Overview of FBX type test reports

1. 12 kV

1.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102 class M0, E3
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 12 kV
	KEMA	42-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	42-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 12 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	42-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection : IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc: see section below			

780

1.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 28 kV1mn 50HZ • 75 kV lightning impulse voltage • on the insulating distance • 32 kV1mn 50HZ • 85 kV lightning impulse voltage	KEMA	02-1192	2002
Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002
Earthing switch for transformer IEC 62271-102 • Short time and peak withstand current, • 5 kA 1s, 13 kAp • short circuit making current, • 13 kAp / 12 kV 5 making operations	KEMA	40-02	2002
Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002
Making-breaking on combination • IEC 60420 • Td1 20kA (Short circuit current: TDisc) • Td2 3,2kA (Integal of Joule maximal: TDiwmax) • Td3 152A • Td5 1100A (Take over: TDito) • IEC 62271-105 • Transfer current: TDitransfer 1500A • 2000A	KEMA KEMA KEMA	387-02 261-05 303-05	2002 2005 2005
Mechanical endurance : (manual) M1 • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 12 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	40-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

781

1.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	KEMA	03-1161
		see 66-03
			2003

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 16 kA 3s, 42 kAp
• short circuit making current,
  • 5 C at 42 kAp / 12 kV
	KEMA	69-03	2003

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002

Making-breaking tests: IEC 62271-100
circuit breaker class M1,E1 at 50Hz and 60Hz
• STC 42 kAp, 16 kA, 3s
  • T10-30-60-100s-100a
  • singlephase16kA double earthfault 13,9kA
• STC 52 kAp, 20 kA, 3s
  • T10-30-60-100/SP
	KEMA
	
	KEMA
		67-03
		
		54-04
			2003
			
			2004

Capacitive switching performance IEC62271-100 circuit breaker class C2 60Hz T60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance: (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance: (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection : IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

782

1.3 Metering range "M"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	AGS	E3-024/04
		E3-005/04
			2004

Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			
Internal arc see section below			

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

783

2. 17 kV

2.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 17,5 kV
	KEMA	42-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	42-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 17 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	42-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

2.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch for transformer IEC 62271-102
• Short time and peak withstand current,
  • 5 kA 1s, 13 kAp
• short circuit making current,
  • 13 kAp / 17,5 kV 5 making operations
	KEMA	40-02	2002

Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002

Making-breaking on combination
• IEC 60420
  • Td1 20kA (Short circuit current: TDisc)
  • Td2 3,2kA
  (Integal of Joule maximal:TDiwmax)
  • Td3 152A
  • Td5 800A (Take over: TDito)
• IEC 62271-105
  • Transfer current: TDitransfer 1500A
  • 2000A
	KEMA
	?
	?
		44-02	2002

Mechanical endurance: (manual) • Switch-disconnector 1000 operations (CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 12 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	42-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

785

2.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	KEMA	03-1161
		see 66-03
			2003

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 16 kA 3s, 42 kAp
• short circuit making current,
  • 5 C at 42 kAp / 17,5 kV
	KEMA	69-03	2003

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002

Making-breaking tests IEC 62271-100:
circuit breaker class M1,E1 at 50Hz and 60Hz
• STC 42 kAp, 16 kA, 3s
  • T10-30-60-100s-100a
  • singlephase16kA double earthfault 13,9kA
• STC 52 kAp, 20 kA, 3s
  • T10-30-60-100/SP
	KEMA
	
	KEMA
		67-03
		
		54-04
			2003
			
			2004

Capacitive switching performance IEC62271-100 circuit breaker class C2 60Hz T60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance: (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance: (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

786

2.4 Metering range "M"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	AGS	E3-024/04
		E3-005/04
			2004

Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit: • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			
Internal arc see section below			

ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ

3. 24 kV

3.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 24 kV
	KEMA	41-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 16 kA, 42 kAp • TD6a 600 A • TD6b 277 A	KEMA	41-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	41-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 24 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	41-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

788

3.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch for transformer IEC 62271-102
• Short time and peak withstand current,
  • 5 kA 1s, 13 kAp
• short circuit making current,
  • 13 kAp / 24 kV 5 making operations
	KEMA	40-02	2002

Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002

Making-breaking on combination
• IEC 60420
  • Td1 16kA (Short circuit current : TDisc)
  • Td2 3,2kA
  (Integal of Joule maximal:TDiwmax)
  • Td3 152A
  • Td5 800A (Take over: TDito)
• IEC 62271-105
  • Transfer current: TDitransfer 1500A
  • 2000A
	KEMA	43-02	2002

Mechanical endurance : (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 24 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	43-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

789

3.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	KEMA	03-1161
		see 66-03
			2003

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 16 kA 3s, 42 kAp
• short circuit making current,
  • 5 C at 42 kAp / 24 kV
	KEMA	69-03	2003

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 42 kAp • TD6a 600 A • TD6b 277 A	KEMA	41-02	2002

Making-breaking tests IEC 62271-100:
circuit breaker class M1,E1 at 50Hz and 60Hz
• STC 42 kAp, 16 kA, 3s
  • T10-30-60-100s-100a
  • singlephase16kA double earthfault 13,9kA
• STC 52 kAp, 20 kA, 3s
  • T10-30-60-100/SP
	KEMA
	
	KEMA
		67-03
		
		54-04
			2003
			
			2004

Capacitive switching performance IEC62271-100 circuit breaker class C2 60HzT60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance : (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance : (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

3.4 Metering range

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	AGS	E3-024/04
		E3-005/04
			2004

Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit: • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

791

4. Internal Arc Test - Main Range

Tests in accordance with 62271-200

DESIGNATION	Laboratory	Report N°	Year test
IAC AF 16kA-1s Criteria 1-5 In the gas tank – with simplified gas cooler	ZKU	06-131	2006
IAC AF 20kA-1s Criteria 1-5 In the gas tank – with gas cooler	ZKU	06-035	2006
IAC AFL 16kA-1s Criteria 1-5 In the gas tank – with exhaust duct	ZKU	06-093	2006
IAC AFL 20kA-1s Criteria 1-5 In the gas tank – with exhaust duct	ZKU	06-094	2006
IAC AFL 16kA-1s Criteria 1-5 In the cable compartment – with exhaust duct	ZKU	06-057	2006
IAC AFL 20kA-1s Criteria 1-5 In the cable compartment – with exhaust duct	ZKU	06-058	2006
IAC AFL 20kA-1s Criteria 1-5 With chimney	IPH	1803.2080405.156	2008
IAC AFL 20kA-1s Criteria 1-5 In the gas tank – with gas cooler	IPH	2228.20800724.583	2008
IAC AF 16kA-1s Criteria 1-5 In the cable compartment – with closed bottom	IPH	2228.20800724.584	2008

5. MV/LV Stations

Tests in accordance with IEC 61330

DESIGNATION	Laboratory	Report N°	Year test
Acc. IEC61330 in MV/LV stations Annex A, 16kA-1s, Criteria 1-6	IPH	1374.0877.1.39	2001

6. Metering range

Tests in accordance with IEC 62271-200

DESIGNATION	Laboratory	Report N°	Year test
IAC AF 21kA-1s Criteria 1-5 In a M1 (U-U) metering panel	IPH	1374.0086.4.095	2004
IAC AF 21kA-1s Criteria 1-5 In a M4 (O-O) metering panel	IPH	1374.0086.4.096	2004

7. Global Type Test List

8. Other Tests

Tests in accordance with 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Pressure withstand of tank 5 functions	MEVEL	AMTR06469-00	2006
Short time current on busbar 21KA 3s 52,5KAp 5 functions	CERDA	6193	2008

