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## Certificate of Analysis

Product name	: Mono Ethylene Glycol (MEG) IBC1100	Delivery no.	: 5840007981
Batch no	: MEGA221206	Customer Po.No.	: TOC22-002145
Quantity(TO)	: 9.900	Sampling date	: 09.12.2022
Manufacturing date	: 06.12.2022	Sampling point	: EG1-SC25101E-A
Issue date	: 18.01.2023	Expiry date	: 05.12.2024
Customer name	: ARK CO.,LTD.		
Sale order no.	: 5812001920		

Test item	Test Method	Unit	Specification	Result
Appearance	Visual Inspection	-	Clear,Colorless	Passed
Suspended Matter	Visual Inspection	-	None	Passed
Specific Gravity @ 20/20oC	ASTM D4052-2015	-	1.1151 - 1.1156	1.1153
MEG Content	By Difference	%wt	99.90 Min	99.99
DEG Content	Based on ASTM E2409	%wt	0.02 Max	< 0.01
Water Content	ASTM E1064	%wt	0.020 Max	0.002
Distillation@760mmHg InitialBoilingPoint	ASTM D1078	oC	196.0 Min	196.9
Distillation@760mmHg 5% to 95%V Range	ASTM D1078	oC	1.0 Max	0.3
Dry point	ASTM D1078	oC	199.0 Max	197.6
%Transmittance @ 220nm.	ASTM E2193	%	80.0 Min	97.2
%Transmittance @ 250nm.	ASTM E2193	%	90.0 Min	99.2
%Transmittance @ 275nm.	ASTM E2193	%	95.0 Min	99.7
%Transmittance @ 350nm.	ASTM E2193	%	99.0 Min	100.0
Colour Pt-Co units Before Heating	ASTM D5386	mgPt/L	5.0 Max	0.0
Colour Pt-Co units after Heating 4 hrs.	DC-406	mgPt/L	10.0 Max	1.0
Colour Pt-Co After Heating with NaOH	EO-548	mgPt/L	10.0 Max	1.0
Colour Pt-Co After Heating with HCl	DC-407	mgPt/L	10.0 Max	1.0
Acidity as Acetic acid	ASTM D1613	ppmwt	10.0 Max	6.1
Chloride	EO-635	ppmwt	0.1 Max	< 0.1
Iron	ASTM E394	ppmwt	0.05 Max	< 0.01
Ash Content	ASTM D482	ppmwt	10.0 Max	< 10.0
Aldehyde as Formaldehyde	S-63C	ppmwt	8.0 Max	< 0.5

Remark : Reported results are as-received sample.

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On Spec

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Approved by :

Pongpicha B

MR. PONGPICHA BOONTUN

(For Laboratory Supervisor)

Date: December 10 , 2022

QA :

AMPORN KETCHARUNG

(Plant Operation Manager)

Date: December 10 , 2022

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## Certificate of Analysis

Product name	: Mono Ethylene Glycol (MEG) SD225	Delivery no.	: 5840007980
Batch no	: MEGA230111	Customer Po.No.	: TOC22-002143
Quantity(TO)	: 18.000	Sampling date	: 14.01.2023
Manufacturing date	: 11.01.2023	Sampling point	: EG1-SC25101E-A
Issue date	: 18.01.2023	Expiry date	: 10.01.2025
Customer name	: ARK CO.,LTD.		
Sale order no.	: 5812001922		

Test item	Test Method	Unit	Specification	Result
Appearance	Visual Inspection	-	Clear,Colorless	Passed
Suspended Matter	Visual Inspection	-	None	Passed
Specific Gravity @ 20/20oC	ASTM D4052-2015	-	1.1151 - 1.1156	1.1151
MEG Content	By Difference	%wt	99.90 Min	99.99
DEG Content	Based on ASTM E2409	%wt	0.02 Max	< 0.01
Water Content	ASTM E1064	%wt	0.020 Max	0.003
Distillation@760mmHg InitialBoilingPoint	ASTM D1078	oC	196.0 Min	196.7
Distillation@760mmHg 5% to 95%V Range	ASTM D1078	oC	1.0 Max	0.3
Dry point	ASTM D1078	oC	199.0 Max	197.6
%Transmittance @ 220nm.	ASTM E2193	%	80.0 Min	97.3
%Transmittance @ 250nm.	ASTM E2193	%	90.0 Min	99.3
%Transmittance @ 275nm.	ASTM E2193	%	95.0 Min	99.8
%Transmittance @ 350nm.	ASTM E2193	%	99.0 Min	100.0
Colour Pt-Co units Before Heating	ASTM D5386	mgPt/L	5.0 Max	1.0
Colour Pt-Co units after Heating 4 hrs.	DC-406	mgPt/L	10.0 Max	2.0
Colour Pt-Co After Heating with NaOH	EO-548	mgPt/L	10.0 Max	3.0
Colour Pt-Co After Heating with HCl	DC-407	mgPt/L	10.0 Max	2.0
Acidity as Acetic acid	ASTM D1613	ppmwt	10.0 Max	6.8
Chloride	EO-635	ppmwt	0.1 Max	< 0.1
Iron	ASTM E394	ppmwt	0.05 Max	< 0.01
Ash Content	ASTM D482	ppmwt	10.0 Max	< 10.0
Aldehyde as Formaldehyde	S-63C	ppmwt	8.0 Max	1.0

