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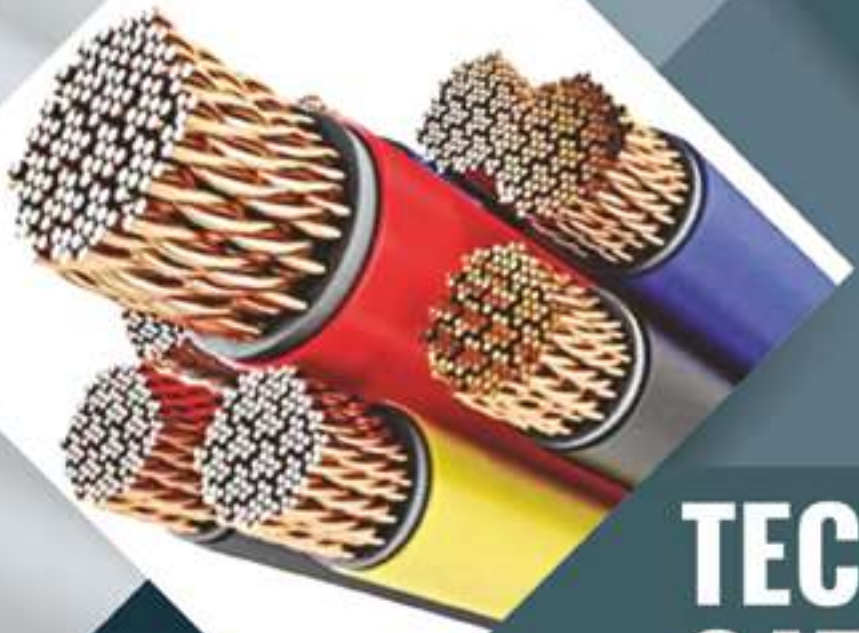
Conductores eléctricos

"Energy and service,
our mission"



TECHNICAL CATALOG

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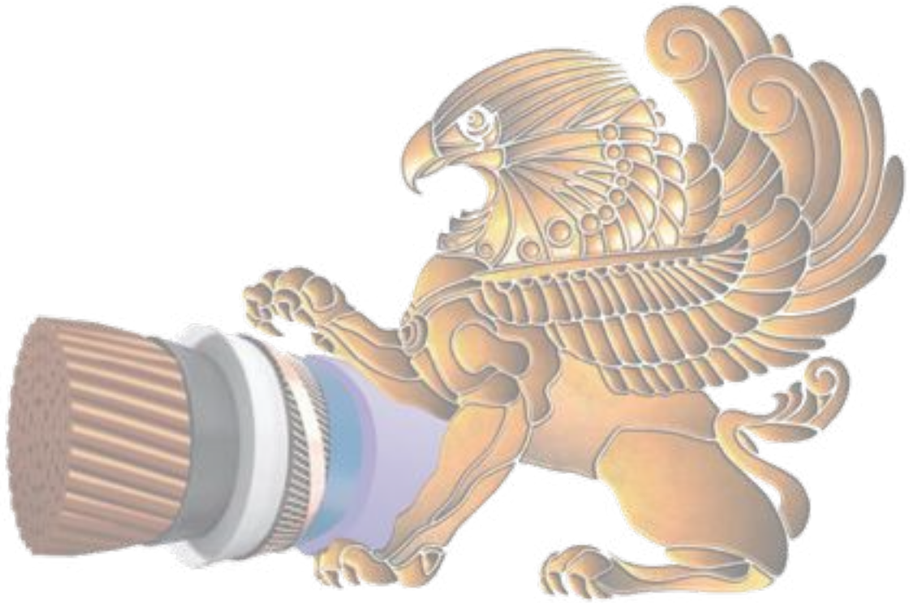

Vicbril Internacional S.A.
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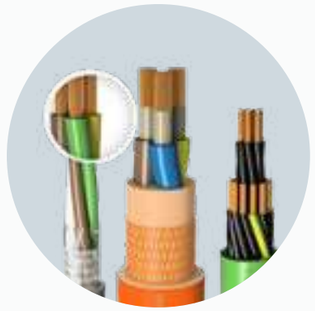
TECHNICAL CATALOG

HOME AND OTHER LOW VOLTAGE INSTALLATIONS

UNIPOLAR FLEXIBLE CABLE - 450/750 V – 70° - PVC

Suitable for fixed installations in civil, commercial and industrial buildings



Applications

Allows wiring in panels, embedded pipes and exposed pipes. Use of cable trays recommended.

Characteristics

Maximum temperature: 70°C operating
Voltage: 450/750 Volt
Construction standard: IEC 60227-3 - IRAM NM 247-3
Fire standard: IEC 60332-3-23 / IRAM NM IEC 60332-3-23 - Non propagation of fire.
Conductor standard: IEC 60228 / IRAM NM 280

Instalación

Mounting: Minimum bend radius equal to 7 x outer diameter of the cable
Maximum traction: 5daN/mm² applied to the conductors
Mounting temperatura: equal to or greater than 5°C

flexible cords

home installation

non-spread of fire

Operating temperature: 70°C

Nominal section mm²	Insulation thickness	Outside diameter mm	Weight kg/km	Electrical resistance Ohm/km	Admissible intensity Amper (*)
0,5	0,60	2,1	8,2	39	4,8
0,75	0,60	2,3	10,8	26	7,2
1	0,70	2,7	14,4	19,5	9,6
1,5	0,70	3,0	20	13,3	13
2,5	0,80	3,6	31	7,98	18
4	0,80	4,1	45	4,95	24
6	0,80	4,7	63	3,3	31
10	1,00	6,2	112	1,91	43
16	1,00	7,1	166	1,21	59
25	1,20	8,7	256	0,78	77
35	1,20	9,7	358	0,554	96
50	1,40	11,5	504	0,386	116
70	1,40	13,5	688	0,272	148
95	1,60	15,9	904	0,206	180
120	1,60	17,3	1136	0,161	207
150	1,80	19,9	1415	0,129	228
185	2,00	21,7	1730	0,106	260
240	2,20	25,1	2256	0,0801	290
300	2,40	28,3	2796	0,0641	340

HALOGEN FREE (LSZH – HFFR)

UNIPOLAR FLEXIBLE CABLE – 450/750 Volt – 70° C – IRAM 62267

Conductors to be installed in closed places with high traffic of people, for example cinemas, sanatoriums, theaters, underground train stations, universities, shopping centers, schools, mine tunnels, etc.; That is, any place where evacuation due to fire is difficult to resolve.

Applications

Allows wiring in panels, embedded pipes and exposed pipes, recommending the use of supporting trays

Characteristics

Maximum temperature: 70°C operating
Normal voltage: 450/750 Volt.
Construction standard: IRAM 62267
Fire standard: IEC 60332-3-24 / IRAM NM IEC 60332-3-24 - Non-propagation of fire
Halogen standard: IEC 60754 - 1/2 - Halogen free
Smoke standard: IEC 61034 - Smoke transparency.
Toxicity standard: NES 713 / CEI 20-37 - Absence of toxins
Conductor standard: IEC 60228 / IRAM NM 280
Conductor: Electrolytic copper metal annealed in class 5 formation.
Flexibility: Class 5; according to IRAM NM-280 and IEC 60228

Facility

Mounting: Minimum bend radius at 7 x outer diameter of the cable
Maximum traction: 5daN/mm² applied to copper conductors.
Assembly temperature: equal to or greater than 5°C.

