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Superseding AIR1160B

Aircraft Engine and Accessory Drives and Flange Standards

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FOREWORD

Changes in this revision are format/editorial only.

1. SCOPE:

This document defines features that require interface definitions between aircraft engines and accessory drives and flanges and summarizes various aerospace standard dimensional performance data.

1.1 Purpose of Standard:

To provide the means by which both engine manufacturers and accessory manufacturers may save appreciable design and development time by utilizing the collective and coordinated efforts and the past experience of the industry in solving the problems of tolerances and performance capability.

2. REFERENCES:

AS959	Drive - Studded, Accessory, 2.653 BC Square, Design Standard for
AS960	Flange - Accessory, 2.653 BC Square, Design Standard for
AS961	Drive - Studded, Accessory, 5.000 BC Square, Design Standard for
AS962	Flange - Accessory, 5.000 BC Square, Design Standard for
AS963	Drive - Studded, Accessory, (127) 5.000 BC Round, Design Standard for
AS964	Flange - Accessory, 5.000 BC Round, Design Standard for
AS965	Drive - Studded, Accessory, (203.2) 8.000 BC Round, Design Standard for
AS966	Flange - Accessory, 8.000 BC Round, Design Standard for
AS967	Drive - Studded, Accessory, (254) 10.000 BC Round, Design Standard for
AS968	Flange - Accessory, 10.000 BC Round, Design Standard for
AS969	Drive - Accessory, (127) 8.000 BC Round, QAD, Design Standard for
AS970	Drive - Accessory, (203.2) 8.000 BC Round, QAD, Design Standard for
AS971	Drive - Accessory, (254) 10.000 BC Round, QAD, Design Standard for
AS972	Spline Details, Accessory Drives and Flanges

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3. To assure, by simple identification designation, design compatibility between engine pads and drives and accessory flanges and drive shafts.

   The following is a brief description of all pertinent parts of a "Standard". It may be used as a check list to determine that a given design conforms in all respects to a given "Standard".

   1. ENGINE OR GEARBOX DRIVE PAD - NON-QAD TYPE: (AS959, AS961, AS963, AS965, AS967)

   1.1 Minimum diameter or perimeter of machined surface.
   1.2 Minimum clearance requirements surrounding pad.
   1.3 Basic bolt circle diameter.
   1.4 Number of studs.
   1.5 Basic angular location of studs, spacing and tolerance thereof.
   1.6 Stud height and minimum full thread.
   1.7 Pilot diameter, chamfer of pilot entrance, pilot cavity depth and width.
   1.8 Minimum distance between pad face and drive shaft boss.
   1.9 Distance from pad face to end of drive shaft.
   1.10 Direction of rotation of drive shaft.
   1.11 Surface finish requirements as well as minimum radii at intersecting surfaces.
   1.12 Squareness and concentricity requirements of drive shaft to pad and pilot diameter.
   1.13 Spline lubrication is specified.
   1.14 Limit of oil leakage out of drive is specified.
   1.15 Drive cavity drain.

   2. ENGINE OR GEARBOX DRIVE PAD - QAD TYPE: (AS969, AS970, AS971)

   Same as (1) above, except:

   2.1 Clearance requirement surrounding pad is increased to accommodate "Vee" band.
   2.2 Details of "Vee" band shoulder at O.D. of pad.
   2.3 Use of dowel pin may be specified in lieu of studs to accept torque reaction from accessory.
   2.4 Basic angular location of pin and stud(s).
   2.5 Detail dimensions of pin and stud(s).

   3. ACCESSORY FLANGE: (AS960, AS962, AS964, AS966, AS968)

   3.1 Maximum flange diameter or perimeter.
   3.2 Basic location and dimension of stud holes.
   3.3 Use of dowel pin may be specified in lieu of studs to accept torque reaction from accessory.
   3.4 Basic dimensions for keyhole slots including dimensions of recess on back side of flange, where applicable.

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3. (Continued):

3.5 For starter applications direction of slots to oppose torque developed by accessory.
3.6 Distance from flange to end of drive shaft.
3.7 Wrench clearance requirements.
3.8 Minimum stud and nut clearance requirements.
3.9 Pilot dimension and concentricity requirements.
3.10 Pilot inner and outer depth dimensions.
3.11 Pilot "O" ring groove dimensions, where applicable.
3.12 "Vee" clamp shoulder at O.D. of flange, complete dimensions.
3.13 Surface finish requirements as well as minimum radii at all intersection surfaces.
3.14 Misalignment requirement for drive shaft.
3.15 Retention requirements for drive shaft.
3.16 Requirement for operation when exposed to oil leakage into pilot compartment.
3.17 Drive cavity drain.

4. DRIVE OUTPUT SHAFT: (AS972)

4.1 Shaft and Sealing Design Details

4.1.1 Complete dimensions of "O" ring cavity.
4.2.2 Surface finish requirements.
4.1.3 Depth of shaft cavity.
4.1.4 Radii at intersecting surfaces.
4.1.5 Concentricity limits of "O" ring cavity entrance chamfer.
4.1.6 Concentricity limits of "O" ring cavity bore and spline P.D.

