Overview Engineered Thermoplastics

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			Reference Values																																	
			General						Mechanical														Thermal				Burning Behaviour		Processing								
Properties			Density	Viscosity number (VN)	Melt volume rate (MVR)	Water absorption	Shrinkage	Conditioning	Tensile strength at yield	Tensile strain at yield	Tensile stress at break	Tensile strain at break	Tensile modulus	Charpy unnotched impact strength	Charpy unnotched impact strength	Charpy notched impact strength	Charpy notched impact strength	Melting temperature	Temp. of deflection under load (HDT)	Temp. of deflection under load (HDT)	Vicat softening temperature (VST B)	Burning behaviour (UL 94)	Burning behaviour (UL 94)	Predrying temperature	Predrying time	Melt temperature range	Mould surface temperature											
		Method	Immersion method	96% H_2SO_4, 0.5 g/dl,	XXX °C/XXX kg	Saturation at 23 °C/ 50 % rel. LF	2 mm wall thickness		50 mm/min	50 mm/min	5 mm/min	5 mm/min	1 mm/min	23 °C	-30 °C	23 °C	-30 °C	DSC	Af (1.80 MPa)	Bf (0.45 MPa)	50 °C/h, 50N																
		Standard	DIN EN ISO 1183-1/A	DIN EN ISO 307	DIN EN ISO 1133	DIN EN ISO 62	DIN EN ISO 294-4		DIN EN ISO 527-2/1A/50	DIN EN ISO 527-2/1A/50	DIN EN ISO 527-2/1A/5	DIN EN ISO 527-2/1A/5	DIN EN ISO 527-2/1A/1	DIN EN ISO 179-1/1eU	DIN EN ISO 179-1/1eU	DIN EN ISO 179-1/1eA	DIN EN ISO 179-1/1eA	DIN 51007	DIN EN ISO 75-1/-2	DIN EN ISO 75-1/-2	DIN EN ISO 306	DIN EN 60695-11-10	DIN EN 60695-11-10													
Material	**Short Description**	**Unit**	g/cm³	cm³/g	cm³/ 10 min	%	%		MPa	%	MPa	%	MPa	kJ/m²	kJ/m²	kJ/m²	kJ/m²	°C	°C	°C	°C	Class	Thickness (mm)	°C	h	°C	°C											
Schulamid® 6	**Polyamide 6**																																			
MV 14	Medium viscosity standard grade		1.13	145	–	2.5	0.8-1.5	dry cond.	80 45	4 20	–	–	2,900 1,100	NB NB	NB –	7 50	5 –	220	60	170	190	V-2	1.5 all colors	80	3-4	250-270	60-90											
MV HI	Medium viscosity, high impact modified		1.11	–	–	2.3	0.8-1.5	dry cond.	60 35	4.2 20	–	–	2,200 800	NB NB	NB –	16 60	10 –	220	60	140	175	HB	0.75 all colors	80	3-4	240-270	60-90											
GF15 HI BM	15% glass fiber reinforced and impact modified, with high melt strength for blow moulding processing		1.20	–	–	2	0.5/1.5	dry cond.	–	–	86 55	7 24	5,000 2,300	70 NB	60 –	12 36	6 –	220	165	205	195	HB	0.75 all colors	80	3-4	260-280	60-100											
GF30 H	30% glass fiber reinforced, heat stabilised		1.35	145	–	2	0.2/1.2	dry cond.	–	–	165 100	3.5 8	9,200 5,000	85 NB	60 –	14 30	9 –	220	200	220	210	–	–	80	3-4	250-280	60-100											
GF30 IS (former GF30 GID)	30% glass fiber reinforced Polyamide 6, improved surface		1.35	145	–	–	0.2/1.2	dry cond.	–	–	155 90	3.5 8.5	8,800 5,200	80 95	74 –	12 26	8 –	–	195	212	192	–	–	80	3-4	250-280	60-100											
GF30 HI K1704	30% glass fiber reinforced PA 6, impact modified		1.28	145	–	1.9	0.2/1.2	dry cond.	–	–	125 80	5 10	8,000 4,500	85 NB	80 –	24 40	14 –	–	200	210	200	–	–	80	3-4	250-280	60-100											
