LANHAO ELECTRIC

Lanhao Cable Catalogue for

MINING APPLICATIONS

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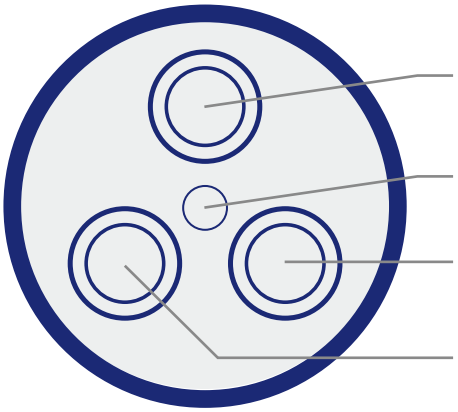
Connecting the World



Shanghai Lanhao Electric Co., Ltd is a leading technology-driven specialist cable manufacturer. Since founded in 2001, the company has been devoted to providing innovative, effective, and efficient cable solutions for mining, railways, port machinery, tunneling and many other critical industries.

Over years, we developed a deep understanding of application scenarios with different operational conditions through close cooperation with our clients. The experience we gain every day directs our research and production, allowing us to meet and to exceed our clients' expectations each and every time. As an industry leader in cabling, Lanhao has established an enviable record over the world for delivering quality cables and accessories, expert technical support, and a first-class customer experience. We have constantly driven the wheels of the industry and promoted the development of communities with our customer-focused, high-performing, and complete solutions.

Leading the Development of the Industry

The increasing production volume of the mining industry provides a steady energy supply for the development of communities worldwide. While Australia, Indonesia, and South Africa keep a stable supply of fossil resources, in 2021, coal production in China reaches 2,260 million tons in the first 7 months, and U.S. production is estimated to rise 14.5% from the 539.1 million produced in 2020. The continuous development of the mining industry requires the ever-increasing performance of machines, methods, and systems. Cables play a key role in supporting the nonstop and efficient operations on large moveable equipment as well as enabling intelligent systems with stable data and signal transmission.

Understanding its responsibility, Lanhao has devoted itself to developing innovative and reliable cable solutions since its establishment. We provide a full product range suitable for different scenarios, satisfying every special demand. We take every detail of our products to realize the best performance of our cables. Lanhao cables have been proven so far in thousands of applications, ensuring continuous, flexible and safe operation of the cables in extreme environmental conditions.

In 20 years of history, we go beyond "pure cable manufacturing". Drawing upon our state-of-art technology, professional experience, and a genuine desire to deliver excellent products and services, our branded cables have constantly provided reliable support to our local and international customers, ensuring the sustainable and efficient energy supply and driving the development of communities.

At Lanhao, we design and manufacture cables with considerations of all factors that could impact the application to offer products having optimal and balanced performance with certain features strengthened for customized demands.

Our Solutions

Outstanding electrical performance

Lanhao mining cable is designed to provide continuous safe and stable operations:

- Extremely low partial discharge and leakage current
- Reliable electrical field control
- Advanced characteristic impedance matching for telecommunication
- Minimized electromagnetic interference, etc.

Exceptional mechanical performance

Our advanced material science and structural design enhance the durability and reliability of products withstanding harsh operational conditions, including:

- High tensile loads and torsional stresses tolerance
- Repeated small radius bending
- Flexibility in wide range of temperatures
- Chemical and climate resistance

Miniaturized and multifunctional Engineering

Lanhao cables can come with a 30%-40% reduction in weight and dimension comparing to the existing standards while keeping the electric specification and mechanical performance beyond the industry standard. Meanwhile, our advanced technology creates equally durable power/ control/communication/ fiber optic cores. This opens the possibility of the most sophisticated structure incorporating following functions:

- Energy supply
- Communication
- Data transmission
- Lighting
- Monitoring

Convenience and Reliable Support

Lanhao incorporates convenience into the design language, such as:

- Reflective surface for nighttime visibility of exposed cable
- Connector-free technology for convenient multifunctional cable extension

We further provide a complete service platform ranging from testing, onsite repair, installation, and training for personnel as parts of the solutions.

Lanhao Mining Product Series

BENDLEX

Rubber sheathed power supply cables emphasizing flexibility and durability under high mechanical stress and continuous movement. Intended for connection to mobile equipment, especially for those requiring repeated small radius **bend**ing in fully f**lex**ible applications, e.g. coal shearers. Control cores are provided in the cables, where proprietary technology is applied to make these small cores have the durability similar to the phase conductors.

MEC

Flexible **m**ining cable optimized for **e**lectrical **c**ommunication signaling. Besides fulfilling the electrical specifications and mechanical performance required for high-quality power supply mining cables, this series emphasizes stable and high-fidelity telecommunication. Very suitable for mines with a central monitoring center or a dispatching center.

LHCC

Lanhao's control signaling and data cables for mining application, fire-resistance guaranteed. Different types can meet semi-fixed installation or reeling applications. Other special versions are available on demand. Signal stability and quality are guaranteed[2].

MGA

Mining cables for **g**eneral **a**pplications. This series takes into consideration of different requirements for connections to movable equipment and fixed installations in various settings, ranging from switchgear cubicles and emulsion pumps to shovels and shuttle cars. At users' option, additional functions (controlling, telecommunication, data transmission, etc.) can be added to the basic types in this series, making the product customized and optimized for each application scenario.

FEAM

Flat cables designed specifically for thin coal s**eam** applications, providing an extremely small bending radius for flexible operations, like coal shearers. Proprietary technology allows the flat cables to have similar mechanical performance and durability compared to the round cables used for underground mining. Control signal, telecommunication, and/or fiber optic data transmission are provided at option.

FOMIS

Next-generation opto electric composite cables. Proprietary design makes it possible for incorporating the optic fibers into the cables used for fully flexible operation with continuous movement and repeated bending (with mechanical stress applied). These cables enable large-volume and high-speed **f**ibre **o**ptic data transmission in **m**ines, especially for **i**ntelligent **s**urfaces. Electrical control and telecommunication functions are provided as well.

1. This brochure listed out products for typical (but not all) mining applications, for special needs or special versions, please consult sales for more details.
2. Assuming the installation of the cable and surrounding equipment/cable system are in good standing.

Lanhao Type Code Decipher

A type code is assigned to a group of cables which have the same or very similar structural design and features. The letters used by Lanhao in type codes can be deciphered as below:

(LHM) ···	Lanhao general mining cables
(LHD) ···	Lanhao mining cables, mainly for opencast applications
(LHF) ···	Lanhao flat mining cables, mainly for thin coal seam applications
(C) ···	Control cable or data cable
(G) ···	Single-core cable
X ···	Multi-core cable, more than 3 phase conductors (not applicable for control cables)
Y ···	Multi-core cable with cores laid up in layers
R- ···	Rubber sheathed cable, often neglected for mining cables
P- ···	Plastic sheathed cable, often neglected for control cables
···E···	Semiconductive layer on the insulation of the phase conductors
···EE···	Inner and outer semiconductive layer over the phase conductors
···D···	Double sheathed cable, neglected if the cable is armored or has reinforced layer
···G···	Having ground check unit
···N···	Having monitoring cores
···R···	Armor between the inner and the outer sheath
···L···	Metallic screen between the inner and the outer sheath
···I···	Reinforced layer between the inner and the outer sheath
···NL···	Monitoring layer between the inner and the outer sheath
···A···	Metallic screen over the phase conductors
···P···	Metallic screen over the pilot conductors, neglected for communication pairs or when PE units are as spinning conductors in the outer interstices
···S···	Concentric (spinning) PE conductors over the phase conductors or pilot cores
···B···	Braided PE conductors over the phase conductors
···T···	Standalone grounding conductors
···O···	Having optic fiber units, (O) used when optic fiber elements are optional for types with generalized design
···C···	Having control units, (C) used when control cores are optional for types with a generalized design
···M···	Having telecommunication units or can be used for telecommunication, (M) used when communication pairs are optional for types with generalized design
···W···	Waterproof layer between the inner and the outer sheath
···/W^X	Waterproof at a water depth of no more than X meters
.../FR	Outstanding cold resistance performance
···/RS	Having reflective surface
-R	Mainly for reeling, neglected when installation type is not emphasized
-TR	Mainly for trailing, neglected when installation type is not emphasized
-F	Mainly for (semi-)fixed installation, neglected when installation type is not emphasized

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1 Underground

Trailing/Cable chain

Reeling

2 Opencast

Fixed Installation

Trailing

Reeling

Fixed Installation

BENDLEX

Series Overview

BENDLEX — Power cables with control function for extremely flexible operations

Metallic screened power cables				
	(LHM)BAC	**(LHM)TAC**	**(LHM)BAIC**	**(LHM)BARC**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	Trailing/cable chain	Trailing/cable chain	Trailing/reeling/cable chain	Trailing/cable chain
Layout	3 core design	4 core design	3 core design	3 core design
Electric field control	Metallic screen	Metallic screen	Metallic screen	Metallic screen
Design	· Braided PE conductors · Distributed control cores	· Central PE unit · Control core group	· Reinforcement layer · Double sheath	· Steel/copper armor · Double sheath

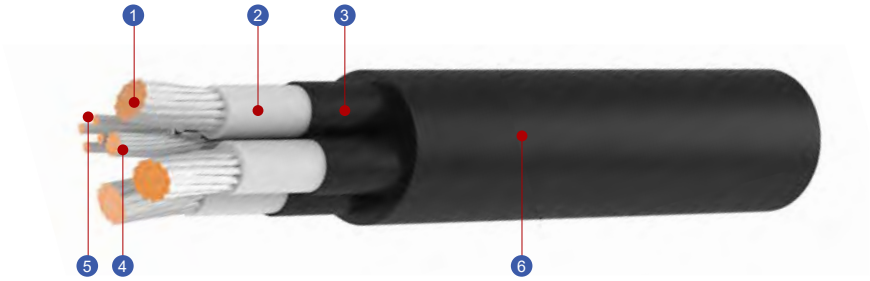
Non-metallic shielded power cables				
	(LHM)TEC	**(LHM)SEIC**	**(LHM)SEC**	**(LHM)SERC**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	Trailing/cable chain	Trailing/reeling/cable chain	Trailing/cable chain	Trailing/cable chain
Layout	4 core design	3 core design	3 core design	3 core design
Electric field control	Semiconductive layer	Semiconductive layer	Semiconductive layer	Semiconductive layer
Design	· Central PE conductor · Control core group	· Fully screened control cores · Reinforcement layer	· Fully screened control cores · Evenly distributed PE conductors	· Steel/copper armor · Double sheath

BENDLEX (LHM)TEC 1kV - 3kV

Medium voltage trailing cable

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)TEC
- **VDE type designation:** (N)TMCGEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 power conductors and stranded pilot cores (3-4 cores) laid up around central PE conductor
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Finely stranded tinned copper conductors (class 5)
2	**Insulation**	90°C rated synthetic compound, basic material: EPR, better than 3GI3[1]
3	**Electrical field control**	Semiconductive rubber screen
4	**PE conductor**	Tinned copper conductor with semi-conductive tape
5	**Pilot conductor**	Tinned copper, insulated with EPR[2] rubber compound, serve as control cores
6	**Sheath**	Basic material: CM, better than 5GM5[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage trailing cable for power supply and control signal transmission to mobile equipment, such as coal shearer or TBM's. Designed to endure small bending radius operations. Proprietary sheath compound provides strengthened abrasion resistance and tearproof.

Sketch

Classic power supply cable, economic and very durable under normal working conditions.

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
35 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. According to DIN VDE 0207.
2. HEPR may be applied based on actual working condition.

Specification- BENDLEX (LHM)TEC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+1x25+3x2.5ST	01110131308C	3	3	6.86	36.88	39.88	2.31	0.7950
3x35+1x25+3x2.5ST	01110131309C	3	3	8.00	40.11	43.11	2.87	0.5650
3x50+1x35+3x2.5ST	01110131310C	3	3	9.65	44.77	47.77	3.70	0.3930
3x70+1x35+3x2.5ST	01110131311C	3	3	11.55	50.17	54.17	4.79	0.2770
3x95+1x50+3x2.5ST	01110131312C	3	3	13.36	55.87	59.87	6.13	0.2100
3x120+1x50+3x2.5ST	01110131313C	3	3	15.21	61.09	65.09	7.46	0.1640
3x150+1x70+3x2.5ST	01110131314C	3	3	16.85	67.44	71.44	9.19	0.1320
3x185+1x70+3x2.5ST	01110131315C	3	3	18.75	72.82	76.82	10.93	0.1080
3x240+1x95+3x2.5ST	01110131316C	3	3	21.29	81.71	85.71	13.94	0.0817
3x300+1x120+3x2.5ST	01110131317C	3	3	24.21	90.54	94.54	17.18	0.0654
3x25+1x25+4x2.5ST	01110131408C	3	4	6.86	36.88	39.88	2.33	0.7950
3x35+1x25+4x2.5ST	01110131409C	3	4	8.00	40.11	43.11	2.90	0.5650
3x50+1x35+4x2.5ST	01110131410C	3	4	9.65	44.77	47.77	3.73	0.3930
3x70+1x35+4x2.5ST	01110131411C	3	4	11.55	50.17	54.17	4.83	0.2770
3x95+1x50+4x2.5ST	01110131412C	3	4	13.36	55.87	59.87	6.19	0.2100
3x120+1x50+4x2.5ST	01110131413C	3	4	15.21	61.09	65.09	7.52	0.1640
3x150+1x70+4x2.5ST	01110131414C	3	4	16.85	67.44	71.44	9.26	0.1320
3x185+1x70+4x2.5ST	01110131415C	3	4	18.75	72.82	76.82	11.00	0.1080
3x240+1x95+4x2.5ST	01110131416C	3	4	21.29	81.71	85.71	14.03	0.0817
3x300+1x120+4x2.5ST	01110131417C	3	4	24.21	90.54	94.54	17.30	0.0654

1.8/3 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+1x25+3x2.5ST	01110231308C	3	3	6.86	38.01	41.01	2.45	0.7950
3x35+1x25+3x2.5ST	01110231309C	3	3	8.00	41.25	44.25	3.00	0.5650
3x50+1x35+3x2.5ST	01110231310C	3	3	9.65	45.90	48.90	3.87	0.3930
3x70+1x50+3x2.5ST	01110231311C	3	3	11.55	51.87	55.87	5.04	0.2770
3x95+1x50+3x2.5ST	01110231312C	3	3	13.36	58.13	62.13	6.49	0.2100
3x120+1x50+3x2.5ST	01110231313C	3	3	15.21	63.35	67.35	7.86	0.1640
3x150+1x70+3x2.5ST	01110231314C	3	3	16.85	68.57	72.57	9.46	0.1320
3x185+1x70+3x2.5ST	01110231315C	3	3	18.75	74.52	78.52	11.33	0.1080
3x240+1x95+3x2.5ST	01110231316C	3	3	21.29	82.28	86.28	14.16	0.0817
3x300+1x120+3x2.5ST	01110231317C	3	3	24.21	90.54	94.54	17.30	0.0654
3x25+1x25+4x2.5ST	01110231408C	3	4	6.86	38.01	41.01	2.50	0.7950
3x35+1x25+4x2.5ST	01110231409C	3	4	8.00	41.25	44.25	3.05	0.5650
3x50+1x35+4x2.5ST	01110231410C	3	4	9.65	45.90	48.90	3.92	0.3930
3x70+1x50+4x2.5ST	01110231411C	3	4	11.55	51.87	55.87	5.10	0.2770
3x95+1x50+4x2.5ST	01110231412C	3	4	13.36	58.13	62.13	6.54	0.2100
3x120+1x50+4x2.5ST	01110231413C	3	4	15.21	63.35	67.35	7.91	0.1640
3x150+1x70+4x2.5ST	01110231414C	3	4	16.85	68.57	72.57	9.51	0.1320
3x185+1x70+4x2.5ST	01110231415C	3	4	18.75	74.52	78.52	11.38	0.1080
3x240+1x95+4x2.5ST	01110231416C	3	4	21.29	82.28	86.28	14.21	0.0817
3x300+1x120+4x2.5ST	01110231417C	3	4	24.21	90.54	94.54	17.35	0.0654

BENDLEX (LHM)SEIC 1kV - 3kV

Double-sheath MV flexible cable for trailing application

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)SEIC
- **VDE type designation:** (N)TSCGEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 main cores laid up around the central cradle separator. Double concentric control cores and PE units in the outer interstices.
- **Installation:** Trailing/Reeling/Cable Chain

1	**Power conductor**	Very finely stranded copper conductors cabled around central semiconductive cradle[1], tinned.
2	**Insulation**	Basic material: EPR, better than 3GI3[2]
3	**Electrical field control**	Semiconductive rubber compound
4	**PE conductor**	Spinning of tinned copper wires over each control core, covered with semi conducting tape and semiconductive layer
5	**Pilot conductor**	Insulated spinning tinned copper wires, evenly distributed in the outer interstices
6	**Inner sheath**	Synthetic rubber compound, basic material: CR (5GM5)
7	**Reinforcement layer**	Reinforced braid of aramid threads between inner and outer sheath
8	**Outer sheath**	Special chloroprene rubber compound, mold-cured, 5GM5+[2]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed flexible cables used as power supply to underground mobile equipment. Intended for working conditions with considerable torsion stresses.Suitable for both trailing and reeling installation.

Sketch

- Double sheathed cable with reinforcement layer, outstanding performance under high torsion stress
- Copper wires spinning over control cores, providing super stable control signals
- Good for either trailing or reeling application
- Special version provided for mining surfaces with significant slope

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Minimum bending radius
1.5 D, 4 D for reeling

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Central reinforcement unit applied as necessary (based on actual working conditions).
2. See DIN VDE 0207.

Specification- BENDLEX (LHM)SEIC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01150131308C	3	3	6.86	33.75	36.75	2.29	0.7950
3x35+3x16/3+3x2.5ST	01150131309C	3	3	8.00	37.14	40.14	2.80	0.5650
3x50+3x25/3+3x2.5ST	01150131310C	3	3	9.65	41.80	44.80	3.66	0.3930
3x70+3x35/3+3x2.5ST	01150131311C	3	3	11.55	47.13	51.13	4.53	0.2770
3x95+3x50/3+3x2.5ST	01150131312C	3	3	13.36	52.62	56.62	5.87	0.2100
3x120+3x70/3+3x2.5ST	01150131313C	3	3	15.21	57.82	61.82	7.20	0.1640
3x150+3x70/3+3x2.5ST	01150131314C	3	3	16.85	62.44	66.44	8.53	0.1320
3x185+3x95/3+3x2.5ST	01150131315C	3	3	18.75	68.02	72.02	10.35	0.1080
3x240+3x120/3+3x2.5ST	01150131316C	3	3	21.29	75.22	79.22	13.06	0.0817
3x300+3x150/3+3x2.5ST	01150131317C	3	3	24.21	83.10	87.10	16.00	0.0654

1.8/3 kV

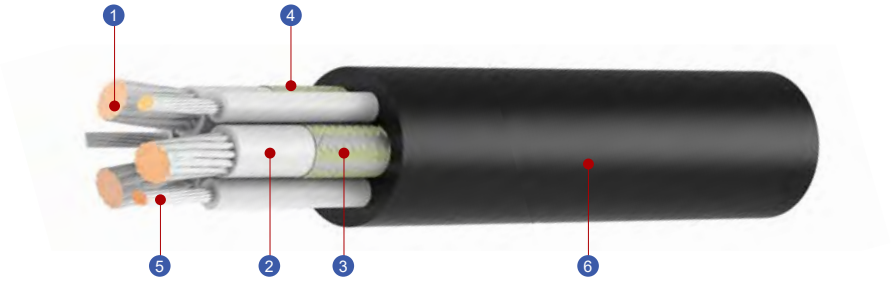
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01150231308C	3	3	6.86	36.28	39.28	2.50	0.7950
3x35+3x16/3+3x2.5ST	01150231309C	3	3	8.00	39.16	42.16	2.99	0.5650
3x50+3x25/3+3x2.5ST	01150231310C	3	3	9.65	43.59	46.59	3.84	0.3930
3x70+3x35/3+3x2.5ST	01150231311C	3	3	11.55	48.92	52.92	4.76	0.2770
3x95+3x50/3+3x2.5ST	01150231312C	3	3	13.36	54.51	58.51	6.12	0.2100
3x120+3x70/3+3x2.5ST	01150231313C	3	3	15.21	59.57	63.57	7.46	0.1640
3x150+3x70/3+3x2.5ST	01150231314C	3	3	16.85	63.96	67.96	8.79	0.1320
3x185+3x95/3+3x2.5ST	01150231315C	3	3	18.75	69.27	73.27	10.54	0.1080
3x240+3x120/3+3x2.5ST	01150231316C	3	3	21.29	76.47	80.47	13.26	0.0817
3x300+3x150/3+3x2.5ST	01150231317C	3	3	24.21	83.84	87.84	16.14	0.0654

BENDLEX (LHM)BAC 1kV - 3kV

Coal shearer cables for trailing application

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)BAC
- **VDE type designation:** (N)TMKCEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design. Power cores laid-up with control cores in the outer interstices around the central semi-conductive cradle separator.
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Flexible tinned copper conductors (class 5), metallic screened.
2	**Insulation**	90 °C rated EPR compound, better than 3GI3[1]
3	**Electrical field control**	Copper/textile braid over power conductors
4	**PE conductor**	Copper/textile braid over each main core, laid up with power conductors around the central separator[2]
5	**Pilot conductor**	Insulated spinning wires[3] in the outer interstices, tinned copper
6	**Sheath**	Robust synthetic compound, basic material, e.g. CM/CR, 5GM5+[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage flexible cable designed for mobile equipment such as coal cutters, continuous miners, conveyors, etc. Robust structural design, being able to handle harsh environment including repeated small radius bending with stress applied. Metallic shielding provides excellent electromagnetic interference screen.

Sketch

- Metallic screened phase conductors, reduced electromagnetic interference from power cores
- Miniaturized design
- Very durable structure in terms of mechanical performance under tensile loads, torsion stress, and repeated bending
- Up to 6 control cores

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE 0207.
2. Reinforcement unit maybe added as if the application requires the cable to handle extreme tensile loads.
3. Double concentric structure applied when more than 3 control cores are required.

Specification- BENDLEX (LHM)BAC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01140131308C	3	3	6.86	34.99	37.99	2.36	0.7950
3x35+3x25/3E+3x2.5ST	01140131309C	3	3	8.00	37.88	40.88	2.87	0.5650
3x50+3x35/3E+3x2.5ST	01140131310C	3	3	9.65	42.54	45.54	3.67	0.3930
3x70+3x35/3E+3x2.5ST	01140131311C	3	3	11.55	47.86	51.86	4.75	0.2770
3x95+3x50/3E+3x2.5ST	01140131312C	3	3	13.36	52.94	56.94	5.95	0.2100
3x120+3x50/3E+3x2.5ST	01140131313C	3	3	15.21	57.60	61.60	7.17	0.1640
3x150+3x50/3E+3x2.5ST	01140131314C	3	3	16.85	63.27	67.27	8.69	0.1320
3x185+3x70/3E+3x2.5ST	01140131315C	3	3	18.75	68.07	72.07	10.24	0.1080
3x240+3x70/3E+3x2.5ST	01140131316C	3	3	21.29	76.01	80.01	12.80	0.0817
3x300+3x70/3E+3x2.5ST	01140131317C	3	3	24.21	83.88	87.88	15.54	0.0654

1.8/3 kV

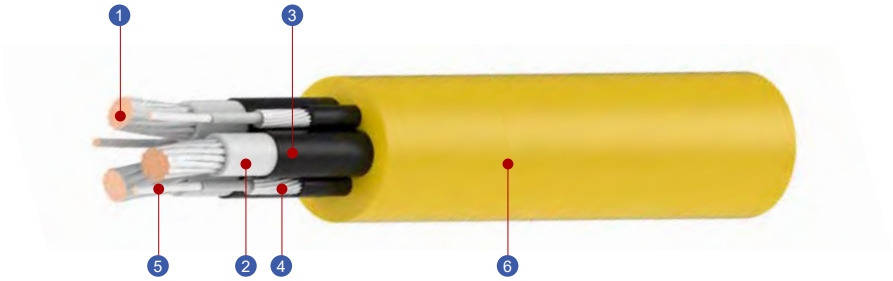
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01140231308C	3	3	6.86	37.01	40.01	2.52	0.7950
3x35+3x25/3E+3x2.5ST	01140231309C	3	3	8.00	39.90	42.90	3.05	0.5650
3x50+3x35/3E+3x2.5ST	01140231310C	3	3	9.65	44.06	47.06	3.82	0.3930
3x70+3x35/3E+3x2.5ST	01140231311C	3	3	11.55	49.38	53.38	4.92	0.2770
3x95+3x50/3E+3x2.5ST	01140231312C	3	3	13.36	54.97	58.97	6.25	0.2100
3x120+3x50/3E+3x2.5ST	01140231313C	3	3	15.21	59.62	63.62	7.44	0.1640
3x150+3x50/3E+3x2.5ST	01140231314C	3	3	16.85	64.28	68.28	8.89	0.1320
3x185+3x70/3E+3x2.5ST	01140231315C	3	3	18.75	69.59	73.59	10.49	0.1080
3x240+3x70/3E+3x2.5ST	01140231316C	3	3	21.29	76.51	80.51	12.89	0.0817
3x300+3x70/3E+3x2.5ST	01140231317C	3	3	24.21	83.88	87.88	15.54	0.0654

BENDLEX (LHM)SEC 1kV - 3kV

Medium voltage 3-core trailing cable

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)SEC
- **VDE type designation:** (N)TMKCGEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 power cores laid-up around the central semi-conductive separator, double concentric control and PE cores placed in the outer interstices
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Finely stranded tinned copper conductors cabled with central cradle separator [1]
2	**Insulation**	90°C rated EPR compound, 3GI3+[2]
3	**Electrical field control**	Semiconductive layer over the insulation
4	**PE conductor**	Concentric spinning tinned copper wire over control cores, covered with semiconducting layer
5	**Pilot conductor**	EPR insulated tinned copper conductors, covered with non-conductive tape
6	**Sheath**	Reinforced synthetic elastomer compound (thermosetting), mold-cured (5GM5+)

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage flexible cable for mobile equipment in underground mining applications. Suitable for trailing and semi-fixed installation. Robust structure design to handle significant mechanical stresses and tensile forces. Optimized for machines requiring the cable trailed behind to endure small radius bending, such as coal cutters.

Sketch

- 3 core design, light weighted and yet good to handle high mechanical stress
- Reinforcement unit can be added at option
- Concentric control/PE units guarantee that the electromagnetic interference on the control signals is minimized

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
60 °/m

Minimum bending radius
1.5 D

Electrical Parameters

	0.6/1 kV	1.8/3 kV
Rated voltage		
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Central reinforcement unit maybe applied depending on the provided description of working conditions.
2. See DIN VDE 0207.

Specification- BENDLEX (LHM)SEC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01130131308C	3	3	6.86	34.15	37.15	2.34	0.7950
3x35+3x16/3+3x2.5ST	01130131309C	3	3	8.00	37.27	40.27	2.81	0.5650
3x50+3x25/3+3x2.5ST	01130131310C	3	3	9.65	41.80	44.80	3.66	0.3930
3x70+3x35/3+3x2.5ST	01130131311C	3	3	11.55	47.13	51.13	4.53	0.2770
3x95+3x50/3+3x2.5ST	01130131312C	3	3	13.36	53.30	57.30	5.93	0.2100
3x120+3x70/3+3x2.5ST	01130131313C	3	3	15.21	58.23	62.23	7.24	0.1640
3x150+3x70/3+3x2.5ST	01130131314C	3	3	16.85	62.71	66.71	8.56	0.1320
3x185+3x95/3+3x2.5ST	01130131315C	3	3	18.75	68.70	72.70	10.43	0.1080
3x240+3x120/3+3x2.5ST	01130131316C	3	3	21.29	75.63	79.63	13.11	0.0817
3x300+3x150/3+3x2.5ST	01130131317C	3	3	24.21	83.51	87.51	16.06	0.0654

1.8/3 kV

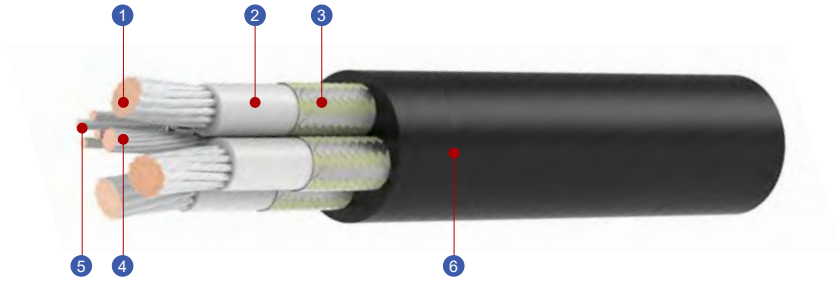
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01130231308C	3	3	6.86	37.36	40.36	2.59	0.7950
3x35+3x16/3+3x2.5ST	01130231309C	3	3	8.00	41.19	44.19	3.13	0.5650
3x50+3x25/3+3x2.5ST	01130231310C	3	3	9.65	45.22	48.22	3.99	0.3930
3x70+3x35/3+3x2.5ST	01130231311C	3	3	11.55	48.78	52.39	4.76	0.2770
3x95+3x50/3+3x2.5ST	01130231312C	3	3	13.36	55.32	59.13	6.22	0.2100
3x120+3x70/3+3x2.5ST	01130231313C	3	3	15.21	59.98	63.79	7.52	0.1640
3x150+3x70/3+3x2.5ST	01130231314C	3	3	16.85	63.55	67.56	8.70	0.1320
3x185+3x95/3+3x2.5ST	01130231315C	3	3	18.75	69.13	73.35	10.52	0.1080
3x240+3x120/3+3x2.5ST	01130231316C	3	3	21.29	76.87	81.28	13.33	0.0817
3x300+3x150/3+3x2.5ST	01130231317C	3	3	24.21	84.11	88.72	16.19	0.0654

BENDLEX (LHM)TAC 1kV - 3kV

Medium voltage trailing cable

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)TAC
- **VDE type designation:** (N)TMCEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 4 core design, 3 metallic screened power conductors and the control group cabled with central PE conductor
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Shielded flexible tinned copper conductors (Class 5)
2	**Insulation**	Synthetic EPR compound, 90°C rated, 3GI3+[1]
3	**Electrical field control**	Metallic screen over phase cores
4	**PE conductor**	Central PE unit (tinned copper)
5	**Pilot conductor**	Cabled control core group. Tinned copper, insulated and sheathed (thermosetting jacket).
6	**Sheath**	Special chlorinated rubber compound, better than 5GM5[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage flexible power cable for use in circuits not exceeding 3300 volts, especially suitable for use with mobile mining equipment including continuous miners, longwall shearers, drills, and conveyors. Metallic screen is applied for enhanced electric field shielding.

Sketch

4-core design. Metallic screen over phase conductors reduces the electrical interference from power cores. Very robust control cores, having the same service life as the power conductors.

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. According to DIN VDE 0207.

Specification- BENDLEX (LHM)TAC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+1x25+3x2.5ST	01120131308C	3	3	6.86	39.71	42.71	2.83	0.7950
3x35+1x25+3x2.5ST	01120131309C	3	3	8.00	42.95	45.95	3.45	0.5650
3x50+1x35+3x2.5ST	01120131310C	3	3	9.65	47.60	50.60	4.37	0.3930
3x70+1x50+3x2.5ST	01120131311C	3	3	11.55	53.00	57.00	5.56	0.2770
3x95+1x50+3x2.5ST	01120131312C	3	3	13.36	58.70	62.70	6.98	0.2100
3x120+1x50+3x2.5ST	01120131313C	3	3	15.21	63.92	67.92	8.42	0.1640
3x150+1x70+3x2.5ST	01120131314C	3	3	16.85	70.27	74.27	10.23	0.1320
3x185+1x70+3x2.5ST	01120131315C	3	3	18.75	75.66	79.66	12.05	0.1080
3x240+1x95+3x2.5ST	01120131316C	3	3	21.29	84.55	88.55	15.10	0.0817
3x300+1x120+3x2.5ST	01120131317C	3	3	24.21	93.37	97.37	18.38	0.0654
3x25+1x25+4x2.5ST	01120131408C	3	4	6.86	39.71	42.71	2.84	0.7950
3x35+1x25+4x2.5ST	01120131409C	3	4	8.00	42.95	45.95	3.46	0.5650
3x50+1x35+4x2.5ST	01120131410C	3	4	9.65	47.60	50.60	4.38	0.3930
3x70+1x50+4x2.5ST	01120131411C	3	4	11.55	53.00	57.00	5.58	0.2770
3x95+1x50+4x2.5ST	01120131412C	3	4	13.36	58.70	62.70	6.98	0.2100
3x120+1x50+4x2.5ST	01120131413C	3	4	15.21	63.92	67.92	8.42	0.1640
3x150+1x70+4x2.5ST	01120131414C	3	4	16.85	70.27	74.27	10.23	0.1320
3x185+1x70+4x2.5ST	01120131415C	3	4	18.75	75.66	79.66	12.05	0.1080
3x240+1x95+4x2.5ST	01120131416C	3	4	21.29	84.55	88.55	15.10	0.0817
3x300+1x120+4x2.5ST	01120131417C	3	4	24.21	93.37	97.37	18.39	0.0654

1.8/3 kV

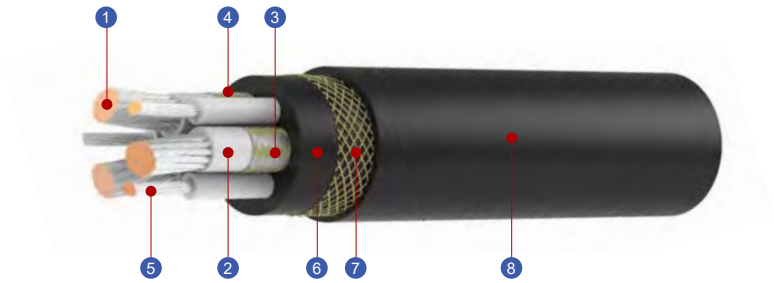
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+1x25+3x2.5ST	01120231308C	3	3	6.86	40.85	43.85	2.96	0.7950
3x35+1x25+3x2.5ST	01120231309C	3	3	8.00	44.08	47.08	3.58	0.5650
3x50+1x35+3x2.5ST	01120231310C	3	3	9.65	48.74	51.74	4.49	0.3930
3x70+1x50+3x2.5ST	01120231311C	3	3	11.55	54.70	58.70	5.79	0.2770
3x95+1x50+3x2.5ST	01120231312C	3	3	13.36	60.97	64.97	7.35	0.2100
3x120+1x50+3x2.5ST	01120231313C	3	3	15.21	66.18	70.18	8.80	0.1640
3x150+1x70+3x2.5ST	01120231314C	3	3	16.85	71.40	75.40	10.48	0.1320
3x185+1x70+3x2.5ST	01120231315C	3	3	18.75	77.35	81.35	12.39	0.1080
3x240+1x95+3x2.5ST	01120231316C	3	3	21.29	85.11	89.11	15.23	0.0817
3x300+1x120+3x2.5ST	01120231317C	3	3	24.21	93.37	97.37	18.38	0.0654
3x25+1x25+4x2.5ST	01120231408C	3	4	6.86	40.85	43.85	2.96	0.7950
3x35+1x25+4x2.5ST	01120231409C	3	4	8.00	44.08	47.08	3.59	0.5650
3x50+1x35+4x2.5ST	01120231410C	3	4	9.65	48.74	51.74	4.50	0.3930
3x70+1x50+4x2.5ST	01120231411C	3	4	11.55	54.70	58.70	5.79	0.2770
3x95+1x50+4x2.5ST	01120231412C	3	4	13.36	60.97	64.97	7.35	0.2100
3x120+1x50+4x2.5ST	01120231413C	3	4	15.21	66.18	70.18	8.80	0.1640
3x150+1x70+4x2.5ST	01120231414C	3	4	16.85	71.40	75.40	10.48	0.1320
3x185+1x70+4x2.5ST	01120231415C	3	4	18.75	77.35	81.35	12.44	0.1080
3x240+1x95+4x2.5ST	01120231416C	3	4	21.29	85.11	89.11	15.38	0.0817
3x300+1x120+4x2.5ST	01120231417C	3	4	24.21	93.37	97.37	18.62	0.0654

BENDLEX (LHM)BAIC 1kV - 3kV

Double Sheathed MV flexible cable with screened power cores

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)BAIC
- **VDE type designation:** (N)TSCEWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 main cores and pilot cores (in the outer interstices) cabled around the central semiconductive cradle
- **Installation:** Trailing/Reeling/Cable Chain



1	**Power conductor**	Very finely stranded conductors (class 5), tinned copper and metallic shielded
2	**Insulation**	90°C rated ethylene-propylene rubber
3	**Electrical field control**	Copper/textile braid over phase conductors
4	**PE conductor**	Metallic screen provides grounding effect
5	**Pilot conductor**	Tinned copper (double[1]) concentric control elements in the outer interstices, insulated.
6	**Inner sheath**	Special rubber compound, basic material: CR (5GM5+)[2]
7	**Reinforcement layer**	Anti-torsion braid of twisted aramid threads over the inner sheath
8	**Outer sheath**	Synthetic elastomer compound, basic material: CR (5GM5+)[2]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed flexible cable for the connection of mobile equipment. Intended for underground application requiring small radius bending under high torsion stresses and tensile loads such as connection to coal shearers.

Sketch

- Advanced structure evenly distribute the mechanical stress over the cable
- Good for repeated small radius bending under significant torsion stress
- Metallic screened, recommended when EMI is a concern to the surrounding equipment

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Minimum bending radius
1.5 D, 4 D for reeling

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. When more than 3 control cores required.
2. According to DIN VDE 0207.

Specification- BENDLEX (LHM)BAIC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01160131308C	3	3	6.86	34.99	37.99	2.36	0.7950
3x35+3x25/3E+3x2.5ST	01160131309C	3	3	8.00	37.88	40.88	2.87	0.5650
3x50+3x35/3E+3x2.5ST	01160131310C	3	3	9.65	42.54	45.54	3.67	0.3930
3x70+3x35/3E+3x2.5ST	01160131311C	3	3	11.55	47.86	51.86	4.75	0.2770
3x95+3x50/3E+3x2.5ST	01160131312C	3	3	13.36	52.94	56.94	5.95	0.2100
3x120+3x50/3E+3x2.5ST	01160131313C	3	3	15.21	57.60	61.60	7.17	0.1640
3x150+3x50/3E+3x2.5ST	01160131314C	3	3	16.85	63.27	67.27	8.69	0.1320
3x185+3x70/3E+3x2.5ST	01160131315C	3	3	18.75	68.07	72.07	10.24	0.1080
3x240+3x70/3E+3x2.5ST	01160131316C	3	3	21.29	76.01	80.01	12.80	0.0817
3x300+3x70/3E+3x2.5ST	01160131317C	3	3	24.21	83.88	87.88	15.54	0.0654

1.8/3 kV

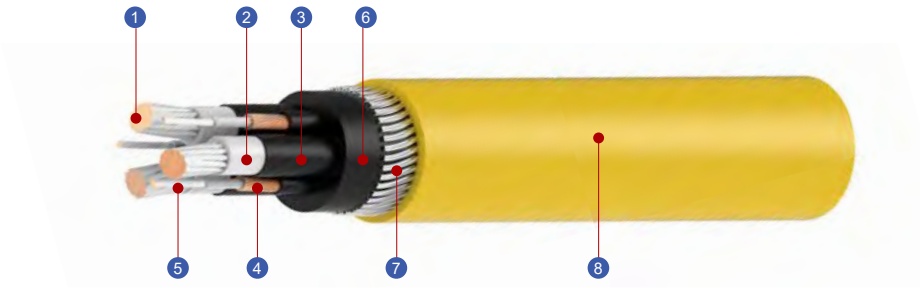
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01160231308C	3	3	6.86	37.01	40.01	2.52	0.7950
3x35+3x25/3E+3x2.5ST	01160231309C	3	3	8.00	39.90	42.90	3.05	0.5650
3x50+3x35/3E+3x2.5ST	01160231310C	3	3	9.65	44.06	47.06	3.82	0.3930
3x70+3x35/3E+3x2.5ST	01160231311C	3	3	11.55	49.38	53.38	4.92	0.2770
3x95+3x50/3E+3x2.5ST	01160231312C	3	3	13.36	54.97	58.97	6.25	0.2100
3x120+3x50/3E+3x2.5ST	01160231313C	3	3	15.21	59.62	63.62	7.44	0.1640
3x150+3x50/3E+3x2.5ST	01160231314C	3	3	16.85	64.28	68.28	8.89	0.1320
3x185+3x70/3E+3x2.5ST	01160231315C	3	3	18.75	69.59	73.59	10.49	0.1080
3x240+3x70/3E+3x2.5ST	01160231316C	3	3	21.29	76.51	80.51	12.89	0.0817
3x300+3x70/3E+3x2.5ST	01160231317C	3	3	24.21	83.88	87.88	15.54	0.0654

BENDLEX (LHM)SERC 1kV - 3kV

Armoured flexible MV trailing cable

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)SERC
- **VDE type designation:** (N)TSKCGERWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design, power conductors laid up around the central cradle separator. Double concentric control cores and PE units in the outer interstices
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Finely stranded tinned copper conductors (class 5)
2	**Insulation**	90°C rated synthetic compound, basic material: EPR, better than 3GI3[1]
3	**Electrical field control**	Semiconductive layer
4	**PE conductor**	Spinning tinned copper wires over control cores, covered with semiconductive tape and rubber layer
5	**Pilot conductor**	Concentric tinned copper conductors, insulated and taped[2]
6	**Inner sheath**	Special rubber compound, basic material: CM (5GM3+)
7	**Armouring**	Copper/steel wires spinning over the inner sheath
8	**Outer sheath**	Special synthetic elastomer compound, 5GM5+[1]
OPT	**Reinforcement unit**	Central reinforcemnet unit added at option as if the tensile loads is significant

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Heavy duty power supply cable for flexible operation. These armoured cables are excellent for working conditions in which falling rocks and tire impact are frequent. The robust structure can bear extreme tensile loads as well.

Sketch

- Good for mining surfaces where impact forces are concerned
- Spinning wires over control cores, stable signal guaranteed
- Robust structure to handle small radius bending with torsion and tensile forces applied, can be even strengthened if significant tensile loads

Mechanical Parameters

Max. tensile loads on the cable
40 MPa

Torsion stress
25 °/m

Minimum bending radius
6 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE 0207.
2. Up to 6 concentric control cores.

