

Polybutylene Terephthalate (PBT)

**DURANEX®**

711SA

EF2001/ED3002

Low Warpage, SA  
Series

## Introduction

The addition of glass fibers to PBT resins such as Duranex brings with it a significant reinforcing effect, and therefore, 30% glass fiber reinforced grades such as **Duranex 3300** are used. However, filling resins with glass fibers results in significant differences in mold shrinkage ratios, and cases can frequently be seen whereby problems with warpage and deformation can occur during molding.

To overcome these problems, we have developed various low warpage grades such as **Duranex 7400W** and **7407**, but in order to endow these grades with low warpage characteristics, specific gravity is increased and flowability is also downgraded, thus causing in unbalancing of properties.

This time, the **Duranex SA series** developed by us has, through special alloying technology, achieved a balanced property mix, while at the same time achieved low warpage and deformation, as well as low specific gravity.

Moreover, as various grades are available to cater for various objectives, we anticipate applications that include large parts, and decorative, cosmetic, and external parts.

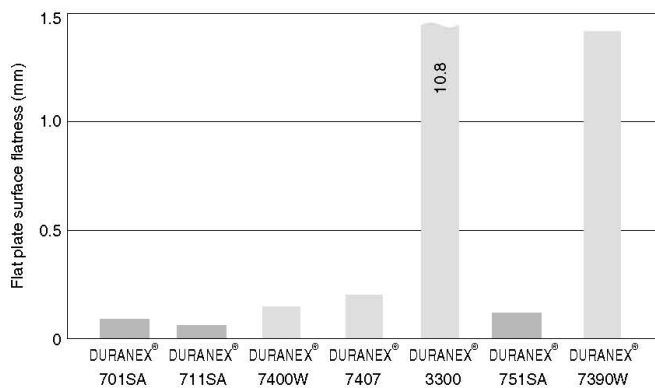
**The SA series** is distinguished by the following properties:

1. Small mold shrinkage ratio and anisotropy.  
Superior low warpage properties.
2. Low specific gravity
3. Superior flowability

| DURANEX® SA series     | HB type        | V-0 type       |
|------------------------|----------------|----------------|
| Standard type          | DURANEX® 701SA | DURANEX® 751SA |
| Ultra-low warpage type | DURANEX® 711SA | —              |

DURANEX® SA series low warpage properties

Flat plate warpage deformation



Processing parameters

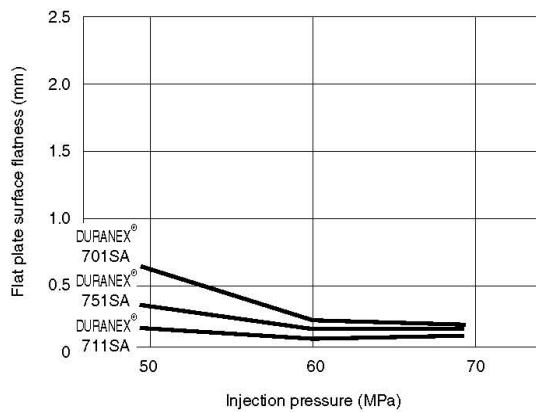
Cylinder temperature: 250-250-230-210°C  
Mold temperature: 65°C  
Injection speed: 50 mm/sec  
Injection pressure: 68MPa  
Mold: 120×120×2 mm flat plate  
(side gate: 4 (W)×2 (t))

# 1. DURANEX® SA series low warpage properties

The effect of low warpage properties is larger for higher injection pressures.

## 1.1 Flat plate warpage deformation

Figure 1-1 Flat plate warpage deformation



Processing parameters

Cylinder temperature: 250-250-230-210°C

Mold temperature: 65°C

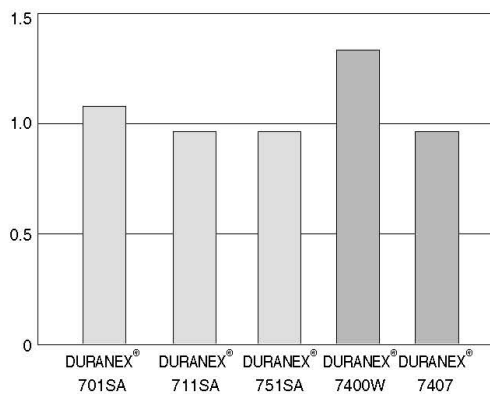
Injection speed: 50 mm/sec

Mold: 120×120×2 mm flat plate

(side gate: 4 (W)×2 (t))

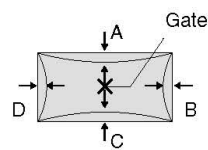
## 1.2 Internal warpage in molded box

Figure 1-2 Internal warpage in molded box



Box shape: 40 (W)×80 (L)×20 (H)

