

Semi-metallic Series

PROFI LINE



- 1 good performance/shorter bedding-in time
- 2 long life($\geq 30,000$ km)
- 3 high shear and impact strength
- 4 free of asbestos and copper
- 5 high price–performance ratio

1 Performances Test Summary

Performance	Applied Standard	Test Equipment	Test Equipment
Density	SAE J380	MP3002 Density Balance	
Hardness	GB5766-2007	Rockwell Hardness Tester	
pH Value	JASO C458-86	PHS-25 Model pH Value Tester	
Shear Strength	ISO6312-2010	MYJ-100J Model Shear Tester	
Porosity	QC/T 583	DF-< Model Magnetic Heating Stirrer	
Impact Strength	GB5763-2008	XJJ Model Impact Strength Test Machine	
Compressibility	ISO6310-2009	JURID(Honeywell) Compressibility Test Machine	
Constant Speed Test	GB5763-2008	XD-MSM Model Constant Speed Test Machine	
Chase Test	SAEJ661a	RP Model Chase Machine	
Dynamometer Brake Effectiveness	SAE J2522	Link1500 Model DYNO	
Dynamometer Noise Test	SAE J2521	Link3000 Model DYNO	
Wear Test	JASO-C427	Link1500 Model DYNO	

2 Physical Properties (1)

Density

	Temperature [<]	Operation	Remarks
1	R.T.	Weight	In Air
2	R.T.	Weight	In Water

Hardness

	Scale	Rockwell	Penetrator Diameter,mm	Standards Loading [N]	Test Loading [N]
1	R	HRR	12.7	98.07	588.4

pH Value

	Scale	pH Value (Buffer Solution)	Soak Solution
1	0.00~14.00	4.00, 6.86, 9.18	KCl(aq.3mol/L)

Shear Strength

	Positive Pressure [MPa]	Shear Force [KN]	Loading Ratio [N/s]	Power [KW]
1	0-0.5	0-100	4500±500	1.5

Porosity

	Temperature [<]	Time [hr]	Remarks
1	90±10	8	In Oil
2	90±10< R.T.	Over 12	In Oil

Impact Strength

	Impact Speed [m/s]	Impact Power [J]	Impact Angel [°]	Sample size [mm]
1	2.9	0.5	150	55*10*6

2 Physical Properties

Density (g/cm ³)	2.95~3.05	Hardness/HRR	105~115
pH Value	7.50~8.20	Shear (N/mm ²)	>5.00
Porosity/%	2.50~3.00	Impact (KJ/m ²)	1.130~1.450

Compressibility

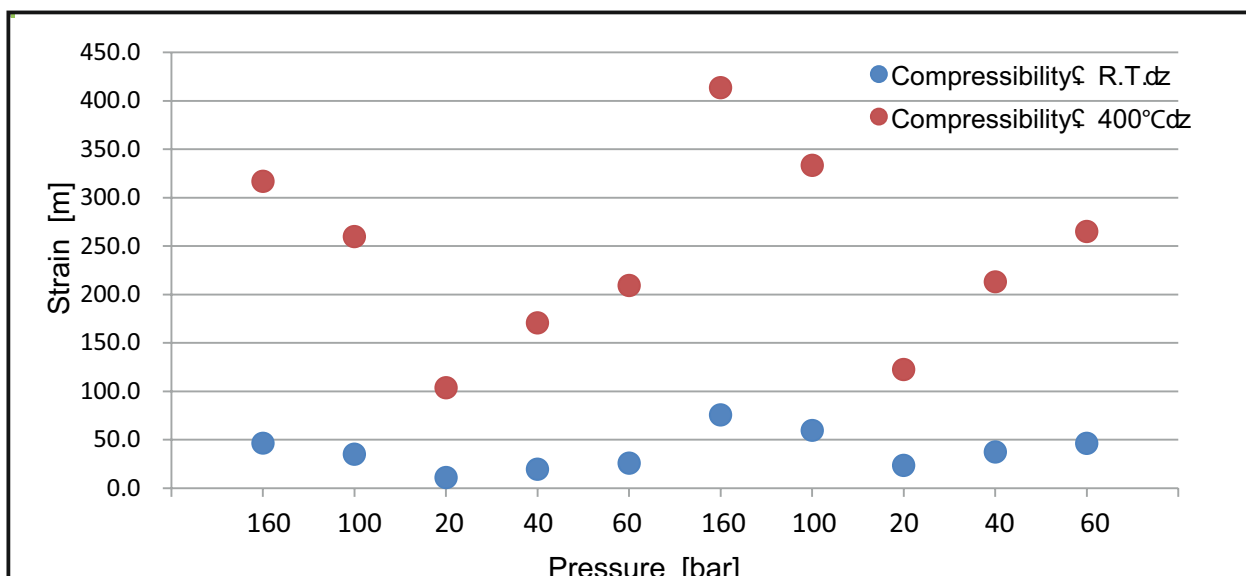
	Load Increment Ratio [Mpa/sec]	Initial Loading [Mpa]	Test Loading [Mpa]	Cycle
1	8±1	0.5	2~16	3

