Reliability at work

BUCYRUS

Operating Manual

Gearbox K-10 / K-10.1

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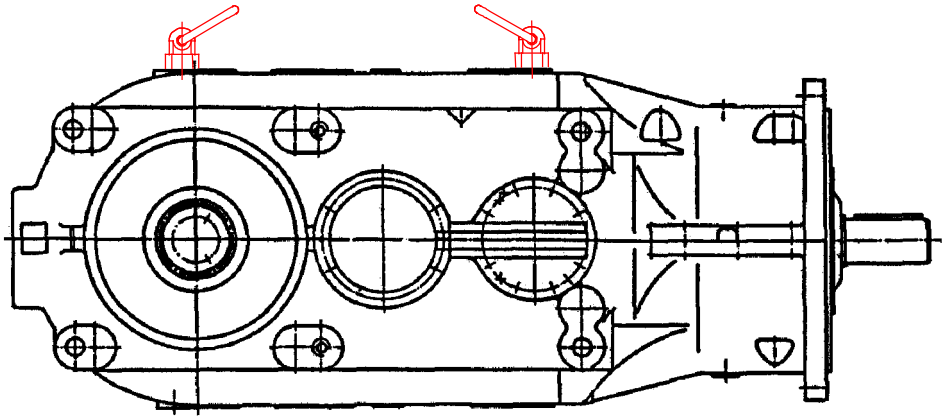
Translation of the original operating manual



Bucyrus Europe GmbH

Industriestraße 1 Phone: +49 (0) 23 06 / 709 - 0 Email: info@de.bucyrus.com

D-44534 Lünen Fax: +49 (0) 23 06 / 709 - 1421 Web: www.bucyrus.com

Your safety

This chapter provides vital information for your safety.

Pay special attention to this chapter. The safety instructions and rules of procedure are intended to help you avoid hazardous situations and perform the necessary work as safely as possible.

state of the art

The gearbox has been manufactured in accordance with the state of the art and generally recognized safety standards and regulations.
You and others can nevertheless be exposed to dangerous situations e.g. as a result of environmental influences, machine damage or operator errors.

Do not make any modifications or carry out conversions which could impair the safety of the gearbox. All modifications and changes must be approved by Bucyrus.

Only use original Bucyrus spare parts. Note the use of parts from other manufacturers will void the guarantee.

The European guidelines/standards which appear in this operating manual must be applied when the gearbox is being used within the member states of the European Union.
If the device is used outside the EU, the directives and standards which apply in those countries must be observed.

In addition to this operating manual be sure to also observe the respective legal provisions and regulations for accident prevention in your country.

Observe the safety and accident prevention regulations:

- of the mining company,
- of the mines inspectorate and
- of the mining supervisory authorities.

additional operating manuals

Please also read the operating manuals of components required for operation, e.g. conveyor, E-motor etc. carefully and thoroughly. Clarify any questions **before** starting work.

Personnel

Installation and repairs

As a fundamental rule, installation and repair work may only be carried out by personnel who have been adequately trained for these particular requirements.

Installation and repair work on:

- safety components (pressure relief valves, extinguishers, etc.)
- the electrical systems (controls, signaling devices, etc.)
- hydraulics

shall only be carried out by Bucyrus service engineers or by specially trained personnel of the mine.

Preservatives must be removed from the breather plug before start up if required. Gasoline, paraffin, diesel oil, wax remover or basic media can be used to do this.

Filters that are part of the gear oil circuit must be monitored regularly for the first months after commissioning.

Transport

Load units; dimensions and weights

It is imperative that you observe the transport sheets. They include information on:

- Dimensions
- Weight
- Lifting points and
- Centers of gravity.

Where technically possible, the load units have suitable lifting points for transport and erection.

Warning!
Use only load handling devices complying with the technical and legal regulations for transporting loads.
You could be seriously injured or even killed by falling loads.
Use only suitable load handling devices.

Before transport

temperatures below freezing

Transport of equipment at temperatures between -21 ºC and -40 ºC is only permissible when certain measures were taken to meet these conditions at the design and manufacturing stages. Nevertheless, the individual parts and devices of this equipment must not be subjected to sudden impact loads at such low temperatures and may only be loaded statically or quasi-statically.

During transport of this equipment with floor conveying devices at such low temperatures, measures must also be taken to ensure that the parts and devices are not subjected to sudden impact loads.
At very low temperatures and on poor roads, the transport vehicle speed must therefore be limited to max. 25 km/h for truck transport.

frost protection for the oil cooler

Before transporting gearboxes with oil coolers at ambient temperatures below the freezing point, flush out the oil cooler with anti-freeze.

