



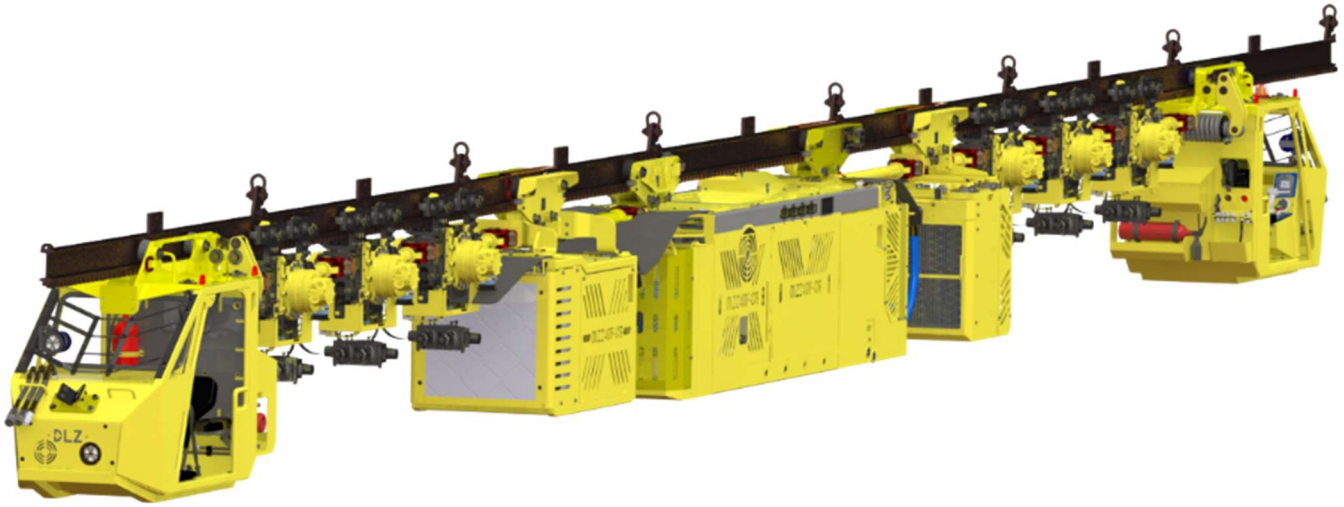
# SUSPENDED MINING LOCOMOTIVE DLZ240F-CR

KL-DLZ240F-CR-EN

Version Valid from

1 31. 01. 2024

Page 1 / 4



## Description:

Suspended mining locomotive type DLZ240F is a traction unit designed for transportation of train sets at the monorail suspended track placed in the underground mines or at the surface in horizontal level and in the inclinations of up to  $\pm 30^\circ$ .

The locomotive is a mechanical device that is assembled from the following parts: two separate driver's cabins and geared driving units in the connected number in the hydraulic circuit of the locomotive, a motor part and an auxiliary part. Individual parts of the locomotives are interconnected by connecting rods, designated by the manufacturer.

The locomotive can be combined according to the selected configuration within the travelling using standard and geared driving units with integrated disconnecter.

Locomotive's design allows its use in areas of gassy mines with hazardous atmospheric conditions 2 according to ČSN EN 1127-2 (EN 1127-2) and in hazardous areas with methane and coal dust explosion danger, classified according to § 232 paragraph. 1 point. b) and § 233 paragraph. 1 point. b). Group I category M2 according to Annex no. 1 NV no. 116/2016 Coll., Laying down technical requirements for equipment and protective systems intended for use in potentially explosive atmospheres (Directive of European Parliament and Committee 2014/34/EU), Decree no. 22/1989 Coll., including potentially outbursts of rocks and gases and mines classified as hazardous mining disturbances, with the exception of areas with methane explosion hazard classified according to § 242 Sec. 3 of the same decree.

Locomotive allows by its design to use interchangeable auxiliary equipment of an approved type, such as set of cabins for passenger transport, transport hydraulic equipment, hydraulic, suspended hydraulic winch, material containers etc., which can be sorted and permanently associated with the locomotive as a train set, according to the user's needs.

The motor part consists of several main logical units – a cooling box, a wet exhaust box or dry method, a diesel engine, hydraulic tank, fuel tank and hydraulic elements box and it is via a spring and damping elements suspended on a supporting frame, which by means of spherical bearings, permitting the necessary relative movement when passing the monorail track, suspended on two carrying trolleys through which it travels along the monorail track. These carrying trolleys are equipped with speed limiter. The speed limiter consists of an inductive speed sensors and hydraulic distributor. Both of these elements independent of each other, are watching the travel speed of the locomotive. When exceeding the max. allowable speed, the speed limiter ensures braking of the locomotives.