Remark : Reported results are as-received sample.

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On Spec

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Approved by :

**Ketsarin I.**

MISS KETSARIN IAMRUM

(For Laboratory Supervisor)

Date: January 14 , 2023

QA :

AMPORN KETCHARUNG

(Plant Operation Manager)

Date: January 14 , 2023

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## Certificate of Analysis

Product name	: Mono Ethylene Glycol (MEG) ISO Tank	Delivery no.	: 5840009191-5
Batch no	: MEGC230210	Customer Po.No.	: TOC22-001932/2
Quantity(TO)	: 115.000	Sampling date	: 16.02.2023
Manufacturing date	: 10.02.2023	Sampling point	: EG1-SC25101E-C
Issue date	: 28.02.2023	Expiry date	: 09.02.2025
Customer name	: ARK CO.,LTD.		
Sale order no.	: 5812002251		

Test item	Test Method	Unit	Specification	Result
Appearance	Visual Inspection	-	Clear,Colorless	Passed
Suspended Matter	Visual Inspection	-	None	Passed
Specific Gravity @ 20/20oC	ASTM D4052-2015	-	1.1151 - 1.1156	1.1153
MEG Content	By Difference	%wt	99.90 Min	99.96
DEG Content	Based on ASTM E2409	%wt	0.02 Max	0.02
Water Content	ASTM E1064	%wt	0.020 Max	0.015
Distillation@760mmHg InitialBoilingPoint	ASTM D1078	oC	196.0 Min	196.7
Distillation@760mmHg 5% to 95%V Range	ASTM D1078	oC	1.0 Max	0.3
Dry point	ASTM D1078	oC	199.0 Max	197.6
%Transmittance @ 220nm.	ASTM E2193	%	80.0 Min	91.9
%Transmittance @ 250nm.	ASTM E2193	%	90.0 Min	94.2
%Transmittance @ 275nm.	ASTM E2193	%	95.0 Min	96.5
%Transmittance @ 350nm.	ASTM E2193	%	99.0 Min	99.5
Colour Pt-Co units Before Heating	ASTM D5386	mgPt/L	5.0 Max	2.0
Colour Pt-Co units after Heating 4 hrs.	DC-406	mgPt/L	10.0 Max	3.0
Colour Pt-Co After Heating with NaOH	EO-548	mgPt/L	10.0 Max	2.0
Colour Pt-Co After Heating with HCl	DC-407	mgPt/L	10.0 Max	2.0
Acidity as Acetic acid	ASTM D1613	ppmwt	10.0 Max	6.5
Chloride	EO-635	ppmwt	0.1 Max	< 0.1
Iron	ASTM E394	ppmwt	0.05 Max	< 0.01
Ash Content	ASTM D482	ppmwt	10.0 Max	< 10.0
Aldehyde as Formaldehyde	S-63C	ppmwt	8.0 Max	2.1

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Approved by :

MS. ORATHAI MAHAYOTHIN

(For Laboratory Supervisor)

Date: February 16 , 2023

QA :

MR. SOMPOP HONGSAMAT

(Plant Operation Manager)

Date: February 16 , 2023

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## Certificate of Analysis

Product name	: Mono Ethylene Glycol (MEG) ISO Tank	Delivery no.	: 5840008557
Batch no	: MEGA230111	Customer Po.No.	: TOC23-000114
Quantity(TO)	: 20.000	Sampling date	: 14.01.2023
Manufacturing date	: 11.01.2023	Sampling point	: EG1-SC25101E-A
Issue date	: 07.02.2023	Expiry date	: 10.01.2025
Customer name	: ARK CO.,LTD.		
Sale order no.	: 5812002111		

