1.3. Alloy

High-strength Aluminum Alloy "A-1 Alloy"

"A-1 Alloy," a newly developed high-strength aluminum alloy, is an alloy with Aℓ-ZnSi3 being the main components, is used in the holder of model AL.

●Features of the A-1 Alloy

- ●Achieves one of the highest strengths among the existing aluminum die cast alloys.
- ●Has yield strength approximately twice that of the commonly used aluminum die cast alloy (ADC 12).
- ●Has hardness equal to the high-strength zinc alloy and achieves high wear resistance.
- ●Achieves specific gravity less than a half of the high-strength zinc alloy to allow significant weight saving.
- ●Highly resistant to corrosion and can be used as an automotive part related to wheel control.

●Mechanical Properties

Tensile strength:	343 to 392 N/mm^2
Tensile yield strength (0.2%):	245 to 294 N/mm^2
Compressive strength:	490 to 637 N/mm^2
Compressive yield strength (0.2%):	294 to 343 N/mm^2
Charpy impact strength:	0.098 to 0.196 N-m/mm^2
Elongation:	2 to 3 %
Hardness:	140 to 160 HV

●Physical Properties

Specific gravity:	3
Melting point:	570 ℃
Specific heat:	793 J/(kg·k)
Linear expansion ratio:	22×10^{-6}

●Wear Resistance

The result of our test has proven that the wear resistance of the A-1 alloy is equivalent to the high-strength zinc alloy.

Rotation-and-rocking comparative durability test between model AL10D (A-1 alloy) and model BL10D (high-strength zinc alloy)

Test conditions	Ambient temperature	Normal temperature	
	Applied load	±1.9kN (perpendicular to axis) (note)	
	Loading frequency	0.6Hz	
	Kinematic angle	Rotation ±20°	Rocking ±20°
	No. of cycles	40 cycles per min.	40 cycles per min.
	Total No. of cycles	1,000,000 cycles	
Test result: change in clearance (mm)		AL10D (A-1 alloy)	BL10D (high-strength zinc alloy)
	Perpendicular to axis	0.036	0.033
	Axial direction	0.052	0.045

Note: For the load direction, see page T-11.

High-strength Zinc Alloy

The high-strength zinc alloy used in the holders of models BL, RBL, RBI and TBS has been developed as a bearing alloy by mixing Aℓ, Cu, Mg, Be and Ti as well as zinc as the base component. It is excellent in mechanical properties, seizure resistance and wear resistance.

●Composition

Table 1 Composition of the High-strength Zinc Alloy Unit:%

Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

●Mechanical Properties

Tensile strength:	275 to 314 N/mm²
Tensile yield strength (0.2%):	216 to 245 N/mm₂
Compressive strength:	539 to 686 N/mm²
Compressive yield strength (0.2%):	294 to 343 N/mm²
Fatigue strength:	132 N/mm²×10⁷ (Schenk bending test)
Charpy impact strength:	0.098 to 0.49 N-m/mm²
Elongation:	1 to 5 %
Hardness:	120 to 145 HV

●Physical Properties

Specific gravity:	6.8
Melting point:	390 ℃
Specific heat:	460 J/(kg·k)
Linear expansion ratio:	24×10⁻⁶

●Wear Resistance

The wear resistance of the high-strength zinc alloy is superior to that of class-3 brass and class-3 bronze, almost equal to that of class-2 phosphor bronze.

Amsler wear-tester:

Test piece rotation speed:	185 min⁻¹
Load:	392 N
Lubricant:	Dynamo oil

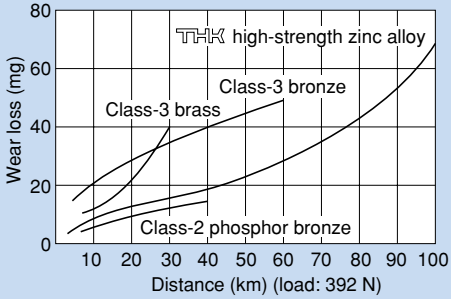

Fig. 3 Wear Resistance of the High-strength Zinc Alloy