

# **SURFACE VEHICLE STANDARD**

**SAE** J1946

Issued 1990-06-18

Submitted for recognition as an American National Standard

## **COMPANION FLANGES, TYPE A (EXTERNAL PILOT) AND TYPE S (INTERNAL PILOT)**

### **1. SCOPE:**

This SAE Standard specifies the nominal dimensions and tolerances which affect the interchangeability between companion flanges and mating parts. The flanges covered by this document are designated type A and type S.

The type A flanges are equivalent to type A ISO/DIS 7646. The type S flanges are equivalent to the type S ISO/DIS 7647. Type A is an external (male) pilot construction and type S is an internal (female) pilot construction. These flanges are not interchangeable. Dimensions not specified are left to the discretion of the component manufacturer.

### **2. REFERENCES:**

#### **2.1 Applicable Documents:**

ISO 286, ISO System of Limits and Fits

ISO 1101, Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location and Run-Out - Generalities, Definitions, Symbols, Indications on Drawings

ISO 7646, Road Vehicles - Gearbox Flanges for Commercial Vehicles and Buses - Type A

### **3. DIMENSIONS AND TOLERANCES:**

Nominal dimensions, tolerances and bolt hole locations of type A companion flanges are shown in Figures 1 to 5, and given in Table 1. Nominal dimensions, tolerances and bolt hole locations of type S companion flanges are shown in Figures 6 to 9, and given in Table 2.

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4. DESIGNATION:

Companion flanges meeting the requirements of this document shall be identified by the following details in the order specified:

- a. Reference to this document
- b. The flange type
- c. The diameter of the flange,  $D_1$ ; (Type A only - See Table 1)
- d. The size code; (Type S only - See Table 2)
- e. The number of bolts
- f. The size of bolts