Specification- BENDLEX (LHM)SERC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01170131308C	3	3	6.86	36.45	39.75	2.95	0.7950
3x35+3x16/3+3x2.5ST	01170131309C	3	3	8.00	39.84	43.14	3.52	0.5650
3x50+3x25/3+3x2.5ST	01170131310C	3	3	9.65	44.50	47.80	4.48	0.3930
3x70+3x35/3+3x2.5ST	01170131311C	3	3	11.55	49.83	54.13	5.47	0.2770
3x95+3x50/3+3x2.5ST	01170131312C	3	3	13.36	55.32	59.62	6.92	0.2100
3x120+3x70/3+3x2.5ST	01170131313C	3	3	15.21	60.52	64.82	8.35	0.1640
3x150+3x70/3+3x2.5ST	01170131314C	3	3	16.85	65.14	69.44	9.77	0.1320
3x185+3x95/3+3x2.5ST	01170131315C	3	3	18.75	70.72	75.02	11.71	0.1080
3x240+3x120/3+3x2.5ST	01170131316C	3	3	21.29	77.92	82.22	14.57	0.0817
3x300+3x150/3+3x2.5ST	01170131317C	3	3	24.21	85.80	90.10	17.68	0.0654

1.8/3 kV

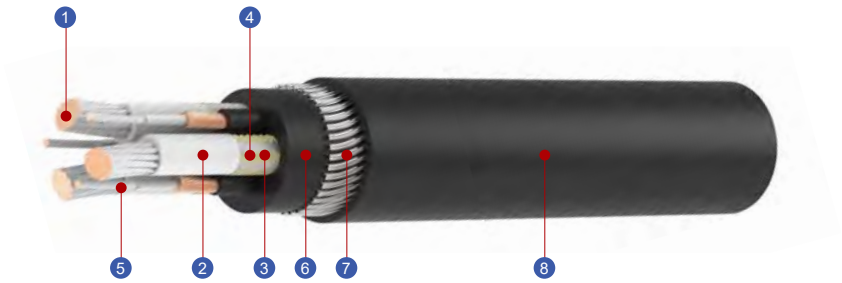
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST	01170231308C	3	3	6.86	38.68	42.28	3.21	0.7950
3x35+3x16/3+3x2.5ST	01170231309C	3	3	8.00	42.16	45.16	3.76	0.5650
3x50+3x25/3+3x2.5ST	01170231310C	3	3	9.65	46.59	49.59	4.71	0.3930
3x70+3x35/3+3x2.5ST	01170231311C	3	3	11.55	51.92	55.92	5.73	0.2770
3x95+3x50/3+3x2.5ST	01170231312C	3	3	13.36	57.51	61.51	7.20	0.2100
3x120+3x70/3+3x2.5ST	01170231313C	3	3	15.21	62.27	66.27	8.66	0.1640
3x150+3x70/3+3x2.5ST	01170231314C	3	3	16.85	66.96	70.96	10.07	0.1320
3x185+3x95/3+3x2.5ST	01170231315C	3	3	18.75	72.27	76.27	11.93	0.1080
3x240+3x120/3+3x2.5ST	01170231316C	3	3	21.29	79.47	83.47	14.81	0.0817
3x300+3x150/3+3x2.5ST	01170231317C	3	3	24.21	86.84	90.84	17.83	0.0654

BENDLEX (LHM)BARC 1kV - 3kV

Double Screened MV trailing cable

Product Overview

- **LH series:** BENDLEX
- **LH code:** (LHM)BARC
- **VDE type designation:** (N)TSKCECWOEU
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 main cores and double concentric control/PE units laid up around the central semiconductive cradle
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Finely stranded tinned copper conductors (class 5), metallic shielded
2	**Insulation**	EPR based compound, better than 3GI3[1]
3	**Electrical field control**	Braid of mixed copper and aramid wires over phase conductors
4	**PE conductor**	Grounded metallic screen
5	**Pilot conductor**	Spinning of copper wires (tinned) over reinforcement yarn threads [2]
6	**Inner sheath**	Vulcanized rubber sheath, special compound
7	**Armouring**	Spinning of copper/steel wires over the inner sheath
8	**Outer sheath**	Synthetic elastomer compound e.g. CM, 5GM5[1]
OPT	**Reinforcement unit**	Central reinforcement unit of aramid rope applied when necessary

Suitable Working Environment

Ambient temperature for fixed installation
-40°C~80°C

Ambient temperature in fully flexible operation
-25°C~80°C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Armoured medium voltage flexible cable with metallic screened power conductors. Double screen technology applied, which extensively reduces EMC. Good for trailing application and semi-fixed installation with heavy mechanical stresses (e.g. connections between upper and lower levels).

Sketch

- Double screen, good for applications in which EMC is very concerned
- Additional PE units between the inner and the outer sheath
- Good for mining surfaces with significant slope or frequent falling rocks; central reinforcement units applied for the former case

Mechanical Parameters

Max. tensile loads on the cable
40 MPa

Torsion stress
25 °/m

Minimum bending radius
6 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE 0207.
2. Up to 6 control cores without impacting the outer dimension.

Specification- BENDLEX (LHM)BARC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01180131308C	3	3	6.86	37.69	40.99	3.04	0.7950
3x35+3x25/3E+3x2.5ST	01180131309C	3	3	8.00	40.58	43.88	3.61	0.5650
3x50+3x35/3E+3x2.5ST	01180131310C	3	3	9.65	45.24	48.54	4.51	0.3930
3x70+3x35/3E+3x2.5ST	01180131311C	3	3	11.55	50.56	54.86	5.70	0.2770
3x95+3x50/3E+3x2.5ST	01180131312C	3	3	13.36	55.64	59.94	7.00	0.2100
3x120+3x50/3E+3x2.5ST	01180131313C	3	3	15.21	60.30	64.60	8.32	0.1640
3x150+3x50/3E+3x2.5ST	01180131314C	3	3	16.85	65.97	70.27	9.95	0.1320
3x185+3x70/3E+3x2.5ST	01180131315C	3	3	18.75	70.77	75.07	11.61	0.1080
3x240+3x70/3E+3x2.5ST	01180131316C	3	3	21.29	78.71	83.01	14.33	0.0817
3x300+3x70/3E+3x2.5ST	01180131317C	3	3	24.21	86.58	90.88	17.23	0.0654

1.8/3 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST	01180231308C	3	3	6.86	39.71	43.01	3.24	0.7950
3x35+3x25/3E+3x2.5ST	01180231309C	3	3	8.00	42.60	45.90	3.83	0.5650
3x50+3x35/3E+3x2.5ST	01180231310C	3	3	9.65	46.76	50.06	4.69	0.3930
3x70+3x35/3E+3x2.5ST	01180231311C	3	3	11.55	52.08	56.38	5.90	0.2770
3x95+3x50/3E+3x2.5ST	01180231312C	3	3	13.36	57.67	61.97	7.34	0.2100
3x120+3x50/3E+3x2.5ST	01180231313C	3	3	15.21	62.32	66.62	8.64	0.1640
3x150+3x50/3E+3x2.5ST	01180231314C	3	3	16.85	66.98	71.28	10.17	0.1320
3x185+3x70/3E+3x2.5ST	01180231315C	3	3	18.75	72.29	76.59	11.88	0.1080
3x240+3x70/3E+3x2.5ST	01180231316C	3	3	21.29	79.21	83.51	14.43	0.0817
3x300+3x70/3E+3x2.5ST	01180231317C	3	3	24.21	86.58	90.88	17.23	0.0654

MEC

Series Overview

MEC — Power cables with telecommunication function (advanced characteristic impedance matching)

Multifunctional cable with anti-torsion layer		
	(LHM)SEIM	**(LHM)BAIM**
Voltage range (U)	1kV - 3kV	1kV - 3kV
Installation	Trailing/reeling/chain application	Trailing/reeling/chain application
Layout	3 core design	3 core design
Electric field control	Semiconductive layer	Metallic screen
Communication pair screening	Spiral	Foil/braid

Armored multifunctional cable		
	(LHM)BARM	**(LHM)SERM**
Voltage range (U)	1kV - 3kV	1kV - 3kV
Installation	Trailing/chain application	Trailing/chain application
Layout	3 core design	3 core design
Electric field control	Semiconductive layer	Metallic screen
Communication pair screening	Spiral	Foil/braid

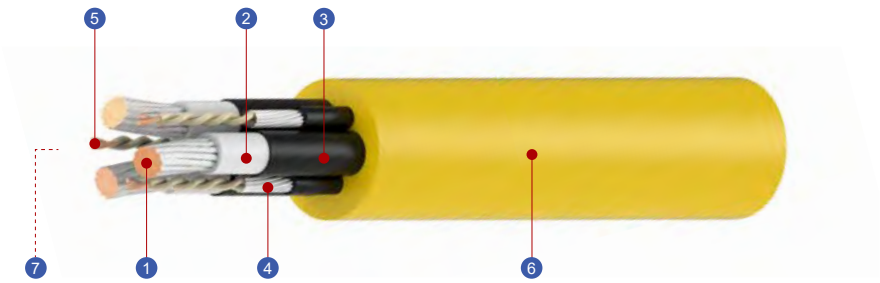
Power cables with telecommunication function		
	(LHM)SEM	**(LHM)BAM**
Voltage range (U)	1kV - 3kV	1kV - 3kV
Installation	Trailing/chain application	Trailing/chain application
Layout	3 core design	3 core design
Electric field control	Semiconductive layer	Metallic screen
Communication pair screening	Spiral	Foil/braid

MEC (LHM)SEM 1kV - 3kV

Medium voltage flexible cable (trailing/chain application)

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)SEM
- **VDE type designation:** (N)TMKCGEWOEU-FM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 power conductors laid up around the central cradle separator, with twisted pairs of communication cores in the interstices
- **Installation:** Trailing/Cable Chain



1	**Power conductor**	Finely stranded copper conductors, tinned (class 5)
2	**Insulation**	EPR based synthetic compound, 3GI3+[1]
3	**Electrical field control**	Outer layer of semiconducting rubber compound
4	**PE conductor**	Spinning tinned copper wires over communication cores
5	**Pilot conductor**	Twisted pairs of insulated communication cores, sheathed[2]
6	**Sheath**	Proprietary synthetic rubber compound, basic material: CR/CM
7	**Reinforcement unit**	Central semiconductive cradles with aramid rope

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage flexible cable with communication cores. Intended for connections to mobile equipment and machines requiring both power supply and stable communication signals with continuous movement, i.e. coal cutters with modern mining communication systems.

Sketch

- Stable and high quality telecommunication signals with advanced characteristic impedance matching
- Robust structure to endure repeated small radius bending with mechanical stress applied

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max short circuit temperature of the conductor
250 °C

1. See DIN VDE 0207.
2. Designed based on provided characteristic impedance.

Specification- MEC (LHM)SEM

0.6/1 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM	01400131308U1	3	3	6.86	37.13	40.13	2.56	0.7950
3x35+3x16/3+3x(2x1.5)FM	01400131309U1	3	3	8.00	39.85	42.85	3.04	0.5650
3x50+3x25/3+3x(2x1.5)FM	01400131310U1	3	3	9.65	43.84	46.84	3.87	0.3930
3x70+3x35/3+3x(2x1.5)FM	01400131311U1	3	3	11.55	49.30	53.30	4.75	0.2770
3x95+3x50/3+3x(2x1.5)FM	01400131312U1	3	3	13.36	54.92	58.92	6.08	0.2100
3x120+3x70/3+3x(2x1.5)FM	01400131313U1	3	3	15.21	59.31	63.31	7.34	0.1640
3x150+3x70/3+3x(2x1.5)FM	01400131314U1	3	3	16.85	63.12	67.12	8.55	0.1320
3x185+3x95/3+3x(2x1.5)FM	01400131315U1	3	3	18.75	68.43	72.43	10.29	0.1080
3x240+3x120/3+3x(2x1.5)FM	01400131316U1	3	3	21.29	74.95	78.95	12.81	0.0817
3x300+3x150/3+3x(2x1.5)FM	01400131317U1	3	3	24.21	82.42	86.42	15.64	0.0654

0.6/1 kV Characteristic Impedance = 120Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01400131308U4	3	3	6.86	39.84	42.84	2.84	0.7950
3x35+3x25/3+3x(2x1.5)FM	01400131309U4	3	3	8.00	42.56	45.56	3.34	0.5650
3x50+3x35/3+3x(2x1.5)FM	01400131310U4	3	3	9.65	46.82	49.82	4.24	0.3930
3x70+3x35/3+3x(2x1.5)FM	01400131311U4	3	3	11.55	52.55	56.55	5.15	0.2770
3x95+3x50/3+3x(2x1.5)FM	01400131312U4	3	3	13.36	57.63	61.63	6.48	0.2100
3x120+3x50/3+3x(2x1.5)FM	01400131313U4	3	3	15.21	62.29	66.29	7.81	0.1640
3x150+3x50/3+3x(2x1.5)FM	01400131314U4	3	3	16.85	66.10	70.10	9.05	0.1320
3x185+3x70/3+3x(2x1.5)FM	01400131315U4	3	3	18.75	70.73	74.73	10.71	0.1080
3x240+3x70/3+3x(2x1.5)FM	01400131316U4	3	3	21.29	76.71	80.71	13.18	0.0817
3x300+3x70/3+3x(2x1.5)FM	01400131317U4	3	3	24.21	83.78	87.78	15.96	0.0654

1.8/3 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01400231308U1	3	3	6.86	38.71	41.71	2.71	0.7950
3x35+3x25/3+3x(2x1.5)FM	01400231309U1	3	3	8.00	41.19	44.19	3.17	0.5650
3x50+3x35/3+3x(2x1.5)FM	01400231310U1	3	3	9.65	44.95	47.95	3.98	0.3930
3x70+3x35/3+3x(2x1.5)FM	01400231311U1	3	3	11.55	50.00	54.00	4.84	0.2770
3x95+3x50/3+3x(2x1.5)FM	01400231312U1	3	3	13.36	55.45	59.45	6.17	0.2100
3x120+3x50/3+3x(2x1.5)FM	01400231313U1	3	3	15.21	60.25	64.25	7.48	0.1640
3x150+3x50/3+3x(2x1.5)FM	01400231314U1	3	3	16.85	63.55	67.55	8.63	0.1320
3x185+3x70/3+3x(2x1.5)FM	01400231315U1	3	3	18.75	68.86	72.86	10.38	0.1080
3x240+3x70/3+3x(2x1.5)FM	01400231316U1	3	3	21.29	75.79	79.79	12.96	0.0817
3x300+3x70/3+3x(2x1.5)FM	01400231317U1	3	3	24.21	83.16	87.16	15.78	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01400231308U4	3	3	6.86	41.29	44.29	2.99	0.7950
3x35+3x25/3+3x(2x1.5)FM	01400231309U4	3	3	8.00	43.90	46.90	3.48	0.5650
3x50+3x35/3+3x(2x1.5)FM	01400231310U4	3	3	9.65	48.06	51.06	4.37	0.3930
3x70+3x35/3+3x(2x1.5)FM	01400231311U4	3	3	11.55	53.25	57.25	5.25	0.2770
3x95+3x50/3+3x(2x1.5)FM	01400231312U4	3	3	13.36	58.98	62.98	6.66	0.2100
3x120+3x50/3+3x(2x1.5)FM	01400231313U4	3	3	15.21	63.64	67.64	8.01	0.1640
3x150+3x50/3+3x(2x1.5)FM	01400231314U4	3	3	16.85	66.94	70.94	9.18	0.1320
3x185+3x70/3+3x(2x1.5)FM	01400231315U4	3	3	18.75	71.84	75.84	10.89	0.1080
3x240+3x70/3+3x(2x1.5)FM	01400231316U4	3	3	21.29	78.23	82.23	13.43	0.0817
3x300+3x70/3+3x(2x1.5)FM	01400231317U4	3	3	24.21	84.79	88.79	16.14	0.0654

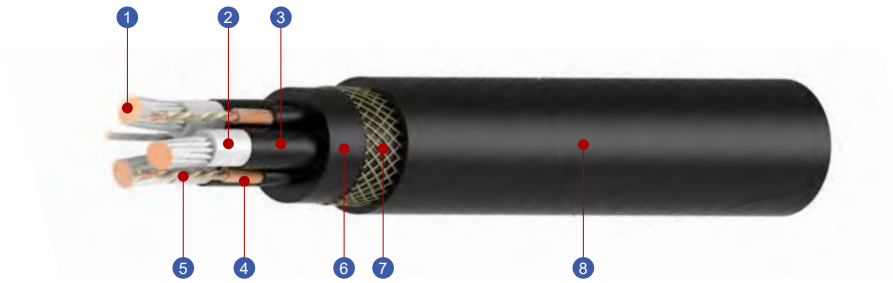
NOTE

MEC (LHM)SEIM 1kV - 3kV

Double sheathed trailing cables for modern mining system

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)SEIM
- **VDE type designation:** (N)TSCGEWOEU-FM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 power cores and communication pairs laid up
- **Installation:** Trailing/Reeling/Chain Application



1	**Power conductor**	Tinned copper conductors, very finely stranded
2	**Insulation**	EPR based synthetic compound, 3GI3+[1]
3	**Electrical field control**	Outer layer of semiconduting rubber, cold strippable
4	**PE conductor**	Spinning of tinned copper wires over sheathed communication pairs, covered with semiconductive tape and rubber
5	**Pilot conductor**	Pairs of stranded bare copper conductors[2] (FEP insulated), each pair is sheathed and screened[3]
6	**Inner Sheath**	CM based rubber compound, 5GM3+
7	**Reinforcement Layer**	Anti-torsion braid of aramid yarns
8	**Outer Sheath**	High grade synthetic rubber compound, basic material: CR, 5GM5+

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed multifunctional cable, for power supply and for communication signal transmission. Good for trailing/cable chain application as well as reeling. The reinforced structure is able to handle high mechanical stress caused during frequent winding and unwinding.

Sketch

- Anti-torsion layer between the inner and the outer sheath
- Fully screened communication pairs, high-quality and stable telecommunication signals
- For either trailing or reeling installation

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
90 °/m

Minimum bending radius
1.5 D, 4 D for reeling

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE Part 0207.
2. Can provide both telecommunication pairs and control cores at option.
3. Designed based on provided characteristic Impedance, support common choices including 50, 75, 100, 120Ω as well as customized impedance.

Specification- MEC (LHM)SEIM

0.6/1 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01420131308U1	3	3	6.86	37.13	40.13	2.58	0.7950
3x35+3x25/3+3x(2x1.5)FM	01420131309U1	3	3	8.00	39.17	42.17	3.00	0.5650
3x50+3x35/3+3x(2x1.5)FM	01420131310U1	3	3	9.65	43.84	46.84	3.89	0.3930
3x70+3x35/3+3x(2x1.5)FM	01420131311U1	3	3	11.55	49.84	53.84	4.83	0.2770
3x95+3x50/3+3x(2x1.5)FM	01420131312U1	3	3	13.36	54.65	58.65	6.05	0.2100
3x120+3x50/3+3x(2x1.5)FM	01420131313U1	3	3	15.21	59.31	63.31	7.34	0.1640
3x150+3x50/3+3x(2x1.5)FM	01420131314U1	3	3	16.85	62.85	66.85	8.52	0.1320
3x185+3x70/3+3x(2x1.5)FM	01420131315U1	3	3	18.75	68.02	72.02	10.24	0.1080
3x240+3x70/3+3x(2x1.5)FM	01420131316U1	3	3	21.29	74.95	78.95	12.81	0.0817
3x300+3x70/3+3x(2x1.5)FM	01420131317U1	3	3	24.21	82.42	86.42	15.64	0.0654

0.6/1 kV Characteristic Impedance = 120Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01420131308U4	3	3	6.86	39.98	42.98	2.87	0.7950
3x35+3x25/3+3x(2x1.5)FM	01420131309U4	3	3	8.00	42.56	45.56	3.35	0.5650
3x50+3x35/3+3x(2x1.5)FM	01420131310U4	3	3	9.65	47.22	50.22	4.30	0.3930
3x70+3x35/3+3x(2x1.5)FM	01420131311U4	3	3	11.55	52.82	56.82	5.20	0.2770
3x95+3x50/3+3x(2x1.5)FM	01420131312U4	3	3	13.36	57.90	61.90	6.50	0.2100
3x120+3x50/3+3x(2x1.5)FM	01420131313U4	3	3	15.21	62.56	66.56	7.84	0.1640
3x150+3x50/3+3x(2x1.5)FM	01420131314U4	3	3	16.85	65.96	69.96	9.03	0.1320
3x185+3x70/3+3x(2x1.5)FM	01420131315U4	3	3	18.75	70.73	74.73	10.71	0.1080
3x240+3x70/3+3x(2x1.5)FM	01420131316U4	3	3	21.29	76.71	80.71	13.18	0.0817
3x300+3x70/3+3x(2x1.5)FM	01420131317U4	3	3	24.21	83.91	87.91	15.98	0.0654

1.8/3 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01420231308U1	3	3	6.86	38.99	41.99	2.74	0.7950
3x35+3x25/3+3x(2x1.5)FM	01420231309U1	3	3	8.00	41.33	44.33	3.19	0.5650
3x50+3x35/3+3x(2x1.5)FM	01420231310U1	3	3	9.65	45.35	48.35	4.05	0.3930
3x70+3x35/3+3x(2x1.5)FM	01420231311U1	3	3	11.55	50.68	54.68	4.93	0.2770
3x95+3x50/3+3x(2x1.5)FM	01420231312U1	3	3	13.36	55.45	59.45	6.17	0.2100
3x120+3x50/3+3x(2x1.5)FM	01420231313U1	3	3	15.21	60.25	64.25	7.48	0.1640
3x150+3x50/3+3x(2x1.5)FM	01420231314U1	3	3	16.85	63.55	67.55	8.63	0.1320
3x185+3x70/3+3x(2x1.5)FM	01420231315U1	3	3	18.75	68.86	72.86	10.38	0.1080
3x240+3x70/3+3x(2x1.5)FM	01420231316U1	3	3	21.29	75.79	79.79	12.96	0.0817
3x300+3x70/3+3x(2x1.5)FM	01420231317U1	3	3	24.21	83.16	87.16	15.78	0.0654

0.6/1 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01420231308U4	3	3	6.86	41.70	44.70	3.03	0.7950
3x35+3x25/3+3x(2x1.5)FM	01420231309U4	3	3	8.00	43.90	46.90	3.49	0.5650
3x50+3x35/3+3x(2x1.5)FM	01420231310U4	3	3	9.65	48.06	51.06	4.40	0.3930
3x70+3x35/3+3x(2x1.5)FM	01420231311U4	3	3	11.55	53.39	57.39	5.29	0.2770
3x95+3x50/3+3x(2x1.5)FM	01420231312U4	3	3	13.36	58.98	62.98	6.66	0.2100
3x120+3x50/3+3x(2x1.5)FM	01420231313U4	3	3	15.21	63.64	67.64	8.01	0.1640
3x150+3x50/3+3x(2x1.5)FM	01420231314U4	3	3	16.85	66.94	70.94	9.18	0.1320
3x185+3x70/3+3x(2x1.5)FM	01420231315U4	3	3	18.75	71.57	75.57	10.86	0.1080
3x240+3x70/3+3x(2x1.5)FM	01420231316U4	3	3	21.29	77.82	81.82	13.37	0.0817
3x300+3x70/3+3x(2x1.5)FM	01420231317U4	3	3	24.21	84.52	88.52	16.10	0.0654

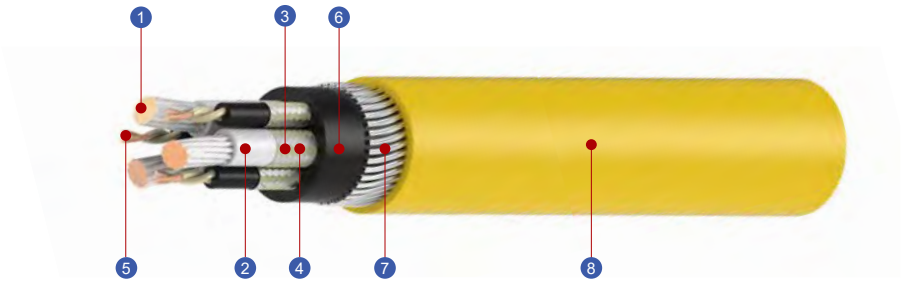
NOTE

MEC (LHM)BARM 1kV - 3kV

Multifunctional MV flexible cable (trailing/reeling)

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)BARM
- **VDE type designation:** (N)TSCEWOEU-FM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design, shielded phase cores and communication pairs cabled around central separator
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Stranded conductors, tinned copper (class 5)
2	**Insulation**	90°C rated synthetic EPR compound
3	**Electrical field control**	Metallic screen over each of the phase cores
4	**PE conductor**	Braid of copper and textile yarns over the main conductors
5	**Pilot conductor**	Twisted tinned copper conductors, insulated, sheathed and screened. Actual design based on provided characteristic impedance
6	**Inner Sheath**	Synthetic rubber compound, 5GM3+[1]
7	**Armouring**	Spinning of steel/copper wires between the inner and the outer sheath
8	**Outer Sheath**	Proprietary synthetic elastomer compound, 5GM5+[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Multifunctional coal cutter cable for trailing/cable chain application. Double screened structure. Applicable to mobile equipments other than coal shearers as well when impact force or electrical interference is concerned.

Sketch

- Double screen where the outer screen serves as armouring, good for working conditions where impact forces are concerned
- High quality and stable telecommunication signals, suitable for mining surfaces requiring data transmission between the equipment and the monitoring center
- Strengthened structure to handle high tensile loads and torsion forces[2]

Mechanical Parameters

Max. tensile loads on the cable
45 MPa

Torsion stress
30 °/m

Minimum bending radius
6 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE Part 0207.
2. Central reinforcement unit added if necessary for application with extreme tensile loads.

Specification- MEC (LHM)BARM

0.6/1 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430131308U1	3	3	6.86	38.69	41.99	2.87	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430131309U1	3	3	8.00	42.08	45.38	3.47	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430131310U1	3	3	9.65	46.74	50.04	4.32	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430131311U1	3	3	11.55	52.20	56.50	5.46	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430131312U1	3	3	13.36	57.42	61.72	6.69	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430131313U1	3	3	15.21	62.35	66.65	7.99	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430131314U1	3	3	16.85	67.52	71.82	9.44	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430131315U1	3	3	18.75	72.83	77.13	11.08	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430131316U1	3	3	21.29	79.75	84.05	13.44	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430131317U1	3	3	24.21	87.63	91.93	16.13	0.0654

0.6/1 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430131308U4	3	3	6.86	38.69	41.99	2.88	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430131309U4	3	3	8.00	42.08	45.38	3.47	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430131310U4	3	3	9.65	46.74	50.04	4.32	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430131311U4	3	3	11.55	52.20	56.50	5.46	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430131312U4	3	3	13.36	57.42	61.72	6.69	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430131313U4	3	3	15.21	62.35	66.65	7.99	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430131314U4	3	3	16.85	67.52	71.82	9.44	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430131315U4	3	3	18.75	72.83	77.13	11.08	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430131316U4	3	3	21.29	79.75	84.05	13.44	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430131317U4	3	3	24.21	87.63	91.93	16.13	0.0654

1.8/3 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430231308U1	3	3	6.86	41.21	44.51	3.11	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430231309U1	3	3	8.00	44.10	47.40	3.67	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430231310U1	3	3	9.65	48.26	51.56	4.48	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430231311U1	3	3	11.55	53.72	58.02	5.64	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430231312U1	3	3	13.36	59.45	63.75	7.02	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430231313U1	3	3	15.21	64.37	68.67	8.27	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430231314U1	3	3	16.85	69.03	73.33	9.72	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430231315U1	3	3	18.75	74.34	78.64	11.33	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430231316U1	3	3	21.29	81.27	85.57	13.71	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430231317U1	3	3	24.21	88.64	92.94	16.34	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430231308U4	3	3	6.86	41.21	44.51	3.11	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430231309U4	3	3	8.00	44.10	47.40	3.67	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430231310U4	3	3	9.65	48.26	51.56	4.49	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430231311U4	3	3	11.55	53.72	58.02	5.64	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430231312U4	3	3	13.36	59.45	63.75	7.02	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430231313U4	3	3	15.21	64.37	68.67	8.27	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430231314U4	3	3	16.85	69.03	73.33	9.72	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430231315U4	3	3	18.75	74.34	78.64	11.33	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430231316U4	3	3	21.29	81.27	85.57	13.72	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430231317U4	3	3	24.21	88.64	92.94	16.34	0.0654

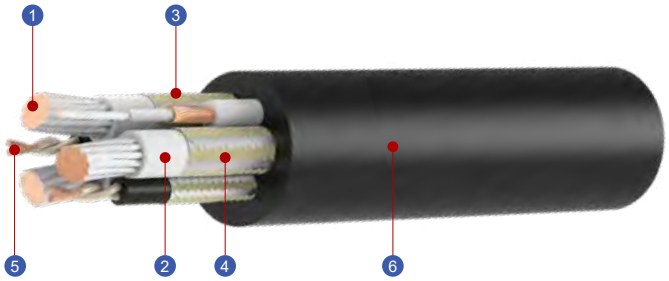
NOTE

MEC (LHM)BAM 1kV - 3kV

Coal cutter cables (trailing/chain application)

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)BAM
- **VDE type designation:** (N)TMKCEWOEU-FM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 metallic screened phase conductors and pairs of communication cores laid up around the central semiconductive separator
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Finely stranded flexible conductors. Tinned copper, class 5.
2	**Insulation**	90°C rated synthetic compound, better than 3GI3[1]
3	**Electrical field control**	Mixed wires of copper and aramid yarns, braided over power cores
4	**PE conductor**	Metallic screen over phase conductors, which are cabled around the central semiconducting separator
5	**Pilot conductor**	Cabled pairs of FEP insulated copper conductors, metallic braid and foil shielded. [3]
6	**Sheath**	Special chlorinated rubber compound, 5GM5+[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

MV coal shearer cables having telecommunication function, used as connection to automatic/semi-automatic mobile equipment in modern mining system. The structure is particularly suitable for application requiring frequent small-radius bending.Good for free trailing or use in cable handler.

Sketch

- Metallic screened phase conductors and communication cores, EMI reduced from power cores while electromagnetic interference on pilot cores are minimized
- Advanced characteristic impedance matching (50/75/100/120Ω) [2]
- Durable under repeated bending with mechanical stress applied

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. According to DIN VDE Part 0207.
2. Other non-standard impedance matching can be provided as required, the dimension of the cable may be impacted.
3. The user can choose to have both telecommunication and control elements, i.e. 2 communicaiton pairs and a control conductor.

Specification- MEC (LHM)BAM

0.6/1 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01410131308U1	3	3	6.86	35.99	38.99	2.21	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01410131309U1	3	3	8.00	39.38	42.38	2.74	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01410131310U1	3	3	9.65	44.04	47.04	3.49	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01410131311U1	3	3	11.55	49.50	53.50	4.52	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01410131312U1	3	3	13.36	54.72	58.72	5.65	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01410131313U1	3	3	15.21	59.65	63.65	6.82	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01410131314U1	3	3	16.85	64.82	68.82	8.17	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01410131315U1	3	3	18.75	70.13	74.13	9.69	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01410131316U1	3	3	21.29	77.05	81.05	11.90	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01410131317U1	3	3	24.21	84.93	88.93	14.41	0.0654

0.6/1 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01410131308U4	3	3	6.86	36.53	39.53	2.25	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01410131309U4	3	3	8.00	39.51	42.51	2.75	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01410131310U4	3	3	9.65	44.04	47.04	3.49	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01410131311U4	3	3	11.55	49.50	53.50	4.52	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01410131312U4	3	3	13.36	54.72	58.72	5.65	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01410131313U4	3	3	15.21	59.65	63.65	6.82	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01410131314U4	3	3	16.85	64.82	68.82	8.17	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01410131315U4	3	3	18.75	70.13	74.13	9.69	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01410131316U4	3	3	21.29	77.05	81.05	11.90	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01410131317U4	3	3	24.21	84.93	88.93	14.41	0.0654

1.8/3 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01410231308U1	3	3	6.86	38.51	41.51	2.41	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01410231309U1	3	3	8.00	41.40	44.40	2.90	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01410231310U1	3	3	9.65	45.56	48.56	3.63	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01410231311U1	3	3	11.55	51.02	55.02	4.67	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01410231312U1	3	3	13.36	56.75	60.75	5.93	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01410231313U1	3	3	15.21	61.67	65.67	7.07	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01410231314U1	3	3	16.85	66.33	70.33	8.42	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01410231315U1	3	3	18.75	71.64	75.64	9.91	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01410231316U1	3	3	21.29	78.57	82.57	12.14	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01410231317U1	3	3	24.21	85.94	89.94	14.59	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01410231308U4	3	3	6.86	38.51	41.51	2.41	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01410231309U4	3	3	8.00	41.40	44.40	2.90	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01410231310U4	3	3	9.65	45.56	48.56	3.63	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01410231311U4	3	3	11.55	51.02	55.02	4.67	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01410231312U4	3	3	13.36	56.75	60.75	5.93	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01410231313U4	3	3	15.21	61.67	65.67	7.07	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01410231314U4	3	3	16.85	66.33	70.33	8.42	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01410231315U4	3	3	18.75	71.64	75.64	9.91	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01410231316U4	3	3	21.29	78.57	82.57	12.14	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01410231317U4	3	3	24.21	85.94	89.94	14.59	0.0654

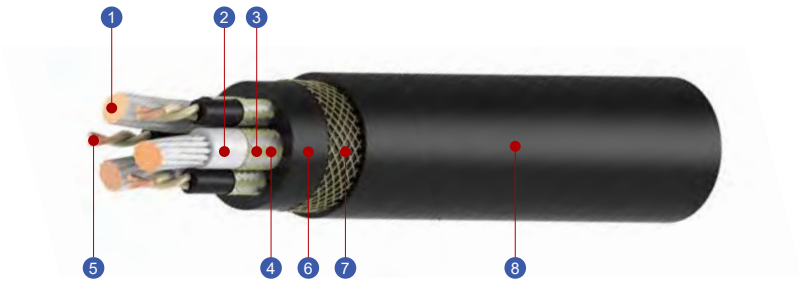
NOTE

MEC (LHM)BAIM 1kV - 3kV

Multifunctional MV flexible cable (trailing/reeling)

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)BAIM
- **VDE type designation:** (N)TSCEWOEU-FM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 metallic screened phase conductors and communication pairs laid up around the semiconductive central cradle separator
- **Installation:** Trailing/Reeling/Chain Application



1	**Power conductor**	Very finely stranded conductors, tinned copper
2	**Insulation**	Synthetic EPR compound rubber
3	**Electrical field control**	Braid of copper/textile wires over phase conductors
4	**PE conductor**	Metallic screen providing grounding effect
5	**Pilot conductor**	Cabled pairs of communication cores placed in the outer interstices, sheathed and metallic screened [1]
6	**Inner Sheath**	Synthetic rubber compound, basic material: CR
7	**Reinforcement Layer**	Textile braid between the inner and the outer sheath
8	**Outer Sheath**	Robust elastomer compound, mold-cured, basic material: CR (5GM5+[2])
OPT	**Reinforcement unit**	Central reinforcement unit may be applied for high tensile loads

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 8 0°C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed cable with braided PE conductors over phase cores. Reinforced layer is applied to handle torsion stresses and high tensile loads. Telecommunication pairs are provided for automatic/semi-automatic operation.

Sketch

- Metallic shielded phase cores, electromagnetic interference to surrounding equipment minimized
- High quality and stable telecommunication signals
- Robust structure, handling repeated small radius bending under high torsion stress and tensile loads

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
90 °/m

Minimum bending radius
1.5 D, 4 D for reeling

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Communication pairs with advanced characteristic impedance matching.
2. See DIN VDE Part 0207.

Specification- MEC (LHM)BAIM

0.6/1 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430131308U1	3	3	6.86	35.99	38.99	2.24	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430131309U1	3	3	8.00	39.38	42.38	2.77	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430131310U1	3	3	9.65	44.04	47.04	3.53	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430131311U1	3	3	11.55	49.50	53.50	4.57	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430131312U1	3	3	13.36	54.72	58.72	5.72	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430131313U1	3	3	15.21	59.65	63.65	6.91	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430131314U1	3	3	16.85	64.82	68.82	8.28	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430131315U1	3	3	18.75	70.13	74.13	9.81	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430131316U1	3	3	21.29	77.05	81.05	12.05	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430131317U1	3	3	24.21	84.93	88.93	14.60	0.0654

0.6/1 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430131308U4	3	3	6.86	35.99	38.99	2.24	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430131309U4	3	3	8.00	39.38	42.38	2.77	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430131310U4	3	3	9.65	44.04	47.04	3.53	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430131311U4	3	3	11.55	49.50	53.50	4.57	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430131312U4	3	3	13.36	54.72	58.72	5.72	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430131313U4	3	3	15.21	59.65	63.65	6.91	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430131314U4	3	3	16.85	64.82	68.82	8.28	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430131315U4	3	3	18.75	70.13	74.13	9.81	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430131316U4	3	3	21.29	77.05	81.05	12.05	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430131317U4	3	3	24.21	84.93	88.93	14.60	0.0654

1.8/3 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430231308U1	3	3	6.86	38.51	41.51	2.43	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430231309U1	3	3	8.00	41.40	44.40	2.94	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430231310U1	3	3	9.65	45.56	48.56	3.67	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430231311U1	3	3	11.55	51.02	55.02	4.73	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430231312U1	3	3	13.36	56.75	60.75	6.00	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430231313U1	3	3	15.21	61.67	65.67	7.16	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430231314U1	3	3	16.85	66.33	70.33	8.53	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430231315U1	3	3	18.75	71.64	75.64	10.03	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430231316U1	3	3	21.29	78.57	82.57	12.30	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430231317U1	3	3	24.21	85.94	89.94	14.78	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	01430231308U4	3	3	6.86	38.51	41.51	2.43	0.7950
3x35+3x25/3E+3x(2x1.5)FM	01430231309U4	3	3	8.00	41.40	44.40	2.94	0.5650
3x50+3x35/3E+3x(2x1.5)FM	01430231310U4	3	3	9.65	45.56	48.56	3.67	0.3930
3x70+3x35/3E+3x(2x1.5)FM	01430231311U4	3	3	11.55	51.02	55.02	4.73	0.2770
3x95+3x50/3E+3x(2x1.5)FM	01430231312U4	3	3	13.36	56.75	60.75	6.00	0.2100
3x120+3x50/3E+3x(2x1.5)FM	01430231313U4	3	3	15.21	61.67	65.67	7.16	0.1640
3x150+3x50/3E+3x(2x1.5)FM	01430231314U4	3	3	16.85	66.33	70.33	8.53	0.1320
3x185+3x70/3E+3x(2x1.5)FM	01430231315U4	3	3	18.75	71.64	75.64	10.03	0.1080
3x240+3x70/3E+3x(2x1.5)FM	01430231316U4	3	3	21.29	78.57	82.57	12.30	0.0817
3x300+3x70/3E+3x(2x1.5)FM	01430231317U4	3	3	24.21	85.94	89.94	14.78	0.0654

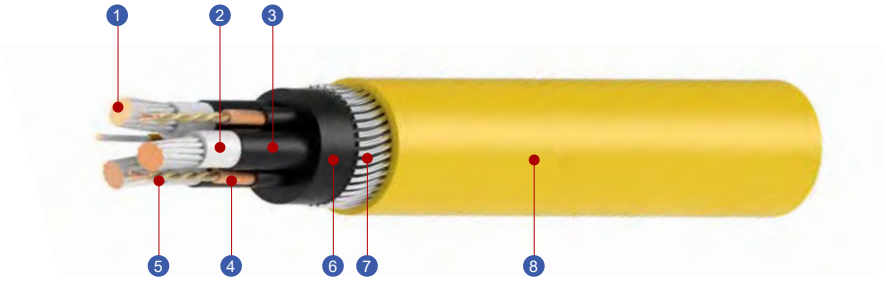
NOTE

MEC (LHM)SERM 1kV - 3kV

Armored MV flexible cable with communication cores

Product Overview

- **LH series:** MEC
- **LH code:** (LHM)SERM
- **VDE type designation:** SERM
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design armoured cable, phase conductors and pilot cores laid up
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Finely stranded tinned copper conductors
2	**Insulation**	EPR based rubber compound, 3GI3+[1]
3	**Electrical field control**	Semiconducting rubber layer
4	**PE conductor**	Spinning copper wires over communication cores, tinned
5	**Pilot conductor**	Sheathed twisted pairs of insulated copper conductors (FEP insulation) [3]
6	**Inner Sheath**	CM based rubber compound, 5GM3+[1]
7	**Armouring**	Mixed steel and copper wires, spinning over the inner sheath
8	**Outer Sheath**	Synthetic chlorinated rubber compound, basic material: CM[2], 5GM5+[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Armored cable with fully screened telecommunication pairs, the electromagnetic interference on communication cores is minized. Double sheathed. Particularly good for working environment where impact forces are concerned.

Sketch

- Semiconductive rubber screen over phase cores and fully screened communication pairs
- Armored cable, recommended for mining surfaces where falling rocks and tire impact are frequent
- Good for automatic/semi-automatic mining surfaces requiring communication with the monitoring center

Mechanical Parameters

Max. tensile loads on the cable
40 MPa

Torsion stress
30 °/m

Minimum bending radius
6 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC Test Voltage (Main Cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE Part 0207.
2. Based on working conditions, CR may be used as basic material.
3. Each communication pair can be used as two separate control cores at users' option.