GBF3010 H	30% glass fiber and glass bead reinforced, heat stabilized, improved dimensional stability and warpage optimized		1.35	145	–	1.7	0.5/1.3	dry cond.	–	–	110 55	3.5 12	6,000 3,000	35 90	30 –	4 12	3.5 –	220	190	215	210	HB	1.5	80	3-4	250-280	60-100											
MT30	30% talc filled		1.36	140	–	1.8	0.7/1	dry cond.	–	–	70 45	3.5 15	6,500 3,300	35 60	30 –	4 8	3 –	220	100	200	200	–	–	80	3-4	250-280	60-100											
Schulamid® 66	**Polyamide 66**																																			
MV 2	Medium viscosity standard grade		1.14	140	–	2.5	0.8-1.5	dry cond.	85 55	5 20	–	–	3,200 1,300	NB NB	NB –	6 12	4 –	260	80	220	240	V-2	1.5 all colors	80	3-4	270-290	60-100											
SK 1000	Extreme high impact modified		1.06	–	–	2	1-1.5	dry cond.	50 30	6 32	–	–	1,800 600	NB NB	NB –	80 120	25 –	260	60	135	175	HB	1.5 all colors	80	3-4	270-290	60-100											
GF30 H	30% glass fiber reinforced, heat stabilized		1.36	145	–	1.9	0.2/1.2	dry cond.	–	–	180 110	3 7	10,000 6,200	90 95	60 –	10 18	7 –	260	245	>250	>250	HB	0.75 all colors	80	3-4	280-300	60-120											
GF30 HI	30% glass fiber reinforced, high impact modified		1.27	–	–	1.8	0.2/1.2	dry cond.	–	–	150 100	3.5 5.5	8,600 5,600	80 90	70 –	20 30	14 –	260	245	>250	240	HB	1.5	80	3-4	280-300	60-120											
GF50 H	50% glass fiber reinforced, heat stabilized		1.57	140	–	1.2	0.2/0.7	dry cond.	–	–	228 180	2.3 3.3	16,500 13,000	90 94	70 –	14 18	12 –	260	>250	>250	>250	HB	0.75 all colors	80	3-4	280-300	60-120											
CF20 H	20% carbon fiber reinforced, heat stabilized with very high tensile strength		1.21	145	–	1.7	0.2/1.3	dry cond.	–	–	220 160	2.8 5.2	17,000 11,000	60 85	45 –	8 15	5 –	260	246	>250	>250	HB	1.5	80	3-4	280-300	60-120											
MNF2510 H	25% mineral and glass fiber reinforced, warpage optimised, heat stabilized		1.33	140	–	1.7	0.5/1	dry cond.	–	–	125 70	2.5 7	8,100 5,000	40 55	35 –	5 7	4 –	260	238	>250	245	HB	1.5	80	3-4	280-300	60-120											
Schulamid®	**Special Polyamides**																																			
RD6 GF30 (former 6 GF30 TC)	30% glass fiber reinforced with reduced density, minimized humidity absorption and high dimensional stability		1.25	–	–	1.2	0.2/1.3	dry cond.	–	–	130 95	3 4.5	8,700 6,700	56 60	46 –	15 17	10 –	220	190	215	175	HB	1.5	80	3-4	250-270	60-90											
XT 180 GF30	30% glass fiber reinforced Polyamide 66 for high temperature applications		1.38	–	–	–	–	dry cond.	–	–	230 160	3 6	17,500 10,000	95 NB	90 –	15 20	– –	240	205	>250	208	–	–	80	3-4	280-300	80-120											
XT 200 GF30	30% glass fiber reinforced Polyamide 66 for high temperature applications, electrically neutral, gap-less stabilization		1.38	–	–	1.9	–	dry cond.	–	–	180 104	3 9.4	10,800 5,800	70 NB	52 –	9 16	– –	240	202	221	207	–	–	80	3-4	270-290	80-120											
