

Grade Series of **DURACON®**

Acetal Copolymer

DURACON®

NW-02

(High Performance
Wear-resistant Grade)

Polyplastics

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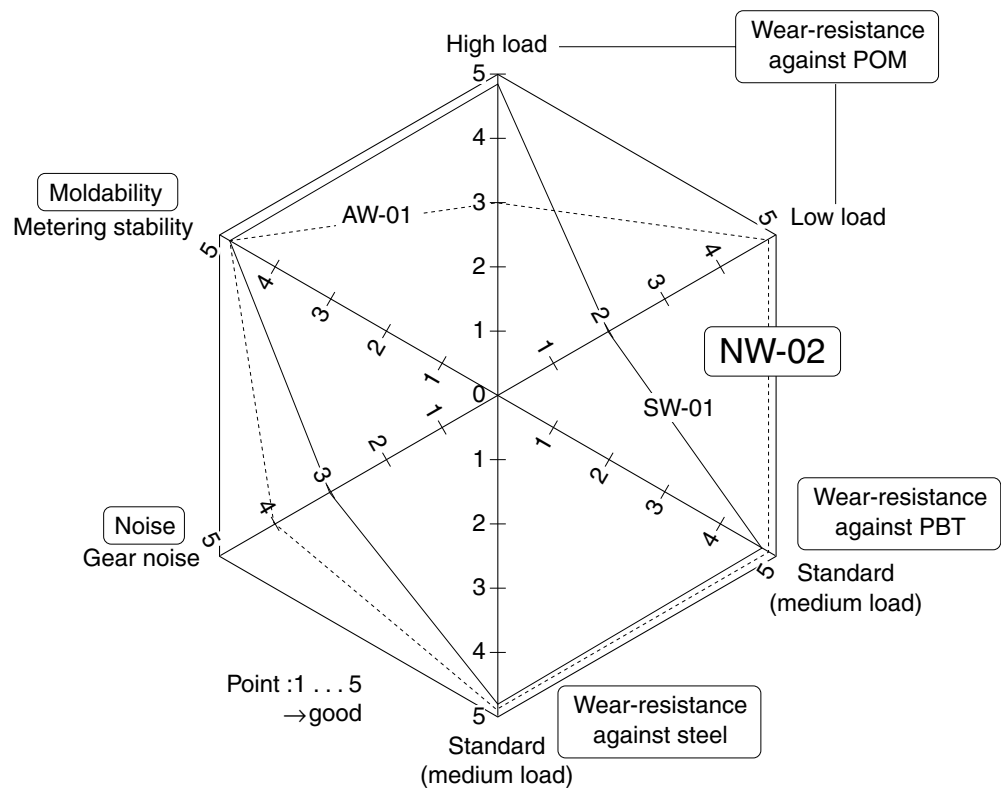
Introduction

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NOTES TO USERS

- All property values shown in this brochure are the typical values obtained under varying 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.
- It is the users' responsibility to investigate patent rights, service life and potentiality of applications introduced in this brochure. Materials we supply are not intended for the implant applications in the medical and dental fields, and therefore are not recommended for such uses.
- For all works done properly, it is advised to refer to the appropriate **"Technical Catalog"** for specific material processing.
- For safe handling of materials we supply, it is advised to refer to the Material Safety Data Sheet **"MSDS"** of the proper material.
- This brochure is edited based on reference literatures, information and data currently available to us. So the contents of this brochure are subject to change without notice due to new data.
- Please contact our office for any questions about products we supply, descriptive literatures or any description in this brochure.

The summary chart of DURACON® NW-02 characteristics



Introduction

Duracon has been well known of its well balanced properties and particular superiority in wear resistance. Still, Polyplastics Co., Ltd, has never stopped challenging to excel the best in the market, by introduction of specialized grades in wearing like AW and SW series for example. Developing a "truly grease-free" wear-resistant grade of **Duracon** through application of the most advanced technology is our final goal. Wear-resistant applications of **Duracon** vary so widely and those application conditions are frequently changing with the advancement of the design technology that it has often been difficult to define the exact requirements.

Therefore, a grade that can be grease-free under any usage conditions has not long been developed.

Duracon NW-02 is the first ever developed versatile version of the wear-resistant grade, which has been given the final touch employing the state of art polymer alloy technology based on the accumulated modification knowledge through the past developmental works of AW and SW series.

The points of superior performance of **NW-02** over our conventional wear-resistant grades are shown below.

Characteristics of NW-02

Wear-resistant properties

- Stable friction-wear characteristics covering the wide range from low load to high load.
- Stable friction-wear characteristics over the wide range from low temperature to high temperature.
- Good friction-wear characteristics regardless of the counter materials.
- Low wear noise in gears.
- Superior characteristics over Duracon AW-01 and SW-01.