Specification- MEC (LHM)SERM

0.6/1 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01440131308U1	3	3	6.86	39.83	43.13	3.30	0.7950
3x35+3x25/3+3x(2x1.5)FM	01440131309U1	3	3	8.00	41.87	45.17	3.77	0.5650
3x50+3x35/3+3x(2x1.5)FM	01440131310U1	3	3	9.65	46.54	49.84	4.76	0.3930
3x70+3x35/3+3x(2x1.5)FM	01440131311U1	3	3	11.55	52.54	56.84	5.81	0.2770
3x95+3x50/3+3x(2x1.5)FM	01440131312U1	3	3	13.36	57.35	61.65	7.13	0.2100
3x120+3x50/3+3x(2x1.5)FM	01440131313U1	3	3	15.21	62.01	66.31	8.52	0.1640
3x150+3x50/3+3x(2x1.5)FM	01440131314U1	3	3	16.85	65.55	69.85	9.78	0.1320
3x185+3x70/3+3x(2x1.5)FM	01440131315U1	3	3	18.75	70.72	75.02	11.60	0.1080
3x240+3x70/3+3x(2x1.5)FM	01440131316U1	3	3	21.29	77.65	81.95	14.32	0.0817
3x300+3x70/3+3x(2x1.5)FM	01440131317U1	3	3	24.21	85.12	89.42	17.30	0.0654

0.6/1 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01440131308U4	3	3	6.86	42.68	45.98	3.65	0.7950
3x35+3x25/3+3x(2x1.5)FM	01440131309U4	3	3	8.00	45.26	48.56	4.19	0.5650
3x50+3x35/3+3x(2x1.5)FM	01440131310U4	3	3	9.65	49.92	53.22	5.24	0.3930
3x70+3x35/3+3x(2x1.5)FM	01440131311U4	3	3	11.55	55.52	59.82	6.25	0.2770
3x95+3x50/3+3x(2x1.5)FM	01440131312U4	3	3	13.36	60.60	64.90	7.65	0.2100
3x120+3x50/3+3x(2x1.5)FM	01440131313U4	3	3	15.21	65.26	69.56	9.09	0.1640
3x150+3x50/3+3x(2x1.5)FM	01440131314U4	3	3	16.85	68.66	72.96	10.36	0.1320
3x185+3x70/3+3x(2x1.5)FM	01440131315U4	3	3	18.75	73.43	77.73	12.14	0.1080
3x240+3x70/3+3x(2x1.5)FM	01440131316U4	3	3	21.29	79.41	83.71	14.72	0.0817
3x300+3x70/3+3x(2x1.5)FM	01440131317U4	3	3	24.21	86.61	90.91	17.67	0.0654

1.8/3 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01440231308U1	3	3	6.86	41.69	44.99	3.51	0.7950
3x35+3x25/3+3x(2x1.5)FM	01440231309U1	3	3	8.00	44.03	47.33	4.01	0.5650
3x50+3x35/3+3x(2x1.5)FM	01440231310U1	3	3	9.65	48.05	51.35	4.95	0.3930
3x70+3x35/3+3x(2x1.5)FM	01440231311U1	3	3	11.55	53.38	57.68	5.93	0.2770
3x95+3x50/3+3x(2x1.5)FM	01440231312U1	3	3	13.36	58.15	62.45	7.27	0.2100
3x120+3x50/3+3x(2x1.5)FM	01440231313U1	3	3	15.21	62.95	67.25	8.68	0.1640
3x150+3x50/3+3x(2x1.5)FM	01440231314U1	3	3	16.85	66.25	70.55	9.91	0.1320
3x185+3x70/3+3x(2x1.5)FM	01440231315U1	3	3	18.75	71.56	75.86	11.76	0.1080
3x240+3x70/3+3x(2x1.5)FM	01440231316U1	3	3	21.29	78.49	82.79	14.48	0.0817
3x300+3x70/3+3x(2x1.5)FM	01440231317U1	3	3	24.21	85.86	90.16	17.45	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3+3x(2x1.5)FM	01440231308U4	3	3	6.86	44.40	47.70	3.85	0.7950
3x35+3x25/3+3x(2x1.5)FM	01440231309U4	3	3	8.00	46.60	49.90	4.36	0.5650
3x50+3x35/3+3x(2x1.5)FM	01440231310U4	3	3	9.65	50.76	54.06	5.35	0.3930
3x70+3x35/3+3x(2x1.5)FM	01440231311U4	3	3	11.55	56.09	60.39	6.35	0.2770
3x95+3x50/3+3x(2x1.5)FM	01440231312U4	3	3	13.36	61.68	65.98	7.84	0.2100
3x120+3x50/3+3x(2x1.5)FM	01440231313U4	3	3	15.21	66.34	70.64	9.29	0.1640
3x150+3x50/3+3x(2x1.5)FM	01440231314U4	3	3	16.85	69.64	73.94	10.53	0.1320
3x185+3x70/3+3x(2x1.5)FM	01440231315U4	3	3	18.75	74.27	78.57	12.30	0.1080
3x240+3x70/3+3x(2x1.5)FM	01440231316U4	3	3	21.29	80.52	84.82	14.93	0.0817
3x300+3x70/3+3x(2x1.5)FM	01440231317U4	3	3	24.21	87.22	91.52	17.81	0.0654

NOTE

LHCC

Series Overview

LHCC — Control cables for mining applications

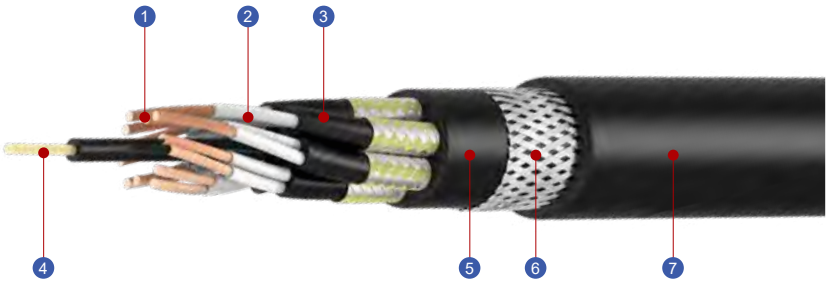
Control, data, and signaling cables		
	(C)YPL	**(C)YPI-R**
Voltage range (U)	500V	500V
Installation	Semi-fixed installation	Semi-fixed installation/reeling
Layout	Layers of communication pairs (screened)	Layers of insulated control conductors
Feature	Tinned copper braid	Anti-torsion braid and central reinforcement unit

LHCC (C)YPL 500V

Data and Signaling Cable

Product Overview

- **LH series:** LHCC
- **LH code:** (C)YPL
- **VDE type designation:** (N)SHOEU
- **Standard:** DIN VDE 0250 Part 812 and internal spec.
- **Core arrangement:** Communication cores twisted as pairs and cabled in layers around the central reinforcement element
- **Installation:** Semi-fixed installation



1	**Communication conductor**	Finely stranded bare copper conductors (class 5), twisted as pairs
2	**Insulation**	Synthetic compound, basic material: HDPE
3	**Electrical field control**	Semiconductive rubber layer over the conductors and metallic screen over each pair
4	**Reinforcement unit**	Twisted aramid yarns serve as the central tensile strength reinforcement, sheathed with rubber compound
5	**Inner sheath**	Synthetic thermoplastic compound, basic material: XLPO
6	**Overall screen**	Tinned copper wires braided over the taped inner sheath
7	**Outer sheath**	Robust compound, anti-abrasion and tearproof, basic material: XLPO

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 70 °C

Ambient temperature in fully flexible operation
-25 °C~ 60 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Unrestricted underground/opencast usage

Application

Control, signal and data transmission cable for mining equipment, mainly for data processing units. Good for fixed installation in either open pit or underground mining.

Sketch

- Fully screened communication pairs with outstanding characteristic impedance matching, used for telecommunication or control signal transmission
- Central reinforcement unit, able to handle high tensile loads
- Robust sheath material, high abrasion resistance and tearproof

Mechanical Parameters

Max. tensile loads on the cable
30 MPa

Torsion Stress
25 °/m

Electrical Parameters

Rated voltage	300/500 V
Max. permissible operating voltage AC	318/550 V
Max. permissible operating voltage DC	413/825 V
AC test voltage (main Cores)	2 kV

Max. operating temperature of the conductor
90°C

Max. short circuit temperature of the conductor
250°C

Specification- LHCC (C)YPL

0.3/0.5 kV Characteristic Impedance = 50Ω

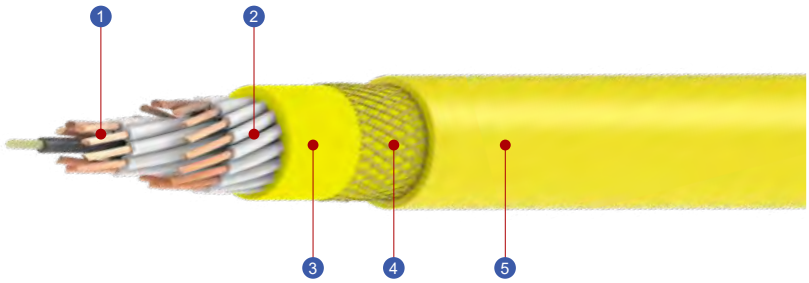
Specifications	Part number	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
6x(2x1.5)FM	01601006XU02N	6	1.44	24.38	26.38	0.62	13.7000
9x(2x1.5)FM	01601009XU02N	9	1.44	30.87	33.17	0.99	13.7000
12x(2x1.5)FM	016010012U02N	12	1.44	37.35	39.95	1.46	13.7000
18x(2x1.5)FM	016010018U02N	18	1.44	50.33	53.23	2.69	13.7000
19x(2x1.5)FM	016010019U02N	19	1.44	37.39	40.39	1.45	13.7000
25x(2x1.5)FM	016010025U02N	25	1.44	43.85	47.35	1.99	13.7000
36x(2x1.5)FM	016010036U02N	36	1.44	55.36	59.36	3.19	13.7000

LHCC (C)YPI-R 500V

Multi-core control cable for mining application

Product Overview

- **LH series:** LHCC
- **LH code:** (C)YPI-R
- **VDE type designation:** (N)SHTOEU
- **Standard:** DIN VDE 0250 Part 814 and internal spec.
- **Core arrangement:** Insulated control cores (and fillers, when applicable) cabled in layers around the central reinforcement unit
- **Installation:** Semi-fixed installation/Reeling



1	**Control conductor**	Tinned copper conductors, finely stranded (class 5), cabled in layers, taped
2	**Insulation**	EPR compound insulation
3	**Inner sheath**	Chlorinated rubber compound, vulcanized
4	**Reinforcement layer**	Anti-torsion textile braid over the inner sheath
5	**Outer sheath**	Synthetic elastomer compound, e.g. CR, tough

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 70 °C

Ambient temperature in fully flexible operation
-25 °C~ 60 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Unrestricted underground/opencast usage

Application

Multi-core flexible cable for control signaling, good for either underground or openpit usage. Suitable for either fixed installation or reeling application. Special design to distribute the tensile loads and torsion forces along the cable, protecting the thin control conductors from mechanical stress.

Sketch

- Multi-core design, up to 55 control conductors available
- Central tensile strength and anti-torsion reinforcement applied
- Stable control signal guaranteed, having a service life similar to the power cables

Mechanical Parameters

Max. tensile loads on the cable
30 MPa

Torsion Stress
50 °/m

Electrical Parameters

Rated voltage	300/500 V
Max. permissible operating voltage AC	318/550 V
Max. permissible operating voltage DC	413/825 V
AC test voltage (main Cores)	2 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- LHCC (C)YPI-R

0.3/0.5 kV

Specifications	Part number	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
2x2.5ST	01602002XC03N	2	1.82	10.11	11.11	0.16	8.2100
3x2.5ST	01602003XC03N	3	1.82	10.55	11.85	0.19	8.2100
4x2.5ST	01602004XC03N	4	1.82	11.29	12.89	0.23	8.2100
5x2.5ST	01602005XC03N	55	1.82	12.10	13.95	0.27	8.2100
6x2.5ST	01602006XC03N	6	1.82	12.95	15.05	0.31	8.2100
7x2.5ST	01602007XC03N	7	1.82	14.67	17.02	0.39	8.2100
12x2.5ST	016020012C03N	12	1.82	19.95	22.55	0.70	8.2100
18x2.5ST	016020018C03N	18	1.82	20.45	23.45	0.78	8.2100
24x2.5ST	016020024C03N	24	1.82	23.60	27.10	1.03	8.2100
36x2.5ST	016020036C03N	36	1.82	29.91	33.81	1.61	8.2100
55x2.5ST	016020055C03N	55	1.82	33.21	37.61	2.17	8.2100

MGA

Series Overview

MGA — Mining cables for general applications

Power supply cables for variable frequency convertors				
	(LHM)TEAR	**(LHM)TEEAR**	**(LHM)TEAL**	**(LHM)TEEAL**
Voltage range (U)	1kV - 3kV	6kV - 10kV	1kV - 3kV	6kV - 10kV
Installation	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Semiconductive layer and metallic screen	Double semiconductive layer and metallic screen	Semiconductive layer and metallic screen	Semiconductive layer and metallic screen
Overall screen	Steel/copper	Steel/copper	Copper	Copper

Power supply cables for fixed installations (1-3kV)				
	(LHM)BEA/(CMO)	**(LHM)BAWM/W^{100}**	**(LHM)BEAI/(CMO)**	**(LHM)BEAR/(CMO)**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Semiconductive layer and metallic screen	Semiconductive layer and metallic screen	Semiconductive layer and metallic screen	Semiconductive layer and metallic screen
Features	Single sheath	Waterproof	Anti-torsion layer	Armored

Power supply cables for fixed installations (6-30kV)				
	(LHM)BEEA/(CMO)	**(LHM)BEEAI/(CMO)**	**(LHM)BEEAR/(CMO)**	**(LHM)BEEAN/(CMO)**
Voltage range (U)	6kV - 30kV	6kV - 30kV	6kV - 30kV	6kV - 35kV
Installation	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing	(Semi-)fixed installation/ trailing
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Double semiconductive layer and metallic screen	Double semiconductive layer and metallic screen	Double semiconductive layer and metallic screen	Double semiconductive layer and metallic screen
Application	Single sheath	Anti-torsion layer	Armored	Monitoring layer

Single core power supply cables		
	(LHM)(G)EEL	(LHM)(G)EEL-F
Voltage range (U)	6kV - 35kV	6kV - 35kV
Installation	(Semi)-fixed installation	Fixed installation
Layout	Single core	Single core
Electric field control	Double semiconductive layer	Double semiconductive layer
Overall screen	Copper wires	Copper strands

Power supply cables for reeling applications		
	(LHM)TEI-R	(LHD)TEEAIG
Voltage range (U)	1kV - 3kV	6kV - 30kV
Installation	Reeling	Reeling/trailing/semi-fixed installation
Layout	4 core design	3 core design
Electric field control	Semiconductive layer	Double semiconductive layer and metallic screen
Additional feature	Anti-torsion, for shuttle cars	Ground check
Ambient temperature (°C)	-25 - 80	-30 - 80

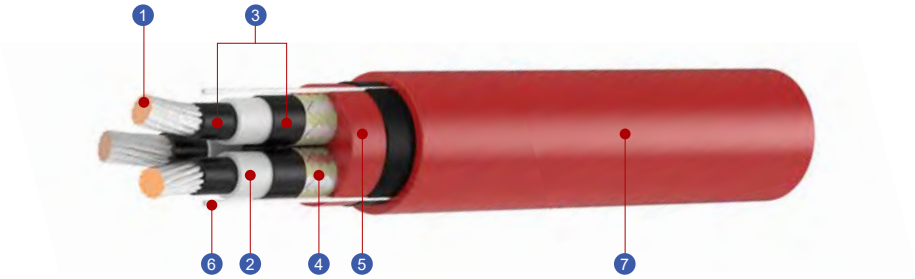
Power supply cables for reeling applications			
	(LHD)P-TEEAIG/FR	(LHD)P-TEEI/FR	(LHD)P-TEEAIG/RS
Voltage range (U)	6kV - 30kV	6kV - 30kV	6kV - 15kV
Installation	Reeling/trailing/semi-fixed installation	Reeling/trailing/semi-fixed installation	Reeling/trailing/semi-fixed installation
Layout	3 core design	3 core design	3 core design
Electric field control	Double semiconductive layer and metallic screen	Double semiconductive layer	Double semiconductive layer and metallic screen
Additional feature	Ground check, cold resistant	Cold resistant	Reflective surface, ground check, cold resistant
Ambient temperature (°C)	-50 - 80	-50 - 80	-50 - 80

MGA (LHM)BEEAN/(CMO) 6kV - 35kV

Medium voltage mining cable with monitoring cores

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEEAN/(CMO)
- **VDE type designation:** (N)TSKCGECWOEU
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** Metallic screened tinned copper conductors laid up
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Stranded copper conductors, tinned (class 5)
2	**Insulation**	EPR based special rubber compound for relatively high voltage application
3	**Electrical field control**	Double layer of semiconducting rubber and metallic screen
4	**PE conductor**	Tinned copper wires and polyester threads braided over the outer semiconductive layer
5	**Inner sheath**	Rubber compound, basic material: NR
6	**Monitoring cores**	Mixed steel/copper conductors placed upon the semicondutive tape layer over the inner sheath
7	**Outer sheath**	Synthetic compound, basic material: chlorinated rubber
OPT	**Pilot conductor**	Up to 6 control cores or 3 communication pairs and/or fibre optic elements available at option

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Flexible cable intended for use in circuits not exceeding 30kV. 3 core design with metallic screen over phase cores. Monitoring cores are integrated for enhanced safety in high voltage applications. Control/communication and/or optic fibre transmission are provided at option.

Sketch

- Intended for application with rated voltage between 6kV to 30kV
- Monitoring cores provided for enhanced safety, protecting the personnel and equipment under relatively high voltage
- Good for being used in the power supply system or for connection to equipment like transformers, emulsion pumps, etc.

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
40 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90°C

Max. short circuit temperature of the conductor
250°C

Specification- MGA (LHM)BEEAN/(CMO)

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060331008A	3	6.47	41.72	44.72	2.71	0.7950
3x35+3x16/3E+UEL	015060331009A	3	7.62	44.64	47.64	3.24	0.5650
3x50+3x25/3E+UEL	015060331010A	3	9.20	48.62	51.62	4.04	0.3930
3x70+3x35/3E+UEL	015060331011A	3	10.99	53.13	56.63	5.02	0.2770
3x95+3x50/3E+UEL	015060331012A	3	12.81	57.72	61.72	6.17	0.2100
3x120+3x50/3E+UEL	015060331013A	3	14.39	61.73	65.73	7.30	0.1640
3x150+3x70/3E+UEL	015060331014A	3	16.05	65.92	69.92	8.62	0.1320
3x185+3x95/3E+UEL	015060331015A	3	17.76	70.22	74.22	10.08	0.1080
3x240+3x120/3E+UEL	015060331016A	3	20.50	77.15	81.15	12.48	0.0817
3x300+3x150/3E+UEL	015060331017A	3	22.79	82.91	86.91	14.94	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060431008A	3	6.47	43.74	46.74	2.93	0.7950
3x35+3x16/3E+UEL	015060431009A	3	7.62	46.65	49.65	3.47	0.5650
3x50+3x25/3E+UEL	015060431010A	3	9.20	50.64	53.64	4.26	0.3930
3x70+3x35/3E+UEL	015060431011A	3	10.99	55.15	58.65	5.27	0.2770
3x95+3x50/3E+UEL	015060431012A	3	12.81	59.74	63.74	6.47	0.2100
3x120+3x50/3E+UEL	015060431013A	3	14.39	63.75	67.75	7.59	0.1640
3x150+3x70/3E+UEL	015060431014A	3	16.05	67.94	71.94	8.93	0.1320
3x185+3x95/3E+UEL	015060431015A	3	17.76	72.24	76.24	10.46	0.1080
3x240+3x120/3E+UEL	015060431016A	3	20.50	79.17	83.17	12.89	0.0817
3x300+3x150/3E+UEL	015060431017A	3	22.79	84.93	88.93	15.38	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060531008A	3	6.47	46.27	49.27	3.21	0.7950
3x35+3x16/3E+UEL	015060531009A	3	7.62	49.18	52.18	3.77	0.5650
3x50+3x25/3E+UEL	015060531010A	3	9.20	53.16	56.16	4.59	0.3930
3x70+3x35/3E+UEL	015060531011A	3	10.99	57.68	61.18	5.61	0.2770
3x95+3x50/3E+UEL	015060531012A	3	12.81	62.26	66.26	6.84	0.2100
3x120+3x50/3E+UEL	015060531013A	3	14.39	66.28	70.28	8.01	0.1640
3x150+3x70/3E+UEL	015060531014A	3	16.05	70.46	74.46	9.33	0.1320
3x185+3x95/3E+UEL	015060531015A	3	17.76	74.77	78.77	10.88	0.1080
3x240+3x120/3E+UEL	015060531016A	3	20.50	81.69	85.69	13.36	0.0817
3x300+3x150/3E+UEL	015060531017A	3	22.79	87.46	91.46	15.87	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060631008A	3	6.47	48.79	51.79	3.51	0.7950
3x35+3x16/3E+UEL	015060631009A	3	7.62	51.70	54.70	4.06	0.5650
3x50+3x25/3E+UEL	015060631010A	3	9.20	55.69	58.69	4.92	0.3930
3x70+3x35/3E+UEL	015060631011A	3	10.99	60.20	63.70	5.98	0.2770
3x95+3x50/3E+UEL	015060631012A	3	12.81	64.79	68.79	7.21	0.2100
3x120+3x50/3E+UEL	015060631013A	3	14.39	68.80	72.80	8.40	0.1640
3x150+3x70/3E+UEL	015060631014A	3	16.05	72.99	76.99	9.79	0.1320
3x185+3x95/3E+UEL	015060631015A	3	17.76	77.29	81.29	11.32	0.1080
3x240+3x120/3E+UEL	015060631016A	3	20.50	84.22	88.22	13.84	0.0817
3x300+3x150/3E+UEL	015060631017A	3	22.79	89.98	93.98	16.39	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060731007A	3	6.47	52.83	55.83	4.00	0.7950
3x35+3x16/3E+UEL	015060731009A	3	7.62	55.74	58.74	4.60	0.5650
3x50+3x25/3E+UEL	015060731010A	3	9.20	59.73	62.73	5.48	0.3930
3x70+3x35/3E+UEL	015060731011A	3	10.99	64.24	67.74	6.57	0.2770
3x95+3x50/3E+UEL	015060731012A	3	12.81	68.83	72.83	7.87	0.2100
3x120+3x50/3E+UEL	015060731013A	3	14.39	72.84	76.84	9.10	0.1640
3x150+3x70/3E+UEL	015060731014A	3	16.05	77.02	81.02	10.48	0.1320
3x185+3x95/3E+UEL	015060731015A	3	17.76	81.33	85.33	12.10	0.1080
3x240+3x120/3E+UEL	015060731016A	3	20.50	88.25	92.25	14.68	0.0817
3x300+3x150/3E+UEL	015060731017A	3	22.79	94.02	98.02	17.29	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060831008A	3	6.47	59.40	62.40	4.88	0.7950
3x35+3x16/3E+UEL	015060831009A	3	7.62	62.31	65.31	5.53	0.5650
3x50+3x25/3E+UEL	015060831010A	3	9.20	66.29	69.29	6.47	0.3930
3x70+3x35/3E+UEL	015060831011A	3	10.99	70.80	74.30	7.63	0.2770
3x95+3x50/3E+UEL	015060831012A	3	12.81	75.39	79.39	9.00	0.2100
3x120+3x50/3E+UEL	015060831013A	3	14.39	79.40	83.40	10.28	0.1640
3x150+3x70/3E+UEL	015060831014A	3	16.05	83.59	87.59	11.74	0.1320
3x185+3x95/3E+UEL	015060831015A	3	17.76	87.89	91.89	13.42	0.1080
3x240+3x120/3E+UEL	015060831016A	3	20.50	94.82	98.82	16.10	0.0817
3x300+3x150/3E+UEL	015060831017A	3	22.79	100.59	104.59	18.80	0.0654

20/35 kV

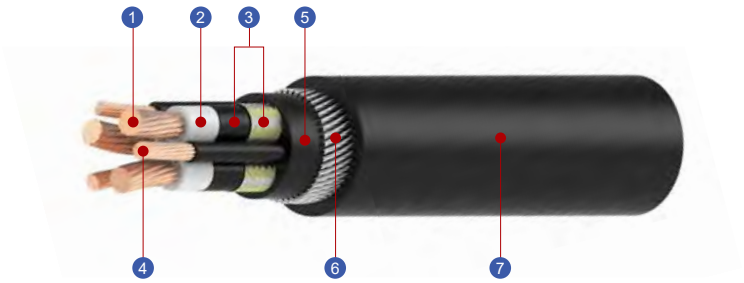
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+UEL	015060931009A	3	6.47	66.97	69.97	6.02	0.7950
3x35+3x16/3E+UEL	015060931009A	3	7.62	69.88	72.88	6.72	0.5650
3x50+3x25/3E+UEL	015060931010A	3	9.20	73.86	76.86	7.72	0.3930
3x70+3x35/3E+UEL	015060931011A	3	10.99	78.38	81.88	8.99	0.2770
3x95+3x50/3E+UEL	015060931012A	3	12.81	82.96	86.96	10.42	0.2100
3x120+3x50/3E+UEL	015060931013A	3	14.39	86.98	90.98	11.77	0.1640
3x150+3x70/3E+UEL	015060931014A	3	16.05	91.16	95.16	13.30	0.1320
3x185+3x95/3E+UEL	015060931015A	3	17.76	95.47	99.47	15.05	0.1080
3x240+3x120/3E+UEL	015060931016A	3	20.50	102.39	106.39	17.86	0.0817
3x300+3x150/3E+UEL	015060931017A	3	22.79	108.16	112.16	20.65	0.0654

MGA (LHM)TEAR 1kV - 3kV

Cables for variable frequency converter

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)TEAR
- **VDE type designation:** (N)TSCGECERWOEU
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** 3 main cores laid up, pilot cores placed in the outer interstices (if applicable)
- **Installation:** (Semi-)fixed Installation/Trailing



1	**Power conductor**	Tinned copper conductors, finely stranded
2	**Insulation**	Synthetic rubber compound, basic material: EPR
3	**Electrical field control**	Outer layer of semiconducting rubber and metallic screen
4	**PE conductor**	Evenly distributed PE conductors in the outer interstices[1]
5	**Inner sheath**	Rubber compound, basic material: CM
6	**Armouring**	Spinning of steel/copper wires over the inner sheath
7	**Outer sheath**	Proprietary synthetic rubber compound, basic material: CM/CR
OPT	**Pilot conductor**	Control cores, communication pairs, and/or fiber optic elements provided at option[2]
OPT	**Reinforcement unit**	Central reinforcement unit applied if necessary to handle extreme tensile loads

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Power supply cables for variable frequency converter controlled drives in mining/tunneling application. Excellent electrical field control and reinforced structure to handle extreme tensile loads. Good for fixed installation and flexible operation such as connections to conveyors, distribution boards, pumps, etc.

Sketch

- Outstanding electrical field control, screened phase conductors, very suitable for variable frequency driver
- Control units, communication cores, and/or fiber optic elements provided at option[3]
- Armored, magnetic field screened and good for tough working conditions with frequent impact forces

Mechanical Parameters

Max. tensile loads on the cable
35 MPa

Torsion stress
25 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. When pilot units added, the PE conductors may be applied in a different way, i.e. spinning of copper wires over pilot cores.
2. The dimension and weight specifications would change if pilot units applied.
3. When pilot units added, the PE conductors may be applied in a different way.

Specification- MGA (LHM)TEAR

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20℃
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x2.5/3	015000131003A	3	1.77	17.20	19.20	0.50	8.2100
3x4+3x4/3	015000131004A	3	2.22	19.30	21.50	0.70	5.0900
3x6+3x6/3	015000131005A	3	3.10	21.50	23.90	0.90	3.3900
3x10+3x10/3	015000131006A	3	3.98	24.80	27.20	1.20	1.9500
3x16+3x10/3	015000131007A	3	5.22	28.40	31.00	1.70	1.2400
3x25+3x16/3	015000131008A	3	6.47	33.20	36.20	2.40	0.7950
3x35+3x16/3	015000131009A	3	7.62	36.10	39.10	2.90	0.5650
3x50+3x25/3	015000131010A	3	9.20	42.20	45.20	4.00	0.3930
3x70+3x35/3	015000131011A	3	10.99	44.70	47.70	4.80	0.2770
3x95+3x50/3	015000131012A	3	12.81	52.30	56.30	6.50	0.2100
3x120+3x50/3	015000131013A	3	14.39	56.90	60.90	7.70	0.1640
3x150+3x70/3	015000131014A	3	16.05	61.50	65.50	9.20	0.1320
3x185+3x95/3	015000131015A	3	17.76	66.40	70.40	11.00	0.1080
3x240+3x120/3	015000131016A	3	20.50	74.30	78.30	13.80	0.0817
3x300+3x150/3	015000131017A	3	22.79	80.60	84.60	16.60	0.0654

1.8/3 kV

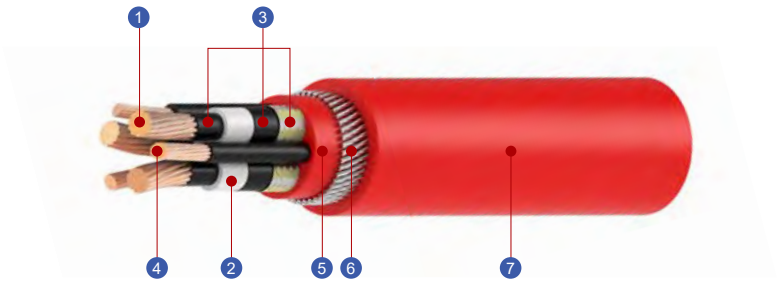
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20℃
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x2.5/3	015000231003A	3	1.77	22.70	24.80	0.90	8.2100
3x4+3x4/3	015000231004A	3	2.22	23.90	26.10	1.00	5.0900
3x6+3x6/3	015000231005A	3	3.10	26.10	28.40	1.20	3.3900
3x10+3x10/3	015000231006A	3	3.98	28.30	30.80	1.40	1.9500
3x16+3x10/3	015000231007A	3	5.22	32.50	35.00	2.00	1.2400
3x25+3x16/3	015000231008A	3	6.47	36.80	39.80	2.70	0.7950
3x35+3x16/3	015000231009A	3	7.62	39.70	42.70	3.30	0.5650
3x50+3x25/3	015000231010A	3	9.20	44.20	47.20	4.30	0.3930
3x70+3x35/3	015000231011A	3	10.99	49.80	52.80	5.50	0.2770
3x95+3x50/3	015000231012A	3	12.81	54.90	58.90	6.80	0.2100
3x120+3x50/3	015000231013A	3	14.39	58.90	62.90	8.10	0.1640
3x150+3x70/3	015000231014A	3	16.05	63.60	67.60	9.50	0.1320
3x185+3x95/3	015000231015A	3	17.76	68.40	72.40	11.30	0.1080
3x240+3x120/3	015000231016A	3	20.50	75.80	79.80	14.00	0.0817
3x300+3x150/3	015000231017A	3	22.79	81.60	85.60	16.70	0.0654

MGA (LHM)TEEAR 6kV - 10kV

Cables for variable frequency converter

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)TEEAR
- **VDE type designation:** (N)TSCGECERWOEU/T
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** 3 main cores laid up with pilot cores (if applicable) placed in the outer interstices
- **Installation:** (Semi-)fixed Installation/Trailing



1	**Power conductor**	Very finly stranded tinned copper conductors (class 5)
2	**Insulation**	Special rubber compound for high voltage insulation, basic material: EPR
3	**Electrical field control**	Inner and outer layer of semiconductive rubber with copper/textile screen over the outer layer
4	**PE conductor**	Tinned copper conductors in the outer interstics [1]
5	**Inner sheath**	Special rubber compound, 5GM3+ [2]
6	**Armouring**	Spinning of steel/copper wires over the inner sheath
7	**Outer sheath**	Vulcanized synthetic compound, basic material: CM/CR
OPT	**Pilot conductor**	Control cores, communication pairs, and/or fiber optic elements provided at option
OPT	**Reinforcement unit**	Central reinforcement unit applied if necessary to handle extreme tensile loads

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Power supply cables for variable frequency converter controlled drives in mining/tunneling application. Excellent electrical field control. Good for fixed installation and flexible operation such as connections to conveyors, distribution boards, mine winch, pumps, etc.

Sketch

- Minimized electrical interference from phase conductors by double layer of semiconductive layer and metallic screen over phase conductors, very suitable for variable frequency driver
- Control units, communication cores, and/or fiber optic elements provided at option
- Armored, magnetic field screened and good for tough working conditions with frequent impact forces

Mechanical Parameters

Max. tensile loads on the cable
35 MPa

Torsion stress
25 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV
AC test voltage (main cores)	11 kV	17 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. When pilot units added, the PE conductors may be applied in a different way, i.e. spinning of copper wires over pilot cores.
2. See DIN VDE 0207.
3. The dimension and weight specifications would change if pilot units applied.

Specification- MGA (LHM)TEEAR

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3	015010331007A	3	5.22	41.70	44.23	2.82	1.2400
3x25+3x16/3	015010331008A	3	6.47	45.75	48.37	3.63	0.7950
3x35+3x16/3	015010331009A	3	7.62	48.61	51.32	4.21	0.5650
3x50+3x25/3	015010331010A	3	9.20	53.33	56.14	5.33	0.3930
3x70+3x35/3	015010331011A	3	10.99	58.12	61.02	6.50	0.2770
3x95+3x50/3	015010331012A	3	12.81	62.66	65.65	7.78	0.2100
3x120+3x50/3	015010331013A	3	14.39	67.28	70.36	9.13	0.1640
3x150+3x70/3	015010331014A	3	16.05	71.40	74.57	10.61	0.1320
3x185+3x95/3	015010331015A	3	17.76	76.16	79.43	12.27	0.1080
3x240+3x120/3	015010331016A	3	20.50	82.53	85.89	14.84	0.0817
3x300+3x150/3	015010331017A	3	22.79	89.84	93.29	17.76	0.0654

6/10 kV

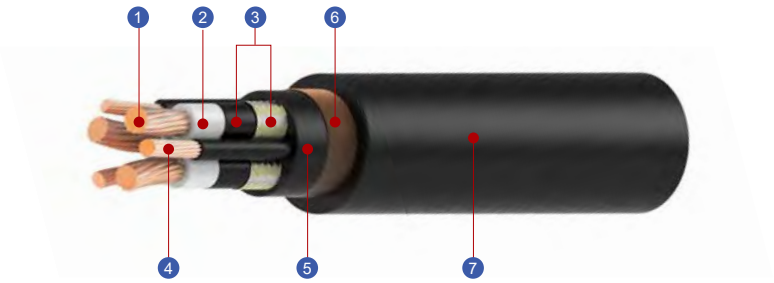
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3	015010431007A	3	5.22	46.83	49.36	3.43	1.2400
3x25+3x16/3	015010431008A	3	6.47	50.87	53.49	4.30	0.7950
3x35+3x16/3	015010431009A	3	7.62	53.73	56.44	4.91	0.5650
3x50+3x25/3	015010431010A	3	9.20	58.45	61.26	6.12	0.3930
3x70+3x35/3	015010431011A	3	10.99	63.24	66.14	7.29	0.2770
3x95+3x50/3	015010431012A	3	12.81	67.78	70.77	8.67	0.2100
3x120+3x50/3	015010431013A	3	14.39	72.40	75.48	10.09	0.1640
3x150+3x70/3	015010431014A	3	16.05	76.52	79.69	11.56	0.1320
3x185+3x95/3	015010431015A	3	17.76	81.29	84.55	13.34	0.1080
3x240+3x120/3	015010431016A	3	20.50	87.66	91.01	15.99	0.0817
3x300+3x150/3	015010431017A	3	22.79	94.97	98.42	18.99	0.0654

MGA (LHM)TEAL 1kV - 3kV

Double screened VFC cables

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)TEAL
- **VDE type designation:** (N)TSCECWOEU
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** 3 power conductors and pilot cores (if any) laid up
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Very finely stranded tinned copper conductors (class 5) laid up around central semiconductive cradle separator
2	**Insulation**	High grade EPR rubber compound
3	**Electrical field control**	Metallic shielded phase cores with outer semiconducting rubber layer
4	**PE conductor**	Tinned copper conductors in the outer interstices, metallic screen provides additional grounding effect[1]
5	**Inner sheath**	Chlorinated rubber compound, basic material: CM, 5GM3+[2]
6	**Overall screen**	Spinning of tinned copper wires over the inner sheath
7	**Outer sheath**	Robust synthetic elastomer compound, 5GM5+[2]
OPT	**Pilot Cores**	Upon needs of control/telecommunication/fibre optic transmission, pilot cores are added
OPT	**Reinforcement unit**	Central reinforcement unit can be added if high tensile loads exist

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

VFC power supply cables for connection to mobile mining equipment. Intended for applications when significant electrical interference exists. Suitable for being used as power supply to material handling units like distribution boards, conveyor belts, etc.

Sketch

- Designed for VFCs (variable frequency convertors), metallic screened phase conductors with semiconducting rubber layer
- Double screen technology, minimized electrical interference on VFC equipment and surrounding machines

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
30 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. If pilot cores are placed upon request, the PE unit may be applied in a different way due to structural change.
2. See DIN VDE 0207.

Specification- MGA (LHM)TEAL

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x2.5/3+KON	01520131003A	3	1.77	15.97	18.04	0.44	8.2100
3x4+3x4/3+KON	01520131004A	3	2.22	18.13	20.31	0.58	5.0900
3x6+3x6/3+KON	01520131005A	3	3.10	20.34	22.69	0.74	3.3900
3x10+3x10/3+KON	01520131006A	3	3.98	23.58	26.02	1.04	1.9500
3x16+3x10/3+KON	01520131007A	3	5.22	27.25	29.78	1.47	1.2400
3x25+3x16/3+KON	01520131008A	3	6.47	31.62	34.62	2.07	0.7950
3x35+3x16/3+KON	01520131009A	3	7.62	34.53	37.53	2.59	0.5650
3x50+3x25/3+KON	01520131010A	3	9.20	40.23	43.23	3.56	0.3930
3x70+3x35/3+KON	01520131011A	3	10.99	42.72	45.72	4.34	0.2770
3x95+3x50/3+KON	01520131012A	3	12.81	50.34	54.34	5.88	0.2100
3x120+3x50/3+KON	01520131013A	3	14.39	54.86	58.86	7.09	0.1640
3x150+3x70/3+KON	01520131014A	3	16.05	59.54	63.54	8.55	0.1320
3x185+3x95/3+KON	01520131015A	3	17.76	64.36	68.36	10.21	0.1080
3x240+3x120/3+KON	01520131016A	3	20.50	72.29	76.29	12.92	0.0817
3x300+3x150/3+KON	01520131017A	3	22.79	78.56	82.56	15.64	0.0654

1.8/3 kV

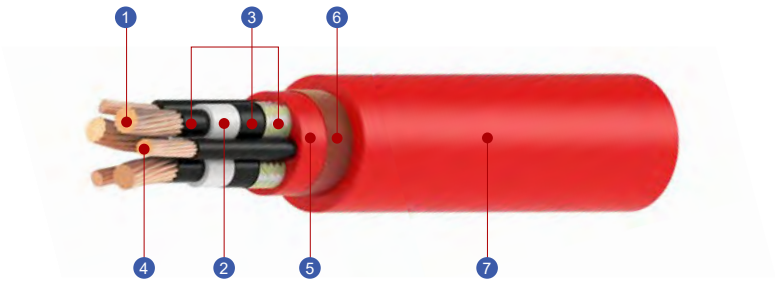
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x2.5/3+KON	01520231003A	3	1.77	21.52	23.59	0.72	8.2100
3x4+3x4/3+KON	01520231004A	3	2.22	22.67	24.85	0.83	5.0900
3x6+3x6/3+KON	01520231005A	3	3.10	24.88	27.23	1.01	3.3900
3x10+3x10/3+KON	01520231006A	3	3.98	27.11	29.55	1.26	1.9500
3x16+3x10/3+KON	01520231007A	3	5.22	31.29	33.82	1.78	1.2400
3x25+3x16/3+KON	01520231008A	3	6.47	35.15	38.15	2.38	0.7950
3x35+3x16/3+KON	01520231009A	3	7.62	38.06	41.06	2.92	0.5650
3x50+3x25/3+KON	01520231010A	3	9.20	42.25	45.25	3.78	0.3930
3x70+3x35/3+KON	01520231011A	3	10.99	47.77	50.77	4.92	0.2770
3x95+3x50/3+KON	01520231012A	3	12.81	52.86	56.86	6.22	0.2100
3x120+3x50/3+KON	01520231013A	3	14.39	56.88	60.88	7.41	0.1640
3x150+3x70/3+KON	01520231014A	3	16.05	61.56	65.56	8.84	0.1320
3x185+3x95/3+KON	01520231015A	3	17.76	66.37	70.37	10.52	0.1080
3x240+3x120/3+KON	01520231016A	3	20.50	73.80	77.80	13.18	0.0817
3x300+3x150/3+KON	01520231017A	3	22.79	79.57	83.57	15.83	0.0654

MGA (LHM)TEEAL 6kV - 10kV

Double screened VFC cables

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)TEEAL
- **VDE type designation:** (N)TSCGECECWOEU
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** 3 core design, phase conductors and pilot cores (if applicable) laid up around central cradle separator
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Finely stranded copper conductors, tinned (class 5)
2	**Insulation**	Special rubber compound for high voltage insulation, basic material: EPR
3	**Electrical field control**	Double semiconductive rubber layer and metallic screen over phase cores
4	**PE conductor**	Tinned copper conductors evenly distributed in the outer interstices, covered with semiconductive rubberr[1]
5	**Inner sheath**	Chlorinated rubber compound, 5GM3+[3]
6	**Overall screen**	Tinned copper wires spinning over the inner sheath
7	**Outer sheath**	Robust mold-cured synthetic rubber compound, basic material: CM/CR
OPT	**Pilot conductor**	Control/communication and fibre optic data transmission functional units provided at option[2]
OPT	**Reinforcement unit**	Central reinforcement of aramid threads if the working conditions requires so

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~80 °C

Ambient temperature in fully flexible operation
-25 °C~80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

VFC power supply cables for connection to mobile mining equipment. Intended for applications when extreme electrical interference exists. Suitable for being used as power supply to material handling units like distribution boards, conveyor belts, etc.

Sketch

- Designed for VFCs (variable frequency convertors), especially for application under relatively high voltage
- Inner and outer screen, minimized electromagnetic interference on surrounding equipment
- Optional large dimension PE, control cores, communication pairs and optic fiber units

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
25 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV
AC test voltage (main cores)	11 kV	17 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. The distribution and placement of PE units may be changed if pilot cores added.
2. One or multiple pilot cores can be provided, the dimension and weight specification would change.
3. See DIN VDE Part 0207.

Specification- MGA (LHM)TEEAL

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x16/3+KON	01530331007A	3	5.22	37.35	39.88	2.29	1.2400
3x25+3x16/3+KON	01530331008A	3	6.47	40.71	43.71	2.91	0.7950
3x35+3x16/3+KON	01530331009A	3	7.62	43.62	46.62	3.49	0.5650
3x50+3x25/3+KON	01530331010A	3	9.20	47.80	50.80	4.41	0.3930
3x70+3x35/3+KON	01530331011A	3	10.99	52.31	55.31	5.51	0.2770
3x95+3x50/3+KON	01530331012A	3	12.81	56.90	60.90	6.77	0.2100
3x120+3x50/3+KON	01530331013A	3	14.39	60.92	64.92	7.98	0.1640
3x150+3x70/3+KON	01530331014A	3	16.05	65.10	69.10	9.42	0.1320
3x185+3x95/3+KON	01530331015A	3	17.76	69.40	73.40	11.02	0.1080
3x240+3x120/3+KON	01530331016A	3	20.50	76.33	80.33	13.63	0.0817
3x300+3x150/3+KON	01530331017A	3	22.79	82.10	86.10	16.31	0.0654

6/10 kV

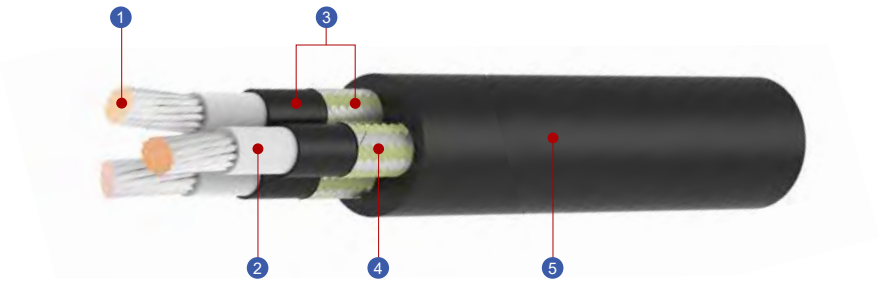
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x16/3+KON	01530431007A	3	5.22	39.37	41.90	2.50	1.2400
3x25+3x16/3+KON	01530431008A	3	6.47	42.73	45.73	3.14	0.7950
3x35+3x16/3+KON	01530431009A	3	7.62	45.64	48.64	3.73	0.5650
3x50+3x25/3+KON	01530431010A	3	9.20	49.82	52.82	4.68	0.3930
3x70+3x35/3+KON	01530431011A	3	10.99	54.33	57.33	5.77	0.2770
3x95+3x50/3+KON	01530431012A	3	12.81	58.92	62.92	7.05	0.2100
3x120+3x50/3+KON	01530431013A	3	14.39	62.94	66.94	8.32	0.1640
3x150+3x70/3+KON	01530431014A	3	16.05	67.12	71.12	9.74	0.1320
3x185+3x95/3+KON	01530431015A	3	17.76	71.42	75.42	11.40	0.1080
3x240+3x120/3+KON	01530431016A	3	20.50	78.35	82.35	14.05	0.0817
3x300+3x150/3+KON	01530431017A	3	22.79	84.12	88.12	16.75	0.0654

MGA (LHM)BEA/(CMO) 1kV - 3kV

Medium voltage flexible cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEA/(CMO)
- **VDE type designation:** (N)TMCGECEWOEU
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** 3 main cores laid up (when applicable, pilot cores are placed in the outer interstices)
- **Installation:** (Semi-)fixed Installation/Trailing



1	**Power conductor**	Tinned copper conductors, stranded and taped
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Semiconducting rubber layer over the insulation and further shielded with metallic screen
4	**PE conductor**	Braid of tinned copper wires and textile threads over the phase conductors[1]
5	**Sheath**	Synthetic CM rubber compound, tearing and abrasion resistant
OPT	**Pilot conductor**	Control cores, communication pairs and/or fibre optic (monomode E9/125) elements provided at option

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Rubber sheathed flexible cable for general mining application - laying alongside the conveyor belts and used as power connection to mining equipment, e.g. distribution boards. Provide control/communication cores and/or fiber optic elements at option.

