

**Rockwell  
Automation**

**Machine Builder  
Partner**

**Rockwell  
Automation**

**Equipment Builder  
Partner**

# INCO

**ENGINEERED SOLUTIONS FOR VERTICAL  
AND INCLINED TRANSPORT  
IN UNDERGROUND AND OPEN PIT MINES**



## Production plan – wide range of supplies

### Mining hoists with a frictional disc

- ⊕ Single-rope up to eight-rope hoisting systems – nominal frictional disc diameter up to 7 m (22,9 ft)
- ⊕ Single-motor and double motor models from 300 kW to 2 x 5500 kW (DC drives) or 2 x 6500 kW (synchronous drives)
- ⊕ DC drives, AC drives, synchronous drives
- ⊕ Static overbalance from 45 kN up to 600 kN
- ⊕ Payload from 5000 kg (11023 lbs) to 60000 kg (132274 lbs)
- ⊕ Hoisting speed from 6 m/sec (19,68 ft/sec) to 20 m/sec (65,6 ft/sec)

### Drum mining hoists

- ⊕ Single-drum and double-drum winding systems – nominal drum diameter up to 6,5 m (21,3 ft)
- ⊕ Single-motor and double-motor models from 250 kW to 2 x 5500 kW (DC drives), or 2 x 6500 kW (synchronous drives)
- ⊕ DC drives, AC drives, synchronous drives (high-voltage drives series PowerFlex 7000)
- ⊕ Static overbalance from 55 kN to 435 kN
- ⊕ Payload from 4000 kg (8818 lbs) to 25000 kg (55115 lbs)
- ⊕ Mining speed from 6 m/sec (19,68 ft/sec) to 16 m/sec (52,5 ft/sec)

### Containerized Mining Machines

- ⊕ Modular/ Containerized System
- ⊕ Reduced on site assembly and start up time
- ⊕ Individual modules/ containerized sections are factory assembled and tested
- ⊕ Mobile solution
- ⊕ Operational temperature -40 °C (-40 F) to +40 °C (+104 F)
- ⊕ Single-drum winding system-nominal drum diameter up to 2.7 m (8.5 ft)
- ⊕ Single-motor and double-motor models from 250 kW to 2 x 1250 kW
- ⊕ Asynchronous drive (PowerFlex 700AFE)
- ⊕ Maximum mining depth 1300 m (4265 ft)
- ⊕ Maximum static force in the rope 250 kN
- ⊕ Mining speed up to 8 m/sec (26.2 ft/sec)

### Windlasses

- ⊕ Single-drum, double-drum, also frictional disc windlasses, nominal drum/disc diameter up to 2,5 m (8,2 ft)
- ⊕ Single-motor from 70 kW up to 350 kW
- ⊕ Asynchronous drives with a frequency converter PowerFlex 750 or PowerFlex 700AFE
- ⊕ Static rope-pull up to 130 kN
- ⊕ Payload up to 7500 kg (16534 lbs)
- ⊕ Hoisting speed up to 3 m/sec (9,84 ft/sec)

### Individual drive/control/braking apparatus systems, etc.

- ⊕ DC and AC drives, synchronous drives (high-voltage drives series PowerFlex 7000)
- ⊕ Thyristor converter sets VARIANT
- ⊕ Frequency converter sets INVERT 7
- ⊕ Regulation set MODULEX with microprocessor regulator EMADYN
- ⊕ Frequency converter PowerFlex 750 (Rockwell Automation)
- ⊕ PowerFlex 700AFE controlled rectifier (Rockwell Automation)
- ⊕ High-voltage drives series PowerFlex 7000 (Rockwell Automation)
- ⊕ Control distribution with microprocessor systems CompactLogix 1769-L33ER (Rockwell Automation)
- ⊕ Auxiliary drive distribution
- ⊕ HV distribution
- ⊕ Disc braking units HPB 170 and HPB 200 alternative units Svendborg (408 or 515)
- ⊕ Model range HR5K, HR7K, HR9K of electro-hydraulic braking system with a constant braking momentum under the safety-brake mode
- ⊕ Model range of electro-hydraulic brake systems Reprimatic HR21K/B with several automatically adjusted values of the braking momentum under the safety-brake mode
- ⊕ Model range of electro-hydraulic braking systems Frenomatic HR11K, Reprimatic HR27K/B with a constant retardation under the safety-brake mode (independent of the polarity and load)
- ⊕ Electro-pneumatic braking system Sistonik PR6K
- ⊕ Model range of bearing lubrication system Tribonik III
- ⊕ Digitalized control panels with integrated central visualization system of operational and faulty conditions
- ⊕ Air-conditioned soundproof machinist cabins

### Remote monitoring system Transdatik

- ⊕ Constant data mining from the hoist controlling system and their transmission to the service center

### Mine signaling systems (Non-explosive design)

- ⊕ Redundant network of optical cables
- ⊕ Microprocessor control



## **Communication systems for transport-containers (Non-explosive design)**

- ⊕ Enable both phonic and signal communication
- ⊕ Hoist control from the transport-container is possible

### **Cages**

- ⊕ One-deck to four-deck design
- ⊕ Human, material, and mine wagon transport
- ⊕ High-capacity cages of 1840 x 6250 mm (6 x 20,5 ft) size with extensible or foldaway floors (inside height up to 10 m (32,8 ft)) for the transport of up to 240 people in one operation
- ⊕ Payload from 2500 kg (5511 lbs) to 16000 kg (35273 lbs); high-capacity cages up to 25000 kg (55114 lbs)

