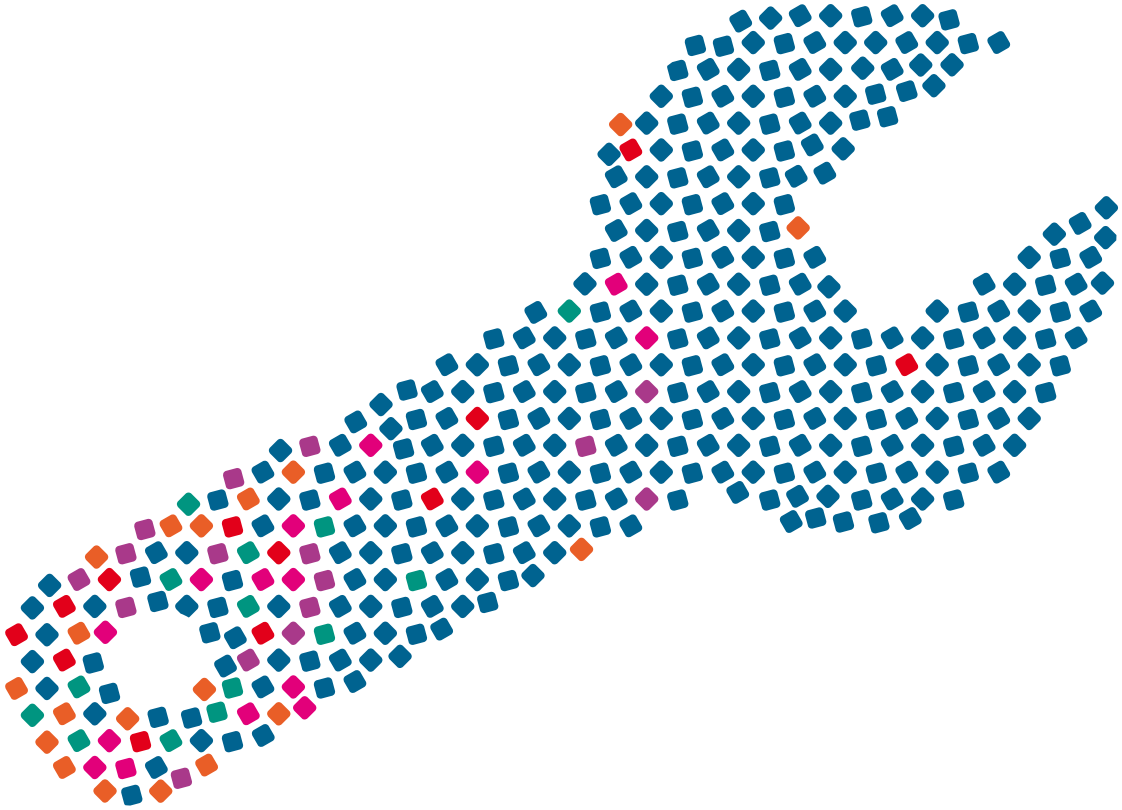
eurotec® engineering plastics



Intelligent Solutions for Metal Replacement

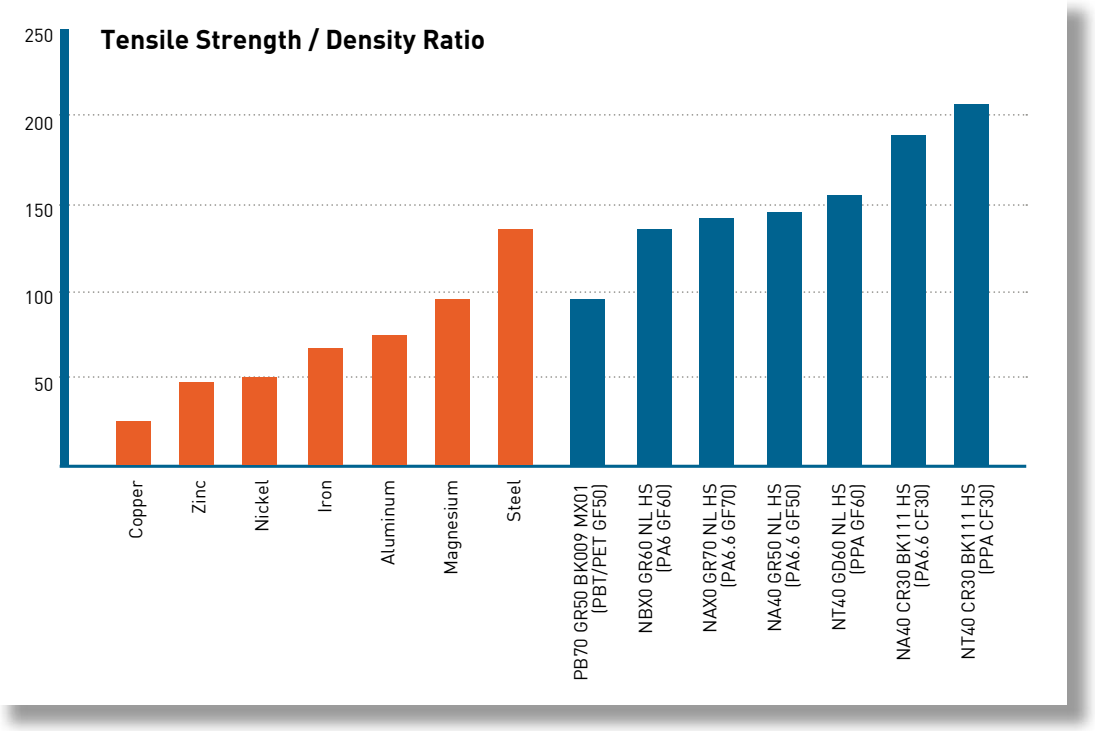
eurotec® Specialty Compounds for Metal Replacement Solutions

Environmental concerns, limited energy resources, and increasing competition are the key drivers for manufacturers to produce sustainable and economic products.

Traditionally metals have been used for the strength, stiffness, conductivity, durability, fire and heat resistance.

Unlike metals, thermoplastics are low density and easy processing materials that require much less energy for production and recycling. Moreover with a single step, sophisticated components can be produced without need of any further secondary operations like machining, painting and surface treatments. Several components can be integrated as one providing decrease in the number of assembly operations. In addition, corrosion and chemical resistance increase the durability and life span of the products. Therefore plastics are environmentally friendly and cost effective materials.

Although some of the key metal properties cannot be matched by standard thermoplastics, manufacturers can replace them by using specialty engineering thermoplastics modified with reinforcements, fillers and additives. These compounds can enhance wear resistance, toughness, stiffness, flame resistance, conductivity, and thermal stability and also offer significant cost reductions over metals.



In order to achieve success in metal replacement, following steps should be taken into consideration;

- What is the working temperature?
  First step should be narrowing down the base polymer type which can be done by evaluating maximum and minimum operating temperature.
- In which environmental conditions product will be operating?
  Contact with chemicals, UV & light exposure, atmospheric conditions etc.
- What are the key requirements?
  Mechanical properties, dimension stability, wear resistance, conductivity, fire resistance, aesthetics, etc.
- How long is the life expectancy?
  In their service life thermoplastics will be subjected to physical aging like creep and relaxation. Therefore reinforcements and modifications should be chosen regarding to life expectancy.
- Are there any regulations that must be fulfilled?
  Safety and fire standards, restricted substances, food contact legislations, etc.
- Production method and part design
  Stiffness of the part can be greatly enhanced by ribs and stiffness/wall thickness balance should be optimized to acquire maximum cost advantage through reduced weight.