4.2 Spline Design Details

4.2.1 Complete dimensions of spline.
4.2.2 Minimum length of spline.
4.2.3 Minimum surface hardness.

5. ACCESSORY DRIVE SHAFT: (AS972)

5.1 Shaft and Sealing Design Details

5.1.1 Shaft outside diameter.
5.1.2 "O" ring groove dimensions and location.
5.1.3 Concentricity limits of shaft O.D. and spline P.D.
5.1.4 Concentricity limit of "O" ring bottom and shaft O.D.
5.1.5 Radii at intersecting surfaces.
5.1.6 Surface finish requirements.
5.1.7 Limitation to location of shear section is specified.

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3. (Continued):

5.1.8 In designing the drive and the accessory, consideration should be given to the possibility of full lubricating system oil pressure occurring within the gearbox spline inner cavity.

5.2 Spline Design Details

5.2.1 Complete dimensions of splines.
5.2.2 Minimum length of spline.
5.2.3 Spline leading edge chamfer.
5.2.4 Chamfer at spline run out end.
5.2.5 Surface hardness.

6. ENGINE OR GEARBOX DRIVE PAD LOADS: Pad overhung moment limit about the centerline of the pad stud pattern should be based, as a minimum, on the accessory weight, overhung moment, and operating environment as specified in the engine model specification or by the procuring agency.

7. SPLINE TORQUE CAPACITY: The selection of the spline size should be based, as a minimum, on the accessory power and speed requirements as specified in the engine model specification or by the procuring agency. Standard stress analysis procedures should be followed to determine the allowable load carrying capacity limits. The engine shaft and spline, except when a starter is to be used, should be capable of withstanding an instantaneous torque five times the rated torque without permanent deformation or failure. When a starter is to be used, the engine shaft and spline should be capable of withstanding an instantaneous torque two times the maximum starting torque without permanent deformation or failure.

8. TYPICAL ACCESSORY DRIVE APPLICATIONS: The tabulation starting on page 5 provides listing of typical drive applications and is provided only as a reference to current practice.

9. NOMINAL USES:

CS	Constant Speed Generating System
FP	Fluid Power Pump
G	Narrow Speed Range Generator
S	Starter
SP	Starter-Generator
TG	Tachometer Generator
VS	Variable Speed

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PREPARED UNDER THE JURISDICTION OF
SAE COMMITTEE AE-1, ENGINE ACCESSORY INSTALLATIONS

TABLE 1

Designation Drive	Accessory	Bolt Circle Dia. (mm)	Bolt Circle Dia. in.	Spline P.D. (mm)	Spline P.D. in.	Drive Rating Rated Speed rpm	Power (kW)	Power hp	Torque (N.m)	Torque lb-in.	Allowable Weight (kg)	Allowable Weight lbs	Static Overhung Moment (N.m)	Static Overhung Moment lb-in.	Nom. Use
AS959	AS960	(67.39)	2.653	(11.641)	0.4583	4000			(16.9)	150	(2.2)	5	(1.6)	15	FP
						8000			(16.9)	150	(2.2)	5	(1.6)	15	FP
						12000			(16.9)	150	(2.2)	5	(1.6)	15	FP
						16000			(16.9)	150	(2.2)	5	(1.6)	15	FP
						4200			(1.6)	15	(2.2)	5	(1.6)	15	TG
AS961	AS962	(127.00)	5.000	(15.240)	0.600	4000			(33.8)	300	(11.3)	25	(11.2)	100	FP
						6000			(33.8)	300	(11.3)	25	(11.2)	100	FP
						8000			(33.8)	300	(11.3)	25	(11.2)	100	FP
						12000			(33.8)	300	(11.3)	25	(11.2)	100	FP
						16000			(33.8)	300	(11.3)	25	(11.2)	100	FP
						12000	(4.4)	6	(84.7)	750	(9.0)	20	(6.7)	60	SG
						12000	(8.9)	12	(169.4)	1500	(15.8)	35	(16.9)	150	SG
						12000	(13.4)	18	(169.4)	1500	(15.8)	35	(16.9)	150	SG
						12000	(17.8)	24	(169.4)	1500	(15.8)	35	(19.2)	170	SG
				(20.320)	0.800	4000			(67.7)	600	(11.3)	25	(11.2)	100	FP
						6000			(67.7)	600	(11.3)	25	(11.2)	100	FP
						8000			(67.7)	600	(11.3)	25	(11.2)	100	FP
AS963	AS964	(127.00)	5.000	(20.320)	0.800	3300			(203.3)	1800	(31.7)	70	(50.8)	450	S
AS969						8000			(56.4)	500	(11.3)	25	(14.1)	125	FP
						8000	(22.3)	30			(24.9)	55	(39.5)	350	G
						12000	(22.3)	30			(22.6)	50	(28.2)	250	G
						9000	(26.0)	35			(36.2)	80	(56.4)	500	CS
						12000	(26.0)	35			(22.6)	50	(33.8)	300	CS
						9000			(56.4)	500	(11.3)	25	(14.1)	125	FP

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