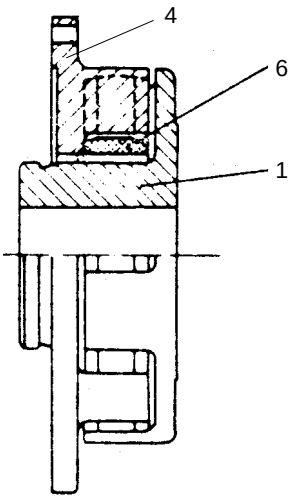
electrical and electronic components

Electrical and electronic components must be removed for overseas transport or prolonged storage outdoors, unless these components or the complete equipment is protected against harmful environmental influences by suitable packaging.
The electrical cables remain in the equipment. They must be carefully protected against transport damage and soiling of the connections.

Flexible coupling for operation with a fluid coupling

The coupling illustrated below is fitted between the E-motor and the Voith coupling and acts as a flexible connecting element. It compensates for minor radial, angular and longitudinal positioning errors which may arise from errors during installation.

Fig. 10: Flexible coupling



1 Coupling hub
4 Connecting flange
6 Intermediate ring

Installation and removal of the flexible plug-in coupling

Clean the bore on the coupling hub and lubricate using grease free from molybdenum. After mounting and securing the Voith coupling bolt the connecting flange on the coupling housing.

Mount the coupling on the motor shaft ends using a mounting device. The intermediate ring is fitted between both coupling halves.

Disassembly is carried out in reverse order.

Operation

Warning!
The casing temperature of the gearbox can reach 85 ºC.
You can burn or scald yourself on hot surfaces, the components screwed into them (dipstick, breather plug, gearbox sensors, heat exchanger, etc.) or hot, leaking oil (oil change).
Check the gearbox temperature and wait until the temperature has dropped to at least 60 ºC if necessary.
Observe the symbol plates on the gearbox.

Gearbox maintenance

Maintenance at regular intervals increases the operational safety and prolongs the service life of the gearbox.

Maintenance includes:

- Checking the functions
- Checking the bolted connections for secure fit
- Checking the oil level
- Performing regular oil changes
- Lubricating the gearbox
- Maintaining the breather plug
- Checking the gearbox bearings
- Cleaning the gearbox casing

Only use proper tools for maintenance work.

Important!
You should place a container with the tools required and the most useful replacement parts in the vicinity of the point of operation. Adequately protect the contents from dirt, dust and moisture.

Tightening the bolted connections

tightening torque

For bolted connections, the tightening torques of which are not listed in the corresponding operating manual or replacement parts list, the tightening torques according to EWN 6003 apply (list in chapter “Technical data”).

tightening bolts

The bolted connections listed in the following must be tightened 60 hours after initial start up and then once every 500 hours.

- drive connection assembly (motor and gearbox side)
- gearbox (attachment on the flange plate)

