MINING REELING CONTROL CABLE · MOBILE MACHINERY | 0.6/1 kV | 5 sizes | CPE rubber

FC-MCR-R-C 4G 0.6/1 kV

Mining Reeling Control Cable 0.6/1 kV – 4-core reeling control cable with overall tinned-copper braid screen, CPE rubber sheath. Complete technical data sheet: construction, dimensions, weights, current ratings, standards and installation guidance for 5 sizes.

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01 Application and Product Overview

FC-MCR-R-C 4G is a 4-core reeling control cable with overall tinned-copper braid screen rated 0.6/1 kV for cable reels on drill rigs, LHD machines, shuttle cars and mobile mining plant. It has fine-wire class 5 copper cores with halogen-free EPR/HEPR rubber insulation, an inner sheath and an outer sheath of chlorinated polyethylene (CPE) rubber, resistant to weather, ozone and oil. Core cross-sections: 0.75 – 4 mm².

Design

4 cores in concentric layers with a short lay length and polyester binder tape. Black cores carry white numbers; the green-yellow protective core lies in the outer layer. The cores are bound with halogen-free filler and covered by an inner sheath before the outer sheath is applied. A tinned-copper braid screen (≥ 85 % coverage) between the inner and outer sheath limits electromagnetic coupling between the control cores and nearby power cables. Cables with few cores are used for dedicated circuits such as brake, limit-switch or sensor supply.

Typical applications

- Control, signal and measuring circuits of drill rigs, LHD machines, shuttle cars and mobile crushers supplied through a cable reel
- Spring-driven and motor-driven cable reels on mining machines, cable handlers and conveyor take-up systems
- Operation with repeated winding, unwinding and bending within the permitted bending radius
- Wet, muddy, oily and abrasive environments typical of underground headings and open pits
- Circuits that need protection against electromagnetic interference: the overall tinned-copper braid screen limits coupling between control cores and nearby power cables
- Open-pit and surface duty that calls for a rubber sheath with proven weather, ozone and oil resistance

5 sizes	0.6/1 kV	+90 °C	CPE rubber
Cross-section 0.75 – 4 mm²	Rated voltage U_0/U	Maximum conductor temperature	Sheath: CPE rubber

Key features

- Fine-wire class 5 copper cores with insulation thickness to 0.6/1 kV for reliable operation on a reel
- Cores laid in concentric layers with a short lay length and polyester binder tape
- Number-printed black cores; green-yellow protective core in the outer layer (G types)
- CPE rubber sheath with proven weather, ozone and oil resistance
- Overall tinned-copper braid screen (≥ 85 % coverage) for EMC
- Flame retardant to IEC 60332-1-2

Service notes for mining duty

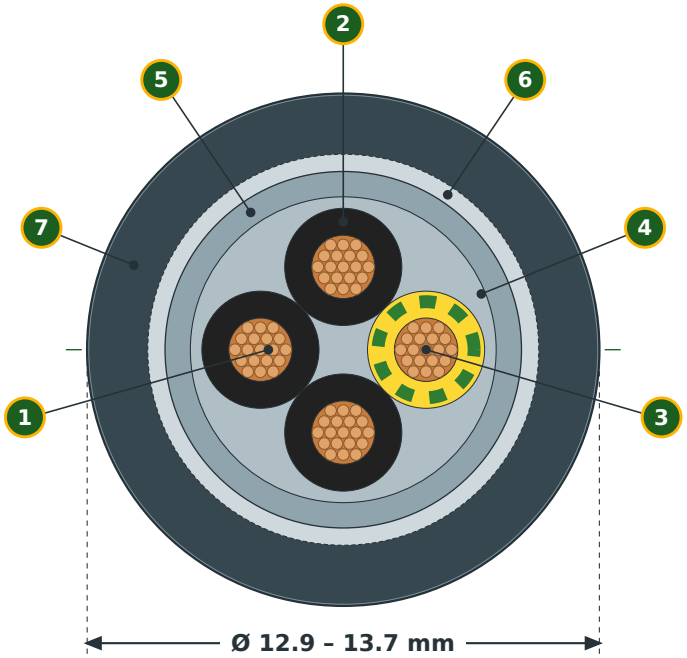
- Route control cables on the reel in a separate channel from MV or unscreened power cables, or use the screened version.
- Mark spare cores at both ends; a broken core in a reeling cable often appears first as an intermittent signal.