9. Overview of substations tests

Tests in accordance with IEC IEC62271-202

DESIGNATION	Laboratory	Manufacturer	Type	Client	Report N°	Year test
Acc. IEC62271-202 in MV/LV stations §6.8, **20kA-1s** Criteria 1-6	IPH	Scheidt	NZ150/300	RWE/EnBW	2228.1292.7.529	2007
			NZ173/283	E.ON/EnBW	2228.1292.7.530	
			NZ210/290	EnBW	1352.2090275.0114	2009
			NZ190/210	EnBW	1352.2090275.0115	
			NZ210/240 IAC B	EnBW	1352.2090275.0116	
			NZ210/240 IAC A		XZ268L015 [4]	
	ABB Ratingen		NZ130/290 [1]	E.ON, Vattenfall	XZ268L017 [3] XZ268L018 [4]	
			BEK 250-300 IAC B	„Stadtwerke"	XZ268L019 [4]	
	IPH		BEK 250-300 IAC A		1352.2100474.0261	2010
		Betonbau	UK1100/1L	E.ON/HEW	2228.1291.7.649	2007
			UKL2817	E.ON	2228.1291.7.650	
			UK3015	RWE	2228.1291.7.651	
			UK2820-L	EnBW	1528.2080.590.343	2008
			UF2922	EnBW	1528.2080.590.344	
			UK1700-23	E.ON	1528.2080.590.345	
			UK2820	EnBW	1528.2080.590.346	
			UK 1700-15	E.ON/ RWE/ Vattenfall	3239.2090728.0691	2009
			UK 1700-15 [2] IAC B			
	IPH		UF 2536	„Stadtwerke"	3239.2090728.0690	
Acc. IEC62271-202 in MV/LV stations §6.8, **16kA-1s** Criteria 1-6		AREVA	CLIPPER C27		2228.1291.7	2007
					1803.2080405.154	2008
			CLIPPER M		1803.2080405.155 [4]	2008
Acc. IEC62271-202 in MV/LV stations §6.8, **20kA-1s** Criteria 1-6		Gräper	HKP	E.ON	1549.2080426.182	2008
			MKP 250/400	E.ON	1549.2080426.185	
			GPK S1	E.ON	1549.2080426.186	
		ELBAG	PvTSM-T-C2-250		1197.2101067 [3]	2010
		UESA/ Scheidt	NZ240/310	E.ON	1226.2111229.0680	2011
	ZKU	SGB Lahmeyer	NDV400.6	RWE	08-056	2008

1) Analogies possible for NZ 145/335 (E.ON, ÜWL) and for NZ 240/310 (E.ON, RWE, Vattenfall)
2) Modified: without 2nd cooling system
3) Under full customer responsibility, test report belongs to customer
4) 21KA/1s

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MEVEL
Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07497-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	17, 18/12/2007
Test specifications	IEC 62271-200 (2003)
Tests performed	Lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9
Issue date	20/12/2007

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На основание чл. 2
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Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07498-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	17, 18/01/2008
Test specifications	IEC 62271-200 (2003)
Tests performed	lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9

Issue date 30/01/2008

Laboratoire d'Essai accrédité N° 1-1654

Portée communiquée sur demande

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ПЛОВДИВ

795

zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 06 - 057

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-16/C-C-T1
Serial No.	:	FBX—06 12 012 / AMT
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	16.05. 2006

Number of issued copies: 2
Praha 9, Běchovice

Copy No.: E

CZECH TESTING LABORATORIES ASSOCIATION CTLA

e-version

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Medium Voltage Electrical Laboratory
MEVEL
Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07499-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	22/01/2008
Test specifications	IEC 62271-200 (2003)
Tests performed	lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9
Issue date	10/02/2008

COFRAC ESSAIS

Laboratoire d'Essai
accrédité N° 1.1654

Portée communiquée
sur demande

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ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

CERDA

Ar0_0/V1

RAPPORT D'ESSAIS
TEST REPORT

N° 6006

Destinataire To	AREVA T&D Mâcon
Appareil Tested equipment	Tableau FBX, type IS C-C-T2 compact Switchboard FBX, type IS C-C-T2 compact
	Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date(s)des essais Date(s) of tests	16 octobre 2007 October, 16th 2007

Essais effectués conformément aux normes : CEI 62271-200 Ed 1 2003/11 et CEI 60694 Ed2.2 2002/01
Tests performed according to : IEC 62271-200 Ed 1 2003/11 and IEC 60694 Ed2.2 2002/01

Assistait aux essais
Tests witnessed by : Mr D. THOMAS

Rapport composé de 8 pages et 10 feuillets joints
Report made of 8 pages and 10 attached leaflets

Date d'émission
Date of issue : 7.11.2007

zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 08 - 006

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/CCT1
Serial No.	:	07/69Y19-05
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	SUZHOU Areva T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	04.02. 2008

Copy No.: E

Praha 9, Běchovice
27. 2 2008
Tested by:

CZECH TESTING LABORATORIES ASSOCIATION CTLA

e-version

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BP 84019
71040 MACON Cedex 9
France
Tel: 33 (0) 3 85 29 35 00
Fax: 33 (0) 3 85 29 36 36

TESTS REPORT AMTR06466-01

Object tested	Gas Insulated Compact Switchboard
Type	FBX-C / 17-20 / C-C-T1
Manufacturer	AREVA T&D
Test Location	Temperature Rise Laboratory
Test date:	1st March 2006
Reference Standards	IEC 62271-200 (11/2003) §6.4 and 6.5 and specification TST 19-2 (11.02) §1.3.1 and Appendix C Method A
Tests carried out	Measurement of the main circuit resistance Temperature rise test
Conformity	Results comply with the reference standards
Issued to Areva T&D	01 June 2006

Accredited Test Laboratory No. 1.1654

Scope communicated by request

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Medium Voltage Electrical Laboratory
MEVEL
Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07495-00

Test object	Metal enclosed cubicle Functional unit feeder with current switch-fuse combination
Type	FBX CCT1
Manufacturer	AREVA T&D
Site of tests	MEVEL temperature rise laboratory
Date of tests	28/02 to 4/03/2005
Test specifications	IEC 60694 2002, 62271-200 2003
Tests performed	Temperature rise test
Conformity	Requirements according to above specification are met

Issued to Areva T&D

Issue date 23/10/2007

На основание чл. 2
от ЗЗЛД

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France
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Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR08509-00

Test object	Metal enclosed switchgear
Type	FBX C C
Manufacturer	Areva T&D
Site of tests	Temperature-rise tests laboratory
Date of tests	17/03/2008
Test specifications	IEC 62271-200 (11-2003), 62271-1 (10-2007)
Tests performed	Temperature rise test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9

Issue date 03/06/2008

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accrédité
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На основание чл. 2
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ВЯРНО С ОРИГИНАЛА

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Edificio 101
48170 Zamudio (Bizkaia) Spain

http://www.labein.es
e-mail: labein@labein.es

labein tecnalia

ELECTRICAL EQUIPMENT LABORATORY

ENERGY UNIT

Test report

Short-time and peak withstand current and short-circuit making tests on the earthing switch

TEST OBJECT:	24 kV Gas-filled metal-enclosed switchgear with SF6
DESIGNATION:	FBX-C/24-20/C-C-T1
REQUESTED BY:	AREVA T&D
	Boulevard de la Résistanse – BP 84019
	71040 Mâcon Cedex 9 - France
MANUFACTURER:	AREVA T&D
STANDARD:	IEC 62271-200:2003
	IEC 62271-102:2003
RECEPTION DATE:	June 28th 2007
TESTS DATE:	July 2nd to 6th 2007

The test object has been subjected to the tests required by the applicant, applying the procedures specified in the standard indicated before.

THE PRESENT REPORT CONSISTS OF:

No of pages:	11 (and annex of 9)
Photographs:	Annex
Oscillograms:	Annex

Este documento es una copia en pdf del informe original, por petición del solicitante

Barakaldo, July 16th 2007

ENAC ENSAYOS Nº 4/LE148

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48170 - Zamudio (Bizkaia)

• Pol. Industrial Basabe
Pabellón E-4
20500 - Arrasate/Mondragón (Gipuzkoa)

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LABEIN FOUNDATION – ENERGY UNIT

ELECTRICAL EQUIPMENT LABORATORY

Test report

No CE35-09-AD-03

Short-time and peak withstand current test

TEST OBJECT:	24 kV / 630 A SF6-filled metal-enclosed switchgear
DESIGNATION:	FBX-C/24-20/CCT1 with aluminium bushings
REQUESTED BY:	AREVA T&D
	Boulevard de la Résistanse – BP 84019
	71040 Mâcon Cedex 9 - France
MANUFACTURER:	AREVA T&D
STANDARD:	IEC 62271-200:2003
RECEPTION DATE:	January 26th 2009
TESTS DATE:	January 27th to 29th 2009

The test object has been subjected to the tests required by the applicant, applying the procedures specified in the standard indicated before.

