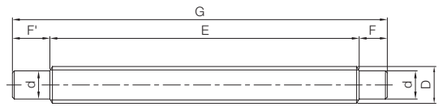
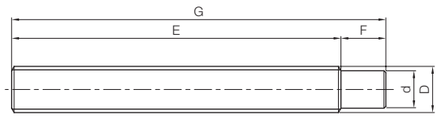
Involute Spline Shafts

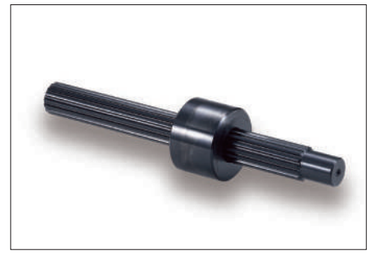
Specifications	
Gear teeth	Stub teeth
Pressure angle	20°
Material	S45C
Heat treatment	Thermal refined
Tooth hardness	200 to 270HB
Surface treatment	Black oxide coating



TA



TB



Catalog Number	Module	No. of teeth	Shape	Outside dia. D	Hub dia. $d^{+0.25}_{+0.15}$	Face width E	Hub width (left) F'	Hub width (right) F	Total length G	Backlash (mm)	Weight (kg)
SV17-170	***m*1.667**	8	TA	16.67	13	135	20	15	170	0.06~0.15	0.26
SV20-200		10	TA	19.67	15	165	20	15	200		0.43
SV25-250		13	TB	24.67	20	220	—	30	250		0.88
SV30-300		16	TB	29.67	25	270	—	30	300		1.55

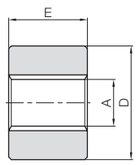
[Caution on Secondary Operations] ① When modifying the SV involute spline shaft with secondary operations, be careful not to crush the teeth or bend the shaft.

■ Characteristics of Involute Spline Shafts

- SV and SVI series are made according to the automotive involute spline standard, JIS B 1603: 1995 (Straight cylindrical involute splines, backlash 0.06 to 0.15).
- Involute spline shafts and bushings are thermal refined to have good abrasion-resistance.
- Spline bushings may be made in CAC (copper) type material as a special custom order item.

Involute Spline Bushings

Specifications	
Gear teeth	Stub teeth
Pressure angle	20°
Material	S45C
Heat treatment	Thermal refined
Tooth hardness	200 to 270HB
Surface treatment	Black oxide coating



T1

Catalog Number	Module	No. of teeth	Shape	Outside dia. A	Outside dia. D	Face width E	Allowable torque (N·m) Surface durability	Allowable torque (kgf·m) Surface durability	Backlash (mm)	Weight (kg)
SVI17-40	***m*1.667**	8	T1	13.7	40	25	33.2	3.38	0.06~0.15	0.21
SVI20-45		10		16.7	45	30	59.6	6.08		0.31
SVI25-55		13		21.7	55	38	125	12.8		0.57
SVI30-65		16		26.7	65	45	222	22.6		0.93

[Caution on Product Characteristics] ① The allowable torque shown are reference values calculated from “Surface strength of splines” on Page 471.
② Lubrication is always required on the mating surface of the spline shaft and hub.

■ Surface Strength of Splines

The design concept of the spline surface strength is the same as that of a key. Here is the formula for the allowable transmission force F(N) of spline.

$$F=\eta \cdot z \cdot h_w \cdot l \cdot \sigma$$

And the formula of allowable torque T (N·m) of spline with respect to the surface strength.

$$T=\frac{F \cdot d_w}{2000}$$

In designing a spline shaft, besides considering the surface strength, we should take into account the torsional and bending stresses of the spline.
Where

η : Contact ratio of surface → 0.75 (assumed)
z : Number of teeth → number of teeth of spline from the table
h_w : Contact depth of tooth (mm) → 1.485
l : Contact length of spline → spline hub face width E from the table
σ : Allowable surface stress of spline → 19.61MPa (2kgf/mm^2) (assumed)
d_w : Contact diameter (mm) → Tip diameter of spline shaft D - h_w