



2011 Catalogue





KRJ mission

Offer different solutions that put products, accessories, dedicated tools, strong technical assistance and field operational training together, aiming the improvement of electrical connections systems over technical and economical aspects regarding them to be able to supply the needs of the market.



The Products presented here are made and developed by **KRJ Indústria e Comércio Ltda.**

Our work in the electrical connectors market started in 1997 importing Aluminum wedge connectors from the United States. The connectors were imported and distributed into the national market by KRON Instrumentos Elétricos.

Making use of market knowledge and strength of the brand KRON, import and distribution of Aluminum wedge connectors started. From 1999 the nationalization process of Aluminum wedge connectors and the development of extension line wedge connectors with a strong technical differential of an OPTIMIZED range of connection line wedge connectors started with the implementation of their own Engineering department.

The work counted on the affiliation of three companies at the CONNECTORS operation inside the structure of Kron Instrumentos Elétricos as a basis, RuF Representações – in charge of all the commercial operation, Jaltec Tecnologia, in charge of all manufacturing and development operations and Kron Instrumentos Elétricos itself, in charge of the operation administration and logistics as a whole.

In 2002 the three companies that were associated at the connectors operation, KRON / RuF / Jaltec and their respective partners founded KRJ Indústria e Comércio Ltda. With a strong participation at the national market and the work consolidated at the international and national markets, in October 2009 the new logo was launched intending to consolidate our company's image with international and national work, keeping our traditional products quality and the technological innovation.

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WEDGE CONNECTORS - KARA - SYMMETRICAL AND ASYMMETRICAL SERIES

KARA connectors are available in 10 different types – 6 from the Symmetrical and 4 from the Asymmetrical series, which may be applied to copper or aluminum, solid or corded conductors ranging from 1,5mm² to 120 mm².

The 10 types of connectors are presented as follows, with their respective color codes that characterize them to electricians and users in general.



Thanks to their electric mechanical project that highlights the concept of connection by spring effect and the features of the materials used in their manufacturing KARA connectors assure a great electric reliability with a lower power loss during their working time to users. (due to the equivalent copper electric section that is inherent to “C” and “Wedge”).

Spring effect is provoked when “C” and “Wedge” compounds deform as they are mechanically requested during connector’s application and start to act as springs, pressing the conductors connected to them with a constant strength, guaranteeing connection for several years.



SYMMETRICAL SERIES

- **KARA 1** - Type I – package in gray
- **KARA 2** - Type II – package in green
- **KARA 3** - it is equivalent to types III, IV and V – packages in red/blue and yellow.
- **KARA 6** - Type VI – packages in white/blue
- **KARA 7** - Type VII – packages in white/red
- **KARA 8** - Type VIII – packages in white/green



ASYMMETRICAL SERIES

- **KARA A** - it is equivalent to the traditional A, F, G and H types – packages in violet, green/blue, violet/blue and orange/blue.
- **KARA B** - it is equivalent to the traditional types B, J and K – packages in orange, brown/blue and white/blue.
- **KARA C** - it is equivalent to the traditional types C and D – packages in white and brown.
- **KARA L** - Type L – packages in gray/blue

KARA connectors went through critical electrical tests which used power values corresponding to the biggest copper conductors admitted by the connectors.

The main standards used for project and lab connectors performance tests are: NBR-9326, NBR 5370 (reference), ASTM B545, ASTM B117, ANSI C119.4-2004.

“C” and “Wedge” compounds that form KARA connector are manufactured with copper bond with mechanical and electrical features compatible to the requirements the connector will be submitted to in real conditions in field or in lab simulations.

Its nickel and tin double superficial finishing and the anti oxide wax in both compounds make KARA connectors to show a high resistance to corrosion in critical environment conditions, regardless the

type of conductor used in the connection, either copper or aluminum.

KARA connectors were dimensionally created taking the ergonomic aspects in field application into consideration, what gives an enormous easiness in handling tools.

Other important feature is the optimization of the equivalent types used in the market.

“C” and “Wedge” compounds are individually marked, making it easier to identify them after they are taken out from their packaging.

Dimensions and tolerances follow our design number 580.958.

Check our Product Specification ETE -028 for further information.

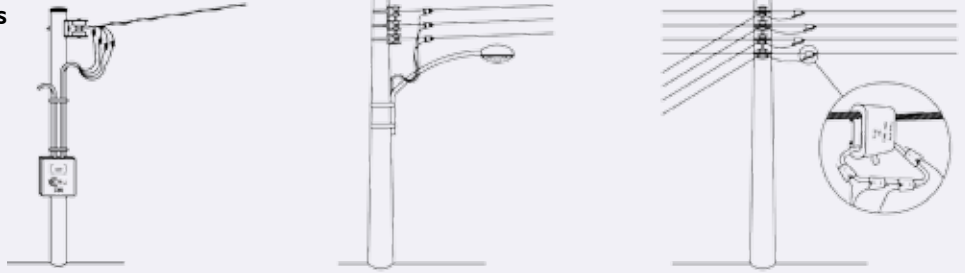
CONNECTORS TO ELECTRIC POWER DISTRIBUTION SYSTEMS – KARA

WEDGE CONNECTORS – KARA – SYMMETRIC AND ASYMMETRIC SERIES

TYPICAL EXAMPLES OF INSTALLATIONS THAT USE KARA CONNECTORS

CONNECTORS SELECTION

The correct choice of connectors is fundamental for an efficient connection accomplishment, thus, the following tables allow the user to a perfect definition of the type of connector to be used.



CONDUCTOR SELECTION TABLE – BY DIAMETER IN MILIMETER

SYMMETRIC CONNECTORS										
REF KRJ	TYPE	PACKAGE	DIAMETER ADDITION		MAIN DIAMETER		DIAMETER DERIVATION		MAXIMUM CURRENT (A) (*)	COVER
			MAX.	MIN.	MAX.	MIN.	MAX.	MIN.		
KARA 1	I	Gray	14,01	11,19	8,12	3,17	7,42	3,17	180	1
KARA 2	II	Green	11,18	9,00	8,12	3,17	5,21	3,17	180	
KARA 3	III	Red, Blue and Yellow	9,50	4,70	6,55	2,54	4,65	1,27	130	
KARA 6	VI	White/Blue	18,72	16,79	10,61	8,01	9,36	6,54	260	2
KARA 7	VII	White/Red	16,78	14,02	10,35	4,66	8,30	4,66	220	
KARA 8	VIII	White/Green	20,22	18,73	10,61	8,01	10,11	8,01	260	
ASYMMETRIC CONNECTORS										
KARA A	A	Violet, Green/Blue, Violet/Blue and Orange/Blue	10,95	7,20	9,36	5,60	5,10	1,36	140	1
KARA B	B	Orange, Brown/Blue and White/Blue	13,11	10,95	11,35	6,20	5,10	1,36	140	
KARA C	C	Brown and white	17,00	13,11	12,74	8,20	5,10	1,74	140	
KARA L	L	Gray/Blue	19,45	16,43	14,60	12,30	5,10	2,25	160	2

(*) electric current considering equivalent copper electric session of connector's mass, having it installed outdoors at room temperature of 40°C and maximum connector temperature elevation of 30°C over room temperature.

The analysis of conductors is essential to the correct selection of a KARA connector, taking their own diameter into consideration. The definition of connector is based on checking that the main and derivative conductors diameter are into the respective functional ranges above, as well as that the addition of those diameters is into the corresponding range of addition.

Main and derivative conductors' occupation range is extremely important to guarantee the spring effect of "C" and "Wedge" pieces.

Connection examples

EXAMPLE 1

Connecting 10mm² AAC aluminum cable to 10mm² non compacted copper cable

Main: diameter = 4,08mm

Derivative: diameter = 4,08mm

Diameters addition = 8,16mm

Connector to be used: KARA 3

EXAMPLE 2

Connecting 16mm² AAC aluminum cable to 16mm² compacted copper cable

Main: diameter = 5,50mm

Derivative: diameter = 4,75mm

Diameters addition = 10,25mm

Connector to be used: KARA 2

EXAMPLE 3

Connecting AWG AAC 2 aluminum cable to 2,5mm² copper wire

Main: diameter = 7,42mm

Derivative: diameter = 1,74mm

Diameters addition = 9,16mm

Connector to be used: KARA A

EXAMPLE 4

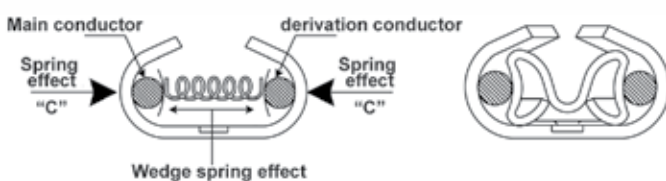
Connecting 10mm² AAC aluminum cable to 2,5mm² copper wire

Main: diameter = 4,08mm

Derivative: diameter = 1,74mm

Diameters addition = 5,82mm

Connector to be used: KARA 3



Obtaining the spring effect in the connection process will only be possible when derivative and main conductor diameter addition ranges are observed. To do so we recommend adopting conductors practical application tables that are standardized by their company. Get in touch with our Application Engineering Division for the elaboration of practical tables.