THE PRESENT REPORT CONSISTS OF:

No of pages:	5 (and annex of 4)
Drawings:	Annex
Photographs:	Annex
Oscillogram:	Annex

На основание чл. 2
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Nº 4/LE148

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20500 - Arrasate/Mondragón (Gipuzkoa)

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LABEIN FOUNDATION – ENERGY UNIT

ELECTRICAL EQUIPMENT LABORATORY

Test report

No CE35-09-AD-04

Short-time and peak withstand current test

TEST OBJECT:	24 kV / 630 A SF6-filled metal-enclosed switchgear
DESIGNATION:	FBX-C/24-20/CCT1 with aluminium bushings
REQUESTED BY:	AREVA T&D
	Boulevard de la Résistanse – BP 84019
	71040 Mâcon Cedex 9 - France
MANUFACTURER:	AREVA T&D
STANDARD:	IEC 62271-200:2003
RECEPTION DATE:	January 26th 2009
TESTS DATE:	January 27th to 29th 2009

The test object has been subjected to the tests required by the applicant, applying the procedures specified in the standard indicated before.

THE PRESENT REPORT CONSISTS OF:

No of pages:	5 (and annex of 4)
Drawings:	Annex
Photographs:	Annex
Oscillogram:	Annex

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Nº 4/LE148

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LABEIN FOUNDATION – ENERGY UNIT

ELECTRICAL EQUIPMENT LABORATORY

Test report

Short-time and peak withstand current test

TEST OBJECT:	24 kV / 630 A SF6-filled metal-enclosed switchgear
DESIGNATION:	FBX-C/24-20/CCT1 with aluminium bushings
REQUESTED BY:	AREVA T&D
	Boulevard de la Résistanse – BP 84019
	71040 Mâcon Cedex 9 - France
MANUFACTURER:	AREVA T&D
STANDARD:	IEC 62271-200:2003
RECEPTION DATE:	January 26th 2009
TESTS DATE:	January 27th to 29th 2009

The test object has been subjected to the tests required by the applicant, applying the procedures specified in the standard indicated before.

THE PRESENT REPORT CONSISTS OF:

No of pages:	5 (and annex of 4)
Drawings:	Annex
Photographs:	Annex
Oscillogram:	Annex

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Nº 4/LE148

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Tecnología más Confianza

Test Report

CESI

Approved

Client	AREVA T&D – MACON (France)
Tested equipment	Three-phase switchgear (RMU), for medium voltage, composed by No.3 sections, designed: FBX-C / 24-12 / C-C-T1
Tests carried out	Temperature-rise test
Standards/Specifications	IEC 62271-200 (2003-11) and IEC 60265-1 (1998-1)
Test date	**from** March 13, 2007 **to** March 15, 2007

No. of pages	15	**No. of pages annexed**	
Issue date	July 26, 2007		
Prepared	Unit LABORATORIES - M. Levati		
Verified	Unit LABORATORIES - A. Geroli		
Approved	Area COMPONENTS - V. Scarioni		

На основание чл. 2
от ЗЗЛД

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20134 Milano - Italia
Telefono +39 022125.1
Fax +39 0221255440
http://www.cesi.it
Capitale sociale 8 550 000 Euro interamente versato
Codice fiscale e numero iscrizione CCIAA 00793580150
Registro Imprese di Milano
Sezione Ordinaria
N. R.E.A. 429222
P.I. IT00793580150

ВЯРНО С ОРИГИНАЛА

ИНТЕРТЕК ПЛОВДИВ ЕАД

EDF R&D
LABORATOIRE DES MATERIELS ELECTRIQUES

ESSAIS

PRODUIT FABRIQUE SOUS SYSTÈME DE MANAGEMENT DE LA QUALITÉ CERTIFIE AFAQ ISO 9001/2000
PRODUCT MADE THROUGH AFAQ ISO 9001/2000 CERTIFIED PROCESS

RAPPORT D'ESSAIS / *TEST REPORT*
HM21/07-301/1

Appareil	*/ Apparatus*	:	Tableau HTA insensible à son environnement FBX	
Tension assignée	*/ Rated voltage*	:	24	kV
Courant assigné	*/ Rated current*	:	400	A
Fréquence assignée	*/ Rated frequency*	:	50	Hz
Constructeur	*/ Manufacturer*	:	ALSTOM	

Objet	*/ Object*	: **Acceptation de type – Défauts internes**/ *Type tests- Internal faults*
Demandeur des essais	*/ Tested for*	: **EGS/DRE/MER**
Date(s) et lieu des essais	*/ Date(s) and place of tests*	: **du 17 au 25/04/2003** **Les Renardières - L.M.E. - SEMT**
Essais réalisés suivant	*/ Tests carried out according to*	: § 6.107 de la HN64-S-52 de Novembre 2002

Le Rapport est composé des documents suivants / *The report comprises the following documents :*

• caractéristiques de l'appareil	*/ characteristics of the apparatus*	:	page 3
• liste des essais effectués	*/ list of tests performed*	:	page 4
• conditions des essais	*/ tests conditions*	:	pages 5 à 9
• tableaux et résultats d'essais	*/ tables and tests results*	:	pages 10 à 13
• photographies	*/ photographs n°*	:	pages 17 à 26
• oscillogrammes	*/ oscillograms n°*	:	1001 à 1007
Ce Rapport comprend	*/ This report includes*	:	26 pages + 26 feuilles jointes/*appended sheets.*

« Seule la version française de ce rapport fait foi */ The english version of this report is a translation of the original french version.* **»**

La reproduction de ce Rapport d'Essais n'est autorisée que sous la forme de fac-similé photographique intégral, avec l'accord écrit du Laboratoire et du Demandeur des essais.
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На основание чл. 2
от ЗЗЛД

Les Renardières, le

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

808

EDF R&D
LABORATOIRE DES MATÉRIELS ÉLECTRIQUES

ACCREDITATION N°1-0120 PORTEE COMMUNIQUEE SUR DEMANDE

cofrac ESSAIS

PRODUIT FABRIQUE SOUS SYSTÈME DE MANAGEMENT DE LA QUALITÉ CERTIFIE AFAQ ISO 9001/2000
PRODUCT MADE THROUGH AFAQ ISO 9001/2000 CERTIFIED PROCESS

RAPPORT D'ESSAIS / *TEST REPORT*
HM21/07-301/8

Appareil	***/ Apparatus***	:	**Tableau HTA insensible à son environnement FBX**	
Tension assignée	***/ Rated voltage***	:	**24**	**kV**
Courant assigné	***/ Rated current***	:	**400**	**A**
Fréquence assignée	***/ Rated frequency***	:	**50**	**Hz**
Constructeur	***/ Manufacturer***	:	**ALSTOM**	

Objet ***/ Object*** : **Acceptation de type – Défauts internes/** ***Type tests- Internal faults***

Demandeur des essais ***/ Tested for*** : **EGS/DRE/MER**

Date(s) et lieu des essais ***/ Date(s) and place of tests*** : **02/10/2003**
Les Renardières - L.M.E. - SEMT

Essais réalisés suivant ***/ Tests carried out according to*** : § 6.107 de la HN64-S-52 de Novembre 2002

Le Rapport est composé des documents suivants / *The report comprises the following documents :*

Ce Rapport comprend / *This report includes* : 9 pages + 6 feuilles jointes/*appended sheets.*

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На основание чл. 2 от ЗЗЛД

Les Renardières, le 15

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ПЛОВДИВ

LME - STATION D'ESSAIS DES CABLES ET CONDENSATEURS TÉL 33 (1) 60 73 60 80 FAX 33 (1) 60 73 67 42 CONTACT RETD-LME-[illegible]
LME - STATION D'ESSAIS DIELECTRIQUES ET MECANO-CLIMATIQUES TÉL 33 (1) 60 73 66 [illegible] FAX 33 (1) 60 73 69 56 CONTACT RETD-LME-[illegible]
LME - STATION D'ESSAIS DE PUISSANCE TÉL 33 (1) 60 73 62 22 FAX 33 (1) 60 73 68 22 CONTACT RETD-LME-SEP@edf.fr
SITE DES RENARDIERES 7 GIFFLEES - 77818 MORET-SUR LOING CEDEX - FRANCE