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02 Construction

FEICHUN · CROSS-SECTION A-A · 0.6/1 kV

FC-MCR-R-C
Sample size 4G1.5 C · Rev 0 · Illustrative, not to scale



No.	Component	Material
1	Conductor	Bare annealed fine-wire copper, class 5 to IEC 60228
2	Insulation	Halogen-free EPR/HEPR rubber
3	Protective (PE) core	Class 5 copper, green-yellow insulation
4	Filler and binder tape	Halogen-free compound, polyester tape
5	Inner sheath	Halogen-free polymer compound
6	Overall screen	Tinned-copper wire braid, coverage ≥ 85 %
7	Outer sheath	Chlorinated polyethylene (CPE) rubber, resistant to weather, ozone and oil

The drawing shows size 4G1.5 C. Other sizes have the same construction with scaled dimensions.

Construction details

Conductor	Bare annealed fine-wire copper, class 5 to DIN EN 60228 / IEC 60228 / VDE 0295
Insulation	Halogen-free EPR/HEPR rubber to IEC 60502-1, maximum conductor temperature 90 °C
Core identification	Black cores with white numbers; green-yellow protective core in the outer layer
Stranding	Cores stranded in concentric layers with a short lay length; polyester binder tape
Overall screen	Tinned-copper wire braid, coverage ≥ 85 %, between inner and outer sheath
Inner sheath	Halogen-free polymer compound, extruded tightly over the stranded cores
Outer sheath	Chlorinated polyethylene (CPE) rubber, resistant to weather, ozone and oil

Sheath material

The chlorinated polyethylene (CPE) rubber sheath offers good resistance to weather, ozone and mineral oil with good mechanical robustness and flexibility to −30 °C in motion, at a favourable cost level. CPE contains halogen; where halogen-free cables are specified, select the PUR version of the same construction.

03 Electrical, Thermal and Mechanical Characteristics

Electrical data

Rated voltage U_0/U	0.6/1 kV AC
Test voltage	3.5 kV AC, 5 min
Maximum operating voltage, DC	0.9/1.8 kV
Current-carrying capacity	To DIN VDE 0298-4 at 30 °C ambient; the table gives rated design values
Conductor resistance	Maximum at 20 °C, class 5 to IEC 60228

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Thermal and mechanical data

Maximum conductor temperature	+90 °C
Maximum temperature at short circuit	+250 °C
Ambient temperature, fixed installation	−40 °C to +90 °C
Ambient temperature, in motion	−30 °C to +90 °C
Minimum bending radius	Fixed: 4 × D (D ≥ 8 mm), 3 × D (D < 8 mm); moving or reeling: 6 × D (D ≤ 12 mm), 8 × D (D ≤ 20 mm), 10 × D (D > 20 mm)
Maximum tensile load	15 N/mm² continuous, on the total copper cross-section of the power cores
Maximum travelling speed	60 m/min on a cable reel; higher speeds on request
Flame propagation	IEC 60332-1-2 / DIN EN 60332-1-2
Halogen-free	No (CPE rubber sheath)
UV and ozone resistance	Resistant
Mineral oil resistance	Resistant, IEC 60811-404

