

SAE The Engineering Society
For Advancing Mobility
Land Sea Air and Space®

A Product of the
Cooperative Engineering Program

SAE J694 SEP88

**Disc Wheel/Hub or
Drum Interface
Dimensions —
Commercial Vehicles**

SAE Recommended Practice
Revised September 1988

SAENORM.COM : Click to view the full PDF of J694-198809

Submitted for Recognition as
an American National Standard

Distributed under license from the IHS Archive

SAENORM.COM : Click to view the full PDF of j694_198809

1023

No part of this publication may be reproduced in any form,
in an electronic retrieval system or otherwise, without the
prior written permission of the publisher.

Copyright 1988 Society of Automotive Engineers, Inc.

Distributed under license from the IHS Archive



400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

TRUCK AND BUS PRACTICE

SAE J694

Issued May 1955
Revised September 1988

Superseding J694 MAY88

Submitted for recognition as an American National Standard

DISC WHEEL/HUB OR DRUM INTERFACE DIMENSIONS - COMMERCIAL VEHICLES

1. PURPOSE:

This SAE Recommended Practice defines wheel mounting systems and documents, the dimensions and tolerances necessary to maintain serviceability, and interchangeability in the interface areas. To be consistent with ISO, it is divided into two sections (I & II). Section I is in concert with ISO 4107, describing mounting systems currently used internationally and nominated for, or included in, the international standards for bolt circle interfaces. Section II records information on current mounting systems also used in North America. Components of different mounting systems with common bolt patterns could be mis-assembled together and cause service problems. Therefore, it is important to note that each mounting system should be treated individually and their components not be intermixed.

2. SCOPE:

This SAE Recommended Practice contains dimensions and their tolerances concerning disc wheel to hub or drum interface areas for commercial vehicles and multi-purpose passenger vehicles. Stamped disc wheels for single applications and special or less common applications are not covered in this recommended practice.

3. REFERENCES:

- A. SAE J393 - Nomenclature - Wheels, Hubs and Rims for Commercial Vehicles
- B. ISO 4107 - Road Vehicles - Wheels for Commercial Vehicles - Dimensional Characteristics of Attachment on Hub
- C. ISO 7575 - Road Vehicles - Wheels for Commercial Vehicles - Flat Attachment - Fixing Nuts

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

4. DEFINITIONS:

A detailed listing of basic nomenclature is contained in SAE J393. Figs. 1 through 13 introduce, illustrate, and specify additional nomenclature and definitions.

Mounting System: The combination of wheel/hub or drum interface characteristics that identify uniqueness. These characteristics are: number of bolt holes, bolt circle diameter and fastener type. Unique mounting systems are identified by the Roman numerals in applicable tables throughout the recommended practice. Within a given mounting system, the wheels are interchangeable only by use of the appropriate fasteners and/or hubs with appropriate dimensions for the wheel material shown.

