



Banc National d'Epreuve
Saint-Etienne

TEST REPORT N° 378-EN/20/BNE

on December 15th, 2020

DELIVERED TO :

INDUSTEEL FRANCE, site du Creusot

56 rue Clémenceau

71201 LE CREUSOT Cedex - FRANCE

PURPOSE : Validation of the protection level of armor plates according to the customer's specification dated on November 24th, 2020.

TESTED SAMPLE(S): MARS 500 thickness 4.0mm

TESTING DATE : December 2nd, 2020

Publication : INDUSTRIEL FRANCE – 2 copies

This test report certifies only to characteristics of the sample subjected to the tests and does not prejudge characteristics of similar products. It does not thus constitute a certification of product in the sense of the article L115-27 of the code of the consumption and the law of June 3rd, 1994.

In order to notify the conformity or non-conformity to the requirements, the uncertainty of the test results has not been explicitly taken into account.

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** Data marked by an asterisk are provided by the customer and couldn't be verified during testing)*

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TESTED SAMPLE(S)

Three samples are supplied by the customer.

Sample number *	226086T01	226086T02	226086T03
Grade *	MARS 500	MARS 500	MARS 500
Cast *	F6778	F6778	F6778
Nominal thickness (mm) *	4.0	4.0	4.0
Real thickness (mm)	4.2	4.2	4.2
Size (mm)	502x503	502x501	502x501
Hardness (HB) *	477	477	477

TESTING CONDITIONS

	December 2nd, 2020
Shooting range temperature (°C)	16.6
Shooting range humidity (% RH)	40

Used equipment

Climatic enclosure: air conditioned room

Target frame: BLINDAGE ETBS

Velocity measurement: Radar DOPPLER BR1001 M-VIT-11

Carriage: PROTOTYPA STZA 13 n° 54

Test barrel caliber:

7.62x39 n° SAX-1

Ammunition caliber:

7.62x39 PS-BALL batch n° A22-18

Implementation

According to the customer's specification dated on November 24th, 2020, VPAM PM 2007 and VPAM APR 2006, level 6.

The sample is tested at an angle of 0° NATO.

A nominal 0.5mm thick 2024 T3 Aluminum alloy sheet was placed at a standoff distance of 150mm behind and parallel to the rear surface of the target. The distance from the muzzle to the target is indicated in the results sheet.

TESTING RESULTS

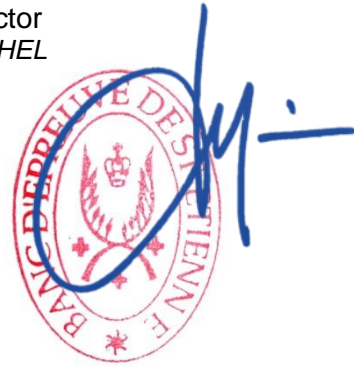
See the enclosed results sheets n° 30750 to 30752.

CONCLUSION

The samples supplied by INDUSTRIEL CREUSOT FRANCE have been submitted to the ballistic testing according to the customer's specification.

Each of the three steel panels withstood 3 impacts in triangle shooting pattern of 120mm and also 3 multi hit impacts of the threat of the level PM6 at ambient temperature.

The director
JM BERTHEL





Test were carried out in accordance with standard Standard : VPAM PM 2007

Remarks :

Individual target(s)			
N°	BNE Ref.	Customer Ref.	Customer composition
1	RBM-20-2743	226086T01	MARS 500

N°	Weight (kg)	Width (mm)	Length (mm)	Nominal THK (mm)	Real THK (mm)	Cast n°	Hardness/ Grade (HB)	Conditioning		
								Temp (°C)	RH (%)	Time (h)
1	8,176	502	503	4	4,2	F6778	477			

Shooting range N° : 2

Witness sheet : 2024 T3 0,5mm

Shooting range humidity : 40,0 %HR

Shooting range temperature : 16,6 °C

Inspection, Measuring and Test Equipment

Scale(s) : M-BAL-02 (R1), M-BAL-03 (12kg)

Carriage(s) : PROTOTYPA STZA 13 N° 54

Climatic Enclosure(s) : Air conditioned room

Target frame(s) : BLINDAGE ETBS

Additional metrology : M-THR-22, M-RAP-02, M-MEX-16, M-TEL-11, M-REG-18

Velocity measuring equipment(s) : RADAR BR1001 M-VIT-11

Attending person(s) :

