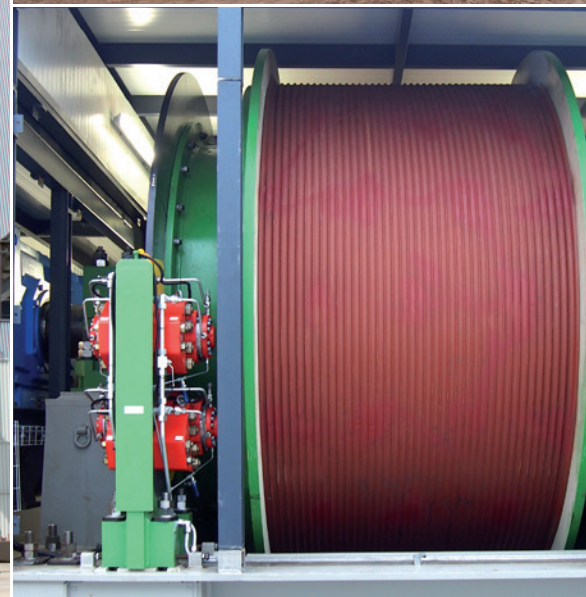




MWM ELEKTRO

Container Type Winding Machine B-3000/AC-6m/s

to drive one-end mining shaft hoists



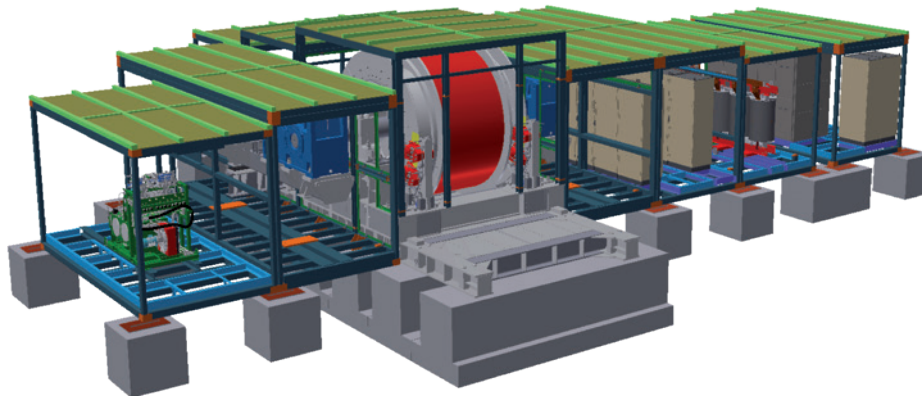
The project was implemented within the scope of the programme:
"Developing innovative container mobile platform to drive shaft
hoists to improve the economic efficiency
of specialist mining works."

A product innovation on a world scale according to the definition of the Oslo Manual.

The project was co-financed by the European Regional Development Fund



Model of the Container Type Winding Machine B-3000/AC-6m/s



The Container Type Winding Machine B-3000/AC-6m/s consists of prefabricated foundation blocks, a foundation frame and 9 container modules.

Purpose

The Container Type Winding Machine can be applied as an element of a shaft hoisting designed to be used mainly during sinking or deepening a shaft, as well as during all specialised works related to a shaft.

As the drive of a mining shaft hoisting, the machine can work in the following modes: carriage of persons, transport of output, transport of materials, performing shaft revisions and other shaft-related works.

Innovative solution

The structure of the Container Type Winding Machine enables its transport to its temporary or permanent working site and its quick installation on a specially prepared foundation, which may consist of prefabricated blocks.

The complete Winding Machine consists of 9 modules comprising all devices, which, once integrated, function as a complete drive of a shaft hoisting.

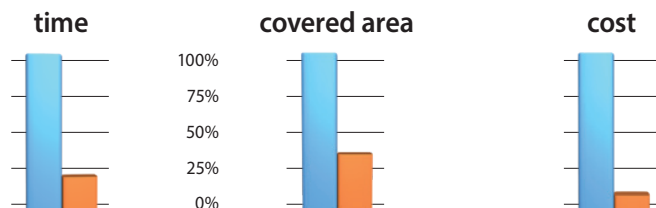
The containers perform the function as structural (bearing) elements, as well as housing during transport, operation and storing between operation periods. The structure of the containers enables easy assembly, handling and performing all control and revision operations on the devices installed inside. The containers protect all internal devices and fixtures from the influence of atmospheric conditions and the access of third parties.

Advantages of the Container Type Winding Machine's application

The main purpose of the MWM Elektro designers was improving the effectiveness of specialised mining works.

The very first installation and application of two commissioned machines, set up as the equipment of the mobile Contained Platform, fully confirmed the set purpose.

