

# Technical information

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## SPECIFICATIONS

Dimensions, specifications and data shown in this catalogue are subject to change without notice. Consequently, they are not contractual in any case. Electrical, mechanical and endurance specifications are based upon in-house tests made by APEM. These tests are conducted using internationally recognised procedures. In the event of a product being used under different conditions, the user must ensure the product's 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.

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## DRAWINGS

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

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

## TOLERANCES

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

Overall dimension tolerance is  $\pm 0,5$  (.020). Ask for a data sheet for further information.

## PART NUMBERS

To order a switch model, every option has to be specified. However, for the S series toggle switches and 18000 series pushbutton switches, we continue to accept former part numbers using default options. If the actuator is not specified, we will supply lever or plunger -13.

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## SOLDERING CONDITIONS

Hand soldering with iron : 300°C, 3 seconds max.

## SEALING OF TERMINALS

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

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## ROHS COMPLIANCE

The new RoHS directive 2002/95/EC of the European parliament and of the Council of 27 January 2003 about the restriction of 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), Lead (Pb)

is applicable to our products and will apply before July 2006.

APEM is working on this subject in order to manufacture RoHS compliant components.

Road map:

. 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.

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.

# 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** Contacts and terminals : brass with gold plating over nickel barrier.
- or **LD** 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

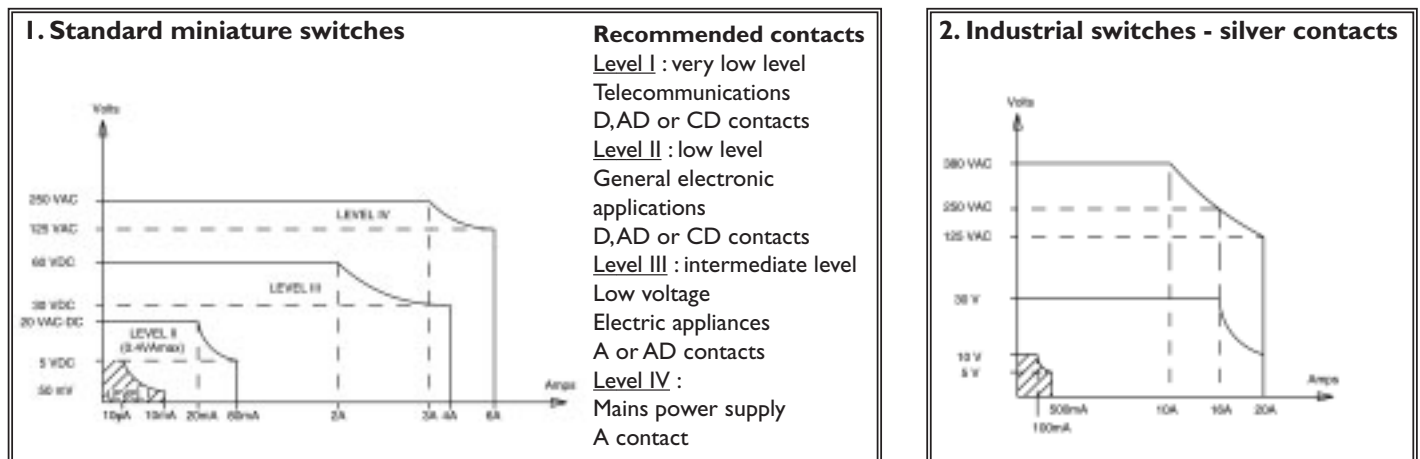
- A** End contacts : silver rivet or silver inlay.  
If not specified in model number, the contact material is indicated in the specifications of each series.
- C** Silver plated copper or brass.

Silver cadmium oxide contacts (**S**) which used to be available on the 4000 - 600H - 600NH and 2600 series, are discontinued and will be replaced by silver tin oxyde contacts before 2005.

### 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



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 10µA 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

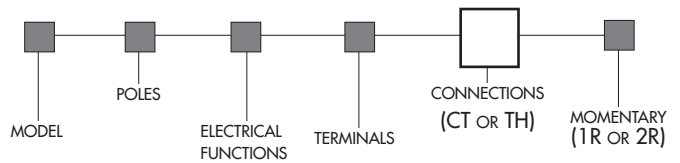
### MINIATURE SWITCHES

5000 and 7000 series are available with CT or TH connections.

Desired connections are to be specified in enlarged box of model structure.

