SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

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Fan Hub Bolt Circles and Pilot Holes

RATIONALE

This document has been reviewed and amended by adding a table of existing common English-unit mounting patterns (legacy patterns) which still dominate in practice.

1. SCOPE

This Recommended Practice applies to engine cooling fans up to 2000 mm in diameter with a mounting interface consisting of a pilot hole and a circular bolt pattern. Most of these fans are belt, gear, clutch, hydraulically, or electrically driven.

1.1 Purpose

The purpose of this SAE document is to encourage the standardization of mounting patterns for engine cooling fans. A secondary purpose is to encourage adoption of SI metric units, although a listing of existing common English unit mounting patterns (legacy patterns) is provided. It is specifically not the objective of the specification to address the soft metric conversion of existing mounting patterns on engines designed in English units. Adherence to this specification should result in cost savings through reduction of part numbers and inventory, and more robust fan design. Failure to comply with this specification will result in the need to release and carry in inventory parts of identical blade geometry and construction, but with different mounting patterns.

2. REFERENCES

There are no referenced publications specified herein.

3. APPLICATION

3.1 Fixed Drive Mounting Patterns

Table 1 lists several bolt circle patterns for each pilot (refer to Figure 1 for definitions). Since large, flat center sections of fans with small pilots and bolt circle diameters are prone to fatigue-related failures from first-mode flexure, it is recommended that the largest diameter bolt circle be chosen, consistent with available space or hub size, to ameliorate such problems.

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3.2 Clutch Drive Mounting Patterns

3.2.1 Clutch-mounted fans typically have larger pilot diameters and bolt circles than fixed drive mounted fans. The choice of pilots and bolt circles for clutch-mounted fans is often more dependent upon clutch design considerations than upon fan diameter, and therefore the correlation between fan size and pilot/bolt circle size listed in Table 1 does not apply.

3.2.2 Table 2 lists recommended pilot and bolt circle diameters (refer also to Figure 1).

3.2.3 Fan mounting patterns for clutches may depart from the common configuration of a circular pilot with outboard mounting bolt holes in order to achieve desired clutch-fan synergy; such features are not covered by this document.

3.3 Tolerances

The following guidelines should be considered in determining tolerance specifications for part drawings of the fan and hub as shown in Figure 1.

3.3.1 The different pilot tolerances shown for fan and hub guarantee that the fan will fit upon the hub, and will help minimize imbalance of the resulting assembly, since the parts are typically balanced separately and not as an assembly.

3.3.2 The bolt circle should be concentric to the pilot.

3.3.3 Positioning of the bolt circle holes should guarantee a match-up between the fan and hub holes.

3.3.4 Fan pilots are typically punched, not machined, and therefore may not be perfectly round. This often necessitates the use of a go-no/go gauge to predict proper fitting on a hub pilot rather than ordinary diameter-measuring techniques. It is recommended that the term “effective fan pilot diameter” be used in place of a simple diameter specification.

3.4 Legacy Mounting Patterns (Common English Unit Patterns)

3.4.1 Tables 3 and 4 list common existing mounting patterns found in use on engine cooling fans. No attempt has been made to correlate these patterns with fan diameters as done with the metric patterns in section 3.1. These patterns are found on both fixed-drive and clutch-mounted applications as indicated. Further, bolt hole sizes are not specified because current applications often find the same mounting pattern using various bolt sizes (e.g., 5/16-inch, 3/8-inch, 1/2-inch, M8, M10, M12 bolts).

