DATA SHEET

hy-vin© VR78900

Description	Rigid PVC Extrusion Compound
Colour	White & Opaque Colours
Application	General Purpose Profiles for Internal and External Use
Characteristics	High impact. Enhanced flame retardant properties.
Form	Pellets

TYPICAL PROPERTIES

	Test Method	Units	Value
General Properties			
Density (varies with colour)	EN ISO 1183-1A	kg/m^3	1430
Vicat softening point	EN ISO 306 B50	°C	79.0
Mechanical properties			
Tensile Stress at Yield (50mm/min)	EN ISO 527-1	MPa	42
Tensile Strain at Break (50mm/min)	EN ISO 527-1	%	20
Izod Impact Strength (23°C)	EN ISO 180/A	kJ/m^2	57
Other Properties			
Thermal stability (180°C)	EN ISO 182-1	min	150
Oxygen Index Value	EN ISO 4589-2	%	46

Issue 3 August 2022

INEOS Compounds Aycliffe Limited
School Aycliffe Lane
Newton Aycliffe
Co. Durham DL5 6EA
United Kingdom
Tel: +44 (0) 1325 300555
Fax: +44 (0) 1325 303001

INEOS Compounds Sins, Switzerland
INEOS Compounds Switzerland AG
Industrie Nord 2
CH-5643 Sins
Switzerland
Tel: +41 41 78 98 200
Fax: +44 41 78 98 234

INEOS Compounds Helsingborg, Sweden
INEOS Compounds Sweden AB
Gevärsgatan 4
SE-254 66 Helsingborg
Sweden
Tel: +46 42 250 200
Fax: +46 42 250 280

INEOS Compounds
www.ineos.com

GRADUS

Gradus Ltd
Park Green
Macclesfield, Cheshire
SK11 7LZ UK
Tel: 01625 428922
www.gradus.com

Date : 11/03/2020

Subject : Impact strength of Gradus Extruded Profiles

Gradus wish to confirm that each of the following profiles are all extruded using the same PVC formulation, a proprietary grade of material known as VR789:

WGS125
WGA100
D200
CHR160
CHR110
CGH5090
CGH7590
CGS5090

Given that each of the profiles listed above also share the same nominal thickness, 2mm, the impact test result for one of these profiles is representative of the impact strength which would be seen on each of the other profiles when tested to the same test method.

It is Gradus' belief that the impact strength reported in the 'Falling Dart test according to EN 6603-2 of the WGS200' as tested in May 2017 is representative of ongoing production of WGS200 profiles as well as each of those other profiles listed above.

This is for your kind information.

Kind regards,

Ciaran Duffy

Process Technician

Dart Impact Testing of Two Materials to EN ISO 6603-1

Report Reference: 13208A

Prepared for: Ciaran Duffy

Gradus Limited,
Chapel Mill,
Park Green,
Macclesfield,
Cheshire
SK11 7LZ

G Howe
16/06/2017

Independent Polymer Technology Limited
Unit F4, Halesfield 23, Telford, Shropshire, TF7 4NY.
Tel: 01952 588 591 www.ipolytech.com
Company Limited in England and Wales No: 4627765

DART IMPACT TESTING OF TWO MATERIALS TO EN ISO 6603-1

1. INTRODUCTION

Gradus Ltd requested the dart impact resistance of two PVC sheet materials be assessed to EN ISO 6603-1.

There are various options within the standard. For example, whether samples are clamped or unclamped and whether impact energy is varied using a constant weight from different drop heights or a variable weight from a fixed drop height. Testing was conducted with the samples clamped and the impact energy varied by drop height.

2. SAMPLES

Sample plaques of nominal dimension 75mm x 75mm were received at ipolytech 30th May 2017, designated as follows:

30 off plaques - Endure (Purple) – approx. 1.8 mm thick
30 off plaques - Design(Wood) – approx. 2.0mm thick

The plaques had a textured and smooth surface and it was confirmed with the client that impact would be applied to the textured surface.

Any of this material remaining after testing will be stored for 6 months from the date of this report prior to disposal unless other instructions are received from Gradus Limited.

3. EXPERIMENTAL

Each material was tested in accordance with EN ISO 6603-1- Method A at a test temperature of 23±2°C. All samples were tested clamped over a 40mm diameter orifice. Impacts were performed with a non-lubricated, 20mm diameter, hemispherical tipped, striker. A constant striker mass of 5.154 kg was used.