809

Independent, accredited test laboratory · Registration with STLA and LOVAG

TYPE TEST REPORT

NO. 1374.0016.2.001

ALSTOM Sachsenwerk GmbH Rathenaustraße 2 93055 Regensburg				CLIENT
ALSTOM Sachsenwerk GmbH				MANUFACTURER
Gas-insulated metal-enclosed ring main unit				TEST OBJECT
FBX				TYPE
08 1026 0008				MANUFACTURING NO.
Rated voltage	U_r	12/24	kVA	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I_r	630	kA	
Rated peak withstand current	I_p	53/42	kA	
Rated short-time withstand current	I_k	21/16	s	
Rated duration of short-circuit	t_k	1		
Values permissible at internal fault			kA	
Peak current		53	kA	
Short-time current		21	s	
Duration of short-circuit		1		
Type of accessibility		Typ A		
IEC 60298:1990 + Corrigendum 1:1995 + Corrigendum 2:1998 + Amendment A1:1994 DIN EN 60298 (VDE 0670 Teil 6):1998-05 + Berichtigung 1:1999-03				NORMATIVE DOCUMENT
Test under conditions of arcing due to internal fault				RANGE OF TESTS PERFORMED
14 and 15 January 2002				DATE OF TEST
The criteria of assessment 1 to 6 of IEC 60298:1990 + Corrigendum 1: 1995 + Corrigendum 2:1998 + Amendment A1:1994 were fullfilled. The tests have been PASSED.				TEST RESULT

На основание чл. 2
от ЗЗЛД

IPH BERLIN

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of hv apparatus and switchgear, power cables and power cable accessories, lv apparatus and switchgear, installation equipment and switching and control equipment

DAT - P - 019/92

810

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1374.0033.3.044

ALSTOM Sachsenwerk GmbH Rathenaustraße 2 93055 Regensburg	CLIENT
ALSTOM Sachsenwerk GmbH	MANUFACTURER
Prefabricated HV/LV substation (transformer substation) with gas-insulated metal-enclosed AC switchgear	TEST OBJECT
Transformer substation: KSTV 20 kV/0.4 kV- 630 kVA Switchgear: FBX–C/24-16/C-C-T1	TYPE
Transformer substation: Test sample Switchgear: 598080 2002, 598082 2002	MANUFACTURING NO.

Rated voltage	U_r	24 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I_r	630 A	
Rated peak withstand current	I_p	40 kA	
Rated short-time withstand current	I_k	16 kA	
Rated duration of short-circuit	t_k	1 s	
Type of accessibility		Typ A/B	

IEC 61330:1995 /DIN EN 61330:1996 (VDE 0670 Teil 611):1997-08	NORMATIVE DOCUMENT
Test under conditions of arcing due to internal fault on a transformer substation • for type A accessibility (restricted to authorized personnel) in front of the medium-voltage switchgear with its doors opened, the rest of the ventilating openings for type B accessibility (unrestricted, including general public). Arc initiation three-pole in the gas compartment with 16.0 kA set short-circuit current for a duration of short-circuit of 1 s. • for type B accessibility (unrestricted, including general public) with the substation's doors closed. Arc initiation was two-pole in the cable compartment with three-pole-set short-circuit current of 16.0 kA for a duration of short-circuit of 1 s.	RANGE OF TESTS PERFORMED
12 March 2003	DATE OF TEST
The criteria of assessment 1 to 6 of IEC 61330 and DIN EN 61330 (VDE 0670 Teil 611), resp., have been met. The tests have been PASSED.	TEST RESULT

На основание чл. 2
от ЗЗЛД

PHT PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK GMBH BERLIN

ЖЕНЕРИНГ ПЛОВДИВ

811

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

IPH BERLIN

Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1374.0729.4.234

Areva Sachsenwerk GmbH Rathenaustraße 2 93055 Regensburg	CLIENT
Areva Sachsenwerk GmbH	MANUFACTURER
Metal-enclosed AC switchgear	TEST OBJECT
FBX-C/24-16/C-C-T1	TYPE
Test sample	MANUFACTURING NO.

Rated voltage	U_r	24	KV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I_r	630	A	
Rated peak withstand current	I_p	40	kA	
Rated short-time withstand current	I_k	16	kA	
Rated duration of short-circuit	t_k	1	s	
Internal arcing classification		IAC AFL 16 kA 1	s	

IEC 60694: 2002-01 DIN EN 60694 (VDE 0670 Teil 1000): 2002-09 IEC 62271-200: 2003-11	NORMATIVE DOCUMENT
Test under conditions of arcing due to internal fault	RANGE OF TESTS PERFORMED
15 July 2004	DATE OF TEST
The ratings of the test object related to the scope of test have been proved. The test has been PASSED.	TEST RESULT

На основание чл. 2
от ЗЗЛД

Berlin, 09 September 2004

ВЯРНО С ОРИГИНАЛА

МЕНЕРИНГ ПЛОВДИВ ЕАД

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH IPH BERLIN

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of h.v. apparatus and switchgear, power cables and power cable accessories, l.v. apparatus and switchgear, installation equipment and switching and control equipment

Deutscher Akkreditierungs Rat DAR

DAT - P - 019/92

812

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH
IPH BERLIN

Independent, accredited testing station · Member laboratory of STL and LOVAG

TEST REPORT

NO. 1803.2080405.156

AREVA T&D Les 4 Chemins Fabrègues 34433 Saint Jean de Védas FRANCE	CLIENT
AREVA T&D Macon	MANUFACTURER
Metal-enclosed AC switchgear	TEST OBJECT
FBX IS-C-C-T1	TYPE
S000007713	SERIAL NO.

Rated voltage	U_r	24 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I_r	630 A	
Rated peak withstand current	I_p	50 kA	
Rated short-time withstand current	I_k	20 kA	
Rated duration of short-circuit	t_k	3 s	
Internal arcing classification		IAC AFL 20 kA 1 s	

IEC 62271-200: 2003-11	NORMATIVE DOCUMENT
Test under conditions of arcing due to internal fault in the gas-filled compartment	RANGE OF TESTS PERFORMED
10 April 2008	DATE OF TEST
See Sub-clause 4.6	TEST RESULT

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

INSTITUT PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK GMBH IPH BERLIN

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Deutscher Akkreditierungs Rat DAR
DAT - P - 019/92

zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9 – Běchovice, Czech Republic

INDEPENDENT TESTING LABORATORY, ACCREDITED ACCORDING TO ČSN EN ISO/IEC 17025
BY THE ČESKÝ INSTITUT PRO AKREDITACI, O.P.S., UNDER THE NUMBER 1035

TEST REPORT
No. 09 - 058

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/12-25/CCT1
Serial No.	:	FBX--0909054/AMT
Ratings		
Rated voltage	:	12 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	12.05. 2009

♦ Interpretation of results:

The acceptance criteria 1 to 5 of IEC 62271-200:2003, cl. 6.106 and Annex A for classification IAC AFL 87% of 25 kA 1 s with two phase arc initiation on the bushing terminals in the cable compartment were met.

Praha 9, Běchovice

Tested by: 11.05.2009

ilac-MRA

L 1035

e-version

zkratovna
Zkušebnictví, a. s.

Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 07 - 120

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/C-C-T1
Serial No.	:	FBX--0721000/AMT
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	02.10. 2007

Praha 9, Běchovice

Tested by: 27.11.2007

ВЯРНО С ОРИГИНАЛА

Copy No.: E

На основание чл. 2
от ЗЗЛД

e-version

815

zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 06 - 131

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-16/CCT1
Serial No.	:	06-18-01
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	17.10. 2006

Praha 9, Běchovice

e-version

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 5559 /VNL

Test report

Short-time withstand current and peak withstand current tests on the main circuit of FBX-C/24-20/CCT1 metal-enclosed switchgear

4th December 2009

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

VIZSGÁLÓ NAT-1-1251/2007 503/0243 MSZT-503/0243-077 STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2007

H-1158 Budapest, Vasgolyó u. 2-4.
E-mail: vnl@vnl.hu
Phone:+36.1.417 3157, Fax:+36.1.417 3163
www.vnl.hu

817

Subject:	Short-time withstand current and peak withstand current tests on the main circuit of FBX-C/24-20/CCT1 metal-enclosed switchgear
Kind of the test:	Development test
Client:	AREVA T&D 381, Bld. de la Résistance – BP 84019 F-71040 Mácon Cedex 9 FRANCE
Reference and date of the order:	No. 3139-4520127354, 05.10.2009
Our reference number:	NTL - 18 / 2009
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4. HUNGARY 18th November 2009
Present at the test in ch of the purchaser:	

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ

818

zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 08 - 007

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/CCT1
Serial No.	:	07/69Y19-06
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	SUZHOU Areva T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	05.02. 2008

Copy No.: E

Praha 9, Běchovice
27. 2 2008
Tested by:

CTLA

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zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 08 - 026

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/C-C-T1
Serial No.	:	FBX--0721058/AMT
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	26.03. 2008

Copy No.: E

Praha 9, Běchovice 5.5.2008

Tested by:

CTLA

e-version

TEST REPORT

Report no.	70370100.000-HVL 03-1130
Client	Alstom Sachsenwerk GmbH Rathenaustrasse 2 93055 Regensburg Germany
Reference	-
Concerning	test
Date	10 up to and including 13 June 2003
Place	KEMA High-Voltage Laboratory, Arnhem, the Netherlands
Object	gas-insulated ring main unit, 24 kV
Type	FBX-E/24-12
Manufacturer	same as client

REQUIREMENTS

The requirements as specified in the standard HN 64-S-52.

