

[logo] ATH Akademia Techniczno- Humanistyczna w Bielsku-Białej [University of Bielsko-Biała] [logo] LAB-A	Faculty of Mechanical Engineering and Computer Science LABORATORY MODULE A Willowa 2, 43-309 Bielsko-Biała Tel: +48 338279(248,381) E-mail: dzwbm@ath.bielsko.pl, juma@ath.bielsko.pl
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REPORT

Number: LAB-A/1/2018

Date: 8.01.2018

Subject of testing: Test of the terminal shockproof protection efficiency.

Ordered by: DRIM ROBOTICS sp. z o.o.
ul. Szkolna 39
43-502 Czechowice-Dziedzice

Order		Test	
Order number	Date	Start	End
LAB-A/1/2018	04.01.2018	04.01.2018	08.01.2018

Laboratory Manager: prof. ATH dr hab. inż Jerzy Madej [illegible signature]

Test performed by: prof. ATH dr hab. inż Jerzy Madej [illegible signature]
mgr inż. Mateusz Śliwka [illegible signature]

Report drafted by: prof. ATH dr hab. inż Jerzy Madej [illegible signature]

The Report comprises: 5 pages



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1. DESCRIPTION AND DESIGNATION OF SAMPLES

Name: Terminal protected with a shockproof cover

The subject of the test was a single terminal protected with a shockproof cover, assuming that the weight of the terminal does not exceed 3 kg (Fig. 1).

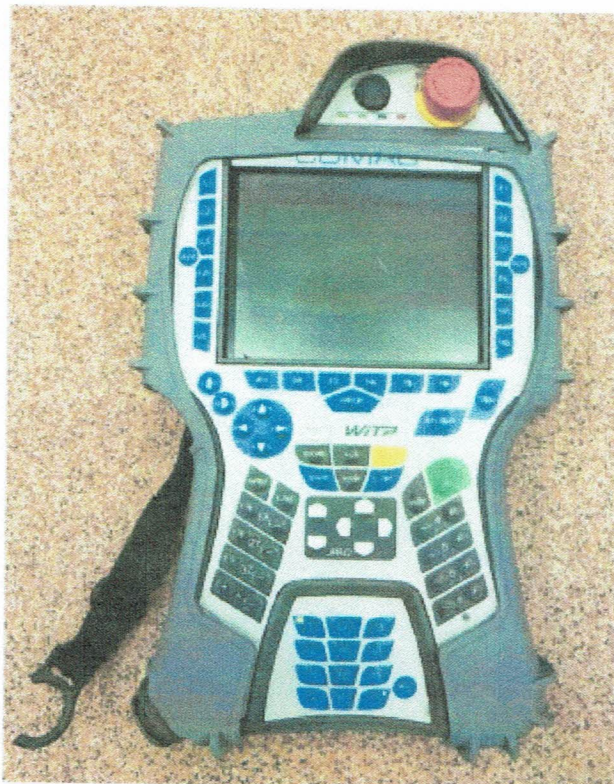


Fig. 1

Number of tests: 3

Applied method: Static and dynamic compression test with an MTS servo-hydraulic machine.

2. OBJECTIVE AND SCOPE OF TESTING

Test objective: Testing the efficiency of the shockproof cover protecting the terminal while dropped on the floor from different heights.

Method of conducting: as instructed by the Client.

3. TEST DESCRIPTION

Applied testing device:

The tests were conducted on a testing stand with an MTS servo-hydraulic machine with 150 mm stroke and 25 kN maximum load, equipped with a universal adapter for flat samples (Fig. 2-3). The servomotor was operated with displacement signal at the speed of 0.05m/s as per the proprietary procedure developed in the MTS Test Suit software. The load procedure



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was set in such a manner that upon exceeding the set load level reflecting the calculated force the servomotor was immediately stopped. Due to the high speed of loading and the inertia of the measuring system, the servomotor was always stopped at a slightly higher force value.

