

IEC 947-1 & IEC 947-3 Standards

Selecting Switches According to IEC 947 -3 Standard

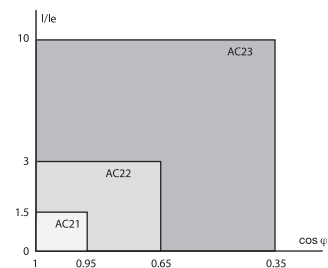
Utilization category		Use	Application
AC	DC		
AC20	DC20	No-load making and breaking	Disconnecter (device without on-load making and breaking capacity)
AC21	DC21	Resistive including moderate overloads	Switches at installation head or for resistive circuits (heating, lighting, except discharge lamps, etc.)
AC22	DC22	Inductive and resistive mixed loads including moderate overloads	Switches in secondary circuits or reactive circuits (capacitor banks, discharge lamps, shunt motors, etc.)
AC23	DC23	Loads made of motor or other highly inductive loads	Switches feeding one or several motors or inductive circuits (electric carriers, brake magnet, series motor, etc.)

Breaking and Making Capacities

Unlike circuit breakers, where these criteria indicate tripping or short-circuit making characteristics and perhaps requiring device replacement, switch making and breaking capacities correspond to utilization category maximum performance values. In these uses, the switch must still maintain its characteristics, in particular its resistance to leakage current and temperature rise.

	Making		Breaking		N° of operating cycles
	I/le	cos φ	I/le	cos φ	
AC 21	1.5	0.95	1.5	0.95	5
AC 22	3	0.65	3	0.65	5
AC 23 I ≤ 100 A	10	0.45	8	0.45	5
AC 23 Ie > 100 A	10	0.35	8	0.35	3

	L/R (ms)		L/R (ms)	
DC 21	1.5	1	1.5	1
DC 22	4	2.5	4	2.5
DC 23	4	15	4	15



Making and breaking capacities.

Short Circuit Characteristics

- Short-time withstand current (I_{cw}): allowable rms current for 1 second.
- Short circuit making capacity (I_{cm}): peak current value which the device can withstand when closed on a short-circuit.
- Conditional short circuit current: the rms current the switch can withstand when associated with a protection device limiting both the current and short circuit duration.
- Dynamic withstand: peak current the device can withstand in a closed position.

The characteristic established by this standard is the short-time withstand current (I_{cw}) from which minimal dynamic withstand is deduced. This essential withstand value corresponds to what the switch can stand without welding.

Electrical and Mechanical Endurance

This standard establishes the minimum number of electrical (full load) and mechanical (no-load) operating cycles that must be performed by devices. These characteristics also specify the device's theoretical lifespan during which it must maintain its characteristics, particularly resistance to leakage current and temperature rise.

This performance is linked to the device's use and rating. According to anticipated use, two additional application categories are offered:

- Category A: frequent operations (in close proximity to the load),
- Category B: infrequent operations (at installation head or wiring system).

Ie (A)	≤ 100	≤ 315	≤ 630	≤ 2500	> 2500
N° cycles/hour	120	120	60	20	10
N° of operations in cat. A					
without current	8500	7000	4000	2500	1500
with current	1500	1000	1000	500	500
Total	10000	8000	5000	3000	2000
N° of operations in cat. B					
without current	1700	1400	800	500	300
with current	300	200	200	100	100
Total	2000	1600	1000	600	400

Definitions

Conventional thermal current (I_{th}): Value of the current the disconnect switch can withstand with pole in closed position, in free air for an eight hour duty, without the temperature rise of its various parts exceeding the limits specified by the standards.

Rated insulation voltage (U_i): Voltage value which designates the unit and to which dielectric tests, clearance and creepage distances are referred.

Rated impulse withstand voltage (U_{imp}): Peak value of an impulse voltage of prescribed form and polarity which the equipment is capable of withstanding without failure under specified conditions of test and to which the values of the clearances are referred.

Rated operating current (I_e): Current value determined by endurance tests (both mechanical and electrical) and by making and breaking capacity tests.