TEST PROGRAMME

The programme was specified by the client and was as follows:

1 measurement of the resistance of the main circuit in accordance with HN 64-S-52 clause 6.4
2 temperature-rise test in accordance with HN 64-S-52 clause 6.5
3 measurement of the resistance of the main circuit in accordance with HN 64-S-52 clause 6.4.

SUMMARY AND CONCLUSION

The results obtained relate only to the work ordered and to the material tested.
The tests were passed.

На основание чл. 2
от ЗЗЛД

Arnhem, 15 August 2003

ВЯРНО С ОРИГИНАЛА

Utrechtseweg 310, 6812 AR Arnhem. Telephone +31 26 3 56 31 85. Telefax +31 26 4 43 38 49

821

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH

Independent, accredited testing station ·Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1803.2080405.154

AREVA T&D Les 4 Chemins Fabrègues 34433 Saint Jean de Védas FRANCE	CLIENT
Transformer substation: AREVA T&D Saint Jean de Védas Switchgear: AREVA T&D Macon	MANUFACTURER
Prefabricated high-voltage and low-voltage substation (transformer substation) with gas-insulated medium-voltage switchgear	TEST OBJECT
Transformer substation: Clipper C27 Switchgear: FBX-C/24-20/C-C-T1	TYPE
Transformer substation: 37062007 and 37062008 Switchgear: FBX--0745095/AMT and FBX--0745117/AMT	SERIAL NO.
Rated voltage U_r 24 kV Rated normal current I_r 630 A Rated peak withstand current I_p 50 kA Rated short-time withstand current I_k 20 kA Rated duration of short-circuit t_k 3 s Internal arcing classification IAC AB 20 kA 1 s	RATED CHARACTERISTICS GIVEN BY THE CLIENT
IEC 62271-202: 2006-06	NORMATIVE DOCUMENT
Test under conditions of arcing due to internal fault	RANGE OF TESTS PERFORMED
10 April 2008	DATE OF TEST
The ratings of the test object related to the scope of test have been proved. The test has been PASSED.	TEST RESULT

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of hv apparatus and switchgear, power cables and power cable accessories, lv. apparatus and switchgear, installation equipment and switching and control equipment.

Deutscher Akkreditierungs Rat
DAT - P - 019/92

822

IPH BERLIN

Independent, accredited testing station · Member laboratory of STL and LOVAG

TEST REPORT

NO. 2228.2090315.0254

AREVA T&D MACON Boulevard de la Résistance 71040 Macon cedex 9 FRANCE				CLIENT
AREVA T&D MACON				MANUFACTURER
High-voltage alternating current switch-disconnector				TEST OBJECT
FBX-E/24-20/C + FBX-E/24-20/C + FBX-E/24-20/C				TYPE
09-17-03 / 09-17-05 / 09-17-06				SERIAL NO.
Rated voltage	U_r	24	kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I_r	630	A	
Rated peak withstand current	I_p	53	kA	
Rated short-time withstand current	I_k	21	kA	
Rated duration of short-circuit	t_k	1	s	
IEC 60265-1: 1998-01 IEC 62271-200: 2003-11 IEC 62271-1: 2007-10				NORMATIVE DOCUMENT
Short-time withstand current and peak withstand current tests of the main switch				RANGE OF TESTS PERFORMED
4 May 2009				DATE OF TEST
See Sub-clause 4.6				TEST RESULT

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

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DAR
DAT - P - 019/92

PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK · INSTITUT GMBH
IPH BERLIN

823

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 4712 / VNL

Test Report

Short-time withstand current and peak withstand current tests on main circuit of high-voltage switchgear type FBX-E/24-16/C

5th April 2007

MSZ EN ISO 9001

STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2004

H-1158 Budapest, Vasgolyó u. 2-4.
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www.vnl.hu

ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ

824

Subject:	Short-time withstand current and peak withstand current tests on main circuit of high-voltage switchgear type FBX-E/24-16/C
Kind of the test:	Development test
Client:	AREVA T&D Appareillage Moyenne Tension Boulevard de la Résistance – BP 84019 71040 Mâcon Cedex 9 FRANCE
Reference and date of the order:	40973 , 17th January 2007
Our reference number:	V-104 / 2007
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4 HUNGARY 02nd March 2007
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 4713 / VNL

Test Report

Short-time withstand current and peak withstand current tests on main circuit of high-voltage switchgear type FBX-E/24-16/C

5th April 2007

MSZ EN ISO 9001

STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2004

H-1158 Budapest, Vasgolyó u. 2-4. Phone:+36.1.417 3157, Fax:+36.1.417 3163
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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

826

Subject:	Short-time withstand current and peak withstand current tests on main circuit of high-voltage switchgear type FBX-E/24-16/C
Kind of the test:	Development test
Client:	AREVA T&D Appareillage Moyenne Tension Boulevard de la Résistance – BP 84019 71040 Mâcon Cedex 9 FRANCE
Reference and date of the order:	40973 , 17th January 2007
Our reference number:	V-104 / 2007
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4 HUNGARY 02nd March 2007
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 4906 /VNL

Test Report

Verification of the IP coding, Temperature-rise, Mechanical endurance and Tightness test of switchgear type FBX-C/12-20/C-C-T1

17th of January 2008

VIZSGÁLÓ NAT-1-1251/2007 503/0243 MSZT-503/0243-077 STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2007

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E-mail: vnl@vnl.hu www.vnl.hu

ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ

528

Subject:	Verification of the IP coding, Temperature-rise, Mechanical endurance and Tightness test of switchgear type FBX-C/12-20/C-C-T1
Kind of the test:	Type test
Client:	AREVA T&D Bld. de la Résistance – BP 84019 F-71040 Mácon cedex 9 France
Reference and date of the order:	3139-4500071613 21st of September 2007
Our reference number:	V-104/2007
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4 Hungary 12th –16th of November 2007
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

829

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 4947 /VNL

Test report

Dielectric tests on switchgear type FBX-C/24-12/C-C-T1a for rated voltage of 24 kV

9th January 2008

MSZ EN ISO 9001

VIZSGÁLÓ NAT-1-1251/2007 503/0243 STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2007

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ВЯРНО С ОРИГИНАЛА
830

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Subject:	Dielectric tests on switchgear type FBX-C/24-12/C-C-T1a for rated voltage of 24 kV
Kind of the test:	Clarification test
Client:	AREVA T&D Bld. de la Résistance – BP 84019 F-71040 Mácon cedex 9 France
Reference and date of the order:	3139-4500076196 27th of November 2007
Our reference number:	V-104/2007
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4. Hungary 19th of December 2007
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ ЕАД

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 5439 /VNL

Test report

Dielectric tests on switchgear type FBX-C/24-12/C-C-T1a for rated voltage of 24 kV

30th July 2009

MSZ EN ISO 9001

VIZSGÁLÓ NAT-1-1251/2007 | 503/0243 | MSZT-503/0243-077 | STL participant

The accreditation of VEIKI-VNL Ltd.
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Phone:+36.1.417 3157, Fax:+36.1.417 3163
www.vnl.hu

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Subject:	Dielectric tests on switchgear type FBX-C/24-12/C-C-T1a for rated voltage of 24 kV
Kind of the test:	Control test
Client:	AREVA T&D Bld. de la Résistance – BP 84019 F-71040 Mácon cedex 9 France
Reference and date of the order:	3139-4500115010 07th of April 2009
Our reference number:	NTL-18/2009
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4. Hungary 21st of July 2009
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

833

VEIKI-VNL ELECTRIC LARGE LABORATORIES LTD.

