

CABLES FOR A MOVING WORLD

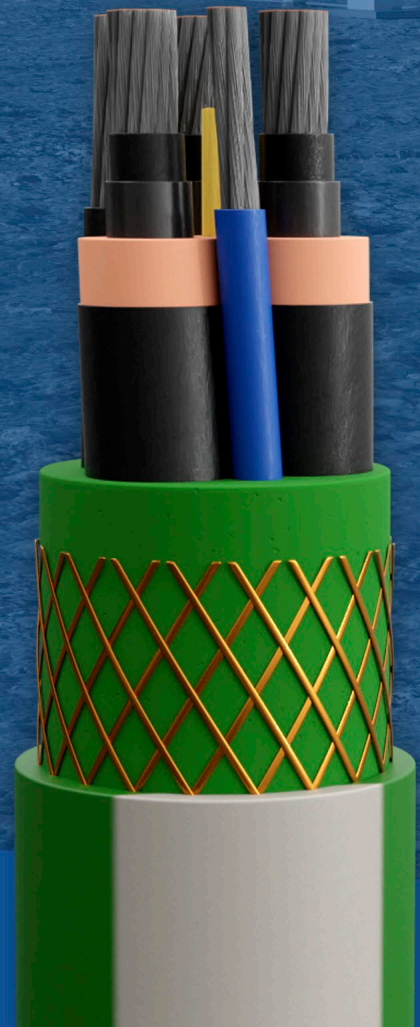
TRATOS® RF HighVision REFLECTIVE + FLUORESCENT *for MTO and Reeling cable applications*

Tratos Reflective and Fluorescent Compound has been patented by **Tratos** and used in other several applications where safety is paramount.
Patent Rif. A28864 ER.ac

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TBn10-Rev31



www.tratosgroup.com



TRATOS® RF HighVision

INDEX

TRATOS® MTO-RF

Tratos has developed an innovative solution for the mining industry. **Tratos MTO-RF - HighVision** is a **High Visibility** cable that is used to power up machines like excavators shovels and draglines. It ensures the highest level of safety and productivity of your mining operation. Tratos recognise that the conditions under which electric cables must operate in the **mining industry** are extremely severe, the premature failure of an electric cable can be both expensive and hazardous. It is therefore essential that a **high level of safety** be achieved. Reduced accidental damage means increased safety, an extended working life thus increasing the efficiency and productivity of your operation by reducing expensive downtime.

Tratos MTO-RF is a High Visibility cable intended to increase the nighttime visibility of **trailing cables** used to supply power to items of large mining machinery with two separate and complementary solutions:

- **R for Reflective.** The Reflective stripe will reflect any even small source of light, like the car headlights. or even the light of your smart-phone. Using a similar principle of the High Visibility Jackets.
- **F for fluorescent.** The Fluorescent compound maintains its emission of fluorescent light for up to 8 hours, without the need for any type of source of light and without the need to be powered up or external costly devices to work... just the compound itself. This guarantees also the durability of its property for a long time without any maintenance in harsh environments such as open cast mines.

Tratos MTO-RF minimises the hazard to people and damage to equipment or even damage to the electrical system of the mine without using any active illumination techniques which need to be powered or high costly solutions with fibre optics. But with a **patent technology** applied inside the compound itself will keep the cable highly visible during complete darkness.

Tratos MTO-RF has a Medium Voltage flexible construction based on EPR insulation. This compound has been **patented by Tratos** and used in other several applications where safety is paramount.





TRATOS-MTO RF = Reflective + Fluorescent



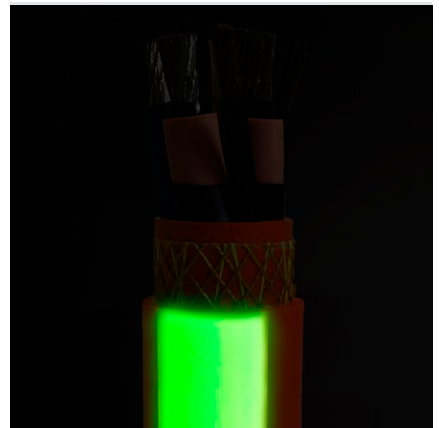
Tratos-MTO RF for Mining

TRATOS-MTO RF cables use two complementary technologies, reflective and fluorescence or, as it is sometime known, luminescence. This compound has been patented by Tratos and used in other several applications where high visibility is paramount for safety.



