



ENGINEERING DEPARTMENT

# BULLETIN

**No. 71**

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## **KNOCKOUT DIAMETERS AND FITTING DIMENSIONS TO ASSURE MECHANICAL AND ELECTRICAL CONTINUITY**

### **INTRODUCTION:**

The Joint Sections Committee on Knockout Diameters and Fitting Dimensions reviewed the existing industry practices and standards for knockout diameters and conduit fittings, and developed a table of dimensional relationships which assure no opening in the enclosure at the conduit entrance under normal conditions. Any situation which might result in an opening at the conduit entrance when a maximum size knockout and a minimum size locknut or bushing are combined with maximum off-centering of the conduit may be corrected by a minor readjustment of the conduit.

The Committee recommends that future designs of enclosures which include knockouts be tooled to the nominal knockout diameters specified to allow a greater overlap for bushings or locknuts over the enclosure opening, particularly if the conduit cannot be kept centered in the opening.

The Committee also reviewed the dimensions of existing conduit fittings and current installation practices, and concluded that there is no reasonable and practical way to control the maximum penetration of fittings or conduit and bushings into an enclosure when more than one conduit enters the enclosure. The solution to this problem lies with good work practices; what is reasonable penetration in one enclosure may be unacceptable in another.

### **GUIDELINES:**

The following dimensions have been developed by the Joint Sections Committee on Knockout Diameters and Fitting Dimensions and approved by the Codes and Standards Committee as a proposal to be considered by NEMA Sections for inclusion in existing standards publications.

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Table 71-1  
 COMPATIBILITY OF KNOCKOUT DIMENSIONS WITH LOCKNUTS, BUSHINGS,  
 AND METALLIC CONDUIT (IMC OR RIGID) TO ASSURE COORDINATION<sup>a)</sup> <sup>b)</sup>

Trade Size of Conduit, Nom.	Major Diameter of External Thread		Knockout Diameter <sup>e)</sup>			Metallic Bushing With or Without Insulated Throat (See Fig. 71-1)		Nonmetallic Bushing With Locknut on Inside of Enclosure (See Fig. 71-2)	
	Min.c)	Max.d)	Min.	Nom.	Max.	Diameter at Flange, Min.	Overlap over Nominal Knockout, Min. <sup>f)</sup>	Covering Diameter of Locknut, Min.	Overlap over Nominal Knockout, Min. <sup>f)</sup>
Col. 1	Col. 2 Dim. P	Col. 3	Col. 4	Col. 5 Dim. K	Col. 6	Col. 7 Dim. B	Col. 8 Dim. X	Col. 9 Dim. B	Col. 10 Dim. X
1/2	0.815	0.855	0.859	0.875	0.906	1.00	0.033	0.937	0.001
3/4	1.029	1.066	1.094	1.109	1.141	1.23	0.021	1.189	0.000
1	1.290	1.331	1.359	1.375	1.406	1.54	0.040	1.485	0.013
1-1/4	1.638	1.676	1.719	1.734	1.766	1.92	0.045	1.859	0.015
1-1/2	1.878	1.916	1.958	1.984	2.016	2.18	0.045	2.109	0.010
2	2.352	2.399	2.433	2.469	2.500	2.68	0.047	2.635	0.025
2-1/2	2.843	2.904	2.938	2.969	3.000	3.20	0.053	3.156	0.030
3	3.469	3.535	3.563	3.594	3.625	3.83	0.056	3.812	0.046
3-1/2	3.970	4.040	4.063	4.125	4.156	4.40	0.060	4.343	0.032
4	4.466	4.545	4.563	4.641	4.672	4.94	0.062	4.890	0.037
4-1/2	4.967	5.050	5.063	5.109	5.166	5.51	0.130	5.453	0.101
5	5.530	5.619	5.625	5.719	5.750	6.05	0.071	6.062	0.077
6	6.587	6.691	6.700	6.813	6.844	7.20	0.081	7.110	0.035

a) Dimensional changes in Cols. 2 (Dim. P), 5 (Dim. K), 7 (Dim. B), and/or 9 (Dim. B) may cause an incompatible assembly.

