

# SPECIAL ELECTRIC CABLES

1950

## OUR FIRST MISSION: COUNTRY ELECTRIFICATION

The researches, projects, products and equipment developed in Icpe contributed to the development of the National Energy System.

PRESENT

## INNOVATING THE FUTURE

Today, Icpe represents a complex structure, covering a wide range of innovative concerns, linked by the **ELECTRIC** way.

The main activities are focused on research, development, engineering, OEM fabrication and professional services having as a main goal obtaining innovative technologies and products, efficient and competitive, without harmful impact on the environment.

Technologies for a sustainable development



# FEP INSULATION CONDUCTORS

## APPLICATIONS

Internal connections in automatization, electronic or IT equipments etc.



**Insulation**  
FEP DYNEON®  
PFA DYNEON®

### Conductor

Uncoated copper wire/ tin coated/ silver coated  
SR EN 60228

unifilar  $\varnothing$  0,25 ÷ 2,30 mm<sup>2</sup>  
multicore  $\varnothing$  0,055 ÷ 4,0 mm<sup>2</sup>

## FEATURES

### Operating temperature range

Tin coated copper: +180°C  
Silver coated copper: +200°C  
Nickel coated copper: +250°C

**Operating voltage** 250/600/1000 V c.a.

**Insulation resistance** min. 1500 MΩ x Km

**Flame propagation retardation**

**Testing voltage** 750/1800/3000 V c.a.

Besides the types of OEM products which we are manufacturing, we have tested and selected products with a very high quality level.

Contact us and you will receive an offer for any type of cable at the shortest notice!

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## SOLID INSULATED CONDUCTORS

| Nominal diameter<br>mm |        | Maximum outside diameter<br>mm | Maximum electrical resistance at 20°C<br>W / Km | Nominal voltage<br>V a.c. |
|------------------------|--------|--------------------------------|---|---------------------------|
| 0,25                   | AWG 30 | 0,85                           | 379   | 250                       |
| 0,30                   |        | 0,90                           | 263,4   | 250                       |
| 0,40                   | AWG 26 | 1,10                           | 144   | 600                       |
| 0,50                   | AWG 24 | 1,20                           | 92,2  | 600                       |
| 0,64                   | AWG 22 | 1,35                           | 58,1  | 600                       |
| 0,80                   | AWG 20 | 1,55/1,70                      | 36,8  | 600/1000                  |
| 1,00                   | AWG 18 | 1,75/1,90                      | 23,3  | 600/1000                  |
| 1,30                   |        | 2,05/2,20                      | 14,6  | 600/1000                  |
| 1,63                   | AWG 14 | 2,45/2,60                      | 9,0   | 600/1000                  |
| 2,00                   | AWG 12 | 2,90/3,05                      | 5,7   | 600/1000                  |
| 2,30                   |        | 3,20/3,35                      | 4,6   | 600/1000                  |

Symbols: FE<sub>5</sub> su ... Example: FE<sub>5</sub>su 0,25  
where: F = fixed installation connecting conductor  
E<sub>5</sub>/ E<sub>3</sub> = FEP / PFA insulation  
s / a / n = tinned / silver / nickel -plated copper  
u = solid wire

