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CONFORMITY TESTS ON SHOCK-RESISTANT RESIN SUITCASES

CLIENT: GT LINE S.r.l.
Via del Lavoro, 50/52
40056 Crespellano BO

JOB: L02E379

REFERENCES: Your confirmation of order of 2002-09-04

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INDEX

1.0 Foreword

The Client delivered No. 29 samples of suitcases model Explorer taken from the preproduction. The samples were subdivided according to the product code:

- Code 3818 No. 1 sample
- Code 4820 No. 12 samples
- Code 5822 No. 2 samples
- Code 5833 No. 2 samples
- Code 7630 No. 12 samples

Photo 1
Series Explorer

Photo 2
Cod. 3818

Photo 3
Cod. 4820

Foto 4
Cod. 5822

Photo 5
Cod. 5833

Photo 6
Cod. 7630

The activity aims at verifying the sample compliance with the requirements of the following standards indicated by the Client:

- STANAG 4280 (issue 2) of 1999-02-08
- DEFENCE STANDARD 81-41 (PART 3)/ISSUE 4 of 1991-06-28
- CEI EN 60529 issue 2 file No. 3227C of 1997-06 and CEI EN 60529/A1 file 5682 of 2000-06

Any sample was identified according to the product code followed by a letter.

The test were carried out according to the sequence indicated in the table. Regarding the tests referred to the standards “Defence Standard and STANAG” the Nato Level 3 was assumed as reference level.

Stage A		
Sample	**Test**	**Reference standard**
4820_A	Vibration test	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 and STANAG 4280 (issue 2) of 08-02-1999
5822_A		
5833_A		
7630_A		
4820_B	Establing the IP degree	CEI EN 60529 issue 2 file No. 3227C of 06-1997 e CEI EN 60529/A1 file 5682 of 06-2000
7630_B		
3818_A	Vertical Impact Test*	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 and STANAG 4280 (issue 2) of 08-02-1999
4820_C		
5822_B		
5833_B		
7630_C		
3818_A	Horizontal Impact Test*	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 and STANAG 4280 (issue 2) of 08-02-1999
4820_C		
5822_B		
5833_B		
7630_C		

Stage B		
Sample	**Test**	**Reference standard**
4820_D	Climatic conditioning, carrying out in sequence: Dry heat test and Low temperature test. Temperature values were modified with respect to the standard: -25 °C e +80 °C con UR 75%	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991. The thermal cycle parameters were indicated by the Client increasing the test severity.
4820_E		
4820_F		
7630_D		
7630_E		
7630_F		

Stage C		
Sample	**Test**	**Reference standard**
4820_D	Vertical Impact Test*	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 and STANAG 4280 (issue 2) of 08-02-1999
4820_E		
7630_D		
7630_E		
4820_D	Horizontal Impact Test*	Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 and STANAG 4280 (issue 2) of 08-02-1999
4820_E		
7630_D		
7630_E		
7630_F	Establishing the IP degree	CEI EN 60529 issue 2 file No. 3227C of 06-1997 e CEI EN 60529/A1 file 5682 of 06-2000

** on the impact tests we used an additional mass of 20 kg for codes 3818 and 4820 and of 30 kg for codes 5822, 5833 and 7630.*

Stage D		
Sample	**Test**	**Reference standard**
4820_G	Climatic conditioning for 28 days. The temperature values were set between -33 °C and +90 °C with RH variable from 30% to 100%.	STANAG 4280 (issue 2) of 08-02-1999 The limit cycle temperatures and the humidity variation range were indicated by the Client.
4820_H		
4820_I		
7630_G		
7630_H		
7630_I		

The results of the tests carried out on the samples as per the above table may also be extended to any codes indicated at paragraph 1.0, as they are representative of the whole range of suitcases series Explorer regarding both the geometry, linear size and fasteners arrangement.

The schematic drawings of suitcases are given in the annex.

2.0 Results in brief

The test results are indicated in the table here below.

