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ITC-BT-19 INTERIOR OR RECEIVING INSTALLATIONS. GENERAL PRESCRIPTIONS

1. FIELD OF APPLICATION

The prescriptions contained in this Instruction extend to indoor installations within the scope of article 2 and with voltage assigned within the voltage margins set in article 4 of the Electrotechnical Regulation for Low Voltage.

2. GENERAL PRESCRIPTIONS

2.1 General rule

The determination of the characteristics of the installation must be carried out in accordance with the provisions of Standard UNE 20.460-3.

2.2 Active drivers

2.2.1 Nature of conductors

The conductors and cables used in the installations will be made of copper or aluminum and will always be insulated, except when they are mounted on insulators, as indicated in ITC-BT 20.

2.2.2 Conductors section. Voltage drops

The section of the conductors to be used will be determined in such a way that the voltage drop between the origin of the indoor installation and any point of use is, except as prescribed in the Particular Instructions, less than 3% of the nominal voltage for any indoor circuit. of homes, and for other interior or reception facilities, 3% for lighting and 5% for other uses. This voltage drop will be calculated considering all utilization devices capable of operating simultaneously being powered. The value of the voltage drop may be offset between that of the indoor installation and that of the individual derivations, so that the total voltage drop is less than the sum of the limit values specified for both, depending on the type of scheme used.

For industrial installations that are supplied directly in high voltage by means of their own distribution transformer, it will be considered that the low voltage indoor installation has its origin in the output of the transformer. In this case, the maximum admissible voltage drops will be 4.5% for lighting and 6.5% for other uses.

The number of devices capable of operating simultaneously will be determined in each particular case, in accordance with the indications included in the instructions of this regulation and, failing that, with the indications provided by the user considering a rational use of the devices.

In indoor installations, to take into account harmonic currents due to non-linear loads and possible unbalances, unless justified by calculation, the section of the neutral conductor will be at least equal to that of the phases.

2.2.3 Maximum allowable currents

The maximum admissible intensities will be governed in their entirety by the provisions of the UNE 20.460-5-523 Standard and its National Annex.

The following table shows the admissible currents for an ambient air temperature of 40 ºC and for different installation methods, bundles and types of cables. For other temperatures, installation methods, groupings and types of cable, as well as for buried conductors, consult the UNE 20.460-5-523 Standard

Table 1. Admissible intensities (A) in air 40 ºC. No. of charged conductors and nature of insulation

A		Conductores aislados en tubos empotrados en paredes aislantes		3x PVC	2x PVC		3x XLPE o EPR	2x XLPE o EPR					
A2		Cables multiconductores en tubos empotrados en paredes aislantes	3x PVC	2x PVC		3x XLPE o EPR	2x XLPE o EPR						
B		Conductores aislados en tubos[2] en montaje superficial o empotrados en obra				3x PVC	2x PVC			3x XLPE o EPR	2x XLPE o EPR		
B2		Cables multiconductores en tubos[2] en montaje superficial o emprotrados en obra			3x PVC	2x PVC		3x XLPE o EPR		2x XLPE o EPR			
C		Cables multiconductores directamente sobre la pared[3]					3x PVC	2x PVC		3x XLPE o EPR	2x XLPE o EPR		
E		Cables multiconductores al aire libre[4] Distancia a la pared no inferior a 0.3D[5]						3x PVC		2x PVC	3x XLPE o EPR	2x XLPE o EPR	
F		Cables unipolares en contacto mutuo[4] Distancia a la pared no inferior a D[5]							3x PVC			3x XLPE o EPR[1]	
G		Cables unipolares separados mínimo D[5]									3x PVC[1]		3x XLPE o EPR
		mm²	1	2	3	4	5	6	7	8	9	10	11
		1,5	11	11,5	13	13,5	15	16	-	18	21	24	-
		2,5	15	16	17,5	18,5	21	22	-	25	29	33	-
		4	20	21	23	24	27	30	-	34	38	45	-
		6	25	27	30	32	36	37	-	44	49	57	-
		10	34	37	40	44	50	52	-	60	68	76	-
		16	45	49	54	59	66	70	-	80	91	105	-
	Cobre	25	59	64	70	77	84	88	96	106	116	123	166
		35		77	86	96	104	110	119	131	144	154	206
		50		94	103	117	125	133	145	159	175	188	250
		70				149	160	171	188	202	224	244	321
		95				180	194	207	230	245	271	296	391
		120				208	225	240	267	284	314	348	455
		150				236	260	278	310	338	363	404	525
		185				268	297	317	354	386	415	464	601
		240				315	350	374	419	455	490	552	711
		300				360	404	423	484	524	565	640	821