b) These dimensions are for knockout diameters for single or concentric types only and exclude any projection of breakout ears or tabs.

c) This dimension is the nominal major diameter of the thread at El (Ref: Fig. 4-7 of NEMA Standards Publication No. FB 1-1977) or the nominal diameter or the intermediate metal conduit (Ref: UL 6-1976, ANSI/UL 514-1978, UL 1242-Jan. 1977 draft), whichever is less.

d) The maximum diameter of rigid conduit (Ref: ANSI C80.1-1977).

e) Dimensions for trade sizes of 1/2 through 1-1/4 are from Table 20.2 of ANSI/UL 514-1978. Minimum dimension for larger sizes is necessary to clear the maximum diameter of the external thread (i.e., Col. 4 is greater than Col. 3).

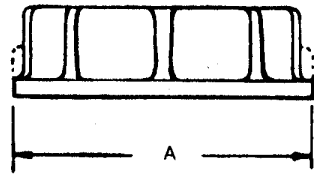
f) The stated values are calculated: the minimum overlap (Dim. X) equals the minimum diameter (at flange or outer diameter of locknut) (Dim. B), minus the minimum major diameter (Dim. P), divided by 2, minus the conduit clearance (Dim. C); where Dim. C equals the nominal knockout diameter (Dim. P). The relationship is given by:

$$X = \frac{B-P}{2} - (K-P)$$

(Refer to Fig. 71-3)

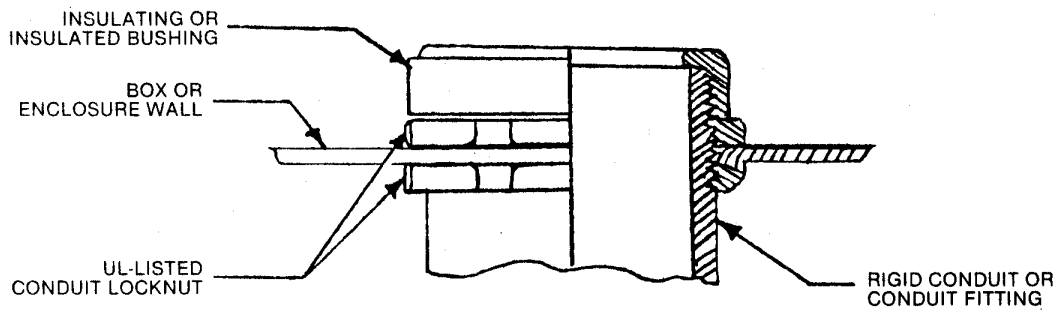
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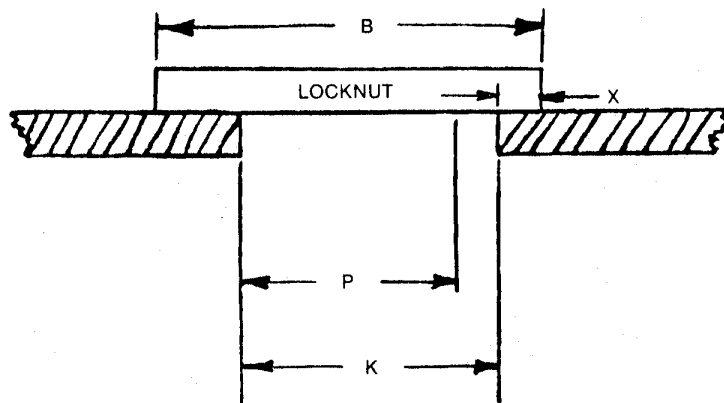
(ILLUSTRATION IS NOT A DESIGN DETAIL)

**Fig. 71-1  
METALLIC BUSHING**



(ILLUSTRATION IS NOT A DESIGN DETAIL)

**Fig. 71-2  
NONMETALLIC BUSHING WITH LOCKNUT  
INSIDE OF ENCLOSURE**



(ILLUSTRATION IS NOT A DESIGN DETAIL)

**Fig. 71-3  
MINIMUM OVERLAP OVER  
NOMINAL KNOCKOUT**