- Container Type Winding Machine B-3000/AC-6m/s
- Traditional winding machine

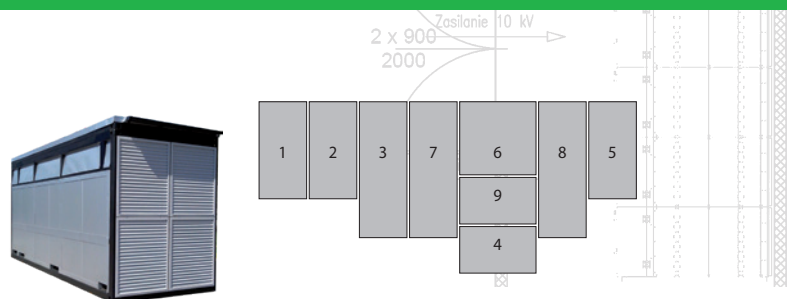


The total assembly time was limited by approx. 65%, the expected disassembly time – around 78%.

The area of the set of devices comprised by the winding machine was limited by approx. 63%.

The assembly cost was limited by approx. 60%, the expected limiting of the disassembly cost – around 89%.

The complete winding machine is composed of 20 transport units (*) and the set of devices comprised by the winding machine is composed of 9 container modules. The foundation elements (in case of the transport of prefabricated foundation blocks) are another 11 containers.



The distinctive feature of the B-3000/AC-6m/s machine is its container structure, which:

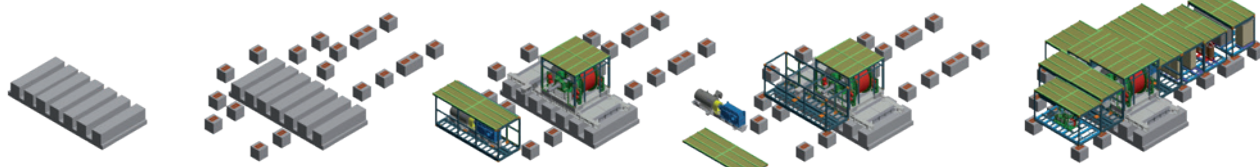
- eliminates the necessity of erecting additional buildings, covers or other protective elements both during the application and storing,
- guarantees conformity to the transport standards,
- limits (by approx. 85%) installation operations on the assembly site.

Containers are adjusted to the elements, devices and subassemblies installed inside. Some of them bear the following features:

- dismantling roof – the solution facilitating the assembly and the application of the devices,
- dismantling walls – the solution enabling communicating between the modules,
- lifting blades – enables the access to the devices from outside,
- ventilation and revision slots.

The foundations of the main shaft unit were designed as seven prefabricated reinforced concrete blocks with the unit weight of 20 tones.

The foundations of the container technical supply base are foundation blocks weighing 2,5 tones.



Loading

One crane is enough to load and unload the Container Type Winding Machine B-3000/AC-6m/s. The structure of individual containers – their handles, strengthening and protecting parts, as well as the precisely designed technology guarantee easy and safe loading on appropriate transporting vehicles.



Storing

The container type structure of the machine enables it to be stored in any place in various atmospheric conditions. The materials and technologies used in the production of the covers and connections ensure the resistance against extreme temperatures, humidity and negative influence of aggressive environment conditions.



Transport

Depending on local conditions and available infrastructure, the transportation can be performed by land, sea or air.

In case of road transport vast majority of the elements can be transported on public roads without any special permit. Only the module 6 (the winding drum with the shaft) needs a relevant permit due to its significant size and its weight of approx. 60 tones.



(*) - transport unit - separately transported container or module



First application

The designed Mobile Container Platform (working name: MPPP-21), composed of two complete B-3000/AC-6m/s type machines, was applied during the shaft sinking in a newly opened chemical mine. As at 1 August 2017 approximately 400m of the shaft was completed.

All the planned parameters of the winding engines were achieved.

phot. 1 Platform next to the shaft at the assembly stage – individual containers are placed on the prefabricated foundations prepared by the investor, creating a whole.

phot. 2 Main shaft unit of the winding machine – assembly stage.

phot. 3 Main shaft unit with the gearbox.

phot. 4 Executive unit of the brake – brake actuators.

phot. 5 Driver's worksite – control panel, visualisation screen.

phot. 6 Medium voltage switchgear powering the devices of the winding machine.

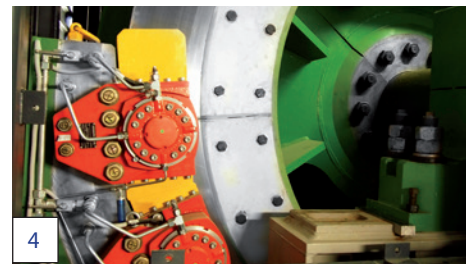
phot. 7 Frequency converter with an air charging and discharging system.

phot. 8 Drive module - the container's lifting blades facilitate the access to the devices from outside – assembly stage.

phot. 9 Elements of the machine's drive – the engine with the gearbox settled on a common bar.

phot. 10 Transformer module: main transformer and the internal power transformer.

phot. 11 Electrohydraulic control and power unit - type H-C MWM-4/VER.IIID.