The turbocharged engine with manufacturer's modification for operation in mining environments, has its own cooled turbocharger and an intercooler of intake air. The engine intake air is passed through the filter and intake stop valve, through the flame arrester element further into the compressor section of the turbocharger, intercooler and intake system of the engine. The fuel system is equipped with a fuel filter with a water separator and a signalization, and can be equipped with a fuel flowmeter.

Exhaust gases from the engine are guided through the cooled exhaust pipes into a cooled turbine housing of the turbocharger. Subsequently, the exhaust gases are led again through cooled high pressure metal hoses to the catalyst





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KL-DLZ240F-CR-EN

Version Valid from

1 31. 01. 2024

Page 2 / 4

casing, disposed in the wet exhaust box which subsequently cools down the gas to the permissible temperature. From here the gas is discharged through two flame inserts safely into the surrounding air of underground mine, or to the atmosphere at the surface.

The water system of the engine part is dual, mutually independent. It consists of two-circuit water pump with a direct drive from the engine, double expansion tanks and a cooling box.

The first circuit – pump, engine, cooled exhaust manifold, cooled turbocharger, thermostat ensuring a constant operating temperature, cooler and expansion tank in this circuit.

The second circuit - pump, intercooler, bearing housing of turbocharger, engine oil cooler and a separate cooler and expansion tank in this circuit.

The cooling box system includes dual radiator fans and a hydraulic motor; It is optimized for maximum cooling performance, while also cools down the wet exhaust box.

Furthermore, the engine part is equipped with the set of safety sensors which stop the engine if fault conditions occur.

The electrical installation of the locomotive provides monitoring and diagnostics parameters of the locomotive such as temperature, level and pressure of fluids, locomotive speed etc. The operator of the locomotive is informed about above mentioned conditions and fault reports through a visualization unit which is placed in driver's cabin. All information monitored by electrical installations are stored on a memory card for the purpose of maintenance and evaluation of operating conditions.

The hydraulic circuit of the locomotives consists of a hydraulic fluid tank, a pair of double intake filters, assembly of the main hydraulic generator (for driving units) and a double geared pump (hydraulic motors of the radiator fan and the hydraulic circuit auxiliary functions), separate geared pump (for supply of alternator's hydraulic motor) and the necessary regulatory, control and distribution elements. Hydraulic disconnecter of drive units is used along the combination of standard and geared driving units.

The auxiliary part of the locomotive includes mainly a hydraulic fluid cooler, flameproof alternator, control system, methane meter and other hydraulic and distribution elements of the locomotives.

## Basic technical parameters:

Engine	DMF240-6TCR-I
Engine type	Electrically controlled diesel engine, system Common Rail, turbocharger with intercooler suction
Max. power of the diesel engine:	179 kW (240 hp)
Nominal speed	2300 RPM
Number of cylinders	6
Volume of cylinder	7146 cm <sup>3</sup>
Cylinder diameter	108±3 mm
Piston stroke	130±3 mm
Fuel consumption	228 [g/kWh]
Fuel	Diesel
Engine cooling	Forced by water
Exhaust gas cooling	Dry method
Engine lubrication	Circulating, under pressure
Temperature of the oil in the oil tank	125 ± 5 [°C]
Minimum pressure of lubricating oil when engine is hot, idling (120 [°C] SAE 15W40)	0,8 ± 0,1 [bar]





# SUSPENDED MINING LOCOMOTIVE DLZ240F-CR

KL-DLZ240F-CR-EN

Version Valid from

1 31. 01. 2024

Page 3 / 4

Lubrication system volume	21 ± 3 [liter]
Allowable temperature of engine cooling water	105± 5 [°C]
Start by opening thermostat	83 ± 5 [°C]
Open all thermostat	95± 5 [°C]
Engine cooling pump flow	170 [liter/minute] - when the number of revolutions is max
Exhaust gas cooling pump flow	160 [liter/minute] - when the number of revolutions is max
Engine cooling volume	60±10 cm <sup>3</sup>
Volume of exhaust gas cooling system	90±10 cm <sup>3</sup>
Fuel tank volume	150±10 cm <sup>3</sup>
Hydraulic fluid volume	130±5 dm <sup>3</sup>
Working conditions	In underground mine environments, there are explosive gases and dust in methane-free areas or methane-containing areas. The system must automatically shut down the machine in case the methane content in the air exceeds the allowable value of 1.5%
Operating ambient temperature / humidity	-40 to +40 °C (when starting, the ambient temperature must be >5°C)
Max. relative humidity	95%
Methane concentration	Working in an environment with a maximum methane concentration of 1.5%
Working medium (hydraulic fluid)	HLP68, VG68
Volume of hydraulic oil tank	130 ± 5 [dm <sup>3</sup> ]
Main hydraulic pump	250 ± 5 [cm <sup>3</sup> ]
Additional charge hydraulic pump	52 ± 5 [cm <sup>3</sup> ]
Control hydraulic pump	8 ± 5 [cm <sup>3</sup> ]
Auxiliary equipment hydraulic pump	34 ± 5 [cm <sup>3</sup> ]
Air fan hydraulic motor	23 ± 5 [cm <sup>3</sup> ]
Maximum pressure supplied to auxiliary equipment	200 ± 5 [bar]
Install safety valve in hydraulic accumulator	230 ± 5 [bar]
Minimum flow of power supply system for auxiliary devices	30 ± 5 [liter/minute]
Maximum flow rate of the power supply system for auxiliary devices	78,2 ± 5 [liter/minute]
Hydraulic accumulator:	
- Volume	10 ± 2 [liter]
- Working pressure	Max 180 ± 10 [bar]
- Pre-pressure in the air bag	90 ± 10 [bar]
- Type of the gas in the bag	Nitrogen
Nominal voltage	24 V
Lights:	
- Main light	diod, 24V



