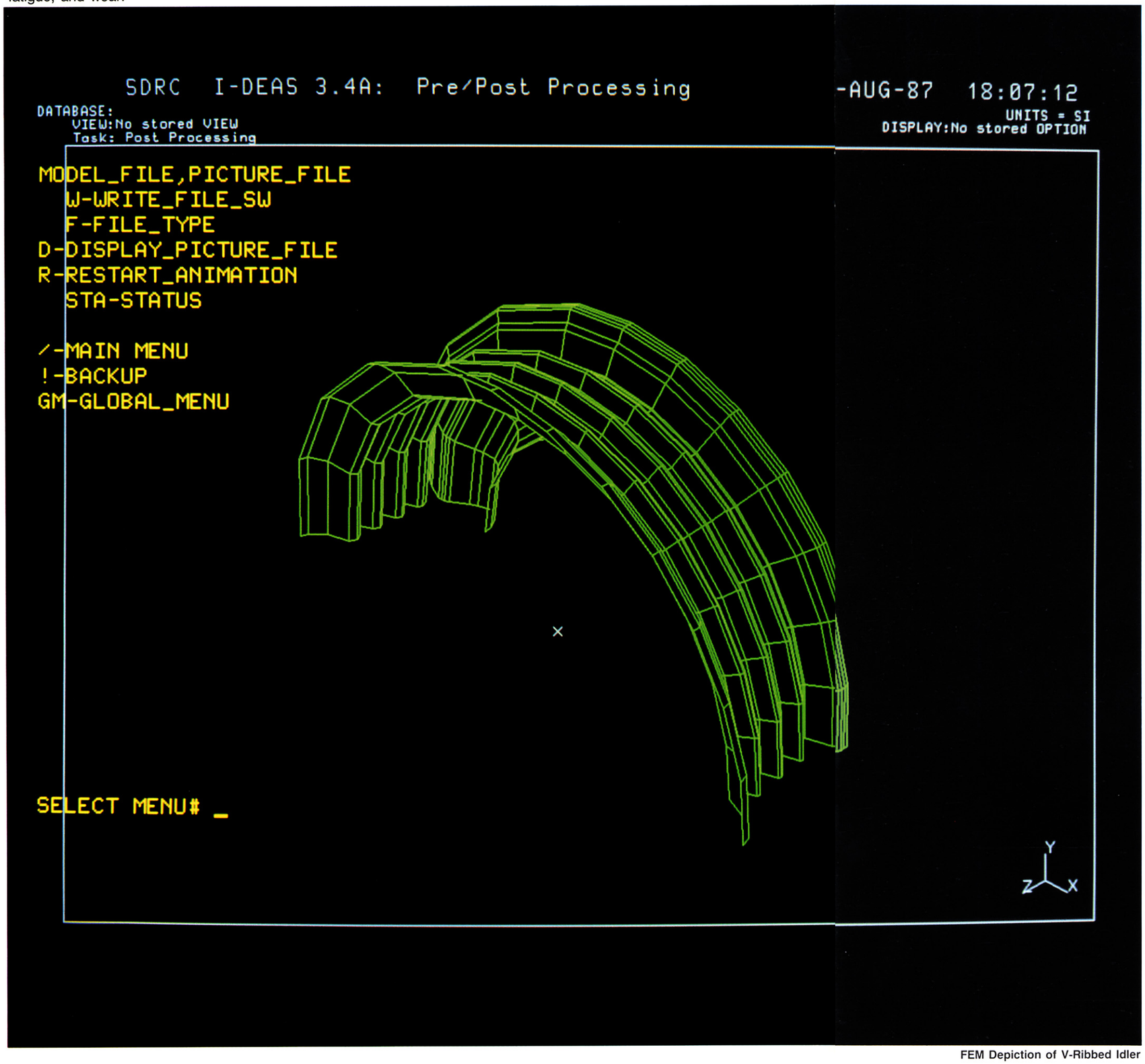
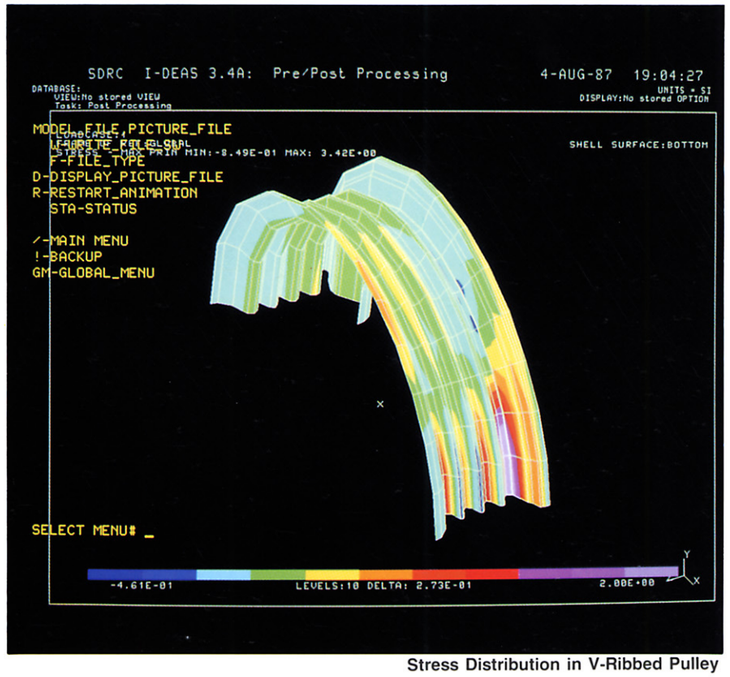
Computer Aided Design (CAD)

