F-Lab
Volta & Amplitude

Test report

N°: SPEC23AA7349_V1 AC3 electrical durability

Delivered to	:	***Jan SOLAR,*** Schneider Electric, Cízovská 447 39701, PISEK, CZECH REPUBLIC
Device under test ⓘ	:	Low voltage contactor
Reference ⓘ	:	LC1F150 Rated voltage 400 V - Rated normal current 132A (75kW) – Rated frequency 50/60 Hz
Trade mark ⓘ	:	SCHNEIDER ELECTRIC
Manufacturer ⓘ	:	SCHNEIDER ELECTRIC INDUSTRIES SAS
Type/Nature of test	:	Electrical Durability AC3 – 400V - 792A – 132A (75kW) cos 0.35
Standard	:	IEC 60947-4-1 edition 4.0 (October 2018), GL_T_TM12 And customer specification based on contactor F surveillance test specification N° 106717101 AK6_32
Date(s) of the tests	:	From 2024-01-10 to 2024-03-27
Place of tests	:	F-Lab Amplitude

Conclusion

Pass _ The results are in accordance with the acceptance criteria.

	Average	Minimum	Maximum
Operating cycles	983 642	914 725	1 071 888
% Catalogue value	98%	91%	107%

See the detailed conclusion on page 12.

The results obtained during the tests consigned in this test report justify the above assigned characteristics stated by the manufacturer.
To declare, or not, the compliance according to the standard, it was not taken into account of uncertainty measurements in the test results.
This document results from tests carried out on a sample. It does not prejudge the compliance of the whole manufactured products with the tested specimen.
In the case of an amendment to this test report, we draw your attention to the risks of keeping obsolete version. Each new version cancels and replaces the previous one. Any expired copies must be destroyed.

ⓘ: Information provided by the customer, the laboratory is not responsible of the information given by the customer.

This report contains 14 pages

Dispatch date of report: 02 April 2024

Writer
Patrick Pons de Vincent
Test Leader

Approver
Pierre-Jean REY
Technical Leader

SUMMARY

HISTORY TABLE

Version	Dated	Author	Description
V1	2024-03-28	Patrick Pons de Vincent	Creation

TEST ENGINEERS

Device Under Test	LC1F150 contactor TeSys F	
Test	Electrical Durability	
Test	Date	Test Leader
Characterization before test	2024-01-10	Patrick Pons de Vincent
Electrical Durability	From 2024-01-18 to 2024-03-11	Patrick Pons de Vincent
Dielectric after test	2024-03-27	Patrick Pons de Vincent
Characterization after test	2024-03-27	Patrick Pons de Vincent

1. DESCRIPTION OF THE PRODUCTS TESTED

1.1. Identification and number of tested products

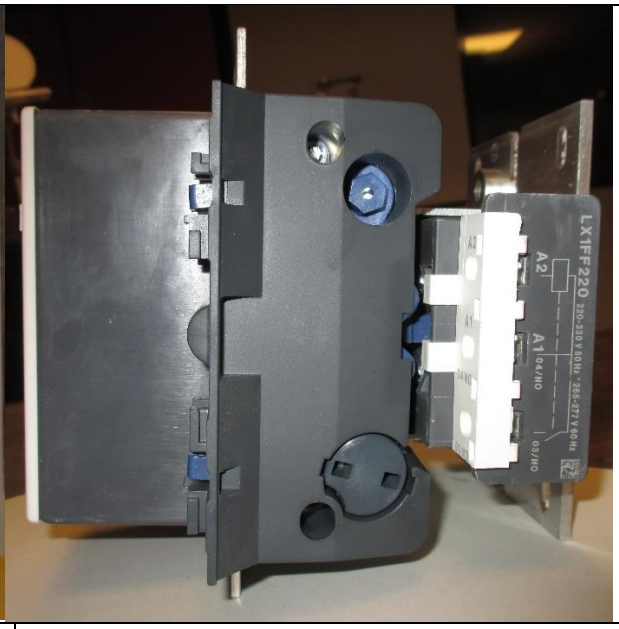
4 LC1F150: N° 1, 2 ,3, 4

SAMPLE ID	TYPE	NB OF SAMPLE
BTCH23AA1751	BATCH	4

SAMPLE ID	DESCRIPTION	MATURITY
BTCH23AA1751	LC1F150	Commercial product

SAMPLE ID	FAMILY 1	FAMILY 2	FAMILY 3
BTCH23AA1751	LV-TeSyS	Contactor	TeSys F

1.2. Characteristics, Descriptions and References of the tested products



Contactor LC1F150 Type of product: Mass production Connector: Screw clamp terminal Date code: 3R2325308 Ue = 400V Ie = 132A P = 75kW	Rated control circuit voltage supply: 230 V (AC) With coil LX1FF220 (220-230V 50Hz / 265-277V 60Hz) N°1 coil date code: 3R2131 N°2, N°3, N°4 coil date code: 3R2128

1.3. Date of Receipt

Samples has been received on 2023-07-03.

2. TEST PROGRAM

2.1. Detail of Test(s)

Surveillance test

Test AC3 400V following the specification N° 106717101 AK6_32

4 products from the same production batch to be sent to the test laboratory.
One more product must be sent with the batch as a witness product.
The witness product will be managed with the business unit standard.

