NEMZETI AKKREDITÁLÓ HATÓSÁG

AKKREDITÁLÁSI OKIRAT
ACCREDITATION CERTIFICATE

A NEMZETI AKKREDITÁLÓ HATÓSÁG
The National Accreditation Authority

a 2015. évi CXXIV. törvény és a 424/2015. (XII.23.) Kormányrendeletben foglalt felhatalmazás alapján elismeri, hogy az
authorized by Act No. CXXIV of 2015 and Government Decree No. 424/2015. (XII.23.), recognizes, that

VEIKI-VNL Villamos Nagylaboratóriumok Kft.
Vizsgáló Laboratórium
1158 Budapest, Vasgolyó u. 2-4.

megfelel az MSZ EN ISO/IEC 17025:2018 szabvány követelményeinek és a
complies with criteria of Standard MSZ EN ISO/IEC 17025:2018 as

vizsgálólaboratórium
TESTING LABORATORY
kategóriába az alábbi számon bejegyzi
and has been assigned registration number

NAH-1-1251/2019

Az akkreditálás területét az akkreditálási határozat tartalmazza.
The scope of accreditation is specified in the accreditation decision.

Az akkreditált státusz kezdetének napja:
Start date of the accredited status
2019. április 25.

Az akkreditált státusz lejáratának napja:
Expiry date of the accredited status
2024. április 25.

(p. h.)

Budapest, 2019. április 25.

Devecz Miklós
A Nemzeti Akkreditáló Hatóság főigazgatója
Director General of the National Accreditation Authority

A NAH ebben a kategóriában aláírója az Európai Akkreditálási Együttműködés (EA) megállapodásának.
The NAH is a signatory in this field of the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) for accreditation.

Tested products	Tested parameters, types of tests, ranges	Test methods
Power transformers		
Oil immersed transformers	Coil D.C resistance measurement: 100 μΩ – 1 kΩ Ratio measurement: 1-100 Short-circuit impedance, Load loss, No-load current and loss measurement Test equipment limits: Umax=800 V AC-50 Hz Imax=50 A AC 50 Hz	IEC 60076-1 IEC 60310
	Temperature rise test: I ≤ 6500 A, T≤200 °C	IEC 60076-2 IEC 60076-13 HN 52-S-24 HN 52-S-27 HN 52-S-28 HN 52-S-29 IEC 60310
	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ (1.5 A) $U_{100Hz} \leq 3000\ V_{RMS}$ $U_{lightning} \leq 3400\ kV_{pk}$ $U_{switching} \leq 2800\ kV_{pk}$	IEC 60076-3 IEC 60076-4 IEC 60076-13 HN 52-S-24 IEC 60310
	Partial discharge test $U_{100Hz} \leq 100\ kV_{RMS}$, q ≤ 10000 pC	IEC 60076-3 IEC 60076-13 IEC 60270 HN 52-S-24 HN 52-S-27
	Short-circuit test Max 140 kV / 40 000 kVA up to rated transformer parameters	IEC 60076-5 IEC 60076-13 HN 52-S-24 HN 52-S-27 HN 52-S-28 HN 52-S-29 IEC 60310
	Acoustic noise measurement (Sound pressure method) L_{pA} = 20...120 dB(A) Sound power level calculation L_{WA} = 20...120 dB(A)	IEC 60076-10 ISO 3744
	Test of HV terminals: Bending: F ≤ 1 kN Torsion: M ≤ 200 Nm	HN 52-S-24
	IP Protection tests	IEC 60529
	IK Protection tests	IEC 62262 IEC 60068-2-75
Dry transformers	Coil D.C resistance measurement: 100 μΩ – 1 kΩ Ratio measurement: 1-100 Short-circuit impedance, Load loss, No-load current and loss measurement Test equipment limits: Umax=800 V AC-50 Hz Imax=50 A AC 50 Hz	IEC 60076-1 IEC 60076-11
	Temperature rise test: I ≤ 6500 A, T≤200 °C	IEC 60076-2 IEC 60076-11
	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ (1.5 A) $U_{100Hz} \leq 3000\ V_{RMS}$	IEC 60076-3 IEC 60076-4 IEC 60076-11