Nominal section mm²	Insulation thickness	Outside diameter mm	Weight kg/km	Electrical resistance Ohm/km	Admissible intensity Amper (*)
0,5	0,60	2,1	8,2	39	4,8
0,75	0,60	2,3	10,8	26	7,2
1	0,70	2,7	14,4	19,5	9,6
1,5	0,70	3,0	20	13,3	13
2,5	0,80	3,6	31	7,98	18
4	0,80	4,1	45	4,95	24
6	0,80	4,7	63	3,3	31
10	1,00	6,2	112	1,91	43
16	1,00	7,1	166	1,21	59
25	1,20	8,7	256	0,78	77
35	1,20	9,7	358	0,554	96
50	1,40	11,5	504	0,386	116
70	1,40	13,5	688	0,272	148
95	1,60	15,9	904	0,206	180
120	1,60	17,3	1136	0,161	207
150	1,80	19,9	1415	0,129	228
185	2,00	21,7	1730	0,106	260
240	2,20	25,1	2256	0,0801	290
300	2,40	28,3	2796	0,0641	340

BAJO PLOMO TYPE

MULTIPOLAR - PVC/PVC - 300/500 VOLT - 70ºC

Flexible cables designed for use in industrial and domestic mobile installations and portable appliances in general, excluding heating appliances

Applications

Interconnection of machines used for manufacturing processes, including machine tools and hand-held equipment. The cables are permitted for direct connection to the electrical network.

Characteristics

Maximum temperature: 70°C operating, 160°C short circuit
Nominal voltage: 300/500 Volt.
Construction standard: IEC 60227-7.
Fire standard: IRAM NM 60332-1.
Conductor standard: IEC 60228 / IRAM NM 280.
Conductor: Class 5 annealed electrolytic copper.
Insulation: PVC.
Identification: Black with alphanumeric identification in white or yellow. Always includes a green/yellow grounding conductor in all the conductors indicated. Cover: black PVC, non-fire propagating.

Color

Bipolar (Light Blue/Brown)

Tripolar  (Green-Yellow/Light Blue/Brown)

flexible cords | non-spread of fire | sequence metering | industrial installation | grounding conductor | home installation

formation n° x mm²	maximum diameter of conductor wires mm	nominal insulation thickness mm	nominal sheath thickness mm	Dimensiones approximate exterior dimensions mm	Bulk approx kg/km	admissible intensity of current in continuous operation (A)	maximum electrical resistance at 20°C and DC Ohm/km
2x1	0.21	0.6	0.6	4.1 x 6,6	44	7	19,5
2x1,5	0.26	0.7	0.6	4.5 x 7,5	58	10	13,3
2x2,5	0.26	0.8	0.6	5.1 x 8,8	85	16	7,98
3x1	0.21	0.6	0.6	4,1 x 9.2	64	7	19,5
3x1,5	0.26	0.7	0.6	4,5 x 10,6	86	10	13,3
3x2,5	0.26	0.8	0.6	5,1 x 12,5	126	16	7,98

LOW VOLTAGE 300/500 VOLT

MULTIPOLAR – PVC/PVC – 70° C – IRAM 247-5

Conductors designed for family, commercial and industrial mobile installations, manually manipulated machines and portable devices in general.

Applications

Industrial and domestic mobile installations, hand-held machinery and portable appliances in general.

Characteristics

Maximum temperature: 70°C operating, 160°C short circuit
Nominal voltage: 300/ 500 Volt.
Construction standard: IRAM NM-247-5
Fire standard: IRAM NM IEC 60332-1
Conductor standard: IEC 60228 / IRAM NM 280
Conductor: Electrolytic copper metal annealed in class 5 formation.
Flexibility: Class 5; according to IRAM NM-280 and IEC 60228
Sheath: Black PVC, non-fire propagating

Color

Bipolar (Light Blue/Brown)

Tripolar (Green-Yellow/Black/Light Blue/Brown)

Tetrapolar (Green-Yellow/Light Blue/Brown)

Pentapolar (Green-Yellow/Black/Light Blue/Brown/Red)

Instalación

Mounting: Minimum bending radius at 7 x outer diameter of the cable
Maximum traction: 5daN/mm² applied to the copper conductors.
Assembly temperature: equal to or greater than 5°C.

flexible cords · non-spread of fire · sequence metering · industrial installation · grounding conductor · home installation

nominal section mm	nominal thickness mm	sheath thickness mm	outer diameter mm	weight kg/km	electrical resistance at 20°C in DC Ohm/km
0,5	0,6	0,8	5,7	43	39
0,75	0,6	0,8	6,2	52	26
1,0	0,6	0,8	6,5	60	19,5
1,5	0,7	0,8	7,4	80	13,3
2,5	0,8	1	9,1	125	7,98
4,0	0,8	1,1	10,4	172	4,95
6,0	0,8	1,3	11,9	236	3,3
10	1,0	1,5	15,1	389	1,91
0,5	0,6	0,8	6	50	39
0,75	0,6	0,8	6,6	62	26
1,0	0,6	0,8	6,9	72	19,5
1,5	0,7	0,9	8,1	101	13,3
2,5	0,8	1,1	9,9	157	7,98
4,0	0,8	1,2	11,3	219	4,95
6,0	0,8	1,4	12,9	301	3,3
10	1,0	1,6	16	486	1,91
0,5	0,6	0,8	6,6	60	39
0,75	0,6	0,9	7,2	75	26
1,0	0,6	0,9	7,8	91	19,5
1,5	0,7	1	9,1	128	13,3
2,5	0,8	1,1	10,8	191	7,98
4,0	0,8	1,3	12,5	273	4,95
6,0	0,8	1,4	14,1	371	3,3
10	1,0	1,6	17,8	612	1,91
0,5	0,6	0,8	7,2	72	39
0,75	0,6	0,9	8	94	26
1,0	0,6	0.9	8,4	110	19,5
1,5	0,7	1,1	10,1	159	13,3
2,5	0,8	1,2	12	237	7,98
4,0	0,8	1,3	13,7	333	4,95
8,0	0,8	1,5	15,6	459	3,3
10	1,0	1,6	19,5	748	1,91

PVC UNDERGROUND CABLE

UNIPOLAR OR MULTIPOLAR – PVC/PVC - 0,6/1.1KV - 70°C-IRAM 2178 -1

Power conductors designed for low voltage power distribution (0.6/1.1KV). They can be installed aerially using trays, buried in pipes or directly. They are fixed networks for energy distribution applicable in industries, warehouses, machine rooms, building entrances, neighborhoods, energy distributors, etc.

Applications

Suitable for aerial installations in trays, buried in ducts or directly buried. Fixed energy distribution networks in: factories, warehouses, machine rooms, energy distributors, etc.

Characteristics

Maximum temperature: 70°C operating, 160°C short circuit
Rated voltage: 600/1000 Volt AC, maximum 1200 Volt AC/ 1500 Volt AC
Construction standard: IRAM 60502-1 / IRAM 2178-1
Fire standard: IEC 60332-3-24 / IRAM NM IEC 60332-3-24 - Non-propagation of fire.
Conductor standard: IEC 60228 / IRAM NM 280
Conductor: electrolytic copper annealed in class 5 formation.
Flexibility: according to IRAM NM - 280/IEC 60228 standard

Color

Unipolar (Brown)
Bipolar (Brown/Light Blue)
Tripolar (Brown,/Black/Red)
Tetrapolar (Brown/Black/Red/Light Blue)

sequence metering | non-spread of fire | flexible cords | industrial installation | abrasion resistance

Installation

Mounting: Minimum bend radius at 7 x outer cable diameter for unarmored cables and 12 x outer cable diameter for armored cables
TMaximum traction: 5daN/mm² applied to copper conductors. In cables armed with wires, 10daN/mm² can be used applied to the wires, the armor
Assembly temperature: equal to or greater than 5°C.

Variants

Armor: unipolar cables with double helical aluminum strapping. Multipolar cables with helical wires or double helical zinc-plated steel strap.

Copper conductors

Unipolar: class 5 flexible cords up to and including 240 mm2 and class 2 compact cords for higher sections. Upon request, class 5 cords can be replaced with class 2 cords (compact or not as appropriate)
Multipolar: flexible cords class 5 up to 35 mm2 and class 2 for higher sections, being compact circular up to 50 mm2 and sectoral for higher nominal sections.