5. SECTION I - DISC WHEELS/HUB OR DRUM INTERFACE FOR ISO COMPATIBLE WHEELS:

5.1 Wheel Dimensions:

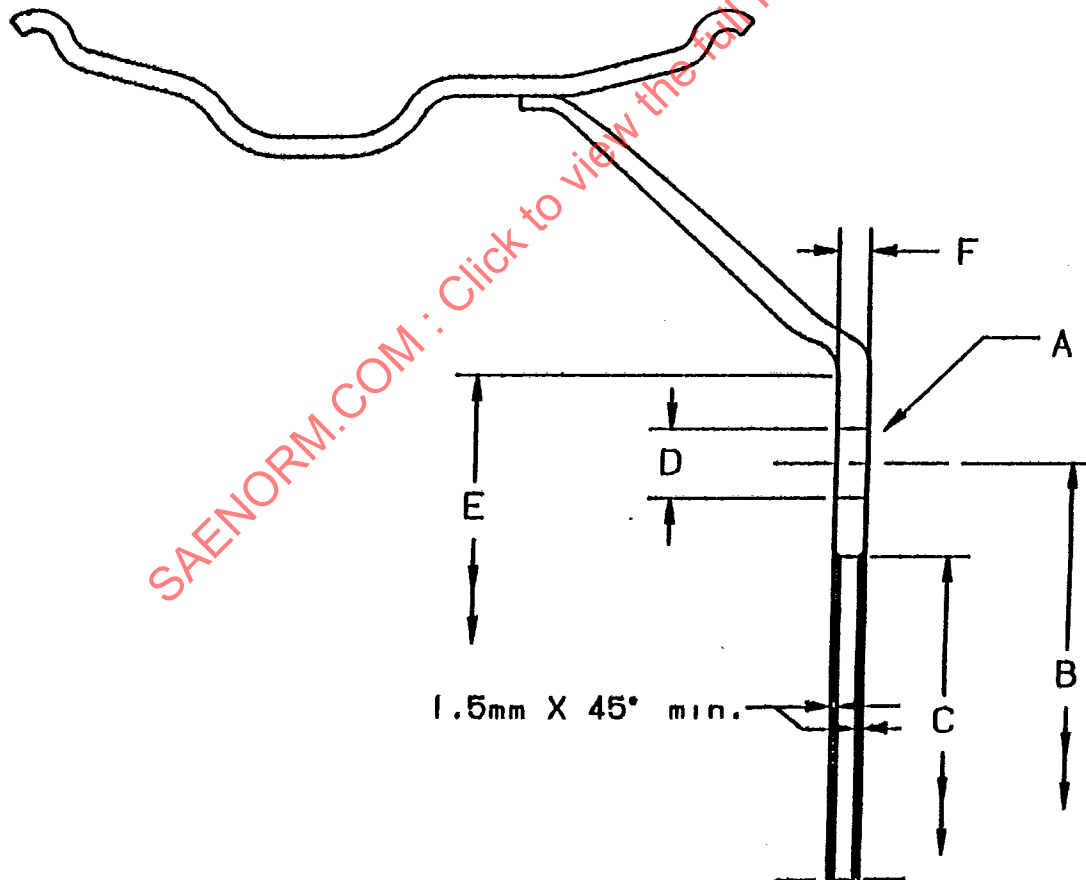


FIGURE 1 - Ferrous Disc Wheel

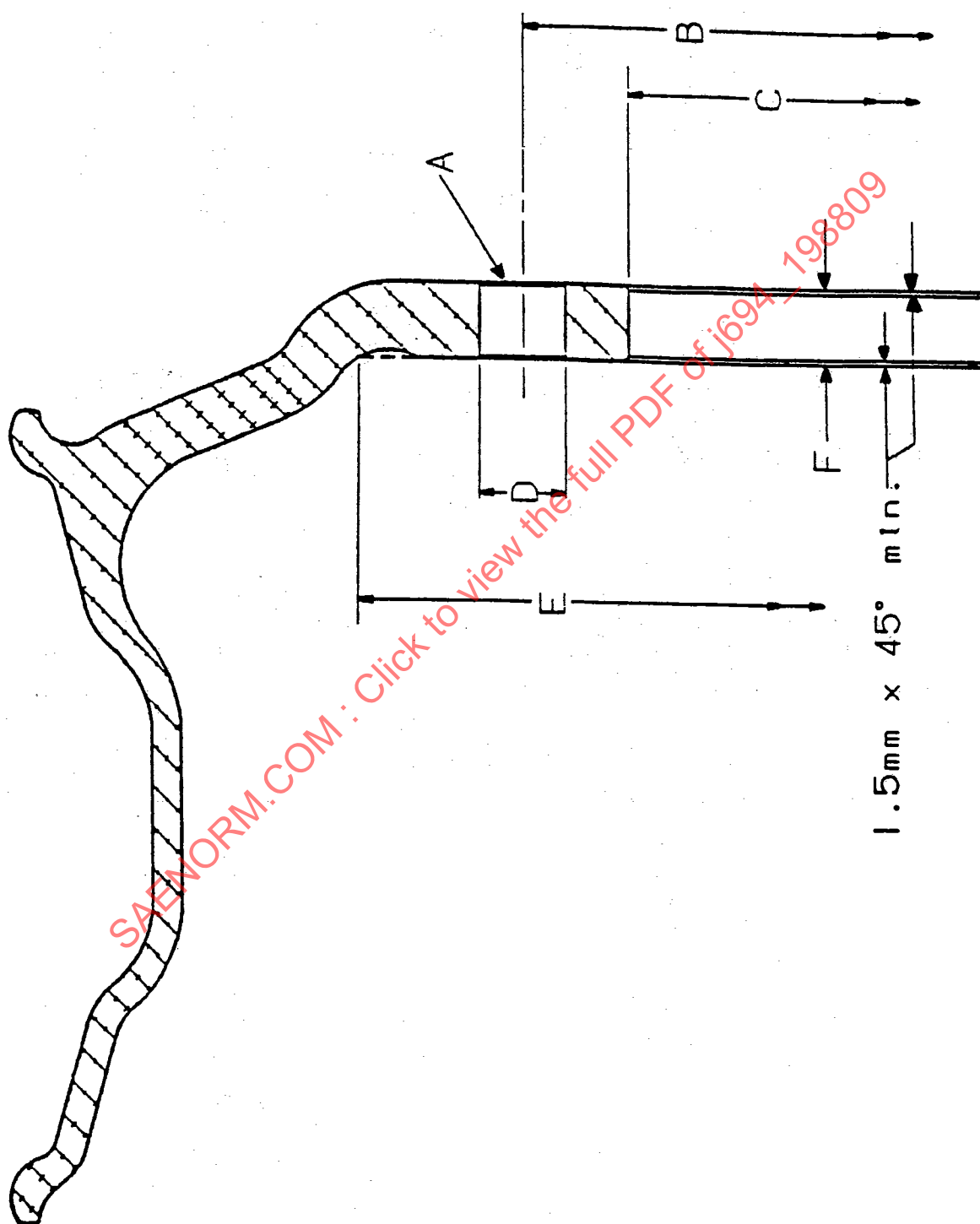


FIGURE 2 - Aluminum Disc Wheel

5.1.1 Definitions of Wheel Dimensions (Ref. Fig. 1 and 2):

A = number of bolt holes
 B = bolt circle diameter
 C = center hole diameter
 D = bolt hole diameter
 E = disc flat clearance diameter
 F = disc thickness

5.1.2 Dimensions and Tolerances of Wheels:

5.1.2.1 Inch System Mountings (all dimensions in inches):

MOUNTING SYSTEMS FOR FERROUS & ALUMINUM WHEELS					DIMENSIONS			
Mounting System	A # of Bolt Holes	B Bolt Circle Diameter +0.010 -0	Fastener Type	Wheel Material	C Center Hole Diameter	D +0.09, -0 Bolt Hole Diameter	E Min Disc Flat Clearance Diameter	F Max Disc Thick- ness
I	8	6.500	FN ¹	Ferrous Aluminum	4.878/4.888 4.880/4.888	0.60 0.60	8.60 8.60	0.35 0.57

¹FN - Flange nut

5.1.2.2 Metric System Mountings (all dimensions in mm):

MOUNTING SYSTEMS FOR FERROUS & ALUMINUM WHEELS					DIMENSIONS			
Mounting System	A # of Bolt Holes	B 0 0.3 0 Bolt Circle Diameter	Fastener Type (1)	Wheel Material (1)	C +0.2, -0 Center Hole Diameter	D +1, -0 Bolt Hole Diameter	E Min Disc Flat Clearance Diameter	F Max Disc Thickness (1)
II	8	275	FN	Ferrous Aluminum	221 221.1	24 24	325 325	13 25.4
III	10	285.75	FN	Ferrous Aluminum	220 220.1	26 26	345 345	14 25.4
IV	10	335	FN	Ferrous Aluminum	281 281.2	26 26	390 390	14 25.4

(1) Disc thickness, fastener type and aluminum disc wheels are not included in ISO Standard 4107.

