

# COMCROSS<sup>®</sup> BCR-30

## Product information

BCR-30 is a cross-linkable; EPDM based insulation compound designed for use in medium and high voltage power cables up to 150 kV, requiring good flexibility and high temperature resistance. Our closed, continuous compounding facility and microprocessor operated process control system ensure a compound of exceptional material consistence.

BCR-30 combines the quality consistency of a typical cross-linked PE, with the performance advantages of an elastomer particularly in such key characteristics flexibility, dimensional stability, and long-term ageing.

Customers can benefit from our extensive know-how and experience of specification compounding right through to cable manufacturing, backed by extensive R&D programmes, processing technology and material testing procedures beginning from raw material up to the finished cable, which results from embedding the compound activity in the BRUGG Cable.

## Characteristics

The typical values listed below representative of BCR-30 produced so far, and should be regarded as relating to a sample of average quality. They were compiled from test carried out on samples of granules and test plaques which had been pressed and cross-linked for 6 minutes at 185°C, followed by degassing for 16h at 80°C. Individual quality standards can be agreed upon through direct negotiation.

| Designation  | Test Standards            | Unit              | Typical Value                |
|--|---------------------------|-------------------|------------------------------|
| <b>External characteristics</b>                      |                           |                   |                              |
| Pourable granule                                     |                           |                   | 4x4                          |
| Colour   |                           | mm                | salmon red                   |
| <b>General characteristics</b>                       |                           |                   |                              |
| Density (at 23°C)                                    | DIN 53479                 | g/cm <sup>3</sup> | 1.20 ± 0.03                  |
| Moisture (trend to release 140°C/40 min)             | K. Fischer, Coulometer    | PPM               | 500 ± 500                    |
| Ozone stability (24h, 0.02-0.03 Vol%)                | IEC 811-2-1               | ---               | without fractures            |
| <b>Electrical characteristics</b>                    |                           |                   |                              |
| Dielectric constant ( 23°C )                         | ASTM D 1513               | ---               | 2.34                         |
| Dielectric loss factor tan $\delta$ ( 23°C/50 Hz )   | ASTM D 1531               | ---               | 17 E-4 + 23·10 <sup>-4</sup> |
| Dielectric loss factor tan $\delta$ ( 90°C/50 Hz )   | ASTM D 1531               | ---               | 33 E-4 + 17·10 <sup>-4</sup> |
| Dielectric strength cable 95mm <sup>2</sup> 20/12 kV | 50 Hz ( 63%-Value )       | kV/mm             | 40                           |
| Dielectric strength cable 95mm <sup>2</sup> 20/12 kV | DC ( 63%-Value )          | kV/mm             | 94                           |
| Electrical resistivity ( 23°C/500 V )                | ASTM D 257                | Ω cm              | >10·10 <sup>15</sup>         |
| <b>Mechanical characteristics</b>                    |                           |                   |                              |
| Tensile strength                                     |                           |                   | 14                           |
| Tensile strength aged( 7d, 135 °C )                  | DIN 53 455                | N/mm <sup>2</sup> | 15                           |
| Ultimate elongation                                  |                           | N/mm <sup>2</sup> | 280                          |
| Ultimate elongation aged( 7 d, 135 °C )              | DIN 53 455                | %                 | 286                          |
| Hardness ( Shore A )                                 |                           | %                 | 89.5                         |
| Hot elongation ( 250°C, 20 N/cm <sup>2</sup> )       | DIN 53 505                |                   | 13                           |
| Permanent deformation                                | IEC 504 / Table 6         | %                 | 1.4                          |
| <b>Fabrication characteristics</b>                   |                           |                   |                              |
| Max. vulcanisation rate at 185°C                     | Monsanto Vulkameter       | dNm               | 11 +10 / -1                  |
| Vulcanisation time (Rt. 90% )                        | Monsanto Vulkameter       | min               | 2.7 ± 0.5                    |
| Viscosity (115 °C and 40 s <sup>-1</sup> )           | Göttfert Viskoelastometer | Pa.s              | 5100 ± 500                   |
| Mooney-viscosity ML 1+4 @ 100°C                      | ASTM D-1646               | ---               | 35 ± 2                       |

The quality ratings are based on our knowledge and experience. They are not intended to be a warranty for particular properties. The user must subject our products to examinations and tests himself before using. This especially applies to its suitability for a certain application. Furthermore, each user is liable for adhering to all statutory provisions.