## STRANDED INSULATED CONDUCTORS

| Nominal cross-area conductor<br>mm <sup>2</sup> |        | Construction<br>n x 0 mm | Maximum outside diameter<br>mm | Maximum electrical resistance at 20°C<br>W / Km | Nominal voltage<br>V a.c. |
|---|--------|--------------------------|--------------------------------|---|---------------------------|
| 0,055   | AWG 30 | 7 x 0,10                 | 0,90                           | 365   | 250                       |
| 0,093   | AWG 28 | 7 x 0,13                 | 1,00                           | 206,8   | 250                       |
| 0,14  | AWG 26 | 7 x 0,16                 | 1,10                           | 136,3   | 250                       |
| 0,22  | AWG 24 | 7 x 0,20                 | 1,30                           | 87,2  | 600                       |
| 0,34  | AWG 22 | 7 x 0,25                 | 1,45                           | 55,8  | 600                       |
| 0,50  |        | 16 x 0,2                 | 1,70/1,85                      | 40,1  | 600/1000                  |
| 0,60  | AWG 20 | 19 x 0,2                 | 1,75/1,90                      | 32,2  | 600/1000                  |
| 0,75  |        | 24 x 0,2                 | 1,95/2,10                      | 26,7  | 600/1000                  |
| 1,00  |        | 32 x 0,2                 | 2,10/2,25                      | 20,0  | 600/1000                  |
| 1,50  |        | 19 x 0,32                | 2,40/2,55                      | 13,7  | 600/1000                  |
| 1,91  | AWG 14 | 27 x 0,30                | 2,60/2,75                      | 10,1  | 600/1000                  |
| 2,50  |        | 50 x 0,25                | 3,00/3,15                      | 8,21  | 600/1000                  |
| 3,18  | AWG 12 | 45 x 0,30                | 3,30/3,45                      | 6,1   | 600/1000                  |
| 4   |        | 56 x 0,30                | 3,60/3,75                      | 5,09  | 600/1000                  |

Symbol: ME<sub>5</sub> sm ... Example: ME<sub>5</sub> sm 0,055  
where: M = mobil installation connecting conductor  
E<sub>5</sub>/ E<sub>3</sub> = FEP / PFA insulation  
c / a / n = tinned / silver / nickel -plated copper  
m = stranded wire

## References |





## SCREENED SINGLE POLE CABLES WITH FEP INSULATION AND SHEATH

### APPLICATION

Electric and electronic equipment cabling



### FEATURES

Operating temperature range FEP:  $-55 \div 200^{\circ}\text{C}$

Operating voltage 600/1000V c.a.

Insulation resistance min. 1500 M $\Omega$  x Km

Flame propagation retardation

Testing voltage 1000/3000V c.a.