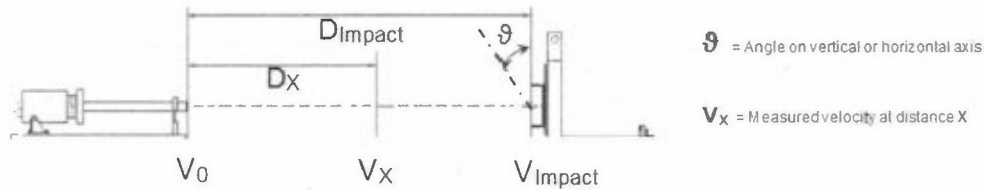
Technician(s) : M. LUCETTE / M. BONNET





Impact resistance testing

Calibre	Barrel N°	Barrel length	Rifle No	Twiste rate	Velocity measurement distance Dx (m)	Impact distance D _{Impact} (m)
7,62 X 39	SAX-1	650	4	240	7,5	10



N°	Serie	Shot	Calibre	Projectile type	Batch	Incidence	V _{7.5} (m/s)	Protection	Remarks
1	1	1	7,62 X 39	PS BALL	A22-18	0°	728,3	YES	PP / Distance between impacts 1-2: 115 mm
		2	7,62 X 39	PS BALL	A22-18	0°	725,3	YES	PP / Distance between impacts 2-3: 113 mm
		3	7,62 X 39	PS BALL	A22-18	0°	729,2	YES	PP / Distance between impacts 3-1: 108 mm
		4	7,62 X 39	PS BALL	A22-18	0°	712,2	YES	PP / Distance between impacts 4-5: 25 mm
		5	7,62 X 39	PS BALL	A22-18	0°	725,9	YES	PP / Distance between impacts 5-6: 30 mm
		6	7,62 X 39	PS BALL	A22-18	0°	703,9	YES	PP / Unfair hit: too low velocity / Distance between impacts 6-4: 30 mm
		7	7,62 X 39	PS BALL	A22-18	0°	730,6	NO	CP / Unfair hit : distance / Distance between impacts 5-7: 12 mm
		8	7,62 X 39	PS BALL	A22-18	0°	726,2	NO	CP / Unfair hit: distance Distance between impacts 5-8: 19 mm Distance between impacts 5-8: no measurable
		9	7,62 X 39	PS BALL	A22-18	0°	717,5	YES	PP / Distance between impacts 9-10: 26 mm
		10	7,62 X 39	PS BALL	A22-18	0°	729,5	YES	PP / Distance between impacts 10-11: 24 mm
		11	7,62 X 39	PS BALL	A22-18	0°	725,9	YES	PP / Distance between impacts 11-9: 17 mm



Test were carried out in accordance with standard Standard : VPAM PM 2007

Remarks :

Individual target(s)			
N°	BNE Ref.	Customer Ref.	Customer composition
1	RBM-20-2744	226086T02	MARS 500

N°	Weight (kg)	Width (mm)	Length (mm)	Nominal THK (mm)	Real THK (mm)	Cast n°	Hardness/ Grade (HB)	Conditioning		
								Temp (°C)	RH (%)	Time (h)
1	8,116	502	501	4	4,2	F6778	477			

Shooting range N° : 2

Witness sheet : 2024 T3 0,5mm

Shooting range humidity : 40,0 %HR

Shooting range temperature : 16,6 °C

Inspection, Measuring and Test Equipment

Scale(s) : M-BAL-02 (R1), M-BAL-03 (12kg)

Carriage(s) : PROTOTYPA STZA 13 N° 54

Climatic Enclosure(s) : Air conditioned room

Target frame(s) : BLINDAGE ETBS

Additional metrology : M-THR-22, M-RAP-02, M-MEX-16, M-TEL-11, M-REG-18

Velocity measuring equipment(s) : RADAR BR1001 M-VIT-11

Attending person(s) :

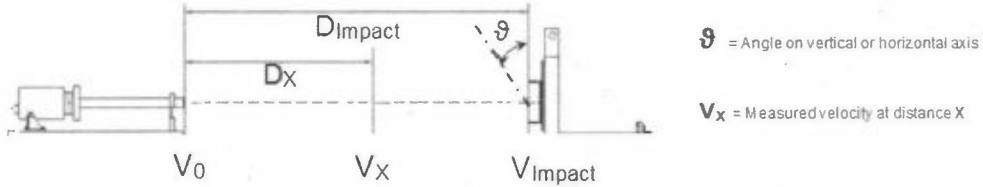
Technician(s) : M. LUCETTE / M. BONNET






Impact resistance testing

Calibre	Barrel N°	Barrel length	Rifle No	Twiste rate	Velocity measurement distance D _x (m)	Impact distance D _{Impact} (m)
7,62 X 39	SAX-1	650	1	240	7,5	10