Compressibility@ R.T.

Load/bar	160	100	20	40	60	160	100	20	40	60
Cycle	3	3	3	3	3	1	1	1	1	1
Mean Value	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]
	46.6	35.3	11.1	19.8	26.0	75.8	59.8	23.7	37.5	46.5

Compressibility@ 400°C

Load/bar	160	100	20	40	60	160	100	20	40	60
Cycle	2	2	2	2	2	1	1	1	1	1
Mean Value	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]	[μm]
	316.8	259.9	103.7	170.8	209.4	413.6	333.4	122.6	213.1	265.1

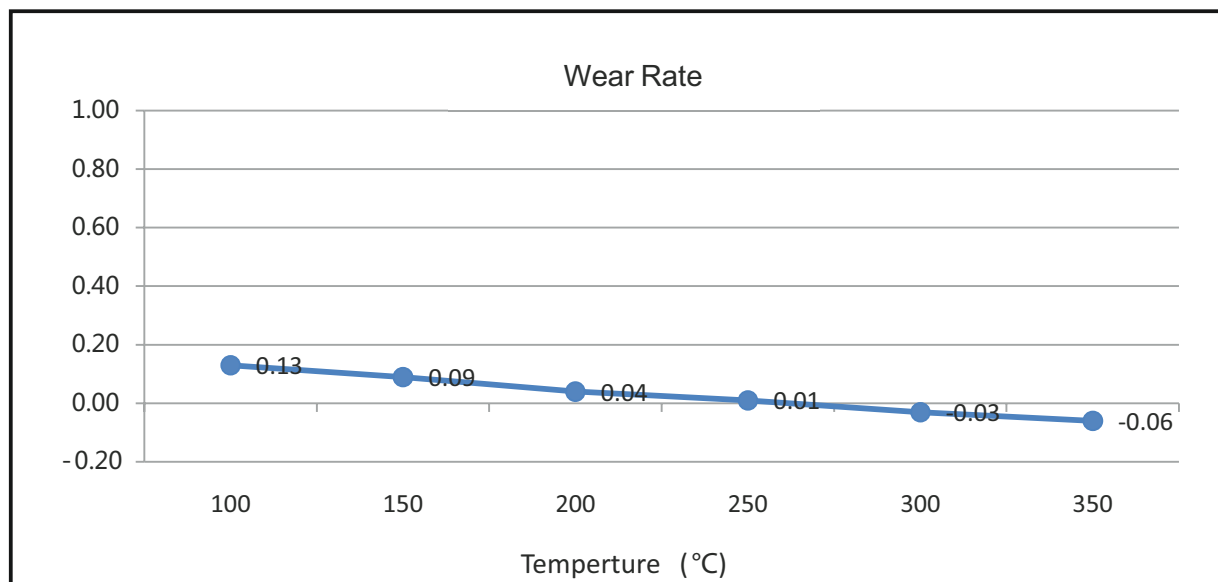
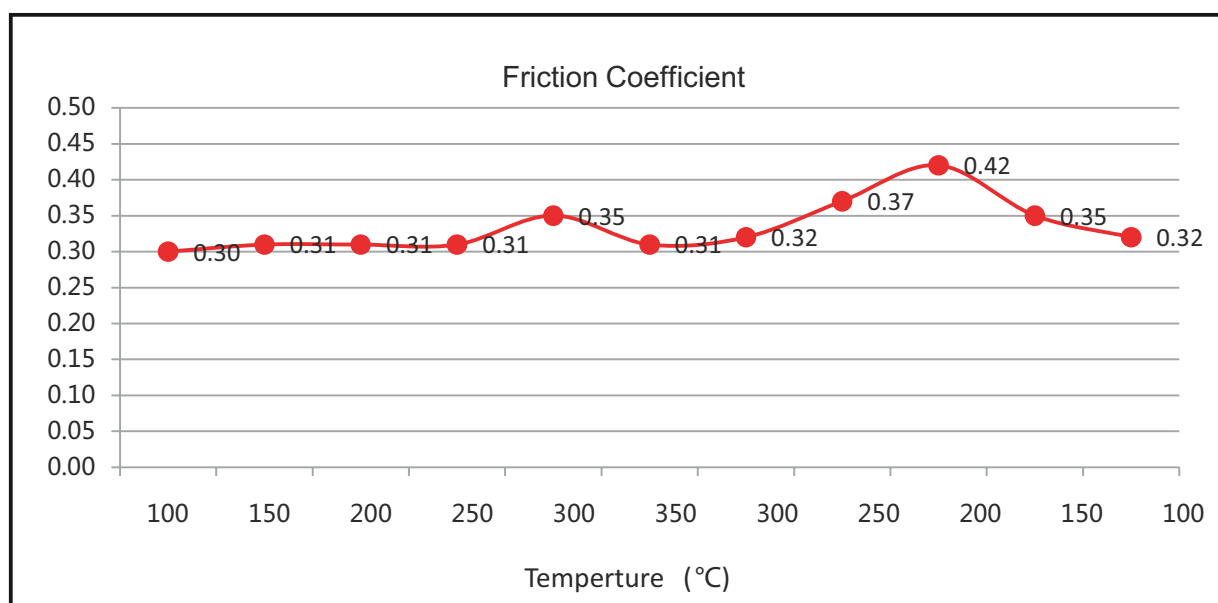


