

# ATAG

SERVING INDUSTRY SINCE 1947



## INDUSTRIAL PLASTICS

- Moulded Technopolymers
- Drawn Plastics



# PAST, PRESENT, FUTURE

ATAG covers Europe, serving industry since 1947

From solid foundations we have grown to become a major supplier in the Italian market with a constantly increasing presence throughout the country, now with over 10,000 m<sup>2</sup> of warehousing.

Our wide range of available products, three locations, large warehouses, extensive sales network, a constantly evolving website a technically qualified customer service team advising on the most suitable product for each application, are the reasons why customers constantly rely on ATAG.

In recent years we have applied our experience and professionalism to those of complementary businesses, absorbing and integrating them into the ATAG group, improving our skills by taking cues from the strengths of each one.

The desire to grow, the drive for continuous improvement and the challenge to open up wider markets are the stimuli that push us to export the formula that has rewarded us until today. We believe that what makes ATAG a successful supplier in Italy will work in other countries.

The new office in Glasgow, Scotland, used to assist the Milan Export Office in research and development projects for foreign customers, allows us to increase our presence in Europe.

Collaborations and agreements with international prestige partners also permit us to propose niche products and solutions in Italy that are already well established in other markets.

ATAG operates in a system of quality company certified. We maintains the utmost professionalism and always ensures that the customer receives the best solution to their problem in the shortest time possible.



# INDUSTRIAL PLASTICS

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**ATAG** supplies many different types of plastic materials, from the most common to the most technical, in semi-finishes of various types.

We have available: Rigid and flexible transparent PVC for doors and barriers, high and low density Polyethylene, extruded and glued Nylon, Acetylic Resin, Polyester, PET, compact and alveolar Polycarbonate, PEI, PSU, PVDF, PTFE, PEEK, Torlon®, with or without additives and / or reinforcement, Bakelite and Graphite.

Besides sales support, we offer technical expertise in the development of new applications, both as regards the choice of materials that in the complete supply of finished design particulars, such as bushings, profiles, molded, shoes, rollers, pulleys, gears, etc.

Moreover, in food and pharmaceutical industries, new frontiers are being opened for a **new family** of plastics. In those applications where technopolymers can replace metals and ceramics, such as to identify residual polymer in the manufactured product as it is fundamental in many industrial processes.

The **capture of foreign bodies** in foodstuffs production is a critical factor, especially in relation to international quality standards (ISO 22000).

Born from this demand are **metal detectable polymer compounds**, that must also remain inert and **suitable for contact with food**, and therefore must not release particles and have good mechanical and aesthetic properties.

**ATAG** can supply metal detectable POM that has complete FDA conformance as well as more commercial grades.

## **Note**

*The data shown in the tables on the following pages (pag. 4+7) has been determined in our laboratories and should be considered as a useful reference only.*