4.1 Examples:

4.1.1 Designation of a companion flange type A with  $D_1 = 150$  mm and eight 12 mm bolts:

- a. Flange SAE J1946 Type A -- 150 x 8 x 12

4.1.2 Designation of a companion flange type S with size code one 500 and four 14 mm bolts:

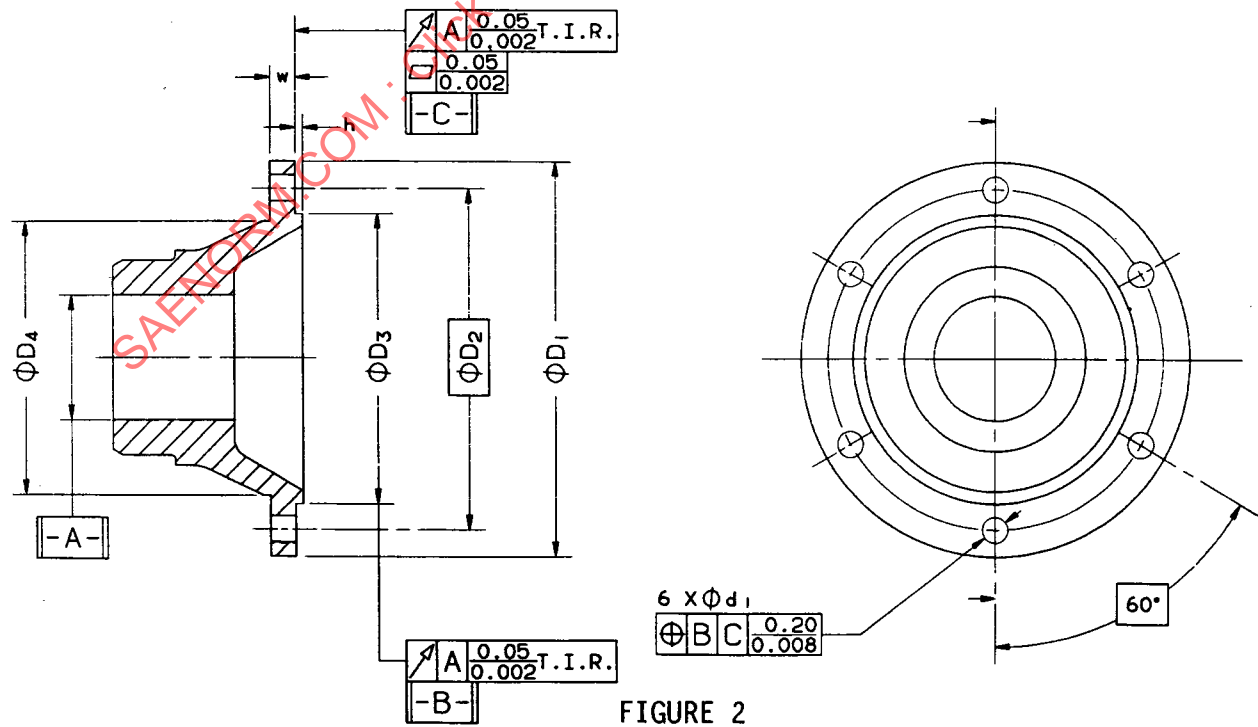
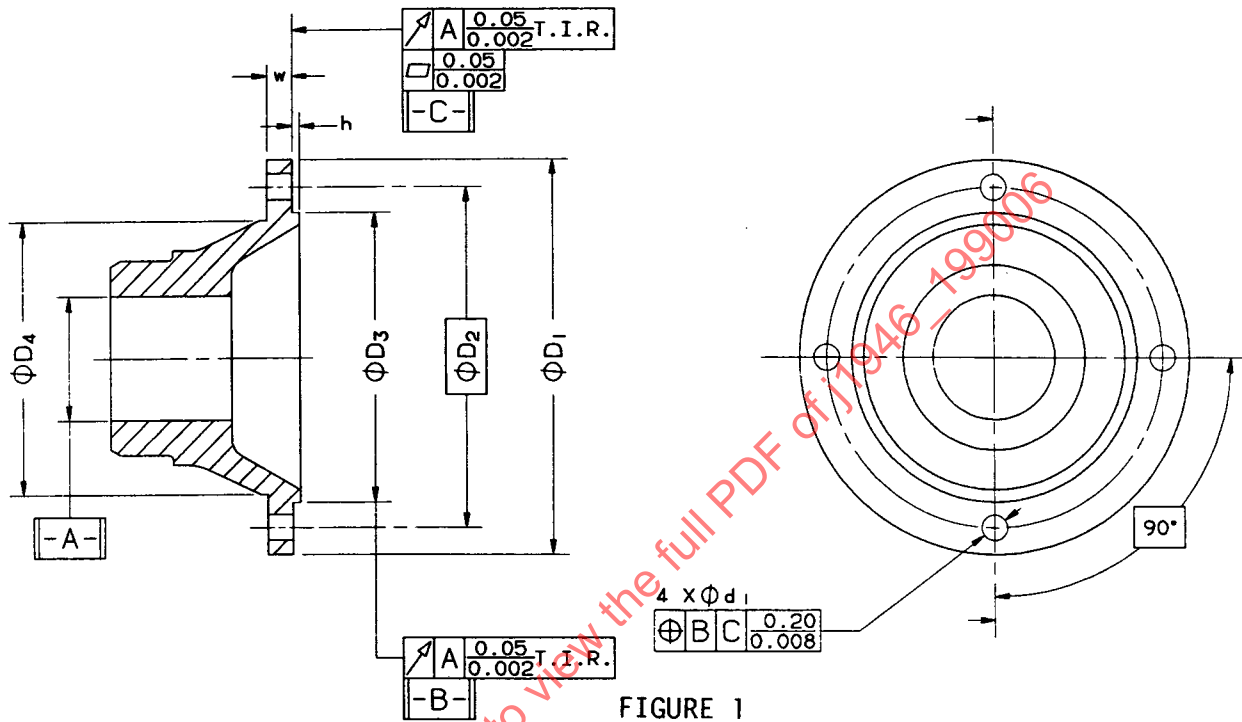
- a. Flange SAE J1946 Type S -- one 500 x 4 x 14

4.1.3 Designation of a companion flange type S with size code one 710 and eight 0.375 inch bolts:

- a. Flange SAE J1946 Type S -- one 710 x 8 x 0.375

TYPE A COMPANION FLANGES  
TRUE POSITION, FLATNESS & RUNOUT TOLERANCES  
(FIGURES 1-5)

