Polyacetal (POM)

DURACON®

HP90X

CF2001

High Rigidity

POLYPLASTICS CO., LTD.

Introduction

The DURACON® HP-X series (HP90X/HP25X/HP270X) are the materials developed under the design concept of all-round polyacetal resins that eliminate the boundaries between homopolymers and copolymers.
The HP-X series has excellent properties of strength and rigidity equal to acetal homopolymers while being acetal copolymers, and it maintains long-term reliability, heat resistance, chemical resistance, and moldability, which are features of acetal copolymers.
The lineup of the HP-X series comprises standard type HP90X, high-viscosity type HP25X, and high-flow type HP270X to adapt to various uses.

Characteristics of DURACON® POM HP-X series

Mechanical properties

- About 10% improved in strength and rigidity compared with conventional copolymers
- Characterized by big elongation at break

Long term properties

- Excellent properties in thermal and chemical stability like conventional copolymers

Processability

- As good moldability as that of general purpose DURACON

General Properties of HP90X

table1-1 General Properties（ISO）

Item	Unit	Test Method	High Rigidity
			HP90X
			Standard
Color			CF2001
ISO(JIS)quality-of-the-material display:		ISO11469 (JIS K6999)	>POM<
Density	g/cm^3	ISO 1183	1.41
Water absorption (23°C,24hrs,1mmt)	%	ISO 62	0.6
MFR (190℃、2.16kg)	g/10min	ISO 1133	9
MVR (190℃, 2.16kg)	cm^3/10min	ISO 1133	8
Tensile strength	MPa	ISO 527-1,2	68
Strain at break	%	ISO 527-1,2	30[*1]
Tensile modulus	MPa	ISO 527-1,2	2,950
Flexural strength	MPa	ISO 178	94
Flexural modulus	MPa	ISO 178	2,700
Charpy notched impact strength (23℃)	kJ/m^2	ISO 179/1eA	7.0
Temperature of deflection under load (1.8MPa)	℃	ISO 75-1,2	100
Coefficient of linear thermal expansion (23 - 55℃、Flow direction)	x10^{-5}/℃	Our standard	11
Coefficient of linear thermal expansion (23 - 55℃、Transverse direction)	x10^{-5}/℃	Our standard	11
Electric strength (3mmt)	kV/mm	IEC 60243-1	19
Volume resistivity	Ω·cm	IEC 60093	1 × 10^{14}
Surface resistivity	Ω	IEC 60093	1 × 10^{16}
Volume resistivity (Our standard)	Ω·cm		-
Surface resistivity (Our standard)	Ω		-
Mold Shrinkage (60×60×2mmt, Flow direction, Cavity Pressure 60 MPa)	%	ISO 294-4	2.1
Mold Shrinkage (60×60×2mmt, Transverse direction, Cavity Pressure 60 MPa)	%	ISO 294-4	2.4
Rockwell hardness	M(Scale)	ISO2039-2	90
Specific wear amount (Thrust, vs C-Steel, material side, pressure 0.49MPa, 30cm/s)	x10^{-3}mm^3/(N·km)	JIS K7218	-
Specific wear amount (Thrust, vs C-Steel, steel side, pressure 0.49MPa, 30cm/s)	x10^{-3}mm^3/(N·km)	JIS K7218	-
Coefficient of Dynamic Friction (Thrust, vs C-Steel, pressure 0.49MPa, 30cm/s)		JIS K7218	-
Specific wear amount (Thrust, vs C-Steel, material side, pressure 0.98MPa, 30cm/s)	x10^{-3}mm^3/(N·km)	JIS K7218	0.80

Item	Unit	Test Method	High Rigidity
			HP90X
			Standard
Specific wear amount (Thrust, vs C-Steel, steel side, pressure 0.98MPa, 30cm/s)	$x10^{-3}mm^3/(N\cdot km)$	JIS K7218	0.01>
Coefficient of Dynamic Friction (Thrust, vs C-Steel, pressure 0.98MPa, 30cm/s)		JIS K7218	0.40
Specific wear amount (Thrust, vs M90-44, material side, pressure 0.06MPa, 15cm/s)	$x10^{-3}mm^3/(N\cdot km)$	JIS K7218	-
Specific wear amount (Thrust, vs M90-44, M90-44 side, pressure 0.06MPa, 15cm/s)	$x10^{-3}mm^3/(N\cdot km)$	JIS K7218	-
Coefficient of Dynamic Friction (Thrust, vs M90-44, pressure0.06MPa, 15cm/s)		JIS K7218	0.37
Flammability		UL94	HB
The yellow card File No.			E45034
Appropriate List number of Ministerial Ordinance for Export Trade Control			Item 16 of Appendix -1

*1) Nominal strain at break

All figures in the table are the typical values of the material and not the minimum values of the material specifications.