***The values should be considered ad a useful reference and are given without engagements.***



## Material Properties

DESCRIPTION	Standards NORM	U.m.	PMMA	PC	Expanded rigid PVC	PETG	PA 6	PA 6 G
<b>PHYSICAL PROPERTIES</b>								
Colour	-	-	transparent	transparent	various colours	various colours transparent	White Black	White
Specific gravity	ISO1183	g/cm <sup>3</sup>	1,19	1,20	-	1,27	1,14	1,14
Water absorption at saturation	ISO 62	%	-	-	-	-	9,5	8
Moisture absorption at 23 °C - 50% RH	ISO 62	%	-	-	-	-	3	2,4
<b>MECHANICAL PROPERTIES</b>								
Yield strength (2)	ISO 527	MPa	74	>60	16	>45	90/45 *	80/60 *
Elongation at yield (2)	ISO 527	%	4	6	-	4	4,5/20 *	-
Tensile strength at break (2)	ISO 527	MPa	-	-	-	-	-	-
Elongation at break (2)	ISO 527	%	-	-	-	-	-/≥50 *	40/100 *
Tensile modulus (2)	ISO 527	MPa	-	-	-	-	3000/1000 *	3100/1800 *
Flexural strength	ISO178	MPa	120	90	25	80	-	-
Tensile modulus	ISO178	MPa	3000	2400	0,85	2020	-	-
Charpy - Un-notched Impact strength	ISO 179	KJ/m <sup>2</sup>	-	without breaking	15	without breaking	NB	NB
Charpy - Notch impact strength	ISO 179	KJ/m <sup>2</sup>	-	-	-	-	9/NB *	4/15 *
Rockwell hardness M	ISO 2039-2	-	90	-	-	-	85	88
Shore D hardness	DIN 53505	° Shore D	-	-	-	-	-	-
Flexural strength	ISO 178	MPa	-	-	-	-	-	140/160 *
Flexural modulus	ISO 178	MPa	-	-	-	-	-	-
Compressive stress (1% strain-23 °C)	ISO 604	MPa	-	-	-	-	24	26
Compressive modulus	ISO 604	MPa	-	-	-	-	-	-
Deformation under load 100 MPa-24 hr- RT	-	%	-	-	-	-	-	-
Poisson's ratio	abs	-	-	-	-	-	0,38/0,45 *	-
<b>THERMAL PROPERTIES</b>								
Maximum operating temperature (1)	-	°C	+85	+115	+60	+65	85	105
Minimum operating temperature (1)	-	°C	-	-	-	-	-40	-40
Vicat softening temperature VST/B/50	ISO 306	°C	-	-	-	-	-	-
Heat deflection temperature at 0,45 MPa	ISO 75	°C	-	-	-	-	160/180	-
Heat deflection temperature at 1,81 MPa	ISO 75	°C	-	-	-	-	70/90	80
Thermal conductivity at 23 °C	DIN 52612	W/(K x m)	-	-	-	-	0,28	0,29
Coef. of linear thermal expansion (23 °C a 100 °C)	ASTM D696	µm/(m x °K)	-	-	-	-	85	80
Coef. of linear thermal expansion (23 °C)	ASTM D696	µm/(m x °K)	-	-	-	-	-	-
<b>TRIBOLOGICAL PROPERTIES</b>								
Static coef. of friction on polished steel	MPC test	abs	-	-	-	-	0,22	0,21
Dynamic coef. of friction on polished steel	MPC test	abs	-	-	-	-	0,26	0,24
PV limit without lubrication	MPC test V=0,5 m/s	MPa x m/s	-	-	-	-	0,07	-
Wear coefficient on hardened polished steel	MPC test PV=0,1 MPa x m/s	µm/s	-	-	-	-	8,5	7,5
Maximum pressure	MPC test	MPa	-	-	-	-	24	26
<b>ELECTRICAL PROPERTIES</b>								
Volume resistance	IEC 60093	Ω x m	-	-	-	-	>10 <sup>12</sup> **	>10 <sup>12</sup> **
Surface resistance	IEC 60094	Ω	-	10 <sup>14</sup>	10 <sup>12</sup>	10 <sup>16</sup>	>10 <sup>12</sup> **	>10 <sup>12</sup> **
Dielectric constant at 1 MHz	IEC 60250	abs	-	-	-	-	3,8	3,7
Dielectric loss factor at 1 MHz	IEC 60250	tan δ	-	-	-	-	0,06	0,05
Dielectric strength (2mm)	IEC 60243	KV/mm	20	35	10	16	16	17
<b>OTHER PROPERTIES</b>								
Bondability	-	-	-	-	-	-	N	N
Food contact safety (FDA Compliance)	DM 21.3.73	-	-	-	-	-	Y	Y
Flammability	UL 94	-	-	-	-	-	V3	V3
Oxygen limit index	ISO 4589	%	-	-	-	-	25	25
UV resistance	-	-	-	-	-	-	N ***	N/Y

# INDUSTRIAL PLASTICS

- (1) For 5000h without strength - Approximate value reduction in 1000 hours to 50% of tensile strength  
 (2) Stabilized in air at 50% relative humidity

(\*) Dried/stabilized in the atmosphere 50% RH -23 °C

(\*\*) Stabilized in the atmosphere 50% RH -23 °C

(\*\*\*) Resistance to UV exposure is reached with the pigmentation or specific additive