#### Conductor

Uncoated copper multicore wire/ tin coated/ silver coated  
SR CEI 228 + A1

#### Insulation

FEP DYNEON®  
PFA DYNEON®

#### Screen

Uncoated copper wire/ tin coated/ silver coated

#### Sheath

FEP DYNEON®  
PFA DYNEON®

| Nominal cross - section |        | Construction | Maximum diameter over insulation | Maximum outside diameter | Maximum electrical resistance at 20°C | Minimum insulation resistance | Maximum capacity | Nominal voltage |
|-------------------------|--------|--------------|----------------------------------|--------------------------|---------------------------------------|-------------------------------|------------------|-----------------|
| mm <sup>2</sup>         | AWG    | n x Ø mm     | mm                               | mm                       | W / Km <sup>1</sup>                   | MW . Km                       | pF/m             | V c.a.          |
| 0,14                    | AWG 26 | 7 x 0,16     | 1,1                              | 2,3                      | 132                                   | 1500                          | 118              | 600             |
|                         |        |              | 1,4                              | 2,5                      |                                       |                               |                  |                 |
| 0,22                    | AWG 24 | 7 x 0,20     | 1,2                              | 2,4                      | 86                                    | 1500                          | 195              | 600             |
|                         |        |              | 1,5                              | 2,6                      |                                       |                               |                  |                 |
| 0,34                    | AWG 22 | 7 x 0,25     | 1,4                              | 2,5                      | 54                                    | 1500                          | 230              | 600             |
|                         |        |              | 1,7                              | 2,9                      |                                       |                               |                  |                 |
| 0,5                     |        | 16x 0,20     | 1,6                              | 2,7                      | 38                                    | 1500                          | 237              | 600             |
|                         |        |              | 1,9                              | 3,1                      |                                       |                               |                  |                 |
| 0,6                     | AWG 20 | 19 x 0,20    | 1,6                              | 2,9                      | 32                                    | 1500                          | 290              | 600             |
|                         |        |              | 1,9                              | 3,2                      |                                       |                               |                  |                 |
| 0,75                    |        | 24 x 0,20    | 1,8                              | 3,2                      | 26                                    | 1500                          | 335              | 600             |
|                         |        |              | 2,1                              | 3,4                      |                                       |                               |                  |                 |
| 0,93                    |        | 19x 0,25     | 1,9                              | 3,2                      | 20                                    | 1500                          | 350              | 600             |
|                         |        |              | 2,2                              | 3,5                      |                                       |                               |                  |                 |
| 1                       |        | 32 x 0,20    | 2,0                              | 3,3                      | 19                                    | 1500                          | 375              | 600             |
|                         |        |              | 2,3                              | 3,6                      |                                       |                               |                  |                 |
| 1,5                     |        | 30 x 0,25    | 2,2                              | 3,6                      | 13                                    | 1500                          | 430              | 600             |
|                         |        |              | 2,5                              | 3,8                      |                                       |                               |                  |                 |
| 1,91                    | AWG 14 | 27 x 0,30    | 2,5                              | 3,9                      | 10                                    | 1500                          | 490              | 600             |
|                         |        |              | 2,8                              | 4,2                      |                                       |                               |                  |                 |
| 2,5                     |        | 50 x 0,25    | 2,7                              | 4,0                      | 8                                     | 1500                          | 550              | 600             |
|                         |        |              | 3,0                              | 4,3                      |                                       |                               |                  |                 |
| 3,18                    | AWG 12 | 45 x 0,30    | 3,1                              | 4,5                      | 6                                     | 1500                          | 630              | 600             |
|                         |        |              | 3,4                              | 5,0                      |                                       |                               |                  |                 |
| 4                       |        | 56 x 0,30    | 3,2                              | 4,6                      | 5                                     | 1500                          | 665              | 600             |
|                         |        |              | 3,5                              | 5,2                      |                                       |                               |                  |                 |





## BIFILAR / THREE-CORE CABLES FOR HIGH TEMPERATURES

### APPLICATIONS

Electric and electronic equipment cabling.



#### Conductor

Uncoated copper multicore wire/ tin coated/ silver coated

SR EN 60228

#### Insulation

FEP DYNEON®

PFA DYNEON®

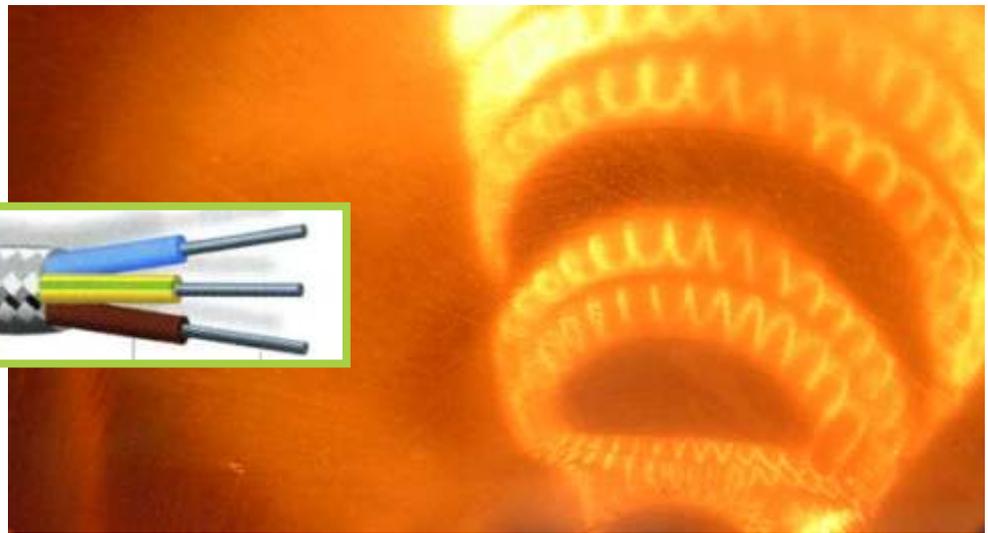
#### Screen

Uncoated copper wire/ tin coated/ silver coated

#### Sheath

FEP DYNEON®

PFA DYNEON®



### FEATURES

#### Operating temperature range

Uncoated conductor: -55 ÷ 130°C

Tin coated conductor: -55 ÷ 180°C

Silver coated conductor: -55 ÷ 200°C

Operating voltage 600 V.c.a.

