

Tél. +33 (0)4 76 57 35 10
 Fax : +33 (0)4 76 57 99 14
 E-mail : jean-marie.baboulin@schneider-electric.com
 laurent.yvroud@schneider-electric.com
 pascal.privet@schneider-electric.com

Postal address Schneider Electric Industries S.A.
 L2E / Pôle environnement /
 Vibrations
 37, quai Paul Louis Merlin
 F 38050 Grenoble Cedex 9

L2E / Environment pole / Vibrations

Mechanical testing report

no : 2007-0118-00A

page : 1 / 20

Testing period: from 20/02/07 to 21/02/07

Publication date: 5/03/2007

Identification of tested equipment

Two contactors TELEMECANIQUE reference LC1D096SDS207 (3-pole size 1);
 Two contactors TELEMECANIQUE reference LC1D256SDS207 (3-pole size 2);
 Two contactors TELEMECANIQUE reference LC1D0986SD207 (4-pole size 1).

Qualification test program

Functional random vibrations test according to CEI 61373 standard (category 1 class B)

Devices in « closed » position

5 - 150 Hz --> 1 ms⁻² R.M.S. as per OX axe / 10 minutes (= OZ, see §7.2).

5 - 150 Hz --> 1 ms⁻² R.M.S. as per OY axe / 10 minutes (= OZ, see §7.2).

5 - 150 Hz --> 1 ms⁻² R.M.S. as per OZ axe / 10 minutes.

Endurance random vibrations test according to CEI 61373 standard (category 1 class B)

Devices in « opened » position

5 - 150 Hz --> 5,50 ms⁻² R.M.S. as per OX axe / 5 hours

5 - 150 Hz --> 3,50 ms⁻² R.M.S. as per OY axe / 5 hours

5 - 150 Hz --> 7,90 ms⁻² R.M.S. as per OZ axe / 5 hours.

Withstand to shocks test as per CEI 61373 standard (category 1 class B)

Devices in « opened » and « closed » position

5g / 30 ms / 3 shocks per direction, in OX axe

3g / 30 ms / 3 shocks per direction, in OY and OZ axes.

Verification of mechanical withstand and of absence of milli-opening and milli-closing on the devices (≥ 1 ms).

Uncertainty of the measurement line concerning acceleration is $\pm 5\%$ from 3 to 500Hz

Results

The specimens were subjected to testing in compliance with the program defined above.

The two contactors TELEMECANIQUE reference LC1D096SDS207 (one mounted on DIN rail and one screwed onto the interface), the two contactors TELEMECANIQUE reference LC1D256SDS207 (one mounted on DIN rail and one screwed onto the interface) and the two contactors TELEMECANIQUE reference LC1D0986SD207 (one mounted on DIN rail and one screwed onto the interface), exhibited no apparent mechanical defect.

To be noted the absence of milli-opening and milli-closing ≥ 1 ms on the devices.

Requesting party

REBOULET J.

B.U. POWER / PCP
 ELECTROPOLE EYBENS

Author

Testing manager : **P. Privet**

Reviewer :

Technical responsible : **L. Yvroud**




Additional recipients

This test report is for the above-defined and tested object alone. This report may only be copied in its entirety. It contains 20 pages.
 "SEULE LA VERSION FRANCAISE FAIT FOI / ONLY THE FRENCH VERSION IS LEGALLY BINDING"

TABLE OF CONTENTS

1. PURPOSE OF REPORT	3
2. ADMINISTRATIVE INFORMATION	3
3. DEVICE THAT WAS TESTED	3
4. FUNCTIONAL CONFIGURATION	3
5. MEANS OF TESTING AND MEASUREMENT	3
6. INSTRUMENTATION	5
7. TEST PROGRAM	7
8. SANCTIONS AND CRITERIA FOR CONFORMITY	7
9. RESULTS	8
10. CONCLUSION	20

1. PURPOSE OF REPORT

The purpose of this report is to present the results of random vibrations tests and withstand to shocks test according to IEC 61373 standard, conducted on two contactors TELEMECANIQUE reference LC1D096SDS207, two contactors TELEMECANIQUE reference LC1D256SDS207 and two contactors TELEMECANIQUE reference LC1D0986SD207.

2. ADMINISTRATIVE INFORMATION

2.1. Test date/Responsibility/Location

Testing was performed under the supervision of P. Privet, from 20/02/07 to 21/02/07 on the mechanical testing platform of Schneider Electric - Grenoble.

2.2. Requesting party

The person who requested testing is M. REBOULET Joël., from B.U. POWER / PCP ELECTROPOLE EYBENS

2.3. Persons present

None.

2.4. Reference documents

IEC 61373 standard - Railway applications – Rolling stock equipment - >Shock and vibration tests (1999-01).
IEC 60068-2-27 standard - Test Ea and guidance : shocks (1987).
IEC 60068-2-64 standard – Test Fh : Random vibrations broad-band (digital control) and guidance (1993).

3. DEVICE THAT WAS TESTED

Two contactors TELEMECANIQUE reference LC1D096SDS207 (no.1 mounted on DIN rail and no.2 screwed onto the interface);
Two contactors TELEMECANIQUE reference LC1D256SDS207 (No.1 mounted on DIN rail and No.2 screwed onto the interface);
Two contactors TELEMECANIQUE reference LC1D0986SD207 (No.1 mounted on DIN rail and No.2 screwed onto the interface).

4. FUNCTIONAL CONFIGURATION

For random vibration with duration of 10 minutes and for shocks :

Contactors coils are supplied with 72 Volts DC.

Contactors are in « closed » position with power contacts de-energized.

For random vibration with duration of 5 hours and for shocks :

Contactors are de-energized, in « opened » position

Before tests, functioning of device are checked by applicant.

5. MEANS OF TESTING AND MEASUREMENT

5.1. Testing means

Main elements of the vibrator:

- Electrodynamical vibration generator L.D.S. 55 kN type V895 COMBO
- Vibrating table L.D.S 900 x 900
- SPECTRAL DYNAMICS work station
- PUMA management software version 2.5.0

5.2. Measurement means

Measurement line:

- Endevco accelerometer 256HX-100 no 11050 ; 101.60 mV/g
- Endevco accelerometer 2250A-10 no 13868 ; 10.28 mV/g
- Endevco accelerometer 256HX-10 no 11119 ; 10.00 mV/g

5.3. Additional means

Detection of contact change of state

A unit for detection and counting of milli openings and milli closings comprising 10 channels and provided with a 10 or 100 kHz clock allows detection from 0.1 to 99 ms. For the tests, the device's setting allows detection milli openings and milli closings ≥ 1 ms.

