

Product Catalogue



bme
BLASTING SOLUTIONS

BME'S FOOTPRINT: YOUR GLOBAL BLASTING PARTNER



We have a footprint in:

Africa

South Africa, Lesotho, Eswatini, Botswana, Zimbabwe, Namibia, Zambia, Mozambique, Tanzania, DRC, Sierra Leone, Guinea, Senegal, Mauritania and Mali

International

Indonesia, Australia, USA and Canada

About BME

BME is a member of the Omnia Group, a JSE-listed diversified provider of specialised chemical products and services used in the mining, agriculture and chemicals sectors.

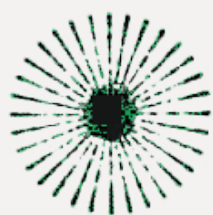
BME is a leader in providing sustainable blasting solutions, mining chemicals and metallurgical solutions for commercial mining applications. Our proprietary blast design software and AXXIS electronic delay detonators deliver precision and accuracy to improve blasting efficiencies and our premium dual-salt emulsion systems further deliver effective blasting to reduce costs. Our products help boost our clients' profitability and safety.

BME's advanced products and services have a positive impact on our customers' environmental footprint.

BME's global footprint extends across Africa, Indonesia, Canada, Australia, and the United States.. Our expertise allows us to rapidly supply and commission emulsion plants and optimise processes in any location.

BME prides itself in providing world-class technical services to ensure that every blast brings value to its customers.

Pursuing growth from the core ammonia and nitrogen value chain



Agriculture



Protea
Chemicals

A member of the Omnia Group

Chemicals

OMNIA



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Mining



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BME'S PRODUCT AND SERVICE OFFERING

BME provides a high-quality range of blasting services and related products, underpinned by leading technical support. Service packages and software leverage BME's knowledge base and best-in-class technology. Services, products and equipment can be customised to meet customer's unique requirements.

SERVICES

						
Products	Infrastructure and equipment		People	Advanced technical services		Software
• AXXIS Detonators • AXXIS Wire • BulkRaw Material • INNOVEX (Surface and Underground) • INNOPAK • INNOFEX • Viperdet • Booster • Traded packaged explosives • Traded 3rd party Nonelectric and Electric I.S. and Accessories	Surface • MMU truck – Emulsion • MMU truck – HA • Stemming Truck • LDV– Bulk • Apex Plant • Acid plant • AXXIS blasting boxes and various other components Production infrastructure • Mobile plants • Water tanks • Silos	Underground • Megacharge • CCU • ECU's • Data ECU • Chargers • Transfer cassette • Filling Station • Rapid Emulsion Delivery System • Vertical pipeline • Closed Emulsion System • CEBS • Data CEBS Support structures • Offices • Fences	Operations personnel • Blaster • Blaster Assistant • Truck Operator • Truck Assistant • Site Manager • Operations Foreman • Priming Operator • Administration person • Blasting licence holders • Magazine master Technical personnel • Blasting Technician • Blasting Engineer • Blast Optimisation head • Blasting Technology Director	Level 1 • Drill & Blast Audit • Drill and Blast Investigation • VOD Monitoring • Vibration and Airblast Monitoring • Fragmentation Analysis • Blast Video Analysis • 20 Laser Profiling Blast Investigation • Borehole calipering • Boretrak • Reactive ground testing • 3G Face Profiling • UAV • High Speed Video Analysis Rock Response Testing (Tmin) • Regression analysis • Blast design and predictions • Survey Services	Level2 • Green Field Design Projects (Consulting based) • Blasting Impact Assessments • Blast design and predictions (Project Based) • Signature Hole Analysis • BLASTMAP software training • Blast Modelling • Burden Response • Mine to Mill Projects • Blast performance optimisation (ore dilution, wall control, fragmentation opt, etc.)	• BLASTMAP • BLASTMAP Underground • XPLOLOG • XPLOCHARGE • SmartMMU • BME Blasting Guide • API development





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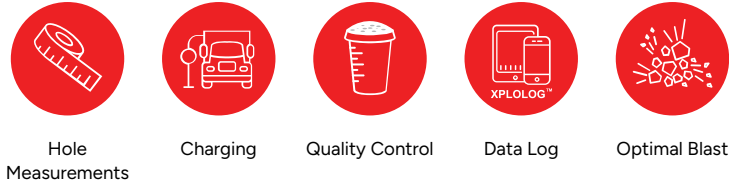
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SERVICES



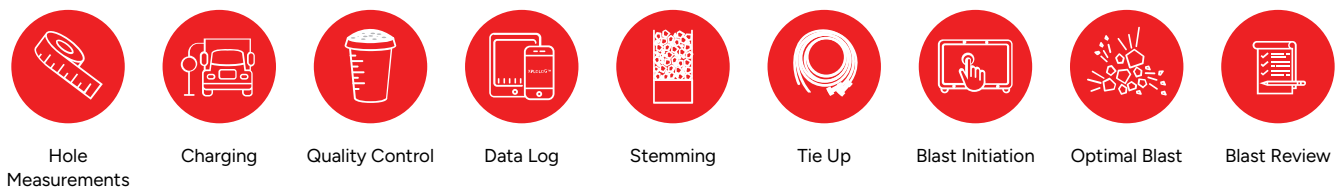
BLASTING SERVICES TO DELIVER IMPROVED MINING EXPERIENCE

BME offers a wide range of service packages that deliver real quantifiable value through optimal blasts – leveraging BME’s knowledge base and best-in-class technology, products, and equipment. These service packages can be customised to meet each customer’s unique requirements.



DOWN THE HOLE (DTH)

BME’s DTH service utilises its Mobile Manufacturing Units (MMUs) to deliver INNOVEX, its high-quality, reliable bulk emulsion explosives, to blast holes. BME ensures that its fit-for-purpose products are pumped to achieve improved and consistent fragmentation.



PRIME, LOAD, TIE, AND SHOOT (PLTS)

BME’s PLTS service is designed for customers who require BME’s team to perform a full blasting service. This service from BME ensures that skilled resources are available to the customer to achieve the best blasting results. The PLTS service, where BME takes on the responsibility for the full operation, safety, and management of the blasting service, is ideal for companies whose core business is not blast planning and execution.



ROCK ON GROUND (ROG) SERVICE

In this comprehensive blasting service, BME takes full responsibility, from blast design to analysing fragmented rock (excluding drilling), thereby allowing its customers to outsource this function, with value being measured on fragmentation quality and volume of broken rock. BME provides the materials, equipment, and skilled staff required to deliver cost-effective and quality blasting, so that its customers can focus on their core business.



MINE TO MILL (M2M) OPTIMISATION

BME’s exclusive M2M service offering delivers the full range of benefits across the mining value chain. Blast designs can be optimised to achieve required fragmentation, blast movement, and muck-pile shape, delivering improved loading, crushing, and milling rates.

M2M reduces overall mining costs by ensuring increased downstream productivity. The customer can be assured that the professionals who design the blasts and those who apply the designs in the field are competent and fully conversant with the project requirements. Benefits include closer management of downstream costs and overall systems optimisation, offering a cradle-to-grave view of the entire mining process in consultation with mine and plant personnel.



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PRODUCTS



INNOVEX® 100

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Industry	Construction, Mining, Quarrying
Properties	Straight

Product Description

Innovex 100 is a bulk pumped booster-sensitive gassed emulsion. Innovex 100 is a dual salt emulsion formulated with reprocessed oil and alternative fuels.



PRODUCT FEATURES

Application

Innovex 100 is designed for blasting applications in open pit mines, quarries, and construction with wet or dry holes. It is not for use in the presence of unprotected sulphide reactive ground or in elevated ground temperatures.

Primary Benefits

Innovex 100 may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. The Innovex 100 dual salt formulation is a product demonstrated to generate very low levels of post blast NOx fume. The use of reprocessed oil in the fuel phase can contribute towards sustainability goals.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Bulk and Volumetric Energies measurements made by underwater bubble energy tests at UTEC labs.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Cup Density	g/cm³	1.46 to 1.50				
Average In-Hole Density	g/ cm³		1.10	1.15	1.20	1.25
Velocity of Detonation	m/sec		4905	5095	5285	5470
Relative Weight Strength	RWS		75	78	84	87
Relative Bulk Strength	RBS		103	112	126	137
Bulk Energy	cal/g				695	693
Volumetric Energy	cal/cm³				827	867
Minimum Hole Diameter	mm		64	64	64	64
Water Resistance			Excellent	Excellent	Excellent	Excellent



Guidelines For Use

Priming and Initiation

Innovex 100 is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex 100 may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
64 mm to 127 mm	150 g
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

The storage life for Innovex 100 base emulsion is typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX 100 – Base Emulsion
 Correct Shipping Name: AMMONIUM NITRATE EMULSION
 Classification: 5.1
 UN Number: 3375

Authorised Name: INNOVEX Sensitising Agent
 Correct Shipping Name: NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.
 Classification: 5.1
 UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX 100
 Correct Shipping Name: EXPLOSIVE, BLASTING
 Classification: 1.1D
 UN Number: 0241

INNOVEX® RG

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Specific Application	Acidic Ground, Reactive Ground
Industry	Mining
Properties	Straight

Product Description

Innovex RG is a bulk pumped booster-sensitive gassed emulsion. Innovex RG is a dual salt emulsion formulated with reprocessed oil and alternative fuels, plus additional inhibiting salts and agents to retard exothermic reaction in sulphide bearing ground.



PRODUCT FEATURES

Application

Innovex RG is designed for blasting applications in open pit mines, quarries, and construction with wet or dry holes. It is specifically formulated for use in the presence of sulphide reactive ground.

Primary Benefits

The Innovex RG multiple salt formulation, in conjunction with other qualified initiation products and site specific procedures, form a system proven to be safe and reliable for blasting in sulphide reactive ground. Innovex RG may also be qualified for use in ground with elevated temperatures on a site specific basis. Innovex RG is a product demonstrated to generate very low levels of post blast NOx fume.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement. Bulk and Volumetric Energies measurements made by underwater bubble energy tests at UTEC labs.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Cup Density	g/cm ³	1.46 to 1.50				
Average In-Hole Density	g/cm ³		1.10	1.15	1.20	1.25
Velocity of Detonation	m/sec		5011	5208	5398	5580
Relative Weight Strength	RWS		66	69	71	74
Relative Bulk Strength	RBS		91	99	107	115
Bulk Energy	cal/g				688	
Volumetric Energy	cal/cm ³				818	
Minimum Hole Diameter	mm		64	64	64	64
Water Resistance			Excellent	Excellent	Excellent	Excellent



Guidelines For Use

Priming and Initiation

Innovex RG is compatible with most non-electric and electronic detonator systems.

Consult with a BME Technical Specialist for application of Innovex RG with compatible priming and initiation products in the ground conditions characterised by elevated heat above 70°C.

Hole Diameter	Minimum Cast Booster Mass
64 mm to 127 mm	150 g
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is specifically formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Specialist for additional guidance.

Sleep Time

The safe loading window and in hole sleep time for Innovex RG is site specific. The site specific sleep time is determined by isothermal reactive ground testing at a BME laboratory. It is also dependent on factors such as hole diameter, density, ground water conditions and initiation system. Please consult with a BME Technical Representative for guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX RG – Base Emulsion
Correct Shipping Name: AMMONIUM NITRATE EMULSION
Classification: 5.1
UN Number: 3375

Authorised Name: INNOVEX – Sensitising Agent
Correct Shipping Name: NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.

Classification: 5.1
UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX RG
Correct Shipping Name: EXPLOSIVE, BLASTING
Classification: 1.1D
UN Number: 0241

INNOVEX® 203

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Specific Application	Coal Overburden, Opencast Mining
Industry	Construction, Mining, Quarrying
Properties	Booster Sensitive, Heavy ANFO

Product Description

Innovex 203 is an augered booster-sensitive Heavy ANFO comprised of Innovex 100 or Innovex 100 C emulsion plus Ammonium Nitrate (AN) porous prill and diesel fuel oil (FO).



PRODUCT FEATURES

Application

Innovex Heavy ANFOs are designed for blasting applications in open pit mines, quarries, and construction in dry holes or dewatered holes. It is not for use in the presence of unprotected sulphide reactive ground or in elevated ground temperatures.

Primary Benefits

Innovex Heavy ANFOs may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. The Innovex 100 and Innovex 100 C dual salt emulsion formulations are products demonstrated to generate very low levels of post blast NOx fume. The use of reprocessed oil in the fuel phase can contribute towards sustainability goals.

Technical Properties

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at average in-hole densities and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Bulk and Volumetric Energies measurements made by underwater bubble energy tests at UTEC labs.

Target Emulsion Content	%	30	30	30
Average In-Hole Density	g/cm ³	1.05	1.10	1.15
Velocity of Detonation	m/sec	5370	5590	5810
Relative Weight Strength	RWS	93	96	99
Relative Bulk Strength	RBS	116	126	136
Minimum Hole Diameter	mm	127	127	127
Water Resistance		Poor	Poor	Poor

Guidelines For Use

Priming and Initiation

Innovex 203 is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex 203 may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 65°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.



Storage

The storage life for Innovex 100 or Innovex 100 C base emulsions to make Innovex Heavy ANFOs is typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX 100 – Base Emulsion
Correct Shipping Name: AMMONIUM NITRATE EMULSION
Classification: 5.1
UN Number: 3375

Authorised Name: Porous Granular Ammonium Nitrate
Correct Shipping Name: AMMONIUM NITRATE
Classification: 5.1
UN Number: 1942

Authorised Name: Innovex Sensitising Agent
Correct Shipping Name: NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S.
Classification: 5.1
UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX 203
Correct Shipping Name: EXPLOSIVE, BLASTING
Classification: 1.1D
UN Number: 0241

INNOVEX® 204 and INNOVEX® 205

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Specific Application	Opencast mining
Industry	Construction, Mining, Quarrying
Properties	Booster Sensitive, Heavy ANFO



Product Description

Innovex 204 and Innovex 205 are bulk augered booster-sensitive Heavy ANFO comprised of Innovex 100 or Innovex C (Clear) emulsion plus Ammonium Nitrate (AN) porous prill and diesel fuel oil (FO).

PRODUCT FEATURES

Application

Innovex Heavy ANFOs are designed for blasting applications in open pit mines, quarries, and construction with dry holes or dewatered holes. It is not for use in the presence of unprotected sulphide reactive ground or in elevated ground temperatures.

Primary Benefits

Innovex Heavy ANFOs may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. The Innovex 100 and Innovex C (Clear) dual salt emulsion formulations are products demonstrated to generate very low levels of post blast NOx fume. The use of reprocessed oil in the fuel phase can contribute towards sustainability goals.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at average in-hole densities and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Technical Properties INNOVEX 204

Target Emulsion Content	%	40	40	40
Average In-Hole Density	g/cm ³	1.05	1.10	1.15
Velocity of Detonation	m/sec	5490	5705	5920
Relative Weight Strength	RWS	92	95	98
Relative Bulk Strength	RBS	121	131	141
Minimum Hole Diameter	mm	127	127	127
Water Resistance		Fair	Fair	Fair

Technical Properties INNOVEX 205

Target Emulsion Content	%	50	50	50
Average In-Hole Density	g/cm ³	1.10	1.15	1.20
Velocity of Detonation	m/sec	5600	5810	6020
Relative Weight Strength	RWS	91	94	97
Relative Bulk Strength	RBS	125	135	145
Minimum Hole Diameter	mm	127	127	127
Water Resistance		Good	Good	Good



Guidelines For Use

Priming and Initiation

Innovex 204 and Innovex 205 is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex 204 and Innovex 205 may influence blast outcomes

Hole Diameter	Minimum Cast Booster Mass
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 65°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

The storage life for Innovex 100 or Innovex C (Clear) base emulsions to make Innovex Heavy ANFOs is typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX 100 – Base Emulsion
 Correct Shipping Name: AMMONIUM NITRATE EMULSION
 Classification: 5.1
 UN Number: 3375

Authorised Name: INNOVEX C (CLEAR) – Base Emulsion
 Correct Shipping Name: AMMONIUM NITRATE EMULSION
 Classification: 5.1
 UN Number: 3375

Authorised Name: Porous Granular Ammonium Nitrate
 Correct Shipping Name: AMMONIUM NITRATE
 Classification: 5.1
 UN Number: 1942

Authorised Name: Innovex Sensitising Agent
 Correct Shipping Name: NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S.
 Classification: 5.1
 UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX 204
 Correct Shipping Name: EXPLOSIVE, BLASTING
 Classification: 1.1D
 UN Number: 0241

INNOVEX® 206 and INNOVEX® 207

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Specific Application	Coal Overburden, Opencast Mining
Industry	Construction, Mining, Quarrying
Properties	Booster Sensitive



Product Description

Innovex 206 and Innovex 207 are bulk pumped booster-sensitive gassed emulsion blend comprised of Innovex 100 or Innovex C (Clear) emulsion plus Ammonium Nitrate (AN) porous prill and diesel fuel oil (FO). Innovex 206 may also be made with Innovex 60 plus uncoiled Ammonium Nitrate (AN) prill.

PRODUCT FEATURES

Application

Innovex emulsion blends are designed for blasting applications in open pit mines, quarries, and construction with dry holes or wet holes. It is not for use in the presence of unprotected sulphide reactive ground or in elevated ground temperatures.