MM  
INCHES



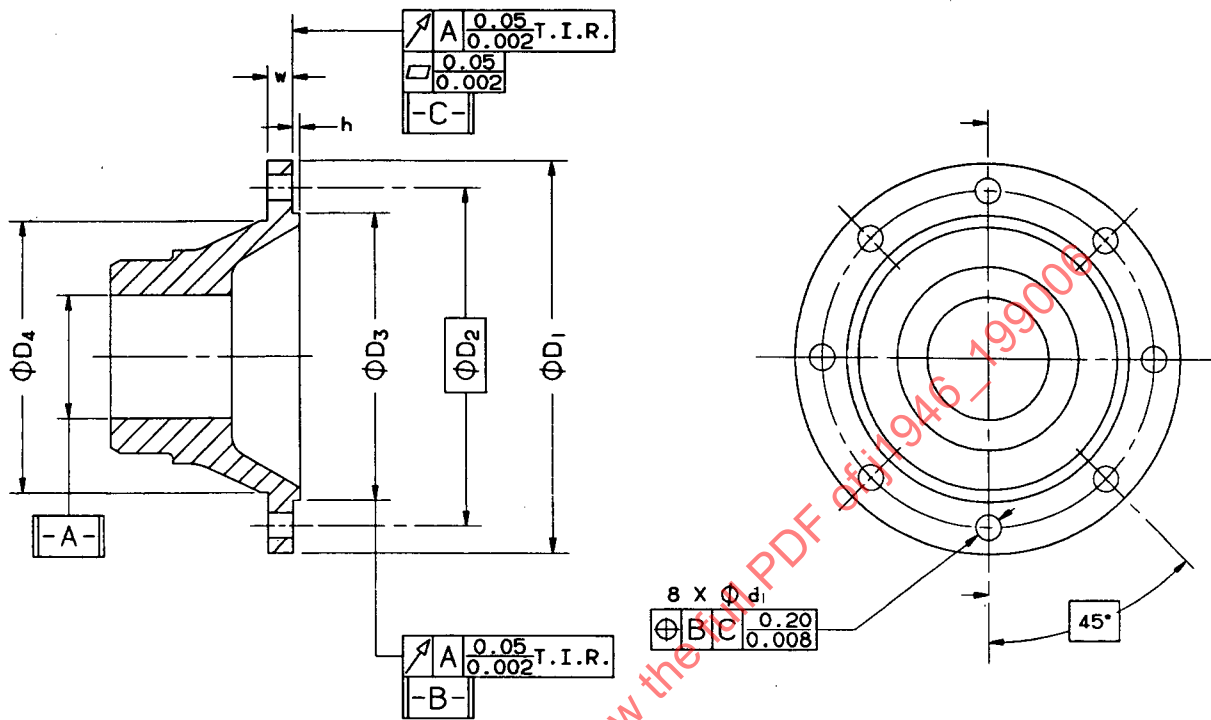


FIGURE 3

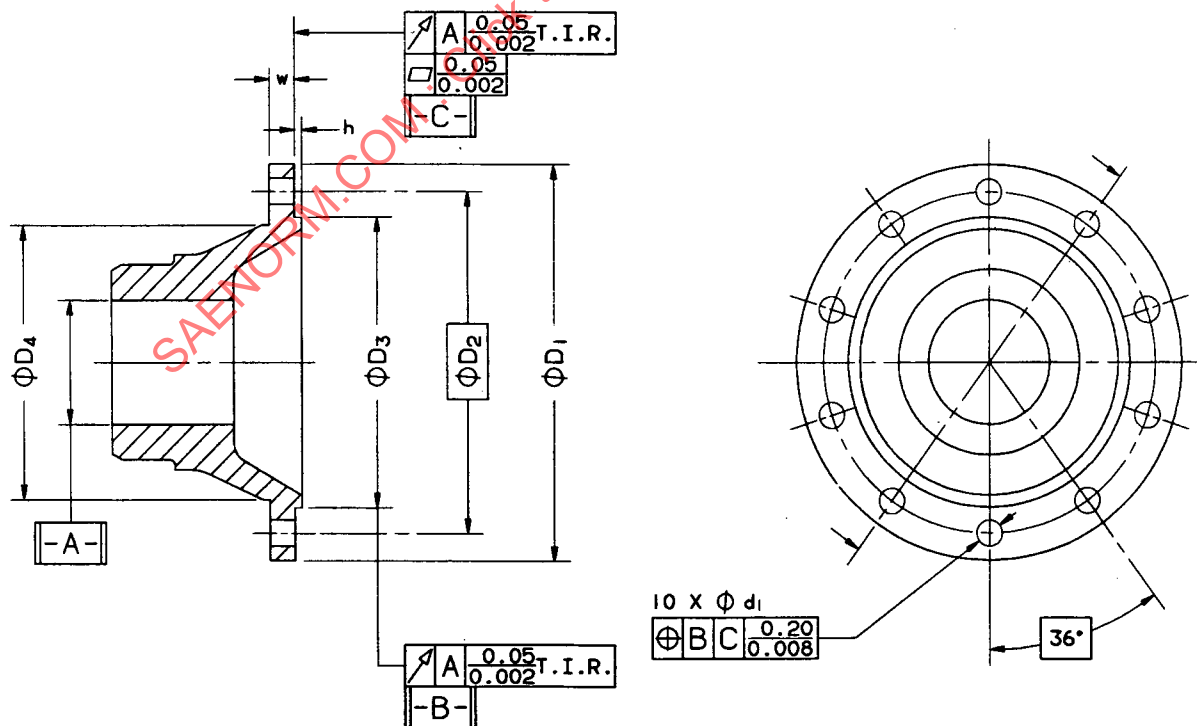


FIGURE 4