For random vibration tests with duration of 5 hours and for shocks, contactors are de-energized, power contacts in opened position, Contacts are monitored as below:

- Channel N°1 : Power contacts of contactors LC1D096SDS207 (in //)
- Channel N°2 : Auxiliaries contacts NO of contactors LC1D096SDS207 (in //)
- Channel N°3 : Auxiliaries contacts NC of contactors LC1D096SDS207 (in series)
- Channel N°4 : Power contacts of contactors LC1D256SDS207 (in //)
- Channel N°5 : Auxiliaries contacts NO of contactors LC1D256SDS207 (in //)
- Channel N°6 : Auxiliaries contacts NC of contactors LC1D256SDS207 (in series)
- Channel N°7 : Power contacts of contactors LC1D0986SD207 (in //)
- Channel N°8 : Auxiliaries contacts NO of contactors LC1D0986SD207 (in //)
- Channel N°9 : Auxiliaries contacts NC of contactors LC1D0986SD207 (in series)

For random vibration tests with duration of 10 minutes and for shocks, Coils of contactors are supplied, with power contacts in closed position, Contacts are monitored as below:

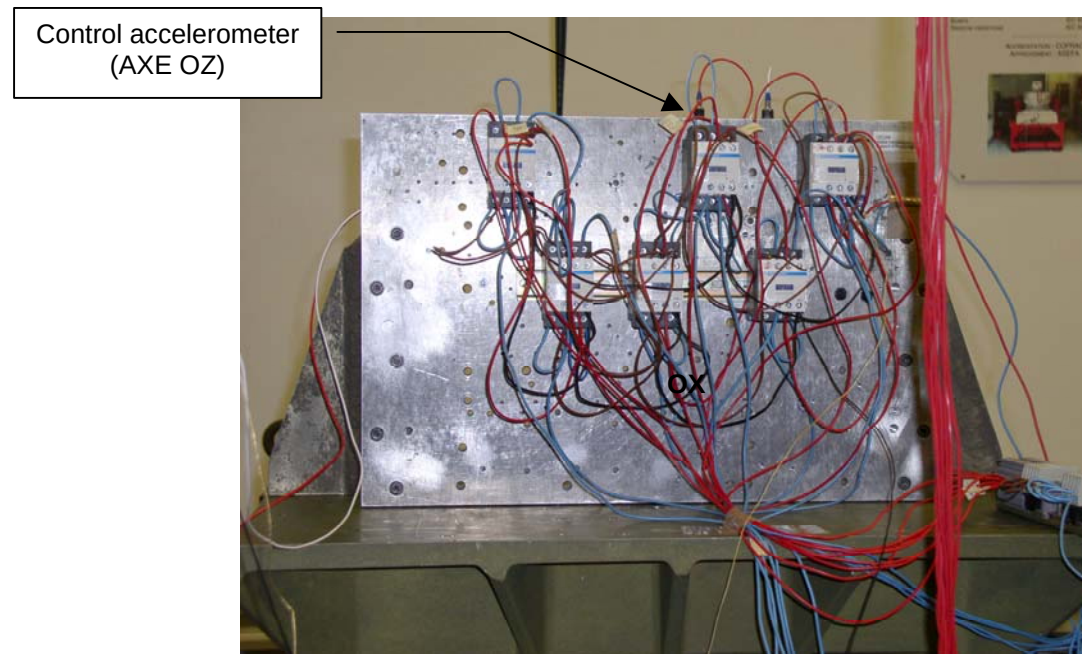
- Channel N°1 : Power contacts of contactors LC1D096SDS207 (in series)
- Channel N°2 : Auxiliaries contacts NO of contactors LC1D096SDS207 (in series)
- Channel N°3 : Auxiliaries contacts NC of contactors LC1D096SDS207 (in //)
- Channel N°4 : Power contacts of contactors LC1D256SDS207 (in series)
- Channel N°5 : Auxiliaries contacts NO of contactors LC1D256SDS207 (in series)
- Channel N°6 : Auxiliaries contacts NC of contactors LC1D256SDS207 (in //)
- Channel N°7 : Power contacts of contactors LC1D0986SD207 (in //)
- Channel N°8 : Auxiliaries contacts NO of contactors LC1D0986SD207 (in //)
- Channel N°9 : Auxiliaries contacts NC of contactors LC1D0986SD207 (in series)

6. INSTRUMENTATION

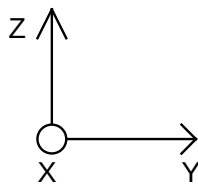
6.1. Equipment assembly

The interface used for this test is PLAQVIB08 interface of laboratory to which the tested device has been fastened. Excitation axes OX and OY are applied using the vibration generator in horizontal position. Excitation axe OZ is applied by moving the vibration generator into the vertical position.