04 Dimensions, Weights and Rated Data – 0.6/1 kV (5 sizes)

Type designation cores × mm²	FeiChun article no.	Conductor Ø max mm	Outer Ø min mm	Outer Ø max mm	Min. bend radius mm	Weight approx. kg/km	Max. pull force N	R_{20} max Ω/km	Current per core A	I_k (1 s) kA
4G0.75 C	FC-MC201-001	1.2	11.7	12.4	100	181	45	26.0	12	0.107
4G1 C	FC-MC201-002	1.4	12.2	12.9	104	200	60	19.5	14	0.143
4G1.5 C	FC-MC201-003	1.7	12.9	13.7	110	235	90	13.3	18	0.214
4G2.5 C	FC-MC201-004	2.2	14.2	15.1	120	300	150	7.98	25	0.357
4G4 C	FC-MC201-005	2.7	15.7	16.6	132	388	240	4.95	33	0.572

Current-carrying capacity: rated design values to DIN VDE 0298-4 for flexible cables, free air, 30 °C ambient; values per core include the derating factor for the number of cores; for other ambient temperatures, grouping or layered winding on a reel, apply the factors below. Pull force = 15 N/mm² × total copper cross-section of the power cores. Diameters, dimensions and weights are nominal design values and vary within manufacturing tolerances; confirm critical dimensions before dimensioning reels, guides or festoon systems. Other sizes and configurations are produced to order.

Ambient temperature factors (conductor 90 °C)

°C	20	25	30	35	40	45	50
Factor	1.08	1.04	1.00	0.96	0.91	0.87	0.82

Short-circuit current rating

I_k = 0.143 kA/mm² × cross-section of the power core (conductor 90 °C → 250 °C). For another short-circuit duration t: $I_{k,t} = I_{k,1s} / \sqrt{t}$ (0.1 s ≤ t ≤ 5 s).

05 Reeling Performance and Reel Design Data

The values below support the dimensioning of the cable reel: minimum reel core diameter, copper weight for earthing and loop-resistance calculations, cable weight, and the rated current for the number of layers wound on the reel.

Type designation cores × mm²	Outer Ø max mm	Min. bend radius on reel, mm	Min. reel core Ø mm	Copper weight kg/km	Cable weight kg/100 m
4G0.75 C	12.4	100	200	64	18.1
4G1 C	12.9	104	208	75	20.0
4G1.5 C	13.7	110	220	96	23.5
4G2.5 C	15.1	120	240	137	30.0
4G4 C	16.6	132	264	197	38.8

Reel design guidance

- Minimum reel core diameter = 2 × minimum bending radius = 2 × minimum bending radius (outer diameter D).
- Spring reels suit short travel and low tensile load; motor-driven reels with torque control keep the cable under constant, low tension.
- Fit a guide or level-wind that keeps the cable parallel to the reel axis to prevent crossing turns.

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06 Selection Guide and Sizing Aid

FC-MCR-R-C 4G covers 5 sizes. The smallest, 4G0.75 C, has an outer diameter of up to 12.4 mm and weighs about 181 kg/km; the largest, 4G4 C, has an outer diameter of up to 16.6 mm and weighs about 388 kg/km, 2.1 times as much. Across the range the rated current per core rises from 12 A to 33 A at 30 °C, and the minimum bending radius from 100 mm to 132 mm.

Example 1. A circuit carries 12 A per core at an ambient temperature of 40 °C. Required table current = 12 / 0.91 = 14 A per core. The smallest suitable size is 4G1 C with 14 A per core.

Example 2. A circuit carries 22 A per core at an ambient temperature of 35 °C. Required table current = 22 / 0.96 = 23 A per core. The smallest suitable size is 4G2.5 C with 25 A per core.

Type designation cores × mm²	Total copper mm²	Cable weight kg/100 m	Winding capacity m	Free-hanging length m (vertical)
4G0.75 C	3	18.1	27,900	25
4G1 C	4	20.0	25,735	30
4G1.5 C	6	23.5	22,930	39
4G2.5 C	10	30.0	18,745	50
4G4 C	16	38.8	15,640	63

Winding capacity is an indicative value for a reel with 2,500 mm flange diameter, 1,000 mm traverse width, core diameter equal to the minimum reel core diameter and 90 % fill; it is not a substitute for the reel manufacturer’s calculation. Free-hanging length = permissible pull ÷ (weight × 9.81); it is the length at which the cable’s own weight reaches the rated pull, without any safety factor for hoisting.