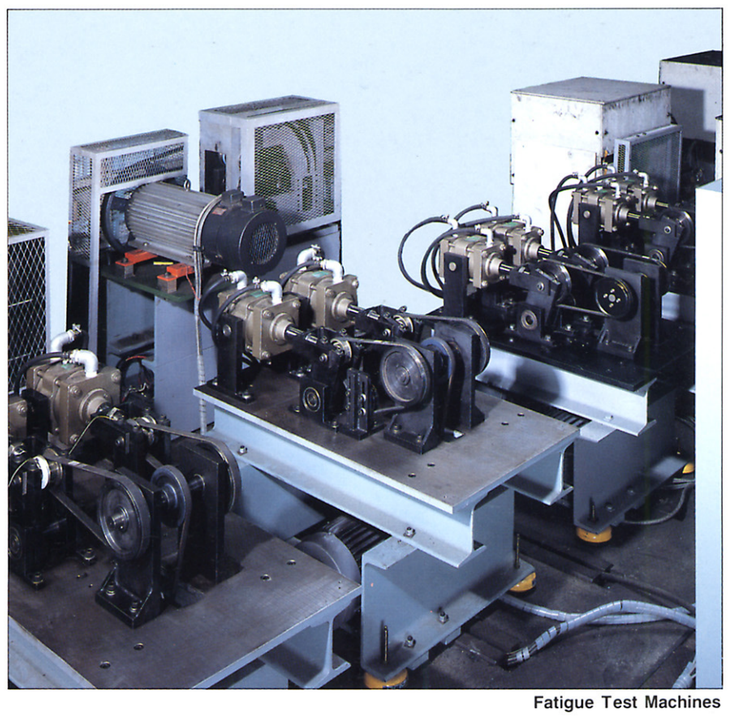
Computers have been instrumental in refining the design of these pulleys. Using the Finite Element Method (FEM), NSK's engineers are able to depict stress distributions under various conditions and learn how to reduce concentrated stress, fatigue, and wear.



FEM Depiction of V-Ribbed Idler



Stress Distribution in V-Ribbed Pulley



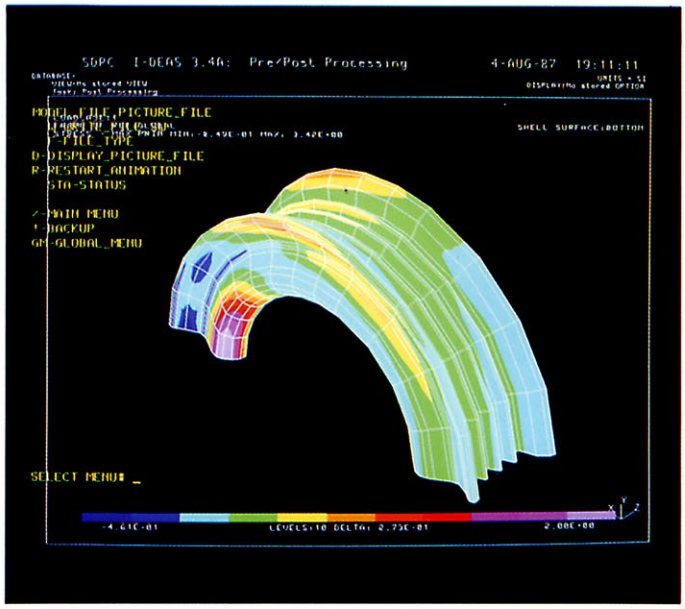
Fatigue Test Machines

Mechanical Strength and Fatigue Test Data

- High strength resulting from well balanced design accomplished using Finite Element Method.
- High geometrical accuracy and good surface finish achieved using unique Rotary Forming Method.