- ASSEMBLY OF EQUIPMENT TO BE TESTED -



Excitation axes

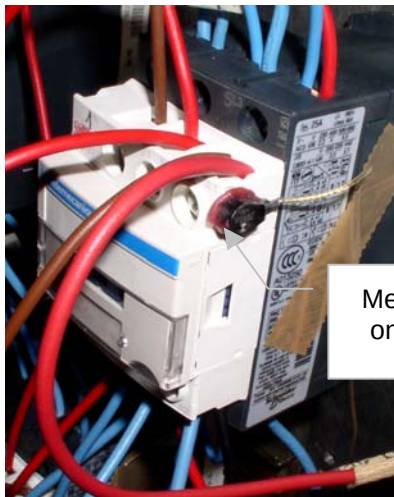


- LOCATION OF MEASUREMENT POINTS-



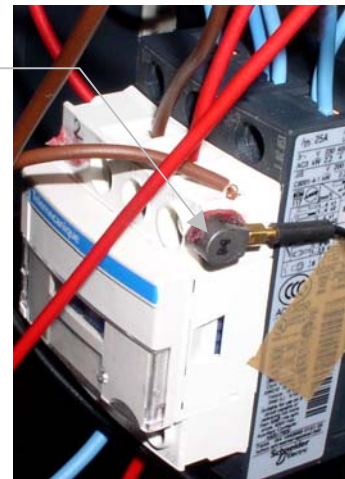
Measurement
on contactor
n°2
/ OX

Measurement
on contactor
n°1 / OX



Measurement
on contactor
n°2
/ OY

Measurement
on contactor
n°1/ OY



Measurement
on contactor
n°2
/ OZ

Measurement
on contactor
n°1/ OZ



6.2. Instrumentation - Control

Channel	Accelerometer	Sensitivity	Position
Channel no1 (control)	Endevco 256HX-100 SN : no 11050	101.60 mV/g	X: PLAQVIB08 Y: PLAQVIB08 Z: PLAQVIB08
Channel n°3 (measurement)	Endevco 2250A-10 SN : n° 13868	10.28 mV/g	X: contactor n°1 Y: contactor n°1 Z: contactor n°1
nel n°4 (measurement)	Endevco 27AM1-10 SN : n° 10119	10.00 mV/g	X: contactor n°2 Y: contactor n°2 Z: contactor n°2

7. TEST PROGRAM

7.1. Order of operations

Standards are performed at the severities described below for each vibration axe.

7.2. Test severities

Withstand to shocks test according to IEC 61373 standard (category 1 / class B).

5g / 30 ms / 3 shocks per direction, as per axe OX longitudinal.

3g / 30 ms / 3 shocks per direction, as per axe OY transverse.

3g / 30 ms / 3 shocks per direction, as per axe OZ vertical.

Random vibrations test according to IEC 61373 standard (category 1 / class B).

Random vibrations functional test

Severities required by IEC 61373 standard for longitudinal and transverse axes show R.M.S. levels of acceleration too low for the background of the vibration installation. Severity for vertical axis is applied for all the axes.

Axe OX longitudinal, axe OY transverse and Axe OZ vertical :

from 5 to 150 Hz, level of acceleration = $1,0 \text{ ms}^{-2}$ R.M.S. / duration 10 minutes

from 5 to 20 Hz, DSP = $0.0298 (\text{ms}^{-2})^2/\text{Hz}$

from 20 to 150 Hz, slope = -6 dB/oct

Random vibrations endurance test

Axe OX longitudinal

from 5 to 150 Hz, level of acceleration = 5.5 ms^{-2} R.M.S. / duration 5 hours

from 5 to 20 Hz, DSP = $0.901 (\text{ms}^{-2})^2/\text{Hz}$

from 20 to 150, Hz slope = - 6 dB/oct

Axe OY transversal

from 5 to 150 Hz, level of acceleration = 3.5 ms^{-2} R.M.S. / duration 5 hours

from 5 to 20 Hz, DSP = $0.366 (\text{ms}^{-2})^2/\text{Hz}$

from 20 to 150 Hz, slope = - 6 dB/oct

Axe OZ vertical

from 5 to 150 Hz, level of acceleration = 7.9 ms^{-2} R.M.S. / duration 5 hours

from 5 to 20 Hz, DSP = $1.857 (\text{ms}^{-2})^2/\text{Hz}$

from 20 to 150 Hz, slope = - 6 dB/oct

8. SANCTIONS AND CRITERIA FOR CONFORMITY

During tests:

No apparent mechanical defect on the tested devices.

Neither milli-opening nor milli closing of monitored contacts ≥ 1 ms.

At the end of the vibrations tests then of shocks test:

Verification of the functional characteristics of devices by personnel of POWER / PCP, who, after reviewing the results obtained, will give final approval to the equipment that was tested.

9. RESULTS

9.1. Random vibrations functional test /OX according to IEC 61373 standard

With the severity 5-150 Hz / 1,0 ms⁻² r.m.s. / 10 minutes.

Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OX	0,1013 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OX	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OX	Nothing to report



9.2. Random vibrations endurance test /OX according to IEC 61373 standard

With the severity 5-150 Hz / 5,5 ms⁻² r.m.s. / 5 hours.

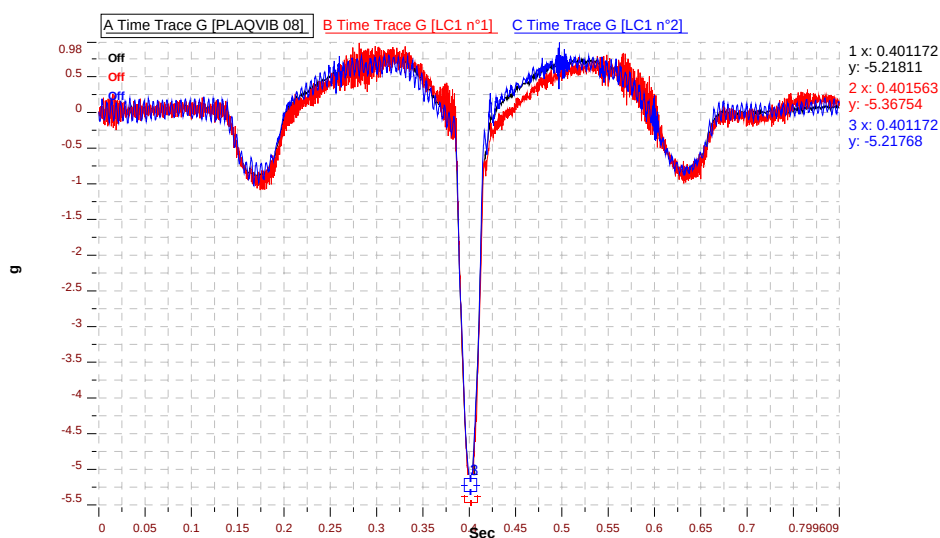
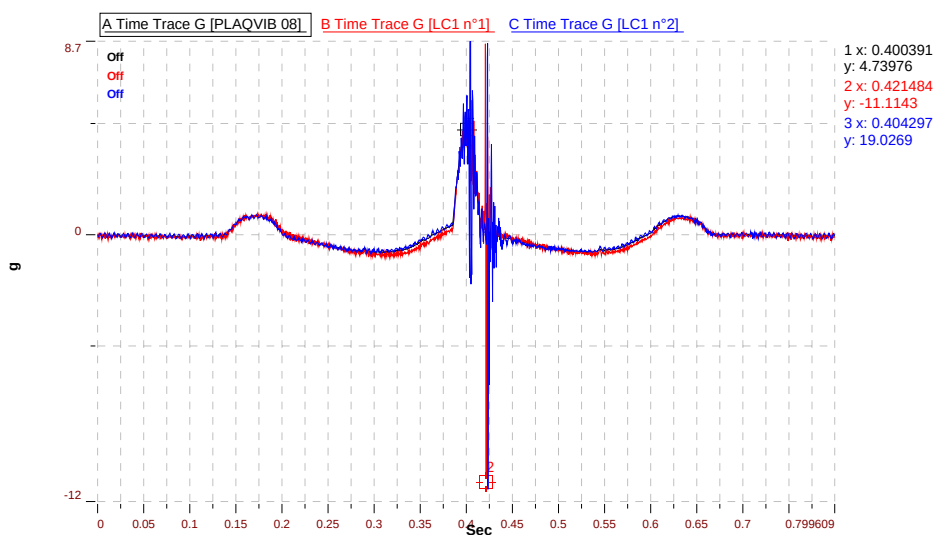
Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OX	0,5786 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OX	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OX	Nothing to report