Sketch

- 3 core design, balanced mechanical stress distribution along the cable
- Generalized design with pilot cores provided at users' option, suitable for most of the mining equipment which does not require frequent and continuous movement

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
50 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Given pilot cores provided, the earth unit may be placed in different ways. Standalone earth conductors provided when large dimension grounding units required.

Specification- MGA (LHM)BEA/(CMO)

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x6/3E	015040131003A	3	1.77	15.47	18.37	0.36	8.2100
3x4+3x6/3E	015040131004A	3	2.22	17.63	20.63	0.49	5.0900
3x6+3x6/3E	015040131005A	3	3.10	19.84	22.94	0.64	3.3900
3x10+3x10/3E	015040131006A	3	3.98	23.08	26.28	0.91	1.9500
3x16+3x10/3E	015040131007A	3	5.22	26.70	30.00	1.29	1.2400
3x25+3x16/3E	015040131008A	3	6.47	30.87	34.27	1.81	0.7950
3x35+3x16/3E	015040131009A	3	7.62	33.78	37.24	2.28	0.5650
3x50+3x25/3E	015040131010A	3	9.20	39.28	42.84	3.09	0.3930
3x70+3x35/3E	015040131011A	3	10.99	41.77	45.43	3.80	0.2770
3x95+3x50/3E	015040131012A	3	12.81	49.39	53.15	5.22	0.2100
3x120+3x50/3E	015040131013A	3	14.39	53.91	57.77	6.63	0.1640
3x150+3x70/3E	015040131014A	3	16.05	58.60	62.60	8.01	0.1320
3x185+3x95/3E	015040131015A	3	17.76	63.41	67.41	9.57	0.1080
3x240+3x120/3E	015040131016A	3	20.50	71.34	75.34	12.10	0.0817
3x300+3x150/3E	015040131017A	3	22.79	77.61	81.61	14.65	0.0654

1.8/3 kV

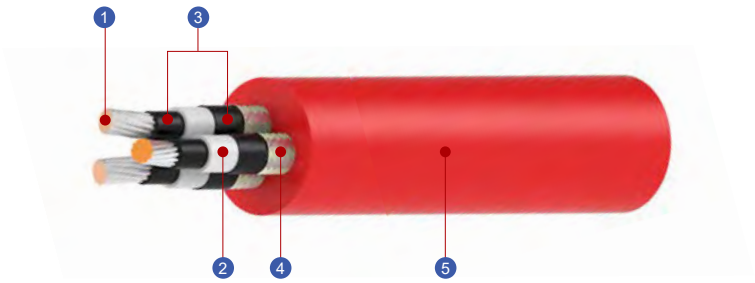
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x6/3E	015040231003A	3	1.77	21.02	23.92	0.62	8.2100
3x4+3x6/3E	015040231004A	3	2.22	22.17	25.17	0.71	5.0900
3x6+3x6/3E	015040231005A	3	3.10	24.39	27.49	0.89	3.3900
3x10+3x10/3E	015040231006A	3	3.98	26.62	29.82	1.12	1.9500
3x16+3x10/3E	015040231007A	3	5.22	30.74	34.04	1.59	1.2400
3x25+3x16/3E	015040231008A	3	6.47	34.40	37.80	2.09	0.7950
3x35+3x16/3E	015040231009A	3	7.62	37.31	40.78	2.58	0.5650
3x50+3x25/3E	015040231010A	3	9.20	41.30	44.86	3.30	0.3930
3x70+3x35/3E	015040231011A	3	10.99	46.82	50.48	4.35	0.2770
3x95+3x50/3E	015040231012A	3	12.81	51.91	55.68	5.51	0.2100
3x120+3x50/3E	015040231013A	3	14.39	55.93	59.79	6.97	0.1640
3x150+3x70/3E	015040231014A	3	16.05	60.62	64.62	8.28	0.1320
3x185+3x95/3E	015040231015A	3	17.76	65.43	69.43	9.87	0.1080
3x240+3x120/3E	015040231016A	3	20.50	72.85	76.85	12.36	0.0817
3x300+3x150/3E	015040231017A	3	22.79	78.62	82.62	14.83	0.0654

MGA (LHM)BEEA/(CMO) 6kV - 30kV

Medium voltage flexible cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEEA/(CMO)
- **VDE type designation:** (N)TMCGECEWOEU/T
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** Metallic screened phase conductors[1] laid up, when applicable, pilot cores are placed in the outer interstices
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Finely stranded tinned copper conductors (class 5)
2	**Insulation**	90°C rated, special compound for high voltage, basic material: EPR
3	**Electrical field control**	Inner and outer layer of semiconductive rubber compound
4	**PE conductor**	Copper/textile braid over the outer semiconductive layer of the phase cores
5	**Sheath**	Robust synthetic elastomer rubber compound, basic material: CM
OPT	**Pilot conductor**	Control cores (up to 6), communication pairs (up to 3),and optic fiber units provided at option to provide additional function like control signal/data transmission [2]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Power supply cable with double semiconductive layer, intended for rated voltage no higher than 30,000 volts. Used for (semi-)fixed installation and connection to (shiftable) mining equipment. Provide control/communication cores and/or fiber optic elements at option.

Sketch

- Double semiconductive layer for application with relatively high voltage, electrical interference to surrounding area reduced
- Very durable, good for (semi-)fixed installation, shiftable but not intended for equipment requiring repeated bending and continuous movement, like coal shearers

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
50 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. When pilot cores provided, the PE conductors may be distributed in different ways.
2. For customized design, please consult the sales for related specification.

Specification- MGA (LHM)BEEA/(CMO)

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050331007A	3	5.22	38.31	41.61	2.14	1.2400
3x25+3x16/3E	015050331008A	3	6.47	41.72	45.12	2.71	0.7950
3x35+3x16/3E	015050331009A	3	7.62	44.64	48.10	3.24	0.5650
3x50+3x25/3E	015050331010A	3	9.20	48.37	51.93	4.00	0.3930
3x70+3x35/3E	015050331011A	3	10.99	52.88	56.54	5.01	0.2770
3x95+3x50/3E	015050331012A	3	12.81	57.47	61.23	6.17	0.2100
3x120+3x50/3E	015050331013A	3	14.39	61.48	65.34	7.27	0.1640
3x150+3x70/3E	015050331014A	3	16.05	65.66	69.66	8.60	0.1320
3x185+3x95/3E	015050331015A	3	17.76	69.97	73.97	10.10	0.1080
3x240+3x120/3E	015050331016A	3	20.50	76.89	80.89	12.50	0.0817
3x300+3x150/3E	015050331017A	3	22.79	82.66	86.66	14.96	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050431007A	3	5.22	40.33	43.63	2.33	1.2400
3x25+3x16/3E	015050431008A	3	6.47	43.74	47.14	2.90	0.7950
3x35+3x16/3E	015050431009A	3	7.62	46.65	50.12	3.45	0.5650
3x50+3x25/3E	015050431010A	3	9.20	50.89	54.45	4.31	0.3930
3x70+3x35/3E	015050431011A	3	10.99	55.40	59.07	5.32	0.2770
3x95+3x50/3E	015050431012A	3	12.81	59.99	63.75	6.53	0.2100
3x120+3x50/3E	015050431013A	3	14.39	64.01	67.87	7.68	0.1640
3x150+3x70/3E	015050431014A	3	16.05	68.19	72.19	9.03	0.1320
3x185+3x95/3E	015050431015A	3	17.76	72.49	76.49	10.51	0.1080
3x240+3x120/3E	015050431016A	3	20.50	79.42	83.42	12.95	0.0817
3x300+3x150/3E	015050431017A	3	22.79	85.19	89.19	15.45	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050531007A	3	5.22	42.86	46.16	2.58	1.2400
3x25+3x16/3E	015050531008A	3	6.47	46.27	49.67	3.18	0.7950
3x35+3x16/3E	015050531009A	3	7.62	49.18	52.64	3.74	0.5650
3x50+3x25/3E	015050531010A	3	9.20	53.42	56.98	4.63	0.3930
3x70+3x35/3E	015050531011A	3	10.99	57.93	61.59	5.67	0.2770
3x95+3x50/3E	015050531012A	3	12.81	62.52	66.28	6.90	0.2100
3x120+3x50/3E	015050531013A	3	14.39	66.53	70.39	8.05	0.1640
3x150+3x70/3E	015050531014A	3	16.05	70.71	74.71	9.43	0.1320
3x185+3x95/3E	015050531015A	3	17.76	75.02	79.02	10.98	0.1080
3x240+3x120/3E	015050531016A	3	20.50	81.94	85.94	13.46	0.0817
3x300+3x150/3E	015050531017A	3	22.79	87.71	91.71	15.99	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050631007A	3	5.22	45.38	48.68	2.85	1.2400
3x25+3x16/3E	015050631008A	3	6.47	48.79	52.19	3.47	0.7950
3x35+3x16/3E	015050631009A	3	7.62	51.70	55.17	4.04	0.5650
3x50+3x25/3E	015050631010A	3	9.20	55.94	59.50	4.97	0.3930
3x70+3x35/3E	015050631011A	3	10.99	60.45	64.11	6.03	0.2770
3x95+3x50/3E	015050631012A	3	12.81	65.04	68.80	7.29	0.2100
3x120+3x50/3E	015050631013A	3	14.39	69.05	72.92	8.48	0.1640
3x150+3x70/3E	015050631014A	3	16.05	73.24	77.24	9.84	0.1320
3x185+3x95/3E	015050631015A	3	17.76	77.54	81.54	11.42	0.1080
3x240+3x120/3E	015050631016A	3	20.50	84.47	88.47	13.94	0.0817
3x300+3x150/3E	015050631017A	3	22.79	90.23	94.23	16.50	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050731007A	3	5.22	49.42	52.72	3.30	1.2400
3x25+3x16/3E	015050731008A	3	6.47	52.83	56.23	3.97	0.7950
3x35+3x16/3E	015050731009A	3	7.62	55.74	59.21	4.57	0.5650
3x50+3x25/3E	015050731010A	3	9.20	59.98	63.54	5.53	0.3930
3x70+3x35/3E	015050731011A	3	10.99	64.49	68.15	6.63	0.2770
3x95+3x50/3E	015050731012A	3	12.81	69.08	72.84	7.93	0.2100
3x120+3x50/3E	015050731013A	3	14.39	73.09	76.96	9.14	0.1640
3x150+3x70/3E	015050731014A	3	16.05	77.28	81.28	10.58	0.1320
3x185+3x95/3E	015050731015A	3	17.76	81.58	85.58	12.20	0.1080
3x240+3x120/3E	015050731016A	3	20.50	88.51	92.51	14.78	0.0817
3x300+3x150/3E	015050731017A	3	22.79	94.27	98.27	17.40	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015050831007A	3	5.22	55.98	59.28	4.12	1.2400
3x25+3x16/3E	015050831008A	3	6.47	59.40	62.80	4.84	0.7950
3x35+3x16/3E	015050831009A	3	7.62	62.31	65.77	5.48	0.5650
3x50+3x25/3E	015050831010A	3	9.20	66.54	70.10	6.52	0.3930
3x70+3x35/3E	015050831011A	3	10.99	71.05	74.72	7.68	0.2770
3x95+3x50/3E	015050831012A	3	12.81	75.64	79.41	9.05	0.2100
3x120+3x50/3E	015050831013A	3	14.39	79.66	83.52	10.33	0.1640
3x150+3x70/3E	015050831014A	3	16.05	83.84	87.84	11.83	0.1320
3x185+3x95/3E	015050831015A	3	17.76	88.15	92.15	13.51	0.1080
3x240+3x120/3E	015050831016A	3	20.50	95.07	99.07	16.21	0.0817
3x300+3x150/3E	015050831017A	3	22.79	100.84	104.84	18.91	0.0654

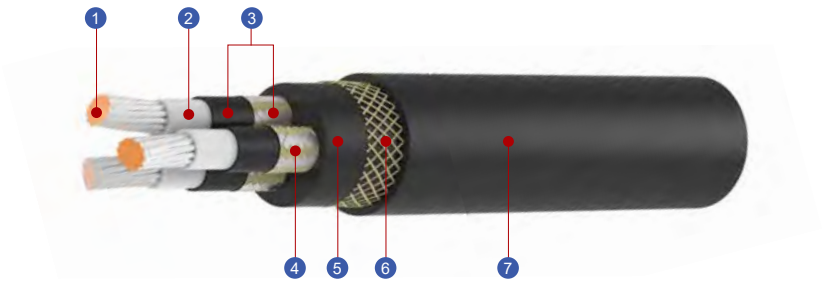
NOTE

MGA (LHM)BEAI/(CMO) 1kV - 3kV

Double sheathed MV cable with reinforced layer

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEAI/(CMO)
- **VDE type designation:** (N)SSHKCGEOEU
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** 3 metallic screened phase conductors laid up, with pilot cores (if applicable) placed in the outer interstices; otherwise, fillers are placed in the outer interstices
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Tinned copper conductors, stranded
2	**Insulation**	90°C rated EPR compound
3	**Electrical field control**	Semiconductive layer over the insulation, further covered by metallic braid
4	**PE conductor**	Braid of copper/textile wires over the outer semiconducting layer
5	**Inner sheath**	Rubber compound, GM1B [2]
6	**Reinforcement layer**	Braid of textile threads over the inner sheath, torsion-resistant
7	**Outer sheath**	Synthetic CM compound, 5GM3+[2]
OPT	**Pilot conductor**	At users' request, control cores/commnunication pairs and/or fibre optic units placed in the outer interstices as special versions[1]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed flexible cable as power supply to mining equipment and material handling equipment such as conveyor betls, emulsion pumps, loaders, etc. Generalized design, good for both underground and opencast application.

Sketch

- Double sheathed, reinforced layer applied to handle significant torsion stress
- Communication, control cores, and even fibre optic elements can be provided as special version
- Good for most of the mining equipment which does not require repeated bending

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
50 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Up to 6 control cores or 3 communication pairs. For fibre optic elements, please consult the sales for additional information.
2. See DIN VDE Part 0207.

Specification- MGA (LHM)BEAI/(CMO)

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x6/3E	015070131003A	3	1.77	15.47	18.37	0.35	8.2100
3x4+3x6/3E	015070131004A	3	2.22	17.63	20.63	0.48	5.0900
3x6+3x6/3E	015070131005A	3	3.10	19.84	22.94	0.63	3.3900
3x10+3x10/3E	015070131006A	3	3.98	23.08	26.28	0.90	1.9500
3x16+3x10/3E	015070131007A	3	5.22	26.70	30.00	1.27	1.2400
3x25+3x16/3E	015070131008A	3	6.47	30.87	34.27	1.79	0.7950
3x35+3x16/3E	015070131009A	3	7.62	33.78	37.24	2.25	0.5650
3x50+3x25/3E	015070131010A	3	9.20	39.28	42.84	3.06	0.3930
3x70+3x35/3E	015070131011A	3	10.99	41.77	45.43	3.75	0.2770
3x95+3x50/3E	015070131012A	3	12.81	49.39	53.15	5.17	0.2100
3x120+3x50/3E	015070131013A	3	14.39	53.91	57.77	6.56	0.1640
3x150+3x70/3E	015070131014A	3	16.05	58.60	62.56	7.93	0.1320
3x185+3x95/3E	015070131015A	3	17.76	63.41	67.41	9.48	0.1080
3x240+3x120/3E	015070131016A	3	20.50	71.34	75.34	11.99	0.0817
3x300+3x150/3E	015070131017A	3	22.79	77.61	81.61	14.51	0.0654

1.8/3 kV

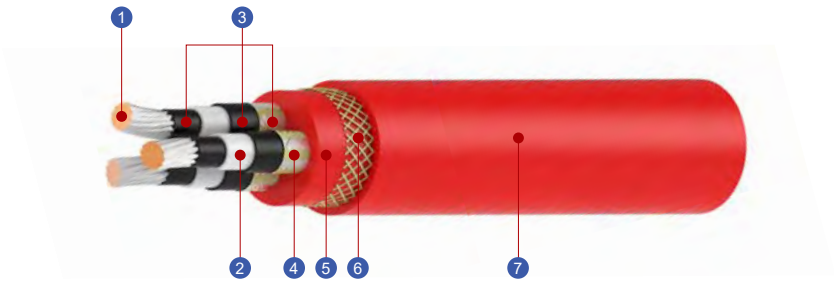
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x2.5+3x6/3E	015070231003A	3	1.77	21.02	23.92	0.61	8.2100
3x4+3x6/3E	015070231004A	3	2.22	22.17	25.17	0.70	5.0900
3x6+3x6/3E	015070231005A	3	3.10	24.39	27.49	0.88	3.3900
3x10+3x10/3E	015070231006A	3	3.98	26.62	29.82	1.10	1.9500
3x16+3x10/3E	015070231007A	3	5.22	30.74	34.04	1.57	1.2400
3x25+3x16/3E	015070231008A	3	6.47	34.40	37.80	2.07	0.7950
3x35+3x16/3E	015070231009A	3	7.62	37.31	40.78	2.55	0.5650
3x50+3x25/3E	015070231010A	3	9.20	41.30	44.86	3.27	0.3930
3x70+3x35/3E	015070231011A	3	10.99	46.82	50.48	4.30	0.2770
3x95+3x50/3E	015070231012A	3	12.81	51.91	55.68	5.46	0.2100
3x120+3x50/3E	015070231013A	3	14.39	55.93	59.79	6.90	0.1640
3x150+3x70/3E	015070231014A	3	16.05	60.62	64.58	8.20	0.1320
3x185+3x95/3E	015070231015A	3	17.76	65.43	69.43	9.78	0.1080
3x240+3x120/3E	015070231016A	3	20.50	72.85	76.85	12.24	0.0817
3x300+3x150/3E	015070231017A	3	22.79	78.62	82.62	14.69	0.0654

MGA (LHM)BEEAI/(CMO) 6kV - 30kV

Double sheathed MV cable with reinforced layer

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEEAI/(CMO)
- **VDE type designation:** (N)SSHKCGEOEU/T
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement** 3 main conductors and earth conductors laid up, with pilot cores (if any) placed in the outer interstices
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Tinned copper conductors, stranded (class 5)
2	**Insulation**	EPR rubber compound, 90°C rated
3	**Electrical field control**	Double layer of semiconducting rubber and metallic screen
4	**PE conductor**	Braid of copper wires and textile threads over the insulation[1]
5	**Inner sheath**	Vulcanized rubber compound
6	**Reinforcement layer**	Braid of aramid yarns over the inner sheath, anti-torsion
7	**Outer sheath**	Synthetic rubber compound, basic material: CM
OPT	**Pilot conductor**	Control cores, communication pairs (fully screened) and fibre optic elements provided at option [2]

Suitable Working Environment

Ambient temperature for fixed installation
-40°C~80°C

Ambient temperature in fully flexible operation
-25°C~80°C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed flexible cable with double semiconductive layer, used as power supply to mobile mining equipment such as mobile transformers, conveyors, crushers, etc. or as power grid connection to high-voltage cubicle switchgear, fluid supply chamber, etc. Generalized design, good for both underground and opencast application.

Sketch

- Double sheathed with anti-torsion layer, intended for applications with rated voltage no higher than 30,000 volts
- At users' option, control/communication and optic fiber elements provided for specific application requirement
- Good for semi-fixed installation and can be moved as the mining surface finishes, not intended for continuous movement

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
50 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. The grounding wires may be distributed in different ways given pilot cores provided.
2. For special versions, please consult the sales for the relative specification.

Specification- MGA (LHM)BEEAI/(CMO)

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080331008A	3	6.47	41.72	45.12	2.69	0.7950
3x35+3x16/3E	015080331009A	3	7.62	44.64	48.10	3.22	0.5650
3x50+3x25/3E	015080331010A	3	9.20	48.62	52.18	4.00	0.3930
3x70+3x35/3E	015080331011A	3	10.99	53.13	56.79	5.00	0.2770
3x95+3x50/3E	015080331012A	3	12.81	57.72	61.48	6.15	0.2100
3x120+3x50/3E	015080331013A	3	14.39	61.73	65.60	7.26	0.1640
3x150+3x70/3E	015080331014A	3	16.05	65.92	69.88	8.58	0.1320
3x185+3x95/3E	015080331015A	3	17.76	70.22	74.22	10.09	0.1080
3x240+3x120/3E	015080331016A	3	20.50	77.15	81.15	12.49	0.0817
3x300+3x150/3E	015080331017A	3	22.79	82.91	86.91	14.95	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080431008A	3	6.47	43.74	47.14	2.91	0.7950
3x35+3x16/3E	015080431009A	3	7.62	46.65	50.12	3.45	0.5650
3x50+3x25/3E	015080431010A	3	9.20	50.64	54.20	4.24	0.3930
3x70+3x35/3E	015080431011A	3	10.99	55.15	58.81	5.24	0.2770
3x95+3x50/3E	015080431012A	3	12.81	59.74	63.50	6.44	0.2100
3x120+3x50/3E	015080431013A	3	14.39	63.75	67.62	7.59	0.1640
3x150+3x70/3E	015080431014A	3	16.05	67.94	71.90	8.89	0.1320
3x185+3x95/3E	015080431015A	3	17.76	72.24	76.24	10.41	0.1080
3x240+3x120/3E	015080431016A	3	20.50	79.17	83.17	12.85	0.0817
3x300+3x150/3E	015080431017A	3	22.79	84.93	88.93	15.33	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080531008A	3	6.47	46.27	49.67	3.16	0.7950
3x35+3x16/3E	015080531009A	3	7.62	49.18	52.64	3.72	0.5650
3x50+3x25/3E	015080531010A	3	9.20	53.16	56.72	4.56	0.3930
3x70+3x35/3E	015080531011A	3	10.99	57.68	61.34	5.59	0.2770
3x95+3x50/3E	015080531012A	3	12.81	62.26	66.03	6.81	0.2100
3x120+3x50/3E	015080531013A	3	14.39	66.28	70.14	7.96	0.1640
3x150+3x70/3E	015080531014A	3	16.05	70.46	74.42	9.33	0.1320
3x185+3x95/3E	015080531015A	3	17.76	74.77	78.77	10.87	0.1080
3x240+3x120/3E	015080531016A	3	20.50	81.69	85.69	13.35	0.0817
3x300+3x150/3E	015080531017A	3	22.79	87.46	91.46	15.87	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080631008A	3	6.47	48.79	52.19	3.45	0.7950
3x35+3x16/3E	015080631009A	3	7.62	51.70	55.17	4.03	0.5650
3x50+3x25/3E	015080631010A	3	9.20	55.69	59.25	4.87	0.3930
3x70+3x35/3E	015080631011A	3	10.99	60.20	63.86	5.94	0.2770
3x95+3x50/3E	015080631012A	3	12.81	64.79	68.55	7.17	0.2100
3x120+3x50/3E	015080631013A	3	14.39	68.80	72.66	8.38	0.1640
3x150+3x70/3E	015080631014A	3	16.05	72.99	76.95	9.74	0.1320
3x185+3x95/3E	015080631015A	3	17.76	77.29	81.29	11.31	0.1080
3x240+3x120/3E	015080631016A	3	20.50	84.22	88.22	13.82	0.0817
3x300+3x150/3E	015080631017A	3	22.79	89.98	93.98	16.38	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080731008A	3	6.47	52.83	56.23	3.95	0.7950
3x35+3x16/3E	015080731009A	3	7.62	55.74	59.21	4.54	0.5650
3x50+3x25/3E	015080731010A	3	9.20	59.73	63.29	5.43	0.3930
3x70+3x35/3E	015080731011A	3	10.99	64.24	67.90	6.53	0.2770
3x95+3x50/3E	015080731012A	3	12.81	68.83	72.59	7.83	0.2100
3x120+3x50/3E	015080731013A	3	14.39	72.84	76.70	9.03	0.1640
3x150+3x70/3E	015080731014A	3	16.05	77.02	80.99	10.46	0.1320
3x185+3x95/3E	015080731015A	3	17.76	81.33	85.33	12.08	0.1080
3x240+3x120/3E	015080731016A	3	20.50	88.25	92.25	14.66	0.0817
3x300+3x150/3E	015080731017A	3	22.79	94.02	98.02	17.26	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015080831008A	3	6.47	59.40	62.80	4.82	0.7950
3x35+3x16/3E	015080831009A	3	7.62	62.31	65.77	5.47	0.5650
3x50+3x25/3E	015080831010A	3	9.20	66.29	69.85	6.41	0.3930
3x70+3x35/3E	015080831011A	3	10.99	70.80	74.46	7.57	0.2770
3x95+3x50/3E	015080831012A	3	12.81	75.39	79.15	8.94	0.2100
3x120+3x50/3E	015080831013A	3	14.39	79.40	83.27	10.21	0.1640
3x150+3x70/3E	015080831014A	3	16.05	83.59	87.55	11.70	0.1320
3x185+3x95/3E	015080831015A	3	17.76	87.89	91.89	13.38	0.1080
3x240+3x120/3E	015080831016A	3	20.50	94.82	98.82	16.07	0.0817
3x300+3x150/3E	015080831017A	3	22.79	100.59	104.59	18.76	0.0654

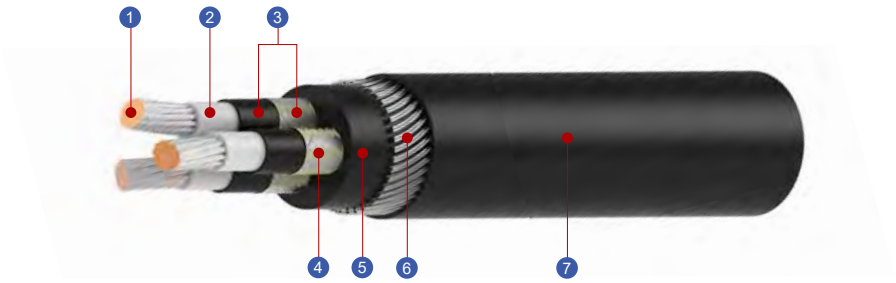
NOTE

MGA (LHM)BEAR/(CMO) 1kV - 3kV

Armored MV power supply cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEAR/(CMO))
- **VDE type designation:** (N)TSKCGECEWOEU
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** Metallic screened phase conductors laid up
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Stranded tinned copper conductors
2	**Insulation**	90°C rated EPR compound
3	**Electrical field control**	Cold strippable outer semicondutive layer with metallic screen over it
4	**PE conductor**	Copper wires and textile threads braided over main cores
5	**Inner sheath**	CM rubber compound, GM1B+[1]
6	**Armouring**	Spinning of steel/copper mixed wires over the inner sheath
7	**Outer sheath**	Synthetic rubber compound, basic material CM, abrasion and tearing resistance
OPT	**Pilot conductor**	Up to 6 control cores or 3 communication pairs or a combined version provided at option, and additional fibre optic elements added as necessary for high speed data transmission

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Armored flexible cable, used as power supply to mobile mining equipment. Generalized design, applicable to both underground and openpit mining, e.g. excavators, dumpers, crushers, etc. in open-cast mines or loaders, distribution boarders, pumps, etc. in underground surfaces.

Sketch

- Armored[2], good for working conditions requiring the cable to handle impact forces frequently
- Balanced structure for mechanical stress distribution
- Control cores, communication pairs and fibre optic elements provided at option
- Intended for use in circuits not exceeding 3300 volts

Mechanical Parameters

Max. tensile loads on the cable
35 MPa

Torsion stress
20 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. See DIN VDE Part 0207.
2. When grounding, the armouring can serve as the additional ground conductor.

Specification- MGA (LHM)BEAR/(CMO)

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015090131007A	3	5.22	28.50	31.80	1.42	1.2400
3x25+3x16/3E	015090131008A	3	6.47	33.27	36.67	1.96	0.7950
3x35+3x16/3E	015090131009A	3	7.62	36.18	39.64	2.44	0.5650
3x50+3x25/3E	015090131010A	3	9.20	42.28	45.84	3.28	0.3930
3x70+3x35/3E	015090131011A	3	10.99	44.77	48.43	3.99	0.2770
3x95+3x50/3E	015090131012A	3	12.81	52.39	56.15	5.44	0.2100
3x120+3x50/3E	015090131013A	3	14.39	56.91	60.77	6.87	0.1640
3x150+3x70/3E	015090131014A	3	16.05	61.60	65.56	8.25	0.1320
3x185+3x95/3E	015090131015A	3	17.76	66.41	70.41	9.84	0.1080
3x240+3x120/3E	015090131016A	3	20.50	74.34	78.34	12.39	0.0817
3x300+3x150/3E	015090131017A	3	22.79	80.61	84.61	14.94	0.0654

1.8/3 kV

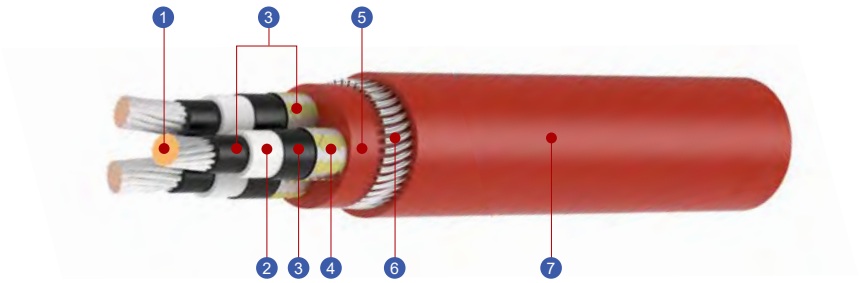
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x16+3x10/3E	015090231007A	3	5.22	32.54	35.84	1.74	1.2400
3x25+3x16/3E	015090131008A	3	6.47	36.80	40.20	2.26	0.7950
3x35+3x16/3E	015090131009A	3	7.62	39.71	43.18	2.75	0.5650
3x50+3x16/3E	015090131010A	3	9.20	44.30	47.86	3.50	0.3930
3x70+3x16/3E	015090131011A	3	10.99	49.82	53.48	4.57	0.2770
3x95+3x25/3E	015090131012A	3	12.81	54.91	58.68	5.74	0.2100
3x120+3x25/3E	015090131013A	3	14.39	58.93	62.79	7.22	0.1640
3x150+3x35/3E	015090131014A	3	16.05	63.62	67.58	8.54	0.1320
3x185+3x35/3E	015090131015A	3	17.76	68.43	72.43	10.14	0.1080
3x240+3x35/3E	015090131016A	3	20.50	75.85	79.85	12.65	0.0817
3x300+3x35/3E	015090131017A	3	22.79	81.62	85.62	15.13	0.0654

MGA (LHM)BEEAR/(CMO) 6kV - 30kV

Armored MV power supply cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BEEAR/(CMO)
- **VDE type designation:** (N)TSKCGECEWOEU/T
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement:** Main cores laid up, 3-core design
- **Installation:** (Semi-)fixed installation/Trailing



1	**Power conductor**	Tinned copper conductors, stranded
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Double semiconductive layer with metallic screen over the outer layer
4	**PE conductor**	Copper/textile braid over the phase conductors[1]
5	**Inner sheath**	Vulcanized rubber compound
6	**Armouring**	Spinning of steel/copper mixed wires between the inner and the outer sheath
7	**Outer sheath**	Synthetic elastomer rubber compound, basic material: CM
OPT	**Pilot conductor**	Control/communication[2]/optic fiber elements[3]provided at option

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Armored flexible cable with double semiconducting layer, used as power supply to mobile mining equipment, such as excavators, dumpers, crushers, etc. in open-cast mines or mobile transformers, distribution boarders, pumps, etc. in underground mining surfaces. Good for laying alongside the conveyor or the gallery.

Sketch

- Armored, good for working conditions where rockfalls or tire impact are frequent
- Double semiconducting layer over the phase cores, intended for working with rated voltage no higher than 30kV
- Control cores, communication pairs and/or optic fibre units are provided at option

Mechanical Parameters

Max. tensile loads on the cable
35 MPa

Torsion stress
20 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. The earth conductors may be distributed in a different way given pilot cores, standalone large-dimension PE units provided at option.
2. Up to 6 control cores or 3 communication pairs, special version providing a combination of control cores and communication units available.
3. E9/125 monomode optic fiber provided at option.

Specification- MGA (LHM)BEEAR/(CMO)

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100331008A	3	6.47	43.52	46.92	3.23	0.7950
3x35+3x16/3E	015100331009A	3	7.62	46.44	49.90	3.79	0.5650
3x50+3x25/3E	015100331010A	3	9.20	51.02	54.58	4.61	0.3930
3x70+3x35/3E	015100331011A	3	10.99	55.53	59.19	5.68	0.2770
3x95+3x50/3E	015100331012A	3	12.81	60.72	64.48	6.90	0.2100
3x120+3x50/3E	015100331013A	3	14.39	64.73	68.60	8.05	0.1640
3x150+3x70/3E	015100331014A	3	16.05	68.92	72.88	9.43	0.1320
3x185+3x95/3E	015100331015A	3	17.76	73.22	77.22	11.00	0.1080
3x240+3x120/3E	015100331016A	3	20.50	80.15	84.15	13.49	0.0817
3x300+3x150/3E	015100331017A	3	22.79	85.91	89.91	16.02	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100431008A	3	6.47	45.54	48.94	3.46	0.7950
3x35+3x16/3E	015100431009A	3	7.62	48.45	51.92	4.05	0.5650
3x50+3x25/3E	015100431010A	3	9.20	53.04	56.60	4.89	0.3930
3x70+3x35/3E	015100431011A	3	10.99	57.55	61.21	5.96	0.2770
3x95+3x50/3E	015100431012A	3	12.81	62.74	66.50	7.21	0.2100
3x120+3x50/3E	015100431013A	3	14.39	66.75	70.62	8.40	0.1640
3x150+3x70/3E	015100431014A	3	16.05	70.94	74.90	9.77	0.1320
3x185+3x95/3E	015100431015A	3	17.76	75.24	79.24	11.34	0.1080
3x240+3x120/3E	015100431016A	3	20.50	82.17	86.17	13.87	0.0817
3x300+3x150/3E	015100431017A	3	22.79	87.93	91.93	16.43	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100531008A	3	6.47	48.07	51.47	3.75	0.7950
3x35+3x16/3E	015100531009A	3	7.62	50.98	54.44	4.35	0.5650
3x50+3x25/3E	015100531010A	3	9.20	55.56	59.12	5.24	0.3930
3x70+3x35/3E	015100531011A	3	10.99	60.08	63.74	6.33	0.2770
3x95+3x50/3E	015100531012A	3	12.81	65.26	69.03	7.62	0.2100
3x120+3x50/3E	015100531013A	3	14.39	69.28	73.14	8.82	0.1640
3x150+3x70/3E	015100531014A	3	16.05	73.46	77.42	10.24	0.1320
3x185+3x95/3E	015100531015A	3	17.76	77.77	81.77	11.84	0.1080
3x240+3x120/3E	015100531016A	3	20.50	84.69	88.69	14.41	0.0817
3x300+3x150/3E	015100531017A	3	22.79	90.46	94.46	17.00	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100631008A	3	6.47	50.59	53.99	4.08	0.7950
3x35+3x16/3E	015100631009A	3	7.62	53.50	56.97	4.69	0.5650
3x50+3x25/3E	015100631010A	3	9.20	58.09	61.65	5.58	0.3930
3x70+3x35/3E	015100631011A	3	10.99	62.60	66.26	6.72	0.2770
3x95+3x50/3E	015100631012A	3	12.81	67.79	71.55	8.01	0.2100
3x120+3x50/3E	015100631013A	3	14.39	71.80	75.66	9.28	0.1640
3x150+3x70/3E	015100631014A	3	16.05	75.99	79.95	10.68	0.1320
3x185+3x95/3E	015100631015A	3	17.76	80.29	84.29	12.31	0.1080
3x240+3x120/3E	015100631016A	3	20.50	87.22	91.22	14.92	0.0817
3x300+3x150/3E	015100631017A	3	22.79	92.98	96.98	17.54	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100731008A	3	6.47	54.63	58.03	4.64	0.7950
3x35+3x16/3E	015100731009A	3	7.62	57.54	61.01	5.25	0.5650
3x50+3x25/3E	015100731010A	3	9.20	62.13	65.69	6.20	0.3930
3x70+3x35/3E	015100731011A	3	10.99	66.64	70.30	7.36	0.2770
3x95+3x50/3E	015100731012A	3	12.81	71.83	75.59	8.72	0.2100
3x120+3x50/3E	015100731013A	3	14.39	75.84	79.70	9.98	0.1640
3x150+3x70/3E	015100731014A	3	16.05	80.02	83.99	11.46	0.1320
3x185+3x95/3E	015100731015A	3	17.76	84.33	88.33	13.13	0.1080
3x240+3x120/3E	015100731016A	3	20.50	91.25	95.25	15.80	0.0817
3x300+3x150/3E	015100731017A	3	22.79	97.02	101.02	18.48	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E	015100831008A	3	6.47	61.20	64.60	5.59	0.7950
3x35+3x16/3E	015100831009A	3	7.62	64.11	67.57	6.28	0.5650
3x50+3x25/3E	015100831010A	3	9.20	68.69	72.25	7.27	0.3930
3x70+3x35/3E	015100831011A	3	10.99	73.20	76.86	8.49	0.2770
3x95+3x50/3E	015100831012A	3	12.81	78.39	82.15	9.91	0.2100
3x120+3x50/3E	015100831013A	3	14.39	82.40	86.27	11.23	0.1640
3x150+3x70/3E	015100831014A	3	16.05	86.59	90.55	12.78	0.1320
3x185+3x95/3E	015100831015A	3	17.76	90.89	94.89	14.52	0.1080
3x240+3x120/3E	015100831016A	3	20.50	97.82	101.82	17.29	0.0817
3x300+3x150/3E	015100831017A	3	22.79	103.59	107.59	20.07	0.0654

NOTE

MGA (LHM)TEI-R 1kV - 3kV

MV reeling cable for shuttle cars

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)TEI-R
- **VDE type designation:** (N)SSHCGEOEU
- **Standard:** DIN VDE 0250 Part 814
- **Core arrangement:** 4 core design, 3 main cores and the grounding conductor laid up
- **Installation:** Reeling

1	**Power conductor**	Flexible tinned copper conductors, very finely stranded (class 5)
2	**Insulation**	EPR rubber compound, 90°C rated
3	**Electrical field control**	Semiconductive rubber layer
4	**PE conductor**	Large dimension standalone grounding conductor, laid up with the main cores. Covered with semiconductive tape and rubber layer
5	**Inner sheath**	High grade synthetic elastomer compound, basic material: CR, sheath movement prevented
6	**Reinforcement unit**	Central reinforcement of aramid yarns to handle significant tensile loads
7	**Reinforcement layer**	Aramid threads braided over the inner sheath, anti-torsion
8	**Outer sheath**	Robust mold-cured rubber compound, basic material: CR, resistance to abrasion and tearing

Suitable Working Environment

Ambient temperature for fixed installation
-40°C~80°C

Ambient temperature in fully flexible operation
-25°C~80°C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Reeling cables designed for mining application with extreme tensile loads and torsion forces, e.g. shuttle cars. The cores are protected against high mechanical stresses during fast winding and unwinding.

Sketch

- Optimized 4-core structure for stress distribution, very suitable for applications with significant mechanical stress
- Reinforcement layer to handle significant torsion forces during frequent winding and unwinding
- Good for reeling installation with continuous movement and acceleration, i.e. shuttle cars

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Electrical Parameters

	0.6/1 kV	1.8/3 kV
Rated voltage		
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90°C

Max. short circuit temperature of the conductor
250°C

1. See DIN VDE 0207.
2. Designed based on provided characteristic impedance.

Specification- MGA (LHM)TEI-R

0.6/1 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x10+1x10	015110131N06A	3	4.20	28.65	31.15	1.25	1.9500
3x16+1x16	015110131N07A	3	5.37	32.61	35.61	1.70	1.2400
3x25+1x25	015110131N08A	3	6.72	36.50	39.50	2.28	0.7950
3x35+1x35	015110131N09A	3	7.83	39.73	43.23	2.87	0.5650
3x50+1x50	015110131N10A	3	9.44	44.97	48.47	3.82	0.3930
3x70+1x70	015110131N11A	3	11.31	50.96	54.96	5.06	0.2770
3x95+1x90	015110131N12A	3	13.08	56.67	60.67	6.52	0.2100
3x120+1x120	015110131N13A	3	14.89	61.90	65.90	7.95	0.1640
3x150+1x150	015110131N14A	3	16.49	67.71	71.71	9.73	0.1320

1.8/3 kV

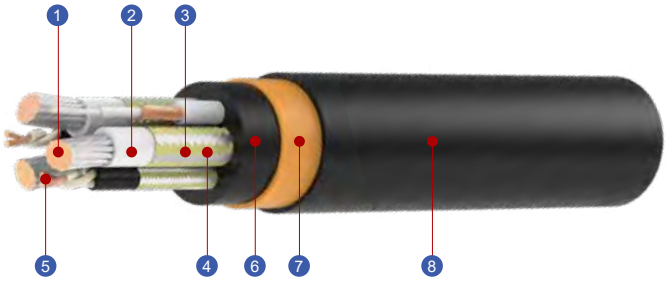
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x10+1x10	015110231N06A	3	4.20	30.38	32.88	1.36	1.9500
3x16+1x16	015110231N07A	3	5.37	34.34	37.34	1.83	1.2400
3x25+1x25	015110231N08A	3	6.72	38.82	41.82	2.48	0.7950
3x35+1x35	015110231N09A	3	7.83	42.05	45.55	3.08	0.5650
3x50+1x50	015110231N10A	3	9.44	46.71	50.21	4.00	0.3930
3x70+1x70	015110231N11A	3	11.31	52.70	56.70	5.27	0.2770
3x95+1x95	015110231N12A	3	13.08	58.99	62.99	6.83	0.2100
3x120+1x120	015110231N13A	3	14.89	64.21	68.21	8.29	0.1640
3x150+1x150	015110231N14A	3	16.49	69.45	73.45	10.00	0.1320

MGA (LHM)BAWM/W^{100} 1kV - 3kV

MV flexible cable for submersible applications

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)BAWM/W^{100}
- **VDE type designation:** (N)TSCEWOEU/W^{100}
- **Standard:** DIN VDE 0250 Part 813
- **Core arrangement** Metallic screened phase conductors laid up with pilot cores in the outer interstices[2]
- **Installation:** Fixed installation



1	**Power conductor**	Tinned copper conductors, stranded
2	**Insulation**	Special HEPR elastomeric compound, suitable for wet environment
3	**Electrical field control**	Metallic screen
4	**PE conductor**	Braid of copper/textile wires over the insulation
5	**Pilot conductor**	Sheathed twist pairs of insulated tinned copper conductors, metallic screened and taped[1]
6	**Inner sheath**	Special rubber compound with emphasis on waterproof and resilience
7	**Waterproof Layer**	Special waterproof rubber layer preventing water penetration and formation of water bubbles, basic material: HDPE
8	**Outer sheath**	Robust synthetic elastomer compound, basic material: CM, emphasizing on waterproof

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Water Resistance
EN 50525-2-21

Weather resistance
Resistant to ozone, UV and moisture

Application

Flexible power supply cable intended for dredging equipment, submersible pumps, floating docks, etc. Metallic screened phase conductors. Can be applied in waste water, sewage water and salt water at depth up to 100 meters. Control, communication and optic fibre transmission provided at option.