Stage	Test type	Result
A	Establishing the IP degree	Compliant
	Vibration test	Compliant
	Vertical Impact Test	Compliant
	Horizontal Impact Test	Compliant
B	Climatic conditioning carrying out, in sequence: Dry heat test and Low temperature test. Temperature values were modified with respect to the standard: -25° C and +80° C with RH 75%	Compliant
C	Vertical Impact Test	Compliant
	Horizontal Impact test	Compliant
	Establishing the IP degree	Compliant
D	Storage Test	Compliant

Sample	Test severity level
3818	MILITARY LEVEL J
4820	MILITARY LEVEL J
5822	MILITARY LEVEL J
5833	MILITARY LEVEL J
7630	MILITARY LEVEL J

3.0 Test results

3.1 Vibration test

The tests were carried out at the Laboratory of Firenze Tecnologia – CE.TA.CE. on the following samples:

- 4820_A
- 5822_A
- 5833_A
- 7630_A

Test parameters

Temperature:	Room
Frequency range:	5 – 530 Hz
Constant acceleration:	20,0 m/sec
Brushing speed:	0,75 Octaves/min.
Vibration length:	2 hours per axis

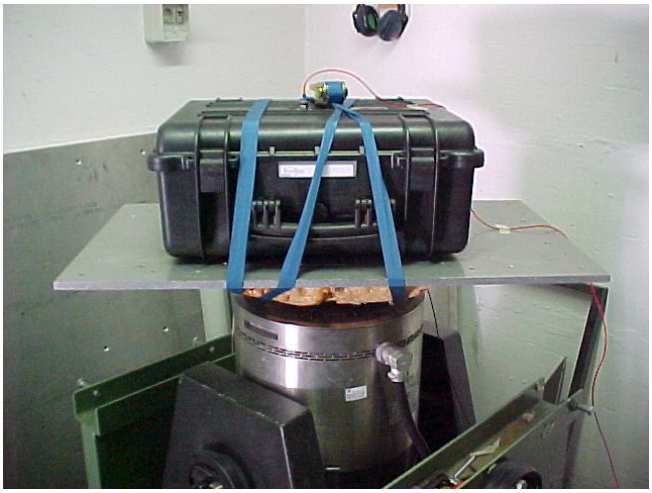


Photo 7 *Vibration test on sample 4280_A Test layout*

No decay was noticed on the samples submitted to test (ref. Test report No. TRP_104_02).

3.2 Establishing the IP degree IP

The tests were carried out at the Laboratory of Firenze Tecnologia – CE.TA.CE. on the following samples:

- 4820_B
- 7630_B

Photo 8 *Immersion test IP67*

Photo 9 *Dust intrusion test IP67*

The test has proved the conformity with the IP 67 degree for both samples (ref. Test report No. TRP_100_02 and Test report No. TRP_101_02).

3.3 Vertical Impact Test)

The tests were carried out on the following samples:

- 3818_A
- 4820_C
- 5822_B
- 5833_B
- 7630_C

Every sample was made heavy with metal masses as indicated by the Client. The masses were located inside the samples by using the polymeric material supplied with the samples (Photo 10).

Photo 10 *Test mass placement*

The mass value is indicated in the table here below:

Sample	Mass	Drop height
3818_A	20 kg	1000 mm
4820_C		1000 mm
5822_B	30 kg	750 mm
5833_B		750 mm
7630_C		750 mm

Samples were positioned on the mobile surface of the drop tester and left drop on a flat and smooth concrete floor (Photo 11).

Photo 11 *Test lay-out*

The samples submitted to the test did not reveal any decay or malfunctioning of the mobile or connected parts.

It has to be emphasized that the samples 3818A, 4820C and 5822B were submitted to the transparent label holder detachment (Photo 12). The opening of the cover securing tongues occurred on sample 3818A.