R = Reflective

The Reflective part of the sheath will reflect even smallest source of light, like a vehicle's headlights or even the light of your smartphone. It does this using a similar principle to that of the Hi-Vis Jacket. As long as there is a source of light the reflective parts of the sheath will strongly reflect it, when the source of light is removed it immediately stops reflecting the light. At this point the Fluorescent part of the sheath takes over.



F = Fluorescent

The Tratos Fluorescent compound, sometimes also referred to as a Phosphorescent or Luminescence compound, absorbs light which it then uses to maintains its light output for up to 8 hours, without the need for any additional source of light and without the need for external power or costly external devices in order to work. The technology is in the Tratos compound itself. It does this using a similar principle to that of glow-in-the-dark toys, watch and clock dials that glow after being subject to bright light such as sunlight. This guarantees the durability of its luminescent property over a long period of time without any maintenance, even in harsh environments such as in open cast mines and quarries.

TRATOS® RF HighVision

STANDARDS AND QUALITY SYSTEM

QUALITY SYSTEM

Tratos aim to work closely with customers to find better, more environmentally friendly solutions to their challenges.

We are committed to our vision and strategy to serve all our internal and external customers by providing high quality services and products. Tratos is an established industry leader in the design, manufacture and supply of cables and products and to maintain this leading

position we are committed at every level to providing our customers with quality services and products at a competitive price. As a commercial enterprise we are aware of the importance of satisfying our customers and of the financial impact of which nonconformities may have on our profitability. For these reasons we are committed to complying with all customer requirements and specifications both legal and statutory requirements. Our Quality Management System has been audited and approved by two independent, Internationally recognized and accepted authorities: BSI and AENOR-IQNET (E), in accordance to BS EN ISO 9001:2015 covering the production, purchasing of raw materials design and final test including various document types. The Tratos Quality Management system is under frequent regular surveillance by inspectors working for the Certification Authorities.



ENVIRONMENTAL SYSTEM

Our Environmental Management System has been audited and approved by two independent, Internationally recognized and accepted authorities:

BSI and AENOR-IQNET (E), in accordance to BS EN ISO 14001:2015 covering the production, purchasing of raw materials design and final test including various document types. The Tratos Quality Management system is under frequent regular surveillance by inspectors working for the Certification Authorities.



ENERGY MANAGEMENT SYSTEMS

By complying with the BS EN ISO 50001:2018 Tratos follows a systematic approach in achieving continual improvement of energy performance and the Energy Management Systems (EnMS).

The BS EN ISO 50001:2018 is a standard issued by the International Standard Organization (ISO) which outlines the requirements for establishing, implementing, maintaining and improving an energy management system (EnMS).



CIRCULAR ECONOMY

The EU Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance. EMAS is open to every type of organisation eager to improve its environmental performance. It spans all economic and service sectors and is applicable worldwide.



AWARDS

Tratos cables are made with award winning Tratos-JBA® compound. Tratos UK Ltd has won a **Queen's Award for Enterprise - Innovation** for its technologically advanced Tratos-JBA® compound.



STANDARDS AND QUALITY SYSTEM

HEALTHY & SAFETY SYSTEM

Once its decision to create a board post dedicated to furthering best practice for Health and Safety, international cable manufacturer Tratos is celebrating receipt of ISO 45001.

ISO 45001 sets out the minimum requirements for occupational health and safety management best practice and helps companies achieve the maximum return for employees, operations and customers.



REACH, WEEE & ROHS

REACH
COMPLIANT

Tratos is fully compliant with the **REACH**. This is a European Union regulation concerning the **Registration, Evaluation, Authorisation and restriction of Chemicals**. It came into force on 1st June 2007 and replaced a number of European Directives and Regulations with a single system. REACH applies to substances manufactured or imported into the EU in quantities of 1 tonne or more per year. Generally, it applies to all individual chemical substances on their own, in preparations or in articles. To summarise, REACH makes the cable industry directly responsible for assessing and managing the risks posed by chemicals and providing safety information to their users.