XM GF50	50% glass fiber reinforced semi-aromatic Polyamide compound with excellent rigity and strength, also if conditioned. For metal substitution.		1.59	–	–	1.1	–	dry cond.	–	–	250 220	3 3	17,500 16,500	110 100	95 –	17 17	15 –	250	210	225	200	–	–	80	4-8	270-305	80-120											
HT GF33 (former PPA GF33)	Polyphthalamid with 33% GF, high stiffness and strength at high temperatures, heatstabilzed, high chemical resistance		1.46	–	–	–	–	dry cond.	–	–	180 162	2 1.6	12,000 12,000	42 37	30 –	10 10	10 –	315	>250	>250	>250	–	–	120	3-4	320-345	130-160											
Schulamid® 612	**Polyamide 612**																																			
FS 4104	High viscosity, high impact modified with electrical neutral heat stabilization, extrusion grade		1.01	–	–	1.2	0.8-1.5	dry cond.	–	–	40 30	>200 >250	1,200 320	NB NB	NB –	110 NB	110 –	218	55	70	100	HB	1.5	80	3-4	230-270	50-90											
FS 5003 MC	Medium viscosity, heat stabilized, impact modified, coating, extrusion and injection moulding grade		1.04	–	–	1.2	0.7-1.3	dry cond.	50 35	5.5 22	–	35 300	1,900 830	NB NB	NB -	75 120	25 –	218	90	108	146	HB	1.5	80	3-4	230-270	50-90											
GF33 H2	33% glass fiber reinforced, heat stabilized		1.32	–	–	1.3	0.3/1.0	dry cond.	–	–	170 130	3.0 3.6	9,500 8,300	75 65	65 –	9 10	8 –	218	195	214	–	HB	1.6	80	3-4	240-280	50-90											
GF65 H IS	65% glass fiber reinforced, heat stabilized, for metal substitution		1,74	–	–	1.2	0.15/0.7	dry cond.	–	–	210 180	1.5 1.6	24,000 20,000	65 70	65 –	9.5 11	9 -	218	200	210	–	–	–	80	3-4	240-280	50-90											
Schulaketon®	**Aliphatic polyketone – PK**				240 °C/ 2.16 kg													-40 °C																		
NV	Low viscosity apliphatic Polyketon		1.24	-	3.7	-	-		65	18			1,450	NB	NB	15	5	220	100	-	191	HB	1.6	80	3-4	240-260	60-120											
E	Medium viscositiy apliphatic Polyketon		1.24	-	0.4	-	-		60	20			1,400	NB	NB	22	5	220	100	-	191	HB	1.6	80	3-4	240-260	60-120											
GF15	15% glass fiber reinforced		1.34	-	0.4	-	-				85	4	4.500	60	50	10	5	220	207	-	210	-	-	80	3-4	240-265	60-120											
GF30	30% glass fiber reinforced		1.47	–	6	-	0.3/0.7	–	–	–	135	3.5	7,800	70	70	13	10	220	204	207	208	HB	1.6	80	3-4	240-265	60-120											
Schuladur®	**PBT, PET**				250 °C/ 2.16 kg																															
A MV 14	Medium viscosity PBT-grade		1.31	–	15	0.5	1.9-2.8	–	55	4	–	–	2,600	NB	–	8	7	–	55	150	–	HB	1.5 all colors	120	2-4	250-260	70-90											
A GF30	30% glass fiber PBT-grade		1.53	–	20	0.3	0.3/1.4	–	–	–	130	2.5	10,000	60	55	8	5	225	205	215	213	HB	1.5 all colors	120	2-4	250-260	70-90											
A GF30 HI	30% glass fiber, high impact PBT-grade		1.49	–	4 (260 °C/2.16 kg)	–	0.3/1.4	–	–	–	101	3.3	8,400	70	60	12	8	–	204	213	–	HB	1.5	100	2-4	240-250	70-90											
PCR GF30	30% glass fiber PBT/PET-blend with post consumer PET		1.55	–	20 (260 °C/2.16 kg)	0.3	0.2/1.2	–	–	–	142	2.1	11,000	55	50	8	8	–	205	225	204	HB	1.5 all colors	120	4-6	260-280	80-110											
A1 GF50	50% glass fiber PBT/PET-blend		1.75	–	20 (280 °C/5 kg)	0.2	0.2/0.9	–	–	–	175	1.5	18.500	60	60	10	10	–	203	220	201	HB	1.6	120	4-6	260-280	80-110											
