



Return address: Postbus 45 2280 AA Rijswijk

Lange Kleiweg 137  
Postbus 45  
2280 AA Rijswijk

www.tno.nl

T +31 88 866 8000  
info-DenV@tno.nlLaboratory for Ballistics  
Research (LBR)Visiting address:  
Ypenburgse Boslaan 2  
2496 ZA Den Haag

# Test report

19REP0233

Experiment according to **EN 1522/1523**  
Class **FB6**Assignor Arcelor Mittal  
56 rue Clemenceau BP19  
71201 Le Creusot  
France

Contact Mr. Francois Verget

Sample references 147783T01 and 147783T04

**TNO project no**  
060.37883/01.17.01**Date**  
13-06-2019**Reference**  
19OD147**Contact**  
J.P.F. Broos**E-mail**  
hans.broos@tno.nl**Direct phone no**  
+31 8886 61436

The Standard Conditions for Research Instructions given to TNO, as filed at the Registry of the District Court and the Chamber of Commerce in The Hague shall apply to all instructions given to TNO.

## Summary

The samples have been tested with three shots (120mm triangle) of each threat specified in the ballistic requirements of 'EN 1522/1523' level 'FB6 NS'.

All impacts partial penetrated the samples and no splinters were detected on the rear side (NS).

The tested material was not a complete construction. Normally the tests in areas 2 and 3 (see description of test method) also have to be performed to complete the requirements.

J.P.F. Broos  
Project leader

Test report number 19REP0233  
Assignor Arcelor Mittal

### Description test method

Establishing the ballistic protection of windows, doors, shutters and blinds according to the requirements specified in the NEN-EN 1522/1523 "Windows, doors, shutters and blinds - Bullet resistance - Requirements and classification"/"Test method". The ballistic impact experiments are performed with a bullet for the desired protection level as described in the standard. Three areas should be tested; 1. Armored and re-enforced areas, 2. Transition / connection between frame and solid or moving sub-frame, 3. Parts like handle's, lock's, and their connection, weld's, etc. The mutual distance between the consecutive points of impact is 120 mm. If no complete penetrations occur but splinters are released at the rear face of the test panel, this is marked as S (Splinters) behind the protection level in the test results. If not, this is marked as NS (No Splinters).

### Experiment specifications

Experiment No. : 19MB01823  
Experiment date : 11-06-2019  
Witness system : Aluminium foil 0.02mm

### Conditioning of sample materials

Conditioning temperature : 18 °C ± 5 °C  
  
Minimum conditioning time : 24 hrs.

### Results

19SC01784 EN 1522/1523 - FB6 - 5.56x45 mm SS109 LP (DM11) (MEN)				
Shot	Valid	Impact velocity [m/s]	Splinters	Result PP/CP *)
KKW1 19SN03264	Yes	943	NS	PP
KKW1 19SN03265	Yes	949	NS	PP
KKW1 19SN03266	Yes	947	NS	PP

\*) PP: Partial Penetration CP: Complete Penetration

### Sample composition specifications

TNO Sample composition No. : 19SC01784

Layer	TNO Sample No.	Customer Sample reference
1	19SA02239	147783T01

### Sample specifications

TNO Sample No.	Customer reference	Arrival	Size	Avg. thick.	Weight	Areal density
19SA02239	147783T01	11-04-2019	915 x 305 mm	6.5 mm	14535 g	52.1kg/m2
*) Heat Nr. F4221 Packet Nr. DN087						

\*All specification of the materials are provided by the assignor

Test report number 19REP0233  
Assignor Arcelor Mittal

**Test specifications**

Experimental facility : TNO, LBR, Small Calibre Firing Range KKW 1  
- Ambient temperature : 20 °C  
- Ambient Relative Humidity : 54 %Rh

**Ballistic specifications**

Weapon : SVB-4 (KKW 1)  
- Barrel length : 655 mm  
- Rifling twist : 1 : 178 mm  
Projectile : 5.56x45 mm SS109 LP (DM11) (MEN)  
- Weight : 4 g  
- Calibre : 5.56 mm  
- Manufacturer : Metallwerk Elisenhutte Gmbh  
Shooting distance : 10 m

Test report number 19REP0233  
Assignor Arcelor Mittal

**Pictures**

*Strike Face sample 19SA02239 after test 19MB01823*



*Back Face sample 19SA02239 after test 19MB01823*

Test report number 19REP0233  
Assignor Arcelor Mittal

**Experiment specifications**

Experiment No. : 19MB01824  
Experiment date : 13-06-2019  
Witness system : Aluminium foil 0.02mm

**Conditioning of sample materials**

Conditioning temperature : 18 °C ± 5 °C  
  
Minimum conditioning time : 24 hrs.