9.3. Withstand to shock test /OX in « opened » position according to IEC 61373 standard

With the severity 5g / 30 ms / 3 shocks per direction.

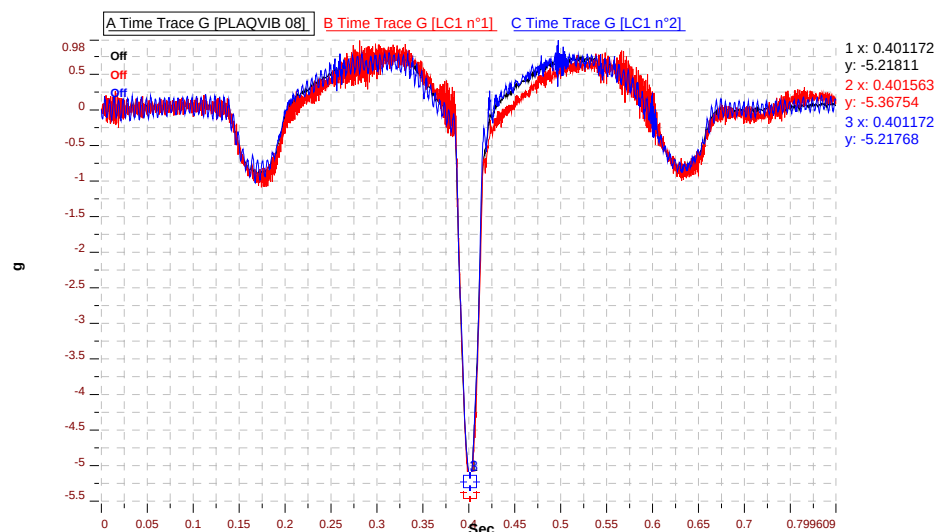
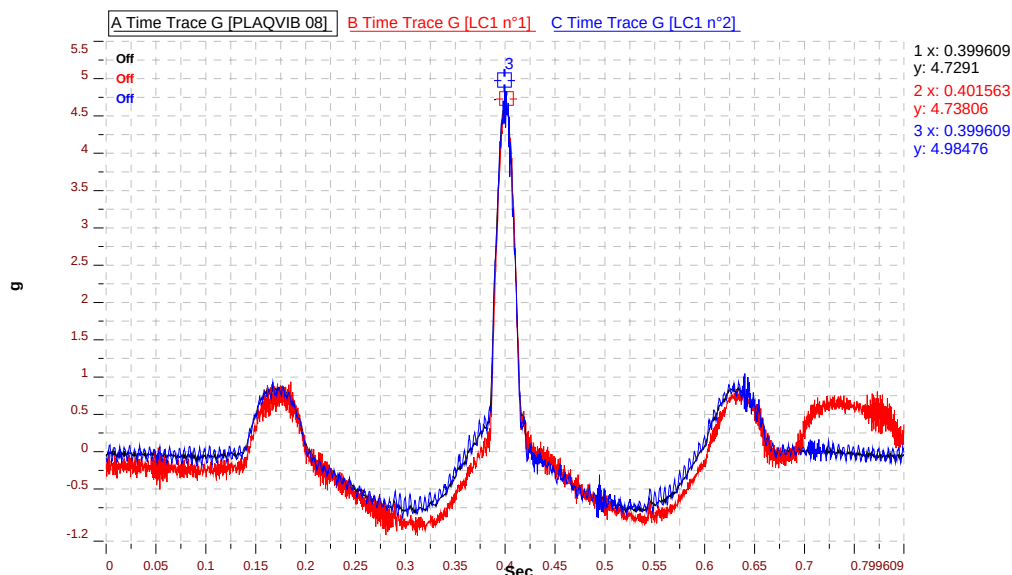
Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OX	4.74	5.22	
Channel 3 (measurement)	Contactor n°1 /OX	11.11	5.37	Nothing to report
Channel 4 (measurement)	Contactor n°2 /OX	19.03	5.32	Nothing to report



9.4. Withstand to shock test /OX in « closed » position according to IEC 61373 standard

With the severity 5g / 30 ms / 3 shocks per direction.