A3 GF30	30% glass fiber PBT/ASA-blend, warpage optimized		1.42	–	20 (280 °C/5 kg)	–	0.2/0.8	–	–	–	118	2.5	9,300	50	48	9	8	230	180	214	145	HB	0.75	100	2-4	250-260	60-90											
E GF35	35% glass fiber PET-grade		1.62	–	28 (280 °C/2.16 kg)	0.2	0.2/0.8	–	–	–	170	2.1	12,300	66	45	8.5	8	250	230	248	234	HB	1.6	120	4-6	280-290	80-110											
Schulaform®	**POM**				190 °C/ 2.16 kg																															
9A	Fast crystallisation		1.41	–	8.5	–	1-3	–	63	11	–	–	2,670	NB	NB	9	8	165	98	152	146	HB	1.5 all colors	100*	2-4*	200-210	60-120											
9D	High flow		1.41	–	25	–	1-3	–	64	8	–	–	2,900	NB	NB	7	6	–	101	150	150	HB	1.5 all colors	100*	2-4*	200-210	60-120											
9D LE	Easy flow Polyoxymethylene grade with low emissions for automotive applications		1.41	–	21	–	1-3	–	62	9	–	–	2,800	NB	NB	8	7	–	94	–	147	–	–	100*	2-4*	200-210	60-120											
Ronfalin® ABS	**Acrylonitrile-Butadiene-Styrene**				220 °C/ 10 kg																															
1541 (former Polyman M/HI W K1808)	High vicat		1.05	–	7	–	0.4-0.6	–	46	3.4	–	–	2,300	NB	NB	22	12	–	86	94	107	HB	1.6	80	2-4	230-250	40-80											
1363 A U (former Polyman M/SHI A UV)	High notched charpy		1.04	–	17	–	0.4-0.6	–	37	3	30	16	1,800	NB	NB	32	15	–	80	91	97	HB	1.6	80	2-4	230-250	40-80											
1328 A (former Polyman ABS M/MI A 40)	High MVR		1.04	–	42	–	0.4-0.6	–	50	3.1	–	–	2,600	NB	79	15	8	–	82	92	97	HB	1.6 all colors	80	2-4	230-250	40-80											
1344 FC (former Polyman LP 299)	General purpose grade, food contact		1.04	–	21	–	0.4-0.6	–	43	2.4	–	–	2,300	NB	NB	21	11	–	74	87	96	HB	1.5	80	2-4	230-250	40-80											
1261 FC (former Polyman LP 126)	General purpose grade, food contact		1.04	–	7	–	0.4-0.6	–	36	2.9	–	–	1,760	NB	NB	34	14	–	70	85	91	HB	1.5	80	2-4	230-250	40-80											
1237 FC (former Polyman LP 128)	General purpose grade, food contact		1.04	–	36	–	0.4-0.6	–	44	2.4	–	–	2,300	NB	98	17	9	–	72	83	94	HB	1.5	80	2-4	230-250	40-80											
1412 GF17 (former Polyman FABS 17GF)	17% glass fiber reinforced		1.16	–	12	–	0.2-0.5	–	–	–	73	1.9	5,000	22	22	7	6	–	95	102	102	HB	1.6 all colors	80	2-4	230-250	40-80											
1175	High charpy, high flow		1.04	–	27	–	0.4-0.6	–	–	3.3	–	–	1700	NB	NB	36	16	–	–	–	89	HB	1.5	80	2-4	230-250	40-80											
Ronfalin® ASA	**Acrylonitrile-Styrene-Acrylate**				220 °C/ 10 kg																															
3323 U (former Polyman ASA WR/MI)	With UV stabilization		1.06	–	17	–	0.4-0.6	–	47	3.6	–	–	2,200	NB	72	12	3	–	80	92	97	HB	1.6	80	2-4	240-270	40-80											
3421 U (former Polyman ASA E /MI 0515 H UV)	With UV stabilization		1.06	–	7	–	0.4-0.6	–	50	3.6	–	–	2,400	60	26	12	2	–	88	103	102	HB	1.6	80	2-4	240-270	40-80											
Ronfalin® SAN	**Styrene-Acrylonitrile**				220 °C/ 10 kg																															
4501 GF35 (former Polyman FSAN 35GF)	With glass fiber		1.35	–	5	–	0.2-0.5	–	–	–	96	1	12,500	15	9	4	3	–	98	101	105	–	–	80	2-4	220-250	50-80											