Tested products	Tested parameters, types of tests, ranges	Test methods
	$U_{lightning} \leq 3400\ kV_{pk}$ $U_{switching} \leq 2800\ kV_{pk}$	
	Partial discharge test $U_{100Hz} \leq 100\ kV_{RMS}$, $q \leq 10000\ pC$	IEC 60076-3 IEC 60076-11 IEC 60270
	Short-circuit test Max 36 kV / 10 000 kVA up to rated transformer parameters	IEC 60076-5 IEC 60076-11
	Acoustic noise measurement (Sound pressure method) L_{pA} = 20...120 dB(A) Sound power level calculation: L_{WA} = 20...120 dB(A)	IEC 60076-10 IEC 60076-11 ISO 3744
	IP Protection tests	IEC 60076-11 IEC 60529
Reactors	Temperature rise test: I ≤ 6500 A, T≤200 °C	IEC 60076-6 IEC 60310
	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ (1.5 A) $U_{lightning} \leq 3400\ kV_{pk}$	IEC 60076-6 IEC 60310
	Short-circuit test $I \leq 40\ kA_{RMS}$	IEC 60076-6
	Acoustic noise measurement (Sound pressure method) L_{pA} = 20...120 dB(A) Sound power level calculation L_{WA} = 20...120 dB(A)	IEC 60076-6
	Coil D.C resistance measurement: 100 μΩ – 1 kΩ Impedance measurement, Loss measurement Test equipment limits: Umax=800 V AC-50 Hz Imax=50 A AC 50 Hz	IEC 60076-6 IEC 60310
Measuring transformers		
Voltage and current transformers	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ $U_{lightning} \leq 3400\ kV_{pk}$ $U_{lightning,\ chopped} \leq 1400\ kV_{pk}$ $U_{switching} \leq 2800\ kV_{pk}$ RIV test $U_{50Hz} \leq 700\ kV_{RMS}$, RIV ≤ 88 dB(μV) IP and IK protection test of enclosure Partial discharge test $U_{50Hz} \leq 700\ kV_{RMS}$, q ≤ 10000 pC Capacitance and tgδ measurement U< 700 kV, C: 10-10000 pF Verification of marking	IEC 61869-1 IEC 61869-2 IEC 61869-3 IEC 61869-4 IEC 61869-5 IEC 60044-7 IEC 60044-8 IEC 61869-10 IEC 61869-11
Current transformers	Temperature rise test I ≤ 6500 A, T≤200 °C Short-circuit test I ≤ 150 kA (1s)	IEC 61869-1 IEC 61869-2 IEC 60044-8 IEC 61869-10
	Short-circuit test $I \leq 150\ kA_{RMS}$	IEEE C57.13
	Secondary coil resistance R ≤ 1 kΩ Knee-point voltage U ≤ 2000 V	IEC 61869-2

Tested products	Tested parameters, types of tests, ranges	Test methods
	Insulation test of winding $U \leq 10$ kV	
Voltage transformers	Temperature rise test $U \leq 700$ kV_{RMS}, Imax=0.5A $T \leq 200$ °C Short-circuit test $U \leq 72.5$ kV_{RMS} (1s)	IEC 61869-1 IEC 61869-3 IEC 61869-5 IEC 60044-7 IEC 61869-11
Combined measuring transformers	Short-circuit test $I \leq 150$ kA_{RMS} (1s) $U \leq 130$ kV_{RMS} (1s)	IEC 61869-4
HV Switchgears	Dielectric test $U_{50Hz} \leq 1400$ kV_{RMS} $U_{lightning} \leq 3400$ kV_{pk} $U_{switching} \leq 2800$ kV_{pk} DC resistance $I_{DC} = 20…200$ A $R = 20$ μΩ … 2.4 Ω Temperature rise test $I \leq 6500$ A, $T \leq 200$ °C Short-circuit test $I \leq 80$ kA (3s)	IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-103 IEC 62271-104 IEC 62271-105 IEC 62271-106 IEC 62271-107 IEC 62271-108 IEC 62271-110 IEC 62271-200 IEC 62271-201 IEC 62271-202 IEC 62505-1 IEC 62505-2
	RIV test $U_{50Hz} \leq 700$ kV_{RMS}, RIV ≤ 88 dB(μV)	IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-104 IEC 62271-105 IEC 62271-108 IEC 62271-110
	Mechanical endurance test operation time: 1 ms … 60 s	IEC 62271-100 IEC 62271-102 IEC 62271-103 IEC 62271-104 IEC 62271-105 IEC 62271-106 IEC 62271-107 IEC 62271-108 IEC 62271-110 IEC 62271-200 IEC 62271-201 IEC 62505-1 IEC 62505-2
	Making and breaking test: 36 kV / 630 A inductive 36 kV / 50 A capacitive	IEC 62271-100 IEC 62271-102 IEC 62271-103 IEC 62271-104 IEC 62271-105 IEC 62271-106 IEC 62271-107 IEC 62271-108 IEC 62271-110 IEC 62271-200 IEC 62271-201 IEC 62505-1 IEC 62505-2