Processability

- High flowability.
- As good moldability as that of general purpose Duracon.

1. Wear Resistance of NW-02

1.1 Wear Resistance Against POM

At low load under a wide range of temperatures **Duracon NW-02** shows better friction properties than does AW-01 which may increase the functional efficiency in various electro-mechanical parts thus result in saving the power loss. At

medium and high load under a wider range of temperatures, **NW-02** shows much better friction-wear characteristics than does SW-01 (**Fig. 1-1** to **Fig. 1-5**).

Fig. 1-1 Coefficient of friction at low load (ASTM friction test)

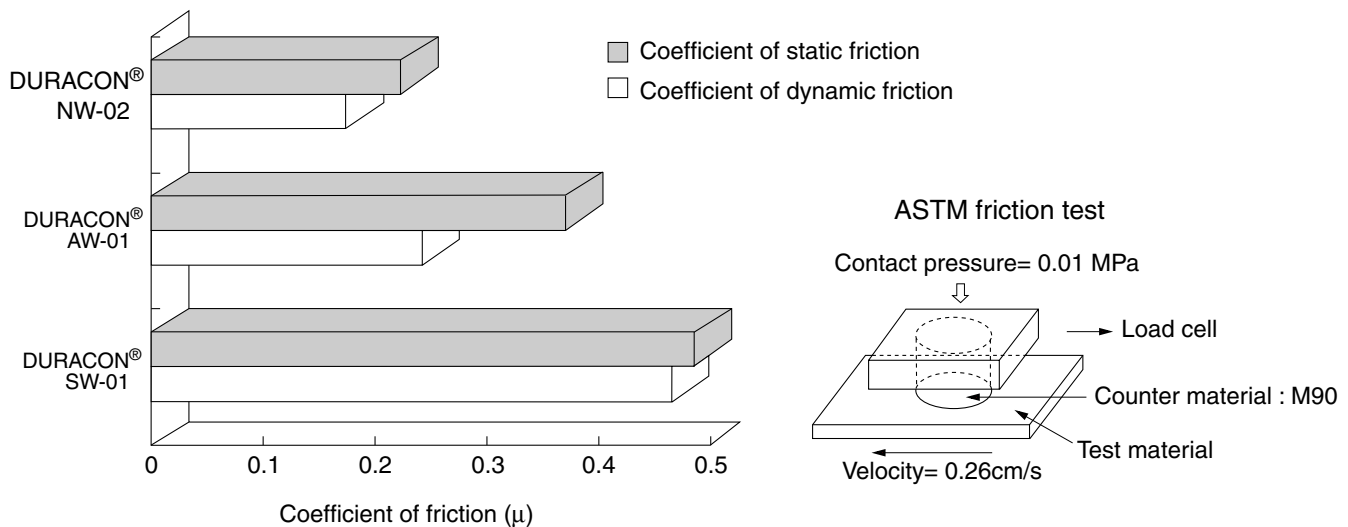


Fig. 1-2 Temperature dependence of coefficient of friction at low load (ASTM friction test)

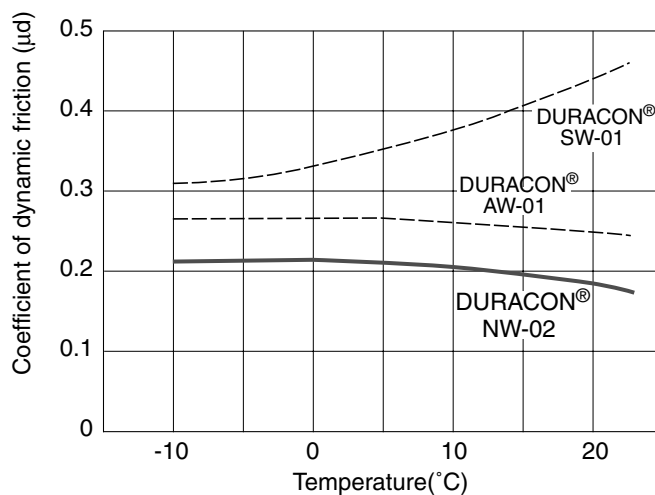


Fig. 1-3 Friction-wear characteristics under load(Suzuki method of wear testing)