1) A partir de 25 mm² de sección.
2) Incluyendo canales para instalaciones -canaletas- y conductos de sección no circular.
3) O en bandeja no perforada.
4) O en bandeja perforada.
5) D es el diámetro del cable.

2.2.4 Identification of conductors

The conductors of the installation must be easily identifiable, especially with regard to the neutral conductor and the protective conductor. This identification will be made by the colors that present their isolates. When there is a neutral conductor in the installation or its subsequent transition to a neutral conductor is foreseen for a phase conductor, these will be identified by the light blue color. The protective conductor will be identified by the green-yellow color. All phase conductors, or where appropriate, those for which their subsequent transition to neutral is not foreseen, will be identified by the colors brown or black.

When it is considered necessary to identify three different phases, the color gray will also be used**.**

2.3 Protective conductors

The provisions of Standard UNE 20.460-5-54 in its section 543 will be applied. As an example, for protection conductors that are made of the same metal as the phase or polar conductors, they will have a minimum section equal to that set in Table 2, depending on the section of the phase or polar conductors of the installation; in case they are made of different material, the section will be determined so that it presents a conductivity equivalent to that resulting from applying table 2.

Table 2

Secciones de los conductores de fase o polares de la instalación (mm^2)	Secciones mínimas de los conductores de protección (mm^2)
S ≤ 16 16< S ≤ 35 S > 35	S (*) 16 S/2
(*) Con un mínimo de: 2,5 mm^2 si los conductores de protección no forman parte de la canalización de alimentación y tienen una protección mecánica 4 mm^2 si los conductores de protección no forman parte de la canalización de alimentación y no tienen una protección mecánica	

For other conditions, the UNE 20.460-5-54 standard, section 543, will be applied.

When installing the protective conductors, the following will be taken into account:

- If different protection systems are applied in nearby installations, a different protective conductor will be used for each of the systems. The systems to be used will be in accordance with those indicated in the UNE 20.460-3 standard. In the passages through walls or ceilings, they will be protected by a tube of adequate mechanical resistance, according to ITC-BT 21 for embedded pipes.
- A common protective conductor shall not be used for installations with different nominal voltages.
- If the active conductors go inside a common enclosure, it is recommended to also include the protective conductor within it, in which case it will present the same insulation as the other conductors. When the protective conductor is installed outside this channel, it will follow its course.
- In a moving pipeline, all conductors, including the protective conductor, will go through the same pipeline
- In the case of pipes that include conductors with mineral insulation, the outer covering of these conductors may be used as a protective conductor for the corresponding circuits, provided that their continuity is perfectly ensured and their conductivity is at least equal to that resulting from the application of Standard UNE 20.460-5-54, section 543.

- When the conduits are made up of insulated conductors placed under tubes of ferromagnetic material, or by cables that contain a metallic armor, the protection conductors will be placed in the same tubes or will form part of the same cables as the active conductors.
- The protective conductors will be suitably protected against mechanical and chemical deterioration, especially in the passages through the elements of the construction.
- The connections in these conductors will be made by means of welded joints without the use of acid or by connection pieces that are tightened by thread, and must be accessible for verification and testing. These pieces will be made of stainless material and the clamping screws, if used, will be provided to prevent their loosening.

Devices that comply with the UNE-EN 60.998-2-1 standard are considered to comply with this prescription.

- The necessary precautions will be taken to avoid deterioration caused by electrochemical effects when the connections are between different metals (for example, cobrealuminum).

2.4 Subdivision of facilities

The facilities will be subdivided in such a way that the disturbances caused by breakdowns that may occur at one point in them affect only certain parts of the facility, for example a section of the building, a floor, a single room, etc. for which the protection devices of each circuit will be adequately coordinated and selective with the general protection devices that precede them.