4404 FC (former Polyman SAN 29/10)	Food contact		1.08	–	10	–	0.4-0.6	–	–	–	70	3	3,700	17	–	3	–	–	100	103	102	HB	1.5 all colors	80	2-4	220-250	50-80											
Perlex® PC	**Polycarbonate**				300 °C/ 1.2 kg																															
R253-ST	UV and hydrolysis stabilized		1.20	–	11	–	0.4-0.6	–	60	6			2,350					–	125	135	142	V2	1.6	120	3-4	280-310	90-110											
Schulablend®	**Blends**				250 °C/ 5 kg																															
(ABS/PA) M/MK 6501 SF U (former M/MK K2004 SF)	High flow and high impact strength		1.08	–	(260 °C/5.0kg) 10	–	0.8-1.2	dry	40	3.4	40	120	1,800	NB	NB	90	30	–	60	–	129	HB	1.6	80	0-4	230-270	40-80											
(ABS/PA) M/MK 6102 GF8 (former M/MK 8 GF)	8% glass fiber reinforced		1.1	–	4	–	0.4-1.0	dry	43	3	–	–	3,300	70	55	13	5	–	76	152	115	–	–	80	4	230-270	40-80											
(ABS/PA) M/MK 6201 MT (former M/MK NC 800)	Nanocomposite filler, reduced shrinkage		1.14	–	4	–	0.6-0.9	dry cond.	39.0 28	3 14	–	–	2,400 1,250	NB NB	NB –	30 110	15 –	–	77 –	97 –	116 –	HB	1.6 all colors	80	4	230-270	40-80											
(ASA/PA) M/MW 6201 U (former M/MW UV)	UV stabilized, high impact strength		1.12	–	17	–	0.8-1.2	dry	55	4	–	–	2,000	NB	NB	21	7	–	53	98	140	HB	1.6	80	4	230-270	40-80											
(ASA/PA) M/MW 6201 MT SF U (former M/MW NC100 SF K2083)	Nanocomposite filler, reduced shrinkage, high flow		1.17	–	20.3	–	0.8-1.2	dry cond.	55 32	3.2 4.7	– –	– –	3,200 1,800	NB NB	NB NB	18 10	4 –	–	78 –	96 –	115 –	HB	1.6	80	4	230-270	40-80											
(PC/ASA) M/MA 6301 CA U (former WR 5 UV CA)	High impact, high UV resistance, constant antistatic		1.15	–	(260 °C/5.0kg) 30	–	0.8-1.2	–	51	4.8	42	40	2,010	NB	NB	70	14	–	88	112	126	HB	1.6	100-110	4	260-280	70-100											
(PC/ABS) M/MB 5301 REC (former M/MB 705 REC)	High impact strength, improved heat resistance		1.12	–	(260 °C/5.0kg) 25	–	0.4-0.6	–	49	4			2,100	NB	NB	45	17	–	100		116	HB	1.6	100-110	4	260-280	70-100											
(PC/ABS) M/MB 6101 GF20 (former M/MB 5 GF20)	20% glass fiber reinforced, high heat resistance		1.27	–	(260 °C/5.0kg) 14	–	0.2-0.4	–			96	2	5,900	25	30	8	7	–	121	132	132	HB	1.6	100-110	4	260-280	70-100											
(PA/PP) M/MO 5101 (former M/MO)	High flow, excellent chemical resistance		Dry: 1.01	–	Dry: 11	–	1.1-1.8	dry cond.	50 38	5 21	– –	– –	1,800 1,100	NB NB	49 –	11 15	6 –	–	55 –	119 –	120 –	HB –	1.6 –	80	3-4	240-270	60-90											
(PETG) M/MC 3401 SF	High flow, transparent Copolyester Blend		1.18	–	(265 °C/2.16kg) 26	–	0.4-0.6	–	47	6	42	130	1,600	NB	NB	80	7	–	80	86	98	HB	1.6	90	4	280-300	60-80											
(PC/PBT) M/MX 5301 U	High gloss surface, high impact, good chemical and UV resistance		1.21	–	(260 °C/5.0kg) 54	–	0.8-1.2	–	52	4.5	35	11	2,000	NB	NB	45	14	–	66	85	107	HB	1.6	120	3-4	250-260	70-100											
Polyfort®	**Polypropylene**				230 °C/ 2.16 kg																															
FIPP 10 T silver K2369	Copolymer, 10% mineral filled, silver metallic effect		0.95	–	30		0.9-1.4	–	17	8	9.1	49	1,100	NB	20	16	3	165	47	63	56	–	–	80*	2-3*	230-270	40-70											
