Ac cable size calculation formula pdf

The links below show tables of current transport capacity and voltage drops related to Doncaster Cables products. Below these links you will find our cable calculator. Instructions below:-1. Choose your supply type (Single Phase 230V / Third Phase 400V)2. Choose the required voltage drop3. Insert power into watts or current into amperes that you require your cable to charge4. Enter the length of the run5 cable. Choose the installation method of how the cable will be installed6. The calculation and cable sizes will be calculated. Our calculator now lists different types of cable, so when scrolling down the list, you can see how different types of cables can have different sizes for the same set of parameters. Choose a cable suitable for your installation. Cable Size Calculator Cable Size Calculator Recommended cable sizes are based on user-provided information and are intended as a guide only. The calculation is derived from the BS7671 Requirements for Electrical Installation, IEE Wiring Regulations, and is based on the voltage drop selected at 230 and 400 volts. In order for us to provide this information as a guide, certain assumptions will be made, it remains the user's responsibility to ensure that all data and assumptions are correct and that any cable used is suitable for its purpose. The current transport capacity tables for flexible cables in BS7671 do not include options for different installation methods, the results have been included for flexible cables for the full range of installation methods. It remains the user's responsibility to check where the flexible cables are suitable. We combine flexible cables in one result for the use of our calculator (to make it more user friendly) see BS7671 for individual tables and any relevant correction factors etc Doncaster cables do not accept any responsibility for any use made of the proposed cable size 80KW electrical charge, Distance between source and load is 200 meters, system voltage 415V three phase, power factor is 0.8, voltage drop allowed is 5%, demand factor is 1. The cable is directed buried in the ground in trench at the depth of 1 meter. The soil temperature is approximately 35 Deg. The number of cables per trench is 1. The number of cable runs is 1 run. An example of how to calculate voltage drop and electric cable size (photo credit: 12voltplanet.co.uk)The thermal resistivity of the soil is not known. The nature of the soil is moist soil. Okay, let's dive into the calculations... Consumed Load = Total Load · Demand Factor: Load consumed in KW = 80 · 1 = 80 KWConsumed Load in KVA = KW/P.F.: Load consumed in KVA = 80/0.8 = 100 KVAFull Load Current = (KVA · 1000) / (1,732 · Voltage: Current total = (100 · 1000) / (1,732 · 415) = 139 Amp.Calculation cable correction factor from the following data:Temperature correction factor (K1) (K1) Cable is in the AirTemperature Correction Factor in Air: K1Ambient TemperatureInsulationPVCXLPE/EPR101.221.15151.171.12201.121.08251.061.04350.940.96400.870.91450.790.87500.710.82550.610.76600.50.716500.657000.587500.58000.41 Ground Temperature Correction Factor (K2)Ground Temperature Correction Factor: K2Ground TemperatureInsulationPVCXLPE/EPR101.11.07151.051.04200.950.96250.890.93350.770.89400.710.85450.630.8500.550.76550.450.716000.656500.67000.537500.468000.38 Thermal Resistance Correction Factor (K4) for Soil (When Thermal Resistance of Soil is known)Soil Thermal Resistivity: 2.5 KM/WResistivityK311.181.51.121.052.5130.96 Soil Correction Factor (K4) of Soil (When Thermal Resistance of Soil is not known)Nature of SoilK3Very Wet Soil1.21Wet Soil1.13Damp Soil1.05Dry Soil1Very Dry Soil0.86 Cable Depth Correction Factor (K5)Laying Depth (Meter)Rating Factor0.51.10.71.050.91.01111.20.981.50.96 Cable Distance correction Factor (K6)No of CircuitNilCable diameter0.125m0.25m0.5m11111120.750.80.850.90.930.650.70.750.80.8540.60.60.70.750.850.550.550.650.70.860.50.550.60.70.8 Cable Grouping Factor (No of Tray Factor) (K7)No of Cable/Tray1234681111111120.840.80.780.770.760.7530.80.760.740.730.720.7140.780.740.720.710.70.6950.770.730.70.690.680.6760.750.710.70.680.680.6670.740.690.6750.660.660.6480.730.690.680.670.660.64 According to above detail correction factors:– Ground temperature correction factor (K2) = 0.89 – Soil correction factor (K4) = 1.05 – Cable depth correction factor (K5) = 1.0 – Cable distance correction factor (K6) = 1.0Total derating factor = k1 · K2 K3 K4 (2009) K5 (2009) K6 (2009) K7 - Total depreciation factor = 0.93 For the selection of suitable cables following the conditions must be satisfied:The cable depreciation amplifier must be greater than the full load current of the load. The cable voltage drop should be less than the drop. No voltage set. (full ≥ load current/cable depreciation current). The short circuit capacity of the cable must be greater than the short-circuit capacity of the system at that time. Cable Selection - Case #1Let selects 3.5-core 70-Sq.mm for single execution. The current capacity of 70 Sq.mm cable is: 170 Amp, Resistance = 0.57 Ω/Km and Reactance = 0.077 mho/KmTotal current desertion of 70 Sq.mm = 170 · 0.93 = 159 Amp.Voltage Drop of Cable = (1,732 · Current · (RcosØ + jsinØ) · Cable length · 100) / (Line voltage · It's not race · 1000) = (1,732 · 139 · (0.57 · 0.8 + 0.077 · 0.6) · 200 · 100) / (415 · 1 · 1 · 1000) = 5.8% Cable voltage drop = 5.8% Cable selection – #2Let box selects 3.5 core 95 Sq.mm cable for single running, short circuit capacity = 8.2 KA. The current capacity of 95 Sq.mm cable is 200 Amp, Resistance = 0.41 Ω/Km and Reactance = 0.074 mho/kmTotal degradation current of 70 Sq.mm Cable = 200 · 0.93 = 187 drop of cape (1,732 x 139 (0.41 s 0.8 + 0.074 s 0.6) 200 200 / (415 · 1 · 1 · 1000) = 2.2% Updated August 7, 2017 By Ryan Menezes Thicker cables offer less resistance to electrical flow. They offer more electrons to carry a charge and a greater number of paths through which electrons can travel. As a result, given the same voltage, a thicker cable carries more current. Choose the exact thickness of a cable to achieve a level of resistance. The other relevant factors are the length of the cable, which external needs usually dictate and the resistivity of the cable material. Divide the voltage that flows through the cable by the destination current. If, for example, 120 volts act on the cable, and you want 30 amperes to pass through it: 120 / 30 = 4. This is your target resistance, measured in ohms. Multiply the length of the cable by the resistivity of your material. Copper, for example, has a resistivity of 1.724 x 10^-8 ohm meters at room temperature. If the cable should measure 30,000 meters long: 30,000 x 1,724 x 10^-8 = 0.0005172 ohm m². Divide the response by target resistance: 0.0005172 / 4 = 0.0001293. This is the required cross-sectional area of the cable. Divide the cable area by pi: (0.0001293) / 3.142 = 4.1152 x 10^-5. Find the square root of this answer: (4.1152 x 10^-5) ^ 0.5 = 0.006415. This is the cable radius, measured in meters. Multiply your response by 39.37 to convert it to inches: 0.006415 x 39.37 = 0.2526. Multiply the response by 2: 0.2526 x 2 = 0.5052 inches. This is the required thickness of the cable. It corresponds approximately with the standard 16 gauge cable. About Author Ryan Menezes is a professional writer and blogger. He holds a bachelor's degree in journalism from Boston University and has written for the American Civil Liberties Union, the marketing company InSegment, and the project management service Assembla. He is also a member of Mensa and the American Parliamentary Debate Association. This site uses cookies. Cookies are small text files stored on your device that allow data states to be tracked as you navigate around a website. They are essential for features such as shopping baskets, user logins, preferences, pages or newly viewed items, or pre-filled form elements. Clicking Accept Cookies or continuing to browse the Cleveland Cable Company website will consent to our use of cookies. You, of course, can deny this use of cookies. If you do, the Cleveland Cable Fast Quote Basket won't work. To deny the use of cookies, set your browser accordingly. If you want more details, please see our cookie policy. The Eland Cables cable calculator can help you determine the most suitable cable size for your installation against British and IEC standards. the sections below to calculate your results. Results for british standard cable are calculated from BS7671 (18th Edition) requirements for electric IEE Wiring Regulations and are