



ROUTINE
TEST REPORT

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Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Customer
ABB POWER GRIDS DENMARK A/S

Customer reference
6500001132

Country
DENMARK

Standard
IEC 62271-100

Test completed
2020-12-14

	Serial number	ABB reference	Project
Circuit breaker LTB145D1/B	1HSB02045078	KD0001445/2	K10018755
Mechanism FSA1	1HSB02045078-A1 1HSB02045078-B1 1HSB02045078-C1	KD0001445/2	K10018755

We hereby certify that the above objects have passed all routine tests in accordance with the standard referred to in above and with the terms of the contract.

ABB AB
High Voltage Products/Circuit Breakers
Quality

Date: 2020-12-14

Tobias Pettersson

Test witnessed by

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ABB AB

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Registered office: Ludvika

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
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Rated data

Rated filling pressure for operation: 0,70 MPa(abs)

Check of rating plates

Approved: Q104

MECHANISM RESULTS

Resistance in ohms of auxiliary circuits

Description	Mechanism No. 1HSB02045078-A1	Mechanism No. 1HSB02045078-B1	Mechanism No. 1HSB02045078-C1
Closing coil 1	25	25	25
Opening coil 1	25	25	25
Opening coil 2	25	25	25
Antipumping relay 1	0	8250	0
Antipumping relay 2	0	8270	0
Antipumping relay 3	0	8200	0
Extra relay 1	0	8120	0
Extra relay 2	0	8410	0
Density blocking relay 1	0	8290	0
Density blocking relay 2	0	8220	0
Density blocking relay 3	0	8290	0
Heater anticondense	0	224	0
Heater total	0	81	0

All resistances checked

Approved Q104

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Check of

Approved

Wiring acc. To circuit diagram	Q104
Local/remote operation	Q104
Blocking relays	Q104
Antipumping relays	Q104
Extra relays	Q104
On-line-motor starter does not trip for 10 consecutive operations	Q104
Auxiliary contacts	Q104
Thermostat settings	Q104
Counter	Q104
All adjustments and paint marking	Q104
Socket circuit	Q104

Settings

Description	Unit	Mech. 1	Mech. 2	Mech. 3
Thermostat	°C	10,0	10,0	10,0
Close spring setting	mm	83	82	76
Trip spring setting	mm	70,0	75,0	60,0
Damp device Open	mm	12,0	9,0	4,0

Approved: Q104

Spring charge at nominal voltage

Description	Unit	Mech. 1	Mech. 2	Mech. 3
Charging time	s	9	10	10
Motor current	A	3,5	3,7	3,8

Approved: Q104

Lowest operating voltage

Description	Unit	Mech. 1	Mech. 2	Mech. 3
Close coil 1	VDC	58	46	70
Trip coil 1	VDC	58	52	64
Trip coil 2	VDC	58	52	70

Approved: Q104

Power frequency test of auxiliary circuits

1 second 50 Hz 1,0 kV
- second 50 Hz - kV, motor

Approved: Q104

Approved: -

Circuit breaker
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POLE RESULTS

Resistance in main circuit

Phase	Unit	Part 1	Part 2	Part 3	Part 4
A	μOhm	33			
B	μOhm	33			
C	μOhm	35			

Approved: Q104

Power frequency test performed at 0,60 MPa(abs)

60 seconds 50 Hz across open switching device: 275 kV

60 seconds 50 Hz to earth: 275 / kV

Approved: Q104

Approved: Q104

Overpressure test on each pole

10 minutes duration 1,15 MPa(abs)

Approved: Q104

Tightness test on each pole

Approved: Q104

OPERATING TEST

Test assumptions

Technical provision: 1HSB425452-36 REV.E

Conversion table: CSB1_FSA

Fill pressure: 0,70 MPa(abs)

Operations	Voltage level	Motor VAC	Close 1 VDC	Close 2 VDC	Trip 1 VDC	Trip 2 VDC	Trip 3 VDC
5 Close and Open	Min	196	94		77	77	
5 Close and Open	Max	253	121		121	121	
5 Close and Open	Nom	230	110		110	110	
5 Close-Open	Nom	230	110		110	110	
5 Open-0.3s-Close	Nom	230	110		110	110	

Operating test

At least 25 operations as above

Approved: Q104

Circuit breaker
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Test Samples