Tested products	Tested parameters, types of tests, ranges	Test methods
	Short-circuit making and breaking test: 600 MVA / 3-Phase 1100 MVA / 1-Phase	IEC 62271-100 IEC 62271-101 IEC 62271-102 IEC 62271-103 IEC 62271-104 IEC 62271-105 IEC 62271-106 IEC 62271-108 IEC 62271-110 IEC 62505-1 IEC 62505-2
	Synthetic tests 1100 MVA / 1F up to 245 kV rated voltage	IEC 62271-101
	Busbar transfer switching test I ≤ 1600 A, U = 10…100 V operation time: 1 ms … 60 s	IEC 62271-102
	Induced current switchning tests on earthing switches 245 kV Class B	IEC 62271-102
	Internal arc test: I ≤ 31.5 kA/1s	IEC 62271-200 IEC 62271-201 IEC 62271-202
	IP protection test	IEC 62271-1 IEC 60529
	IK protection test	IEC 62271-1 IEC 62262 IEC 60068-2-75
Tests of earthing/damping resistors	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ $U_{lightning} \leq 3400\ kV_{pk}$; R>230 Ω $U_{switching} \leq 3200\ kV_{pk}$ DC resistance I_{DC} = 20…200 A R = 20 μΩ … 2.4 Ω Temperature rise test I ≤ 20000 A, T≤1400 °C Impedance and loss measurement	IEEE Std 32 IEEE C57.32
LV Switchgears	Dielectric test $U_{50Hz} \leq 20\ kV_{RMS}$ $U_{lightning} \leq 20\ kV_{pk}$ Temperature rise test I ≤ 6500 A, T≤200 °C Short-circuit test: I ≤ 170 kA/1s I ≤ 120 kA/3s Making and breaking test: 550V / 120 kA 1000V / 100 kA Mechanical tests	IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 60947-4-1 IEC 61439-1 IEC 61439-2 IEC 61439-3 IEC 61439-5 IEC 61439-6
	Electrical power drive systems: Dielectric test $U_{50Hz} \leq 120\ kV_{RMS}$ $U_{lightning} \leq 250\ kV_{pk}$ Temperature rise test I ≤ 6500 A, T≤200 °C Short-circuit test: I ≤ 150 kA/3s	IEC 61800-5-1

Tested products	Tested parameters, types of tests, ranges	Test methods
	Creeping distances and clearances 1…500 mm	IEC 60947-1 IEC 61439-1 IEC 61800-5-1
	Corrosion protection and thermal stability test of insulating materials Chamber (0.7x0.7x0.7 m, m<15 kg) Temperature = -40…+100 °C, Humidity = 10…100 % Lifting, m ≤ 5000 kg Verification of marking	IEC 61439-1 IEC 61439-2 IEC 61439-3 IEC 61439-5 IEC 61439-6 IEC 62208
	Mechanical tests m ≤ 500 kg	IEC 61439-6
	Heat cycle test I ≤ 8000 A, T≤200 °C	IEC 61439-6
	Vertical flammability test air: (77,7±4,8) l/min propane: (13,5±0,5) l/min	IEC 61439-6 IEC 60332-3-10
	Power arc test 120 kA / 3s	IEC/TR 61641
	IP protection test	IEC 60529 IEC 61439-1 IEC 62208
	IK protection test	IEC 60068-2-75 IEC 62208 IEC 62262
Fuses		
LV fuses	Dielectric test $U_{50Hz} \leq 20\ kV_{RMS}$ $U_{lightning} \leq 20\ kV_{pk}$ Short-circuit breaking test: up to 190 MVA Temperature rise test: I ≤ 6500 A, T≤200 °C DC resistance measurement I_{DC} = 20…200 A R = 20 μΩ … 2.4 Ω	IEC 60269-1 IEC 60269-2
HV fuses	Dielectric test $U_{50Hz} \leq 1400\ kV_{RMS}$ $U_{lightning} \leq 3400\ kV_{pk}$ Temperature rise test: I ≤ 6500 A, T≤200 °C Short-circuit breaking test: up to 1000 MVA	IEC 60282-1 IEC 60282-2 IEC 60549
Over-voltage protection equipment	Dielectric test (enclosure) $U_{50Hz} \leq 1400\ kV_{RMS}$ $U_{lightning} \leq 3600\ kV_{pk}$ $U_{switching} \leq 2800\ kV_{pk}$ Short-circuit test: I ≤ 80 kA Partial discharge test $U_{50Hz} \leq 700\ kV_{RMS}$, q≤10000 pC RIV test $U_{50Hz} \leq 700\ kV_{RMS}$, RIV ≤ 88 dB(μV) Salt-fog aging test: Umax=24 kV	IEC 60099-4 IEC 60099-6 IEC 60099-8
	UV-test UVA-340 lamp Wavelength: 340 nm	IEC 60099-4 ISO 4892-1 ISO 4892-3