CONNECTORS FOR ELECTRIC POWER DISTRIBUTION SYSTEMS – KARA

▶ PRACTICAL TABLES FOR COONDUCTORS SELECTION BY TYPE/GAUGE

■ AWG X AWG

CABLES/WIRES CU/AL (AWG)		CONDUCTOR CABLE WITHOUT STEEL SOUL							CONDUCTOR CABLE WITH STEEL SOUL						
		8	6	4	2	1/0	2/0	3/0	8	6	4	2	1/0	2/0	3/0
INSULATED CABLE	14	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	12	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	10	III	III	III/A	A	B	C	C	III	III	III/A	B	B	C	C
	8	III	III	III/A	II/B	B	C	C	III	III	II/A	I/B	C	C	C
	6	III	II	II/A	I/B	C	C	C	III	II	II/A	I/B	C	C	L
	4	II/A	II/A	I	I	VII	VII		II/A	II/A	I	I	VII		
	2	II/A	I/B	I	VII	VII	VI		II/B	I/B	I	VII	VI		
	1/0	B	C	VII	VII	VI	VIII		C	VII/C	VII	VI	VIII		
NAKED ACSR CABLE	8	III	III	II/A	I/B	C	C	C	III	III	II/A	I/B	C	C	L/C
	6	III	II	II/A	I/B	VII/C	VII/C	C	III	II	I/B	I/B	VII/C	C	L
	4	II/A	II/B	I	I	VII			II/A	I/B	I	VII	VII		
	2	I/B	I/B	I	VII	VI	VI		I/B	I/B	VII	VII	VI		
	1/0	C	VII/C	VII	VI	VIII			C	VII/C	VII	VI	VIII		
INSULATED WIRE	14	III	III	III/A	A	B	B		III	III	III/A	A	B		
	12	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	10	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	8	III	III	III/A	II/A	B	C	C	III	III	II/A	I/B	C	C	C
	6	III	III	II/A	I/B	C	C	C	III	III	II/A	I/B	C	C	L/C
	4	III	II	II	I	VII	VII		III	II	I	I	VII		
2	II/A	I/B	I	I	VII	VI		II/A	I/B	I	VII	VII			

■ AWG X mm²

CABLES/WIRES CU/AL (mm ²)		CONDUCTOR CABLE WITHOUT STEEL SOUL – AWC NAKED							CONDUCTOR CABLE WITH STEEL SOUL – AWC NAKED						
		8	6	4	2	1/0	2/0	3/0	8	6	4	2	1/0	2/0	3/0
INSULATED CABLE	1,5	III	III	III/A	A	A	B		III	III	III/A	A	B		
	2,5	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	4	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	6	III	III	III/A	A	B	C	C	III	III	III/A	B	C	C	C
	10	III	III	II/A	II/B	B	C	C	III	III	II/A	I/B	C	C	L/C
	16	III	III	II/A	I/B	VII/C	VII/C	C	III	II	II/B	I/B	VII/C	C	L
	25	II/A	II/A	I	I	VII	VII		II/A	II	I	I	VII		
	35	II/A	I/B	I	VII	VII	VI		II/A	I/B	I	VII	VI		
	50	I/B	I/B	I	VII	VI	VI		I/B	I/B	VII	VII	VI		
INSULATED WIRE	1,5	III	III	III/A	A	A	B		III	III	III/A	A	B		
	2,5	III	III	III/A	A	B	B	C	III	III	III/A	A	B		C
	4	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C	C
	6	III	III	III/A	A	B	C	C	III	III	III/A	A	B	C	C
	10	III	III	III/A	II/A	B	C	C	III	III	II/A	I/B	C	C	C
	16	III	III	II/A	I/B	C	C	C	III	II	II/A	I/B	C	C	L

CONNECTORS FOR ELECTRIC POWER DISTRIBUTION SYSTEMS – KARA

» PRACTICAL TABLES FOR COONDUCTORS SELECTION BY TYPE/GAUGE

■ mm² X AWG

CABLES/WIRES CU/AL (AWG)		MULTIPLYED INSULATED PHASE AAC CABLE - mm ²								NEUTRAL NAKED CABLE - mm ²					
		WIRE 6	WIRE 10	16	25	35	50	70	95	10 AAC	16 AAC	25 CAL	35 CAL	50 CAL	70 CAL
INSULATED CABLE	14		III	III	III/A	A	A	B	C	III	III	III/A	A	A	B
	12	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	10	III	III	III	III/A	A	B	B	C	III	III	III/A	A	B	B
	8	III	III	III	II/A	II/A	I/B	C	C	III	III	II/A	II/B	B	C
	6	III	III	III	II/A	II/B	I/B	C	C	III	II	II/A	I/B	C	C
	4	III/A	II/A	II/A	II	I	I	VII		II/A	II/A	I	I	VII	VII
	2	A	II/A	I/B	I	VII	VII	VI		I/B	I/B	I	VII	VII	VII
	1/0	B	B	C	VII	VII	VI	VIII		C	VII	VII	VII	VI	VIII
NAKED ACSR CABLE	8	III	III	III	II/A	II/A	I/B	C	C	III	II	II/A	I/B	B	C
	6	III	III	II	II	I/B	I/B	VII/C	C	II	II	I	I/B	VII/C	VII/C
	4	III/A	II/A	II/B	I	I	VII	VII		II/A	I/B	I	I	VII	VII
	2	A	I/B	I/B	I	VII	VII	VI		I/B	I/B	VII	VII	VI	VI
	1/0	B	C	VII/C	VII	VI	VI			C	VII	VII	VI	VIII	
INSULATED WIRE	14		III	III	III/A	A	A	B		III	III	III/A	A	A	B
	12	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	10	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	8	III	III	III	II/A	II/A	I/B	B	C	III	III	II/A	II/A	B	C
	6	III	III	III	II/A	II/B	I/B	C	C	III	II	II/A	I/B	C	C
	4	III	III	II	II	I	I	VII		II	II	I	I	VII	VII
	2	III/A	II/A	I/B	I	I	VII	VII		II/A	I/B	I	VII	VII	VI

■ mm² X mm²

CABLES/WIRES CU/AL (mm ²)		MULTIPLYED INSULATED PHASE AAC CABLE - mm ²								NEUTRAL NAKED CABLE - mm ²					
		WIRE 6	WIRE 10	16	25	35	50	70	95	10 AAC	16 AAC	25 CAL	35 CAL	50 CAL	70 CAL
INSULATED CABLE	1,5		III	III	III/A	A	A	B		III	III	III/A	A	A	B
	2,5		III	III	III/A	A	A	B	C	III	III	III/A	A	A	B
	4	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	6	III	III	III	III/A	A	B	B	C	III	III	III/A	A	B	C
	10	III	III	III	II/A	II/A	I/B	C	C	III	III	II/A	I/B	B	C
	16	III	III	II	II/A	I/B	B	VII/C	C	III	II	II/A	I/B	C	VII/C
	25	III/A	II/A	II/A	I	I	I	VII		II/A	II	I	I	VII	VII
	35	A	II/A	I/B	I	I	VII	VII		II/B	I/B	I	VII	VII	VI
	50	A	I/B	I/B	I	VII	VII	VI		I/B	I	VII	VII	VI	VI
INSULATED WIRE	1,5		III	III	III/A	A	A	B		III	III	III/A	A	A	B
	2,5		III	III	III/A	A	A	B	C	III	III	III/A	A	A	B
	4	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	6	III	III	III	III/A	A	A	B	C	III	III	III/A	A	B	B
	10	III	III	III	III/A	II/A	I/B	C	C	III	III	II/A	II/B	B	C
	16	III	III	III	II/A	I/B	I/B	C	C	III	II	II/A	I/B	C	C

- Cable diameters considered here are from the cable table on page 19.
- In case connections which wires/cables are not on the table need to be accomplished, for instance, extra flexible cables, use the diameters addition table from page 5 and follow the examples. In case of any doubt, please get in touch with our technical-commercial department.

CONNECTORS FOR ELECTRIC POWER DISTRIBUTION SYSTEMS – KARA

» CONNECTORS APPLICATION AND EXTRACTION – KARA

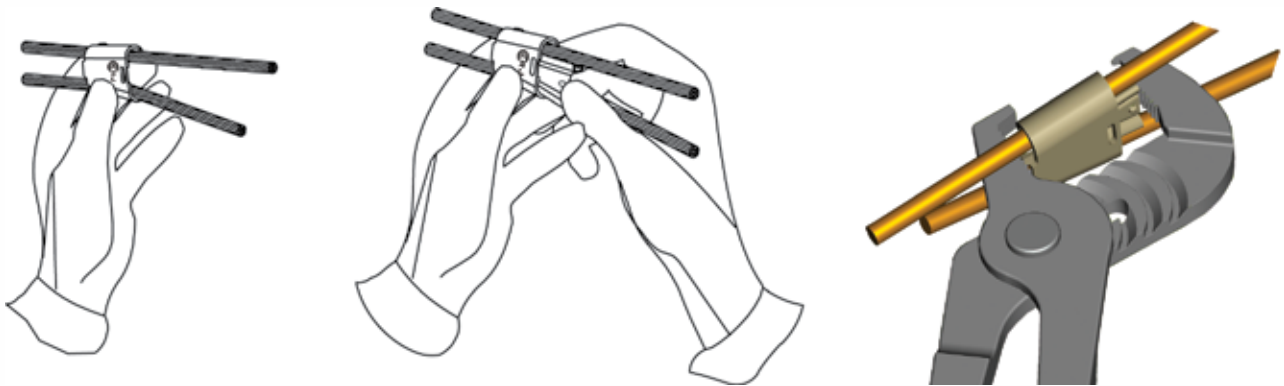
KARA connectors are easily applied and extracted by using the 12” pump pliers (30 cm of minimal length) with a maximum nib thickness equals to 8 mm and isolation up to 1 KV on handles.