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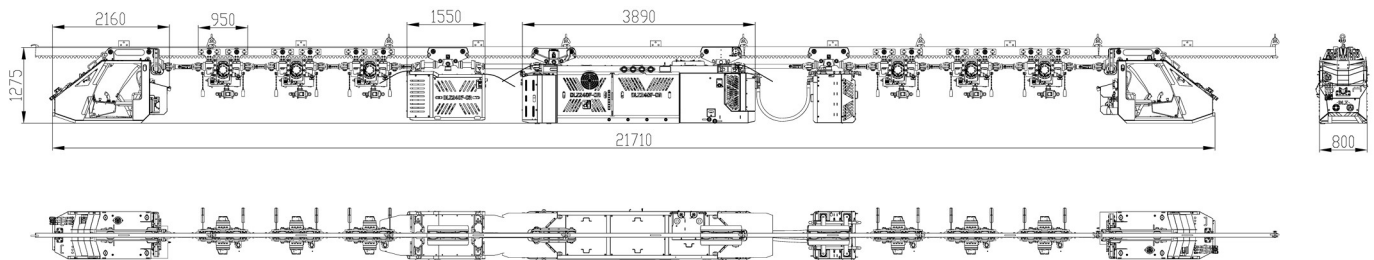
Page 4 / 4

- Stop light	diode, red, 24V
<b>Automatic fire protection:</b> 8 kg tank - (6 kg Pyrocool solution, 2kg nitrogen) + 2 kg release tank - (1.8l Fe-36, 0.2l nitrogen)	1 Set
<b>Manual fire protection:</b> Fireproof powder bottle - 6kg	2 Pcs.

## Transportation characteristics:

- \* Minimum curvature radius of the curve section (in the horizontal plane): 4 m.
- \*\* Minimum curvature radius of convex and concave curve section (in the vertical plane): 8 m.
- \*\*\* Suspension rail line : Type of I155 rail profile with serrated bars welded on the bottom.
- \*\*\*\* Allowable gradient of the suspension rail line :  $\pm 30^\circ$ .

## Dimensional drawing:



## Main dimensions:

- \* Max. length and weight is only for orientation depending on the configuration of the locomotive.
- \*\* Length of connecting rod: 600mm or 1000mm. The maximum length of the hydraulic line supplying power to the driving unit must not exceed 50m.
- \*\*\* Height (from edge of rail) x Width x Length : (1275 x 800 x 21710)  $\pm 50$  mm.
- \*\*\*\* Length of cabin (from outer edge to connecting shaft) : 2160  $\pm 50$  mm.
- \*\*\*\*\* Length of engine part (from connecting shaft to connecting shaft) : 3890  $\pm 50$ mm.
- \*\*\*\*\* Length of auxiliary part (from connecting shaft to connecting shaft) : 1550  $\pm 50$  mm.
- \*\*\*\*\* Length of HZA toothed driving unit (from connecting shaft to connecting shaft) : 950  $\pm 50$  mm.

## Traction characteristics:

- \* Number of Driving Unit: 6 set.
  - \*\* The maximum traction force of 1 Driving Unit is 30 kN.
  - \*\*\* The maximum total traction force of 6 Driving Units is 180 kN.
  - \*\*\*\* Maximum speed: 2,5 m/s.
  - \*\*\*\*\* Min. static braking force must meet 1.5 times safety, according to the customer's national regulations.
  - \*\*\*\*\* Min. static braking force of 1 Driving Unit is 45 kN.
  - \*\*\*\*\* Min. total static braking force of 6 Driving Units is 270 kN.
- Equipment catalog is for general description only and we will produce according to customer's detailed requirements.



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