3 Friction and wear constant speed

Equipment Name: Constant speed tester

Standard Applied: GB5763-2008

Test Temperature (°C)	Friction Coefficient	Coefficient appointed	Wear Rate $10^{-7} \text{ cm}^3/(\text{N} \cdot \text{m})$	Test Temperature (°C)	Friction Coefficient		Wear Rate $10^{-7} \text{ cm}^3/(\text{N} \cdot \text{m})$
					Warming	Cooling	
100	0.25-0.65	0.35 ± 0.08	0-0.50	100	0.30	0.32	0.13
150	0.25-0.70	0.35 ± 0.10	0-0.70	150	0.31	0.35	0.09
200	0.25-0.70	0.35 ± 0.10	0-1.00	200	0.31	0.42	0.04
250	0.25-0.70	0.35 ± 0.10	0-1.50	250	0.31	0.37	0.01
300	0.25-0.70	0.35 ± 0.12	0-2.00	300	0.35	0.32	-0.03
350	0.25-0.70	0.35 ± 0.12	0-2.50	350	0.31		-0.06

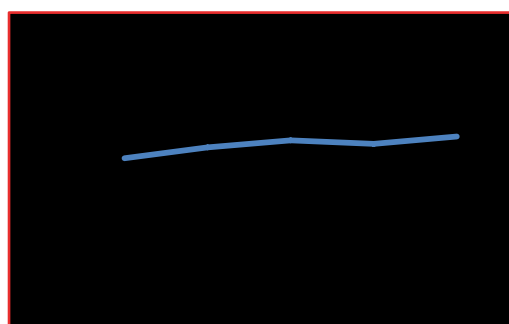
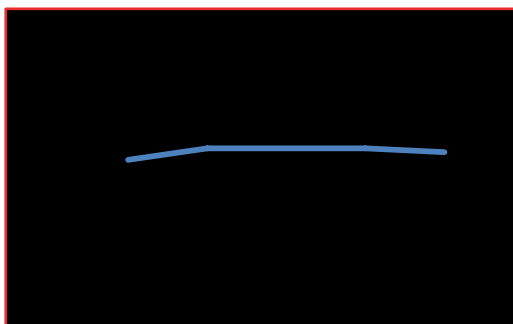
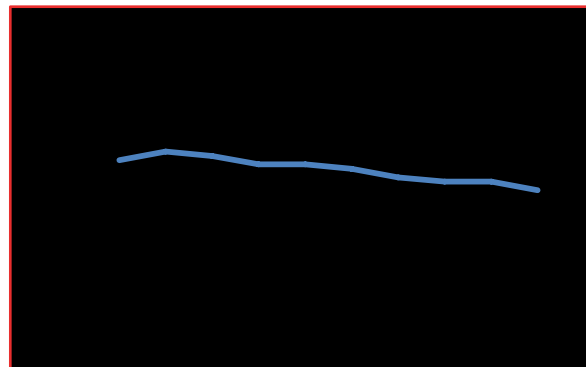
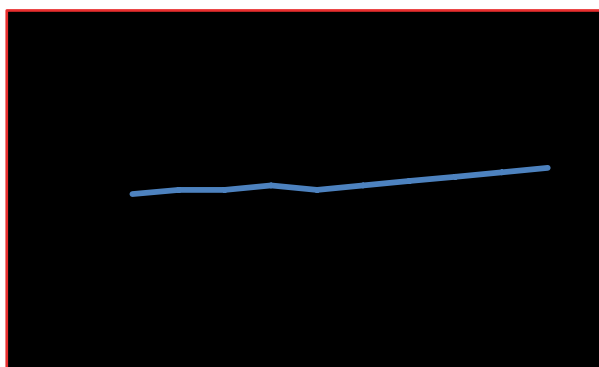
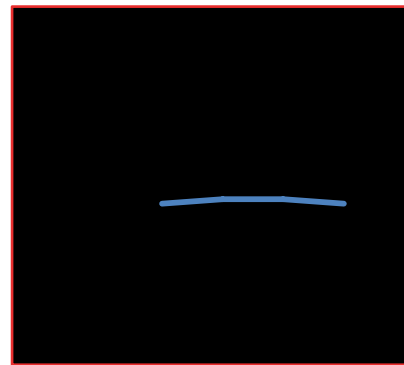
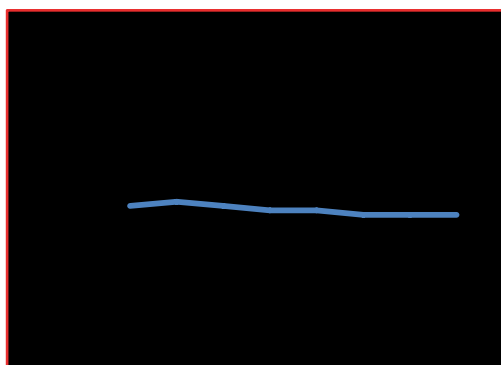
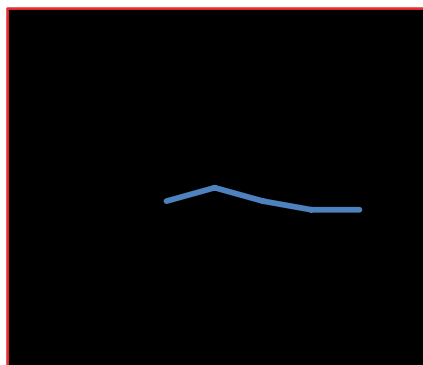