Aluminum conductors

Unipolar: normal or compact class 2 circular cords as appropriate
Multipolar: normal or compact class 2 circular cords as appropriate up to 50mm2 and sectorial cords for higher nominal sections.
Maximum conductor temperature : 70°C operating, 160°C short circuit

Protections and shields

- Mechanical protection: for multipolar cables, a metal armor of straps or zinc-plated steel wires is used (for small sections or when the armor must withstand longitudinal stress) for unipolar cables, aluminum straps are used.
- Electromagnetic protection: in all cases the material used is annealed copper.
In these cases, two helical tapes are used, a longitudinal corrugated tape or wires and an anti-unwinding tape. Likewise, if required, special shielding (also with wires and anti-unwinding tape) specially designed for cables that power frequency converters can be considered.

UNIPOLAR (BROWN CORES)

nominal section mm	conductor diameter	nominal thickness of the insulation	nominal thickness of the sheath	outere diameter approx	bulk approx	Max electrical resistance at 70°C and 50Hz	Reactance at 50 Hz
4	2,5	1,0	1,4	7,6	91	5,92	0,189
6	3,0	1,0	1,4	8,1	114	3,95	0,180
10	3,9	1,0	1,4	9,1	160	2,29	0,170
16	4,9	1,0	1,4	10,0	227	1,45	0,162
25	7,1	1,2	1,4	12,7	346	0,933	0,154
35	8,3	1,2	1,4	13,8	447	0,663	0,150
50	9,9	1,4	1,4	15,9	612	0,462	0,147
70	12,0	1,4	1,4	17,6	811	0,326	0,143
95	13,5	1,6	1,5	20,0	1037	0,248	0,142
120	16,5	1,6	1,5	22,9	1334	0,194	0,139
150	17,5	1,8	1,6	24,0	1634	0,156	0,139
185	20,0	2,0	1,7	27,1	1985	0,129	0,139
240	24,0	2,2	1,8	32.0	2611	0,987	0,137
300	20,7	2,4	1,9	29,8	3186	0,0754	0,140
400 (*)	23,0	2,6	2,0	32,7	4008	0,0606	0,140
500 (*)	26,4	2,8	2,1	37,0	5213	0,0493	0,138
630 (*)	30,0	2,8	2,2	40,6	6581	0,0407	0,138

BIPOLAR (BROWN AND BLACK CORES)

nominal section mm	conductor diameter	nominal thickness of the insulation	nominal thickness of the sheath	outere diameter approx	bulk approx	Max electrical resistance at 70°C and 50Hz	Reactance at 50 Hz
1,5	1,5	0,8	1,8	9,9	132	15,9	0,108
2,5	2	0,8	1,8	10,8	165	9,55	0,0995
4	2,5	1,0	1,8	12,7	234	5,92	0,0991
6	3	1,0	1,8	13,7	293	3,95	0,0991
10	3,9	1,0	1,8	15,6	410	2,29	0,0860
16	5,0	1,0	1,8	18,5	632	1,45	0,0813
25	7,1	1,2	1,8	24,0	1030	0,933	0,0780
35	8,3	1,2	1,8	26,5	1310	0,663	0,0760

TRIPOLAR (BROWN, BLACK AND LIGHT-BLUE CORES)

nominal section mm	conductor diameter	nominal thickness of the insulation	nominal thickness of the sheath	outere diameter approx	bulk approx	Max electrical resistance at 70°C and 50Hz	Reactance at 50 Hz
1,5	1,5	0,8	1,8	10	152	15,9	0,108
2,5	2	0,8	1,8	11	195	9,55	0,09995
4	2,5	1,0	1,8	13	280	5,92	0,0991
6	3	1,0	1,8	15	356	3,95	0,0991
10	3,9	1,0	1,8	17	509	2,29	0,0860
16	5,0	1,0	1,8	20	786	1,45	0,0813
25	7,1	1,2	1,8	26	1270	0,933	0,0780
35	8,3	1,2	1,8	28,5	1630	0,663	0,0760
50	8,1	1,4	1,8	30	2075	0,464	0,0777
70	10,9	1,4	2,0	30	2365	0,321	0,0736
95	12,7	1,6	2,1	33	3208	0,232	0,0733
120	14,2	1,6	2,2	36	3910	0,184	0,0729
150	15,9	1,8	2,4	40	4806	0,150	0,0720
185	17,7	2,0	2,5	44	5956	0,121	0,0720
240	20,1	2,2	2,7	49	7729	0,0911	0,0716
300	22,5	2,4	2,9	54	9636	0,0730	0,0714

TETRAPOLAR (BROWN, BLACK, RED AND LIGHT-BLUE CORES)

nominal section mm	conductor diameter	nominal thickness of the insulation	nominal thickness of the sheath	outere diameter approx	bulk approx	Max electrical resistance at 70°C and 50Hz	Reactance at 50 Hz
1,5	1,5	0,8	1,8	11	180	15,9	0,180
2,5	2	0,8	1,8	12	233	9,55	0,0995
4	2,5	1,0	1,8	15	337	5,92	0,0991
6	3	1,0	1,8	16	433	3,95	0,0901
10	3,9	1,0	1,8	18	627	2,29	0,0860
16	5,0	1,0	1,8	22	992	1,45	0,0813
25/16	-	1,2/1,0	1,8	27	1430	0,933	0,0780
35/16	-	1,2/1,0	1,8	29	1780	0,663	0,0760
50/25	-	1,4/1,2	1,9	31	2355	0,464	0,0777
70/35	-	1,4/1,2	2,0	31	2742	0,321	0,0736
95/50	-	1,6/1,4	2,2	35	3736	0,232	0,0733
120/70	-	1,6/1,4	2,3	39	4643	0,184	0,0729
150/70	-	1,8/1,4	2,4	42	5546	0,150	0,0720
185/95	-	2,0/1,6	2,6	47	6969	0,121	0,0720
240/120	-	2,2/1,6	2,8	53	8973	0,0911	0,0716
300/150	-	2,4/1,8	3,0	59	11154	0,0730	0,0714

FOUR-POLE WITH NEUTRAL SECTION EQUAL TO THE PHASES (BROWN, BLACK, RED AND LIGHT-BLUE CORES)

nominal section mm	conductor diameter	nominal thickness of the insulation	nominal thickness of the sheath	outere diameter approx	bulk approx	Max electrical resistance at 70°C and 50Hz	Reactance at 50 Hz
25	7,1	1,2	1,8	28	1560	0,93	0,0780
35	8,3	1,2	1,8	32	2100	0,663	0,0760
50	8,1	1,4	1,9	33	2639	0,464	0,0777
70	9,6	1,4	2,1	37	3541	0,321	0,0736
95	11,3	1,6	2,2	43	4823	0,232	0,0733
120	12,8	1,6	2,3	47	5921	0,184	0,0729
150	14,3	1,8	2,5	52	7325	0,150	0,0720
185	16,0	2,0	2,7	58	9120	0,121	0,0720
240	18,4	2,2	2,9	65	11840	0,0911	0,0716

ELECTRICAL DATAS

nominal section mm²	Method B1 and B2 pipe embedded in Wall. Exposed pipes.		Method C non-perforated or solid bottom cable tray		Method E non-perforated cable tray laddertype cable tray	
	Bipolar	Tripolar	Bipolar	Tripolar	Bipolar	Tripolar
1,5	14	13	17	15	19	16
2,5	20	17	23	21	26	22
4	26	23	31	28	35	30
6	33	30	40	36	44	37
10	45	40	55	50	61	52
16	60	54	74	66	82	70
25	78	70	97	84	104	88
35	97	86	120	104	129	110
50	-	103	146	125	157	133
70	-	130	185	160	202	170
95	-	156	224	194	245	207
120	-	179	260	225	285	240
150	-	-	299	260	330	278
185	-	-	341	297	378	317
240	-	-	401	350	447	374
300	-	-	461	403	516	432