Oper .	Oper No.	Volt level	Cc	Tc	Ph	Operation times pole contact				Cont. stroke	Cont. speed	Over-travel	Re-bounce	Damp time	Time difference	
						1	2	3	4						a	b
						ms	ms	ms	ms	mm	m/s	mm	mm	ms	ms	ms
Close	5	Min.	1	-	A	66,0				111,1	3,1	10,6	1,5		5,4	-22,5
					B	67,0				110,2	3,1	9,9	1,9		2,5	-31,9
					C	64,6				109,6	2,9	8,7	1,3		6,6	-28,9
Open	6	Min.	-	1	A	37,5				111,1	5,1	4,2	1,0	14,0	-8,4	8,9
					B	37,1				110,3	4,9	3,6	1,5	14,5	-7,4	13,1
					C	39,9				109,4	5,2	2,3	0,4	14,6	-8,5	13,1
Close	15	Max.	1	-	A	62,7				111,1	3,1	10,7	1,5		5,3	-22,6
					B	63,4				110,2	3,2	10,0	2,0		2,5	-31,5
					C	61,0				109,6	3,0	9,0	1,3		6,2	-28,8
Open	16	Max.	-	1	A	31,7				111,1	5,2	4,5	1,0	14,0	-8,7	8,9
					B	31,4				110,3	4,9	3,7	1,5	14,4	-7,4	12,8
					C	33,5				109,5	5,2	2,5	0,7	14,7	-8,6	13,7
Close	25	Nom.	1	-	A	63,9				111,1	3,1	10,8	1,4		5,2	-22,6
					B	64,7				110,2	3,1	9,9	1,9		2,0	-31,8
					C	62,2				109,6	3,0	9,0	1,3		6,1	-28,7
Open	26	Nom.	-	1	A	32,7				111,0	5,1	4,2	1,0	14,0	-8,4	9,0
					B	32,4				110,3	4,9	3,6	1,5	14,6	-7,5	13,2
					C	34,7				109,4	5,2	2,2	0,5	14,6	-8,6	13,5
Open	41	Nom.	-	2	A	32,1				111,1	5,2	4,9	0,9	13,9	-8,7	9,1
					B	32,0				110,2	4,9	3,7	1,5	14,5	-7,5	13,9
					C	33,9				109,4	5,2	2,4	0,5	14,5	-8,5	13,6

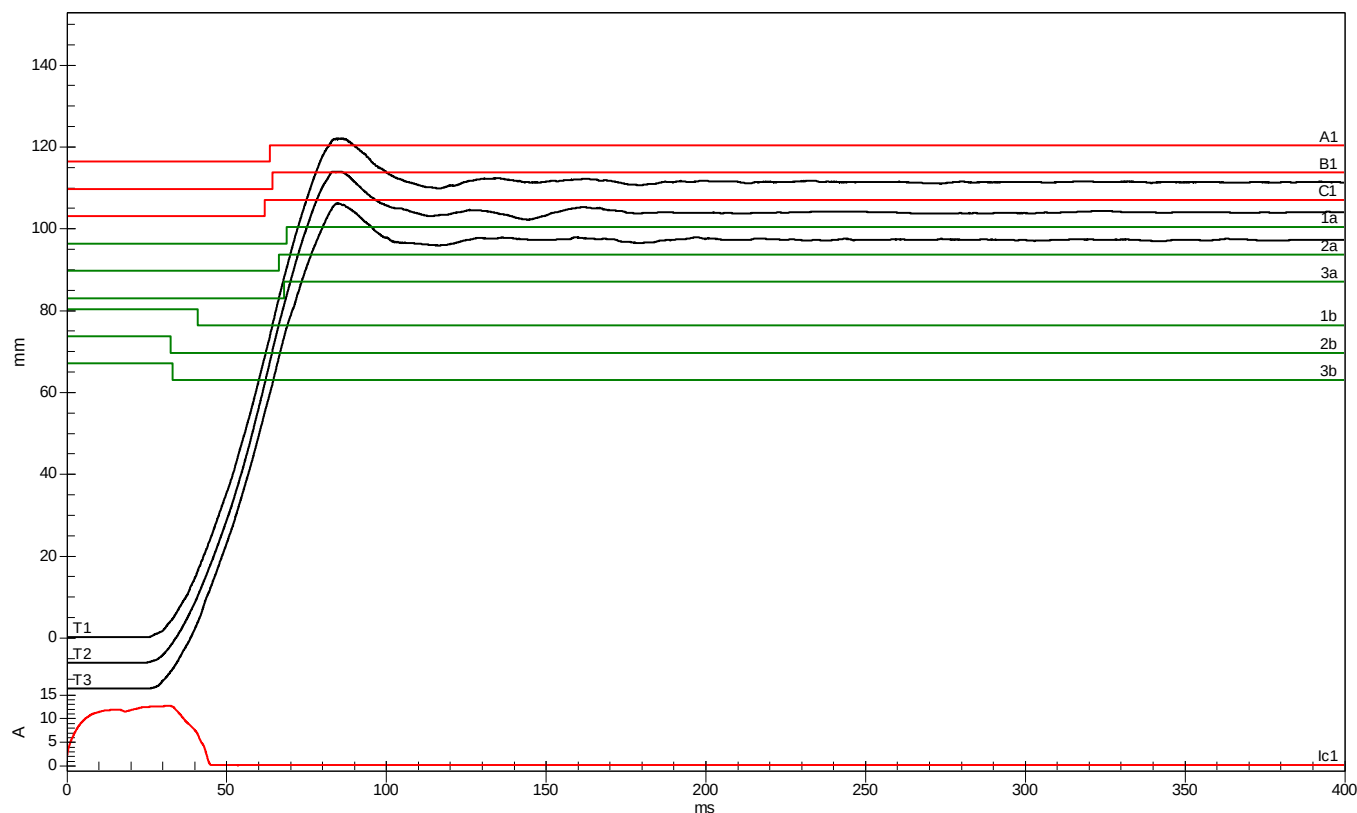
Oper .	Oper No.	Volt level	Cc	Tc	Ph	Interval times 1 pole contact				Interval times 2 pole contact				Time difference	
						1	2	3	4	1	2	3	4	a	b
						ms	ms	ms	ms	ms	ms	ms	ms	ms	ms
C-O	31	Nom.	1	1	A	39,8								5,4	-22,5
					B	37,5								2,1	-31,4
					C	41,1								6,1	-28,8
O-C-O	37	Nom.	1	1	A	279,9				40,3				-8,7	8,9
					B	280,8				37,8				-7,5	13,3
					C	276,9				40,8				-8,5	13,5

