

MICTRANS

전기절연유

제품소개

- 미창석유공업은 전기절연유 전문 제조업체로서 1964년 국내 최초로 KS표시허가를 획득하여 한국전력 및 유수의 변압기 제조업체에 납품되며 품질의 우수성을 인정 받아 세계각지에 수출되고 있습니다.
- 브랜드인 MICTRANS 시리즈는 수첨된 나프텐기유를 엄선하여 최적의 공정으로 제조되며 전기적 특성의 우수로 KS규격은 물론 ASTM D3487, IEC296, IEC60296, BS148, JIS 등 각국 규격을 만족하는 최적의 전기절연유로 인정받고 있습니다.
- 내수용 : MICTRANS OT-2, OT-4
- 수출용 : MICTRANS A, B, C, D, G, HI

제품 특징점

- 정제도가 높아 절연파괴전압, 부피저항율, 유전정접 등 전기특성이 우수합니다.
- 산화안정성이 우수하여 장기사용에도 물리, 화학적 안정성이 우수합니다.
- 냉각작용이 우수하여 변압기 운전 중 발생하는 발열을 신속히 흡수합니다.
- 유동점이 낮아 저온 유동성이 좋습니다.
- 인화점이 높으며 증발량이 적습니다.

제품규격

MICTRANS " <u>OT-2</u> "	KS C 2301 Class 1, No.2
MICTRANS " <u>OT-4</u> "	KS C 2301 Class 1, No.4
MICTRANS " <u>A</u> "	JIS C 2320 Class 1, No.2 , BS 148 (1972)
MICTRANS " <u>B</u> "	KS C 2301 Class 1, No.4
	JIS C 2320 Class 1, No.4
	IEC 296 Class I (1982)
	IEC 296 ClassII (1982)
MICTRANS " <u>B-II</u> "	IEC 296 Class I A (1982)
MICTRANS " <u>B'</u> "	IEC 296 ClassIIA (1982)
MICTRANS " <u>BI-II</u> "	ASTM D 3487, type I, CSA C-50 (1997)
MICTRANS " <u>C</u> "	ASTM D 3487, type II
MICTRANS " <u>C'</u> "	IEC 60296(2012)-Uninhibited
MICTRANS " <u>DU</u> "	BS 148 (1998) Class I (excluding gassing tendency)
MICTRANS " <u>D'</u> "	IEC 60296(2012)-Traceinhibited
MICTRANS " <u>D''</u> "	IEC 60296(2012)-Inhibited
MICTRANS " <u>HI</u> "	IEC 60296(2012)-Inhibited (Special Applications)

Technical Data Sheet

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MICTRANS "A"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		ASTM D 1524	Clear & Bright		Clear & Bright
Density, 20°C	kg/dm ³	BS 4714		0.895	0.820
Viscosity, -15°C	mm ² /s	BS 4708		800.0	85.0
Viscosity, 20°C	mm ² /s	BS 4708		40.0	15.0
Flash Point, PM	°C	BS 2839	140		148
Pour Point	°C	BS 4452		-30.0	-42.0
Color		ASTM D 1500		0.5	L0.5
2. Chemical					
Neutralization value	mg KOH/g	BS 4705		0.03	<0.01
Corrosive sulfur		BS 148 App. D	noncorrosive		noncorrosive
Antioxidant additive	wt%	BS 5984			not detectable
Water content	ppm	BS 2511		35	<20
3. Electrical					
Dielectric dissipation factor at 90 °C		BS 148 App. C		0.005	<0.001
Breakdown voltage		BS 148 App. C			
- Oil delivered in bulk	kV		30		>60
Interfacial tension	mN/m	ISO 6295			>45
4. Oxidation Stability					
At 100°C, 164hrs :		BS 148 App. B			
- Sludge	wt%			0.1	0.05
- Total acid No.	mg KOH/g			0.4	0.20
5. Health,safety and environment					
PCA	wt%	BS 2000, Part346		3	<3.0
PCB	ppm	ASTM D 4059	not detectable		not detectable

Mictrans "A" is an uninhibited transformer oil, meeting BS 148(1972) General specification.

