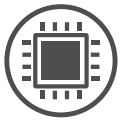
Ferrit | MONORAIL

Monorail suspended transport

Ferrit | GLOBAL MINING SOLUTIONS

MONORAIL		*Monorail suspended transport*
RAIL		*Ground rail transport*
TRACKLESS		*Wheeled transport*
MINING		*Mining activity*
SAFETY		*Mining rescue equipment*
ELECTRIC		*Monitoring and communication systems*

Ferrit | MONORAIL

Monorail suspended transport

Suspended monorail transport is among the most economical, safest and most widely used mode of transport in mines. Thanks to its safety and reliability it is very efficient and continuous in transport of people and different kinds of technological and operational material and excels particularly in transport at long mine roadways with variable inclination of up to ± 30 degrees in tunnel or roadway profiles ≥ 8 square meters. Other advantages include durability and installation method enabling system implementation without requirement for making changes in the configuration of the existing transport infrastructure. Individual components of the system can therefore be re-used, making it cheapest transport system with adaptable features.

Dead weight of measure unit of monorail track is halved compared with unit of measure of ground rail system, which brings savings even while moving its own components from liquidated workplaces to newly established ones. These benefits should be supplemented by the fact that the assembly, disassembly and maintenance of monorail track is the least demanding compared to other types of transport systems with minimal impacts of mining and geological influences to conditions of transport routes.

Monorail locomotives or manipulators driven by diesel, electric, or pneumatic motors are used on the monorail track as autonomous traction devices for manipulation and transport. Locomotives and manipulators are equipped by friction driving units. The number of driving units is individually proposed in order to match resultant traction force required by customers for transport in specific mining conditions.

Ferrit´s production program includes a complete equipment range designed for the monorail transport, starting with a track itself, monorail locomotives and manipulators, lifting and manipulating equipment, persons and injured persons transport cabins, material containers and last not least purposely designed equipment and small mechanization.

All Ferrit´s monorail products meet requirements for operation in mines classified as hazardous areas with mining gasses and coal dust explosion danger (flameproof mines) like coal mines. The exceptions are machines operated outside these areas (eg. ore mines, surface operations) which are classified as non-flameproof mines.

Key

Suitable to areas with explosion danger

Suitable to areas with no explosion danger

MINING MONORAIL LOCOMOTIVES

DIESEL LOCOMOTIVES - DLZ110F-II, DLZ210F, DLZ130F

Mining monorail diesel locomotive is a traction equipment designed for persons or material transport on monorail track in underground mines or surface operations.The locomotive is usually composed of two independent driver´s cabins, motor part (diesel-hydraulic power unit) and friction hydraulic driving units in numbers and their distribution corresponding with a weigh and a type of transported loads and parameters of the monorail track. All these components are interconnected by connecting rods.

Locomotive´s design allows to use an auxiliary equipment, such as cabins sets for a transport of persons or injured personnel, transport and lifting hydraulic equipment, containers and other devices for fast, safe and efficient transport of material.

Locomotive´s operational mode, speed, motor hours, pressure and temperature values of diesel-hydraulic aggregate are controlled by an electronic control and safety system. According to the locomotive type this system can be further equipped with audio-visual elements, such as wireless voice transmission system or a camera system monitoring current situation in front and rear of the transported set. For more control over the handling of material, mostly in material reloading areas, the locomotive can be further equipped with a remote control device, allowing the operator to leave the driver´s cabin.

The engine of the locomotive is equipped with intake and exhaust tracts protection devices preventing explosion of methane or coal dust. All electrical and electronic components entering the locomotive´s system are flameproof or intrinsically safe. Above protection measures together with used materials and production technologies allow locomotive´s operation in mining areas with methane and coal dust explosion danger.

BATTERY LOCOMOTIVES - DLZA90F

Mining monorail battery locomotive, same as its diesel variant, is a traction device designed for a transport of persons or material on the monorail track located in the underground mine or at the surface. Its electronic control system can also be equipped with functions identical to those of a diesel-powered machine. However, its main advantages include the ability to be deployed in mines with reduced ventilation air velocity, where operation of a diesel driven machine would be unthinkable. Absence of a diesel engine and a greatly reduced hydraulic system only requires minimal machine maintenance.

Specification:	DLZ 110F-II	DLZ210F	DLZ130F	DLZA90F
Power:	81 kW*	127 - 142 kW*	100 kW*	6 x 7,5 kW*
Max. traction force:	60 - 140 kN*	96 - 330 kN*	88 - 250 kN*	33 - 180 kN*
Max. speed:	7,2 km/h*	3,7 - 25 km/h*	5,0 - 12,6 km/h*	7,2 - 13,7 km/h*
Max. inclination:	30°	30°	30°	30°
Consumption:	255 g/kWh	250 g/kWh	214 g/kWh	0 g/kWh

* depending on the number of drives and machine type

MINING SUSPENDED MANIPULATORS

SA-MAN 01

Electro-hydraulic mining manipulator type SA-MAN-01 is a traction unit designed for auxiliary handling of train sets on the monorail track. Its hydraulic unit is used for powering manipulator´s drive or lifting equipment and other elements of small auxiliary mechanization (bolt drills etc.). It can work at any place of the mine within the reach of a power contactor.

DME30F

Electro-hydraulic mining manipulator type DME30F is a traction unit which compared with a manipulator type SA-MAN-01 has increased traction parameters with the ability to connect a second driving unit. Manipulator´s driving units can be equipped with pinions for operation on rack monorail track. This machine can be modified for use with a remote control.

