


VESTAMID® HT *plus*
PA 6T/X and PA 10T/X product range and main properties



VESTAMID® HT*plus* base polymers

VESTAMID® HT <i>plus</i>	Description acc. ISO 1874-1	Characterization	Process- ing	Tensile modulus [MPa]	Applications
M1000 natural color	PA6T/X	Medium viscosity, semicrystalline with aromatic segments	C	3600	Manufacturing of compounds for injection molding
M3000 natural color 	PA10T/X	Medium viscosity, semicrystalline with aromatic segments; partly based on renewable raw materials	C	2700	Manufacturing of compounds for injection molding

Abbreviations:

I = Injection molding

E = Extrusion

C = Compounding

P = Powder

Main properties of VESTAMID® HT*plus* base polymers

Property		Test method	Unit	VESTAMID® HT <i>plus</i> M1000	VESTAMID® HT <i>plus</i> M3000
Physical, thermal, mechanical properties, and flammability					
Density	23 °C	ISO 1183	g/cm ³	1.2	1.1
Melting temperature DSC	2 nd heating	ISO 11357	°C	315	285
Temp. of deflection under load Method A Method B	1.8 MPa 0.45 MPa	ISO 75	°C °C	126 223	128 225
VICAT softening temperature Method A	10 N	ISO 306	°C	300	280
Flammability acc. UL94	1.6 mm 3.2 mm	IEC 60695		HB HB	HB HB
Water absorption	23 °C, saturation 23°C, 50% rel. humidity	ISO 62	% %	8.0 0.3	3.0 0.15
Mold shrinkage in flow direction in transverse direction		ISO 294-4	% %	1.3 1.5	1.4 1.5
Tensile test Stress at break Strain at break		ISO 527-1/2	MPa %	90 3	73 5
Tensile modulus		ISO 527-1/2	MPa	3600	2700
CHARPY impact strength	23 °C -30 °C	ISO 179/1eU	kJ/m ² kJ/m ²	50 C 45 C	60 C 60 C
CHARPY notched impact strength	23 °C -30 °C	ISO 179/1eA	kJ/m ² kJ/m ²	7 C 5 C	6 C 6 C
Electrical properties					
Electric strength	K20/P50	IEC 60243-1	kV/mm	30	
Comparative tracking index	CTI	IEC 60112		550	
Volume resistivity		IEC 60093	Ω cm	2 x 10 ¹⁶	

C = complete break

Main properties of unfilled VESTAMID® HT *plus* grades

Property	Test method	Unit	VESTAMID® HT <i>plus</i> F1001	VESTAMID® HT <i>plus</i> F1002	VESTAMID® HT <i>plus</i> F2001	VESTAMID® HT <i>plus</i> F2002	VESTAMID® HT <i>plus</i> C2505*
Physical, thermal, and mechanical properties							
Density 23 °C	ISO 1183	g/cm ³	1.2	1.2	1.11	1.11	1.11
Melting temp. DSC 2 nd heating	ISO 11357	°C	315	315	265	265	265
Temp. of deflection under load Method A 1.8 MPa Method B 0.45 MPa	ISO 75	°C °C					124 242
Water absorption 23 °C, saturation 23°C, 50% rel. humidity	ISO 62	% %	8.0 0.3	8.0 0.3	3.0 0.15	3.0 0.15	3.0 0.15
Tensile test Stress at break Strain at break	ISO 527-1/2	MPa %	100 3	100 3	80 6	80 6	62 >100
Tensile modulus	ISO 527-1/2	MPa	3700	3700	2700	2700	2100
CHARPY impact strength 23 °C -30 °C	ISO 179/1eU	kJ/m ² kJ/m ²					N <100
CHARPY notched impact strength 23 °C -30 °C	ISO 179/1eA	kJ/m ² kJ/m ²					18 C 15 C