The device is able to establish and cut the current in the load. The test will be stopped in case of weld, of no current flow, or for any defects.

Note: continue the test until the death of the product, or 150% of the catalogue value.

According to IEC 60947-4-1 Ed 4.0 (§ B.3)
Three-phase test, 50 Hz

Test type	Test voltage	Operating rate
AC3	400 V	1 operating cycle / 4 s

	Closing	Opening	I open / Ie
Voltage	400	67	
Current (A)	792	132	1.00
Power factor	0.35	0.35	

	Catalogue value	Objective value	Minimum value
Operating cycles	1 000 000	700 000	500 000
% catalogue value		70%	50%

Cable section for contactor:

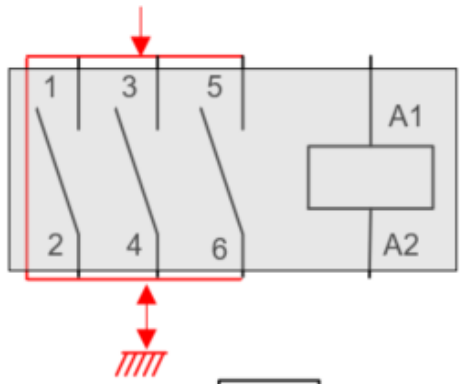
Ue Voltage (V)	Tested AC3 category Power kW	Tested AC3 rated operational current (A)	Current flow time (s)	Operating Cycle	Equivalent current (A)	Size of conductor used (mm²)
400	75	132	0.1	1 OC / 4s	20.9	70

Dielectric test
Following IEC 60947-4-1 edition 4.0 (October 2018)

> **B.3.2 Results to be obtained**
>
> After the test, the contactor or the starter shall fulfil the operating conditions as specified in 9.3.6.2 of this document at ambient temperature and withstand a dielectric test voltage as given in 8.3.3.4.1, item 4) b), of IEC 60947-1:2007, and applied as in 8.3.3.4.1, item 4), of IEC 60947-1:2007, the test voltage being applied only:
>
> – between all poles connected together and the frame of the contactor or starter, and
> – between each pole and all the other poles connected to the frame of the contactor or starter.

Test configurations:

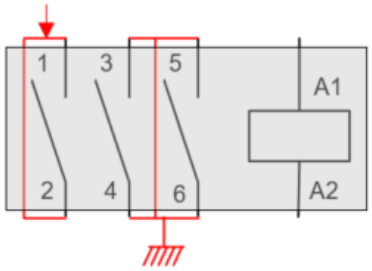
- Between all poles connected together and the frame of the contactor



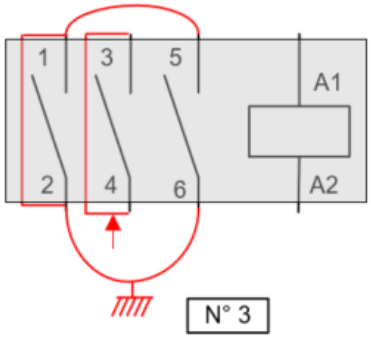
N° 1

*

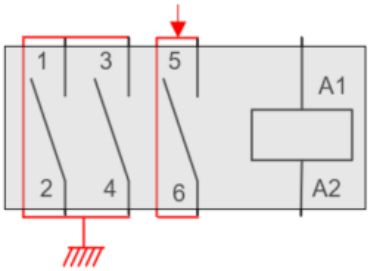
- between each pole and all the other poles connected to the frame of the contactor



N° 2



N° 3



N° 4

Test duration: 5 s

	Test voltage = 1000 V / Overcurrent relay 100 mA										
Configurations	N° 1		N° 2		N° 3		N° 4		*In addition**		
Sample	All poles / frame		Pole 1 / other poles + frame		Pole 2 / other poles + frame		Pole 3 / other poles + frame		Incoming terminals / outgoing terminals (open)		
N°	open	closed	open	closed	open	closed	open	closed	Pole 1	Pole 2	Pole 3

* Not requested by standard IEC 60947-4-1 § B.3.2

2.2. Criteria Acceptance of Test's

Following surveillance test specification N° 106717101 AK6_32

The test is satisfactory if:

- the arithmetical average of performances calculated on the 4 units is above 70% of the catalogue value and the minimum performance is above 50% of the catalogue value.

- If the minimum performance is below 70% of the catalogue value, then a deviation request must be made.
- If the minimum performance is below 50% of the catalogue value, then a deviation request must be made.

2.3. Places of Tests

- Amplitude site.