REACH
COMPLIANT

Tratos fully subscribes to The **Waste Electrical and Electronic Equipment Directive (WEEE Directive)**, introduced into UK law in January 2007 by the Waste Electrical and Electrical Equipment Regulations 2006. The WEEE Directive aims to reduce the amount of electrical and electronic equipment being produced and to encourage everyone to reuse, recycle and recover it. The WEEE Directive also aims to improve the environmental performance of businesses that manufacture, supply, use, recycle and recover electrical and electronic equipment. TRATOS has enlisted the services of the UK's leading producer compliance scheme, Valpak, whom manage our recycling obligations and also ensure our compliance to the WEEE Regulations and the Waste Batteries and Accumulators Regulations.

REACH
COMPLIANT

Tratos is fully compliant with the **Restriction of Hazardous Substances (RoHS) Regulations**. These Regulations implement EU Directive 2011/65/EU which bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. Tratos fully understands the requirements of the RoHS Directive and ensures that our products, and their components, comply.

CORPORATE SOCIAL RESPONSABILITY

Tratos adopts a Code of Ethics which adheres to the United Nations Global Compact on human rights, labour standards, protection of the environment and anti corruption measures.

Under this self regulatory code, Tratos will carry out initiatives in the environmental and social fields with special reference to environmental policies and social policies regarding child labour, compulsory labour, health and security, freedom of association and the right to collective bargaining, discrimination, disciplinary procedures, working hours and wages.

STANDARDS

Tratos RF compound can be used to produce High Visibility cables in accordance with the various National and International standards covering cables for use in Opencast Mines and Quarries. Examples of these standards are: DIN VDE0250-813, DIN VDE0250-814, AS/NZS 2802

PATENTS

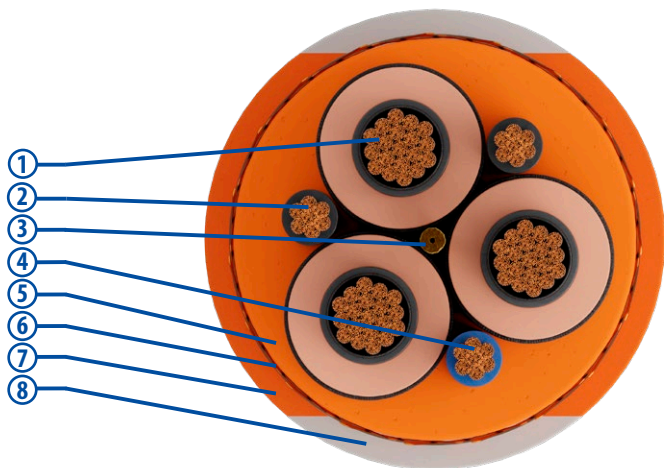
Tratos **Reflective** and **Fluorescent Compound** has been **patented by Tratos** and used in other several applications where safety is paramount. Patent **Rif.: A28864 ER.ac**

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TRATOS® RF HighVision

TRATOS MTO-RF-VB® REFLECTIVE + FLUORESCENT

TRATOS MTO-RF-VB® is the ultimate solution tailored to the rigorous demands of open-cast mining environments. Engineered with state-of-the-art technology and premium materials, this cable is specifically designed to connect large material-handling machines such as drills, excavators, face shovels, and mobile crushers. Built to endure high mechanical stresses, Tratos MTO Reflective Fluorescent Cable seamlessly integrates with Flexible MV and LV trailing or reeling cable systems, effortlessly navigating mono spiral reels and cylindrical reels. Its robust construction ensures uninterrupted performance, even in the most challenging mining conditions. In addition to its durability, Tratos MTO Reflective Fluorescent Cable features control, signalling, and bus cables with specialized transmission characteristics. These cables play a vital role in facilitating the operation of electric and electronic equipment, enabling precise measured value and process data processing, as well as seamless automation unit integration within open-cast mining applications. Furthermore, the cable's design allows for optimal placement alongside conveyor belts and material handling equipment, ensuring efficient communication and connectivity across the mining site. With Tratos MTO Reflective Fluorescent Cable, mining operations can achieve enhanced productivity and safety levels, making it the preferred choice for critical connections in the mining industry.