1. Mechanical Properties of HP-X Series

1.1 Tensile Property

The mechanical properties of the HP-X series have improved about 10% in strength and rigidity compared with conventional copolymers, and they are characterized by big elongation at break. Although their elongation values are slightly inferior to conventional copolymers, the HP-X series are tough materials which show big elongation at break, while having high strength and high rigidity.

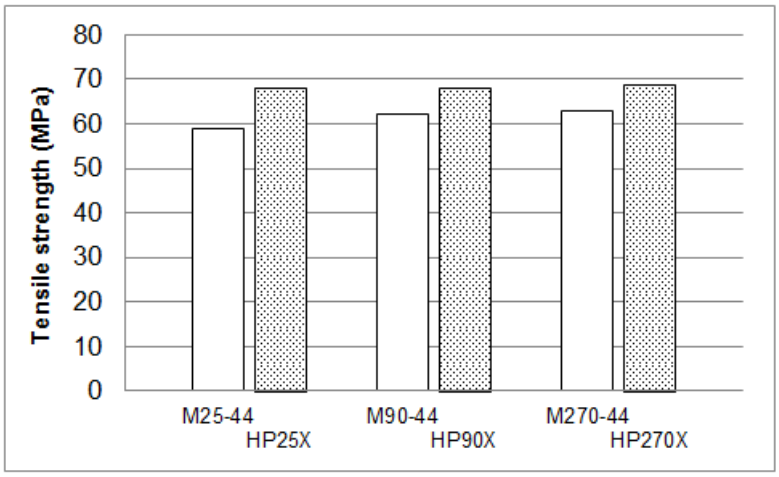

Fig. 1-1 Comparison of tensile strength between HP-X series and standard grades (ISO 527, at 23 degC)

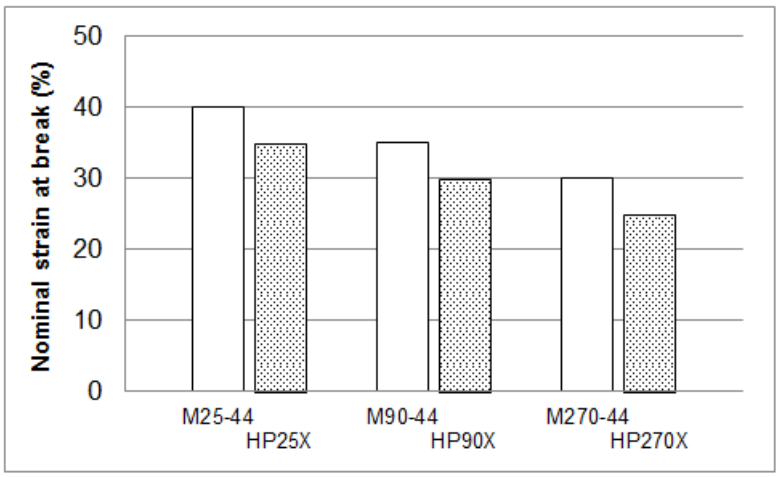

Fig. 1-2 Comparison of nominal strain at break between HP-X series and standard grades (ISO 527, at 23 degC)

1.2 Flexural Property

The DURACON HP-X series shows about 10% higher flexural strength and flexural modulus compared with standard grades. It can be applied to molded parts that require high strength and high rigidity.

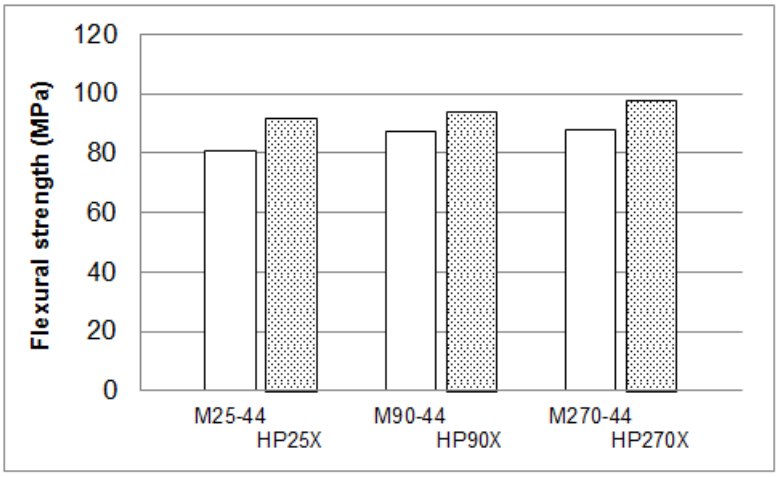

Fig. 1-3 Comparison of flexural strength between HP-X series and standard grades (ISO 178, at 23 degC)