3. MEANS USED

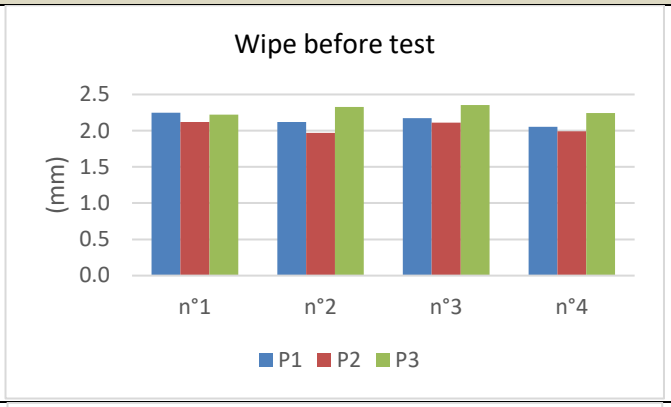
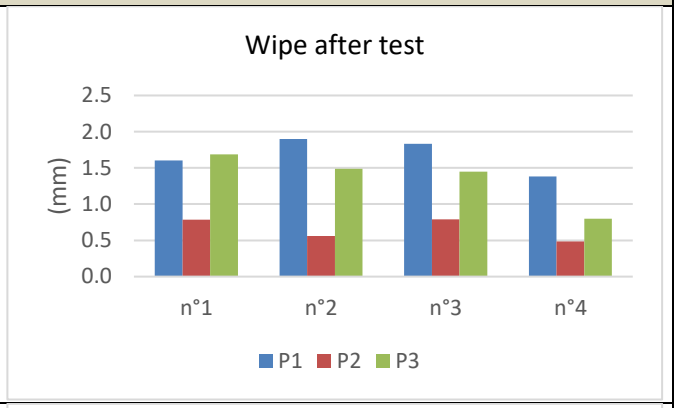
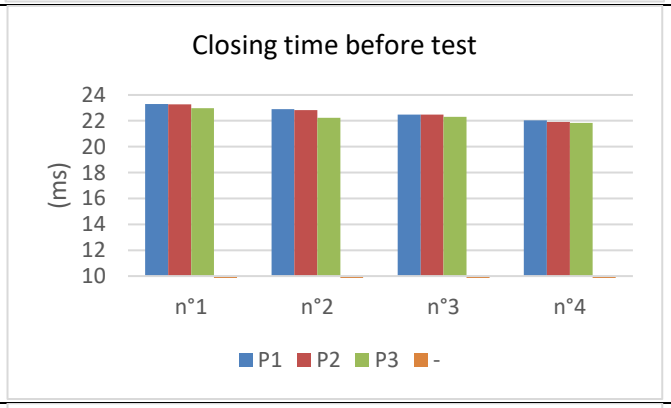
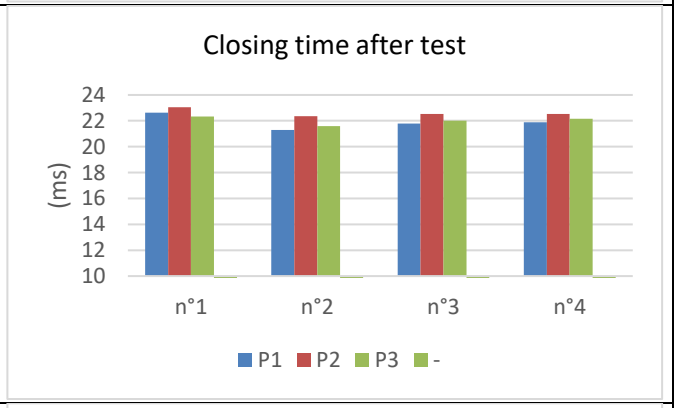
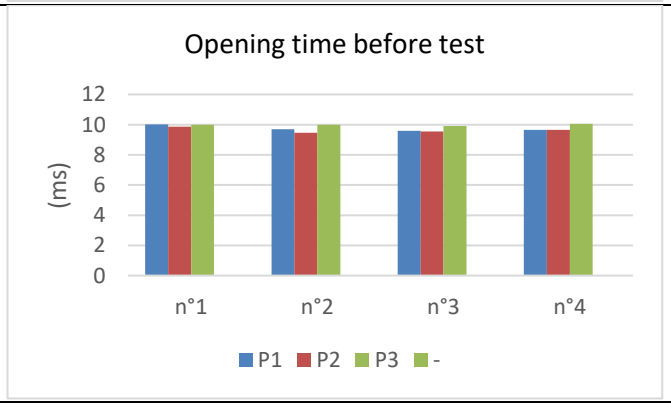
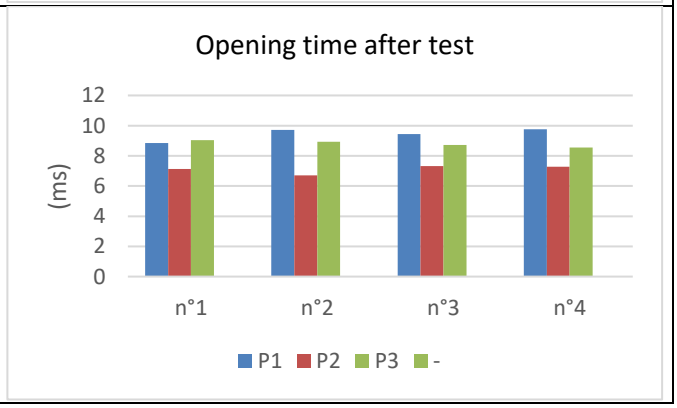
EQUIPMENT NAME	EQUIPMENT ID	EXTERNAL ID	STATUS	METROLOGY STATUS	NEXT OPERATION DATE
Baie de mesure 06	EQPT21AA8470	BAIE06	Operational	Valid	06/12/24
BAIELASER3 - BAIE LASER	EQPT21AA8474	BAIELASER3	Operational	Valid	11/30/24
GZ090 - DIEL - SEFELEC	EQPT21AB0474	GZ090	Operational	Valid	05/24/25
CLE DYNAMOMETRIQUE FACOM 5 à 25Nm	EQPT21AB1521	PMSCLE002	Operational	Valid	05/30/24
MESURES D'AMBIANCE	EQPT21AB3476	METEOTH018	Operational	Valid	05/24/24
S42_B09_AC3_ 792/132A_400V_ cos0.35_Tri_6places	EQPT21AB3516	S42_B09_AC3_ 792/132A_400V	Operational	Valid	07/18/24
DIEL - BOITEDIELCT01 - ACCESSOIRE	EQPT22AB0011	BOITEDIELCT01	Operational	Valid	06/20/24
METEOTH136 + sonde Testo	EQPT22AB2615	METEOTH136	Operational	Valid	06/27/24