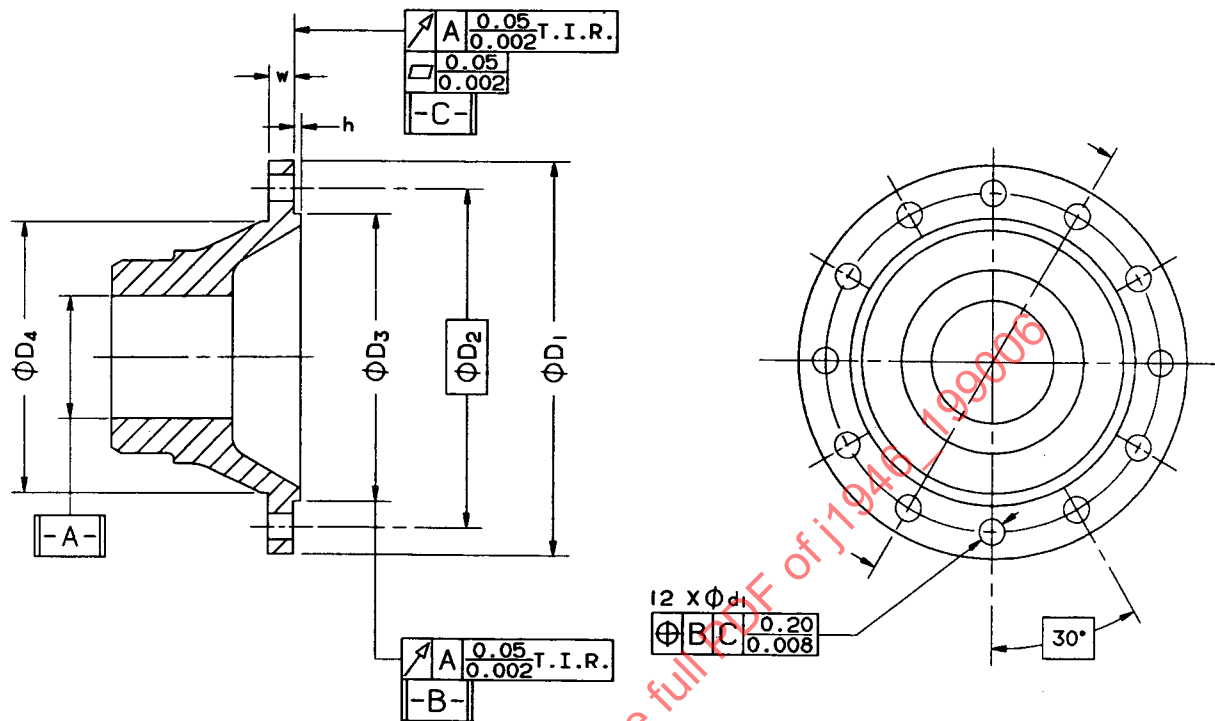


FIGURE 5

TABLE 1 - Dimensions and Tolerances  
(Applicable to Figures 1 to 5)