No. 5669 /VNL

Test report

Dielectric tests on the main circuit of the C functions of FBX-C/24-12/CCT1a metal-enclosed switchgear

26th February 2010

MSZ EN ISO 9001

STL participant

The accreditation of VEIKI-VNL Ltd.
refers to the test activities registered by HAB (Hungarian Accreditation Board) under No.: NAT-1-1251/2007

H-1158 Budapest, Vasgolyó u. 2-4.
E-mail: vnl@vnl.hu
Phone:+36.1.417 3157, Fax:+36.1.417 3163
www.vnl.hu

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Subject:	Dielectric tests on the main circuit of the C functions of high-voltage switchgear type FBX-C/24-12/CCT1a for rated voltage of 24 kV
Kind of the test:	Control test
Client:	AREVA T&D Bld. de la Résistance – BP 84019 F-71040 Mácon cedex 9 France
Reference and date of the order:	3139-4520134278 11th of January 2010
Our reference number:	NTL-01/2010
Place and date of the test:	VEIKI-VNL Electric Large Laboratories Ltd. H-1158 Budapest, Vasgolyó u. 2-4. Hungary 01st of February 2010
Present at the test in charge of the purchaser:	На основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

835

CERDA

Ar0_0/V1

RAPPORT D'ESSAIS
TEST REPORT

N° 6006

Destinataire To	AREVA T&D Mâcon
Appareil Tested equipment	Tableau FBX, type IS C-C-T2 compact Switchboard FBX, type IS C-C-T2 compact
	Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date(s)des essais Date(s) of tests	16 octobre 2007 October, 16th 2007
Essais effectués conformément aux normes : Tests performed according to :	CEI 62271-200 Ed 1 2003/11 et CEI 60694 Ed2.2 2002/01 IEC 62271-200 Ed 1 2003/11 and IEC 60694 Ed2.2 2002/01
Assistait aux essais Tests witnessed by	На основание чл. 2 от ЗЗЛД
Rapport composé de Report made of	
Date d'émission Date of issue	

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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

836

CERDA

RAPPORT D'ESSAIS
TEST REPORT

N°6037

Destinataire To	AREVA T&D Mâcon (France)
Appareil Tested equipment	Tableau FBX, type IS C-C-T2 compact Switchboard FBX, type IS C-C-T2 compact Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon (France)
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date des essais Date of tests	6 novembre 2007 2007, November, the 6th
Essais effectués conformément aux normes : Tests performed according to :	CEI 62271-200 Ed1(2003-11) et CEI 62271-1 Ed1(2007-10) IEC 62271-200 Ed1(2003-11) and IEC 62271-1 Ed1(2007-10)
Assistait aux essais Tests witnessed by	На основание чл. 2 от ЗЗЛД
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COFRAC accreditation demonstrates that the laboratories competence for the sole tests which are in the scope of accreditation, and which are identified by a C symbol in tests summary pages.

Le Responsable des Essais
Responsible for the tests

C. BOURD

Le Chef du CERDA
Head of CERDA

На основание чл. 2
от ЗЗЛД

ЖЕНЕРИНГ ПЛОВДИВ ЕАД

237

CERDA

RAPPORT D'ESSAIS
TEST REPORT

N°6066-1

Destinataire To	AREVA T&D Mâcon (France)
Appareil Tested equipment	Tableau FBX, IS type C-C-T2 compact Switchboard FBX, IS type C-C-T2 compact Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon (France)
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date des essais Date of tests	24 et 25 janvier 2008 2008, January, the 24th and 25th
Essais effectués conformément aux normes : Tests performed according to :	CEI 62271-200 Ed1(2003-11) et CEI 62271-1 Ed1(2007-10) IEC 62271-200 Ed1(2003-11) and IEC 62271-1 Ed1(2007-10)
Assistaient aux essais Tests witnessed by	На основание чл. 2 от ЗЗЛД
Rapport composé de Report made of	
Date d'émission Date of issue	

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

838

CERDA

RAPPORT D'ESSAIS
TEST REPORT

N°6193

Destinataire To	AREVA T&D Mâcon (France)
Appareil Tested equipment	Tableau FBX, IS type C-C-T1-C-T1compact Switchboard FBX, IS type C-C-T1-C-T1compact Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon (France)
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date des essais Date of tests	9 juin 2008 2008, June, the 9th
Essais effectués conformément aux normes : Tests performed according to :	CEI 62271-200 Ed1(2003-11) et CEI 62271-1 Ed1(2007-10) IEC 62271-200 Ed1(2003-11) and IEC 62271-1 Ed1(2007-10)
Assistaient aux essais Tests witnessed by	На основание чл. 2 от ЗЗЛД
Rapport composé de Report made of	
Date d'émission Date of issue	

На основание чл. 2
от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

839

CERDA

RAPPORT D'ESSAIS
TEST REPORT

N°6216-1

Destinataire To	AREVA T&D Mâcon (France)
Appareil Tested equipment	Tableau FBX, IS type C-C-T1 + C compact Switchboard FBX, IS type C-C-T1 + C compact Ur = 24 kV I_r = 630 A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon (France)
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date des essais Date of tests	10 juillet 2008 2008, July, the 10th

Essais effectués conformément aux normes : CEI 62271-200 Ed1(2003-11) et CEI 62271-1 Ed1(2007-10)
Tests performed according to : IEC 62271-200 Ed1(2003-11) and IEC 62271-1 Ed1(2007-10)

Assistait aux essais
Tests witnessed by

Rapport composé de
Report made of

Date d'émission
Date of issue

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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING

ICMET CRAIOVA
HIGH POWER DIVISION

HIGH POWER LABORATORY
"Ovidiu Rarinca"
200515-CRAIOVA Calea Bucuresti Nr. 144 ROMANIA
Phone: (351) 402 427; Fax: (251) 415482; (351) 404 890;
E-mail: lmp@icmet.ro

ÎNCERCARE
RE MR
SR EN ISO / CEI 17025: 2005
CERTIFICAT DE ACREDITARE
nr. LI 004 / 2007

TEST REPORT
No. 10117

CUSTOMER: **AREVA T&D Appareillage Moyenne Tension**
Boulevard de la Resistance BP 84019 – 71040
Mâcon Cedex France

MANUFACTURER: AREVA T&D SAS SUZHOU
285 Jinfeng Road
215129 SUZHOU, JIANGSU - CHINA

TESTED PRODUCT: 12 kV, 630 A, 21 kA Switchboard

REFERENCE STANDARD: IEC 62271-200/2003, clause 6.6

TEST PERFORMED: Short-time withstand current and peak withstand current test

TEST DATE: 11.03.2008

TEST RESULT: Passed the tests

Report has 10 pages and it is edited in 4 copies from which 3 copies for customer.

На основание чл. 2
от ЗЗЛД

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ВЯРНО С ОРИГИНАЛА

ПЛОВДИВ
ЕАД

8/11

RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING
ICMET CRAIOVA
HIGH POWER DIVISION

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E-mail: http://icmet.ro

DAT-P-266/07-20

ÎNCERCARE
SR EN ISO / CEI 17025: 2005
CERTIFICAT DE ACREDITARE
nr. LI 004 / 2007

TEST REPORT
No. 10321

CUSTOMER: **AREVA T&D Appareillage Moyenne Tension**
Boulevard de la Resistance BP 84019 – 71040
Mâcon Cedex - France

MANUFACTURER: **AREVA T&D Appareillage Moyenne Tension**
Boulevard de la Resistance BP 84019 – 71040
Mâcon Cedex - France

TESTED PRODUCT: 24 kV, 21 kA Cubicle

REFERENCE IEC 62271-200/2003, clause 6.6

TEST PERFORMED: Short-time withstand current and peak withstand current test on earthing switch

TEST DATE: 17.10.2008

TEST RESULT: Passed the test

Report has 8 pages and it is edited in 4 copies from which 3 copies for customer.

