Disposable Carbon Dioxide Fracturing Tube

A Safe, Efficient, and Regulation-Free Alternative to Traditional Explosives

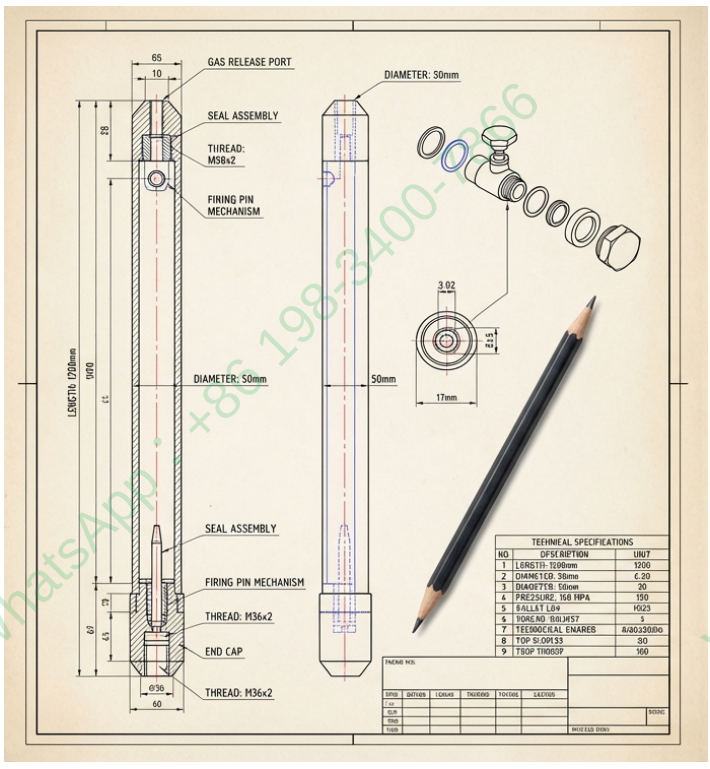
Manufacturer: Shanxi Zhongde Dingsheng Machinery Manufacturing Co., Ltd. **Contact:** Allen Shen | allen@dlminingequipment.com | WhatsApp: +86 198-3400-7866

1. What Is a Disposable CO2 Fracturing Tube?

A disposable carbon dioxide fracturing tube is a single-use rock fragmentation device that generates high-pressure gas through a rapid chemical reaction inside a sealed PPR tube. Upon electrical initiation, an internal chemical compound reacts within milliseconds, instantly producing a large volume of gas (primarily CO2) that builds up to 100–300 MPa of pressure. The tube body ruptures at a designed threshold, and the high-pressure gas propagates into the surrounding rock mass through the borehole, cracking and fracturing the rock.

Unlike conventional explosives, this process involves **no detonation, no shock wave, and no open flame** — the rock is fractured by directed gas expansion, not by an explosive blast. After fracturing, the tube body ruptures and is not recoverable, making it a cost-effective consumable for large-scale operations.

Key Distinction: Disposable vs. Reusable



Feature	Disposable CO2 Tube	Reusable CO2 System
Usage	Single use — tube ruptures after fracturing	Reusable — tube body recovered after each use
Tube diameter	32 mm / 40 mm	51 mm / 76 mm / 89 mm / 108 mm
Handling	Light weight (0.35 – 2.63 kg per tube)	Heavy (12 – 30+ kg per unit)
Logistics	No recovery needed — faster cycle	Must retrieve tubes after each blast
Setup time	Minimal — charge, connect, fire	Longer — requires filling, valve setup
Best for	High-volume repetitive blasting	Deep-hole specialized applications
Storage life	~180 days (sealed PPR)	Years (steel body)

2. Internal Structure and Working Principle

Tube Components

Each fracturing tube is a sealed PPR unit containing the following internal components:

- **Chemical compound (gas-generating agent)** — A formulated mixture of potassium perchlorate (KClO4), salicylic acid, and ammonium oxalate, which undergoes a rapid chemical reaction when ignited by the electric match, instantly generating a large volume of high-pressure gas (primarily CO2) to fracture the rock
- **Electric match (initiator)** — A low-voltage igniter (9V) embedded in the chemical compound, triggered by external current through the lead wires
- **Sealed PPR tube body** — PPR (polypropylene random copolymer) housing that contains the chemical compound and ruptures at a designed pressure threshold during fracturing