ELECTRICAL DATAS

nominal section mm²	Method F, perforated cable tray, ladder type cable tray, unipolar cables in contact			Method F, perforated cable tray, ladder type cable tray, unipolar cables in contact	
	two unipolar cables in contact	three unipolar cables staggered	three unipolar cables in contact	three horizontal unipolar cables	three vertical unipolar cables
4	36	29	30	39	34
6	46	37	39	51	44
10	64	52	55	70	62
16	86	71	74	96	84
25	114	95	99	127	113
35	141	119	124	157	141
50	171	145	151	191	171
70	218	199	196	244	221
95	264	230	239	297	271
120	306	268	279	345	315
150	353	310	324	397	365
185	403	356	371	453	418
240	475	422	441	535	495
300	647	488	511	617	573
400	656	571	599	741	692

ELECTRICAL DATAS

nominal section mm²	bipolar	tripolar	unipolar	bipolar	tripolar
1,5	25	20	28	29	25
2,5	33	27	37	39	34
4	43	35	47	51	44
6	53	44	59	65	55
10	71	58	80	88	74
16	91	75	104	112	95
25	117	96	134	137	117
35	140	115	162	164	140
50	-	137	198	-	173
70	-	169	240	-	211
95	-	201	280	-	254
120	-	228	324	-	290
150	-	258	363	-	325
185	-	289	405	-	369
240	-	333	475	-	428
300	-	377	533	-	484

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
1x1	5,6	41	-	-	-
1x1,5	6	49	-	-	-
1x2,5	6,4	60	-	-	-
1x4	7,3	84	-	-	-
1x6	7,9	106	-	-	-
1x10	9	154	-	-	-
1x16	9,9	208	13,0	18,6	521
1x25	11,5	304	13,0	18,6	576
1x35	12,5	398	13,0	18,6	641
1x50	14,3	545	13,0	18,6	731
1x70	16,3	750	15,5	21,1	985
1x95	18,9	987	17,9	23,5	1245
1x120	20,3	1295	19,3	24,9	1571
1x150	23,1	1517	21,9	27,5	1815
1x185	25,1	1835	23,7	29,3	2144
1x240	28,7	2412	27,1	32,9	2762
1x300	32,1	2994	30,7	36,5	3402
1x400	35,8	3847	34,2	40,4	4318
1x500	39,6	4815	37,8	44.2	5333

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
1x630	44,5	6296	42,5	49,1	6876
2x1	8,7	97	7,7	12,9	290
2x1,5	9,3	116	8,3	13,5	320
2x2,5	10,2	146	9,2	14,4	369
2x4	11,9	208	10,9	16,1	467
2x6	13,2	268	12,2	17,4	554
2x10	15,3	389	14,3	19,1	671
2x16	19,8	652	16,2	21	846
2x25	23	927	19,4	24,2	1157
2x35	25	1172	21,4	26,2	1425
2x50	28,6	1585	25	29,8	1877
2x70	32,8	2158	29	34	2495
2x95	38,2	2875	34,2	39,6	3288
2x120	41,2	3650	37	43,3	4386
2x150	46,6	4372	42,2	48,8	5208
2x185	51	5296	46,2	53	6186
2x240	58,2	6934	53	60,2	7951
2x300	65,2	8644	59,8	67,4	9818

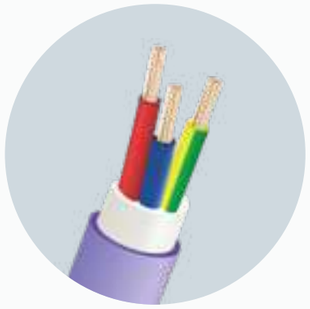
number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
3x1	9,1	111	8,1	13,3	312
3x1,5	9,8	136	8,8	14	350
3x2,5	10,8	174	9,8	15	409
3x4	12,6	250	11,6	16,8	523
3x6	14	327	13,0	17,8	583
3x10	16,3	486	15,3	20,1	783
3x16	20,9	798	17,3	20,1	1005
3x25	24,4	1151	20,8	25,6	1396
3x35	26,6	1480	23,0	27,8	1750
3x50	30,4	2009	26,8	31,8	2335
3x70	35,6	2812	31,6	36,8	3178
3x95	40,9	3680	36,7	43,1	4412
3x120	44,2	4745	39,8	46,4	5535
3x150	50,4	5673	45,8	52,6	6578
3x185	54,7	6823	49,7	56.9	7803
3x240	62,8	8996	57,4	65	10125
3x300	70,1	11156	64,3	72,1	12386
4x1	9,9	133	8,9	14,1	350
4x1,5	10,6	161	9,6	14,8	392
4x2,5	11,7	208	10,7	15,9	461
4x4	13,8	306	12,8	18	601
4x6	15,3	400	14,3	19,1	679
4x10	17,9	602	16,9	21,7	926

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
4x16	22,8	978	19,2	24	1205
3x25 + 1x16	25,7	1309	22,1	26,9	1563
3x35 ′+ 1x16	27,5	1619	23,9	28,7	1892
3x50 + 1x25	31,9	2248	28,1	33,1	2577
3x70 + 1x35	36,8	3103	32,8	38	3452
3x95 + 1x50	42,6	4117	38,2	44,6	4841
3x120 + 1x70	47	5430	42,4	49	5992
3x150 + 1x70	51,9	6244	47,1	54,1	7166
3x185 + 1x95	57	7622	51,8	59	8612
3x240 + 1x120	64,8	10032	59,2	66,8	11054
3x300 + 1x150	72,6	12358	66,6	74,6	13606

CONTROL CABLE

MULTIPOLAR – PVC/PVC –0,6-1kv- 70° C – IEC 60502-1/ IRAM 2178-1

They are cables specially designed for control, signaling and measurement equipment. Also used for electrical commands in industrial processes.



Applications

Control, signaling, measurement, protection and electrical command equipment for industrial facilities. Suitable for aerial installations in trays, buried in ducts or directly buried

Characteristics

Maximum temperature: 70°C operating, 160°C short circuit
Nominal voltage: 600/1000 Volt AC, maximum 1200 Volt AC / 1500 Volt DC
Construction standard: IEC 60502-1 / IRAM 2178-1
Fire standard: IEC 60332-3-24 / IRAM NM IEC 60332-3-24
Non-propagation of fire
Conductor standard: IEC 60228 / IRAM NM 280
Insulation: PVC
Conductor: Electrolytic copper metal annealed in class 5 formation.
Flexibility: Class 5; according to IRAM NM-280 and IEC 60228 (rigid optional)

Color

Bipolar (Green-Yellow/Light Blue/Brown)
Tripolar (Green-Yellow/Black/Light Blue/Brown)
Tetrapolar (Light Blue/Brown)
Pentapolar (Green-Yellow/Black/Light Blue/Brown/Red)

flexible cords

sequence metering

non-spread of fire

Facility

Mounting: minimum bending radius equal to 7 x outer diameter of the cable for unarmored cables and 12 x outer diameter of the cable for armored cables.
Maximum traction: 5daN/mm2 applied to copper conductors. In wire-armored cables, 10 daN/mm2 applied to the armor wires can be used.
Assembly temperature: equal to or greater than 5°C
Suitable for aerial installations in trays, buried in pipes or directly buried.

Protection and Shielding

As mechanical protection, a metal armor of galvanized steel tapes or wires is used. As electromagnetic protection, a longitudinally corrugated copper tape shield is used

Alternatives

Conductor: upon request the cables can be supplied with semi-rigid ropes in class 2 Identification: one of the conductors of each cable insulated in green/yellow. Use other colors to identify them such as black, gray, blue, etc.