Incremental changes in energy were achieved by using a constant mass and changing the height from which the striker was dropped. The approximate impact strength was determined during a pre-test phase and the step height used during testing set to produce approximately a 5% change in impact energy.

Step heights of 25 mm were used for the Design samples and 15 mm for the Endure samples

20 test pieces were impacted and the 50% impact-failure energy (E_{50}) calculated as per ISO 6603-1.

4. RESULTS

The test data is presented in Appendix I. This is summarised as the E_{50} values in Table 1 below:

Sample	Average Thickness (mm)	Impact Failure Energy E50 (J)
Endure	1.85	15
Design	1.90	40

Table 1. 50% Impact Failure Energy

Appendix I Test data

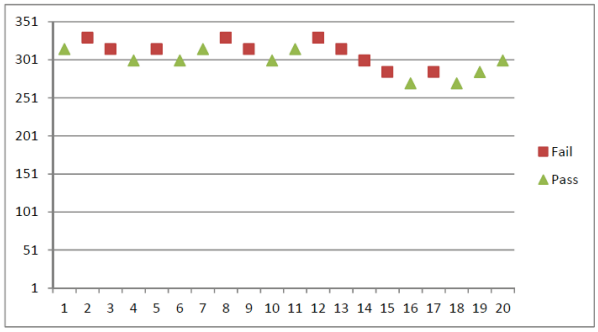
Endure (Purple)

Sample	t1	t2	t3		Tav		Energy J		Pass/fail
9	1.859	1.878	1.863		1.87	315.00	15.910		Pass
10	1.849	1.852	1.852		1.85	330.00	16.668	shatter	Fail
11	1.853	1.84	1.846		1.85	315.00	15.910	shatter	Fail
12	1.857	1.866	1.854		1.86	300.00	15.153		Pass
13	1.857	1.869	1.868		1.86	315.00	15.910	shatter	Fail
14	1.859	1.872	1.861		1.86	300.00	15.153		Pass
15	1.842	1.85	1.839		1.84	315.00	15.910		Pass
16	1.866	1.85	1.862		1.86	330.00	16.668	shatter	Fail
17	1.852	1.86	1.847		1.85	315.00	15.910	shatter	Fail
18	1.851	1.856	1.848		1.85	300.00	15.153		Pass
19	1.885	1.858	1.842		1.86	315.00	15.910		Pass
20	1.875	1.877	1.854		1.87	330.00	16.668	shatter	Fail
21	1.872	1.873	1.901		1.88	315.00	15.910	shatter	Fail
22	1.816	1.806	1.815		1.81	300.00	15.153	shatter	Fail
23	1.829	1.828	1.826		1.83	285.00	14.395	shatter	Fail
24	1.852	1.864	1.866		1.86	270.00	13.637		Pass
25	1.807	1.809	1.823		1.81	285.00	14.395	shatter	Fail
26	1.872	1.857	1.869		1.87	270.00	13.637		Pass
27	1.895	1.862	1.859		1.87	285.00	14.395		Pass
28	1.85	1.863	1.869		1.86	300.00	15.153		Pass
				Average	**1.85**				

Mass	5.154
Ha	270.00
DH	15

Height	Frequency	zi	ni Zi
270	0	0	0
285	2	1	2
300	1	2	2
315	4	3	12
330	3	4	12

A=	28
N=	10
H50=	304.50
E50=	15

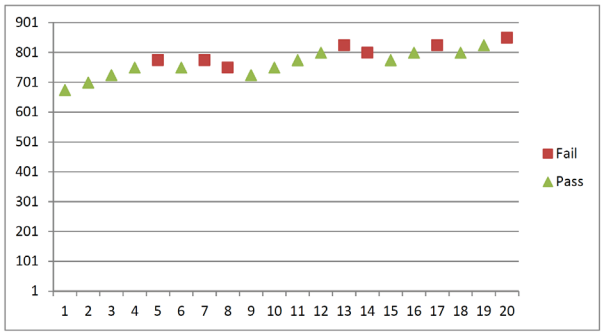


Design(Wood)