(\*\*\*\*) Bonding and painting are possible after special surface treatment

PA 6.6	PA 6.6 30% GF	Nylatron GSM	Nylatron MC	POM C	POM H	PVDF	PVC	PP	PP-s	PET	PE HD	PE UHMW
Ivory	Ivory	Dark grey	Blue	White Black	White Black	White	Grey White Black	Light Grey	Grey, Natural	White	White Black Green	White Black Green
1,15	1,29	1,16	1,15	1,41	1,43	1,79	1,4-1,45	0,92	0,95	1,39	0,95	0,93
6:05	5,5	6,7	6,6	0,85	0,85	0,05	0,2	0,1	0,1	0,5	0,2	0,2
2,2	1,7	-	-	0,2	-	0,05	0,2	0,01	0,05	0,25	0,01	0,02
90/55 *	90/45 *	78	81	63	78	50-55	55	32	32	90	23	20
>40/>100 *	-	-	-	10	-	-	3	8	8	-	10	15
-	100/75 *	-	-	-	-	30-50	30	38,5	-	-	-	-
-	5/12 *	25/>50 *	35/>50 *	33	35	20-60	10	80	70	15	50	50
3450/1650 *	5900/3200 *	3300/1550 *	3200/1600 *	2800	3600	2300	3000	1600	1600	3700	1300	900
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
NB	≥50/- *	-	-	>180	>200	-	-	-	-	50	-	-
4,5/- *	6/- *	3,5	3,5	8	10	10	3	50	7	2	105	90
88	76	84	85	84	88	75	-	-	-	96	-	-
-	-	-	-	-	-	-	80-82	70	72	-	66	63
-	-	-	-	89	-	74	90	-	-	-	-	-
-	-	-	-	2500	-	2250	-	-	-	-	-	-
25	28	25	24	19	22	17	-	12	14	26	9	6
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	0,48	-	-	-	-
0,38/0,45 *	-	-	-	0,43	-	0,35	-	-	-	0,44	0,42	0,42
95	120	90	90	115	100	150	60	100	100	115	80	80
-30	-20	-30	-30	-40	-20	-40	-15	-40	0	-20	-100	-150
-	-	-	-	-	-	-	75	94	87	-	80	80
200/230	-	-	-	156	-	-	72	86	-	-	-	-
80/100	150	80	80	105	115	105	-	64	-	75	44	42
0,28	0,3	0,29	0,29	0,31	0,31	0,19	0,14	-	0,22	0,29	0,4	0,4
80/95	60	90	90	110/110	110	125-140	80	140	-	80/80	-	-
-	-	80	80	-	-	-	-	105	160	-	160	180
0,2	0,23	-	-	0,14	-	0,2-0,4	0,5	-	-	0,19	0,18	0,16
0,28	0,24	-	-	0,21	-	0,2-0,35	0,7	-	-	0,25	0,28	0,25
0,09	0,33	-	-	0,15	-	-	-	-	-	0,08	-	-
8,5	3,8	-	-	1,5-2,8	-	-	-	-	-	4,9-8	-	-
25	28	-	-	18	-	-	-	-	-	25	-	-
>10 <sup>12</sup> **	>10 <sup>13</sup> **	>10 <sup>12</sup> **	>10 <sup>12</sup> **	>10 <sup>14</sup>	>10 <sup>14</sup>	5 x 10 <sup>14</sup>	10 <sup>15</sup>	10 <sup>16</sup>	10 <sup>16</sup>	10 <sup>15</sup> ≈ 10 <sup>16</sup>	10 <sup>16</sup>	10 <sup>16</sup>
>10 <sup>12</sup> **	>10 <sup>12</sup> **	>10 <sup>12</sup> **	>10 <sup>12</sup> **	>10 <sup>13</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>	-	10 <sup>14</sup>	10 <sup>14</sup> ≈ 10 <sup>15</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>
3,8	3,9	3,7	3,7	3,8	3,8	7,5	3	2,3	2,2	3,2	2,4	3
0,06	0,04	0,05	0,05	0,007	0,008	0,15	0,01	0,0002	0,0012	0,014	0,0002	0,001
18	20	16	17	21	21	20-30	20-40	-	22	22	45	45
N	N	-	-	N ****	-	N	Y	N ****	N ****	Y	N ****	N ****
Y	N	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y
V2	V2	HB	HB	HB-V2	HB	V0	V0	HB	V2	HB-V2	HB	HB
26	-	25	25	15	15	44	-	-	-	25	<20	<20
N ***	N/Y	-	-	N ***	-	Y	N ***	N ***	N	N ***	N ***	N ***

## Material Properties

DESCRIPTION	Standards NORM	U.m.	VESPEL® SP1	VESPEL® SP21	PEEK	PTFE
<b>PHYSICAL PROPERTIES</b>						
Colour	-	-	Dark Grey	Dark Grey	Natural (beige grey)	White
Specific gravity	ASTM D792	g/cm <sup>3</sup>	1,43	1,51	1,26-1,32	2,21
Water absorption at saturation	ASTM D570	%	0,72	0,57	-	-
Moisture absorption at 23 °C - 50% RH	ASTM D570	%	1-1,3	0,8-1,1	0,5	-
<b>MECHANICAL PROPERTIES</b>						
Yield strength	ASTM D638	-	-	-	88	12-15
Elongation at yield	ASTM D638	-	-	-	5	25
Tensile strength at break	ASTM D638	MPa	86	66	97	28-35
Elongation at break	ASTM D638	%	7,5	4,5	20-60	210-500
Tensile modulus	ASTM D638	MPa	-	2620	3500	450-750
Izod - Unnotched Impact strength	ASTM D256	KJ/m <sup>2</sup>	0,75	0,32	-	-
Izod - Notch impact strength	ASTM D256	KJ/m <sup>2</sup>	0,043	0,043	6,1	15,6
Charpy - Notch impact strength	ISO 179/1eU	KJ/m <sup>2</sup>	-	-	-	-
Rockwell hardness - M	ASTM D785	-	-	-	99	-
Shore D hardness	ASTM D2240	° Shore D	-	-	-	51
Flexural strength - ultimate	ASTM D790	MPa	110	110	170	-
Compressive strength	ASTM D695	MPa	-	-	122	-
Compressive stress (1% strain-23 °C-1000 hr)	ASTM D695	MPa	24,8	29	-	4,4
Deformation under load 100 MPa-24 hr- RT	ASTM D621	%	1	0,7	-	-
Compressive modulus of elasticity	ASTM D695	MPa	2413	2895	-	420
Poisson's ratio	-	-	0,41	0,41	0,4	0,4
<b>THERMAL PROPERTIES</b>						
Temperature limit of use	-	°C	+395	+395	-50/+260	-200/260
Heat deflection temperature at 0,45 MPa	ASTM D648-45	°C	-	-	-	135
Heat deflection temperature at 1,81 MPa	ASTM D648-45	°C	360	360	160	55
Thermal conductivity at 23 °C	ASTM D177	W/(K x m)	0,35	0,87	0,25	-
Coef. of linear thermal expansion (23 °C a 100 °C)	Mold direction	µm/(m x °K)	54	49	47	150
Coef. of linear thermal expansion (23 °C)	Cross direction	µm/(m x °K)	-	-	-	120
<b>TRIBOLOGICAL PROPERTIES</b>						
Static coef. of friction on polished steel	MPC test	abs	0,35	0,3	0,22	0,16
Dynamic coef. of friction on polished steel	MPC test	abs	0,29 *	0,24 *	0,25	0,12
PV limit without lubrication	MPC test	MPa x m/s	-	12	1,9	-
Wear coefficient on hardened polished steel	MPC test PV=0,1 MPa x m/s	µm/s	-	0,43	3,9	65
Maximum pressure	MPC test	MPa	-	30	30	4,4
<b>ELECTRICAL PROPERTIES</b>						
Volume resistance	ASTM D257	Ω x m	10 <sup>14</sup> ≈ 10 <sup>15</sup>	10 <sup>12</sup> ≈ 10 <sup>13</sup>	>10 <sup>14</sup>	10 <sup>18</sup>
Surface resistance	ASTM D257	Ω	10 <sup>15</sup> ≈ 10 <sup>16</sup>	-	>10 <sup>13</sup>	10 <sup>17</sup>
Dielectric constant at 1 MHz	ASTM D150	abs	3,55	13,41	3,2	2,1
Dielectric loss factor at 1 MHz	ASTM D150	tan δ	0,0034	0,0106	0,003	7e-05
Dielectric strength (2mm)	ASTM D149	KV/mm	22	9,48	24	25
<b>OTHER PROPERTIES</b>						
Bondability	-	-	Y	Y	Y	N **
Food contact safety (FDA Compliance)	DM 21.3.73	-	N	N	Y	Y
Flammability	UL 94	-	V0	V0	V0	V0
Oxygen limit index	ISO 4589	%	53	49	24-35	-
UV resistance	-	-	N	N	Y	Y