| $D_1$ | Figure Number | Number of holes | $d$<br>$+0.12$<br>$0$ | $D_2$ | $D_3$<br>$0$<br>$-0.05$ | $D_4^a$<br>$0$<br>$-0.2$ | $w$<br>$0$<br>$-0.5$ | $h$<br>$0$<br>$-0.2$ |
|-------|---------------|-----------------|-----------------------|-------|-------------------------|--------------------------|----------------------|----------------------|
| 75    | 2             | 6               | 6.1                   | 62    | 42                      | 51.6                     | 5.5                  | 1.8                  |
| 90    | 1             | 4               | 8.1                   | 74.5  | 47                      | 61                       | 6                    | 2.3                  |
| 100   | 2             | 6               | 8.1                   | 84    | 57                      | 70.5                     | 7                    | 2.3                  |
| 120   | 3             | 8               | 10.1                  | 101.5 | 75                      | 84.3                     | 8                    | 2.3                  |
| 150   | 3             | 8               | 12.1                  | 130   | 90                      | 110.7                    | 10                   | 2.3                  |
| 165   | 5             | 12              | 16.1                  | 140   | 95                      | 115                      | 12                   | 2.3                  |
| 180   | 3             | 8               | 16.1                  | 155.5 | 110                     | 130.5                    | 12                   | 2.3                  |
| 225   | 4             | 10              | 16.1                  | 196   | 140                     | 171                      | 15                   | 4                    |

Dimensions and tolerances in millimeters.

<sup>a</sup>This dimension shall be used when required to prevent bolt heads from rotating.

TYPE S COMPANION FLANGES  
TRUE POSITION, FLATNESS & RUNOUT TOLERANCES  
(FIGURES 6-9)