General characteristics

nominal section mm²	Electrical resist. 70°C in AC. Ohm/km	admissible intensity in air							
		2xAmper	4xAmper	7xAmper	10xAmper	19xAmper	30xAmper	40xAmper	48xAmper
1	23,33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,5	15,91	18,1	15,3	12,2	7,6	7,6	6,9	6,1	5,4
2,5	9,55	24,7	20,9	16,7	10,5	10,5	9,4	8,4	7,3
4	5,92	33,3	28,5	22,8	14,3	14,3	12,8	11,4	10,0

number of conductors (by section)	STANDARD		SHIELDED			ARMOURED		
	outer diameter mm	weight kg/km	diameter under shield mm	outer diameter mm	weight kg/km	diameter under armor mm	outer diameter mm	weight kg/km
2x1	8,7	97	11	14,9	295	7,7	12,9	290
3x1	9,2	113	11	14,9	300	8,1	13,3	312
4x1	9,9	133	11	14,9	304	8,9	14,1	350
5x1	10,7	159	11	14,9	311	9,7	14,9	387
7x1	11,5	194	11	14,9	322	10,7	15,9	452
10x1	14,8	263	13,2	17,1	379	13,5	18,3	542
12x1	15,3	301	13,7	17,6	421	14,0	18,8	590
14x1	16,3	340	14,7	18,6	467	14,7	19,5	643
16x1	17,1	382	15,5	19,4	515	15,5	20,3	699
19x1	18	435	16,4	20,3	576	16,4	21,2	777
21x1	18,8	471	17,2	21,1	619	17,3	22,1	837
24x1	20,5	533	18,9	22,8	693	19,2	24,0	947
27x1	21	587	19,4	23,3	751	19,7	24,5	1013
30x1	22	642	20,4	24,3	814	20,4	25,2	1083
32x1	22,8	684	21,2	25,1	862	21,2	26,0	1142
37x1	23,7	771	22,1	26,1	975	22,1	26,9	1256
48x1	26,7	972	25,1	29,1	1201	25,3	30,3	1558
2x1,5	9,3	116	11	14,9	300	8,3	13,5	320
3x1,5	9,8	136	11	14,9	308	8,8	14	350
4x1,5	10,6	161	11	14,9	314	9,6	14,8	392
5x1,5	11,5	194	11	14,9	323	10,5	15,7	437
7x1,5	12,5	244	11,5	15,4	359	11,6	16,8	492
10x1,5	16	326	14,4	18,3	447	14,7	19,5	588
12x1,5	16,5	373	14,9	18,8	497	15,2	20	643
14x1,5	17,6	423	16	19,9	554	16,0	20,8	704
16x1,5	18,6	481	17	20,9	620	16,9	21,7	768
19x1,5	19,5	547	17,9	21,8	691	17,9	22,7	859
21x1,5	20,4	595	18,8	22,7	745	18,9	23,7	924

number of conductors (by section)	STANDARD		SHIELDED			ARMOURED		
	outer diameter mm	weight kg/km	diameter under shield mm	outer diameter mm	weight kg/km	diameter under armor mm	outer diameter mm	weight kg/km
24x1,5	22,3	675	20,7	24,6	838	21,0	25,8	1038
27x1,5	22,8	744	21,2	25,1	909	21,5	26,3	1114
30x1,5	23,9	815	22,3	26,3	1006	22,3	27,1	1196
32x1,5	24,9	875	23,3	27,3	1074	23,2	28,0	1260
37x1,5	25,8	984	24,2	28,2	1189	24,2	29,0	1396
48x1,5	29,3	1258	27,5	31,7	1486	28,2	33,4	1780
2x2,5	10,2	146	11,0	14,9	311	9,2	14,4	369
3x2,5	10,8	174	11,0	14,9	324	9,8	15,0	409
4x2,5	11,7	208	11,0	14,9	334	10,7	15,9	461
5x2,5	12,7	252	11,7	15,6	376	11,7	16,9	518
7x2,5	13,8	318	12,8	16,7	448	12,9	17,7	542
10x2,5	17,8	428	16,2	20,1	567	16,5	21,3	717
12x2,5	18,3	490	16,7	20,6	633	17,1	21,9	792
14x2,5	19,6	560	18,0	21,9	713	18,0	22,8	872
16x2,5	20,7	637	19,1	23,0	799	19,1	23,9	960
19x2,5	21,7	727	20,1	24,0	897	20,1	24,9	1074
21x2,5	22,8	797	21,2	25,1	975	21,3	26,1	1162
24x2,5	25	906	23,4	27,4	1120	23,7	28,5	1309
27x2,5	25,5	998	23,9	27,9	1216	24,3	29,1	1416
30x2,5	26,8	1098	25,2	29,2	1327	25,2	30,2	1539
32x2,5	27,9	1176	26,3	30,3	1416	26,3	31,3	1628
37x2,5	29,1	1341	27,3	31,5	1589	27,3	32,3	1803
48x2,5	33,1	1719	31,5	35,9	2036	31,9	37,3	2311
2x4	11,9	208	11,0	14,9	330	10,9	16,1	467
3x4	12,6	251	11,6	15,5	374	11,6	16,8	523
4x4	13,8	306	12,8	16,7	441	12,8	18	601
5x4	15	372	14,0	17,9	517	14,0	18,8	633
7x4	16,4	477	15,4	19,3	629	15,5	20,3	730

number of conductors (by section)	STANDARD		SHIELDED			ARMOURED		
	outer diameter mm	weight kg/km	diameter under shield mm	outer diameter mm	weight kg/km	diameter under armor mm	outer diameter mm	weight kg/km
10x4	21,1	632	19,5	23,4	797	19,9	24,7	978
12x4	21,8	734	20,2	24,1	905	20,7	25,5	1094
14x4	23,4	843	21,8	25,8	1043	21,8	26,6	1215
16x4	24,7	959	23,1	27,1	1171	23,1	27,9	1342
19x4	26	1104	24,4	28,4	1327	24,4	29,4	1532
21x4	27,3	1208	25,7	29,7	1442	25,9	30,9	1665
24x4	30,2	1389	28,8	33,0	1679	29,2	34,4	1928
27x4	31,1	1554	29,5	33,9	1853	29,9	35,1	2091
30x4	32,7	1712	31,1	35,5	2025	31,1	36,5	2283
32x4	34	1830	32,4	37,0	2172	32,4	38,6	2669
37x4	35,5	2092	33,7	38,3	2431	33,7	40,1	2977
48x4	40,6	2702	38,8	43,8	3132	38,8	46	3767

XLPE UNDERGROUND POWER CABLE

UNIPOLAR O MULTIPOLAR - XLPE - 0,6/1KV-90°C-IRAM 2178-1

Conductor that, due to its characteristics, is used in aerial tray installations, buried in pipes or directly, for fixed energy distribution networks, especially in places where there is a high concentration of people, such as, for example, hospitals, shopping malls, underground stations, cinemas, etc

Applications

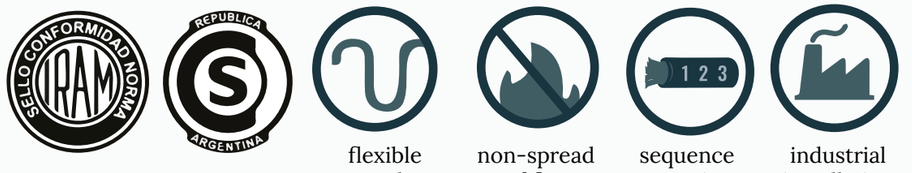
Suitable for aerial installations in trays, buried in ducts or directly buried. Fixed energy distribution networks in: factories, warehouses, machine rooms, energy distributors.