# INDUSTRIAL PLASTICS

(1) Without strength - Approximate value reduction in 1000 hours to 50% of tensile strength

(\*) A 0,875 MPa X m/s

(\*\*) Bonding is possible only after treatment cementation

RULON® LR	RULON® J	RULON® 641	HPV PPS	PPSU	PEI	PSU	TORLON PAI
Red rust	Dull gold	White	Dark blue	Black	Translucent Amber	Translucent Yellow	Yellow ochre
2,25	1,95	2,1	1,43	1,29	1,27	1,24	1,41
0,015	0,3	-	0,03	0,6	0,75	0,40	2,5
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
10,3	13,8	13,8	-	-	-	-	-
150	180	175	5	30	10	10	10
-	-	-	3700	2500	3400	2700	4500
-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-
-	-	-	3,5	10	3,5	4	10
-	-	-	84	80	114	91	120
60 -65	60	60	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
3,6	3,6	4,8	28	18	25	20	27
3	3	4	-	-	-	-	-
440	420	400	-	-	-	-	-
-	-	-	-	-	-	-	-
-240/+288	-240/+288	-240/+288	220 (Max. 260)	180 (Max. 210)	170 (Max. 200)	150 (Max. 180)	250 (Max. 270)
-	-	-	-	-	-	-	-
-	-	-	115	200	190	170	280
0,33	0,24	0,37	0,30	0,35	0,22	0,26	0,26
106	122	102	50	55	45	60	30
92	93	75	-	-	-	-	-
0,15	0,12	0,1	-	-	-	-	-
0,25	0,2	0,3	-	-	-	-	-
0,35	0,26	0,35	-	-	-	-	-
0,05	0,65	0,13	-	-	-	-	-
6,9	5,2	6,9	-	-	-	-	-
1 x 10 <sup>15</sup>	8,2 x 10 <sup>18</sup>	-	>10 <sup>14</sup>	>10 <sup>14</sup>	>10 <sup>14</sup>	>10 <sup>14</sup>	>10 <sup>14</sup>
2 x 10 <sup>13</sup>	6,3 x 10 <sup>18</sup>	-	>10 <sup>13</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>	>10 <sup>13</sup>
2,5	2,4	-	3,3	3,5	3	3	3,9
0,001-0,004	0,0015	-	0,003	0,005	0,002	0,003	0,031
15,7	7,9	-	24	-	27	30	24
N **	N **	N **	-	-	-	-	-
N	N	Y	N	Y	N	N	N
V0	V0	V0	V0	HB	V0	V0	V0
-	-	-	47	44	47	30	45
Y	Y	Y	-	-	-	-	-

## Characteristics and Uses

Our semi-finished materials are available in the form of sheets, bars, tubes and profiles, etc.

For every available plastic common commercial dimensions exist but they can also be produced, with the right balance between quantities and tooling costs, in non-standard sizes.

Due to their many remarkable and different physical and chemical characteristics, our semi-finished materials are used in a great variety of industrial applications: mechanical, aeronautical, chemical, electrical, construction, foodstuffs, advertising etc.

Please contact us in order to verify sizes and availability.

## PA POLYAMIDES

Polyamides, commonly known as nylon, are divided into several types. The most important are: PA6, PA6+MOS2, PA66 and PA66 +GF. The different physical properties between these types of materials are mainly determined by their composition and molecular chain structure.

### Characteristics:

- High mechanical strength, stiffness, hardness and toughness.
- Good fatigue resistance.
- High mechanical damping ability.
- Good sliding properties.
- Excellent wear resistance.
- Good electrical insulation properties.
- Good resistance to high energy radiation (gamma and X rays).
- Easily workable with machine tools.