TYPICAL CONSTRUCTION

1. Phase core
2. Earth core
3. Central support
4. Ground check core
5. Inner sheath
6. Antitorsional protection
7. Reflective outer sheath
8. Phosphorescent stripes



	U.M.	3x35+2x25/2+16	3x50+2x25/2+16	3x70+2x35/2+16	3x150+2x70/2+16
Phase core cross-section	mm ²	35	50	70	150
Nominal conductor diameter	mm	7,8	9,6	11,0	16,4
Nominal phase diameter	mm	15,8	17,0	18,6	24,1
Earth core cross-section	mm ²	25/2	25/2	35/2	70/2
Nominal conductor diameter	mm	4,8	4,8	5,5	7,8
Nominal earth diameter	mm	7,2	7,2	8,2	11,4
Pilot core cross-section	mm ²	16	16	16	16
Nominal conductor diameter	mm	5,4	5,4	5,4	5,4
Nominal Pilot diameter	mm	7,4	7,4	8,3	11,0
Minimum overall diameter	mm	45,0	47,6	51,2	65,5
Maximum overall diameter	mm	48,0	50,1	54,2	68,5
Nominal weight	kg/m	3,270	3,940	5,100	8,800
Minimum bending radius	mm	576	610	650	820
Maximum tensile strength	N	2100	3000	4200	9000
Maximum phase resistance	Ω/km	0,565	0,393	0,277	0,132
Maximum earth resistance	Ω/km	0,795	0,795	0,565	0,272
Maximum pilot resistance	Ω/km	1,24	1,24	1,24	1,24

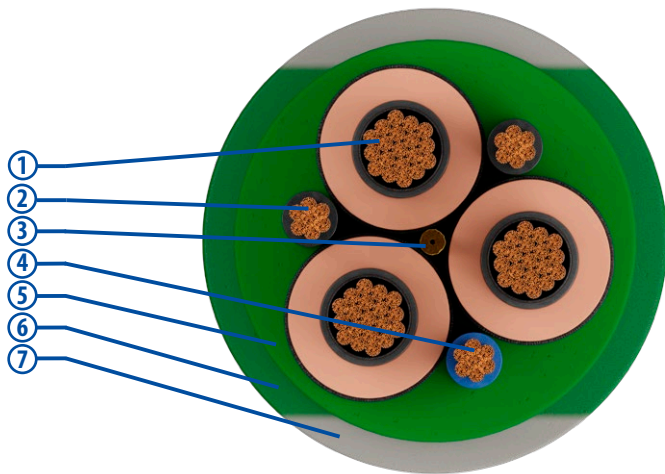
Tratos can produce the following types of cable sheathed with Tratos MTO-RF sheathing:

- TRATOS MTO®-M and TRATOS MTO®-M (FO)
- TRATOSFLEX MTO®-ST
- TRATOSFLEX MTO®-SB
- TRATOS FIX MTO®-M and TRATOS FIX MTO®-M (FO)
- TRATOSFLEX MTO®- OCS Single-Core
- TRATOS FESTOON MTO®-M
- TRATOSFLEX MTO®-MSR
- TRATOSMART® MTO - (N)SHTÖU-J
- TRATOS MTO®-TDM

TRATOS® RF HighVision

TRATOS MTO-RF-M® REFLECTIVE + FLUORESCENT

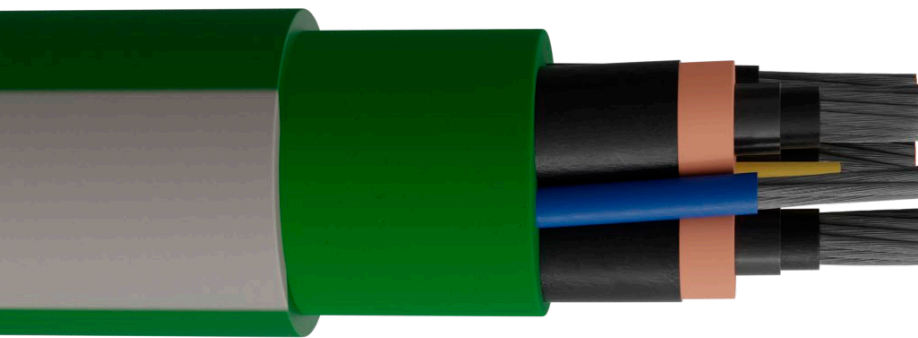
TRATOS MTO-RF-M® is the ultimate trailing cable solution engineered to meet the rigorous demands of open-cast mining environments. Specifically designed for use as a power supply or connection cables for large material handling machines, such as excavators, Tratos MTO-RF-M® is built to withstand extremely high mechanical stresses. Tratos MTO-RF-M® excels in applications where abrasion and chafing stresses are prevalent during trailing operations. Its robust construction ensures unparalleled durability, allowing it to endure the harsh conditions encountered in open-cast mines with ease. With its advanced technology and premium materials, Tratos MTO-RF-M® delivers reliable power supply and connectivity to ensure the uninterrupted operation of excavators and other material handling machines. Its resilience to mechanical stresses makes it particularly suitable for use in trailing operations, where constant movement and friction are common. In summary, Tratos MTO-RF-M® sets the standard for trailing cables in open-cast mining environments, offering unmatched durability and reliability. With its ability to withstand extreme mechanical stresses, it ensures the smooth and efficient operation of large material handling machines, enhancing productivity and safety in mining operations.