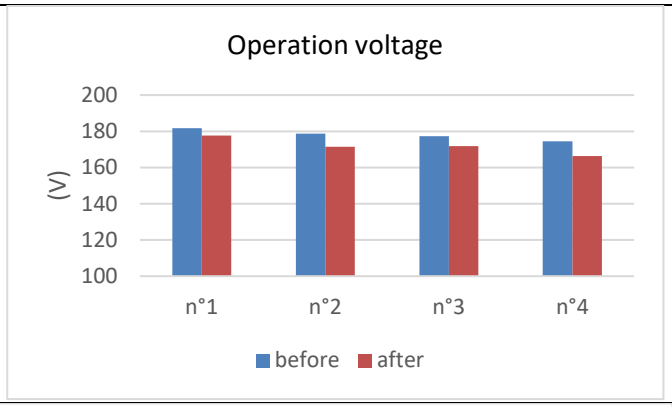
4. RESULTS

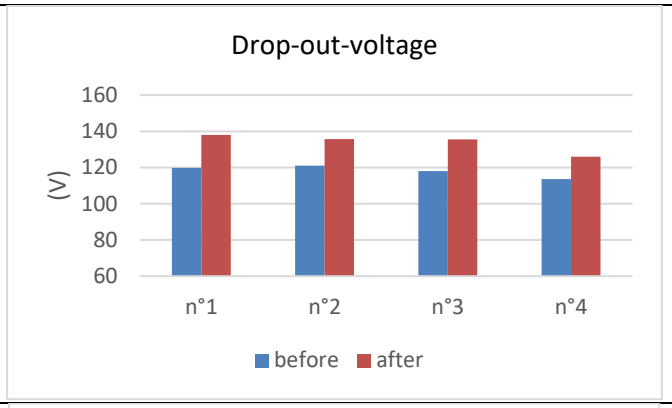
4.1. Characterization

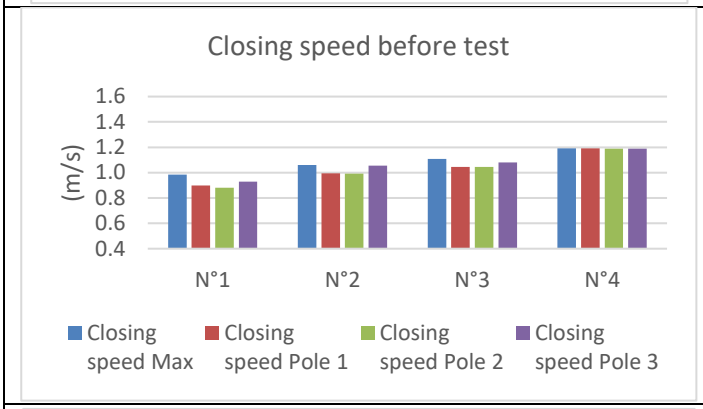
Average of 5 measurements (see excel file “synthesis-laser-test-bench-LC1F150 for more details).

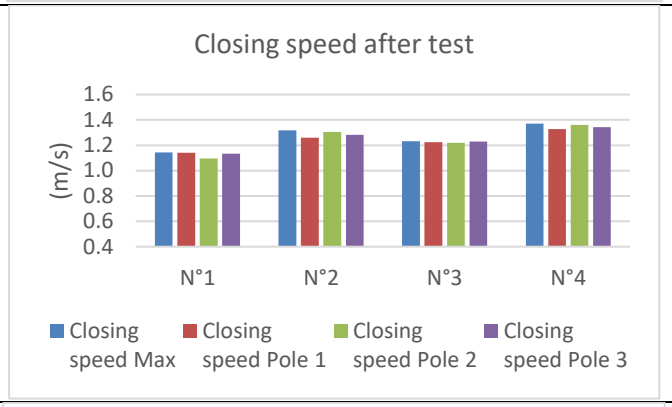
Product		N°1	N°2	N°3	N°4
Total travel (mm)	before	11.8	11.7	11.8	11.7
	after	11.7	11.6	11.7	11.6