Insulation resistance min. 1500 MΩ x Km

Flame propagation retardation

Testing voltage 1500 V.c.a.

| Nominal cross - section |        | Construction | Number of conductors x nominal cross-section | Maximum outside diameter | Maximum electrical resistance at 20°C |
|-------------------------|--------|--------------|--|--------------------------|---------------------------------------|
| mm <sup>2</sup>         |        | n x Ø mm     | no x mm                                      | mm                       | W / Km                                |
| 0,22                    | AWG 24 | 7 x 0,20     | 2 x 0,22                                     | 4,00                     | 86                                    |
|                         |        |              | 3 x 0,22                                     | 4,06                     |                                       |
| 0,34                    | AWG 22 | 7 x 0,25     | 2 x 0,34                                     | 4,50                     | 54                                    |
|                         |        |              | 3 x 0,34                                     | 4,90                     |                                       |
|                         |        |              | 3 x 0,5                                      | 5,30                     |                                       |
| 0,5                     |        | 16 x 0,20    | 2 x 0,6                                      | 4,70                     | 38,2                                  |
|                         |        |              | 3 x 0,6                                      | 5,50                     |                                       |
| 0,6                     | AWG 20 | 19 x 0,20    | 2 x 0,75                                     | 4,80                     | 32,1                                  |
|                         |        |              | 3 x 0,75                                     | 5,20                     |                                       |
| 0,75                    |        | 24 x 0,20    | 2 x 1  | 5,20                     | 25,6                                  |
|                         |        |              | 3 x 1  | 5,90                     |                                       |
| 1                       |        | 32 x 0,20    | 2 x 1,5                                      | 5,50                     | 19,1                                  |
|                         |        |              | 3 x 1,5                                      | 6,50                     |                                       |
| 1,5                     |        | 30 x 0,25    | 2 x 2,5                                      | 5,80                     | 13                                    |
|                         |        |              | 3 x 2,5                                      | 6,80                     |                                       |
| 2,5                     |        | 50 x 0,25    | 2 x 4  | 6,60                     | 7,82                                  |
|                         |        |              | 2 x 4  | 8,90                     |                                       |
| 4,0                     |        | 56 x 0,30    |  |                          | 4,85                                  |

CsE<sub>2</sub>EE<sub>2</sub>nm 2x0,50mm<sup>2</sup>  
CsE<sub>2</sub>EE<sub>2</sub>cm 2x1,00mm<sup>2</sup>  
CsE<sub>2</sub>EE<sub>2</sub>am 2x 4,00mm<sup>2</sup>

Cs - special cable  
E<sub>2</sub> - FEP / PFA insulation and sheath  
E - Screen  
n / c / a - tinned / silver / nickel -plated wire  
m - stranded wire

### References |





## MULTICORE CABLES FOR HIGH TEMPERATURES

### APPLICATIONS

The cables with fluorocarbon resin insulation and sheath are installed in those places where the wire insulation is subjected to high and low temperatures or to high temperature oscillations: metallurgical works, steel plants and rolling mills, foundries, in the building of the planes and ships, in the cement, glass and ceramics works.