### PA6 - EXTRUDED

#### PA6 - natural

This material offers an excellent combination of mechanical properties, stiffness, toughness, mechanical damping and wear resistance, good electrical insulation ability and good chemical resistance.

#### PA6+MOS2 - black

Mechanical strength, stiffness and flow ability increase with the addition of molybdenum bisulphide.

#### PA66 - natural

This material has better wear, heat and stiffness resistance than PA6. The creep resistance is also better, while impact strength and damping ability are slightly reduced. PA66 is well suited for machining on automatic lathes.

#### PA66+MOS2 - black

The addition of molybdenum bisulphide gives this polyamide greater hardness, stiffness and dimensional stability, but causes a slight decrease in impact strength. MOS2's "nucleating" effect improves the material's crystalline structure and enhances its wear resistance and sliding properties.

#### PA66+GF30 - black

Compared with a virgin PA66, this polyamide strengthened with 30% glass fibre has better mechanical strength, stiffness, dimensional stability and creep resistance, as well as excellent retention of wear resistance and the possibility of use with higher temperatures.

### PA6 - CAST

#### PA6G - natural

This natural cast polyamide has characteristics very similar to those of PA66. It combines high mechanical strength, stiffness and hardness with good wear and creep resistance, as well as fairly good resistance to thermal ageing and good workability with machine tools.

#### PA6+Oil - black

This cast polyamide 6 is self-lubricating, developed for parts used in dynamic applications (slow movements), with high loads. In the absence of lubrication, it makes it possible to expand the polyamide application fields, given the lower friction coefficient (reduced by up to 50%) and better wear resistance (up to 10 times better).



## Characteristics and Uses

### PA6G+MOS2 - black

This material contains finely dispersed particles of molybdenum bisulphide, which improves the wear resistance and the sliding properties in dynamic applications without decreasing fatigue resistance and impact strength typical of unmodified cast polyamide 6. It is normally used for making bushes, gears, pinions and pulleys.

## PTFE POLYTETRAFLUOROETHYLENE

PTFE, normally considered a thermoplastic material, is the most widely known and used fluoropolymer. Specific techniques must be used to manufacture it owing to its chemical-physical characteristics.

### Caratteristiche:

- Low friction coefficient.
- Excellent dielectric properties.
- Excellent chemical inertness.
- Excellent resistance to both low and high temperatures.
- Anti-adhesive surface.
- Well suited for contact with foods.
- Zero hygroscopicity.
- Resistance to ageing.

### PTFE Filled

To improve the already exceptional characteristics, especially if used in demanding applications, PTFE is modified by adding several fillers, including:

- |               |                   |             |
|---------------|-------------------|-------------|
| • Glass fibre | • Ceramic         | • Mos2      |
| • Carbon      | • Stainless steel | • Polyimide |
| • Graphite    | • Bronze          |             |

These allow the improvement of some mechanical characteristics, such as compressive strength, wear resistance, thermal conductivity, or reducing the tendency to creep, to therefore obtain manufactured parts that allow considerable improvements in both the design and operation phase (e.g. piston rings and sliding blocks for compressors).

## G GRAPHITE

Graphite is a material obtained through the compression and lamination of natural graphite without the addition of binders or impregnators.

The extraordinary chemical resistance of graphite has found widespread use in the chemical and pharmaceutical industries. Thanks to its thermal resistance, also to unexpected temperature spikes, it has become an irreplaceable material in applications involving steam.

For specific applications the producers of graphite have improved its mechanical and physical qualities by using reinforcing inserts such as steel sheets or by binding it with woven inserts such as glass fibre.

It is also used in order to modify the performance of other plastics and can be found as an additive to PTFE.

## Characteristics and Uses

### PET POLYETHYLENE TEREPHTHALATE

Crystalline thermoplastic well suited for making high precision parts to which good lubrication is added.

#### PET – natural and black

##### Characteristics:

- High mechanical strength, hardness and stiffness.
- Very good creep resistance.
- Low and constant friction coefficient.
- Excellent wear resistance (comparable and even better than polyamides).
- Excellent dimensional stability (better than acetyl resin).
- Better resistance to acids than PA6 and polyacetals.
- Good electrical insulation properties.
- Physiologically inert (well suited for contact with foods).
- Good resistance to high energy radiation (gamma and X rays).
- Excellent stain resistance.

#### PET TX – grey

Modified terephthalate polyethylene with the introduction of solid lubricants into its structure. This process gives particular self-lubricating properties and an excellent resistance to wear. It offers a better coefficient of friction than the version without solid lubricants.

### POM POLYOXYMETHYLENE

Polyoxymethylene, also known as **Polyacetal Resin** and polyformaldehyde, is an engineering thermoplastic characterized by its high strength, hardness and rigidity to  $-40\text{ }^{\circ}\text{C}$ .

#### POM C - natural and black

Semi finished products made of polyacetal copolymer are more resistant to hydrolysis, to strong alkalis and to thermo-oxidative degradation.