Characteristics

Maximum temperature: 90°C service, 130°C overload and 250°C short circuit
Nominal voltage: 600/1000 Volt AC, maximum 1200 Volt AC / 1500 Volt DC
Construction standard: IEC 60502-1 / IRAM 2178-1
Fire standard: IEC 603332-3-24 / IRAM NM IEC 60332-3-24 - Non-propagation of fire
Conductor standard: IEC 60228 / IRAM NM 280
Conductor: class 5 annealed electrolytic copper
Insulation: XLPE (cross-linked polyethylene)
Low emission of smoke and toxic gases
Cover: fire-resistant black PVC

Color

Unipolar (Brown)
Bipolar (Brown/Light Blue)
Tripolar (Brown/black/Red)
Tetrapolar (Brown/black/Red/Light Blue)



flexible cords
non-spread of fire
sequence metering
industrial installation

Facility

Mounting: Minimum bending radius equal to 7 x outer diameter of the cable for unarmored cables and 12 x outer diameter of the cable for armored cables.
Maximum traction: 5daN/mm2 applied to copper conductors. In wire-armored cables, 10daN/mm2 applied to the armor wires can be used.
Assembly temperature: Equal to or greater than 5°C.

nominal section mm²	electrical resistance at 90°C in AC Ohm/km	inductive reactance at 50Hz		admissible intensity in the air			admissible intensity on the ground		
		unipolar (1) Ohm/km	multipolar Ohm/km	1x (1) Amper	2x Amper	3x (4) Amper	1x (1) Amper	2x Amper	3x (4) Amper
1	24,86	0,166	0,107	N/A	N/A	N/A	N/A	N/A	N/A
1,5	16,96	0,157	0,100	19,0	22,8	20,0	32,3	32,3	27,6
2,5	10,18	0,145	0,093	25,7	31,4	27,6	42,8	43,7	37,1
4	6,31	0,137	0,088	34,2	42,8	36,1	55,1	57,0	48,5
6	4,21	0,128	0,083	44,7	54,2	46,6	69,4	72,2	60,8
10	2,44	0,118	0,078	61,8	74,1	64,6	93,1	96,9	82,7
16	1,54	0,112	0,075	82,7	99,8	86,5	120,7	128,3	107,4
25	0,995	0,109	0,075	121,6	128,3	109,3	156,8	166,3	140,6
35	0,707	0,105	0,073	152,0	159,6	136,8	188,1	199,5	168,2
50	0,493	0,102	0,073	187,2	194,8	166,3	220,4	238,5	198,6
70	0,348	0,098	0,071	241,3	249,9	212,8	270,8	291,7	243,2
95	0,264	0,096	0,070	295,5	304,0	257,5	325,9	350,6	292,6
120	0,207	0,095	0,070	345,8	354,4	299,3	370,5	399,0	333,5
150	0,166	0,094	0,070	400,9	408,5	344,9	415,2	448,4	373,4
185	0,137	0,094	0,070	460,8	468,4	394,3	470,3	508,3	424,7
240	0,105	0,092	0,069	548,2	553,9	464,6	547,2	591,9	493,1
300	0,0853	0,091	0,069	636,5	640,3	536,8	621,3	668,8	558,6
400	0,0666	0,090	--	750,5	--	--	709,7	--	--
500	0,0547	0,090	--	862,6	--	--	824,6	--	--
630	0,0438	0,089	--	994,7	--	--	941,5	--	--

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
1x1	5,4	37	--	--	--
1x1,5	5,8	44	--	--	--
1x2,5	6,2	54	--	--	--
1x4	6,7	71	--	--	--
1x6	7,3	92	--	--	--
1x10	8,4	137	--	--	--
1x16	9,3	190	13,0	18,6	517
1x25	10,9	281	13,0	18,6	569
1x35	11,9	372	13,0	18,6	634
1x50	13,5	509	13,0	18,6	721
1x70	15,7	707	13,0	18,6	843
1x95	17,9	917	16,9	22,5	1163
1x120	19,5	1232	18,5	24,1	1498
1x150	22,3	1437	21,1	26,7	1725
1x185	24,1	1734	22,9	28,5	2044
1x240	27,5	2285	26,1	31,7	2621
1x300	30,7	2838	29,1	34,9	3212
1x400	34,4	3665	33,0	39	4119
1x500	38,2	4605	36,6	42,8	5107
1x630	43,7	6108	41,7	48,3	6678
2x1	8,3	86	7,3	12,5	269
2x1,5	8,9	103	7,9	13,1	299

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
2x2,5	9,8	131	8,8	14	347
2x4	10,7	171	9,7	14,9	405
2x6	12	226	11,0	16,2	487
2x10	14,1	340	13,1	17,9	600
2x16	18,6	589	15,0	19,8	770
2x25	21,8	849	18,2	23	1065
2x35	23,8	1087	20,2	25	1326
2x50	27	1458	23,4	28,2	1733
2x70	31,4	2012	27,8	32,8	2350
2x95	36,2	2646	32,2	37,4	3019
2x120	39,6	3444	35,4	41,6	4131
2x150	45	4122	40,6	47,2	4928
2x185	49,2	4994	44,6	51,4	5876
2x240	56	6537	51,0	58,2	7543
2x300	62,8	8172	57,4	64,8	9271

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
3x1	8,7	97	7,7	12,9	290
3x1,5	9,4	120	8,4	13,6	326
3x2,5	10,3	154	9,3	14,5	379
3x4	11,3	206	10,3	15,5	452
3x6	12,7	277	11,7	16,9	552
3x10	15	427	14,0	18,8	700
3x16	19,6	722	16,0	20,8	915
3x25	23,1	1056	19,5	24,3	1287
3x35	25,3	1377	21,7	26,5	1632
3x50	28,7	1860	25,1	29,9	2154
3x70	34,1	2630	30,3	35,3	2981
3x95	38,6	3387	34,6	40	3805
3x120	42,2	4467	38,0	44,4	5223
3x150	48,7	5363	44,1	50,9	6235
3x185	52,7	6440	47,9	54,9	7387
3x240	60,5	8517	55,3	62,7	9604
3x300	67,3	10546	61,7	69,5	11758
4x1	9,4	114	8,4	13,6	320
4x1,5	10,1	140	9,1	14,3	361
4x2,5	11,2	184	10,2	15,4	428
4x4	12,3	251	11,3	16,5	516

number of conductors (by section)	STANDARD		ARMOURED		
	outer diameter mm	weight kg/km	Under armour diam.	Outer diameter	weight kg/km
4x4	12,3	251	11,3	16,5	516
4x6	13,9	341	12,9	18,1	639
4x10	16,4	527	15,4	20,2	826
4x16	21,3	884	17,7	22,5	1096
3x25+1x16	24,2	1198	20,6	25,4	1441
3x35+1x16	26	1501	22,4	27,2	1764
3x50+1x25	29,9	2069	26,3	31,3	2389
3x70+1x35	35,1	2898	31,3	36,5	3277
3x95+1x50	40,1	3791	35,9	42,1	4488
3x120+1x70	44,6	5079	40,2	46,8	5877
3x150+1x70	49,9	5878	45,3	52,1	6774
3x185+1x95	54,7	7177	49,7	56,9	8158
3x240+1x120	62,3	9495	56,9	64,5	10614
3x300+1x150	69,7	11691	63,9	71,7	12912

TECHNICAL APPENDIX
AMPERAGE FOR CONDUCTIVITY THROUGH COPPER

nominal section mm^2	 Method D Bipolar buried pipe	 Method D tripolar buried pipe	 Method D unipolar buried pipe	 Method D Bipolar buried pipe	 Method D tripolar buried pipe
1,5	29	25	-	34	29
2,5	39	33	-	46	39
4	50	42	-	60	51
6	63	52	-	76	64
10	83	69	94	102	87
16	108	89	121	135	113
25	-	114	157	-	148
35	-	138	189	-	177
50	-	163	231	-	209
70	-	202	280	-	256
95	-	239	327	-	308
120	-	272	379	-	351
150	-	307	424	-	393
185	-	344	473	-	447
240	-	398	555	-	519
300	-	449	624	-	588

MEDIUM VOLTAGE CABLES

FROM 2.3/3.3 kV TO 26/33 kV

They are suitable for buried use with protection in electrical ducts, gutters; For directly buried use, metal reinforcement may be required.

