VOLTAGE DROP FOR LOW VOLTAGE CABLES

Normally for an electric line or for power supply to a motor the voltage drop would be less than 5% of nominal voltage. To calculate the voltage drop must apply the following formula:

$$\Delta V = \frac{K \cdot I \cdot L}{1000}$$

Where :
ΔV = Voltage drop in Volt s
K = Coefficient as per table
I = Current rate in Ampere
L = Length of the line in meters

NOMINAL CROSS SECTION	POWER FACTOR (K)			
mm²	0,7	0,8	0,9	1
1,5	20,66	23,57	26,48	29,34
2,5	12,44	14,18	15,91	17,60
4	7,75	8,83	9,89	10,92
6	5,20	5,91	6,61	7,28
10	3,05	3,45	3,85	4,21
16	1,96	2,21	2,46	2,67
25	1,30	1,45	1,60	1,72
35	0,94	1,05	1,15	1,22
50	0,68	0,76	0,82	0,85
70	0,51	0,55	0,59	0,60
95	0,40	0,44	0,46	0,46
120	0,34	0,36	0,37	0,36
150	0,29	0,30	0,31	0,29
185	0,25	0,26	0,27	0,24
240	0,21	0,22	0,22	0,18
300	0,19	0,19	0,18	0,15
400	0,17	0,16	0,16	0,12

CONDUCTORS

CORRECTION FACTORS (VDE 0298-4)

N° operating cores	5	7	10	14	19	24	40	61								
Factor	0,75	0,65	0,55	0,50	0,45	0,40	0,35	0,30								
Ambient temp. (C°)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
Factor	1,15	1,12	1,08	1,04	1	0,96	0,91	0,87	0,82	0,76	0,71	0,65	0,58	0,50	0,41	0,29

SHORT CIRCUIT CURRENT CALCULATION

The maximum temperature allowed for rubber cables, during short circuit, is 250°C. The maximum thermal short circuit current allowed, for a timet, can be calculated by the following formulas, valid in adiabatic conditions:

$$I_{cc} = \frac{143 \cdot S}{\sqrt{t}}$$

Where :

I_{cc} = Short circuit current (A)

S = Conductor size (mm^2)

t = Time period of short circuit (max 5 s)

CURRENT CARRYING CAPACITY, CABLES FOR **FIXED APPLICATION**

For rubber insulated cables EPR:

The values shown in the table refer to followin laying and service conditions:

- Conductor service temperature: 90 °C
- Ambient air temperature: 30 °C
- Ground temperature for underground laying: 20 °C
- Ground thermal resistivity: 1° km/W
- Depth of laying: 0,8 m

With different laying conditions, the above values should be multiplied by the respective corrective coefficients.

NOMINAL	LAYING IN PIPE IN AIR (3 active phases)		LAYING IN FREE AIR (3 active phases)	
	3 single-core cables	1 three-core cable	3 single-core cables plane laying	1 three-core cable
mm^2	A	A	A	A
1.5	20	19.5	24	23
2.5	28	26	33	32
4	37	35	45	42
6	48	44	58	54
10	66	60	80	75
16	88	80	107	100
25	117	105	141	127
35	144	128	176	158
50	175	154	216	192
70	222	194	279	246
95	269	233	342	298
120	312	268	400	346
150	355	300	464	399
185	417	340	533	456
240	490	398	634	538
300	-	455	736	621
400	-	-	868	-
500	-	-	998	-
630	-	-	1151	-