Sample	t1	t2	t3		Tav		Dart Energy J		Pass/fail
11	1.923	1.9	1.904		1.91	675.00	34.094		Pass
12	1.897	1.92	1.899		1.91	700.00	35.356		Pass
13	1.977	1.931	1.928		1.95	725.00	36.619		Pass
14	1.821	1.845	1.855		1.84	750.00	37.882		Pass
15	1.912	1.887	1.904		1.90	775.00	39.145	break	Fail
16	1.937	1.929	1.929		1.93	750.00	37.882		Pass
17	1.871	1.889	1.89		1.88	775.00	39.145	shattered	Fail
18	1.984	1.916	1.928		1.94	750.00	37.882	shattered	Fail
19	1.912	1.842	1.822		1.86	725.00	36.619		Pass
20	1.924	1.838	1.847		1.87	750.00	37.882		Pass
21	1.936	1.915	1.919		1.92	775.00	39.145		Pass
22	1.968	1.908	1.916		1.93	800.00	40.407		Pass
23	1.925	1.916	1.923		1.92	825.00	41.670	shattered	Fail
24	1.926	1.922	1.925		1.92	800.00	40.407	shattered	Fail
25	1.866	1.827	1.818		1.84	775.00	39.145		Pass
26	1.848	1.849	1.838		1.85	800.00	40.407		Pass
27	1.897	1.891	1.918		1.90	825.00	41.670	shattered	Fail
28	1.854	1.853	1.862		1.86	800.00	40.407		Pass
29	1.867	1.886	1.893		1.88	825.00	41.670		Pass
30	1.96	1.941	1.932		1.94	850.00	42.933	shattered	Fail
				Average	**1.90**				

Mass	5.154
Ha	675.00
DH	25

Height	Frequency	zi	ni Zi
675	0	0	0
700	0	1	0
725	0	2	0
750	1	3	3
775	2	4	8
800	1	5	5
825	2	6	12
850	1	7	7



A=	35
N=	7
H50=	787.50
E50=	40

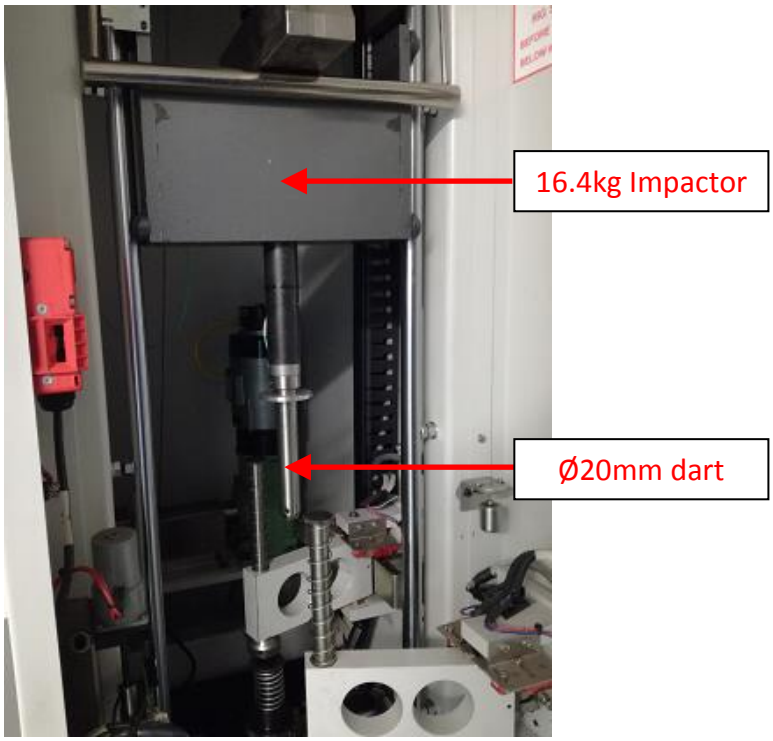
Testing Department

GRADUS

Impact Strength Assessment

Falling Dart Impact Test according to EN 6603-2

Equipment



Rosand Impact Tester fitted with Ø20mm ball-nosed dart and an impactor mass of 16.4kg

Method

The EN6603-2 standard stipulates the method for determining the energy to impact failure and this corresponds to the method implemented in the software of the Rosand impact tester. The values reported by the tester are calculated by a fully automated calculation system.

Samples

All samples tested are 75mm x 75mm plaques, have been conditioned to the ambient temperature of the test laboratory prior to test and are clamped into position using an industry standard internal Ø40mm clamping ring. At least 10 samples of each material are tested before reporting the test result.

Results

Material	Gradus SureProtect Endure
Batch	170218/028/Clay
Date Tested	12/05/2017
Pass/Fail Criteria	>15 Joules
Result	Pass

Gradus Limited Park Green Macclesfield Cheshire SK11 7LZ England UK Tel: 01625 428922 Fax: 01625 433949
For enquiries outside the UK and Eire contact Gradus International on +44 (0)1625 613780

www.gradus.com