#### Conductor

Uncoated copper multifilar wire/ tin coated/ silver coated  
0,055...4mm<sup>2</sup>

#### Insulation

FEP DYNEON®  
PFA DYNEON®

#### Screen

Tin coated copper

#### Sheath

FEP DYNEON®  
PFA DYNEON®

### FEATURES

Sections: 0,22÷4,00mm<sup>2</sup>

Operating temperature range

FEP: -55 ÷ 200C

PFA: -55 ÷ 250C

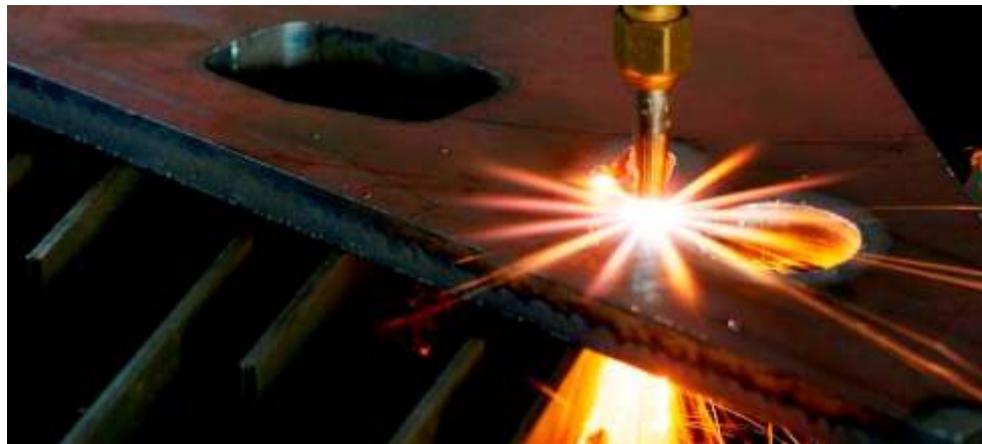
Operating voltage 600 V c.a.

Insulation resistance min. 1500 MΩ x Km

Flame propagation retardation

Resistance to acids, bases, solvents, oil

Testing voltage 1500 V c.a.



# EXTENSION AND COMPENSATION CABLES FOR THERMOCOUPLES

## APPLICATIONS

Connection of thermocouples to the measuring and control equipment

## FEATURES

Similar properties to those of the thermocouples within the temperature range

Temperature range (function the insulation material):  
-55... +2000C



### Conductor

Ni-Cr/Ni-Al  
Fe/Cu-Ni  
Cu/Cu-Ni  
Pt-Rh/Pt

### Insulation

FEP DYNEON®  
PFA DYNEON®  
PVC

### Screen

Copper wire  
Glass fiber

### Sheath

FEP DYNEON®  
PFA DYNEON®  
PVC

### Symbol:

Y = PVC insulation  
6Y = FEP insulation/sheath  
Fs = fiberglass braiding  
E = tinned copper braiding

e.g.1: KX 1HD 6YE6Y 2 x 1mm  
K = thermocouple type  
X = extension cable  
1 = tolerance class  
HD = color identification (IEC 584-3)

6Y = FEP insulation  
E = tinned copper screen  
6Y = FEP sheath  
2 = single pair  
1mm = conductor diameter

e.g.2: RCA 2HD 6YFsE 2 x (12x0,32mm)

R = thermocouple type R  
C = compensating cable  
A = alloy type  
2 = tolerance class  
HD = color identification  
6Y = FEP insulation  
Fs = fiberglass braiding  
E = copper braiding  
2 = single pair  
12x0,32mm = construction of conductor