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MICTRANS "B"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		IEC 296	Clear & Bright		Clear & Bright
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.833
Viscosity, -15°C	mm ² /s	ISO 3104		800	82.0
Viscosity, 40°C	mm ² /s	ISO 3104		16.5	7.8
Flash Point, PM	°C	ISO 2719	140		148
Pour Point	°C	ISO 3016		-30	-36.0
Color		ASTM D 1500		0.5	L0.5
2. Chemical					
Neutralization value	mg KOH/g	IEC 296		0.03	<0.01
Corrosive sulfur		ISO 5662	noncorrosive		noncorrosive
Antioxidant additive	wt%	IEC 666	not detectable		not detectable
Water content	ppm	IEC 814		30	<20
3. Electrical					
Dielectric dissipation factor at 90 °C		IEC 247		0.005	<0.001
Breakdown voltage					
- as delivered	kV	IEC 156	30		40~60
- after treatment	kV	IEC 156	50		>65
Interfacial tension	mN/m	ISO 6295	40		>45
4. Oxidation Stability					
At 100°C, 164hrs :		IEC 1125A			
- Sludge	wt%			0.1	0.05
- Total acid No.	mg KOH/g			0.4	0.25
5. Health, safety and environment					
PCB	ppm	ASTM D 4059	not detectable		not detectable

Mictrans "B" is an uninhibited transformer oil, meeting IEC 296(1982) Class I General specification.

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MICTRANS "BI"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		IEC 296	Clear & Bright		Clear & Bright
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.830
Viscosity, -15°C	mm ² /s	ISO 3104		800	72.0
Viscosity, 40°C	mm ² /s	ISO 3104		16.5	7.5
Flash Point, PM	°C	ISO 2719	140		145
Pour Point	°C	ISO 3016		-30	-45
Color		ASTM D 1500		0.5	L0.5
2. Chemical					
Neutralization value	mg KOH/g	IEC 296		0.03	<0.01
Corrosive sulfur		ISO 5662	noncorrosive		noncorrosive
Antioxidant additive	wt%	IEC 666	-		0.3
Water content	ppm	IEC 814		30	<20
3. Electrical					
Dielectric dissipation factor at 90 °C		IEC 247		0.005	<0.001
Breakdown voltage					
- as delivered	kV	IEC 156	30		40~60
- after treatment	kV	IEC 156	50		>65
Interfacial tension	mN/m	ISO 6295	40		>45
4. Oxidation Stability					
Induction period		IEC 1125B	120		140
5. Health, safety and environment					
PCB	ppm	ASTM D 4059	not detectable		not detectable

Mictrans "BI" is an inhibited transformer oil, meeting IEC 296(1982) Class I A General specification.

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MICTRANS "C"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		D 1524	Clear & Bright		Clear & Bright
Density, 15°C	kg/dm ³	D 1298		0.91	0.878
Viscosity, 100°C	mm ² /s	D 445		3.0	2.2
Viscosity, 40°C	mm ² /s	D 445		12.0	8.5
Viscosity, 0°C	mm ² /s	D 445		76.0	47.0
Flash Point, COC	°C	D 92	145		156
Pour Point	°C	D 97		-40	-48
Aniline Point	°C	D 611	63	84	80
Color		D 1500		0.5	L0.5
Interfacial tension	mN/m	D 971	40		>45
2. Chemical					
Neutralization value	mg KOH/g	D 974		0.03	<0.01
Corrosive sulfur		IEC 62535	noncorrosive		noncorrosive
Corrosive sulfur		D 1275 B	noncorrosive		noncorrosive
Antioxidant additive	wt%	D 2668		0.08	0.03
Water content	ppm	D 1533		35	<20
3. Electrical					
Dielectric dissipation factor at 25 °C	%	D 924		0.05	<0.01
100 °C	%	D 924		0.3	<0.1
Breakdown voltage					
- Disk electrodes	kV	D 877	30		>40
Gassing tendency	μℓ/min	D 2300		+30	+22
4. Oxidation Stability					
At 110°C, 72hr :		D 2440			
- Sludge	wt%			0.15	0.02
- Total acid No.	mg KOH/g			0.5	0.1
At 110°C, 164hr :					
- Sludge	wt%			0.3	0.1
- Total acid No.	mg KOH/g			0.6	0.3
5. Health, safety and environment					
PCB	ppm	D 4059	not detectable		not detectable

Mictrans "C" is an inhibited transformer oil, meeting ASTM D 3487, type I General specification.