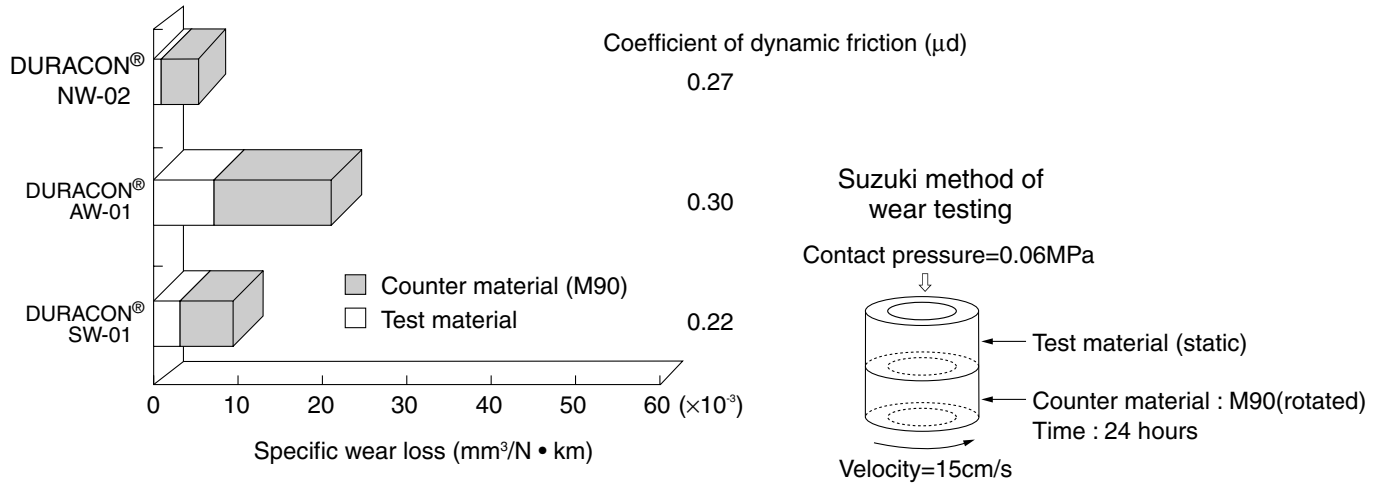


Fig. 1-4 Friction-wear characteristics under medium load at low temperature(-10°C)(Suzuki method)

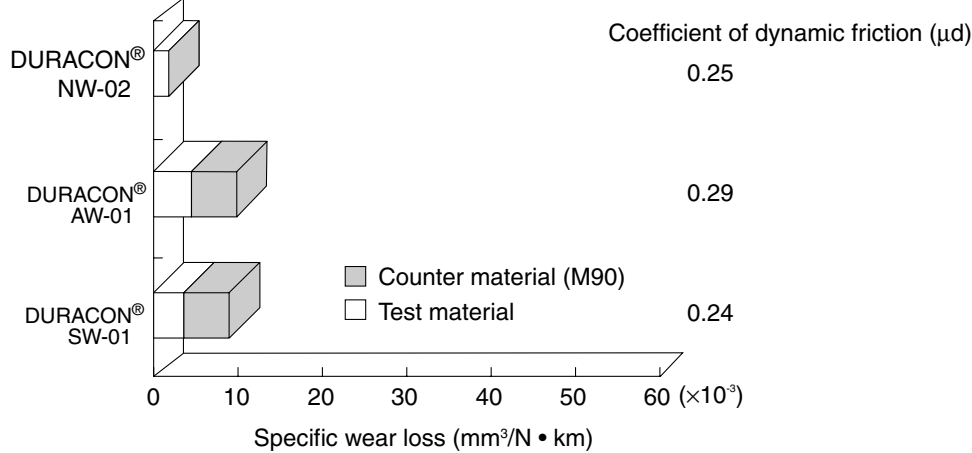
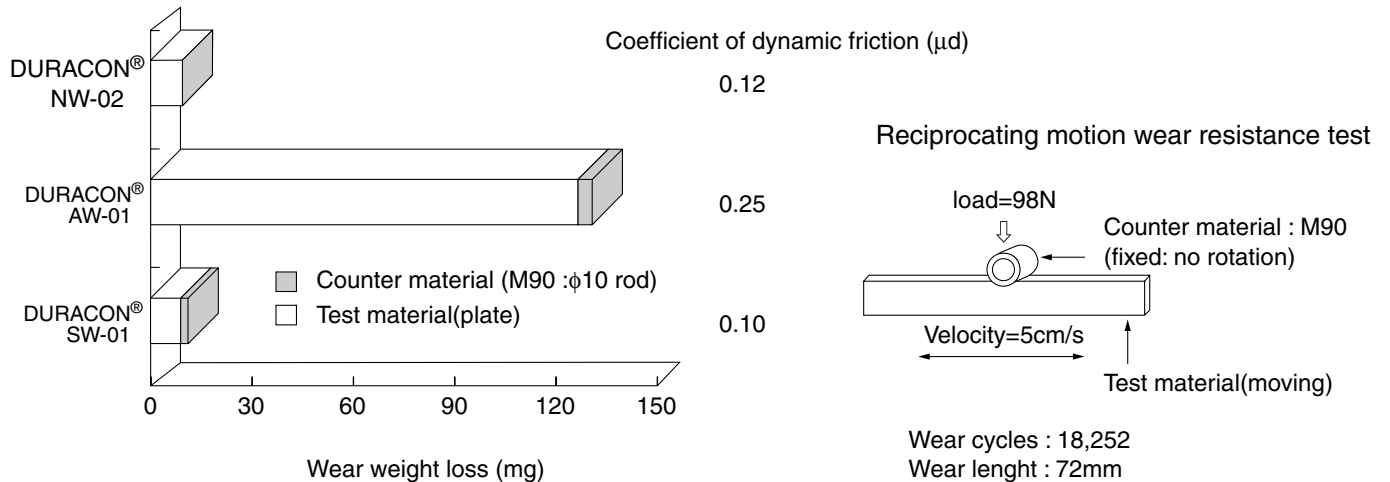