Mechanical Strength

1. FEM Depiction of Stress in V-Ribbed Idler



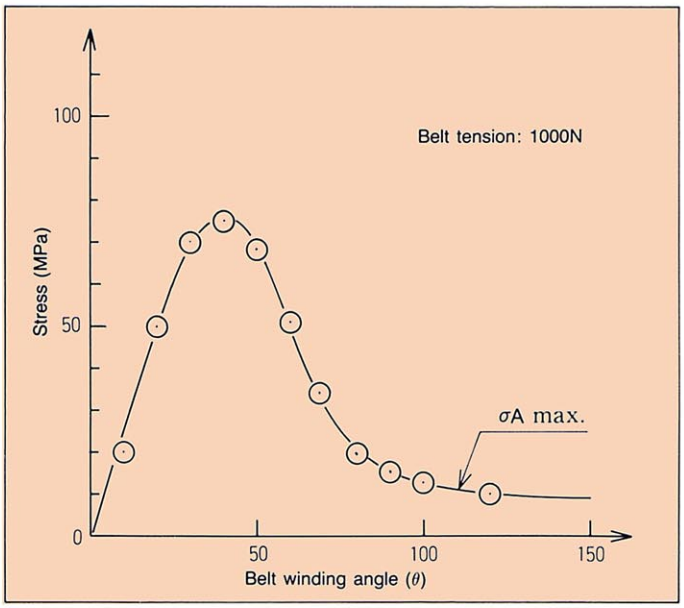
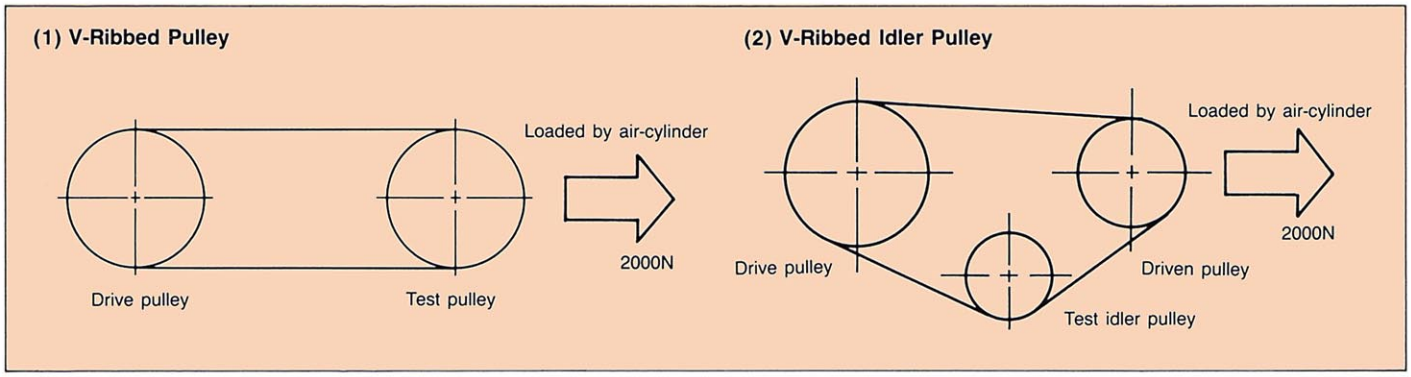