4 Friction and wear

Equipment Name Chase Tester

Standard Applied:SAE J661A

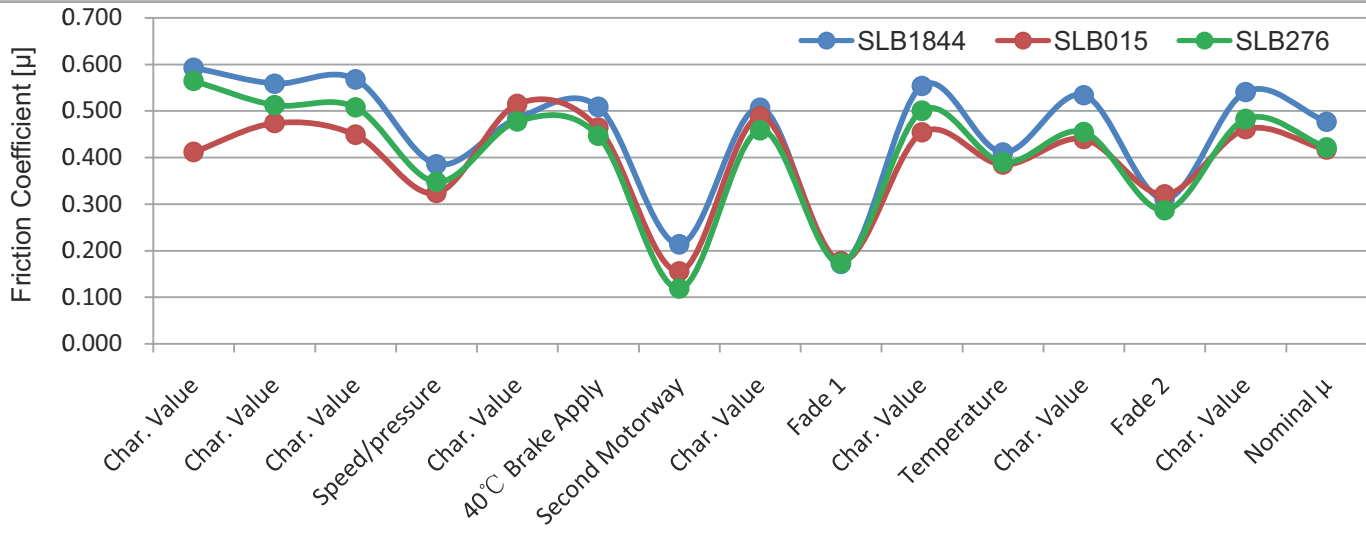
	Before Test	After Test	Loss	Loss%
Weight (g)	13.13	12.96	0.17	1.29%
Thickniss (mm)	6.74	6.69	0.05	0.74%
μ	normal	0.36	hot	0.31



5 Friction and wear

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
6.1	30	80km/h	30km/h	30	100℃
6.2	192	80km/h	30km/h	15,30,15,18,22,38 15,26,18,34,15,26 15,22,30,46,26,51 22,18,42,15,18,46 26,15,34,22,18,30 18,38 cycles 6	100℃
6.3	6	80km/h	30km/h	30	100℃
6.4.1	8	40km/h	5km/h	10~80	100℃
6.4.2	8	80km/h	40km/h	10~80	100℃
6.4.3	8	120km/h	80km/h	10~80	100℃
6.4.4	8	160km/h	130km/h	10~80	100℃
6.4.5	8	200km/h	170km/h	10~80	100℃
6.5	6	80km/h	30km/h	30	100℃
6.6	1	40km/h	5km/h	30	40℃
6.7	2	100km/h 90% of V_{max}	5km/h 50% of V_{max}	0.6g	50℃
6.8	6	80km/h	30km/h	30	100℃
6.9	15	100km/h	5km/h	0.4g	100℃, 215℃, 283℃, 330℃, 367℃, 398℃, 423℃, 446℃, 465℃, 483℃, 498℃, 513℃, 526℃, 539℃, 550℃
6.10	18	80km/h	30km/h	30	100℃
6.11	8	80km/h	30km/h	10~80	100℃
6.12.1	9	80km/h	30km/h	30	100℃, 150℃, 200℃, 250℃, 300℃, 350℃, 400℃, 450℃, 500℃
6.12.2	8	80km/h	30km/h	30	500℃
6.13	18	80km/h	30km/h	30	100℃
6.14	15	100km/h	5km/h	0.4g	100℃, 215℃, 283℃, 330℃, 367℃, 398℃, 423℃, 446℃, 465℃, 483℃, 498℃, 513℃, 526℃, 539℃, 550℃
6.15	18	80km/h	30km/h	30	100℃