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MICTRANS "CI"

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Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		D 1524	Clear & Bright		Clear & Bright
Density, 15°C	kg/dm ³	D 1298		0.91	0.880
Viscosity, 100°C	mm ² /s	D 445		3.0	2.4
Viscosity, 40°C	mm ² /s	D 445		12.0	9.3
Viscosity, 0°C	mm ² /s	D 445		76.0	55.0
Flash Point, COC	°C	D 92	145		150
Pour Point	°C	D 97		-40	-48
Aniline Point	°C	D 611	63		82.0
Color		D 1500		0.5	L0.5
Interfacial tension	mN/m	D 971	40		>45
2. Chemical					
Neutralization value	mg KOH/g	D 974		0.03	<0.01
Corrosive sulfur		D 1275 A	noncorrosive		noncorrosive
Corrosive sulfur		D 1275 B	noncorrosive		noncorrosive
Antioxidant additive	wt%	D 2668	0.08	0.3	0.28
Water content	ppm	D 1533		35	<20
3. Electrical					
Dielectric dissipation factor at 25 °C	%	D 924		0.05	<0.01
100 °C	%	D 924		0.3	<0.1
Breakdown voltage					
- Disk electrodes	kV	D 877	30		>40
Gassing tendency	μℓ/min	D 2300		+30	+22
4. Oxidation Stability					
At 110°C, 72hr :		D 2440			
- Sludge	wt%			0.1	0.01
- Total acid No.	mg KOH/g			0.3	0.06
At 110°C, 164hr :					
- Sludge	wt%			0.2	0.05
- Total acid No.	mg KOH/g			0.4	0.10
Rotating bomb test	minutes	D 2112	195		250
5. Health, safety and environment					
PCB	ppm	D 4059	not detectable		not detectable

Mictrans "CI" is an inhibited transformer oil, meeting ASTM D 3487, type II General specification.



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MICTRANS "DU"

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Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		-	Clear, free from sediment and suspended matter		complies
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.880
Viscosity, 40°C	mm ² /s	ISO 3104		12.0	8.2
Viscosity, -30°C	mm ² /s	ISO 3104		1800	550.0
Pour Point	°C	ISO 3016		-40	-48.0
2. Chemical					
Acidity	mg KOH/g	IEC 62021 - 1		0.01	< 0.01
Corrosive sulfur		DIN 51353		noncorrosive	noncorrosive
Corrosive sulfur		ASTM D1275, B		noncorrosive	noncorrosive
Potentially corrosive sulfur		IEC 62535		noncorrosive	noncorrosive
DBDS		IEC 62697-1		not detectable(<5mg/kg)	not detectable
Antioxidant additive	wt%	IEC 60666		not detectable(<0.01%)	not detectable
Metal passivator additives		IEC 60666		not detectable(<5mg/kg)	not detectable
Water content	mg/kg	IEC 60814		30	< 20
2-furfural & related content	mg/kg	IEC 61198		0.05	< 0.05
3. Electrical					
DDF at 90 °C		IEC 60247		0.005	< 0.001
Interfacial tension	mN/m	EN 14210	40		>45
Breakdown voltage		IEC 60156			
- Before treatment	kV		30		40~60
- After treatment	kV		70		>70
4. Oxidation Stability					
At 120°C, 164hr		IEC 61125, C			
- Total acidity	mg KOH/g			1.2	0.50
- Sludge	wt%			0.8	0.25
- DDF at 90 °C		IEC 60247		0.5	<0.2
Gassing tendency	μl/min	IEC 60628, A			+25
5. Health, safety and environment (HSE)					
Flash Point, PM	°C	ISO 2719	135		144
PCA	wt%	IP 346		3	<3.0
PCB	ppm	IEC 61619		not detectable	not detectable

Mictrans "DU" is an uninhibited transformer oil, meeting IEC 60296(2012), General specifications.