Fig. 1 Relationship between Belt Winding Angle and Stress

2. Fatigue Test Method



3. Test results

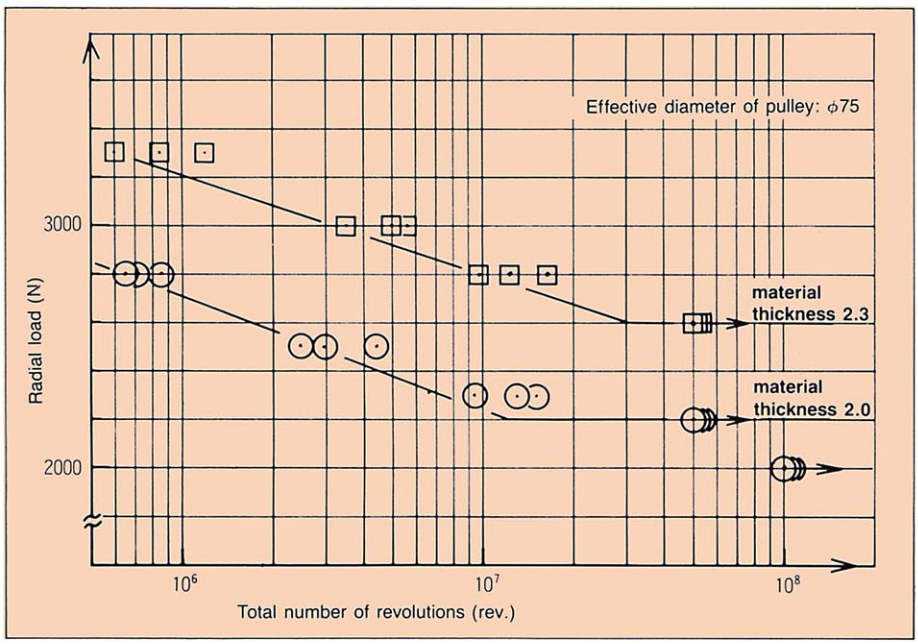
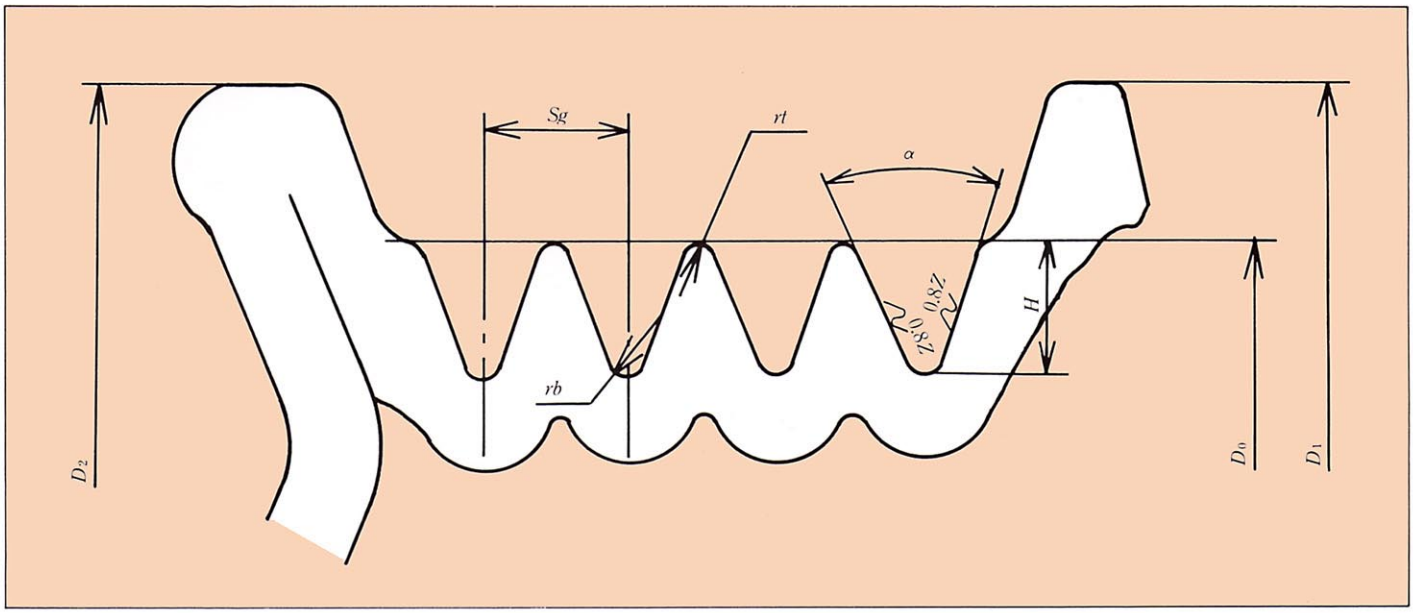


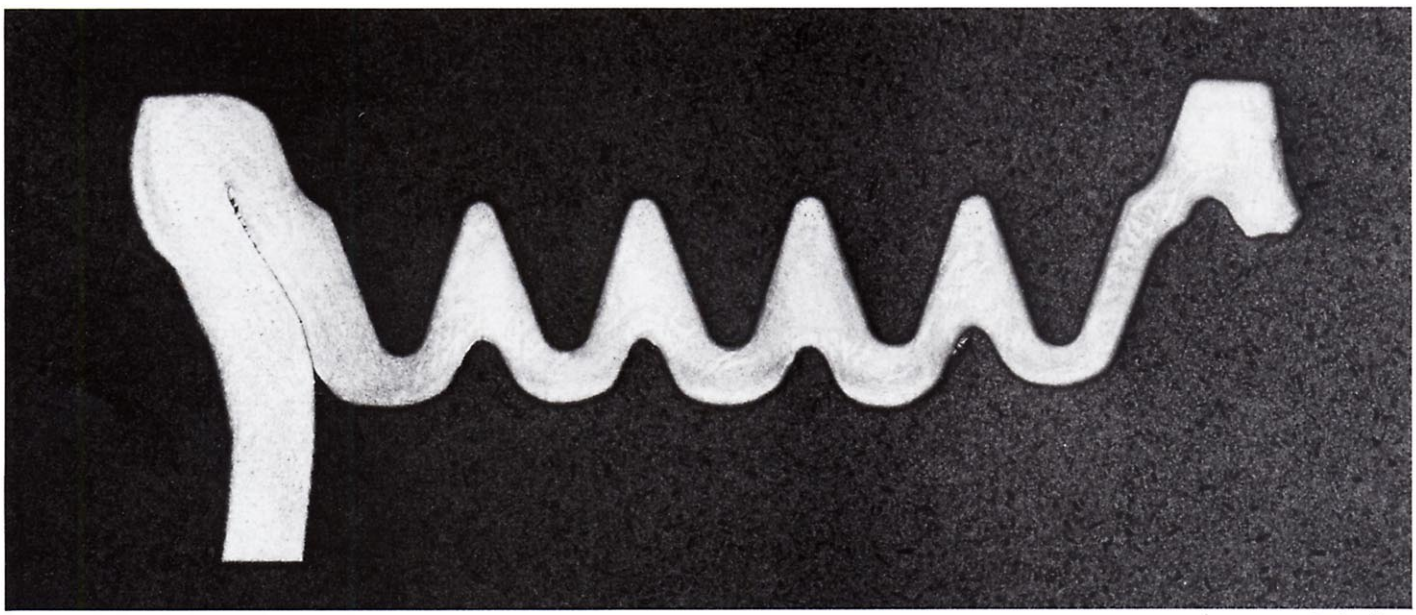
Fig. 2 Results of Fatigue Test of V-Ribbed Idler Pulley

