
becker®
MINING SYSTEMS

Unlocking **Potential**

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Introduction

Becker Mining Systems is the only worldwide supplier of complete energy, automation, communication, transportation and infrastructure technology for the mining industry. It is one of the technology leaders in its markets. The products can be used in all mining operations, and fulfill even the highest demands for use in explosive atmospheres.

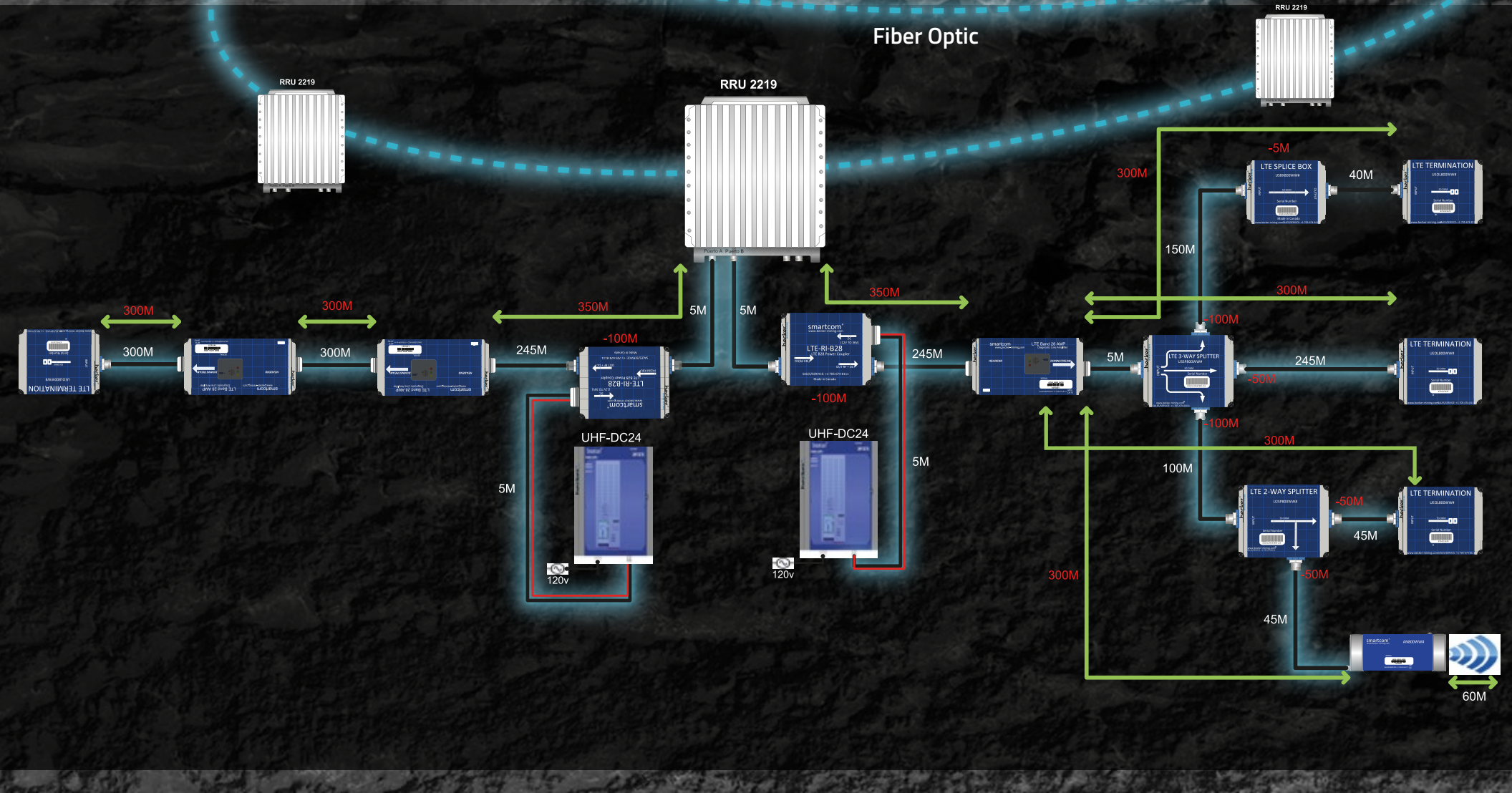
All mines recognize the need for a reliable, robust and low maintenance communication system to enhance safety and production. The **Becker Mining Systems smartcom®** Leaky Feeder range is world renowned for its reliability, powerful performance and maintainability.