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MICTRANS "DT"

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Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		-	Clear, free from sediment and suspended matter		complies
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.880
Viscosity, 40°C	mm ² /s	ISO 3104		12.0	8.1
Viscosity, -30°C	mm ² /s	ISO 3104		1800	540.0
Pour Point	°C	ISO 3016		-40	-48.0
2. Chemical					
Acidity	mg KOH/g	IEC 62021 - 1		0.01	< 0.01
Corrosive sulfur		DIN 51353		noncorrosive	noncorrosive
Corrosive sulfur		ASTM D1275, B		noncorrosive	noncorrosive
Potentially corrosive sulfur		IEC 62535		noncorrosive	noncorrosive
DBDS		IEC 62697-1		not detectable(<5mg/kg)	not detectable
Antioxidant additive	wt%	IEC 60666		0.08	0.05
Metal passivator additives		IEC 60666		not detectable(<5mg/kg)	not detectable
Water content	mg/kg	IEC 60814		30	< 20
2-furfural & related content	mg/kg	IEC 61198		0.05	< 0.05
3. Electrical					
DDF at 90 °C		IEC 60247		0.005	< 0.001
Interfacial tension	mN/m	EN 14210	40		>45
Breakdown voltage		IEC 60156			
- Before treatment	kV		30		40~60
- After treatment	kV		70		>70
4. Oxidation Stability					
At 120°C, 332hr		IEC 61125, C			
- Total acidity	mg KOH/g			1.2	0.55
- Sludge	wt%			0.8	0.21
- DDF at 90 °C		IEC 60247		0.5	<0.2
Gassing tendency	μl/min	IEC 60628, A			+25
5. Health, safety and environment (HSE)					
Flash Point, PM	°C	ISO 2719	135		144
PCA	wt%	IP 346		3	<3.0
PCB	ppm	IEC 61619		not detectable	not detectable

Mictrans "DT" is a trace-inhibited transformer oil, meeting IEC 60296(2012), General specifications.



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MICTRANS "DI"

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Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		-	Clear, free from sediment and suspended matter		complies
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.875
Viscosity, 40°C	mm ² /s	ISO 3104		12.0	9.5
Viscosity, -30°C	mm ² /s	ISO 3104		1800	600.0
Pour Point	°C	ISO 3016		-40	-50
2. Chemical					
Acidity	mg KOH/g	IEC 62021 - 1		0.01	< 0.01
Corrosive sulfur		DIN 51353		noncorrosive	noncorrosive
Corrosive sulfur		ASTM D1275, B		noncorrosive	noncorrosive
Potentially corrosive sulfur		IEC 62535		noncorrosive	noncorrosive
DBDS		IEC 62697-1		not detectable(<5mg/kg)	not detectable
Antioxidant additive	wt%	IEC 60666	0.08	0.4	0.3
Metal passivator additives		IEC 60666		not detectable(<5mg/kg)	not detectable
Water content	mg/kg	IEC 60814		30	< 20
2-furfural & related content	mg/kg	IEC 61198		0.05	< 0.05
3. Electrical					
DDF at 90 °C		IEC 60247		0.005	< 0.001
Interfacial tension	mN/m	EN 14210	40		>45
Breakdown voltage		IEC 60156			
- Before treatment	kV		30		40~60
- After treatment	kV		70		>70
4. Oxidation Stability					
At 120°C, 500hr		IEC 61125, C			
- Total acidity	mg KOH/g			1.2	0.35
- Sludge	wt%			0.8	0.20
- DDF at 90 °C		IEC 60247		0.5	<0.1
Gassing tendency	μℓ/min	IEC 60628, A			+28
5. Health, safety and environment (HSE)					
Flash Point, PM	°C	ISO 2719	135		146
PCA	wt%	IP 346		3	<3.0
PCB	ppm	IEC 61619		not detectable	not detectable

Mictrans "DI" is an inhibited transformer oil, meeting IEC 60296(2012), General specifications.