In addition to steps above, role of the material supplier is very crucial. Achieving success in metal replacement projects require not only a thermoplastic compound supplier but also a solution partner.

euro**tec**® is an independent compounder of engineering thermoplastics that creates and offers intelligent solutions based on innovative products and tailor made services.

euro**tec**® combines state of the art technology with high level of know-how and a dynamic, service oriented team, developing high quality products in order to meet multiple demands for metal replacement applications;

- Structural reinforcements
- Conductivity
- Flame retardancy
- Wear and abrasion resistance
- High temperature stability
- Durability
- Custom colours
- Aesthetics

Giving Strength to Structural Components

Although metals are known for their high strength and stiffness, structural plastic components with excellent strength to weight ratio can be obtained by using variety of speciality reinforcements with high loading levels. Common reinforcement material for thermoplastic compounds is glass fiber. While they reinforce the polymer matrix with their high mechanical strength and impact resistance, they also provide very good stiffness with tensile modulus up to 30 GPa. For more demanding applications, carbon fiber can be used for increased reinforcement performance. Carbon fiber reinforced compounds have excellent stiffness with tensile modulus exceeding 40 GPa and they provide even further weight reduction due to their low density. These compounds have tensile strength higher than that of aluminum, copper, silver and many alloys.

Most thermoplastics are thermally and electrically insulative materials. As perfect insulators, while they can stand high voltages and currents without causing any electrical fault and they can also insulate heat flux from its source. If it is necessary, thermoplastics can be modified for high conductivity that can imitate metal properties. These compounds can have wide electrical conductivity range starting from anti-static (10^{12} to 10^{9} ohm) to highly conductive, EMI/RF shielding compounds (10^{3} to 10^{0} ohm).

In the applications where fire resistance is needed, flame retardant thermoplastics will interfere with the potential fire hazard by resisting ignition and delaying or preventing its propagation.

Tecomid® NBX0 GR60 NL HS

PA6, 60% glass fiber reinforced, heat stabilized

- Tensile Strength 225 MPa
- Tensile Modulus 20000 MPa
- HDT (1.8MPa) 215°C

The grade combines easy processing, very good mechanical strength with excellent surface and stiffness.

Tecomid® NAX0 GD50 NL CA

PA6.6, 50% glass fiber reinforced, heat & UV stabilized

- Tensile Strength 250 MPa
- Tensile Modulus 17500 MPa
- HDT (1.8MPa) 255°C

Specially formulated very low warpage grade provides higher mechanical strength than standard grades and delivers excellent weatherability, thermal stability, and exceptional surface aspect.

Tecomid® NA40 CR30 BK111 HS

PA6.6, 30% carbon fiber reinforced, heat stabilized, black

- Tensile Strength 225 MPa
- Tensile Modulus 20000 MPa
- HDT (1.8MPa) 250°C
- Volume Resistivity <1E+3 ohm.cm

The grade combines excellent mechanical strength with low density and, electrical conductivity

Tecomid® NT40 GR50 NL XA60

PPA, 50% glass fiber reinforced, flame retardant, heat stabilized

- Tensile Strength 210 MPa
- Tensile Modulus 18500 MPa
- HDT (1.8MPa) 285°C
- UL94 V0

High performance grade provides excellent mechanical strength and stiffness, outstanding thermal stability and exceptional self-extinguishing performance for most demanding applications.

Tecomid® NAX0 GR70 NL HS

PA6.6, 70% glass fiber reinforced, heat stabilized

- Tensile Strength 260 MPa
- Tensile Modulus 28000 MPa
- HDT (1.8MPa) 255°C

Special grade offers extreme stiffness and mechanical strength with high heat aging resistance.

Tecomid® NT40 KC60 BK111 HS 0A

PPA, 60% glass fiber / carbon fiber reinforced, heat stabilized, black

- Tensile Strength 285 MPa
- Tensile Modulus 38000 MPa
- HDT (1.8MPa) 290°C

Extremely stiff grade, that delivers excellent strength even at elevated temperatures.

Tecodur® PB70 GR50 BK009 MX01

PBT/PET, 50% glass fiber reinforced, heat & UV stabilized, improved impact, black

- Tensile Strength 145 MPa
- Tensile Modulus 17000 MPa
- HDT (1.8MPa) 200°C

The grade offers high stiffness, excellent weatherability, and easy assembly performance.

Tecotek® PC40 CN20 BK016 TD70

PC, 20% carbon fiber reinforced, flame retardant, black

- Tensile Modulus 12000 MPa
- Volume Resistivity <1E+1 ohm.cm
- UL94 V0

The grade delivers very good self-extinguishing performance, EMI/RF shielding capability and dimensional stability.

Strength - Stiffness

When weight matters

In today's automotive and appliance sectors weight reduction is a must for energy efficiency and environmental compliance.

Low density thermoplastics provide light weight components with improved chemical and corrosion resistance over metals extending service life.

On the other hand when weight of a metal is needed, heavy thermoplastic compounds can also combine their easy processing with high density. Heavy compounds can deliver corrosion free, vibration and sound dampening equipment along with heft and feel of the metals.

Tecomid® NBX0 HF75 NL

PA6, 75% heavy filler, improved flexibility

- Density 2.50 g/cm³
- Tensile Modulus 7500 MPa

Specially formulated grade is designed for weighting and balancing applications where toughness is a requirement.

Tecolen® CP20 HF65 NL

PPCP, 65% heavy filler

- Density 1.90 g/cm³
- Tensile Modulus 3250 MPa

This cost effective grade delivers sound and vibration dampening properties, with very good aesthetics performance.

Tecomid® NB40 HF85 MT112 EC 0B

PA6, 85% heavy filler

- Density 4.50 g/cm³
- Tensile Modulus 12000 MPa
- HDT (1.8Mpa) 150°C

The grade combines heft, feel and weight of the metals with processing advantages of plastics.

Taking the Heat with High Performance Thermoplastics

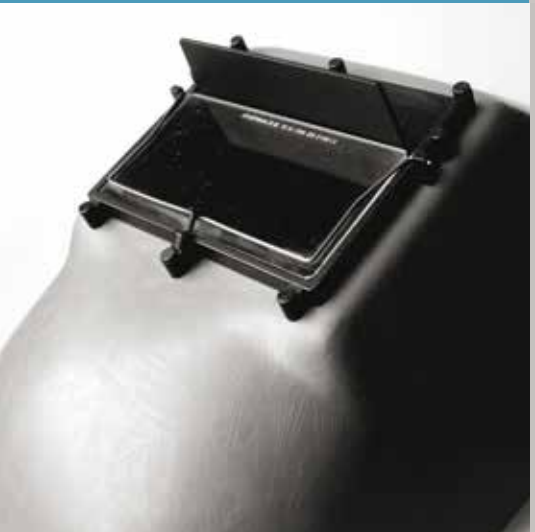
In the past, metals were indispensable due to their high operational temperature performance and high heat aging resistance. Through various developments, engineering thermoplastic compounds can deliver required heat aging and operational temperatures needed thanks to heat stabilization and high performance polymers.

