

Capacity of Steel Boxes and Covers

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies. Boxes and conduit bodies shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be as calculated in 314.16(C).

The provisions of this section shall not apply to terminal housings supplied with motors.

FPN: For volume requirements of motor terminal housings, see 430.12.

Boxes and conduit bodies enclosing conductors 4 AWG or larger shall also comply with the provisions of 314.28.

(A) Box Volume Calculations. The volume of a wiring enclosure (box) shall be the total volume of the assembled sections and, where used, the space provided by plaster rings, domed covers, extension rings, and so forth, that are marked with their volume or are made from boxes the dimensions of which are listed in Table 314.16(A).

(1) Standard Boxes. The volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A).

(2) Other Boxes. Boxes 1650 cm³ (100 in.³) or less, other than those described in Table 314.16(A), and Nonmetallic boxes shall be durably and legibly marked by the manufacturer with their volume. Boxes described in Table 314.16(A) that have a volume larger than is designated in the table shall be permitted to have their volume marked as required by this section.

Table 314.16(A) Metal Boxes

| Box Trade Size | | | Minimum Volume | | Maximum Number of Conductors* | | | | | | | |
|-----------------|-----------------------------|------------------|-----------------|------------------|-------------------------------|----|----|----|----|----|---|--|
| mm | in. | | cm ³ | in. ³ | 18 | 16 | 14 | 12 | 10 | 8 | 6 | |
| 100x32 | (4x1¼) | round/octagon | 205 | 12.5 | 8 | 7 | 6 | 5 | 5 | 5 | 2 | |
| 100x38 | (4x1½) | round/octagon | 254 | 15.5 | 10 | 8 | 7 | 6 | 6 | 5 | 3 | |
| 100x54 | (4x2) | round/octagon | 353 | 21.5 | 14 | 12 | 10 | 9 | 8 | 7 | 4 | |
| 100x32 | (4x1¼) | square | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | |
| 100x38 | (4x1½) | square | 344 | 21.0 | 14 | 12 | 10 | 9 | 8 | 7 | 4 | |
| 100x54 | (4x2) | square | 497 | 30.3 | 20 | 17 | 15 | 13 | 12 | 10 | 6 | |
| 120x32 | (4x1¼) | square | 418 | 25.5 | 17 | 14 | 12 | 11 | 10 | 8 | 5 | |
| 120x38 | (4x1½) | square | 484 | 29.5 | 19 | 16 | 14 | 13 | 11 | 9 | 5 | |
| 120x54 | (4x2) | square | 689 | 42.0 | 28 | 24 | 21 | 18 | 16 | 14 | 8 | |
| 75x50x38 | (3x2x1½) | device | 123 | 7.5 | 5 | 4 | 3 | 3 | 3 | 2 | 1 | |
| 75x50x50 | (3x2x2) | device | 164 | 10.0 | 6 | 5 | 5 | 4 | 4 | 3 | 2 | |
| 75x50x57 | (3x2x2¼) | device | 172 | 10.5 | 7 | 6 | 5 | 4 | 4 | 3 | 2 | |
| 75x50x65 | (3x2x2½) | device | 205 | 12.5 | 8 | 7 | 6 | 5 | 5 | 4 | 2 | |
| 75x50x70 | (3x2x2¾) | device | 230 | 14.0 | 9 | 8 | 7 | 6 | 5 | 4 | 2 | |
| 75x50x90 | (3x2x3½) | device | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | |
| 100x54x38 | (4x2x1½) | device | 169 | 10.3 | 6 | 5 | 5 | 4 | 4 | 3 | 2 | |
| 100x54x48 | (4x2x1) | device | 213 | 13.0 | 8 | 7 | 6 | 5 | 5 | 4 | 2 | |
| 100x54x54 | (4x2x2) | device | 238 | 14.5 | 9 | 8 | 7 | 6 | 5 | 4 | 2 | |
| 95x50x65 | (3¾x2x2½) | masonry box/gang | 230 | 14.0 | 9 | 8 | 7 | 6 | 5 | 4 | 2 | |
| 95x50x90 | (3¾x2x3½) | masonry box/gang | 344 | 21.0 | 14 | 12 | 10 | 9 | 8 | 7 | 4 | |
| min. 44.5 depth | FS - single cover/gang (1¾) | | 221 | 13.5 | 9 | 7 | 6 | 6 | 5 | 4 | 2 | |
| min. 60.3 depth | FD - single cover/gang (2) | | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | |
| min. 44.5 depth | FS - multi. cover/gang (1¾) | | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | |
| min. 60.3 depth | FD - multi. cover/gang (2) | | 395 | 24.0 | 16 | 13 | 12 | 10 | 9 | 8 | 4 | |