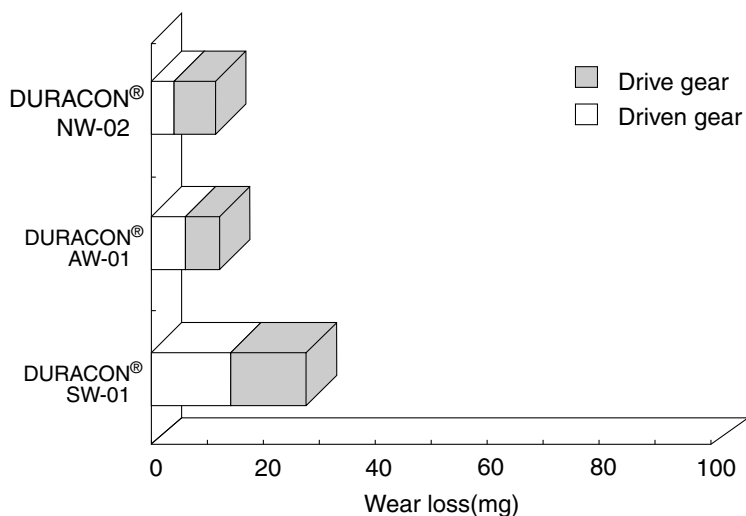
Fig. 1-5 Friction-wear characteristics under high load (reciprocating motion wear test)



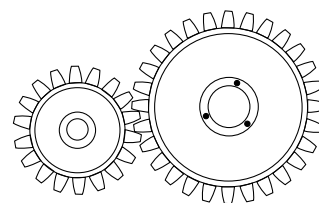
1.2 Gear Wear Characteristics(against the same material)

Duracon NW-02 shows good gear wear characteristics under a wide range of conditions and best fits gears as well as other parts in AV/OA applications where various wear properties are required(**Fig. 1-6,1-7**).

Fig. 1-6 Gear wear characteristics under low load
(against the same material)

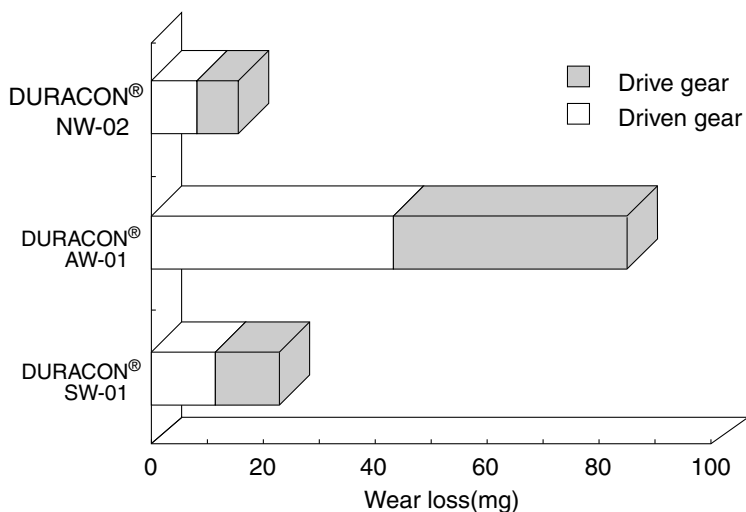


Gear wear test

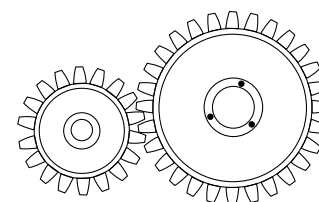


Rotation velocity : 1,000rpm
 Torque : 0.20N • m
 Back lash : 15 μm
 Module : 1.0
 Gear ratio : 23(drive)/54(driven)
 Number of rotations : 5,000,000