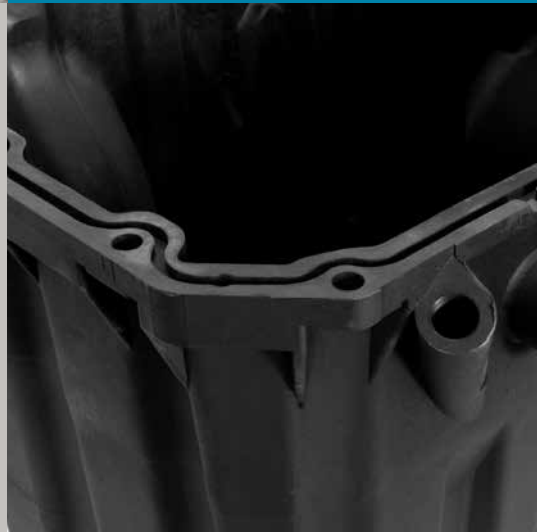
Tecomid® NT40 GR50 NL HS

PPA, 50% glass fiber reinforced, heat stabilized

- Tensile Strength 250 MPa
- Tensile Modulus 18000 MPa
- HDT (1.8MPa) 290°C

The grade offers hot water resistance, excellent mechanical strength and superior thermal stability.





Tecopet® PT70 KK45 NL XA20 0B

PET, 45% glass fiber / mineral reinforced, flame retardant, heat stabilized

- Tensile Modulus 13000 MPa
- HDT (1.8MPa) 200°C
- GWIT 875°C
- UL94 V0

Outstanding fire & ignition resistant grade combines, heft and thermal resistance of metals.

Tecomid® NT40 GD60 NL HS

PPA, 60% glass fiber reinforced, heat stabilized

- Tensile Strength 270 MPa
- Tensile Modulus 38000 MPa
- HDT (1.8MPa) 295°C

Exceptionally heat aging resistant grade provides excellent mechanical strength, outstanding surface aspect, very low warpage and superior thermal stability.

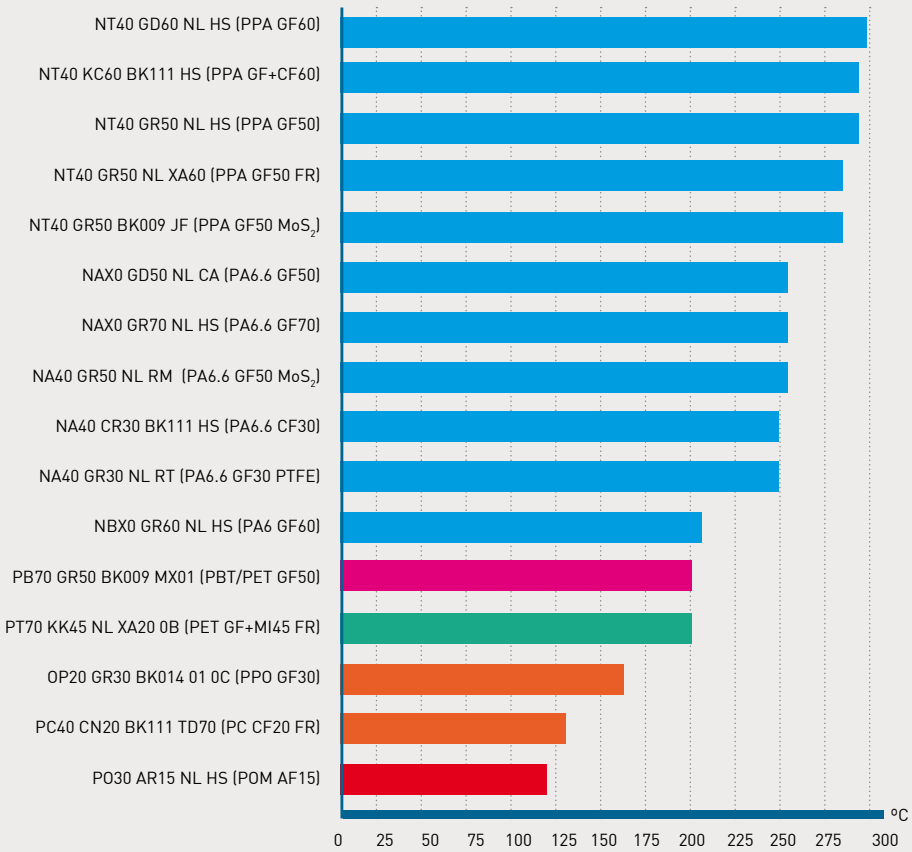
Tecotek® OP20 GR30 BK014 01 0C

PPO, 30% glass fiber reinforced

- Tensile Strength 120 MPa
- Tensile Modulus 9000 MPa
- HDT (1.8MPa) 165°C

This high temperature amorphous grade offers very low moisture absorption, hydrolytic resistance, and dimensional stability.

HDT at 1.80MPa



Achieving Excellent Wear Resistance with Self Lubricating Thermoplastic Compounds

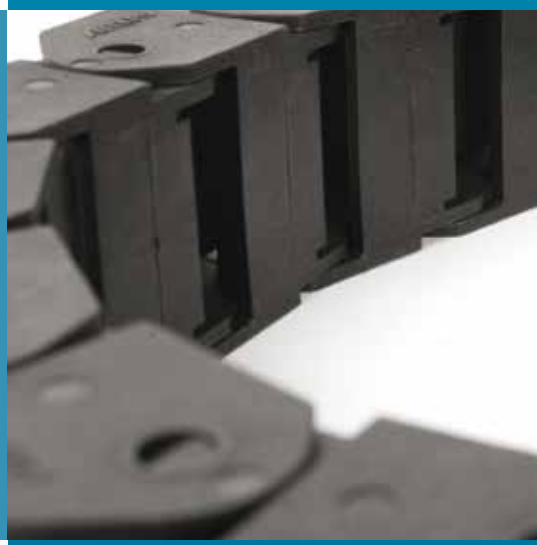
Metals are used in components like gears, bushings, and shafts where wear resistance is crucial. On the other hand metal applications require machining, polishing and surface treatments in order to get low coefficient of friction. However, easy processing thermoplastics deliver required product within a single step. Moreover self-lubricating thermoplastic compounds provide scratch and wear resistance along with low coefficient of friction.

Tecomid® NA40 GR30 NL RT

PA6.6, 30% glass fiber reinforced, PTFE modified

- Tensile Strength 170 MPa
- Tensile Modulus 10000 MPa
- HDT (1.8MPa) 250°C

Self-lubricating grade delivers, very good oil resistance and stiffness for plastic to plastic contact applications.



Tecomid® NA40 GR50 NL RM

PA6.6, 50% glass fiber reinforced, MoS_2 modified

- Tensile Strength 220 MPa
- Tensile Modulus 17000 MPa
- HDT (1.8MPa) 255°C

The grade offers, excellent mechanical strength and outstanding wear resistance for plastic to metal contact applications.