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Main Test sequence: Close Nom. Operation No 25



Operation data

Motor	Close coil 1	Trip coil -
230 VAC	110 VDC	-

Contact times in ms

Main	Contact time	Close/Open interval		Close/Open interval
A1	63,9 (0,0 - 70,0)			
B1	64,7 (0,0 - 70,0)			
C1	62,2 (0,0 - 70,0)			
Aux.	Contact time	Close/Open	Close/Open	Aux-Main
1a	69,1			5,2
1b	41,3			-22,6
2a	66,7			2,0
2b	32,9			-31,8
3a	68,3			6,1
3b	33,5			-28,7

Travel parameters

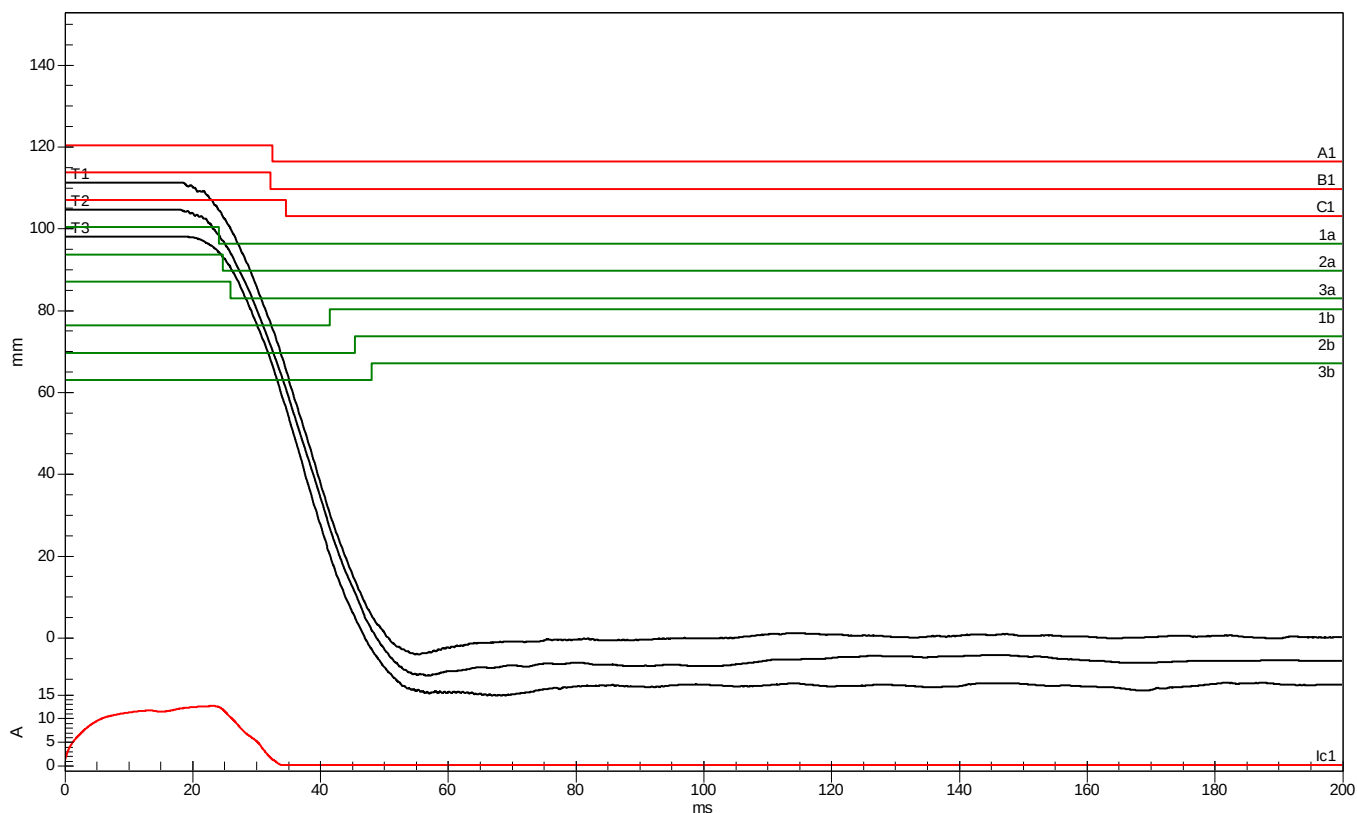
Description	Unit	T1	T2	T3	Limits
Travel speed 1	m/s	3,1	3,1	3,0	(2,9 - 3,4)
Contact Stroke	mm	111,1	110,2	109,6	(109,0 - 112,0)
OverTravel	mm	10,8	9,9	9,0	(0,0 - 13,0)
Rebound	mm	1,4	1,9	1,3	