FPP 20 T	Homopolymer, 20% talc filled		1.06	–	11	–	0.9-1.4	–	33	6	–	–	2,600	38	14	4	2	165	58	109	84	HB	1.5 all colors	80*	2-3*	230-270	40-70											
FPP 20 TE	Homopolymer, 20% talc filled, extrusion grade		1.05	–	3		0.9-1.4	–	33	8	–	–	2,600	60	–	6	–	165	70	125	90	HB	1.5	80*	2-3*	190-240	30-60											
FPP 22 T K1093	Homopolymer, 22% talc filled, long term heat stabilized		1.07	–	15	–	0.9-1.4	–	29	5	–	–	2,650	30	15	3.5	1.5	165	60	110	86	HB	1.5	80*	2-3*	230-270	40-70											
FPP 40 T	Homopolymer, 40% talc filled		1.28	–	6	–	0.6-0.9	–	28	2.5	–	–	4,000	18	10	2.5	1.5	165	69	118	92	HB	1.5 all colors	80*	2-3*	230-270	40-70											
FPP 40 T LE K2274	Homopolymer, 40% talc filled, low emission, low odor		1.25	–	8	–	0.6-0.9	–	24	4.6	–	–	4,200	20	11	2.5	1.8	165	75	130	90	HB	1.5	80*	2-3*	230-270	40-70											
FIPP MKF4025	Copolymer, 15% talc + 25% GF, high impact resistance		1.23	–	19	–	0.6/0.9	–	–	–	62	3	6,500	30	22	8	6	165	142	157	–	HB	1.5	80*	2-3*	230-270	40-70											
FPP 30/10 GB GF	Homopolymer, 20% glass beads, 10% glass fibers		1.12	–	5	– –	0.7/1.3	–	–	–	51	4	3,500	35	–	5	–	165	112	150	–	–	–	80*	2-3*	230-270	40-70											
FPP 20 GFC	Homopolymer, 20% glass fiber reinforced		1.05	–	5	–	0.45/1.4	–	68	3	–	–	4,600	30	25	8	7	165	136	153	115	HB	1.5 all colors	80*	2-3*	230-270	40-70											
FPP 30 GFC K1079	Homopolymer, 30% GF, long term heat stabilized		1.11	–	5	–	0.3/1.2	–	–	–	85	3.0	6,700	48	45	9	8	165	145	159	–	HB	1.5	80*	2-3*	230-270	40-70											
FPP 40 GFC LE K2097	Homopolymer, 40% GF, low emission, long term heat stabilized		1.21	–	5	–	0.2/1	–	–	–	100	2.8	9,600	50	49	10	8	165	145	159	–	HB	1.5	80*	2-3*	230-270	40-70											
FPP 40 GFC	Homopolymer, 40% glass fiber reinforced		1.21	–	4	–	0.2/1	–	–	–	90	2.7	8,100	41	–	8	–	165	147	–	–	–	–	80*	2-3*	230-270	40-70											
Ecotran® PPS	**Polyphenylene Sulphide**				240 °C/ 2.16 kg																															
E1040S AS	40% glass fiber, high strength		1.64	–	–	0.02	0.25-0.65	–	–	–	195	1.8	16,500	42	–	10	–	280	266	–	–	0.75-3.0	V-0	140	3-4	295-325	135-145											
E5060G AS	65% glass and mineral reinforced, general purpose		1.98	–	–	0.02	0.2/0.6	–	–	–	130	1	19,000	20	–	6	–	280	266	–	–	0.75-3.0	V-0	140	3-4	295-325	135-145											
Schulatec® PEEK	**Polyetheretherketone**				400 °C/ 2.16 kg																															
MV 14	Medium viscosity, extrusion and injection moulding grade		1.3	–	3	0.1	1.1-1.5	–	96	4.9	–	–	3,850	42	–	10	–	–	–	160	–	V-0	1,5	150-160	3-4	350-380	170-190											
GF30 NV12	30% glass fiber reinforced, low viscosity		1.51	–	14	0.1	0.3/1.3	–	–	–	174	2.8	11,300	75	75	9	8	–	–	315	–	V-0	0.8	150-160	3-4	350-380	170-190											

0002-EP-EMEA-EN-16-01

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* = drying normally not required
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