DMZ50F

Diesel-hydraulic mining manipulator type DMZ50F is not limited by the action radius of electric cable thanks to its driving diesel engine which in addition to its primary function of material transport and handling, allows using its hydraulic unit to supply auxiliary hydraulic mechanization at places where other pressure or electric supplies are not available. The manipulator can be modified for use with a remote control and is available in versions with one or two driving units.

Specification:	SA-MAN 01	DME30F	DMZ50F
Power:	**5,5 - 7,5 kW***	**30 kW**	**36 kW**
Max. traction force:	**20 kN**	**50 kN***	**40 kN***
Max. speed:	**3 km/h**	**3,2 km/h**	**3,2 km/h**
Max. inclination:	**30°**	**30°**	**30°**

* depending on the number of drives

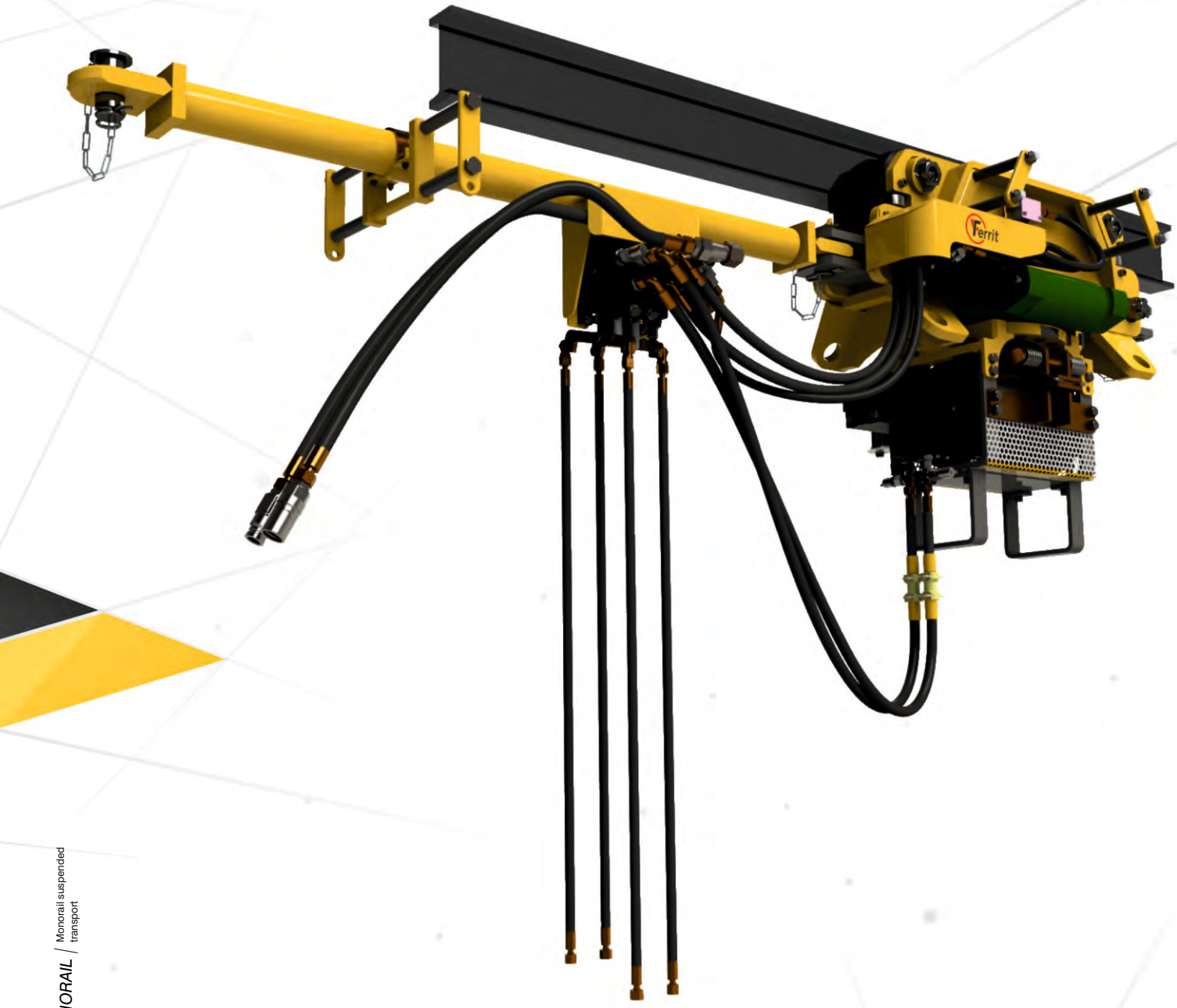
Accessories

ZHN2000F

Suspended hydraulic winch type ZHN2000F is a device used for manipulation with loads, and their pulling under the monorail so that they could be lifted and subsequently transported by lifting equipment. The hydraulic winch is usually connected to hydraulic lifting devices attached to the traction device.