07 Engineering Profile by Size

Each size of FC-MCR-R-C 4G with the values that matter when sizing a circuit: dimensions, weight, copper share, heat and voltage drop at rated current, and the permissible pull. Voltage drop is for 100 m of cable at rated current with conductors at 90 °C (single-phase AC or DC round trip).

Choose 4G0.75 C when the load is near 12 A: the conductor resistance is 26.00 Ω/km, the overall size is Ø 12.4 mm and the weight 181 kg/km. The minimum reel core is 200 mm and the 1 s short-circuit rating 0.11 kA. Handling 4G0.75 C: 18.1 kg per 100 m, bending radius 100 mm; two people can lift a 20 m piece of about 3.6 kg.

4G1 C: Ø 12.9 mm; bend radius 104 mm; weight 200 kg/km. Voltage drop at rated current (14 A) is 69.6 V per 100 m, loss 9.7 W/m, and the cable can support 30 m of its own length vertically at the rated pull of 60 N. A 500 m length of 4G1 C weighs about 100 kg; with a 208 mm minimum core the drum must be sized for that load.

For 4G1.5 C the design values are: Ø 13.7 mm, 235 kg/km, 90 N permissible pull, 18 A rated current. The copper accounts for 41% of the weight, and 11.0 W/m is dissipated at full load, so heat-sensitive reel layers should be derated as shown in section 04. Reel and handling: at 4G1.5 C the minimum reel core is 220 mm and the cable weighs 23.5 kg per 100 m, so a 500 m length weighs about 118 kg before the drum.

For 4G2.5 C the design values are: Ø 15.1 mm, 300 kg/km, 150 N permissible pull, 25 A rated current. The copper accounts for 46% of the weight, and 12.7 W/m is dissipated at full load, so heat-sensitive reel layers should be derated as shown in section 04. Per 100 m, 4G2.5 C contains 13.7 kg of copper and 16.3 kg of insulation, filler and sheath material, which sets the scrap value and the recycling split.

Size 4G4 C has a maximum conductor resistance of 4.95 Ω/km, a copper content of 197 kg/km and a minimum bending radius of 132 mm (reel core 264 mm). Short-circuit capability for 1 s is 0.57 kA. Expect 41.7 V of drop per 100 m at 33 A. Handling 4G4 C: 38.8 kg per 100 m, bending radius 132 mm; two people can lift a 20 m piece of about 7.8 kg.

08 Configuration Guidance and Variant Comparison

Typical case: a drill rig that moves its control and sensor signals in a separate channel from the power reel. For this case FC-MCR-R-C 4G is a fit in the 4G1.5 C size (Ø 13.7 mm).

CPE rubber is the economical rubber option for surface trailing and reeling duty where halogen-free materials are not required.

Rated 0.6/1 kV, the cable covers the common 400 V, 690 V and 1,000 V mining supplies.

In the drawn size 4G1.5 C the cores fill 59% of the circle inside the inner sheath, the inner sheath is 0.7 mm thick, the screen 0.45 mm and the outer sheath 1.6 mm, giving a total wall of 2.7 mm around a core bundle of Ø 8.0 mm.

FC-MCR-R-C 4G is one of 360 datasheets in the mining reeling control cable group and one of 953 in the library. The next smaller core count, FC-MCR-R-C 3G, has an outer Ø of 12.8 mm at 1.5 mm² against 13.7 mm here. The next larger core count, FC-MCR-R-C 5G, measures 14.7 mm and weighs 273 kg/km (this model: 235 kg/km).

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Element inventory and core layout

Element inventory of the drawn size 4G1.5 C: 4 elements with 6.0 mm² of copper in total. The 4 cores are stranded in 1 concentric layer (layer 1: 4 cores), counted from the centre outwards, each layer with a short lay length and alternating lay direction. Keeping about 15 % of the cores as spare leaves 2 usable circuits plus the protective core; plan the core allocation before ordering because the number cannot be changed after manufacture.