N°	Serie	Shot	Calibre	Projectile type	Batch	Incidence	V _{7,5} (m/s)	Protection	Remarks
1	1	1	7,62 X 39	PS BALL	A22-18	0°	728,8	YES	PP / Distance between impacts 1-2: 120 mm
		2	7,62 X 39	PS BALL	A22-18	0°	724,2	YES	PP / Distance between impacts 2-3: 114 mm
		3	7,62 X 39	PS BALL	A22-18	0°	722,9	YES	PP / Distance between impacts 3-1: 119 mm
		4	7,62 X 39	PS BALL	A22-18	0°	725,2	YES	PP / Distance between impacts 4-5: 19 mm
		5	7,62 X 39	PS BALL	A22-18	0°	727,2	YES	PP / Distance between impacts 5-6: 32 mm
		6	7,62 X 39	PS BALL	A22-18	0°	712,4	YES	PP / Distance between impacts 6-4: 24 mm



Test were carried out in accordance with standard Standard : VPAM PM 2007

Remarks :

Individual target(s)			
N°	BNE Ref.	Customer Ref.	Customer composition
1	RBM-20-2745	226086T03	MARS 500

N°	Weight (kg)	Width (mm)	Length (mm)	Nominal THK (mm)	Real THK (mm)	Cast n°	Hardness/ Grade (HB)	Conditioning		
								Temp (°C)	RH (%)	Time (h)
1	8,104	502	501	4	4,2	F6778	477			

Shooting range N° : 2

Witness sheet : 2024 T3 0,5mm

Shooting range humidity : 40,0 %HR

Shooting range temperature : 16,6 °C

Inspection, Measuring and Test Equipment

Scale(s) : M-BAL-02 (R1), M-BAL-03 (12kg)

Carriage(s) : PROTOTYPA STZA 13 N° 54

Climatic Enclosure(s) : Air conditioned room

Target frame(s) : BLINDAGE ETBS

Additional metrology : M-THR-22, M-RAP-02, M-MEX-16, M-TEL-11, M-REG-18

Velocity measuring equipment(s) : RADAR BR1001 M-VIT-11

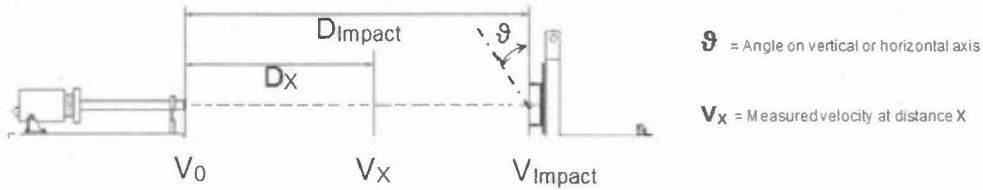
Attending person(s) :

Technician(s) : M. LUCETTE / M. BONNET



Impact resistance testing

Calibre	Barrel N°	Barrel length	Rifle No	Twiste rate	Velocity measurement distance D _x (m)	Impact distance D _{Impact} (m)
7,62 X 39	SAX-1	650	4	240	7,5	10



N°	Serie	Shot	Calibre	Projectile type	Batch	Incidence	V _{7,5} (m/s)	Protection	Remarks
1	1	1	7,62 X 39	PS BALL	A22-18	0°	730,4	YES	PP / Distance between impacts 1-2: 118 mm
		2	7,62 X 39	PS BALL	A22-18	0°	727,9	YES	PP / Distance between impacts 2-3: 121 mm
		3	7,62 X 39	PS BALL	A22-18	0°	721,6	YES	PP / Distance between impacts 3-1: 130 mm
		4	7,62 X 39	PS BALL	A22-18	0°	720,3	YES	PP / Distance between impacts 4-5: 21 mm
		5	7,62 X 39	PS BALL	A22-18	0°	713,1	YES	PP / Distance between impacts 5-6: 28 mm
		6	7,62 X 39	PS BALL	A22-18	0°	711,6	YES	PP / Distance between impacts 6-4: 31 mm