V-Groove Specifications



Symbols	Names	Basic Dimensions
D_0 (Reference)	Effective diameter	100
D_1 (Reference)	Open-side outside diameter	105
D_2 (Reference)	Folded-side outside diameter	105
α (°)	Groove angle	40, 38, 36
Sg	Groove pitch	3, 56
rt	Top radius	0.35
rb	Recess radius	0.5
H	Groove depth	3.1

Grain Flow



Grain flow

No bending flaws, no cracks, no folds, and continuous grain flow

V-Ribbed Pulleys

V-ribbed pulleys made by rotary-forming steel sheets are economical and light but still offer high reliability for auxiliary systems for automobiles.

- **Specification Ranges**
  Effective diameter (D_0): $\phi 50 \sim \phi 200$
  Number of grooves (V): 3 ~ 12
  Material thickness (t): 2.0 ~ 2.8
  Hight (A): 45 max.

* Regarding pulleys for two belts, with either one or two mounting faces, please consult with NSK.

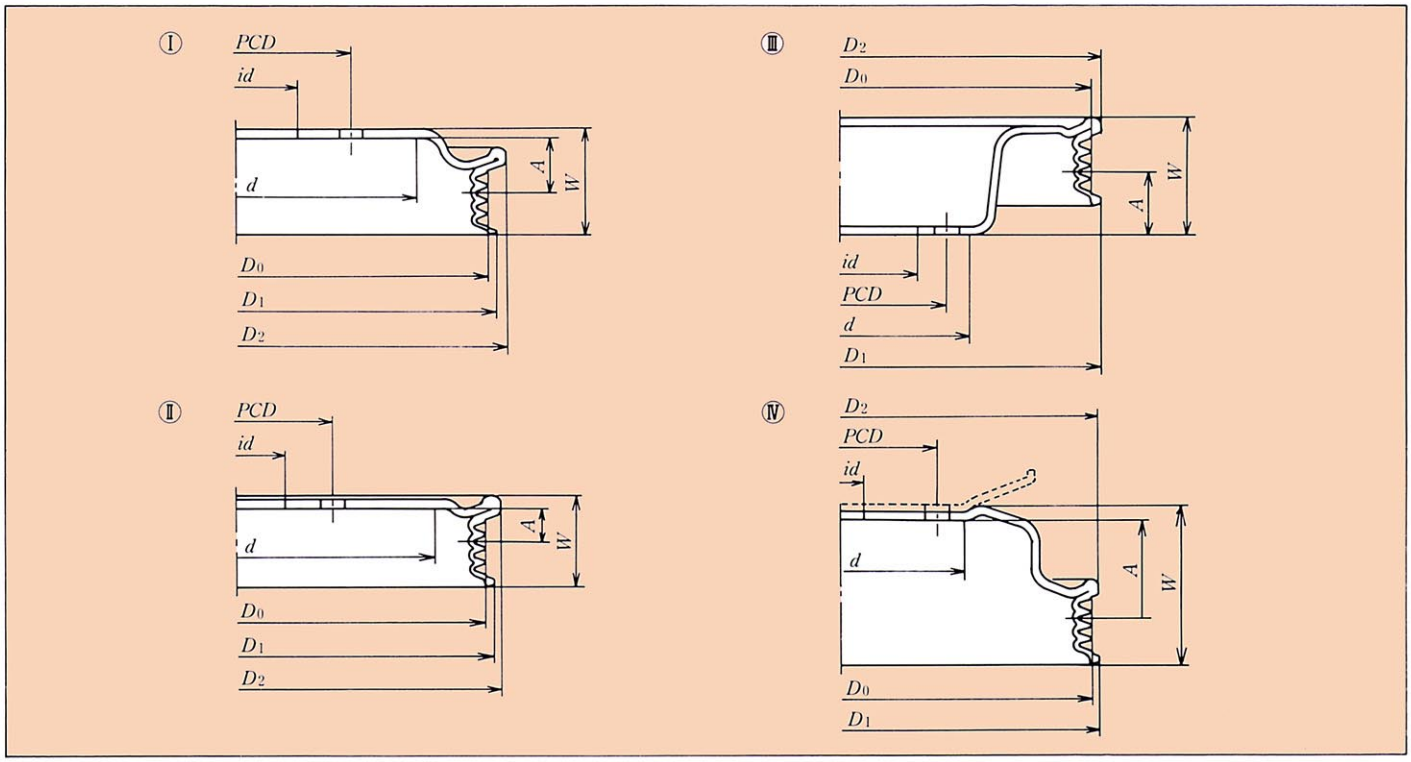
- **Material**
  SAE1008

- **Surface treatment**
  - Electrodeposition cationic plating
  - After electro-galvanizing, yellow chromate treatment, etc.

Typical V-Ribbed Pulleys

V-Ribbed Pulley and Its Cross-Section

Cross-Sections



Dimension Table

Pulley Type	Number of Grooves	Effective Diameter	Open-Side Outside Diameter	Folded-Side Outside Diameter	Mounting Hole Pitch	Nominal Bore Diameter	Mounting Face Effective Diameter	Mounting Face Height from Reference Groove	Overall Width	Material Thickness
	V	*D0*	*D1*	*D2*	*PCD*	*id*	*d*	*A*	*W*	*t*
Ⅰ	4	108	113	116	44.2	30	62	33.82	46.24	2.0
	4	122	126	130.5	60.3	31.75	77.5	25.44	39.4	2.3
	3	114	119	119	63.4	51	80	13.6	22.6	2.0
	3	110	115	115	35	15.918	52	19.5	21.8	2.3