Sketch

- · Cables for use in water at depth up to 100 meters (balanced structure, regular velocity of flow allowable)
- · Communication pairs provided for telecommunication signal transmission under water
- · Control units and fibre optic elements[3] available at option

Mechanical Parameters

Max. tensile loads on the conductors
25 MPa

Torsion stress
40 °/m

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. Control cores provided at option in the outer interstices.
2. This version is provided as an example of cables used in water, please consult sales for other customized design.
3. E9/125 optic fiber provided when applicable.

Specification- MGA (LHM)BAWM/W[100]

0.6/1 kV	Characteristic Impedance = 50Ω[1]							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	015140131308U1	3	3	6.86	39.76	41.76	2.53	0.7950
3x35+3x25/3E+3x(2x1.5)FM	015140131309U1	3	3	8.00	43.21	45.51	3.09	0.5650
3x50+3x35/3E+3x(2x1.5)FM	015140131310U1	3	3	9.65	47.94	50.54	3.89	0.3930
3x70+3x35/3E+3x(2x1.5)FM	015140131311U1	3	3	11.55	53.46	56.36	4.97	0.2770
3x95+3x50/3E+3x(2x1.5)FM	015140131312U1	3	3	13.36	58.61	61.81	6.15	0.2100
3x120+3x50/3E+3x(2x1.5)FM	015140131313U1	3	3	15.21	63.33	66.83	7.35	0.1640
3x150+3x50/3E+3x(2x1.5)FM	015140131314U1	3	3	16.85	68.56	72.36	8.76	0.1320
3x185+3x70/3E+3x(2x1.5)FM	015140131315U1	3	3	18.75	74.07	78.07	10.41	0.1080
3x240+3x70/3E+3x(2x1.5)FM	015140131316U1	3	3	21.29	80.92	84.92	12.79	0.0817
3x300+3x70/3E+3x(2x1.5)FM	015140131317U1	3	3	24.21	88.72	92.72	15.48	0.0654

1.8/3 kV	Characteristic Impedance = 50Ω							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM	015140231308U1	3	3	6.86	42.29	44.29	2.73	0.7950
3x35+3x25/3E+3x(2x1.5)FM	015140231309U1	3	3	8.00	45.24	47.54	3.26	0.5650
3x50+3x35/3E+3x(2x1.5)FM	015140231310U1	3	3	9.65	49.46	52.06	4.04	0.3930
3x70+3x35/3E+3x(2x1.5)FM	015140231311U1	3	3	11.55	54.98	57.88	5.13	0.2770
3x95+3x50/3E+3x(2x1.5)FM	015140231312U1	3	3	13.36	60.63	63.83	6.43	0.2100
3x120+3x50/3E+3x(2x1.5)FM	015140231313U1	3	3	15.21	65.35	68.85	7.61	0.1640
3x150+3x50/3E+3x(2x1.5)FM	015140231314U1	3	3	16.85	70.07	73.87	9.02	0.1320
3x185+3x70/3E+3x(2x1.5)FM	015140231315U1	3	3	18.75	75.58	79.58	10.63	0.1080
3x240+3x70/3E+3x(2x1.5)FM	015140231316U1	3	3	21.29	82.43	86.43	13.04	0.0817
3x300+3x70/3E+3x(2x1.5)FM	015140231317U1	3	3	24.21	89.73	93.73	15.66	0.0654

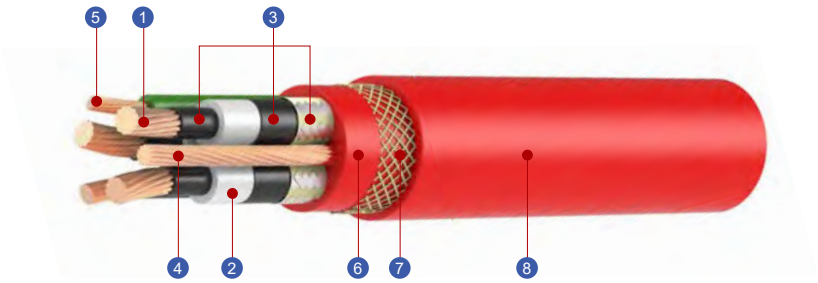
1. Other versions of different characteristic impedance available, please consult sales for specification.

MGA (LHD)TEEAIG 6kV - 30kV

Double sheathed cable with grounding check element

Product Overview

- **LH series:** MGA
- **LH code:** (LHD)TEEAIG
- **VDE type designation:** (N)SSHCGECOEU
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** Metallic screened main cores laid up, earth and grounding check conductors in the outer interstices
- **Installation:** Trailing/reeling/(semi-)fixed installation



1	**Power conductor**	Tinned copper conductors, finely stranded (class 5)
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Double semiconductive layer with metallic screen over the outer layer
4	**PE conductor**	Standalone tinned copper conductors, stranded and placed in the outer interstices
5	**Grounding check conductor**	EPR insulated tinned copper conductor placed in one of the outer interstices
6	**Inner sheath**	High grade rubber compound, basic material: CR, sheath movement prevented
7	**Reinforcement layer**	Aramid yarns braided over the inner sheath
8	**Outer sheath**	Tough synthetic rubber compound, basic material: CR, tearing proof and resistant to abrasion

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-30 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed cable with grounding check element for operational safety. Intended to be used as power supply to opencast mining equipment including shovels, excavators, draglines, etc. Good for either trailing or reeling installation.

Sketch

- Good for trailing, reeling or semi-fixed installation, suitable for most of the opencast mining equipment
- Robust structure and tough jacket with high resilience handling mechanical stress during normal operation as well as accidental tire impact
- Metallic screened phase conductors for optimized EMC, and a grounding check unit provided for enhanced safety

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
90 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHD)TEEAIG

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170331008A	3	6.86	41.20	44.50	2.53	0.7950
3x35+3x16/3	015170331009A	3	8.00	43.83	47.53	3.05	0.5650
3x50+3x25/3	015170331010A	3	9.65	47.73	51.83	3.86	0.3930
3x70+3x35/3	015170331011A	3	11.55	52.29	56.79	4.91	0.2770
3x95+3x50/3	015170331012A	3	13.36	57.11	62.01	6.19	0.2100
3x120+3x50/3	015170331013A	3	15.21	61.76	66.76	7.47	0.1640
3x150+3x70/3	015170331014A	3	16.85	65.91	70.91	8.90	0.1320
3x185+3x95/3	015170331015A	3	18.75	70.71	75.71	10.58	0.1080
3x240+3x120/3	015170331016A	3	21.29	77.12	82.12	13.16	0.0817
3x300+3x150/3	015170331017A	3	24.21	84.48	89.48	16.07	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170431008A	3	6.86	43.22	46.52	2.72	0.7950
3x35+3x16/3	015170431009A	3	8.00	45.85	49.55	3.26	0.5650
3x50+3x25/3	015170431010A	3	9.65	49.75	53.85	4.08	0.3930
3x70+3x35/3	015170431011A	3	11.55	54.31	58.81	5.15	0.2770
3x95+3x50/3	015170431012A	3	13.36	58.63	63.53	6.38	0.2100
3x120+3x50/3	015170431013A	3	15.21	63.03	68.03	7.65	0.1640
3x150+3x70/3	015170431014A	3	16.85	67.43	72.43	9.13	0.1320
3x185+3x95/3	015170431015A	3	18.75	72.22	77.22	10.83	0.1080
3x240+3x120/3	015170431016A	3	21.29	78.64	83.64	13.43	0.0817
3x300+3x150/3	015170431017A	3	24.21	86.00	91.00	16.37	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170531008A	3	6.86	46.25	49.55	3.02	0.7950
3x35+3x16/3	015170531009A	3	8.00	48.88	52.58	3.58	0.5650
3x50+3x25/3	015170531010A	3	9.65	52.78	56.88	4.43	0.3930
3x70+3x35/3	015170531011A	3	11.55	57.34	61.84	5.53	0.2770
3x95+3x50/3	015170531012A	3	13.36	61.66	66.56	6.80	0.2100
3x120+3x50/3	015170531013A	3	15.21	66.06	71.06	8.09	0.1640
3x150+3x70/3	015170531014A	3	16.85	70.45	75.45	9.60	0.1320
3x185+3x95/3	015170531015A	3	18.75	75.25	80.25	11.34	0.1080
3x240+3x120/3	015170531016A	3	21.29	81.67	86.67	13.98	0.0817
3x300+3x150/3	015170531017A	3	24.21	89.03	94.03	16.98	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170631008A	3	6.86	47.76	51.06	3.18	0.7950
3x35+3x16/3	015170631009A	3	8.00	50.39	54.09	3.75	0.5650
3x50+3x25/3	015170631010A	3	9.65	54.29	58.39	4.61	0.3930
3x70+3x35/3	015170631011A	3	11.55	58.85	63.35	5.73	0.2770
3x95+3x50/3	015170631012A	3	13.36	63.68	68.58	7.09	0.2100
3x120+3x50/3	015170631013A	3	15.21	68.33	73.33	8.44	0.1640
3x150+3x70/3	015170631014A	3	16.85	72.47	77.47	9.93	0.1320
3x185+3x95/3	015170631015A	3	18.75	77.27	82.27	11.69	0.1080
3x240+3x120/3	015170631016A	3	21.29	83.68	88.68	14.37	0.0817
3x300+3x150/3	015170631017A	3	24.21	91.05	96.05	17.39	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170731008A	3	6.86	52.81	56.11	3.76	0.7950
3x35+3x16/3	015170731009A	3	8.00	55.44	59.14	4.35	0.5650
3x50+3x25/3	015170731010A	3	9.65	59.34	63.44	5.26	0.3930
3x70+3x35/3	015170731011A	3	11.55	63.90	68.40	6.43	0.2770
3x95+3x50/3	015170731012A	3	13.36	68.22	73.12	7.77	0.2100
3x120+3x50/3	015170731013A	3	15.21	72.62	77.62	9.13	0.1640
3x150+3x70/3	015170731014A	3	16.85	77.02	82.02	10.71	0.1320
3x185+3x95/3	015170731015A	3	18.75	81.82	86.82	12.52	0.1080
3x240+3x120/3	015170731016A	3	21.29	88.23	93.23	15.26	0.0817
3x300+3x150/3	015170731017A	3	24.21	95.59	100.59	18.36	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3	015170831008A	3	6.86	58.37	61.67	4.45	0.7950
3x35+3x16/3	015170831009A	3	8.00	61.00	64.70	5.09	0.5650
3x50+3x25/3	015170831010A	3	9.65	64.89	68.99	6.05	0.3930
3x70+3x35/3	015170831011A	3	11.55	69.46	73.96	7.28	0.2770
3x95+3x50/3	015170831012A	3	13.36	74.28	79.18	8.75	0.2100
3x120+3x50/3	015170831013A	3	15.21	78.93	83.93	10.22	0.1640
3x150+3x70/3	015170831014A	3	16.85	83.08	88.08	11.81	0.1320
3x185+3x95/3	015170831015A	3	18.75	87.88	92.88	13.69	0.1080
3x240+3x120/3	015170831016A	3	21.29	94.29	99.29	16.52	0.0817
3x300+3x150/3	015170831017A	3	24.21	101.65	106.65	19.73	0.0654

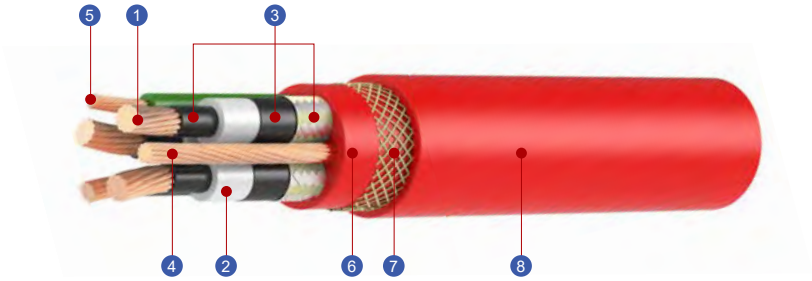
NOTE

MGA (LHD)P-TEEAIG/FR 6kV - 30kV

Double sheathed cable for flexible application in freezing environment

Product Overview

- **LH series:** MGA
- **LH code:** (LHD)P-TEEAIG/FR
- **VDE type designation:** (N)SSHCGECOEU-FR
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** Metallic screened power cores laid up, with PE conductor and grounding check unit placed in the outer interstices
- **Installation:** Trailing/reeling/semi-fixed installation



1	**Power conductor**	Tinned copper conductors, finely stranded (class 5)
2	**Insulation**	Special EPR compound, low-temperature tolerance
3	**Electrical field control**	Double layer of semiconductive rubber and metallic screen over the outer layer
4	**PE conductor**	Standalone grounding conductors placed in the outer interstices, tinned copper
5	**Grounding check conductor**	Insulated tinned copper conductor placed in the outer interstices
6	**Inner sheath**	Special compound with temperature tolerance, especially good for use in freezing environment, sheath movement prevented
7	**Reinforcement layer**	Braid of aramid threads over the inner sheath
8	**Outer sheath**	TPU jacket, extra-tough, the outstanding physical performance maintained in a wide range of temperature

Suitable Working Environment

Ambient temperature for fixed installation
-60 °C~ 80 °C

Ambient temperature in fully flexible operation
-50 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed cable intended for connection to large open pit mining equipment, such as shovels, excavators, draglines, etc. Very suitable for open pit mines in high-latitudes as these cables can be applied for fully flexible operations under temperature down to -50 °C.

Sketch

- Metallic screened phase conductors, optimized EMI shielding
- Grounding check unit provided for enhanced safety under relatively high voltage
- Special rubber compound material applied, being flexible under freezing environment while maintaining high resistance to tearing and abrasion under high temperature
- Special version with control/communication units available

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHD)P-TEEAIG/FR

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160331008A	3	6.86	41.20	44.50	2.53	0.7950
3x35+2x16+1x10C	015160331009A	3	8.00	43.83	47.53	3.05	0.5650
3x50+2x16+1x10C	015160331010A	3	9.65	47.73	51.83	3.86	0.3930
3x70+2x25+1x10C	015160331011A	3	11.55	52.29	56.79	4.91	0.2770
3x95+2x35+1x10C	015160331012A	3	13.36	57.11	62.01	6.19	0.2100
3x120+2x35+1x10C	015160331013A	3	15.21	61.76	66.76	7.47	0.1640
3x150+2x50+1x10C	015160331014A	3	16.85	65.91	70.91	8.90	0.1320
3x185+2x50+1x10C	015160331015A	3	18.75	70.71	75.71	10.58	0.1080
3x240+2x70+1x10C	015160331016A	3	21.29	77.12	82.12	13.16	0.0817
3x300+2x95+1x10C	015160331017A	3	24.21	84.48	89.48	16.07	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160431008A	3	6.86	43.22	46.52	2.72	0.7950
3x35+2x16+1x10C	015160431009A	3	8.00	45.85	49.55	3.26	0.5650
3x50+2x16+1x10C	015160431010A	3	9.65	49.75	53.85	4.08	0.3930
3x70+2x25+1x10C	015160431011A	3	11.55	54.31	58.81	5.15	0.2770
3x95+2x35+1x10C	015160431012A	3	13.36	58.63	63.53	6.38	0.2100
3x120+2x35+1x10C	015160431013A	3	15.21	63.03	68.03	7.65	0.1640
3x150+2x50+1x10C	015160431014A	3	16.85	67.43	72.43	9.13	0.1320
3x185+2x50+1x10C	015160431015A	3	18.75	72.22	77.22	10.83	0.1080
3x240+2x70+1x10C	015160431016A	3	21.29	78.64	83.64	13.43	0.0817
3x300+2x95+1x10C	015160431017A	3	24.21	86.00	91.00	16.37	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160531008A	3	6.86	46.25	49.55	3.02	0.7950
3x35+2x16+1x10C	015160531009A	3	8.00	48.88	52.58	3.58	0.5650
3x50+2x16+1x10C	015160531010A	3	9.65	52.78	56.88	4.43	0.3930
3x70+2x25+1x10C	015160531011A	3	11.55	57.34	61.84	5.53	0.2770
3x95+2x35+1x10C	015160531012A	3	13.36	61.66	66.56	6.80	0.2100
3x120+2x35+1x10C	015160531013A	3	15.21	66.06	71.06	8.09	0.1640
3x150+2x50+1x10C	015160531014A	3	16.85	70.45	75.45	9.60	0.1320
3x185+2x50+1x10C	015160531015A	3	18.75	75.25	80.25	11.34	0.1080
3x240+2x70+1x10C	015160531016A	3	21.29	81.67	86.67	13.98	0.0817
3x300+2x95+1x10C	015160531017A	3	24.21	89.03	94.03	16.98	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160631008A	3	6.86	47.76	51.06	3.18	0.7950
3x35+2x16+1x10C	015160631009A	3	8.00	50.39	54.09	3.75	0.5650
3x50+2x16+1x10C	015160631010A	3	9.65	54.29	58.39	4.61	0.3930
3x70+2x25+1x10C	015160631011A	3	11.55	58.85	63.35	5.73	0.2770
3x95+2x35+1x10C	015160631012A	3	13.36	63.68	68.58	7.09	0.2100
3x120+2x35+1x10C	015160631013A	3	15.21	68.33	73.33	8.44	0.1640
3x150+2x50+1x10C	015160631014A	3	16.85	72.47	77.47	9.93	0.1320
3x185+2x50+1x10C	015160631015A	3	18.75	77.27	82.27	11.69	0.1080
3x240+2x70+1x10C	015160631016A	3	21.29	83.68	88.68	14.37	0.0817
3x300+2x95+1x10C	015160631017A	3	24.21	91.05	96.05	17.39	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160731008A	3	6.86	52.81	56.11	3.76	0.7950
3x35+2x16+1x10C	015160731009A	3	8.00	55.44	59.14	4.35	0.5650
3x50+2x16+1x10C	015160731010A	3	9.65	59.34	63.44	5.26	0.3930
3x70+2x25+1x10C	015160731011A	3	11.55	63.90	68.40	6.43	0.2770
3x95+2x35+1x10C	015160731012A	3	13.36	68.22	73.12	7.77	0.2100
3x120+2x35+1x10C	015160731013A	3	15.21	72.62	77.62	9.13	0.1640
3x150+2x50+1x10C	015160731014A	3	16.85	77.02	82.02	10.71	0.1320
3x185+2x50+1x10C	015160731015A	3	18.75	81.82	86.82	12.52	0.1080
3x240+2x70+1x10C	015160731016A	3	21.29	88.23	93.23	15.26	0.0817
3x300+2x95+1x10C	015160731017A	3	24.21	95.59	100.59	18.36	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015160831008A	3	6.86	58.37	61.67	4.45	0.7950
3x35+2x16+1x10C	015160831009A	3	8.00	61.00	64.70	5.09	0.5650
3x50+2x16+1x10C	015160831010A	3	9.65	64.89	68.99	6.05	0.3930
3x70+2x25+1x10C	015160831011A	3	11.55	69.46	73.96	7.28	0.2770
3x95+2x35+1x10C	015160831012A	3	13.36	74.28	79.18	8.75	0.2100
3x120+2x35+1x10C	015160831013A	3	15.21	78.93	83.93	10.22	0.1640
3x150+2x50+1x10C	015160831014A	3	16.85	83.08	88.08	11.81	0.1320
3x185+2x50+1x10C	015160831015A	3	18.75	87.88	92.88	13.69	0.1080
3x240+2x70+1x10C	015160831016A	3	21.29	94.29	99.29	16.52	0.0817
3x300+2x95+1x10C	015160831017A	3	24.21	101.65	106.65	19.73	0.0654

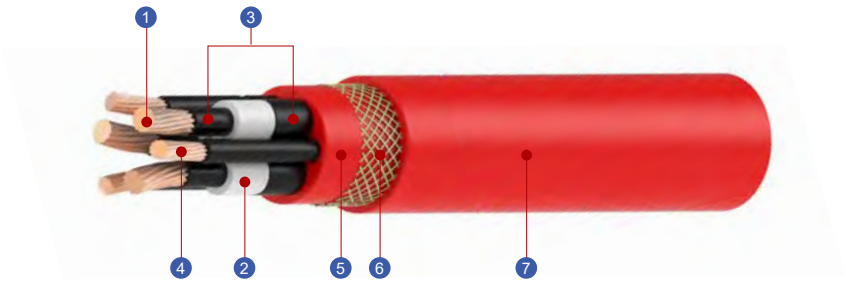
NOTE

MGA (LHD)P-TEEI/FR 6kV - 30kV

Cold resistant MV flexible cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHD)P-TEEI/FR
- **VDE type designation:** (N)SSHCGEOEU-FR
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** Power cores laid up, with grounding conductors placed in the outer interstices
- **Installation:** Trailing/reeling/semi-fixed installation



1	**Power conductor**	Finely stranded copper conductors, tinned (class 5)
2	**Insulation**	Special EPR compound for temperature tolerance
3	**Electrical field control**	Double layer of semiconductive rubber, special compound applied for the outer layer (low temperature resistance)
4	**PE conductor**	Standalone grounding conductors placed in the outer interstices, tinned copper
5	**Inner sheath**	Special rubber compound preventing sheath movement
6	**Reinforcement layer**	Anti-torsion layer, aramid yarns braided over the inner sheath
7	**Outer sheath**	Robust and tough polyurethane compound, proprietary formulation, maintaining physical performance in a wide range of temperature

Suitable Working Environment

Ambient temperature for fixed installation
-60 °C~ 80 °C

Ambient temperature in fully flexible operation
-50 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Medium voltage flexible cable for application with rated voltage no higher than 30 kV. Used as power supply to opencast mining equipment like shovels, draglines, etc. Flexible under low temperature while having outstanding abrasion resistance and tearproof performance in hot environment. Suitable for either trailing or reeling installation.

Sketch

- Special rubber compound material applied, being flexible under freezing environment while maintaining high resistance to tearing and abrasion under high temperature
- Special version with control/communication units available

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHD)P-TEEI/FR

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190331008A	3	6.86	35.90	39.20	2.14	0.7950
3x35+3x6	015190331009A	3	8.00	38.53	42.23	2.64	0.5650
3x50+3x10	015190331010A	3	9.65	42.43	46.53	3.41	0.3930
3x70+3x16	015190331011A	3	11.55	46.99	51.49	4.41	0.2770
3x95+3x16	015190331012A	3	13.36	51.31	56.21	5.58	0.2100
3x120+3x25	015190331013A	3	15.21	55.71	60.71	6.78	0.1640
3x150+3x25	015190331014A	3	16.85	59.60	64.60	8.13	0.1320
3x185+3x35	015190331015A	3	18.75	64.15	69.15	9.72	0.1080
3x240+3x50	015190331016A	3	21.29	70.30	75.30	12.17	0.0817
3x300+3x50	015190331017A	3	24.21	77.41	82.41	14.94	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190431008A	3	6.86	36.91	40.21	2.22	0.7950
3x35+3x6	015190431009A	3	8.00	39.54	43.24	2.73	0.5650
3x50+3x10	015190431010A	3	9.65	43.44	47.54	3.51	0.3930
3x70+3x16	015190431011A	3	11.55	48.00	52.50	4.52	0.2770
3x95+3x16	015190431012A	3	13.36	52.32	57.22	5.70	0.2100
3x120+3x25	015190431013A	3	15.21	56.72	61.72	6.91	0.1640
3x150+3x25	015190431014A	3	16.85	60.61	65.61	8.27	0.1320
3x185+3x35	015190431015A	3	18.75	65.16	70.16	9.87	0.1080
3x240+3x50	015190431016A	3	21.29	71.31	76.31	12.33	0.0817
3x300+3x50	015190431017A	3	24.21	78.42	83.42	15.12	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190531008A	3	6.86	41.45	44.75	2.63	0.7950
3x35+3x6	015190531009A	3	8.00	44.08	47.78	3.17	0.5650
3x50+3x10	015190531010A	3	9.65	47.98	52.08	3.99	0.3930
3x70+3x16	015190531011A	3	11.55	52.54	57.04	5.05	0.2770
3x95+3x16	015190531012A	3	13.36	56.86	61.76	6.27	0.2100
3x120+3x25	015190531013A	3	15.21	61.26	66.26	7.53	0.1640
3x150+3x25	015190531014A	3	16.85	65.15	70.15	8.93	0.1320
3x185+3x35	015190531015A	3	18.75	69.70	74.70	10.58	0.1080
3x240+3x50	015190531016A	3	21.29	75.86	80.86	13.11	0.0817
3x300+3x50	015190531017A	3	24.21	82.97	87.97	15.97	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190631008A	3	6.86	44.0	47.3	2.9	0.7950
3x35+3x6	015190631009A	3	8.00	46.6	50.3	3.4	0.5650
3x50+3x10	015190631010A	3	9.65	50.5	54.6	4.3	0.3930
3x70+3x16	015190631011A	3	11.55	55.1	59.6	5.4	0.2770
3x95+3x16	015190631012A	3	13.36	59.4	64.3	6.6	0.2100
3x120+3x25	015190631013A	3	15.21	63.8	68.8	7.9	0.1640
3x150+3x25	015190631014A	3	16.85	67.7	72.7	9.3	0.1320
3x185+3x35	015190631015A	3	18.75	72.2	77.2	11.0	0.1080
3x240+3x50	015190631016A	3	21.29	78.4	83.4	13.6	0.0817
3x300+3x50	015190631017A	3	24.21	85.5	90.5	16.5	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190731008A	3	6.86	47.51	50.81	3.25	0.7950
3x35+3x6	015190731009A	3	8.00	50.14	53.84	3.83	0.5650
3x50+3x10	015190731010A	3	9.65	54.04	58.14	4.70	0.3930
3x70+3x16	015190731011A	3	11.55	58.60	63.10	5.82	0.2770
3x95+3x16	015190731012A	3	13.36	62.92	67.82	7.11	0.2100
3x120+3x25	015190731013A	3	15.21	67.32	72.32	8.43	0.1640
3x150+3x25	015190731014A	3	16.85	71.21	76.21	9.88	0.1320
3x185+3x35	015190731015A	3	18.75	75.76	80.76	11.60	0.1080
3x240+3x50	015190731016A	3	21.29	81.92	86.92	14.21	0.0817
3x300+3x50	015190731017A	3	24.21	89.03	94.03	17.18	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x6	015190831008A	3	6.86	52.06	55.36	3.78	0.7950
3x35+3x6	015190831009A	3	8.00	54.68	58.38	4.38	0.5650
3x50+3x10	015190831010A	3	9.65	58.58	62.68	5.29	0.3930
3x70+3x16	015190831011A	3	11.55	63.14	67.64	6.46	0.2770
3x95+3x16	015190831012A	3	13.36	67.46	72.36	7.80	0.2100
3x120+3x25	015190831013A	3	15.21	71.86	76.86	9.16	0.1640
3x150+3x25	015190831014A	3	16.85	75.76	80.76	10.65	0.1320
3x185+3x35	015190831015A	3	18.75	80.30	85.30	12.42	0.1080
3x240+3x50	015190831016A	3	21.29	86.46	91.46	15.10	0.0817
3x300+3x50	015190831017A	3	24.21	93.57	98.57	18.14	0.0654

NOTE

MGA (LHD)P-TEEAIG/RS 6kV - 15kV

Flexible mining cable with reflective surface

Product Overview

- **LH series:** MGA
- **LH code:** (LHD)P-TEEAIG/RS
- **VDE type designation:** (N)SSHCGECOEU-RS
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** 3-core design, metallic screened phase cores cabled with earth and grounding check units
- **Installation:** Semi-fixed installation

Suitable Working Environment

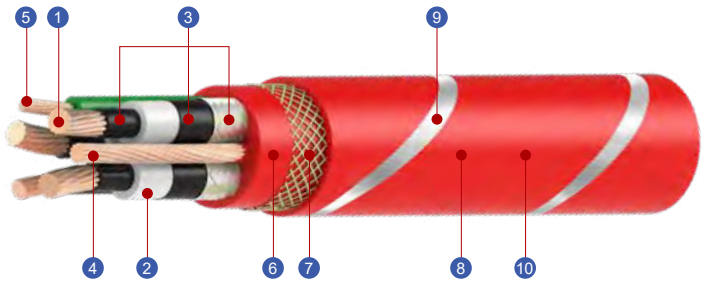
Ambient temperature for fixed installation
-60 °C~ 80 °C

Ambient temperature in fully flexible operation
-50 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture



1	**Power conductor**	Tinned copper conductors, finely stranded (class 5)
2	**Insulation**	Special EPR compound, flexible under low temperature
3	**Electrical field control**	Double layer of semiconductive rubber and metallic screened (special compound applied for cold resistance)
4	**PE conductor**	Tinned copper conductors, stranded, placed in the outer interstices
5	**Grounding check conductor**	Insulated tinned copper conductor in one of the outer interstices
6	**Inner sheath**	Inner layer of special rubber compound, SiR based, temperature tolerant and sheath movement prevented
7	**Reinforcement layer**	Aramid yarns braided over the inner sheath, anti-torsion
8	**Intermediate sheath**	TPU based compound, fire-resistant and temperature tolerant
9	**Reflective layer**	Special reflective strip taped over the intermediate sheath, enhancing the visual circuit identification
10	**Outer sheath**	Transparent TPU based special formulation, temperature tolerant and provide higher abrasion resistance, tearing proof and tensile strength

Application

Trailing cable for mobile mining equipment connection with grounding check function. Designed for open cast flexible applications like shovels, crushers and draglines. Special reflective surface design for visibility in the dark, enhancing operational safety of equipment and personnel.

Sketch

- Special design for reflective surface, enhanced visibility reducing accidental damage in dark environment
- Grounding check unit provided for electrical safety
- Suitable for most of the opencast application, trailing, reeling or semi-fixed installation allowed
- Remaining flexibility and abrasion/tearing resistance in a wide range of temperature

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHD)P-TEEAIG/RS

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015180331008A	3	6.86	40.78	44.08	2.23	0.7950
3x35+2x16+1x10C	015180331009A	3	8.00	43.52	47.22	2.73	0.5650
3x50+2x16+1x10C	015180331010A	3	9.65	47.41	51.51	3.49	0.3930
3x70+2x25+1x10C	015180331011A	3	11.55	51.91	56.41	4.46	0.2770
3x95+2x35+1x10C	015180331012A	3	13.36	56.19	61.09	5.60	0.2100
3x120+2x35+1x10C	015180331013A	3	15.21	60.54	65.54	6.77	0.1640
3x150+2x50+1x10C	015180331014A	3	16.85	64.43	69.43	8.08	0.1320
3x185+2x50+1x10C	015180331015A	3	18.75	68.92	73.92	9.62	0.1080
3x240+2x70+1x10C	015180331016A	3	21.29	74.87	79.87	11.97	0.0817
3x300+2x95+1x10C	015180331017A	3	24.21	81.70	86.70	14.61	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015180431008A	3	6.86	42.72	46.02	2.39	0.7950
3x35+2x16+1x10C	015180431009A	3	8.00	45.46	49.16	2.90	0.5650
3x50+2x16+1x10C	015180431010A	3	9.65	49.35	53.45	3.67	0.3930
3x70+2x25+1x10C	015180431011A	3	11.55	53.85	58.35	4.66	0.2770
3x95+2x35+1x10C	015180431012A	3	13.36	58.13	63.03	5.82	0.2100
3x120+2x35+1x10C	015180431013A	3	15.21	62.48	67.48	7.00	0.1640
3x150+2x50+1x10C	015180431014A	3	16.85	66.37	71.37	8.33	0.1320
3x185+2x50+1x10C	015180431015A	3	18.75	70.86	75.86	9.89	0.1080
3x240+2x70+1x10C	015180431016A	3	21.29	76.82	81.82	12.27	0.0817
3x300+2x95+1x10C	015180431017A	3	24.21	83.64	88.64	14.93	0.0654

8.7/15 kV

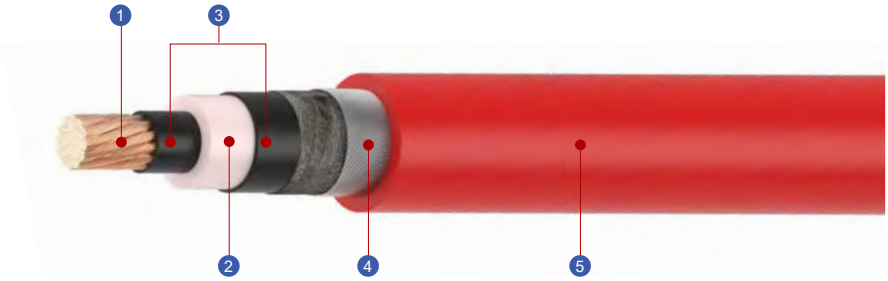
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+2x10+1x10C	015180531008A	3	6.86	45.22	48.52	2.61	0.7950
3x35+2x16+1x10C	015180531009A	3	8.00	47.96	51.66	3.14	0.5650
3x50+2x16+1x10C	015180531010A	3	9.65	51.86	55.96	3.92	0.3930
3x70+2x25+1x10C	015180531011A	3	11.55	56.35	60.85	4.94	0.2770
3x95+2x35+1x10C	015180531012A	3	13.36	60.63	65.53	6.12	0.2100
3x120+2x35+1x10C	015180531013A	3	15.21	64.99	69.99	7.32	0.1640
3x150+2x50+1x10C	015180531014A	3	16.85	68.88	73.88	8.67	0.1320
3x185+2x50+1x10C	015180531015A	3	18.75	73.36	78.36	10.25	0.1080
3x240+2x70+1x10C	015180531016A	3	21.29	79.32	84.32	12.66	0.0817
3x300+2x95+1x10C	015180531017A	3	24.21	86.14	91.14	15.36	0.0654

MGA (LHM)(G)EEL 6kV - 35kV

Single core power supply cable

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)(G)EEL
- **VDE type designation:** (N)TMCGECROEU-F
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** A stranded single core
- **Installation:** Semi-fixed installation



1	**Power conductor**	Finely stranded conductor, bare copper (class 5)
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Double layer of semiconductive rubber
4	**Overall screen**	Tinned copper wires spinning over the semiconducting tape
5	**Outer sheath**	Rubber compound, basic material: CPE, red

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Power supply cable for electrical system with rated voltage (U) between 6 kV and 35 kV. Typically used for (semi-) fixed installation, e.g. connection to power grid, switchgear, and transformers, etc.

Sketch

- Single core cable for power grid connection
- Overall screened, electrical interference to surrounding equipment controlled
- Double semiconducting layer for relatively high voltage in application

Mechanical Parameters

Max. tensile loads on the conductor
15 MPa

Torsion stress
25 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV	20/35 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV	24.2/42 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV	31.5/63 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV	50 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHM)(G)EEL

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190310008A	1	6.47	21.40	23.20	0.78	0.7950
1x35	015190310009A	1	7.62	22.67	24.57	0.91	0.5650
1x50	015190310010A	1	9.20	24.42	26.42	1.11	0.3930
1x70	015190310011A	1	10.99	26.40	28.50	1.36	0.2770
1x95	015190310012A	1	12.81	28.43	30.63	1.66	0.2100
1x120	015190310013A	1	14.39	30.41	32.71	1.96	0.1640
1x150	015190310014A	1	16.05	32.48	34.88	2.32	0.1320
1x185	015190310015A	1	17.76	34.60	37.10	2.71	0.1080
1x240	015190310016A	1	20.50	37.90	40.50	3.34	0.0817
1x300	015190310017A	1	22.79	40.68	43.38	3.99	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190410008A	1	6.47	22.31	24.11	0.83	0.7950
1x35	015190410009A	1	7.62	23.58	25.48	0.97	0.5650
1x50	015190410010A	1	9.20	25.33	27.33	1.17	0.3930
1x70	015190410011A	1	10.99	27.31	29.41	1.42	0.2770
1x95	015190410012A	1	12.81	29.33	31.53	1.72	0.2100
1x120	015190410013A	1	14.39	31.32	33.62	2.03	0.1640
1x150	015190410014A	1	16.05	33.39	35.79	2.39	0.1320
1x185	015190410015A	1	17.76	35.51	38.01	2.79	0.1080
1x240	015190410016A	1	20.50	38.81	41.41	3.43	0.0817
1x300	015190410017A	1	22.79	41.59	44.29	4.09	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190510008A	1	6.47	23.45	25.25	0.89	0.7950
1x35	015190510009A	1	7.62	24.72	26.62	1.03	0.5650
1x50	015190510010A	1	9.20	26.46	28.46	1.24	0.3930
1x70	015190510011A	1	10.99	28.45	30.55	1.50	0.2770
1x95	015190510012A	1	12.81	30.47	32.67	1.81	0.2100
1x120	015190510013A	1	14.39	32.46	34.76	2.12	0.1640
1x150	015190510014A	1	16.05	34.53	36.93	2.48	0.1320
1x185	015190510015A	1	17.76	36.65	39.15	2.89	0.1080
1x240	015190510016A	1	20.50	39.95	42.55	3.53	0.0817
1x300	015190510017A	1	22.79	42.73	45.43	4.20	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190610008A	1	6.47	24.59	26.39	0.96	0.7950
1x35	015190610009A	1	7.62	25.85	27.75	1.11	0.5650
1x50	015190610010A	1	9.20	27.60	29.60	1.32	0.3930
1x70	015190610011A	1	10.99	29.59	31.69	1.58	0.2770
1x95	015190610012A	1	12.81	31.61	33.81	1.89	0.2100
1x120	015190610013A	1	14.39	33.60	35.90	2.21	0.1640
1x150	015190610014A	1	16.05	35.66	38.06	2.58	0.1320
1x185	015190610015A	1	17.76	37.78	40.28	2.99	0.1080
1x240	015190610016A	1	20.50	41.08	43.68	3.64	0.0817
1x300	015190610017A	1	22.79	43.86	46.56	4.32	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190710008A	1	6.47	26.41	28.21	1.08	0.7950
1x35	015190710009A	1	7.62	27.67	29.57	1.23	0.5650
1x50	015190710010A	1	9.20	29.42	31.42	1.44	0.3930
1x70	015190710011A	1	10.99	31.41	33.51	1.72	0.2770
1x95	015190710012A	1	12.81	33.43	35.63	2.04	0.2100
1x120	015190710013A	1	14.39	35.42	37.72	2.36	0.1640
1x150	015190710014A	1	16.05	37.48	39.88	2.74	0.1320
1x185	015190710015A	1	17.76	39.60	42.10	3.16	0.1080
1x240	015190710016A	1	20.50	42.90	45.50	3.83	0.0817
1x300	015190710017A	1	22.79	45.68	48.38	4.51	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190810008A	1	6.47	29.36	31.16	1.28	0.7950
1x35	015190810009A	1	7.62	30.63	32.53	1.44	0.5650
1x50	015190810010A	1	9.20	32.38	34.38	1.67	0.3930
1x70	015190810011A	1	10.99	34.36	36.46	1.95	0.2770
1x95	015190810012A	1	12.81	36.38	38.58	2.28	0.2100
1x120	015190810013A	1	14.39	38.37	40.67	2.62	0.1640
1x150	015190810014A	1	16.05	40.44	42.84	3.01	0.1320
1x185	015190810015A	1	17.76	42.56	45.06	3.45	0.1080
1x240	015190810016A	1	20.50	45.86	48.46	4.14	0.0817
1x300	015190810017A	1	22.79	48.64	51.34	4.84	0.0654

20/35 kV

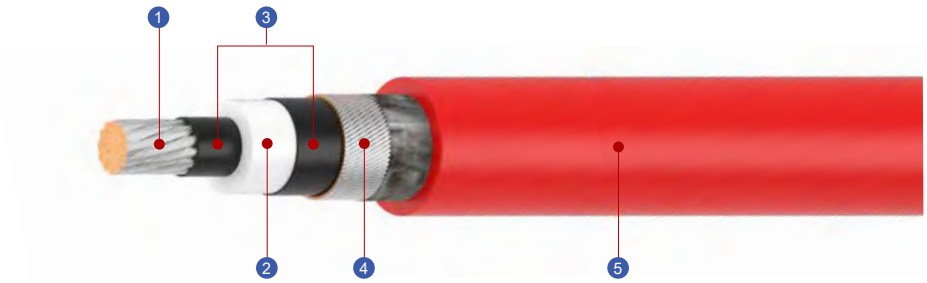
Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015190910008A	1	6.47	32.77	34.57	1.54	0.7950
1x35	015190910009A	1	7.62	34.04	35.94	1.70	0.5650
1x50	015190910010A	1	9.20	35.79	37.79	1.95	0.3930
1x70	015190910011A	1	10.99	37.77	39.87	2.25	0.2770
1x95	015190910012A	1	12.81	39.79	41.99	2.60	0.2100
1x120	015190910013A	1	14.39	41.78	44.08	2.95	0.1640
1x150	015190910014A	1	16.05	43.85	46.25	3.35	0.1320
1x185	015190910015A	1	17.76	45.97	48.47	3.81	0.1080
1x240	015190910016A	1	20.50	49.27	51.87	4.52	0.0817
1x300	015190910017A	1	22.79	52.05	54.75	5.24	0.0654

MGA (LHM)(G)EEL-F 6kV - 35kV

Single core power supply cable with litz wire screen

Product Overview

- **LH series:** MGA
- **LH code:** (LHM)(G)EEL-F
- **VDE type designation:** (N)TMCGECRLOEU-F
- **Standard:** DIN VDE 0250 Part 813 and internal spec.
- **Core arrangement:** A stranded single core
- **Installation:** Fixed installation



1	**Power conductor**	Finely stranded conductor, tinned copper (class 5)
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Double layer of semiconductive rubber
4	**Overall screen**	Stranded wires spinning over the semiconducting tape, tinned copper
5	**Outer sheath**	Rubber compound, basic material: CPE, red

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Fire resistance
IEC 60332-1-2

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Power supply cable for electrical system with rated voltage (U) between 6kV and 35 kV. Typically used for (semi-) fixed installation, e.g. connection to power grid, switchgear, and transformers, etc.