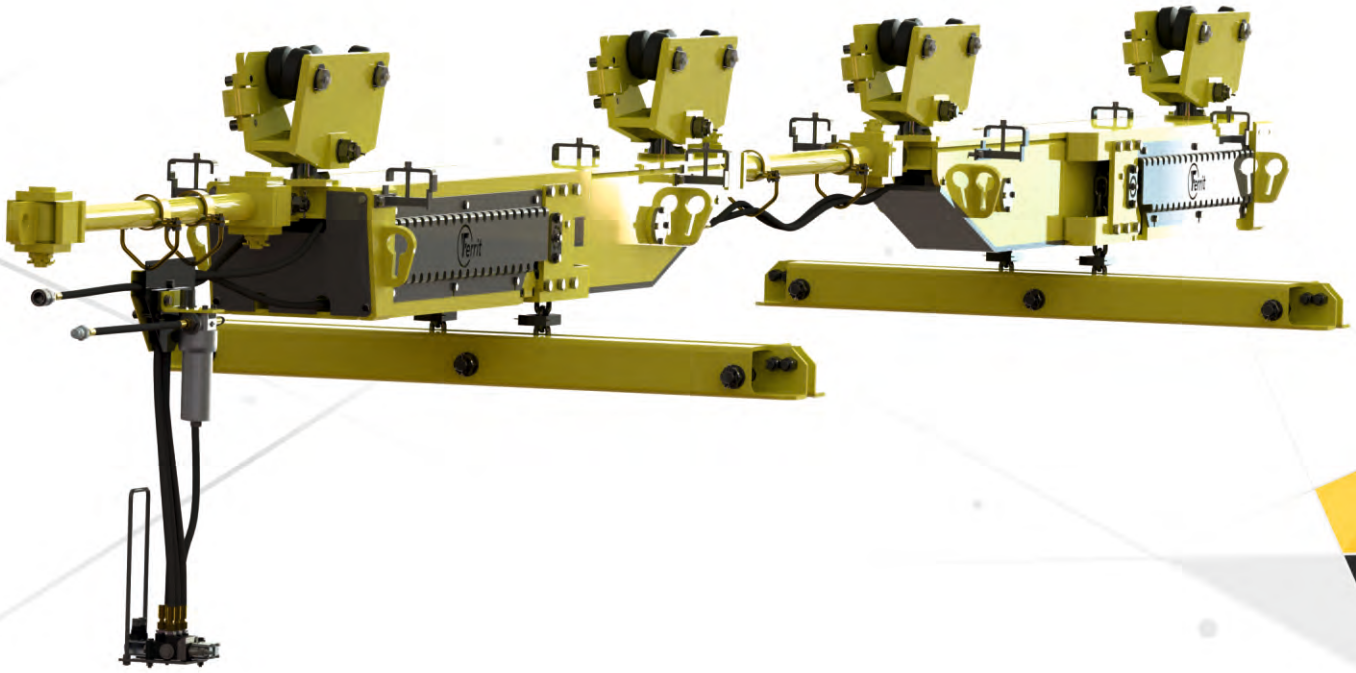
Specification:

Pull force:	**20 kN**
Rotation:	**hydraulic**
Control lock:	**mechanic**
Max. inclination:	**30 °**
Winding speed:	**9,8 - 15,5 m/min**



LIFTING TRANSPORT EQUIPMENT

Hydraulic lifting transport equipment is used for lifting and transport of material (or cabins) on the monorail suspended track. The lifting equipment is connected to locomotives or manipulators and pressure supplied from their auxiliary hydraulic circuits. There are many types of lifting transport devices differing from each other structurally or by their load capacities of up to 40 tons. They can be further modified to transport specific loads, or arranged into sets and thus achieve the required transport capacity.