Element	Quantity	Cross-section	Ø over insulation mm	Copper mm²
Power / main core	3	1.5 mm²	3.1	4.5
Protective (PE) conductor	1	1.5 mm²	3.1	1.5

Termination data (indicative)

Type designation cores × mm²	Outer Ø or W × H mm	Cable gland thread	Lug / ferrule bolt	Strip length mm	Terminal row mm	Gland-to-bend straight mm
4G0.75 C	12.4	M25	ferrule	12	20	50
4G1 C	12.9	M25	ferrule	12	20	52
4G1.5 C	13.7	M25	ferrule	12	20	55
4G2.5 C	15.1	M25	ferrule	12	20	60
4G4 C	16.6	M32	ferrule	12	30	66

Gland, lug and terminal-row values are planning guides computed from the dimensions above; confirm them with the accessory manufacturer.

Comparison with related variants at size 4G1.5 C

Variant	Differs in	Outer Ø / H mm	Weight kg/km	Pull N	Current A
This datasheet FC-MCR-R-C 4G	–	13.7	235	90	18
FC-MCR-S-C 4G 0.6/1 kV	sheath	13.7 (+0%)	241 (+3%)	90 (+0%)	18 (+0%)
FC-MCR-A-C 4G 0.6/1 kV	sheath	13.7 (+0%)	221 (-6%)	90 (+0%)	18 (+0%)
FC-MCR-R-C 3G 0.6/1 kV	configuration	12.8 (-7%)	201 (-14%)	68 (-24%)	23 (+28%)
FC-MCR-R-C 5G 0.6/1 kV	configuration	14.7 (+7%)	273 (+16%)	112 (+24%)	18 (+0%)
FC-MCR-R 4G 0.6/1 kV	screen	12.8 (-7%)	187 (-20%)	90 (+0%)	18 (+0%)
FC-MCR-R-C-HT 4G 0.6/1 kV	tensile braid	15.1 (+10%)	273 (+16%)	1,190 (+1222%)	18 (+0%)

Percentages show the change against this datasheet for the same cross-section; use them to judge what a change of sheath, voltage class, screen or tensile braid costs in size and weight.

09 Standards and Testing

Standard	Scope
DIN EN 60228 / IEC 60228 / VDE 0295	Conductors, class 5
IEC 60502-1	Insulation compound, power cables up to 1 kV
DIN VDE 0298-3	Application of cables – bending radii and tensile loads
DIN VDE 0298-4	Application of cables – current-carrying capacity
DIN EN 60332-1-2 / IEC 60332-1-2	Flame propagation, single cable
DIN VDE 0293-308	Core identification
IEC 60811-404	Mineral oil immersion test

Routine and type tests

- AC voltage test on every reel length (routine test): 3.5 kV AC, 5 min
- Conductor resistance and checks of dimensions, insulation thickness and sheath thickness
- Continuity of conductors and protective earth
- Bending, tensile tests (type test)
- Flame propagation (IEC 60332-1-2)

Test documentation: every delivery is accompanied by a test certificate from FeiChun’s own laboratory. Third-party witnessed tests can be arranged at the buyer’s cost.

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10 Installation, Marking and Delivery

Installation guidance

- Use a reel core diameter of at least twice the minimum bending radius; keep the cable free of loops and kinks while winding.
- Connect the protective core (G types) at both ends; terminate the screen 360° where fitted.
- Keep control cables away from unscreened power cables running in parallel where possible.
- Inspect the sheath regularly for abrasion and mechanical damage.

Sheath marking

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FEICHUN FC-MCR-R-C [cross-section] 0.6/1 kV [year] [serial no.] [metre mark]
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Packing and delivery

Reel	Steel or fumigated wooden reels; cable ends sealed with heat-shrink caps
Delivery length	As ordered, in one continuous length without joints
Lead time	2–3 weeks after technical approval
Warranty	At least 3 years against manufacturing defects
Reel label	Type, cross-section, length, gross/net weight, batch no., reel no.