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Main Test sequence: Open Nom. Operation No 26



Operation data

Motor	Close coil -	Trip coil 1
230 VAC	-	110 VDC

Contact times in ms

Main	Contact time	Close/Open interval		Close/Open interval
A1	32,7 (28,0 - 35,0)			
B1	32,4 (28,0 - 35,0)			
C1	34,7 (28,0 - 35,0)			
Aux.	Contact time	Close/Open	Close/Open	Aux-Main
1a	24,3			-8,4
1b	41,7			9,0
2a	24,9			-7,5
2b	45,6			13,2
3a	26,1			-8,6
3b	48,2			13,5

Travel parameters

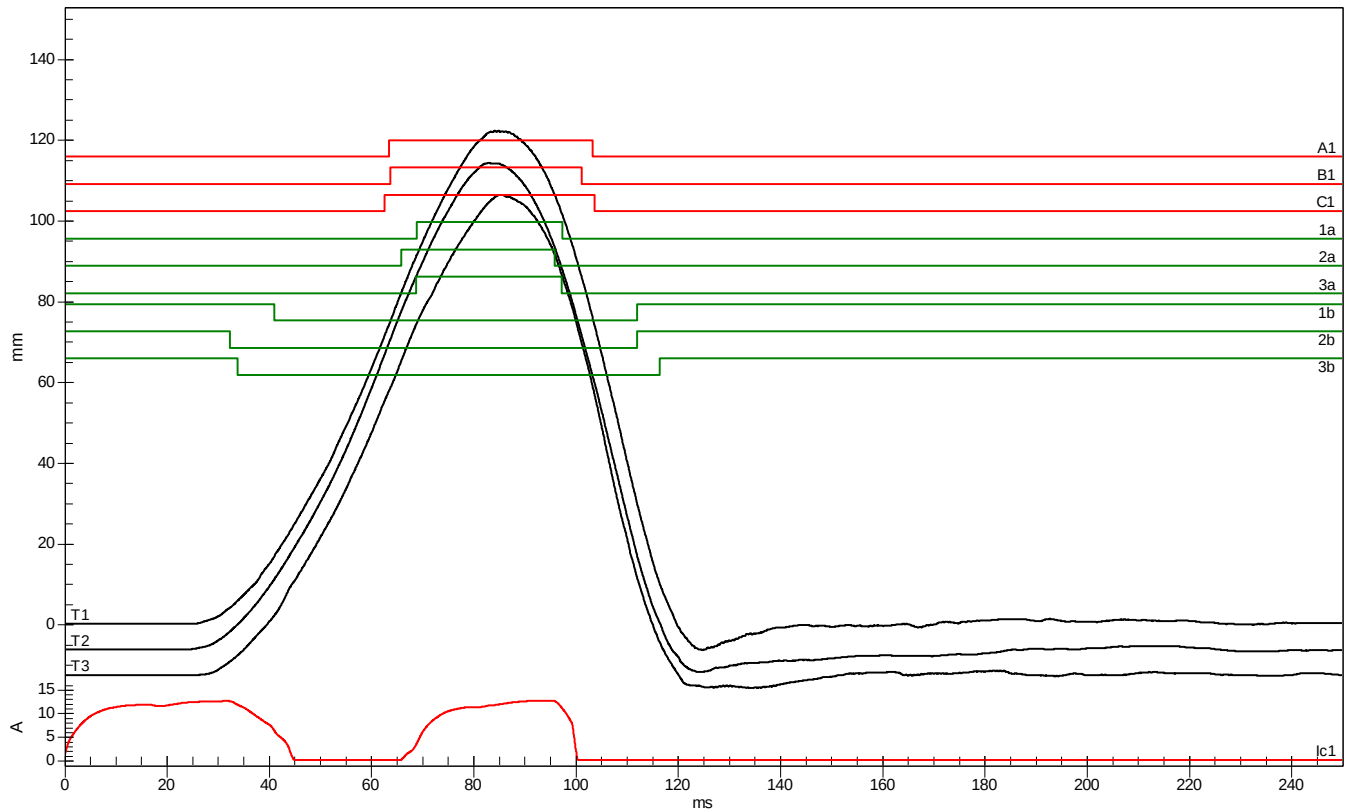
Description	Unit	T1	T2	T3	Limits
Travel speed 1	m/s	5,1	4,9	5,2	(4,9 - 5,2)
Contact Stroke	mm	111,0	110,3	109,4	(109,0 - 112,0)
OverTravel	mm	4,2	3,6	2,2	(0,0 - 7,0)
Rebounce	mm	1,0	1,5	0,5	
Damping time	ms	14,0	14,6	14,6	(13,5 - 17,5)