|              | Type | Materials        | Tolerance class          |                          | Cable temperature range | Conductor construction<br>nr. x mm |
|--------------|------|------------------|--------------------------|--------------------------|-------------------------|------------------------------------|
|              |      |                  | 1                        | 2                        |                         |                                    |
| Extension    | JX   | Fe / Cu-NiJ      | JX1: - 85 mV (- 1,5 °C)  | JX2: - 140 mV (- 1,5 °C) | -25 , 200 °C            | 1 x 0,32                           |
|              | TX   | Cu / Cu-Ni T     | TX1: - 30 mV (- 0,5 °C)  | TX2: - 60 mV (- 1,0 °C)  | -25 , 100 °C            | 1 x 0,5                            |
|              | EX   | Ni-Cr / Cu-Ni E  | EX1: - 120 mV (- 1,5 °C) | EX2: - 200 mV (- 2,5 °C) | -25 , 200 °C            | 1 x 1,0                            |
|              | KX   | Ni-Cr / Ni Alloy | KX1: - 60 mV (- 1,5 °C)  | KX2: - 100 mV (- 2,5 °C) | -25 , 200 °C            | 1 x 1,38                           |
|              | NX   | Ni-Cr-Si / Si-Ni | NX1: - 60 mV (- 1,5 °C)  | NX2: - 100 mV (- 2,5 °C) | -25 , 200 °C            | 5 x 0,32                           |
| Compensation | KCA  | Fe / Cu-Ni       | -                        | - 100 mV (- 2,5 °C)      | 0 , 150 °C              | 7 x 0,32                           |
|              | KCB  | Cu / Cu-Ni       | -                        | - 100 mV (- 2,5 °C)      | 0 , 100 °C              | 12 x 0,32                          |
|              | NC   | Ni-Cr-Si / Ni-Si | -                        | - 100 mV (- 2,5 °C)      | 0 , 150 °C              | 19 x 0,32                          |
|              | RCA  | Cu / Cu-Ni R     | -                        | - 30 mV (- 2,5 °C)       | 0 , 100 °C              |                                    |
|              | RCB  | Cu / Cu-Ni R     | -                        | - 60 mV (- 5,0 °C)       | 0 , 200 °C              |                                    |
|              | SCA  | Cu / Cu-Ni S     | -                        | - 30 mV (- 2,5 °C)       | 0 , 100 °C              |                                    |
|              | SCB  | Cu / Cu-Ni S     | -                        | - 60 mV (- 5,0 °C)       | 0 , 200 °C              |                                    |
|              | BC   | Cu / Cu Alloy    | -                        | - 40 mV (- 2,5 °C)       | 0 , 100 °C              |                                    |

## References |





## PAIR FOR THE DETECTION OF THE THERMAL HIGHWAY FAILURES

### APPLICATIONS

Detection of steam losses of the thermal lines



#### Conductor

Unifilar tin coated copper wire  
Unifilar Ni-Cr alloy wire

#### Insulation

FEP DYNEON®  
PFA DYNEON®



### FEATURES

Operating temperature range: -55 ÷ +180°C

Operating voltage 600 V c.a.

Insulation resistance min. 1500 MΩ x Km

Flame propagation retardation

Testing voltage 1500 V c.a.

| Characteristics               | Sensor wire<br>FE5 ru 0.5mm | Return wire<br>FE5 0.8mm |
|-------------------------------|-----------------------------|--------------------------|
| <i>Conductor</i>              |                             |                          |
| material                      | NiCr 8020                   | tinned copper            |
| diameter                      | (0.5–0.009)mm               | (0.8–0.012)mm            |
| electrical resistance         | (5.7–1%)W/m                 | max. 36.7 W/km           |
| <i>Insulation</i>             |                             |                          |
| material                      | FEP                         | FEP                      |
| radial thickness              | min. 0.2mm                  | min. 0.25mm              |
| insulation color              | red                         | green                    |
| perforated every 15mm         | yes                         | no                       |
| insulation resistance at 20°C | min. 20MΩhm x km            | min. 1.5GΩhm x km        |
| operating temperature range   | -55...+180°C                | -55...+180°C             |



## Icpe | Special electric cables

Icpe holds the only manufacturing line in the country for cables and wires resistant to high temperatures and the continuous research contributes to the development of some new series of competitive products according to the SR EN ISO 9001/2001, SR EN ISO 14001/2005 standards.

Using materials such as FEP, glass fiber, PVC, TPU, Icpe produces a wide range of wires, detection, compensation and extension cables, heating cables which depending on the configuration can be used for electrical connections, heating and defrosting electrical equipment, industrial furnaces etc.

Icpe has all the necessary means to develop customized products – special configurations and series at customer's request.



Discover the ESCo services for energy efficiency!

Our experts will present you customized solutions to optimize the energy use.



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