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## General recommendations

BCR-30 may be processed on CV-lines. For medium and high-voltage cables semiconductive, conductor- and insulation-screens have to be applied and may be extruded using a tandem arrangement or with a triple extrusion head. The processing recommendations below are based upon manufacturing of a 20 kV, 95 mm<sup>2</sup> cable with a copper conductor.

## Extrusion parameters

The recommended temperature settings given below, are depending upon screw design and extruder type. Optimum temperature profile for a given extruder must be determined experimentally. The mass-temperature of the insulation BCR-30 must not exceed 130°C! The insulation BCR-30 should pass a screen package of at least 125 µm.

| General parameters     |  |
|------------------------|--|
| Insulation-thickness   | 5.07 mm  |
| Core diameter          | 11.8 mm  |
| Extruder, water cooled | 175 mm, 24 D                                       |
| Screw                  | Nokia-Maillefer F78634.4, Single zone rubber screw |
| Temperatures           |  |
| Screw                  | 50 °C  |
| Z1                     | 60 °C  |
| Z2                     | 90 °C  |
| Z3                     | 90 °C  |
| Z4                     | 90 °C  |
| Z5                     | 90 °C  |
| Z6                     | 90 °C  |
| Z7                     | 110 °C   |
| Z8                     | 110 °C   |
| Z9                     | 110 °C   |
| Z10                    | 110 °C   |
| T-Head                 | 120°C  |
| T-Mass                 | 129°C  |
| Machine parameters     |  |
| Rotation Screw.        | 11.6 U / min                                       |
| Pressure               | 373 bar  |
| Screen-package (µm)    | 800/2x100/800                                      |
| Line Speed             | 13.1 m/min   |
| Motor                  | 45 %   |

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## Cross-Linking

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BCR-30 can be handled as a CV-crosslinkable Polyethylene.

| Pressure              | Residence time | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | Zone 8 |
|-----------------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|
| 13 bar N <sub>2</sub> | 3'40"          | 450°C  | 430°C  | 390°C  | 370°C  | 350°C  | 350°C  | 330°C  | 330°C  |

The surface-temperature of the cable must not exceed 275°C (depending from the outer semiconductive layer type) during the curing-processing. The recommended temperature settings are depending upon insulation thickness, used outer semiconductive and length of the given curing-zone. Optimum curing-temperature must be determined experimentally.

## Handling and product safety

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BCR-30 is an ecological compatible compound and there are no health or environment risks during processing. However as with all insulation material, care must be taken to avoid a build up of electrostatic charges. During cross-linking, gaseous by-products such as acetophenone, methane and 2-phenylpropanol can be generated. Under normal processing conditions these should not exceed 100 mg per hour, and air extraction systems can be vented directly into atmosphere, according to current Swiss regulations. BCR-30 contains a lead ingredient and waste material should be disposed of according to local regulations. When considering the use of Comcross<sup>®</sup> BCR-30, please review our latest Material Safety Data Sheet.

## Storage and shelf life

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Store product in cool warehouse away from direct sunlight, below 25°C. No changes in processing characteristics are expected after storage for periods well over one year.

## Transport

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BCR-30 should be transported in closed containers and protected from moisture and temperatures above 35°C.

## Packing

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BCR-30 is packaged in standard cardboard boxes, mounted on one-way pallets and protected by a PE-outerbag. The filling weight is 700 kg

The boxes are labelled as follows:

- Sender: BRUGG COMPOUND
- Designation of material: BCR-30
- Product-number
- Batch number
- Net weight

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