CURRENT CARRYING CAPACITY, CABLES FOR **MOBILE APPLICATION**

CURRENT CARRYING CAPACITY UP TO 6/10 kV (VDE 0298-4) ambient temperature 30°C

Application									
Cross section	Laying on the floor	Free in air	Reeled						
			1 layer	2 layer	3 layer	4 layer	5 layer	6 layer	7 layer
mm²	A	A	A	A	A	A	A	A	A
1	19	20	15	12	9	8	7	5	4
1,5	24	25	19	15	12	10	9	6	5
2,5	30	32	24	18	15	13	11	8	7
4	41	43	33	25	20	17	16	11	9
6	53	56	42	32	26	22	20	14	12
10	74	78	59	45	36	31	28	20	16
16	99	104	79	60	49	42	38	27	22
25	131	138	105	80	64	55	50	35	29
35	162	170	130	99	79	68	62	44	36
50	202	212	162	123	99	85	77	55	44
70	250	263	200	153	123	105	95	68	55
95	301	316	241	184	147	126	114	81	66
120	352	370	282	215	172	148	134	95	77
150	404	424	323	246	198	170	154	109	89
185	461	484	369	281	226	194	175	124	101
240	528	554	422	322	259	222	201	143	116
300	608	638	486	371	298	255	231	164	134

CURRENT CARRYING CAPACITY ABOVE 6/10 kV (VDE 0298-4) ambient temperature 30°C

Application									
Cross section	Laying on the floor	Reeled							
		1 layer	2 layer	3 layer	4 layer	5 layer	6 layer	7 layer	
mm²	A	A	A	A	A	A	A	A	
16	105	84	64	51	44	40	28	23	
25	139	111	85	68	58	53	38	31	
35	172	138	105	84	72	65	46	38	
50	216	173	132	106	91	82	58	48	
70	265	212	162	130	111	101	72	58	
95	319	255	195	156	134	121	86	70	
120	371	297	226	182	156	141	100	82	
150	428	342	261	210	180	163	116	94	
185	488	390	298	239	205	185	132	107	
240	574	459	350	281	241	218	155	126	
300	660	528	403	323	277	251	178	145	

CONDUCTORS

ELECTRICAL RESISTANCE

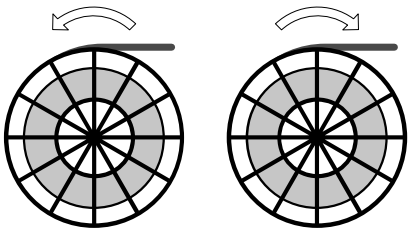
Electrical W Ohm/km (according to IEC 60228 - VDE 0295)

CROSS-SECTION mm²	FLEXIBLE CONDUCTORS, RESISTANCE AT 20°C		FLEXIBLE CONDUCTORS, RESISTANCE AT 90°C		RIGID CONDUCTORS, RESISTANCE AT 20°C		RIGID CONDUCTORS, RESISTANCE AT 90°C	
	Bare copper	Tinned copper	Bare copper	Tinned copper	Bare copper	Tinned copper	Bare copper	Tinned copper
1,5	13,30	13,70	16,93	17,44	12,1	12,2	15,40	15,53
2,5	7,98	8,21	10,16	10,45	7,41	7,56	9,43	9,62
4	4,95	5,09	6,30	6,48	4,61	4,70	5,87	5,98
6	3,30	3,39	4,20	4,32	3,08	3,11	3,92	3,96
10	1,91	1,95	2,43	2,48	1,83	1,84	2,33	2,34
16	1,21	1,24	1,54	1,58	1,15	1,16	1,46	1,48
25	0,78	0,795	0,993	1,012	0,727	0,734	0,925	0,934
35	0,554	0,565	0,705	0,719	0,524	0,529	0,667	0,673
50	0,386	0,393	0,491	0,500	0,387	0,391	0,493	0,498
70	0,272	0,277	0,346	0,353	0,268	0,27	0,341	0,344
95	0,206	0,210	0,262	0,267	0,193	0,195	0,246	0,248
120	0,161	0,164	0,205	0,209	0,153	0,154	0,195	0,196
150	0,129	0,132	0,164	0,168	0,124	0,126	0,158	0,160
185	0,106	0,108	0,135	0,137	0,0991	0,100	0,126	0,127
240	0,0801	0,0817	0,102	0,104	0,0754	0,0762	0,0960	0,0970
300	0,0641	0,0654	0,0816	0,0833	0,0601	0,0607	0,0765	0,0773
400	0,0486	0,0495	0,0619	0,0630	0,0470	0,0475	0,0598	0,0605
500	0,0384	0,0391	0,0489	0,0498	0,0366	0,0369	0,0466	0,0470
630	0,0287	0,0292	0,0365	0,0372	0,0283	0,0286	0,0360	0,0364