Becker Mining Systems recognizes that there is no one-size-fits-all solution and that customer needs vary depending on the size of their mines and their budgets. Based on the robust RNG-AMP, **Becker Mining Systems** offers VHF, UHF and LTE systems that enable mines to build their Leaky Feeder networks according to specific requirements of each site, with easy upgradeability when required.

smartcom® provides multiple simultaneous noise-free voice and data radio channels. The robust and low maintenance VHF, ensures the lowest cost of ownership on the market. While our UHF and LTE communications platform ensures future upgrade paths as well as expandability. Narrowband radio modems can also be used to provide a 9600 bps fixed/mobile data connection over the entire coverage area of the Leaky Feeder network.

Communication diagram

Fiber Optic



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HELICAL ANTENNA

INTRODUCTION

Becker Mining Systems Helical Antenna gives a clean signal and a low VSWR across its entire 690 MHz to 1.0 GHz band, making the helical antenna suitable for almost any application, including drone jamming, public safety, mining, video surveillance, warehousing, and more.

Its high quality internal components protected by an all-weather, impact resistant polycarbonate radome allow it to withstand almost any environment.

- Polycarbonate radome and sealing gasket ensure protection against water and dust ingress.
- Less interference than with linear signal for cleaner line of sight.
- Greater data throughput and transmission distance.
- Circular polarization ideal for harsh environments.

ELECTRICAL SPECIFICATIONS

Frequency Range MHz	690-1000
Impedance	50 Ω
Gain - dBic	12
F/B RATIO - dB	>20
VSWR (max)	2:1
Connector Type	N-Female
Number of Outputs	1
Polarization	RHCP
Half Power Beamwidth @ 900 MHz - °	44
Power Rating - W	100

MECHANICAL SPECIFICATIONS

Length from Bottom of Ground Plane - in (cm)	18.5 (47.0)
Ground Plane Diameter - in (cm)	12.0 (30.5)
Radome Diameter - in (cm)	5.0 (12.7)
Bulkhead Base Diameter - in (cm)	6.0 (15.2)
Cap Diameter - in (cm)	5.1 (13.0)
Antenna Weight - lbs (kg)	4.3 (2.0)

ENVIRONMENTAL DATA

Operational Temperature	-40°C to +75°C (-40 F to +167)

PART NUMBERS

SKU	Description
2.1.6 LTE-VA-ANT	HELICAL ANTENNA

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LTE 2-WAY SPLITTER

INTRODUCTION

The Becker Mining Systems' smartcom® LTE Two-Way Splitter, with its N-type connectors, enables branching of a single Leaky Feeder input into two Leaky Feeder outputs.

The two-way splitter is fully functional over the smartcom® VHF, smartcom® UHF and sub 1 GHz LTE frequencies.
2 year component and workmanship warranty.

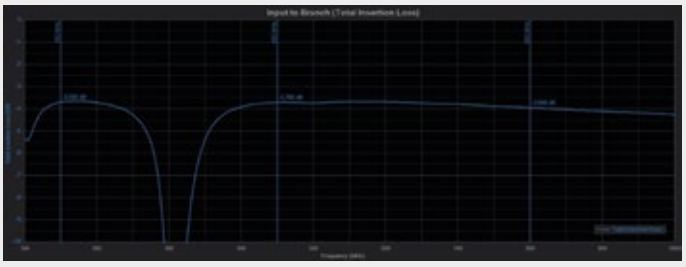
- Two-way bypass of the Leaky Feeder cable.
- Compact Design.
- N-Type Connectors.
- 50 Ohm Impedance.

PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Frequency Range	140 MHz - 220 MHz 415 MHz - 1 GHz
RF Loss – Branch 1	-3.7 dB at 150 MHz -3.8 dB at 450 MHz -4.0 dB at 800 MHz
RF Loss – Branch 2	-3.7 dB at 150 MHz -3.8 dB at 450 MHz -4.0 dB at 800 MHz
Voltage	36 V
Max Current	2.2 A
Temperature Range	-40 °C to + 85 °C

MECHANICAL DATA

Dimensions	200 x 140 x 88 mm (7.9 x 5.5 x 3.5 in)
Weight	800 g (1.8 lb)
Enclosure	ABS, anti-static
Connectors	N-Type



PART NUMBERS

SKU	Description
2.1.6 LTE-VA-2-SPL	LTE 2-WAY SPLITTER

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LTE 3-WAY SPLITTER

INTRODUCTION

The Becker Mining Systems smartcom® LTE Band 28 Three-Way Splitter, with its N-type connectors, enables branching of a single Leaky Feeder input into two Leaky Feeder outputs.

The three-way splitter is fully functional over the 400 MHz to 1 GHz frequency range.
Additional Bands include: 5, 8, 12, 13, 14, 17, 20, and 26, and can go up to 350 m spacing.
2 year component and workmanship warranty.

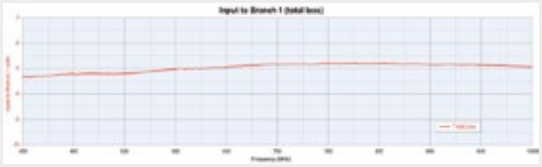
- Three-way bypass of the Leaky Feeder cable.
- Compact Design.
- N-Type Connectors.
- 50 Ohm Impedance.

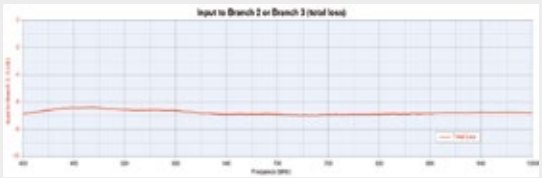
PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Frequency Range	400 MHz – 1 GHz
RF Loss – Branch 1	3.7 dB at 700 MHz
RF Loss – Branch 2	6.8 dB at 700 MHz
RF Loss - Branch 3	6.8 dB at 700 MHz
Isolation between Branches (worst case)	15dB @ 703MHz, 25dB @ 803MHz
Voltage	36 V
Max Current	2.2 A
Temperature Range	-40 °C to + 85 °C

MECHANICAL DATA

Dimensions	200 x 140 x 88 mm (7.9 x 5.5 x 3.5 in)
Weight	475 g (1.015 lb)
Enclosure	ABS, anti-static
Connectors	N-Type





PART NUMBERS

SKU	Description
2.1.6 LTE-VA-3-SPL	LTE 3-WAY SPLITTER

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LTE Amplifier BAN-5

INTRODUCTION

Becker Mining Systems' new LTE amplifier offering offers an effective alternative to enable LTE connectivity in mines.t

Becker Mining Systems LTE amplifiers offer a robust and cost-effective alternative to installing expensive remote radio units at short intervals.

The Amplifier offers 25MHz of bandwidth in the upstream and downstream, with 20MHz separation between bands.

Becker Mining Systems' LTE Amplifiers are also available for other bands.
2 year component and workmanship warranty.

- Mine-wide LTE Band 5 signal distribution.
- Reduced cost compared to traditional LTE implementations in mines.
- Easy installation and maintenance.

PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Input Voltage	10.5 V to 36V
Current Consumption	200 mA @ 12 V, 150 mA @ 16 V, 110 mA
Gain	@ 24 V ~25.5dB uplink, ~26dB downlink
Amplifier Spacing	Up to 350m
Attenuation Adjustment Range	0 to 31.5 dB in 0.5 dB steps
Gain Control	MGC, AGC

MECHANICAL DATA

Dimensions	200 x 140 x 88 mm (7.9 x 5.5 x 3.5 in)
Weight	475 g (1.015 lb)
Enclosure	ABS, anti-static
Connectors	N-Type

ENVIRONMENTAL DATA

Temperature Range	-20 to +60 °C
Protection Class	IP66

LTE BAND 5 SPECIFICATIONS

Bandpass (3 dB)	824 MHz to 849 MHz (uplink); 869 MHz to 894 MHz (downlink)
Bandwith (3 dB)	>25 MHz
Passband Ripple	< 1.5 dB

PART NUMBERS

SKU	Description
2.1.6 LTE-VA-AMP-5	LTE AMPLIFIER BAN-5

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LTE Amplifier BAN-28

INTRODUCTION

Becker Mining Systems' new LTE amplifier offering offers an effective alternative to enable LTE connectivity in mines.t

Becker Mining Systems LTE amplifiers offer a robust and cost-effective alternative to installing expensive remote radio units at short intervals.

The LTE Amplifier offers 45MHz of bandwidth in the upstream and downstream, with 10MHz separation between bands.

Becker Mining Systems LTE Amplifiers are also available for other bands.
2 year component and workmanship warranty.

- Mine-wide LTE Band 28 signal distribution.
- Reduced cost compared to traditional LTE implementations in mines.
- Easy installation and maintenance.

PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Input Voltage	10.5 V to 36V
Current Consumption	200 mA @ 12 V, 150 mA @ 16 V, 110 mA @ 24 V
Gain	~25.5dB uplink, ~26dB downlink
Amplifier Spacing	Up to 350m
Attenuation Adjustment Range	0 to 31.5 dB in 0.5 dB steps
Gain Control	MGC, AGC

MECHANICAL DATA

Dimensions	270 mm x 125 mm x 105 mm
Weight	900 g
Enclosure	ABS, anti-static
Connectors	N-Type Jack

ENVIRONMENTAL DATA

Temperature Range	-20 to +60 °C
Protection Class	IP66

LTE BAND 28 SPECIFICATIONS

Bandpass (3 dB)	703 MHz to 748 MHz (uplink); 758 MHz to 803 MHz (downlink)
Bandwith (3 dB)	45 MHz
Passband Ripple	< 1.5 dB

PART NUMBERS

SKU	Description
2.1.6 LTE-VA-AMP-28	LTE AMPLIFIER BAN-28

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LTE TERMINATOR

INTRODUCTION

The Becker Mining Systems' smartcom® LTE End-of-Line Termination Unit is required at the end of each Leaky Feeder cable branch to absorb RF signals, preventing reflections and distortions.

Additional Bands include: 5, 8, 12, 13, 14, 17, 20, 26 and 28, and can go up to 350 m spacing.

2 year component and workmanship warranty.

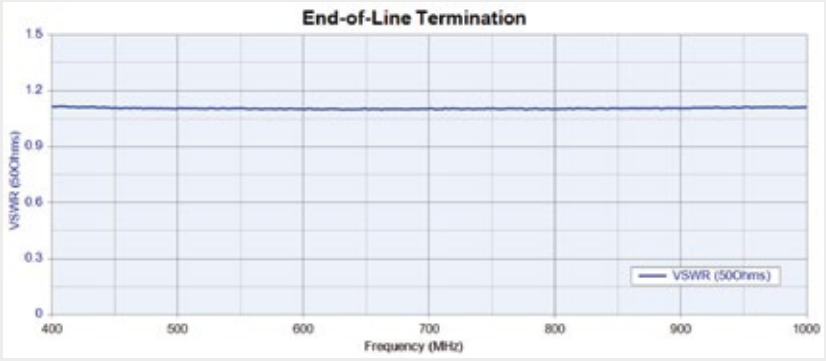
- End-of-Line Unit.
- Prevents Reflections and Distortions.
- N-Type Connectors.
- 50 Ohm Impedance.

PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Frequency Range	400 MHz - 1 GHz
VSWR	<1.12
Temperature Range	-40 °C to + 85 °C

MECHANICAL DATA

Dimensions	170 x 90 x 88 mm (6.7 x 5.5 x 3.5 in)
Weight	500 g (1.1 lb)
Enclosure	ABS, anti-static
Connectors	N-Type



PART NUMBERS

SKU	Description
2.1.6 LTE-VA-TER	LTE TERMINATOR

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LTE SPLICE BOX

INTRODUCTION

The Becker Mining Systems' smartcom® LTE Splice Units are used to repair cable breaks and splice together lengths of Leaky Feeder cable during system configuration or repair.

These units present minimal RF loss between the two joined lengths of Leaky Feeder cable.

Additional Bands include: 5, 8, 12, 13, 14, 17, 20, 26 and 28, and can go up to 350 m spacing.
2 year component and workmanship warranty.

- Repair Cable Breaks.
- Minimal RF Loss.
- 50 Ohm Impedance.

PERFORMANCE SPECIFICATIONS

Impedance	50 Ω
Frequency Range	400 MHz – 1 GHz
Insertion Loss	0.2 dB
Max Current	2.2 A
Temperature Range	-40 °C to + 85 °C

MECHANICAL DATA

Dimensions	200 x 90 x 88 mm (7.9 x 3.5 x 3.5 in)
Weight	460 g (1.01 lb)
Enclosure	ABS, anti-static
Connectors	N-Type

PART NUMBERS

SKU	Description
2.1.6 LTE-VA-SPLICE	LTE SPLICE BOX

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LTE RADIO INTERFACE

INTRODUCTION

Becker Mining Systems' new LTE Leaky Feeder offerings provide an effective alternative to enable LTE connectivity in mines.

The LTE Remote Radio Unit Interface (LTE-RI) acts as the bridge between the Remote Radio Unit and the Leaky Feeder network.

The LTE-RI-xx is specifically designed to work with our LTE amplifier offerings to enable automatic gain control and remote diagnostics.

The LTE-RI-xx powers the amplifiers connected downstream with a choice of 12V, 24V or 48V DC. Each port of the RRU will require one LTE-RI:

LTE-RI-12: LTE-RI with 12VDC output.
LTE-RI-24: LTE-RI with 24VDC output.
LTE-RI-48: LTE-RI with 48VDC output.

2-year component and workmanship warranty.

- Mine-wide LTE signal distribution.
- Reduced cost compared to traditional LTE implementation in mines.
- Easy installation and maintenance.

PERFORMANCE SPECIFICATIONS

Input Impedance	50 Ω
Input Voltage	110 - 240 VAC
Output Voltage	12, 24, 48 VDC
Attenuation Adjustment Range	0 to 31.5 dB in 0.5 dB steps
Gain Control	MGC, AGC
Supported Bands	5, 28

MECHANICAL DATA

Dimensions	200 x 75 x 130 mm (7.9 x 3.0 x 5.1 in)
Weight	910 g (2 lbs)
Enclosure	Polycarbonate
Connectors	N-Type (RF) RJ45 (Ethernet) M25 Cable Crip (AC Input)

ENVIRONMENTAL DATA

Temperature Range	-20 to +60 °C
Protection Class	IP66

PART NUMBERS

SKU	Description
2.1.6 LTE-VA-PS-12VDC	LTE RADIO INTERFACE 12VDC
2.1.6 LTE-VA-PS-24VDC	LTE RADIO INTERFACE 24VDC
2.1.6 LTE-VA-PS-48VDC	LTE RADIO INTERFACE 48VDC

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LTE UHF 350 LEAKY FEEDER CABLE

INTRODUCTION

Becker Mining Systems smartcom® LTE UHF Leaky Feeder Cable acts as an antenna to bring wireless voice, data, video and ethernet into mines and tunnels.

smartcom® 450 is more suitable for chamber and pillar or longwall mines than smartcom® 150, as the signal propagates up to 4 times better.