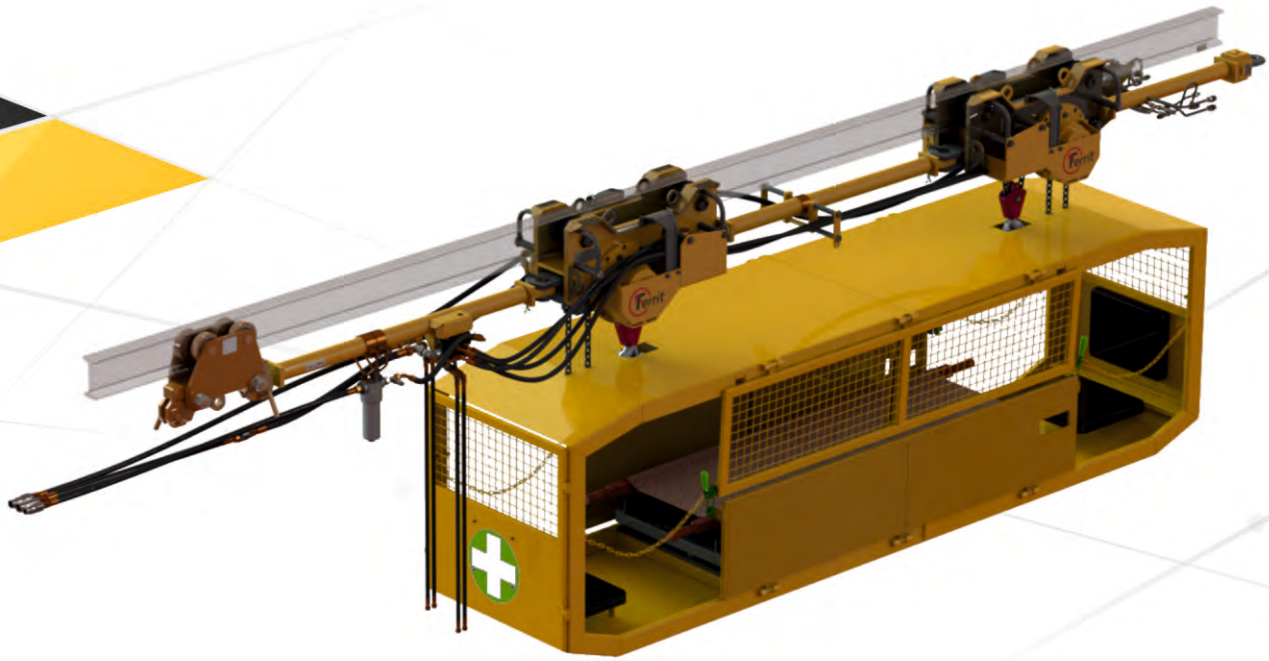


BRAKING TROLLEYS

The braking trolley is a safety device designed to stop transport sets and their parts (carrying trolleys, lifting equipment etc.) in emergencies in case of spontaneous travel on the monorail track. When pre-set transport speed is exceeded, the braking trolley brakes by clamping the track profile by the brake shoes. The braking trolleys are connected to transport sets by connecting rods and are placed in front of the transport set in downhill direction. Number of mechanically and hydraulically interconnected braking trolleys is determined by the operator in dependence on transport set weight and track inclination. The braking trolleys are usually delivered interconnected as single, duo or trio.

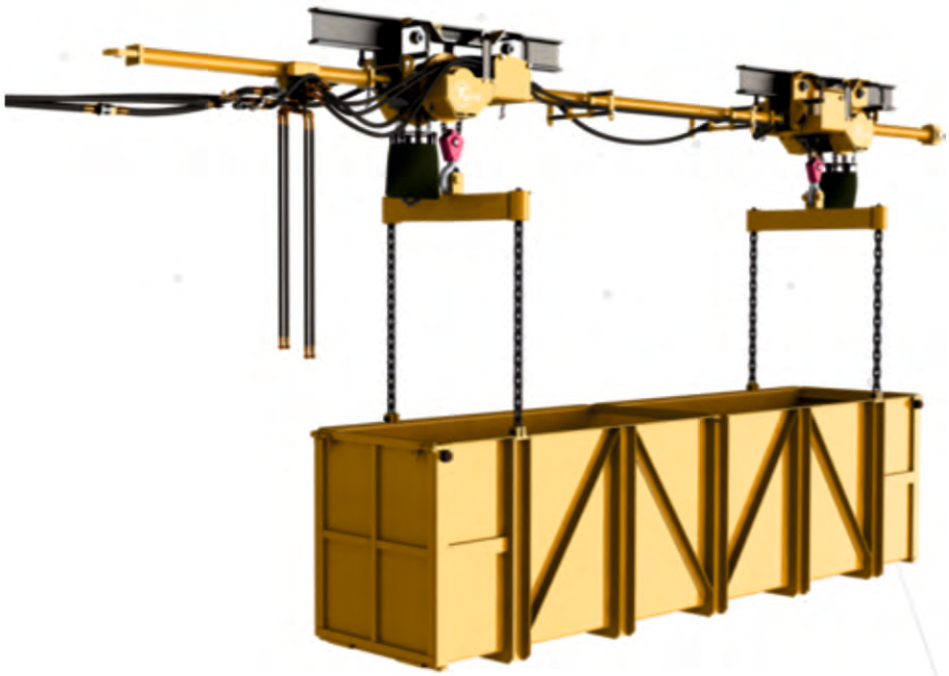
CABINS

Cabins for passenger transport are designed and manufactured with regard to the purpose of their use. Most often it is a cabin for transport of crew (various sizes and numbers of seats) rescue teams, injured personnel or last not least a special cabin for high speed transport (up to 25 km / h). Cabins are suspended on a monorail track on carrying trolleys, or a hydraulic lifting device, which after completion of transport of persons could be further used to transport a material. Cabins can be individually customized or combined to achieve variable capacity and dimensions.



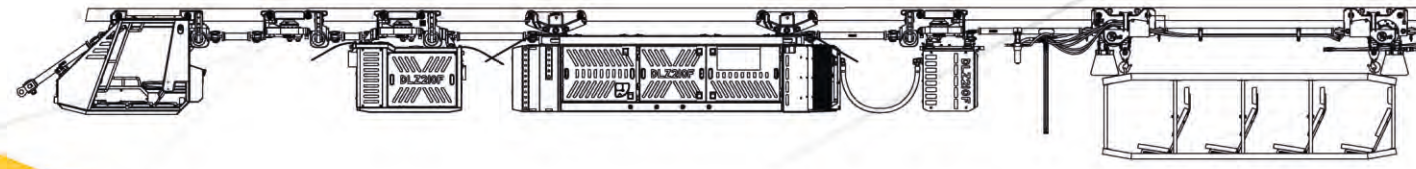
CONTAINERS

Containers of different types are used for transport of any kind of material in underground mines, or on the surface. Standardized versions of containers may be used for transport of technological materials such as components of mining arch supports, as well as bulky materials, explosives or fuels and the like. The derived or purpose-built variants of these containers may be delivered on customer's request.