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Main Test sequence: Close-Open Nom. Operation No 31



Operation data

Motor	Close coil 1	Trip coil 1
230 VAC	110 VDC	110 VDC

Contact times in ms

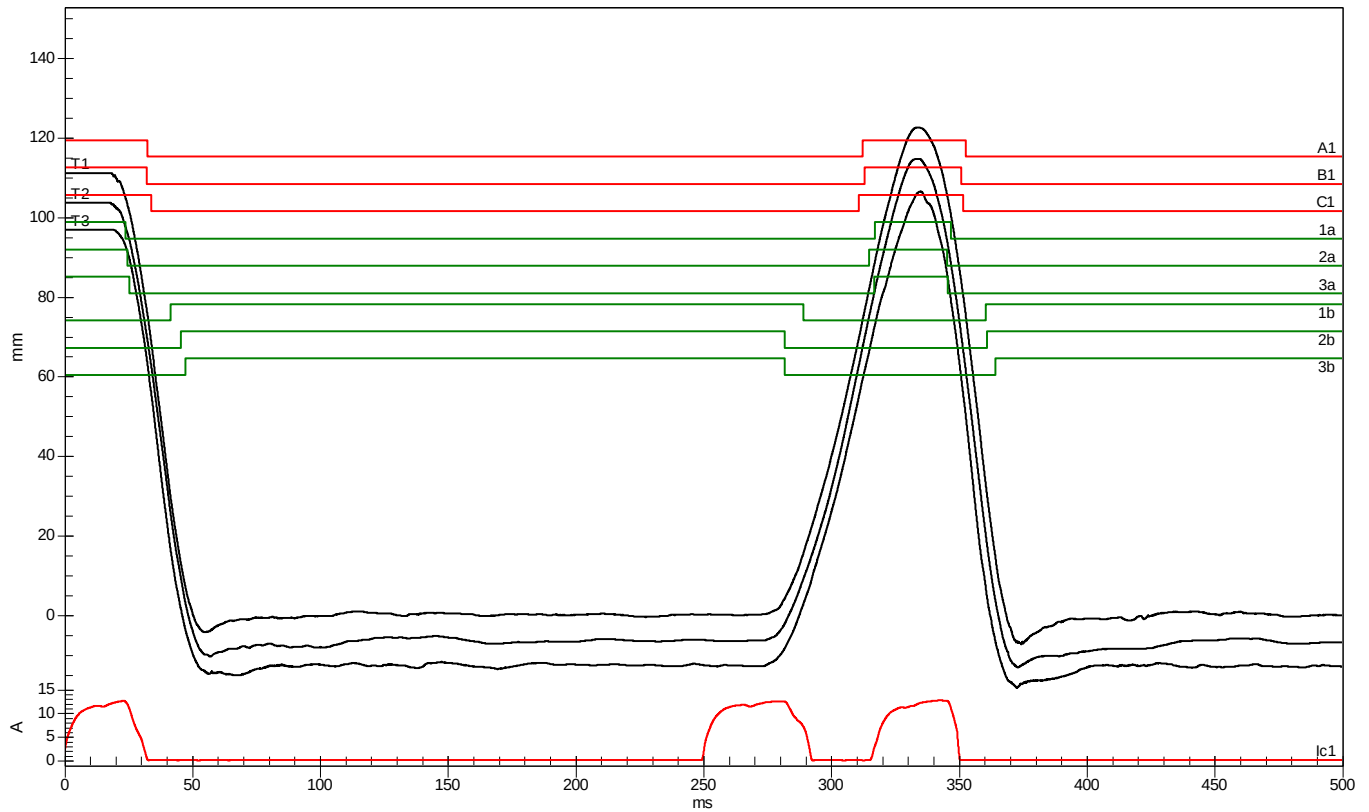
Main	Contact time	Close/Open interval		Close/Open interval
A1	63,6 (0,0 - 70,0)	39,8		
B1	63,9 (0,0 - 70,0)	37,5		
C1	62,8 (0,0 - 70,0)	41,1		
Aux.	Contact time	Close/Open	Close/Open	Aux-Main
1a	69,0	28,5		5,4
1b	41,1	71,1		-22,5
2a	66,0	30,1		2,1
2b	32,5	79,6		-31,4
3a	68,9	28,6		6,1
3b	34,0	82,5		-28,8