**Results**

19SC01785 EN 1522/1523 - FB6 - 7.62x51 mm Ball DM111 (M80)				
Shot	Valid	Impact velocity [m/s]	Splinters	Result PP/CP *)
KKW1 19SN03312	Yes	837	NS	PP
KKW1 19SN03313	Yes	832	NS	PP
KKW1 19SN03314	Yes	825	NS	PP

\*) PP: Partial Penetration CP: Complete Penetration

**Sample composition specifications**

TNO Sample composition No. : 19SC01785

Layer	TNO Sample No.	Customer Sample reference
1	19SA02240	147783T04

**Sample specifications**

TNO Sample No.	Customer reference	Arrival	Size	Avg. thick.	Weight	Areal density
19SA02240	147783T04	11-04-2019	915 x 305 mm	6.5 mm	14640 g	52.5kg/m2
*) Heat Nr. F4221 Packet Nr. DN933						

\*All specification of the materials are provided by the assignor

Test report number 19REP0233  
Assignor Arcelor Mittal

**Test specifications**

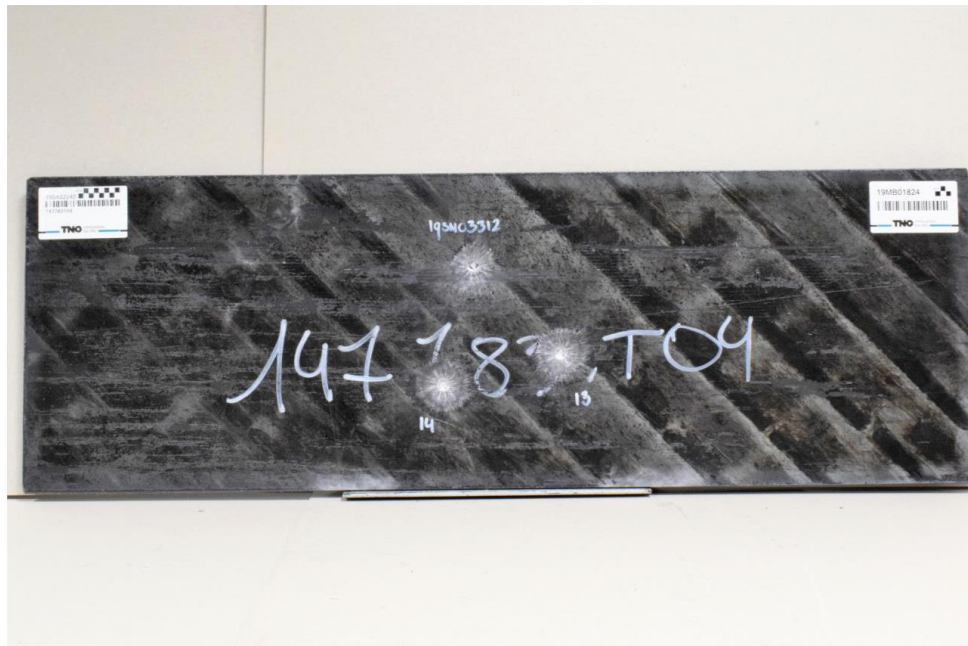
Experimental facility : TNO, LBR, Small Calibre Firing Range KKW 1  
- Ambient temperature : 19 °C  
- Ambient Relative Humidity : 59 %Rh

**Ballistic specifications**

Weapon : SVB-4 (KKW 1)  
- Barrel length : 650 mm  
- Rifling twist : 1 : 254 mm  
Projectile : 7.62x51 mm Ball DM111 (M80)  
- Weight : 9.55 g  
- Calibre : 7.62 mm  
- Manufacturer : Metallwerk Elisenhutte Gmbh  
Shooting distance : 10 m

Test report number 19REP0233  
Assignor Arcelor Mittal

### Pictures



*Strike Face sample 19SA02240 after test 19MB01824*



*Back Face sample 19SA02240 after test 19MB01824*