Aiming tooling simplification, KRJ developed ALIKARA, which has a differential handling angle, what makes connectors application easier. It also has a configuration that allows connectors extraction, what eliminates the need of an extra conventional extractor.

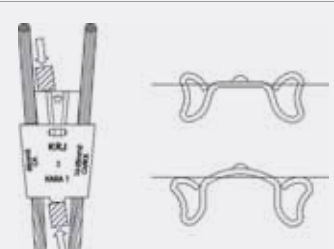
Additional information on KARA connectors’ application may be taken through the Instruction Manual ETE-006.



KARA CONNECTORS APPLICATION SEQUENCE



WARNING:
At the beginning of the application it is advisable that pliers gag, which acts on the back part of the wedge is positioned to its side, not to its center, avoiding restrictions in the deformation expected in it. Wedge's form must be turned to its side prior to and after connector application.



The diagram shows a cross-section of the wedge and wires. It illustrates the correct placement of pliers on the side of the wedge, rather than the center, to ensure proper deformation.

KARA CONNECTORS EXTRACTION SEQUENCE



CONNECTORS FOR GROUNDING IN ELECTRIC POWER DISTRIBUTION SYSTEMS – KARA-T

» WEDGE CONNECTORS – KARA-T SYMMETRIC AND ASYMMETRIC SERIES

Symmetrical and asymmetrical KARA T connectors are applicable in protection grounding systems with circle stem and cables or only cables. They are available in three different models, ranging from 1/2 inch stem to 5/8 inches and cables ranging from 10mm² to 35mm². The table indicates the type and their respective derivation cable and main stem cables diameter range. .



They were submitted to specific electrical mechanical tests and they were approved, according to the technical standards NBR-9326, NBR-5370, ASTM B117, ANSI C119.4-2004 e UL 467.

They receive a double superficial nickel and tin finishing and they are assembled by introducing anti-oxide wax into C and Wedge compounds. Dimensions and tolerances follow 580.945 design. Additional information may be obtained through our Product Technical Specification ETE-008.



	DERIVATION CABLE Cu (mm ²)	MAIN							
		WIRE	CABLE					STEM (mm)	
		10 (mm ²)	16 (mm ²)	25 (mm ²)	35 (mm ²)	95 (mm ²)	120 (mm ²)	1/2" Ø12,5-12,8	5/8" Ø14-16
	10	2T	2T	2T	2T	-	LT	LT	ST
	16	2T	2T	2T	1T	LT	LT	LT	ST
	25	-	-	-	1T	LT	-	ST	NT
	35	-	-	-	7T	-	-	ST	NT

KARA T connectors have the same mechanical and electrical features from KARA Series, with the difference of a better behavior facing traction and resistance requirements, which are particularly used for that type of application, besides an adequate superficial finishing to the environment where they will be applied to.

» WEDGE CONNECTORS – KARA WITH SIDE STRING

KARA connectors may be applied to naked networks with aluminum side string.



SIDE STRING SELECTION TABLE

ALUMINUM SIDE STRING DESIGN 580.962			
REF KRJ	L	STRAP DERIVATION	COLOR
Kara 1 Al	4 - 2 AWG AAC	2 AWG (Ø 6,35mm)	gray
Kara 7 Al	2 AWG ACSR - 1/0 AWG AAC/ ACSR	2 AWG (Ø 6,35mm)	white / red

OBS. Tinned Copper String

» WEDGE CONNECTORS - PT ALUMINUM BOND

PT connectors are available in six different series, known as PT10, PT40, PT35, PT33, PT55 and PT79. That may be applied to copper or aluminum, solid or corded conductors ranging from 13mm² to 470mm². And they are identified by their identification colors to electricians and users in general:

Red - PT10

Blue - PT40 and PT35

Yellow - PT33, PT55 and PT79

Colors are also indications of the respective application shells to be used during installation.

Thanks to its electrical mechanical project PT connectors show a great technical reliability with a minimum loss, due to its concept of connection by spring effect.

The main rules used in projects and connectors lab performance tests are NBR-9326, NBR 11788 (reference), ASTM B545, ASTM B154, ASTM B117, ANSI C119.4-2004.

PT connectors are made of aluminum bond with and electrical conductivity compatible to the conductors connected to them besides mechanical features adequate to the concept of spring connection.

They are usually applicable to solid or corded aluminum connectors and have the anti-oxide wax as a regular supply on compounds assembled to the connector and an electrical contact protection against corrosion. PT connectors may be used in bimetallic connections. In that case connection life will be limited to the environmental conditions of the place where the connection is accomplished.

Aluminum bond PT connectors are not indicated to copper x copper combinations.

PT connectors are easily removable and do not affect the structure of the conductors they are connected to.



» WEDGE CONNECTORS - PT ALUMINUM BOND



An important advantage of PT40, PT35, PT33, PT55 and PT79 series is the optimization of the equivalent types used in the market.

In that new optimized aluminum wedge connectors series, connectors “wedge” piece may be supplied with the Concessionaire Code recorded in it and also with the plastic packaging with the same identification.

The selection of connectors x conductors to be connected when using a wedge connector has always shown as one of the greatest difficulties to the operational electricians. By adopting that double identification such difficulty disappears avoiding losses or even problems to connectors and connections due to the incorrect connector selection.

Furthermore, due to the great reliability of mechanical shell, connector/shell set may be supplied into the same packaging, generating a reduction in unit price, as well

as gains in stock administration.

You may request that option by including the suffix “/C” at the end of the connector code.

Example, wedge connector to AAC 1/0 AWG cable wit derivation AAC 1/0 AWG is PT40 B. At request for metallic shell it is PT40 B/C.

Logistics, stock and distribution process of productive material of all electric power concessionaire is basically composed of:

- Deposit / central warehouse
- Deposit regional warehouse
- Attending vehicle – truck or pick up

None of the three steps mentioned above requires material within a security factor. By reducing types, we obviously have savings in stock items administration costs. We can also add the savings regarding security factors to the savings mentioned above, once the connectors are mandatory in network

connections and derivations. All sectors apply those same security factors when requesting connectors. We can affirm we would have savings of around 30% in pieces quantity, based on the experience of some concessionaires that adopted optimized connectors.

Dimensions and tolerances follow our design number 580.980.

For further information check our Product Specification ETE-019.



CONNECTORS FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION SYSTEM – PT/PTB

WEDGE CONNECTORS – PT ALUMINUM BOND

CONNECTORS SELECTION

From PT connectors own dimensional it was possible to reconstruct the connectors selection table regarding the diameters to which they are connected.

TABLE OF CONDUCTORS SELECTION BY DIAMETER IN MILLIMETERS

SERIES	CODE	DIAMETERS ADDITION		MAIN CONDUCTOR		DERIVATION CONDUCTOR		CAPACITY CURRENT (A) (*)	
		MAX.(mm)	MIN.(mm)	MAX.(mm)	MIN.(mm)	MAX.(mm)	MIN.(mm)		
RED PT 10	PT-1001	18,39	14,81	10,11	6,55	10,11	6,55	190	
	PT-1002	15,29	11,79	10,11	6,55	6,55	4,11		
	PT-1003	16,66	13,08	10,11	6,55	8,38	5,18		
	PT-1004	11,81	8,41	6,55	4,11	5,84	4,11		
	PT-1005	13,46	10,41	8,38	5,18	6,55	4,11		
BLUE PT40 AND PT 35	PT-40A	17,18	13,36	14,53	8,23	7,60	4,11	350	
	PT-40B	21,46	16,22	14,53	8,23	11,79	4,11		
	PT-40C	25,66	20,67	14,53	9,25	14,53	6,55		
	PT-40D	28,70	24,86	14,53	9,25	14,53	9,25		
	PT-35A	22,76	18,75	17,37	15,00	12,70	4,11	490	
	PT-35B	27,01	22,77	17,37	15,00	14,27	5,88		
	PT-35C	31,22	27,02	17,37	15,00	15,24	8,23		
	PT-35D	34,75	31,21	17,37	15,00	17,37	11,68		
	PT-35E	37,00	32,50	18,50	16,30	18,50	15,00		
	PT-35F	32,60	30,10	18,30	16,90	14,80	11,80		
	PT-35G	29,64	25,71	18,30	16,90	11,35	7,42		
	PT-35H	25,35	22,95	18,30	16,90	6,35	4,66		
	PT-33A	23,87	19,40	19,05	13,31	6,50	4,11		550
	PT-33B	28,94	22,79	19,05	13,31	10,11	5,88		
PT-33C	33,14	27,42	20,12	13,31	14,31	7,42			
PT-33D	38,85	31,96	20,47	13,31	19,05	15,00			
YELLOW PT 33, PT 55 AND PT 79	PT-55A	31,00	24,36	24,21	16,92	8,01	4,11	730	
	PT-55B	32,53	28,27	23,88	16,92	11,35	5,88		
	PT-55C	38,03	31,98	23,88	16,92	19,05	10,51		
	PT-55D	45,00	38,56	24,21	16,92	23,88	16,90		
	PT-55E	48,42	43,40	24,21	21,70	24,21	21,70		
	PT-63A	50,32	46,62	29,36	21,79	29,36	21,73		
	PT-63B	49,42	45,04	29,36	21,79	29,36	21,73		
	PT-63C	48,31	43,49	29,36	21,79	22,86	17,78	920	
	PT-63D	46,36	41,69	29,36	21,79	22,86	17,78		
	PT-63E	44,72	40,22	29,36	21,79	19,05	13,34		
	PT-63F	42,19	38,36	29,36	21,79	19,05	13,34		
	PT-79A	56,26	52,14	29,36	21,79	29,36	21,73		
	PT-79B	54,11	48,44	29,36	21,79	29,36	21,73		
	PT-79C	51,66	47,80	29,36	21,79	29,36	21,73		
	PT-79D	50,55	46,25	29,36	21,79	22,86	17,78		
	PT-79E	48,60	44,45	29,36	21,79	22,86	17,78		
	PT-79F	46,96	42,98	29,36	21,79	20,18	13,34		
PT-79G	44,43	41,20	29,36	21,79	19,05	13,34			

(*) Estimated electric current, considering copper equivalent section of the connector's compounds mass, having it installed in open air, 40°C room temperature and maximum connector's temperature raising of 30°C above room temperature..