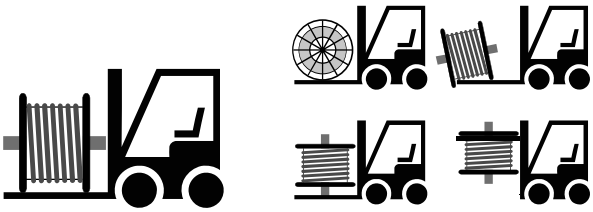
GUIDE TO USE

HANDLING

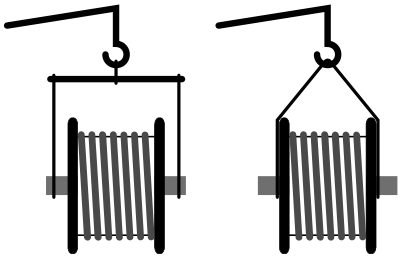
When handling drums, reasonable precautions should be taken in consideration in order to avoid damage to the cable and injury to people. Due regard should be paid to the mass of the drum, the method and direction of rolling and the method of lifting.



Correct **Incorrect**



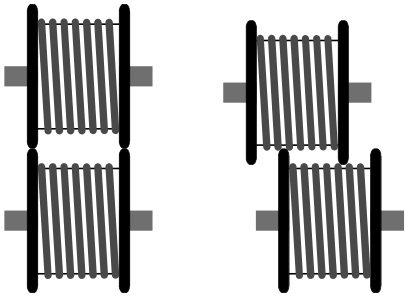
Correct **Incorrect**



Correct **Incorrect**

STORAGE

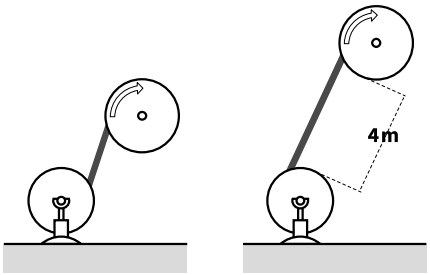
Cable drums should be stored so that the drum flanges do not contact cable on another drum.
Cables stored at temperatures which are below those recommended for installation conditions, should not be subject to any mechanical stress including shocks, impacts, bending and torsions.
If cables are not fully protected (with battens or plastic foils for example), store should be in a protected area and not weather-beaten. The cable end should be sealed, in case, to prevent ingress of moisture during transport and storage.



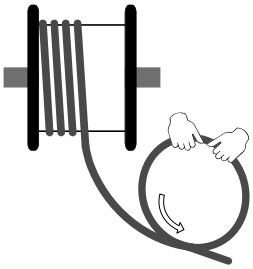
Correct **Incorrect**

INSTALLATION & USE

The correct installation method should be done by unwinding the cable along the machine with standard cable pulling system and rollers. If this is not possible, because of the site conditions, it's possible to transfer the cable directly to the operating drum but avoiding reverse bending and, if possible, with a distance between the reels at least of 4 meters.

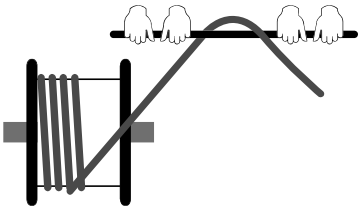


It's necessary to be careful during the transfer of the cable because it could have a residual torsion from the beginning, before to start its real application.
In order to remove the initial torsions, if present, we suggest a couple of solutions:

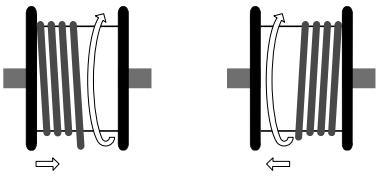


· Create a spiral with the cable from the drum jacked on and roll it up to the free end, this operation will remove the twisting
Fix the cable in order to start the operation. If after the first operation there is still a twisting it's better to repeat the removal process.