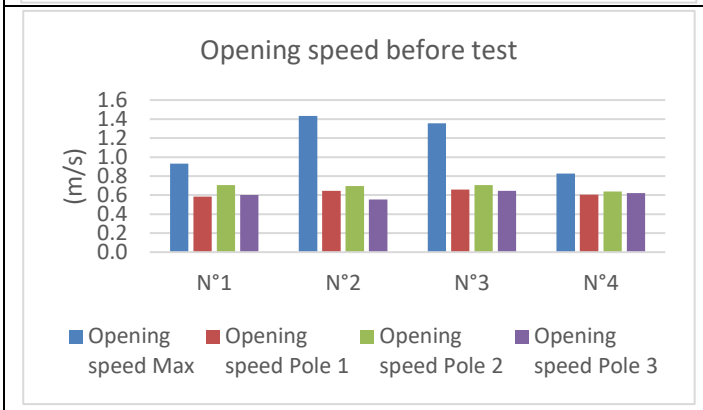
Before test	After test
	
	
	

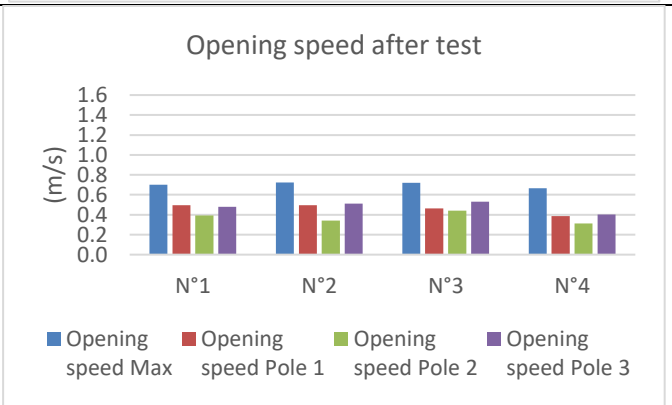

Operation voltage
200
180
160
140
120
100
(V)
n°1
n°2
n°3
n°4
before
after

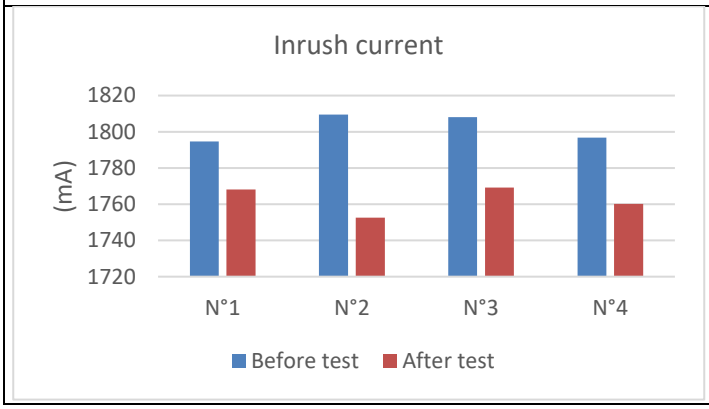

Drop-out-voltage
160
140
120
100
80
60
(V)
n°1
n°2
n°3
n°4
before
after

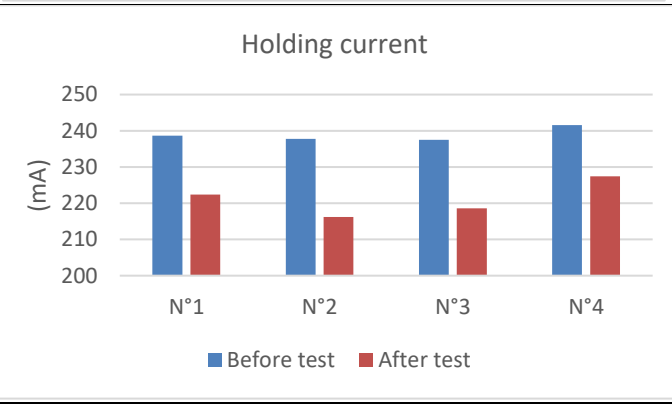

Closing speed before test
1.6
1.4
1.2
1.0
0.8
0.6
0.4
(m/s)
N°1
N°2
N°3
N°4
Closing speed Max
Closing speed Pole 1
Closing speed Pole 2
Closing speed Pole 3


Closing speed after test
1.6
1.4
1.2
1.0
0.8
0.6
0.4
(m/s)
N°1
N°2
N°3
N°4
Closing speed Max
Closing speed Pole 1
Closing speed Pole 2
Closing speed Pole 3


Opening speed before test
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
(m/s)
N°1
N°2
N°3
N°4
Opening speed Max
Opening speed Pole 1
Opening speed Pole 2
Opening speed Pole 3


Opening speed after test
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
(m/s)
N°1
N°2
N°3
N°4
Opening speed Max
Opening speed Pole 1
Opening speed Pole 2
Opening speed Pole 3