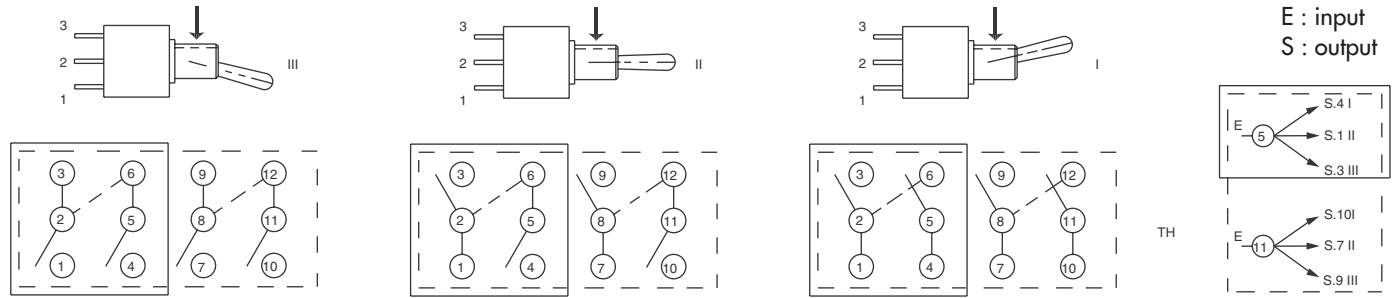
12000 and S series are available with TH connections only.

Model structure 5000 and 7000 series

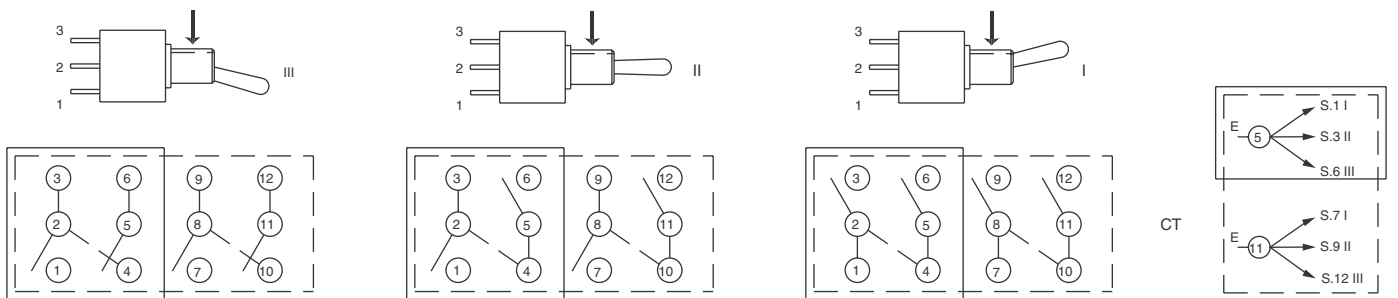


### FUNCTION 4 - TYPE TH (preferred) - 5000 - 7000 - 12000 - S - SR - 10600 series

→ Keyway



### FUNCTION 4 - TYPE CT (reversed) - 5000 - 7000 series



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



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

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

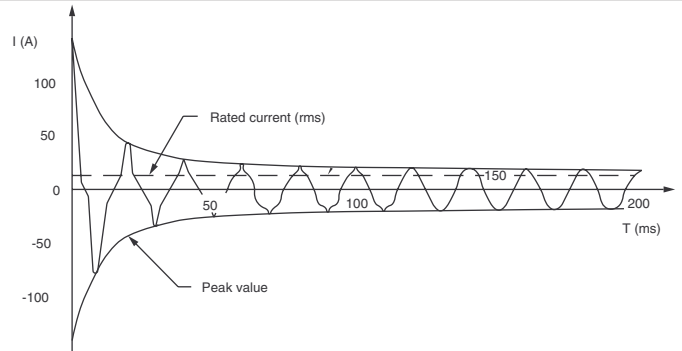
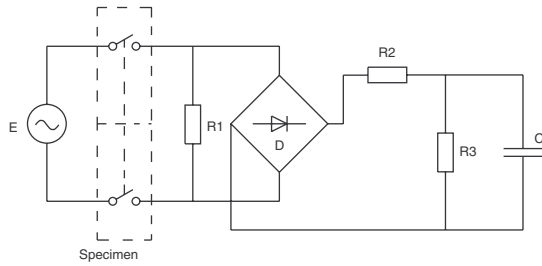
FUNCTION 4			FUNCTION 4-1R (momentary one side)			FUNCTION 4-2R (momentary both sides)		
ON 5-6 2-3	ON 5-6 2-1	ON 5-4 2-1	MOM 5-6 2-3 ▲	ON 5-6 2-1	ON 5-4 2-1	MOM 5-6 2-3 ▲	ON 5-6 2-1	MOM 5-4 ▲ 2-1
• Common	◦ Maintained	▲ Momentary	ON			ON		
Terminals 2 and 6 must be connected by the user for a 3 way switch. Single pole switches in a double pole case.								