C = complete break

* Powder, based on C2000

Reinforced and filled VESTAMID® HT*plus* compounds

VESTAMID® HT <i>plus</i>	Description acc. ISO 1874-1	Characterization	Processing	Tensile modulus [MPa]	Applications
M10315	PA6T/X, GF15	15% glass fibers, medium viscosity, stabilized; colors: natural, black	I	7100	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery
M1033	PA6T/X, GF30	30% glass fibers, medium viscosity, stabilized; colors: natural, black	I	11200	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery
M10345	PA6T/X, GF45	45 % glass fibers, medium viscosity, stabilized; colors: natural, black	I	15500	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M1035	PA6T/X, GF50	50% glass fibers, medium viscosity, stabilized; colors: natural, black	I	19000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M1036	PA6T/X, GF60	60% glass fibers, medium viscosity, stabilized; colors: natural, black	I	23000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M3033 	PA10T/X, GF30	30% glass fibers, medium viscosity, stabilized; wide processing window; "green", colors: natural, black	I	9400	Dimension-stable, highly rigid technical parts for the use at high service temperatures and in contact with chemicals in automotives, electronics and machinery
M3035 	PA10T/X, GF50	50% glass fibers, medium viscosity, stabilized; wide processing window; "green", colors: natural, black	I	15500	Dimension-stable, highly rigid technical parts for the use at high service temperatures and in contact with chemicals in automotives, electronics and machinery, metal replacement
M3036 	PA10T/X, GF60	60% glass fibers, medium viscosity, stabilized; wide processing window; "green", colors: natural, black	I	20100	Dimension-stable, highly rigid technical parts for the use at high service temperatures and in contact with chemicals in automotives, electronics and machinery, metal replacement

Main properties of reinforced VESTAMID® HT *plus* grades for drinking water applications

Property	Test method	Unit	VESTAMID® HT <i>plus</i> M1633	VESTAMID® HT <i>plus</i> M1634	VESTAMID® HT <i>plus</i> M1635	VESTAMID® HT <i>plus</i> M1636
Glass fiber content		%	30	40	50	60
Physical, thermal, and mechanical properties						
Density 23 °C	ISO 1183	g/cm ³	1.43	1.54	1.64	1.77
Water absorption 23 °C, saturation 23°C, 50% rel. humidity	ISO 62	% %	5.6 0.2	4.8 0.2	4.0 0.2	3.2 0.2
Tensile strength 23°C	ISO 527	MPa	160	195	230	260
Strain at break	ISO 527	%	1.7	1.7	1.6	1.5
Tensile modulus	ISO 527-1/2	MPa	11000	14000	17000	23000
CHARPY impact strength 23 °C -30 °C	ISO 179/1eU	kJ/m ² kJ/m ²	35 27	47 34	60 40	60 40
CHARPY notched impact strength 23 °C -30 °C	ISO 179/1eA	kJ/m ² kJ/m ²	7 7	9 9	11 11	17 17
Temp. of deflection under load Method A 1.8 MPa Method B 0.45 MPa	ISO 75	°C °C	290 305	290 305	293 305	293 305
VICAT softening point A (10 N)	ISO 306	°C	308	308	308	308
Flammability	UL94		HB	HB	HB	HB

Reinforced and filled VESTAMID® HTplus compounds for drinking water applications

VESTAMID® HTplus	Description acc. ISO 1874-1	Characterization	Processing	Tensile modulus [MPa]	Applications
M1633	PA6T/X, GF30	30% glass fibers, medium viscosity, stabilized; colors: natural, black	I	11000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M1634	PA6T/X, GF40	40% glass fibers, medium viscosity, stabilized; colors: natural, black	I	14000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M1635	PA6T/X, GF50	50 % glass fibers, medium viscosity, stabilized; colors: natural, black	I	17000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement
M1636	PA6T/X, GF60	60 % glass fibers, medium viscosity, stabilized; colors: natural, black	I	23000	Dimension-stable, highly rigid technical parts for the use at high service temperatures in automotives, electronics and machinery, metal replacement

Main properties of reinforced and filled VESTAMID® HTplus compounds

Property	Test method	Unit	VESTAMID® HTplus M10315	VESTAMID® HTplus M1033	VESTAMID® HTplus M10345	
Physical, thermal, mechanical properties, and flammability						
Density	23 °C	ISO 1183	g/cm ³	1.31	1.43	1.58
Melting temperature DSC	2 nd heating	ISO 11357	°C	315	315	315
Temp. of deflection under load Method A Method B	1.8 MPa 0.45 MPa	ISO 75	°C °C	280 303	290 305	292 305
VICAT softening temperature Method A	10 N	ISO 306	°C	305	308	308
Linear thermal expansion	23–55°C	ISO 11359	10 ⁻⁴ K ⁻¹			
Flammability acc. UL94	1.6 mm 3.2 mm	IEC 60695		HB HB	HB HB	HB HB
Water absorption	23 °C. saturation 23°C. 50% rel. humidity	ISO 62	% %	7.2 0.3	5.6 0.2	4.4 0.2
Mold shrinkage in flow direction in transverse direction		ISO 294-4.	% %	0.6 0.9	0.2 0.9	
Tensile test Stress at break Strain at break		ISO 527-1/2	MPa %	110 2.0	160 1.7	210 1.7
Tensile modulus		ISO 527-1/2	MPa	7100	11000	15500
CHARPY impact strength	23 °C -30 °C	ISO 179/1eU	kJ/m ² kJ/m ²	19 C 18 C	35 C 27 C	54 C 37 C
CHARPY notched impact strength	23 °C -30 °C	ISO 179/1eA	kJ/m ² kJ/m ²	4 C 4 C	7 C 7 C	10 C 10 C
Electrical properties						
Electric strength		IEC 60243-1	kV/mm		29	
Volume resistivity		IEC 60093	Ω cm		7 × 10 ¹⁵	