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MICTRANS "PAI"

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Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		-	Clear, free from sediment and suspended matter		complies
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.845
Viscosity, 40°C	mm ² /s	ISO 3104		12.0	8.0
Viscosity, -30°C	mm ² /s	ISO 3104		1800	400.0
Pour Point	°C	ISO 3016		-40	-45
2. Chemical					
Acidity	mg KOH/g	IEC 62021 - 1		0.01	< 0.01
Corrosive sulfur		DIN 51353		noncorrosive	noncorrosive
Corrosive sulfur		ASTM D1275, B		noncorrosive	noncorrosive
Potentially corrosive sulfur		IEC 62535		noncorrosive	noncorrosive
DBDS		IEC 62697-1		not detectable(<5mg/kg)	not detectable
Antioxidant additive	wt%	IEC 60666	0.08	0.4	0.3
Metal passivator additives		IEC 60666		not detectable(<5mg/kg)	not detectable
Water content	mg/kg	IEC 60814		30	< 20
2-furfural & related content	mg/kg	IEC 61198		0.05	< 0.05
3. Electrical					
DDF at 90 °C		IEC 60247		0.005	< 0.001
Interfacial tension	mN/m	EN 14210	40		>45
Breakdown voltage		IEC 60156			
- Before treatment	kV		30		40~60
- After treatment	kV		70		>70
4. Oxidation Stability					
At 120°C, 500hr		IEC 61125, C			
- Total acidity	mg KOH/g			1.2	0.30
- Sludge	wt%			0.8	0.10
- DDF at 90 °C		IEC 60247		0.5	< 0.1
Gassing tendency	μl/min	IEC 60628, A			+40
5. Health, safety and environment (HSE)					
Flash Point, PM	°C	ISO 2719	135		150
PCA	wt%	IP 346		3	<3.0
PCB	ppm	IEC 61619		not detectable	not detectable

Mictrans "PAI" is an inhibited transformer oil, meeting IEC 60296(2012), General specifications.

MICTRANS "HI"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
1. Physical					
Appearance		-	Clear, free from sediment and suspended matter		complies
Density, 20°C	kg/dm ³	ISO 3675		0.895	0.867
Viscosity, 40°C	mm ² /s	ISO 3104		12.0	9.7
Viscosity, -30°C	mm ² /s	ISO 3104		1800	550.0
Pour Point	°C	ISO 3016		-40	-48
2. Chemical					
Acidity	mg KOH/g	IEC 62021 - 1		0.01	< 0.01
Corrosive sulfur		DIN 51353		noncorrosive	noncorrosive
Corrosive sulfur		ASTM D1275, B		noncorrosive	noncorrosive
Potentially corrosive sulfur		IEC 62535		noncorrosive	noncorrosive
DBDS		IEC 62697-1		not detectable(<5mg/kg)	not detectable
Antioxidant additive	wt%	IEC 60666	0.08	0.4	0.38
Metal passivator additives		IEC 60666		not detectable(<5mg/kg)	not detectable
Water content	mg/kg	IEC 60814		30	< 20
2-furfural & related content	mg/kg	IEC 61198		0.05	< 0.05
3. Electrical					
DDF at 90 °C		IEC 60247		0.005	< 0.001
Interfacial tension	mN/m	EN 14210	40		>45
Total Sulfur content	wt%	ISO 14596		0.05	0.04
Breakdown voltage		IEC 60156			
- Before treatment	kV		30		40~60
- After treatment	kV		70		>70
4. Oxidation Stability					
At 120°C, 500hr		IEC 61125, C			
- Total acidity	mg KOH/g			0.3	0.10
- Sludge	wt%			0.05	0.03
- DDF at 90 °C		IEC 60247		0.05	<0.03
Gassing tendency	μl/min	IEC 60628, A			+28
5. Health, safety and environment (HSE)					
Flash Point, PM	°C	ISO 2719	135		148
PCA	wt%	IP 346		3	<3.0
PCB	ppm	IEC 61619		not detectable	not detectable

Mictrans "HI" is an inhibited transformer oil, meeting IEC 60296(2012), Special applications.