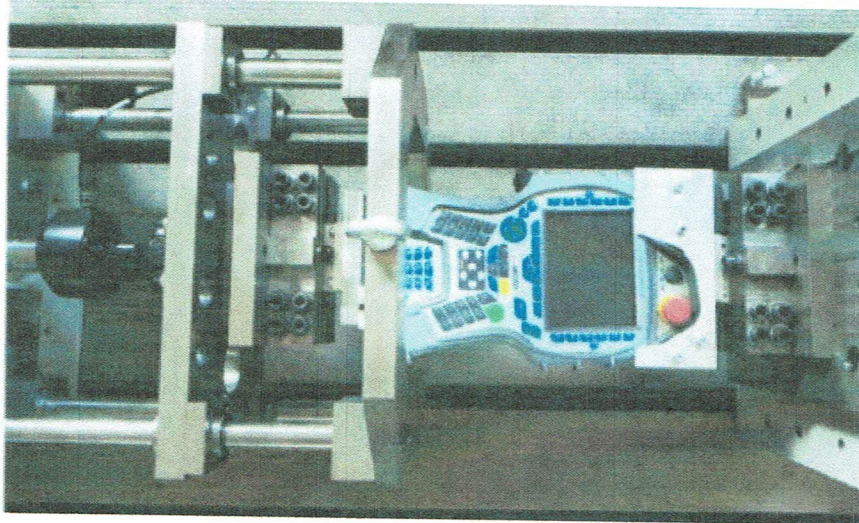


Fig. 2

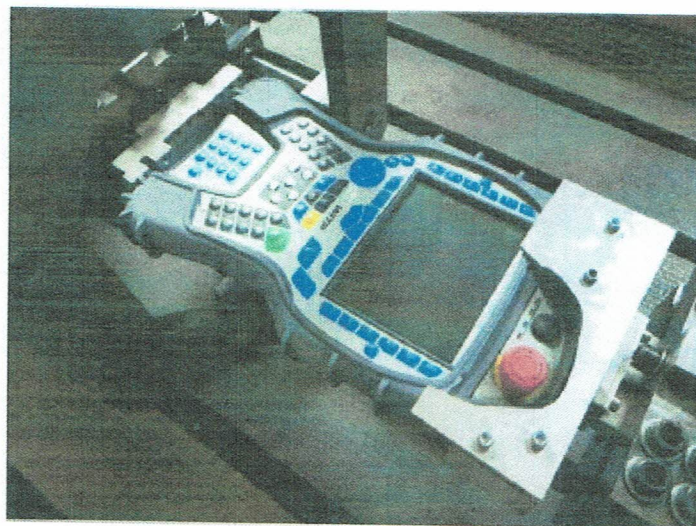


Fig. 3

The impact force was assumed based on the assumption that it reflects the impact force affecting the terminal while dropped from the height of 1.2, 1.5 and 1.8m. The force was calculated based on the energy conservation law, according to the following formula:

$$F = \sqrt{k2mgh}$$

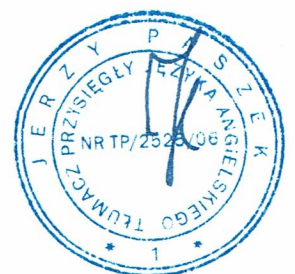
where k – stiffness modulus of the tested object determined in the static compression test with the speed of 5mm/min (40000N/m),

m – mass of object (3kg),

g – standard gravity ($9.81\text{m/s}^2 \approx 10 \text{m/s}^2$)

h – drop height (1.2m, 1.5m, 1.8m)

The estimated force values depending on the drop height are presented in table 1.



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$h[m]$	$F[kN]$
1.2	1.697
1.5	1.897
1.8	2.078
2.8	2.592

Tab. 1

4. TEST FINDINGS

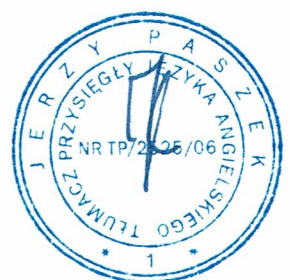
The test findings are presented in the table and in Annex 1, which is a report generated by Test Suit software.

No.	Force $F[kN]$	Displacement $\Delta x[mm]$	which reflects $h[m]$	Notes
P1	-1.70	-7.75	1.2	no damage
P2	-1.91	-8.15	1.5	no damage
P3	-2.17	-8.94	1.8	no damage
P4	-2.62	-9.20	2.8	no damage

5. CONCLUSIONS

Summing up the test findings it may be stated that no of the applied loads caused visible mechanical damage of the terminal casing, even with a force simulating a drop from 2.8m, which proves the efficiency of the shockproof protection. However, it should be emphasized that while calculating the force affecting the flexibility of the floor and the elastic properties of the shock absorbing carpeting were not taken into account.

Annex No. 1



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2018-01-08
Test Run 08-01_2018.xlsx

Project Name
User Name
Test Name
Test Run Date

Project Terminal
DRIM ROBOTICS
Test Terminala
1/8/2018 8:29:4

Test Run Results:

Name	F[kN]	Δ[mm]
P1	-1,70	-7,75
P2	-1,92	-8,15
P3	-2,17	-8,94
P4	2,62	9,20

Test Run Comments:

No terminal damage was observed.

End of translation

I, the undersigned Jerzy Paszek, Sworn English Translator TP/2525/06, authorized by the Minister of Justice, hereby certify the foregoing text to be true and faithful translation from Polish into English. Issued on January 18th, 2018 and registered under the Register No. 192/2018.

Witness my hand and official seal