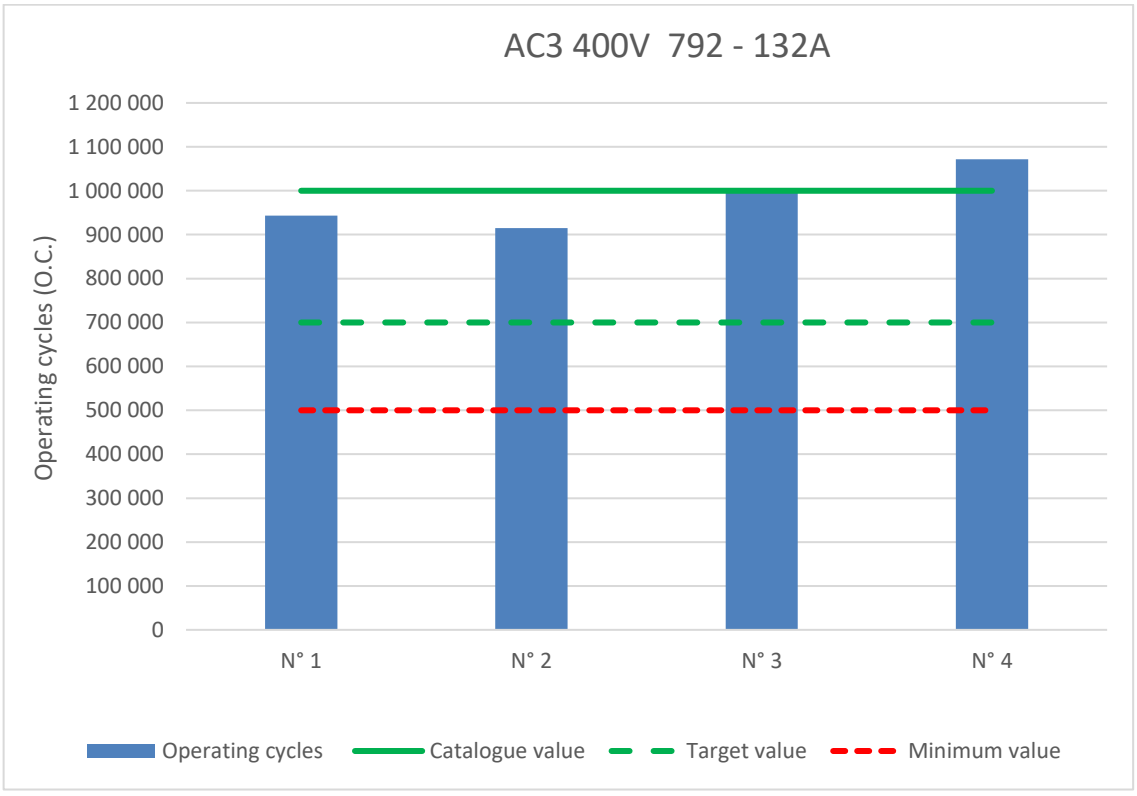

Inrush current
1820
1800
1780
1760
1740
1720
(mA)
N°1
N°2
N°3
N°4
Before test
After test


Holding current
250
240
230
220
210
200
(mA)
N°1
N°2
N°3
N°4
Before test
After test

4.2. Operating cycles

Report N°:	**SPEC23AA7349**				Catalogue Value (O.C.)	**1 000 000**
Test name :	SPEC23AA7349 AC3 792A_132A_400V		Start :	**18-Jan-24**	Target Value (O.C.)	**700 000**
Room/Bench :	42-9		End :	**11-Mar-24**	Minimum (O.C.):	**914 725**
Type of test :	AC3 400V 792 - 132A	1FO/4s			Maximum (O.C.) :	**1 071 888**
Product :	LC1-F150				Average (O.C.) :	**983 642**
Identification :	3R2325308				Minimum/ catalogue value:	**91%**
Quantity :	**4**				Maximum/ catalogue value	**107%**
Applicant :	Jan Solar				Average / Catalogue Value :	**98%**
Test Leader :	PPDV				Minimum/ target value:	**131%**
					Maximum/ target value	**153%**
					Average / Target Value :	**141%**

Bench place	Samples name	Operating cycles	Date	State	Denominated defect	Result / catalogue value	Result / target value
1	N° 1	943 573	09/03/2024	Fault stop	Fault during OPENING TEST on poles 1 and 3	94%	135%
2	N° 2	914 725	03/03/2024	Fault stop	Fault during OPENING TEST on poles 1 and 3	91%	131%
3	N° 3	1 004 383	07/03/2024	Fault stop	Fault during OPENING TEST on poles 1 and 3	100%	143%
4	N° 4	1 071 888	10/03/2024	Fault stop	Fault during OPENING TEST on poles 1,2 and 3	107%	153%



4.3. Characterization of a failure mode

IEC 60947-4-1 Annex K (§ K.3.3)

Table K.1 – Failure mode of contactors

Failure modes	Characteristics for a normally open contactor
Failure to open	– current remaining after the electromagnet is de-energised
Failure to close	– no current in one or more poles after the electromagnet is energised
Short-circuit between poles	– insulation failure between poles
Short-circuit between pole and any adjacent part	– insulation failure with any adjacent part

TESTED PRODUCT: LC1-F150

OBSERVATION: The samples are checked at the end of life
(The measurements are made when the samples are still mounted on the bench).