Vehicle Information			Sample Model	SLB1844	Sample Model	SLB015	Sample Model	SLB276
			Engine Size	1.4	Engine Size	2.0	Engine Size	2.4
			Required Load	518Kg	Required Load	597Kg	Required Load	942Kg
			Required Inertia	40.6kg·m ²	Required Inertia	56.7kg·m ²	Required Inertia	111.8kg·m ²
			Piston Diameter	51.0mm	Piston Diameter	55.0mm	Piston Diameter	56.6mm
			Effective Radius	93.8mm	Effective Radius	107.0mm	Effective Radius	112.0mm
Dynamometer Brake Effectiveness								
Characteristic Values μ			AVG	MIN	AVG	MIN	AVG	MIN
Char. Value	€ 6.1dz	μ_{avg}	0.593		0.412		0.565	
Char. Value	€ 6.2dz	μ_{avg}	0.559		0.474		0.513	
Char. Value	€ 6.3dz	μ_{0p6}	0.568		0.449		0.508	
Speed/pressure	€ 6.4.3dz	μ_{v120}	0.386		0.324		0.348	
Char. Value	€ 6.5dz	μ_{0P6}	0.484		0.515		0.478	
40 Brake Apply	€ 6.6dz	μ_{T40}	0.509		0.464		0.447	
Second Motorway	€ 6.7dz	μ_{Mw2}	0.214		0.156		0.119	
Char. Value	€ 6.8dz	μ_{0P18}	0.507		0.488		0.459	
Fade 1	€ 6.9dz	μ_{F1}		0.172		0.178		0.174
Char. Value	€ 6.10dz	μ_{0P18}	0.554		0.454		0.501	
Temperature	€ 6.12dz	$T500/\mu_{T300}$		0.411		0.385		0.390
Char. Value	€ 6.13dz	μ_{0P18}	0.534		0.440		0.455	
Fade 2	€ 6.14dz	μ_{F2}		0.311		0.321		0.287
Char. Value	€ 6.15dz	μ_{0P18}	0.541		0.461		0.483	
Nominal μ		μ_{avg}	0.477		0.417		0.422	



6 Noise Performance

Section 1-Break-in(Accrording to AK Noise Procedure) , Section 1 (30)

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
1.1	30	80km/h	30km/h	30	100°C

Section 2-Bedding (32)-(As defined in AK Master)-Section 2

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
2.1	32	80km/h	30km/h	15,30,15,18,22,38 15,26,18,34,15,26 15,22,30,46,26,51 22,18,42,15,18,46 26,15,34,22,18,30 18,38	100°C

Optional Section 3 -Friction Characteristic Value After Break-in (6)-(As defined in AK Master)-

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
3.1	6	80km/h	30km/h	30	100°C

Section 4-Drag Module (266)

Cycle	# Of Application	Intital Speed	Pressure (bar)	Intital Temp.
4.1	14	3 10km/h(Altemate)	0,30,5,25,10,20,15	50°C
4.2	same	same	same	75°C
4.3	same	same	same	100°C
4.4	same	same	same	125°C
4.5	same	same	same	150°C
4.6	same	same	same	175°C
4.7	same	same	same	200°C
4.8	same	same	same	225°C
4.9	same	same	same	250°C
4.10	same	same	same	300°C
4.11	same	same	same	250°C
4.12	same	same	same	225°C
4.13	same	same	same	200°C
4.14	same	same	same	175°C
4.15	same	same	same	150°C
4.16	same	same	same	125°C
4.17	same	same	same	100°C
4.18	same	same	same	75°C
4.19	same	same	same	50°C

Section 5- Intermediate Conditioning and Warm-up Module (24)

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
5.1	12	50km/h	0km/h	30,5,25,10,20,15	100°C
5.2	same	same	same	same	150°C

Run 2 stops for each pressure. Continue this for the remaining pressures.

6 Noise Performance (2)

Section 6-Backward/forward (50)

Cycle	# Of Application	Intital Speed	Pressure (bar)	Intital Temp.
6.1	10	3,-3 km/h(Altemate)	0,20,5,15,10	150°C
6.2	same	same	same	125°C
6.3	same	same	same	100°C
6.4	same	same	same	75°C
6.5	same	same	same	50°C

Section 7-Deceleration Module (108)

Cycle	# Of Application	Intital Speed	Final Speed	Pressure (bar)	Intital Temp.
7.1	12	50km/h	0km/h	30,5,25,10,20,15	50°C
7.2	same	same	same	same	100°C
7.3	same	same	same	same	150°C
7.4	same	same	same	same	200°C
7.5	same	same	same	same	250°C
7.6	same	same	same	same	200°C
7.7	same	same	same	same	150°C
7.8	same	same	same	same	100°C
7.9	same	same	same	same	50°C

Run 2 stops for each pressure.For example, 5 bar at 50°C for 2 stops. Then run 10 bar at 50°C for 2 stops. Continue this for the remaining pressures.Do this for all 9 cycles.