Photo 12 *Label detachment, sample 3818A*

3.4 Horizontal Impact Test)

The test were carried out on the following samples:

- 3818_A
- 4820_C
- 5822_B
- 5833_B
- 7630_C

The test was conducted by using the same test equipment as for the vertical impact test.
Samples were positioned at a drop height such as to achieve, on the impact, a sample speed of 2.5 m/s, as reported:

$$v = \sqrt{2 * g * h} \Rightarrow h = \frac{v^2}{2 * g}$$

Every sample was made heavy with metal masses as indicated by the Client. The masses were located inside the samples by using the polymeric material supplied with the samples (Photo 10).

The mass value is the same as that of the vertical impact test.
At the end of the tests, no irregularity was noticed on the samples.

3.5 Dry heat test e Low temperature test

The test was carried out on the following tests:

- 4820_D
- 4820_E
- 4820_F
- 7630_D
- 7630_E
- 7630_F

The samples were put into the climatic chamber (Photo 13) and submitted to two subsequent conditioning cycles. The length of the two cycles was in compliance with the requirements of the standard Defence Standard 81-41 (part 3)/ISSUE 4 of 28-06-1991 while the reference temperatures were established by the Client increasing the test criticality.

Photo 13 *Climatic conditioning*

Test parameters

Low temperature test:

temperature:	- 25 °C
length of time:	168 hours
humidity:	not checked

Dry heat test:

temperature:	80 °C
length of time:	48 hours
humidity:	max 75%

At the end of the test, the samples did not show any deformation or breakage. The only trouble occurred was the detachment of the logo Explorer, stuck on the top cover, from all the samples submitted to test.

A piece of the material, of which the internal moldable padding is made, was put inside the sample 7630_F in order to estimate its behavior. At the end of the conditioning, the material did not show any appreciable mark of decay or deformation.

3.5 Vertical Impact Test and Horizontal Impact Test)

The tests were carried out on the following samples:

- 4820_D
- 4820_E
- 7630_D
- 7630_E

The tests were repeated after the heat conditioning according to the procedure described at paragraphs 3.3 and 3.4 of this report. The samples submitted to test were without the label with the I Explorer log, that had came off during the climatic conditioning.

No sample broken or with decays.

3.6 Establishing the IP degree

The tests were repeated after the heat conditioning at the laboratory of Firenze Tecnologia – CE.TA.CE. on sample 7630_F.

The test has proven its conformity with the IP 67 degree (ref. Test report No. TRP_121_02).

3.7 Storage Test

The tests were carried out on the following samples:

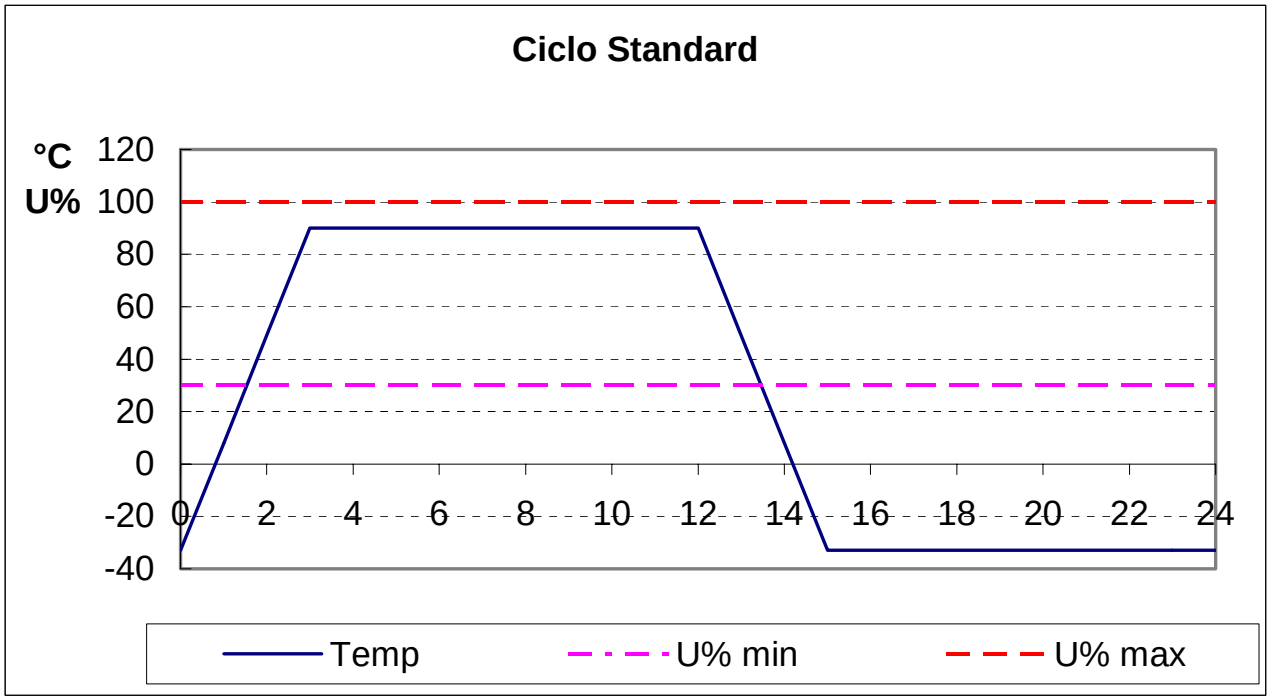
- 4820_G
- 4820_H
- 4820_I
- 7630_G
- 7630_H
- 7630_I