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Main Test sequence: Open-0.3s-Close-Open Nom. Operation No 37



Operation data

Motor	Close coil 1	Trip coil 1
230 VAC	110 VDC	110 VDC

Contact times in ms

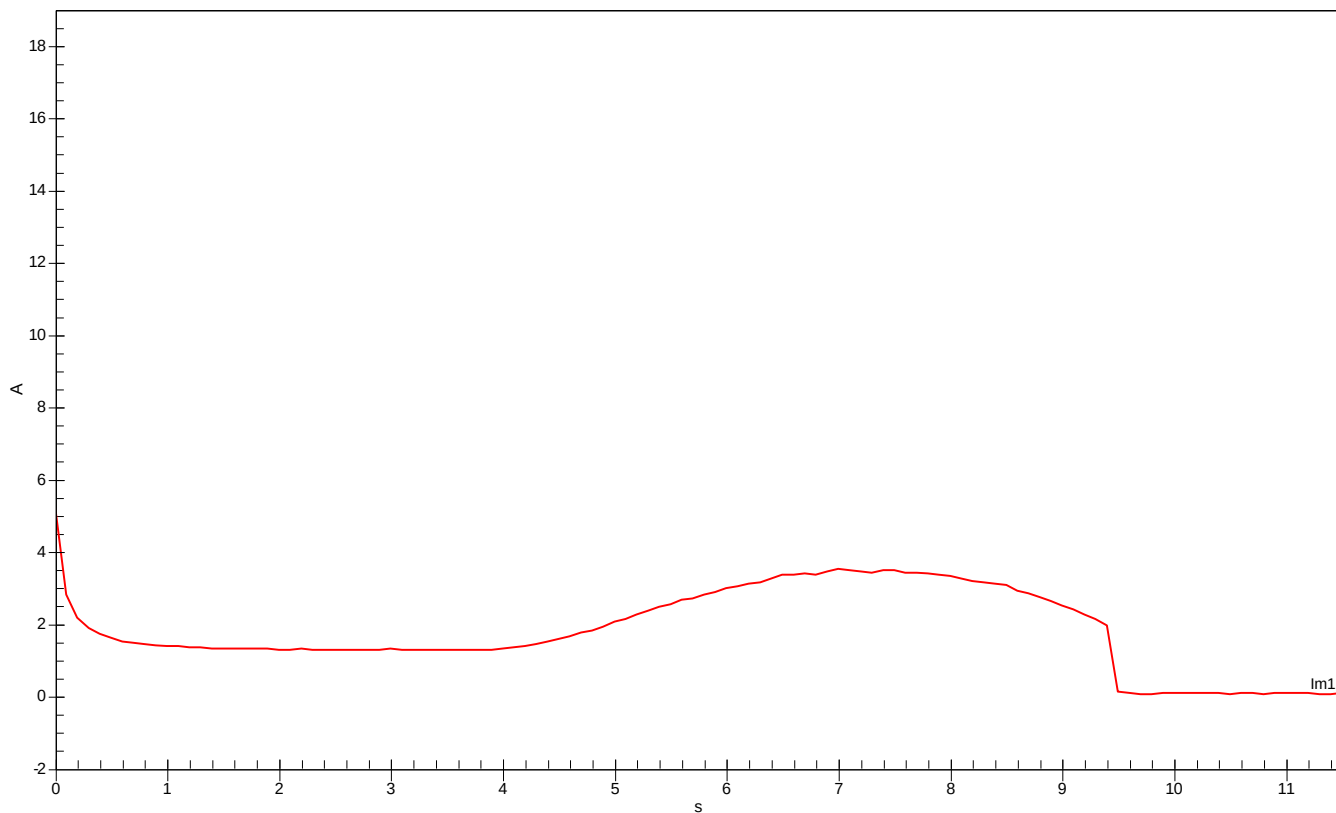
Main	Contact time	Close/Open interval		Close/Open interval
A1	32,8 (28,0 - 35,0)	279,9		40,3
B1	32,5 (28,0 - 35,0)	280,8		37,8
C1	34,2 (28,0 - 35,0)	276,9		40,8
Aux.	Contact time	Close/Open	Close/Open	Aux-Main
1a	24,1	293,3	29,7	-8,7
1b	41,7	247,6	71,4	8,9
2a	25,0	290,1	30,6	-7,5
2b	45,8	236,3	79,2	13,3
3a	25,7	291,3	28,8	-8,5
3b	47,7	234,4	82,3	13,5