Every installation will be divided into several circuits, according to needs, in order to:

- avoid unnecessary interruptions of the entire circuit and limit the consequences of a failure

- facilitate verifications, tests and maintenance

- avoid the risks that could result from the failure of a single circuit that could be divided, for example if there is only one lighting circuit.

2.5 Load balancing

In order to maintain the greatest possible balance in the load of the conductors that are part of an installation, it will be ensured that it is distributed among its phases or polar conductors.

2.6 Possibility of power separation

The following facilities may be disconnected from the power supply source:

a) Any installation whose origin is in a general power line

b) Any installation originating from a control or distribution panel.

The devices admitted for this disconnection, which will guarantee omnipolar separation except in the neutral of TN-C networks, are:

- Fusible circuit breakers

- The disconnectors

- Switches with contact separation greater than 3 mm or with equivalent safety level

- The connection terminals, only in the case of bypassing a circuit

The disconnection devices will be located and act at the same point of the installation, and when this condition is difficult to fulfill, explanatory instructions or notices will be posted. The devices must be accessible and arranged in such a way as to allow easy identification of the part of the installation that they separate.

2.7 Possibility of connecting and disconnecting under load

Appropriate devices will be installed to allow connection and disconnection of the load in a single operation, in:

a) Any interior installation or reception at its origin, main circuits and secondary panels. Circuits intended for clocks, rectifiers for telephone installations whose nominal power does not exceed 500 VA and command or control circuits may be exempted from this prescription, provided that their disconnection prevents them from fulfilling any important function for the safety of the installation. These circuits may be disconnected by means of independent devices from the general installation.

b) Any receiver

c) Any auxiliary circuit for command or control, except those destined to the pricing of energy

d) Any installation of lifting or transport devices, as a whole.

e) Any low voltage power circuit intended for a pipe installation high voltage discharge lights

f) Any installation of premises that presents a risk of fire or explosion.

g) Installations in the open

h) Circuits originating from distribution boards

i) Accumulator installations

j) Generator output circuits

The devices supported for connection and disconnection under load are:

- Manual switches.

- Manually operated fuses, or any other isolated system that allows these operations as long as they have adequate cutting and closing power independent of the operator.

- The plugs of the sockets with a nominal intensity not exceeding 16 A.

The following devices must be of omnipolar cut:

- Those located in the general and secondary tables of any interior or reception facility.

- Those intended for circuits except in TN-C distribution systems, in which cutting the neutral conductor is prohibited and except in TN-S in which it can be ensured that the neutral conductor is at ground potential.

- Those intended for receivers whose power is greater than 1,000 W, unless specific regulations admit non-omnipolar cutting.

- Those located in circuits that feed discharge lamps or autotransformers.

- Those located in circuits that feed high voltage discharge tube installations.

In all other cases, the devices may not be omnipolar cut.

The neutral or compensating conductor may not be interrupted except when the cut is established by omnipolar switches.

2.8 Protective measures against direct or indirect contact

The electrical installations shall be established in such a way that they do not pose a risk to people and pets both in normal service and when foreseeable breakdowns may occur.

In relation to these risks, the facilities must be designed and executed applying the necessary protection measures against direct and indirect contacts.

These protection measures are those indicated in Instruction ITC-BT-24 and must comply with the provisions of UNE 20.460, part 4-41 and part 4-47.

2.9 Insulation resistance and dielectric strength

Installations must have an insulation resistance at least equal to the values indicated in the following table:

Table 3

Tensión nominal de la instalación	Tensión de ensayo en corriente continua (v)	Resistencia de aislamiento (MΩ)
Muy Baja Tensión de Seguridad (MBTS) Muy Baja Tensión de protección (MBTP)	250	≥ 0,25
Inferior o igual a 500 V, excepto caso anterior	500	≥ 0,5
Superior a 500 V	1000	≥ 1,0
Nota: Para instalaciones a MBTS y MBTP, véase la ITC-BT-36		

This isolation is understood for an installation in which the length of the set of pipes and whatever the number of conductors that compose them does not exceed 100 meters. When this length exceeds the aforementioned value and the installation can be divided into parts of approximately 100 meters in length, either by sectioning, disconnection, removal of fuses or opening of switches, each of the parts in which the installation has been divided must present the corresponding insulation resistance.