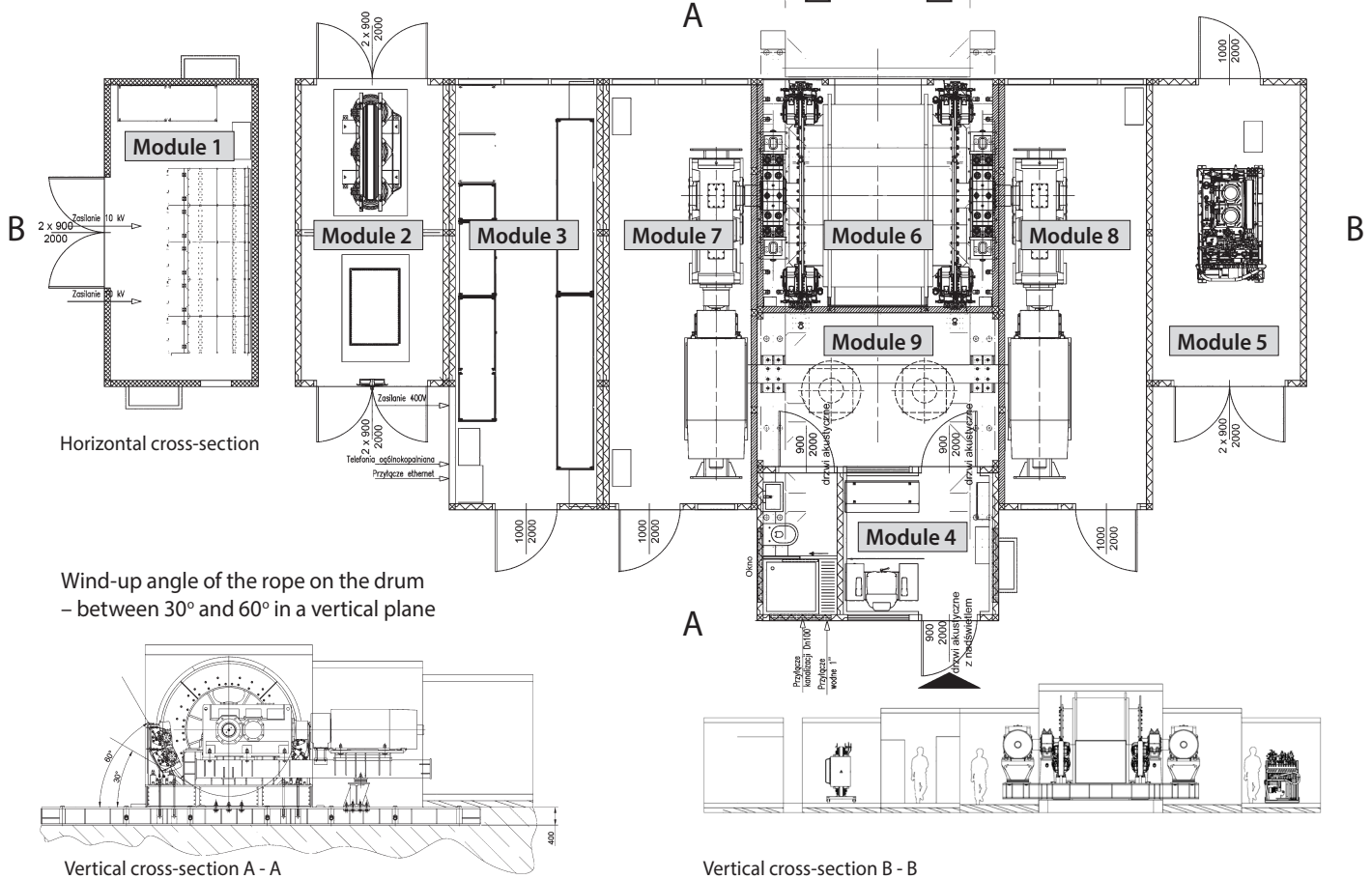


Characteristics

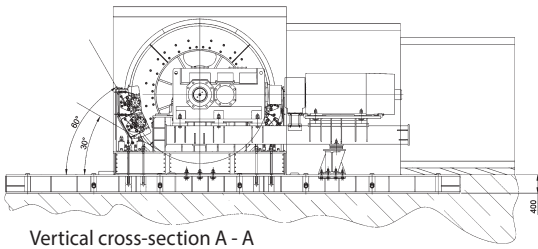
Container Type Winding Machine B-3000/AC-6m/s is one of the two drives of the Mobile Container Platform.