Sketch

- Single core cable for applications with relatively high voltage
- Overall screen of copper strands, minimized electrical interference from the power core
- Double semiconducting layer for relatively high voltage in application

Mechanical Parameters

Max. tensile loads on the conductor
15 MPa

Torsion stress
25 °/m

Electrical Parameters

Rated voltage	3.6/6 kV	6/10 kV	8.7/15 kV	12/20 kV	14/25 kV	18/30 kV	20/35 kV
Max. permissible operating voltage AC	4.2/7.2 kV	6.9/12 kV	10.4/18 kV	13.9/24 kV	17.3/30 kV	20.8/36 kV	24.2/42 kV
Max. permissible operating voltage DC	5.4/10.8 kV	9/18 kV	13.5/27 kV	18/36 kV	22.5/45 kV	27/54 kV	31.5/63 kV
AC test voltage (main cores)	11 kV	17 kV	24 kV	29 kV	36 kV	43 kV	50 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

Specification- MGA (LHM)(G)EEL-F

3.6/6 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200310008A	1	6.47	23.68	25.48	1.01	0.7950
1x35	015200310009A	1	7.62	24.94	26.84	1.15	0.5650
1x50	015200310010A	1	9.20	26.69	28.69	1.37	0.3930
1x70	015200310011A	1	10.99	28.68	30.78	1.66	0.2770
1x95	015200310012A	1	12.81	30.70	32.90	1.97	0.2100
1x120	015200310013A	1	14.39	32.69	34.99	2.29	0.1640
1x150	015200310014A	1	16.05	34.75	37.15	2.68	0.1320
1x185	015200310015A	1	17.76	36.87	39.37	3.09	0.1080
1x240	015200310016A	1	20.50	40.17	42.77	3.76	0.0817
1x300	015200310017A	1	22.79	42.95	45.65	4.44	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200410008A	1	6.47	24.59	26.39	1.07	0.7950
1x35	015200410009A	1	7.62	25.85	27.75	1.22	0.5650
1x50	015200410010A	1	9.20	27.60	29.60	1.44	0.3930
1x70	015200410011A	1	10.99	29.59	31.69	1.73	0.2770
1x95	015200410012A	1	12.81	31.61	33.81	2.04	0.2100
1x120	015200410013A	1	14.39	33.60	35.90	2.37	0.1640
1x150	015200410014A	1	16.05	35.66	38.06	2.76	0.1320
1x185	015200410015A	1	17.76	37.78	40.28	3.18	0.1080
1x240	015200410016A	1	20.50	41.08	43.68	3.85	0.0817
1x300	015200410017A	1	22.79	43.86	46.56	4.55	0.0654

8.7/15 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200510008A	1	6.47	25.72	27.52	1.14	0.7950
1x35	015200510009A	1	7.62	26.99	28.89	1.31	0.5650
1x50	015200510010A	1	9.20	28.74	30.74	1.53	0.3930
1x70	015200510011A	1	10.99	30.72	32.82	1.81	0.2770
1x95	015200510012A	1	12.81	32.75	34.95	2.13	0.2100
1x120	015200510013A	1	14.39	34.73	37.03	2.48	0.1640
1x150	015200510014A	1	16.05	36.80	39.20	2.86	0.1320
1x185	015200510015A	1	17.76	38.92	41.42	3.30	0.1080
1x240	015200510016A	1	20.50	42.22	44.82	3.98	0.0817
1x300	015200510017A	1	22.79	45.00	47.70	4.68	0.0654

12/20 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200610008A	1	6.47	26.86	28.66	1.24	0.7950
1x35	015200610009A	1	7.62	28.13	30.03	1.39	0.5650
1x50	015200610010A	1	9.20	29.87	31.87	1.62	0.3930
1x70	015200610011A	1	10.99	31.86	33.96	1.90	0.2770
1x95	015200610012A	1	12.81	33.88	36.08	2.24	0.2100
1x120	015200610013A	1	14.39	35.87	38.17	2.58	0.1640
1x150	015200610014A	1	16.05	37.94	40.34	2.98	0.1320
1x185	015200610015A	1	17.76	40.06	42.56	3.41	0.1080
1x240	015200610016A	1	20.50	43.36	45.96	4.10	0.0817
1x300	015200610017A	1	22.79	46.14	48.84	4.80	0.0654

14/25 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200710008A	1	6.47	28.68	30.48	1.37	0.7950
1x35	015200710009A	1	7.62	29.95	31.85	1.53	0.5650
1x50	015200710010A	1	9.20	31.69	33.69	1.76	0.3930
1x70	015200710011A	1	10.99	33.68	35.78	2.07	0.2770
1x95	015200710012A	1	12.81	35.70	37.90	2.41	0.2100
1x120	015200710013A	1	14.39	37.69	39.99	2.75	0.1640
1x150	015200710014A	1	16.05	39.76	42.16	3.16	0.1320
1x185	015200710015A	1	17.76	41.88	44.38	3.60	0.1080
1x240	015200710016A	1	20.50	45.18	47.78	4.30	0.0817
1x300	015200710017A	1	22.79	47.95	50.65	5.01	0.0654

18/30 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200810008A	1	6.47	31.64	33.44	1.60	0.7950
1x35	015200810009A	1	7.62	32.90	34.80	1.78	0.5650
1x50	015200810010A	1	9.20	34.65	36.65	2.03	0.3930
1x70	015200810011A	1	10.99	36.64	38.74	2.33	0.2770
1x95	015200810012A	1	12.81	38.66	40.86	2.68	0.2100
1x120	015200810013A	1	14.39	40.65	42.95	3.05	0.1640
1x150	015200810014A	1	16.05	42.71	45.11	3.46	0.1320
1x185	015200810015A	1	17.76	44.83	47.33	3.93	0.1080
1x240	015200810016A	1	20.50	48.13	50.73	4.66	0.0817
1x300	015200810017A	1	22.79	50.91	53.61	5.38	0.0654

20/35 kV

Specifications	Part number	Number of main cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
			max. mm	min. mm	max. mm	kg/m	max. Ω/km
1x25	015200910008A	1	6.47	35.05	36.85	1.90	0.7950
1x35	015200910009A	1	7.62	36.31	38.21	2.09	0.5650
1x50	015200910010A	1	9.20	38.06	40.06	2.35	0.3930
1x70	015200910011A	1	10.99	40.05	42.15	2.67	0.2770
1x95	015200910012A	1	12.81	42.07	44.27	3.03	0.2100
1x120	015200910013A	1	14.39	44.06	46.36	3.42	0.1640
1x150	015200910014A	1	16.05	46.12	48.52	3.84	0.1320
1x185	015200910015A	1	17.76	48.24	50.74	4.32	0.1080
1x240	015200910016A	1	20.50	51.54	54.14	5.08	0.0817
1x300	015200910017A	1	22.79	54.32	57.02	5.83	0.0654

FEAM

Series Overview

FEAM — Flat cables for flexible mining applications

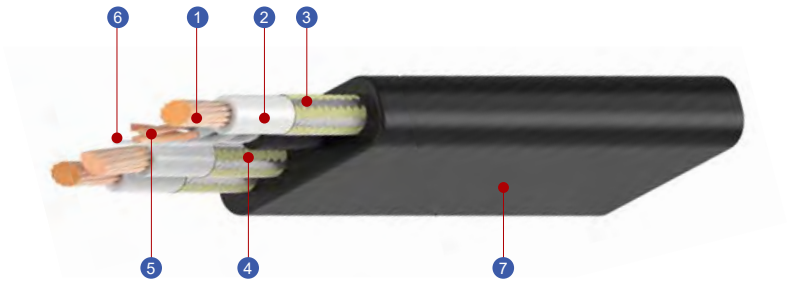
Flat cables				
	(LHF)BAC	**(LHF)BAMO**	**(LHF)BEEAC**	**(LHF)BEEAMO**
Voltage range (U)	1kV - 3kV	1kV - 3kV	6kV - 10kV	6kV - 10kV
Installation	Trailing/reeling/(semi-) fixed installation	Trailing/reeling/(semi-) fixed installation	Trailing/reeling/(semi-) fixed installation	Trailing/reeling/(semi-) fixed installation
Layout	Flat, 3 power cores	Flat, 3 power cores	Flat, 3 power cores	Flat, 3 power cores
Electric field control	Metallic screen	Metallic screen	Double semiconductive layer	Double semiconductive layer
Design	· Control core group · Reinforcement unit	· Communication pairs · Optic fibers	· Control core group · Reinforcement unit	· Communication pairs · Optic fibers

FEAM (LHF)BAC/(LHF)BEEAC 1kV - 10kV

Flat flexible cable for thin coal seam

Product Overview

- **LH series:** FEAM
- **LH code:** (LHF)BAC/(LHF)BEEAC
- **VDE type designation:** (N)GFLGCGECEOEU, (N)GFLGCGECEOEU/T
- **Standard:** DIN VDE 0250 Part 809 and internal spec.
- **Core arrangement:** Power cores and control group laid up in parallel under flat structure with reinforcement unit placed at the center
- **Installation:** Trailing/reeling/(semi-)fixed installation



1	**Power conductor**	Special stranded tinned copper conductors (class 5, proprietary design for flat structure)
2	**Insulation**	EPR rubber compound insulation over taped power conductors
3	**Electrical field control**	Metallic screen over phase cores (double semiconductive layer for rated voltage higher than 3300 volts)
4	**PE conductor**	Tinned copper wires and aramid yarns braided over the main cores
5	**Pilot conductor**	Tinned copper conductors, insulated and cabled as a control group
6	**Reinforcement unit**	Steel wires stranded as a central tensile strength reinforcement
7	**Sheath**	High grade synthetic rubber compound, mold-cured, basic material: CM/CR, 5GMG+[2]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Flat rubber sheathed cable designed for fully flexible operation. These cables are intended for mobile equipment used in thin coal seam mining, which require extremely small bending radius. Robust structure provides extended service life comparing to regular flat cables.

Sketch

- Flat cable, specifically designed for fully flexible operation and small radius bending (e.g. coal shearers) in thin coal seam
- Proprietary technology allowing extended service life under flat structure
- Optic fiber elements [1] provided at option to enable intelligent mining application

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Minimum bending radius
2.5 H

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV	3.6/6 kV	6/10 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV	4.2/7.2 kV	6.9/12 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV	5.4/10.8 kV	9/18 kV
AC test voltage (main cores)	3 kV	6 kV	11 kV	17 kV

Max. operating temperature of the conductor
90 °C

Max. short circuit temperature of the conductor
250 °C

1. E9/125 monomode fiber provided, for more than 3 fibers, the structure would change.
2. See DIN VDE 0207 Part 20-21.

Specification- FEAM (LHF)BAC/(LHF)BEEAC

0.6/1 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x2.5ST	012000131308C	3	3	6.72	18.63	19.56	58.49	60.83	2.45	0.7950
3x35+3x16/3E+3x2.5ST	012000131309C	3	3	7.83	20.23	21.24	64.13	66.70	3.04	0.5650
3x50+3x25/3E+3x2.5ST	012000131310C	3	3	9.44	22.42	23.54	72.10	74.98	3.85	0.3930
3x70+3x25/3E+3x2.5ST	012000131311C	3	3	11.31	24.93	26.17	80.61	83.83	4.94	0.2770
3x95+3x35/3E+3x2.5ST	012000131312C	3	3	13.08	27.32	28.68	87.29	90.78	6.05	0.2100
3x120+3x35/3E+3x2.5ST	012000131313C	3	3	14.89	29.51	30.98	94.46	98.23	7.29	0.1640
3x150+3x50/3E+3x2.5ST	012000131314C	3	3	16.49	31.94	33.53	101.24	105.29	8.62	0.1320
3x185+3x50/3E+3x2.5ST	012000131315C	3	3	18.36	34.44	36.16	108.82	113.17	10.22	0.1080
3x240+3x50/3E+3x2.5ST	012000131316C	3	3	20.84	37.69	39.58	117.92	122.64	12.48	0.0817
3x300+3x50/3E+3x2.5ST	012000131317C	3	3	23.70	41.40	43.47	129.17	134.34	15.14	0.0654

1.8/3 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x2.5ST	012000231308C	3	3	6.72	19.82	20.81	61.82	64.29	2.66	0.7950
3x35+3x16/3E+3x2.5ST	012000231309C	3	3	7.83	21.18	22.24	66.79	69.46	3.22	0.5650
3x50+3x25/3E+3x2.5ST	012000231310C	3	3	9.44	23.14	24.29	74.09	77.06	4.01	0.3930
3x70+3x25/3E+3x2.5ST	012000231311C	3	3	11.31	25.64	26.92	82.60	85.90	5.09	0.2770
3x95+3x35/3E+3x2.5ST	012000231312C	3	3	13.08	28.27	29.68	89.94	93.54	6.32	0.2100
3x120+3x35/3E+3x2.5ST	012000231313C	3	3	14.89	30.46	31.98	97.11	101.00	7.52	0.1640
3x150+3x50/3E+3x2.5ST	012000231314C	3	3	16.49	32.65	34.28	103.23	107.36	8.85	0.1320
3x185+3x50/3E+3x2.5ST	012000231315C	3	3	18.36	35.15	36.91	110.81	115.24	10.43	0.1080
3x240+3x50/3E+3x2.5ST	012000231316C	3	3	20.84	38.41	40.33	119.91	124.71	12.71	0.0817
3x300+3x50/3E+3x2.5ST	012000231317C	3	3	23.70	41.88	43.97	130.50	135.72	15.31	0.0654

3.6/6 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x2.5ST	012010331308C	3	3	6.72	22.44	23.56	69.12	71.89	3.18	0.7950
3x35+3x16/3E+3x2.5ST	012010331309C	3	3	7.83	23.80	24.99	74.10	77.06	3.77	0.5650
3x50+3x25/3E+3x2.5ST	012010331310C	3	3	9.44	25.75	27.04	81.40	84.66	4.63	0.3930
3x70+3x25/3E+3x2.5ST	012010331311C	3	3	11.31	28.02	29.42	89.24	92.81	5.71	0.2770
3x95+3x35/3E+3x2.5ST	012010331312C	3	3	13.08	30.17	31.68	95.26	99.07	6.83	0.2100
3x120+3x35/3E+3x2.5ST	012010331313C	3	3	14.89	32.36	33.98	102.43	106.52	8.07	0.1640
3x150+3x50/3E+3x2.5ST	012010331314C	3	3	16.49	34.32	36.03	107.88	112.20	9.37	0.1320
3x185+3x50/3E+3x2.5ST	012010331315C	3	3	18.36	36.58	38.41	114.80	119.39	10.90	0.1080
3x240+3x50/3E+3x2.5ST	012010331316C	3	3	20.84	39.60	41.58	123.23	128.16	13.14	0.0817
3x300+3x50/3E+3x2.5ST	012010331317C	3	3	23.70	43.06	45.22	133.82	139.17	15.78	0.0654

6/10 kV

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x2.5ST	012010431308C	3	3	6.72	23.39	24.56	71.78	74.65	3.40	0.7950
3x35+3x16/3E+3x2.5ST	012010431309C	3	3	7.83	24.75	25.98	76.75	79.82	3.99	0.5650
3x50+3x25/3E+3x2.5ST	012010431310C	3	3	9.44	26.70	28.04	84.06	87.42	4.86	0.3930
3x70+3x25/3E+3x2.5ST	012010431311C	3	3	11.31	28.97	30.42	91.90	95.58	5.94	0.2770
3x95+3x35/3E+3x2.5ST	012010431312C	3	3	13.08	31.12	32.68	97.91	101.83	7.11	0.2100
3x120+3x35/3E+3x2.5ST	012010431313C	3	3	14.89	33.31	34.98	105.08	109.29	8.38	0.1640
3x150+3x50/3E+3x2.5ST	012010431314C	3	3	16.49	35.27	37.03	110.54	114.96	9.64	0.1320
3x185+3x50/3E+3x2.5ST	012010431315C	3	3	18.36	37.53	39.41	117.46	122.15	11.24	0.1080
3x240+3x50/3E+3x2.5ST	012010431316C	3	3	20.84	40.55	42.58	125.89	130.93	13.51	0.0817
3x300+3x50/3E+3x2.5ST	012010431317C	3	3	23.70	44.02	46.22	136.48	141.94	16.17	0.0654

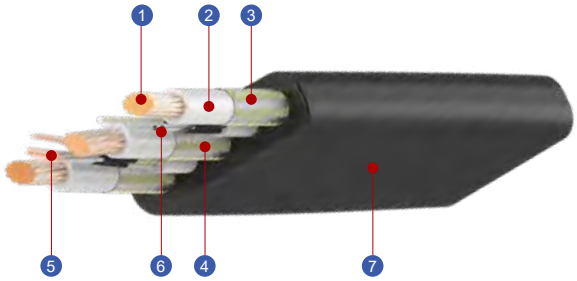
NOTE

FEAM (LHF)BAMO/(LHF)BEEAMO 1kV - 10kV

Flat mining cable for intelligent mining surfaces

Product Overview

- **LH series:** FEAM
- **LH code:** (LHF)BAMO/(LHF)BEEAMO
- **VDE type designation:**
  (N)GFLGCGECEOEU-FMOFE,
  (N)GFLGCGECEOEU-FMOFE/T
- **Standard:**
  DIN VDE 0250 Part 809 and internal spec.
- **Core arrangement:**
  Metallic screened phase conductors laid up with the fiber optic elements and a group of communication pairs in parallel
- **Installation:**
  Trailing/reeling/(semi-)fixed installation



1	**Power conductor**	Tinned copper conductors, special design for flat cable (class 5)
2	**Insulation**	Rubber compound, basic material: EPR
3	**Electrical field control**	Metallic screened phase conductors (double layer of semiconducting rubber applied for rated voltage higher than 3300 volts)
4	**PE conductor**	Braid of tinned copper wires and aramid threads over the insulation (or over the outer semiconductive layer when applicable)
5	**Pilot conductor**	Bare copper conductors insulated with FEP, twisted in pairs, sheathed and fully metallic screened. The communication pairs are further cabled as a pilot group
6	**Fibre optic group**	Optic fibers placed in buffering tubes, cabled around the central support element and sheathed
7	**Sheath**	Synthetic elastomer compound, mold-cured, basic material: CM/CR

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Multifunctional flat cables (rubber sheathed) designed for intelligent mining. Designed for flexible applications such as automatic coal cutters. Both telecommunication and optic fibre transmission are provided for high-speed large data volume transmission between the equipment and the monitoring center.

Sketch

- Flat structure, intended for applications requiring very small bending radius, very suitable for thin coal seam mining
- Having extended service life, comparable to the round coal shearer cables
- Stable telecommunication, electrical interference minized, and more over, fibre optic elements provided for large volume and high-speed data transmission

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Minimum bending radius
2.5 H

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV	3.6/6 kV	6/10 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV	4.2/7.2 kV	6.9/12 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV	5.4/10.8 kV	9/18 kV
AC test voltage (main cores)	3 kV	6 kV	11 kV	17 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. See DIN VDE Part 0207.
2. Special version for providing a combination of communication pairs and control cores.

Specification- FEAM (LHF)BAMO/(LHF)BEEAMO

(LHF)BAMO - 0.6/1 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxFO	012020131308U1	3	3	6.72	18.63	19.56	75.39	77.66	2.82	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxFO	012020131309U1	3	3	7.83	20.23	21.24	79.69	82.08	3.37	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxFO	012020131310U1	3	3	9.44	22.42	23.54	91.89	94.64	4.52	0.3930
3x70+3x25/3E+3x(2x1.5)FM+nxFO	012020131311U1	3	3	11.31	24.93	26.17	98.62	101.58	5.56	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxFO	012020131312U1	3	3	13.08	27.32	28.68	105.06	108.21	6.73	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxFO	012020131313U1	3	3	14.89	29.51	30.98	110.95	114.28	7.91	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxFO	012020131314U1	3	3	16.49	31.94	33.53	117.48	121.01	9.29	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxFO	012020131315U1	3	3	18.36	34.44	36.16	124.20	127.93	10.87	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxFO	012020131316U1	3	3	20.84	37.69	39.58	132.97	136.96	13.20	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxFO	012020131317U1	3	3	23.70	41.40	43.47	142.93	147.22	15.80	0.0654

(LHF)BAMO - 1.8/3 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxFO	012020231308U1	3	3	6.72	19.82	20.81	78.59	80.95	3.08	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxFO	012020231309U1	3	3	7.83	21.18	22.24	82.24	84.71	3.58	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxFO	012020231310U1	3	3	9.44	23.14	24.29	93.80	96.62	4.69	0.3930
3x70+3x25/3E+3x(2x1.5)FM+nxFO	012020231311U1	3	3	11.31	25.64	26.92	100.54	103.56	5.73	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxFO	012020231312U1	3	3	13.08	28.27	29.68	107.62	110.84	7.02	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxFO	012020231313U1	3	3	14.89	30.46	31.98	113.51	116.91	8.17	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxFO	012020231314U1	3	3	16.49	32.65	34.28	119.40	122.98	9.54	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxFO	012020231315U1	3	3	18.36	35.15	36.91	126.12	129.91	11.09	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxFO	012020231316U1	3	3	20.84	38.41	40.33	134.89	138.93	13.43	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxFO	012020231317U1	3	3	23.70	41.88	43.97	144.21	148.54	16.02	0.0654

(LHF)BEEAMO - 3.6/6 kV Characteristic Impedance = 50Ω

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxFO	012030331308U1	3	3	6.72	22.44	23.56	85.63	88.20	3.65	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxFO	012030331309U1	3	3	7.83	23.80	24.99	89.28	91.96	4.20	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxFO	012030331310U1	3	3	9.44	25.75	27.04	100.84	103.87	5.36	0.3930
3x70+3x25/3E+3x(2x1.5)FM+nxFO	012030331311U1	3	3	11.31	28.02	29.42	106.94	110.15	6.41	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxFO	012030331312U1	3	3	13.08	30.17	31.68	112.73	116.11	7.57	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxFO	012030331313U1	3	3	14.89	32.36	33.98	118.63	122.19	8.80	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxFO	012030331314U1	3	3	16.49	34.32	36.03	123.88	127.60	10.09	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxFO	012030331315U1	3	3	18.36	36.58	38.41	129.96	133.86	11.59	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxFO	012030331316U1	3	3	20.84	39.60	41.58	138.08	142.23	13.89	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxFO	012030331317U1	3	3	23.70	43.06	45.22	147.41	151.83	16.45	0.0654

(LHF)BEEAMO - 6/10 kV	Characteristic Impedance = 50Ω									
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Height	Height	Width	Width	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxFO	012030431308U1	3	3	6.72	23.39	24.56	88.19	90.83	3.87	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxFO	012030431309U1	3	3	7.83	24.75	25.98	91.84	94.60	4.43	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxFO	012030431310U1	3	3	9.44	26.70	28.04	103.40	106.50	5.61	0.3930
3x70+3x25/3E+3x(2x1.5)FM+nxFO	012030431311U1	3	3	11.31	28.97	30.42	109.50	112.78	6.66	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxFO	012030431312U1	3	3	13.08	31.12	32.68	115.29	118.75	7.88	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxFO	012030431313U1	3	3	14.89	33.31	34.98	121.19	124.82	9.08	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxFO	012030431314U1	3	3	16.49	35.27	37.03	126.44	130.23	10.38	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxFO	012030431315U1	3	3	18.36	37.53	39.41	132.52	136.50	11.95	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxFO	012030431316U1	3	3	20.84	40.55	42.58	140.64	144.86	14.26	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxFO	012030431317U1	3	3	23.70	44.02	46.22	149.97	154.47	16.86	0.0654

NOTE

FOMIS

Series Overview

FOMIS — Electro-optical cables for intelligent mining applications

Armored electro-optical cables				
	(LHM)SERCO	**(LHM)SERMO**	**(LHM)BARCO**	**(LHM)BARMO**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	Trailing/ chain application	Trailing/ chain application	Trailing/ chain application	Trailing/ chain application
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Semiconductive layer	Semiconductive layer	Metallic screen	Metallic screen
Additional feature	Control function	Telecommunication	Control function	Telecommunication

Electro-optical cables with anti-torsion layer				
	(LHM)SEICO	**(LHM)SEIMO**	**(LHM)BAIMO**	**(LHM)BAICO**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	Reeling/trailing/ chain application	Reeling/trailing/ chain application	Reeling/trailing/ chain application	Reeling/trailing/ chain application
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Semiconductive layer	Semiconductive layer	Metallic screen	Metallic screen
Additional feature	Control function	Telecommunication	Telecommunication	Control function

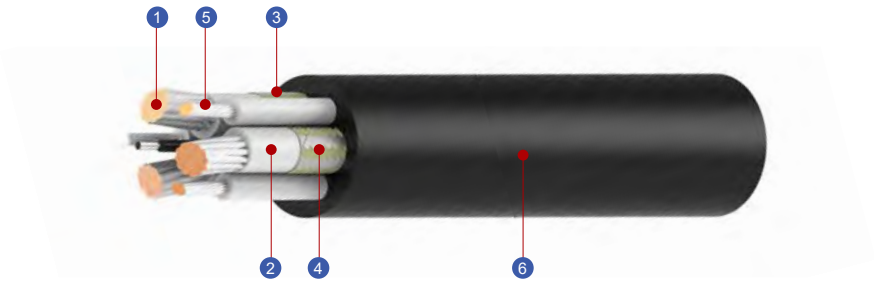
Electro-optical cables (single sheath)				
	(LHM)BACO	**(LHM)SEMO**	**(LHM)BAMO**	**(LHM)SECO**
Voltage range (U)	1kV - 3kV	1kV - 3kV	1kV - 3kV	1kV - 3kV
Installation	Trailing/ chain application	Trailing/ chain application	Trailing/ chain application	Trailing/ chain application
Layout	3 core design	3 core design	3 core design	3 core design
Electric field control	Metallic screen	Semiconductive layer	Metallic screen	Semiconductive layer
Additional feature	Control function	Telecommunication	Telecommunication	Control function

FOMIS (LHM)BACO 1kV - 3kV

Medium voltage trailing cable with integrated optic fiber

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)BACO
- **VDE type designation:** (N)TMKCEWOEU-OFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** Metallic screened phase conductors cabled around the central separator with control cores placed in the outer interstices
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Finely stranded tinned copper conductors (class 5)
2	**Insulation**	Insulated with EPR rubber compound
3	**Electrical field control**	Metallic screened phase conductors, balanced electric field and enhanced EMC
4	**PE conductor**	Copper/textile braid over the main cores
5	**Pilot conductor**	Tinned copper control conductors, covered with non-conductive tape and insulated with EPR compound
6	**Sheath**	Robust synthetic CM compound, high resistance to abrasion and tearing

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Multifunctional trailing cable with integrated fiber optic elements. Enhanced data transmission yet remaining high mechanical performance. Intended for fully flexible mining applications, such as coal cutters. Good for free-trailing or use with cable handler.

Sketch

- Mining cable with stable control signal transmission along with high speed data transmission for monitoring and/or (semi-)automatic operation
- Screened power cores, reduced electromagnetic interference on surrounding equipment
- 3 core design with central semiconducting separator[1], very balanced mechanical stress distribution

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. Tensile strength reinforcement unit applied when necessary.

Specification- FOMIS (LHM)BACO

0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013010131308CO	3	3	6.86	38.43	40.43	2.84	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013010131309CO	3	3	8.00	41.82	43.82	3.42	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013010131310CO	3	3	9.65	46.48	48.48	4.27	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013010131311CO	3	3	11.55	52.67	56.28	5.39	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013010131312CO	3	3	13.36	57.75	61.57	6.63	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013010131313CO	3	3	15.21	62.28	66.28	7.88	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013010131314CO	3	3	16.85	67.17	71.17	9.33	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013010131315CO	3	3	18.75	72.35	76.35	10.97	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013010131316CO	3	3	21.29	79.00	83.00	13.36	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013010131317CO	3	3	24.21	86.61	90.61	16.08	0.0654

1.8/3 kV n = 1~6

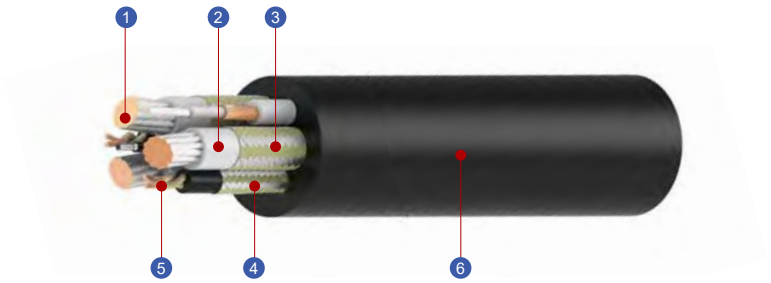
Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013010231308CO	3	3	6.86	40.95	42.95	3.07	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013010231309CO	3	3	8.00	43.70	45.70	3.61	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013010231310CO	3	3	9.65	47.86	49.86	4.42	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013010231311CO	3	3	11.55	53.92	57.53	5.53	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013010231312CO	3	3	13.36	59.37	63.18	6.89	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013010231313CO	3	3	15.21	63.89	67.91	8.11	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013010231314CO	3	3	16.85	68.55	72.56	9.59	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013010231315CO	3	3	18.75	73.73	77.94	11.20	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013010231316CO	3	3	21.29	80.52	84.93	13.64	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013010231317CO	3	3	24.21	87.48	92.10	16.25	0.0654

FOMIS (LHM)BAMO 1kV - 3kV

Optoelectric composite cable with metallic shield power cores

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)BAMO
- **VDE type designation:** (N)TMKCEWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 metallic shielded phase conductors laid up, with communication pairs placed in the outer interstices
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Tinned copper conductors, finely stranded (class 5)
2	**Insulation**	EPR rubber compound, better than 3GI3[1]
3	**Electrical field control**	Metallic shielded phase conductors
4	**PE conductor**	Braid of mixed copper/textile wires over the phase conductors
5	**Pilot conductor**	Sheathed twisted pairs of insulated copper conductors for telecommunication with advanced characteristic impedance matching, fully screened [2]
6	**Outer sheath**	Robust synthetic rubber compound, basic material: CM

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Optoelectric composite cable having both telecommunication cores and optic fiber elements in addition to the power conductors. Metallic shielded power conductors. Very suitable for intelligent mining applications requiring the cables to bear frequent small radius bending, such as coal shearers.

Sketch

- Provide fibre optic data transmission and fully screened communication pairs for very stable telecommunication signal
- Metallic shielded main cores, reduced electromagnetic interference to surrounding equipment
- High mechanical performance under tough conditions, i.e. repeated bending with tensile stress applied

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. See DIN VDE 0207.
2. Special version for providing a combination of communication pairs and control cores.

Specification- FOMIS (LHM)BAMO

0.6/1 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013070131308U1	3	3	6.86	38.43	41.43	2.38	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013070131309U1	3	3	8.00	41.82	44.82	2.92	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013070131310U1	3	3	9.65	46.48	49.48	3.69	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013070131311U1	3	3	11.55	51.67	55.67	4.71	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013070131312U1	3	3	13.36	56.62	60.62	5.84	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013070131313U1	3	3	15.21	61.14	65.14	6.98	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013070131314U1	3	3	16.85	66.17	70.17	8.33	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013070131315U1	3	3	18.75	71.35	75.35	9.84	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013070131316U1	3	3	21.29	78.00	82.00	12.03	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013070131317U1	3	3	24.21	85.61	89.61	14.51	0.0654

0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013070131308U4	3	3	6.86	38.43	41.43	2.38	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013070131309U4	3	3	8.00	41.82	44.82	2.92	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013070131310U4	3	3	9.65	46.48	49.48	3.69	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013070131311U4	3	3	11.55	51.67	55.67	4.71	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013070131312U4	3	3	13.36	56.62	60.62	5.84	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013070131313U4	3	3	15.21	61.14	65.14	6.98	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013070131314U4	3	3	16.85	66.17	70.17	8.33	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013070131315U4	3	3	18.75	71.35	75.35	9.84	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013070131316U4	3	3	21.29	78.00	82.00	12.03	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013070131317U4	3	3	24.21	85.61	89.61	14.51	0.0654

1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013070231308U1	3	3	6.86	40.82	43.82	2.57	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013070231309U1	3	3	8.00	43.70	46.70	3.08	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013070231310U1	3	3	9.65	47.86	50.86	3.82	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013070231311U1	3	3	11.55	52.92	56.92	4.85	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013070231312U1	3	3	13.36	58.37	62.37	6.09	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013070231313U1	3	3	15.21	62.89	66.89	7.21	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013070231314U1	3	3	16.85	67.55	71.55	8.57	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013070231315U1	3	3	18.75	72.73	76.73	10.05	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013070231316U1	3	3	21.29	79.52	83.52	12.28	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013070231317U1	3	3	24.21	86.62	90.62	14.69	0.0654

1.8/3 kV	Characteristic Impedance = 120Ω, n = 1~6							
Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013070231308U4	3	3	6.86	40.82	43.82	2.57	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013070231309U4	3	3	8.00	43.70	46.70	3.08	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013070231310U4	3	3	9.65	47.86	50.86	3.82	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013070231311U4	3	3	11.55	52.92	56.92	4.85	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013070231312U4	3	3	13.36	58.51	62.51	6.11	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013070231313U4	3	3	15.21	63.03	67.03	7.22	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013070231314U4	3	3	16.85	67.55	71.55	8.57	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013070231315U4	3	3	18.75	72.73	76.73	10.05	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013070231316U4	3	3	21.29	79.52	83.52	12.28	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013070231317U4	3	3	24.21	86.62	90.62	14.69	0.0654

NOTE

FOMIS (LHM)SECO/SEMO 1kV - 3kV

Coal cutter cable with optic fiber

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)SECO/SEMO
- **VDE type designation:** (N)TMKCGEWOEU-OFE/(N)TMKCGEWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design, main cores and control cores laid up with central cradle separator
- **Installation:** Trailing/Chain Application

Suitable Working Environment

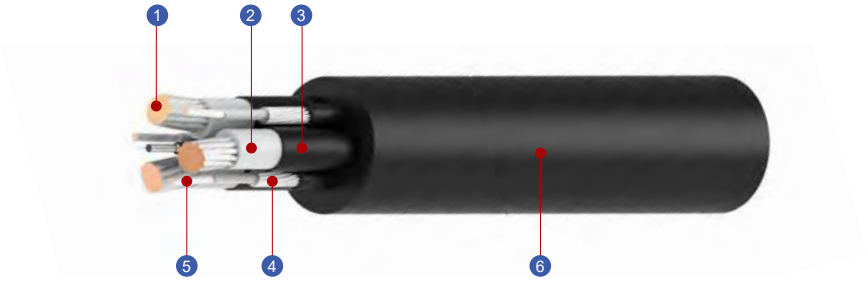
Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture



1	**Power conductor**	Flexible tinned copper conductors (class 5) [1]
2	**Insulation**	EPR rubber compound, 90°C rated
3	**Electrical field control**	Cold-strippable outer layer of semiconductive rubber
4	**PE conductor**	Spinning of tinned copper wires over the control cores
5	**Pilot conductor**	Copper conductors serve as communication pairs and/or control cores, placed in the outer interstices[2]. Upon on users' option, can be 3 communication pairs or up to 6 control conductors or mixed version.
6	**Sheath**	High grade thermosetting chlorinated rubber compound, 5GM5+ [3]

Application

Coal cutter cable for automatic/semi-automatic mining surfaces with monitoring center. Fiber optic elements are integrated in the power supply cable along with control cores, providing advanced data transmission quality and speed in addition to electrical control signals.

Sketch

- Fiber optic units integrated in coal cutter cables, having the same durability as main cores
- Providing high-volume fast data transmission in addition to stable control/communication signal transmission given fully screened pilot cores
- Miniaturized design, yet have outstanding mechanical performance, enduring repeated small radius bending with tensile loads and torsion stress applied

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
50 °/m

Minimum bending radius
1.5 D

Electrical Parameters

	0.6/1 kV	1.8/3 kV
Rated voltage		
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. Cabled around the semiconductive cradle separator, central reinforcement unit can be added at option.
2. Double concentric structure applied when more than 3 control cores required.
3. See DIN VDE 0207.

Specification- FOMIS (LHM)SECO/SEMO

(LHM)SECO - 0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013000131308CO	3	3	6.86	35.92	38.92	2.46	0.7950
3x35+3x16/3+3x2.5ST+nxG	013000131309CO	3	3	8.00	39.17	42.17	2.96	0.5650
3x50+3x25/3+3x2.5ST+nxG	013000131310CO	3	3	9.65	43.84	46.84	3.86	0.3930
3x70+3x35/3+3x2.5ST+nxG	013000131311CO	3	3	11.55	49.16	53.16	4.77	0.2770
3x95+3x50/3+3x2.5ST+nxG	013000131312CO	3	3	13.36	54.24	58.24	6.07	0.2100
3x120+3x70/3+3x2.5ST+nxG	013000131313CO	3	3	15.21	58.90	62.90	7.37	0.1640
3x150+3x70/3+3x2.5ST+nxG	013000131314CO	3	3	16.85	63.52	67.52	8.67	0.1320
3x185+3x95/3+3x2.5ST+nxG	013000131315CO	3	3	18.75	68.70	72.70	10.44	0.1080
3x240+3x120/3+3x2.5ST+nxG	013000131316CO	3	3	21.29	75.63	79.63	13.12	0.0817
3x300+3x150/3+3x2.5ST+nxG	013000131317CO	3	3	24.21	83.23	87.23	16.03	0.0654

(LHM)SECO - 1.8/3 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013000231308CO	3	3	6.86	38.31	41.31	2.66	0.7950
3x35+3x16/3+3x2.5ST+nxG	013000231309CO	3	3	8.00	41.19	44.19	3.13	0.5650
3x50+3x25/3+3x2.5ST+nxG	013000231310CO	3	3	9.65	45.22	48.22	3.99	0.3930
3x70+3x35/3+3x2.5ST+nxG	013000231311CO	3	3	11.55	50.27	54.27	4.89	0.2770
3x95+3x50/3+3x2.5ST+nxG	013000231312CO	3	3	13.36	55.86	59.86	6.27	0.2100
3x120+3x70/3+3x2.5ST+nxG	013000231313CO	3	3	15.21	60.38	64.38	7.57	0.1640
3x150+3x70/3+3x2.5ST+nxG	013000231314CO	3	3	16.85	64.91	68.91	8.86	0.1320
3x185+3x95/3+3x2.5ST+nxG	013000231315CO	3	3	18.75	70.08	74.08	10.64	0.1080
3x240+3x120/3+3x2.5ST+nxG	013000231316CO	3	3	21.29	76.87	80.87	13.33	0.0817
3x300+3x150/3+3x2.5ST+nxG	013000231317CO	3	3	24.21	84.11	88.11	16.19	0.0654

(LHM)SEMO - 0.6/1 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013060131308U1	3	3	6.86	37.13	40.13	2.56	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013060131309U1	3	3	8.00	39.58	42.58	3.02	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013060131310U1	3	3	9.65	43.84	46.84	3.87	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013060131311U1	3	3	11.55	49.84	53.84	4.80	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013060131312U1	3	3	13.36	54.92	58.92	6.08	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013060131313U1	3	3	15.21	59.31	63.31	7.34	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013060131314U1	3	3	16.85	63.39	67.39	8.58	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013060131315U1	3	3	18.75	68.70	72.70	10.32	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013060131316U1	3	3	21.29	75.22	79.22	12.84	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013060131317U1	3	3	24.21	82.83	86.83	15.70	0.0654

(LHM)SEMO - 0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013060131308U4	3	3	6.86	39.84	42.84	2.84	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013060131309U4	3	3	8.00	42.56	45.56	3.34	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013060131310U4	3	3	9.65	46.82	49.82	4.24	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013060131311U4	3	3	11.55	52.55	56.55	5.15	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013060131312U4	3	3	13.36	57.63	61.63	6.48	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013060131313U4	3	3	15.21	62.29	66.29	7.81	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013060131314U4	3	3	16.85	66.10	70.10	9.05	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013060131315U4	3	3	18.75	70.73	74.73	10.71	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013060131316U4	3	3	21.29	76.71	80.71	13.18	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013060131317U4	3	3	24.21	83.64	87.64	15.94	0.0654

(LHM)SEMO - 1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013060231308U1	3	3	6.86	38.58	41.58	2.70	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013060231309U1	3	3	8.00	41.06	44.06	3.16	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013060231310U1	3	3	9.65	44.95	47.95	3.98	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013060231311U1	3	3	11.55	50.27	54.27	4.87	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013060231312U1	3	3	13.36	55.73	59.73	6.20	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013060231313U1	3	3	15.21	60.38	64.38	7.49	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013060231314U1	3	3	16.85	64.91	68.91	8.78	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013060231315U1	3	3	18.75	70.22	74.22	10.55	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013060231316U1	3	3	21.29	76.74	80.74	13.09	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013060231317U1	3	3	24.21	83.84	87.84	15.88	0.0654

(LHM)SEMO - 1.8/3 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013060231308U4	3	3	6.86	41.42	44.42	3.00	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013060231309U4	3	3	8.00	43.77	46.77	3.47	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013060231310U4	3	3	9.65	47.52	50.52	4.32	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013060231311U4	3	3	11.55	53.25	57.25	5.25	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013060231312U4	3	3	13.36	58.98	62.98	6.66	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013060231313U4	3	3	15.21	63.64	67.64	8.01	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013060231314U4	3	3	16.85	66.94	70.94	9.18	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013060231315U4	3	3	18.75	71.57	75.57	10.86	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013060231316U4	3	3	21.29	77.82	81.82	13.37	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013060231317U4	3	3	24.21	84.52	88.52	16.10	0.0654

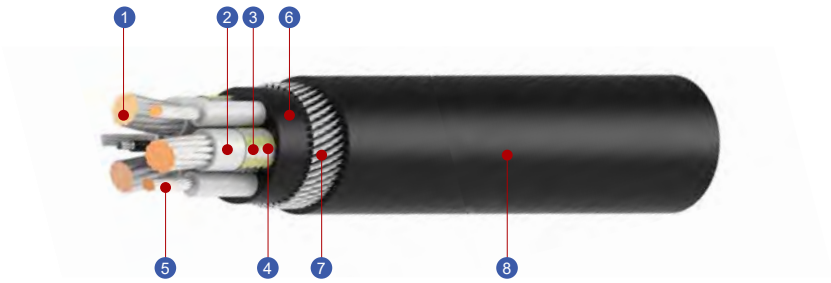
NOTE

FOMIS (LHM)BARCO/BARMO 1kV - 3kV

Multifunctional MV trailing cable (Armored)

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)BARCO/BARMO
- **VDE type designation:** (N)TMKCGEWOEU-OFE/(N)TMKCGEWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 core design, 3 power conductors and earth conductors laid up around central separator, with pilot cores placed in the outer interstices
- **Installation:** Trailing/Chain Application



1	**Power conductor**	Finely stranded conductors, tinned copper (class 5)
2	**Insulation**	Synthetic EPR compound, 3GI3+[1]
3	**Electrical field control**	Metallic screen over phase conductors
4	**PE conductor**	Copper and textile wires braided over the insulation of the main cores
5	**Pilot conductor**	Tinned copper conductors in the outer interstices, insulated and covered with non-conductive tape [2]
6	**Inner sheath**	Special rubber compound, 5GM3+[1]
7	**Armouring**	Spinning of mixed copper/steel wires over the inner sheath
8	**Outer sheath**	Synthetic elastomer rubber compound, high resistance to abrasion and tearing[3]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

MV trailing cables with double screen technology applied. Good for application which requiring optimized EMC or armouring. Fiber optic units are integrated to provide high data transmission volume and speed, very suitable for automatic mining surfaces.

Sketch

- Armored trailing cable, good for conditions with significant impact forces on the cable
- When grounded, the armouring can serve as the outer screen to further enhance the EMC
- Fibre optic data transmission enabled for mining surfaces with a central monitoring center or (semi-)automatic operation
- Fully screened communication pairs provided at option, providing additional stable data transmission route

Mechanical Parameters

Max. tensile loads on the cable
40 MPa

Torsion stress
25 °/m

Minimum bending radius
6 D

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. See DIN VDE 0207.
2. Up to 6 control cores available. Communication pairs can be provided at request.
3. Basic material: CM or CR, depending on the actual working conditions.