- Intrinsically Safe MSHA Certified.
- Wireless Voice, Data, Video and Ethernet.
- Up to 120m Off-Cable Coverage in a 4m Opening.
- Up to 350m Amplifier Spacing.

PERFORMANCE SPECIFICATIONS

Max. Operating Frequency	6 GHz
Impedance	50 ± 2 Ω
Capacitance	76 pF/m
Inductance	0.190 uH/m
Inner Conductor DC Resistance	1.57 Ω/km
Outer Conductor DC Resistance	2.23 Ω/km
Attenuation	21 dB/350 m @ 475 MHz; 20 dB/350 m @ 455 MHz; 12 dB/350 m @ 145 MHz; 7 dB/ 350 m @ 20 MHz

ENVIRONMENTAL DATA

Storage temperature	-70 to +85 °C (-94 to +185 °F)
Installation temperature	-25 to +60 °C (-13 to +140°F)
Operation temperature	-40 to +85 °C (-40 to +185 °F)

MECHANICAL DATA

Diameter	16.2 mm (0.64 in)
Cable Length/Roll	350 m (1148 ft), Custom roll lengths also available
Minimum bend radius	1 m (3.3 ft)
Max tensile force	1000 N (225 lbs)
Cable Weight	0.26 kg/m (0.17 lbs/ft)
Cable Stand-off Height (approx)	10cm (4in)
Cable Attachment Drift Installation	Every 5m (16ft)
Cable Attachment Shaft Installation	Every 3m (10ft)

PART NUMBERS

SKU	Description
3.1.1 -LF-LTE-350	LTE UHF LEAKY FEEDER CABLE (350m).

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LTE UHF 500 LEAKY FEEDER CABLE

INTRODUCTION

Becker Mining Systems smartcom® LTE UHF Leaky Feeder Cable acts as an antenna to bring wireless voice, data, video and ethernet into mines and tunnels.

smartcom® 450 is more suitable for chamber and pillar or longwall mines than smartcom® 150, as the signal propagates up to 4 times better.

- Intrinsically Safe MSHA Certified.
- Wireless Voice, Data, Video and Ethernet.
- Up to 120m Off-Cable Coverage in a 4m Opening.
- Up to 500m Amplifier Spacing.

PERFORMANCE SPECIFICATIONS

Max. Operating Frequency	6 GHz
Impedance	50 ± 2 Ω
Capacitance	76 pF/m
Inductance	0.190 uH/m
Inner Conductor DC Resistance	1.57 Ω/km
Outer Conductor DC Resistance	2.23 Ω/km
Attenuation	21 dB/350 m @ 475 MHz; 20 dB/350 m @ 455 MHz; 12 dB/350 m @ 145 MHz; 7 dB/ 350 m @ 20 MHz

ENVIRONMENTAL DATA

Storage temperature	-70 to +85 °C (-94 to +185 °F)
Installation temperature	-25 to +60 °C (-13 to +140°F)
Operation temperature	-40 to +85 °C (-40 to +185 °F)

MECHANICAL DATA

Diameter	16.2 mm (0.64 in)
Cable Length/Roll	500 m (1640.ft), Custom roll lengths also available
Minimum bend radius	1 m (3.3 ft)
Max tensile force	1000 N (225 lbs)
Cable Weight	0.26 kg/m (0.17 lbs/ft)
Cable Stand-off Height (approx)	10cm (4in)
Cable Attachment Drift Installation	Every 5m (16ft)
Cable Attachment Shaft Installation	Every 3m (10ft)

PART NUMBERS

SKU	Description
3.1.1 -LF-LTE-500	LTE UHF LEAKY FEEDER CABLE (500m).