The heat conditioning was carried out in climatic chamber:

Test parameters

No. of cycles:	28
Cycle length	24 h
Maximum temperature:	90 °C
Minimum temperature:	-33 °C
Maximum relative humidity:	100 %
Minimum relative humidity:	30 %

The graph here below shows the programmed temperature and humidity percentage trend of any single conditioning cycle. The humidity percentage was let change to the random law during the 9 hours when the climatic chamber was at the steady at 90 °C.



At the end of the test no dimensional variation or decay of the sample looking was noticed. Instead the formation of oxide was noticed on all the lock pins of the fasteners, handles and hinges present between the two half-cases (Photos 14 and Photo 15).

Photo 14 *Handle pin oxidation*

Photo 15 *Closing pin oxidation*

The following troubles were moreover noticed on the samples:

- Detachment of the adhesive label with Explorer logo from its seat on the suitcase covers submitted to test. The label did not suffer any alteration visible with naked eye (Photo 16)
- Water steam seepage into the samples 4820_G, 4820_H and 7630_G due to the gasket shrinkage with consequent separation of the two edges in the sticking point (Photo 17 and

Photo 18)

Photo 16 *Label after the storage test*

Photo 17 *Sample 4820 G – limestone deposit after water steam evaporation*

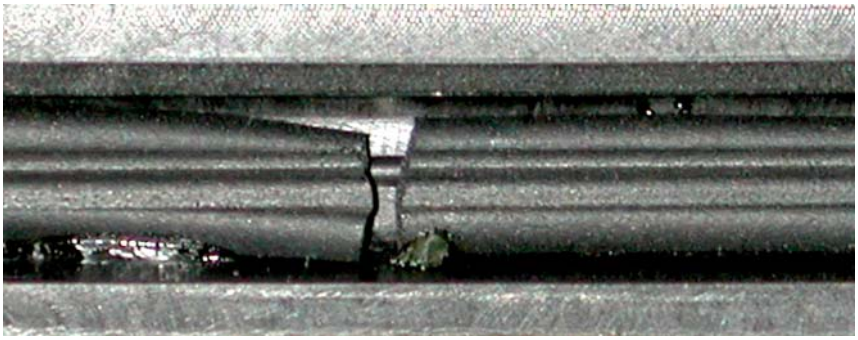


Photo 18 *Sample 4820 G – Detail of the separation of the two gasket edges*

4.0 Table of test methods and equipment

Test type	**Instrument**	**Calibration**
Impact tests	Drop tower LANSMONT CORPORATION PDT-56	---
Climatic conditioning tests	Climatic chamber ANGELANTONI CH 1200	Calibration certificate of 2001-04-20