TYPICAL CONSTRUCTION

1. Phase core
2. Earth core
3. Central support
4. Ground check core
5. Inner sheath
6. Reflective outer sheath
7. Phosphorescent stripes

* Antitorsional protection upon request

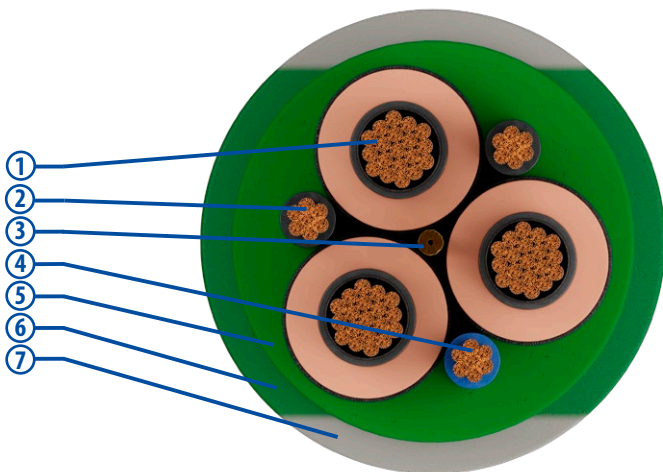


U.M.		Technical Data		
PHASE CORES				
CONDUCTOR				
Material	Annealed flexible tinned copper (Cl. 5)			
Nominal cross section	mm ²	3X35	3X50	3X70
Nominal diameter	mm	7,8	9,3	11,00
Max. resistance at 20°C	Ω/km	0,565	0,393	0,277
CONDUCTOR SCREEN				
Type	Semiconductor layer			
Colour	Black			
INSULATION				
Material	HEPR			
INSULATION SCREEN				
Type	Semiconductive layer strippable			
Colour	Black			
Nominal diameter	mm	15,8	17,0	18,6
EARTH CORES				
CONDUCTOR				
Material	Material Annealed flexible tinned copper (Cl. 5)			
Nominal cross section	mm ²	2X25/2	2X25/2	2X35/2
Nominal diameter	mm	4,8	4,8	5,5
Max. resistance at 20°C	Ω/km	1,59	1,59	0,565
COVERING				
Type	Semiconductor layer			
Colour	Black			
Nominal diameter	mm	7,2	7,5	8,2
GROUND CHECK CORE				
CONDUCTOR				
Material	Annealed flexible copper (Cl.5)			
Nominal cross section	mm ²	1X16		
Nominal diameter	mm	5,4		
Max. resistance at 20°C	Ω/km	1,24		
INSULATION				
Type	EPR			
Colour	Blue			
Nominal diameter	mm	7,4	7,5	7,5
CENTRAL SUPPORT				
Material	Aramidic yarns			
INNER SHEATH				
Material	TRATOSFLEX IS compound (for low temperature)			
OUTER SHEATH				
Material	TRATOSFLEX OS compound (for low temperature)			
Colour	Green			
PHOSPHORESCENT STRIPES				
Material	TRATOSLUX OS compound (for low temperature)			
Number	2			
Colour	Phosphorescent			
Minimum diameter	mm	45,0	47,2	50,2
Maximum diameter	mm	48,0	50,2	53,2
Nominal weight	Kg/m	3,210	3,900	5,200
Minimum bending radius	mm	576	605	650
Maximum tensile strength	N	3200	3000	4200