MM  
INCHES

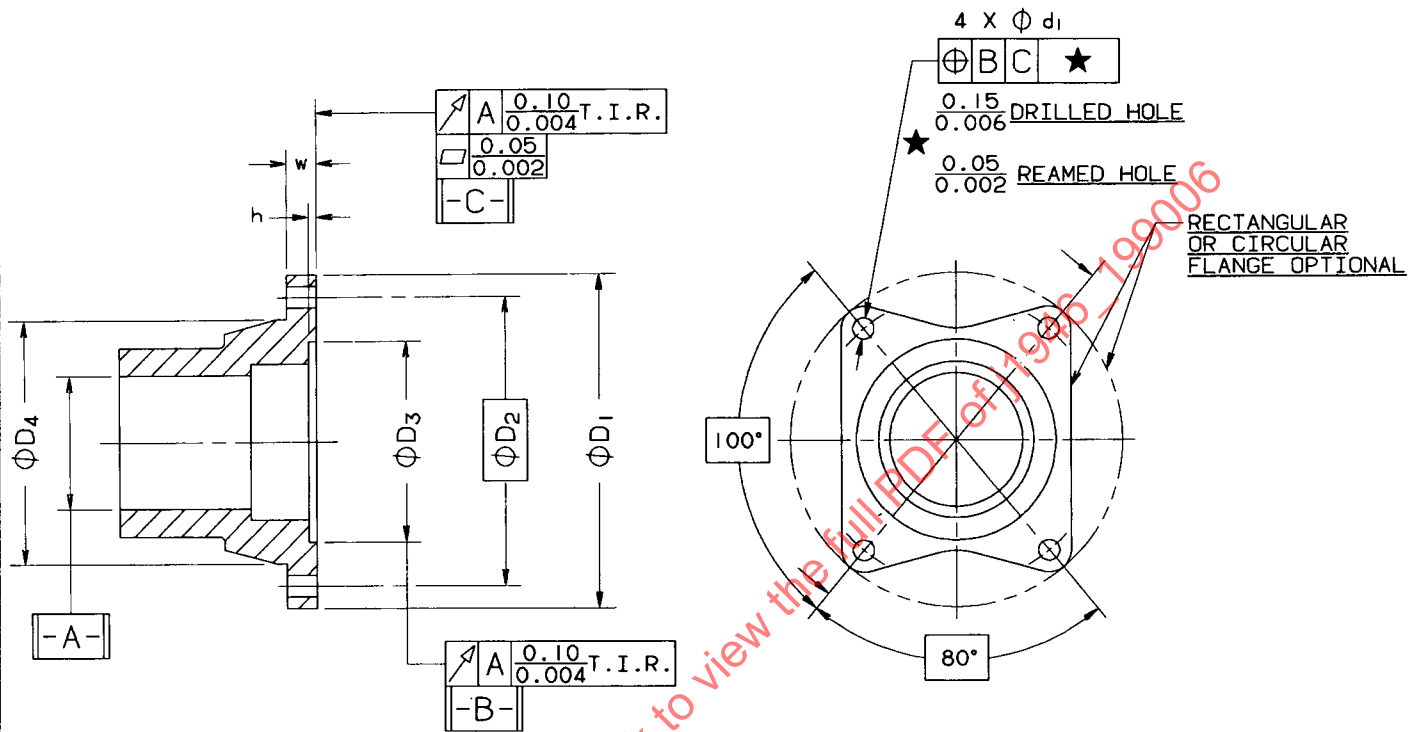


FIGURE 6

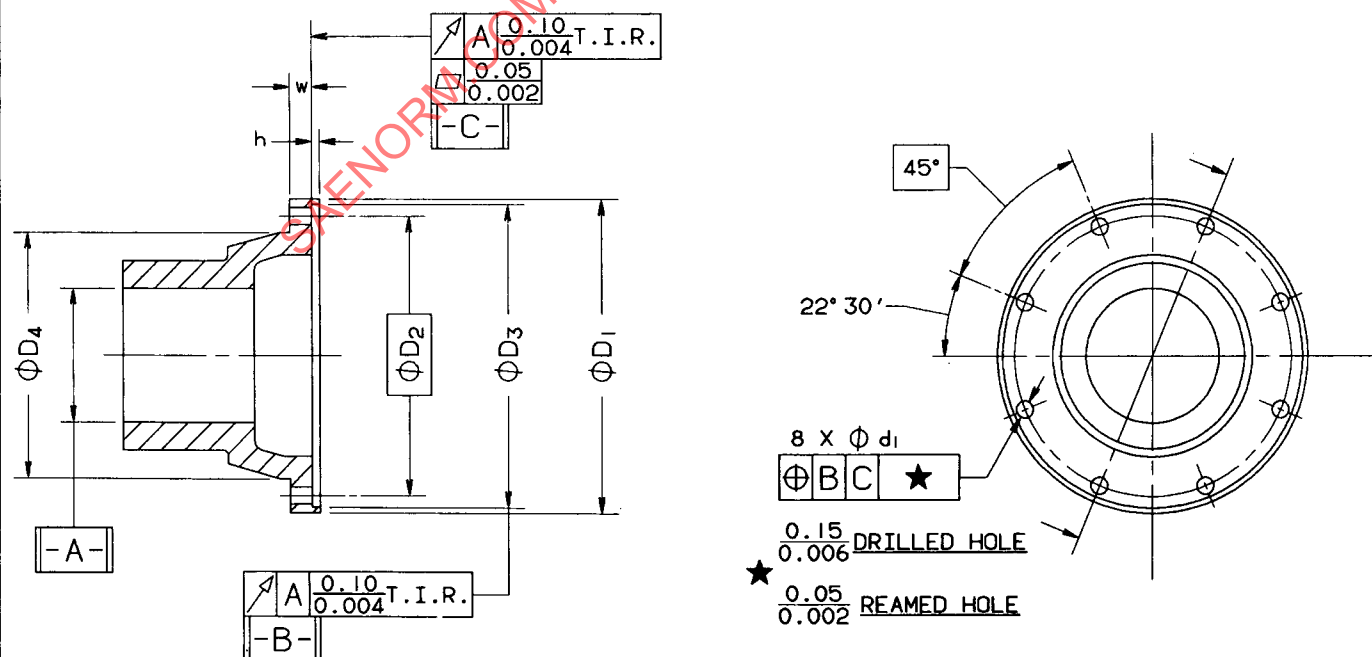


FIGURE 7

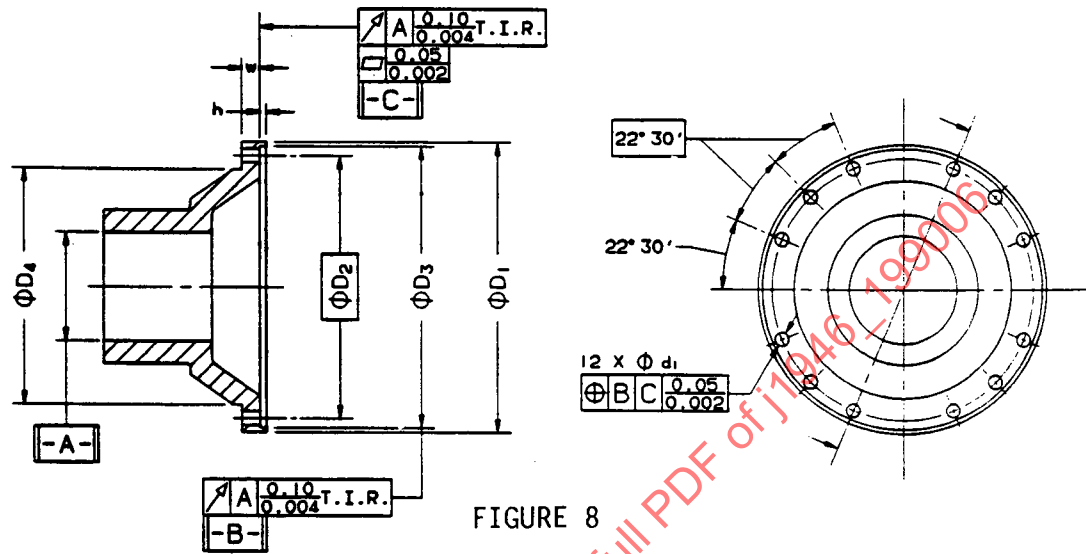