Gate:  $\phi$  2.0 pin gate



Internal warpage extent = A+B+C+D

Processing parameters

Cylinder temperature: 250-250-230-210°C

Mold temperature: 65°C

Injection speed: 33 mm/sec

Injection pressure: 78 MPa

# General Properties of 711SA

table1-1 General Properties (ISO)

| Item  | Unit                 | Test Method          | Low Warpage, SA Series                   |
|---|----------------------|----------------------|--|
|   |                      |                      | 711SA                                    |
|   |                      |                      | GF Reinforced, Low Density, High Sliding |
| Color   |                      |                      | EF2001/ED3002                            |
| ISO(JIS)quality-of-the-material display:                                  |                      | ISO11469 (JIS K6999) | >PBT+ABS-(GF+PS)30<                      |
| Density   | g/cm <sup>3</sup>    | ISO 1183             | 1.45                                     |
| Water absorption (23°C,24hrs,1mmt)  | %                    | ISO 62               | 0.2                                      |
| Tensile strength  | MPa                  | ISO 527-1,2          | 93                                       |
| Strain at break   | %                    | ISO 527-1,2          | 2.0                                      |
| Flexural strength   | MPa                  | ISO 178              | 130                                      |
| Flexural modulus  | MPa                  | ISO 178              | 7,620                                    |
| Charpy notched impact strength (23℃)                                      | kJ/m <sup>2</sup>    | ISO 179/1eA          | 5.3                                      |
| Temperature of deflection under load (1.8MPa)                             | ℃                    | ISO 75-1,2           | 180                                      |
| Coefficient of linear thermal expansion (23 - 55℃、Flow direction)         | x10 <sup>-5</sup> /℃ | Our standard         | 3  |
| Coefficient of linear thermal expansion (23 - 55℃、Transverse direction)   | x10 <sup>-5</sup> /℃ | Our standard         | 6  |
| Electric strength (3mmt)  | kV/mm                | IEC 60243-1          | 26                                       |
| Volume resistivity  | Ω・cm                 | IEC 60093            | -  |
| Volume resistivity (Our standard)   | Ω・cm                 |                      | -  |
| Tracking resistance (CTI)   | V                    | IEC 60112            | -  |
| Rockwell hardness   | M(Scale)             | ISO2039-2            | 90                                       |
| Flammability  |                      | UL94                 | HB                                       |
| The yellow card File No.  |                      |                      | E213445                                  |
| Appropriate List number of Ministerial Ordinance for Export Trade Control |                      |                      | Item 16 of Appendix -1                   |

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

### 3. Flow characteristics of DURANEX® SA series (Bar flow length: 2mmt)

Figure 3-1 DURANEX® 701SA

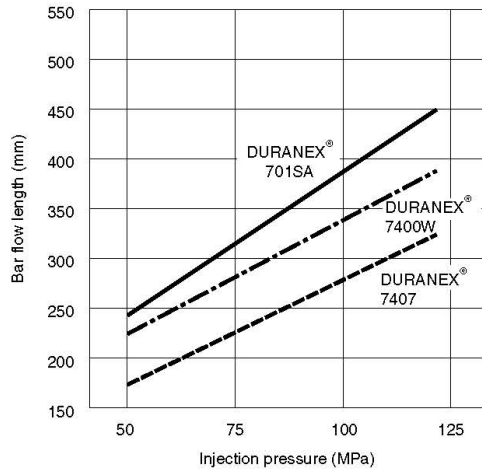
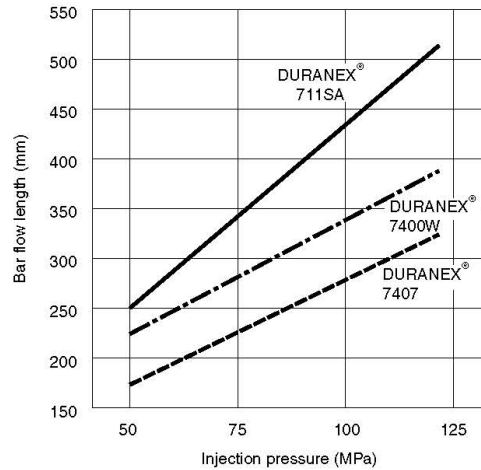