Primary Benefits

Innovex emulsion blends may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. The Innovex 100, Innovex C (Clear), and Innovex 60 dual salt emulsion formulations are products demonstrated to generate very low levels of post blast NOx fume. The use of reprocessed oil in the fuel phase can contribute towards sustainability goals.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at average in-hole densities and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Technical Properties INNOVEX 206

Target Emulsion Content	%	60	60	60
Average In-Hole Density	g/cm ³	1.15	1.20	1.25
Velocity of Detonation	m/sec	5695	5905	6110
Relative Weight Strength	RWS	90	93	96
Relative Bulk Strength	RBS	130	140	150
Minimum Hole Diameter	mm	127	127	127
Water Resistance		Excellent	Excellent	Excellent

Technical Properties INNOVEX 207

Target Emulsion Content	%	70	70	70
Average In-Hole Density	g/cm ³	1.15	1.20	1.25
Velocity of Detonation	m/sec	5595	5805	6011
Relative Weight Strength	RWS	87	90	93
Relative Bulk Strength	RBS	126	136	146
Bulk Energy	cal/g		713	
Volumetric Energy	cal/cm ³		849	
Minimum Hole Diameter	mm	102	102	102
Water Resistance		Excellent	Excellent	Excellent



Guidelines For Use

Priming and Initiation

Innovex 206 and Innovex 207 is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex 206 and Innovex 207 may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

The storage life for Innovex 100, Innovex C (Clear), and Innovex 60 base emulsions to make Innovex emulsion blends are typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name:	INNOVEX 100 – Base Emulsion
Correct Shipping Name:	AMMONIUM NITRATE EMULSION
Classification:	5.1
UN Number:	3375
Authorised Name:	INNOVEX C (CLEAR) – Base Emulsion
Correct Shipping Name:	AMMONIUM NITRATE EMULSION
Classification:	5.1
UN Number:	3375
Authorised Name:	INNOVEX 60 – Base Emulsion
Correct Shipping Name:	AMMONIUM NITRATE EMULSION
Classification:	5.1
UN Number:	3375
Authorised Name:	Porous Granular Ammonium Nitrate
Correct Shipping Name:	AMMONIUM NITRATE
Classification:	5.1
UN Number:	1942
Authorised Name:	Innovex Sensitising Agent
Correct Shipping Name:	NITRITES, INORGANIC, AQUEOUS SOLUTION, N.O.S.
Classification:	5.1
UN Number:	3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name:	INNOVEX 206
Correct Shipping Name:	EXPLOSIVE, BLASTING
Classification:	1.1D
UN Number:	0241
Authorised Name:	INNOVEX 207
Correct Shipping Name:	EXPLOSIVE, BLASTING
Classification:	1.1D
UN Number:	0241

INNOVEX® 300D

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Specific Application	Fractured Geological Conditions, Highly Friable Conditions
Industry	Construction, Quarrying
Properties	Booster Sensitive



Product Description

Innovex 300D is an industry-leading bulk explosives solution, delivered by mechanical equipment or device, for optimal performance in extremely challenging mining environments. The product features an adjustable rheology, making it suitable for highly friable and fractured geological conditions. Innovex 300D offers increased resistance to dynamic water, reducing the likelihood of misfires and incomplete explosions. The mechanized emulsion system offers resistance against free ammonia, commonly found in mine waters and tailing dams.

PRODUCT FEATURES

Application

Innovex 300D is designed for blasting applications in open pit mines, quarries, and construction with wet or dry holes. It is not for use in the presence of unprotected sulphide reactive ground or in elevated ground temperatures. Minimum in-hole viscosity of 160 000 cP.

Primary Benefits

Innovex 300D offers increased resistance to dynamic water, reducing the likelihood of misfires and incomplete explosions. The product features an adjustable rheology, making it suitable for highly friable and fractured geological conditions. Innovex 300D delivers a significant advancement in managing challenging mining operational environments, ensuring safety, efficiency, and environmental protection.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Cup density	g/cm ³	1.46 to 1.50				
Average In-Hole Density	g/cm ³		1.10	1.15	1.20	1.25
Velocity of Detonation	m/sec		4905	5095	5285	5470
Relative Weight Strength	RWS		75	78	84	87
Relative Bulk Strength	RBS		103	112	126	137
Bulk Energy	cal/g				695	693
Volumetric Energy	cal/cm ³				827	867
Minimum Hole Diameter	mm		64	64	64	64
Water Resistance			Excellent	Excellent	Excellent	Excellent

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement. Bulk and Volumetric Energies measurements made by underwater bubble energy tests at UTEC labs.



Guidelines For Use

Recommended application viscosity of 160 000 cP + (Brookfield viscometer with spindle 7 at 20 rpm).

Priming and Initiation

Innovex 300D is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex 300D may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
64 mm to 127 mm	150 g
Greater than 127 mm	400 g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0 ° to a maximum of 65 °C. If the application requires use outside this temperature range please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

The storage life for Innovex 300D base emulsion is typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX 300D – Base Emulsion
Correct Shipping Name: AMMONIUM NITRATE EMULSION
Classification: 5.1
UN Number: 3375

Authorised Name: INNOVEX Sensitizing Agent

Correct Shipping Name: NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.
Classification: 5.1
UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX 300D
Correct Shipping Name: EXPLOSIVE, BLASTING
Classification: 1.1D
UN Number: 0241

INNOVEX® Uphole

Function	Explosive
Application	Underground
Class	Bulk Emulsion
Specific Application	Up-Hole/Lateral
Industry	Construction, Mining
Properties	Ammonium Nitrate Based, Straight

Product Description

Innovex Uphole is a bulk pumped booster-sensitive gassed emulsion. Innovex Uphole is a dual salt emulsion formulated with refined oils.



PRODUCT FEATURES

Application

Innovex Uphole is designed for general blasting applications in underground mines, quarries, and construction with wet or dry holes. Innovex Uphole is not for use in the presence of sulphide reactive ground or elevated ground temperatures.

Primary Benefits

Innovex Uphole may be loaded at varying densities to achieve energies that optimise fragmentation distribution and minimise perimeter overbreak. The Innovex Uphole dual salt formulation is a product demonstrated to generate very low levels of post blast fume.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Guidelines For Use

Priming and Initiation

Innovex Uphole is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex Uphole may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
Innovex Lateral holes 32 mm - 48 mm	12g or larger
Innovex Uphole holes 32mm - 102 mm	90g or larger

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 65°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Density	g/cm ³	1.47 to 1.51	0.90	1.00	1.15	1.20
Velocity of Detonation	m/sec		4116	4497	5071	5260
Relative Weight Strength	RWS		67	73	84	90
Relative Bulk Strength	RBS		75	91	120	135



Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: Innovex Uphole – Base Emulsion
Correct Shipping Name: Ammonium Nitrate Emulsion
Classification: 5.1
UN Number: 3375

Authorised Name: Innovex Sensitising Agent
Correct Shipping Name: Nitrates, Organic, Aqueous solution, N.O.S
Classification: 5.1
UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: Innovex Uphole
Correct Shipping Name: Explosive, Blasting
Classification: 1.1D
UN Number: 0241

INNOVEX® Lateral

Function	Explosive
Application	Underground
Class	Bulk Emulsion
Specific Application	Lateral
Industry	Construction, Mining
Properties	Ammonium Nitrate Based, Straight

Product Description

Innovex Lateral is a bulk pumped booster-sensitive gassed emulsion. Innovex Lateral is a dual salt emulsion formulated with refined oils.



PRODUCT FEATURES

Application

Innovex Lateral is designed for general blasting applications in underground mines, quarries, and construction with wet or dry holes. Innovex Lateral is not for use in the presence of sulphide reactive ground or elevated ground temperatures.

Primary Benefits

Innovex Lateral may be loaded at varying densities to achieve energies that optimise fragmentation distribution and minimise perimeter overbreak. The Innovex Lateral dual salt formulation is a product demonstrated to generate very low levels of post blast fume.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Guidelines For Use

Priming and Initiation

Innovex Lateral is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex Lateral may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
Innovex Lateral holes 32 mm - 48 mm	12g or larger

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 65°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Density	g/cm ³	1.47 to 1.51	0.90	1.00	1.15	1.20
Velocity of Detonation	m/sec		4116	4497	5071	5260
Relative Weight Strength	RWS		67	73	84	90
Relative Bulk Strength	RBS		75	91	120	135



Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX LATERAL – Base Emulsion
Correct Shipping Name: AMMONIUM NITRATE EMULSION
Classification: 5.1
UN Number: 3375

Authorised Name: INNOVEX Sensitising Agent
Correct Shipping Name: NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.
Classification: 5.1
UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX LATERAL
Correct Shipping Name: EXPLOSIVE, BLASTING
Classification: 1.1D
UN Number: 0241

INNOVEX® C (Clear)

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Industry	Construction, Mining, Quarrying
Properties	Straight

Product Description

Innovex C (Clear) is a bulk pumped booster-sensitive gassed emulsion. Innovex C (Clear) is a low viscosity dual salt emulsion formulated with refined oils.



PRODUCT FEATURES

Application

Innovex C (Clear) is designed for blasting applications in open pit mines, quarries, and construction with wet or dry holes. It is not for use in the presence of sulphide reactive ground or elevated ground temperatures.

Primary Benefits

Innovex C (Clear) may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. The Innovex C (clear) dual salt formulation is a product demonstrated to generate very low levels of post blast NOx fume. Innovex C (Clear) maintains stability over extended storage periods.

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Density	g/cm ³	1.46 to 1.50	1.10	1.15	1.20	1.25
Velocity of Detonation	m/sec		4910	5105	5300	5494
Relative Weight Strength	RWS		75	79	86	89
Relative Bulk Strength	RBS		104	113	129	139
Minimum Hole Diameter	mm		64	64	64	64
Water Resistance			Excellent	Excellent	Excellent	Excellent



Guidelines For Use

Priming and Initiation

Innovex C (Clear) is compatible with most non-electric and electronic detonator systems.

Use of detonating cord downlines with Innovex C (Clear) may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
Less than 127 mm	150g
Greater than 102 mm	400g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name: INNOVEX C (CLEAR) – Base Emulsion
 Correct Shipping Name: AMMONIUM NITRATE EMULSION
 Classification: 5.1
 UN Number: 3375

Authorised Name: INNOVEX Sensitising Agent
 Correct Shipping Name: NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.
 Classification: 5.1
 UN Number: 3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name: INNOVEX C (CLEAR)
 Correct Shipping Name: EXPLOSIVE, BLASTING
 Classification: 1.1D
 UN Number: 0241

INNOVEX® HE

Function	Explosive
Application	Surface
Class	Bulk Emulsion
Industry	Construction, Mining, Quarrying
Properties	Straight

Product Description

Innovex HE is a high energy bulk pumped booster-sensitive gassed emulsion. Innovex HE is a dual salt emulsion formulated with diesel oil and alternative fuels.



PRODUCT FEATURES

Application

Innovex HE is designed for blasting applications in open pit mines, quarries, and construction with wet or dry holes where a high energy explosive is desired. It is not for use in the presence of unprotected sulphide reactive ground or elevated ground temperatures.

Primary Benefits

Innovex HE may be loaded at varying densities to achieve energies that optimise fragmentation distribution and influence mine to mill productivity. Innovex HE is a high energy bulk emulsion designed to drive a greater degree of fragmentation and/or pattern expansions without sacrifice to fragmentation. The Innovex HE dual salt formulation is a product demonstrated to generate very low levels of post blast NOx fume. The use of reprocessed oil in the fuel phase can contribute towards sustainability goals.

Technical Properties

Property	Unit	Base Emulsion	Gas Sensitised Emulsion			
Cup Density	g/cm ³	1.46 to 1.50				
Average In-Hole Density	g/cm ³		1.10	1.15	1.20	1.25
Velocity of Detonation	m/sec		4894	8083	5270	5490
Relative Weight Strength	RWS		79	82	89	93
Relative Bulk Strength	RBS		108	118	134	145
Bulk Energy	cal/g				744	
Volumetric Energy	cal/cm ³				885	
Minimum Hole Diameter	mm		64	64	64	64
Water Resistance			Excellent	Excellent	Excellent	Excellent

Product Specifications

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code for average in-hole densities and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Bulk and Volumetric Energies measurements made by underwater bubble energy tests at UTEC labs.



Guidelines For Use

Priming and Initiation

Innovex HE is compatible with most non-electric and electronic detonator systems.

Use of detonating cord with Innovex HE may influence blast outcomes.

Hole Diameter	Minimum Cast Booster Mass
64mm to 127mm	150g
Greater than 127mm	400g

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage Life

The storage life for Innovex HE base emulsion is typically up to 6 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name:	INNOVEX HE – Base Emulsion
Correct Shipping Name:	AMMONIUM NITRATE EMULSION
Classification:	5.1
UN Number:	3375

Authorised Name:	INNOVEX – Sensitising Agent
Correct Shipping Name:	NITRITES, ORGANIC, AQUEOUS SOLUTION, N.O.S.
Classification:	5.1
UN Number:	3219

Product Classification of Finished Sensitised Explosive Product

Authorised Name:	INNOVEX HE
Correct Shipping Name:	EXPLOSIVE, BLASTING
Classification:	1.1D
UN Number:	0241

PGAN

Function	Explosive
Application	Surface, Underground
Class	Packaged
Industry	Mining, Quarrying
Properties	Blend, Heavy ANFO, Raw Material

Product Description

Porous Granular Ammonium Nitrate prills (PGAN).



PRODUCT FEATURES

Application

Porous Granular Ammonium Nitrate (PGAN) is primarily used as an oxidiser component to manufacture ANFO, Heavy ANFOs, emulsion blends, and base straight emulsions. PGAN applications include underground mines, open pit mines, quarries, and construction. PGAN alone has zero water resistance. PGAN is susceptible to reactivity with sulphide bearing ground and/or elevated ground temperatures.

Primary Benefits

PGAN is one of several oxidising salts used to manufacture Innovex base emulsion products. PGAN is added to BME emulsions to manufacture Innovex Heavy ANFOs and Innovex emulsion blends. ANFO is manufactured by mixing PGAN with diesel fuel only.

Technical Properties

Property	Unit	
Ammonium Nitrate Content	%	> 99.5
Bulk Density	g/cm ³	0.76 - 1.80
Oil Absorption	%	> 0.6
Moisture Content	%	> 0.2
Particle Size Distribution	%	> 95
	mm	1 - 3

Guidelines For Use

Storage

Shelf life

12 months when stored under good conditions.

PGAN prills are subject to breakdown caused by repeated temperature cycling, moisture/humidity, and multiple handlings/ transfers. Prill breakdown can lead to dust that subsequently may consolidate into lumps.

Always store PGAN in dry and protected areas or silos, away from combustible substances.

Packaging

PGAN is transported and stored in the following formats to suit user applications.

Bulk, 1000 kg and 2000 kg semi-bulk poly-woven bags, and 25 kg and 50 kg paper bags.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name:	POROUS GRANULAR AMMONIUM NITRATE (PGAN)
Correct Shipping Name:	OXIDISER
Classification:	5.1, OXIDISING SUBSTANCES
UN Number:	1942

INNOPAK® Plus, Super, Super Plus, Super Plus Sink

Function	Explosive
Application	Surface, Underground
Class	Packaged
Industry	Construction, Mining, Quarrying
Properties	Detonator Sensitive, Wax Based



Product Description

Innopak products are high energy detonator sensitive film wrapped cartridge emulsions. Wax additives in the formulation make for firm products with excellent handling, tamping and hole retention characteristics.

PRODUCT FEATURES

Application

Innopak products are designed for general purpose blasting applications in underground mines, open pit mines, quarries, and construction with wet or dry holes. Innopak products may be used to prime holes dry holes loaded with ANFO. Innopak cartridges should not be slit or tamped in the presence of sulphide reactive ground.

Primary Benefits

Innopak products are used as column loads in small to medium hole diameter applications where bulk heavy ANFOs or emulsions blends fall below their critical diameters. Innopak products are detonator sensitive and can be used to prime Innopak column loads in wet holes, and prime blow loaded or free poured column loads of ANFO in dry holes. Innopak product energies can be selected to match desired blast fragmentation distributions or economies.

Technical Properties

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.14 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Property	Unit	Innopak Plus	Innopak Super	Innopack Super Plus	Innopak Super Plus Sink
Density	g/cm ³	1.14 ±0.06	1.14 ±0.06	1.14 ±0.06	1.14 ±0.06
Velocity of Detonation	m/sec	5990	5825	5860	5815
Relative Weight Strength	RWS	100	104	111	109
Relative Bulk Strength	RBS	143	149	158	156
Water Resistance		Excellent	Excellent	Excellent	Excellent

Innopak products are dual salt emulsions demonstrated to generate very low levels of post blast fume and suitable for use in underground and surface blasting. Dual salt emulsions are also demonstrated to have extended magazine storage life under a variety of environmental conditions.

Guidelines For Use

Priming and Initiation

Innopak cartridges emulsions are compatible with most non-electric and electronic detonator systems and are reliably.

initiated with detonators assembled with high strength detonators (No. 8 strength or greater base charge).

Do not attempt to initiate Innopak with No. 6 strength fuse caps.

Innopak cartridges emulsions are reliably initiated with 10 gram detonating cord or greater core load.

Innopak products are detonator sensitive down to an internal temperature of -20°C.

Do not use Innopak products to prime bulk loaded heavy ANFOs or emulsion blends.

Consult with a BME Technical Representative for additional priming and initiation guidance.



Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, and the presence of water. Please contact a BME Technical Representative for additional guidance.

Ground Temperature

This product may be used in ground temperatures from 0° to a maximum of 70°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. Innopak cartridges should not be slit or tamped in the presence of sulphide reactive ground. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Storage

Innopak products must be stored in an approved Class 1.1 D magazine with adequate ventilation.

Innopak products are best stored at temperatures above -20°C.

Innopak products typically have a minimum shelf life of 1-year under correct storage conditions.

Please consult with a BME Technical Representative for additional guidance.

UN Classification for Transport and Storage

Product Classification of System Components

Authorised Name	Innopak Plus, Innopak Super, Innopak Super Plus, Innopak Super PlusSink
Correct Shipping Name	EXPLOSIVE, BLASTING, TYPE E
Classification	1.1 D
UN Number	0241

Packaging

Innopak detonator sensitive emulsions are packaged in robust coloured PMP film cartridges. Innopak cartridges are packed in 25 kg fibreboard cases. Case cartridge count is based on a nominal product density of 1.14 g/cm³.

Cartridge size mm	Nominal weight g (±3g)	Cartridge Diameter mm	Cartridge Colour
25 x 200	113	25	Red
25 x 270	153	25	Red
25 x 580	325	25	Red
27 x 270	182	27	Red
27 x 580	382	27	Red
29 x 200	152	29	Green
29 x 270	205	29	Green
29 x 580	436	29	Green
32 x 200	184	32	Yellow
32 x 270	248	32	Yellow
32 x 580	532	32	Yellow
38 x 200	260	38	Orange
38 x 270	348	38	Orange
38 x 580	750	38	Orange
45 x 200	360	45	Orange
45 x 270	486	45	Orange
45 x 580	1050	45	Orange
50 x 200	445	50	Orange
50 x 270	602	50	Orange
50 x 580	1295	50	Orange

INNOFEX®

Function	Explosive
Application	Surface, Underground
Class	Packaged
Specific Application:	Dry Blast Holes
Industry	Construction, Mining, Quarrying
Properties	ANFO

Product Description

Innofex, or Bagged ANFO, is free flowing bagged ANFO made of porous granulated ammonium nitrate prills and fuel oil.



PRODUCT FEATURES

Application

Innofex applications include underground mines, open pit mines, quarries, and construction. Innofex should only be loaded in dry holes, as a top loading in holes sealed with cartridge product, or holes that have been dewatered and suitably lined. Do not load Innofex into wet holes. Innofex is not for use in the presence of sulphide reactive ground or elevated ground temperatures.

Primary Benefits

Innofex is commonly used in small to medium diameter blastholes where bulk explosives loading is impractical or uneconomic. Innofex is oxygen balanced and produces low volumes of fume. In underground small hole applications, Innofex may be blow loaded to increase product density, improve detonator sensitivity, and optimise energy output.

Technical Properties

Velocity of Detonation, Relative Weight and Bulk Strengths calculated using the IPX code at a density of 1.20 g/cm³ and a cut-off pressure of 100 MPa relative to ANFO at a density of 0.80 g/cm³.