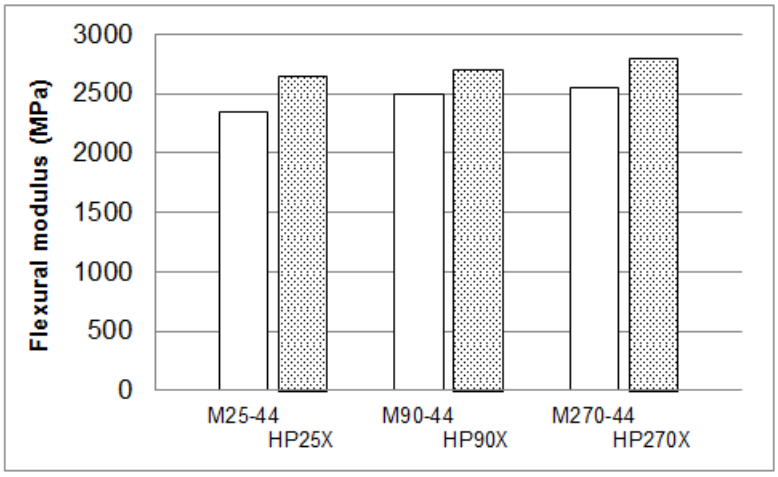

Fig. 1-4 Comparison of flexural modulus between HP-X series and standard grades (ISO 178, at 23 degC)

Fig. 1-5 shows the influence of temperature on modulus of the DURACON HP-X series. It is found that it has high modulus in the range of -40 degC to 100 degC.

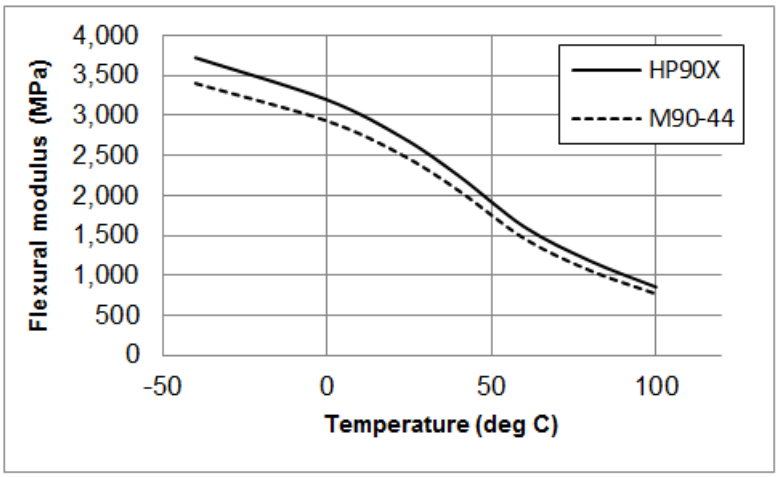

Fig. 1-5 Effect of temperature on flexural modulus (ISO 178)

2. Long-term Properties of HP-X Series

2.1 Aging in Hot Air

Fig. 2-1 shows the retention rate of tensile strength of the DURACON HP-X series when heat-treated at 140 degC. The heat aging properties of the HP-X series are almost equivalent to conventional grades.

Because the HP-X series is copolymer type polyacetal, they have excellent long-term stability. This is one of the superior properties compared with homopolymers.

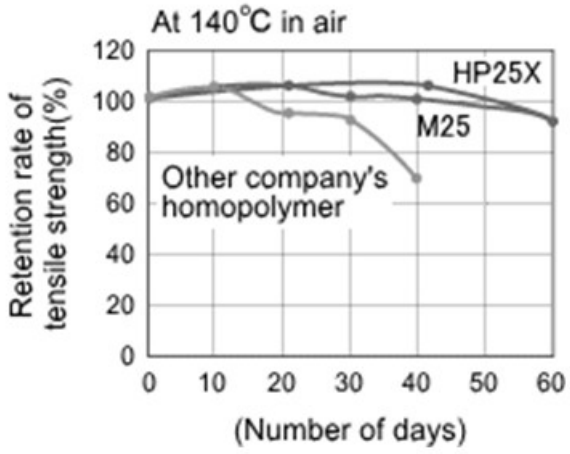

Fig. 2-1 Heat aging properties

2.2 Chemical Resistance

Fig. 2-2 shows the retention rate of tensile strength of the DURACON HP-X series about heat resistance and chemical resistance with grease applied. It is found that HP25X keeps almost 100% retention rate even after 40 days at 120 degC, and shows good resistance against grease.