MARK	Failure to open				Failure to close			Short-circuit			Short-circuit between pole and any adjacent part		
	A*	P1	P2	P3	P1	P2	P3	P1	P2	P3	P1	P2	P3
N°1	Y	Y		Y									
N°2	Y	Y		Y									
N°3	Y	Y		Y									
N°4	Y	Y	Y	Y									
Legend:	*A: Possibility of current in the circuit. **Y**: Yes N: No												

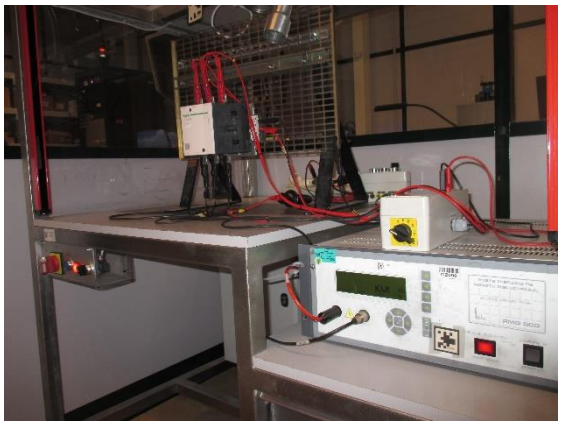
4.4. Power-frequency withstand voltage

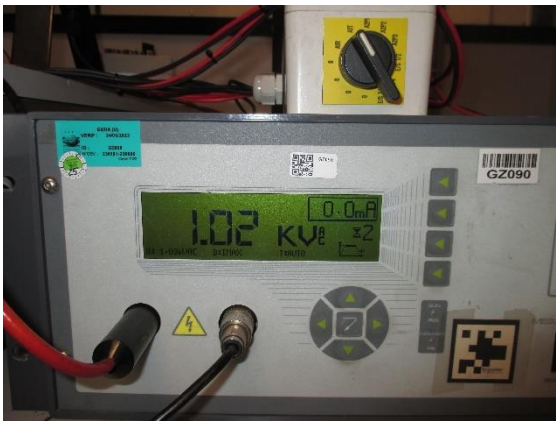
Test carried out on 2024-03-27.
Temperature from 21.5°C to 21.8°C and relative humidity from 35.8% to 36.5%HR.

IEC 60947-4-1 edition 4.0

(October 2018) annex B3.2
And IEC 60947-1:2007

U test = 1000 V AC
Test duration = 5 s
Detection Imax = 100 mA
Rising time: 5 s
Falling time: 5 s





	Test voltage = 1000 V / Overcurrent relay 100 mA										
Configurations	N° 1		N° 2		N° 3		N° 4		*In addition**		
Sample	All poles / frame		Pole 1 / other poles + frame		Pole 2 / other poles + frame		Pole 3 / other poles + frame		Incoming terminals / outgoing terminals (open)		
N°	open	closed	open	closed	open	closed	open	closed	Pole 1	Pole 2	Pole 3
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* Not requested by standard IEC 60947-4-1 § B.3.2

Conformity:
✓: **Pass**
×: **Fail**

5. CONCLUSION

Request AC3 400 V – 792A – 132A:

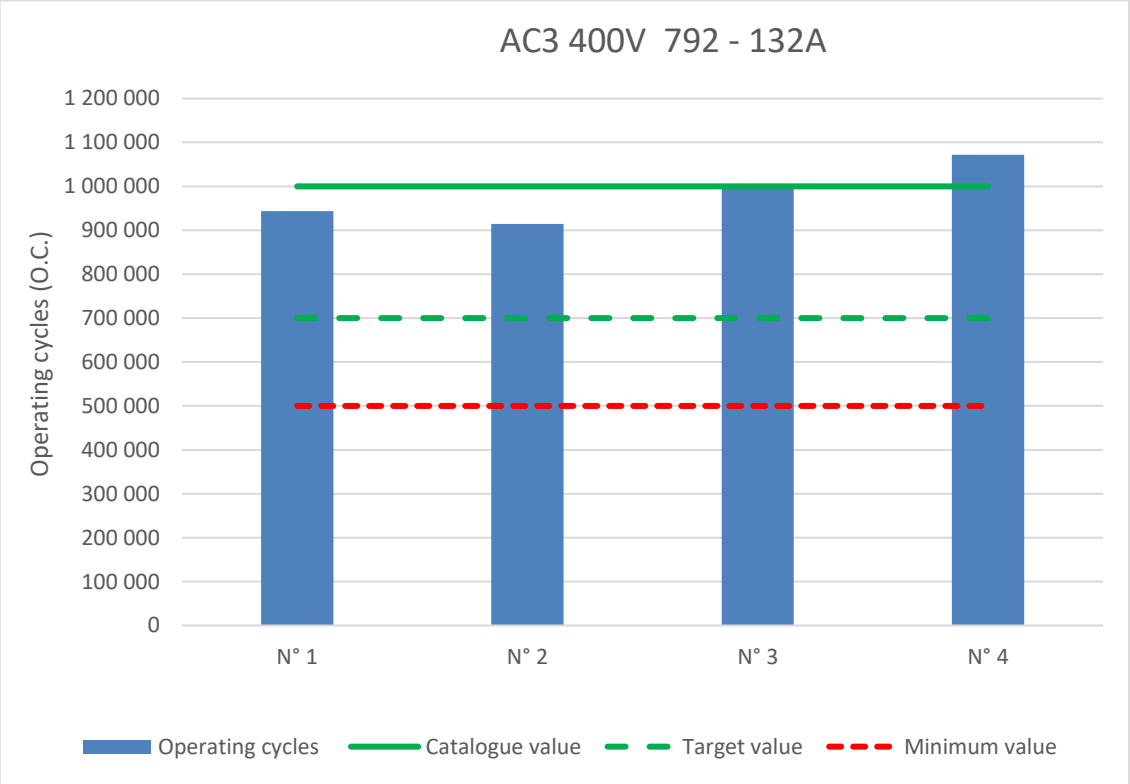
	Catalogue value	Objective value	Minimum value
Operating cycles (O.C)	1000000	700000	500000
% Catalogue value		70	50