	5	130	135	137	49	35	67	20.32	33	2.0
	5	110	115	115	56	32	70	23.94	28.94	2.0
	5	118	123	126	56	32	68	22.04	36.66	2.0
	4	100	105	105	56	24	68	11.14	25.56	2.0
Ⅱ	4	113	118	121	60.3	31.75	80	6.7	23.56	2.0
	4	125	130	133.5	50	25	100	8.68	22.6	2.3
	4	129	134	137.5	50	25	104	8.68	22.6	2.3
	4	137	142	145	60.3	31.75	108	6.72	23.54	2.0
Ⅲ	4	106	111	114	50	28	64	3.3	21.62	2.0
	4	130	136	138.5	44.2	30	62	37.38	49.1	2.3
	4	130	135	135	55	40	68	20.12	30	2.0
	4	133	136	141	58	36	88	2.4	20.7	2.3
	5	100	105	108	50	28	65	0.58	26.18	2.0
	5	100	105	108	50	28	65	1.42	26	2.0
	5	135	140	143.5	53	25	67	4.98	27.1	2.3
	5	146	151	154.5	62	44	88	6.95	27.19	2.3
Ⅳ	4	133	137	137	50	12	65	25.92	42	2.6

*This table presents dimensions of production pulleys.

Idler Pulleys

Idler pulleys are used to adjust belt tension between the driving pulley and other pulleys for air-conditioner compressors, power steering pumps, superchargers, and alternators of automobiles. An NSK idler pulley is a combination of a high performance bearing and a light but strong pulley with high accuracy fitting.

• Specification Ranges

	(V-ribbed)	(Flat)	(V)
Effective diameter (D_o):	ϕ70 ~ 90	ϕ90 ~ 100	ϕ70 ~ 100
Number of grooves (V):	3 ~ 7	—	1
Material thickness (t):	2.3 ~ 2.6	2.0 ~ 2.3	1.6 ~ 2.0

*For special specifications, please contact NSK.

• Material

SAE1008

• Surface treatment

- Electrodeposition cationic plating
- After electro-galvanizing, yellow chromate treatment

• High Performance Bearings

- Low torque, high performance seals for reliability
- Packed with high quality grease for long life at high speeds and low temperature rise.