Working Sequence

1. **Initiation** — External current passes through lead wires to the electric match (9V low-voltage activation)
2. **Chemical reaction** — The internal compound (potassium perchlorate, salicylic acid, ammonium oxalate) reacts rapidly within approximately 4 milliseconds, generating a large

volume of high-pressure gas

3. **Pressure buildup** — Gas pressure inside the sealed tube rises rapidly, reaching 100–300 MPa
4. **Tube rupture** — The PPR tube body ruptures at the designed pressure threshold
5. **Rock fracturing** — High-pressure gas is released into the borehole and propagates through rock fissures, cracking the surrounding rock mass
6. **Gas release** — The expelled gas (primarily CO2) dissipates naturally. CO2 is an inert gas that poses no fire or explosion risk and has a fire-suppressing effect

Cycle time: The actual fracturing event lasts just 4 milliseconds. No misfires — no post-blast inspection for unexploded charges.

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3. Safety Performance

Third-Party Verified: Zero Sensitivity

The internal chemical compound inside each tube has been tested and certified by relevant national authorities with the following results:

Test Item	Result
Impact sensitivity	Zero
Friction sensitivity	Zero
Flame sensitivity	Zero
Static electricity sensitivity	Zero

The internal compound **cannot be activated by impact, friction, flame, or static electricity**. Charging, transportation, and storage are inherently safe.

Intrinsic Safety Advantages

CO2 fracturing relies on a contained chemical reaction inside a sealed tube to generate high-pressure gas, which then expands to fracture the rock. The core safety benefits include:

- **No open flame or sparks** — The chemical reaction occurs entirely inside the sealed tube, producing no external flame or spark
- **No gas explosion risk** — The primary gas generated (CO2) is inert and non-flammable, and actually suppresses combustion

- **Minimal harmful emissions** — The primary gas released is CO2, with no carbon monoxide or nitrogen oxides. Trace amounts of sulfur dioxide may be produced from the chemical compound decomposition, but this dissipates rapidly in ventilated environments
- **Minimal vibration** — No destructive shock waves; suitable for sensitive environments (residential areas, tunnels, underground mines)
- **Short safe distance** — Personnel can return to the work face quickly after the operation
- **No misfires** — Eliminates the dangerous and time-consuming process of locating and handling unexploded charges

Regulatory Advantages

Requirement	Traditional Explosives	CO2 Fracturing Tube
Explosives permit	Required	Not required
Specialized storage facility	Required	Not required (CO2 is not classified as explosive)
Licensed blasting team	Required	Not required (simple training sufficient)
Special transport permit	Required	Not required
Security personnel on site	Required	Not required
Environmental impact assessment	Strict requirements	Minimal impact — easy compliance

Handling Precautions

Although the tubes are non-explosive, the following conditions should be avoided during storage and use:

- Electrostatic discharge
- Heat sources and direct sunlight
- Moisture and water immersion (unless specifically designed for wet conditions)
- Open flames
- Strong reducing agents, active metal powders, strong acids, alcohols, flammable or combustible materials (incompatible with the internal chemical compound)

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4. Technical Specifications

32 mm Series

Length	Ignition Heads	Resistance (ohm)	Weight
0.35 m	2	1.7 – 2.2	350 g
0.55 m	2	2.2 – 2.7	450 g
1.0 m	4	3.8 – 4.2	830 g
1.5 m	7	4.4 – 5.7	1,300 g
2.0 m	10	9.1 – 9.6	1,700 g

40 mm Series

Length	Ignition Heads	Resistance (ohm)	Weight
0.35 m	2	1.9 – 2.2	380 g
0.55 m	2	2.2 – 2.7	670 g
1.0 m	5	5.1 – 5.6	1,350 g
1.5 m	7	5.7 – 6.6	1,850 g
2.0 m	10	9.1 – 9.6	2,630 g

General specifications:

- Resistance tolerance: +/-0.5 ohm
- Tube material: PPR (polypropylene random copolymer)
- Lead wire: 0.55 mm2 pure copper wire, leads extended 15 mm
- Gas-generating compound: Formulated mixture of potassium perchlorate (KClO4), salicylic acid, and ammonium oxalate
- Compound state: White powdery solid, weakly alkaline (pH)
- Compound decomposition temperature: 610 degrees C
- Solubility: Slightly soluble in water, insoluble in ethanol

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5. Drilling Parameters Reference

Proper borehole design is critical for optimal fracturing results. The following table provides recommended drilling dimensions for each tube model:

Tube Model	Hole Diameter	Hole Spacing	Hole Depth	Application
32 mm x 0.35 m	40 mm	500–700 mm	700–900 mm	Cut hole / smoothing hole
32 mm x 0.55 m	40 mm	500–700 mm	800–1,000 mm	Cut hole / smoothing hole
32 mm x 1.0 m	40 mm	700–1,000 mm	1,300–1,500 mm	Cut hole / perimeter hole
32 mm x 1.5 m	40 mm	700–1,000 mm	1,800–2,200 mm	Perimeter hole
32 mm x 2.0 m	40 mm	700–1,000 mm	2,500–3,000 mm	Perimeter hole
40 mm x 1.0 m	46 mm	800–1,000 mm	1,300–1,500 mm	Perimeter hole
40 mm x 1.5 m	46 mm	800–1,000 mm	1,800–2,200 mm	Perimeter hole
40 mm x 2.0 m	46 mm	1,000–1,200 mm	2,500–3,000 mm	Perimeter hole

Important Notes on Borehole Design

- **First trial**: During initial use, the hole depth and spacing should be set conservatively. Observe the fracturing results, then adjust parameters for subsequent blasts based on actual performance.
- **Tunnel face excavation**: For tunnel driving, first execute **cut holes** (relieving holes) — drill at a 45-degree angle from both sides toward the center. This creates a free face (relief face) that dramatically improves the fracturing effectiveness of subsequent perimeter holes.
- **Hole spacing adjustment**: Tighter spacing produces finer fragmentation; wider spacing produces larger broken rock pieces. Adjust based on the desired fragmentation size for your specific application.

6. Application Areas

Mining

Applicable to coal mines (including low-gas mines), metal mines, and non-metal mines. The gas produced during fracturing is primarily CO2, which is inert and does not trigger gas explosions, making the tubes particularly suitable for underground coal mining where methane safety is critical. In underground applications, the fracturing pressure can disrupt gas-rich coal seams, allowing methane to escape safely and reducing in-seam gas content.

Stone Quarrying

Unlike explosives that shatter and damage the internal texture of stone, gas expansion fracturing cracks rock along natural planes, preserving the stone's structural integrity. This results in significantly higher yield rates and better quality stone blocks — especially valuable for dimensional stone and decorative stone production.

Tunnel Excavation

Ideal for tunnel driving, subway construction, water diversion tunnels, and underground civil defense projects. The minimal vibration and controllable fracturing direction protect surrounding rock structures and existing infrastructure. Safe for use in areas with residential buildings or sensitive structures nearby.

Infrastructure Projects

Suitable for foundation excavation, photovoltaic array foundation trenching, vertical shaft construction, directional fracturing, and urban construction projects where environmental and safety regulations restrict the use of conventional explosives.

7. Why Choose Our Disposable CO2 Fracturing Tubes?

- **Comprehensive product range** — 32 mm and 40 mm diameters, 5 length options each, covering cut holes to deep perimeter holes
- **Third-party safety certified** — Zero sensitivity to impact, friction, flame, and static electricity
- **Detailed technical documentation** — Complete MSDS, operation manual, and safety certificates provided with every order

- **Competitive pricing** — Factory-direct from manufacturer, volume discounts available
- **Technical support** — Engineering team provides on-site guidance and customized blast design
- **Global shipping** — Experienced in export logistics to Southeast Asia, Africa, South America, and the Middle East
- **Fast delivery** — Standard models in stock, custom specifications available upon request

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For pricing, technical consultation, or project-specific solutions, please contact:

Allen Shen — Sales Manager Email: allen@dlminingequipment.com WhatsApp: +86 198-3400-7866 Company: Shanxi Zhongde Dingsheng Machinery Manufacturing Co., Ltd. Website: https://rockbreaking.com.cn

Allen shen

WhatsApp 联系人