German Plastics Center

Test report no.:	**234529-II**
Client:	ETHYDCO Egyptian Ethylene and Derivatives Company. KM36 Alexandria-Cairo Desert Road Alnahda - Amreya - Alexandria, Post Office Mubarak Housing, M.B 44, Zip Code: 23641, Alex, EGYPT
Order:	Material tests on a black coloured PE100 compound, acc. to DIN EN 1555-1 & DIN CEN/TS 1555-7
	Production plant: Alnahda - Amreya - Alexandria Brand name: Black PE 100/ADVANCENE bEEB5906AAH Material: PE100

Letter of:	2024-07-08	**Reference:**	---
Receipt of samples:	2024-05-29	**Sampling:**	---
Test period:	2024-09-19 to 2025-02-24		

This test report comprises 6 pages.

Würzburg, 26 February 2025
Bar/we

i. V.

Dr.-Ing. Marcus Heindl
Head of Testing Laboratory

Das Kunststoff-Zentrum SKZ - Testing GmbH

i. A.

Dipl.-Ing. Tobias Bauer
Project Manager Pipe Systems

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The results refer to the products tested. The scope of accreditation is available on the Internet at www.skz.de.

SKZ – Testing GmbH
Testing, Inspection, Certification
Friedrich-Bergius-Ring 22
97076 Würzburg/Germany

Managing Director
Dr. rer. nat. Thomas Hochrein
HRB 7840
Local court Würzburg/Germany

Tel. +49 931 4104-0
Fax +49 931 4104-477
testing@skz.de
www.skz.de

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-19033-01-00

1 Order

By letter of 2024-07-08 the company ETHYDCO, Egyptian Ethylene and Derivatives Company., KM36 Alexandria-Cairo Desert Road, Alnahda - Amreya - Alexandria, Post Office Mubarak Housing, M.B 44, Zip Code: 23641, Alex, EGYPT, placed an order with SKZ – Testing GmbH to carry out material tests on a black coloured PE100 compound, acc. to DIN EN 1555-1 & DIN CEN/TS 1555-7.

2 Test material

SKZ – Testing GmbH had no influence on the selection of samples and received the following test material from the client.

Sample no.	Designation	DN/OD [mm]	SDR	Colour	Quantity	Marking
1	PE100 granulate	---	---	black	1,5 kg	Black PE 100/ADVANCENE bEEB5906AAH
2	Pipe	110	11	black	4 x 1.5 m	1326331 -1 / -2 / -4 / -5
3	Pipe	32	11	black	10 x 1 m	no marking

3 Test procedure

Usually, we carry out tests according to standards for which we have an accreditation. The list of all standards for which we are accredited can be viewed as an annex to the accreditation certificate on the homepage at https://www.skz.de/en/testing/products. In case of non-accredited procedures, they are marked with *. If it is only a matter of deviating test conditions of an accredited standard, this is marked with #.

In case that a conformity assessment is issued, the general decision rule is as follows: The measurement uncertainty and the standard deviation are not taken into account. Deviations from this rule are only made at the client's request, in the case of standard specifications or other specifications about which the client is informed in each individual case.

Unless otherwise noted all tests were carried out at standard atmosphere 23/50, according to DIN EN ISO 291:2008-08 “Plastics – Standard atmospheres for conditioning and testing”, class 2.

The tests were carried out according to product standard DIN EN 1555-1:2021 and DIN EN 1555-7:2022, table 3.

4 Test results

4.1 Compound density acc. to DIN EN ISO 1183-1:2019-09, method A

Without air correction

Sample no.	Density [kg/cm³]		
	Actual value	Mean value	Set value
1	0.954 / 0.957	0.955	≥ 930

4.2 Oxidation induction time (OIT) acc. to DIN EN ISO 11357-6:2018-07

Measurement method; tangent method:

Sample no.	OIT at 210°C [min]	
	Mean value	Set value
1	> 20	≥ 20

4.3 Melt mass-flow rate (MFR) acc. to DIN EN ISO 1133-1:2022-10, method B

Sample no.	MFR at 190 °C / 5 kg [g/10 min]	
	Mean value	Set value
1	0.194	0.15 [1] ≤ MFR ≤ 1.40

[1] According to DIN EN 1555-1, table 1, footnote j (in case that welding requirements are fulfilled)

4.4 Volatile content acc. to DIN EN 12099:1997-08

Sample no.	Volatile content [mg/kg]		
	Actual value	Mean value	Set value
1	281.5 / 294.3	287.9	≤ 350

4.5 Carbon black content acc. to ISO 6964:2019-02, method A

Sample no.	Carbon black content [%]		
	Actual value	Mean value	Set value
1	2.15 / 2.17	2.16	2.0 – 2.5

4.6 Carbon black dispersion acc. to ISO 18553:2002-03

Sample no.	Appearance		Homogeneity (pigment/carbon black dispersion) [grade]	
	Dominant value	Set value	Mean value	Set value
1	A2	B	1.4	≤ 3

4.7 Resistance to gas condensate acc. to DIN EN 1555-1:2021

Sample no.	Conditioning, pipe filled with 50:50 n-Decan and 1,3,5-Trimethylbenzol		Test temperature [°C]	Hoop stress [N/mm²]	Test duration [h]	
	Temperature [°C]	Duration [h]			Actual Value	Set value
3	23	1500	80	2	> 20	≥ 20

4.8 Resistance to weathering

Not applicable for black compounds.

4.9 Resistance to rapid crack propagation (RCP-S4) acc. to DIN EN ISO 13477:2008-06

Test medium: air

Sample no.	Conditioning		Test pressure [bar]	Actual length of crack [mm]	Critical crack length [mm]	Evaluation
	Temperature [°C]	Notch [1]				
1	- 2.8	no	25.0 [3]	145	517 [2]	crack arrest
	- 2.8	yes	24.8 [3]	130	517 [2]	crack arrest
	- 2.8	yes	25.0 [3]	143	517 [2]	crack arrest

[1] A razor notch of approximately 1 mm depth, in axial direction, positioned under the point of impact on the internal surface of the pipe.
[2] Critical crack length for DN 110: Lc = 4.7 x DN
[3] Test pressure of 25 bar is the maximum permissible pressure of test equipment.

For a test temperature of 0 °C, a critical pressure p_{cS4} ≥ 25.0 bar was determined.

4.10 Resistance to slow crack growth, notched pipe test (NPT) acc. to DIN EN ISO 13479:2022-09

A test report “LC 21861” dated 2023-02-09 from Kiwa Nederland BV is available.

Free length: 580 mm
End cap: type A
Conditioning duration: 24 h

Test medium: water-in-water (NPT)

Sample no.	Test temperature [°C]	Test pressure [bar]	Residual wall thickness [mm]	Time-to-failure [h]	
				Actual value	Set value
---	80	9.2	8.2	> 500	≥ 500
---	80	9.2	8.2	> 500	≥ 500
---	80	9.2	8.2	> 500	≥ 500

4.11 Determination of the failure mode in a tensile test on a butt-fusion weld acc. to ISO 13953:2001-09

Welding parameters: 23°C
Deformation rate: 5 mm/min

Sample no.	Type of test piece	Number of test pieces	Tensile strength [MPa]		Failure mode	
			Actual value	Mean value	Actual value	Set value
1	A	4	4,56 – 4.60	4.58	ductile	ductile

5 Summary of test results

The presented test material "**Black PE 100/ADVANCENE bEEB5906AAH**" met the requirements of DIN EN 1555-1 and DIN CEN/TS 1555-7, table 3, for PE 100 compounds within the tested scope.