5.2 Hub or Drum Interface Dimensions:

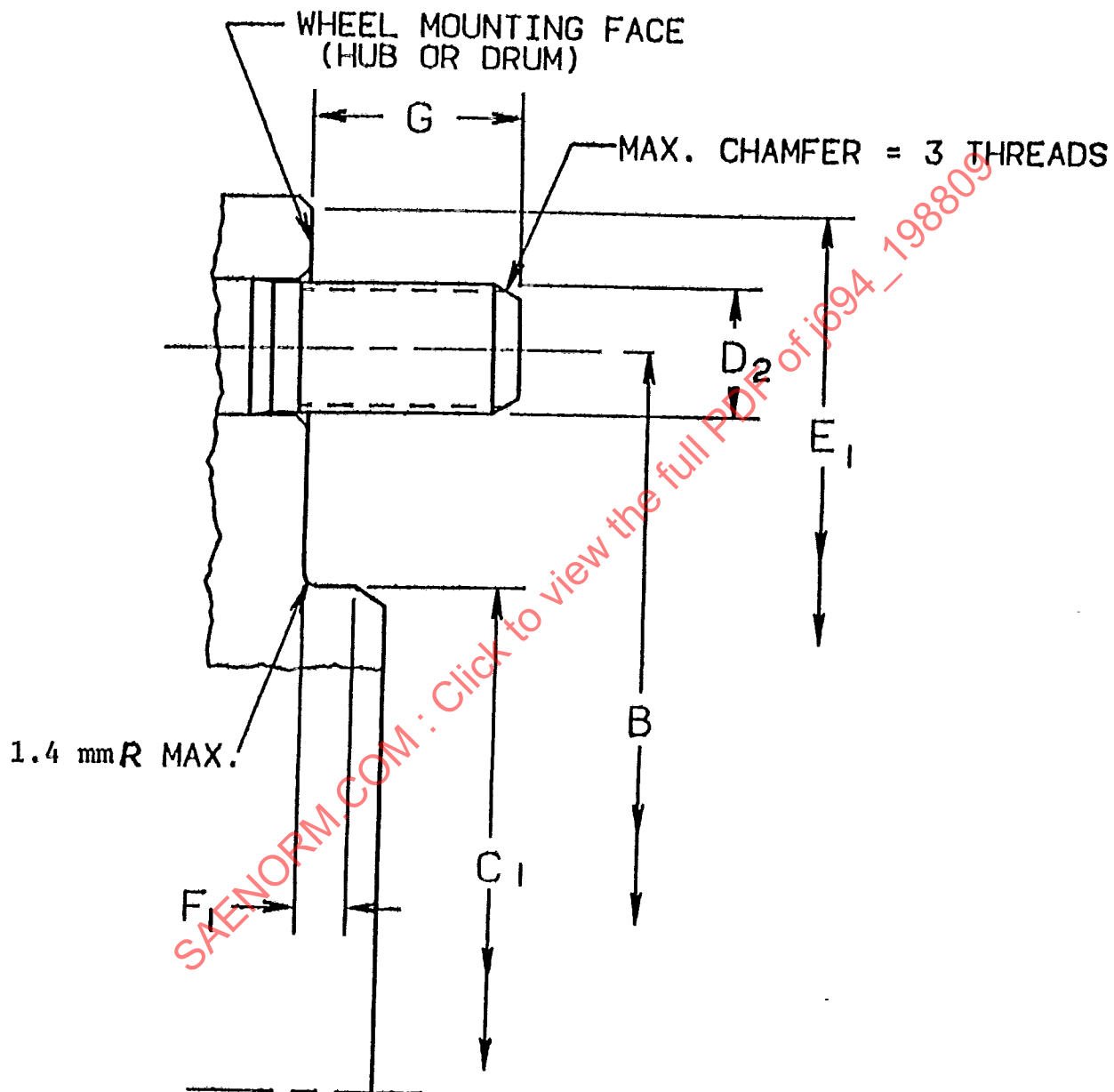


FIGURE 3 - Hub or Drum Interface Dimensions

5.2.1 Definitions of Hub or Drum Interface Dimensions (Ref. Fig. 3):

A = Number of studs or bolts

B = Bolt circle diameter

C1 = Wheel pilot diameter

D2 = Stud or bolt size

E1 = Diameter of wheel backup - Hub or outboard drum (usually not coincident with hub flange)

F1 = Pilot width (does not include lead in radius or chamfer)

G = Stud or bolt stand out beyond wheel mounting face of hub or outboard drum

5.2.2 Interface Dimensions and Tolerances of Hubs or Drums:

SAENORM.COM : Click to view the full PDF of J694 - 198809

5.2.2.1 Inch System Mountings (all dimensions in inches):

MOUNTING SYSTEMS				DIMENSIONS							
Mounting System	A # of Studs or Bolts	B Bolt Circle Diameter	Fastener Type	Wheel Material	D2 Stud or Bolt Diameter	C1 Wheel Pilot Diameter	E1 Wheel Backup Diameter	F1 (Min)		G Stand Out	
								Single	Dual	Single Min	Dual Min
I	8	6.500	FN	Ferrous Aluminum	0.563 0.563	4.872/4.877 4.872/4.877	8.38/8.50 8.38/8.50	0.25	0.62	1.39	1.74
								0.25	0.81	1.61	2.18

5.2.2.2.2 Metric System Mountings (all dimensions in mm):

MOUNTING SYSTEMS				DIMENSIONS						
Mounting System	A # of Studs or Bolts	B Bolt Circle Diameter 0 0.3 0	Fastener Type	D2 Stud or Bolt Diameter	C1 +0, -0.2 Wheel Pilot Diameter	E1 Wheel Backup Diameter	F1 (Min) Pilot Width		G (Min) Stand Out	
							Single	Dual	Single	Dual
II	8	275	FN (1)	20	220.8	315/320	13	26	42	55
			FN (2)	20	220.8	315/320	13	35	54	79
III	10	285.75	FN (1)	22	219.8	335/340	13	26	48	62
			FN (2)	22	219.8	335/340	13	35	59	84
IV	10	335	FN (1)	22	280.8	380/385	13	26	48	62
			FN (2)	22	280.8	380/385	13	35	59	84