(*) 대표 성상은 최근의 평균시험 값이며 제품 성능에 이상이 없는 범위 내에서 다소 차이가 있을 수 있습니다.



Technical Data Sheet

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MICTRANS "OT-4"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
Appearance		Visual	Clear & Bright		Clear & Bright
Specific gravity, 15/4°C	kg/dm ³	KS M ISO 12185		0.91	0.835
Kinematic Viscosity, 40 °C	mm ² /s	KS M ISO 3104		13	8.5
Kinematic Viscosity, 100 °C	mm ² /s	KS M ISO 3104		4	2.5
Pour Point	°C	KS M ISO 3016		-30	-36
Flash Point, PM	°C	KS M ISO 2719	140		160
Evaporated volume ratio, 98°C/5hr	%	KS C 2101, 14		0.4	0.25
Reaction		KS M 2012	NEUTRAL		NEUTRAL
Acid No.	mg KOH/g	KS M ISO 6618		0.02	<0.01
Corrosive sulfur, 140°C/19hr		KS C 2101, 18	noncorrosive		noncorrosive
Oxidation Stability, 120°C/75hr		KS C 2101, 19			
- Sludge	wt%			0.4	0.1
- Acid No.	mg KOH/g			0.6	0.2
Water content	ppm	KS C 2101, 21		30	<20
Breakdown voltage	kV	KS C IEC 60156		40	>60
Power factor (or DDF), 60Hz, 80°C	%	KS C 2101, 23		0.1	<0.05
Volume resistivity, 80 °C	Ω·cm	KS C 2101, 24		5×10 ¹³	>1.0×10 ¹⁴
PCBs content	mg/ℓ	KS C 2375	not detectable		not detectable

Mictrans OT-4 meets KS C2301, Class 1, No. 4 specification.

(*) 대표 성상은 최근의 평균시험 값이며 제품 성능에 이상이 없는 범위 내에서 다소 차이가 있을 수 있습니다.



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MICTRANS "OT-2"

Property	Unit	Test Method	Guaranteed Data		Typical Data
			Min	Max	
Appearance		Visual	Clear & Bright		Clear & Bright
Specific gravity, 15/4°C	kg/dm ³	KS M ISO 12185		0.91	0.831
Kinematic Viscosity, 40 °C	mm ² /s	KS M ISO 3104		13	7.7
Kinematic Viscosity, 100 °C	mm ² /s	KS M ISO 3104		4	2.3
Pour Point	°C	KS M ISO 3016		-30	-36
Flash Point, PM	°C	KS M ISO 2719	140		150
Evaporated volume ratio, 98°C/5hr	%	KS C 2101, 14		0.4	0.24
Reaction		KS M 2012	NEUTRAL		NEUTRAL
Acid No.	mg KOH/g	KS M ISO 6618		0.02	<0.01
Corrosive sulfur, 140°C/19hr		KS C 2101, 18	noncorrosive		noncorrosive
Oxidation Stability, 120°C/75hr		KS C 2101, 19			
- Sludge	wt%			0.4	0.1
- Acid No.	mg KOH/g			0.6	0.2
Water content	ppm	KS C 2101, 21		-	<20
Breakdown voltage	kV	KS C IEC 60156		30	>60
Volume resistivity, 80 °C	Ω·cm	KS C 2101, 24		1.0×10 ¹³	>1.0×10 ¹⁴
PCBs content	mg/l	KS C 2375	not detectable		not detectable

Mictrans OT-2 meets KS C2301, Class 1, No. 2 specification.

(*) 대표 성상은 최근의 평균시험 값이며 제품 성능에 이상이 없는 범위 내에서 다소 차이가 있을 수 있습니다.