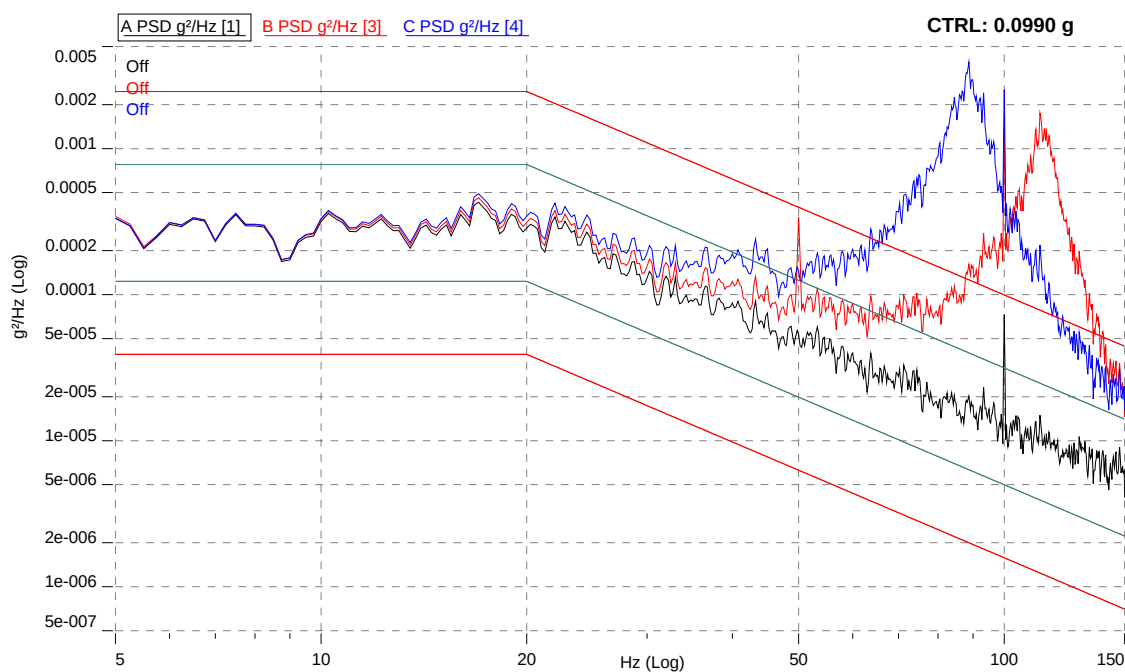
Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OX	4.73	5.22	
Channel 3 (measurement)	Contacteur n°1 /OX	4.74	5.37	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OX	4.98	5.22	Nothing to report



9.5. Random vibrations functional test /OY according to IEC 61373 standard

With the severity 5-150 Hz / 1,0 ms⁻² r.m.s. / 10 minutes.

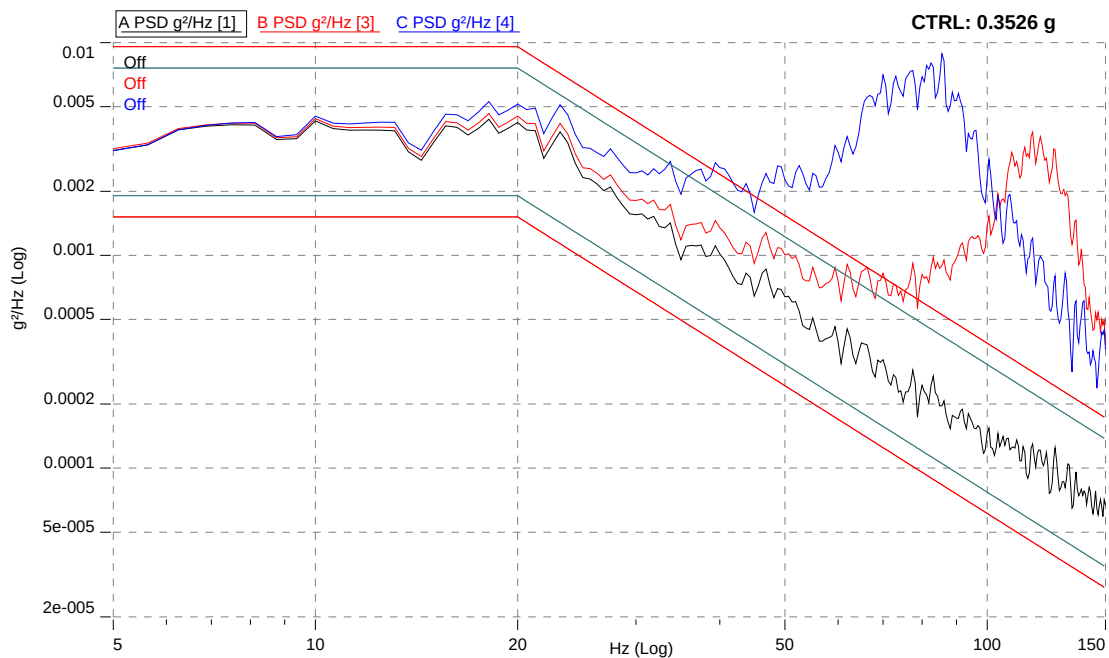
Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OY	0,0990 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OY	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OY	Nothing to report



9.6. Random vibrations endurance test /OY according to IEC 61373 standard

With the severity 5-150 Hz / 3,5 ms⁻² r.m.s. / 5 hours.