Tecomid® NT40 GR50 BK009 JF

PPA, 50% glass fiber reinforced, heat stabilized, MoS_2 modified

- Tensile Strength 225 MPa
- Tensile Modulus 18000 MPa
- HDT (1.8MPa) 285°C

High performance grade provides exceptional heat aging resistance, hydrolytic stability, oil resistance, exceptional wear resistance, and very low coefficient of friction for high temperature applications.

Tecomid® P030 AR15 NL HS

POM copolymer, 15% aramid fiber reinforced, heat stabilized

- Tensile Strength 75 MPa
- Tensile Modulus 3450 MPa
- HDT (1.8MPa) 120°C

Counterpart friendly grade offers very low coefficient of friction and excellent wear resistance.

Structural

PROPERTY	CONDITION	UNIT	STANDARD	**NB60 CR10 BK111 IL** PA6, 10% carbon fiber reinforced, impact modified, black, extrusion grade	**NB40 CR15 BK111** PA6, 15% carbon fiber reinforced, black	**NB30 GR13 BK EF** PA6, 13% glass fiber reinforced, black, suitable for electrostatic powder coating	**NB40 GR50 NL MB** PA6, 50% glass fiber reinforced, impact modified, heat stabilized, natural	**NB40 GR50 NL HS** PA6, 50% glass fiber reinforced, heat stabilized, natural
GENERAL								
Density	-	g/cm³	ISO 1183	1.14	1.19	1.30	1.54	1.56
Molding Shrinkage	Parallel / Normal	%	eurotec®	0.3 / 1.1	0.4 / 1.2	0.3 / 1.0	0.2 / 0.9	0.1 / 0.9
Moisture Content	-	%	ISO 960	<0.2	<0.2	<0.2	<0.2	<0.2
Moisture Absorption	50% RH, 23 °C	%	ISO 62	2.5	2.3	2.0	1.4	1.5
MECHANICAL								
Stress at Break	+23°C	MPa	ISO 527	120	155	100	200	220
Strain at Break	+23°C	%	ISO 527	4.0	3.0	3.0	3.0	2.5
Tensile Modulus	+23°C	MPa	ISO 527	8000	12000	6000	14000	16000
Yield Strength	+23°C	MPa	ISO 527	-	-	-	-	-
Izod Impact, notched	+23 °C	kJ/m²	ISO 180/1A	12	6	7	22	20
Izod Impact, notched	-30 °C	kJ/m²	ISO 180/1A	-	5	5	20	18
Izod Impact, un-notched	+23 °C	kJ/m²	ISO 180/1U	-	-	-	NB	110
Izod Impact, un-notched	-30 °C	kJ/m²	ISO 180/1U	-	-	-	NB	100
THERMAL								
Melting Temperature	10 K/min	°C	ISO 11357	223	223	223	223	223
Heat Deformation Temperature	0.45 MPa	°C	ISO 75	-	-	-	220	220
Heat Deformation Temperature	1.80 MPa	°C	ISO 75	175	200	170	210	215
Vicat Softening Temperature	50N	°C	ISO 306	-	-	-	210	215
ELECTRICAL & FLAMMABILITY								
Volume Resistivity	-	Ohm.cm	IEC 60093	<1E+5	<1E+5	<1E+3	1E+15	1E+15
Surface Resistivity	-	Ohm	IEC 60093	-	-	-	1E+15	1E+13
Comparative Tracking Index	solution A	V	IEC 60112	-	-	-	500	500
Glow Wire Flammability Index	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Glow Wire Ignitability Temperature	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Flame Rating	0.75 mm	-	UL94	HB	HB	HB	HB	HB
Flame Rating	1.6 mm	-	UL94	HB	HB	HB	HB	HB

* data are based on dry as molded

NBX0 GR60 NL HS PA6, 60% glass fiber reinforced, heat stabilized, natural	**NB30 GR15 BK005 FS90** PA6, 15% glass fiber reinforced, flame retardant - halogen & red phosphorus free, low smoke & toxic gas grade	**NA40 CR10 BK111 HS** PA6.6, 10% carbon fiber reinforced, heat stabilized, black	**NA40 CR20 BK111 MB** PA6.6, 20% carbon fiber reinforced, impact modified, heat stabilized, black	**NA40 CR20 BK111** PA6.6, 20% carbon fiber reinforced, black	**NA40 CN20 BK012 HS** PA6.6, 20% carbon fiber reinforced, heat stabilized, black	**NA40 CR30 BK111 MB** PA6.6, 30% carbon fiber reinforced, impact modified, heat stabilized, black	**NA40 CR30 BK111 HS** PA6.6, 30% carbon fiber reinforced, heat stabilized, black	**NA40 CR40 BK111 HS** PA6.6, 40% carbon fiber reinforced, heat stabilized, black	**NA40 CR45 BK111 HS** PA6.6, 45% carbon fiber reinforced, heat stabilized, black	**NA40 KC35 BK111 0G** PA6.6, 35% glass fiber /carbon fiber reinforced, black
1.70	1.67	1.18	1.20	1.22	1.28	1.23	1.27	1.31	1.34	1.38
0.1 / 0.8	0.3 / 0.7	0.3 / 1.1	0.3 / 1.1	0.3 / 1.1	-	0.3 / 1.1	0.2 / 1.0	-	-	-
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1.2	1.1	2.5	2.0	2.2	2.2	1.5	1.9	1.6	1.5	1.8
225	70	150	180	200	125	210	225	240	250	220
2.0	2.0	2.5	3.0	2.5	1.5	2.0	2.0	1.5	1.5	2.5
20000	9000	9000	14500	15000	12000	19500	20000	27500	30000	15000
-	-	-	-	-	-	-	-	-	-	-
18	7	5	10	8	6	12	10	12	14	10
15	6	-	-	-	5	-	-	-	-	-
-	40	-	-	-	-	-	-	-	-	-
-	35	-	-	-	-	-	-	-	-	-
223	223	262	262	262	262	262	262	262	262	262
220	205	-	-	-	-	-	-	-	-	-
215	185	235	240	245	245	240	250	255	255	255
215	205	-	-	-	-	-	-	-	-	-
1E+15	1E+15	<1E+5	<1E+4	<1E+4	<1E+4	<1E+3	<1E+3	<1E+1	<1E+1	<1E+5
1E+13	1E+13	-	-	-	<1E+3	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-
-	960	-	-	-	-	-	-	-	-	-
-	850	-	-	-	-	-	-	-	-	-
HB	V0	HB	HB	HB	HB	HB	HB	HB	HB	HB
HB	V0	HB	HB	HB	HB	HB	HB	HB	HB	HB

