

TESTING AND MEASURING EQUIPMENT/ALLOWED SUBCONTRACTING

IEC 60947-1:2020, Edition 6.0

Low-voltage switchgear and controlgear

Part 1: General rules

“R”	Required
“S”	May be subcontracted, see OD 2012
“SP”	Specialized Facility, see IECEE 02-2
“W”	Witness testing in the categories “MED” and “MEAS”
“3PPS”	Three Phase Power Supply required

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
9.2.2.1	Glow-wire test (on equipment)	Glow wire test apparatus according to IEC 60695-2-10	ZRS-3H
9.2.2.2	Flammability, hot wire ignition and arc ignition tests (on materials)	flammability test apparatus according to IEC 60695-11-10; hot wire ignition (HWI), test as described in Annex M; arc ignition (AI) test, as described in Annex M.	ZY-3 RSY-LT
9.2.4	Enclosures for equipment	Sphere 50 mm diameter Jointed test finger Test rod 2.5mm diameter Test wire 1.0mm diameter Sphere 12.5mm diameter	

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
		Dust Chamber Drip box Drip box 15° Oscillating tube/ spray $\pm 60^\circ$ or spray nozzle/spray $\pm 60^\circ$ Oscillating tube/ spray $\pm 180^\circ$ Water jet hose nozzle - nozzle 6,3 mm diameter Water jet hose nozzle - nozzle 12.5mm diameter Immersion tank Fan jet nozzle Force gauge Turn table Flow meter	SC-015 JL-X
9.2.5	Mechanical and electrical properties of terminals	Test screwdriver or spanner with torquemeter, test apparatus according to figure 1, weights, force gauge, AC / DC source, electrical loads, temperature-, current- and voltage measuring instruments, timer, heating cabinet, gauges according to table 7	JCY-2
9.2.6	Verification of the effectiveness of indication of the main contact position of equipment suitable for isolation	Force gauge, timer, AC / DC source, voltage measuring instruments	
9.2.8	Conduit pull-out test, torque test and bending test with metallic conduits	Test screwdriver or spanner with torquemeter, force gauge, ruler, timer	SW-6 CH338
9.2.9	Test of earth continuity for protective earth	AC / DC source, voltage and current measuring instruments	
9.3.3.2	Operating limits	AC / DC source, current- and voltage measuring instruments, timer, temperature chamber(s), capacitors (capacitive drop out test)	
9.3.3.3, 9.3.3.8	Temperature-rise, Pole impedance	AC / DC source, electrical loads, temperature-, current- and voltage measuring instruments, timer Thermocouple	WS-1
9.3.3.4	Dielectric properties	Impulse voltage generator (1,2/50 μ s), oscilloscope, high voltage probe, AC / DC high voltage source, current- and voltage measuring instruments, timer	SUG255

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
9.3.3.5, 9.3.3.6, 9.3.3.7	Making and breaking capacities, Operational performance capability, Durability	For test currents up to 1 kA (AC) / 100 A (DC): AC / DC source, electrical loads, measuring devices for voltage, current, $\cos \varphi$, time, I^2t , time constant, oscilloscope for monitoring of arcing and measuring transient recovery voltage, robotic actuator to operate the devices; metallic screen fine wire fuse	SUG335
		For test currents higher than 1 kA (AC) / 100 A (DC)	
9.3.4	Performance under short-circuit conditions	For short-circuit test currents up to 10 kA (AC) / 1 kA (DC): AC / DC source, electrical loads, measuring devices for voltage, current, $\cos \varphi$, time, I^2t , time constant, measurement equipment (e.g. oscilloscope) for monitoring of arcing, robotic actuator to operate the devices, metallic screen fine wire fuse	
		For short-circuit test currents higher 10kA (AC) / 1 kA (DC)	
9.4	Tests for EMC	---	
Annex Q			
	- EMC tests	---	ESD61000-2 GTEM-2 RFCI61000-6 EFT61000-4 SG61000-5 PFM61000-8A CSS61000-11
	- Insulation resistance before testing and visual inspection	Insulation testing equipment complying with IEC 61557-2	WB2681A
	- Vibration test	Vibration test according to IEC 60068-2-6	LVD-100KG
	- Shock test	Shock test according to IEC 60068-2-27	LS-VS50
	- Inclination test	Inclination test according to IEC 60092-504	
	- Dry heat test	Temperature chamber, timer	GDJS-015B
	- Damp heat test	Climatic chamber, timer	
	- Recovery	Timer	

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
	- Insulation resistance	Insulation testing equipment complying with IEC 61557-2	WB2681A
	- Low temperature test	Temperature chamber, timer	GDJS-015B
	- Recovery	Timer	
	- Insulation resistance	Insulation testing equipment complying with IEC 61557-2	WB2681A
	- Dielectric test	AC / DC high voltage source, current- and voltage measuring instruments, timer	
	- Salt mist	Salt mist test according to IEC 60068-2-52	YWX/Q-010
	- Insulation resistance	Insulation testing equipment complying with IEC 61557-2	WB2681A
	- Verification of operational capability	See 9.3.3.6	
Annex S	Digital inputs and outputs	AC / DC source, electrical loads, measuring devices for voltage, current, time, oscilloscope	
Annex T	Extended functions within electronic overload relays	AC source, electrical loads, measuring devices for voltage, current, time, oscilloscope	