Characteristics

Maximum permanent operating temperature: 90°C
Metal: highest purity electrolytic copper wires or electrical grade aluminum
Shape: in all cases and regardless of the metal, these are compact circular conductors
Flexibility: Class 2; according to IRAM NM-280 and IEC 60228.
Optionally, the conductors can be plugged to prevent the longitudinal spread of water and retard the development and spread of water trees.
Internal semiconductor: extruded layer of semiconductor material
Insulation: chemically cross-linked polyethylene (XLPE). Thermostable material that has good dialectical rigidity, low loss factor and excellent insulation resistance
External semiconductor: extruded layer of cold-separable semiconductor material "easy stripping". External semiconductor layer formed by an extruded and cross-linked mixture with chemical characteristics similar to those of insulation, but with low electrical resistance.
Maximum permanent service temperature: 90°C
Maximum short circuit temperature: 250°C (for 5s maximum)

non-spread of fire | abrasion resistance | resistance to grease and oils | operating temperatura

Vicbril Internacional SA, markets medium and high voltage cables from the country's main factories, including Prismyan, IMSA and Cimet.

INSTALLATION TYPES ACCORDING TO IEC 60364

Electrical cables in real estate installations

Considering the diversity of modes of electrical installations in buildings, for the purposes of this catalog, those adopted to the AEA regulations for Electrical Installations in Properties have been considered, ...which follow the recommendation of the International Electrotechnical commission IEC 60364-5 - 523. The determination of the admissible currents in the cables described in this publication will comply with the provisions of the AEA Installations Regulation mentioned above and with the traditional current calculation methods, based on IEC procedures.

Installation modes

In this Guide, the criteria of Chapter 52 of the IEC 60364 standard, as well as others derived from it, were adopted, indicating "installation modes appropriate to the different situations foreseen in the works. They are summarized in a series of "type installations", whose capacity to dissipate the heat generated by the losses is similar to those, so they can be grouped in a certain common load table for all the modes that adapt to the same type installation. In the case of the AEA Regulations are summarized in six "type" installations that respond to the following generic description.

Modo A Insulated conductors in tubes embedded in thermally insulating walls.

Modo B1 y B2 Multiconductor cables in tubes embedded in a thermally insulating wall or pipes placed in plain sight.

Modo B1 y B2 A multiconductor cable or single-core cables in contact, on a non-perforated or solid bottom tray.

Modo E Multiconductor cables installed outdoors, on a perforated tray or ladder tray, separated from the wall by a distance greater than 0.3 times its diameter.

Modo F Single-core cables installed outdoors, in mutual contact, on a perforated tray or ladder tray, separated from the wall by a distance greater than the diameter of the cable.

Modo G Single-core cables installed outdoors, without mutual contact, on a perforated tray or ladder type tray, separated from it and from each other. a distance greater than the diameter of the cable.

Insulated conductors without sheathing are called "insulated conductors." These are cable thermoplastics that have an insulation level of 750 V and are always unipolar, which limits their field of application to their "installation in ducts located on surfaces or embedded, or in similar closed systems." On the other hand, when referring to cables, it always refers to insulated conductors with an additional cover, both unipolar and multipolar. These are cables for a nominal voltage of 1000 V. The possibility of using one or another type of cable is determined by the current Low Voltage Installation Regulations, in accordance with the characteristics of the work.

INSTALLED CABLES
ACCORDING TO IRAM STANDARDS NM 247-3 and 62267

The parameters for installations according to the reference standards indicate maximum admissible intensities for an ambient temperature of 40° C. The correction factors are used for conditions other than those indicated above. Some of them are:

Temperature

When varying from 40° C, the following correction factors should be used:

insulating material	ROOM TEMPERATURA (C°)										
	10	15	20	25	30	35	40	45	50	55	60
PVC	1.40	1.34	1.29	1.22	1.15	1.08	1.00	0.91	0.82	0.70	0.57
XLPE	1.26	1.23	1.19	1.14	1.10	1.05	1.00	0.96	0.90	0.84	0.78

The electrical flow is greater and better in cooler environments below 40° C. However, when that brand operates, the electrical currents should be reduced.

Grouping

The key word is "dissipate", the contact heating of several cables in the different conduits requires the use of the following correction factors.

circuits in the same pipe	number of loaded conductors	Factor
2 SINGLE-PHASE	UP TO 4	0.80
3 SINGLE-PHASE	UP TO 6	0.70
2 THREE-PHASE	UP TO 6	0.80
3 THREE-PHASE	UP TO 9	0.70

CABLES WITH INSULATION AND PROTECTIVE WRAP
ACCORDING TO IRAM 2178 AND 62226 STANDARDS

Maximum admissible intensities:

This type of Network can adopt the following installation methods:

a) In air.
b) Directly buried.
c) Buried inside the conduits.
d) In galleries, visitable or not.

The cables suitable for this installation mode may be with copper or aluminum conductors, with a nominal voltage of 0.6/1Kv., insulated with polymeric, thermoplastic or thermostable materials (XLPE, EPR, or similar), in accordance with what is specified in the IRAM 2178 or 62226 standards. Depending on the number of conductors with which the distribution is made, the minimum section of the neutral must be:

A) With 2 or 3 conductors, equal to that of the phase conductors.
B) With 4 conductors, the neutral section will be, at least, that indicated in the following table:

phase conductors (mm^2)	neutral section (mm^2)	phase conductors (mm^2)	neutral section (mm^2)
8 (Cu)	6	95	50
10 (Cu)	10	120	70
16 (Cu)	10	150	70
6 (Al)	16	185	95
25	16	240	120
35	16	300	150
50	25	400	185
70	35	500	240

Cables in air. Maximum intensities

The load tables included in the Data sheets included above have been provided for the following "typical" installation conditions:

a) A circuit of unipolar cables or a multipolar cable
b) Working with alternating current
c) Arranged in a pipe or on an outdoor tray.
d) Ambient temperature of 40°c

Correction Factors

When the installation conditions are different from those indicated above, the following correction factors will be applied

number of circuits	1	2	3	4	5	6	7	8	9	12	16	20
inside embedded pipes	1	0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.45	0.41	0.38
in a single layer, on wall, floor or unperforated surface	1	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70			
In a single layer, fixed directly under a wooden ceiling	NO PERMITIDO											
In a single layer, on a vertical or horizontal perforated tray	1	0.88	0.82	0.77	0.75	0.73	0.73	0.72	0.72			
In a single layer, on a ladder or wire tray	1	0.87	0.82	0.80	0.80	0.79	0.79	0.78	0.78			

Correction factors F for room temperature of 40°C.

insulating material	ROOM TEMPERATURA (C°)										
	10	15	20	25	30	35	40	45	50	55	60
PVC	1.40	1.34	1.29	1.22	1.15	1.08	1.00	0.91	0.82	0.70	0.57
XLPE	1.27	1.22	1.18	1.14	1.10	1.05	1.00	0.95	0.90	0.84	0.77

The following tables give the correction factors to apply in the groupings of several circuits built by unipolar or multipolar cables, according to the type of installation.