FIGURE 8

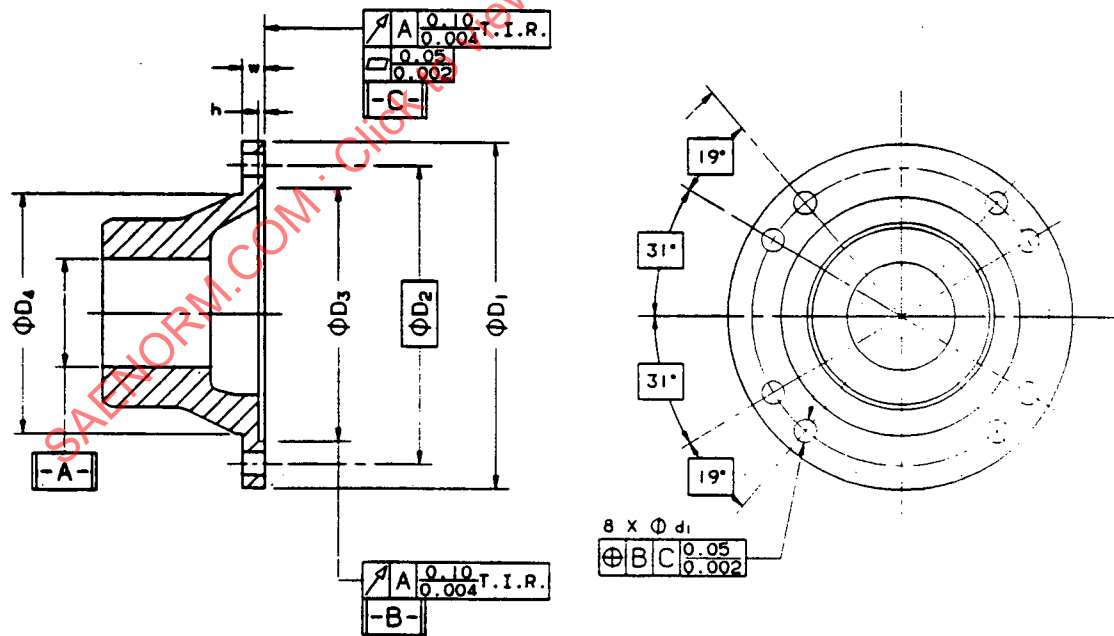


FIGURE 9

TABLE 2 - Dimensions and Tolerances  
(Applicable to Figures 6 to 9)