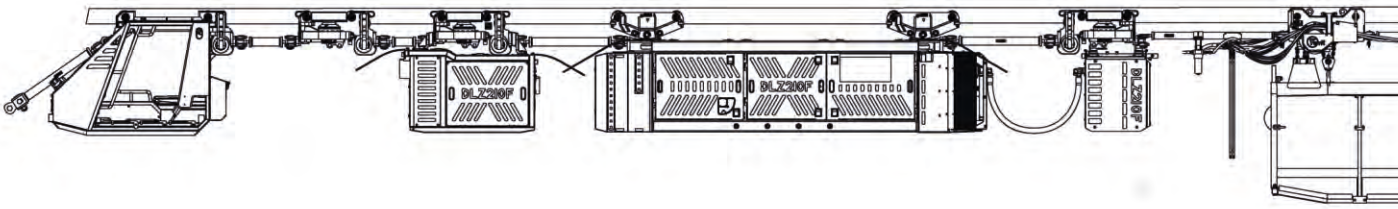


NOTES

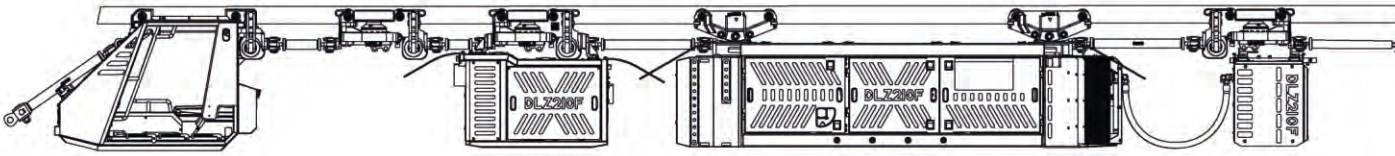
DLZ210F with cabin KVS4 for personal transport



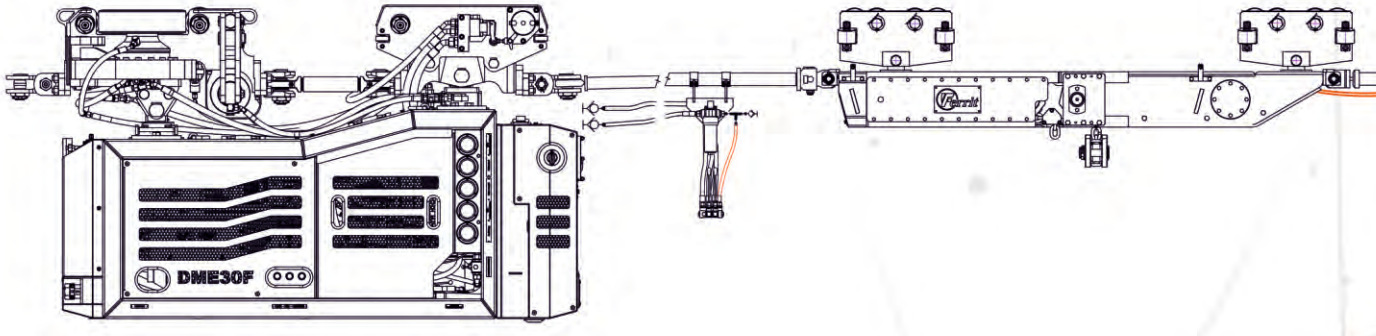
DLZ210F with lifting transport equipment NZH2/4 + containers

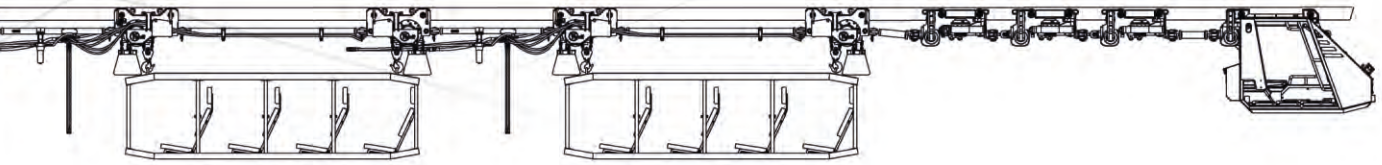


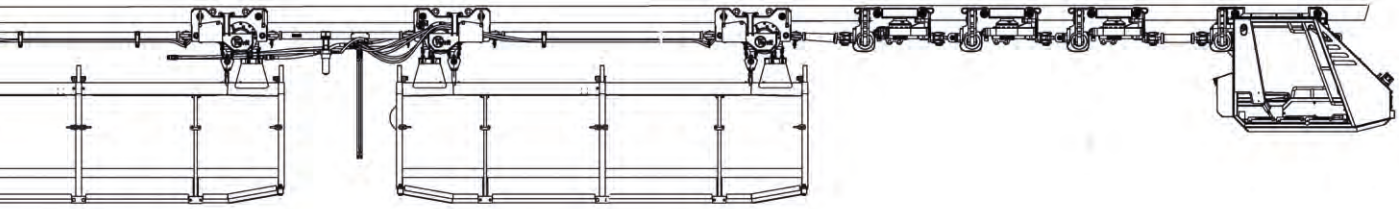
DLZ210F with lifting transport equipment TZH8/16

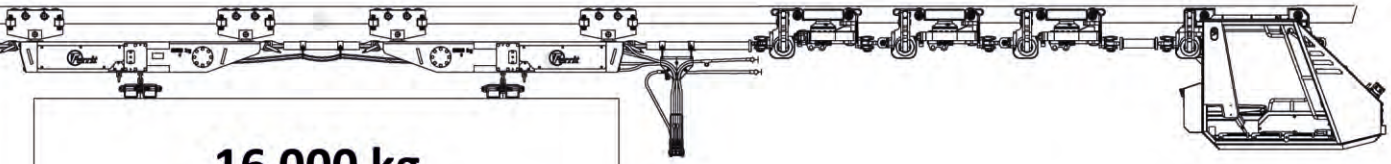


DME 30F + TZH 8/16

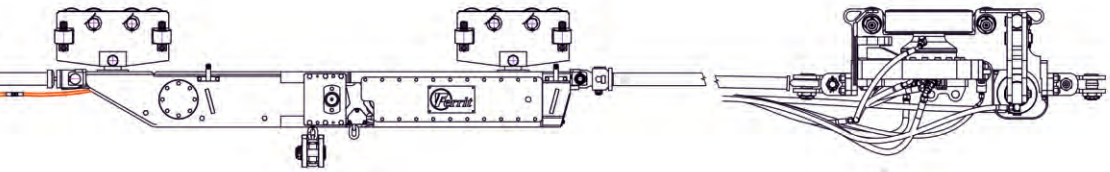








16 000 kg



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Ferrit | RAIL

Ground rail transport

Ferrit | GLOBAL MINING SOLUTIONS

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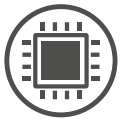
ELECTRIC		*Monitoring and communication systems*