Fig. 1-7 Gear wear characteristics under high load
(against the same material)



Gear wear test



Torque : 0.55N • m

1.3 Wear Resistance Against Steel

Duracon NW-02 shows better-wear resistance against metals such as steel than do AW-01 and SW-01(**Fig.1-8**).

1.4 Wear Resistance Against PBT

Duracon NW-02 shows good friction-wear resistance against Duranex SA series, which are preferably used for AV/OA chassis applications. Good characteristics of **NW-02** as the sliding parts against Duranex 751SA slider or boss on the chassis are illustrated in **fig. 1-9**.

Fig. 1-8 Friction-wear characteristics against steel
(Suzuki method)

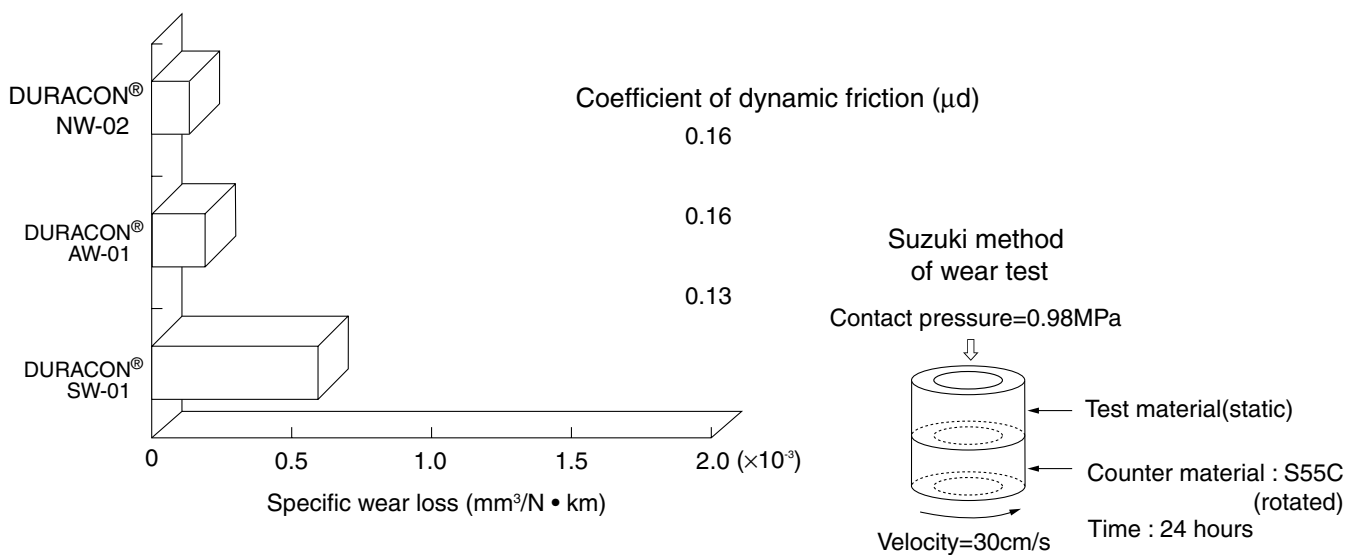
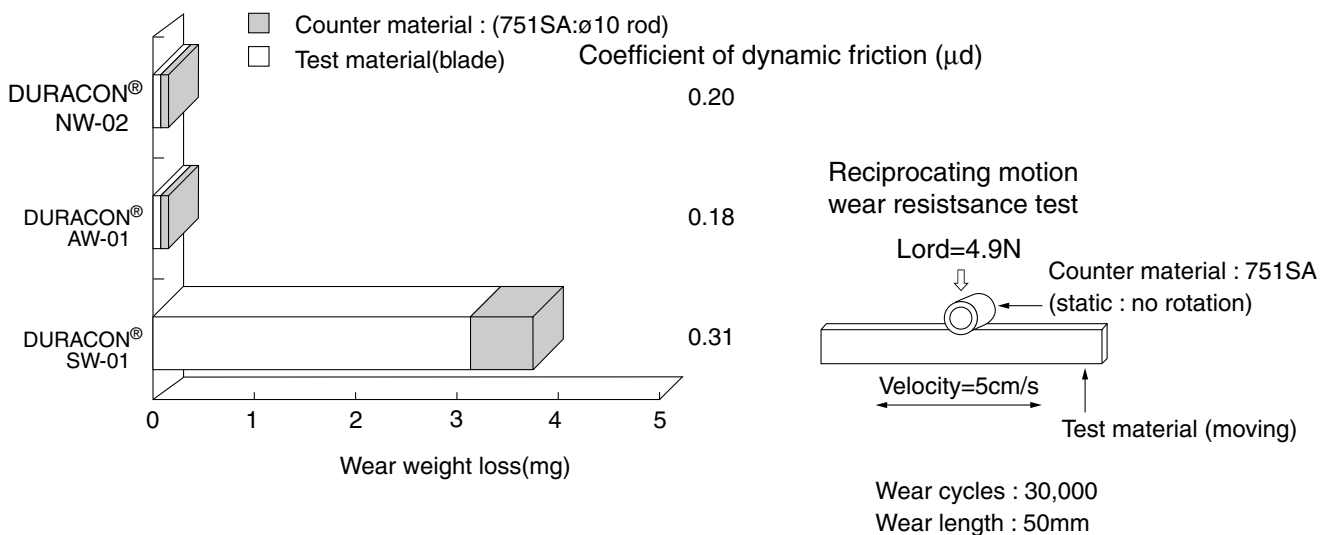