- (1) Ferrous wheels
(2) Aluminum or ferrous wheels

5.3 Fastener Dimensions & Tolerances:

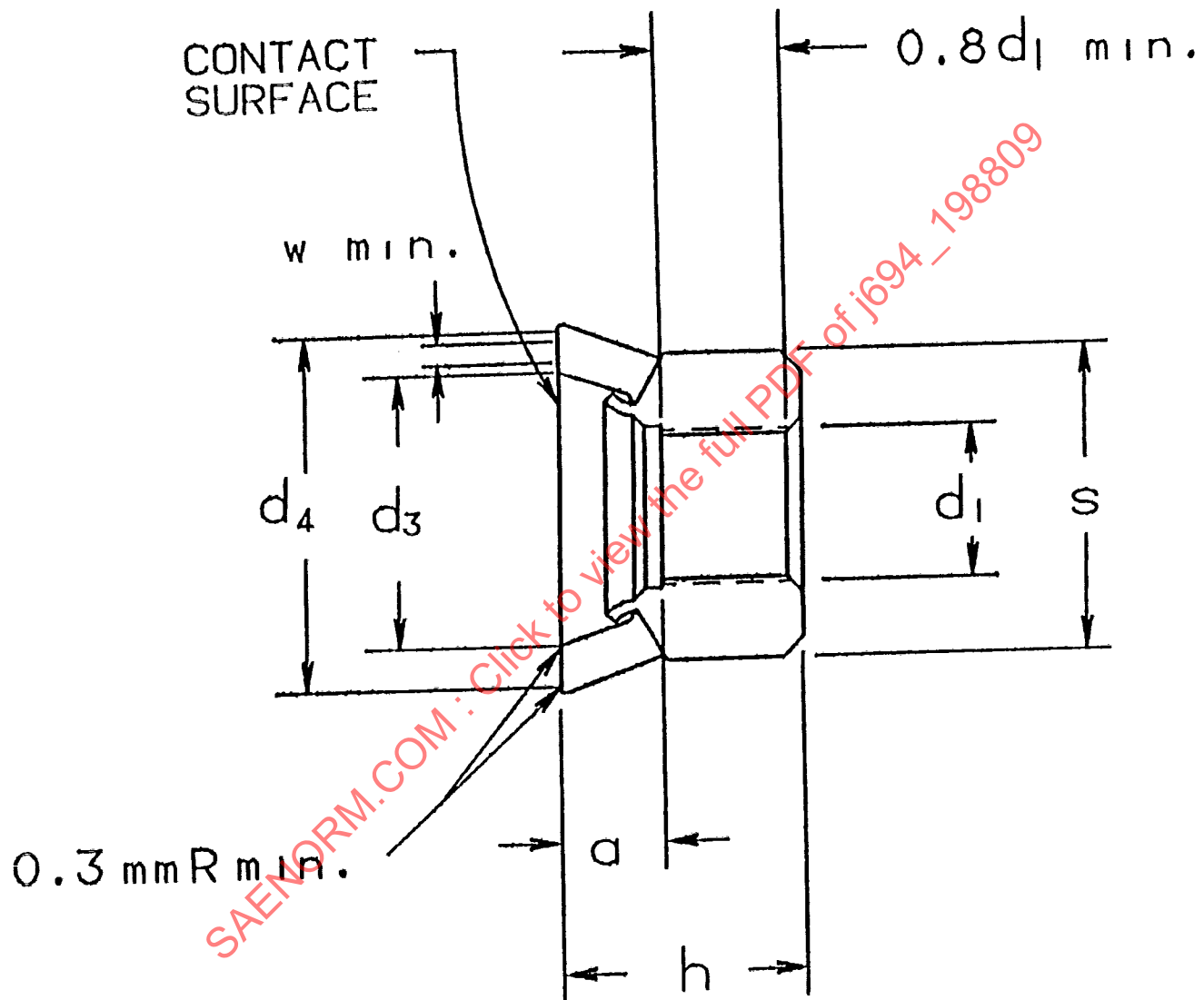


FIGURE 4 - Two Piece Flange Nut

5.3.1 Definitions of Fastener Dimensions (Ref. Fig. 4):

a = Distance to first thread from seat end
 d1 = Thread size
 s = Nominal width across flats
 d3 = Flange inner diameter
 d4 = Flange outer diameter
 w = Width of flange contact
 h = Overall nut height

5.3.2 Dimensions and Tolerances of Two Piece Flange Nuts (FN):

5.3.2.1 Inch System Mountings (all dimensions in inches):

d1 Thread Size	s Hex Size	d3 Min Flange Inner Dia	d4 Max Flange Outer Dia	a Min Thread Start	w Min Width of Flange Contact	h Max Height of Nut & Flange
9/16 - 18	1.062	1.00	1.625	0.180	0.110	1.04