Specification- FOMIS (LHM)BARCO/BARMO

(LHM)BARCO - 0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013050131308CO	3	3	6.86	41.13	44.43	3.59	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013050131309CO	3	3	8.00	44.52	47.82	4.24	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013050131310CO	3	3	9.65	49.18	52.48	5.19	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013050131311CO	3	3	11.55	54.37	58.67	6.42	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013050131312CO	3	3	13.36	59.32	63.62	7.74	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013050131313CO	3	3	15.21	63.84	68.14	9.09	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013050131314CO	3	3	16.85	68.87	73.17	10.66	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013050131315CO	3	3	18.75	74.05	78.35	12.40	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013050131316CO	3	3	21.29	80.70	85.00	14.93	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013050131317CO	3	3	24.21	88.31	92.61	17.80	0.0654

(LHM)BARCO - 1.8/3 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013050231308CO	3	3	6.86	43.52	46.82	3.85	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013050231309CO	3	3	8.00	46.40	49.70	4.48	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013050231310CO	3	3	9.65	50.56	53.86	5.37	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013050231311CO	3	3	11.55	55.62	59.92	6.58	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013050231312CO	3	3	13.36	61.07	65.37	8.05	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013050231313CO	3	3	15.21	65.59	69.89	9.37	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013050231314CO	3	3	16.85	70.12	74.42	10.91	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013050231315CO	3	3	18.75	75.43	79.73	12.66	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013050231316CO	3	3	21.29	82.22	86.52	15.24	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013050231317CO	3	3	24.21	89.32	93.62	18.02	0.0654

(LHM)BARMO - 0.6/1 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxG	013110131308U1	3	3	6.86	41.13	44.43	3.08	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxG	013110131309U1	3	3	8.00	44.52	47.82	3.69	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxG	013110131310U1	3	3	9.65	49.18	52.48	4.56	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110131311U1	3	3	11.55	54.37	58.67	5.70	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110131312U1	3	3	13.36	59.32	63.62	6.93	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxG	013110131313U1	3	3	15.21	63.84	68.14	8.18	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxG	013110131314U1	3	3	16.85	68.87	73.17	9.63	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxG	013110131315U1	3	3	18.75	74.05	78.35	11.25	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxG	013110131316U1	3	3	21.29	80.70	85.00	13.60	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxG	013110131317U1	3	3	24.21	88.31	92.61	16.25	0.0654

(LHM)BARMO - 0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxG	013110131308U4	3	3	6.86	41.13	44.43	3.08	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxG	013110131309U4	3	3	8.00	44.52	47.82	3.69	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxG	013110131310U4	3	3	9.65	49.18	52.48	4.56	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110131311U4	3	3	11.55	54.37	58.67	5.70	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110131312U4	3	3	13.36	59.32	63.62	6.93	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxG	013110131313U4	3	3	15.21	63.84	68.14	8.18	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxG	013110131314U4	3	3	16.85	68.87	73.17	9.63	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxG	013110131315U4	3	3	18.75	74.05	78.35	11.25	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxG	013110131316U4	3	3	21.29	80.70	85.00	13.60	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxG	013110131317U4	3	3	24.21	88.31	92.61	16.25	0.0654

(LHM)BARMO - 1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxG	013110231308U1	3	3	6.86	43.65	46.95	3.32	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxG	013110231309U1	3	3	8.00	46.54	49.84	3.90	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxG	013110231310U1	3	3	9.65	50.56	53.86	4.72	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110231311U1	3	3	11.55	55.75	60.05	5.86	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110231312U1	3	3	13.36	61.07	65.37	7.21	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxG	013110231313U1	3	3	15.21	65.59	69.89	8.43	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxG	013110231314U1	3	3	16.85	70.25	74.55	9.90	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxG	013110231315U1	3	3	18.75	75.43	79.73	11.49	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxG	013110231316U1	3	3	21.29	82.22	86.52	13.88	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxG	013110231317U1	3	3	24.21	89.32	93.62	16.44	0.0654

(LHM)BARMO - 1.8/3 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3E+3x(2x1.5)FM+nxG	013110231308U4	3	3	6.86	43.65	46.95	3.33	0.7950
3x35+3x16/3E+3x(2x1.5)FM+nxG	013110231309U4	3	3	8.00	46.54	49.84	3.90	0.5650
3x50+3x25/3E+3x(2x1.5)FM+nxG	013110231310U4	3	3	9.65	50.56	53.86	4.72	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110231311U4	3	3	11.55	55.62	59.92	5.85	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110231312U4	3	3	13.36	61.07	65.37	7.21	0.2100
3x120+3x70/3E+3x(2x1.5)FM+nxG	013110231313U4	3	3	15.21	65.59	69.89	8.43	0.1640
3x150+3x70/3E+3x(2x1.5)FM+nxG	013110231314U4	3	3	16.85	70.25	74.55	9.90	0.1320
3x185+3x95/3E+3x(2x1.5)FM+nxG	013110231315U4	3	3	18.75	75.43	79.73	11.49	0.1080
3x240+3x120/3E+3x(2x1.5)FM+nxG	013110231316U4	3	3	21.29	82.22	86.52	13.88	0.0817
3x300+3x150/3E+3x(2x1.5)FM+nxG	013110231317U4	3	3	24.21	89.32	93.62	16.44	0.0654

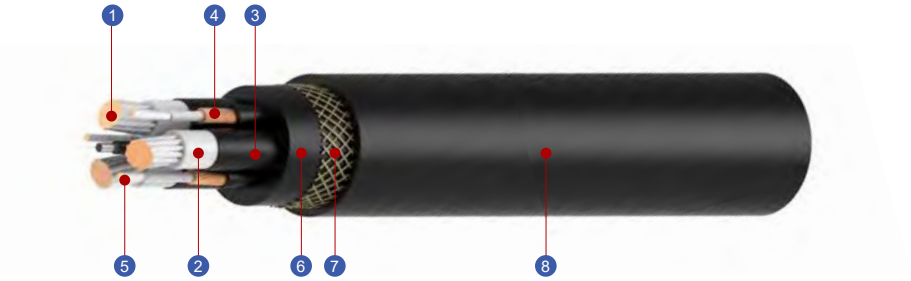
NOTE

FOMIS (LHM)SEICO/SEIMO 1kV - 3kV

MV flexible cabe for intelligent mining surfaces

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)SEICO/SEIMO
- **VDE type designation:** (N)TSCGEWOEU-OFE/(N)TSCGEWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 main conductors, with pilot cores and PE conductors placed in the outer interstices, central fibre optic elements added
- **Installation:** Reeling/Trailing/Chain Application



1	**Power conductor**	Finely stranded tinned copper conductors (Class 5)[1]
2	**Insulation**	EPR rubber compound
3	**Electrical field control**	Outer layer of semiconductive rubber (over insulation)
4	**PE conductor**	Spinning of copper wires over the pilot cores
5	**Pilot conductor**	Tinned copper control cores[2] placed in the outer interstices, insulated and taped
6	**Inner sheath**	Special CM rubber compound
7	**Reinforcement layer**	Reinforced braid of aramid yarns, anti-torsion layer over the inner sheath
8	**Outer sheath**	Special chlorinated rubber compound, basic material: CR, 5GM5+[3]

Suitable Working Environment

Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture

Application

Double sheathed multifunctional cable with reinforced layer. Intended for working in circuits not exceeding 3300 volts. These cables provide both telecommunication and optic fibre transmission, suitable for intelligent mining surfaces requiring fast and high volume data transmission.

Sketch

- Satisfying intelligent mining surfaces requiring fibre optic data transmission and control signals, special telecommunication version available
- Double sheathed with anti-torsion layer, suitable for both trailing and reeling application
- Miniaturized design and yet having robust mechanical performance for fully flexible operation with complex mechanical stress applied

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Minimum bending radius
1.5 D, 4 D for reeling installation

Electrical Parameters

Rated voltage	0.6/1 kV	1.8/3 kV
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. Power cores around central cradle separator, tensile-strength reinforcement unit applied as necessary.
2. Double concentric structure for more than 3 control cores, communication pairs can also be provided at option.
3. See DIN VDE 0207.

Specification- FOMIS (LHM)SEICO/SEIMO

(LHM)SEICO - 0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013020131308CO	3	3	6.86	35.78	38.78	2.41	0.7950
3x35+3x16/3+3x2.5ST+nxG	013020131309CO	3	3	8.00	39.17	42.17	2.94	0.5650
3x50+3x25/3+3x2.5ST+nxG	013020131310CO	3	3	9.65	43.84	46.84	3.81	0.3930
3x70+3x35/3+3x2.5ST+nxG	013020131311CO	3	3	11.55	49.03	53.03	4.69	0.2770
3x95+3x50/3+3x2.5ST+nxG	013020131312CO	3	3	13.36	53.97	57.97	6.00	0.2100
3x120+3x70/3+3x2.5ST+nxG	013020131313CO	3	3	15.21	58.63	62.63	7.28	0.1640
3x150+3x70/3+3x2.5ST+nxG	013020131314CO	3	3	16.85	63.39	67.39	8.63	0.1320
3x185+3x95/3+3x2.5ST+nxG	013020131315CO	3	3	18.75	68.70	72.70	10.43	0.1080
3x240+3x120/3+3x2.5ST+nxG	013020131316CO	3	3	21.29	75.63	79.63	13.11	0.0817
3x300+3x150/3+3x2.5ST+nxG	013020131317CO	3	3	24.21	83.51	87.51	16.06	0.0654

(LHM)SEICO - 1.8/3 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013020231308CO	3	3	6.86	38.17	41.17	2.69	0.7950
3x35+3x16/3+3x2.5ST+nxG	013020231309CO	3	3	8.00	41.06	44.06	3.16	0.5650
3x50+3x25/3+3x2.5ST+nxG	013020231310CO	3	3	9.65	45.08	48.08	3.98	0.3930
3x70+3x35/3+3x2.5ST+nxG	013020231311CO	3	3	11.55	50.27	54.27	4.88	0.2770
3x95+3x50/3+3x2.5ST+nxG	013020231312CO	3	3	13.36	55.73	59.73	6.24	0.2100
3x120+3x70/3+3x2.5ST+nxG	013020231313CO	3	3	15.21	60.38	64.38	7.55	0.1640
3x150+3x70/3+3x2.5ST+nxG	013020231314CO	3	3	16.85	64.91	68.91	8.90	0.1320
3x185+3x95/3+3x2.5ST+nxG	013020231315CO	3	3	18.75	70.08	74.08	10.64	0.1080
3x240+3x120/3+3x2.5ST+nxG	013020231316CO	3	3	21.29	76.74	80.74	13.30	0.0817
3x300+3x150/3+3x2.5ST+nxG	013020231317CO	3	3	24.21	83.84	87.84	16.14	0.0654

(LHM)SEIMO - 0.6/1 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013080131308U1	3	3	6.86	37.13	40.13	2.58	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013080131309U1	3	3	8.00	39.85	42.85	3.06	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013080131310U1	3	3	9.65	44.51	47.51	3.96	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013080131311U1	3	3	11.55	49.84	53.84	4.83	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013080131312U1	3	3	13.36	54.65	58.65	6.05	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013080131313U1	3	3	15.21	59.04	63.04	7.31	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013080131314U1	3	3	16.85	63.39	67.39	8.58	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013080131315U1	3	3	18.75	68.43	72.43	10.29	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013080131316U1	3	3	21.29	75.22	79.22	12.84	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013080131317U1	3	3	24.21	82.83	86.83	15.70	0.0654

(LHM)SEIMO - 0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013080131308U4	3	3	6.86	39.98	42.98	2.87	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013080131309U4	3	3	8.00	42.56	45.56	3.35	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013080131310U4	3	3	9.65	47.22	50.22	4.30	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013080131311U4	3	3	11.55	52.82	56.82	5.20	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013080131312U4	3	3	13.36	57.90	61.90	6.50	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013080131313U4	3	3	15.21	62.56	66.56	7.84	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013080131314U4	3	3	16.85	65.96	69.96	9.03	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013080131315U4	3	3	18.75	70.73	74.73	10.76	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013080131316U4	3	3	21.29	76.71	80.71	13.26	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013080131317U4	3	3	24.21	83.91	87.91	16.10	0.0654

(LHM)SEIMO - 1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013080231308U1	3	3	6.86	38.71	41.71	2.72	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013080231309U1	3	3	8.00	41.19	44.19	3.18	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013080231310U1	3	3	9.65	45.35	48.35	4.05	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013080231311U1	3	3	11.55	50.68	54.68	4.93	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013080231312U1	3	3	13.36	55.86	59.86	6.21	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013080231313U1	3	3	15.21	60.38	64.38	7.49	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013080231314U1	3	3	16.85	64.91	68.91	8.78	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013080231315U1	3	3	18.75	70.08	74.08	10.53	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013080231316U1	3	3	21.29	76.87	80.87	13.11	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013080231317U1	3	3	24.21	83.84	87.84	15.88	0.0654

(LHM)SEIMO - 1.8/3 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013080231308U4	3	3	6.86	41.70	44.70	3.03	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013080231309U4	3	3	8.00	43.90	46.90	3.49	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013080231310U4	3	3	9.65	48.06	51.06	4.40	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013080231311U4	3	3	11.55	53.39	57.39	5.29	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013080231312U4	3	3	13.36	58.98	62.98	6.66	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013080231313U4	3	3	15.21	63.64	67.64	8.01	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013080231314U4	3	3	16.85	66.94	70.94	9.18	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013080231315U4	3	3	18.75	71.84	75.84	10.89	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013080231316U4	3	3	21.29	78.23	82.23	13.43	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013080231317U4	3	3	24.21	84.79	88.79	16.14	0.0654

NOTE

FOMIS (LHM)SERCO/SERMO 1kV - 3kV

Armored MV cable for intelligent mining surfaces

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)SERCO/SERMO
- **VDE type designation:** (N)TSKCGERWOEU-OFE/(N)TSKCGERWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 main cores laid up with communication pairs around the central separator, armored
- **Installation:** Trailing/Chain Application

Suitable Working Environment

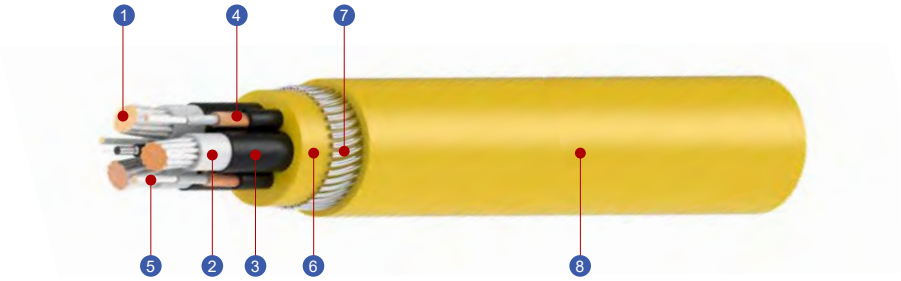
Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture



1	**Power conductor**	Tinned copper conductors, very finely stranded
2	**Insulation**	EPR rubber compound, better than 3GI3[1]
3	**Electrical field control**	Cold strippable outer layer of semiconductive rubber
4	**PE conductor**	Spinning of copper wires over the pilot cores, covered with semiconductive layer and taped
5	**Pilot conductor**	Upon users' option, fully screened control cores and/or communication pairs are provided in the outer interstices. Communication pairs: Twisted pairs of bare copper conductors (FEP insulated), sheathed and covered with non-conductive tape[2] Control cores: Tinned copper conductors, EPR insulated and taped
6	**Inner sheath**	Rubber compound, basic material: CM
7	**Armouring**	Mixed steel/copper wires, spinning over the inner sheath
8	**Outer sheath**	Reinforced synthetic compound, basic material: CM, 5GM5+[1]

Application

Armored medium voltage multifunctional cable with both telecommunication and optic fibre data transmission functions. Intended for intelligent mining surface mobile equipment, like coal shearers.

Sketch

- Armored, good for working conditions requiring the cable to handle significant impact forces
- When grounded, the armouring can serve as outer screen and provide additional grounding effect
- Providing fibre optic data transmission along with electric control and/or communication signal (fully screened pilot cores), very suitable for intelligent mining surfaces

Mechanical Parameters

Max. tensile loads on the cable
40 MPa

Torsion stress
25 °/m

Minimum bending radius
6 D

Electrical Parameters

	0.6/1 kV	1.8/3 kV
Rated voltage		
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. See DIN VDE 0207.
2. Actual design based on user provided characteristic impedance for communication pairs: 50Ω, 75Ω, 100Ω, 120Ω or other specific values.

Specification- FOMIS (LHM)SERCO/SERMO

(LHM)SERCO - 0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013040131308CO	3	3	6.86	38.48	41.78	3.12	0.7950
3x35+3x16/3+3x2.5ST+nxG	013040131309CO	3	3	8.00	41.87	45.17	3.71	0.5650
3x50+3x25/3+3x2.5ST+nxG	013040131310CO	3	3	9.65	46.54	49.84	4.68	0.3930
3x70+3x35/3+3x2.5ST+nxG	013040131311CO	3	3	11.55	51.73	56.03	5.66	0.2770
3x95+3x50/3+3x2.5ST+nxG	013040131312CO	3	3	13.36	56.67	60.97	7.08	0.2100
3x120+3x70/3+3x2.5ST+nxG	013040131313CO	3	3	15.21	61.33	65.63	8.45	0.1640
3x150+3x70/3+3x2.5ST+nxG	013040131314CO	3	3	16.85	66.09	70.39	9.89	0.1320
3x185+3x95/3+3x2.5ST+nxG	013040131315CO	3	3	18.75	71.40	75.70	11.81	0.1080
3x240+3x120/3+3x2.5ST+nxG	013040131316CO	3	3	21.29	78.33	82.63	14.64	0.0817
3x300+3x150/3+3x2.5ST+nxG	013040131317CO	3	3	24.21	86.21	90.51	17.75	0.0654

(LHM)SERCO - 1.8/3 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x2.5ST+nxG	013040231308CO	3	3	6.86	40.57	44.17	3.44	0.7950
3x35+3x16/3+3x2.5ST+nxG	013040231309CO	3	3	8.00	44.06	47.06	3.96	0.5650
3x50+3x25/3+3x2.5ST+nxG	013040231310CO	3	3	9.65	48.08	51.08	4.87	0.3930
3x70+3x35/3+3x2.5ST+nxG	013040231311CO	3	3	11.55	53.27	57.27	5.88	0.2770
3x95+3x50/3+3x2.5ST+nxG	013040231312CO	3	3	13.36	58.73	62.73	7.36	0.2100
3x120+3x70/3+3x2.5ST+nxG	013040231313CO	3	3	15.21	63.08	67.08	8.76	0.1640
3x150+3x70/3+3x2.5ST+nxG	013040231314CO	3	3	16.85	67.91	71.91	10.19	0.1320
3x185+3x95/3+3x2.5ST+nxG	013040231315CO	3	3	18.75	73.08	77.08	12.05	0.1080
3x240+3x120/3+3x2.5ST+nxG	013040231316CO	3	3	21.29	79.74	83.74	14.84	0.0817
3x300+3x150/3+3x2.5ST+nxG	013040231317CO	3	3	24.21	86.84	90.84	17.83	0.0654

(LHM)SERMO - 0.6/1 kV Characteristic Impadence = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013100131308U1	3	3	6.86	39.83	43.13	3.30	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013100131309U1	3	3	8.00	42.55	45.85	3.84	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013100131310U1	3	3	9.65	47.21	50.51	4.84	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013100131311U1	3	3	11.55	52.54	56.84	5.81	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013100131312U1	3	3	13.36	57.35	61.65	7.13	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013100131313U1	3	3	15.21	61.74	66.04	8.49	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013100131314U1	3	3	16.85	66.09	70.39	9.84	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013100131315U1	3	3	18.75	71.13	75.43	11.67	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013100131316U1	3	3	21.29	77.92	82.22	14.35	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013100131317U1	3	3	24.21	85.53	89.83	17.37	0.0654

(LHM)SERMO - 0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013100131308U4	3	3	6.86	42.68	45.98	3.65	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013100131309U4	3	3	8.00	45.26	48.56	4.19	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013100131310U4	3	3	9.65	49.92	53.22	5.24	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013100131311U4	3	3	11.55	55.52	59.82	6.25	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013100131312U4	3	3	13.36	60.60	64.90	7.65	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013100131313U4	3	3	15.21	65.26	69.56	9.09	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013100131314U4	3	3	16.85	68.66	72.96	10.36	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013100131315U4	3	3	18.75	73.43	77.73	12.19	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013100131316U4	3	3	21.29	79.41	83.71	14.80	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013100131317U4	3	3	24.21	86.61	90.91	17.79	0.0654

(LHM)SERMO - 1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013100231308U1	3	3	6.86	41.41	44.71	3.48	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013100231309U1	3	3	8.00	43.89	47.19	4.00	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013100231310U1	3	3	9.65	48.05	51.35	4.95	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013100231311U1	3	3	11.55	53.38	57.68	5.93	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013100231312U1	3	3	13.36	58.56	62.86	7.33	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013100231313U1	3	3	15.21	63.08	67.38	8.71	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013100231314U1	3	3	16.85	67.61	71.91	10.08	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013100231315U1	3	3	18.75	72.78	77.08	11.94	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013100231316U1	3	3	21.29	79.57	83.87	14.65	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013100231317U1	3	3	24.21	86.54	90.84	17.57	0.0654

(LHM)SERMO - 1.8/3 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x16/3+3x(2x1.5)FM+nxG	013100231308U4	3	3	6.86	44.40	47.70	3.85	0.7950
3x35+3x16/3+3x(2x1.5)FM+nxG	013100231309U4	3	3	8.00	46.60	49.90	4.36	0.5650
3x50+3x25/3+3x(2x1.5)FM+nxG	013100231310U4	3	3	9.65	50.76	54.06	5.35	0.3930
3x70+3x35/3+3x(2x1.5)FM+nxG	013100231311U4	3	3	11.55	56.09	60.39	6.35	0.2770
3x95+3x50/3+3x(2x1.5)FM+nxG	013100231312U4	3	3	13.36	61.68	65.98	7.84	0.2100
3x120+3x70/3+3x(2x1.5)FM+nxG	013100231313U4	3	3	15.21	66.34	70.64	9.29	0.1640
3x150+3x70/3+3x(2x1.5)FM+nxG	013100231314U4	3	3	16.85	69.64	73.94	10.53	0.1320
3x185+3x95/3+3x(2x1.5)FM+nxG	013100231315U4	3	3	18.75	74.54	78.84	12.33	0.1080
3x240+3x120/3+3x(2x1.5)FM+nxG	013100231316U4	3	3	21.29	80.93	85.23	15.00	0.0817
3x300+3x150/3+3x(2x1.5)FM+nxG	013100231317U4	3	3	24.21	87.49	91.79	17.85	0.0654

NOTE

FOMIS (LHM)BAICO/BAIMO 1kV - 3kV

Medium voltage flexible cable

Product Overview

- **LH series:** FOMIS
- **LH code:** (LHM)BAICO/BAIMO
- **VDE type designation:** (N)TSCEWOEU-OFE/(N)TSCEWOEU-FMOFE
- **Standard:** DIN VDE 0250 Part 812-813
- **Core arrangement:** 3 power cores cabled around the central cradle separator with pilot cores split into the outer interstices. Central fibre optic element added.
- **Installation:** Trailing/Reeling/Chain application

Suitable Working Environment

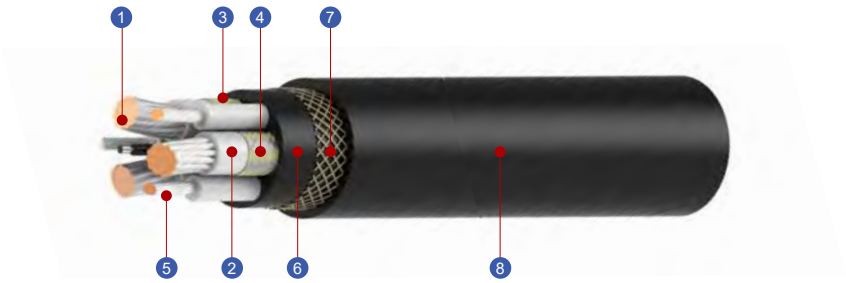
Ambient temperature for fixed installation
-40 °C~ 80 °C

Ambient temperature in fully flexible operation
-25 °C~ 80 °C

Fire resistance
IEC 60332-3

Oil resistance
IEC 60811-404

Weather resistance
Resistant to ozone, UV and moisture



1	**Power conductor**	Tinned copper conductors, very finely stranded and cabled around the central separator
2	**Insulation**	90°C synthetic compound, basic material: EPR
3	**Electrical field control**	Metallic screen over main cores
4	**PE conductor**	Braided copper wires and textile threads over the power core insulation
5	**Pilot conductor**	Up to 6 insulated control cores in the outer interstices, tinned copper[1]
6	**Inner sheath**	Special compound, adhesive to the outer sheath
7	**Reinforcement layer**	Braid of aramid yarns over the inner sheath, anti-torsion
8	**Outer sheath**	Synthetic elastomer rubber compound, mold-cured

Application

Double sheathed optoelectric composite cable with metallic screen over phase cores. Intended for (semi-) automatic underground mining equipment. The cables are designed for fully flexible application. Suitable for either trailing or reeling installation. Can withstand high mechanical stress, and in particular, significant torsion forces.

Sketch

- Double sheathed with anti-torsion layer, suitable for both trailing or reeling installation
- Providing high speed large-volume data transmission in addition to control and/or telecommunication function
- Reduced electrical interference on surrounding equipment

Mechanical Parameters

Max. tensile loads on the conductors
30 MPa

Torsion stress
100 °/m

Minimum bending radius
1.5 D, 4 D for reeling installation

Electrical Parameters

	0.6/1 kV	1.8/3 kV
Rated voltage		
Max. permissible operating voltage AC	0.7/1.2 kV	2.1/3. 6 kV
Max. permissible operating voltage DC	0.9/1.8 kV	2.7/5.4 kV
AC test voltage (main cores)	3 kV	6 kV

Max. operating temperature of the conductor : 90 °C
Max. short circuit temperature of the conductor : 250 °C

Fibre Optic Transmission

Diameter over cladding (µm): 125
Diameter over coating (µm): 245
Number of optic fibers Max.: 6
Attenuation at 1310 nm (dB/km): <0.35
Attenuation at 1550 nm (dB/km): <0.2
Dispersion at 1300 nm (ps/nm·km): ≤3.5
Dispersion at 1550 nm (ps/nm·km): ≤16

1. The user can choose to have communication pairs replacing the control cores for additional telecommunication requirement. For more than 3 control cores, please consult the sales for specification details.

Specification- FOMIS (LHM)BAICO/BAIMO

(LHM)BAICO - 0.6/1 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013030131308CO	3	3	6.86	38.43	41.43	2.84	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013030131309CO	3	3	8.00	41.82	44.82	3.42	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013030131310CO	3	3	9.65	46.48	49.48	4.27	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013030131311CO	3	3	11.55	51.67	55.67	5.39	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013030131312CO	3	3	13.36	56.62	60.62	6.61	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013030131313CO	3	3	15.21	61.14	65.14	7.86	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013030131314CO	3	3	16.85	66.17	70.17	9.33	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013030131315CO	3	3	18.75	71.35	75.35	10.97	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013030131316CO	3	3	21.29	78.00	82.00	13.36	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013030131317CO	3	3	24.21	85.61	89.61	16.08	0.0654

(LHM)BAICO - 1.8/3 kV n = 1~6

Specifications	Part number	Number of main cores	Number of control cores	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x2.5ST+nxG	013030231308CO	3	3	6.86	40.82	43.82	3.05	0.7950
3x35+3x25/3E+3x2.5ST+nxG	013030231309CO	3	3	8.00	43.70	46.70	3.61	0.5650
3x50+3x35/3E+3x2.5ST+nxG	013030231310CO	3	3	9.65	47.86	50.86	4.42	0.3930
3x70+3x35/3E+3x2.5ST+nxG	013030231311CO	3	3	11.55	52.92	56.92	5.53	0.2770
3x95+3x50/3E+3x2.5ST+nxG	013030231312CO	3	3	13.36	58.37	62.37	6.89	0.2100
3x120+3x50/3E+3x2.5ST+nxG	013030231313CO	3	3	15.21	62.89	66.89	8.11	0.1640
3x150+3x50/3E+3x2.5ST+nxG	013030231314CO	3	3	16.85	67.42	71.42	9.56	0.1320
3x185+3x70/3E+3x2.5ST+nxG	013030231315CO	3	3	18.75	72.73	76.73	11.20	0.1080
3x240+3x70/3E+3x2.5ST+nxG	013030231316CO	3	3	21.29	79.52	83.52	13.64	0.0817
3x300+3x70/3E+3x2.5ST+nxG	013030231317CO	3	3	24.21	86.62	90.62	16.28	0.0654

(LHM)BAIMO - 0.6/1 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013110131308U1	3	3	6.86	38.43	41.43	2.40	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013110131309U1	3	3	8.00	41.82	44.82	2.95	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013110131310U1	3	3	9.65	46.48	49.48	3.73	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110131311U1	3	3	11.55	51.67	55.67	4.77	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110131312U1	3	3	13.36	56.62	60.62	5.91	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013110131313U1	3	3	15.21	61.14	65.14	7.07	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013110131314U1	3	3	16.85	66.17	70.17	8.44	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013110131315U1	3	3	18.75	71.35	75.35	9.97	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013110131316U1	3	3	21.29	78.00	82.00	12.19	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013110131317U1	3	3	24.21	85.61	89.61	14.70	0.0654

(LHM)BAIMO - 0.6/1 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013110131308U4	3	3	6.86	38.43	41.43	2.40	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013110131309U4	3	3	8.00	41.82	44.82	2.95	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013110131310U4	3	3	9.65	46.48	49.48	3.73	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110131311U4	3	3	11.55	51.67	55.67	4.77	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110131312U4	3	3	13.36	56.62	60.62	5.91	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013110131313U4	3	3	15.21	61.14	65.14	7.07	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013110131314U4	3	3	16.85	66.17	70.17	8.44	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013110131315U4	3	3	18.75	71.35	75.35	9.97	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013110131316U4	3	3	21.29	78.00	82.00	12.19	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013110131317U4	3	3	24.21	85.61	89.61	14.70	0.0654

(LHM)BAIMO - 1.8/3 kV Characteristic Impedance = 50Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013110231308U1	3	3	6.86	40.95	43.95	2.60	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013110231309U1	3	3	8.00	43.84	46.84	3.12	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013110231310U1	3	3	9.65	47.86	50.86	3.86	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110231311U1	3	3	11.55	53.05	57.05	4.91	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110231312U1	3	3	13.36	58.37	62.37	6.16	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013110231313U1	3	3	15.21	62.89	66.89	7.29	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013110231314U1	3	3	16.85	67.55	71.55	8.67	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013110231315U1	3	3	18.75	72.73	76.73	10.17	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013110231316U1	3	3	21.29	79.52	83.52	12.43	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013110231317U1	3	3	24.21	86.62	90.62	14.88	0.0654

(LHM)BAIMO - 1.8/3 kV Characteristic Impedance = 120Ω, n = 1~6

Specifications	Part number	Number of main cores	Number of communication pairs	Conductor diameter	Outer diameter	Outer diameter	Weight	Conductor resistance at 20°C
				max. mm	min. mm	max. mm	kg/m	max. Ω/km
3x25+3x25/3E+3x(2x1.5)FM+nxG	013110231308U4	3	3	6.86	40.95	43.95	2.60	0.7950
3x35+3x25/3E+3x(2x1.5)FM+nxG	013110231309U4	3	3	8.00	43.84	46.84	3.12	0.5650
3x50+3x35/3E+3x(2x1.5)FM+nxG	013110231310U4	3	3	9.65	47.86	50.86	3.86	0.3930
3x70+3x35/3E+3x(2x1.5)FM+nxG	013110231311U4	3	3	11.55	52.92	56.92	4.90	0.2770
3x95+3x50/3E+3x(2x1.5)FM+nxG	013110231312U4	3	3	13.36	58.37	62.37	6.16	0.2100
3x120+3x50/3E+3x(2x1.5)FM+nxG	013110231313U4	3	3	15.21	62.89	66.89	7.30	0.1640
3x150+3x50/3E+3x(2x1.5)FM+nxG	013110231314U4	3	3	16.85	67.55	71.55	8.67	0.1320
3x185+3x70/3E+3x(2x1.5)FM+nxG	013110231315U4	3	3	18.75	72.73	76.73	10.17	0.1080
3x240+3x70/3E+3x(2x1.5)FM+nxG	013110231316U4	3	3	21.29	79.52	83.52	12.43	0.0817
3x300+3x70/3E+3x(2x1.5)FM+nxG	013110231317U4	3	3	24.21	86.62	90.62	14.88	0.0654

NOTE

Tech Appendix

1 Cable Connections and Extensions

To help facilitate the installation and cable extension, Lanhao provides quick-connect couplers for mining applications, which are designed with durability, safety, and reliability in mind.

Key features

- Explosion proof
- Easy and fast installation and termination
- Rigid and reliable insulation
- Efficient sealing and lasting connection
- Corrosion resistant
- Good for multifunctional cable, including optoelectrical versions

Or, Connector-free Extension

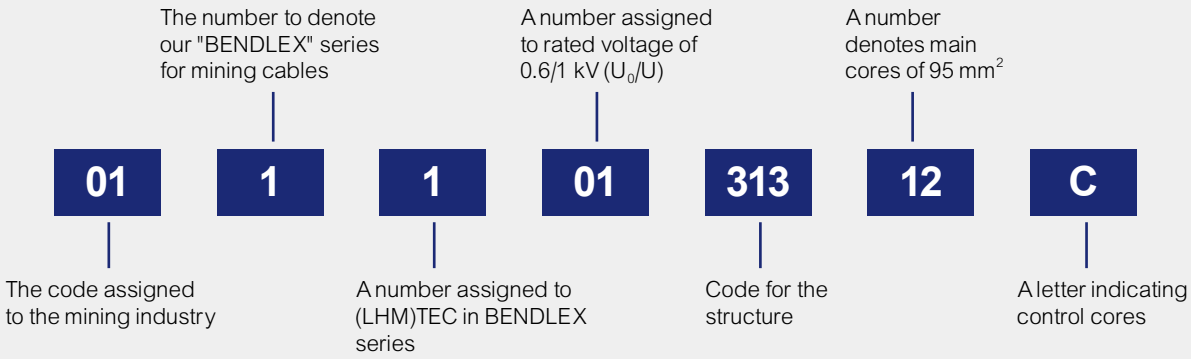
Taking one step further, we provide on-site coupler-free cable extension service.

This allows users to extend the cables easily in a reliable way, especially for underground mining applications in which cable extensions are common due to limited length of cable per drum entering the working surface. The extended cable would have nearly the same performance as the two original cables.

Please consult sales for service regions and other details.

2.1 Part Number & Specification Decipher

Lanhao assigns part numbers to products so that each part number is a combination of digits indicating application industry, product series, product ID, rated voltage, structure ID, main conductor cross-section size, and pilot core types. E.g. for (LHM)TEC 0.6/1kV - 3x95+1x50+3x2.5ST, the part number is 01110131312C, which can be breakdown as below.



2.2 Lanhao Specification Illustration

A cable's specification is written as $n_1 \times D_1 + n_2 \times D_2 (+n_3 \times D_3 + \cdots)$, where n_1, n_2 indicate the number of main cores and PE conductors while D_1,D_2 denote the nominal cross-section area of the conductors. n_3,D_3 (and so on) are added on for pilot cores and other structures (if applicable). Lanhao uses certain letters to provide comprehensive specification notations, which can be deciphered as below:

/3	PE conductors evenly distributed in the interstices (stranded or spinning)
/3E	PE conductors evenly distributed over the insulation (or outer semiconductive layer) of the phase conductors
ST	Control cores in the cable
FM	Communication cores in the cable
FO	Optic fiber elements in the cable, according to internal spec.
KON	Concentric conductor between inner and outer sheaths, i.e. concentric grounding conductors or overall metallic screen
UEL	Monitoring wire or layer in the cable
C	Grounding check conductor in the cable, according to internal spec.

3 Referenced Standards

The table below lists out the standards being referenced in this catalog.

Standards	Title
DIN VDE 0250	Cables, wires and flexible cords for power installation
IEC 60332-1-2	Tests on electric and optical fibre cables under fire condition: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame
IEC 60332-3	Tests on electric and optical fibre cables under fire conditions: Test for vertical flame spread of vertically-mounted bunched wires or cables
IEC 60811-404	Electric and optical fibre cables - Test methods for non-metallic materials: Miscellaneous tests - Mineral oil immersion tests for sheaths
EN 50525-2-21	Electric cables - Low voltage energy cables of rated voltages up to and including 450/750 V (U_0/U) Part 2-21: Cables for general applications - Flexible cables with crosslinked elastomeric insulation
IEC 60502	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV)
IEC 60446	Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or alphanumerics
DIN VDE 0298-3	Application of cables and cords in power installations: Guide to use of non-harmonized cables
DIN VDE 0298-4	Application of cables and cords in power installations: Recommended current-carrying capacity for sheathed and nonsheathed cables for fixed wirings in and around buildings and for flexible cables and cords
DIN VDE 0472	Testing of cables, wires and flexible cords
IEC 60228	Conductors of insulated cables
IEC 60364	Low-voltage electrical installations
DIN VDE 0168	Erection of electrical installations in open-cast mines, quarries and similar plants
IEC 60885-3	Electrical test methods for electric cables - Part 3: Test methods for partial discharge measurements on lengths of extruded power cables

As the cable manufacturing industry develops, Lanhao and many other leading cable manufacturers have built proprietary internal specifications exceeding the recommended standards, which guide the company's everyday innovation, design, production, and quality control, etc. Lanhao is proud of providing field-proven "state-of-the-art" solutions to users in the mining industry.

4 Core Identification

Core identifications are important for easy installations, and Lanhao uses obvious and highly distinguishable color/alphanumeric combinations to help users identify the functional elements quickly.

Core identification		
Power conductor[1]	with metallic screen	Colored braided layer or adhesive tape Default color combination: red, blue, yellow
	with semiconductive layer	Black semiconductive rubber with white numbers: 1, 2, 3, ⋯ or letters: A, B, C, ⋯
PE conductor	bare conductors or concentric conductors	Not applicable
	when not easily distinguishable	Green/yellow color combination or marked with "PE"
Control cores	insulation	Default color: white
	sheath	Default color: black
Communication cores	insulation	Default color: white or white/transparent combination
	sheath	Default color: black
Pilot cores	insulation	Default color: white
Fiber optic units	fibers	Default color: blue/red/yellow/white/black/brown
	tube	Default color: blue/red/yellow/white/black/brown/green/orange/violet/pink/cyan/turquoise/natural color

Color code					
Blue	Red	Yellow	Green	Orange	Brown
White	Black	Violet	Pink	Turquoise	Cyan

The tables above give the default core identification methods. However, depending on the users' option and the related guiding standard in users' countries, the color combinations may change accordingly, e.g. IEC 60446 recommends black, brown, and grey for AC-phase conductors, while VDE 0250 part 813 recommended no colorant insulation for cables with rated voltage 1.8/3.3 kV and above.

1. Assuming AC 3-phase power conductors.

5.1 Tensile Loads

Tensile force is one of the most significant mechanical stresses impacting the cables during flexible operations. When excessive tensile loads applied, it often leads to core rupture, insulation and/or sheath breakage, shielding failure, etc. To make a cable more durable, one should consider the following factors (and many others):

- Miniaturized design
  The lower the weight of the cable, the lower the tensile loads in a given working condition. Also, a reduced overall diameter helps protect the shields and other layers far from the neutral axis of the cable.
- Stress distribution over the entire cable
  When the mechanical stress does not distribute evenly over the entire cable, certain parts of the cable would receive unexpected high tensile loads (especially when being bent).
- Material
  When the material does not meet the required quality, its tensile strength and yield strength may be lower than expected, resulting in early rupture or plastic deformation.
- Supporting elements
  Stress relief elements help the cable to handle extreme tensile loads, protecting the other integral parts.

When high tensile loads are inevitable, an increased bending radius is recommended in operation. It is suggested that in the mining applications, the tensile loads applied on the flexible cables should not exceed 15 MPa[1](N/mm^2), and the recommended bending radius are given (see Appendix 5.4). With optimized design, advanced material, and production technology, Lanhao provides flexible cables with outstanding mechanical performance.

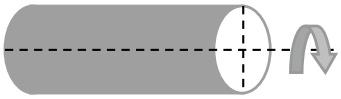
Max. suggested tensile loads during installation and operation[2] (N/mm^2)

Series	Type	As suggested in VDE 0298	Lanhao featured products
BENDLEX	(LHM)TEC	15	25
BENDLEX	(LHM)SEC	15	30
BENDLEX	(LHM)BAIC	15	30
MEC	(LHM)SERM	15	40[3]
MEC	(LHM)BAIM	15	30
FOMIS	(LHM)BAMO	15	30
FOMIS	(LHM)BARCO	15	40[3]
MGA	(LHM)BEAI	15	25
FEAM	(LHF)BEEAC	15	35
MGA	(LHM)BEEAR	15	35[3]
MGA	(LHM)TEI-R	15	30
MGA	(LHD)TEEAIG	15	30
MGA	(LHD)P-TEEAIG/RS	15	30
MGA	(LHM)BEA	15	25
MGA	(LHM)TEEAR	15	35[3]

1. According to DIN VDE 0298 Part 3.
2. This table is only for the purpose of illustration, please refers to the datasheet of a particular product for more details.
3. Over the entire cable.

5.2 Torsional Stress

Generally speaking, torsional stresses in regular mining applications are low. It usually occurs when pulling the cables obliquely. The flexible cable should be installed in a way avoiding such misalignment; however, sometimes torsional stress is unavoidable (for example, when the shuttle car turns a corner pulling the cable against the wall).



Torsion stress causes the twisting of the cable through an applied torque. When the torque is in the same direction as the cores being cabled, it makes the strand tighter, imposing a significant compression force on the elements (conductors, braids, etc.) and causing their deformation. When the torque is in the opposite direction as the cores being cabled, it looses the cabled cores. This does not break the cores directly but makes the cores more fragile under tensile forces.

In addition, a shear stress develops during torsion, and it is highest on the surface of the cable as the radius is maximum (assuming the natural axis of the cable is the torsion axis). This could damage cable sheath, insulation and braids.

In practice, except for materials, the design and production process could impact the cable's durability under torsion. For example, the twisting and stranding of conductors, the cabling process, the smoothness of insulation, conductors, braids, etc.

5.3 Impact Force

Impact force occurs when the cable is hit by falling rocks or by truck tires.

When impact forces are over the limit, the most common damage is the insulation breakage due to squeezing. Although rubber materials have a high elongation at break, being different from its elongation in the installation direction, the space for its deformation is limited in the direction perpendicular to the cable. If a braided concentric grounding core exists, it is also vulnerable to impact, and its failure leaves significant safety concerns, especially for underground mining.

The accidents should be avoided; when impact forces are expected, several options exist to protect the productivity. A cable chain would protect the cables from impact forces, but when such protection is not applicable, the sheath serves as the buffering layer absorbing the shock, so the sheath quality matters. In working conditions expecting frequent impact, for example, in a mining surface with a considerable slope, armored cables would be recommended, where the metal armor can protect the cable against crushing and other physical damage.