Fig. 1-9 Friction-wear characteristics against PBT(DURANEX® 751SA)
(reciprocating motion)



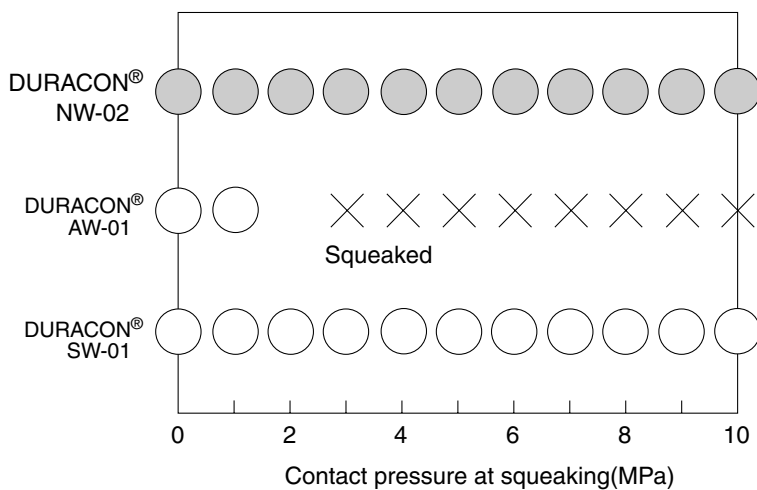
2.Noise Characteristics of NW-02

2.1 Wear Noise

Duracon NW-02, like SW-01, generates little squeaking noise even under high contact pressure friction and also reduces gear noise, thus use of

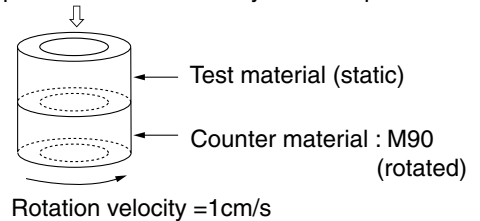
NW-02 in frictional parts makes the operations comfortably quiet (**Fig.2-1,2-2**).

Fig. 2-1 Squeaking noise generation behavior



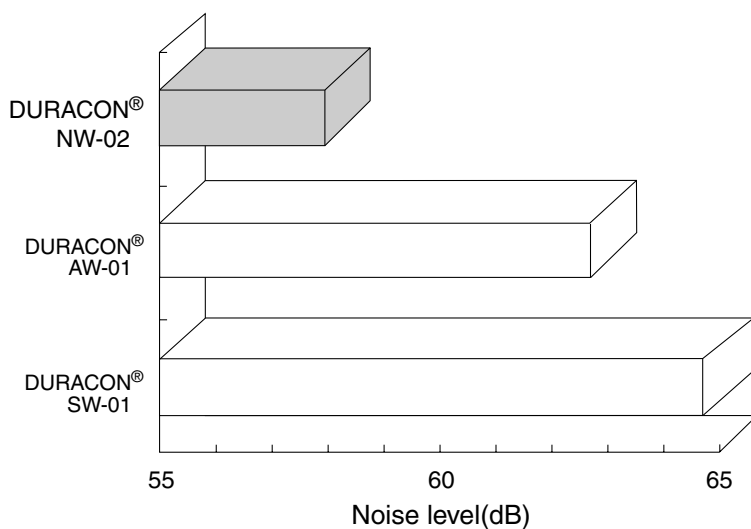
Suzuki method of wear testing

Rotation velocity is kept constant and the contact pressure is increased by 0.1 MPa per minute.