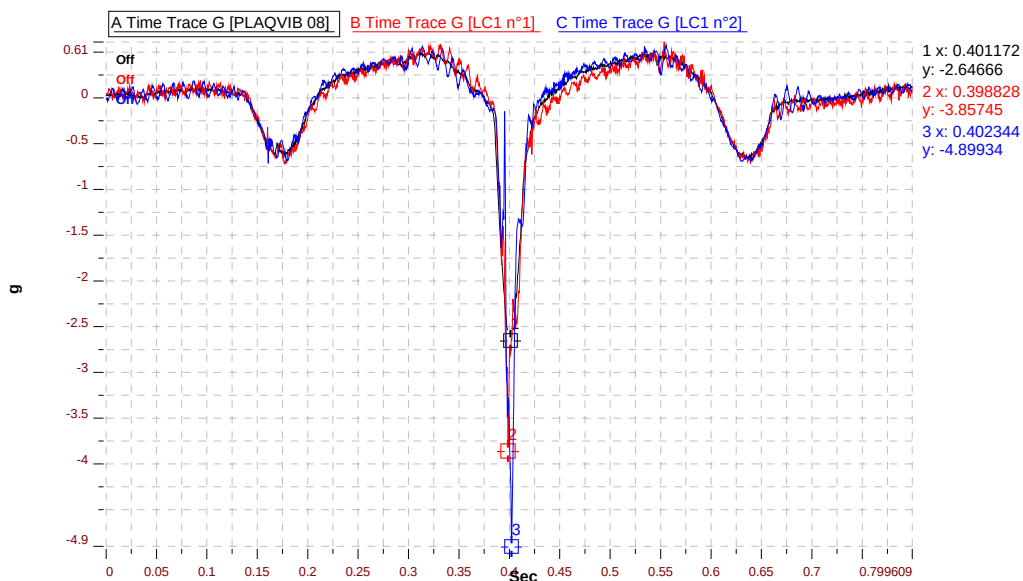
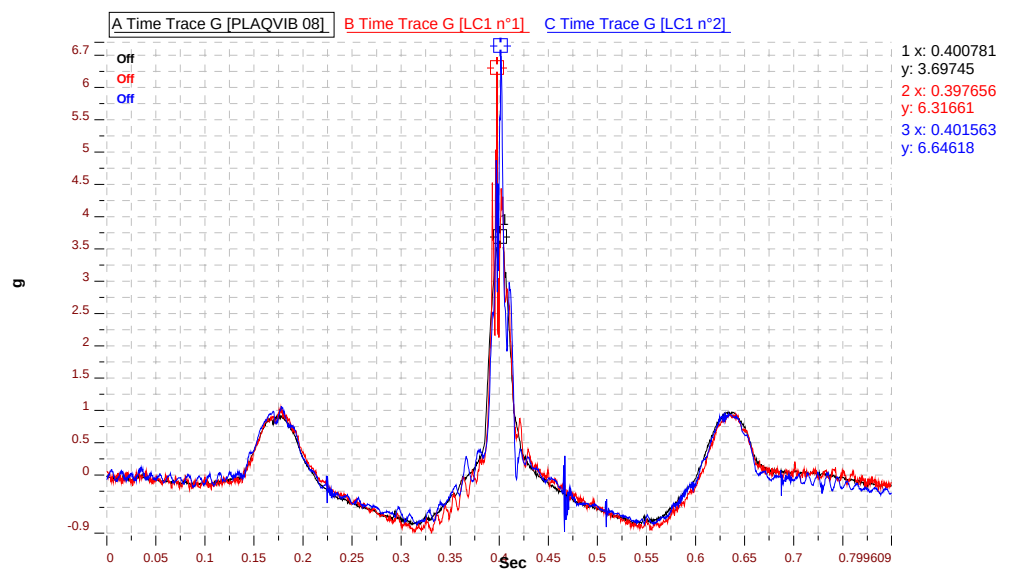
Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OY	0,350 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OY	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OY	Nothing to report



9.7. Withstand to shock test /OY in « opened » position according to IEC 61373 standard

With the severity 3g / 30 ms / 3 shocks per direction.

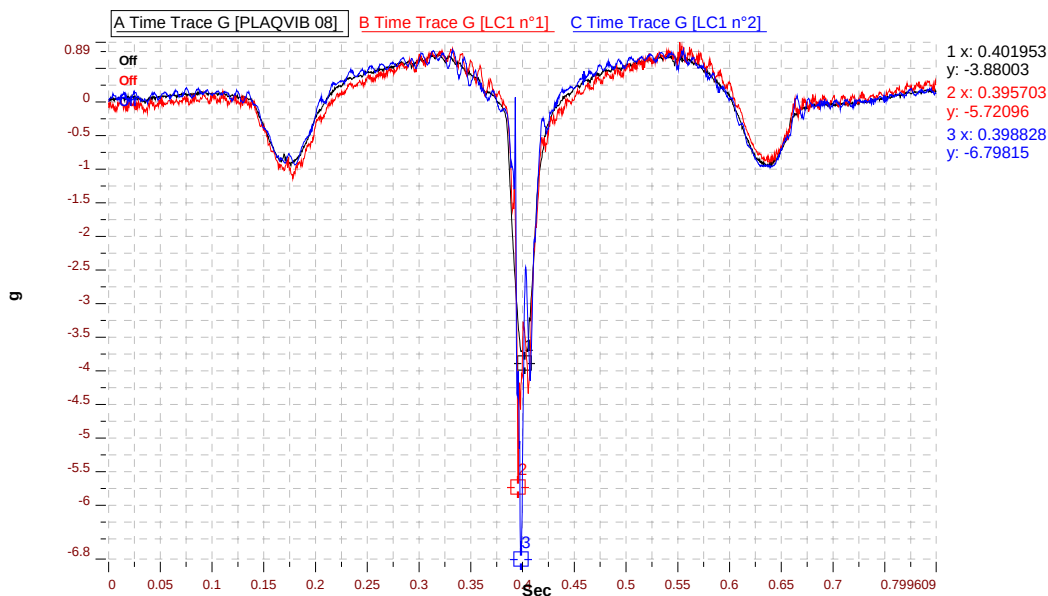
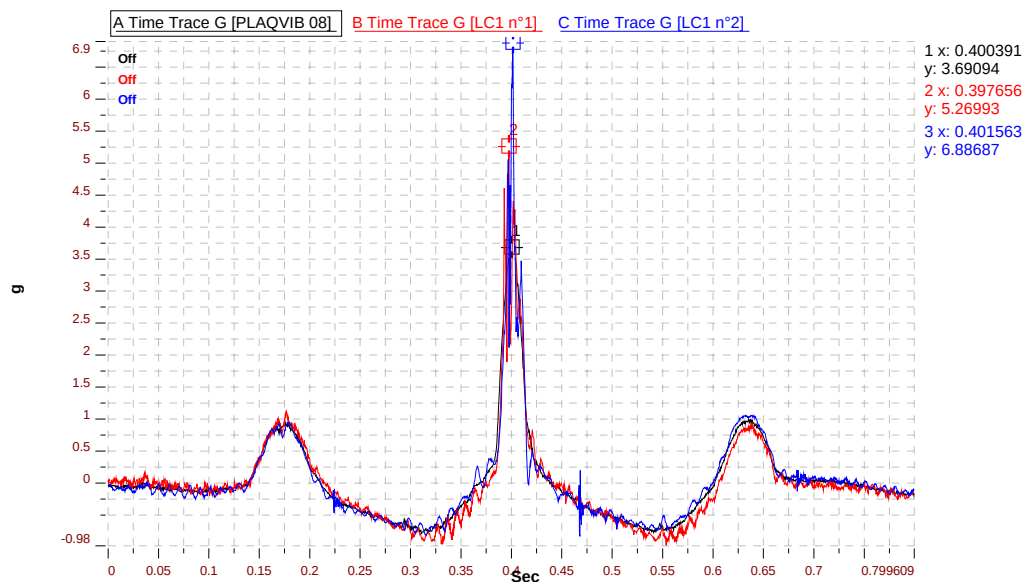
Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OY	3.70	2.65	
Channel 3 (measurement)	Contactor n°1 /OY	6.32	3.86	Nothing to report
Channel 4 (measurement)	Contactor n°2 /OY	6.65	4.90	Nothing to report



9.8. Withstand to shock test /OY in « closed » position according to IEC 61373 standard

With the severity 3g / 30 ms / 3 shocks per direction.

Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OY	3.69	3.88	
Channel 3 (measurement)	Contactor n°1 /OY	5.27	5.72	Nothing to report
Channel 4 (measurement)	Contactor n°2 /OY	6.89	6.80	Nothing to report



9.9. Random vibrations functional test /OZ according to IEC 61373 standard

With the severity 5-150 Hz / 1,0 ms⁻² r.m.s. / 10 minutes.

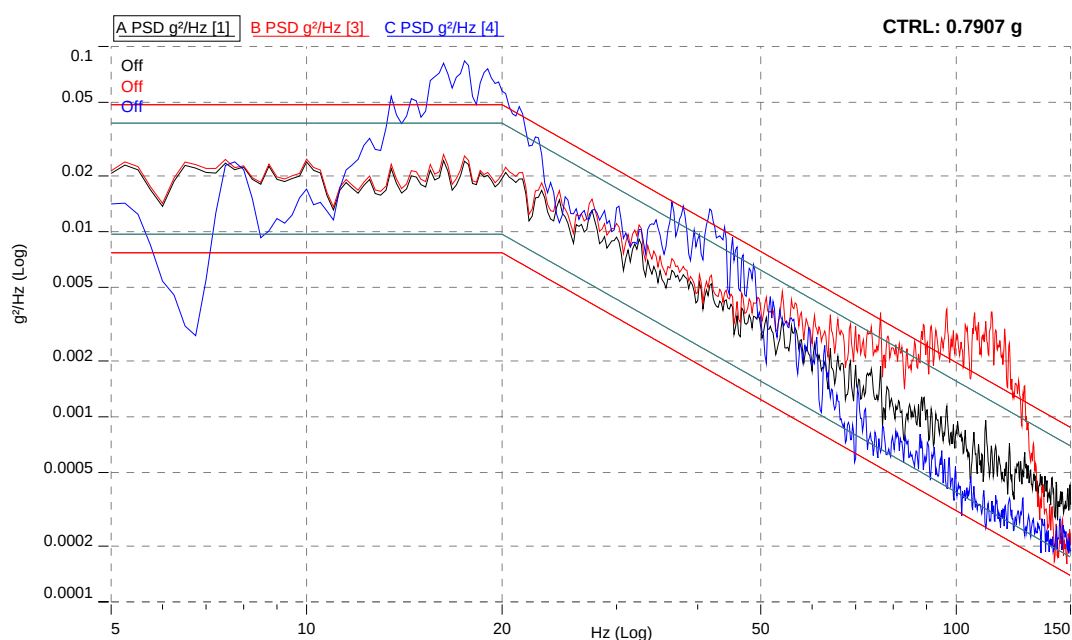
Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OZ	0,1013 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OZ	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OZ	Nothing to report



9.10.Random vibrations endurance test /OZ according to IEC 61373 standard

With the severity 5-150 Hz / 7,9 ms⁻² r.m.s. / 5 hours.

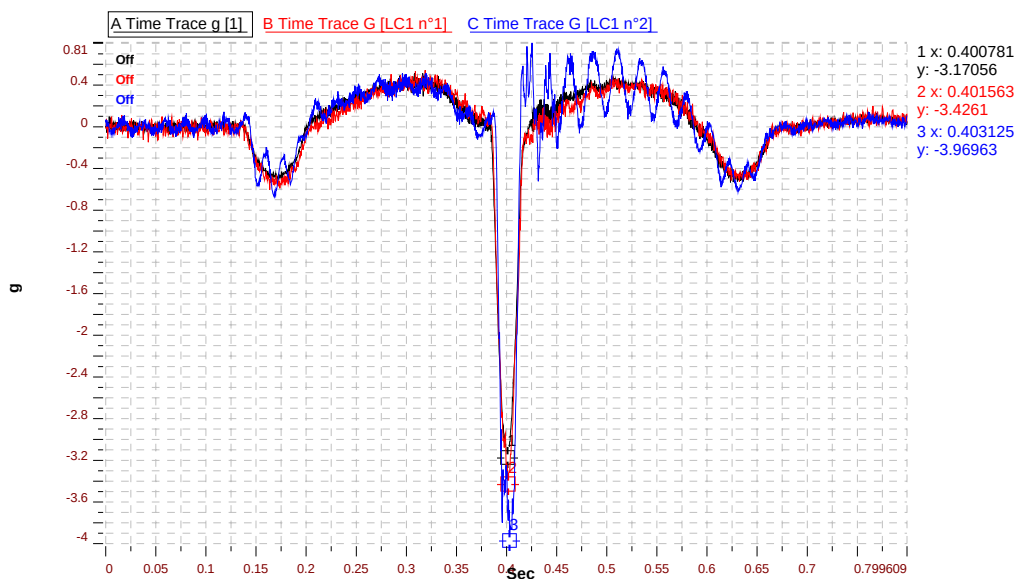
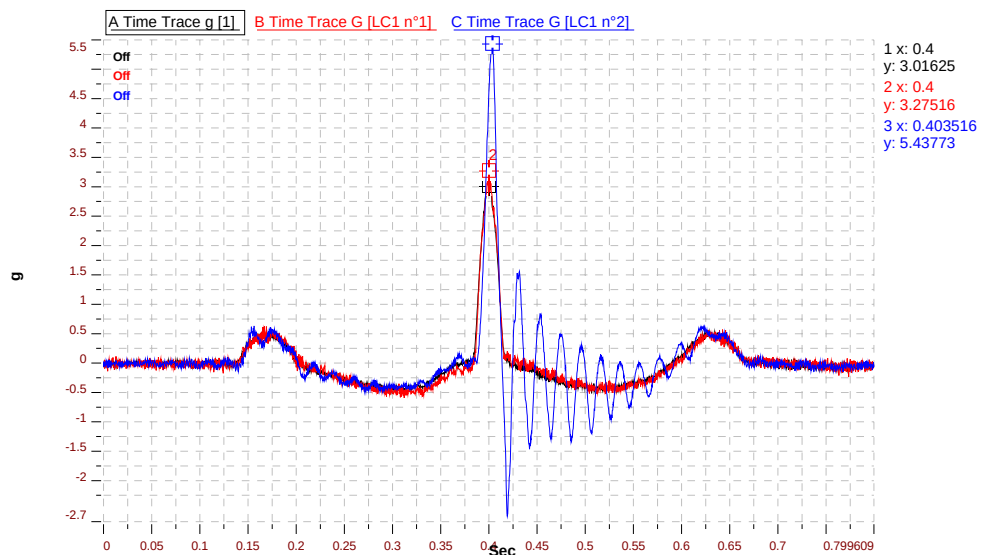
Channel	Position	Comments
Channel 1 (control)	PLAQVIB08 /OZ	0,7907 g r.m.s.
Channel 3 (measurement)	Contacteur n°1 /OZ	Nothing to report
Channel 4 (measurement)	Contacteur n°2 /OZ	Nothing to report