Structural

PROPERTY	CONDITION	UNIT	STANDARD	**NA40 KC40 BK111** PA6.6, 40% glass fiber / carbon fiber reinforced, black	**NA30 KC60 BK111 HS 0A** PA6.6, 60% glass fiber / carbon fiber reinforced, heat stabilized, black	**NA40 GR50 NL HS** PA6.6, 50% glass fiber reinforced, heat stabilized, natural	**NAX0 GD50 NL CA** PA6.6, 50% glass fiber reinforced, heat & UV stabilized, natural, low warpage and good surface finish grade	**NAX0 GR60 NL HS** PA6.6, 60% glass fiber reinforced, heat stabilized, natural
GENERAL								
Density	-	g/cm³	ISO 1183	1.42	1.55	1.57	1.56	1.71
Molding Shrinkage	Parallel / Normal	%	eurotec®	-	-	0.2 / 0.9	0.2 / 0.5	0.2 / 0.7
Moisture Content	-	%	ISO 960	<0.2	<0.2	<0.2	<0.2	<0.2
Moisture Absorption	50% RH, 23 °C	%	ISO 62	1.6	1.8	1.3	1.4	1.0
MECHANICAL								
Stress at Break	+23°C	MPa	ISO 527	210	240	230	250	250
Strain at Break	+23°C	%	ISO 527	2.0	-	2.5	2.0	2.0
Tensile Modulus	+23°C	MPa	ISO 527	17000	38750	16500	17500	22500
Yield Strength	+23°C	MPa	ISO 527	-	-	-	-	-
Izod Impact, notched	+23 °C	kJ/m²	ISO 180/1A	12	9	18	20	17
Izod Impact, notched	-30 °C	kJ/m²	ISO 180/1A	-	-	15	18	16
Izod Impact, un-notched	+23 °C	kJ/m²	ISO 180/1U	-	-	100	-	-
Izod Impact, un-notched	-30 °C	kJ/m²	ISO 180/1U	-	-	90	-	-
THERMAL								
Melting Temperature	10 K/min	°C	ISO 11357	262	262	262	262	262
Heat Deformation Temperature	0.45 MPa	°C	ISO 75	-	-	260	-	260
Heat Deformation Temperature	1.80 MPa	°C	ISO 75	255	250	255	255	255
Vicat Softening Temperature	50N	°C	ISO 306	-	-	255	250	255
ELECTRICAL & FLAMMABILITY								
Volume Resistivity	-	Ohm.cm	IEC 60093	<1E+5	<1E+3	1E+15	1E+15	1E+15
Surface Resistivity	-	Ohm	IEC 60093	-	<1E+2	1E+13	1E+13	1E+13
Comparative Tracking Index	solution A	V	IEC 60112	-	-	500	500	-
Glow Wire Flammability Index	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Glow Wire Ignitability Temperature	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Flame Rating	0.75 mm	-	UL94	HB	HB	HB	HB	HB
Flame Rating	1.6 mm	-	UL94	HB	HB	HB	HB	HB

* data are based on dry as molded

NAX0 GD60 NL CA PA6.6, 60% glass fiber reinforced, heat & UV stabilized, natural, low warpage and good surface finish grade	**NAX0 GR70 NL HS** PA6.6, 70% glass fiber reinforced, heat stabilized, natural	**NA40 CR40 BK111 XA70** PA6.6, 40% carbon fiber reinforced, flame retardant -halogen [RoHS compliant], heat stabilized, black	**NA30 GR50 NL XA43** PA6.6, 50% glass fiber reinforced, flame retardant - red phosphorus, heat stabilized, natural	**NT40 KC60 BK111 HS 0A** PPA, 60% glass fiber / carbon fiber reinforced, heat stabilized, black	**NT40 GR50 NL XA60** PPA, 50% glass fiber reinforced, flame retardant - halogen & red phosphorus free, heat stabilized, natural	**PB70 CR20 BK111 EC** PBT, 20% carbon fiber reinforced, electrically conductive, black	**PB70 CR30 BK111** PBT, 30% carbon fiber reinforced, black	**PB50 GR50 BK002 MB04** PBT/ASA, 50% glass fiber reinforced, heat & UV stabilized, black	**PB70 GR50 BK009 MX01** PBT/PET, 50% glass fiber reinforced, heat & UV stabilized, improved impact, black	**PB70 GR50 NL100** PBT, 50% glass fiber reinforced, natural
1.70	1.85	1.52	1.56	1.61	1.63	1.40	1.41	1.62	1.73	1.72
0.2 / 0.4	-	-	0.2 / 0.8	-	0.2 / 0.7	-	-	-	-	0.2 / 0.8
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.08	<0.08	<0.08	<0.08	<0.08
1.1	-	-	1.1	1.3	1.0	0.2	0.2	0.1	0.1	0.1
260	260	250	175	285	210	120	150	120	145	150
1.5	1.5	1.0	2.0	-	2.0	1.5	1.5	1.5	2.0	1.5
23000	28000	40000	16000	38000	18500	16000	24000	16000	17000	18000
-	-	-	-	-	-	-	-	-	-	-
18	16	12	12	12	12	7	7	11	11	11
16	-	11	11	-	11	6	6	10	10	9
-	-	-	-	-	-	45	45	-	-	-
-	-	-	-	-	-	40	40	-	-	-
262	262	262	262	315	315	225	225	225	225	225
-	260	-	260	-	-	-	-	-	210	220
255	255	250	250	290	285	-	-	190	200	210
-	255	-	250	-	-	-	-	170	-	-
1E+15	1E+15	<1E+1	1E+15	<1E+1	1E+15	<1E+3	<1E+3	1E+16	1E+16	1E+16
1E+13	1E+13	<1E+1	1E+13	-	1E+13	-	-	1E+14	1E+14	1E+14
500	-	-	> 350	-	600	-	-	-	-	-
-	-	960	960	-	960	-	-	-	-	-
-	-	-	-	-	875	-	-	-	-	-
HB	HB	V0	V0	HB	V0	HB	HB	HB	HB	HB
HB	HB	V0	V0	HB	V0	HB	HB	HB	HB	HB

Structural

PROPERTY	CONDITION	UNIT	STANDARD	**PB70 GR50 BK009 CE01** PBT/PET, 50% glass fiber reinforced, heat & UV stabilized, black	**PT74 CR20 BK111 PR** PET, 20% carbon fiber reinforced, black, fast crystallization grade	**PT74 CR30 BK111 PR** PET, 30% carbon fiber reinforced, black, fast crystallization grade	**PT70 GR45 NL100 PR** PET, 45% glass fiber reinforced, heat stabilized, natural, fast crystallization grade	**PC40 SR15 NL TD70** PC, 15% steel fiber reinforced,flame retardant - halogen (RoHS compliant), impact mpdified, natural
GENERAL								
Density	-	g/cm³	ISO 1183	1.75	1.41	1.44	1.69	1.40
Molding Shrinkage	Parallel / Normal	%	eurotec®	-	-	-	0.2 / 0.8	0.1 / 0.7
Moisture Content	-	%	ISO 960	<0.08	<0.08	<0.08	<0.08	<0.1
Moisture Absorption	50% RH, 23 °C	%	ISO 62	0.1	0.2	0.2	0.2	0.2
MECHANICAL								
Stress at Break	+23°C	MPa	ISO 527	150	150	180	175	65
Strain at Break	+23°C	%	ISO 527	1.0	2.0	1.5	1.5	-
Tensile Modulus	+23°C	MPa	ISO 527	19000	15000	24000	16000	3250
Yield Strength	+23°C	MPa	ISO 527	-	-	-	-	-
Izod Impact, notched	+23 °C	kJ/m²	ISO 180/1A	9	8	9	10	9
Izod Impact, notched	-30 °C	kJ/m²	ISO 180/1A	8	-	-	9	-
Izod Impact, un-notched	+23 °C	kJ/m²	ISO 180/1U	-	-	-	-	-
Izod Impact, un-notched	-30 °C	kJ/m²	ISO 180/1U	-	-	-	-	-
THERMAL								
Melting Temperature	10 K/min	°C	ISO 11357	225	250	250	255	-
Heat Deformation Temperature	0.45 MPa	°C	ISO 75	215	-	-	-	-
Heat Deformation Temperature	1.80 MPa	°C	ISO 75	205	195	210	235	120
Vicat Softening Temperature	50N	°C	ISO 306	-	-	-	-	-
ELECTRICAL & FLAMMABILITY								
Volume Resistivity	-	Ohm.cm	IEC 60093	1E+16	<1E+4	<1E+3	1E+16	<1E+4
Surface Resistivity	-	Ohm	IEC 60093	1E+14	-	-	1E+14	-
Comparative Tracking Index	solution A	V	IEC 60112	-	-	-	250	-
Glow Wire Flammability Index	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Glow Wire Ignitability Temperature	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Flame Rating	0.75 mm	-	UL94	HB	HB	HB	HB	-
Flame Rating	1.6 mm	-	UL94	HB	HB	HB	HB	V0