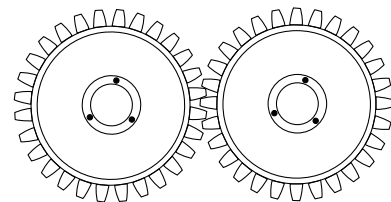


○ : Not squeaked
× : Squeaked

Fig. 2-2 Gear noise (high velocity/low torque)



Gear noise test



Model : 0.5
Number of teeth : 40
Tooth width : 3mm
Number of rotations : 1,200rpm
Torque : 0.02N • m

3.General Properties of NW-02

3.1 General Properties

Duracon NW-02 features engineering plastics mechanical properties as good as those of our conventional wear resistant grades(**Table 3-1**).

Table 3-1 General properties (ISO)

			High sliding			Standard
Item	Unit	Testing Method	NW-02	AW-01	SW-01	M90S
			Special lubricant, High sliding	Special lubricant, High sliding	Special lubricant, High sliding	General
Density	g/cm ³	ISO 1183	1.36	1.37	1.42	1.41
Tensile strength	MPa	ISO 527-1,2	52	54	50	62
Strain at break	%	ISO 527-1,2	20*	25*	20*	35*
Tensile modulus	MPa	ISO 527-1,2	2,350	2,350	2,700	2,700
Flexural strength	MPa	ISO 178	72	75	75	87
Flexural modulus	MPa	ISO 178	2,200	2,200	2,500	2,500
Charpy notched impact strength	kJ/m ²	ISO 179/1eA	5.9	5.6	5.4	6.0
Temperature of deflection under load (1.80MPa)	°C	ISO 75-1,2	85	80	80	95
Coefficient of linear thermal expansion (23~55°C) parallel	×10 ⁻⁵ /°C	ISO 11359-2	11	13	14	12
Coefficient of linear thermal expansion (23~55°C) transverse	×10 ⁻⁵ /°C	ISO 11359-2	11	13	14	12
Electric strength	kV/mm	IEC 60243-1	20	20	18	19
Volume resistivity	Ω • cm	IEC 60093	1×10 ¹⁴	3×10 ¹⁴	2×10 ¹⁴	1×10 ¹⁴
Surface resistivity	Ω	IEC 60093	3×10 ¹⁵	3×10 ¹⁴	—	1×10 ¹⁶
Flammability		UL94	HB	HB	HB	HB

*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.
- For qualified values of UL (Underwriters Laboratories Inc.) refer to the yellow card (File No.E45034) issued by UL.

Table 3-2 General properties (ASTM)

				High sliding			Standard
Item		Unit	Testing Method	NW-02	AW-01	SW-01	M90S
				Special lubricant, High sliding	Special lubricant, High sliding	Special lubricant, High sliding	General
Specific gravity		g/cm ³	D 792	1.36	1.37	1.42	1.41
Tensile strength		MPa	D 638	52	52	49	60
Tensile elongation		%	D 638	35	70	35	60
Flexural strength		MPa	D 790	77	75	78	90
Flexural modulus		MPa	D 790	2,300	2,150	2,590	2,580
Izod impact strength (with notch)	Notch side	J/m	D 256	58	53	49	63
	Reversed notch	J/m	D 256	880	880	530	760
Deflection temperature under load (1.82MPa)		°C	D 648	117	100	110	110
Coefficient of linear thermal expansion (Room temperature)		×10 ⁻⁵ /°C	—	—	10	10	10
Dielectric breakdown strength (Short-time test: 2mmt)		MV/m	D 149	—	22	23	24
Volume resistivity (3mmt)		Ω • cm	D257	—	3×10 ¹⁴	2×10 ¹⁴	1×10 ¹⁴
Surface resistivity		Ω	D257	—	—	—	1×10 ¹⁶
Arc resistance		s	D495	—	—	—	240
Tracking resistance		V	(IEC)	—	—	—	600+
Flammability (UL94)		—	(UL94)	HB	HB	HB	HB