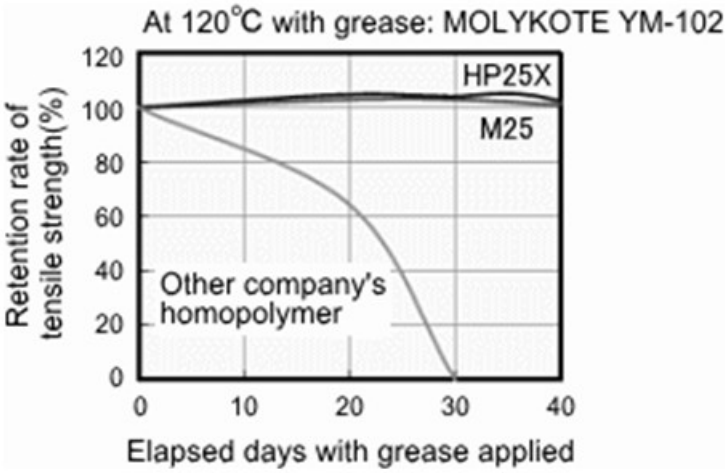

Fig. 2-2 Chemical (grease) resistance

2.3 Creep Property

The creep-fracture life and amount of creep deformation of the DURACON HP-X series are shown below. When stress is applied, not only the short-term deformation but also the long-term deformation are small and the creep rupture time is long. It can be expected that the reliability of parts will be improved by using the HP-X series.

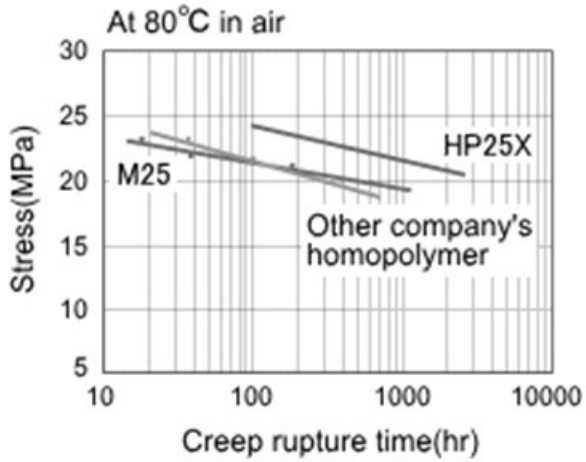

Fig. 2-3 Creep-fracture life properties (tensile creep test)

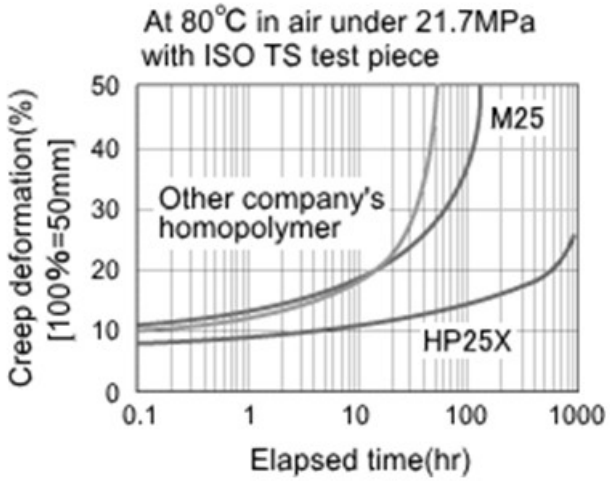

Fig. 2-4 Creep deformation properties (tensile creep test)

3. Processability of HP-X Series

3.1 Flowability

The flowability of the HP-X series is comparable to the corresponding standard grades.

3.2 Mold Shrinkage

The mold shrinkage of standard-viscosity HP90X and high-flow type HP270X are equivalent to those of the corresponding DURACON standard grades, while the mold shrinkage of high-viscosity type HP25X is slightly larger than that of DURACON M25.

Table 3-1 Flowability and mold shrinkage

Item	Unit	Test Method	**HP25X**	M25-44	**HP90X**	M90-44	**HP270X**	M270-44
Bar flow length (2mmt, Injection pressure 100MPa)	mm	Our standard	250	250	400	400	650	650
Mold Shrinkage (120×120×2mmt, Flow direction, Inj. pressure 60MPa)	%	Our standard	2.34	2.35	2.01	2.04	1.8	1.9
Mold Shrinkage (120×120×2mmt, Trans direction, Inj. pressure 60MPa)	%	Our standard	2.68	2.22	2.1	2.12	1.95	1.93

< Molding conditions >
Resin temperature: 200 degC
Mold temperature: 80 degC

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NOTES TO USERS

- All property values shown in this brochure are the typical values obtained under conditions prescribed by applicable standards and test methods.
- This brochure has been prepared based on our own experiences and laboratory test data, and therefore all data shown here are not always applicable to parts used under different conditions. We do not guarantee that these data are directly applicable to the application conditions of users and we ask each user to make his own decision on the application.
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- For safe handling of materials we supply, it is advised to refer to the Safety Data Sheet "**SDS**" of the proper material.
- This brochure is edited based on reference literature, information and data available to us at the time of creation. The contents of this brochure are subject to change without notice upon achievement of new data.
- Please contact our office for any questions about products we supply, descriptive literatures or any description in this brochure.

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