Electrical durability

	Average	Minimum	Maximum
Operating cycles	983642	914725	1071888
% Catalogue value	98	91	107

Dielectric test (1000 V for 5 s):

Product	N°1	N°2	N°3	N°4
Result	**PASS**	**PASS**	**PASS**	**PASS**



Conformity :CONFORM

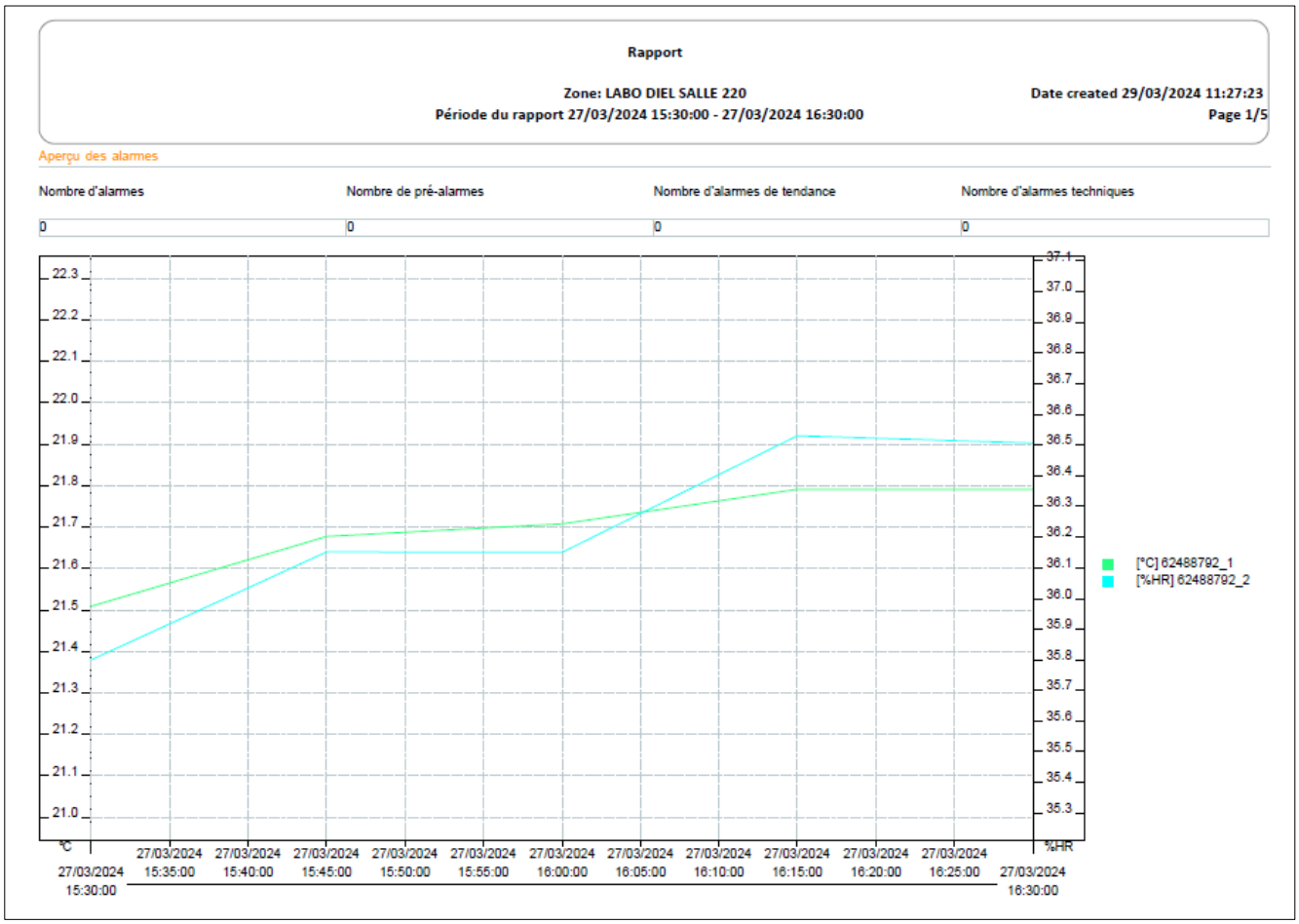
6. ANNEX

6.1. Ambient temperature and humidity during the electrical durability test

Temperature recorded from the 2024-01-18 to 2024-03-11.

	Sensor	Minimum	Maximum
Temperature (°C)	METEOTH136	16.1	29.6
Humidity (%HR)	METEOTH136	14.7	60.7

6.2. Ambient temperature and humidity during the dielectric test



6.3. Comparison graph of previous test