Tested products	Tested parameters, types of tests, ranges	Test methods
	Radiation: 0.76 W/m^2 Temperature: 60 °C	IEC 60099-6 IEC 60099-8
Cables	Insulation resistance test U ≤ 5kV$_{DC}$	HD 605 IEC 60840 EN 50395 IEC 60502-1 IEC 60502-2 IEC 60502-4
	Leakage current test I ≤ 1 A	IEC 60502-4
	Dielectric test U ≤ 1400 kV	IEC 60840 HD 605 EN 50395 IEC 60502-1 IEC 60502-2 IEC 60502-4
	Dielectric test U ≤ 200kV$_{DC}$	EN 50395 IEC 60502-2 IEC 60502-4 IEC 60840 HD 605
	Lightning impulse test: U$_{lightning}$ ≤ 3400 kV	IEC 60230 IEC 60840 HD 605 IEC 60502-1 IEC 60502-2 IEC 60502-4
	Visual inspection, verification of dimensions: ≤ 5 m	IEC 60840 IEC 60502-4
	Water tightness test	IEC 60840
	Partial discharge test Umax 700 kV (Imax = 0.5A) Qmax 10000pC	IEC 60885-2 IEC 60502-2 IEC 60502-4
	Dielectric loss (tgδ) test U< 700 kV, C: 10-10000 pF	IEC 60840 HD 605 IEC 60502-2
	Capacitance measurement U< 700 kV, C: 10-10000 pF	IEC 60502-4 IEC 60840
	Heat cycle test Umax 75 kV 267 mA Imax 2000 A	IEC 60840 IEC 60502-2 IEC 60502-4
	Clean and salt fog test Umax 30 kV	IEC 60502-4
	Short-circuit test I ≤ 63 kA	HD 605 IEC 60502-4
	Smoke emission test Vertical flammability test of electric and optic cables (A, B, C, D) Integrity test T=750..830°C	IEC 60331-1 IEC 60331-2 IEC 60331-3 IEC 60331-11 IEC 60332-1-1 IEC 60332-1-2 IEC 60332-1-3 IEC 60332-2-1 IEC 60332-2-2 IEC 60332-3-10 IEC 60332-3-21 IEC 60332-3-22 IEC 60332-3-23 IEC 60332-3-24

Tested products	Tested parameters, types of tests, ranges	Test methods
		IEC 60332-3-25 IEC 61034-1 IEC 61034-2
Cable assemblies	Dielectric test (AC) U ≤ 1400 kV	EN 50393 IEC 61442 HD 629.1 HD 629.2 HD 632 IEC 60243-1 IEC 60502-4 IS 13573-1 IS 13573-2 IS 13573-3
	Dielectric test (DC) U ≤ 200kV$_{DC}$	HD 629.1 IEC 61442 HD 629.2 HD 632 IEC 60243-2 IEC 60502-4 IS 13573-2 IS 13573-3
	Lightning impulse test U$_{lightning}$ ≤ 1600 kV	EN 50393 IEC 61442 IEC 60502-4 HD 629.1 HD 629.2 HD 632 IEC 60243-3 IS 13573-1 IS 13573-2 IS 13573-3
	Insulation resistance test U ≤ 5kV$_{DC}$	EN 50393 IEC 61442 HD 629.1 IEC 60502-4 HD 629.2 HD 632 IS 13573-1 IS 13573-2 IS 13573-3
	Capacitance measurement U< 700 kV, C: 10-10000 pF	IEC 61442 HD 629.1 IEC 60502-4 HD 629.2 HD 632 IS 13573-2 IS 13573-3
	Dielectric loss (tgδ) test U< 700 kV, C: 10-10000 pF	HD 632
	Verification of dimensions ≤ 5 m	HD 629.1 IEC 60502-4 HD 629.2 HD 632 EN 50393 IS 13573-1 IS 13573-2 IS 13573-3
	Impact test Energy ≤ 10 J	EN 50393 IEC 61442