HEAD OF HIGH POWER DIVISION: **HEAD OF LABORATORY:**

На основание чл. 2
от ЗЗЛД

DATE OF ISSUE: 8.12.2008

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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

8/12

Prüfbericht

Bericht-Nr.: XZ 268 L 015 Ausfertigung-Nr.: 1 Inhalt: 17 Blatt

Prüfobjekt: Fabrikfertige Station mit einer metallgeschotteten, gasisolierten Schaltanlage

Typbezeichnung: NZ 210-240 mit FBX-C/24-20/C-C-T1
Bemessungs-Spannung: 12 / 24 kV Bemessungs-Strom: 630 A Bemessungs-Frequenz: 50 Hz

Hersteller: Scheidt GmbH & Co. KG, Rinteln, Deutschland (Betonstation)
AREVA T&D, Mâcon, Frankreich (Schaltanlage)

Auftraggeber: Scheidt GmbH & Co. KG, Rinteln, Deutschland

Prüfdatum: 22. September 2009

Angewandte Prüfbestimmungen:

Die Prüfung wurde in Übereinstimmung mit folgende Prüfvorschriften durchgeführt:
IEC 62271-200 / 1st Ed. / 2003-11
IEC 62271-202 / 1st Ed. / 2006-06

Durchgeführte Prüfungen:

Typprüfung ‚Verhalten bei Inneren Fehlern' der Schaltanlage innerhalb der fabrikfertigen Station.

Prüfung des Verhaltens der fabrikfertigen Station bei Auftreten eines Störlichtbogens aufgrund eines inneren Fehlers. Die Prüfung wurde dreiphasig im Gasraum der Schaltanlage mit einem Stoßstrom von 54,6 kA und einem Kurzschlussstrom von 20,8 kA - 1, 03 s äquivalent zu 21,0 kA - 1,02 s bei 50 Hz durchgeführt.
Fortsetzung auf Blatt 3.

Prüfergebnisse:

Das Prüfobjekt hat die in Übereinstimmung mit den Prüfbestimmungen durchgeführte Prüfung bestanden.

Diese Störlichtbogenprüfung kann zur Klassifizierung der fabrikfertigen Station gemäß

IAC-A 21kA 1s

herangezogen werden.

ABB Prüffeld Ratingen

На основание чл. 2
от ЗЗЛД

Ratingen, 18. Januar 2010

8413

ИНЖЕНЕРИНГ ЕАД, Пловдив 4004, ул Коматевско шосе 92, тел: 032/608 881; факс: 032/608 138
Интернет сайт: www.filkab.com , E-mail: engineering@eng.bg

ДЕКЛАРАЦИЯ

Долуподписаният Петър Иванов Данчев, в качеството си на изпълнителен директор на ИНЖЕНЕРИНГ ЕАД, участник в процедура на договаряне с обявление за възлагане на обществена поръчка №PPD 18-063, с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове (БКТП)“,

Д Е К Л А Р И Р А М Е, Ч Е:

Предлаганите компактни КРУ тип FBX са призведени в завода на Шнайдер Електрик в гр. Макон, Франция. Използваните материали при производството на КРУ тип FBX подлежат на рециклиране спазвайки дейностите подробно описани в инструкцията за „Извеждане от експлоатация на елегазови КРУ след края на живота им“.

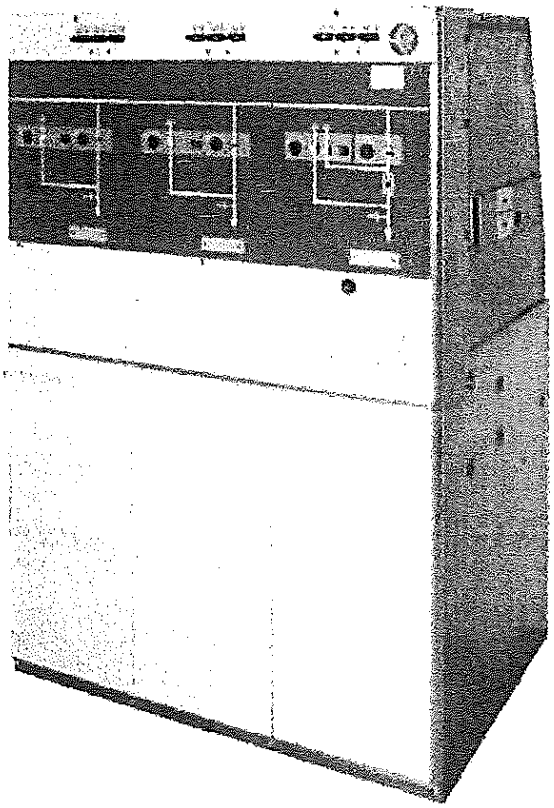
Дата 13.08.2018г.

На основание чл. 2
от ЗЗЛД

FBX-C Табло тип CCT1

Екологичен профил на продукта

SF6-изолирано, табло за вторично разпределение



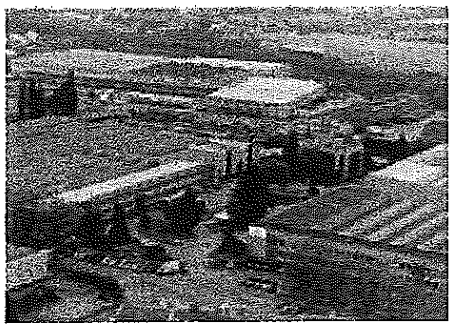
Schneider Electric

Екологичен профил на продукта - PEP

Въведение

Целта на настоящият документ е да предостави информация за екологичните показатели на FBX SF6 изолирано второстепенно разпределително табло през целият му експлоатационен жизнен цикъл.

Данни за производителя



Шнайдер Електрик Индъстрис АД
Ул. Жозеф Моние 35 , Рюьейл –Малмезон , Франция
www.schneider-electric.com

Обектът в Macon произвежда комутатори за средно напрежение (HVA). Табла за първично и вторично разпределение. Следвайки стратегиите на Шнайдер Електрик, обекта в Macon провежда политика на респектиране на околната среда. Обекта притежава сертификат по ISO 14001 обхващащ проектирането на продуктите от 2002. На обекта се прилага Система за Управление на околната среда. В рамките на понятието за еко-дизайн, са разработени и внедрени много от процедурите свързани с развитието на продуктите (оперативни инструкции).

Представяне на продукта

Таблото за вторично разпределение FBX е компактно, надеждно и лесно за употреба. То е с дизайн на моно блок, налично в компактна и разширена версия. С различните си опции може да бъде адаптирано към изискванията на потребителите за напрежения до 24kV. Устойчиво е на околната среда, непотъващо и не изисква поддръжка. Ролята на FBX таблата е да предават и разпределят електрическа енергия за приложения като публични мрежи, промишлени инсталации, вятърни паркове и др.

- Изследванията на FBX са базов, международен стандартен модел, който се състои от:
- Две C функции (подаващ входящ или изходящ кабел с комутируем прекъсвач);
- Една T1 функция (защитен панел в комбинация с предпазители и прекъсвач за товар);
- Не моторизирани механични контроли;
- Охлаждаща решетката, позволяваща на образуваните от вътрешните дъгови газове да дисипират чрез в задната част на блока.

Техническите характеристики на оборудването са както следва:

- Номинално напрежение: 24 kV
- Номинален ток (шина): 630 A
- Номинален ток (панел C): 630 A
- Номинален ток (панел T1): 200 A
- номинален ток на късо съединение, краткосрочен (или равен) на : 16 kA
- Номинална честота : 50/60 Hz

ВЯРНО С ОРИГИНАЛА

846

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

Разбивка на използваните материали

Посочената по- долу разбивка на използваните материали показва вида и количествата на съставните елементи на функционалната единица (виж § 5).

Метали (Kg)		Термореактивни продукти (kg)	
Стомана	155.810	**Епоксидна смола**	12.141
Неръждаема стомана	83.854		
Медна сплав	26,514	**Gas (kg)**	
Алуминиева сплав	9,763	**SF6**	2,450
Сребро	0,051		
		Еластомери (kg)	
Общо	275.991		0,095
Вкл. олово	0,013	**EPDM**	
		Други материали (Kg)	
Термопластични продукти (Kg)		**Силициев двуокис**	3,000
Полиестери	7,330	**Порцелан**	2,993
Ароматични полиамиди	2,964	**Кордиерит/ иолит**	1,097
Полиамиди	1,198	**Натриев алуминосиликат**	0,500
Други	0,152	**Фенолна смола – импрегнирана хартия**	0,430
Общо	11,645	**Грес**	0,050
		Общо	8,070
		Общо (kg)	**310,392**

Металите представляват 89 % от общото тегло на FBX, термопластичните продукти 3.7 %, термо реактивните продукти 3,9 %, SF6 газообразни 0,8 %, а останалите 2.6 %. В металните сплави има олово, с концентрация от 38 ppm (0.0038 %).