* data are based on dry as molded

					Self Lubricating					
PC40 CN20 BK016 TD70 PC, 20% carbon fiber reinforced, EMI/RF shielding, flame retardant -halogen (RoHS compliant), black	**PC30 KR27 BK016 TD70** PC, 20% carbon fiber / steel fiber reinforced, EMI/RF shielding, flame retardant -halogen (RoHS comliant), black	**PC40 CR30 BK111 EP70** PC, 30% carbon fiber reinforced, electrically conductive, flame retardant -halogen (RoHS compliant), black	**PC50 GR30 NL ZH70** PC, 30% glass fiber reinforced, flame retardant -halogen (RoHS compliant), natural	**HP10 GR60 NL HS** PPHP, 60% glass fiber reinforced, heat stabilized, natural	**NB40 NL RM** PA6, unfilled, MoS_2 modified, natural	**NB40 GB30 NL RM** PA6, 30% glass bead reinforced, MoS_2 modified, natural	**NA40 NL RM** PA6.6, unfilled, MoS_2 modified, natural	**NA40 NL JA 0D** PA6.6, unfilled, heat stabilized, PTFE modified, natural	**NA40 AR15 NL JA 0B** PA6.6, 15% aramide fiber reinforced, heat stabilized, PTFE modified, natural	**NA40 AR20 NL HS** PA6.6, 20% aramide fiber reinforced, heat stabilized, natural
1.36	1.40	1.34	1.44	1.46	1.14	1.35	1.15	1.25	1.23	1.19
0.1 / 0.7	0.2 / 0.7	-	0.4 / 0.4	-	1.2 / 1.2	0.9 / 0.9	1.4 / 1.4	-	-	-
<0.1	<0.1	<0.1	<0.1	-	-	<0.2	<0.2	-	-	<0.2
0.2	0.2	0.2	0.2	-	2.9	2.1	2.6	-	-	-
120	130	150	110	110	-	80	-	65	80	100
1.5	1.5	1.8	2.0	1.5	-	10.0	-	-	-	5.0
12000	15000	20000	9000	15000	3250	4500	3500	2250	3500	5000
-	-	-	-	-	80	-	85	-	-	-
7	8	9	8	11	6	6	6	6	6	5.5
6	7	8	7	-	5	5	5	-	-	-
-	-	-	-	-	NB	50	NB	-	-	-
-	-	-	-	-	NB	40	NB	-	-	-
-	-	-	-	170	223	223	262	262	262	262
-	-	-	-	-	185	185	220	-	-	-
125	120	140	140	150	65	80	80	75	-	220
-	-	-	-	-	200	-	-	235	250	-
<1E+2	<1E+2	<1E+2	1E+15	1E+15	1E+15	1E+15	1E+15	1E+15	1E+15	1E+15
-	-	<1E+1	1E+15	1E+15	1E+13	1E+13	1E+13	1E+13	1E+13	1E+13
-	-	-	-	-	600	500	-	-	-	-
-	-	-	960	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	V0	V0	V0	HB	HB	HB	HB	HB	HB	HB
V0	V0	V0	V0	HB	HB	HB	HB	HB	HB	HB

				Self Lubricating				
PROPERTY	**CONDITION**	**UNIT**	**STANDARD**	**NA40 CR30 BK111 RM** PA6.6, 30% carbon fiber reinforced, MoS_2 modified, natural	**NA40 GR15 NL RT** PA6.6, 15% glass fiber reinforced, PTFE modified, natural	**NA40 GR30 BK012 RQ 01** PA6.6, 30% glass fiber reinforced, surface modified, PTFE modified, black	**NA40 GR30 NL RM** PA6.6, 30% glass fiber reinforced, MoS_2 modified, natural	**NA40 GR30 NL RT** PA6.6, 30% glass fiber reinforced, PTFE modified, natural
GENERAL								
Density	-	g/cm^3	ISO 1183	1.29	1.25	1.46	1.37	1.43
Molding Shrinkage	Parallel / Normal	%	eurotec®	0.2 / 1.0	-	0.3 / 1.1	0.3 / 1.1	0.2 / 0.7
Moisture Content	-	%	ISO 960	<0.2	<0.2	<0.2	<0.2	<0.2
Moisture Absorption	50% RH, 23 °C	%	ISO 62	1.8	2.2	1.9	1.8	1.5
MECHANICAL								
Stress at Break	+23°C	MPa	ISO 527	215	125	145	185	170
Strain at Break	+23°C	%	ISO 527	2.0	2.5	3.0	3.0	2.5
Tensile Modulus	+23°C	MPa	ISO 527	20000	6500	9000	10000	10000
Yield Strength	+23°C	MPa	ISO 527	-	-	-	-	-
Izod Impact, notched	+23 °C	kJ/m^2	ISO 180/1A	9	7	11	12	13
Izod Impact, notched	-30 °C	kJ/m^2	ISO 180/1A	-	6	10	10	11
Izod Impact, un-notched	+23 °C	kJ/m^2	ISO 180/1U	-	-	-	75	80
Izod Impact, un-notched	-30 °C	kJ/m^2	ISO 180/1U	-	-	-	65	70
THERMAL								
Melting Temperature	10 K/min	°C	ISO 11357	262	262	262	262	262
Heat Deformation Temperature	0.45 MPa	°C	ISO 75	-	-	245	260	255
Heat Deformation Temperature	1.80 MPa	°C	ISO 75	250	240	240	255	250
Vicat Softening Temperature	50N	°C	ISO 306	-	-	240	255	250
ELECTRICAL & FLAMMABILITY								
Volume Resistivity	-	Ohm.cm	IEC 60093	<1E+5	1E+15	1E+15	1E+15	1E+15
Surface Resistivity	-	Ohm	IEC 60093	-	1E+13	1E+13	1E+13	1E+13
Comparative Tracking Index	solution A	V	IEC 60112	-	500	-	-	-
Glow Wire Flammability Index	2 mm plaque	°C	IEC 60695	-	650	-	-	-
Glow Wire Ignitability Temperature	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Flame Rating	0.75 mm	-	UL94	HB	HB	HB	HB	HB
Flame Rating	1.6 mm	-	UL94	HB	HB	HB	HB	HB