5.3.2.2 Metric System Mountings (all dimensions in mm):

M20 x 1.5	30	26	45	4.5	5.5	29
M22 x 1.5	33	28	49	4.5	6.0	34

6. SECTION II - INFORMATION ON MOUNTING SYSTEMS ALSO USED IN NORTH AMERICA:

6.1 Wheel Dimensions:

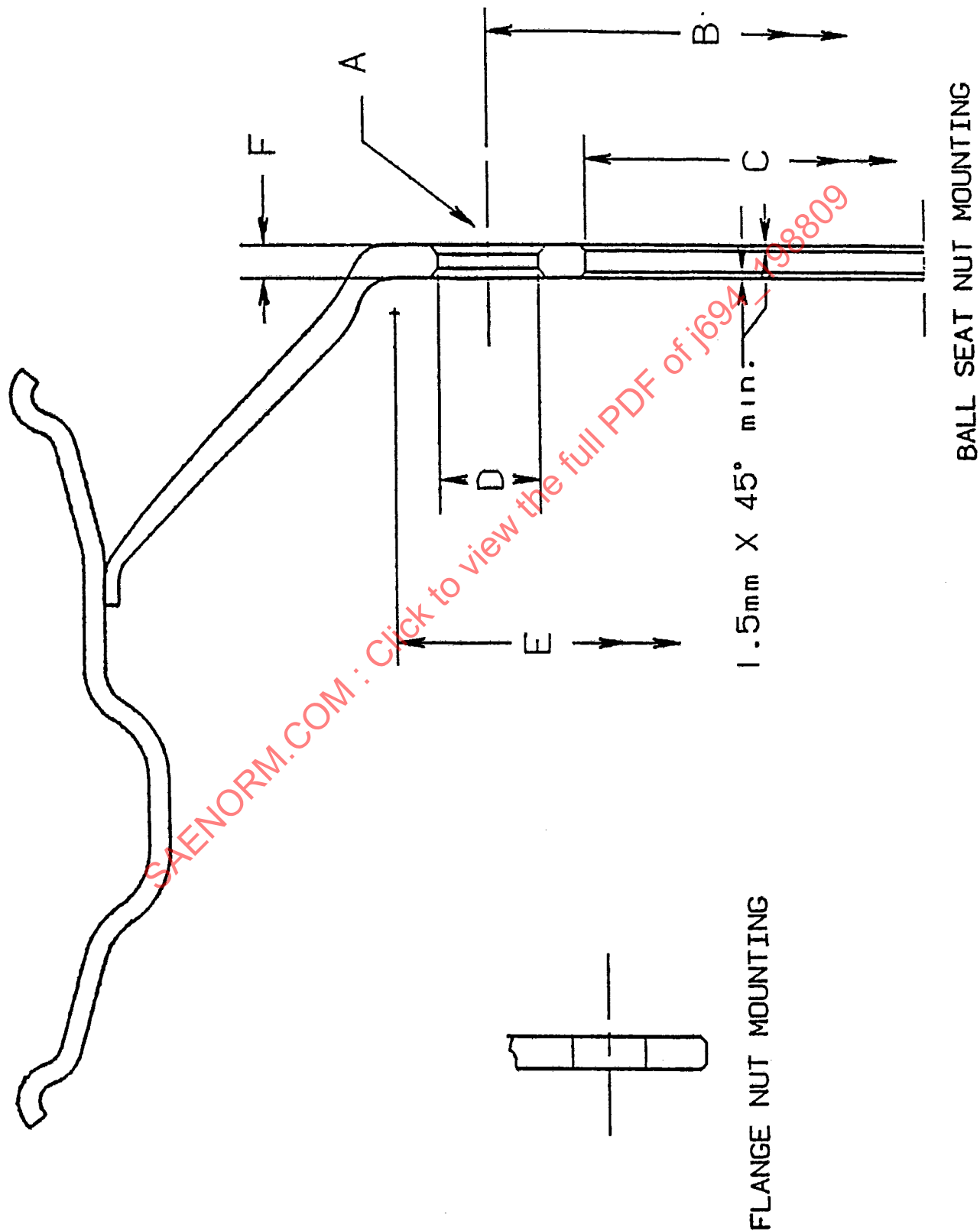
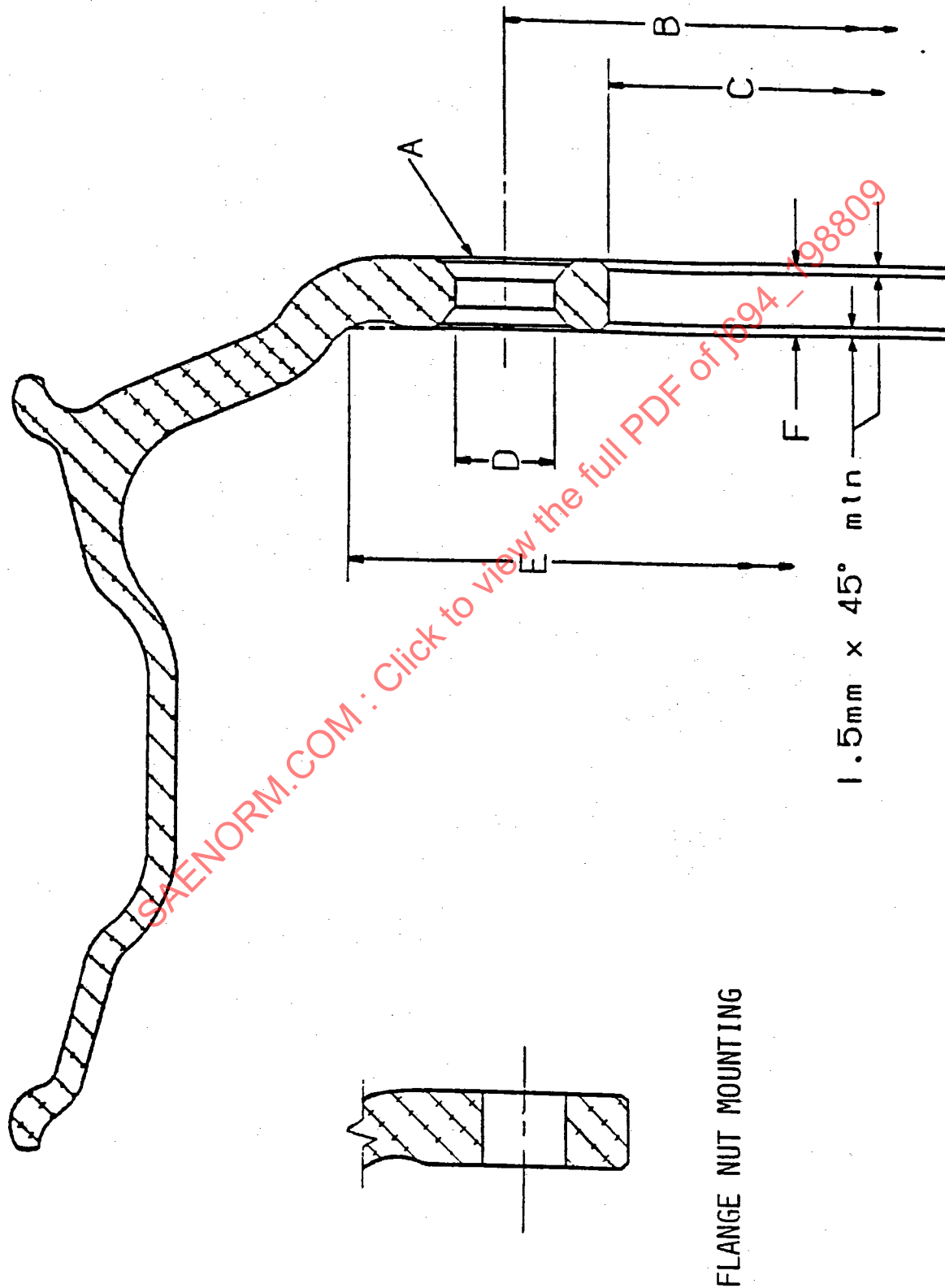


FIGURE 5 - Ferrous Disc Wheel



6.1.1 Definitions of Wheel Dimensions (Ref. Figs. 5 and 6):

- A = number of bolt holes
- B = bolt circle diameter
- C = center hole diameter
- D = bolt hole diameter
- E = disc flat clearance diameter
- F = disc thickness

6.1.2 Dimensions and Tolerances of Wheels:

SAENORM.COM : Click to view the full PDF of J694 - 198809

6.1.2.1 Inch System Mountings (all dimensions in inches):

MOUNTING SYSTEMS FOR FERROUS & ALUMINUM WHEELS					DIMENSIONS			
Mounting System	A # of Bolt Holes	B Bolt Circle Diameter	Fastener Type	Wheel Material	C Center Hole Diameter	D +0.09, -0 Bolt Hole Diameter	E Min Disc Clearance Diameter	F Max Disc Thickness
V	6	8.750	BSN BSN-AL	Ferrous Aluminum	6.469 min 6.495 min	1.21 1.18	11.32 11.32	NA NA
VI	8	6.500	FN	Ferrous Aluminum	4.563/4.573 4.565/4.573	0.60 (1) 0.60 (1)	8.30 8.30	0.35 0.57
VII	10	7.250	FN	Ferrous Aluminum	5.251/5.254 5.251/5.254	0.64 0.64	9.23 9.23	0.35 0.57
VIII	10	8.750	BSN	Ferrous	6.469 min	1.21	11.32	NA
IX	10	8.750	FN	Ferrous	6.251/6.259	1.10 (2)	11.32	0.50
X	10	11.250	BSN BSN-AL	Ferrous Aluminum	8.725 min 8.722 min	1.21 1.18	13.56 13.56	NA NA
XI	10	11.250	FN	Ferrous Aluminum	8.665/8.673 8.669/8.677	1.18 1.18	13.56 13.56	0.50 0.90
XII	10	13.188	BSN-heavy duty	Ferrous	10.650 min	1.35	15.48	NA

NOTE: Components of different mounting systems with common bolt patterns must not be intermixed

BSN - Ball seat nut

BSN-AL - Ball seat nut for aluminum wheels

FN - Flange nut

NA - Not applicable

(1) 0.75 for 0.625 diameter stud

(2) 1.00 for 0.688 diameter stud

6.1.2.2 Metric System Mountings (all dimensions in mm):

MOUNTING SYSTEMS FOR FERROUS AND ALUMINUM WHEELS						DIMENSIONS			
Mounting System	A # of Bolt Holes	B Bolt Circle Diameter $\Phi 0.3 \Phi$	ISO STD. 4107	Fastener Type (1)	Wheel Material (1)	C +0.2, -0 Center Hole Diameter	D +1, -0 Bolt Hole Diameter	E Disc Flat Clearance Diameter	F Disc Thickness (1)
XIII	6	205	ISO	FN	Ferrous Aluminum	161 161.1	21 21	255 255	13 20
XIV	8	275		FN	Ferrous Aluminum	221 221.1	26 26	345 345	14 25.4

(1) Disc thickness, fastener type, and aluminum disc wheels are not included in ISO standard 4107.