Tested products	Tested parameters, types of tests, ranges	Test methods
		HD 629.1 IEC 60502-4 HD 629.2 IS 13573-1 IS 13573-2 IS 13573-3
	Heat cycle test Umax 75kV 267mA Imax 2000A	EN 50393 IEC 61442 HD 629.1 IEC 60502-4 HD 629.2 HD 632 IS 13573-1 IS 13573-2 IS 13573-3
	Short-circuit test I ≤ 63 kA	IEC 61238-1-1 IEC 61238-1-2 IEC 61238-1-3 IEC 61442 HD 629.1 IEC 60502-4 HD 629.2 HD 632 EN 50393 IEC 61914 IS 13573-1 IS 13573-2 IS 13573-3
	Screen fault current initiation test U_{Rated} ≤ 36 kV	IEC 61442 IEC 60502-4 IS 13573-2 IS 13573-3
	Partial discharge test Umax 700kV Qmax 10000pC	IEC 61442 IEC 60502-4 HD 629.1 HD 632 IS 13573-2 IS 13573-3
	Clean and salt fog test Umax 30kV	IEC 61442 IEC 60502-4 HD 629.1 HD 629.2 HD 632 IS 13573-2 IS 13573-3
	Leakage current test I ≤ 1 A	HD 629.1 IEC 60502-4 IEC 61442 HD 629.2 IS 13573-2 IS 13573-3
	Aging test T =20-250 °C; I ≤ 8000 A R = 10 … 10000 μΩ	IEC 61238-1-1 IEC 61238-1-2 IEC 61238-1-3

Tested products	Tested parameters, types of tests, ranges	Test methods
Insulators		
Glass and ceramic insulators	Lightning impulse test $U_{lightning} \leq 3400\ kV_{pk}$	IEC 60060-1 IEC 60060-2 MÁVSZ 2180 IEC 60168 IEC 60383-1 IEC 60383-2 IEC 60797 IEC 61211 NEMA ANSI C29.1 NEMA ANSI C29.2A NEMA ANSI C29.2B NEMA ANSI C29.3 NEMA ANSI C29.4 NEMA ANSI C29.5 NEMA ANSI C29.6 NEMA ANSI C29.7 NEMA ANSI C29.8 NEMA ANSI C29.9 NEMA ANSI C29.10
	Switching impulse test $U_{switching} \leq 2800\ kV_{pk}$	IEC 60060-1 IEC 60060-2 IEC 60168 IEC 60383-2
	Industrial-frequency test $U_{50Hz} \leq 1400\ kV_{RMS}$	IEC 60060-1 IEC 60060-2 IEC 60168 IEC 60383-1 IEC 60383-2 MÁVSZ 2180 NEMA ANSI C29.1 NEMA ANSI C29.2B
	Partial discharge test $U_{50Hz} \leq 700\ kV_{RMS}, q \leq 10000\ pC$	IEC 60270
	Mechanical tests Tensile : 0-300 kN Bending: 0-50 kN (max 0.8m)	IEC 60168 IEC 60383-1 IEC 60797 MÁVSZ 2180 NEMA ANSI C29.1 NEMA ANSI C29.2B
	Thermo-mechanic test 300 kN / -40 … +65°C	IEC 60383-1 NEMA ANSI C29.2B
	Electro-mechanic test 300 kN / 50 kV	IEC 60383-1 NEMA ANSI C29.1 NEMA ANSI C29.2B
	Corona / RIV test $U_{50Hz} \leq 700\ kV_{RMS}$, RIV ≤ 88 dB(µV)	IEC 60168 IEC 60437
	Zinc coating test 5 … 300 µm	IEC 60168 ISO 1461 IEC 60383-1 MÁVSZ 2180
	Verification of dimensions ≤ 5 m	IEC 60168 IEC 60383-1 MÁVSZ 2180 NEMA ANSI C29.2B

Tested products	Tested parameters, types of tests, ranges	Test methods
	Power arc test $I \leq 50$ kA	IEC 61467
Composite insulators	Lightning impulse test $U_{lightning} \leq 3400$ kV_{pk}	IEC 60060-1 IEC 60060-2 IEC 61109 IEC 61952 IEC 62217 EN 50151 IEC 60383-1 IEC 60383-2 IEC 62231 NEMA ANSI C29.12 NEMA ANSI C29.17 NEMA ANSI C29.11 IEC 60660
	Switching impulse test $U_{switching} \leq 2800$ kV_{pk}	IEC 60060-1 IEC 60060-2 IEC 60383-2 IEC 61109 IEC 61952
	Industrial-frequency test $U_{50Hz} \leq 1400$ kV_{RMS}	IEC 61109 IEC 61952 IEC 62217 IEC 62231 NEMA ANSI C29.12 NEMA ANSI C29.17 NEMA ANSI C29.11 IEC 60060-1 IEC 60060-2 IEC 60383-1 IEC 60383-2 IEC 60660
	Partial discharge test $U_{50Hz} \leq 700$ kV_{RMS}, $q \leq 10000$ pC	IEC 60660 IEC 60270
	Water absorption test $U \leq 1400$ kV_{RMS} Thermal cycle test -25 °C , +50°C Thermo-mechanical tests 300 kN / -40 … +65°C	IEC 60660
	Design test- Test on interfaces and connections of end fittings 300 kN / -40 … +65°C 1000 kV/ msec, 500 kV_{RMS}	IEC 61109 IEC 62217 IEC 62231 IEC 61952 NEMA ANSI C29.12 NEMA ANSI C29.11 NEMA ANSI C29.17
	Design test - Assembled core load test $F \leq 300$ kN	IEC 61109 IEC 62231 IEC 61952 NEMA ANSI C29.12 NEMA ANSI C29.11 NEMA ANSI C29.17
	Design test- Test on shed and housing material	IEC 61109 IEC 61952 IEC 62231 IEC 62217 NEMA ANSI C29.11 NEMA ANSI C29.12