C = complete break

	VESTAMID® HTplus M1035	VESTAMID® HTplus M1036	VESTAMID® HTplus M3033	VESTAMID® HTplus M3035	VESTAMID® HTplus M3036
	1.64	1.77	1.36	1.58	1.71
	315	315	285	285	285
	293 305	293 305	266 286	276 288	276 288
	308	308	289	292	292
	0.27		-	-	0.8
	HB HB	HB HB	HB HB	HB HB	HB HB
	4.0 0.2	3.2 0.2	2.1 0.11	1.5 0.08	1.2 0.06
	0.1 0.7	<0.1 0.5	0.3 0.8	0.1 0.7	
	230 1.6	260 1.5	170 2.4	215 2.2	230 1.9
	17000	23000	9400	15500	20100
	60 C 40 C	60 C 40 C	56 C 52 C	83 71	90 88
	11 C 11 C	17 C 17 C	9 C 8 C	11C 10 C	18 C 19 C
	2				
	9 x 10 ¹			10 ¹⁴	10 ¹³

Flame retardant VESTAMID® HT *plus* compounds

VESTAMID® HT <i>plus</i>	Description acc. ISO 1874-1	Characterization	Processing	Tensile modulus [MPa]	Applications
M1900	PA6T/X	unreinforced, medium viscosity, flame retardant (UL94 V-0 from 0,4 mm), halogen free, free of red phosphorus, RoHS and WEEE conform colors: natural, black	I	4000	Parts for the electric and electronics industry demanding UL94 V-0, suitable for industrial soldering. UL94 listed in file E100211. Parts fulfill RoHS 2002/95/EC, Restriction of Hazardous Substances. WEEE: Parts are not related to "selective recovery" according to Directive 2002/96/EC on waste electrical and electronic equipment.
M1933	PA6T/X	30% glass fibers, medium viscosity, flame retardant (UL94 V-0 from 0,4 mm), halogen free, free of red phosphorus, RoHS and WEEE conform colors: natural, black	I	10000	Parts for the electric and electronics industry demanding UL94 V-0, suitable for industrial soldering. UL94 listed in file E100211. Parts fulfill RoHS 2002/95/EC, Restriction of Hazardous Substances. WEEE: Parts are not related to "selective recovery" according to Directive 2002/96/EC on waste electrical and electronic equipment.

Main properties of flame retardant VESTAMID® HT*plus* compounds

Property		Test method	Unit	VESTAMID® HT <i>plus</i> M1900	VESTAMID® HT <i>plus</i> M1933
Physical, thermal, mechanical properties, and flammability					
Density	23 °C	ISO 1183	g/cm ³	1.22	1.45
Melting temperature DSC	2 nd heating	ISO 11357	°C	315	315
Temp. of deflection under load Method A Method B	1.8 MPa	ISO 75	°C	135	275
	0.45 MPa		°C	250	300
VICAT softening temperature Method A	10 N	ISO 306	°C	300	303
Flammability acc. UL94	0.4 mm	IEC 60695		V-0	V-0
	0.8 mm			V-0	V-0
Water absorption	23 °C, saturation 23°C, 50% rel. humidity	ISO 62	%	5.8	3.9
			%	0.2	0.2
Mold shrinkage in flow direction in transverse direction		ISO 294-4	%	1.3	0.2
			%	1.6	0.9
Tensile test Stress at break Strain at break		ISO 527-1/2	MPa	70	140
			%	2.0	1.9
Tensile modulus		ISO 527-1/2	MPa	4000	10000
CHARPY impact strength	23 °C	ISO 179/1eU	kJ/m ² kJ/m ²	34 C	40 C
	-30 °C			27 C	30 C
CHARPY notched impact strength	23 °C	ISO 179/1eA	kJ/m ² kJ/m ²	3 C	6 C
	-30 °C			3 C	6 C
Electrical properties					
Electric strength	K20/P50	IEC 60243-1	kV/mm	32	32
Comparative tracking index	CTI	IEC 60112			600
Volume resistivity		IEC 60093	Ω cm	10 ¹⁶	10 ¹⁶