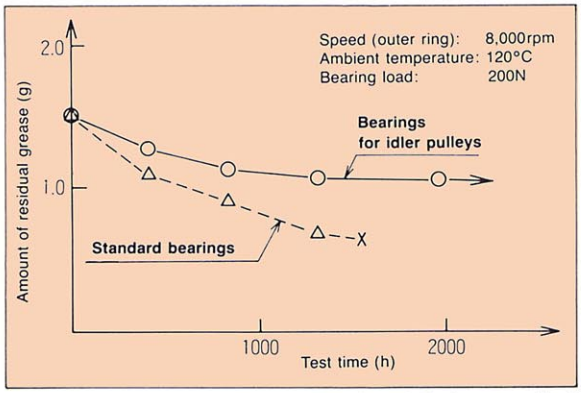
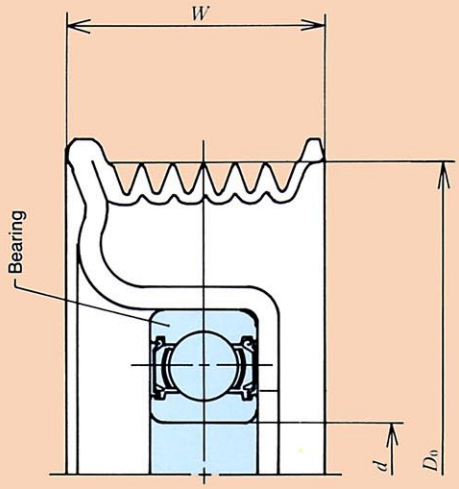


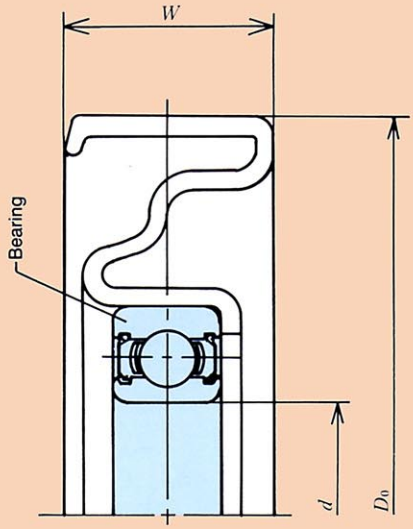
Fig. 3 Results of Endurance Test

Cross-Section

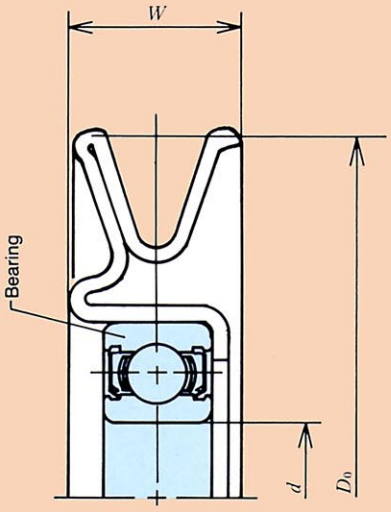
(I) V-Ribbed Type



(II) Flat Type



(III) V Type



Dimension Table

Pulley Type	Effective Diameter D_o	Bearing Bore Diameter d	Overall Width W	Number of Grooves V	Material thickness t	Mass (g)	Bearing Numbers
V-Ribbed	70	12	28.30	6	2.6	280	6301
	70	15	21.68	4	2.3	250	6302
	70	17	21.68	4	2.3	230	6203
	75	17	26.70	5	2.3	275	6203
	80	12	22.40	4	2.3	260	6301
	90	20	28.30	6	2.6	400	6304
Flat	80	25	23.5	—	2.0	265	6005
	90	20	25.5	—	2.0	340	6304
	90	25	23.5	—	2.0	280	6005
V	75	12	18.3	1	1.6	200	6301
	75	17	18.8	1	1.8	220	6203
	80	17	19.3	1	1.6	220	6203
	90	20	23.5	1	2.0	370	6204
	100	20	19.8	1	2.0	380	6204

*This table presents the dimensions of production idlers.

V pulleys

V pulleys are used to drive auxiliary components of automobiles, agricultural machines, and parts of various power transmission systems.

- **Specification Ranges**
  Effective diameter (D_o): $\phi 50 \sim \phi 300$
  Material thickness (t): 1.6 ~ 2.6
  Height (A_o, A_1): 60 max.