Figure 3-2 DURANEX® 711SA



### 4. Mold shrinkage ratio of DURANEX® SA series (120□×2mmt)

Figure 4-1 DURANEX® 701SA

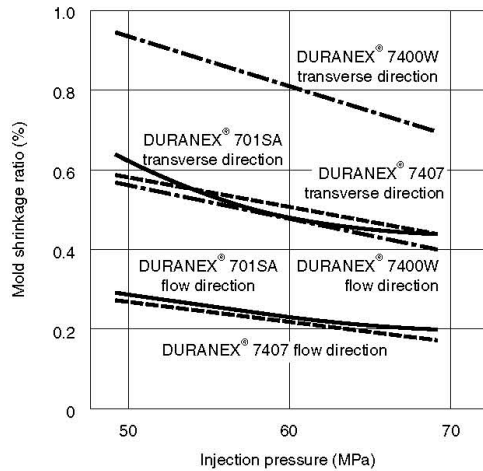
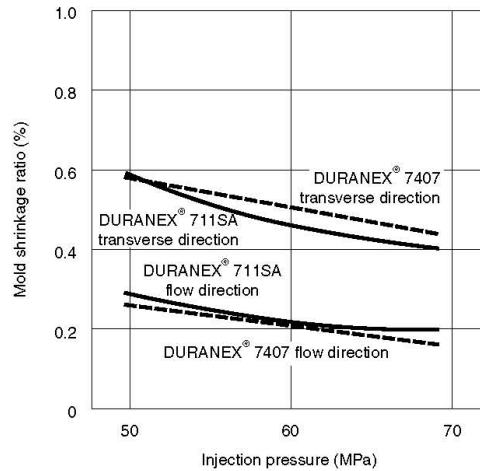


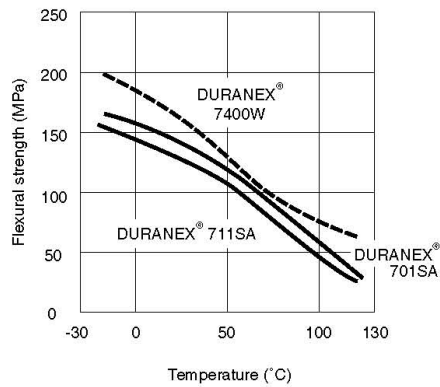
Figure 4-2 DURANEX® 711SA



## 5. Temperature dependence on flexural properties of DURANEX® SA series

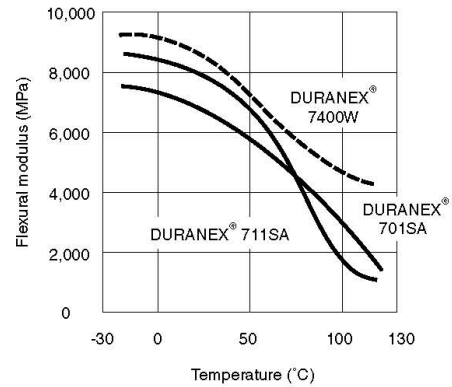
### 5.1 Flexural strength

Figure 5-1 Flexural strength of DURANEX® SA series



### 5.2 Flexural modulus

Figure 5-2 Flexural modulus of DURANEX® SA series



## 6. Creep properties of DURANEX® SA series (stress: 19.6 MPa, temperature: 80°C)

Figure 6-1 DURANEX® 701SA

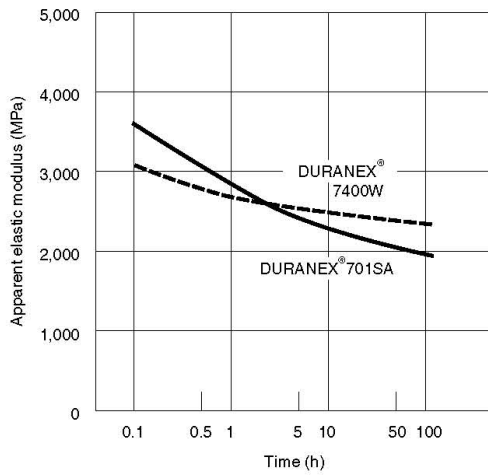
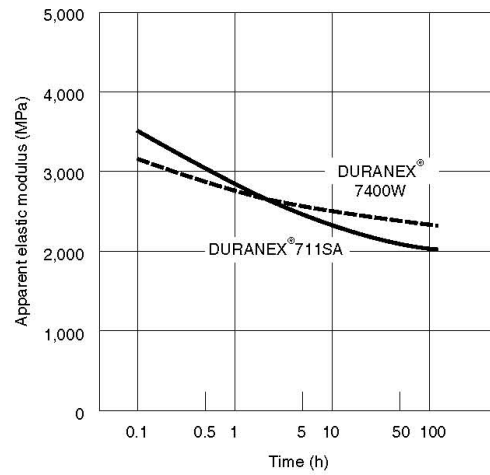


Figure 6-2 DURANEX® 711SA



## 7. Important points when processing DURANEX® SA series

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As the **Duranex SA series** employs special alloying technology, the pellet drying parameters differ from those of standard **Duranex** grades.

Please aim to adhere to a maximum drying temperature of 120°C.

Pellet drying parameters

DURANEX® SA series

| Drying temperature | Drying time |
|--------------------|-------------|
| 105°C              | over 8 hrs  |
| 120°C              | 5-6 hrs     |



Standard DURANEX®

| Drying temperature | Drying time |
|--------------------|-------------|
| 105°C              | over 8 hrs  |
| 120°C              | 5-6 hrs     |
| 140°C              | 3 hrs       |

If **Duranex SA series** pellets are dried at 140°C, there are cases in which the pellets agglomerate. Therefore, we advise adherence to the above conditions.



## 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.
- 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 appropriate technical catalogs for specific material processing.
- 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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