based on the voltage drop of 230V and 415V. Covers low-voltage shielded AWA and SWA cables, insulated cables including twin & earth and 6491X, and insulated and bay cables in PVC and LSZH, such as h07ZZ-F and SY cable. The results of the cable size for international standard cable are calculated from IEC 60364-5-52: Low voltage electrical installations, selection and reaction of electrical equipment – Wiring systems and are based on voltage drop of 230V and 415V. You can click on FastQuote, our online quotation tool, to select a cable that meets the size and specification requirements. For further assistance in sizing or selecting the most suitable cable, or where no results are calculated for your application, please contact our cable specialists at +44 20 7241 8500 or technical@elandcables.com. We know that all conductors and cables (except super conductor) have some amount of resistance. This resistance is directly proportional to the length and inversely proportional to the diameter of the conductor, i.e. R ∝ L/a ... [Resistance laws R = ρ (L/a)] Whenever the current flows through a conductor, a voltage drop occurs in that conductor. Generally, the voltage drop can neglect the small length of the conductors, but in the case of a lower diameter and long-length conductors, we have to take into account the considerable voltage drops for proper wiring installation and future load management. According to IEEE rule B-23, at any time between the power terminal and the installation, the voltage drop should not increase above 2.5% of the supplied voltage (supply). Example: if the supply voltage is 220V AC, then the value of the permitted voltage drop should be; Voltage drop allowed = 220 x (2.5/100) = electrical wiring circuits of 5.5VIn, voltage dropouts also occur from the distribution plate to the subsum and subsu final circuits, but for sub circuits and final subcircuits, the value of the voltage drop should be half of the permitted voltage drops (i.e. 2.75V of 5.5V as calculated above)Normally, the voltage drop in the tables is described in Ampere per meter (A/m) for example, what would be the voltage drop on a one meter cable that carries an ampere current? There are two methods to set the voltage drop on a cable that we will disarm below. In SI (International system and metric system) the voltage drop is described by ampere per meter (A/m). In FPS (pound standing system) the voltage drop is described in length based which is 30 meters. Update: You can now also use the following electrical calculators to find the voltage drop and wire size in the American wire meter system. Below are the important tables that you should follow to the proper size of the cable for electrical wiring installation. Click on the image to enlarge Click image to enlarge Click image to enlarge Click image to enlarge Click image to enlarge To find voltage drop on a cable, follow the steps taken below. First, find the maximum voltage drop allowedNow find load currentNow, according to the load current, select a suitable cable (which current rating should be closest to the calculated load current) from table 1 of Table 1, find the voltage drop on the meter or 100 feet (which system you prefer) according to your rated current (Stay cool :) we will follow the methods and system to find voltage drops (in meter and 100 feet) in our solved example for all electrical installation wiring). Now calculate the voltage drop to the actual length of the wiring circuit according to its rated current with the help of following formulas. (Actual circuit length x volt drop by 1m) /100 —> to find volt drop per meter. (Actual circuit length x volt drop to 100 feet) /100 — > find volt drop at 100 feet. Now multiply this calculated value of drop volts by load factor where; Load factor = Load current to be taken by the cable/ Rated cable current given in the table. This is the value of the Volt fall on the cables when the charge current flows through it. If the calculated value of voltage drop is less than the value calculated in step (1) (Maximum voltage drop allowed), than the selected cable size is adequate If the calculated value of voltage drop is greater than the calculated value in step (1) (Maximum voltage drop allowed), than calculating voltage drop for the next cable (larger in size) and so on until the calculated value of the voltage drop becomes less than the maximum allowed voltage drop calculated in step (1). Related Posts: For a certain load, the cable size can be found with the help of different tables, but we must keep in mind and follow the rules on voltage drop. Determining the cable size for a given load, take into account the following rules. For a given load, except for the known current value, there must be 20% extra current scope for additional, future or emergency needs. From the power meter to the distribution plate, the voltage drop should be 1.25% and for the final subsusion, the voltage drop should not exceed 2.5% of the supply voltage. Consider the temperature change, when necessary, use the temperature factor (Table 3)Also, consider the load factor when finding the cable size When determining the cable size, consider the wiring system, i.e. in open wiring system, the temperature would be low, but in conduit wiring, the temperature increases due to the absence of air. Related posts: The following are examples of determining the appropriate size of cables for electrical wiring installation that will facilitate understanding of the method of how to determine the size cable for a given charge. For installation of electrical wiring in a building, the total charge is 4.5kW and the total length of the power meter cable for the subcircuit distribution board is 35 feet. The power voltages are 220V and the temperature is 40°C (104°F). Find the most suitable size of the meter for subcircuit if the wiring is installed in conduits. Solution:-Total Load = 4.5kW = 4.5 x1000W = 4500W20% additional load = 4500 x (20/100) = 900WTotal Load = 4 500W + 900W = 5400WTotal Current = I = P/V = 5400W /220V =24.5ANow select the size of cable for load current of 24.5 Now check the selected (7/0.036) cable with temperature factor in Table 3, so the temperature factor is 0.94 (in table 3) at 40°C (104°F) and current carrying capacity of (7/0.036) is 28A, therefore, current carrying capacity of this cable at 40°C (104°F) would be; Current rating for 40°C (104°F) = 28 x 0.94 = 26.32 Amp., since the calculated value (26.32 Amp) at 40°C (104°F) is lower than that of the current cable carrying capacity (7/0.036) which is 28A, so this cable size (7/0.036) is also suitable for temperature. Now find the voltage drop to 100 feet for this (7/0.036) table 4 cable which is 7V, but in our case, the cable length is 35 feet. Therefore, the voltage drop for 35-foot cable would be; Actual voltage drop to 35 feet = (7 x 35/100) x (24.5/28) = 2.1VE Voltage drop allowed = (2.5 x 220)/100 = 5.5VHere The actual voltage drop (2.1V) is less than the maximum allowed voltage drop of 5.5V. Therefore, the appropriate and most suitable cable size is (7/0.036) for that given load for Electrical Wiring Installation.What type and size of cable suits for given situationLoad = 5.8kWVolts = 230V AVLength of Circuit = 35 meterTemperature = 35°C (95°F) Solution:-Load = 5.8kW = 5800WVoltage = 230VCurrent = I = P/V = 5800 / 230 = 25.2A20% additional load current = (20/100) x 5.2A = 5ATotal Load Current = 25.2A + 5A = 30.2ANow select the size of cable for load current of 30.2A (from Table 1) which is 7/1.04 (31 Amperes) it means we can use 7/0.036 cable according table 1.Now check the selected (7/1.04) cable with temperature factor in Table 3, so the temperature factor is 0.97 (in table 3) at 35°C (95°F) and current carrying capacity of (7/1.04) is 31A , therefore, the current carrying capacity of this cable at 40°C (104°F) would be; Current rating for 35°C (95°F) = 31 x 0.97 = 30 Amp., since the calculated value (30 Amp) at 35°C (95°F) is lower than that of the current cable carrying capacity (7/1.04), which is 31A, so this cable size (7/1.04) is also suitable for temperature. Now find the voltage drop per extension meter for this cable (7/1.04) of (Table 5) which is 7mV, but in our case, the cable length is 35 meters. Therefore, the voltage drop for cable of 35 meters would be: Actual voltage drop to 35meters = mV x I x L (7/1000) x 30×35 = 7.6V And voltage allowed drop = (2.5 x 230)/100 = 5.75VHere the actual drop in voltage (7.35V) is greater than that of the maximum drop allowed of 5.75V. So this not suitable cable size for this