It is necessary to analyze conductors to the correct selection of a PT connector, taking their diameter into consideration. Connector definition is based on the checking that the main conductors' diameter and the derivative are in the respective functional ranges above, as well as that the addition of those diameters is into the corresponding addition range.

Examples of selection

EXAMPLE 1

AAC 1/0 AWG aluminum cable with AAC 1/0 AWG aluminum cable connection
Main: diameter: 9,36mm
Derivation: diameter: 9,36mm
Diameter addition: 18,72mm
Connector to be used: PT40B

EXAMPLE 2

AAC 336,4 MCM aluminum cable with AAC 336,4 MCM aluminum cable connection
Main: diameter: 16,91mm
Derivation: diameter: 16,91mm
Diameter addition: 33,62mm
Connector to be used: PT 35D

According to the criterion above practical tables may be constructed in function of the standards used by the users.

CONNECTORS FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION SYSTEM - PT/PTB

TABLE OD CONDUCTOR SELECTION BY TYPE/ GAUGE - PT

mm ² X mm ²		MAIN CONDUCTOR - mm ² - AAC - INSULATED									
		240	185	150	120	95	70	50	35	25	16
DERIVATION CONDUCTOR - mm ² CA INSULATED	16	PT-55A	PT-35A	PT-40B	PT-40B	PT-40A	PT-40A	PT-1005	PT-1005	PT-1004	PT-1004
	25	PT-55A	PT-35A	PT-40B	PT-40B	PT-40B	PT-40A	PT-1002	PT-1002	PT-1005	
	35	PT-55A	PT-35B	PT-40B	PT-40B	PT-40B	PT-40A	PT-1003	PT-1003		
	50	PT-55A	PT-35B	PT-40C	PT-40B	PT-40B	PT-40B	PT-1001			
	70	PT-55A	PT-35B	PT-40C	PT-40C	PT-40B	PT-40B				
	95	PT-55B	PT-35C	PT-40D	PT-40C	PT-40C					
	120	PT-55B	PT-35C	PT-40D	PT-40D						
	150	PT-55B	PT-35C	PT-40D							
	185	PT-55C	PT-35D								
	240	PT-55C									

MCM/AWG X MCM/AWG		MAIN CONDUCTOR MCM/AWG - AAC/ACSR - NAKED																
		795	636	556,5	477	397,5 CAA	397,5 CA	336,4 CAA	336,4 CAA***	336,4 CA	266,8	4/0	3/0	2/0	1/0	2	4	6
DERIVATION CONDUCTOR MCM / AWG - AAC/ACSR - NAKED	6	-	-	PT-55A	PT-55A	PT-33A	PT-33A	PT-33A	PT-35H	PT-35A	PT-35A	PT-40B	PT-40B	PT-40A	PT-1002	PT-1005	PT-1004	PT-1004
	4	-	-	PT-55A	PT-55A	PT-33B	PT-33B	PT-33B	PT-35G	PT-35B	PT-35A	PT-40B	PT-40B	PT-40B	PT-1003	PT-1002	PT-1005	
	2	-	-	PT-55B	PT-55A	PT-33B	PT-33B	PT-33B	PT-35G	PT-35B	PT-35B	PT-40C	PT-40B	PT-40B	PT-1001**	PT-1003		
	1/0	-	-	PT-55B	PT-55B	PT-33B	PT-33B	PT-33B	PT-35G	PT-35B	PT-35B	PT-40C	PT-40C	PT-40B	PT-40B			
	2/0	-	-	PT-55C	PT-55B	PT-33C	PT-33C	PT-33B	PT-35G	PT-35C	PT-35B	PT-40C	PT-40C	PT-40C				
	3/0	-	-	PT-55C	PT-55C	PT-33C	PT-33C	PT-33C	PT-35F	PT-35C	PT-35B	PT-40D	PT-40C					
	4/0	-	-	PT-55C	PT-55C	PT-33C	PT-33C	PT-33C	PT-35F	PT-35C	PT-35C	PT-40D						
	266,8	PT-79G	PT-63F	PT-55C	PT-55C	PT-33D	PT-33D	PT-33D	PT-35E	PT-35D	PT-35C							
	336,4 CA	PT-79F	PT-63E	PT-55D	PT-55C	PT-33D	PT-33D	PT-33D	PT-35E	PT-35D								
	336,4 CAA	PT-79F	PT-63E	PT-55D	PT-55D	PT-33D	PT-33D	PT-33D	PT-35E									
	397,5 CA	PT-79E	PT-63D	PT-55D	PT-55D	PT-33D	PT-33D											
	397,5 CAA	PT-79E	PT-63D	PT-55D	PT-55D	PT-55D	PT-33D											
	477	PT-79D	PT-63C	PT-55D	PT-55D													
	556,5	PT-79C	PT-63B	PT-55D/E*														
	636	PT-79B	PT-63A															
	795	PT-79A																

* WHEN USING CABES 556,5 ACSR WITH 556,5 ACSR, CHECK ADDITION SELECTION TABLE
 ** OPTIONAL PT-408
 ***ALTERNATIVE

CONNECTORS FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION SYSTEM – PT/PTB

WEDGE CONNECTORS – PT WITH STRING

PT connectors may be applied to protected or insulated naked networks, with a tin-coppered string or vivid line clips to which connectors are connected. The three models of PT connectors with string are presented in the following instructions:

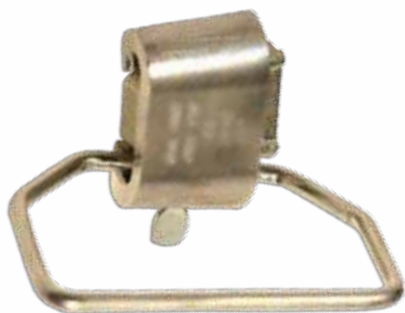
REGULAR – EN

Usually used to AT – to vivid line clips
Design 580.96 I



SIDE – EL

Usually used to BT – to consumer extension connections
Design 580.96 I



PROTECTED NETWORK EN RP

Usually used to protected lines to vivid line clips.
Design 580.97 I



OBS.: Items with PQ and GR are for use in 15kV covering.

STRING SELECTION TABLE

REGULAR STRING			
KRJ REF.	CONDUCTOR	STRAP DERIVATION	COLOR
PT 1003 EN	4 - 2 AWG	2 AWG	Red
PT 40B EN	1/0 - 2/0 - 3/0 - 4/0 AWG	2 AWG	Blue
PT 40B EN - 1/0	1/0 - 2/0 - 3/0 - 4/0 AWG	1/0 AWG	Blue
PT 35B EN	336,4 MCM AAC	2 AWG	Blue
PT 35B EN - 1/0	336,4 MCM AAC	1/0 AWG	Blue
SIDE STRING			
KRJ REF.	CONDUCTOR	STRAP DERIVATION	COLOR
PT 1003 EL	4 - 2 AWG	2 AWG	Red
PT 40B EL	1/0 - 2/0 - 3/0 - 4/0 AWG	2 AWG	Blue
PT 40B EL - 1/0	1/0 - 2/0 - 3/0 - 4/0 AWG	1/0 AWG	Blue
PT 35B EL	336,4 MCM AAC	2 AWG	Blue
PT 35B EL - 1/0	336,4 MCM AAC	1/0 AWG	Blue
PROTECTED NETWORK STRING			
KRJ REF.	CONDUCTOR	STRAP DERIVATION	COLOR
PT 1003 EN RP	4 - 2 AWG	2 AWG	Red
PT 1003 EN RP PQ	4 - 2 AWG	2 AWG	Red
PT 40B EN RP	1/0 - 2/0 - 3/0 - 4/0 AWG	2 AWG	Blue
PT 40B EN RP GR	1/0 - 2/0 - 3/0 - 4/0 AWG	2 AWG	Blue
PT 40B EN RP - 1/0	1/0 - 2/0 - 3/0 - 4/0 AWG	1/0 AWG	Blue
PT 35B EN RP	336,4 MCM AAC	2 AWG	Blue
PT 35B EN RP GR	336,4 MCM AAC	2 AWG	Blue
PT 35B EN RP - 1/0	336,4 MCM AAC	1/0 AWG	Blue

OBS.:

String in 2 AWG = Ø6,35mm

String in 1/0 AWG = Ø 8,20mm

» WEDGE CONNECTORS - PTB IN ALUMINUM BOND WITH SUPERFICIAL FINISHING

PTB connectors are available in three different series known as PTB 10, PTB 40 and PTB 350 that may be applied to solid or corded, aluminum or copper conductors ranging from 13mm² to 185mm² and they can be identified by the colors that characterize them to technicians and users in general:

Red - PTB 10

Blue - PTB 40 and PTB 350

Their colors also indicate their respective application shell to be used during installation. Due to their electric-mechanical project, PTB connectors show a great electric reliability with minimal loss, thanks to the concept of spring effect connection.