Tested products	Tested parameters, types of tests, ranges	Test methods
		NEMA ANSI C29.17
	Hardness test Shore A: 10-100 ShA	ISO 868
	Accelerated weathering test Method A, Cycle 1	ISO 4892-1 ISO 4892-3 ISO 4582
	Tracking and erosion - 1000 h salt fog test 20 mm/kV creeping distance max. 30kV 8 kg/m3 Na Cl content	IEC 60068-2-11
	Flammability test 50 W flame	IEC 60695-11-10
	Design test- Test of core material Dye penetration (10 mm sample) Water diffusion test (30 mm sample) 12 kV	IEC 61109 IEC 61952 IEC 62231 IEC 62217 NEMA ANSI C29.11 NEMA ANSI C29.12 NEMA ANSI C29.17
	5000 hour accelerated aging test 20 mm/kV creeping distance max. 30kV, 7 kg/m^3 Na Cl content 50 °C, 6500 W Xenon lamp	IEC/TR 62730 IEC 60068-2-11
	Power arc test I ≤ 50 kA	IEC 61467
	Corona / RIV test U_{50Hz} ≤ 700 kV_{RMS}, RIV ≤ 88 dB(μV)	IEC 60437
Insulator strings	Power arc test I ≤ 50 kA	MSZ-09-00.0342 IEC 61467
Insulator assemblies	Tests of connections Galvanizing test 5 … 300 μm	IEC 60372 ISO 1461 ISO 2178
Overhead line conductors and hardware		
Phase conductors and OPGW, OPPC	Verification of dimension length ≤ 5 m diameter ≤ 150 mm mass ≤ 10 kg	EN 50182 EN 50540 IEC 61089 IEC 62219
	Tensile break test F ≤ 300 kN, L ≤ 14 m Modulus of elasticity F ≤ 300 kN, L ≤ 14 m, nyúlás ≤ 1 m Stringing test 400 m, max. 100 kN	EN 50182 EN 50540 IEC 61089 IEC 62219 IEEE 1138
	Compression test F ≤ 50 kN Impact test Energy ≤ 10 J	IEC 60794-1-2 IEC 60794-1-21 IEC 60794-4-20 IEEE 1138
	Heat cycle test: -50 … +250 °C Water penetration test 1 m water gauge	IEC 60794-1-22 IEC 60794-4-20 IEEE 1138
	Short-circuit test I ≤ 63 kA Lightning test I ≤ 400 A	IEC 60794-1-401 IEC 60794-1-402 IEC 60794-1-403 IEEE 1138

Tested products	Tested parameters, types of tests, ranges	Test methods
	DC resistance measurement R = 10 … 10000 μΩ	IEC 60468 ASTM B193 ASTM D257
	AC resistance measurement R = 10 … 10000 μΩ	EN 50540
	Corona / RIV test: $U_{50Hz} \leq 700\ kV_{RMS}$, RIV ≤ 88 dB(μV)	IEC 61284
	Creep test T = 20 °C, F ≤ 70 kN creep = 0.01 … 10 mm	IEC 61395
	Self-damping test: 5 … 500 Hz	IEEE 563
	Test of wires: Verification of dimensions diameter ≤ 10 mm Tensile break test F ≤ 50 kN Torsion and wrap test speed: 0 … 100 RPM DC resistance measurement R = 0.5 … 1000 mΩ	EN 50182 EN 50183 EN 50189 IEC 60104 IEC 60888 IEC 60889 IEC 61089 IEC 61232 IEC 62004 IEC 62219 ASTM A938 ASTM B230/B230M ASTM B398/B398M
Covered conductors	Insulation resistance test $U \leq 5kV_{DC}$ Leakage current test I ≤ 1 A Dielectric test U ≤ 1400 kV Zinc coating thickness test 5 … 300 μm Water tightness test Test of marking Short-circuit test I ≤ 63 kA	EN 50397-1
Railway contact wires	Verification of dimensions length ≤ 5 m diameter ≤ 150 mm mass ≤ 10 kg Resistance measurement R = 10 … 10000 μΩ Tension, bending F ≤ 300 kN Wrap, torsion	EN 50149
Overhead-line hardware	Verification of dimensions ≤ 5 m Test of galvanisation 5 … 300 μm Magnetic loss test I ≤ 2000 A	IEC 61284
	Heat cycle test T =20-250 °C I ≤ 8000 A, $I_{SC} \leq 63$ kA R = 10 … 10000 μΩ Tension, slip, bending test	IEC 61284 ANSI/NEMA CC1 ANSI C 119.4 BS 3288-1