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Free Test: Spring charge Nom. Mechanism No 1 Operation No 1



Operation data

Motor	Close coil 1	Trip coil -
230 VAC	110 VDC	-

Spring charge for mechanism 1

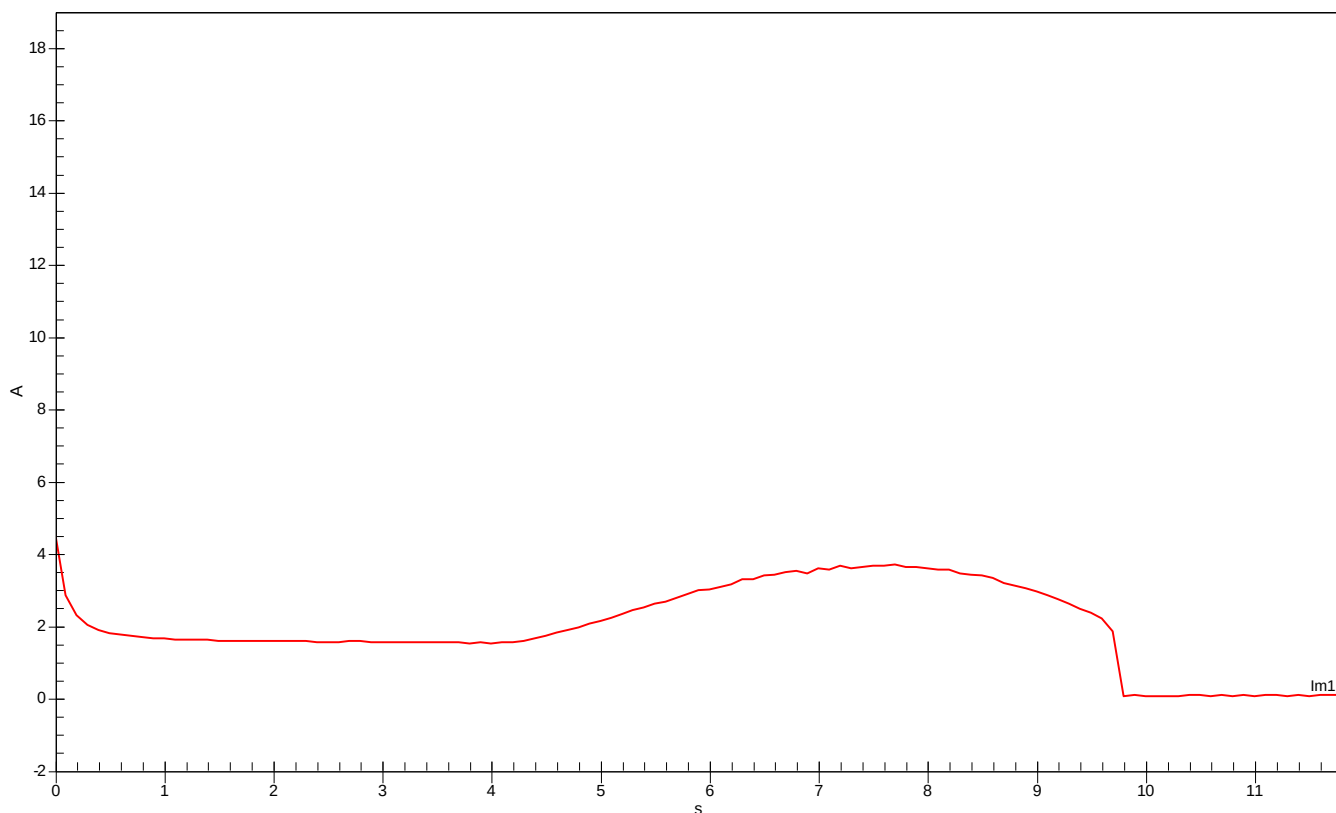
Description	Unit	Result	Limits
Charge current	A	3,5	
Charge time	s	9	(0 - 15)