Area covered by the machine ready to work – 19.5 m / 11.2 m.

Required distance between the drive drum of the machine and the head-pulley – between 35 m and 80 m.



Wind-up angle of the rope on the drum – between 30° and 60° in a vertical plane



Vertical cross-section A - A

Vertical cross-section B - B

Setup of the modules

Module 1 – Medium voltage and low voltage switchgears

A medium voltage (6 kV or 10 kV) switchgear, composed of five bays and powering the unit of transformers, was set up in the module. The module is equipped with a connection enabling connecting two cables to ensure power from two sources of medium voltage.

Module 2 – Transformers

There are two transformers in the module:

- main transformer – 1 800 kVA converter transformer,
- auxiliary transformer – 250 kVA transformer powering the internal circuits.

Module 3 – Power-control unit

The equipment set up in the module:

- power, control and inspection unit of the winding machine,
- system of frequency converters.

Module 4 – Winding machine driver's site

In this module there is the driver's worksite equipped with all required manipulators, indicators and control tools, as well as the complete station of the winding engine's working conditions' visualisation. The inside of the module is air-conditioned, separated from external factors, such as dust, noise and atmospheric conditions, at the same time allowing constant observation of the winding drum's work.

Module 5 – Powering and controlling brake actuators

The module comprises the H-C MWM-4/VER.IIID type hydraulic unit with two pumps, which powers and controls brake actuators, and the UWDSO-e type device inducing the emergency oil discharge.

Module 6 – Main shaft unit

In this module the winding machine's main shaft unit (the main shaft is settled in bearings along with the drive drum) and the executing unit of the brake (brake actuators settled on 4 stands) are set up. The complete equipment of the module 6 was set up on a common frame.

Module 7 and 8 – Drive units

In the winding machine's setup there were installed two drive units - respectively in the module 7 and 8. Each drive unit consists of a drive engine, a flexible coupling and a gear. During the assembly drive units are settled on two ends of the main shaft.

Module 9 – Connecting compartment

The compartment is designed to provide communication, as well as ventilation of the adjacent compartments with the installed fans.

Complementary equipment

Depending on the performed function, all modules are equipped with the following fixtures: electric (including illumination),

plumbing, sewage system (sanitary unit), heating, air-to-air mechanical and gravitational ventilation system and air-conditioning.

Technical specifications of the Container Type Winding Machine B-3000/AC-6m/s

machine type	B-3000/AC-6m/s	
machines location	shaft entry	
control	manual control; automatic, in the remote start mode with full speed regulation;	
work modes	transport of persons individual transport revision of the shaft and shaft devices output transport of materials	
drive speed levels	regulated, from 0 to 6 m/s (within the full range)	
accelerating/delaying	movement acceleration	up to 0.7 m/s ²
	movement delay	up to 0.8 m/s ²
main and backup power	6 kV or 10 kV	
drive type	converter drive	
drive engines' power	2 x 780 kW	
suggested distance from the head-pulley	between 35 m and 80 m	
suggested wind-up angle of the rope on the drum	between 30° and 60° to the level	
nominal diameter of the drum	3 000 mm	
bearings of the main shaft	rolling-element, spherical bearings	
brake	disc type, hydraulically released	
maximum static force of the rope	200 kN	
– maximum force breaking the bearing rope	1 600 kN	
– maximum pressure of the rope on the drum shell	7,0 MPa	
maximum length of the rope	1 100 m	
average capacity (depending on the depth and the mining and geological conditions of shafting)	200 t/h	

Overview

Container Type Winding Machine B-3000/AC-6m/s designed for shaft hoisting is a completely innovative solution, acknowledged by clients and research and development centres.

Solutions applied in the B-3000/AC-6m/s machine, eliminating the need of erecting permanent infrastructure and foundations, enable repeated applications of the device in various places and atmospheric conditions. The structure based on prefabricated foundations, not permanently bound to the ground, does not require building permits.

Preparing the engine for land, sea or air transport enables its installation in any place of the globe for a preferred application period.

The applied drive unit is powered and controlled by highly effective frequency converters and is able to return energy to the electroenergetic network.

The mobile, container type B-3000/AC-6m/s machine can be applied during works performed by an investor in one or several subsequent sites. During periods between applications it can be shared with other investors.

The innovative Container Type Winding Machine B-3000/AC-6m/s designed for shaft hoisting drives is the solution of the MWM Elektro constructors aimed at meeting increasingly high requirements of the world mining industry, related to the economy and reliability of the vertical transport.



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