

## Levelok® CAGE HOLDING DEVICE

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### Frequently asked questions:

- QUESTION 1: What load can the clamps support?  
QUESTION 2: What load is there on the guide?  
QUESTION 3: What factor of safety is used on the clamps?  
QUESTION 4: How heavy are the clamps and powerpack?  
QUESTION 5: What material are the clamp shoes made of?  
QUESTION 6: What clearance is there between the shoe and the guide?  
QUESTION 7: Can the clamps clamp while the cage is in motion?  
QUESTION 8: How long does it take for the clamps to operate?  
QUESTION 9: How are the clamps fitted to the cage?  
QUESTION 10: Where should the powerpack and accumulator be mounted?  
QUESTION 11: What air supply is required to operate the system?  
QUESTION 12: What happens if the driver pulls away when the clamps are still clamped?  
QUESTION 13: What happens if a hose fails?  
QUESTION 14: Who is using this system at present?  
QUESTION 15: Why should I consider using the Levelok Cage System?  
QUESTION 16: What is delivery time on the complete Levelok Cage System ?

QUESTION 1: What load can the clamps support?

ANSWER: Clamps can be designed to suit any load conditions and the limiting factors are the strength of the guide and the shoe area. To date clamps have been designed for loads of up to 50 tonnes using four clamps. Please note that the clamps do not have to support the cage mass but only the load being transferred to or from the cage.

QUESTION 2: What load is there on the guide?

ANSWER: The clamping force on each guide is approximately 4 times the total mass to be supported divided by the number of guides. Thus if two clamps support a 10 tonne load, the clamp force on each guide would be 20 tonnes. The guide also has to be capable of supporting a vertical load equal to half the holding capacity of the clamps.

QUESTION 3: What factor of safety is used on the clamps?

ANSWER: All the clamp units are designed with a minimum safety factor of 5 on ultimate tensile strength. On clamping force, a safety factor of 2 is used.

QUESTION 4: How heavy are the clamps and powerpack?

ANSWER: The mass of each of the two clamps for the 9 tonne installation is approximately 150 kg (per clamp) while the mass of the powerpack is 20 kg. The total mass for two 9 tonne clamps installation would thus be approximately 325 kg. The larger capacity clamps will be proportionately heavier.

QUESTION 5: What material are the clamp shoes made of?

ANSWER: The material used is mild steel and the shoes are milled from a single piece of mild steel. This material has been found to be quite satisfactory under wet and dry conditions. In special cases we do use high grip friction materials which greatly increases the load bearing capacity of the clamps.

QUESTION 6: What clearance is there between the shoe and the guide?

ANSWER: The normal design clearance is 16mm so that there is virtually no possibility of the shoe making contact with the guide while the cage is in motion.

QUESTION 7: Can the clamps clamp while the cage is in motion?

ANSWER: No, the clamps are spring loaded to the open position and they can only be operated when an air supply is connected to the cage.

## Frequently asked questions:

QUESTION 8: How long does it take for the clamps to operate?

ANSWER: With the 9 tonne system, the time from the plug in of the air supply to fully clamped is approximately 6 to 7 seconds, but with a larger capacity unit the time will increase slightly.

Initially the clamp arms move into contact with the guide at low pressure and pressure is then built up by the action of a reciprocating pump until a stalled condition is obtained at the set pressure. The decompression period is adjustable by means of the metering pin and it has been found that a period of 4 seconds provides good results and does not give an excessive amount of rope oscillation when the clamps release.

The 4 seconds refers to a rope stretch of 600mm or more when material is being handled but where greater stretch is experienced and when men are being carried, the period may need to be lengthened.

QUESTION 9: How are the clamps fitted to the cage?

ANSWER: The clamps are normally fitted on top of the cage in place of the bridle roll brackets and the latter are bolted on top of the clamps.

Fitting clamps to the bottom of the cage is not recommended. If a load is added to the cage, the bridle channels are put into compression, a condition for which they are not usually designed.

In attaching the clamps to the bridle, adaptor plates may be required if holes do not match up, but in any event, all holding down bolts should be able to support the maximum clamp load with the required factor of safety. When fitting bridle roll brackets above the clamps, care must be taken to ensure that there is sufficient clearance between the wheels and the clamp arms, as on some installations, brackets have had to be modified.

QUESTION 10: Where should the powerpack and accumulator be mounted?

ANSWER: The powerpack should be located as close as possible to the clamp units and it can often be conveniently mounted on top of the cage or on the side of the main bridle cross member. A suitable cover should be provided to protect the powerpack and accumulator against spillage.

QUESTION 11: What air supply is required to operate the system?

ANSWER: On each level where the levelok system is to be operated, a filtered, dry and lubricated supply of air is required at 50 c.f.m. with a minimum pressure of 5 bar.

QUESTION 12: What happens if the driver pulls away when the clamps are still clamped?

ANSWER: An interlock system is essential to prevent the driver from trying to raise or lower the conveyance while the clamps are in operation. The design of the interlock system can vary from mine to mine, due to individual preferences, but the interlock system is normally arranged to isolate the onsetter's bell unit until pressure has been released from the clamp system. A slack and tight rope monitoring device with communication capability up the rope can be used to send a clamp release signal to the driver from the limit switches clamp.

We therefore have no standard interlocking system but we can put forward suggestions and recommendations.

QUESTION 13: What happens if a hose fails?

ANSWER: Air pressure is locked in the system by a check valve on the hose as well as a solenoid operated valve on the powerpack. The check valve in the hose will keep the air locked if the hose fails. Should the hydraulic hose/pipe between the powerpack and the clamp be severed, a clamp lock valve installed on the back of the clamp will retain 75% of the clamp pressure.

QUESTION 14: Who is using this system at present?

ANSWER: The first cage holding system was installed on a cage at Matchless Mine in Windhoek in 1970.

Notable systems installed:

- Falcon Bridge Craig Mine
- Falcon Bridge Kidd Creek Mine – Timmins Ontario Canada Hutchison Facility - USA
- Kopanang mine – South Africa
- Great Nologwa – South Africa
- Mponeng mine – South Africa
- Tau Lekoa mine – South Africa
- Target mine – South Africa South deep mine
- Twin Shafts – South Africa
- Tshepong mine – South Africa
- Moab Khotsong mine – South Africa

**Frequently asked questions:**

QUESTION 15: Why should I consider using the Levelok Cage System?

ANSWER:

- It permits safer loading and unloading of both men and material.
- Damage to equipment is prevented.
- Time and labour are saved as the onsetter / cage tender is able to lock the conveyance in position in a short time after it comes to rest.
- Installation is simple and no structural modifications are normally required to either the bridle, cage or shaft.
- Only the mine air supply is required to power the unit.
- One system on a conveyance can be used to clamp the conveyance at any level, provided an air supply is available.
- The system can be used with multi-deck cages.
- Clamp units can be supplied for any desired load, providing there is sufficient guide contact area.
- The clamp system can simply be interlocked with the shaft bell and winder safety system.
- No extra labour is required to operate the system at each station.
- Inspection and maintenance are minimal and the recommended spares holding is reasonable.

QUESTION 16: What delivery is offered on the complete Levelok Cage System?

ANSWER: Normally within 12 weeks.