The main rules used to the project, as well as to lab connectors performance tests are: NBR-9326, NBR 11788 (reference), ASTM B545, ASTM B117 (saline mist test 1000h), ANSI C119.4 - 2004.

PTB connectors are manufactured in aluminum bond with an electric conductivity compatible to the conductors connected to them.

PTB connectors receive a superficial finishing that inhibits galvanic corrosion, which allows connections to copper conductors. Such connections have a good performance during connector's life under practical application environmental conditions to which they are submitted.

They are normally applicable to aluminum or copper, solid or corded conductors and have anti-oxide wax as a regular supplying on connector's assembled compounds that is responsible for cleaning oxides during connector's application and also for protection the electric contact against corrosion. PTB connectors may be used to bimetallic connections.

PTB connectors are easily removed without affecting the structure of the conductors to which they were connected. Furthermore, due to the great reliability of our metallic shells regarding failures, we are able to supply the connector and shell set into the same packaging, what generates unit cost reduction, as well as gains in stock administration.

Include suffix "/C" to the end of connector's code to request that option.

Example wedge connectors to AAC 1/0 AWG cables with derivations AAC 1/0 AWG is PTB4001 and for metallic shell request it is PTB4001/C.

Dimensions and tolerances follow our design number 580.954. For further information check our Product Specification ETE-004.



CONNECTORS SELECTION

Connectors' selection table building was possible from PTB connectors' dimensional project, that's the diameter function of the conductors to which they are connected.

Conductors' analysis is necessary to the correct selection of a PTB connector taking their diameters into consideration. Connector's definition is based on checking that main and derivation conductor's diameters meet the respective functional ranges mentioned above, as well as that the diameters are into the corresponding addition range.

Example of selection

Example 1 connecting 1/0 AWG copper cable to 1/0 AWG copper cable

Main diameter = 9,36mm

Derivation diameter = 9,36mm

Diameters addition = 18,72mm

Connector to be used = PTB 4001

Example 2 connecting 336,4 MCM copper cable to 336,4 MCM copper cable

Main diameter = 16,91mm

Derivation diameter = 16,91mm

Addition of diameters = 33,82mm

Connector to be used = PTB 35013

Practical tables according to the criteria mentioned above may be built according to the standards used by users.

CONDUCTORS SELECTION TABLE BY DIAMETERS IN MILIMETERS

SERIES	CODE	DIAMETER ADDITION		MAIN CONDUCTOR		DERIVATION CONDUCTOR		CURRENT CAPACITY (A) (*)
		MAX.(mm)	MIN.(mm)	MAX.(mm)	MIN.(mm)	MAX.(mm)	MIN.(mm)	
RED	PTB-1001	18,39	14,81	10,11	6,55	10,11	6,55	190
	PTB-1002	15,29	11,79	10,11	6,55	6,55	4,11	
	PTB-1003	16,66	13,08	10,11	6,55	8,38	5,18	
	PTB-1004	11,81	8,41	6,55	4,11	5,84	4,11	
	PTB-1005	13,46	10,41	8,38	5,18	6,55	4,11	
BLUE	PTB-4001	20,22	16,52	12,70	8,23	11,79	6,53	350
	PTB-4002	22,89	19,71	14,88	9,25	11,79	6,18	
	PTB-4003	18,00	14,30	14,88	9,25	6,18	4,11	
	PTB-4004	19,43	16,46	14,88	9,25	7,50	4,75	
	PTB-4005	21,49	18,98	14,88	9,25	10,51	6,53	
	PTB-4006	19,60	17,55	14,88	9,25	5,18	4,11	490
	PTB-4007	21,06	18,25	14,88	9,25	7,42	4,75	
	PTB-4008	24,46	20,77	14,88	9,25	12,30	6,53	
	PTB-4009	25,73	22,41	14,88	9,25	14,53	9,25	
	PTB-4010	27,13	24,13	14,88	9,25	14,53	9,25	
	PTB-4011	29,00	25,60	14,88	9,25	14,53	9,25	
	PTB-4012	27,75	24,87	14,88	9,25	14,53	9,25	
	PTB-35000	22,80	19,70	17,37	13,64	6,18	4,11	
	PTB-35001	24,33	21,11	17,37	13,64	7,50	5,18	
PTB-35002	25,68	22,17	17,37	13,64	9,00	6,53		
PTB-35003	26,60	23,29	17,37	13,64	12,70	8,23		
PTB-35004	29,03	24,87	17,37	13,64	14,27	9,25		
PTB-35005	30,43	26,65	17,37	13,64	14,27	10,39		
PTB-35006	33,16	28,40	17,37	13,64	15,32	11,68		
PTB-35007	31,41	27,84	17,37	13,64	15,32	11,68		
PTB-35008	29,38	26,44	17,37	13,64	15,32	11,68		
PTB-35009	25,30	21,80	18,38	15,32	7,50	5,10		
PTB-35010	28,10	23,90	18,38	15,32	11,33	7,97		
PTB-35011	30,20	27,30	18,38	15,32	14,50	11,30		
PTB-35012	32,30	28,80	18,38	15,32	14,50	11,30		
PTB-35013	34,00	30,20	18,38	15,32	18,30	14,20		
PTB-35014	35,50	31,32	18,38	15,32	18,30	15,32		

(*) Estimated electric current considering copper equivalent electric section of connector's compounds mass, having it installed in open air, at 40°C room temperature and maximum connector temperature elevation of 30°C over room temperature.

➤ PRACTICAL TABLES TO SELECT CONDUCTORS BY TYPE/GAUGE – PTB

MCM/AWG X MCM/AWG

ALUMINIUM/ COPPER CABLE		MAIN CONDUCTOR MCM / AWG								
		336,4	266,8	4/0	3/0	2/0	1/0	2	4	6
DERIVATION MCM / AWG	6	-	-	PTB-4003	PTB-4003	PTB-4003	PTB-1002	PTB-1005	PTB-1004	PTB-1004
	4	PTB-35000	PTB-4007	PTB-4004	PTB-4003	PTB-4003	PTB-1002	PTB-1005	PTB-1005	
	2	PTB-35001	PTB-4002	PTB-4007	PTB-4004	PTB-4004	PTB-1003	PTB-1003		
	1/0	PTB-35003	PTB-4008	PTB-4002	PTB-4005	PTB-4001	PTB-4001			
	2/0	PTB-35004	PTB-4009	PTB-4008	PTB-4002	PTB-4005				
	3/0	PTB-35004	PTB-4010	PTB-4009	PTB-4008					
	4/0	PTB-35005	PTB-4011	PTB-4010						
	266,8	PTB-35006	PTB-35001							
	336,4	PTB-35013								

mm² X mm²

COPPER CABLE		MAIN CONDUCTOR mm ²								
		185	150	120	95	70	50	35	25	16
DERIVATION mm ²	16	-	-	PTB-4006	PTB-4003	PTB-4003	PTB-1002	PTB-1005	PTB-1004	PTB-1004
	25	PTB-35009	PTB-35000	PTB-4007	PTB-4004	PTB-4003	PTB-1002	PTB-1005	PTB-1005	
	35	PTB-35009	PTB-35001	PTB-4002	PTB-4001	PTB-4001	PTB-1003	PTB-1003		
	50	PTB-35010	PTB-35002	PTB-4008	PTB-4005	PTB-4001	PTB-4001			
	70	PTB-35010	PTB-35003	PTB-4009	PTB-4002	PTB-4005				
	95	PTB-35011	PTB-35004	PTB-4010	PTB-4009					
	120	PTB-35012	PTB-35005	PTB-4011						
	150	PTB-35013	PTB-35006							
	185	PTB-35014								

mm² X MCM/AWG

ALUMINIUM COPPER CABLE		MAIN CONDUCTOR - MCM / AWG							
		336,4	266,8	4/0	3/0	2/0	1/0	2	4
DERIVATION mm ²	16	PTB-35000	PTB-4007	PTB-4004	PTB-4003	PTB-4003	PTB-1002	PTB-1005	PTB-1004
	25	PTB-35001	PTB-4007	PTB-4004	PTB-4003	PTB-4003	PTB-1002	PTB-1005	
	35	PTB-35002	PTB-4002	PTB-4005	PTB-4001	PTB-4004	PTB-1001	PTB-1003	
	50	PTB-35003	PTB-4008	PTB-4002	PTB-4005	PTB-4001	PTB-4001		
	70	PTB-35004	PTB-4009	PTB-4008	PTB-4002	PTB-4005			
	95	PTB-35005	PTB-4012	PTB-4009	PTB-4008				
	120	PTB-35007	PTB-35008	PTB-4012					
	150	PTB-35006	PTB-35007						
	185	PTB-35014							

TOOLS FOR WEDGE CONNECTORS APPLICATION AND EXTRACTION



KF-002 BIG
Requerided Patent

PT/PTB connectors are applied through a specific tool which is easily and quickly handled, allowing the electrician to solve connections and extractions in a minimum time in critical emergency occasions without affecting the connected conductors.

PT/PTB connectors are expected to be connected/extracted within an average time of 2 to 4 minutes, what makes them extremely practical and economical.

PT/PTB connectors' application/extraction must always be accomplished by staff that is previously trained and adapted to the connection proceedings with those concepts.

After the correctly accomplished connection, done with the suitable connectors to the applicable conductors, the electrician must observe the existence of a lock which is characteristic and indicates the effective connection.

KF-002 tool is currently available to connectors' application with metallic shells.

Models according to the table at the side: BIG for applying connectors from the yellow, blue and red series and SMALL for applying connectors from the blue and red series.