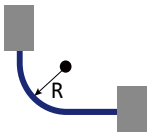
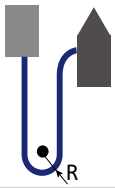
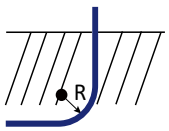
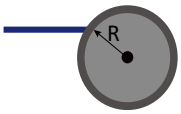
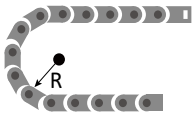
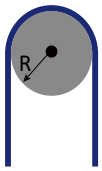
5.4 Bending

In mining applications, especially for underground surfaces, it is common that the cables are required to endure repeated bending in fully flexible operations. Therefore, most mining cables for trailing (including chain application) or reeling installations are tested for repeated bending with stress applied. With that said, when the bending radii are smaller than the permitted value, it may lead to core rupture, insulation breakage, or sheath damage (more often for thermoplastic materials).

As an industry standard, the bending radius is denoted as a multiple of the overall diameter of the cable, e.g. 4D, where D is the maximum outer diameter.

The minimum permissible bending radius is determined by the conductor quality (in terms of flexibility, structure and production process), insulation and sheath material, and the existence and the flexibility of the support elements, etc. In real applications, the minimum bending radius is not a standalone measurement, it is impacted by the surrounding environment (e.g. temperature) and the stress conditions (tensile loads, torsion forces, etc.). DIN VDE 0298 Part 3 provided a guidance to permissible bending radius in different applications, which is summarized below for cables with an overall diameter[1] above 20 mm.

Applications	Rated voltage	
	For rated voltage <= 0.6/1 kV	For tated voltage > 0.6/1 kV
Fixed installation	4D	6D
Free movement	5D	10D
Lead-in	5D	10D
Reeling[2]	6D	12D
Cable chain[2]	5D	10D
Roller deflection[2]	7.5D	15D

Fixed installation	Free movement	Lead-in	Reeling	Cable chain	Sheave
					

Note the bending radius is composed of a "bending factor" and the outer diameter. Here at Lanhao, we always try to provide miniaturized solutions with higher mechanical performance. The minimum bending radii listed in the table above are fully tested through type tests and routine tests, which grants the durability in continuous flexible operations with such a small bending radius under normal working conditions[3]. With that said, when the working scenarios allow, letting the cables bend with radii higher than the minimum permissible bending radius would extend the service life[4].

1. For flat cables, it is measured with the height (or thickness) of the cable, denoted as H.
2. These operations are with forced guidance system.
3. See the specification of each cable for mechanical stress conditions.
4. When using in harsh conditions (e.g. extreme tensile loads), a larger bending radius may be required. Please consult the manufacturer for detailed guides.

Bending radius for Lanhao cables			
Cable types		Minimum bending radius	Recommended operational bending radius
BENDLEX	Not Armored (e.g. (LHM)SEC)	1.5D	2.5D
	Armored (e.g. (LHM)BARC)	6D	7.5D
	Reeling (e.g. (LHM)BAIC)	4D	5D
FOMIS	Not Armored (e.g. (LHM)BAMO)	1.5D	2.5D
	Armored (e.g. (LHM)BARCO)	6D	7.5D
	Reeling (e.g. (LHM)SEICO)	4D	5D
MEC	Not Armored (e.g. (LHM)BAM)	1.5D	2.5D
	Armored (e.g. (LHM)SERM)	6D	7.5D
	Reeling (e.g. (LHM)SEIM)	4D	5D
MGA	(Semi-)fixed installation (e.g. (LHM)TEAL)	3D	4D
	Trailing (e.g. (LHD)P-TEEAIG/FR)	4D	5D
	Reeling (e.g. (LHM)TEI-R)	4D	5D
	Submersible (e.g. (LHM)BAWM/W100)	5D	7D
FEAM	e.g. (LHF)BEEAC	2.5H	4H
LHCC	Reeling (e.g. (C)YPI-R)	4D	6D
	(Semi-)fixed installation (e.g. (C)YPL)	3D	4D

6.1 Voltage

6.1.1 Rated Voltage

The rated voltage for a cable product is the voltage value used as the basis of design in terms of electrical specifications, shaping the cable's production and testing procedure. It is also considered as the nominal operating voltage that the cable is intended for safe thermal operation.

Rated voltage is expressed as U_0/U, in an AC (alternating current) system:

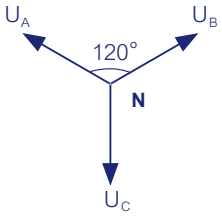
- U denotes the rms value between any two phases in a three phase generator
- U_0 denotes rms value between a phase and the ground

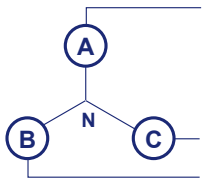
As in the three-phase motor, $U_A = U_B = U_C$ (where U_A,U_B,U_C denote the voltage between the phase and the ground).

By vector calculation, U_{AB}, the voltage between phase A and B, is $U_A \cos 120° + U_B \cos 120° = \sqrt{3}\, U_A$.

Therefore, in rated voltage expression, $U = \sqrt{3}\, U_0$.

In a DC system, there is no so-called "phase". The crest factor for a sinusoidal current waveform is 1.414 since the peak value of a true sinusoid is 1.414 times the RMS value. We take the peak voltage as the DC voltage rating (and usually a multiplier of 1.5 is used for convenience).





6.1.2 Maximum Operating Voltage

In actual applications, a tolerance rate (or say, safety factor) is given upon a rated voltage, which results in a voltage range that the system is allowed to be operated in.

Typically, in an AC system:

- A ±10% tolerance is given to systems with a rated voltage U <=750V
- A ±20% tolerance is given to systems with a rated voltage U >=1kV

The maximum permissible operating voltage is defined by taking the highest value in such voltage range. People are more concerned about the maximum rather than the minimum because an operating voltage higher than the maximum permissible value leads to overheating, resulting in cumulative and irreversible damage to the equipment.

In a DC system, as illustrated, the maximum permissible operating voltage is generally 1.5 times the permissible AC operating voltage. For example, for a cable with a rated voltage of 0.6/1 kV, the maximum permissible operating voltage in AC system is typically 1.2 kV (unless otherwise specified by the manufacturer), and in a DC installation, the value would be 1.8 kV.

Max permissible operating voltage									
Rated voltage (kV)	0.6/1	1.8/3	3.6/6	6/10	8.7/15	12/20	14/25	18/30	20/35
AC (kV)	0.7/1.2	2.1/3.6	4.2/7.2	6.9/12	10.4/18	13.9/24	17.3/30	20.8/36	24.2/42
DC (kV)	0.9/1.8	2.7/5.4	5.4/10.8	9/18	13.5/27	18/36	22.5/45	27/54	31.5/63

6.1.3 Test Voltage

For the safety purpose (especially for underground mining), cables are tested with voltage way higher than the ratings, which are well regulated by standards. Different types of voltage tests are designed for controlling the quality of conductors, insulation, and the entire cable. For example, a widely used routine test is to apply AC test voltage between each phase conductor and the metallic layer (individually screened phase cores) or between each insulated phase conductor and all the other conductors and the collective metallic layers for no less than 5 minutes. In DIN VDE 0250, a 3kV voltage test is required for 0.6/1 kV cables, and 2.5~3.3U_0 is required for cables with rated voltage higher than 0.6/1 kV. IEC 60502 requires the test voltage to be 2.5U_0+2 kV for 1kV – 3kV cables, and 3.5U_0 for 6 kV – 30 kV cables. BS and ANSI require similar tests as well.

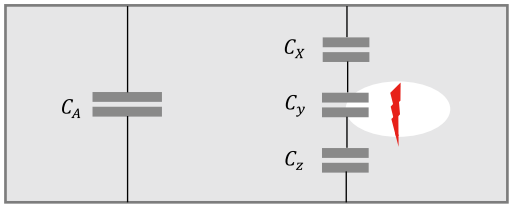
AC test voltage applied to the complete cable									
Rated voltage U_0/U (kV)	0.6/1	1.8/3	3.6/6	6/10	8.7/15	12/20	14/25	18/30	20/35
Power conductors (kV)									
DIN VDE 0250	3[1]	6	11	17	24	29	36	43	50
IEC 60502[2]	3.5	6.5	12.5	21	30.5	42	49	63	70
Lanhao	4	7	15	21	30.5	42	49	63	70
Control cores (kV)									
DIN VDE 0250	2								
Lanhao	2								
Communication cores (kV)									
DIN VDE 0250	1								
Lanhao	2								

1. 4kV is required for type designations specified in Part 813.
2. Values of single-phase test voltage.

6.2 Partial Discharge

Partial discharge (PD) is a localized dielectric breakdown that partly bridges the insulation between conductors under high voltage stress. It is often caused by gas voids in the solid insulation material. Also, PD can occur along the surface of the insulating material if the tangential electric field is high enough to cause a breakdown along the insulator surface (e.g. caused by rough conductor surface, or gaps between insulation and semiconductive layer).

The partial discharge can be viewed as a capacitive voltage divider in parallel with another capacitor (the unvoided part). Using internal PD as an example:



The dielectric strength of the void is considerably less than the surrounding unvoided part, the electric field is significantly higher in the void.

If the electric field strength in the void (C_y) is higher than the dielectric strength of the gas inside, the discharge appears. As the discharge is completed, the void's dielectric strength returns.

Since there is no "perfect" material or production technology, partial discharge is inevitable. However, significant PD can erode the insulation, leading to a breakdown of insulation eventually and causing arc flashes (especially dangerous in underground application); therefore, minimizing PD is important to the insulation quality and long term safe operations.

Different technologies have developed to measure the partial discharge, and the measurement is expressed in picocoulombs (pC). IEC 60885-3 regulates the procedure for the testing, and such tests are generally performed for cables with rated voltage above 3.6/6 kV. The required PD level varies across countries and standards.

Partial discharge testing requirement

	Test voltage (kV)	Requirement (pC)
DIN VDE 0250 Part 813[1]	$1.25U_0$	40
IEC 60502-2	Raise to $2U_0$ and reduce to $1.73U_0$	10
Lanhao	Raise to $2U_0$ and reduce to $1.73U_0$	5

1. Test procedure specified in DIN VDE 0472 Part 513.

6.3 Electric Field Control

The MV cables are shielded with either a metallic screen and/or semiconductive rubber layer (over the insulation) to divert the concentrated electrical stress around the conductors and uniform the electrical fields.

An unshielded cable would:

- have non-uniform electric field in the insulation
- tend to have concentrated electrostatic field between the insulated conductor and earthed object at the contact point, resulting in corona discharge (damaging the insulation)
- tend to cause an electric shock due to leakage current

A metallic screen is a braid, spiral, or foil (or combined form) of metallic materials or mixed wires (e.g. mixed copper and aramid wires), while a semiconductive rubber is typically made of basic rubber material and additives (like carbon black for conductivity).

To achieve the shielding effect, the shielding layer needs to be grounded to drain the leakage currents.

For MV cables with a rated voltage greater than 3.6/6 kV, double semiconductive layers are necessary. Triple extrusion production tech is applied to extrude the inner and outer semiconductive layers with the insulation in a single pass, which prevents the gaps and movements between the layers.

While the effectiveness of the electric field control is of primary concern, other factors should also be considered for type selection such as costs, mechanical performance, cable size, etc. In general, a semiconductive rubber layer is better than a metallic screen in electric field control as the surface is smooth and it is also less fragile in flexible operation; with that said, when electrical interference comes into play, a metallic screen has its own advantage.

6.4 Electromagnetic Interference

Electromagnetic interference (EMI) is a disturbance to an electrical circuit through induction or coupling, caused by changing magnetic fields and by electric fields, respectively.

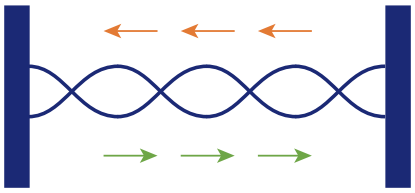
In an electrical system, the interference between cables and equipment is mutual. The major concerns include:

- the power conductors' interference to surrounding cables/equipment[1]
- the environment's EMI to control/communication cores
- the power conductor's EMI to control/communication cores

Metallic shielding helps reduce the EMI. When EMI to surrounding equipment or power system is of concern, cables with metallic shielded power conductors are recommended, this also helps reduce the EMI from power cores to control and communication cores (but does not reduce the EMI from surrounding environments).

When control/telecommunication signal quality is required, the pilot cores should be shielded as well. As mentioned in Appendix 6.3, foil, braid and spiral (or combined types) are most commonly used. Taking shielding effectiveness and mechanical performance into consideration, a braid-foil combination (e.g. see (LHM)BAMO) or a spiral of stranded wires (e.g. see (LHM)SEMO) provides the best shielding effect and has long flex life. Conductive shields cannot completely prevent magnetic induction or coupling though, therefore, for extreme EMI control, magnetic materials should be applied as well (usually as an overall screen, see (LHM)TEEAR).

Another way to reduce EMI is to have twisted pairs of conductors. The EMFs and induced noise current change direction with each twist, and the overall unwanted noise is cancelled. Such a structure is commonly used for communication pairs (cores).



Although the cable design is critical to reducing the EMI, installations also matter:

- Making the power consuming units as far as possible (the electric and magnetic fields decrease rapidly as the distance increases)
- Avoid parallel power lines to reduce capacitive coupling
- Making sure the grounding is proper (e.g. single-point ground is preferred for low frequency applications)

1. For power cores, as the applied voltage are generally high, the interference to power cores are less concerned.

6.5 Resistance

Resistance of an object is its opposition to the flow of electric current, measured in Ω. The only factors that affect the resistance of the conductor are the length of the conductor, resistivity (just like density, which is a material's property), and the cross-section area:

$$R = \frac{\rho L}{A}$$

where R is resistance, ρ is the resistivity, L is the length of the conductor, and A is the cross-section area. The impact of A is obvious. However, the second factor may not be that obvious. Here, L is the actual wire length, which is longer (when making it straight) than the cable length in a stranded conductor. Thus, a stranded conductor would have higher resistance than a solid conductor, and tightly stranded conductors would have higher resistance than loosely stranded conductors.

The third factor is the resistivity. For tinned copper, as the copper wire diameter does not eliminate the thickness of tinned layer, a thick tinned layer increases the conductor's resistance due to the material's higher resistance than copper. Also, as a property, resistivity is related to the thermal effects, where $\rho_T = \rho_0\ (1+\alpha(T-T_0))$, T is the temperature and α is called temperature coefficient. For annealed copper, $\alpha = 0.00393$. IEC 60228 has provided the maximum resistance for a tinned copper conductor at 20°C. Most Lanhao mining cables use class 5[1] conductors.

Copper conductors' resistance at 20°C

Nominal cross-section area (mm^2)	Class 2 metal coated (Ω/km)	Class 5&6 metal coated (Ω/km)	Class 5&6 pain (Ω/km)
1.5	12.2	13.7	13.3
2.5	7.56	8.21	7.98
4	4.7	5.09	4.95
6	3.11	3.39	3.30
10	1.84	1.95	1.91
16	1.16	1.24	1.21
25	0.734	0.795	0.780
35	0.529	0.565	0.554
50	0.391	0.393	0.386
70	0.270	0.277	0.272
95	0.195	0.210	0.206
120	0.154	0.164	0.161
150	0.126	0.132	0.129
185	0.100	0.108	0.106
240	0.0762	0.0817	0.0801
300	0.0607	0.0654	0.0641

1. Class 6 conductors are mainly used for highly flexible control cables or at request.

6.6 Reactance & Impedance

In electrical circuits, reactance is caused by inductance and capacitance of the conductors, which oppose the alternating current. In real applications, very few special cases have constant current, and therefore, reactance is common. Differing from the resistance, reactance does not lead to dissipation of energy as heat.

Capacitive Reactance

When the change of voltage across the dielectric, it is opposed by the capacitive reactance (X_C), the strength depends on the frequency (f, the number of times a cycle of the waveform is repeated per second, measured in hertz, Hz) and the capacitance (C, measure in farad, F):

$$X_C = \frac{1}{2\pi fC}$$

when $f = 0$, X_C is infinite, therefore, a direct current cannot flow through the dielectric. In an AC system, a higher frequency and/or a higher capacitance would lead to lower capacitive reactance.

Inductive Reactance

A changing electromagnetic field would generate an electromotive force opposing the change of current, which is known as inductive reactance (X_L). It depends on the conductor's inductance (L, measured in henry, H) and the frequency:

$$X_L = 2\pi fL$$

In a DC system, as $f = 0$, there is no inductive reactance. In an AC system, a higher frequency or a conductor with higher inductance would result in higher inductive reactance.

The inductance L, is composed of self-inductance of the conductor and its mutual inductance with other conductors or power consuming units. For a single straight wire, the self-inductance increase as the length gets longer and/or the cross-section gets smaller. In a multi-core cable, the mutual inductance would be affected by the insulation material and thickness, conductor material, the way the conductor being stranded, etc.

Impedance

Impedance is composed of reactance X and resistance R, where

$$Z = R + jX$$

and j is the imaginary unit. In complex analysis,

$$jX = j2\pi fL + \frac{1}{j2\pi fC} = j\left(2\pi fL - \frac{1}{2\pi fC}\right)$$

and so,

$$X = X_L - X_C$$

The norm (magnitude) of the impedance is:

$$\|Z\| = \sqrt{(R^2 + X^2)}$$

To reduce the impedance, a lower resistance and/or a lower reactance is required.

6.7 Voltage Drop

By Ohm's law, in a circuit, the voltage drop (VD, measured in volts, V) is

$$VD = I \times Z = a \times I_B \times (R\cos\emptyset + X\sin\emptyset)$$

where

- I is the electrical current (measure in ampere, A)
- Z is the impedance (measured in ohm, Ω)
- R is the resistance (Ω)
- X is the reactance (Ω)
- I_B is the full load current (A)
- a is the factor determined by circuit type
- $\emptyset$ is the phase angle

For a single phase, $a = 2$ and for a 3-phase circuit, $a = \sqrt{3}$. In a DC circuit, the formula is simplified as $VD = I \times R$ as $Z_{DC} = R$.

As introduced in Appendix 6.4 and 6.5, choosing a cable with lower resistance and reactance would help lower the voltage drop. Some of other potential methods to decrease the voltage drop are as the following:

- having a shorter installation length
- lowering the conductor temperature
- reducing the load current (use higher voltage)

A voltage drop within 5% of the source voltage is generally permitted for industrial electrical installation. Depending on the application, a 3% criteria may be applied.

6.8 Characteristic Impedance

Unlike impedance, characteristic impedance (Z_0) is a concept in telecommunication. It is the ratio of the voltage and current of a sinusoidal wave of certain frequency propagating along a transmission line at a given angular frequency.

It is very important for Z_0 to match the impedance of the load, which maximizes the power transfer and minimizes the signal reflection (loss). Ideally, Z_0 should be constant along the transmission line to pave a smooth way for the signal being transmitted. In practice, Z_0 depends on cable structure, conductor material, insulation material, conductor smoothness, etc.

The general model describing the characteristic impedance is

$$Z_0 = \sqrt{\frac{R+j\omega L}{G+j\omega C}}$$

where

- j is the imaginary unit
- ω is the angular frequency
- R is the resistance per unit length
- L is the inductance per unit length
- G is the conductance of the dielectric per unit length
- C is the capacitance per unit length

In a lossless line (which is not practical but can be used as an estimation), there is no conductor resistance and dielectric conductance. So the model is simplified as:

$$Z_0 = \sqrt{\frac{L}{C}}$$

6.9 Current-carrying Capacity

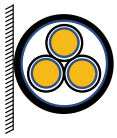
Current-carrying capacity, also called ampacity, is the maximum current (measured in amperes, A) that a conductor can carry continuously without exceeding the temperature rating.

In practice, as the conductor material (e.g. copper) and its coated metal layer (e.g. tin) have a much higher melting point than the rated temperature of the insulation, the temperature rating of an insulated conductor is primarily determined by the insulation material.

Given a rated temperature, whether a conductor can easily exchange heat with the surrounding environment and the amount of heat generated when current flow through the conductor is critical. Therefore, the current-carrying capacity is impacted by a lot of factors, the table below listed out a few of them:

Increment in the factor (assuming all else equal)	Direction of change in ampacity
Conductor resistance	decrease
Conductor size (cross-section)	increase
Number of bundled insulated conductors	decrease
Number of insulated conductors bundled without space	decrease
Number of loaded cores	decrease
Ambient temperature	decrease
Installed in ducts instead of in free air	decrease
Thickness of coated layer of a single wire	decrease
Number of layers in stacker reeling	decrease
Number of multicore cables grouped	decrease
Duty factor in intermittent periodic duty operation	increase
Spacing distance between grouped cables	increase
etc.	…

Therefore, the current carrying capacity measurement has a lot of preset assumptions. Different standards give out values at certain conditions for reference. At Lanhao, the internal specification sets the baseline for different cables.

	VDE[1]	IEC[2]	3-core design[3]	4-core design[3]
Nominal cross-section of copper conductor in mm^2				
1	18	-	19	20
1.5	23	23	24	26
2.5	30	32	31	33
4	41	42	43	47
6	53	54	54	58
10	74	75	77	83
16	99	100	104	113
25	131	127	137	148
35	162	157	170	184
50	202	192	213	229
70	250	246	255	275
95	301	298	317	342
120	352	346	373	402
150	404	399	426	462
185	461	456	489	526
240	540	538	570	617
300	620	620	647	698

As mentioned, operating conditions and installations have significant impacts on the ampacity, derating factors for common cases are guided as below.

Derating factors by number of layers on the reel[4]						
Number of Layers	Monospiral	1	2	3	4	5
Conversion factors	0.8	0.8	0.61	0.49	0.42	0.38

1. DIN VDE 0298 Part 4. Multicore rubber sheathed flexible cables with 3 loaded cores installed on or by the surface for rated voltage up to 6/10 kV. Ambient temperature 30°C.
2. IEC 60364-5-523. For multicore cables (3 loaded cores) with XLPE/EPR insulation in free air at ambient temperature 30°C, conductor temperature 90°C.
3. For multicore cables with 3 loaded cores in free air, 90°C rated insulation, ambient temperature: 30°C.
4. As of DIN VDE 0298 Part 4.

Conversion factors for ambient temperature deviating from 30°C (in free air)[5]								
Ambient temperature (°C)	10	15	20	25	30	35	40	45
Derating factor	1.15	1.12	1.08	1.04	1	0.96	0.91	0.87
Ambient temperature (°C)	50	55	60	65	70	75	80	85
Derating factor	0.82	0.76	0.71	0.65	0.58	0.5	0.41	0.29

Derating factors for cables and wires with above 5 cores[6]								
Number of loaded cores	5	7	10	14	19	24	40	61
Conversion factors	0.75	0.65	0.55	0.5	0.45	0.4	0.35	0.3

Derating factors for grouping of more than one circuit or multicore cable[7]					
Number of grouped cables	Buched on a surface or enclosed in a conduit	Single-layer on the wall or floor		Single Layer under ceiling	
		Touching	Spaced[8]	Touching	Spaced[8]
1	1.00	1.00	1.00	0.95	0.95
2	0.80	0.85	0.95	0.80	0.85
3	0.70	0.80	0.90	0.70	0.85
4	0.65	0.75	0.90	0.70	0.85
5	0.60	0.75	0.90	0.65	0.85
6	0.55	0.70	0.90	0.65	0.85
7	0.55	0.70	0.90	0.65	0.85
8	0.50	0.70	0.90	0.60	0.85
9	0.50	0.70	0.90	0.60	0.85
10	0.50	0.70	0.90	0.60	0.85
12	0.45	0.70	0.90	0.60	0.85
14	0.45	0.70	0.90	0.60	0.85
16	0.40	0.65	0.90	0.55	0.85
18	0.40	0.65	0.90	0.55	0.85
20	0.40	0.65	0.90	0.55	0.85

5. DIN VDE 0298 Part 4.
6. DIN VDE 0298 Part 4, for cables with nominal conductor cross-section up to 10 mm^2.
7. IEC 60364-5-523.
8. At least one cable outer diameter is required for spacing distance.

6.10 Short-circuit Current

When short-circuit happens, ideally, the protective device shall interrupt the current in a time not exceeding the time that the short-circuit current brings the insulation to the limit temperature. On the other side, short-circuit generally happens in a quick duration, and during the period, the heat from the current ($P = I^2R$) is almost contained entirely in the conductor. The right cable size should be chosen so that the fault current would not damage the cable permanently.

The short-circuit duration t (in s, up to 5 seconds), in which the current would raise the temperature of the insulation from the maximum permitted operating value (e.g. 90°C for EPR) to its temperature limit (e.g. 250°C for EPR), can be calculated approximately as below:

$$t = \frac{k^2 S^2}{I^2}$$

where k is a factor, S is the cross-section area in (mm^2), and I is the current (A). Reform the formula,

$$I = \frac{kS}{\sqrt{t}}$$

For example, a copper conductor using 90°C rated EPR as insulation, the k is 143. Assume $t = 1$, then the permissible short-circuit current at limit temperature (250°C) is $I\,(A) = 143 \times S$.

Nominal cross-section (mm^2)	1	1.5	2.5	4	6	10	16	25	35
Short-circuit current (kA)	0.143	0.215	0.358	0.572	0.858	1.430	2.288	3.575	5.005
Nominal cross-section (mm^2)	50	70	95	120	150	185	240	300	
Short-circuit current (kA)	7.150	10.010	13.585	17.160	21.450	26.455	34.320	42.900	

For a copper conductor, 90°C rated XLPE would lead to the same maximum short-circuit current, while PVC has a limit temperature of 160°C (140°C for $S > 300mm^2$), and a $k = 115$ (103 for $S > 300mm^2$).

A heat-resistant version of PVC is similar, except the k is lower (100 for $S \leq 300mm^2$, and 86 for $S > 300mm^2$). Aluminum conductors generally have a lower k.

7 Thermal Effects

The environment temperature has a significant impact on cable performance, in terms of electrical and physical properties.

When the environment temperature is high, less heat is required to reach the maximum temperature rating of the insulation, and so it must be compensated for by a reduction in the current flowing through the conductor (see Appendix 6.9).

On the other hand, when the jacket is exposed to high temperatures (e.g. due to sunlight radiation), the hardness, abrasion and tear resistance and many other physical properties would reduce, making the cable more vulnerable to physical damages, especially in trailing and reeling applications. An increased temperature would accelerate the aging of the materials as well.

When the environment temperature is low, the compounds used in insulation, semiconductive layer, fillers, and sheath would become stiffer, a reduced flexibility is expected. This would be significant in reeling operation. When the temperature is below a certain point, the materials become brittle - bending, crushing, and impact are forbidden, or the cable would break.

Under no circumstances a cable shall be used in an environment with ambient temperature significantly lower or higher than the service temperature range. The flexible electric cables must be selected according to the expected operation temperature.

Commonly used insulation materials

Compounds	Maximum conductor temperature (°C)
PVC	70
EPR	90
EPDM	90
HEPR	90
PVC (heat resistant)	90
XLPE	90
EVA	110
ETFE	135
SiR	180
FEP	180
PTFE	250

8.1 Conductors

The quality of a conductor is determined by its material, design, and production.

Material

The material is the primary factor for a conductor's electrical and mechanical performance. For instance, steel has extremely high tensile strength; however, it is not flexible, and so it is not used for flexible operations except for serving as the armoring. Aluminum is cheaper than copper, but its resistance is much higher. For a metal coated material, the thickness of the coated layers would have marginal impact on the overall resistance of the conductor (e.g. tin vs copper), especially when the length of the cable is considerable.

Other than the obvious influences mentioned above, the size of the single wire is a key factor for the conductor's flexibility. IEC 60228 provides comprehensive guidelines for different classes of the conductors. For a conductor with certain nominal cross-section, the use of single wires of smaller size would make the conductor more flexible and more resistant to bending.

Max. diameter of wires in conductor (mm)		
Cross-section (mm^2)	Class 5	Class 6
0.5	0.21	0.16
1	0.21	0.16
1.5	0.26	0.16
2.5	0.26	0.16
4	0.31	0.21
6	0.31	0.21
10	0.41	0.21
16	0.41	0.21
25	0.41	0.21
35	0.41	0.21
50	0.41	0.31
70	0.51	0.31
95	0.51	0.31
120	0.51	0.31
150	0.51	0.31
185	0.51	0.41
240	0.51	0.41
300	0.51	0.41

Design

A stranded conductor is actually a strand of component strands of single wires. For a conductor, the strands are laid up in layers so that each strand in the outer layer is placed contacting each other and around the inner layer, covering the diameter of the inner "circle". To achieve this, each layer has a certain number of strands, the outer layer always has 6 more strands than the inner layer, and the total number of strands increases in an ordered way as the required cross-section increases, e.g. 7, 19, 37, 61, 91, 128…

A single strand	
7 strands (1+6)	
19 strands (1+6+12)	

Each strand and the twist of bunched strands can be stranded either to the left (Z-direction) or right (S-direction). This leaves a choice of how to arrange the direction of the strands.

Z-direction S-direction

When the strands per layer and wires per strand are all in the same direction, it is namely the "unilay" form.

When the directions of strand changes per layer and the directions of wires per strand are always opposite to the layer direction, it is namely the "alternating" form.

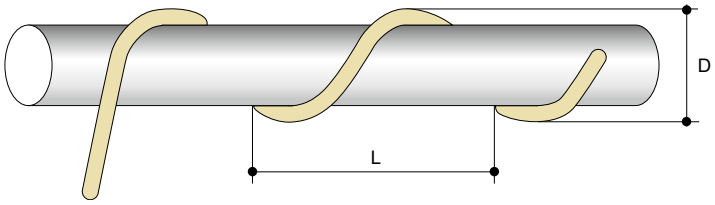
When the direction of strands in each layer and the direction of the wires per strand keeps unchanged but opposite to each other (say, all layers are "Z" and all strands are "S"), it is namely the "opposite" form.

Type	Strand direction	Single wire direction
Unilay		Same as the layer direction 
Alternating		Second layer:  Third layer: 
Opposite		Opposite to the layer direction 

A unilay is very flexible and has a small outer diameter as the gaps between the strands are smaller. However, as explained in Appendix 5.2, conductors in this form can be easily loosen by torsion, and cause a reduced mechanical performance. It is also vulnerable under repeated bending. For an alternating form, when the torsion applies, in either direction, the force to tighten or loosen a layer of strands have opposed effect on the wires per strand and on the other layers. As a result, an alternating form is not vulnerable under torsion. However, it also has a larger outer diameter and is less flexible than a unilay. As a middle point, the opposite form is mainly used for flexible cables as it reaches a balance point for flexibility, bending performance, torsion resistance, and conductor size.

Another important consideration would be the length of lay, which significantly impact the flexibility and bending performance. It is defined as the length in the direction of the conductor that a strand circumscribes a circle around the axis comparing to the diameter of the conductor.

A smaller length of lay would increase the flexibility, making the conductor more durable under repeated bending.



However, as the path length for the electrons to travel along the conductor increases, the conductor's overall resistance would increase, and the ampacity would decrease.

8.2 Shield

A shield serves as a wall against the electromagnetic interference from the cores and from the outside surrounding environment. The following forms are common in application:

- Overall shield
- Shield over power cores
- Shield over telecommunication pairs/control cores

The overall shield is typically placed between the inner and outer sheath. It reduces the interference from the power cores to the nearby electrical appliances and also protects the signaling wires from the unwanted signals in the surrounding environment. As a shield must be grounded to get effective, it can also be considered as an additional PE unit. The shielding material is typically aluminum, copper, or steel. When steel is applied, the shield is also an armor. This means such a shield is not very recommended for cables requiring extremely high flexibility or reeling installation. For non-magnetic metals, they do not provide an outstanding shield against magnetically dominant waves.

The shield over power cores usually serves as the grounding wires as well. It is mainly used for protecting the control cores and surrounding cables/equipment from the EMI generated by the power cores.

A shield over the telecommunication pairs and/or control cores is used for ensuring stable and continuous signals in the signaling conductors. A shield is generally required for a telecommunication pair.

Foil, spiral, braid, and their combination are typical forms of shield. Depending on installation types and actual requirements, a choice is made upon considering both the shielding effect and mechanical performance for a specific application.

8.3 Insulation

Insulation is a nonconductive (dielectric) material within a cable, and it is critical to safe operation. As introduced in Appendix 6.9, it is also a primary factor for the conductor's current-carrying capacity. Although the electrical specification and thermal properties are important for the insulation, its mechanical performance and physical properties guard the continuous safe operations, especially in fully flexible application. Except for temperature rating and electrical performance, different application scenario emphasizes different properties.

For example, the flame resistance would be required for underground mining; flexibility under low temperature is concerned for opencast mining especially in high latitudes; and waterproof is required for submersible cables.

The properties of an insulation is determined by its basic material and the additives. Even for the same type designation of cables, the insulation material may change based on the actual application requirement to achieve the best performance.

8.4 Sheath

A sheath (jacket) is the outermost layer of a cable, protecting the insulation and the cores from external physical damage, flame, moisture, and chemical deterioration, etc. Some of the major characteristics describing a jacket are listed as below:

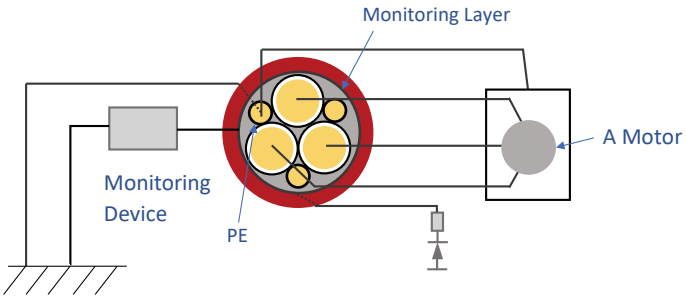
- Toughness (tear and abrasion resistance)
- Flexibility under low temperatures
- Resistance to heat aging
- Tensile strength
- Elongation at break
- Reaction to flame
- Oil resistance
- Moisture absorption
- Resistance to chemicals
- Weather and ultraviolet resistance

Just like insulation, the properties of a jacket is resulting from both the basic material and the additives. There is no "perfect" jacket, it is more about reaching a balanced point so that it is optimized for a specific application. Appendix 8.10 lists out some typical basic materials for insulation and sheath.

8.5 Monitoring

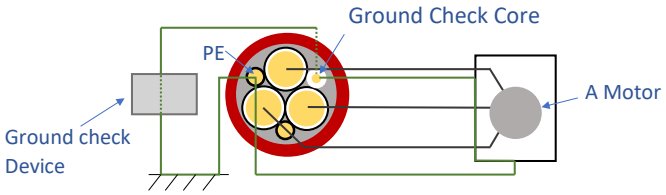
The monitoring layer (monitoring cores) helps enhance the operational safety by indicating whether there is a PE-Monitoring short circuit. Although modern electrical systems usually employ a relay to protect the devices when phase-to-grounding short circuit happens, a monitoring layer would warn the users before insulation breakage due to external physical damage.

When the system is working properly, there is no current in the monitoring layer. Assume a nail is knocked into the cable and breaks the inner jacket, the monitoring layer is now connected with the grounding wire and a circuit forms. The current starts to flow in the circuit, and the monitoring layer is "activated" to warn the users about the damage. Being different from a ground check unit, the monitoring layer is in an open circuit at normal conditions.



8.6 Ground Check

A ground check core is an insulated conductor connecting to a monitoring device, used to check whether the grounding is in desired effect. At normal conditions, the ground check conductor, the grounding wire, the device enclosure, and the ground forms a closed circuit. The ground check device usually uses a normally closed reed switch, when the grounding wire break or is not grounded properly, the circuit becomes an open circuit, which triggers the alarm.



8.7 Armoring

A cable armor is a metal layer placed between the inner and outer sheath of the cable, providing physical protection from external damages like falling objects. The most common armor material is steel, aluminum, and steel/copper mixed wires. For crushing, steel is the best option as it is much stronger than aluminum or copper. To achieve the same crush resistance as steel, the aluminum or copper layer have to be much thicker.

In practice, the armor can be a braid or a spiral of metal wires over the inner sheath. A spiral would be recommended for flexible operation as it is more durable under torsion and tension, and in the case that an armor breaks, it generally causes less damage than the braid.

When not grounded, the metallic armor does not have much shielding effect. Even when the armor is grounded, if it is made of steel or aluminum, the shielding effect would be limited by its lower conductivity comparing to the copper wires. However, in terms of "blocking" magnetic fields, a steel or steel/copper mixed armor would be effective regardless of whether it is grounded.

Though an armor provides some shielding effects, it is heavy, and a cable's weight plays a critical role in the mechanical stress that it has to handle. When the armor breaks, it can potentially damage the cable (imaging the broken steel wires pierce into the insulation layer). Therefore, cable armor is not meant for applications where physical protection is not required.

8.8 Supporting Elements

When high tensile loads are expected, supporting elements are required in cable construction to help relieve the conductors. The supporting elements can be placed at the center (so called "central supporting elements", a most common form in flexible cables) or in the outer interstices (more space for placement and are used when tensile loads are extreme, e.g. shaft cables).

Since the purpose is to relieve the conductors, the support elements should have less elongation at break than the conductor material and yet a higher tensile strength. Steel and special fibers (e.g. aramid) are typical in practice as they start to bear the tensile forces earlier than copper/aluminum conductors. As the cross-section of the conductor increases, the marginal effect of the supporting elements decreases, so its effectiveness is most significant when the conductor size is not too large.

8.9 Reinforcement Layer

The most common reinforcement layer is an anti-torsion braid. With appropriate configuration, the anti-torsion braid would support the cable against the torsional stress and make the cable twist less than a cable without such a braid. In other words, an anti-torsion braid attempts to stop the twist instead help the cable handle an extreme angle of twist, and so such effects cannot be measured with the unit °/m, which is generally used in torsion tests. When the torsional stress is extremely high, the reinforcement layer provides no help, and it depends on the material and structure of a cable to handle certain angle of twist.

Another type of reinforcement layer is a supporting layer. With appropriate configuration, the braid can help relieve the cores in the direction along the cable. However, it is less effective than supporting elements introduced in Appendix 8.8 because the braid become effective only after certain deformation happened.

8.10 Basic Materials for Insulation and Sheath

Name	Abbreviation	Description
Thermoplatic		
Polyvinyl chloride	PVC	Good abrasion, chemical, sunlight, weathering resistance. Commonly used basic material for insulation and sheath.
Polyethylenen	PE	Good electrical properties, low dielectric constant. Not flexible. Sensitive to moisture. Commonly used basic material for insulation.
Cross-linked polyethylene	XLPE	High electrical performance and hardness. Poor flame resistance. Commonly used basic material for insulation. Not intended for flexible application.
High density polyethylenen	HDPE	High density PE. Similar electrical properties as PE, high mechanical strength. Not flexible. Good to serve as waterproof material.
Fluorinated ethylene-propylene	FEP	Excellent electrical properties, flame and chemical resistance, and flexible. Wide service temperature range. Commonly used for insulation.
Polyurethane	PUR	Excellent tear strength and toughness, and high resistance to oxidation, oil and ozone. Poor fire resistance. Commonly used basic material for jacketing. Good for flexible application.
Thermoplastic polyurethane	TPU	Outstanding abrasion resistance, elasticity, shear strength, oil resistance and insensitive to temperature. Commonly used basic material for sheath. Good for flexible application.
Polytetrafluoroethylene	PTFE	Flame retardant, high insulation resistance and low dielectric constant. Very high melting point. Flexible. Commonly used as insulation basic material extruded over a silver- or nickel-coated wire.
Polypropylene	PP	Low dielectric constant. High resistance to chemicals but poor flame resistance. Not flexible. Commonly used for insulation.
Ethylene tetrafluoroethylene	ETFE	One type of fluoropolymers. Outstanding hardness and excellent electrical properties. Chemical, heat, radiation and flame resistance. Can be used as jacketing or insulation basic material.
Polyimide	PI	Compact, lightweight and mechanically tough polymer with good flexibility, heat and chemical resistance. Usually used as a basic material for insulation.
Polyvinylidene fluoride	PVDF	Thermal stable, rated temperature: 135°C. Flexible, and high resistance to abrasion, oil, heat, ozone, etc. High dielectric constant. Commonly used for jacketing.
Polyfluoroalkoxy	PFA	One type of fluoropolymers. High mechanical strength at high temperature, remaining flexible under low temperature. Low dielectric constant. Commonly used as insulation basic material.

Name	Abbreviation	Description
Elastomer		
Ethylene propylene	EPR	Commonly used basic material for 90°C rated insulation, serving from low voltage to high voltage applications. Outstanding high-temperature performance, flame retardant. Good dielectric strength. Very suitable for flexible application.
Chloroprene rubber	CR	High resistance to flame, aging, ozone, chemicals. Moderate oil resistance. Outstanding mechanical performance. Typical basic material for compounds used for jacket, very suitable for flexible application.
Chlorated polyethylene	CM/CPE	Flame retardent. Outstanding physical and electrical performance. Resistance to thermal aging, ozone, UV, chemicals, water penetration, etc. Outstanding low temperature tolerance, not brittle down to -40°C. Typical basic material for compounds used for jacket, very suitable for flexible application.
Silicon rubber	SiR	Good electrical properties. Resistance to weather, radiation, moisture, and ozone. Soft. Usually used when ultra flexibility or a wide service temperature range is required. Typically 180°C rated when used for insulation. Very suitable for flexible application.
Ethylene vinylacetate	EVA	Common basic material for semiconductive rubber, when used for insulation, 110°C rated.
High modulus ethylene propylene	HEPR	High strength EPR. Good dielectric strength. Typically used as a basic material for insulation.
Natural rubber	NR	Commonly used for semiconductive rubber (with additives), other semiconductive rubber basic materials include NBR (Nitrile butadiene rubber), SBR (Styrene-butadiene rubber), IIR (Isobutylene -isoprene rubber), etc.

9 Understanding AWG and the Conversion

While most countries use an international standard of wire cross-section measured in square millimeters (mm^2), being defined in IEC 60228 (International Electrotechnical Commission), AWG (American Wire Gauge) is the standard way to denote wire size in North America.

To understand AWG, one should notice that AWG defines size 36 as 0.005 inches in diameter and size 0000 (4/0) as 0.46 inches in diameter, the ratio is 92. There are 39 steps from size 36 to 0000, so for each AWG size, the equivalent metric in mm^2 can be calculated as:

$$A = 1000 \times \frac{\pi}{4} (0.005 \times 25.4 \times 92^{(36-n)/39})^2$$

where n is the AWG size and 1 inch = 25.4 millimeters. Please note that AWG specifies the cross-section sizes for conductors carrying current below 200 amp. For larger cross-section, kcmil (or MCM) is used, meaning thousands of circular milli inches, which can be converted in the following way:

$$1\text{kcmil} = 1000 \times \frac{\pi}{4} \left(\frac{25.4}{1000}\right)^2 \text{mm}^2$$

To avoid confusion, a size conversion table covering most standard metric sizes is provided as below.

AWG size (& kcmil)	Equivalent metric (mm^2)	Nearest standard metric (mm^2)
20	0.35	0.5
18	0.82	1
16	1.31	2
14	2.08	2
12	3.31	4
10	5.26	6
8	8.37	10
6	13.30	16
4	21.15	25
2	33.63	35
1/0	53.48	50
2/0	67.43	70
3/0	85.03	95
4/0	107.22	120
250 kcmil	126.68	120
300 kcmil	152.01	150
350 kcmil	177.35	185
400 kcmil	202.68	240
450 kcmil	253.35	240
500 kcmil	304.02	300

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