6.2 Hub or Drum Interface Dimensions:

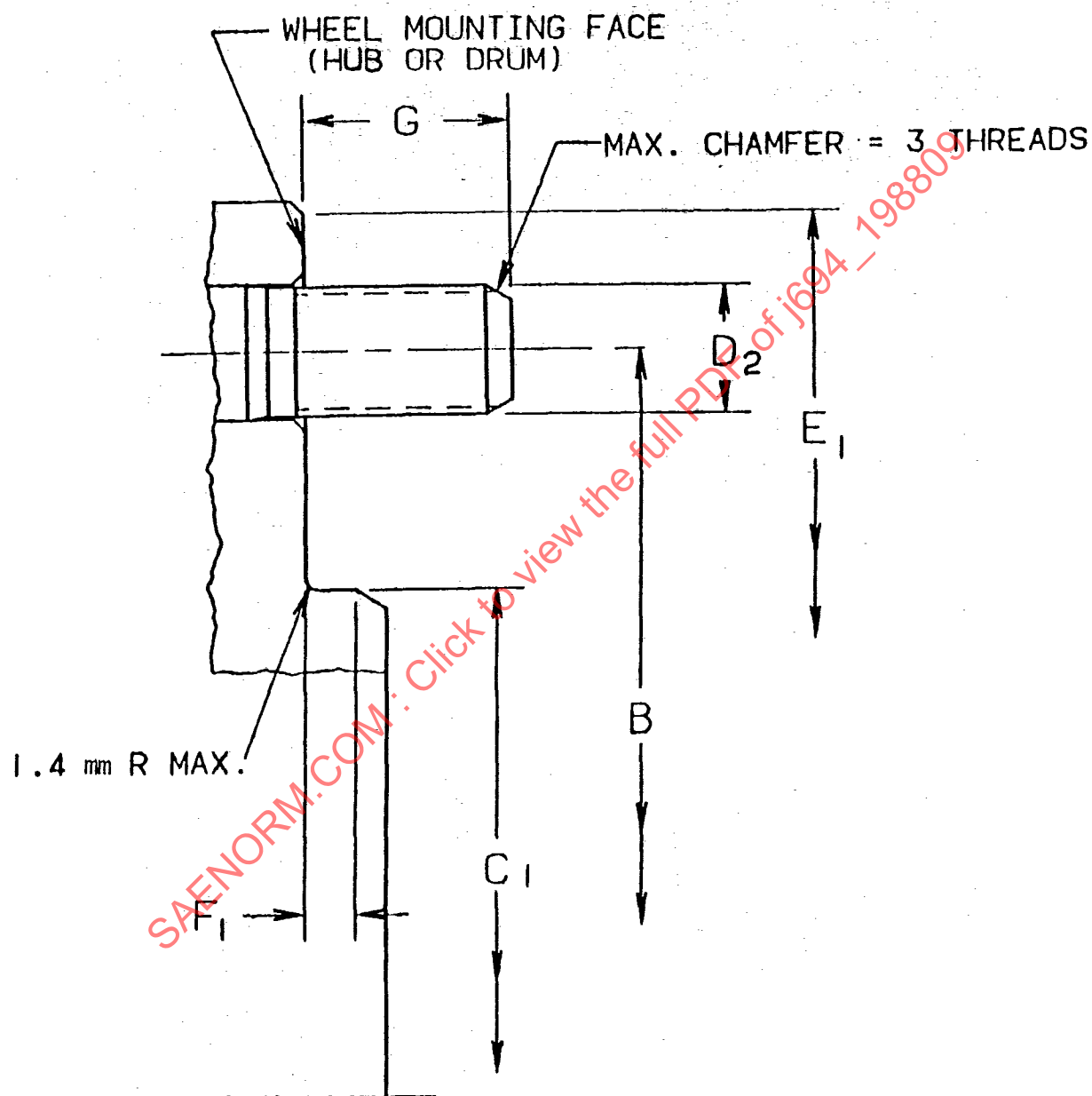


FIGURE 7 - Hub or Drum Interface Dimensions

6.2.1 Definitions of Hub or Drum Interface Dimensions (Ref. Fig. 7):

- A = number of studs or bolts
- B = bolt circle diameter
- C1 = wheel pilot diameter
- D2 = stud or bolt size
- E1 = diameter of wheel backup - hub or outboard drum (usually not coincident with hub flange outside diameter)
- F1 = pilot width (does not include lead in radius or chamfer)
- G = stud or bolt standout beyond wheel mounting face of hub or outboard drum

6.2.2 Interface Dimensions and Tolerances of Hubs or Drums:

SAENORM.COM : Click to view the full PDF of J694 - 198809

6.2.2.1 Inch System Mountings (all dimensions in inches):
 p

MOUNTING SYSTEMS				DIMENSIONS						
MOUNTING SYSTEM	A # OF STUDS OR BOLTS	B BOLT CIRCLE DIAMETER 	FASTENER TYPE	D2 STUD OR BOLT DIAMETER	C1 WHEEL PILOT DIAMETER	E1 WHEEL BACKUP DIAMETER	F1 (MIN) PILOT WIDTH		G STAND OUT	
							SINGLE	DUAL	SINGLE MIN	DUAL
V	6	8.750	BSN	0.750 1.125	6.45 max	11.00/11.25	NA	NA	1.25	1.31/1.44
VI	8	6.500	FN (1) FN (2)	0.563 0.563	4.554/4.562 4.554/4.562	8.00/8.25	0.25 0.25	0.62 0.81	1.44 1.66	1.79 min 2.23 min
VII	10	7.250	FN (1) FN (2)	0.625 0.625	5.245/5.250 5.245/5.250	9.00/9.13 9.00/9.13	0.24 0.24	0.62 0.81	1.44 1.66	1.79 min 2.23 min
VIII	10	8.750	BSN	0.750 1.125	6.45 max	11.00/11.25	NA	NA	1.25	1.31/1.44
IX	10	8.750	FN (1)	0.688	6.242/6.250	11.00/11.25	0.34	0.81	1.59	2.09 min
X	10	11.250	BSN BSN-AL	0.750 1.125	8.720 max 8.720 max	13.18/13.50 13.18/13.50	NA NA	NA NA	1.25 1.60	1.31/1.44 1.31/1.44
XI	10	11.250	FN (1) FN (2)	0.875 0.875	8.656/8.660 8.656/8.660	13.18/13.50 13.18/13.50	0.50 0.50	1.00 1.31	1.88 2.28	2.38 min 3.18 min
XII	10	13.188	BSN-hvy duty	0.938 1.312 1.125	10.645 max	15.25/15.38	NA	NA	1.25	1.68/1.81

NOTE: Components of different mounting systems with common bolt hole patterns must not be intermixed.