Tool pack which uses 22 metallic shell to apply PT/PTB connectors are basically composed of:

QT.	DESCRIPTION	STD	Y	SMALL	BIG
01	Power unit	X	X	X	X
01	Shooting unit	X	X	X	X
04	Shell case – red/blue	X	X	X	X
04	Shell case – yellow		X		X
01	Small head			X	X
01	Big head				X
01	Application platform – red			X	X
01	Extraction platform – red			X	X
01	Extraction platform – blue			X	X
01	Extraction platform – yellow				X
01	Shell screw device – yellow		X		X
01	Cleaning brush	X	X	X	X
01	Plastic case	X	X	X	X
01	Manual	X	X	X	X

KF002 TOOL COMPOSITION

- coupler + breech
- breech cover with shutter button
- plunger

Dimensions and tolerances follow our design number 580.969 – KF-002

For further information check our product specification ETE-031 – KF-002 and additional information about PT/PTB connectors' application and tools usage may be taken through the instruction manual ETE-029.

WEDGE CONNECTORS APPLICATION AND EXTRACTION - PT/PTB



APPLICATION SEQUENCE



» METALLIC SHELLS FOR WEDGE CONNECTORS APPLICATION – PT/PTB

Metallic shells are caliber 22 that generate the necessary energy to KF-002 plunger moving. Those shells have specific charges which are suitable to each type of connector and they are identified by the colors red, blue and yellow, which are visible on their extremes.

Metallic shells are made of tin, charged with gunpowder and tested according to the quality proceedings of the exclusive manufacturer, following the rules established by the Ministry of Army.



Red - PT Red

Blue - PT Blue

Yellow - PT Yellow

There are two types of shell: the long one and the short one. The short one is used to apply connectors from red and blue series. The long one is used to apply connectors from yellow series.

Shells are packed into boxes containing 100 pieces each.

Due to their manufacturing process metallic shells generate great detonation reliability and low purchase cost.

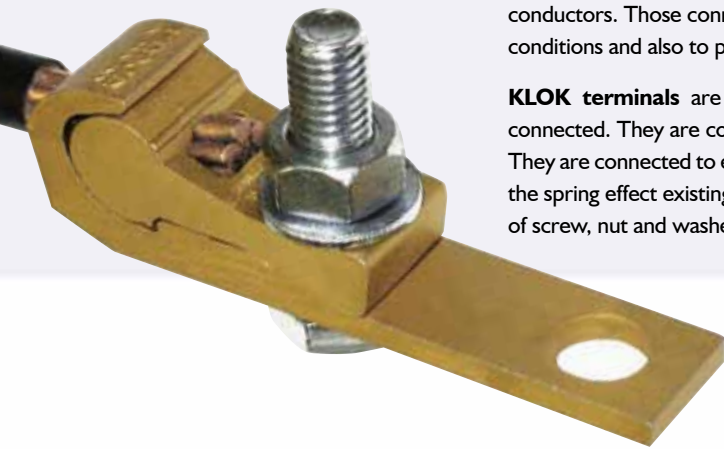
Other important factor is their great performance regarding moist generating failure levels close to zero.

Dimensions and tolerances follow our design number 580.981.

Further information on our
Product Specification ETE-002.

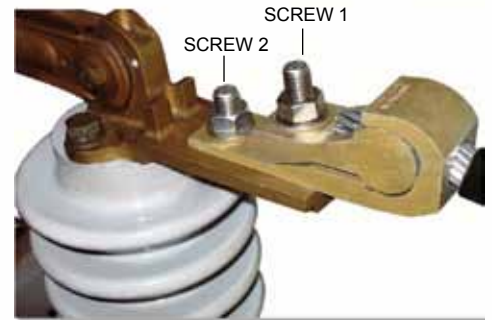
TERMINALS FOR ELECTRIC POWER DISTRIBUTION SYSTEMS - KLOK

»» TERMINAL IN ALUMINUM BOND WITH SUPERFICIAL FINISHING

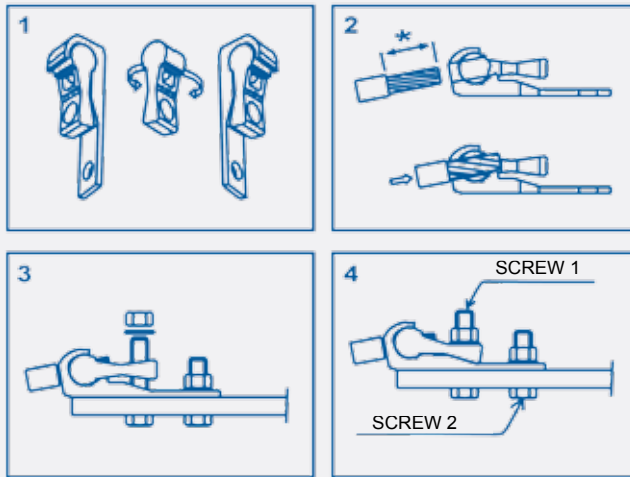


KLOK terminals have a superficial finishing inhibiting galvanic corrosion that allows connections to copper conductors. Those connections will have an adequate performance during terminals life under environmental conditions and also to practical applications to which they are submitted.

KLOK terminals are easily removed without affecting the structure of connectors to which they are connected. They are composed by two components: one of them is a "C" female and the other one is male. They are connected to each other. Such connection generates a regular force on the electric contact, thanks to the spring effect existing into the female component. They are fixed to a bar through a fixation set composed of screw, nut and washer (optional supplying in version 2).



Application sequence



*Peel the cable according to what is specified in the package.

KLOK terminal commercial versions:

Version 1:

Terminal without screw, nut and washer.

Version 2:

Terminal with screw, stainless steel nut and tinned brass washer.

CABLE CLASSIFICATION TABLE

MODEL	DIAMETER RANGE (mm)		NAKED CABLES (AWG/MCM)		NAKED CABLES (mm ²)		INSULATED CABLES (mm ²)		SCREW 1	SCREW 2
	SIDE FOR SMALLER CABLE (P)	SIDE FOR BIGGER CABLE (G)	SIDE FOR SMALLER CABLE (P)	SIDE FOR BIGGER CABLE (G)	SIDE FOR SMALLER CABLE (P)	SIDE FOR BIGGER CABLE (G)	SIDE FOR SMALLER CABLE (P)	SIDE FOR BIGGER CABLE (G)		
KL-1	4,6 - 4,8	5,0 - 5,1	6 AAC/Cu	6 ACSR	-----	16 AAC/Cu	16 COMP AAC/Cu	-----	M5 X 30	-----
KL-2	5,8 - 6,0	6,2 - 6,4	4 AAC/Cu	4 ACSR	-----	25 AAC/Cu	25 COMP AAC/Cu	-----	M5 X 30	-----
KL-3	6,7 - 7,3	7,3 - 8,1	-----	2 AAC/Cu 2 CAA	-----	35 AAC/Cu	35 COMP AAC/Cu	50 COMP AAC/Cu	M8 X 45	-----
KL-4	9,0 - 9,7	10,0 - 10,6	1/0 AAC/Cu	2/0 AAC/Cu 1/0 ACSR	50 AAC/Cu	70 AAC/Cu	70 COMP AAC/Cu	-----	M10 X 60	M10 X 30
KL-5	11,2 - 12,3	12,7 - 13,3	3/0 AAC/Cu 2/0 ACSR	4/0 AAC/Cu 3/0 ACSR	95 AAC/Cu	-----	95 COMP AAC/Cu	120 COMP AAC/Cu	M12 X 75	M12 X 35
KL-6	14,2 - 14,4	14,5 - 15,1	4/0 ACSR	266,8 AAC/Cu	-----	120 AAC/Cu	150 COMP AAC/Cu	-----	M12 X 75	M12 X 35
KL-7	15,4 - 17,0	17,3 - 18,9	266,8 ACSR 366,4 AAC/Cu	397,5 AAC/Cu 336,4 ACSR	150 AAC/Cu	185 AAC/Cu	185 COMP AAC/Cu	240 COMP AAC/Cu	M12 X 75	M12 X 35
KL-8	20,0 - 20,8	21,7 - 22,5	477 AAC/Cu 397,5 ACSR	556,5 AAC/Cu 477 ACSR	240 AAC/Cu	300 AAC/Cu	300 COMP AAC/Cu	350 COMP AAC/Cu	M12 X 75	M12 X 35
KL-9	22,3 - 23,7	23,8 - 25,4	636 AAC/Cu 556,5 ACSR	750 AAC/Cu 636 ACSR	-----	350 AAC/Cu	400 COMP AAC/Cu	-----	M14 X 90	M14 X 40

NOTE **AAC** - Naked aluminum cable without steel soul
Cu - Naked copper cable
ACSR - Aluminum cable with steel soul
COMP - Compacted or insulated copper or aluminum cables

Dimensions and tolerances follow our design number 580.976
 Further information at our product specification ETE-005.

Observation:

The definition of the type of material to be used to fixation is up to the users decision. Screw dimension will be defined in the table aside.

Recommendation:

Using anti oxide wax on conductors termination to be connected to the terminal is recommended, as well as on the screw-thread in the fixation system.

PIERCING CONNECTORS

» PIERCING CONNECTOR FOR PROTECTION GROUNDING - KAT MODEL

KAT connectors were developed aiming to allow protection grounding in low tension power distribution in electric systems by using insulated multiplexed cables.