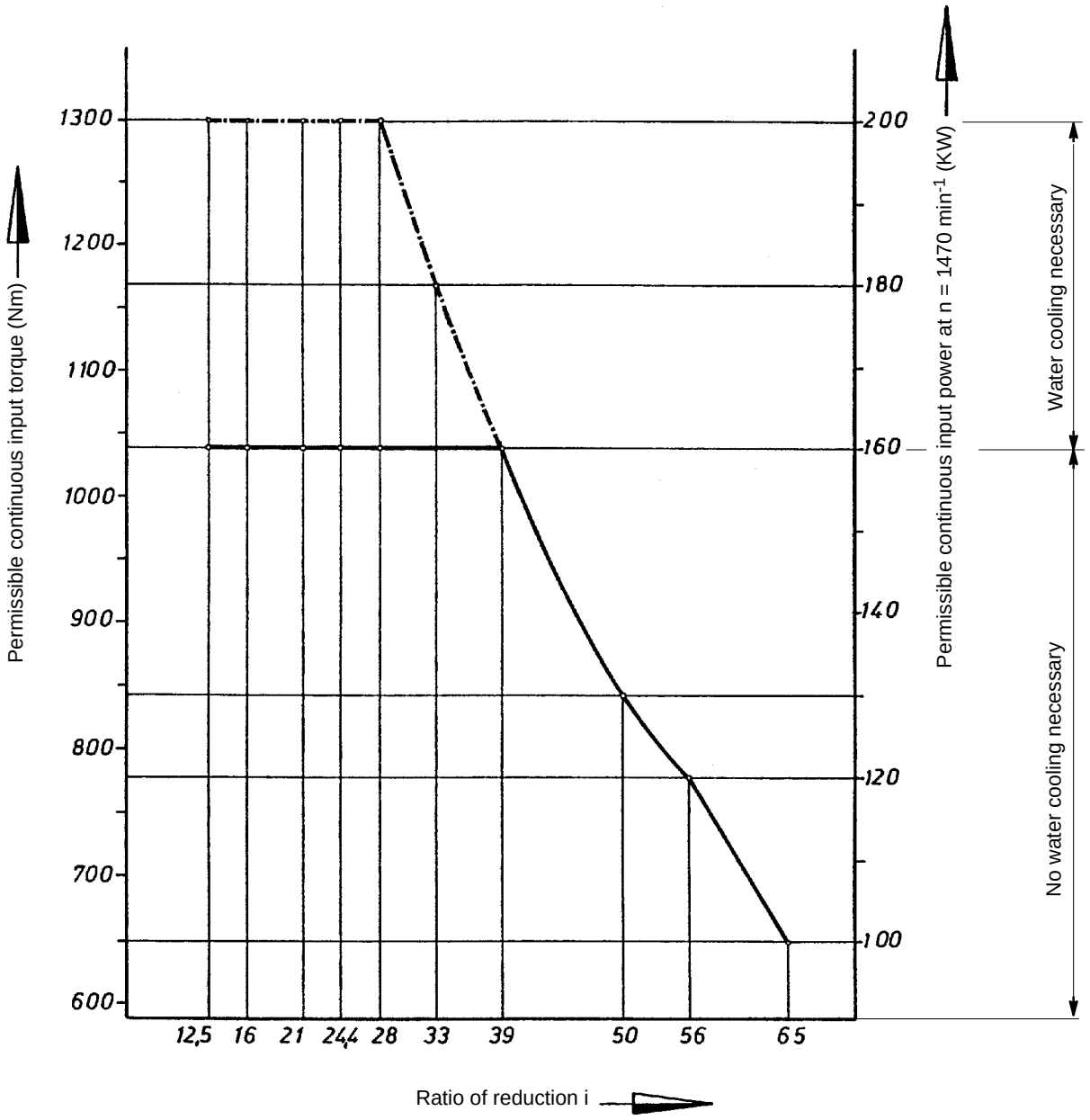
Checking the oil level

The oil level must be checked weekly when the gearbox is at a standstill. Foreign bodies must be prevented from penetrating the gearbox (see Chapter 6, “Oil levels and oil quantities”).

Insufficient oil impairs lubrication of the gears and roller bearing. Excessive oil results in high churning loss, oil foam and an increase in heat development.

Continuous power and continuous torque

Fig. 17: Gearbox K-10 - Continuous power and continuous torque



Gear oil requirements

Choosing the correct gear oil and carefully monitoring lubrication are important prerequisites for trouble-free operation. These factors also contribute to prolonging the service life of the gearbox.

Load-bearing capacity

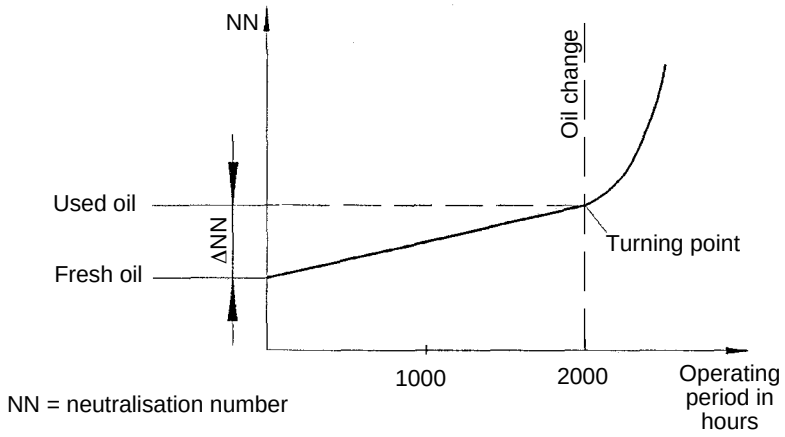
For mechanically testing gear oil according to DIN 51354, sudden changes in the upper wear profiles in all 12 power levels are not permitted in the GRC normal test A/8, 3/90 and the GRC special test A/16, 6/120. This means that the critical power level must be above 12.

In addition, the “specific change in weight” of the test gears m_S (specific wear) may not exceed 0.27 mg/kWh.

Ageing resistance

The gear oil must possess outstanding “thermostability” and “ageing resistance” for the oil changing interval after 2000 hours of operation.

Fig. 27: Neutralization number curve



The neutralisation number (NN) curve of mineral oils at actual operation of 2,000 hours and the permissible continuous temperatures must be prevented from reaching the point where it turns upward (see Fig.).

Kinematic viscosity

The gear oil should remain within the viscosity range of 210 to 320 mm^2/s at 40°C, with a high viscosity index.

Additives

- Wear EP protection
- Corrosion protection
- Foaming protection

Suitability

- Compatibility with commercial sealing elements