Tested products	Tested parameters, types of tests, ranges	Test methods
	F ≤ 300 kN Bolt tightening test M ≤ 200 Nm.	
	Corona / RIV test: U_{50Hz} ≤ 700 kV_{RMS}, RIV ≤ 88 dB(μV)	IEC 61284 ANSI/NEMA CC1
	Short-circuit test I ≤ 63 kA	STL Procedure 4
Covered conductor hardware	Tension and slip test F ≤ 300 kN Bolt tightening test M ≤ 200 Nm Dielectric test U_{50Hz} ≤ 10kV	EN 50483-1 EN 50483-2 EN 50483-3 EN 50483-4 NFC 33-020 NFC 33-040 NFC 33-041
	Aging test Chamber (0,7x0,7x0,7 m) Temperature = -40…+100 °C, Humidity = 10…100 % Salt-fog test Salt-content: 1…10 kg/m^3	EN 50483-2 EN 50483-3 EN 50483-4 EN 50483-6 NFC 33-003 NFC 33-020 NFC 33-040 NFC 33-041
	Electrical aging T =20-250 °C; I ≤ 6500 A, I_{SC} ≤ 63 kA R = 10 … 10000 μΩ	EN 50483-4 EN 50483-5 NFC 33-004 NFC 33-020
Railway contact wire assemblies	Verification of dimensions Corrosion protection test 5-300 μm Tensile test F ≤ 300 kN Short-circuit test I ≤ 63 kA Electrical aging U ≤ 24 kV	RFI DMAIM TE SP IFS 016A RFI DMAIM TE SP IFS 024A RFI DPRIM STF IFS TE064A
Vibration dampers	Slip test F ≤ 50 kN Attachment of weights/clamp to messenger cable F ≤ 10 kN Corrosion protection test 5-300 μm Clamp bolt tightening test M ≤ 200 Nm Fatigue test: 10…300 Hz Damper characteristic test 3…300 Hz	IEC 61897
	Corona / RIV test: U_{50Hz} ≤ 700 kV_{RMS}, RIV ≤ 88 dB(μV)	IEC 61897 IEC 61284
	Damper performance test 3…300 Hz	IEEE 664
Spacers	Corrosion protection test 5-300 μm Slip test F ≤ 50 kN Clamp bolt tightening test M ≤ 200 Nm	IEC 61854

Tested products	Tested parameters, types of tests, ranges	Test methods
	Real short-circuit test I ≤ 50 kA Simulated short-circuit test (Compression/tension) F ≤ 30/20 kN Characterisation of elastic and damping properties 1…2 Hz, 10…500 N Fatigue test Aeolian: 5…100 Hz Sub-span: 1-10 Hz / 50 mm Electrical resistance test: 100 Ω…100 MΩ	
	Corona / RIV test: U_{50Hz} ≤ 700 kV_{RMS}, RIV ≤ 88 dB(μV)	IEC 61854 IEC 61284
Equipment for live line working		
Aerial devices with insulating boom	Dielectric test on boom: Tests at U_0, $2U_0$, $3U_0$ Leakage current: 1 μA/kV (U=200÷462 kV) Switching impulse test Dielectric test on platform and liner: Platform: U=20 kV_{RMS} AC Liner: U=50 kV_{RMS} AC Dielectric test of platform surface U=50 kV_{RMS} AC Low-voltage tests U_{DC}=1500 V, U_{AC}=1000 V I_{max}=3,5 mA (to lower boom pin) I_{max}=0,5mA (to ground)	IEC 61057 ANSI/SIA A92.2 DIN VDE 0682-742
Voltage detectors and phase comparators	Verification of dimensions Durability of marking Drop test Shock resistance test (Energia ≤ 10 J) Functional tests (Threshold voltage measurement Clear indication, response time, power source dependability, check of testing elements, non-response to DC voltage) Temperature and humidity dependence	IEC 61243-1 IEC 61243-3 IEC 61481-1 IEC 61481-2
Insulating sticks and tubes	Verification of dimensions Test of marking Mechanical test Tensile, bend: F ≤ 30 kN Torsion: M≤ 200 Nm Drop test Impact test (Energia ≤ 10 J) Environmental test T = -40 … +100 °C Penetration test Temperature rise test U ≤ 1400 kV, T ≤ 200 °C Dielectric test with leakage-current measurement U ≤ 1400 kV, I ≤ 1 A	IEC 60832-1 IEC 60855-1 IEC 62193
Helmets	Flammability test Dielectric test U ≤ 1200 V	EN 397

