



## Technical data 2015

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## Physical & chemical tests

Type of test			Type of material Ranprex <sup>®</sup>									
			ML22EL	ML20EL	ML15EL	ML10L	ML22E	ML20E	ML15E	ML10	ML20ET	ML15ET
UM			P1R	P2R	P4R	PFWV304	C1R	C2R	C4R	PFWV202	T2R	T4R
			KP20210	KP20212	KP20214	KP20218	KP20220	KP20222	KP20224	KP20228	KP20242	KP20244
Density		g/cm <sup>3</sup>	0.7+0.9	0.9+1.1	1.2+1.3	1.3+1.4	0.7+0.9	0.9+1.1	1.2+1.3	1.3 ÷ 1.4	0.9 ÷ 1.1	1.2 ÷ 1.3
Moisture content		%	4.0	4.0	4.5	/	4.0	4.0	4.5	/	4.0	4.5
Shrinkage in air after drying	Direction A	%	0.1	0.2	0.2	/	0.2	0.2	0.2	/	0.3	0.3
	Direction B	%	0.2	0.3	0.2	/	0.2	0.2	0.2	/		
	Thickness	%	0.4	1.2	1.2	/	0.8	1.4	1.4	/	1.4	1.3
Oil absorption		%	32	30	7	/	30	26	10	/	28	7.5
Contamination of dielectric liquids <sup>1)</sup>	a	$\Delta \text{tg}\delta$	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	b											
	c											
Contamination of dielectric liquids <sup>2)</sup>	a	$\Delta \text{tg}\delta$	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	b											
	c											

Table 1: Physical & chemical tests.

- 1) Tests according to IEC 61061 / IEC 60247 at 90 °C.
- 2) Tests according to TUN 901 074 (2007.06) at 105 °C (a) and 120 °C (b - c)

Type of oil used for the tests:

- |                                |           |
|--------------------------------|-----------|
| a) Mineral oil according to    | IEC 60296 |
| b) Silicon oil according to    | IEC 60836 |
| c) Organic Esters according to | IEC 61099 |

Tests carried out according to IEC 61061, IEC 60893 and Siemens' TUN 901 074 2007.06, by certified external laboratories.

## Mechanical tests

Type of test			Type of material Ranprex <sup>®</sup>									
			ML22EL	ML20EL	ML15EL	ML10L	ML22E	ML20E	ML15E	ML10	ML20ET	ML15ET
			P1R	P2R	P4R	PFVV304	C1R	C2R	C4R	PFVV202	T2R	T4R
UM			KP20210	KP20212	KP20214	KP20218	KP20220	KP20222	KP20224	KP20228	KP20242	KP20244
Flexural strength	IEC <sup>1)</sup>		145	150	200	220	120	130	140	150	135	160
	TUN <sup>2)</sup>	a	150	145	190	/	125	130	155	150	142	160
b		75	135	170	/	80	120	145	120	130	155	
Modulus of elasticity in flexure	IEC <sup>1)</sup>		10	14	16	18	7.5	9.5	12	15	11	13
Compressive strength ⊥	TUN <sup>2)</sup>	a	130	130	145	170 <sup>3)</sup>	150	210	245	240	140	160
		b	70	130	130	/	155	190	255	250	110	140
Compressive strength ≡	TUN <sup>2)</sup>	a	95	95	130	160 <sup>3)</sup>	60	75	110	170	/	/
		b	70	85	160	/	70	70	130	160	/	/
Impact strength	IEC <sup>1)</sup>		43	48	55	40	22	28	32	25	40	45
Tensile strength	IEC <sup>1)</sup>		/	/	/	200	/	/	/	120	/	/
Compressibility	C Max Crev. Min.	%	4.0	3.2	2.2	/	4.3	3.1	2.3	/	3.1	2.5
			81	80	80	/	80	80	80	/	80	80
Shearing strength test for glue line bond	IEC <sup>1)</sup>		7.8	12	14	30	7	8.5	14	30	12	15

Table 2: Mechanical tests.

- 1) Tests according to IEC 61061 / IEC 60893.
- 2) Tests according to TUN 901 074 (2007.06)

Type of conditioning:

- a) 23 °C - 50% r. h.
- b) 90 °C
- 3) Tests according to IEC 60893.

Tests carried out according to IEC 61061, IEC 60893 and Siemens' TUN 901074 2007.06, by certified external laboratories.

## Electrical tests

Type of test		Type of material Ranprex®									
		ML22EL	ML20EL	ML15EL	ML10L	ML22E	ML20E	ML15E	ML10	ML20ET	ML15ET
UM		P1R	P2R	P4R	PFWV304	C1R	C2R	C4R	PFWV202	T2R	T4R
		KP20210	KP20212	KP20214	KP20218	KP20220	KP20222	KP20224	KP20228	KP20242	KP20244
Electrical strength $\perp$	kV/mm	15	15.5	17.5	7	15	15.5	17.5	7	15.5	17.5
Breakdown voltage $\equiv$	kV/25mm	> 80	> 80	> 80	> 25	> 80	> 80	> 80	> 25	> 80	> 80
Partial discharge level $\perp$ th test specimen th 3mm (1pC)	kV/mm	4.5	5.0	5.5	4.5	4.5	5.0	5.5	4.5	5.0	5.5
Partial discharge level $\equiv$ th test specimen th 25mm (1pC)	kV/mm	3.0	3.1	3.2	3.1	3.0	3.1	3.2	3.1	3.1	3.2
Volume resistivity	$\Omega$ cm	$10^{12}$	$10^{12}$	$10^{12}$	$10^{11}$	$10^{12}$	$10^{12}$	$10^{12}$	$10^{11}$	$10^{12}$	$10^{12}$
Surface resistivity	$\Omega$	$10^{12}$	$10^{12}$	$10^{12}$	$10^{11}$	$10^{12}$	$10^{12}$	$10^{12}$	$10^{11}$	$10^{12}$	$10^{12}$
Loss angle	tg $\delta$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Relative permittivity	$\epsilon_r$	3.3	3.5	3.8	4.2	3.3	3.5	3.8	4.2	3.5	3.8

Table 3: Electrical tests.

Tests carried out according to IEC 61061, IEC 60893 and Siemens' TUN 901 074 2007.06, by certified external laboratories.

The data mentioned in this Technical Data Sheet are **average values** ascertained by current statistical returns and tests. The above data is provided purely for information and shall not be regarded as binding unless expressly agreed in a contract of sales.