Ferrit | RAIL

Ground rail transport

Ground rail transport is used for transport of material and persons on horizontal surface tracks or roadways and tunnels of underground mines where the track inclination does not exceed 35 ‰ and the profile is ≥ 10m^2. Provided that underground roadways are driven horizontally with their life span planned in an order of years, the ground rail transport becomes the most efficient and economical mode of transport with highest transport capacity.

The fundamental part of the rail transport system is a track, which is composed of rails, matching the projected carrying capacity, fastening and anchoring elements, curves, switches and other accessories. The rails are being installed in most common gauges ranging from 450 to 900 mm and wider gauges are rarely being used. Sliding track elements (switches) can be operated manually, pneumatically or electrically by remote control, thus extremely improving productivity and transport logistics. Underground wagons, containers, platforms and support systems with capacity of 2 to 20 tons are being transported on the rail track.

In cases, where there is requirement on transport of excessive loads in inclined roadways of up to 30 degrees, ground diesel-hydraulic rack and pinion systems might be used. Ground rack and pinion electro-hydraulic systems might be used in inclines of up to 35 degrees, however with action radius limited by an electric supply cable. The rack and pinion traction units are operating and transporting loads on special purpose made track sections with a welded rack. The locomotives or power units are using a hydraulically powered pinions for transmission of torque on the rack track.

All ground rail transport products meet requirements for operation in mines classified as hazardous areas with mining gasses and coal dust explosion danger (flameproof mines) like coal mines. The exceptions are machines operated outside these areas (e.g. ore mines, surface operations) which are considered as non-flameproof mines.

Key

Suitable to areas with no explosion danger

Suitable to areas with explosion danger

Diesel hydraulic locomotive

DLP50F

Diesel hydraulic locomotive DLP50F belongs to the 8.5t weight range with two driver´s cabins. It is driven by a four cylinder engine and it is equipped with flameproof protections enabling its use in areas with occurrence of methane and coal dust. Locomotive´s operational mode, speed, motor hours, pressure and temperature values of diesel-hydraulic aggregate are controlled by an electronic control and safety system.

Specification:

Power:	**36 kW**
Max. traction force:	**20 kN**
Max. inclination:	**35 ‰**
Gauge:	**550 - 900 mm**
Wheelbase:	**1150 mm**
Total weight:	**8,2 t**

DLP140F

Diesel hydraulic locomotive DLP140F belongs to the 15t weight range with two driver´s cabins. This locomotive is also manufactured in 13t version at request. It is driven by a six cylinder engine which is together with its electric and electronic control system manufactured in flameproof design enabling its use in areas with occurrence of methane and coal dust.

Specification:

Power:	**104 kW**
Max. traction force:	**40 kN**
Max. inclination:	**35 ‰**
Gauge:	**550 - 900 mm**
Wheelbase:	**1450 mm**
Total weight:	**15,5 t**

PLP50F

Diesel hydraulic locomotive PLP50F belongs to the 8.5t weight range with single driver´s cabin. The locomotive is designed for surface operations or areas with no methane or coal dust explosion danger (non-flameproof mines). It uses identical diesel aggregate as it´s flameproof modification DLP50F. Locomotive´s electronic functions are also offering same amount of control.

Specification:

Power:	**36 kW**
Max. traction force:	**20 kN**
Max. inclination:	**35 ‰**
Gauge:	**600 - 900 mm**
Wheelbase:	**1300 mm**
Total weight:	**8,2 t**

Locomotives may be manufactured in various modifications

Diesel hydraulic locomotive

PLP50F-II

Another purpose made modification of PLP50F locomotive. The locomotive has been customized for belt conveyors maintenance works as transport and changing of conveyor rollers, pulling and powering hydraulic roller manipulator and transport of persons.

Specification:

Power:	**36 kW**
Max. traction force:	**14 kN**
Max. inclination:	**40 ‰**
Gauge:	**900 mm**
Wheelbase:	**1150 mm**
Total weight:	**5 t**

PLP50F-II-M

The PLP50F-II-M locomotive is functionally identical modification of PLP50F with same traction capabilities. It has been purposely designed on customer´s request in order to dimensionally fit to local transport route conditions. (building underground metro)

Specification:

Power:	**36 kW**
Max. traction force:	**20 kN**
Max. inclination:	**50 ‰**
Gauge:	**600 - 900 mm**
Wheelbase:	**1300 mm**
Total weight:	**8,5 t**

Locomotives may be manufactured in various modifications

Electric and battery powered locomotives

DLPA44F

The battery electric locomotive belongs to the 10t weight range with two driver´s cabins. The locomotive is manufactured in flameproof design. It is driven by variable frequency electric motors which are power supplied by a traction battery. The locomotive is usually supplied together with a battery charger and two batteries which ensure smooth operation without time delays (one battery in operation, second battery on charge).