## SAE - ORIGINAL INCH STANDARD

| Size<br>Code | Figure<br>Number | $D_1$ | Number<br>of<br>holes | $d_1^a$<br>+0.007(a)<br>0 | $D_2$ | $D_3$<br>+0.002<br>0 | $D_4^b$<br>0<br>-0.005 | w<br>0<br>-0.020 | h<br>+0.010<br>0 |
|--------------|------------------|-------|-----------------------|---------------------------|-------|----------------------|------------------------|------------------|------------------|
| 1 000        | 6                | 3.438 | 4                     | 0.318                     | 2.750 | 2.248                | 2.240                  | 0.260            | 0.080            |
| 1 100        | 6                | 3.438 | 4                     | 0.318                     | 2.750 | 2.248                | 2.240                  | 0.260            | 0.080            |
| 1 310        | 6                | 3.875 | 4                     | 0.381                     | 3.125 | 2.375                | 2.550                  | 0.290            | 0.080            |
| 1 350        | 6                | 4.625 | 4                     | 0.441/0.439               | 3.750 | 2.750                | 3.115                  | 0.320            | 0.080            |
| 1 410        | 6                | 4.625 | 4                     | 0.441/0.439               | 3.750 | 2.750                | 3.115                  | 0.320            | 0.080            |
| 1 480        | 6                | 5.875 | 4                     | 0.506                     | 4.750 | 3.750                | 3.990                  | 0.390            | 0.080            |
| 1 550        | 6                | 5.875 | 4                     | 0.506                     | 4.750 | 3.750                | 3.990                  | 0.390            | 0.080            |
| 1 610        | 7                | 6.875 | 8                     | 0.381                     | 6.125 | 6.625                | 5.550                  | 0.390            | 0.050            |
| 1 710        | 7                | 8.000 | 8                     | 0.379/0.377               | 7.250 | 7.750                | 6.677                  | 0.390            | 0.050            |
| 1 760        | 8                | 8.000 | 12                    | 0.441/0.439               | 7.250 | 7.750                | 6.615                  | 0.390            | 0.050            |
| 1 810        | 8                | 8.000 | 12                    | 0.441/0.439               | 7.250 | 7.750                | 6.615                  | 0.390            | 0.050            |
| 1 880        | 9                | 9.500 | 8                     | 0.629/0.627               | 8.250 | 7.000                | 7.300                  | 0.620            | 0.125            |
| 1 910        | 9                | 9.500 | 8                     | 0.629/0.627               | 8.250 | 7.000                | 7.300                  | 0.620            | 0.125            |

Dimensions and tolerances in inches

NOTE: Basic differences between the ISO and SAE companion flange standards are in bolt hole diameters ( $d_1$ ) and bolt head locking diameters ( $D_4$ ).  
These two diameters correspond to the use of metric or inch mounting bolts.

## ISO - METRIC CONVERSION STANDARD

| Size<br>Code | Figure<br>Number | $D_1$ | Number<br>of<br>holes | $d_1$<br>+0.2<br>0 | $D_2$  | $D_3$<br>0<br>+0.05 | $D_4(b)$<br>0<br>-0.2 | w<br>0<br>-0.5 | h<br>+0.2<br>0 |
|--------------|------------------|-------|-----------------------|--------------------|--------|---------------------|-----------------------|----------------|----------------|
| 1 100        | 6                | 87    | 4                     | 8.1                | 69.85  | 57.10               | 56.4                  | 8              | 2.0            |
| 1 300        | 6                | 97    | 4                     | 10.1               | 79.37  | 60.32               | 62.2                  | 8              | 2.3            |
| 1 400        | 6                | 116   | 4                     | 12.1               | 95.25  | 69.85               | 76                    | 8              | 2.3            |
| 1 500        | 6                | 151   | 4                     | 14.1               | 120.65 | 95.25               | 96.4                  | 10             | 2.3            |
| 1 510        | 6                | 146   | 4                     | 12.1               | 120.65 | 95.25               | 101.4                 | 10             | 2.3            |
| 1 600        | 7                | 175   | 8                     | 10.1               | 155.57 | 168.28              | 138.4                 | 11             | 1.5            |
| 1 700        | 7                | 203   | 8                     | 10.1               | 184.15 | 196.86              | 167                   | 11             | 1.5            |
| 1 800        | 8                | 203   | 12                    | 10.1               | 184.15 | 196.86              | 167                   | 11             | 1.5            |

Dimensions and tolerances in millimeters

<sup>a</sup>+0.007 applies to dimensions without tolerance specified.

<sup>b</sup>This dimension shall be used when required to prevent bolt heads from rotating.