9.11. Withstand to shock test /OZ in « opened » position according to IEC 61373 standard

With the severity 3g / 30 ms / 3 shocks per direction.

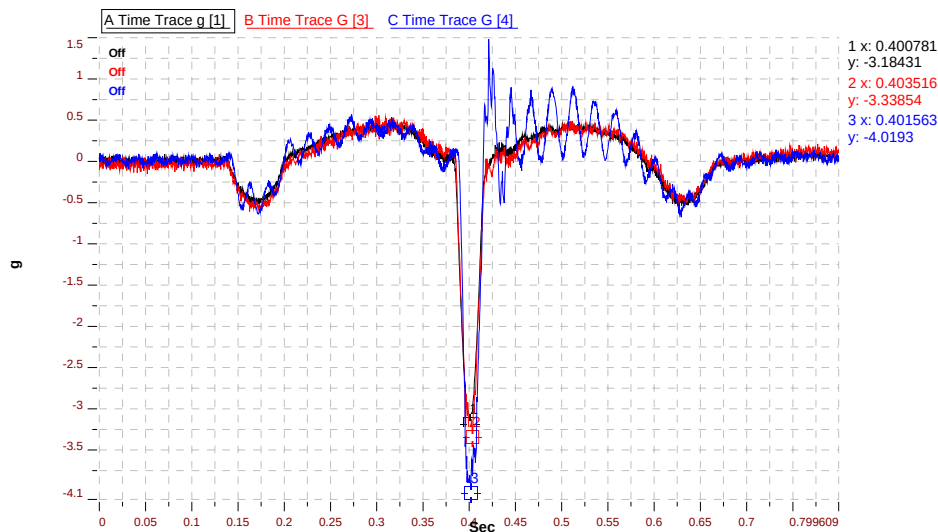
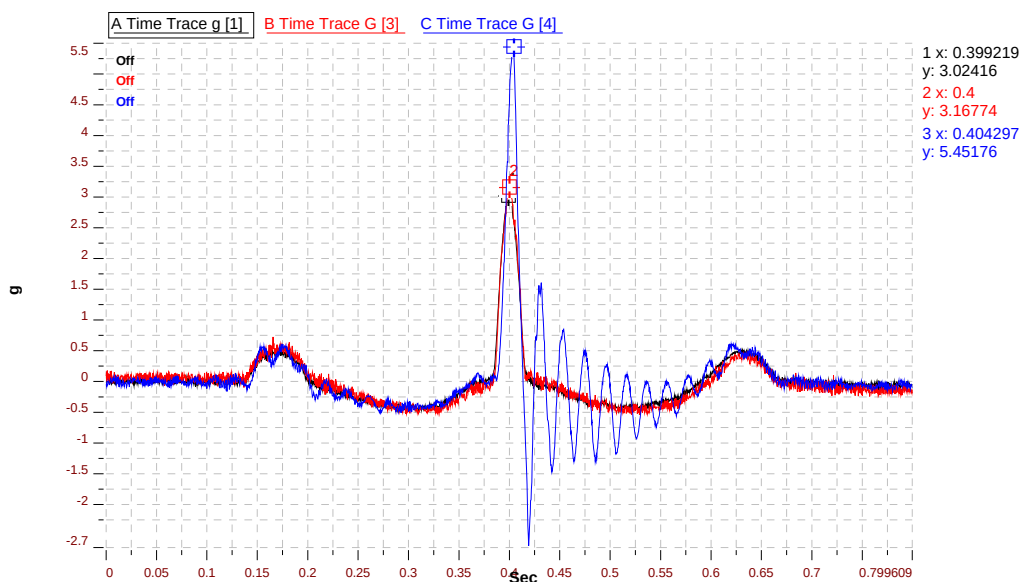
Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OZ	3.02	3.17	
Channel 3 (measurement)	Contactor n°1 /OZ	3.27	3.43	Nothing to report
Channel 4 (measurement)	Contactor n°2 /OZ	5.44	3.97	Nothing to report



9.12. Withstand to shock test /OZ in « closed » position according to IEC 61373 standard

With the severity 3g / 30 ms / 3 shocks per direction.

Channel	Position	Values Max (Gn)		Observations
		+	-	
Channel 1 (control)	PLAQVIB08 /OZ	3.02	3.18	
Channel 3 (measurement)	Contactor n°1 /OZ	3.17	3.34	Nothing to report
Channel 4 (measurement)	Contactor n°2 /OZ	5.45	4.02	Nothing to report



10. CONCLUSION

The specimens were subjected to testing in compliance with the program defined above.

The two contactors TELEMECANIQUE reference LC1D096SDS207 (one mounted on DIN rail and one screwed onto the interface), the two contactors TELEMECANIQUE reference LC1D256SDS207 (one mounted on DIN rail and one screwed onto the interface) and the two contactors TELEMECANIQUE reference LC1D0986SD207 (one mounted on DIN rail and one screwed onto the interface), exhibited no apparent mechanical defect.

To be noted the absence of milli-opening and milli-closing $\geq 1\text{ms}$ on the devices.