4. NOTES

4.1 Marginal Indicia

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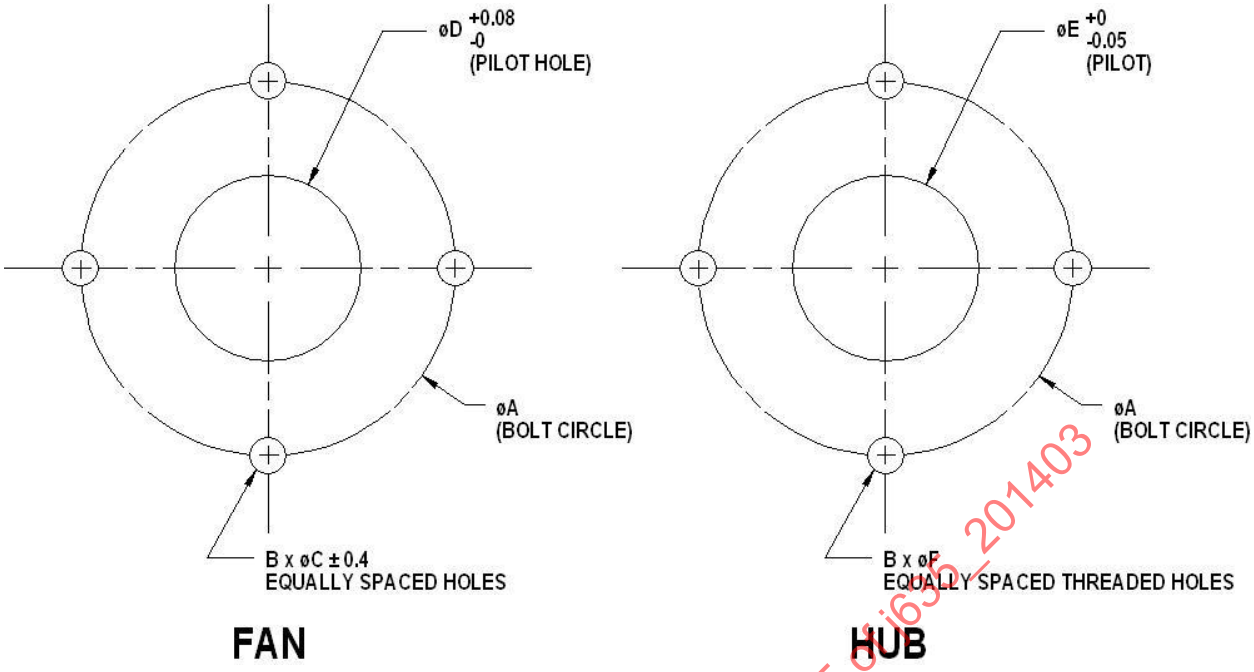

FIGURE 1 - FIXED DRIVE MOUNTING PATTERNS

TABLE 1 - FIXED DRIVE MOUNTING PATTERNS (mm)

Fan Diameter	A Bolt Circle Diameter	B Number Bolts	C Bolt Hole Diameter	D Fan Pilot Hole Dia	E Hub Pilot Diameter	F Bolt Diameter
Thru 600	50	4	8.75	25	24.95	8
	75	4	8.75	25	24.95	8
	100	6	11.00	25	24.95	10
Over 600 Thru 1000	75	4	8.75	50	49.95	8
	100	6	11.00	50	49.95	10
	125	6	11.00	50	49.95	10
	150	6	13.00	50	49.95	12
Over 1000 Thru 1600	100	6	11.00	75	74.95	10
	125	6	11.00	75	74.95	10
	150	6	13.00	75	74.95	12
	200	8	13.00	75	74.95	12
Over 1600 Thru 2000	125	6	11.00	100	99.95	10
	150	6	13.00	100	99.95	12
	200	8	13.00	100	99.95	12
	250	8	13.00	100	99.95	12

TABLE 2 - CLUTCH MOUNTING PATTERNS (mm)

A Bolt Circle Diameter	B Number Bolts	C Bolt Hole Diameter	D Fan Pilot Hole Dia	E Hub Pilot Diameter	F Bolt Diameter
100	4	8.75	75	74.95	8
125	4	8.75	100	99.95	8
150	6	8.75	125	124.95	8
175	6	8.75	150	149.95	8
200	6	11.00	175	174.95	10
225	6	11.00	200	199.95	10

TABLE 3 - LEGACY FAN MOUNTING PATTERNS, FIXED-DRIVE AND NON-VISCOUS CLUTCHES

A Bolt Circle Diameter	B Number Bolts	D Fan Pilot Hole Diameter
inches	ea	Inches
1.75	4	0.625
1.968	4	1.001
2.362	4	1.001
2.5	4	1.500
2.88	4	1.500
2.5	4	1.614
3	4	1.751
3.5	6	2.001
3.88	6	2.053
4.5	6	2.501
3.5	6	2.562
5.5	6	3.001
5.75	8	3.001
5.5	6	4.125
6.5	8	4.125
5.5	6	4.501
5.709	8	4.921
9.842	8	4.921