Specification:

Power:	**2 x 22 kW**
Max. traction force:	**22 kN**
Max. inclination:	**35 ‰**
Gauge:	**550 - 900 mm**
Wheelbase:	**1250 mm**
Battery life:	**8 hod.**

DLPA2x44F-K

The purpose built battery electric locomotive belongs to the 18t weigh range with two driver´s cabins. The locomotive is manufactured as modified version of DLPA44F with increased dead weight and traction parameters.

Specification:

Power:	**4 x 22 kW**
Max. traction force:	**40 kN**
Max. inclination:	**35 ‰**
Gauge:	**600 - 750 mm**
Wheelbase:	**1250 mm**
Battery life:	**8 - 24 hod.**

DLPA90F

The purpose built battery electric locomotive belongs to the 19 t weight range with two driver´s cabins. The locomotive is specially designed for use on 1067 mm gauge tracks with ability to operate in gradients of up to 50 ‰.

Specification:

Power:	**45 kW**
Max. traction force:	**48 kN**
Max. inclination:	**50 ‰**
Gauge:	**1067 mm**
Wheelbase:	**1700 mm**
Battery life:	**8 hod.**

Locomotives may be manufactured in various modifications

Electric trolley locomotives

TLP120F

The trolley electric locomotive is designed for use in underground or surface operations with no methane or coal dust explosion danger (non-flameproof mine). It belongs to 20t weight range with a single driver´s cabin. It is powered by electric motors and frequency convertors. The locomotive´s driving and control systems are power supplied from the trolley line through a collector.

Specification:

Power:	**2 x 75 kW**
Max. traction force:	**55 kN**
Max. inclination:	**35 ‰**
Gauge:	**750 - 900 mm**
Wheelbase:	**1800 mm**
Total weight:	**20 t**

Locomotives may be manufactured in various modifications

Thanks to Ferrit´s global experience and flexibility, all locomotives may be modified into various versions. Machines may be manufactured in flameproof or non-flameproof designs with focus to quality with aim to customer´s satisfaction.

Supplied machines may be equipped by various auxiliary equipment as for instance mechanisms for changing of conveyor rollers, brushes for track cleaning, ploughs etc.

Rack and pinion systems

DLZ110F.NZD

The diesel hydraulic rack and pinion locomotive works on same principles as the electric EHT180 except that the electric motor is replaced by a diesel one, which does not suffer from supply cable action radius limitations. It is therefore suitable for long distances heavy transport in inclinations of up to 30 degrees. The locomotive is equipped with two driver's cabins and an electronic control system enabling monitoring of all important machine´s operational values.

Specification:

Power:	**81 kW**
Max. traction force:	**120 - 240 kN**
Max. inclination:	**30 °**
Max. speed:	**1 - 5 m/s**
Number of cabs:	**2**
Weight:	**9 t**

EHT180

The electro hydraulic rack and pinion power unit is designed for transport of material along the rack track in inclines of up to 35 degrees. It is usually used for short distance material transport, for example transport of longwall components from assembly chamber to face etc. The driving hydraulic motors (or planetary gearboxes) are supplied by a hydraulic pressure from hydraulic pump, which is powered by an electric motor. The machine is power supplied by an electric cable and moves on special rack track sections.

Specification:

Max. traction force:	**110 - 220 kN**
Max. inclination:	**35 °**
Max. speed:	**1,67 m/s**
Number of cabs:	**0**
Weight:	**10 t**

Locomotives may be manufactured in various modifications

Technical parameters table

Type	Height	Width	Length
DLP50F	1450	1100-1250*	4800-4900*
PLP 50F - II	2140	1050	3760
PLP50F-II-M	1650	1100-1250*	4480
PLP 50F	2100	1100-1250*	4330
DLP 140F	1600	1150-1350*	5800-6000*
DLPA 2x44F-K	1600	1100-1250*	9090
DLPA 44F	1600	1100-1250*	5557
DLPA 90F	1850	1450	6170
TLP 120F	1650	1300	5500
DLZ 110F.NZD	1650	1200	10900
EHT 180	1750	2076	9000

*depending on the gauge

NOTES

NOTES

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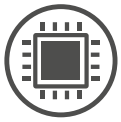
Ferrit | TRACKLESS

Crawler and wheeled mining machines

Ferrit | GLOBAL MINING SOLUTIONS

MONORAIL		*Monorail suspended transport*
RAIL		*Ground rail transport*
TRACKLESS		*Crawler and wheeled mining machines*
MINING		*Mining activity*
SAFETY		*Mining rescue equipment*
ELECTRIC		*Monitoring and communication systems*

Ferrit | TRACKLESS

Crawler and wheeled mining machines

Wheeled transport is a traditional transport mode of material and personnel in both surface and underground mines. It can be implemented wherever the inclination of the transport route does not exceed 15°. This mode of transport is mainly used in underground mines utilizing mechanized mining methods like room and pillar, block caving, open level stoping and drift mining, where a rich network of roadways are created to extract the orebody. Wheeled transport methods can achieve a very high efficiency when selected correctly for the appropiate applications and they can be used in both flameproof and non-flameproof mines.

Ferrit is an exclusive distributor of AARD Mining Equipment which is a South African producer of underground mining equipment. Motion of AARD machines is generally ensured by a low-emission diesel engine and a hydraulic generator. These machines are controlled by either a steering wheel or steering levers. All AARD machines meet high levels of safety requirements both for the operator as well as for the immediate surroundings. Operator's cabins are ISO ROPS / FOPS certified and the requirements on low maintenance and operator´s comfort during operation are also met. AARD machines are able to work in very difficult working conditions with high productivity and reliability. AARD Mining Equipment is able to adapt the machines to particular customers conditions and thus supply customized solutions.