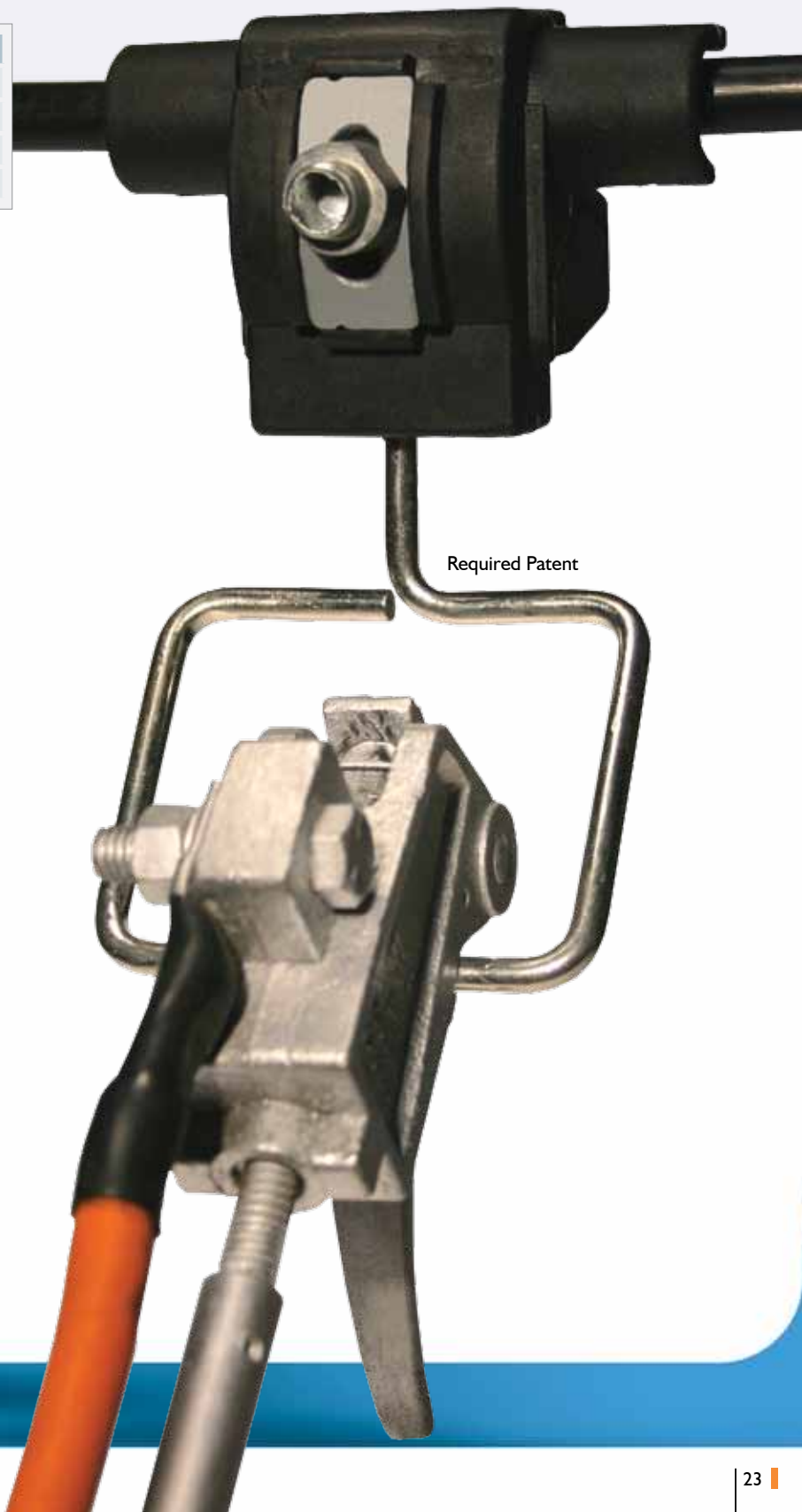
KAT TYPES		
CONNECTOR	KAT A	KAT B
MAIN CABLE (mm ²)	25 - 70	70 - 150
MAIN CABLE (AWG/MCM)	4 - 2/0	2/0-336,4
TORQUE RANGE (N.m)	9,5-13,5	13,5 - 17,5

KAT connectors are basically composed of two aluminum bodies with a polymeric coat for electric insulation, as well as piercing terminals fixed in each one of the bodies to connect to the main conductor of the main multiplexed network. With KAT connector connected to the network user may reliably accomplish protection grounding at any time by connecting grounding claws to the connector's string. The string is threaded to the body of the connector when maintenance on the network is required. After that it is taken out keeping the connector applied. KAT connector application is done through commercial ratchet wrench and socket, guaranteeing the effectiveness of connection by breaking a head-fuse with a defined torch, which is fixed to the connection screw.

Two types of KAT gauge function connector from main conductor are shown, according to the table above.

Trunk connectors may be copper or aluminum made because connector's internal compounds were built to allow bimetallic connections.

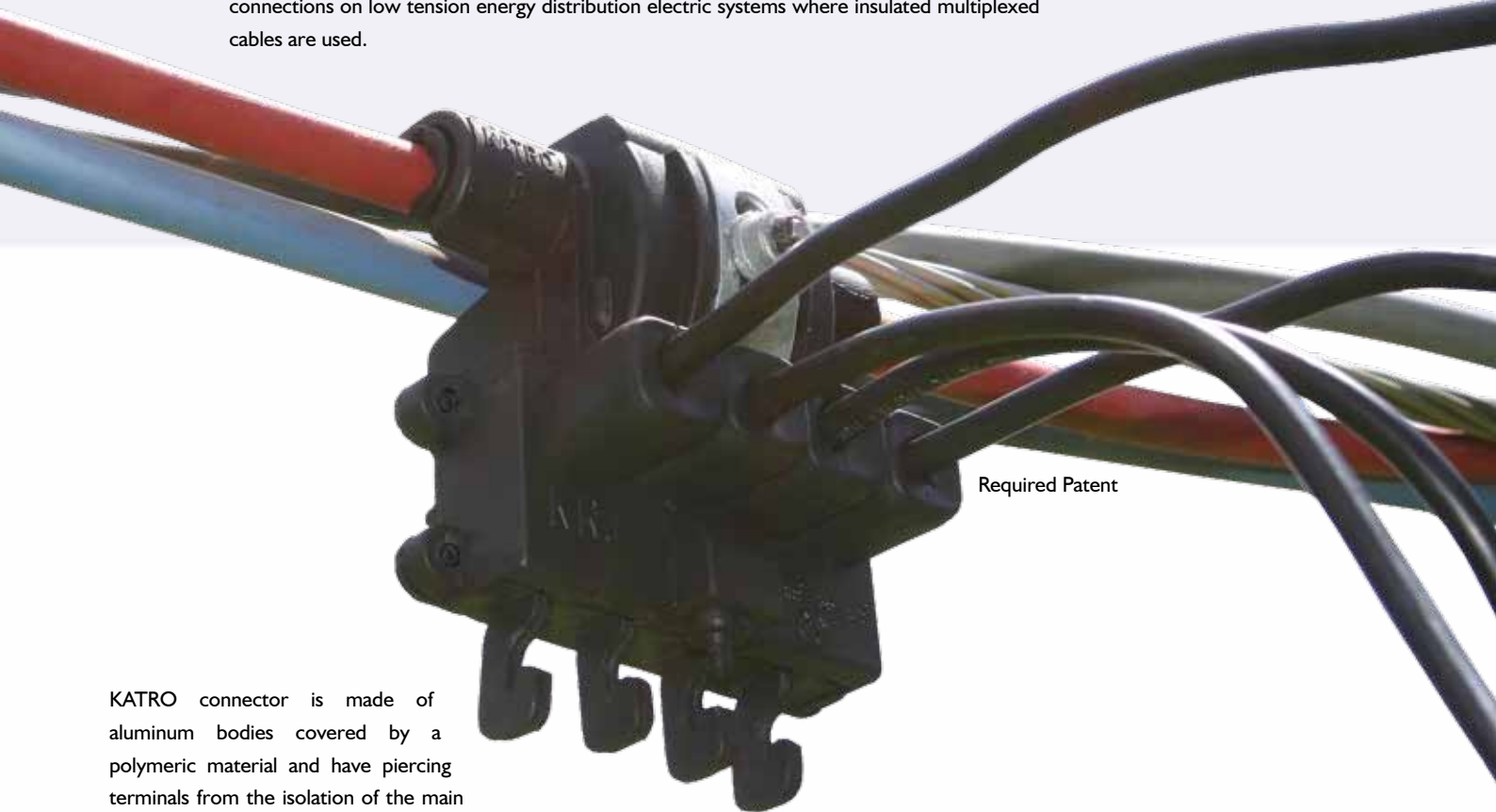
Further information on the correct way of installing KAT connectors may be taken from the instructions manual ETE-042, product specification ETE-033, design 580.951.



PIERCING CONNECTORS

» PIERCING CONNECTORS FOR CONSUMER CONNECTIONS – KATRO MODEL

KATRO connectors were developed aiming to allow commercial or residential consumer connections on low tension energy distribution electric systems where insulated multiplexed cables are used.



Required Patent

KATRO connector is made of aluminum bodies covered by a polymeric material and have piercing terminals from the isolation of the main

conductor. Conductor's structural set allows an excellent thermal dissipation in a critical charge regime associated to a stable electric connection during connector's life. KATRO connectors are applied on the network main conductor through a commercial key ratchet and socket or through the socket from ALIKATRO, guaranteeing connection effectiveness against the breaking up of a head-fuse with a defined torch which is connected to the connection screw.