*Where no volume allowances are required by 314.16(B)(2) through (B)(5).
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(B) Box Fill Calculations. The volumes in paragraphs 314.16(B)(1) through (B)(5), as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings.

(1) Conductor Fill. Each conductor that originates outside the box and terminates or is spliced within the box shall be counted once, and each conductor that passes through the box without splice or termination shall be counted once. A looped, unbroken conductor not less than twice the minimum length required for free conductors in 300.14 shall be counted twice. The conductor fill shall be calculated using Table 314.16(B). A conductor, no part of which leaves the box, shall not be counted.

Exception: An equipment grounding conductor or conductors not over four fixture wires smaller than 14 AWG, or both, shall be permitted to be omitted from the calculations where they enter a box from a domed luminaire (fixture) or similar canopy and terminate within that box.

(2) Clamp Fill. Where one or more internal cable clamps, whether factory or field supplied, are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest conductor present in the box. No allowance shall be required for a cable connector with its clamping mechanism outside the box.

(3) Support Fittings Fill. Where one or more luminaire (fixture) studs or hickey are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made for each type of fitting based on the largest conductor present in the box.

(4) Device or Equipment Fill. For each yoke or strap containing one or more devices or equipment, a double volume allowance in accordance with Table 314.16(B) shall be made for each yoke or strap based on the largest conductor connected to a device(s) or equipment supported by that yoke or strap.

Table 314.16(B) Volume Allowance Required per Conductor

| Size of Conductor (AWG) | Free Space Within Box for Each Conductor | |
|-------------------------|--|------------------|
| | cm ³ | in. ³ |
| 18 | 24.6 | 1.50 |
| 16 | 28.7 | 1.75 |
| 14 | 32.8 | 2.00 |
| 12 | 36.9 | 2.25 |
| 10 | 41.0 | 2.50 |
| 8 | 49.2 | 3.00 |
| 6 | 81.9 | 5.00 |

(5) Equipment Grounding Conductor Fill. Where one or more equipment grounding conductors or equipment bonding jumpers enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor or equipment bonding jumper present in the box. Where an additional set of equipment grounding conductors, as permitted by 250.146(D), is present in the box, an additional volume allowance shall be made based on the largest equipment grounding conductor in the additional set.

406.8 Receptacles in Damp or Wet Locations.

(B) Wet Locations.

(1) 15- and 20-Ampere Receptacles in a Wet Location. 15- and 20-Ampere, 125- and 250-Volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

(2) Other Receptacles. All other receptacles installed in a wet location shall comply with (B)(2)(a) or (B)(2)(b).

(a) A receptacle installed in a wet location, where the product intended to be plugged into it is not attended while in use, shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.

(b) A receptacle installed in a wet location where the product intended to be plugged into it will be attended while in use (e.g., portable tools) shall have an enclosure that is weatherproof when the attachment plug is removed.