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Free Test: Spring charge Nom. Mechanism No 2 Operation No 2



Operation data

Motor	Close coil 1	Trip coil -
230 VAC	110 VDC	-

Spring charge for mechanism 2

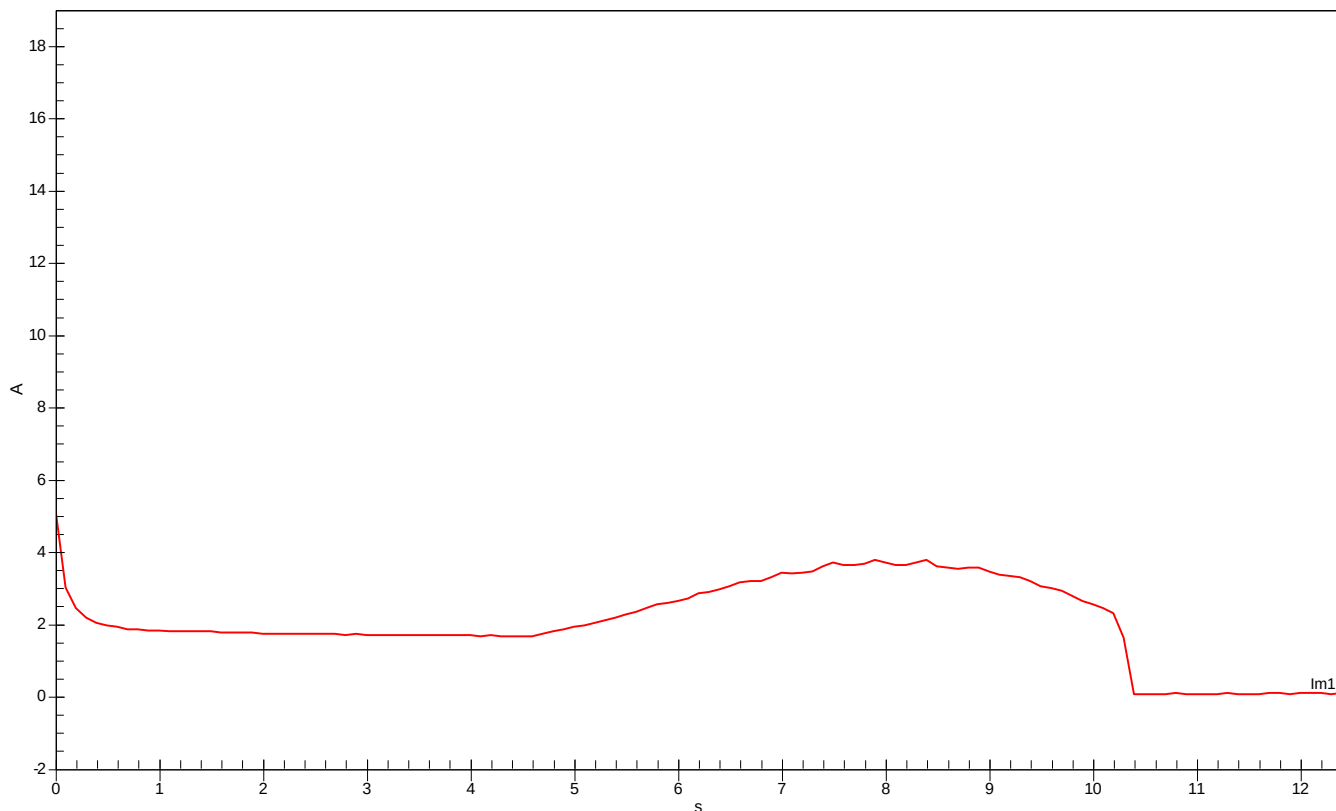
Description	Unit	Result	Limits
Charge current	A	3,7	
Charge time	s	10	(0 - 15)

Circuit breaker
Mechanism:

LTB145D1/B
FSA1

Order No: KD0001445/2
Serial No: 1HSB02045078

Free Test: Spring charge Nom. Mechanism No 3 Operation No 3



Operation data

Motor	Close coil 1	Trip coil -
230 VAC	110 VDC	-

Spring charge for mechanism 3

Description	Unit	Result	Limits
Charge current	A	3,8	
Charge time	s	10	(0 - 15)