C = complete break

Specialty VESTAMID® HTplus grades

VESTAMID® HTplus	Description acc. ISO 1874-1	Characterization	Processing	Tensile modulus [MPa]	Applications
M1533	PA6T/X, GF30	30% glass fibers, medium viscosity, stabilized, lubricated, low wear colors: natural, black	I	11000	Tribological loaded parts at high service temperatures, e.g., sliding bearings, pivot bushings, bearing cups, slide rails, sliding parts
R1033	PA6T/X, GF30	30% glass fibers, medium viscosity, stabilized, adhesive modified for plastic-rubber composites, high heat resistance colors: black	I	11000	Plastic-rubber composites (K&K): Bonding to rubber without adhesive, e.g., to ACM, FPM, H-NBR; dimension-stable, highly rigid parts for use at high service temperatures
R1133	PA6T/X, GF30	30% glass fibers, medium viscosity, stabilized, adhesive modified for plastic-rubber composites especially with EPDM, high heat resistance colors: black	I	10500	Plastic-rubber composites (K&K): Bonding to rubber without adhesive, especially to EPDM, AEM; dimension-stable, highly rigid parts for use at high service temperatures
R1035	PA6T/X, GF50	50 % glass fibers, medium viscosity, stabilized, adhesive modified for plastic-rubber composites, high heat resistance colors: black	I	17000	Plastic-rubber composites (K&K): Bonding to rubber without adhesive, e.g., to ACM, FPM, H-NBR; dimension-stable, highly rigid parts for use at high service temperatures

Main properties of specialty VESTAMID® HTplus grades

Property	Test method	Unit	VESTAMID® HTplus M1533	VESTAMID® HTplus R1033	VESTAMID® HTplus R1133	VESTAMID® HTplus R1035
Physical, thermal, mechanical properties, and flammability						
Density 23 °C	ISO 1183	g/cm ³	1.53	1.43	1.40	1.64
Melting temp. DSC 2 nd heating	ISO 11357	°C	315	315	315	315
Temp. of deflection under load Method A 1.8 MPa Method B 0.45 MPa	ISO 75	°C °C	255	290 305	244 296	290 305
VICAT softening temp. Method A 10 N	ISO 306	°C		308	300	308
Flammability acc. UL94 1.6 mm 3.2 mm	IEC 60695		HB HB	HB HB	HB HB	HB HB
Water absorption 23 °C, saturation 23°C, 50% rel. humidity	ISO 62	% %	5.6 0.2	5.6 0.2	5.0 0.2	4.0 0.2
Mold shrinkage in flow direction in transverse direction	ISO 294-4	% %	0.2 0.9	0.2 0.9	0.2 0.9	0.1 0.7
Tensile test Stress at break Strain at break	ISO 527-1/2	MPa %	175 2	180 2	140 1.5	260 1.8
Tensile modulus	ISO 527-1/2	MPa	11000	11000	10500	17000
CHARPY impact strength 23 °C -30 °C	ISO 179/1eU	kJ/m ² kJ/m ²	45 C	45 C 30 C	29 C 23 C	70 C 50 C
CHARPY notched impact strength 23 °C -30 °C	ISO 179/1eA	kJ/m ² kJ/m ²	8 C	7 C 7 C	6 C 6 C	12 C 12 C

Unfilled VESTAMID® HT*plus* grades

VESTAMID® HT <i>plus</i>	Description acc. ISO 1874-1	Characterization	Process- ing	Tensile modulus [MPa]	Applications
F1001	PA6T/X	High viscosity, stabilized, natural color	E	3600	Monofilaments
F1002	PA6T/X	Low viscosity, stabilized, natural color	E	3600	Multifilaments
F2001	PA10T/X	High viscosity, stabilized, natural color	E	2700	Monofilaments
F2002	PA10T/X	Low viscosity, stabilized, natural color	E	2700	Multifilaments
C2505	PA10T/X	Low viscosity, powder, natural color	P	2100	Fiber composites

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