- (1) Ferrous Wheels
 (2) Aluminum or Ferrous Wheels

6.2.2.2 Metric System Mountings (all dimensions in mm):

MOUNTING SYSTEMS				DIMENSIONS						
MOUNTING SYSTEM	A # OF STUDS OR BOLTS	B  0.3 0 BOLT CIRCLE DIAMETER	FASTENER TYPE	D2 STUD OR BOLT DIAMETER	C1 +0, -0.2 WHEEL PILOT DIAMETER	E1 WHEEL BACKUP DIAMETER	F1 (MIN) PILOT WIDTH		G (MIN) STAND OUT	
							SINGLE	DUAL	SINGLE	DUAL
XIII	6	205	FN (1) FN (2)	18 18	160.8 160.8	245/250 245/250	13 13	26 30	40 47	53 67
XIV	8	275	FN (1) FN (2)	22 22	220.8 220.8	334/343 334/343	13 13	26 35	49 60	63 85

(1) Ferrous wheels

(2) Aluminum or ferrous wheels

6.3 Fastener Types, Dimensions & Tolerances:

6.3.1 Definitions of Fastener Dimensions (Reference Figs. 8, 9, 10, 11, 12, 13):

- a = Distance to first thread from seat end
- b = Depth of inner thread from seat end
- c = Distance of outer thread from seat end
- d1 = Thread size
- d2 = Outer thread size
- e = Seat diameter
- f = Shoulder length
- s = Nominal width across flats
- g = Shoulder diameter
- d3 = Flange inner diameter
- d4 = Flange outer diameter
- r = Ball seat radius (must be appropriate to nut seat of wheel)
- w = Width of flange contact
- h = Overall nut height
- x = Ball seat or cone intersection reference diameter

6.3.2 Dimensions and Tolerances of Ball Seat Nuts (BSN) for Inch System Mountings (all dimensions in inches):

6.3.2.1 Single or Outer Ball Seat Nut for Ferrous Wheels (BSN):

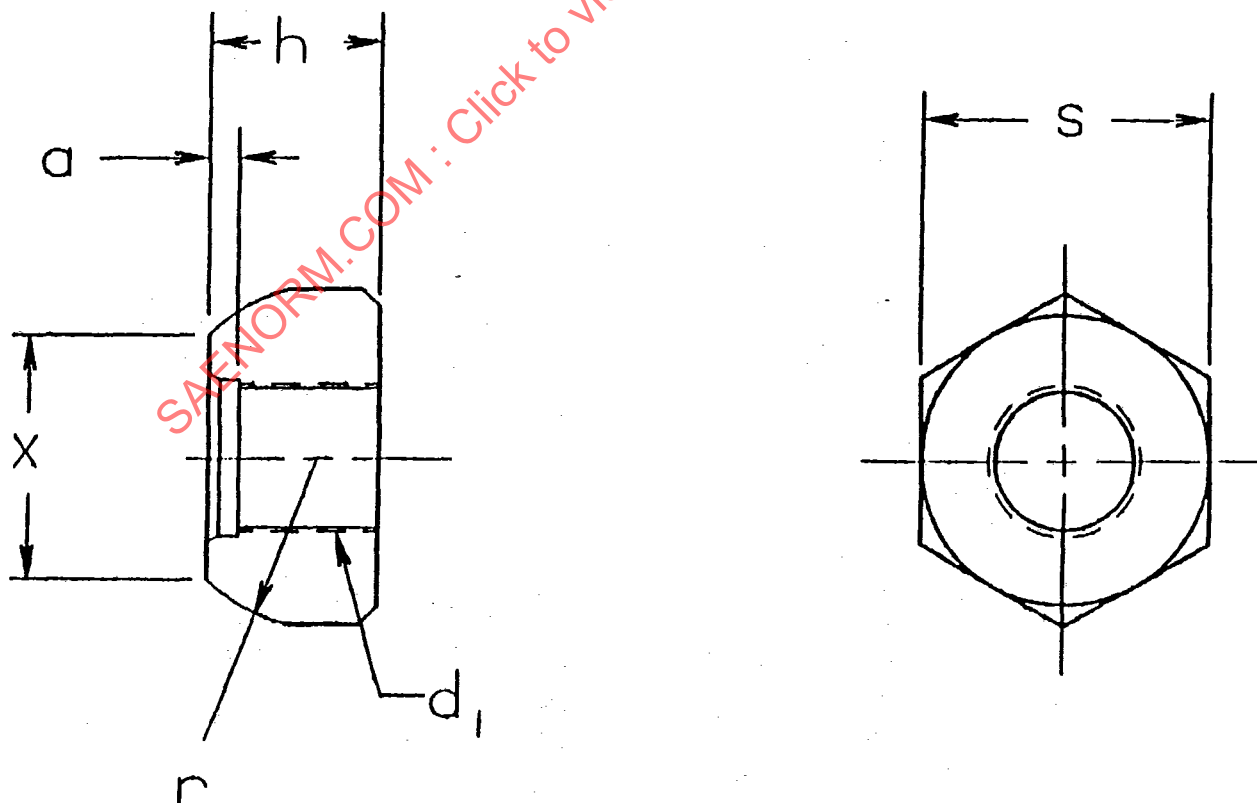


FIGURE 8 - Single or Outer Dual Ball Seat Nut for Ferrous Wheels

6.3.2.1 (Continued):

d1 Thread Size	s Hex Size	r +0.010 Ball Seat Radius	a Min Thread Start	h Max Overall Nut Height	x (Ref) Intersection Diameter	Disc Thickness
3/4 - 16	1.50	0.875	0.25	0.91	1.25	0.625 or less
1-1/8 - 16	1.50	0.875	0.06	0.91	1.25	A11
15/16 - 12(1)	1.75	1.188	0.12	1.41	1.469	A11
1-5/16 - 12(1)	1.75	1.188	0.12	1.41	1.469	A11