##### Characteristics:

- Mechanical strength, stiffness and hardness
- Excellent ductility and toughness (elastic memory)
- Good creep resistance
- High impact strength, even at low temperatures.
- Very good dimensional stability
- Good sliding properties and wear resistance
- Excellent workability with machine tools
- Good dielectric and electrical insulation properties
- Physiologically inert (well suited for contact with foods)
- Not self-extinguishing

*POM C is well suited for machining on automatic lathes and is especially recommended for making precision parts.*

#### POM H - natural

Mechanical properties, hardness and stability increase and wear resistance improves.

#### POM METALDETECTABLE

Supplied in food grade and metal detectable qualities for foodstuff and pharmaceutical applications.

### FABRIC REINFORCED BAKELITE

Fabric based product composed of fine cotton and phenolic resin. It has excellent dielectric and mechanical characteristics.

Optimal for the construction of medium and small silencing gears, also complex parts, scavenging rings, slide guides, closure rods, blades for compressors and vacuum pumps, bearings for rolling-mills, bushes, pump impellers, parts for low stress electrical applications.

At low thicknesses it is easily cut at ambient temperatures, but should be heated when cutting greater thicknesses. Good machinability by machine tools, good impact and temperature resistance. Brown colour.

## Characteristics and Uses

### PVDF POLYVINYLIDENE FLUORIDE

**PVDF - natural** is a non-toxic semi-crystalline thermoplastic with high chemical resistance. Well suited for contact with foods.

**Characteristics:**

- Good resistance to atmospheric agents.
- High degree of purity (does not contain plasticisers, lubricants and fire-retardant additives).
- High resistance and stiffness.
- High resilience even at low temperatures.
- Good thermoplasticity.
- Good weldability.
- High continuous operating temperature.
- Good electric insulation properties.

Excellent resistance to acids, oxidising agents, halogens, alcohol, chlorinated solvents, aliphatic hydrocarbons, fuels. They are well suited for making components requiring excellent resistance to chemical products even at high temperatures.

### PEEK POLIETHERETERCHETONE

**PEEK - natural/black**

Material technologically advanced, presents a unique combination of outstanding mechanical properties, making it the best known material between the "advanced plastic materials".

This semi-crystalline thermoplastic is based on polyetheretherketone resin; it is a technologically advanced material and has a special combination of remarkable mechanical properties, temperature resistance and excellent chemical resistance.

**Characteristics:**

- Excellent dimensional stability.
- Hardly flammable and self-extinguishing.
- Density of exhaust gases very low.
- Good resistance to high doses of energy radiation.
- Excellent sliding properties.
- Excellent abrasion and wear resistance.
- Excellent relationship between stiffness, resistance and resilience.
- Low tendency to creep.
- Good workability, thermoformability, adhesive properties and weldability.
- High dimensional stability at warm temperatures.
- High continuous operating temperature.
- Low linear-expansion coefficient.
- Good electric insulation at different temperatures.

Versions exist with glass fibre, PTFE or Carbon fibres that have particular specific characteristics.

### ABS ACRYLONITRILE-BUTADIENE-STYRENE

ABS is an amorphous terpolymer, combining acrylonitrile, butadiene and styrene.

It is a plastic material with excellent processing characteristics either for moulding or for injection, extrusion and Thermoformable. Glueable and thermoweldable.

ABS is hard rigid, highly impact resistant and tough even at very low temperatures (- 40 °C); it is usable from - 40 °C up to + 85 °C ( Even more for special types) . It has a high hardness, and a great Impact strength. Good thermal resistance, too.

## Characteristics and Uses

### **RULON®** HIGH-PERFORMANCE FLUOROPOLYMER COMPOUNDS

This is the registered trademark of a family of fluoropolymers with extraordinary properties ideal for continuous use in a wide range of temperatures (-240 ÷ to +288 °C).

Their main characteristics are low friction coefficient, excellent abrasion resistance and chemical inertness. Other characteristics are stiffness, chemical resistance and low friction with self-lubricating properties, which make them an ideal solution in extreme applications.

*There are several types of Rulon®, manufactured for specific applications; Rulon® LR, Rulon® J, Rulon® W2, Rulon® 641, and Rulon® 1337 are the most commonly used. RULON® is a Saint-Gobain Performance Plastics registered trademark.*

### **VESPEL®** DUPONT™ HIGH-PERFORMANCE POLYIMIDE-BASED PLASTICS

This is a versatile material that combines the qualities of plastic, ceramic and metal with high wear and creep resistance, allowing it to be used under extreme conditions in various sectors, including transport, aerospace, semiconductors and general industry.

Components made of DuPont™ Vespel® are exceptionally resistant to wear, even when there is no lubrication, and they can work in a wide range of temperatures: from -288 °C up to +482 °C (for brief periods). Components made of DuPont™ Vespel® can be used in many different applications:

- Transport, for the manufacture of any type of military or civilian vehicle.
- Aerospace, to reduce weight of components.
- In semiconductors, with savings given by longer than average duration.
- Industrial in general, for compressors, valves, pumps, insulation.
- In office machines, including printers, photocopiers, etc.

*DuPont™ and Vespel® are trademarks registered.*

### **PVC** RIGID POLYVINYL CHLORIDE

**Rigid PVC** has high chemical stability and excellent fire resistance (it is self-extinguishing).

Rigid PVC belongs to the thermoplastics category and has an amorphous structure, high solidity and a high modulus of elasticity. It has excellent electrical properties, especially in the low voltage and frequency field. It is used with temperatures between - 10 °C and + 60 °C. Up to temperatures of 60 °C, rigid PVC is stable against the majority of diluted or concentrated acids.