Section 8-Friction Characteristic Value After Break-in (6)

-Repeat Section 3 above

Section 9-Drag Module (226)

-Repeat Section 4 above

Section 10-Intermediate Conditioning and Warm-Up Module (24)

-Repeat Section 5 above

Section 11-Backward/Forward (50)

-Repeat Section 6 above

Section 12-Deceleration Module (108)

-Repeat Section 7 above

Section 13-Friction Characteristic Value After Break-in (6)

-Repeat Section 3 above

Section 14-Drag Module(266)

-Repeat Section 4 above

Section 15-Intermediate Condironing and Warm-Up Module (242)

-Repeat Section 5 above

Section 16-Backward/Forward(50)

-Repeat Section 6 above

Section 17-Deceleration Module (108)

-Repeat Section 7 above

Section 18-Friction Characteristic Value After Break-in (6)

-Repeat Section 3 above

SAE J2521

Fixture identification:SLB276

Required Wheel Load:528.5kg

Actual Wheel Load:528.5kg

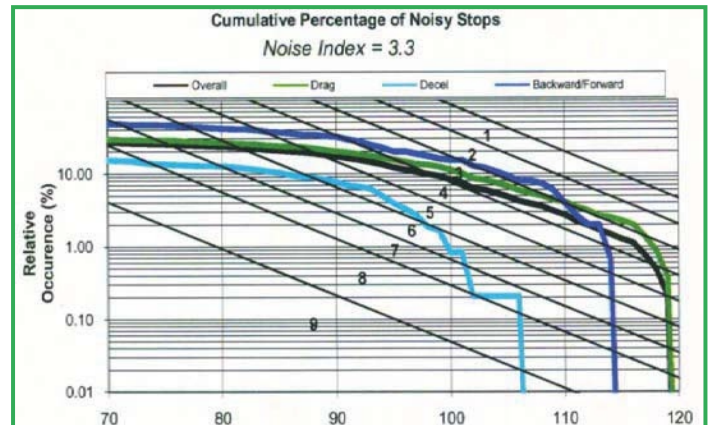
Required Inertia:55.2kg·m²

Actual Inertia:55.0kg·m²

Pri/Lead/Inner Lining:AD101

Sec/Trail/Outer Lining:AD101

Comments:With Normal shim No knuckle



SAE J2521

Fixture identification:SLB276

Required Wheel Load:942.1kg

Actual Wheel Load:942.1kg

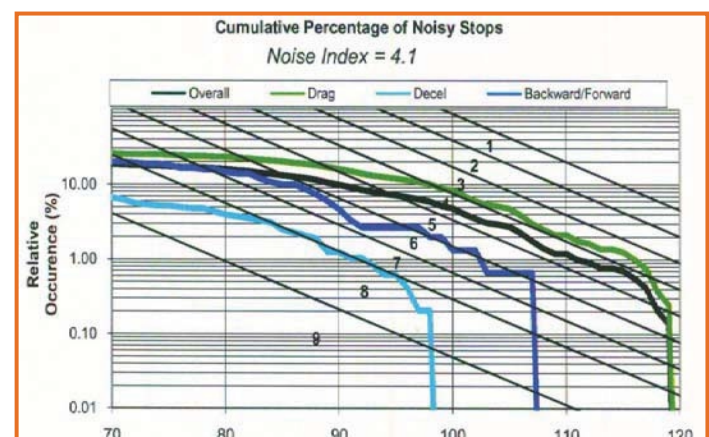
Required Inertia:111.8kg·m²

Actual Inertia:111.8kg·m²

Pri/Lead/Inner Lining:AD101

Sec/Trail/Outer Lining:AD101

Comments:With Normal shim No knuckle



7 Wear Test

Applied Standard	Appended Table 1 List of Test Items				
	initial speed	Initial brake temperature °C	Braking deceleration G	Number of applications	remark
JASO C427	50	100	0.3	500	Measure the thickness of pads for each specified temperature in parentheses are optional.
	50	200	0.3	500	
	50	300	0.3	500	
	50	400	0.3	500	
	100	100	0.3	500	

SLB1844 Engine Size 1.4 Required InerΘa 40.6kg·m ²
SLB015 Engine Size 2.0 Required InerΘa 56.7kg·m ²
SLB276 Engine Size 2.4 Required InerΘa 111.8kg·m ²