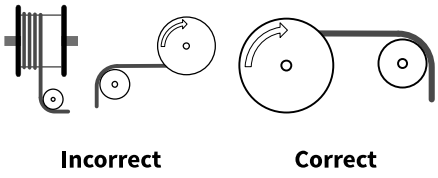
· A couple of people could walk handling a cylinder bar under the cable from the drum jacked on up to free end, in this way they will push the twisting out from the cable. In case of residual twisting repeat the operation.



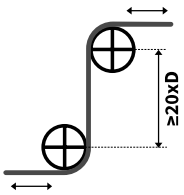
Aristoncavi's cables are produced with S stranding direction. In this case we recommend to start winding the cables, on the reeling drum, from the left side of reel as shown in the pictures:



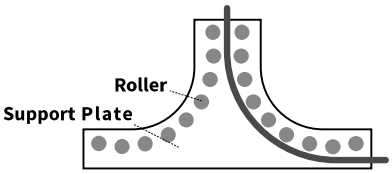
Changing direction during winding or unwinding, is a dangerous operation: it has to be gradual. The rollers and the shaves must be well positioned at an adequate distance in order to avoid mechanical stresses to the cores.



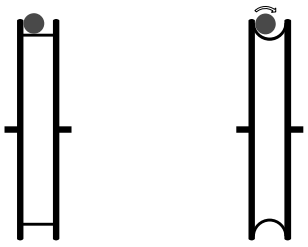
If the change of direction cannot be avoided, the minimum distance with double or S-type directional changer must be bigger than 20xD (D= overall cable diameter).



For a large diameter cable it would be better to use rollers to reduce the friction with the sheath during the change of direction.

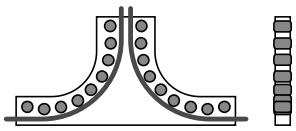


If sheaves are used, it is important to have a flat surface profile, to avoid unwanted rotations or twisting caused by the continuous clash with the sides of the sheave. In any case, the width of a cradle or that of a roller, should be 10-15% larger than the outer cable diameter to allow a correct running.



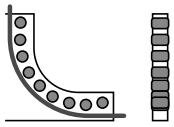
CABLE GUIDE

Safe and smooth guidance of the cable for end and centre feed.



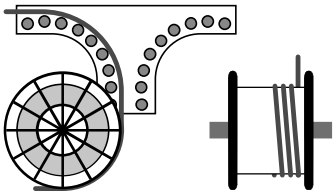
ROLLER GUIDE

Defined guidance of the cable from reel body to feed point.



CABLE FEED POINT

Ideal cable guidance at feeding point for centre feed applications.

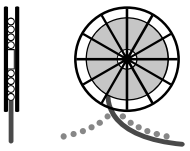


CABLE MESH GRIP

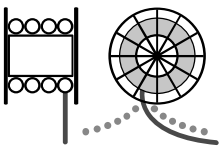
Ideal tension relief for cable at feeding point. Safe and simple to handle, it spreads the forces over a wide surface area to prevent cable damage.

TYPES

Monospiral drum (single spire multi layers) ideal to guarantee the heat dissipation and the control of irregular twisting during unwinding. The limit could be the cable's length in relation with the reel's diameter.



Multispiral drum (multi spires single layer) used in case of long cable lengths. It is important to ensure that the guide mechanism doesn't damage the cable during unwinding, for example: avoiding anomalous rub against the surface of the previous spire or irregular twisting. It is advisable to use maximum two layers to allow the thermal balance.



Cylindric drum (multi spires multi layers random wound) it is the cheaper reel but it doesn't guarantee the control over the layers of cable: the cable could be stacked, for example, on one side of the drum.