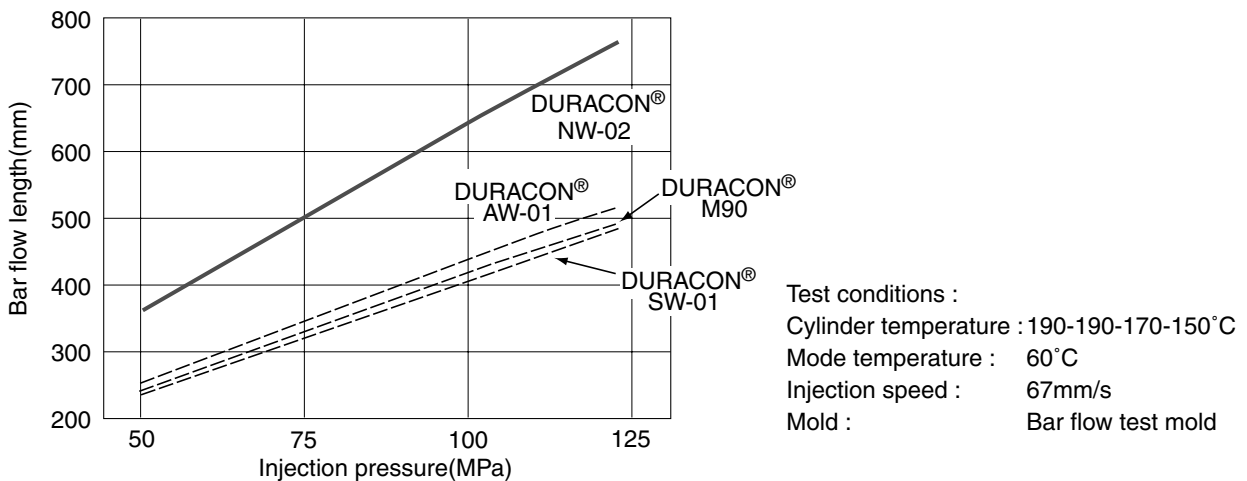
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4. Processability of NW-02

4.1 Processability

Duracon NW-02 exhibits higher flowability than do the conventional wear-resistant grades, which may result in higher productivity and higher dimensional accuracy in molding (**Fig. 4-1**).

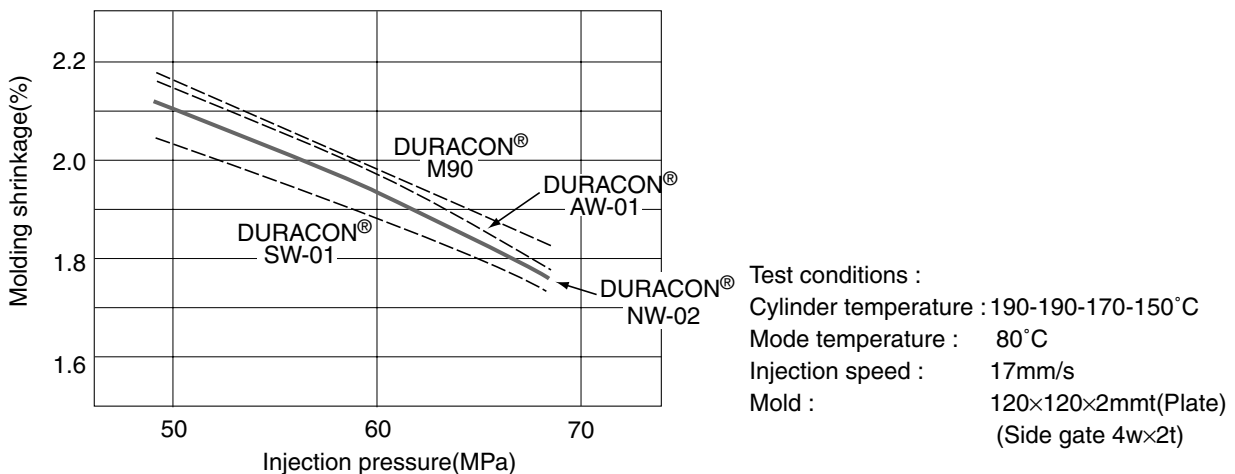
Fig. 4-1 Bar flow length(2mmt)



4.2 Molding Shrinkage

Duracon NW-02 shows molding shrinkage approximately the same as that of AW-01 or SW-01 (**Fig. 4-2**).

Fig. 4-2 Molding shrinkage(2mmt)



4.3 Metering Characteristics

Duracon NW-02 features metering characteristics (screw feeding characteristics) as good as those of AW-01 or SW-01 and is free from poor metering that the silicon-added materials often encounter while molding operation.

4.4 Other Processing Characteristics

Less mold deposit, which tends to occur during molding of the modified polyacetal, is expected for **Duracon NW-02** than for the conventional grades.

Polyplastics



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ISO14001 Certified
JQA-EM0337 Research & Development Div.
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