### **Skips and skip-cages**

- ⊕ Double-shell or single-shell design made of high-strength steel
- ⊕ Custom made types of container covers
- ⊕ Payload from 1500 kg (3306 lbs) up to 60000 kg (132274 lbs)

## **Fully automated loading and unloading skip stations**

### **Wagon pushers**

### **Tracked wagon circuits including tipper stations**

### **Fixed of suspended wheel leads**

### **Rope thimbles for hoisting and balancing ropes**

### **Rope-pull equalizers**

### **Rope-pull measurement systems**

### **Auxiliary mechanisms for hoisting rope replacement**

### **Wheel-off pulleys and strapping pulleys**

### **Reservoirs, chutes, hoppers including covers**

### **Chain creepers, shifters, swivels, indentations**

### **Belt and chain conveyors**

### **Mine ventilators including drives and frequency regulation**

## **Mining hoists and equipment for vertical and inclined transport in mines**

INCO engineering s.r.o. manufactures and delivers a full package of machines and equipment for vertical and inclined transport in underground and open-pit mines. Modernization and retrofit of older mining hoists and equipment utilizing the latest up to date systems and technologies, which are used in newly built machines, is another core competency of INCO engineering.

## **Complete solution from design to turnkey delivery**

INCO engineering competent and experienced team assures in house design and production. Turnkey onsite assembly and start up, warranty and spare parts form an integral part of our total portfolio.

## **Tradition and the present**

INCO engineering s.r.o., formally known as CKD Prague, is built on a strong foundation dating back to 1874 when the original company was formed.

### **Tradition**

The far-reaching tradition is supported by the following facts:

- 1877 the first steam-powered mining hoist was manufactured
  - 1896 the company commissioned the first electric-powered hoist
  - 1908 the first tower-mounted mining hoist with a frictional disc was commissioned
- Over time, the company has delivered almost 700 hoists as well as innumerable amount of related mining products to many countries of the world.



## Present

One of the state-of-the-art and also one of the largest hoists we ever manufactured, model 8K5032 for a Russian mining company, was produced in 2007. It is an eight-rope double-motor frictional disc hoist of a nominal diameter of 5000 mm (16,4 ft), and a total output of 11000 kW. This hoist is able to transport 55 metric tons of ore in one operation at 16,5 m/sec (54,1 ft/sec). The main shaft is 14 m (45,9 ft) long and is set in four anti-frictional bearings. The frictional disc rotation is controlled by 22 braking units, which act on two braking discs. The hoist has a fully digital drive regulation, and its systems are controlled by a set of three microprocessor systems, which are mutually interconnected by a redundant network. Its electro-hydraulic braking system Frenomatic is backed up manifold, reaching Constant Retardation under the safety brake mode. The machine is capable of skip-extraction in the fully automated mode and is equipped with an advanced visualization system to show operational conditions and alarms.

**INCO engineering s.r.o. is ISO 9001, ISO 14001 and ISO 18001 certified.**

## Advanced technology - a high degree of security and operational reliability

Global OEM Partnership with Rockwell Automation provides our customers access to the latest automation products and global services. We use the PowerFlex750 AC drives, the PowerFlex 700AFE controlled rectifier and also the most advanced range of high-voltage drives series PowerFlex 7000. For the regulation and safety of mining machines, we fully utilize control systems CompactLogix 1769-L33ER mutually communicating over an Ethernet network using the Common Industrial Protocol (CIP). The amount of cables is significantly reduced thanks to the consistent application of distributed inputs and outputs.

Our sophisticated electro-hydraulic brake systems Reprimatic Series ® and Frenomatic Series ® provides an electronic brake force control in all operating modes and are equipped with a system of identification of polarity and load of the machine at all times of the operation. Safety brake consists of three to four completely independent circuits. Safety braking process is carried out using one which is electronically controlled and its status is closely and continuously checked. Based on these controls, the system is ready to immediately activate another independent circuits. All of our brake systems are equipped with extensive security system that watches over the safety at every moment, regardless of the current operating mode.

Finally, traditional design and manufacture of precision mechanical parts of our machines is well-balanced as a whole, characterized by a high technological level and providing all our customers with the highest level of

**We believe in innovative perfection...**



## Emphasis on innovation

We continuously expand and improve our product range and services. One of the newest innovations are modular mobile hoists for shaft sinking in container design. This allows operation in a wide range of ambient temperatures -40 °C to +40 °C (-40 F to +104 F). They are equipped with thermal insulation, heating and air conditioning system and fully automatic fire alarm system. Two of these machines are working successfully and reliably for the second year at the mining company EuroChem-VolgaKaliy.

## We believe in innovative perfection

This sentence has become the company's motto, concisely expressing our invariable emphasis on designing invention during the process of development of new technologies, our passion for constant innovation of company's current products as well as our determination to improve and extend our services.

## Our priorities

Our priorities include high level of technical sophistication, guaranteed operational safety, top-notch operational reliability, extended service life, and economical convenience for the customer.

## Our objective

Our long-term objective is to fully satisfy the needs of our clients. It is our self-confidence based on tradition and experience, along with the ever increasing customer trust and satisfaction that help us achieve this objective.



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