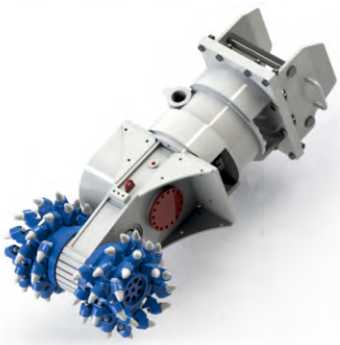
Key

Suitable to areas with explosion danger

Suitable to areas with no explosion danger

MULTIPURPOSE MACHINES ON CRAWLER BELTS CHASSIS

Universal machines of the PSU series are multi-purpose mining machines designed for dinting of swollen mine floors, recovering/expanding operations of roadways, loading of rock , breaking of rock by hydraulic hammers and drilling holes for either blast holes or support holes. All mechanisms for these operations are exchangeable on the PSU within a few minutes using a quick coupling mechanism. Universal machine PSU moves along crawler belts. Machine´s drive is electrohydraulic and is powered by an electric supply cable. The machines are manufactured in various modifications with voltages ranging 500V, 1000V, 1140V and 660V.



Technical parameters table

Parameters	PSU 7000	PSU 9000 II	PSU 10000
Power:	30 kW	55 nebo 63 kW	63 kW
Weight:	6600 - 7100 kg	9100 - 9700 kg	10500 - 11200 kg
Side bucket reach:	2x1615 - 2x2400 mm*	2x2397 - 2x2836 mm*	2x2441 - 2x2877 mm*
Arm extension:	700 mm	750 mm	750 mm
Bucket width:	630 - 1120 mm*	830 - 2170 mm*	830 - 2170 mm*
Bucket volume:	250 - 500 l*	300 - 850 l*	300 - 850 l*

*depending on used mechanism

DRILLING AND BOLTING MACHINES

Drilling and bolting machines are used for drilling holes for either blast holes or support holes . These machines are equipped with one or two 360° rotary drill carriages with a percussion drill hammer. Drill hammers are connected to the machine´s hydraulic system and supplied with both flush water and compressed air. These machines are propelled by a diesel engine and a hydraulic generator. Carriages, extendable arms and drill hammers are independently driven by electro hydraulic system on the machine. The machines must be connected to external electric power supply in operational position.

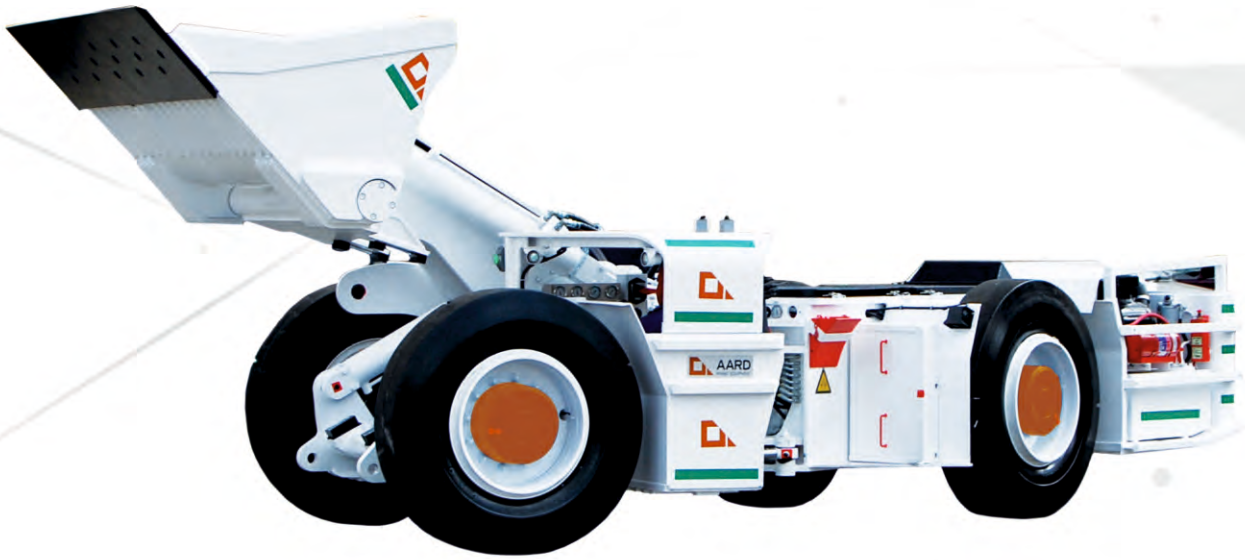
MULTIPURPOSE VEHICLES

Underground multi purpose vehicles provides a complete range for transport requirements. These machines are designed for applications requiring full carrier utilization resulting in custom-built vehicles such as fuel transport, lubrication, mobile worksho-p, personnel transport and material transport. Multiple interchangeable cassettes can be utilized with one carrier, each for a specific purpose. The size of the cassette is determined by dimensional parameters of the carrier and its load capacity. The cassettes are secured to the supporting of the supporting frame of the vehicle by means of safety pins.

LOADERS AND GRADERS

Underground loaders are designed for loading and transport of bulky rocks from faces to conveyors, or to designated storage locations in mine. Bucket size determines transport volume, capacity and performance of loaders in range of 5.5 - 10 tonnes. Loader movement, including bucket control are ensured by diesel engine and hydraulic generator.

The graders are used for maintenance of transport route surfaces.



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