(1) BSN-heavy duty

6.3.2.2 Inner Dual Ball Seat Nut for Ferrous Wheels (BSN):

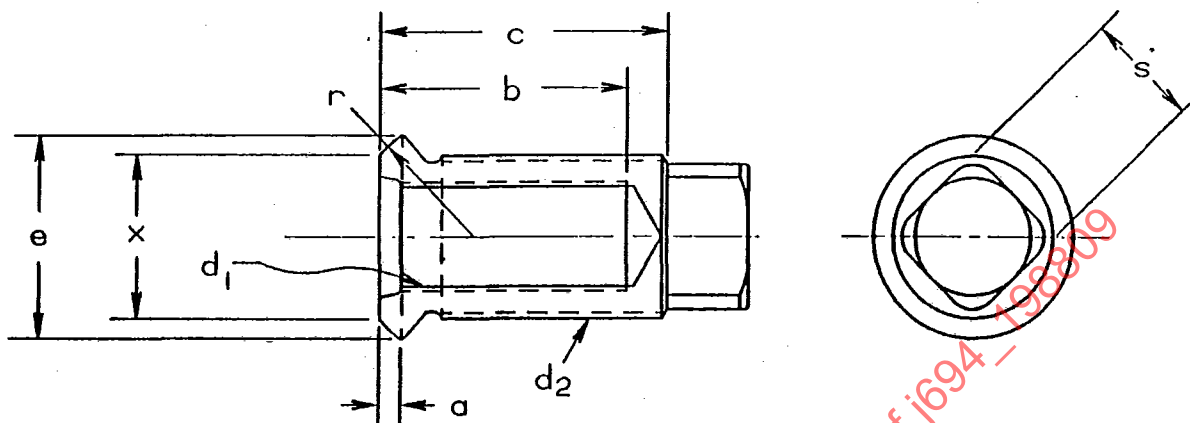


FIGURE 9 - Inner Dual Ball Seat Nut for Ferrous Wheels

d1 Inner Thread	d2 Outer Thread	s Wrench Flat	r ±0.010 Ball Seat Radius	a Min Thread Start	b Min Thread Length	c Min Thread Length	e Seat Dia	x (Ref) Intersec. Diameter	Disc Thickness
3/4 - 16	1-1/8 - 16	0.813	0.875	0.250	1.25	1.375	<u>1.425</u> 1.385	1.195	0.625 max
15/16 - 12 (1)	1-5/16 - 12	0.938	1.188	0.250	1.88	2.000	<u>1.693</u> 1.677	1.344	All

(1) BSN-heavy duty

6.3.2.3 Single or Outer Dual Ball Seat Nut for Aluminum Wheels (BSN-AL):

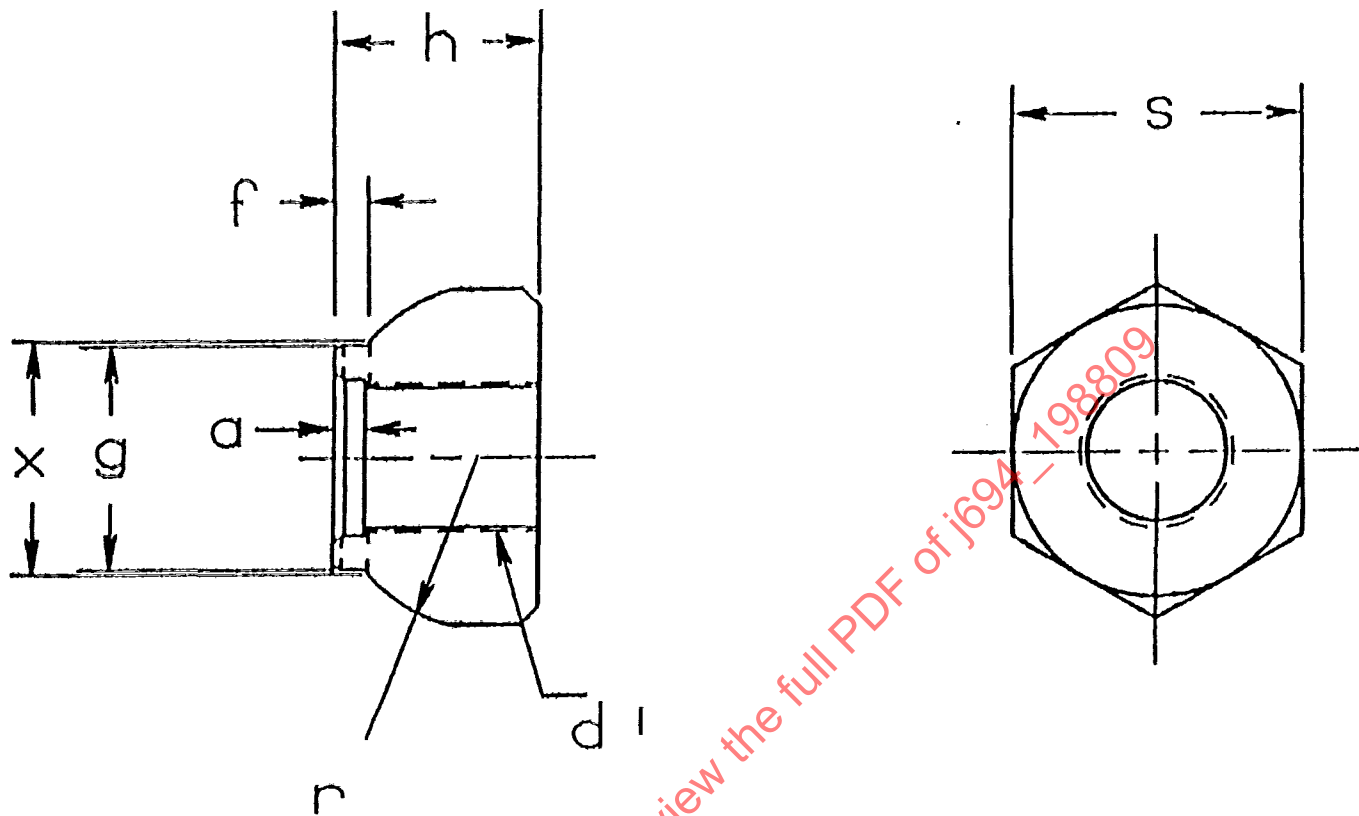


FIGURE 10 - Single or Outer Dual Ball Seat Nut for Aluminum Wheels

d1 Thread Size	g Hex Size	r ±0.010 Ball Seat Radius	a Min Thread Start	f +0.10, -0 Shoulder Length	g Max Shoulder Diameter	h (Max) Overall Nut Height	x (Ref) Intersec. Diameter	Disc Thickness
3/4 - 16	1.50	0.875	0.170	0.18	1.14	1.10	1.187	Greater than 0.625
1-1/8 - 16	Same as ball seat nut for ferrous wheels, Ref: 6.3.2.1							