Rigid PVC is physiologically inert. The possibility of using products in the food sector depends exclusively on the type of stabilisation. It is a good electrical insulator and absorbs little water; it can also be welded and glued.

#### **Areas of use:**

Mechanical, chemical and electrical sectors, mainly used to build tanks for industrial plants, hoods, scrubbers, gears, pressure pipes for water and chemical industry, drain pipes and general wastewater purification systems.

### **PP** POLYPROPYLENE

Polypropylene has excellent electrical and chemical properties. It has good stiffness and solidity. It is normally used with temperatures between +5 °C and + 90 °C. It has high resistance to chemical agents and it can be welded.

On the other hand, it is not very resistant to abrasion and to atmospheric agents.

It is a thermoplastic material, semi-crystalline like PE, but it is more resistant and rigid and melts at a higher temperature even though it has a lower density.

Being non-polar, PP is very resistant from a chemical standpoint. Up to 120 °C it maintains its resistance

## Characteristics and Uses

properties in the presence of aqueous solutions containing salts, acids and strong alkalis. It is sensitive to attack from strong oxidising agents like nitric acid and halogens at ambient temperature. It is available in formulations that improve fire resistance.

### PP-s

Talc is one of the fillers used most commonly in PP. It improves stiffness, dimensional stability, heat resistance and ability to slide; it also acts as a nucleating agent. The disadvantages associated with it are a decrease in low temperature impact strength, decrease in weldability and in high temperature oxidation resistance and the formation of more opaque surfaces.

#### Areas of use:

Mechanical, aeronautical, chemical, electrical and building sectors in semi finished products like pipes, connectors, sheets, solid bars and profiles. It is used to make: tanks, plant components, fans, submerged pump parts, rings, flanges, pulleys, gears.

## PE POLYETHYLENE - PELD - PEHD - PEUHMW

This material has a high resistance to chemical agents, it absorbs little water and has good electrical properties. It is normally used with temperatures between - 40 °C and + 80 °C and is resistant to water, saline solutions, acids, alkalis, alcohol and petrol. PE is insoluble in all organic solvents below 60 °C.

The use of some types of high density PE is suitable for the manufacture of fuel-oil containers and fuel tanks.

PE is odourless, tasteless and physiologically harmless and is well suited for use in the food sector.

It is also easy to weld using traditional welding systems. Because it is non polar and not very adhesive, PE is difficult to glue and to decorate.

The surfaces of PE can be printed, painted or glued using contact adhesives, however only after pretreatment with plasma oxidation, glow discharge, oxidising flame, ozone or in a chromic acid solution. When machining PE, be careful not to overheat the material.

#### Areas of use:

Mechanical, chemical, electrical, advertising and food sectors in the form of semi-finished products for tooling, such as solid or hollow round bars, pipes and sheets. It is used to make equipment for the chemical industry, bins and containers, liners for hoppers and chutes, pump components, sliding elements, rollers, gears, guide tracks and cutting boards.

## PPS POLYPHENYLENE SULFIDE

PPS products offer the broadest resistance to chemicals of any advanced engineering plastic.

They have no known solvents below 200 °C (392 °F) and offer inertness to steam, strong bases, fuels and acids.

Minimal moisture absorption and a very low coefficient of linear thermal expansion, combined with Quadrant's proprietary stress relieving processes, make these PPS products ideally suited for precise tolerance machined components. In addition, PPS products exhibit excellent electrical characteristics and are inherently flame retardant.

- Very high maximum allowable service temperature in air (220 °C continuously, up to 260 °C intermittently).
- High mechanical strength, stiffness and creep resistance, also at elevated temperatures.
- Excellent chemical and hydrolysis resistance.
- Excellent wear & frictional behaviour.
- Very good dimensional stability.
- Physiologically inert (suitable for food contact).
- Excellent resistance to high energy radiation (gamma- and X-rays).
- Good UV-resistance.
- Inherent low flammability.
- Good electrical insulating and dielectric properties.

## Characteristics and Uses

### PEI POLYETHERIMIDE

PEI is extremely suitable for electrical / electronic insulators (including many semiconductor process components) and a variety of structural components requiring high strength and rigidity at elevated temperatures.

PEI is an amber translucent (non-optical quality) amorphous thermoplastic material, offering high strength and heat resistance.

- High maximum allowable service temperature in air (170 °C continuously).
- Very good hydrolysis resistance (suitable for repeated steam sterilization).
- High strength and stiffness over a wide temperature range.
- Inherent low flammability and low levels of smoke evolution during combustion.
- Good dimensional stability.
- Physiologically inert (suitable for food contact).
- Very good resistance against high energy radiation (gamma- and X-rays).
- Very good electrical insulating and dielectric properties.

### PSU POLYSULFONE

PSU is a translucent (non-optical quality) amorphous thermoplastic material, offering a combination of excellent mechanical, thermal and electrical properties.

It often replaces polycarbonate (PC) whenever higher temperature resistance, improved chemical resistance or autoclavability is required.