Actual in field velocity of detonation will vary and is dependent on hole diameter and confinement.

Property	Unit	Poured	Blow Loaded
Density	g/cm³	0.82	0.95 - 1.06
Velocity of Detonation	m/sec	3000 - 4200	5510 - 6005
Relative Weight Strength	RWS	100	112 - 120
Relative Bulk Strength	RBS	100	132 - 159
Bulk Energy	cal/g	730	
Volumetric Energy		913	
Minimum Hole Diameter	mm	64	29
Water Resistance		None	None



Guidelines For Use

Priming and Initiation

Innofex is compatible with most non-electric and electronic detonator systems.

Consult with a BME Technical Representative for detonating cord application with Innofex.

Hole Diameter	Minimum Cast Booster Mass	
Innofex Blow Loaded Holes	29 - 48mm	Bare high strength detonator (No. 8 strength or greater), 12g or larger cast booster, Innovex cartridged detonator sensitive emulsion of sufficient diameter in dry holes.
Innofex Free Poured Holes	64- 102mm	120g or larger cast booster, Innovex cartridged detonator sensitive emulsion of sufficient diameter in dry holes.

Blasthole Charge Length Hole Diameter Density Relationships

Maximum hole depth depends on product selection, hole diameter, product densities, critical void space and the presence of water. Please contact a BME Technical Representative for additional guidance and site specific calculations using BME's DensDepth program.

Ground Temperature

This product may be used in ground temperatures up to a maximum of 60°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

This product is not formulated for use in reactive ground. Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole diameter, density, ground water conditions and initiation system. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

Shelf life – 12 months when stored under good conditions.

Innofex is subject to breakdown caused by repeated temperature cycling, moisture/humidity, and multiple handlings/transfers.

Always store Innofex in dry and protected areas, away from combustible substances.

Packaging

25 kg in clear LDPE liner packed in a white poly-woven outer bag.

UN Classification for Transport and Storage

Product Classification

Authorised Name:	INNOFEX
Correct Shipping Name:	EXPLOSIVE, BLASTING, Type B
Classification:	1.1 D
UN Number:	0082

VIPERDET® LP

Function	Initiation
Application	Surface, Underground
Industry	Construction, Mining, Quarrying

Product Description

Viperdet LP is a non-electric long-period delay detonator. Viperdet LP assemblies are precise and reliable. Units consist of a specific length of yellow shock tube with a high-strength delay detonator crimped to the one end and a seal at the other end. A detonating cord connector clip is attached to the sealed end.



PRODUCT FEATURES

Application

Viperdet LP non-electric detonators are designed for use in underground mining and tunnelling.

Viperdet LP non-electric detonators must not be used in flammable environments such as methane or coal dust.

Viperdet non-electric detonators are safe against extraneous electric currents except lightning.

Features

- **Detonator Strength:** No. 8 detonator with a double crimp.
- **Shock Tube:** Yellow, with three layers coiled in a 'Figure 80' for ease of deployment and the avoidance of tangles. The shock tube is resistant to abrasion and designed to elongate to avoid tensile strength damage under normal use conditions.
- **J-Hook:** J-hook to ease connection to detonating cord (5 g/m minimum core load).
- **Label tag:** Water resistant. Laser printing provides clear and smudge resistant timing and product information.

Guidelines For Use

Priming and Initiation

Viperdet LP non-electric detonators can be initiated by a single strand of detonating cord with a minimum core load of 5 g/m.

Viperdet LP non-electric detonators can be used to prime the full range of BME's detonator sensitive explosive products.

To prevent a snap, slap, and shoot incident (unexpected detonation) never pull or stretch non-electric shock tube to the point of breaking.

Ground Temperature

This product may be used in ground temperatures up to a maximum of 65°C (150°F). If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Delay Times

Delay	Time (ms)	Delay	Time (ms)	Delay	Time (ms)
1	100	12	1 200	50	5 000
2	200	14	1 400	55	5 500
3	300	16	1 600	60	6 000
4	400	18	1 800	70	7 000
5	500	20	2 000	80	8 000
6	600	25	2 500	90	9 000
7	700	30	3 000		
8	800	35	3 500		
9	900	40	4 000		
10	1 000	45	4 500		

Sleep Time

The recommended maximum sleep time is 21 days. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.



Handling

All explosives must be transported and stored in accordance with relevant local, state and federal regulations.

Product Risk Profile

All explosives are classified as dangerous goods and may cause damage to property, personal harm, or death, if not used correctly.

Severe detonation hazard when exposed to heat.

Detonation may occur from impact, friction, or excessive heating.

Never attempt to fight explosives fires.

First Aid: Refer to Safety Data Sheet for first-aid information.

Storage

Viperdet LP shelf life is 36 months when stored in the original packaging, under dry conditions at moderate temperatures, and in a well ventilated and approved magazine.

Packaging

Standard lengths below. Other lengths upon request.

Unit packaging is in coils.

Length		Units/case	Case weight	
(m)	(ft)		(kg)	(lb)
4.8	16	250	12	26
6	20	200	10	22
7.8	26	100	10	22

UN Classification for Transport and Storage

Class: 1.1B, UN 0360, DETONATOR ASSEMBLIES, NON-ELECTRIC

Class: 1.4B, UN 0361, DETONATOR ASSEMBLIES, NON-ELECTRIC

Class: 1.4S, UN 0500, DETONATOR ASSEMBLIES, NON-ELECTRIC

VIPERDET® SD

Function	Initiation
Application	Surface, Underground
Class	Non-Electric
Specific Application	Minimise Shrapnel Damage
Industry	Construction, Mining, Quarrying

Product Description

Viperdet Dual SD is a non-electric detonator comprised of a specific length of green shock tube with a high-strength in-hole delay detonator on one end and a low-base charge surface delay detonator in a connector block on the other end. The unit is designed to ensure easy connection and reliable initiation, while minimising shrapnel damage to exposed shock tube.



PRODUCT FEATURES

Application

Viperdet SD non-electric detonators are designed to provide reliable sequential initiation of explosives charges in underground narrow reef stopping applications.

Viperdet Dual non-electric detonators must not be used in flammable environments such as methane or coal dust.

Viperdet non-electric detonators are safe against extraneous electric currents except lightning.

Features

- **Detonator strengths:** High strength No. 8 in-hole detonator. Low strength No. 3 surface detonator.
- **Delay timing:** In-hole detonator = 3800ms. Surface detonator = 200ms.
- **Shock tube:** Extruded polyethylene exterior over surlyn inner with minimum of 19 kg (41 lb) tensile strength.
- **Connector:** T-clip ratchet connector. The connector can hold up to 4 shock tubes and is designed to ensure reliable initiation, while minimising shrapnel damage to the shock tube.

Guidelines For Use

Priming and Initiation

Viperdet Dual SD non-electric detonators can be used to prime the full range of BME's detonator sensitive explosive products. To prevent a snap, slap, and shoot incident (unexpected detonation) never pull or stretch non-electric shock tube to the point of breaking.

Ground Temperature

This product may be used in ground temperatures up to a maximum of 65°C (150°F). If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Sleep Time

The recommended maximum sleep time is 21 days. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Handling

Product Risk Profile

All explosives are classified as dangerous goods and may cause damage to property, personal harm, or death, if not used correctly.

Severe detonation hazard when exposed to heat.

Detonation may occur from impact, friction, or excessive heating.

Never attempt to fight explosives fires.

Transportation

All explosives must be transported in accordance with relevant local, state and federal regulations.

Storage

Viperdet Dual SD shelf life is 36 months when stored in the original packaging, under dry conditions and moderate temperate, and in a well ventilated and approved magazine.

All explosives must be stored in accordance with relevant local, state and federal regulations.

Packaging

Units are placed in plastic inner packaging that is heat sealed and packed in boxes. Other lengths are available on request.

Length (m)	Units/box
2.1	400
2.4	350
3.0	350
3.6	300
4.2	250
4.8	250

UN Classification for Transport and Storage

Class 1.1B, UN No. 0360, Detonator Assemblies, Non-Electric.

Class 1.4B, UN No. 0361, Detonator Assemblies, Non-Electric.

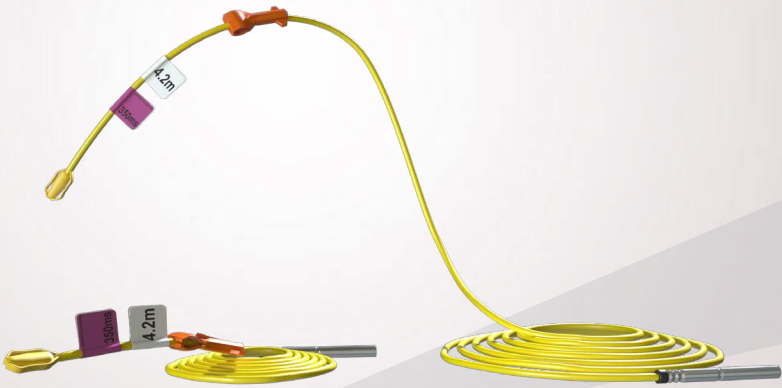
Class 1.4S, UN No. 0500, Detonator Assemblies, Non-Electric.

VIPERDET® MS
(Downline)

Function	Initiation
Application	Surface, Underground
Class	Non-Electric

Product Description

Viperdet MS non-electric downline assemblies consist of a specific length of yellow shock tube, with a high-strength delay detonator crimped to one end and closed at the other end by an ultrasonic seal. A colour coded label marked with the specified delay is attached to the shock tube within 10cm of the seal.



PRODUCT FEATURES

Application

Viperdet MS Downline is used as a in-the-hole detonator for the initiation of explosives in surface and underground mines, quarries, and construction blasting.

Viperdet MS non-electric detonators must not be used in flammable environments such as methane or coal dust. Viperdet MS non-electric detonators are safe against extraneous electric currents except lightning.

Product Specifications

- **Detonator strength:** No. 8
- **Shock tube:** Triple extruded polyethylene exterior over surlyn inner
- **Shell:** Aluminium
- **Elongation:** 140%
- **Tensile Strength:** Minimum 80N
- **Delay timing:** 350ms or 500ms
- **Nominal VOD of shock tube:** 2000 m/s
- **Resistance to hydrostatic pressure:** 48 hrs at 1 MPa

Guidelines For Use

Priming and Initiation

Viperdet MS Downline can be used to prime the full range of BME's detonator-sensitive explosive products.

Viperdet MS Downline detonators can be sequentially delayed and initiated by Viperdet Trunklines. Viperdet MS Downline can also be initiated by a single strand of detonating cord with a minimum core load of 5 g/m. To prevent a snap, slap, and shoot incident (unexpected detonation) never pull or stretch non-electric shock tube to the point of breaking.

Ground Temperature

This product may be used in ground temperatures up to a maximum of 65°C (150°F). If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Sleep Time

The maximum in-hole sleep time is 28 days. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

Shelf life

36 months from the date of production. Store under recommended conditions.

Storage conditions

Minimum storage temperature (-45°C) and maximum storage temperature (+65°C). The product should be stored in its original packaging.

Disposal

Disposal of expired non-electric detonators and its packaging should be conducted by authorised personnel and/or companies.

Packaging

Units are placed in plastic inner packaging that is heat-sealed and packed in boxes.

Other lengths are available on request.

UN Classification for Transport and Storage

Proper shipping name	Detonator assemblies, non-electric.
Class	1
Division	1.1B (UN 0360). 1.4B (UN 0361). 1.4S (UN 0500).

VIPERDET® MS Dual

Function	Initiation
Application	Surface, Underground
Class	Non-Electric

Product Description

Viperdet MS Dual is a non-electric detonator assembly with a high strength in-hole detonator on one end and a low shrapnel surface detonator in a colour coded connector on the other. A colour coded label marked with the specified delay is attached to the shock tube within 10cm of the connector.



PRODUCT FEATURES

Application

Viperdet MS Dual is used for initiation of explosives in open-pit mines, underground non-coal and non-methane mines, quarries and construction works. Viperdet MS Dual detonators may be used in underground mines, where there is no coal dust and/or methane explosion hazard. The connector can hold up to 6 shock tubes and is designed to ensure easy connection, and reliable initiation while minimising shrapnel damage to the shock tube.

Product Specifications

- **Detonator strength:** In-hole No. 8, Surface No. 3
- **Shell material:** Aluminium
- **Shock tube:** Triple extruded polyethylene exterior over surlyn inner
- **Connector material:** PE
- **Nominal VOD of shock tube:** 2000 m/s
- **Resistance to hydrostatic pressure:** 48 hrs at 1 MPa

Guidelines For Use

Priming and Initiation

Maximum number of shock tubes inserted into a Viperdet Trunkline connector is six (6).

Primary initiation by electronic detonator, electric detonator, or shock tube starter.

Never:

- Insert detonating chord into the surface detonator connector
- Stretch shock tube to the point of breaking

Avoid pinching off shock tubes during loading and stemming. For underwater blasting, please consult your BME Technical Representative.

Ground Temperature

This product may be used in ground temperatures up to a maximum of 65°C (150°F). If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Delay Times

Connector colour	Delay times (ms) of Surface/In-hole detonators
Yellow	17/350
Yellow	17/500
Red	25/350
Red	25/500
White	42/350
White	42/500
Black	67/350
Black	67/500

Storage

Shelf life

36 months from the date of production. Store under recommended conditions.

Storage conditions

Minimum storage temperature (-45°C) and maximum storage temperature (+65°C). The product should be stored in its original packaging.

Disposal

Disposal of expired non-electric detonators and its packaging should be conducted by authorised personnel and/or companies.



Packaging

PE bags filled with bundles of 5 non-electric detonators with the same delay time. Number of detonators per box depends on length of the shock tube.

Shipping container

Cardboard box.

Cargo safety measures

Shipping containers are placed on a wooden pallet and secured with stretch film.

Remarks

Other packaging configurations are available.
Contact your BME Sales Representative for options.

Detonators in a bundle	Shock tube length (m)	Detonators in a box
5	6	250
5	10	200
5	12	150
5	15	140
5	18	120
5	30	80

UN Classification for Transport and Storage

Proper shipping name	Detonator assemblies, non-electric.
Class	1
Division	1.1B (UN 0360). 1.4B (UN 0361). 1.4S (UN 0500).

VIPERDET® Trunkline

Function	Initiation
Application	Surface, Underground
Class	Non-Electric

Product Description

Viperdet Trunkline assemblies consist of a specific length of shock tube with a low shrapnel millisecond delay detonator crimped to the one end and closed at the other end by means of an ultrasonic seal. The low shrapnel surface detonator is contained in a colour coded connector and a colour coded label marked with the specified delay is attached to the shock tube within 10cm of the seal.



PRODUCT FEATURES

Application

Viperdet Trunkline non-electric detonators are used to make connections with Viperdet non-electric products.

Viperdet Trunkline non-electric detonators are used in surface and underground mines, quarries, and construction blasting.

Viperdet Trunkline non-electric detonators must not be used in flammable environments such as methane or coal dust.

Viperdet Trunkline non-electric detonators are safe against extraneous electric currents except lightning.

Product Specifications

- **Detonator strength:** No. 3 Detonator
- **Shock tube:** Triple extruded polyethylene exterior over surlyn inner
- **Shell:** Aluminium
- **Shock tube strength:** Resistant to abrasion and cutting under normal handling conditions
- **Nominal VOD of shock tube:** 2000 m/s
- **Connector:** Color-coded to identify respective delay timings

Guidelines For Use

Priming and Initiation

Viperdet Trunkline can be used to sequentially delay and initiate Viperdet MS Downlines.

Maximum number of shock tubes inserted into a Viperdet Trunkline connector is six (6).

Never insert detonating cord into a Viperdet Trunkline connector.

To prevent a snap, slap, and shoot incident (unexpected detonation) never pull or stretch non-electric shock tube to the point of breaking.

Delay Times

Connector colour	Delay time (ms)
Yellow	17
Red	25
White	42
Black	67

Storage

Storage Conditions

Minimum storage temperature (-45°C) and maximum storage temperature (+65°C). The product should be stored in its original packaging.

Shelf Life

Viperdet MS Downline shelf life is 36 months when stored in original packaging, under dry conditions and moderate temperature, and in a ventilated and approved magazine.

Disposal

Disposal of expired non-electric detonators and its packaging should be conducted by authorised personnel and/or companies.

Packaging

Units are placed in plastic inner packaging that is heat-sealed and packed in boxes. Other lengths are available on request.

Length (m)	Units/box
4.2	260
6	250

UN Classification for Transport and Storage

Proper shipping name	Detonator assemblies, non-electric.
Class	1
Division	1.1 B (UN 0360). 1.4 B (UN 0361). 1.4 B (UN 0500).

BLASTMAP® Surface

Function	Blast and Timing Design
Application	Surface
Class	Desktop
Industry	Mining, Quarrying, Construction



Product Description

BLASTMAP software is BME's flagship blast design application, used by blast engineering professionals globally. BLASTMAP allows you to design blast patterns using its powerful tools. You can import survey data, add hole and deck parameters, specify rock types and layers, add the initiation timing design (electronic and non-electrics) and download a variety of reporting templates. BLASTMAP software can be used as a simulation tool for initiation timing contours, burden relief time, and hole firing sequence. With BLASTMAP, you'll have a 360° view of the blast design in 3D.

Primary Benefits

- Design a blast pattern or import an existing design from a 3rd party application
- Seamless integration with BME's XPLOLOG block data recording and AXXIS systems
- A variety of reporting templates available
- Add initiation timing design (electronic and non-electric)
- A selection of prediction tools available
- Choose between two BLASTMAP packages

Features

- Import survey data of the blast block geometry, holes and surfaces
- Ability to import pit surfaces and triangulate hole collar elevations
- Import wizard to import any txt, csv, dxf or xlsx file from 3rd party software
- Design a blast from scratch, generate patterns, specify hole diameters and depths, add explosives, and initiation timing
- Specify rock types and layers. Ability to add any explosive and rock type to the program database
- Supports electronic and non-electric timing designs
- Optimised for use with AXXIS electronic delay detonators. Import/export AXXIS electronic delay detonator IDs and design timing
- Charge and timing designs may be based on actual hole locations
- Powerful contouring capabilities for blast timing, surface and floor elevations, vibration maps and energy distribution in a blast (multi-screen display capability)

- Multiple explosive deck loading and timing capability for designing specialised blasts, such as multiple seam, through seam, stratified rock, and environmental control
- Import/export planned data to XPLOLOG blast capturing software. 360 view of the blast design in 3D
- Export design information to a .csv file. This allows for integration with 3rd party software such as drill navigation software for drilling according to the design
- Blast analysis tools include hole firing sequence simulation, timing contours (angle of initiation), and burden relief time
- Blast modelling tools include fragmentation distribution prediction models (that can be calibrated with measured distributions), vibration prediction model, wave interference model to optimise timing for either vibration control or fragmentation, and prediction of the blasted rock radius
- Calculate costs and quantities based on actual drilling and explosive loading information
- Reporting capabilities for blast design and communicating critical design issues such as costs, quantities and energy

Product Specifications

Minimum software requirements

Operating system

Windows XP, Vista, Windows 7, Windows 8 Microsoft Dot Net Framework 4.0

Minimum hardware requirements

Ram	4GB
Disk space	500MB
Processor	Dual Core 2.00GHz
Operating system type	32-bit

Recommended hardware requirements

Ram	4GB
Disk space	500MB
Processor	Dual Core 2.00GHz
Operating system type	32-bit

BLASTMAP® Underground

Function	Blast and timing design
Application	Underground
Class	Desktop
Industry	Mining



Product Description

Design tunnel shape geometries with precise grid measurements for accurate hole position placement. Designs can be viewed in 3D to ensure dimensional compliance.

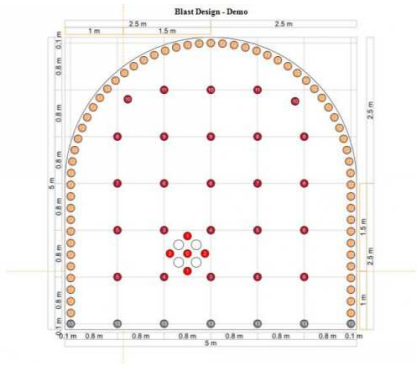
Predictive models like fragmentation prediction, costing, blast timing analysis, and simulation will help guide engineers to improve their designs to achieve their desired blast result.

Primary Benefits

- Better predictability of blast results
- Improved dimensional compliance and hanging wall control
- Simulation and displaying of blast timing and connecting sequence prior to blast
- Improved stock management through precise explosive mass and timing sequence per blast hole
- One application required for Underground and Surface
- Affordable licensing fee

Features

- Design any block shape
- Create cut design
- Perimeter hole design
- Add cost and quantities to predict blast expense
- Create and view technical reports
- Do hole timing analysis
- Manage contouring
- Calculate vibration prediction
- Calculate fragmentation prediction



NAME	SIGNATURE		NAME	SIGNATURE		NAME	SIGNATURE	
HOLE TYPE	BURDEN & SPACING (m)	EXPLOSIVES	HOLE DIAMETER (mm)	AVE HOLE DEPTH (m)	AVE STEMMING LENGTH (m)	TOTAL HOLES	TOTAL DRILLING (m)	TOTAL kg
Block	0.1 X 0.8	DSNOVEX® 100	45	3	1	25	125	169 kg
Cut	0.15 X 0.15	DSNOVEX® 100	45	5	1	5	25	33.9 kg
Lifter	0.1 X 0.8	DSNOVEX® 100	45	5	1	7	35	47.32 kg
Purifier	0.1 X 0.2	DSNOVEX® 100	45	5	1	61	305	412.36 kg
Enter	0.15 X 0.15	N/A	50	5	0	4	20	0 kg
Average Block Powder Factor	5.94	Average Block Energy Factor	8.17			TOTALS	102	662.49 kg

XPLOLOG® Surface

Function	Bench data recording and reporting
Application	Surface
Class	Offline and online compatibility
Industry	Mining, Quarrying

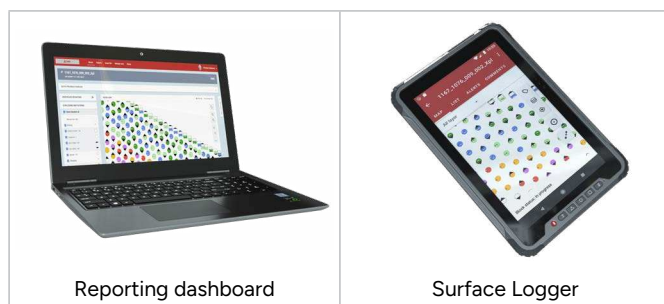


Product Description

BME's XPLOLOG block data recording system provides Blast Engineers with real-time block preparation progress. The information is accessible online, for the Blast Engineer to identify a trend that looks unfamiliar or unsafe, to improve safety or avoid unforeseen cost implications. This information enables the Blast Engineer to respond pro-actively and avoid unwanted incidents. XPLOLOG integrates seamlessly with BME's BLASTMAP blast design software to ensure continuity of work to optimise productivity and avoid human input errors.

Application

Our XPLOLOG platform integrates with BLASTMAP, allowing users to view, edit and sync planned and actual data captured to a cloud database. This integration of data allows you to use the powerful blasting simulation and prediction modules in BLASTMAP to further analyse and improve blast outcomes on real data.



Reporting dashboard

Surface Logger

Primary Benefits

- Access predefined report templates, or create your own custom report
- Digitising and automating manual and paper-based actions
- Real-time visualisation of bench preparation progress
- Accurate customer billing based on actuals charged
- Driller data recording integration with XPLOLOG
- Personalised user experience
- Quick identification of Planned vs Design deviations
- XPLOLOG seamlessly integrates with BME's BLASTMAP and XPLOCHARGE (MMU) solutions

Features

- Customised block list dashboard
- Select from multiple report templates and choose from a variety of export formats
- Easily draw a logline for hole data recording to increase productivity
- Cross-sectional hole view
- Comparison table to view Design vs Actual
- Find block, hole or deck information quickly through search, sort and filter options
- Import a .CSV blast file format from 3rd party blast planning software to display on the Logger and Dashboard
- Using colours and shapes to easily indicate hole or deck status
- QAQC recording for comparison of drilling and stemming values
- Create an unplanned block (useful for quarry mining)
- Easily create, edit or remove users and roles with the User management System
- Easily access loading sheets per Mobile Manufacturing Unit (MMU)
- Data security and privacy guaranteed through a reputable global cloud provider

Guidelines For Use

The XPLOLOG system includes a mobile device for hole and deck data capturing and an online dashboard for data analysis and custom reporting that is making use of a cloud hosted database to securely store client data.

BME understands how important it is to capture accurate blasting information on the block. Providing blast engineers and management with real-time data which enables them to make informed decisions that are critical to ensuring block operations continuity and ultimate delivery of a successful blast outcome.

XPLOCHARGE® Smart MMU

Function	Integrated explosives delivery system
Application	Surface
Industry	Mining



Product Description

The new BME Smart MMU control panel has been designed and developed with the focus to optimise the drill and blast charging process. This technology replaces the manual process with an automated solution to increase operational efficiency and provide accurate charge data as per the blast plan and drilling data captured.

Features

- Seamless integration between BLASTMAP, XPLOLOG and XPLOCHARGE. Design your blast plan, transfer the plan to XPLOLOG for actual data recording, send the actual charge mass to XPLOCHARGE for hole pumping and the actual data is synchronised back to XPLOLOG reporting and analysis platform
- Use of Internet of Things (IoT) devices transferring data to a cloud platform for live monitoring of the MMU fleet location and availability
- A variety of sensors are installed to monitor the plant operations and to shut down the plant when pre-set parameters are met to avoid a possible safety incident
- Monitor the condition state of the equipment and schedule maintenance activities based on the actual hardware data recorded for the plant and truck
- Process optimisation through automation to reduce manual capturing of data
- Custom reporting and analysis for planned and actual charge data comparison when integrated with XPLOLOG
- Secure cloud data storage and data syncing
- Clean user-interface design that requires limited training for users to operate these software solution

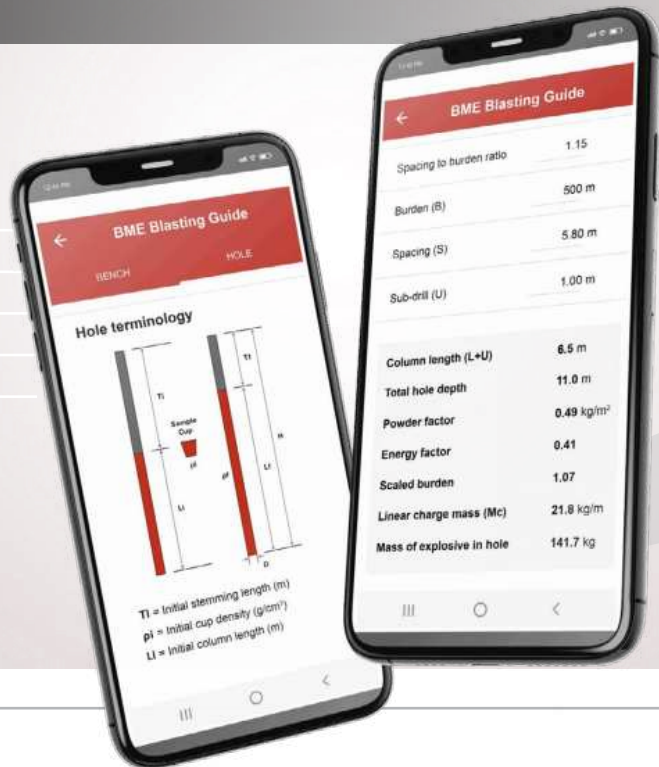


Benefits

- The safety of both BME's and our customers' employees remains our top priority. Therefore, the MMU control panel software includes various operating condition rules that automatically shut down the plant if any of these rules are breached, preventing potential safety incidents
- Seamless integration with BME's digital product suite ensuring that data flows effortlessly across various digital platforms and systems. This interconnected approach provides efficient data handling, resulting in accurate decision-making and operational agility
- More control over the actual quantity of charge mass being pumped per hole. This precision in charge mass control can lead to decreased cost per hole (waste) and the system ensures accurate billing by precisely tracking operational parameters and usage. Ensure operational continuity by using sensing hardware and hardware usage measurement of equipment to predict upcoming maintenance schedules and planned downtime required
- Decrease in time duration moving from hole-to-hole which increase the productivity rate of your workforce

Blasting Guide App

Function	Verify design using calculations
Application	Surface
Class	Mobile Application
Industry	Mining, Quarrying



Product Description

The BME Blasting Guide App enables entry level to experienced explosives engineering professionals the ability to calculate blast designs on their Android smartphones. Explosives engineers can quickly verify blast design outputs and make quick decisions when required, on the block or in the office.

Application

Free application to be used with Android mobile phones.

Features

- Blast design calculator
- Blast equations
- Prediction calculators for vibration and blasted rock distance
- Scaled depth of burial equations
- Metric and imperial unit measurements
- Rules of thumb and environmental guidelines
- Table of common rock properties
- Glossary of blasting terminology

Guidelines For Use

Free application for Android mobile phones.

Available for download in the Google Play store free of charge. Search for the "BME Blasting Guide" on the Google Play store.

BME Blasting Guide

Calculators

Blast design calculator

Quick calculations

Prediction calculators

Rules of thumb

Environmental impact guidelines

Rock properties

Contact BME

BME Blasting Guide

Spacing to burden ratio

Burden (B)

Spacing (S)

Sub-drill (U)

Column length (L+U)

Total hole depth

Powder factor

Energy factor

Scaled burden

Linear charge mass (Mc)

Mass of explosive in hole

BME Blasting Guide

Blast design calculator

Explosive type

INNNOVEX™ 100

Average in hole explosive density (p)

1.2 g/cm³

Relative weight strength (RWS)

84

Hole diameter (D)

152 mm

Bench height (H)

10.00 m

Stemming in hole diameters

Stemming length (T)

4.50 m

Air gap length

m

Target powder factor (K)

0.50 kg/m³

Spacing to burden ratio

1.15

BME Blasting Guide

Blast design calculator

Explosive type

INNNOVEX™ 100

Average in hole explosive density (p)

1.2 g/cm³

Relative weight strength (RWS)

84

Hole diameter (D)

39 mm

Bench height (H)

46 m

Stemming in hole diameters

68

Stemming length (T)

2.7 m

Air gap length

38 m

Target powder factor (K)

36 kg/m³

Spacing to burden ratio

1.15 %

Burden (B)

0.1 m

Spacing (S)

0.1 m

Sub-drill (U)

30.0 m

Column length (L+U)

35.3 m

Total hole depth

76.0 m

Powder factor

107.39 kg/m³

Energy factor

90.21

Scaled burden

0.08

Linear charge mass (Mc)

1.4 kg/m

Mass of explosive in hole

49.4 kg



AXIS[®]

ELECTRONIC INITIATION SYSTEM

AXXIS[®] TITANIUM Electronic Delay Detonator

Product Description

The AXXIS Titanium electronic initiation system is the newest generation of AXXIS technology. The AXXIS Titanium electronic initiation system incorporates numerous handling, performance, and safety improvements upon the highly successful AXXIS GII system.

The AXXIS Titanium electronic initiation system is comprised of four components:

- AXXIS TITANIUM Electronic Delay Detonator (EDD)
- AXXIS TITANIUM Logger
- AXXIS TITANIUM Blasting Box
- BLASTMAP blast design software

The AXXIS Titanium Centralised Electronic Blasting System (CEBS) is also available for underground mining applications.



PRODUCT FEATURES

Application

The AXXIS Titanium electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Titanium electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

Primary Benefits

AXXIS Titanium EDDs safety includes dual capacitors that split the system into two. The logic capacitor is used to communicate and test the detonator and does not have enough storing energy to fire the fuse head. The firing capacitor is only used for firing. The logic capacitor has an internal shunt that when commanded switches gates from logic mode to firing mode. Only in firing mode is the firing capacitor then calibrated and charged for blasting.

The AXXIS Titanium system utilises dual voltage for detonator logging and testing at low voltage. Error testing is reported by exemption thus considerably speeding up the testing and blasting process at the firing point. It takes less than two minutes to finalise a blast for firing regardless of the number of detonators.

AXXIS Titanium Electronic Delay Detonator performance features include a non-volatile detonator memory. Detonators are programmed and tested during logging by writing the desired firing times and log sequence number into each detonator's memory. Once detonators are programmed during logging there is no need to re-programme on powering up again. The detonator history is recorded permanently to the detonator memory making it ideal for track and trace.

AXXIS Titanium EDDs have engineered cables that are highly resistant to damage and cut offs due to a balanced combination of tensile, elongation, and abrasion resistance. This results in a very low rate of misfire occurrence even under the most challenging hole loading conditions.

AXXIS EDD technology has a proven track record of delivering mega blasts with thousands of detonators.

Detonator Specifications

Delay Time Range	0 to 35 seconds (35 000ms) in 1ms increments
Delay Accuracy (COV)	At ambient temperature: Up to 8 seconds < 1ms Above 8 seconds, better than 0.02%
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box	1000 detonators
Maximum Detonators per Blast Controller	20 000 detonators
Detonator Shell	Aluminum magnesium alloy or copper alloy
Detonator Dimensions	• Nominal outer diameter = 7.5mm • Nominal length = 88.9mm • Fits standard boosters
Detonator Charge	• 1.0g • South Africa #8 strength
Cable	HDPE outer insulation and PVC inner insulation over copper clad steel cores
Operating Temperature	-40°C and +80°C
Hydrostatic Resistance	14 bars for 7 days
Dynamic Shock Resistance	80MPa copper alloy shell

Guidelines for Use

AXXIS Titanium electronic delay detonators may only be programmed, tested, and fired with AXXIS Titanium Loggers and AXXIS Titanium Blasting Boxes. Do not attempt to program, test, or fire AXXIS Titanium EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Titanium Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Titanium cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Ground Temperature

This product may be used in ground temperatures from -40°C to a maximum of +80°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Packaging

AXXIS Titanium Electronic Delay Detonator cables are coiled in 150mm diameter shrink-wrapped coils with the detonator feed from the center of spool for safety.

Custom lengths on request.

Sleep Time

The recommended maximum sleep time is 45 days. Sleep time is dependent on factors such as hole depth, explosive column type, and ground water conditions. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage

The storage life for AXXIS Titanium EDDs is 60 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SDS) for first aid.

All explosives must be transported and stored in accordance to relevant regulations.

UN Classification for Transport and Storage

Product Classification

Authorised Name: AXXIS Titanium
Correct Shipping Name: DETONATORS, ELECTRONIC programmable for blasting

Classification: 1.1B manufactured in South Africa
UN Number: 0511

Classification: 1.4B manufactured in South Africa
UN Number: 0512

Classification: 1.4S manufactured in South Africa
UN Number: 0513

Detonator Cable Length (m)	1.1B Packaging		1.4B Packaging		1.4S Packaging	
	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)
10	88	20.80	54	10.93	54	15.95
15	56	18.86	39	13.31	39	15.65
20	42	18.61	30	14.14	30	15.40
25	36	19.40	24	14.53	24	15.20
30	30	19.47	21	14.25	21	15.55
35	30	22.01	22	16.83	22	18.15
40	25	21.09	20	16.70	20	18.60
45	24	22.49	18	17.36	18	18.80
50	20	23.20	16	17.48	16	18.90
60	18	24.97	14	18.30	14	19.10

AXXIS[®] TITANIUM Blasting Box

Product Description

The AXXIS Titanium electronic initiation system is the newest generation of AXXIS technology. The AXXIS Titanium electronic initiation system incorporates numerous handling, performance, and safety improvements upon the highly successful AXXISGII system.

The AXXIS Titanium electronic initiation system is comprised of four components:

- AXXIS Titanium Electronic Delay Detonator (EDD)
- AXXIS Titanium Logger
- AXXIS Titanium Blasting Box
- BLASTMAP blast design software

The AXXIS Titanium Centralised Electronic Blasting System (CEBS) is also available for underground mining applications.



PRODUCT FEATURES

Application

The AXXIS Titanium electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Titanium electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

System Usage

Blasting Boxes

All AXXIS Titanium Blasting Boxes are the same. Each AXXIS Titanium Blasting Box is configurable to a Blaster Box or a Controller Box to accomplish its required function. Blasting Box operation is simple, with double rotary switches for switching a box on, placing it in standby mode, and opening communications channels to fire the blast. Wireless communications are achieved through three selectable open-band frequency channels. Other frequency channels can be configured based on the country requirements.

Blaster Box

AXXIS Titanium Blasting Boxes configured as Blaster Boxes are placed at each blast site and connected to the surface wire harness. No power is supplied to the detonators until system arming from the Controller Box at blasting time.

Each Blaster Box can fire up to 1000 detonators. In large single blasts where more than one Blaster Box is needed, the Blaster Boxes are hard-wired together using AXXIS link sets. Up to 20 Blasting Boxes may be linked together for a total combined firing capability of 20 000 detonators in a single blast.

Final testing of the AXXIS Titanium Electronic Delay Detonators and the harness lines is performed using the AXXIS Titanium Logger before the harness line is connected to the Blaster Box. After the AXXIS Titanium detonators and the harness lines have cleared testing by the AXXIS Titanium Logger, the harness line is connected to the AXXIS Titanium Blaster Box. The AXXIS Titanium Blaster Box is switched on and the unit performs a self-test. Once the self-test is completed the AXXIS Titanium Blasting Box is switched into stand-by mode to open the communications channel – the detonators remain unpowered in stand-by mode.

Controller Box

Only one Blasting Box may be configured as a Controller Box per blast. The Controller Box requires the presence of a Key Logger to authorise arming and firing of the system. On arming of the system with the Controller Box, each Blaster Box then powers up its detonators, and testing routines automatically start and continue until firing time. Detonators respond by exception, allowing a quick testing time and immediate warnings to the operator through the color screen on the Controller Box and the Key Logger.

Combiner box

A Blasting Box may be configured as a Combiner box. The Combiner box configuration is useful in quarry and construction blasting where the harness line-in line from the blast can be directly connected (hard-wired) into the Combiner box at the safe firing point.

The Blasting-Controller Combiner box requires the presence of a Key Logger to authorise arming and firing of the system. On arming of the system with the Blaster-Controller Combiner box, the detonators are powered up, and testing routines automatically start and continue until firing time. Detonators respond by exception, allowing a quick testing time and immediate warnings to the operator through the color screen on the Blaser-Controller Combiner box and the Key Logger.

Antennas

Two types of AXXIS Titanium system specific antennas are available. The short-range antenna can be used for line-of-sight distances up to 1200 m. Depending on frequency allocation, the long-range ET Plate antenna can be used for line-of-sight distances between 1500 m and 5000 m.

Guidelines for Use

AXXIS Titanium electronic delay detonators may only be programmed, tested, and fired with AXXIS Titanium Loggers and AXXIS Titanium Blasting Boxes. Do not attempt to program, test, or fire AXXIS Titanium EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Titanium Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Blasting Box Specifications

Blasting Box Housing	Hard Yellow Plastic
User Interface	Colour LCD with variable intensity and contrast setting
Battery	24-volt rechargeable lithium-ion
Battery Capacity	12 000mAh Battery life dependent on the number of detonators in each blast Batteries are not user replaceable
Blasting Box Mass	3.9kg
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box in Blaster Box Mode	1000 detonators
Controls	Two rotary switches Spring loading on the full-right position to fire a blast in Control Box mode
Communication Ports	Ports for antenna, charging, USB, harness wire and link cables Authentication
Wireless Communication	Wireless communication range between Blasting Boxes = 1000m to 5000m line of sight
Modem Frequency	158.325MHz or 433 MHz or 915MHz
Resistance to Electrostatic Discharge	Electrostatic Discharge Immunity Test (± 8 kV contact, ± 15 kV air) Electrical Fast Transient/Burst Immunity (± 2 kV)
Operating Temperature	-30°C and +60°C
Storage Temperature	-40°C and +70°C

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Titanium cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Operating Temperature

The AXXIS Titanium Logger may be operated in temperatures from -30°C to a maximum of +60°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Water, Dust, and Drop Shock Resistance

AXXIS Titanium EDDs Loggers are robust electronic instruments that are engineered to be water and dust resistant (IEC 60529 IP65 and IP68) and drop shock resistant (IEC 60069-2-32: 1975). AXXIS Titanium EDD Loggers are not waterproof – do not submerge AXXIS Titanium EDD Loggers in water.

Storage

AXXIS Titanium Loggers are robust electronic instruments that need to be used, charged, and stored with care. The AXXIS Titanium Logger may be stored in temperatures from -40°C to a maximum of +70°C. Please consult with a BME Technical Representative for site specific guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SDS) for first aid.

All explosive control equipment must be transported and stored in accordance to relevant regulations.

AXXIS[®] TITANIUM Logger

Product Description

The AXXIS Titanium electronic initiation system is the newest generation of AXXIS technology. The AXXIS Titanium electronic initiation system incorporates numerous handling, performance, and safety improvements upon the highly successful AXXIS GII system.

The AXXIS Titanium electronic initiation system is comprised of four components:

- AXXIS Titanium Electronic Delay Detonator (EDD)
- AXXIS Titanium Logger
- AXXIS Titanium Blasting Box
- BLASTMAP blast design software



PRODUCT FEATURES

Application

The AXXIS Titanium electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Titanium electronic initiation system passes ARP 1717.1, the South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

System Usage

AXXIS Titanium Loggers are robust, hand-held devices for the logging and testing of AXXIS Titanium Electronic Detonators. These mobile devices are manufactured by Trimble and have an AXXIS developed POD that docks onto the device. The POD contains the detonator communication circuit and this enables the logging and programming of AXXIS Titanium Electronic Detonators. The AXXIS Titanium Logger can read and write to the detonator's non-volatile memory, test a single detonator, test multiple detonators and transfer the logged blast files to the AXXIS Titanium Electronic Detonators Blasting Box.

AXXIS Titanium Loggers are easy and convenient to handle. They operate on the Android™ operating system, which facilitates the upload of history files, current logging activity, reporting applications, and web pages.

In order to operate AXXIS Titanium Blasting Boxes (in Blaster Box mode) at blast firing time, one AXXIS Titanium Logger is configured and designated as the Key Logger. The Key Logger generates a one-time pin to configure the AXXIS Titanium Blasting Boxes (in Blaster Box mode). As a security measure, any AXXIS Titanium Blasting Boxes (in Blaster Box mode) that has not been configured for a blast and bound through the one-time pin on the Key Logger will not function for that blast. At the safe firing point, the Key Logger and the one-time pin are also required to arm the AXXIS Titanium Blasting Box (in Controller Box mode). Upon blast completion, all AXXIS Titanium Loggers and Blasting Boxes return to a neutral unconfigured state.

AXXIS EDD technology has a proven track record of delivering mega blasts with thousands of detonators.

Logger Specifications

Logging Device	Logger with AXXIS CAP
Operating System	Android 8.1
Screen Size and Resolution	635mm (5-inches); 1280x720 pixels
User Interface	Colour Touch Screen Function Buttons Stylus Enabled
Battery	Lithium-ion
Battery Capacity	10.8V 3200 mAh 32 Whr
Logger Mass	0.845kg
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box in Blaster Box Mode	1000 detonators
Logger Functions	Log Detonator UIDs Program Detonator Firing Times Test 1 to 500 Detonators
Detonator Communication	Via Attached CAP Read Functionality Program Functionality Test Functionality
Blasting Box Communication	Bluetooth or Wired Authentication
Testing Functions	Line Current Consumption Programmed/Not Programmed Detonator Voltage harness Line Test for Missing Detonators harness Line Test for Intruder Detonators
Resistance to Electrostatic Discharge	Electrostatic Discharge Immunity Test (± 8 kV contact, ± 15 kV air) Electrical Fast Transient/Burst Immunity (± 2 kV)
Operating Temperature	-30°C and +60°C
Storage Temperature	-40°C and +70°C

Guidelines for Use

AXXIS Titanium electronic delay detonators may only be programmed, tested, and fired with AXXIS Titanium Loggers and AXXIS Titanium Blasting Boxes. Do not attempt to program, test, or fire AXXIS Titanium EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Titanium Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Titanium cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Operating Temperature

The AXXIS Titanium Logger may be operated in temperatures from 30 C to a maximum of 60 C. If the application requires use outside of this temperature range, please contact a BME Technical Representative for additional guidance.

Water, Dust, and Drop Shock Resistance

AXXIS Titanium EDDs Loggers are robust electronic instruments that are engineered to be water and dust resistant (IEC 60529 IP 65 and IP 68) and drop shock resistant (IEC 60069 2 32 1975). AXXIS Titanium EDDs Loggers are not waterproof. Do not submerge AXXIS Titanium EDDs Loggers in water.

Storage

AXXIS Titanium Loggers are robust electronic instruments that need to be used, charged, and stored with care. The AXXIS Titanium Logger may be stored in temperatures from -40°C to a maximum of +70°C. Please consult with a BME Technical Representative for site specific guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SSD) for first aid.

All explosive control equipment must be transported and stored in accordance to relevant regulations.



EX Electronic Delay Detonator

PRODUCT DESCRIPTION

The AXXIS EX electronic initiation system is the newest generation of AXXIS technology. Offering an extreme strength downline cable. The AXXIS EX electronic initiation system incorporates numerous handling, performance, and safety improvements.

The AXXIS EX electronic initiation system is comprised of four components:

- AXXIS EX Electronic Delay Detonator (EDD)
- AXXIS Titanium Logger
- AXXIS Titanium Blasting Box
- BLASTMAP blast design software

PRODUCT FEATURES

Application

The AXXIS EX electronic initiation system is designed for most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS EX electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

Primary Benefits

AXXIS EX EDDs safety includes dual capacitors that split the system into two. The logic capacitor is used to communicate and test the detonator and does not have enough stored energy to fire the fuse head. The firing capacitor is only used for firing. The EDD has an internal safety state machine that switches gates from logic mode to firing mode when commanded. Only in firing mode is the EDD calibrated and the firing capacitor charged for blasting.

The AXXIS EX system includes dual voltage for operating modes for safety. Detonator logging and testing are done at low voltage. Error testing is reported by exemption thus, considerably speeding up the testing and blasting process at the firing point. It takes less than two minutes to finalise a blast (without exceptions) for firing regardless of the number of detonators.

AXXIS EX Electronic Delay Detonator performance features include a non-volatile detonator memory. Detonators are programmed and tested during logging by writing the desired firing times into each detonator's memory. Once detonators are programmed during logging, there is no need to re-program them again on powering up. The detonator history is recorded permanently to the detonator memory making it ideal for track and trace.



AXXIS EX EDDs have engineered cables that are highly resistant to damage and cut-offs due to a balanced combination of tensile, elongation, and abrasion resistance. This results in exceptional performance even under the most challenging hole-loading conditions.

AXXIS EDD technology has a proven track record of delivering mega blasts with thousands of detonators.

Guidelines for Use

AXXIS EX electronic delay detonators may only be programmed, tested, and fired with AXXIS Titanium Loggers and AXXIS Titanium Blasting Boxes. Do not attempt to program, test, or fire AXXIS EX EDDs with other blasting equipment. Never mix electronic delay detonators or components from different manufacturers.

AXXIS Loggers and Blasting Boxes must be calibrated and serviced every two years by BME-qualified personnel or providers.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar-looking harness wire as the performance specifications may differ.

Although BME AXXIS EX cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Ground Temperature

This product may be used in ground temperatures from -40°C to a maximum of +80°C. Please contact a BME Technical Representative for additional guidance if the application requires use outside of this temperature range.

Reactive Ground

Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or untested sulphide-bearing ground. Please contact a BME Technical Representative for additional guidance.

Sleep-Time

The recommended maximum sleep time is 45 days. Sleep time depends on factors such as hole depth, explosive column type, and ground water conditions. Please contact a BME Technical Representative for additional guidance.

Storage Life

The storage life for AXXIS EX EDDs is 60 months under good storage conditions. Please consult with a BME Technical Representative for site-specific storage life guidance.

Safe Use

Never fight explosive fires.

Refer to the Safety Data Sheet (SDS) for first aid.

All explosives must be transported and stored in accordance with relevant regulations.

Detonator Specifications

Delay time range	0 to 35 seconds (35 000ms) in 1ms increments
Delay Accuracy	Up to 8 seconds < 1ms Above 8 seconds < 0.02%
Maximum Detonator per Logger	500 detonators per log-line
Maximum Detonators per Blast	16 000 detonators
Detonator Shell	Copper alloy
Detonator Dimensions	Nominal outer diameter = 7.5mm Nominal length = 88.9mm Fits standard boosters
Detonator Charge	1.0g South African #8 strength
Cable	TPU outer insulation and PP inner insulation Copper-cladded steel cores
Operating Temperature	-40°C to +80°C
Hydrostatic Resistance	14 bar for 7 days
Dynamic Shock Resistance	80 MPa copper alloy shell

Packaging

Custom lengths on request.

Detonator Cable Length (m)	1.1B Packaging		1.4B Packaging		1.4S Packaging	
	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)
10	88	20.80	54	10.93	54	15.95
15	56	18.86	39	13.31	39	15.65
20	42	18.61	30	14.14	30	15.40
25	36	19.40	24	14.53	24	15.20
30	30	19.47	21	14.25	21	15.55
35	30	22.01	22	16.83	22	18.15
40	25	21.09	20	16.70	20	18.60
45	24	22.49	18	17.36	18	18.80
50	20	23.20	16	17.48	16	18.90
60	18	24.97	14	18.30	14	19.10

UN Classification for Transport and Storage

Product Classification

Authorised Name: AXXIS EX
Correct Shipping Name: DETONATORS, ELECTRONIC
programmable for blasting

Classification: 1.1B manufactured in South Africa
UN Number: 0511

Classification: 1.4B manufactured in South Africa
UN Number: 0512

Classification: 1.4S manufactured in South Africa
UN Number: 0513

AXXIS[®] SILVER Electronic Delay Detonator

PRODUCT DESCRIPTION

The AXXIS Silver electronic initiation system is the latest expansion of AXXIS technology. The AXXIS Silver electronic initiation system incorporates numerous handling, performance, and safety improvements built upon the highly successful AXXIS GII system. AXXIS Silver is a cost-effective solution for users wanting to upgrade from the limitations and results of non-electric initiation to the flexibility and added blast performance realised by electronic initiation.

The AXXIS Silver electronic initiation system is comprised of four components:

- AXXIS Silver Electronic Delay Detonator (EDD)
- AXXIS Silver Logger
- AXXIS Silver Blasting Box
- BLASTMAP blast design software

PRODUCT FEATURES

Application

The AXXIS Silver electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Silver electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

Primary Benefits

The AXXIS Silver system is designed for high safety and security levels yet remains uncomplicated. The system is designed for blast crew ease of use as there is minimal menu-driven activity to set up a blast.

EDDs safety includes dual capacitors that split the system into two. The logic capacitor is used to communicate and test the detonator and does not have enough storing energy to fire the fuse head. The firing capacitor is only used for firing. The logic capacitor has an internal shunt that when commanded switches gates from logic mode to firing mode. Only in firing mode is the firing capacitor then calibrated and charged for blasting.

The AXXIS Silver system utilises dual voltage for detonator logging and testing at low voltage. Error testing is reported by exemption thus considerably speeding up the testing and blasting process at the firing point. It takes less than two minutes to finalise a blast for firing regardless of the number of detonators.



AXXIS Silver Electronic Delay Detonator performance features include a non-volatile detonator memory. Detonators are programmed and tested during logging by writing the desired firing times and log sequence number into each detonator's memory. Once detonators are programmed during logging, there is no need to re-programme on powering up again. The detonator history is recorded permanently to the detonator memory, making it ideal for track and trace.

AXXIS Silver EDDs have engineered copper-clad steel cables that have excellent resistance to damage and cut-offs due to a balanced combination of tensile, elongation, and abrasion resistance. This results in a very low rate of misfire occurrence even under demanding hole loading conditions.

Detonator Specifications

Delay Time Range	0 to 15 seconds (15 000ms) in 1ms increments
Delay Accuracy (COV)	0.0067%
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box	800 detonators
Maximum Detonators per Blast Controller	1600 detonators
Detonator Shell	Aluminum magnesium alloy Copper Alloy
Detonator Dimensions	• Nominal outer diameter = 7.5mm • Nominal length = 88mm • Fits standard boosters
Detonator Charge	• 1.0g • South Africa #8 strength
Cable	HDPE outer insulation and PVC inner insulation over copper-clad steel cores
Operating Temperature	-40°C and +80°C
Hydrostatic Resistance	7 bars for 7 days
Dynamic Shock Resistance	50MPa

Packaging

AXXIS Silver Electronic Delay Detonator cables are coiled in 150mm diameter shrink-wrapped coils with the detonator feed from the center of spool for safety.

Custom lengths on request.

Detonator Cable Length (m)	1.1B Packaging		1.4B Packaging		1.4S Packaging	
	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)	Units per case	Max Weight per Case (kg)
5	144	15.25	80	11.30	80	11.30
6	126	14.95	80	11.92	80	11.92
8	120	17.80	56	13.75	56	13.75
10	104	18.20	56	14.35	56	14.35
12	88	17.85	52	14.61	52	14.61
15	80	20.20	56	18.52	56	18.52
20	64	20.50	40	16.35	40	16.35
25	48	18.50	32	15.51	32	15.51
30	40	18.40	28	15.70	28	15.70

Guidelines for Use

AXXIS Silver electronic delay detonators may only be programmed, tested, and fired with AXXIS Silver Loggers and AXXIS Silver Blasting Boxes. Do not attempt to program, test, or fire AXXIS Silver EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Silver Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Silver cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Ground Temperature

This product may be used in ground temperatures from -40°C to a maximum of +80°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Reactive Ground

Reactive ground is typically characterised by the presence of sulphide mineralisation. If the application requires use in known reactive ground, or in untested sulphide bearing ground, please contact a BME Technical Representative for additional guidance.

Sleep-Time

The recommended maximum sleep time is 21 days. Sleep time is dependent on factors such as hole depth, explosive column type, and ground water conditions. If the application requires longer in-hole sleep time, please consult with a BME Technical Representative for guidance.

Storage Life

The storage life for AXXIS Silver EDDs is 60 months under good storage conditions. Please consult with a BME Technical Representative for site specific storage life guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SDS) for first aid.

All explosives must be transported and stored in accordance to relevant regulations.

UN Classification for Transport and Storage

Product Classification

Authorised Name: AXXIS Silver
Correct Shipping Name: DETONATORS, ELECTRONIC programmable for blasting

Classification: 1.1B manufactured in South Africa
UN Number: 0511

Classification: 1.4B manufactured in South Africa
UN Number: 0512

Classification: 1.4S manufactured in South Africa
UN Number: 0513

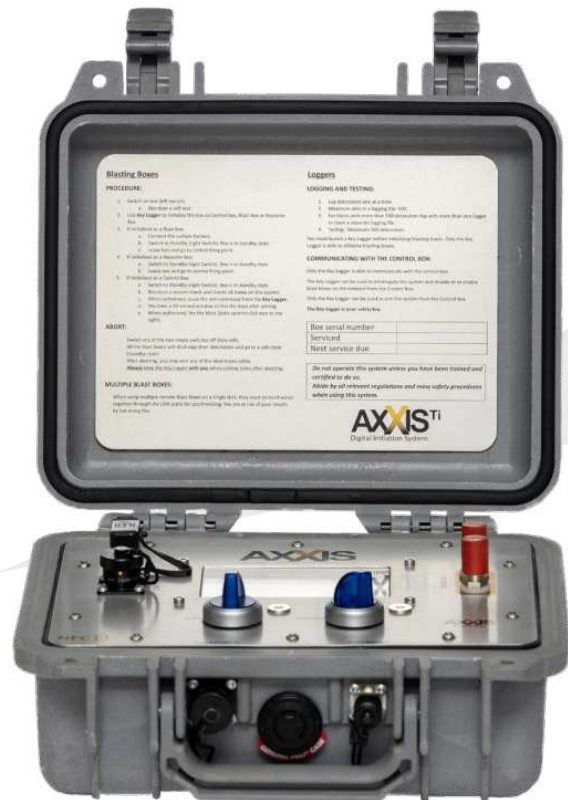
AXXIS[®] SILVER Blasting Box

PRODUCT DESCRIPTION

The AXXIS Silver electronic initiation system is an expansion of AXXIS technology. The AXXIS Silver electronic initiation system incorporates numerous handling, performance, and safety improvements built upon the highly successful AXXIS GII system. AXXIS Silver is a cost-effective solution for users wanting to upgrade from the limitations and results of non-electric initiation to the flexibility and added blast performance realised by electronic initiation.

The AXXIS Silver electronic initiation system is comprised of four components:

- AXXIS Silver Electronic Delay Detonator (EDD)
- AXXIS Silver Logger
- AXXIS Silver Blasting Box
- BLASTMAP blast design software



PRODUCT FEATURES

Application

The AXXIS Silver electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Silver electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

System Usage

Blasting Boxes

All AXXIS Silver Blasting Boxes are the same. Each AXXIS Silver Blasting Box is configurable to a Blaster Box or a Controller Box to accomplish its required function. Blasting Box operation is simple, with double rotary switches for switching a box on, placing it in standby mode, and opening communications channels to fire the blast. Wireless communications are achieved through three selectable open-band frequency channels. Other frequency channels can be configured based on the country requirements.

Blaster Box

AXXIS Silver Blasting Boxes configured as Blaster Boxes are placed at each blast site and connected to the surface wire harness. No power is supplied to the detonators until system arming from the Controller Box at blasting time.

Each Blaster Box can fire up to 800 detonators. In large bench blasts where more than one Blaster Box is needed, the Blaster Boxes are

hard-wired together using AXXIS link sets. Up to 2 Blaster Boxes may be linked together on a single bench for a total combined firing capability of 1600 detonators per bench. When more than one separated bench is fired together it is possible to blast up to a total of 20 Blaster boxes with 16 000 detonators in total.

Final testing of the AXXIS Silver Electronic Delay Detonators and the harness lines is performed using the AXXIS Silver Logger before the harness line is connected to the Blaster Box. After the AXXIS Silver detonators and the harness lines have cleared testing by the AXXIS Silver Logger, the harness line is connected to the AXXIS Silver Blaster Box. The AXXIS Silver Blaster Box is switched on and the unit performs a self-test. Once the self-test is completed the AXXIS Silver Blasting Box is switched into stand-by mode to open the communications channel – the detonators remain unpowered in stand-by mode.

Controller Box

Only one Blasting Box may be configured as a Controller Box per blast. The Controller Box requires the presence of a Key Logger to authorise arming and firing of the system. On arming of the system with the Controller Box, each Blaster Box then powers up its detonators, and testing routines automatically start and continue until firing time. Detonators respond by exception, allowing a quick testing time and immediate warnings to the operator through the color screen on the Controller Box and the Key Logger.

Combiner Box

A Blasting Box may be configured as a Combiner Box. The Combiner Box configuration is useful in quarry and construction blasting where the harness line-in line from the blast can be directly connected (hard-wired) into the Combiner Box at the safe firing point.

The Blasting-Controller Combiner Box requires the presence of a Key Logger to authorise arming and firing of the system. On arming of the system with the Blaster-Controller Combiner Box, the detonators are powered up, and testing routines automatically start and continue until firing time. Detonators respond by exception, allowing a quick testing time and immediate warnings to the operator through the color screen on the Blaser-Controller Combiner Box and the Key Logger.

Antennas

Two types of AXXIS Silver system specific antennas are available. The short-range antenna can be used for line-of-sight distances up to 1200 m. Depending on frequency allocation, the long-range ET Plate antenna can be used for line-of-sight distances between 1500 m and 5000 m.



Blasting Box Specification

Blasting Box Housing	Hard silver plastic
User Interface	Color LCD with variable intensity and contrast setting.
Screen Resolution	2000 x 1500 pixels
Battery	24-volt rechargeable Lithum-ion
Battery Capacity	6000 mAh Battery life dependent on the number of detonators in each blast. Batteries are not user replaceable.
Blasting Box Mass	2.1kg
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box in Blaster Box mode	800 detonators
Maximum Blaster Boxes per Controller Box	2 Blaster Boxes linked per bench 20 Blaster Boxes total
Maximum Detonators per Blast	1600 detonators linked per bench 16000 detonators total
Controls	Two rotary switches. Spring loading on the full-right position to fire a blast in Controller Box mode.

Communication Ports	Ports for antenna, charging, USB, harness wire and link cables. Authentication
Wireless Communication	Wireless communication range between Blasting Boxes= 1000 m to 5000 m line of sight
Modem Frequency	158 MHz or 433 MHz or 915 MHz
Resistance to Electrostatic Discharge	Electrostatic Discharge Immunity Test (± 8 kV contact, ± 15 kV air) Electrical Fast Transient / Burst Immunity (± 2 kV)
Operating Temperature	-30°C and +60°C
Storage Temperature	-40 C and +70°C

Guidelines for Use

AXXIS Silver electronic delay detonators may only be programmed, tested, and fired with AXXIS Silver Loggers and AXXIS Silver Blasting Boxes. Do not attempt to program, test, or fire AXXIS Silver EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Silver Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Silver cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Operating Temperature

The AXXIS Silver Logger may be operated in temperatures from -30°C to a maximum of +60°C. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Water, Dust, and Drop Shock Resistance

AXXIS Silver EDDs Loggers are robust electronic instruments that are engineered to be water and dust resistant (IEC 60529 IP65 and IP68) and drop shock resistant (IEC 60069-2-32: 1975). AXXIS Silver EDD Loggers are not waterproof – do not submerge AXXIS Silver EDD Loggers in water.

Storage

AXXIS Silver Loggers are robust electronic instruments that need to be used, charged, and stored with care. The AXXIS Silver Logger may be stored in temperatures from -40°C to a maximum of +70°C. Please consult with a BME Technical Representative for site specific guidance.

Safe Use

Never fight explosive fires.
Refer to the Safety Data Sheet (SDS) for first aid.

All explosives must be transported and stored in accordance with relevant regulations.

AXXIS[®] SILVER Logger

PRODUCT DESCRIPTION

The AXXIS Silver electronic initiation system is the latest expansion of technology. The AXXIS Silver electronic initiation system incorporates numerous handling, performance, and safety improvements built upon the highly successful AXXIS GII system. AXXIS Silver is a cost-effective solution for users wanting to upgrade from the limitations and results of non-electric initiation to the flexibility and added blast performance realised by electronic initiation.

The AXXIS Silver electronic initiation system is comprised of four components:

- AXXIS Silver Electronic Delay Detonator (EDD)
- AXXIS Silver Logger
- AXXIS Silver Blasting Box
- BLASTMAP blast design software



PRODUCT FEATURES

Application

The electronic initiation system is designed for use in most general and specialised mining, quarrying, and construction blasting applications on the surface or underground. The AXXIS Silver electronic initiation system passes ARP 1717-1: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

System Usage

AXXIS Silver Loggers are robust, hand-held devices for the logging and testing of AXXIS Silver Electronic Detonators. These mobile devices are manufactured by Trimble and have an AXXIS developed POD that docks onto the device. The POD contains the detonator communication circuit and this enables the logging and programming of AXXIS Silver Electronic Detonators. The AXXIS Silver Logger can read and write to the detonator's non-volatile memory, test a single detonator, test multiple detonators and transfer the logged blast files to the AXXIS Silver Electronic Detonators Blasting Box.

AXXIS Silver Loggers are easy and convenient to handle. They operate on the Android operating system which facilitates the upload of history files, current logging activity, reporting applications and web pages.

In order to operate AXXIS Silver Blasting Boxes (in Blaster Box mode) at blast firing time, one AXXIS Silver Logger is configured and designated as the Key Logger. The Key Logger generates a one-time pin to configure the AXXIS Silver Blasting Boxes (in Blaster Box mode). As a security measure, any AXXIS Silver Blasting Boxes (in Blaster Box mode) that has not been configured for a blast and bound through the one-time pin on the Key Logger will not function for that blast. At the safe firing point, the Key Logger and the one-time pin is also required to arm the AXXIS Silver Blasting Box (in Controller Box mode). Upon blast completion, all AXXIS Silver Loggers and Blasting Boxes return to a neutral un-configured state.

Logger Specification

Logging Device	TDC 100 Logger with AXXIS CAP
Operating system	Android 6
Screen Size and Resolution	13.4cm (5.25 inches); 1280 x 720 pixels
User Interface	• Color Touch Screen • Graphic Interface • Buttons for use in cold climates
Battery	• Lithium-ion
Battery Capacity	• 10.8V • 6600mAh • 35Whr
POD Maximum Output	• 9 volts, 50 mA
Logger Mass	• 0.48kg
Maximum Detonators per Logger	500 detonators per log-line
Maximum Detonators per Blasting Box in Blaster Box mode	800 detonators
Maximum Blaster Boxes per Controller Box	2 Blaster Boxes
Maximum Detonators per Blast	1600 detonators
Logger Functions	• Log Detonator UID's • Programming Detonator Firing Times • Test 1-500 Detonators
Detonator Communication	• Via attached POD • Read Functionality • Program Functionality • Test Functionality
Blasting Box Communication	• Bluetooth or Wired • NFC Authentication
Testing Functions	• Line Current Consumption • Programmed/Not Programmed • Detonator Voltage • Harness Line test for Missing Detonator • Harness Line test for Intruder Detonator
Resistance to Electrostatic Discharge	• Electrostatic Discharge Immunity test (± 8kV contact, ± 15 kV air) • Electrical Fast Transient / Burst Immunity (± 2 kV)

Guidelines for Use

AXXIS Silver electronic delay detonators may only be programmed, tested, and fired with AXXIS Silver Loggers and AXXIS Silver Blasting Boxes. Do not attempt to program, test, or fire AXXIS Silver EDDs with other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS Silver Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME AXXIS Silver cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Operating Temperature

The AXXIS Silver Logger may be operated in temperatures from -30°C to a maximum of $+60^{\circ}\text{C}$. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Water, Dust, and Drop Shock Resistance

AXXIS Silver EDDs Loggers are robust electronic instruments that are engineered to be water and dust resistant (IEC 60529 IP65 and IP68) and drop shock resistant (IEC 60069-2-32: 1975). AXXIS Silver EDDs Loggers are not waterproof – do not submerge AXXIS Silver EDDs Loggers in water.

Storage

AXXIS Silver Loggers are robust electronic instruments that need to be used, charged, and stored with care. The AXXIS Silver Logger may be stored in temperatures from -40°C to a maximum of $+70^{\circ}\text{C}$. Please consult with a BME Technical Representative for site specific guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SDS) for first aid.

All explosive control equipment must be transported and stored in accordance to relevant regulations.

AXXIS[®] CEBS Blasting Box

Product Description

The AXXIS CEBS (central electronic blasting system) is the newest generation of AXXIS technology. The AXXIS CEBS electronic initiation system incorporates numerous handling, performance, and safety improvements.

The AXXIS CEBS electronic initiation system is comprised of the following components:

- AXXIS UG Logger
- AXXIS CEBS Key Logger
- AXXIS CEBS Blasting Box
- BLASTMAP UNDERGROUND blast design software
- Supported Electronic Delay Detonators (EDDs):
- AXXIS Silver



PRODUCT FEATURES

Application

The AXXIS CEBS is designed for use in most general and specialised mining and underground blasting operations. The AXXIS CEBS complies with ARP 1717-1 and SANS1717-3: The South African National Standard for the design and approval of EDD initiation systems for mining and civil applications.

System Usage

CEBS Boxes

All AXXIS CEBS Blasting Boxes are the same. Each AXXIS CEBS Box is configurable as either a Blasting Box with the UG Logger or a Controller Box with the CEBS Key Logger. Blasting Box operation is simple, with double rotary switches for switching a box on, placing it in standby mode, and opening communications channels to fire the blast. Communication is achieved by means of Ethernet cable, Fiber and/or Copper backbone.

Blaster Box

AXXIS CEBS Boxes configured as Blaster Boxes are placed at each blast location and connected to the bus wire harness. No power is supplied to the detonators until system status check is launched with the key logger via the Controller Box at blasting time. Backbone communication can be verified from the Key Logger without powering the EDDs.

Each Blaster Box can fire up to 800 detonators. Up to 20 Blaster boxes can be interconnected on the backbone and controlled from a central point.

The total combined number of EDDs that can be fired in a single blast is 16 000.

Testing of the AXXIS Silver EDDs and the harness lines is performed using the AXXIS UG Logger before the harness line is connected to the Blaster Box. After the AXXIS CEBS detonators and the harness lines have passed testing by the AXXIS UG Logger, the harness line is connected to the AXXIS CEBS Blaster Box. The AXXIS CEBS Blaster Box is switched on and the unit performs a self-test. Once the self-test is completed the AXXIS CEBS Blasting Box is initialised using the AXXIS UG Logger and then switched into stand-by mode to open the communications channel. There is no energy supplied to the EDDs in stand-by mode.

Controller Box

An AXXIS CEBS Box in a central location is configured as a Controller Box. The Controller Box requires the presence of a AXXIS CEBS Key Logger to authorise the start of the blasting process. On status check of the system with the Controller Box, each Blaster Box then powers up its detonators, and testing routines automatically start and continue until firing time. Detonators respond by exception, allowing a quick testing time and immediate warnings to the operator through the color screen on the Controller Box and the Key Logger.

Blasting Box Specifications

Blasting Box Housing	Pelican case
User Interface	Colour LCD with variable intensity and contrast setting
Screen Resolution	2000 x 1500 pixels
Battery	15-volt rechargeable lithium-ion
Battery Capacity	14 000mAh Battery life dependent on the number of detonators in each blast Batteries are not user replaceable
Blasting Box Mass	3.9kg
Maximum Detonators per Blasting Box in Blaster Box Mode	800 detonators
Maximum Blast Boxes per Controller Box	20 Blaster Boxes
Controls	Two rotary switches
Communication Ports	Ports for antenna, chargin, USB, harness wire, RS484 and Ethernet QR Code Authentication
Resistance to Electrostatic Discharge	Electrostatic Discharge Immunity Test ($\pm 8\text{kV}$ contact, $\pm 15\text{kV}$ air) Electrical Fast Transient/Burst Immunity ($\pm 2\text{kV}$)
Operating Temperature	-30°C and $+60^{\circ}\text{C}$
Storage Temperature	-40°C and $+70^{\circ}\text{C}$

Guidelines for Use

Supported EDDs may only be programmed, tested, and fired with AXXIS UG Loggers and AXXIS CEBS Boxes. Do not attempt to program, test, or fire supported EDDs with any other blasting equipment. Never mix electronic delay detonators and/or components from different manufacturers.

AXXIS CEBS Loggers and Blasting Boxes need to be calibrated and serviced by BME qualified personnel or providers every 2 years.

Always use AXXIS harness wire to tie-in blasts. Do not substitute similar looking harness wire as the performance specifications may not be the same.

Although BME supported EDD cables are engineered and constructed for challenging work environments, care should still be exercised when loading and stemming to avoid cutting or damaging downlines.

Operating Temperature

The AXXIS UG Logger may be operated in temperatures from -30°C to a maximum of $+60^{\circ}\text{C}$. If the application requires use outside of this temperature range please contact a BME Technical Representative for additional guidance.

Water, Dust, and Drop Shock Resistance

AXXIS UG Loggers are robust electronic instruments that are engineered to be water and dust resistant (IEC 60529 IP65 and IP67) and drop shock resistant (IEC 60069-2-32: 1975). AXXIS UG Loggers are not waterproof – do not submerge AXXIS UG Loggers in water.

Storage

AXXIS UG Loggers are robust electronic instruments that need to be used, charged, and stored with care. The AXXIS UG Logger may be stored in temperatures from -40°C to a maximum of $+70^{\circ}\text{C}$. Please consult with a BME Technical Representative for site specific guidance.

Safe Use

Never fight explosive fires.

Refer to Safety Data Sheet (SDS) for first aid.

All explosive control equipment must be transported and stored in accordance to relevant regulations.

AXXIS[®] CEBS UG Logger



PRODUCT DESCRIPTION

The AXXIS Loggers are Robust, Hand-held devices that allow Logging and testing of Detonators. The Mobile device are Manufactured by Handheld and has an AXXIS developed CAP which docks onto the device. The CAP contains the Detonator Communication Circuit, and this makes possible the Logging and Programming of Detonators. It can Read/Write to the Detonators Non-volatile memory, test a single Detonator, test multiple Detonators and transfer the Logged blast files to the Blaster.

The AXXIS Loggers are easy and convenient to use. They operate on the Android operating system, which facilitates the upload of history files, logging activity, reporting applications and web pages.

In order to configure the Blaster at Fire time, a Key Logger is required. This operates with a one-time pin, the pin is generated and managed by the Software. As a security measure, any Blaster that has not been configured for the Blast and bound through the one-time pin on the Key Logger will not function for that Blast. The Key Logger and the one-time pin are required at the Blast Controller for the system to be Armed.

Upon Blast completion, all Loggers and Blasters return to a neutral un-configured state. Files are stored in memory and can be archived by the User.

Technical data

Type	• Robust Handheld Device
Operating system	• Android 11 Enterprise
Colour	• Grey & Black
Detonator Communication	• Via Attached CAP • Communication 1-500 Detonators Connected • Read Functionality • Program Functionality • Test Functionality
Blaster Communication	• Bluetooth, Wired, QR Scan • NFC Authentication
User Interface	• Color Touch Screen • Function Buttons • Rain Mode
Screen Size	• 6 Inch, 1080x1920
Battery	• Li-ion
Battery Capacity	• 3.8V • 8000mAh • 30.4Whr
POD Maximum Output	• 9 volts, 70 mA
Logger Mass	• 610g
Logger Function	• Scanning UID's • Programming Firing Times • Programming to Detonator NVM • Centralise Programming 1-500 Detonators Connected • Testing 1-500 Detonators Connected
Testing Functions	• Detonator Program Status • Detonator Program Details • Detonator Temperature • Line Current Consumption • Leakage Test • Line Test for Connected • Line Test for Missing • Line Test for Intruders
Detonators Per Log Line	• 500
Detonators Per Log File	• 20 000
Intruder Detection	• 500 connected

Environmental

Conform to Specification	SANS 1717-1: The South African National Standard for: Design and Approval of EDD Initiation Systems: Mining and Civil Blasting
Resistance to ESD	Electrostatic Discharge Immunity Test (±8kV contact, ±15kV air) Electrical Fast Transient / Burst Immunity (±2kV)
Calibration Intervals	2 years
Water/Dust Ingress	Water/Dust Ingress
Drop Shock Protection	IEC 60068-2-32:1975: 122cm
Temperature	Operation: -20 °C to +55 °C, Storage: -40 °C to +70 °C



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BLASTING SOLUTIONS

EQUIPMENT

(Surface)

E-Series HC MMU



Product Description

BME provides a full range of locally manufactured Mobile Manufacturing Units (MMUs), designed for surface mining and quarrying applications. These units are capable of pumping BME's full range of emulsion bulk explosives.

Applications

All MMUs are purpose-built to perform reliably in the demanding environments encountered during normal mining operations. Their robust design and intelligent control systems ensure safe, efficient, and consistent on-bench performance.

Benefits and Features

- Integrated safety control systems
- Data logging and operational transparency
- Ease of operation, maintenance, and reliability
- Delivery Rate: Up to 300 kg/min

Design Features

- Seamless integration between Blastmap, Xplolog and Xplocharge
- Sensor-driven plant shutdown on critical thresholds
- Predictive maintenance scheduling based on hardware data
- Automation for reduced manual data capture
- Wi-Fi/Bluetooth connectivity to Xplolog mobile device
- Clean user interface requiring minimal training

System Safeguards

- Emergency plant shut-off system
- Hydraulic pressure relief valves
- Pumping line bursting disc
- 5-minute auto-stop timer
- 2 x 9kg fire extinguishers

Operator Protection

- Climate-controlled enclosed cabin
- Reverse camera
- Digital sensor network for pump safety:
 - Dry-running prevention
 - Dead-heading detection
 - Emulsion pressure alerts
 - Temperature monitoring
 - Flow-rate monitoring

MMU Monitoring

- Netstar telematics
- DriveCam system

Technical Properties

Chassis Specifications

- Engine: Iveco Cursor 13 F3HGE611
 - Max Power: 475 HP/ 349 kW@ 1900 rpm
 - Max Torque: 2200 Nm@ 1100 rpm
 - Engine Brake Power: 306 kW
- Gearbox: 16T2241TO
- Axle Configuration: 8x4

Chassis Axle Weights

Iveco T-Way AD410T47H-8x4

Weight Category	Front Axle (kg)	Rear Axle (kg)	Gross Vehicle (kg)
Designed Weights	18 000	32 000	50 000

Tank Fluid Specifications

Tank No.	Fluid common name	Volume (L)	Volume (m³)	Product Mass (kg)
TK-01	Fuel Emulsion	19 913	19 913	25 973
TK-02A	Sodium Nitrite	352	0.352	387
TK-028	Water	387	0.387	383
TK-02C	Sulphuric Acid	352	0.352	387
TK-03	Hydraulic Oil	800	0.800	679
Total		21 804	21 804	27 809

MMU E-SERIES



Product Description

BME Provides a full range of locally manufactured Mobile Manufacturing Units (MMUs), which cater for all surface mining and quarrying applications. BME’s MMUs are capable of pumping BME’s full range of bulk explosives. All MMUs are designed to operate in the demanding environments encountered during normal mining operations. Design parameters include all necessary safety control systems, datalogging and integration as well as ease of operation, maintenance and reliability. BME’s MMUs meet all transportation of hazardous goods legislation (European Agreement concerning the international Carriage of Dangerous Goods by Road (ADR)).

The control systems of the MMUs are fitted with advanced control hardware and software, allowing for complete operational transparency. Integration with charge plan designs, guides operators whereas data log reporting ensures data-driven decisions for future blast projections.

Applications

BME’s MMU E-Series is used in all opencast mining and quarrying operations, where bulk emulsion explosives products are required.

Features

- Complete integrated control system, responsible for pump control, system operational control and safety control
- Closed-loop hydraulic control system guarantees product quality
- XPLOLOG tablet integration, monitoring planned and actual production masses
- Log and reporting of production data for data-driven projections
- MMU system health monitoring, guarantees accelerated fault finding and charging operation quality

Design Features

- Closed-loop hydraulic system
- Suitable chassis with all standard safeties, selected for rugged on-bench conditions
- In-cab control system
- Maximum pump rate of 300 kg/min
- Rugged installation onto chassis ensuring increased life-use cycle of the MMU

Pump Safety Features

The MMU control system and integrated digital sensors have been selected and designed to implement pump safety control philosophies protection the pumping system and operation against:

- Dry-running
- Dead-heading
- High and Low emulsion pressures
- High Emulsion and Hydraulic temperatures
- Low gassing/oxidiser and hose lubrication flowrates

Tank Fluid Specifications

Tank No.	Fluid common name	Volume (L)	Volume (m³)	Product Mass (kg)
TK-01	Fuel Emulsion	9 540	9.54	13 833
TK-02A	Sodium Nitrite	331	0.331	364
TK-02B	Water	330	0.33	330
TK-02C	Sulphuric Acid	331	0.331	364
TK-03	Hydraulic Oil	610	0.61	518
Total		11 142	11.142	15 409

MMU HA Series



Product Description

BME Provides a full range of locally manufactured Mobile Manufacturing Units (MMUs), which cater for all surface mining and quarrying applications. BME's MMUs are capable of pumping and auguring BME's full range of bulk explosives. All MMUs are designed to operate in the demanding environments encountered during normal mining operations. Design parameters include all necessary safety control systems, datalogging and integration as well as ease of operation, maintenance and reliability. BME's MMUs meet all transportation of hazardous goods legislation (European Agreement concerning the international Carriage of Dangerous Goods by Road (ADR)).

The control systems of the MMUs are fitted with advanced control hardware and software, allowing for complete operational transparency. Integration with charge plan designs, guides operators whereas data log reporting ensures data-driven decisions for future blast projections.

Applications

BME's MMU HA-Series is used in all opencast mining operations where blended emulsions and Heavy ANFO's are required.

Benefits and Features

- Complete integrated control system, responsible for pump control, system operational control and safety control
- Closed-loop hydraulic control system guarantees product quality
- XPLOLOG tablet integration, monitoring planned and actual production masses
- Log and reporting of production data for data-driven projections
- MMU system health monitoring, guarantees accelerated fault finding and charging operation quality

Design Features

- Closed-loop hydraulic system
- Suitable chassis with all standard safeties, selected for rugged on-bench conditions
- In-cab control system
- Rugged installation onto chassis ensuring increased life-use cycle of the MMU
- Equipped to pump/auger blend and ANFO products

Pump Safety Features

The MMU control system and integrated digital sensors have been selected and designed to implement pump safety control philosophies protection the pumping system and operation against:

- Dry-running
- Dead-heading
- High and Low emulsion pressures
- High Emulsion and Hydraulic temperatures
- Low gassing/oxidiser and hose lubrication flowrates

Tank Fluid Specifications

Tank No.	Fluid common name	Volume (L)	Volume (m ³)	Product Mass (kg)
TK-01	Ammonium Nitrate Prills	9 300	9.30	7 410
TK-02	Ammonium Nitrate / Fuel Emulsion "Innovex"	8 800	8.80	12 762
TK-03	Sodium Nitrite	370	0.37	404
TK-04	Diesel	820	0.82	697
TK-05	Water	370	0.37	367
TK-06	Hydraulic Oil	360	0.36	303
Total		19 950	20.02	21 943

Stemming Truck

Product Description

BME provides a stemming plant fitted on a Iveco 380 T42 WH 6x6 cab chassis or chassis specified by the customer.

The stemming truck is capable of delivering 15 to 18 m³ (20 to 24 yd³) of crushed aggregate.



Product Description

BME provides a stemming plant fitted on a Iveco 380 T42 WH 6x6 cab chassis or chassis specified by the customer.

The stemming truck is capable of delivering 15 to 18 m³ (20 to 24 yd³) of crushed aggregate.

Application

The stemming truck has been perfected for opencast mining with zero waste of emulsion.

Features

- 600 mm (23.6 in) wide positive drive conveyor
- Custom length placing conveyor to reach either side of truck for stemming
- In-cab control system identical to BME bulk MMUs to control belts and positioning, on/off and amount of stemming to be discharged
- Joystick control of the placing conveyor, inside or outside mounted
- Water spray system to control dust
- A metering system that can determine how much stemming to put in the hole on a metered basis
- Zero waste of aggregate
- Four emergency stops located around vehicle
- Camera system on discharge conveyor and truck rear for positioning and monitoring

Design

- Closed-loop control system
- Variable discharge rate
- In-cab control system
- Joystick control for stemming conveyor

Safety

Complies with Bell Equipment Company South Africa (BECSA) Fatal Risk Company Protocol (FRCP)

Guidelines For Use

System Usage

All stemming trucks are designed to operate in demanding environments encountered during normal mining operations.

Design parameters to include all necessary safety control systems as well as ease of operation, maintenance, and reliability.

BME's stemming trucks are SABS approved.

Bulk Technical support vehicle



Product Description

BME provides a technical support vehicle, fitted on a 4.2 L 4x4 Toyota Land Cruiser or vehicle specified by the customer.

The support vehicle is also retrofitted with roll over protection systems (ROPs) and the necessary requirements to operate on all surface mining operations.

The technical support vehicle is fully equipped to provide full technical monitoring capabilities to enable client operations to optimise their blasting.

Applications

Application of the Bulk Technical Support Vehicle is to provide an on-bench full technical service on request.

Features

- Borehole caliper to measure hole diameters from 127 mm to 350 mm (5 in to 13.8 in) at a depth of 40 m (131 ft)
- Velocity of detonation (VOD) recorders
- Seismographs
- 3-D face profiling equipment
- High-speed video-photography camera
- Emulsion and ANFO-testing kits
- Bench scale for truck calibration and auditing
- Reactive ground testing technology

Design Features For The Borehole Caliper

- In-cab control system
- Dual power supply system
- External backup control system
- Easy access to probe and winch for maintenance

Safety Features

Complies with Bell Equipment Company South Africa (BECSA) Fatal Risk Company Protocol (FRCP)



Modularised Emulsion Plant



Product Description

BME Emulsion Plants are designed to be mobile, robust, and user friendly, making them ideally suited for the mining environment. All plants are divided into two primary systems. Steam generation to provide heat for the process and the production modules, which both generate the base solution from dry raw materials and manufacture the emulsions.

With the Emulsion Plants being modular in design we offer processes with two production outputs: The F1 plant, capable of producing 20T of emulsion in an eight hour shift, or the F3 plant, with a production capability of 40T per shift, which is a F1 plant with additional production and steam generation modules.

Most importantly, while all of our plants have been designed to be easily operated and maintained, they also include all the necessary safety controls to provide an operator-friendly work environment.



Benefits and Features

- Proven reliability in remote locations
- Ease of installation in remote sites, as the modules are built into standard sized containers to facilitate transport and handling
- Installed equipment protection devices to minimise safety risks

Safety Features

- All critical pumps are fitted with an independent electronic pump protection system, which monitors and controls operating pressures and temperatures, thus protecting the system from dead-heading and dry-running scenarios
- All critical pumps are further fitted with mechanical pump protection devices to protect the system from a dead-heading scenario
- The boilers are fitted with all the necessary safety devices to minimise the risk of equipment failure, safety incidents and production losses
- Temperature monitoring systems are installed on the solution preparation tanks
- Emergency stops are situated at critical locations throughout the plant



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EQUIPMENT

(Underground)

DEVELOPMENT CHARGING UNIT (DCU)

Function	Charging
Application	Underground
Class	Development Charging Unit
Industry	Mining



Product Description

The Development Charging Unit (DCU) by BME is a compact and versatile rail-bound charging system designed for use with INNOVEX UG emulsion formulations, ideal for smaller mines utilising tracks. The BME DCU it operates independently of a vehicle power head. The DCU features a Model 2 mobile pump (MP2) that delivers emulsion and sensitising solution simultaneously, forming an explosive upon entering the blasthole. Its low energy requirements enable operation on various power sources, including an electric motor, air, or hydro-power.

Applications

Primarily designed for use in underground mining environments that employ tracks, as the DCU is rail-bound.

Benefits and Features

- Robust design and build
- Corrosion-resistant tanks for improved operational life
- Dual MP2 Pumping Configuration
- Emulsion tank is designed to ensure effective emulsion flow to minimise waste
- Integrated peripheral, safety and pumping control system tailored for underground production operations
- Cost-effective solution that offers excellent performance without necessitating a relatively large initial investment

Design Features

Pre-set Emulsion to gassing ratio, optimised for BME's INNOVEX UG Emulsions.

Emulsion Tank Capacity	Available up to 3000 kg
Sensitiser Tank Capacity	Dependent on Emulsion Capacity
Water Tank Capacity	Dependent on Emulsion Capacity
Pumping Rate	Up to s45 kg/min (single pump) or 85 kg/min (dual pump)
Drive System	Electric-over-hydraulic, Hydropower-over-hydraulic

Pump Safety Features

- Intrinsically safe pump technology
 - Safe in instances of dry-running
 - Safe in instances of dead heading
- Pressure bursting disc
- Failsafe Control System
- Emulsion high-pressure trips

CRUISER CHARGING UNIT (CCU)

Function	Repump and Charging Unit
Application	Underground
Industry	Construction, Mining



Product Description

BME's Cruiser Charging Unit (CCU) is a compact charging system designed for INNOVEX emulsion formulations. Equipped with an MP2 pump and an Intelligent Control System, it leads in mechanised emulsion technology and enhances underground safety.

Applications

Developed for underground development charging operations, where maneuverability of carrier vehicles are restricted.

Benefits and Features

- Robust design and build
- Corrosion-resistant tanks for improved operational life
- Single MP2 Pumping Configuration
- Emulsion tank is designed to ensure effective emulsion flow to minimise waste
- Integrated peripheral, safety and pumping control system tailored for underground production operations
- Cost-effective solution that offers excellent performance without necessitating a relatively large initial investment

Design Features

Pre-set Emulsion to gassing ratio, optimised for BME's INNOVEX UG Emulsions

Emulsion Tank Capacity	Up to 800 kg
Sensitiser Tank Capacity	Up to 60L
Water Tank Capacity	Up to 60L
Pumping Rate	45 kg/min (single pump)
Drive System	Hydraulic



Pump Safety Features

- Intrinsically safe pump technology
 - Safe in instances of dry-running
 - Safe in instances of dead heading
- Pressure bursting disc
- Failsafe Control System
- Emulsion high-pressure trips

UG LATERAL EMULSION CHARGING UNIT (ECU)

Function	Storage, Transfer
Application	Underground
Class	Delivery Module
Specific Application	Lateral
Industry	Mining



Product Description

The Emulsion Charging Unit (ECU) is BME’s mechanised charging system developed to be used with BME’s INNOVEX UG emulsion range. These units are typically fitted with two patented mobile pumps, ensuring safe charging and reduced maintenance down-times. BME makes use of a bespoke design to ensure each ECU is perfectly fit for the required underground mining application.

BME’s lateral charging unit is used in operations whereby specific blasting patterns where lateral injection is more effective. The term “lateral” refers to a specific design related to the orientation or direction of the emulsion injection into the faces. This is a system where the emulsion is injected horizontally into the rock rather than vertically. BME lateral charging units are typically fitted with an emulsion tank, a gassing tank, a lube/water tank and two BME MP2 Pumps (mobile pumps), which are uniquely designed for lateral charging.

Benefits and Features

- Robust design and build
- Corrosion-resistant tanks for improved operational life
- Dual MP2 Pumping Configuration
- ECU tanks and frame have a bespoke design to fit with the client-preferred underground carrier vehicle
- Emulsion tank is designed to ensure effective emulsion flow to minimise waste
- Integrated peripheral, safety and pumping control system tailored for underground production operations
- Clients can make data-driven production decisions

Optional

- Optional levels of ECU integrated technology:
- **Entry Level:** for production environments where minimal operational complexity is required and where digital charging data reporting and analytics are not required.
 - **Intermediate:** for production environments where operational complexity can be accommodated, and production decision are data-driven.
 - **Advanced:** technologically advanced production environments where data-driven decisions are the cornerstone of mining enhancement.

Design Features

Pre-set Emulsion to gassing ratio, optimised for BME’s INNOVEX UG Emulsions.

Emulsion Tank Capacity	Minimum 1500kg
Sensitiser Tank Capacity	Dependent on Emulsion Capacity
Water Tank Capacity	Dependent on Emulsion Capacity
Pumping Rate	45 kg/min (single pump) or 85 kg/min (dual pump)
Drive System	Hydraulic

Pump Safety Features

- Intrinsically safe pump technology
 - Safe in instances of dry-running
 - Safe in instances of dead heading
- Pressure bursting disc
- Failsafe Control System
- Emulsion high-pressure trips

BME Underground Emulsion Charging Unit Technical Data Sheet

		Emulsion Charging Unit Types			
Description		Lateral ECU	Up-Hole ECU	Combination ECU	Secondary Breaker
ECU Use	Development	○		○	
	Up-Hole		○	○	
	Down-Hole			○	
	Secondary Breaking				○
	Dual Density	x		x	
Tanks	Emulsion Tank	○	○	○	○
	Gassing Tank	○	○	○	○
	Flushing Tank	○	○	○	○
	Lubrication Tank	x	○	○	x
Pumping	MP2 Pump	○	○	○	○
	Dual Pumping	○	○	○	○
	Independent/Combined Pumping	x		x	x
ECU Accessories	BME Boom 5m		x		
	BME Boom 7m		x		
	Hose Pusher		○	○	
	Hose Reel		○	○	
	Hose Reel Cage		x	x	
	Up-Hole Snorkel			x	
	Up-Hole Snorkel Slew			x	
	Robotic Injector Unit		○		
	Integration /w 3rd Party Boom and/or Basket		x	x	
	Basic Remote Control Functionality	○		x	○
	Robotic Arm Remote Functionality		○		
	Integration /w SBU Remote				x
Control System Displays	4" Display Screen	•			•
	7" Display Screen	••	• / ••	• / ••	••
	12.1" Touch Screen	•••	•••	•••	•••
Control System Monitoring	Hydraulic Pressure	○	○	○	○
	Hydraulic Temperature	○	○	○	○
	Emulsion Pressure	○	○	○	○
	Emulsion NRV Condition	•• / •••	•• / •••	•• / •••	•• / •••
	Tank Low-Level Warning (Only)	•• / •••	•• / •••	•• / •••	•• / •••
	Hose Protection		•• / •••	•• / •••	
Tank Flushing Mode		•••	•••	•••	•••

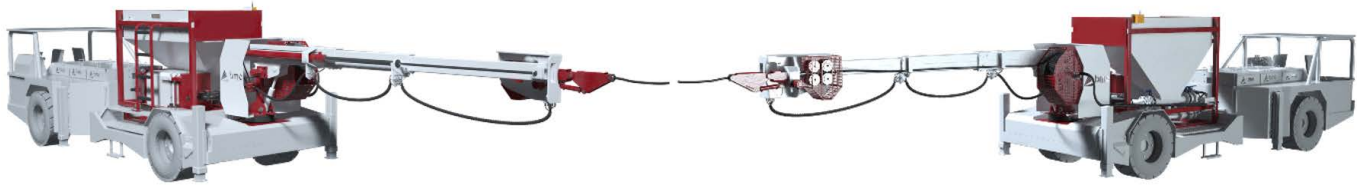
		Emulsion Charging Unit Types			
Description		Lateral ECU	Up-Hole ECU	Combination ECU	Secondary Breaker
Control System Monitoring continued	Active Tank Levels	•••	•••	•••	•••
	Gassing System	•• / •••	•• / •••	•• / •••	•• / •••
	Lubrication System	•••	•••	•••	•••
	High/Low Density Selection	•••		•••	
	Hole Selection Log	○	○	○	○
System Datalogging	Ring/Face Selection Log	○	○	○	○
	Emulsion Pumped per Hole	○	○	○	○
	Emulsion pumped per Ring/Face	○	○	○	○
	Emulsion Pumped Per Shift	○	○	○	○
	MP2 Pump Run Times	○	○	○	○
	System Flushing Log	•••	•••	•••	•••
	Emulsion Pressures	○	○	○	○
	Hydraulic Pressures	○	○	○	○
	Lubrication System Log	•••	•••	•••	•••
	Gassing System Log	•• / •••	•• / •••	•• / •••	•• / •••
	System Troubleshooting Log	•• / •••	•• / •••	•• / •••	•• / •••
	Tank Levels Log	•••	•••	•••	•••
	System Calibration Log	•• / •••	•• / •••	•• / •••	•• / •••
	Applicable System Warnings and Trips Log	○	○	○	○
	Hose Depth Log		○	○	
	Multi-Piming Log		○	○	
	Dual Density Selection Log	•••		•••	
Data Log Communication	USB Download	○	○	○	○
	Tablet Integration	•••	•••	•••	•••
	Live Dashboard Reporting*	•••	•••	•••	•••

- Standard
- Entry-level Control System
- Intermediate Control System
- Advanced Control System
- x On Request

* Please note: Live Dashboard reporting requires a stable Wi-Fi connection to ensure communication with the server. Therefore, Live Dashboard Reporting will only be integrated at mines where an existing full-functioning Wi-Fi infrastructure is installed.