Tested products	Tested parameters, types of tests, ranges	Test methods
Portable fire extinguisher	Dielectric test U ≤ 70 kV	EN 3-7
Earthing, earthing-short-circuiting devices	Mechanical test Tensile, bend: F ≤ 30 kN Torsion: M≤ 200 Nm Verification of dimensions ≤ 5 m Short-circuit test I ≤ 120 kA Test of marking Dielectric test U ≤ 100 kV_{RMS}	IEC 61230 IEC 61230 IEC 61219 IEC 61138 IEC 61230 IEC 61219 IEC 61219 IEC 61138
Protective devices	Power arc test I ≤ 10 kA (0.5s)	IEC 61482-1-1 IEC 61482-1-2 IEC 61482-2
Insulating ropes	Dimensional checking Dielectric test U ≤ 100 kV_{RMS} Leakage current under dry conditions I ≤ 500mA Tests after water conditioning Water absorption Capillary Elongation and creep Durability of marking	IEC 62192
Environmental tests for nuclear power plant	Environmental tests	IEEE/IEC 60780-323
Cables, Cable penetration elements, Cable assemblies	Leakage test	IEEE 317 IEC 60772
	Dielectric test 1600-36000 V 50 Hz 60 – 90 kV 1/50 lightning Insulation resistance test SELV/PELV U:250V_{DC}; R≥500kΩ U≤500V, U:500V_{DC};R≥1MΩ U≥500V U:1000V_{DC};R≥1MΩ Insulation resistance test 5 kV DC R≥500 MΩ/km (6/10..20.8/36 kV) Partial discharge test Dielectric test 45..65 Hz; 2U_0/60 min (max 1000 V) 700 kV 0.5 A 50 Hz 30..1400 kV 1 A 50 Hz	IEEE 317 HD 60364-6 IEC 60772 IEC 60270 IEC 60502-1 MSZ 13207
	Simulation of operating environment: Heat cycle test Temperature: 15..150 °C Thermal aging Temperature: 30..250 °C	IEEE 317
	Load tests: Short-time over-current test I_{max}=150 kA / 1 sec Dynamic short-circuit test I_{max}=330 kA Thermal short-circuit test	IEEE 317 EN 60439-1

Tested products	Tested parameters, types of tests, ranges	Test methods
	I_{max}=150 kA / 1 sec	
	DBE simulation: Temperature: 230 °C_{max} Pressure: 6 bar_{max} Chemicals Flood test Post LOCA condition	IEEE 317 IEEE/IEC 60780-323
Class-1E motors for continuous operation	Simulation of operating environment: Thermal aging Temperature: 30..250 °C DBE simulation: Temperature: 230 °C_{max} Pressure: 6 bar_{max} Chemicals Flood test Post LOCA condition	IEEE 334 IEEE/IEC 60780-323
Safety-related, motor operated devices	Functional tests Thermal aging Cyclic aging Pressure test LOCA simulation: Temperature: 230 °C_{max} Pressure: 6 bar_{max} Chemicals Flood test Post LOCA condition	IEEE 382 IEEE/IEC 60780-323
Class-1E cables and assemblies	Functional tests Thermal aging DBE simulation: Temperature: 230 °C_{max} Pressure: 6 bar_{max} Chemicals Flood test Post LOCA condition	IEEE 383 IEC 60502-1
Class-1E connectors	Functional tests Continuity test Insulation resistance test Dielectric test Test of connections Mechanical test Accelerated aging Heat cycle test DBE simulation: Temperature: 230 °C_{max} Pressure: 6 bar_{max} Chemicals Flood test Post LOCA condition Special DBE simulation	IEEE 572 IEEE/IEC 60780-323 IEC 60502-1