Maximum admissible currents for buried cables

The load tables that follow have been provided for the following "typical" installation conditions; that is to say:

a) A three-phase, or single-phase cable.
b) Working with alternating current
c) Directly buried along its entire length in a 70 cm trench. deep.
d) In a terrain of average resistivity 1 km/W
e) Room temperatura of 25 °C

Correction Factors

If the ground temperature is different than 25°C, the correction factors in the following table will be applied.

operating temperatura (S) (°C)	ROOM TEMPERATURA (C°)								
	10	15	20	25	30	35	40	45	50
70	1.16	1.10	1.05	1.00	0.94	0.88	0.81	0.75	0.66
90	1.11	1.07	1.04	1.00	0.97	0.93	0.89	0.83	0.76

If the thermal resistivity of the ground is different than 1 °K xm/W, according to the AEA regulations, the following correction factors will be applied:

type of terrain and humidity	ground termal resistivity (k.m./w)	correction factor
dry clay or calcareous terrain (normal dry land)	1.0	1.0
very dry clay or calcareous soil	1.5	0.93
	2.0	0.89
	2.5	0.85
very dry sand	3.0	0.81

However, other more demanding coefficients are usually used, such as those indicated in the Spanish regulations for LV installations:

cable type	ground termal resistivity (k.m./W)										
	0.80	0.85	0.90	1.00	1.10	1.20	1.40	1.65	2.00	2.50	2.80
Unipolar	1.09	1.06	1.04	1.00	0.96	0.93	0.87	0.81	0.75	0.68	0.66
Tripolar	1.07	1.05	1.03	1.00	0.97	0.94	0.89	0.84	0.78	0.71	0.69

If several different circuits coincide in the same trench, mutual heating will modify the "standard" conditions, so the following correction factors must be considered:

number of circuits	in contact	1 diameter separator	separation between internal edges		
			0.125 mm	0.25 mm	0.5 mm
2	0.75	0.80	0.85	0.90	0.90
3	0.65	0.70	0.75	0.80	0.85
4	0.60	0.60	0.70	0.75	0.80
5	0.55	0.55	0.65	0.70	0.80
6	0.50	0.55	0.60	0.70	0.80

Reduction factor for groupings in buried pipes and ducts

One multipolar cable per pipe

number of pipes	in contact	separation between internal edges		
		0.25 m	0.5 m	1.0 m
2	0.85	0.90	0.95	0.95
3	0.75	0.85	0.90	0.95
4	0.70	0,80	0.85	0.90
5	0.65	0.85	0.80	0.90
6	0.60	0.80	0.80	0.90

A unipolar cable in a non-metallic pipe

number of pipes	in contact	separation between internal edges		
		0.25 m	0.5 m	1.0 m
2	0.80	0.90	0.90	0.95
3	0.70	0.80	0.85	0.95
4	0.65	0,75	0.80	0.90
5	0.60	0.70	0.80	0.90
6	0.60	0.70	0.80	0.90

Reduction factor for different laying depths

depth (in meters)	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.20
correction factor	1.00	1.02	1.01	1.00	1.99	1.98	1.97	1.95

Permissible short-circuit currents in conductors

The following tables indicate the short-circuit current densities, in A/mm2, admissible in aluminum and copper conductors of cables insulated with thermostable materials, depending on the short circuit duration times and some short-circuit intensities. in A, for some usual sections.

Short circuit current density, in A/mm2, for copper conductors

insulation type	insulation type	duration of the short circuit (SEC)								
		0.1	0.2	0.3	0.5	1.0	1.5	2.0	2.5	3.0
XLPE y EPR	250	449	318	259	201	142	116	100	90	82

Based on the short circuit current densities cited above, in A/mm2, the maximum admissible short circuit currents are indicated below, in Ka, depending on the different short circuit duration times for some typical sections.

Copper conductors

conductor section	duration of the short circuit (SEC)								
	0.1	0.2	0.3	0.5	1.0	1.5	2.0	2.5	3.0
16	7.2	5.0	4.1	3.2	2.2	1.8	1.6	1.4	1.3
25	11.2	7.9	6.4	5.0	3.5	2.9	2.5	2.2	2.0
50	22.4	15.9	12.9	10.0	7.1	5.8	5.0	4.5	4.1
95	42.6	30.2	24.6	19.0	13.4	11.0	9.5	8.5	7.8
150	67.3	47.7	38.8	30.1	21.3	17.4	15.0	13.5	12.3
240	108	76.3	62.1	48.2	34.0	27.8	24.0	21.6	19.6

For other types of cables or installation systems, the standards or regulations in force in the installation area must be consulted.

MINIMUM SECTIONS

Verification of the minimum sections allowed

According to the location of the circuits, the AEA regulations provide for the following minimum sections (for copper conductors)

Type	Characteristics	minimum section
main lines	They link the output terminals of the meter with the input terminals of the main board	4 mm^2
sectional lines	They link the output terminals of the main board with the input terminals of the next one.	2.5 mm^2
general purpose circuit lines	They link the output terminals of the last board with the points of use	1.5 mm^2
special use circuit lines		2.5 mm^2
fixed connection circuit lines		2.5 mm^2
branches and return of the switches	They make it possible to interrupt the phase conduit in lighting circuits	1.5 mm^2
protective conductor	Tie fault currents to ground	2.5 mm^2

Electromagnetic screens – Shielding

The reduction of electromagnetic interference captured by instrumentation circuits, with the use of more sophisticated process instrumentation systems, represents a significant drawback for instrumentation engineers.

The shielding of electronic interconnection cables plays a critical role.

Taped screens made of aluminum and polyester, copper – polyester, copper or high-density braided copper meshes are an excellent solution for low frequencies. In the high frequency range, better results are achieved with helical copper wire screen, very high density copper mesh or longitudinal corrugated copper tape.

Metal Laminated Tape Shielding – Polyester (AK) *

Formed by a laminated tape of polyester aluminum (A) or polyester copper (K) applied in the form of a helical wrapper and with the metal in continuous contact with a tinned copper drain conductor.

Instrumentation cables – Drain boards

Multiternal and multipair

Type	individual drainage	general drainage
20	22	20
18	20	18
16	18	18
14	18	18
12	18	18

Types of shielding

a) Copper mesh: Formed by a braided mesh of red or tinned copper wires applied to the cable, it constitutes a shielding effect against disturbances generated by electric fields
b) Helical Copper Strapping: The cable is covered entirely with a copper strap with an adequate overlap.
c) Longitudinal corrugated copper: A copper tape is placed over the connector in order to generate a cylindrical tube on it, with a transverse corrugation that facilitates bending for assembly.
d) Helical copper wires: Formed by a crown of electrolytic copper wires added to a copper counterspiral.

Types of armor

a) Helical metal strap: Manufactured with double shielding of galvanized steel, aluminum or bronze, covering 100% of the conductor applied in a helical form.
b) Helical wire: Made with galvanized steel or aluminum wire, it covers more than 90% of the conductor applied in a helical shape. Provides excellent mechanical protection and good flexibility.
c) Braided wire: A braided mesh of galvanized steel or bronze wire is applied over the conductor obtaining a coverage greater than 80%
d) Corrugated steel strap: A steel strap is covered on both sides with an adherent film of ethylene copolymer, formed on the conductor longitudinally overlapping in the shape of a corrugated tube. It offers mechanical protection and is a good screen against magnetic interference.
e) Interlock: An aluminum or steel strap is applied to the core of the conductor in a spiral shape. It is effective against crushing and impacts. It has excellent flexibility.

Waterproof cover

An aluminum tape coated on both sides with an adhesive film of ethylene copolymer is applied to the conductor, forming a cylindrical tube. It guarantees tightness against the ingress of liquids.

Galvanized steel support

Composed of a co-extruded galvanized steel rope in the shape of an 8, parallel to the core of the conductor. Facilitates the aerial laying of conductors

Advantages of cross-linked polyethylene compared to PVC

The electrical and mechanical performances of cables are mainly defined by the insulating materials.
As a result of many years of research and development to satisfy market demands, cross-linked polyethylene has been obtained as an insulator for electrical conductors. Which is based on a thermoplastic polyethylene that is vulcanized through the use of chemical or physical agents, rearranging the molecular chains of the thermoplastic polyethylene and obtaining a cross-linked polyethylene with intertwined molecular chains. It has high dielectric and insulation resistance, low dielectric constant, low loss factor and increased resistance to humidity.
PVC is a solid thermoplastic type material.
Cross-linked polyethylene (XLPE) has much more advanced electrical and thermal characteristics than PVC. Since XLPE is a thermostable type material, which once cross-linked does not change its characteristics subject to an increase in temperature or pressure.
Cables insulated with XLPE increase their maximum service temperature compared to those insulated with PVC, from 70° to 90°, making it possible to transport greater current intensity.
It also allows for a higher short circuit current and higher temperature than with PVC.
XLPE has improved resistance to contact with water.

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