given load. So let's select the next selected cable size (7/1.04) which is 7/1.35 and find the voltage drop again. According to Table (5) the current classification of 7/1.35 is 40Amperes and the voltage drop per amperage meter is 4.1 mV (see table (5)). Therefore, the actual voltage drop for cable of 35 meters would be; Actual voltage drop to 35 meters = mV x I x L (4.1/1000) x 40×35 = 7.35V = 5.74VThis drop is less than the maximum allowable voltage drop. Therefore, this is the cable or the most appropriate and suitable wire size. Following loads are connected in a building:-Sub-Circuit 12 lamps each the 1000W and 4 fans each of 80W2 TV each of 120WSub-Circuit 26 Lamps each of 80W and5 soques each of 100W4 lamps each of the 800WIf supply voltages are 230 V AC, then calculate the circuit current and cable size for each Sub-Circuit? Solution:-Total Sub-Circuit Load 1= (2 x 1000) + (4 x 80) + (2×120)= 2000W + 320W + 240W = 2560WCurrent for Sub-Circuit 1 = I = P/V = 2560/23 11.1A Total Sub-Circuit Load 2= (6 x 80) + (5 x 100) + (4 x 800) = 480W + 500W + 3200W= 4180WCurrent for Sub-Circuit 2 = I = P/V = 4 1 80/230 = 18.1A Therefore, suggested cable for subsaluto 1 = 3/029 (13 Amp) or 1/1.38 mm (13 Amp)Suggested cable for Sub-Circuit 2 = 7/029 (21 Amp) or 7/0.0 Total current 85 mm (24 Amp)Total drawn by both Sub-Circuits = 11.1A + 18.1A = 29.27 ASo Cable suggested for Main Circuit = 7/044 (34 Amp) or 7/1.04 mm (31 Amp)A 10H. P (7.46kW) three-stage continuous classification squirrel cage induction motor using the Star-Delta starter is connected by providing 400V by three single core PVC cables run on conduit from 250 feet (76.2m) away from the fuse plate of multi-way distribution. Its total load current is 19A. The average summer temperature in electrical installation wiring is 35°C (95°F). Calculate the size of the cable for engine? Solution:-Motor load = 10H. P = 10 x 746 = 7460W *(1H. P = 746W)Power voltage = 400V (3-Phase)Cable length = 250 feet (76.2m)Total engine load current = 19ATemperature factor to 35°C (95°F) = 0.2 97 (From Table 3)Now select the cable size for 19A full load motor current (from Table 4) which is 7/0.36 (23 Amperes) *(Remember that this is a 3-phase system, i.e. 3-core cable) and the voltage drop is 5.3V to 100 Feet. It means we can use 7/0.036 cable according to table (4). Now check the selected cable (7/0.036) with temperature factor in the table (3), so that the temperature factor is 0.97 (in table 3) at 35°C (95°F) and the current carrying capacity of (7/0.036) is 23 Amperes, so the current carrying capacity of this cable at 40°C (104°F) current to 40°C (104°F) = 23 x 0.97 = 22.31 Amp.Since the calculated value (22.3 Amp) at 35°C (95°F) is less than that of the current cable carrying capacity (7/0.036), which is 23A, so this cable size (7/0.036) is also suitable for cable factor = 19/23 = 0.826Agotfind the voltage drop to 100 feet for this (7/0.036) table cable (4) which is 5.3V, but in our case, the cable length is 250 feet. Therefore, the voltage drop for 250-foot cable would be; Actual voltage drop to 250 péset = (5.3 x 250/100) x 0.826 = 10.94V And maximum voltage drop allowed = (0.826 = 10.94VE maximum voltage drop allowed = (0.826 = 10.94VE maximum voltage drop allowed = (0.826 = 1 0.94VE maximum voltage drop allowed = (0.826 = 10.94VE maximum voltage drop allowed = (0.826 = 10.9 2.5/100) x 400V= 10VHere, the actual voltage drop (10.94V) is greater than that of the maximum permitted voltage drop of 10V. Therefore, this is not the proper cable size for that given load. So let's select the next selected cable size (7/0.036) which is 7/0.044 and find the voltage drop again. According to Table (4) the current classification of 7/0.044 is 28 Amperes and the volt fall by 100 feet is 4.1V (see Table 4). Therefore, the actual voltage drop for 250-foot cable would be; Actual voltage drop to 250 feet = = Volt drop by 100 feet x cable length x load factor (4.1/100) x 250 x 0.826 = 0.826 = 0.826 = 0.822 6 = 0.826 = 0.826 = 0 8.46V And maximum voltage drop allowed = (2.5/100) x 400V= 10VA actual voltage drop is less than that of maximum allowed voltage drop. Therefore, this is the most suitable and suitable size of the cable for the installation of electrical wiring of certain situation. Related posts: Posts: