

ETKEN TEKNOLOGI

# Royex Gen II Rock breaking cartridge

## Technical data sheet

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## 1. Introduction

The Royex Gen II rock breaking system is a safe and efficient tool for rock breaking applications in rock, boulder or concrete demolition applications. In demolition or rock breaking applications close to vibration sensitive structures, Royex rock breaking cartridges is straightforward solution as the Royex cartridge used together with other Royex accessories generates minimal rock and ground vibrations.

## 2. Safety

The below guidelines and principles regarding the safe handling of Royex system should always be considered and respected before and during usage. In the chapter Instructions, a more in depth application-specific safety instruction is described.

- Operators must be minimum 18 years of age or older to operate and use the Royex rock breaking system.
- Handle all rock breaking equipment in such a way that neither cartridges nor auxiliary equipment is damaged. Equipment delivered by AB Etken Teknologi or our suppliers may not be modified in any way.
- Damaged or unused cartridges that won't be used should be returned to your Royex supplier. Or disposed as described below.
- Make sure that all equipment are certified and conforms to local regulations.

## 3. Disposal

Remove the bottom plug using a pair of pliers or other tool. The propellant is poured onto sand or other non-combustible surface in a string. Use a piece of paper or similar to ignite the propellant from a distance of at least 5 feet. This procedure must be done at a safe distance from other flammable materials. The remaining parts (including the igniter) of the cartridge is burnt, preferably outdoors.

### 3. Technical specifications - Cartridges

#### Classification

Product name	Royex Gen II Rock breaking cartridge
UN number	0432
Transport class	1.4 S
Propellant	Ammonium nitrate 70% Nitrocellulose 30%
CE Approval ID	0589-P2-0074
Product type	P2
Track and Trace	Not required

#### Products energies

Energy	911 Kcal/Kg (3,81 MJ/Kg)
Gas volume	923 Liter / Kg
Ignition	Electrical
Speed of deflagration (pressurized and encapsulated)	330 – 850 m / second
Speed of deflagration (not encapsulated)	0 – 1 m / second
Maximum pressure (encapsulated)	520 Mp
Maximum pressure (not encapsulated)	0 Mp

#### Storage

Shelf life	18 months in approved storage device which is dry and not directly exposed to the atmosphere.
Humidity	75%
Storage conditions	Dry and cool. Avoid sunlight.

### Efficiencies

Efficiency (In situ)	1 m <sup>3</sup> / 100 gram cartridge
Efficiency (Boulder)	20 m <sup>3</sup> / 100 gram cartridge
Powder factor (in situ)	0.6 (Anfo, 1,00)
Powder factor (Boulder)	0.01 (Anfo 1,00)

### General

Safety area	30 meters
Water proof	Yes

### Gas generated upon initiation

Nitrogen	41%
Steam / water vapour	37 %
Carbon dioxide	19 %
Carbon monoxide	<< 0,01 %

### Available sizes

Cartridge diameter (mm)	Net explosive weight (gram)	Cartridges per case
32	25	40
32	50	40
32	75	24
32	100	24
38	50	24
38	100	15
38	150	15
38	200	15

## 4. Technical specifications – Maxfire igniters

### General Specifications

Product name:	MaxClip MaxFire igniter
UN number:	0454
Transport class:	1.4 S
Initiation heat	900° C
Initiation propagation	140 mm

### Electrical specifications

Fire current	1,2 A
No fire current	0,2 A
Resistance	1.5 Ohm
Cable strength	3 Kg
Available cable lengths	2,5 / 4,5 meters

### Shock tube specifications

No Layers	3
Thickness	1,8 or 3 mm
Tube material	Dupont Surlyn
VOD	2200 m / s

## 5. Technical comparison, explosives vs Royex

Characteristic	Commercial explosives	Deflagrating RBC / Royex
Reaction speed - confined	3000 – 6000 m / s	330-850 m / s
Reaction speed - unconfined	3000 – 6000 m / s	0 – 1 m / s
Pressure	1200 Gp	900 Mp
Fragmentation	Low control, high % fines	Controllable, 100-300 mm
Continuous blasting	Not possible	Yes
Cost comparison		On par with conventional explosives (usage of detonators, booster and emulsion, ANFO or NG base)
Cost savings		12-30% on tunnel and mining costs (SA mining)
Safety	Significant for secondary breakage and side wall damage	No crush zone or secondary damage to hanging wall or side wall.

## 6. Application and advantages

### General Operations

- Advanced breaking patterns possible due to timing functionality
- Continuous blasting achievable
- High fragmentation control
- Greatly increased operational and handling safety
- Removes the need for explosives at work site
- Initiation systems and cartridges can be shipped via air cargo, lowers local magazine requirements
- In EU, P2 classified product, no track and trace management required

### Mining and Tunnelling

- Decreased mineral dilution in gold and platinum ore, 70% increase in mineral extraction proven in gold
- Continuous advance possible
- Greatly improved gas and ventilation control, 0 ppm CO after 5 mins in normal tunnel ventilation conditions
- Minimal operational stops due to slyping and secondary breaking
- Ideal for secondary breaking of boulders in block caving mining operations
- Ideal for take down back mining operations
- No dust or fines
- Improved mineral dilution in gold and platinum applications

### Quarrying, aggregate and dimensional

- Significant improvements in drill and blast operation speed
- Extends quarry lifetime, enables blasting closer to infrastructure
- High precision breaking for dimensional quarries, less wire sawing or downstream cutting
- Minimal rock throws allows for short clearing distance of equipment (crushers, loaders, drills)
- Complete 1.4S solution minimizes on site storage. Explosive magazines rarely needed

### Civil engineering

- Greatly increased vibration control enables precision breaking close to infrastructure
- Increased operation speeds due to lower safety zones and lower requirements of personnel and equipment clearance
- High precision breaking possible, ideal for secondary breaking after primary blasts.