Test item	Test Method	Unit	Specification	Result
Appearance	Visual Inspection	-	Clear,Colorless	Passed
Suspended Matter	Visual Inspection	-	None	Passed
Specific Gravity @ 20/20oC	ASTM D4052-2015	-	1.1151 - 1.1156	1.1151
MEG Content	By Difference	%wt	99.90 Min	99.99
DEG Content	Based on ASTM E2409	%wt	0.02 Max	< 0.01
Water Content	ASTM E1064	%wt	0.020 Max	0.003
Distillation@760mmHg InitialBoilingPoint	ASTM D1078	oC	196.0 Min	196.7
Distillation@760mmHg 5% to 95%V Range	ASTM D1078	oC	1.0 Max	0.3
Dry point	ASTM D1078	oC	199.0 Max	197.6
%Transmittance @ 220nm.	ASTM E2193	%	80.0 Min	97.3
%Transmittance @ 250nm.	ASTM E2193	%	90.0 Min	99.3
%Transmittance @ 275nm.	ASTM E2193	%	95.0 Min	99.8
%Transmittance @ 350nm.	ASTM E2193	%	99.0 Min	100.0
Colour Pt-Co units Before Heating	ASTM D5386	mgPt/L	5.0 Max	1.0
Colour Pt-Co units after Heating 4 hrs.	DC-406	mgPt/L	10.0 Max	2.0
Colour Pt-Co After Heating with NaOH	EO-548	mgPt/L	10.0 Max	3.0
Colour Pt-Co After Heating with HCl	DC-407	mgPt/L	10.0 Max	2.0
Acidity as Acetic acid	ASTM D1613	ppmwt	10.0 Max	6.8
Chloride	EO-635	ppmwt	0.1 Max	< 0.1
Iron	ASTM E394	ppmwt	0.05 Max	< 0.01
Ash Content	ASTM D482	ppmwt	10.0 Max	< 10.0
Aldehyde as Formaldehyde	S-63C	ppmwt	8.0 Max	1.0

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Approved by :

**Ketsarin I.**

MISS KETSARIN IAMRUM

(For Laboratory Supervisor)

Date: January 14, 2023

QA :

AMPORN KETCHARUNG

(Plant Operation Manager)

Date: January 14, 2023

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## Certificate of Analysis

Product name	: Mono Ethylene Glycol (MEG) SD225	Delivery no.	: 5840010194
Batch no	: MEGC230210	Customer Po.No.	: TOC23-000359
Quantity(TO)	: 18.000	Sampling date	: 16.02.2023
Manufacturing date	: 10.02.2023	Sampling point	: EG1-SC25101E-C
Issue date	: 11.04.2023	Expiry date	: 09.02.2025
Customer name	: ARK CO.,LTD.		
Sale order no.	: 5812002522		

Test item	Test Method	Unit	Specification	Result
Appearance	Visual Inspection	-	Clear,Colorless	Passed
Suspended Matter	Visual Inspection	-	None	Passed
Specific Gravity @ 20/20oC	ASTM D4052-2015	-	1.1151 - 1.1156	1.1153
MEG Content	By Difference	%wt	99.90 Min	99.96
DEG Content	Based on ASTM E2409	%wt	0.02 Max	0.02
Water Content	ASTM E1064	%wt	0.020 Max	0.015
Distillation@760mmHg InitialBoilingPoint	ASTM D1078	oC	196.0 Min	196.7
Distillation@760mmHg 5% to 95%V Range	ASTM D1078	oC	1.0 Max	0.3
Dry point	ASTM D1078	oC	199.0 Max	197.6
%Transmittance @ 220nm.	ASTM E2193	%	80.0 Min	91.9
%Transmittance @ 250nm.	ASTM E2193	%	90.0 Min	94.2
%Transmittance @ 275nm.	ASTM E2193	%	95.0 Min	96.5
%Transmittance @ 350nm.	ASTM E2193	%	99.0 Min	99.5
Colour Pt-Co units Before Heating	ASTM D5386	mgPt/L	5.0 Max	2.0
Colour Pt-Co units after Heating 4 hrs.	DC-406	mgPt/L	10.0 Max	3.0
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Acidity as Acetic acid	ASTM D1613	ppmwt	10.0 Max	6.5
Chloride	EO-635	ppmwt	0.1 Max	< 0.1
Iron	ASTM E394	ppmwt	0.05 Max	< 0.01
Ash Content	ASTM D482	ppmwt	10.0 Max	< 10.0
Aldehyde as Formaldehyde	S-63C	ppmwt	8.0 Max	2.1

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