Outlet and Switch Boxes

Material, Finish, Knockouts, Fire-Rated Assemblies, Compliances, Groundskeeper Raised Ground Boss

UL Standard: 514A, 514B, 514D
UL Listed: E2527
NEMA: FB-1, OS-1

Material/Finish

- AISI/SAE 1008
- Pre-galvanized G60, 0.60 oz/sq ft
- Thickness: 0.0625" minimum

Concentric and Eccentric Knockouts

- Boxes with concentric or eccentric knockouts are suitable for bonding without any additional bonding means where used in circuits above or below 250 V. Unless otherwise noted all concentric or eccentric knockouts are 1/2" – 3/4" combinations.

Use in Fire-Rated Assemblies

- Single and double gang metallic outlet and switch boxes are acceptable for use in two-hour fire rated walls. For additional information refer to the UL guide card information for metallic outlet boxes, QCIT.

Groundskeeper Raised Ground Boss



- Groundskeeper raised ground feature on boss inside box provides one or two #10-32 tapped hole, allowing a 3/8" long green ground screw to be threaded into box without contacting mounting surface. Other boxes provided with flat ground tapped hole, except Plenum Boxes.

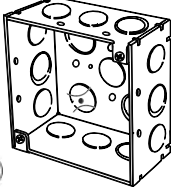

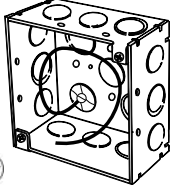

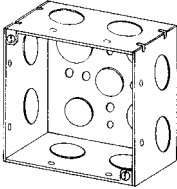
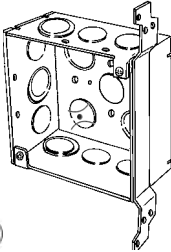

Compliances and Certifications

- UL Standard: 514A, 514B, 514D
- UL Listed: E2527
- NEMA: FB-1, OS-1

4" Square Boxes – 2-1/8" Deep

With Knockouts

UL Standard: 514A
UL Listed: E2527
NEMA: OS-1

| | Catalog Number (Universal No.) | Depth (inches) | Wiring Cubic Inch Capacity | Knockout Description | | | Wt. Lbs./Kgs. Per 100 | |
|---|-----------------------------------|---------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-----------------|
| | | | | Sides | Ends | Bottom | | |
|   2-1/8" Deep, Welded | 4SD-EK | 2-1/8 | 30.3 | (8) 1/2" (4) Eccentric KO | — | (2) 1/2" (2) Eccentric KO | 82.0/ 37.19 | |
| | 4SD-EKRD * | Red Box Option | 2-1/8 | 30.3 | (8) 1/2" (4) Eccentric KO | — | (2) 1/2" (2) Eccentric KO | 82.0/ 37.19 |
|   2-1/8" Deep, Welded | 4SD-EKP † | With Green Ground Wire | 2-1/8 | 30.3 | (8) 1/2" (4) Eccentric KO | — | (2) 1/2" (2) Eccentric KO | 82.0/ 37.19 |
| | 4SD-3/4 (52171-3/4) | | 2-1/8 | 30.3 | (8) 3/4" | — | (3) 1/2" (2) 3/4" | 84.0/ 38.10 |
|  2-1/8" Deep, Welded | 4SD-1 (52171-1) | | 2-1/8 | 30.3 | (8) 1" | — | (3) 1/2" (2) 3/4" | 84.0/ 38.10 |
| | 4SDVB-EK-PL | | 2-1/8 | 30.3 | (6) 1/2" (3) Eccentric KO | — | (2) 1/2" (2) Eccentric KO | 104.0/ 47.17 |
|   2-1/8" Deep, Welded; Plain vertical bracket; Set flush with front of box | 4SDVB-EK-PLRD * | Red Box Option | 2-1/8 | 30.3 | (6) 1/2" (3) Eccentric KO | — | (2) 1/2" (2) Eccentric KO | 104.0/ 47.17 |

* For fire alarm circuits. Red powder coat finish.

† Provided with green ground screw and 10" long No. 12 AWG solid, insulated green ground wire.