ROBOTIC BOOM UP-HOLE EMULSION CHARGING UNIT (ECU)

Function	Storage, Transfer
Application	Underground
Class	Delivery Module
Specific Application	Up-Hole
Industry	Mining



Product Description

The Emulsion Charging Unit (ECU) is BME’s mechanised charging system developed to be used with BME’s INNOVEX UG emulsion range. These units are typically fitted with two patented mobile pumps, ensuring safe charging and reduced maintenance down-times. BME makes use of a bespoke design to ensure each ECU is perfectly fit for the required underground mining application.

BME’s remote-operated Robotic Boom up-hole charging unit uses up-hole blasting practices for emulsion transfer into vertically drilled holes, commonly known as rings. The unit is typically fitted with an emulsion tank, a gassing tank, a lube/water tank, two BME MP2 Pumps (mobile pumps). It also features a hose reel, state-of-the-art hose pusher, and a robotic telescopic boom, which are uniquely designed for up-hole charging to ensure maximum efficiency in charging operations and increased uptime. The robotic telescopic boom is available in either a 5-meter or 7-meter reach. The level of integrated technology can be decided by clients, based on their production needs.

A basket-mounted option, opposed to a Robotic-Arm option, is also available.

Benefits and Features

- Remote-operated
- Fitted with BME’s Hose Pusher for controlled hose traction during charge-up
- Robust design and build
- Corrosion-resistant tanks for improved operational life
- Dual MP2 Pumping Configuration
- ECU tanks and frame have a bespoke design to fit with the client-preferred underground carrier vehicle
- Emulsion tank is designed to ensure effective emulsion flow to minimise waste

- Integrated peripheral, safety and pumping control system tailored for underground production operations
- Clients can make data-driven production decisions

Optional

- Optional levels of ECU integrated technology:
- **Entry Level:** for production environments where minimal operational complexity is required and where digital charging data reporting and analytics are not required.
 - **Intermediate:** for production environments where operational complexity can be accommodated and production decision are data-driven
 - **Advanced:** technologically advanced production environments where data-driven decisions are the cornerstone of mining enhancement.

Design Features

Pre-set Emulsion to gassing ratio, optimised for BME’s INNOVEX UG Emulsions.

Emulsion Tank Capacity	Minimum 2500kg
Sensitiser Tank Capacity	Dependent on Emulsion Capacity
Water Tank Capacity	Dependent on Emulsion Capacity
Pumping Rate	45 kg/min (single pump) or 85 kg/min (dual pump)
Drive System	Hydraulic

Pump Safety Features

- Intrinsically safe pump technology
 - Safe in instances of dry-running
 - Safe in instances of dead heading
- Pressure bursting disc
- Failsafe Control System
- Emulsion high-pressure trips

BME Underground Emulsion Charging Unit Technical Data Sheet

		Emulsion Charging Unit Types			
Description		Lateral ECU	Up-Hole ECU	Combination ECU	Secondary Breaker
ECU Use	Development	○		○	
	Up-Hole		○	○	
	Down-Hole			○	
	Secondary Breaking				○
	Dual Density	x		x	
Tanks	Emulsion Tank	○	○	○	○
	Gassing Tank	○	○	○	○
	Flushing Tank	○	○	○	○
	Lubrication Tank	x	○	○	x
Pumping	MP2 Pump	○	○	○	○
	Dual Pumping	○	○	○	○
	Independent/Combined Pumping	x		x	x
ECU Accessories	BME Boom 5m		x		
	BME Boom 7m		x		
	Hose Pusher		○	○	
	Hose Reel		○	○	
	Hose Reel Cage		x	x	
	Up-Hole Snorkel			x	
	Up-Hole Snorkel Slew			x	
	Robotic Injector Unit		○		
	Integration /w 3rd Party Boom and/or Basket		x	x	
	Basic Remote Control Functionality	○		x	○
	Robotic Arm Remote Functionality		○		
	Integration /w SBU Remote				x
Control System Displays	4" Display Screen	•			•
	7" Display Screen	••	• / ••	• / ••	••
	12.1" Touch Screen	•••	•••	•••	•••
Control System Monitoring	Hydraulic Pressure	○	○	○	○
	Hydraulic Temperature	○	○	○	○
	Emulsion Pressure	○	○	○	○
	Emulsion NRV Condition	•• / •••	•• / •••	•• / •••	•• / •••
	Tank Low-Level Warning (Only)	•• / •••	•• / •••	•• / •••	•• / •••
	Hose Protection		•• / •••	•• / •••	
	Tank Flushing Mode	•••	•••	•••	•••

		Emulsion Charging Unit Types			
Description		Lateral ECU	Up-Hole ECU	Combination ECU	Secondary Breaker
Control System Monitoring continued	Active Tank Levels	•••	•••	•••	•••
	Gassing System	•• / •••	•• / •••	•• / •••	•• / •••
	Lubrication System	•••	•••	•••	•••
	High/Low Density Selection	•••		•••	
	Hole Selection Log	○	○	○	○
System Datalogging	Ring/Face Selection Log	○	○	○	○
	Emulsion Pumped per Hole	○	○	○	○
	Emulsion pumped per Ring/Face	○	○	○	○
	Emulsion Pumped Per Shift	○	○	○	○
	MP2 Pump Run Times	○	○	○	○
	System Flushing Log	•••	•••	•••	•••
	Emulsion Pressures	○	○	○	○
	Hydraulic Pressures	○	○	○	○
	Lubrication System Log	•••	•••	•••	•••
	Gassing System Log	•• / •••	•• / •••	•• / •••	•• / •••
	System Troubleshooting Log	•• / •••	•• / •••	•• / •••	•• / •••
	Tank Levels Log	•••	•••	•••	•••
	System Calibration Log	•• / •••	•• / •••	•• / •••	•• / •••
	Applicable System Warnings and Trips Log	○	○	○	○
	Hose Depth Log		○	○	
	Multi-Pining Log		○	○	
	Dual Density Selection Log	•••		•••	
Data Log Communication	USB Download	○	○	○	○
	Tablet Integration	•••	•••	•••	•••
	Live Dashboard Reporting*	•••	•••	•••	•••

- Standard
- Entry-level Control System
- Intermediate Control System
- Advanced Control System
- x On Request

* Please note: Live Dashboard reporting requires a stable Wi-Fi connection to ensure communication with the server. Therefore, Live Dashboard Reporting will only be integrated at mines where an existing full-functioning Wi-Fi infrastructure is installed.

BME PORTABLE TRAINING UNIT

Function	Storage, Transfer
Application	Underground
Class	Delivery Module
Specific Application	Training
Industry	Mining



Product Description

The BME Portable Training Unit is purpose-built to deliver safe, hands-on training for BME Underground Charging Equipment in a controlled environment. It enables training across multiple disciplines -from engineering teams to face operators and charge crews-on a physical unit that can be deployed anywhere.

Features

Design features

This unit is fully towable by any vehicle with a trailer hitch and can also be adapted for permanent on-site installation, giving sites full control over their training capabilities.

Beyond training, the PTU serves as a demonstration platform for showcasing BME's technological advancements to both the public and mining management. Notably, it has been used to develop and demonstrate BME's movement towards semi-autonomous charging for development and ring blast holes.

Key features

- Fully portable and towable
- Operates on single-phase power
- Weather-protective covering
- Flexible development and training capabilities
- Rapid switching between uphole and development charging modes
- Dual control system compatibility: DeepSea (current) and Cross Control (future)
- Full data compliance for training on data capture, usage, and review

Product Specifications

Safety G Compliance - PTU Standards

Regulatory Compliance

The BME Portable Training Unit complies with all relevant South African trailer registration and roadworthiness standards, including:

- ADR: 2020
- SANS 1518:201G
- National Road Traffic Act (Act G3 of 1GG6) and associated SANS 10047 specifications for trailer roadworthiness and registration

This ensures the unit meets legal requirements for safe towing and operation on public roads within South Africa.

System Safeguards

- Emergency plant shut-off system
- Hydraulic pressure monitoring and trip mechanisms
- Pump bursting disc
- BME's patented MP2 intrinsically safe pumping system
- Outriggers for enhanced stability
- Protective equipment covering
- Separation of sensitising agent and Innovex emulsion within the pumping system

Operator Protection

- LoopX boom protection
- Encoder electronic end stops
- Digital sensor network for pump safety:
 - Dry-running prevention
 - Dead-heading detection
 - Emulsion pressure alerts
 - Temperature monitoring
 - Flow-rate monitoring

Technical Properties

Potable Training Unit (PTU) Name: PRJ25-PTU-01.
BME Trailer: Twin Axel Heavy Load Trailer

- Length: 6.2 m
- Width: 2.42 m
- Height: 2.1 m

Tank Fluid Specifications

Tank No.	Fluid common name	Volume (L)	Volume (m³)	Product Mass (kg)
TK-01	Emulsion	871	0.87	1 200
TK-02	Sodium Nitrite	30	0.03	33
TK-03	Water	30	0.03	30
TK-04	Hydraulic Oil	130	0.13	104

UG TRANSFER CASSETTE

Function	Repump, Transfer
Application	Underground
Class	Delivery Module
Specific Application	Lateral, Narrow Reef, Up-Hole
Industry	Mining
Properties	Mobile



Product Description

BME's Underground Transfer Cassette has been designed and built to distribute BME's INNOVEX UG emulsions in underground operations. This is typically conducted by making use of the transfer cassette to initially transport the emulsion underground and thereafter to distribute the emulsions to the required operating sections.

Applications

Transfer of BME's INNOVEX UG emulsions in underground mines, from surface to underground operational sections.

Benefits and Features

- Corrosion-resistant tank design
- Seamless rugged tank-design, fit for all underground operations
- Optional rail-bound fitment
- Angle base to mitigate emulsion waste
- Optional 2" Diaphragm Pump fitment
- Low maintenance requirements
- Low capital outlay

Design Features

Pre-set Emulsion to gassing ratio, optimised for BME's INNOVEX UG Emulsions.

Emulsion Tank Capacity	3000 kg
Suitable Products	INNOVEX UG Lateral and Up-Hole
Pumping System	2" Diaphragm Pump (optional)

HORIZONTAL EMULSION STORAGE SILO

Function	Storage, Transfer
Application	Underground
Class	Delivery Module
Specific Application	Lateral, Up-Hole
Industry	Mining



Product Description

BME's Horizontal Storage Silos are robustly designed and built to withstand the harsh surface conditions on mines, while BME's INNOVEX UG emulsions are stored in the silos. The design is perfectly fit for BME's INNOVEX UG emulsion to ensure an effective flow angle, thus mitigating emulsion waste and ensuring that the full product supply can be used.

Applications

Storing of BME's INNOVEX UG emulsions on surface for production use.

Benefits and Features

- Robust design and build
- Designed and built with corner posts, to be utilised for twist locks
Thus, making transportation easy and can be used with standard container transportation vehicles
- Low profile design
- Minimal Civils required
- Accessible filling and discharge ports
- Corrosion Resistant Tank Shell
- Various Storage Capacities Available: 15 Ton, 30 Ton and 40 Ton
- Standard footprint of a 6m (20 ft) shipping container

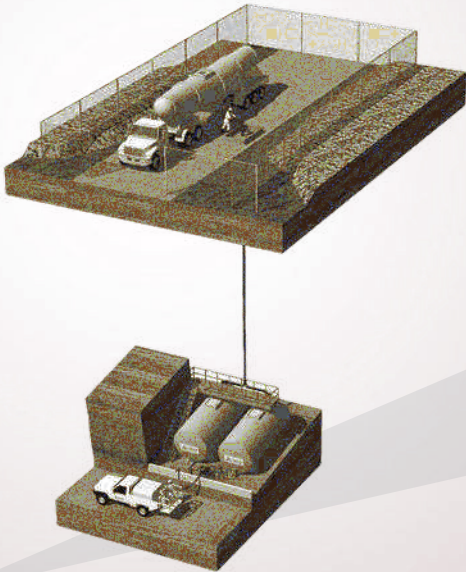
Optional

Option of various level monitoring systems:

- Low Emulsion Level Detection (passive)
- Active emulsion level reporting (on-board control screen)
- Active live emulsion level reporting, with integrated GSM system

VERTICAL PIPELINE FOR LATERAL EMULSION

Function	Delivery, Transfer
Application	Underground
Class	Delivery Module
Industry	Mining



Product Description

BME’s Vertical Pipeline, allows the transfer of Emulsions from surface or surface storage silos to underground storage silos and/or transfer units.

Primary Benefits

- Reduced pumping cycles, maintaining product integrity
- Simplified product transport logistics on-site
- Minimised staff compliments required
- Larger initial capital cost, but significantly reduces running costs and maintenance
- Frees up valuable shaft times
- Underground storage of product ensures a stable temperature environment
- Utilisation rates of mobile equipment are improved in instances of decline shafts, where the charging unit is required to drive out from the underground working area to the surface silo area to refill

Product Specifications

- 4” Vertical pipeline leading to underground horizontal silo storage
- Live level monitoring available
- Electronic monitoring of the system allows for the capturing of all relevant data and information
- Civils and logistics of the vertical pipeline are optimised for road tanker delivery and turn-around
- A sleeved pipeline will be used for emulsion transfer to underground

Guidelines For Use

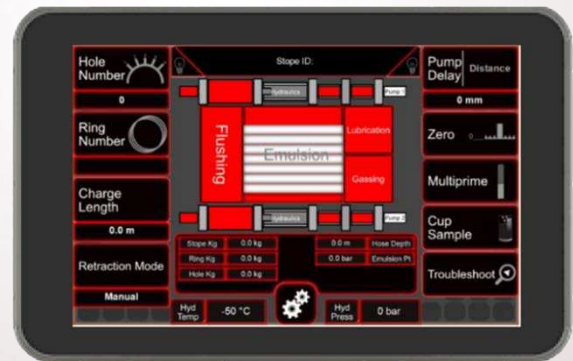
BME’s Vertical Pipeline for lateral emulsion, allows the transfer of Emulsions from surface or surface storage silos to underground storage silos and/or transfer units.

This process allows the transfer of BME’s Innovex UG (lateral and up-hole) Emulsion product underground, without the use of traditional methods, freeing up valuable shaft times.

UNDERGROUND CONTROL SYSTEM

Product Description

BME's advanced charging unit control system is at the heart of the charging unit and the charging operation, allowing for flexibility and accuracy at the same time. The Underground control system controls all the functions of the charging unit and records all the details required to optimise the charging operation and create accountability and transparency for the mine.



Applications

Controlling BME's Underground Emulsion Charging Units and data logging.

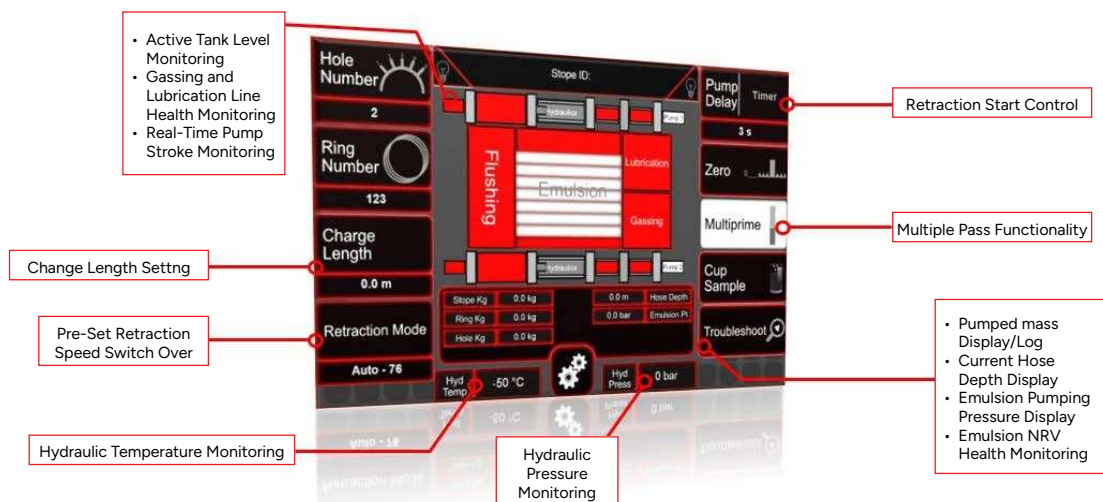
Benefits and Features

- Full DATA logging functionality
 - Hole length
 - Mass pumped
 - Multi Prime data
 - Hole Diameter Selection
 - Face/Ring number
 - Hole Number
 - NRV Health/Condition
 - Safet System monitoring (temperature and pressures)
 - Active Tank Level Monitoring
- Retraction Rate Control

Optional

- Screen Sizes (DeepSea: 4", 8", 12")
- Technology level choice (Entry level, Moderate, Advanced)
- DATA Logging and Dashboard
- Analysis Reporting (in development)
- Data retrieval options – USB, Wi-Fi hotspot, Tablet

Charging Unit Control System





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