* data are based on dry as molded

NA40 GR40 NL RM PA6.6, 40% glass fiber reinforced, MoS_2 modified, natural	**NA40 GR40 NL RT** PA6.6, 40% glass fiber reinforced, PTFE modified, natural	**NA40 GR50 NL RM** PA6.6, 50% glass fiber reinforced, MoS_2 modified, natural	**NT40 GR40 NL JH** PPA, 40% glass fiber reinforced, MoS_2 modified, hydrolysis stabilized, natural	**NT40 GR50 BK009 JF** PPA, 50% glass fiber reinforced, MoS_2 modified, heat stabilized, natural	**PB70 GR15 NL RT** PBT, 15% glass fiber reinforced, PTFE modified, natural	**PB70 GR30 BK002 RT** PBT, 30% glass fiber reinforced, PTFE modified, black	**PO20 NL RT 0D** POM copolymer, unfilled, PTFE modified, natural	**PO20 NL RT 0E** POM copolymer, unfilled, PTFE modified, natural	**PO20 NL RW** POM copolymer, unfilled, surface modified, natural	**PO30 AR15 NL HS** POM copolymer, 15% aramid fiber reinforced, heat stabilized, natural
1.46	1.54	1.58	1.53	1.64	1.43	1.60	1.50	1.50	1.38	1.40
0.2 / 1.0	0.2 / 0.9	0.2 / 0.9	-	0.2 / 0.7	-	-	-	-	-	-
<0.2	<0.2	<0.2	<0.2	<0.2	<0.08	<0.08	-	-	-	-
1.5	1.3	1.3	-	1.1	0.2	0.2	-	-	-	-
200	190	220	220	225	100	120	45	40	-	75
3.0	2.5	2.5	2.0	1.5	3.0	2.5	-	-	-	6.0
13000	13000	17000	17000	18000	6000	10000	2500	2000	2500	3500
-	-	-	-	-	-	-	-	-	60	-
15	16	17	13	14	6	9	5	6	8	8
-	-	-	-	12	7	7	5	5	7	7
-	-	-	-	-	-	55	-	-	-	-
-	-	-	-	-	-	45	-	-	-	-
262	262	262	315	315	225	225	165	165	165	165
260	255	260	-	-	215	215	-	-	-	-
255	250	255	285	285	190	200	85	90	100	120
255	250	255	-	-	210	205	-	145	-	-
1E+15	1E+15	1E+15	1E+15	1E+15	1E+16	1E+16	1E+16	1E+16	1E+16	1E+16
1E+13	1E+13	1E+13	1E+13	1E+13	1E+14	1E+14	1E+14	1E+14	1E+14	1E+14
-	-	-	500	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB

				High Heat				
PROPERTY	CONDITION	UNIT	STANDARD	**NT40 CR30 BK111 HS** PPA, 30% carbon fiber reinforced, heat stabilized, black	**NT40 KC50 BK111 HS 0B** PPA, 50% glass fiber / carbon fiber reinforced, heat stabilized, black	**NT40 KC50 BK111 HS 0G** PPA, 50% glass fiber / carbon fiber reinforced, heat stabilized, black	**NT40 KC60 BK111 MB 0A** PPA, 60% glass fiber / carbon fiber reinforced, heat stabilized, impact modified, black	**NT40 GR30 NL HS** PPA, 30% glass fiber reinforced, heat stabilized, natural
GENERAL								
Density	-	g/cm³	ISO 1183	1.31	1.49	1.56	1.55	1.43
Molding Shrinkage	Parallel / Normal	%	eurotec®	0.1 / 0.8	-	-	-	0.2 / 1.0
Moisture Content	-	%	ISO 960	<0.2	<0.2	<0.2	<0.2	<0.2
Moisture Absorption	50% RH, 23 °C	%	ISO 62	1.7	1.3	1.3	1.3	1.7
MECHANICAL								
Stress at Break	+23°C	MPa	ISO 527	275	280	275	245	185
Strain at Break	+23°C	%	ISO 527	1.5	-	-	-	2.0
Tensile Modulus	+23°C	MPa	ISO 527	25000	35000	32000	35000	11000
Yield Strength	+23°C	MPa	ISO 527	-	-	-	-	-
Izod Impact, notched	+23 °C	kJ/m²	ISO 180/1A	8	10	10	11	11
Izod Impact, notched	-30 °C	kJ/m²	ISO 180/1A	7	-	-	-	10
Izod Impact, un-notched	+23 °C	kJ/m²	ISO 180/1U	-	-	-	-	-
Izod Impact, un-notched	-30 °C	kJ/m²	ISO 180/1U	-	-	-	-	-
THERMAL								
Melting Temperature	10 K/min	°C	ISO 11357	315	315	315	315	315
Heat Deformation Temperature	0.45 MPa	°C	ISO 75	-	-	-	-	305
Heat Deformation Temperature	1.80 MPa	°C	ISO 75	290	285	280	280	280
Vicat Softening Temperature	50N	°C	ISO 306	-	-	-	-	290
ELECTRICAL & FLAMMABILITY								
Volume Resistivity	-	Ohm.cm	IEC 60093	<1E+3	<1E+1	<1E+3	-	1E+15
Surface Resistivity	-	Ohm	IEC 60093	-	-	-	-	1E+13
Comparative Tracking Index	solution A	V	IEC 60112	-	-	-	-	550
Glow Wire Flammability Index	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Glow Wire Ignitability Temperature	2 mm plaque	°C	IEC 60695	-	-	-	-	-
Flame Rating	0.75 mm	-	UL94	HB	HB	HB	HB	HB
Flame Rating	1.6 mm	-	UL94	HB	HB	HB	HB	HB