# Technical information

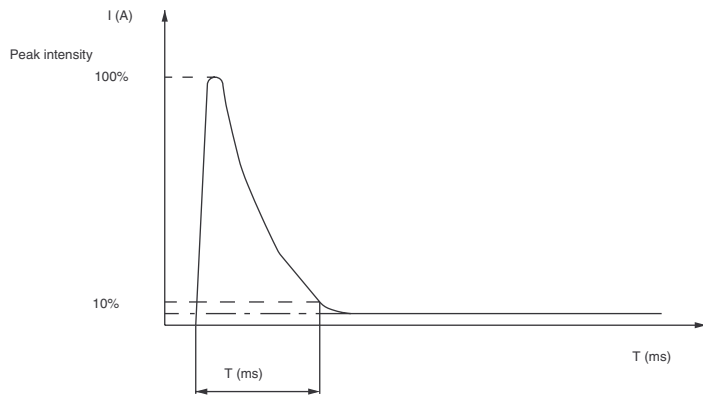
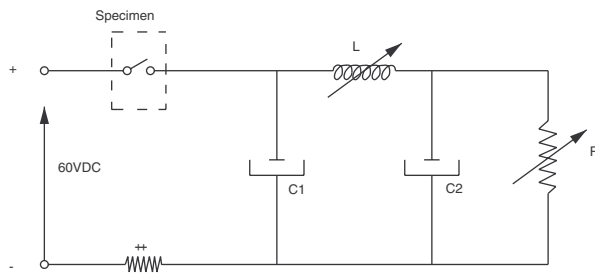
## Switches for peak currents

- 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

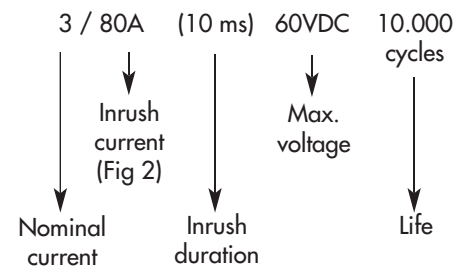
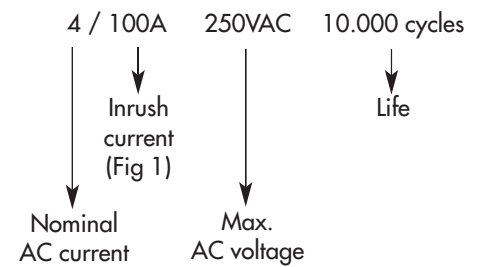
Testing circuit AC voltage  
Figure 1



Testing circuit DC voltage  
Figure 2



Current/voltage rating examples :



# Technical information

## Degrees of protection : IP and IK codes

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







**Example : I P 6 5**









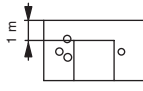
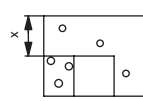
IP•• degree of protection provided by the enclosures of electric appliances according to IEC 529 and DIN 40050.

IK•• degree of protection provided by the enclosures of electric appliances against external mechanical impacts according to EN 50102 (NFC 20-015).

**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
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 50102 of June 1995 (NFC 20-015)

It is only applicable to the "Anti-vandal" models of the AV series.  
See section B .

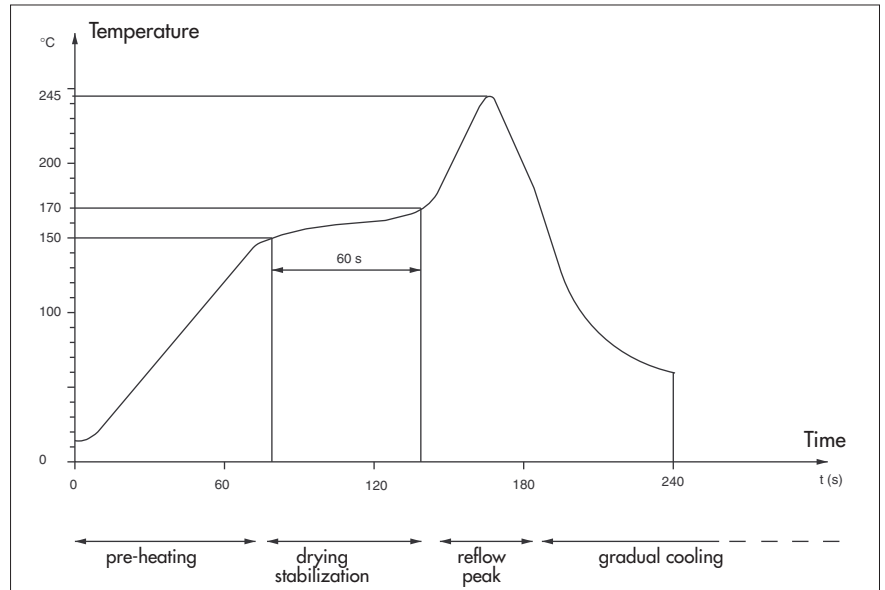
# Technical information

## Surface mount

### TYPICAL SMT REFLOW PROFILE

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

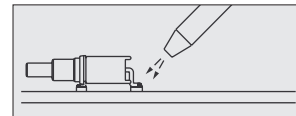
- pre-heating (maximum 170°C, 60 secs)
- reflow peak (maximum 245°C)
- final cleaning (optional)



### 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.