Ordering information

Order example: FC-MCR-R-C 4G1.5 C 0.6/1 kV – 500 m on one steel reel. When requesting a quotation, state the cable type, configuration, cross-section, voltage, length per piece, required standards and installation conditions.

11 Certification and Quality

All cable is subject to FeiChun’s quality control, with routine testing over 100 % of the delivered length. Certificates, type tests and third-party tests (for example partial discharge or compatibility with cable accessories) are provided per project requirement; copies of the records are available on request.

Mine-specific approvals (for example coal-mine safety marks, MSHA, or ATEX / IECEx for gassy atmospheres) are not implied by this datasheet; they depend on the project, the machine and the country and are arranged with the end user.

12 Related Datasheets

Variants of this cable with a different sheath, configuration or voltage. All datasheets are in PDF format.

- FC-MCR-S-C 4G 0.6/1 kV – 4-core reeling control cable with overall tinned-copper braid screen, CSP rubber
- FC-MCR-A-C 4G 0.6/1 kV – 4-core reeling control cable with overall tinned-copper braid screen, PUR low-temp
- FC-MCR-R-C 3G 0.6/1 kV – 3-core reeling control cable with overall tinned-copper braid screen, CPE rubber
- FC-MCR-R-C 5G 0.6/1 kV – 5-core reeling control cable with overall tinned-copper braid screen, CPE rubber
- FC-MCR-R 4G 0.6/1 kV – 4-core reeling control cable, CPE rubber
- FC-MCR-R-C-HT 4G 0.6/1 kV – 4-core reeling control cable with overall tinned-copper braid screen, with aramid tensile support braid, CPE rubber
- FC-MCR-R-C 2× 0.6/1 kV – 2-core reeling control cable with overall tinned-copper braid screen, CPE rubber
- FC-MCR-R-C 7G 0.6/1 kV – 7-core reeling control cable with overall tinned-copper braid screen, CPE rubber

Overview of all datasheets: Mining Reeling Control Cables 300/500 V and 0.6/1 kV

Frequently asked questions

What is FC-MCR-R-C 4G used for?
Typical applications include control, signal and measuring circuits of drill rigs, LHD machines, shuttle cars and mobile crushers supplied through a cable reel.

What are the outer diameter and minimum bending radius of 4G1.5 C?
The outer diameter is 12.9 to 13.7 mm and the minimum bending radius in moving or reeling operation is 110 mm (6 to 10 × D depending on diameter).

What minimum reel core diameter is needed for 4G1.5 C?
At least 220 mm, which is twice the minimum bending radius of 110 mm. A larger core diameter extends cable life.

What current can each core of 4G1.5 C carry?
The table gives 18 A per core in free air at 30 °C ambient, already reduced for the number of cores; apply the ambient temperature factor and, on a reel, the layer factor.

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How much tensile load can 4G1.5 C take, and how long can it hang freely?
The permissible pull force is 90 N. With a weight of about 235 kg/km this corresponds to a free-hanging vertical length of about 39 m before the rated pull is reached; apply your own safety factor for hoisting or suspended installations.

What is the voltage drop and heat loss of 4G1.5 C at rated current?
At 18 A and a conductor temperature of 90 °C the voltage drop is about 61.0 V per 100 m and the conductor loss about 11.0 W per metre (maximum resistance 13.300 Ω/km at 20 °C).

Is this cable halogen-free?
No. The CPE rubber sheath contains halogen. If halogen-free cables are required, select the PUR version of the same construction.

Which cross-sections are available?
FC-MCR-R-C 4G: 0.75, 1, 1.5, 2.5, 4 mm². Other sizes and special designs can be produced to order.

Does this datasheet include mine-specific approvals?
No. Mine-specific approvals, such as coal-mine safety marks, MSHA or ATEX/IECEx for gassy atmospheres, depend on the project and the country and are not implied by this document. Send the requirements to FeiChun technical support.

13 Trademark Notice and Intellectual Property

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