Анализ на цикъла на живот

Методология

Настоящият анализ е извършен с EIME софтуер, версия 1.6. използваната база данни на софтуерът е ECOBILAN 5.0 (оригинал), с добавени вътрешни модули. Настоящият софтуер е в употреба от 1998 год. насам. Оценка на въздействието върху околната среда е извършена за следните етапи от жизнения цикъл на оборудването: Производство, разпространение и употреба. Край на жизнения цикъл и

въздействието на тази фаза не са взети предвид, тъй като софтуерът няма възможност за това. Изследванията на оборудването са на FBX CCT1, така като е описано на предишната страница. При провеждане на симулацията с EIME , не са взети под внимание термопластичните добавки и въздействието на мястото на производство.

Функционален блок

Функционалната единица, използвана в този анализ е компактно FBX (тип CCT1) табло за вторично разпределение, снабдени с 3 MV/HVA предпазители.

Обхват на системата

Анализът обхваща въздействието на фазите на производство, разпределение и употреба върху околната среда. Изчисленията са въз основа на експлоатация от 30 години.

Производство

Използваните материали са тези, които са изброени в разбивката на материалите (вж. описание на продукта). Към тези, ние сме добавили повърхностната обработка (оценка на третираната повърхност = 2.5m2) и защитното покритие на предния панел (боядисаната площ е изчислена на 1.2m2). Компонентите от под изпълнение, използвани в FBX , имат средно покритие 175.3 t.km. 91 % от SF6 газ се рециклира.

Разпространение

FBX се монтира на дървени палети, тежащи 25 kg, след това се покрива с пластмасово фолио (1 кг) за транспортиране до обекта на клиента. В момента, по-голямата част от потенциалните купувачи на това оборудване са от Европа. Прогнозата ни е, че FBX ще покрива средна дистанция от 1060 км, с камион.

Употреба

Жизненият цикъл на FBX е 30 години.

Подразбира се, че фазите на поддръжка са без допълнения към материалите. Разсеяната енергия (ефект на Джаул) през трите фази, когато оборудването е живо (99.9 % от времето) се оценява на средно 7.3. За целите на EIME симулацията се приема, че произходът на електроенергията е в рамките на Европа. SF6 теч на газ за 30 години представлява 7 % от първоначалната маса на SF6, съдържащи се в рамките на FBX единица.

Край на жизнения цикъл на експлоатация

FBX е изграден от голямо разнообразие от материали: четири групи метали (стоманени сплави, сплави на неръждаема стомана, алуминиеви сплави, медни сплави); 8 термопластични материала (PBT, PA, PET, PPA, POM, PVC, PC & PE); 2 термореактивни продукти (стъклени епоксидна смола и силициева епоксидна смола); един еластомер (EPDM); SF6 газ; фенол импрегнирана хартия и натриев

алуминосиликат. Към тези следва да се добавят материалите изграждащи предпазителите (порцелан, кордиерит, сребро, алуминий и силициев диоксид). Това голямо разнообразие от материали, прави сортирането на различните компоненти на таблото, в края експлоатационния му живот много трудно.

В допълнение, таблото FBX се състои от около 1800 съставни части, включително фиксиращи 1000. Възлите, съставени от най голямата бройка части са от прекъсвача за натоварване, предпазителите и контролите. Тези голям брой части могат да доведат до изключително труден демонтаж и сортиране на различните материали. ISO 11469 гласи, че пластмасовите компоненти, които са с тегло над 25 грама трябва да бъдат маркирани постоянно. Пластмасовите компоненти в FBX са маркирани всички, за да се улесни сортирането и да се подобри рециклирането.

Всички използвани материали могат да бъдат рециклирани. Независимо от това, трябва да се отбележи следното: някои части, или много малки, или свързани с други, не могат да бъдат рециклирани, тъй като те правят операцията по рециклиране, много трудна (и нерентабилна).

Каналите за рециклиране,които следва да се използват, са:

- Материали за рециклиране на метали и пластмаси (механично рециклиране на гранули, субпродукти или химично рециклиране до разпадане на продуктите в мономери).
- Възможно е също и енергийно базирано валоризиране на използваната пластмаса, спестяване на гориво при производството на енергия, тъй като пластмасите отделят топлина при горене.

Относно използваните газове, Шнайдер Електрик предлага на клиентите си възможността да директно изпомпване навън на резервоара на FBX. В този случай, след това SF6 е оползотворен и рециклиран от доставчика.

Екологично въздействие

Софтуерът EIME изчислява екологичното въздействие на базата отчитане на 11 критерия:

- Изчерпване на суровини (RMD)
- Енергийно изчерпване (ED)
- Водно изчерпване (WD)
- Глобално затопляне (GW)
- Намаляване на озоновия слой (OD)
- Токсичност на водата (WT)
- Токсичност на въздуха (AT)
- Образуване на фото-химичен озонов слой (POC)
- Подкиселяване на въздуха (AA)
- Еутрофикация на водата (WE)
- Производство на опасни отпадъци (HWP)

Резултатите за въздействието върху околната среда на трите фази (производство (M) - разпределение (D) и употреба (U)) на FBX-CCT1, проучване върху 30-годишен период

Индикатори	Съкратено	Мярка	S = M + D + U	M	D	U
Изчерпване на суровини	**RMD**	Y-1	6,28E-12	6,26E-12	1,77E-15	1,80E-14
Енергийно изчерпване	**ED**	MJ	3,85E+04	1,67E+04	1,58E+03	2,02E+04
Водно изчерпване	**WD**	dm^3	1,27E+04	1,00E+04	1,19E+02	2,63E+03
Глобално затопляне	**GW**	g ~CO_2	5,58E+06	1,34E+06	1,05E+05	4,14E+06
Намаляване на озоновия слой	**OD**	g ~CFC-11	5,12E-01	2,89E-01	6,64E-02	1,57E-01
Токсичност на въздуха	**AT**	m3	6,42E+08	3,44E+08	3,84E+07	2,60E+08
Образуване на фото-химичен озонов слой	**POC**	g ~C_2H_4	1,01E+03	4,33E+02	1,30E+02	4,47E+02
Подкиселяване на въздуха	**AA**	g ~H+	5,14E+02	2,75E+02	2,47E+01	2,14E+02
Токсичност на водата	**WT**	kg	3,52E+05	2,66E+05	1,19E+04	7,44E+04
Еутрофикация на водата	**WE**	g ~PO4	7,18E+01	6,52E+01	1,72E+00	4,91E+00
Производство на опасни отпадъци	**HWP**	kg	1,93E+01	1,00E+00	5,99E-02	1,82E+01

Първоначално следва да се отбележи, че фазата на разпространението има малко въздействие върху околната среда в сравнение с фазите на употреба и производство. Фазата на производство оказва най-силно въздействие върху околната среда (7 от 11).

Фазите на производство и употреба имат влияние върху глобалната околна среда (RMD, AA & OD по време на първата фаза, GW по време на последната), както и върху околната среда в близост до производствената или експлоатационна площадки (WD, WT, WE и AT за първия; ED & HWP за последния).

Принципният метод на повърхностна обработка представлява електролитно цинково покритие, нанесено чрез използването на галванична вана, последвано от процес на пасивиране с тривалентен хром, много по-малка степен опасен за човека и за околната среда от процеса на хексавалентен хром.

FBX не включва компоненти на оловото (Pb); все пак има няколко сплави със съдържание на олово. Съдържанието на олово FBX е ниско (41 ppm).

Заключение

Липсата на поддръжка през срока на експлоатация на FBX е основно предимство и потвърждение за надеждността и издръжливостта на оборудването. Въздействията върху околната среда, независимо дали са глобални или локални, се разпростират през фазите на производство и поддръжка. На фаза на употреба оказва въздействие върху глобалното затопляне и производството на отпадъци, докато фазата на производство има въздействие върху водите и изчерпването на суровини.

Ние се ангажираме да защитим нашата планета посредством "Комбинирани иновации и непрекъснато подобрение за посрещане на новите екологични предизвикателства".

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Настоящият документ се основава на ISO14020, който се отнася до общите принципи на екологичните декларации и на ISO14025, свързани с тип III декларации за околната среда. Изготвен съгласно инструкциите в Справочника относно екологичните профили на продукта , версия V5.

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ВЯРНО С ОРИГИНАЛА

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

851