With four outputs by phase to derivations of connection extensions (to residential or business consumers or to IP), KATRO connectors show ergonomic and technical advantages to users. With derivations working on the spring concept on individual connections, KATRO connectors are extremely reliable regarding temperature stability and electric resistance during the time they are connected to the electric power.

KATRO conductors may optionally show one fifth output to string connection, aiming to accomplish protection grounding for network maintenance. That string is threaded to the base of the connector and it is easily taken out after maintenance is finished.

KATRO connectors are presented in two types, according to the table beside. Function of main conductor gauge in which it will be applied.

Main conductor or derivations may be copper or aluminum, for internal connector's compounds were built to allow bimetallic connections.

Further information on the correct way of applying KATRO connectors may be taken from manual ETE-041. Product specification: ETE-032 design 580.966.

KATRO TYPES		
CONNECTOR	KATRO A	KATRO B
MAIN CABLE (mm ²)	25 - 70	70 - 150
MAIN CABLE (AWG/MCM)	4 - 2/0	2/0-336,4
DERIVATION CABLE (mm ²)	1,5 - 35	1,5 - 35
DERIVATION CABLE (AWG/MCM)	14 - 2	14 - 2
TORQUE RANGE (N.m)	9,5-13,5	13,5 - 17,5



String for safety grounding

OPTIONAL:

Application on one-phase anti-theft network.

PIERCING CONNECTORS

» APPLICATION TOOL FOR KATRO/KATRON CONNECTORS - ALIKATRO

The application of the derivation conductors is accomplished by using ALIKATRO that acts individually on the connection spring opening its corresponding window to easily insert conductor.

■ Application with ALIKATRO



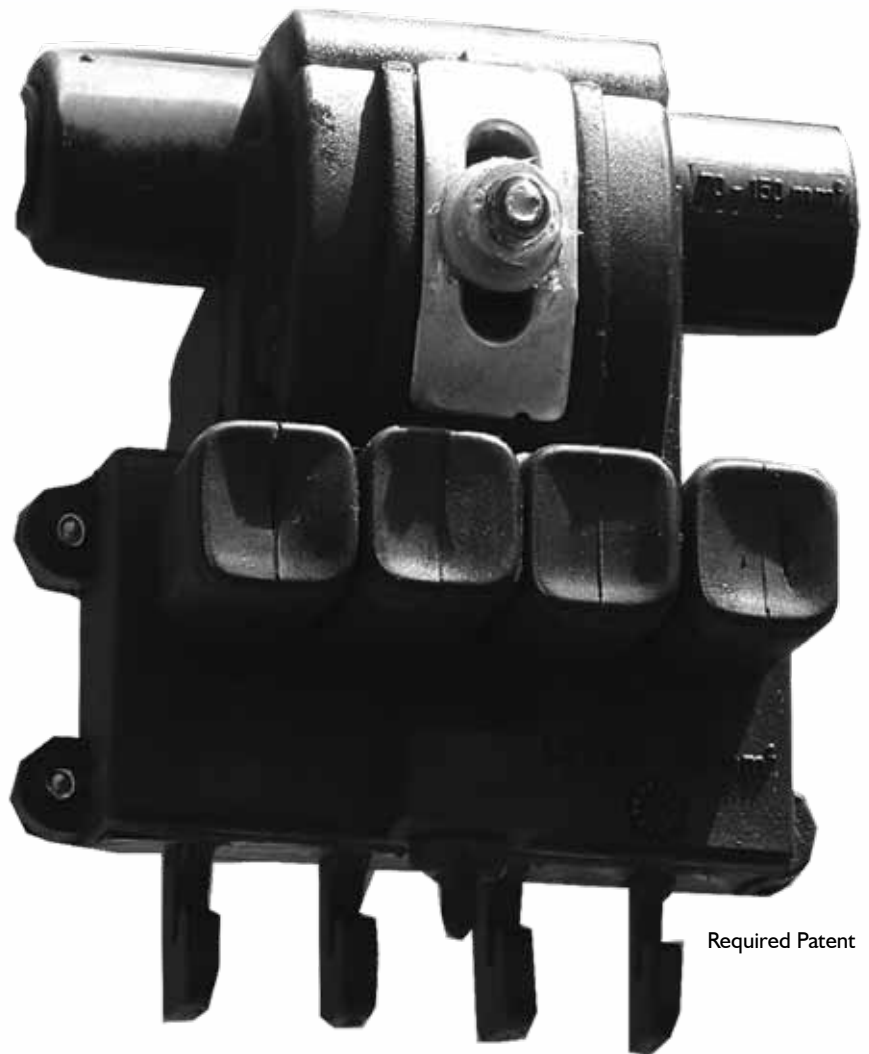
Design 580.948
Required Patent

» CONNECTOR FOR CONSUMER CONNECTIONS - KATRON MODEL

KATRON connectors were developed to consumer connections on low tension electric power distribution systems that use networks with bare copper or aluminum cables, becoming an efficient alternative to the traditional systems with strings and to the connectors connected to it.

Connectors are constituted of aluminum bodies which have defined areas for electrical contact with the main bare conductor. One of the bodies has lodgings where plungers with springs are inserted, what permits the linking of bare or insulated, aluminum or copper derivation conductors. Connector's structural set allows an excellent thermal dissipation together to a stable electric connection and connector's long life.

KATRON is applied though a key ratchet with socket and it allows connections with up to 4 consumers though a linking channel with a minimal mechanical traction. Those connections are accomplished by using ALIKATRO and, depending on the main conductor, a specific type of connector is defined, according to the following table:



Required Patent

KATRON TYPES		
CONNECTOR	KATRON A	KATRON B
MAIN CABLE (mm ²)	25 - 70	70 - 150
MAIN CABLE (AWG/MCM)	4 - 2/0	2/0-336,4
DERIVATION CABLE (mm ²)	1,5 - 35	1,5 - 35
DERIVATION CABLE (AWG/MCM)	14 - 2	14 - 2

TABLE OF MAIN CONDUCTORS APPLIED TO ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

GAUGE mm ² *	ALUMINUM CONDUCTORS				COPPER CONDUCTORS		
	SOLID	WELDED AAC	NAKED		SOLID	WELDED Cu	NAKED
			AAC	ACSR			
1,5	1,36	1,53	1,53	----	1,35	1,53	1,53
2,5	1,74	1,95	1,95	----	1,73	1,95	1,95
4	2,20	2,49	2,49	----	2,19	2,49	2,49
6	2,70	3,03	3,03	----	2,67	3,03	3,03
10	3,50	3,73	4,08	----	3,46	3,75	4,08
16	4,50	4,75	5,10	----	4,50	4,75	5,10
25	----	5,95	6,18	----	----	5,83	6,18
35	----	6,95	7,50	----	----	6,91	7,50
50	----	8,04	9,00	----	----	7,97	9,00
70	----	9,67	10,35	----	----	9,61	10,35
95	----	11,41	12,30	----	----	11,33	12,30
120	----	12,83	14,50	----	----	12,80	14,50
150	----	14,25	16,25	----	----	14,20	16,25
185	----	15,92	17,75	----	----	16,00	17,75
240	----	18,10	20,00	----	----	18,40	20,00

GAUGE AWG/MCM*	ALUMINUM CONDUCTORS				COPPER CONDUCTORS		
	SOLID	WELDED AAC	NAKED		SOLID	WELDED Cu	NAKED
			AAC	ACSR			
14	1,63	1,80	----	----	----	1,80	1,93
12	2,05	2,26	----	----	2,05	2,26	2,34
10	2,59	2,99	----	----	2,59	2,99	2,97
8	3,26	3,60	----	4,00	3,26	3,60	3,71
6	4,12	4,54	4,66	5,04	4,12	4,54	4,66
4	5,19	5,71	5,88	6,35	5,19	5,71	5,89
2	6,54	7,18	7,42	8,01	6,54	7,18	7,42
1/0	8,25	9,19	9,36	10,11	8,25	9,19	9,36
2/0	9,27	10,32	10,51	11,35	9,27	10,32	10,51
3/0	10,40	11,58	11,80	12,74	10,40	11,58	11,80
4/0	11,68	13,01	13,25	14,31	11,68	13,01	13,25
266,8	----	----	----	15,46	----	----	----
	----	----	15,05	16,07	----	----	----
336,4	----	----	----	16,30	----	----	----
	----	----	16,91	17,36	----	----	----
397,5	----	----	----	18,29	----	----	----
	----	----	18,38	18,83	----	----	----
477,0	----	----	----	19,62	----	----	----
	----	----	20,12	19,88	----	----	----
556,5	----	----	----	20,47	----	----	----
	----	----	20,18	20,68	----	----	----
636	----	----	----	21,48	----	----	----
	----	----	21,73	21,79	----	----	----
795	----	----	----	22,42	----	----	----
	----	----	21,80	22,33	----	----	----
	----	----	----	23,20	----	----	----
	----	----	23,31	23,53	----	----	----
	----	----	----	24,21	----	----	----
	----	----	23,88	23,88	----	----	----
	----	----	----	24,81	----	----	----
	----	----	26,11	25,16	----	----	----
	----	----	----	27,73	----	----	----
	----	----	26,11	27,73	----	----	----
	----	----	----	28,13	----	----	----
	----	----	26,11	28,13	----	----	----
	----	----	----	28,95	----	----	----
	----	----	26,11	28,95	----	----	----

(*) GUIDING VALUES FROM SEVERAL MANUFACTURERS CATALOGUES. AVERAGE TOLERANCE TO BE CONSIDERED +/- 0,20.



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