- High maximum allowable service temperature in air (150°C continuously).
- Good hydrolysis resistance (suitable for repeated steam sterilization).
- High strength and stiffness over a wide temperature range.
- Good dimensional stability.
- Physiologically inert (suitable for food contact).
- Very good resistance against high energy radiation (gamma- and X-rays).
- Good electrical insulating and dielectric properties.

### PPSU POLYPHENYLSULFONE

PPSU is an amorphous high performance thermoplastic offering better impact resistance and chemical resistance than polysulfone (PSU) and polyetherimide (PEI).

Polyphenylsulfone offers superior hydrolysis resistance when compared to other amorphous thermoplastics as measured by steam autoclaving cycles to failure. In fact, PPSU has virtually unlimited steam sterilizability. This factor makes it an excellent choice for medical devices as steam autoclaves are widely used for sterilisation purposes. It also resists common acids and bases — including commercial washing solutions — over a broad temperature range.

It is commonly used in sterilization trays, dental and surgical instrument handles, and in fluid handling coupling and fitting applications. PPSU is USP Class VI compliant. It is suitable for use in electronic assembly equipment and devices that must withstand solder temperatures. Quadrant PPSU has a heat deflection temperature of 207 °C (405 °F).

- High maximum allowable service temperature in air (180 °C continuously).
- Good chemical and excellent hydrolysis resistance (suitable for repeated steam sterilization).
- High stiffness over a wide temperature range.
- Very high impact strength.
- Physiologically inert (suitable for food contact).
- High dimensional stability.
- Very good resistance against high energy radiation (gamma- and X-rays).
- Good electrical insulating and dielectric properties.

## Characteristics and Uses

### PC POLYCARBONATE

Polycarbonate is a tecnopolymer with elevated optical, mechanical and thermal properties. It is available in pressed sheets of different thicknesses and in extruded alveolar sheets.

These sheets are suitable for such applications as coverings for different types of private and industrial buildings, winter gardens, verandas, terraces, automobile covers, transparent dome-shaped coverings, skylights, gymnasiums and stadiums. It is the ideal material for windows because it has a high resistance to UV rays, has excellent insulation properties (energy saving) and important weight savings. Having a ribbed structure its weight can be very low whilst maintaining rigidity and robustness.

Sheets of solid polycarbonate (thicknesses from 0.75 mm up to 15 mm) have extreme impact resistance and their ease of use make them ideal for many different industrial applications. These sheets can be formed when warm or cold and are easily workable. Special versions of polycarbonate exist, that are more solid than the alveolar version: these are specially treated to guarantee 10 years against UV, to specifically resist abrasion, or to be bulletproof etc.

### PMMA POLYMETHYLMETHACRYLATE (PLEXIGLASS)

Polymethylmethacrylate (PMMA) is a transparent thermoplastic, which is the synthetic polymer of methyl methacrylate (MMA). These acrylic sheets are easy to thermoform, to work, are stable and have an excellent resistance to atmospheric agents, they can be bonded, formed, cut, pierced, polished, glued and carved.

PMMA the ideal material for innumerable purposes: for illuminated signs, displays, windows, skylights, furniture, motorcycle and boat windscreens. Also special version of this product exist: sheets produced via special processes to give metallic or pearlescent reflections on the surface, protection from UV rays, with textured surfaces, that are non-glaring, etc.

### PVC EXPANDED RIGID

Sheets in expanded rigid pvc with both opaque surfaces and with a close cellular structure. It is ideal for use as walls in exhibition stands, indication signs, licence plates and exhibitions. It is printable, has a suitable surface for mounting printed photographs or vinyl films, and can be cut, milled and carved.

This product, because it is usually used outside, has a high resistance to the elements: air, water and dampness do not change its features and do not alter its state. It is also widely used also in the construction industry.

### PETG POLYESTER CO-POLYMER

It is the ideal product for the following uses: display stands, pricing labels, partitions for shelves, signs, advertising hoardings; containers and trays for food, pharmaceutical applications, flat and shaped machinery coverings, separation panels. It is quickly thermoformable and has low energy consumption.

These sheets are able to be easily serigraphed, printed in 3D and machine worked. Also various types can be produced with specific characteristics: high transparency and brightness, a transparent bronze colour, with high gloss and fluorescent colours, etc.

### PAI TORLON®

Optimal mechanical and lengthening resistance, optimal electric and thermal properties up to 250°C. Resistant to scouring under load and usage, low friction coefficient. Excellent rigidity and creep resistance in a wide range of temperatures. Elevated elastic modulus and low thermal conductivity.

Combined with other materials it offers excellent performance for high temperature applications. Low intrinsic flammability. Exceptional resistance to the strong energy radiations.

# ATAG

SERVING INDUSTRY SINCE 1947

**IT\_20128 MILANO**

ph. +39 02 255.22.51  
mob. +39 329 68.78.260  
ufftec@atag-europe.com

**UK\_G66 GLASGOW**

ph. +44 01360 311.685  
mob. +44 0756 204.70.05  
andrew.wood@atag-europe.com

**CH\_SVIZZERA**

RTS Group  
ph. +41 091 960.04.63  
infosvizzera@atag-europe.com

[WWW.ATAG-EUROPE.COM](http://WWW.ATAG-EUROPE.COM)