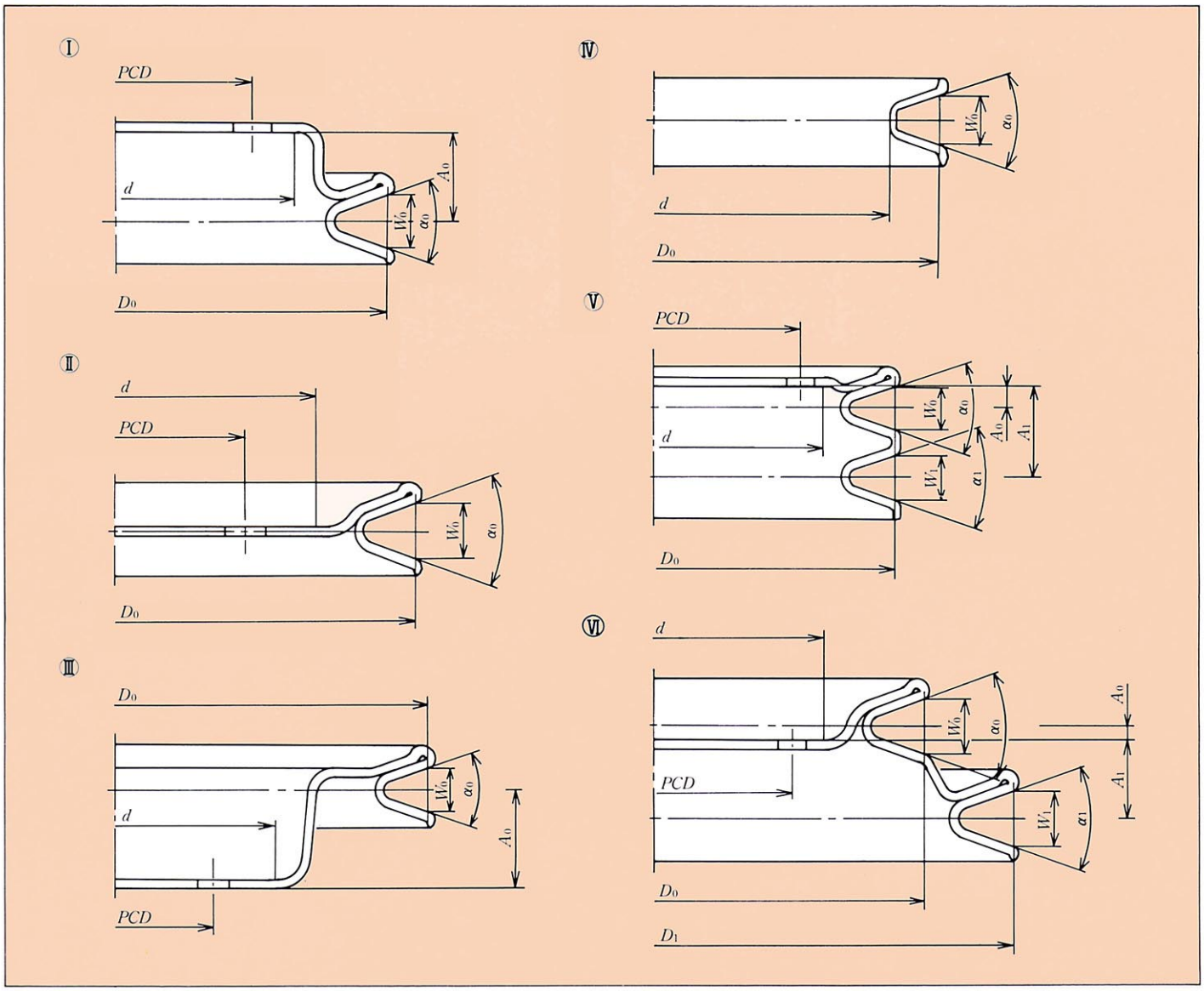
- **Material**
  SAE1008

- **Surface treatment**
  - Electrodeposition cationic plating
  - After electro-galvanizing, yellow chromate treatment

Typical V pulleys

Double V pulley (same dia.) and cross-section of stepped double pulley

Cross-Sections



Dimension Table

Pulley Type	Effective Diameter		Dia. of Flat Mounting Surface	Effective Width		Groove Angle (°)		Height from Mounting Face		Material Thickness	Mounting Hole Pitch
	D_0	D_1	d	W_0	W_1	α_0	α_1	A_0	A_1	t	PCD
I	126	—	86	11.7	—	38	—	36	—	2.0	63.5
	138	—	60	9.5	—	36	—	13	—	1.6	42.0
II	110	—	64	15.9	—	34	—	0	—	1.6	44.0
	140	—	80	11.7	—	38	—	0	—	2.0	60.0
III	145	—	76	9.5	—	36	—	19.8	—	2.0	44.2
	155	—	62	11.7	—	38	—	35.6	—	2.0	44.2
IV	115	—	92.8	9.5	—	36	—	0	—	2.0	—
	135	—	108	12.7	—	36	—	0	—	2.0	—
V	92	—	53	9.5	—	36	—	46.5	61.5	2.0	44.0
	112	—	81	9.5	—	36	—	4.5	19.5	2.0	66.0
VI	124	154	90	11.7	9.5	38	36	2.7	17.3	2.0	63.4
	124	165	95	11.7	11.7	38	38	2.7	17.3	2.0	63.4

*This table presents the dimensions of production pulleys.