When it is not possible to carry out the aforementioned fractioning, it is admitted that the value of the insulation resistance of the entire installation is, in relation to the minimum that corresponds to it, inversely proportional to the total length, in hectometers, of the pipes.

The insulation shall be measured in relation to ground and between conductors, by means of a direct current generator capable of supplying the test voltages specified in the table above with a current of 1 mA for a load equal to the minimum insulation resistance specified for each voltage. .

During the measurement, the conductors, including the neutral or compensating conductor, will be isolated from ground, as well as from the power supply source to which they are usually attached. If the masses of the receiving apparatus are connected to the neutral conductor, these connections will be suppressed during the measurement, and will be restored once the measurement is completed.

When the installation has circuits with electronic devices, in said circuits the phase conductors and the neutral will be linked together during the measurements.

The insulation measurement in relation to ground will be carried out by joining the positive pole of the generator to it and leaving, in principle, all the receivers connected and their controls in the "off" position, ensuring that there is no lack of electrical continuity in the part of the installation being verified; interrupting devices shall be placed in the "closed" position and circuit breakers installed as in normal service. All the conductors will be connected to each other including the neutral or compensating conductor, at the origin of the installation being verified and at this point the negative pole of the generator will be connected.

When the insulation resistance obtained is lower than the minimum value that corresponds to it, it will be accepted that the installation is nevertheless correct, if the following conditions are met:

- Each receiving device has an insulation resistance at least equal to the value indicated by the UNE Standard that concerns it or, failing that, 0.5 MΩ.
- Once the receiving devices are disconnected, the installation has the corresponding insulation resistance.

The measurement of the insulation resistance between polar conductors is carried out after having disconnected all the receivers, leaving the switches and circuit breakers in the same position as that indicated above for the measurement of the insulation in relation to ground. The measurement of the insulation resistance will be carried out successively between the conductors taken two by two, comprising the neutral or compensating conductor.

With regard to the dielectric strength of an installation, it must be such that once the utilization devices (receivers) are disconnected, it resists for 1 minute a voltage test of 2U + 1000 volts at industrial frequency, U being the maximum voltage of service expressed in volts and with a minimum of 1,500 volts. This test will be carried out for each of the conductors including the neutral or compensator, in relation to ground and between conductors, except for those materials in which it is justified that said test has been previously carried out by the manufacturer.

During this test the interrupting devices shall be placed in the "closed" position and the circuit breakers installed as in normal service. This test will not be carried out in installations corresponding to premises that present a risk of fire or explosion.

The leakage currents will not be higher for the whole installation or for each of the circuits into which it can be divided for the purposes of its protection, than the sensitivity of the differential switches installed as protection against indirect contacts.

2.10 Power outlet bases

The power socket bases used in the interior or reception facilities will be of the type indicated in figures C2a, C3a or ESB 25-5a of the UNE 20315 standard. The type indicated in figure C3a is reserved for installations in which it is required distinguish the phase from the neutral, or have a specific earth network.

In installations other than those indicated in the ITC-BT 25 for homes, the socket outlets indicated in the series of UNE EN 60309 standards will also be accepted.

The mobile bases must be of the type indicated in figures ESC 10-1a, C2a or C3a of the UNE 20315 Standard. The plugs used in the extension cords must be of the type indicated in figures ESC 10-1b, C2b, C4, C6 or ESB 25-5b.

The socket outlets of the type indicated in figures C1a, the fixed versions of figures ESB 10-5a and ESC 10-1a, as well as the plugs of figures ESB 10-5b and C1b, included in the UNE 20315 standard They can only be marketed and installed to replace existing ones.

2.11 Connections

In no case shall the union of conductors be allowed by means of connections and / or derivations by simple twisting or winding of the conductors between them, but must always be carried out using individually mounted connection terminals or by constituting connection blocks or strips; The use of connecting flanges may also be permitted. They must always be carried out inside junction and / or derivation boxes except in the cases indicated in section 3.1 of the ITC-BT-21. In the case of conductors of several wired wires, the connections will be made in such a way that the current is distributed through all the component wires and if the system adopted is a tightening screw between a metal washer under its head and a metal surface, the conductors with a section greater than 6 mm2 must be connected by means of suitable terminals, so that the connections are not subjected to mechanical stress.