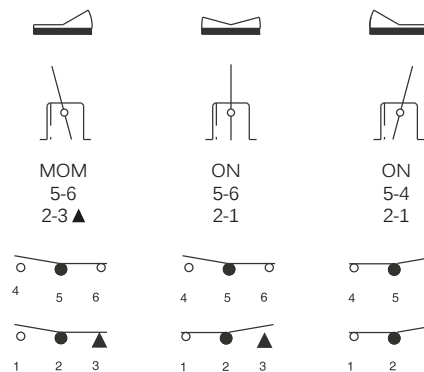
⚠ Dotted line between poles : jumper to be wired by the user.

INDUSTRIAL SWITCHES : 600 600H - 3600NF - 6000 AND 2600 SERIES

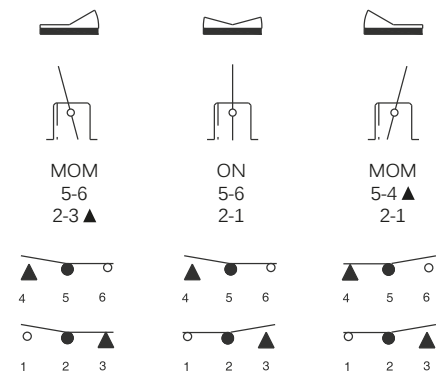
FUNCTION 4



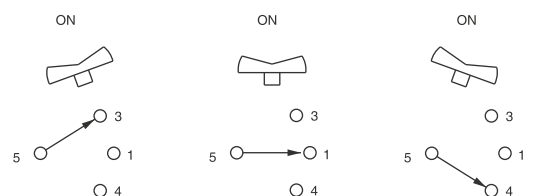
FUNCTION 4-1R (MOMENTARY ONE SIDE)



FUNCTION 4-2R (MOMENTARY BOTH SIDES)



● Common ○ Maintained ▲ Momentary
Terminals 2 and 6 must be connected by the user for a 3 way switch. Single pole switches in a double pole case.



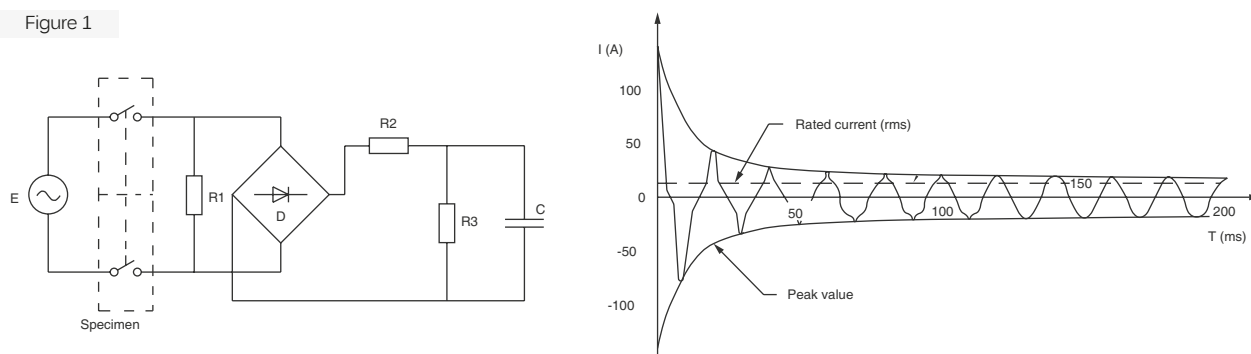
TECHNICAL INFORMATION

Switches for peak currents

- For switching power supplies, DC-DC converters, motors...
- Peak current with 125/250VAC according to IEC 1058 (Fig 1) and direct current 60VDC (Fig 2)
- 2 maintained positions

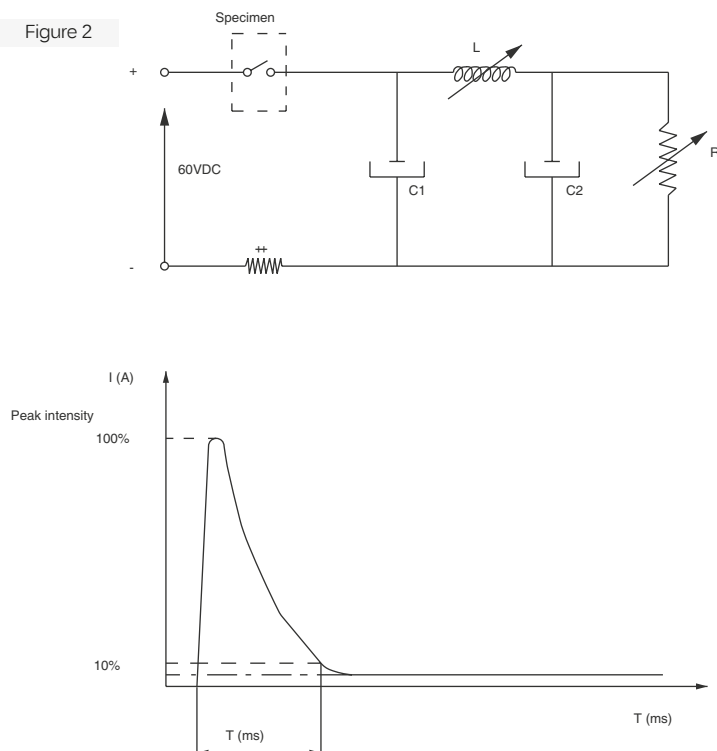
TESTING CIRCUIT AC VOLTAGE

Figure 1



TESTING CIRCUIT DC VOLTAGE

Figure 2



CURRENT/VOLTAGE RATING EXAMPLES

4 / 100A	250VAC	10.000 cycles	
↓	↓	↓	
		Life	
↓	↓		
Nominal AC current	Max. AC voltage		
3 / 80A	(10 ms)	60VDC	10.000 cycles
↓	↓	↓	↓
Inrush current (Fig 2)		Max. voltage	Life
↓	↓		
Nominal AC current	Inrush duration		

See 11000 and 12000 series, special option X910.

TECHNICAL INFORMATION

Degrees of protection : IP and IK codes

The degree of protection is indicated by 2 letters and 2 numbers.

IP•• degree of protection provided by the enclosures of electric appliances according to IEC 60529 and DIN 40050.

IK•• degree of protection provided by the enclosures of electric appliances against external mechanical impacts according to EN 62262.

Example : I P 6 5

protection
against dust

protection
against water

1ST NUMBER : PROTECTION AGAINST INGRESS OF SOLID OBJECTS

IP	TESTS	
0		Non-protected
1		Protected against solid objects of 50 mm (1.968) and greater
2		Protected against solid objects of 12.5 mm (.492) and greater
3		Protected against solid objects of 2.5 mm (.098) and greater
4		Protected against solid objects of 1 mm (.039) and greater
5		Dust-protected (no harmful ingress)
6		Dust-tight (no ingress)

2ND NUMBER : PROTECTION AGAINST LIQUIDS

IP	TESTS	
0		Non-protected
1		Protected against vertically falling water drops
2		Protected against vertically falling water drops when enclosure tilted up to 15°
3		Protected against water sprayed vertically at an angle up to 60°
4		Protected against splashing water
5		Protected against water jets from any direction
6		Protected against powerful water jets
7		Protected against the effects of temporary immersion in water (1 m water, 30 minutes)
8		Protected against the effects of continuous immersion in water (depth x to be specified)

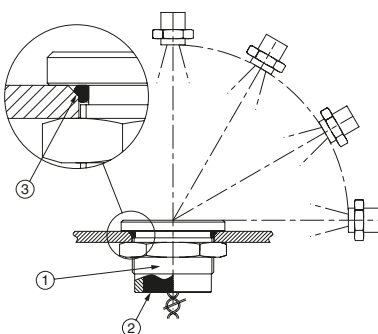
IK CODE : MECHANICAL PROTECTION

The degree of mechanical protection is now defined by the letters IK according to EN 62262.



For an additional protection of switches used in harsh environments against sand, frost or other contaminants that may cause switch failure, we recommend the use of sealing boots.

SEALING IP69K



High pressure, high temperature wash down IP69K test conditions

- . Pressure : 80 - 120 bars
- . Distance : 15 cm
- . Temperature : 80°C ± 5°C
- . Flow : 14 - 16 l/mn
- . Duration : 30 seconds per position

Illustration : PBA series switch.

- ① - One-piece bushing
- ② - Epoxy sealed terminals
- ③ - O-ring

TECHNICAL INFORMATION

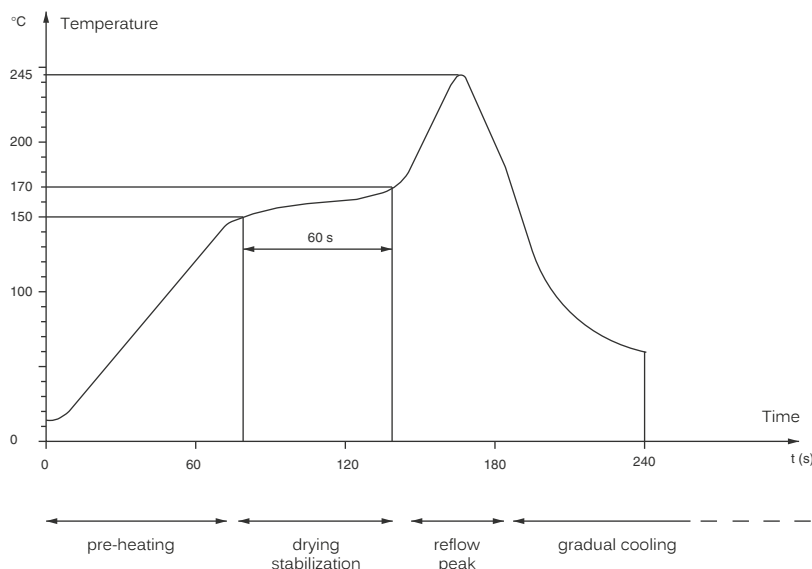
Surface mount

- The wave soldering profile is given as an indication, it does not commit APEM. Each application must be subject to specific validation by the customer.

TYPICAL SMT REFLOW PROFILE

The PC board, carried by a conveyor belt, goes through the different areas of a reflow soldering oven :

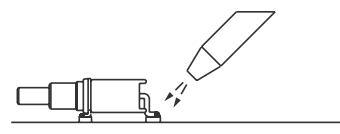
- pre-heating (maximum 170°C, 60 secs)
- reflow peak (maximum 245°C)
- final cleaning (optional)



BOARD REWORK TECHNIQUE

Hot air reflow technique is preferred. Avoid use of a traditional soldering iron.

Caution : Excessive and/or repeated high temperature exposure may affect switch performance and reliability.



TYPICAL LEAD-FREE SMT REFLOW PROFILE

Complying with the ROHS directive.

Example of Pb-free profile requirements for soldering heat resistance		
Parameter	Reference	Specification (small case)
Temperature gradient in preheating		3°C/s max.
Soak time	t_{soak}	2-3 minutes
Time above 217°C	t_1	60-150 seconds
Time within 5°C of actual peak temperature	t_3	20-40 seconds
Peak temperature in reflow	T_{peak}	260°C (+0/-5°C)
Temperature gradient in cooling		6°C/second max.
Time 25°C to peak temperature		8 minutes max.