TRATOS® RF HighVision

TRATOSFLEX-RTG RF VB® REFLECTIVE + FLUORESCENT

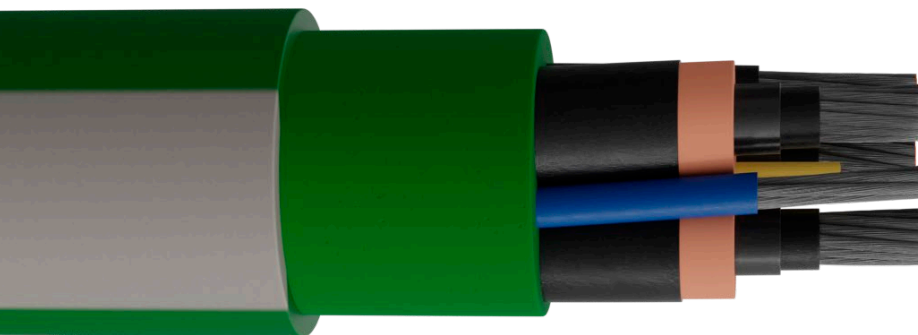
Tratos RTG RF VB® Reflective Fluorescent Cable is engineered to meet the exacting demands of container handling operations, specifically for Rubber-Tired Gantry (RTG) cranes. Crafted with cutting-edge technology and premium materials, this cable is designed for seamless integration with RTG cranes, ensuring optimal performance in container yards and terminals. It is engineered to withstand the high mechanical stresses encountered in container handling environments, delivering unparalleled durability and reliability, guaranteeing uninterrupted operation of RTG cranes. In addition to its robust construction, Tratos RTG RF VB Reflective Fluorescent Cable can be supplied with control, signalling, and bus cables with specialized transmission characteristics. These cables play a crucial role in facilitating the precise control and communication required for RTG crane operations, enabling efficient container handling and management. Furthermore, the cable's design allows for flexible installation alongside RTG crane structures and equipment, ensuring seamless integration and optimal performance. With Tratos MTO Reflective Fluorescent Cable, container terminals can achieve enhanced productivity, efficiency, and safety, making it the preferred choice for critical connections in RTG crane operations.



TYPICAL CONSTRUCTION

1. Phase core
2. Earth core
3. Central support
4. Ground check core
5. Inner sheath
6. Reflective outer sheath
7. Phosphorescent stripes

* Antitorsional protection upon request



	U.M.	Technical Data		
CONDUCTOR				
Material		Annealed flexible copper (Cl.5)		
Nominal cross section	mm ²	3X25	+2X25/2	+24 FO**
Nominal diameter	mm	6,4	4,8	5,4
Max. resistance at 20°C	Ω/km	0,795	1,59	-
CONDUCTOR SCREEN				
Material		Semiconductor layer	Semiconductor	-
Colour		Black	Black	-
INSULATION				
Material		HEPR	-	-
Nominal thickness	mm	2,6	-	1,0
Colour		Natural	-	Blue
INSULATION SCREEN				
Material		Semiconductor layer strippable	-	-
INNER SHEATH				
Material		SPECIAL TRATOSLUX® IS		
Nominal thickness	mm	2,0	2,0	2,0
ANTITORSIONAL PROTECTION				
Material		Aramid braid yarn		
OUTER SHEATH				
Material		SPECIAL TRATOSLUX® OS REFLECTIVE-FLUORESCENT COMP.		
Nominal thickness	mm	3,0	3,0	3,0
Nom. outer diameter	mm	42,5	42,5	42,5
Max. outer diameter	mm	45,5	45,5	45,5
Nominal weight	Kg/km	2.560	2.560	2.560
GENERAL CHARACTERISTICS				
Min. bending radius	mm	Fixed: 12 x Ø	Fixed: 12 x Ø	Fixed: 12 x Ø
Max. tensile load	N	3.000	3.000	3.000
**	FO	SM 9/125 or 65.5/125	SM 9/125 or 65.5/125	SM 9/125 or 65.5/125

Tratos can produce the following types of cable sheathed with Tratos MTO-RF sheathing:

- TRATOS MTO®-M and TRATOS MTO®-M (FO)
- TRATOSFLEX MTO®-ST
- TRATOSFLEX MTO®-SB
- TRATOS FIX MTO®-M and TRATOS FIX MTO®-M (FO)
- TRATOSFLEX MTO®- OCS Single-Core
- TRATOS FESTOON MTO®-M
- TRATOSFLEX MTO®-MSR
- TRATOSMART® MTO - (N)SHTÖU-J
- TRATOS MTO®-TDM



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