* data are based on dry as molded

							Heavy Compounds			
NT40 GR45 NL HS PPA, 45% glass fiber reinforced, heat stabilized, natural	**NT40 GR50 NL HS** PPA, 50% glass fiber reinforced, heat stabilized, natural	**NT40 GD60 NL HS** PPA, 60% glass fiber reinforced, heat stabilized, natural	**NT40 CR30 BK111 XA60** PPA, 30% carbon fiber reinforced, flame retardant - halogen & red phosphorus free, heat stabilized, black	**NT40 GR30 NL XA60** PPA, 30% glass fiber reinforced, flame retardant - halogen & red phosphorus free, heat stabilized, natural	**PT70 KK45 NL XA20 0B** PET, 45% glass fiber/ mineral reinforced, flame retardant -halogen (RoHS complaint), heat stabilized, natural	**OP20 GR30 BK014 01 0C** PPE/PS, 30% glass fiber reinforced, black	**NBX0 HF75 NL** PA6, 75% heavy filler, improved flexibility, natural	**NB40 HF85 MT112 EC 0B** PA6, 85% heavy filler, electrically conductive, natural	**CP20 HF65 NL** PPCP, 65% heavy filler	**HP30 HF75 BK001** PPHP, 75% heavy filler, improved flexibility, black
1.58	1.63	1,75	1.34	1.45	1.83	1.29	2.50	4.50	1.90	2.27
-	0.2 / 0.7	-	0.1 / 0.7	0.2 / 0.9	0.2 / 0.8	-	0.6 / 0.6	-	-	-
<0.2	<0.2	<0.2	<0.2	<0.2	<0.08	<0.2	<0.2	<0.2	<0.1	<0.1
-	1.2	1.0	1.3	1.3	0.2	-	0.8	0.4	-	-
240	250	290	260	170	100	120	35	40	14	25
1.5	2.0	-	1.5	2.0	1.5	-	-	0.5	-	-
18000	18000	38000	26000	11500	13000	9000	7500	12000	3250	7500
-	-	-	-	-	-	-	-	-	-	-
16	14	20	6	8	6	9	5	8	4	4
-	13	18	5	7	5	8	4	6	3	3
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
315	315	315	315	315	255	-	223	223	165	170
-	305	-	-	-	-	-	-	-	-	-
285	290	295	280	280	200	165	90	150	55	75
-	295	300	-	-	-	-	-	-	-	-
-	1E+15	1E+15	1E+3	1E+15	1E+16	1E+15	-	<1E+8	-	-
-	1E+13	1E+13	1E+1	1E+13	1E+14	1E+15	-	<1E+7	-	-
-	550	-	-	600	200	-	-	-	-	-
-	-	-	960	960	960	-	-	-	-	-
-	-	-	875	850	875	-	-	-	-	-
HB	HB	HB	V0	V0	V0	HB	HB	HB	HB	HB
HB	HB	HB	V0	V0	V0	HB	HB	HB	HB	HB

All information in this complete document presents current state of knowledge and experience. The information and data may not be valid when any mentioned material is used in combination with other materials. These data do not guarantee certain values since may vary on processing conditions and end-use conditions. All information and data are provided for reference purposes only and should not be used alone to create specification limits and design basis. It is strongly recommended to test the product under own processing conditions and test facilities to determine the suitability for the required application and use.

Tecomid® PA6, PA6.6, PA6.6/6, and PA blends

Tecomid® HT PPA

Tecodur® PBT, and PBT blends

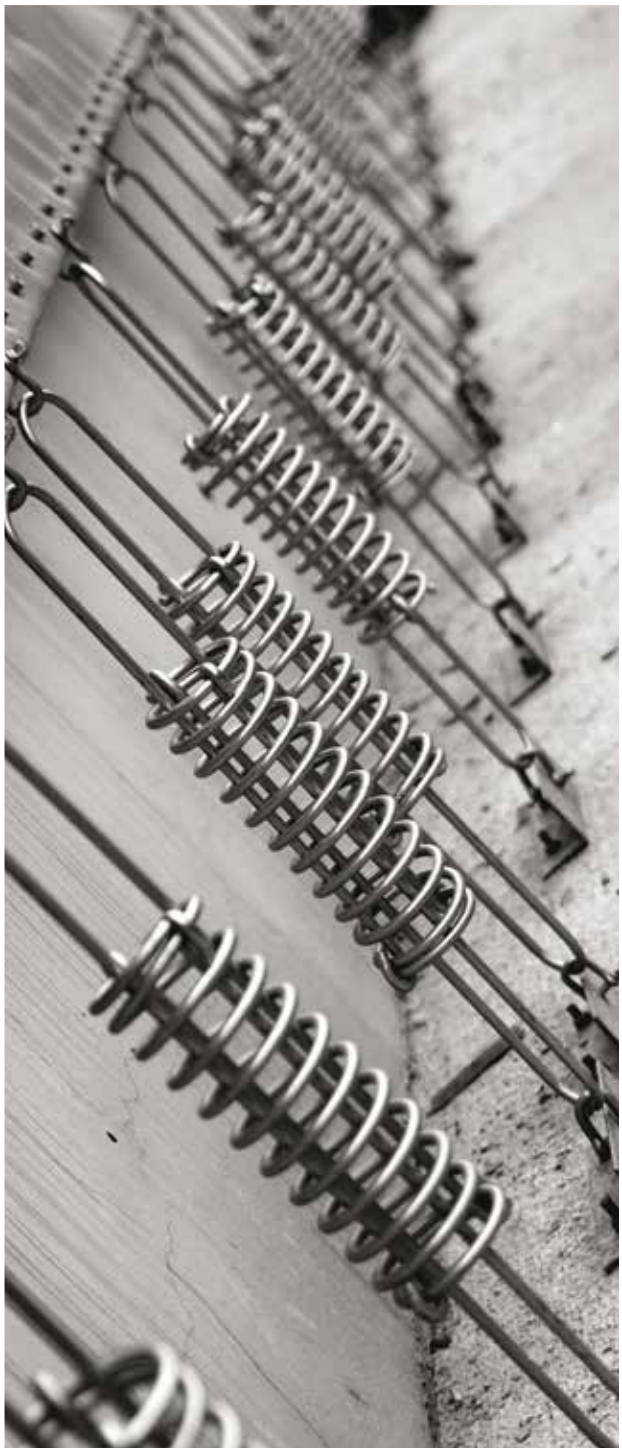
Tecopet® PET

Tecotek® PC, and PC blends

Tecotek® PPO, and PPO blends

Tecolen® PP, and PE speciality

Tecoform® POM



Established in 2004 and based in European Free Zone/Corlu, euro**tec**® is a leading manufacturer of engineering plastics for various sectors, primarily automotive and transportation, electrical/electronic, home appliances, sports and leisure, safety equipment, garden and power tools, medical industry, construction & agricultural equipment, furniture industries.

Making a difference via its unique structure and approach to business, euro**tec**® sells more than half of its products in international markets and has managed to be the leader in the market with the help of its high quality products, sustained quality, multi-alternative solutions and understanding of aesthetics.

euro**tec**® supports its advanced technology with its dynamic and experienced human resources. Aiming to manufacture the best in the most efficient way and with the most possible competitive attitude, euro**tec**® supports its objective by continuous development efforts that involve offering a wide range of high quality products.

Adopting team work as a business philosophy, euro**tec**® views its customers as a part of this team. As customer needs and requests are forwarded accurately and completely to the R&D Department as a result of mutual information exchange, a product and application development process customized according to the customer needs are planned and implemented. Thanks to this process, we ensure that special products in desired colours and quality meet the requirements of the customer from each and every aspect and that they are designed in the shortest time possible with minimum amount of trials.

Tests are conducted in latest technology R&D and Quality laboratories, in compliance with ISO and other generally accepted international standards by using automatic and semi-automatic equipment to obtain reliable and reproducible results. euro**tec**® offers the following comprehensive services to its customers and business partners;

- Development of customized products, applications and colours at pilot facilities
- Material identification
- Flame and fire resistance tests
- Accelerated ageing tests against environmental and extraordinary conditions/ influences
- Colour and gloss measurements
- Mechanical and physical tests
- Electrical and thermal tests
- Instrumental analysis
- Rheology and process ability applications
- Customer process simulations and
- Other tests specific to the customer

eurotec® engineering plastics

European Free Zone
116/24 Velimese 59850 Corlu
Tekirdag - Turkey
T: +90 282 691 12 12 pbx
F: +90 282 691 12 18
www.eurotec-ep.com