SAFETY SYSTEMS WITH SELF-LOCKING FEATURE

AUTO-LOCK®

To lock a load or a movement during an unlimited length of time, to ensure the safety of a jack in case a circuit breaks down, to create a remote distance connection between two rotating elements, such are the three main functions of the self-locking safety systems named AUTO-LOCK®.

HYDROMECHANIQUE

QUIRI

when hydraulics rhymes with safety
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QUIRI HYDROMECHANICS: High standard components for to size installations
Definition of Auto-Lock.
It is a patented locking system based on the principle of the expansion of metals caused by a fluid under pressure.

Principle of operation «Auto-Lock» system.
The female part of the «Auto-lock» system has a bore inferior to the diameter of the male element on which it is mounted, thus creating a connecting friction caused by the elastic deformation of the metals used. The unlocking is obtained by hydraulic pressure evenly applied between the two surfaces in contact.

Reverse «Auto-lock» system.
Reversely to the previous system, locking is obtained through application of hydraulic pressure and unlocking through lack of pressure.

In both systems, deformation is proportional to pressure. The locking force of the Auto-Lock is calculated taking into account the minimum locking pressure.
THE AVAILABLE AUTO-LOCK DESIGNS

Autonomous « Auto-lock » system.
This system makes it possible to implement locking in any direction (translation-rotation, simultaneous translation and rotation) over long strokes. It is independent from the motor system. Mounting should be carried out at the factory by means of a conical tool which has to be adapted onto the end of the rod.

Linear jack with « Auto-Lock » on rod.
This system combines the advantages of a hydraulic jack with those of an integrated locking system. The locking capacity of the « Auto-Lock » system is independent from the efforts carried out by the jack.

Internal «Auto-Lock» jack also called «Auto-lock» on crosshead.
Whilst this system has the same characteristics as the previous one, it is also particularly adapted to aggressive environments which need a special protection of the rod.

Rotating jack with « Auto-Lock » on axis.
This system combines the advantages of a rotating jack with those of an integrated locking system. The locking capacity of the « Auto-Lock » system is independent from the torques carried out by the jack.

THE IMPLEMENTED FUNCTIONS

Locking of a load.
* the system is able to lock an important load and to keep the position with great precision during an unlimited length of time.
* the locking does not modify the position that was reached before it was implemented. Thus, positions that have been reached by an automatic control unit with a precision of 1/100 mm may be kept during an unlimited length of time.
* the stroke is not limited and there exists an infinite variety of locking positions.
* the control of the locking may be remote.
* the locking is insensitive to vibrations as well as to temperature variations.

Keeping up safety.
* the system functions through lack of pressure and is automatically a follower (locking in case of piping rupture or through lack of energy source).
* in case of accidental overloading, the rod will slide and the Auto-Lock will act as a brake. Provided the sliding is accidental and not repetitive, it will not bring about any damage.

Connection of two elements.
* the autonomous form of the « Auto-Lock » system makes it possible to connect two rotating and translating elements.
* this connection may be remotely removable and adjustable.
CHOOSING AN AUTO-LOCK SYSTEM

* the choice of the system type, « Auto-Lock »
on rod, internal on crosshead, depends mainly
on the environment.
* the choice of the unlocking pressure
200-300-500 bar (or other upon request):
* depends on the available space requirement,
* depends on the pressure available in an
existing hydraulic power unit.
However, it is recommended to choose a
pressure of 500 bar, when there is no
particular contraindication.

Selection abacus for linear
and rotating « Auto-Lock »
This chart makes it possible to determine
the diameter of the rod according to the
unlocking pressure and to the effort or
the torque that has to be locked.

Examples: Force to be locked: $4.5 \times 10^4$ N
Dimensions of the Auto-Lock for an unlocking pressure of:
- 500 bar: Ø 87 mm. Choose 90 mm
- 300 bar: Ø 116 mm. Choose 120 mm
- 200 bar: Ø 147 mm. Choose 150 mm

Torque to be locked: $2.0 \times 10^3$ N.m
- 500 bar: Ø 185 mm. Choose 190 mm
- 300 bar: Ø 238 mm. Choose 240 mm
- 200 bar: Ø 260 mm.
THE CHOICE OF AN AUTO-LOCK SYSTEM

Maximum space requirement for Auto-Lock system on rod (for unlocking pressure of 500 bar).
Space requirements are reduced when locking forces are lower than those indicated.

<table>
<thead>
<tr>
<th>Locking force $10^4$ N</th>
<th>Ø d mm</th>
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<th>L mm</th>
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</table>

Special executions on request.
Technical sheets available on request.

THE LIMITS OF USE

* unlocking pressures 200-300 and 500 bar for standard models, 600 to 1000 bar on request.
For a given space requirement, the locked load is proportional to the unlocking pressure.
For very low pressures, the tube becomes very thin, there is therefore a risk of reaching high compression and traction stresses. It is recommended to use pressures ranging from 300 to 500 bar.
* temperature range - 50°C to 150°C (Auto-Lock system in accordance with NATO specification).
* the « Auto-Lock » system cannot be used as a brake systematically, however, an accidental sliding does not damage it.

To avoid the slipping of the lock, it is necessary mainly as far as lifting of loads is concerned, to take up the effort hydraulically before unlocking the lock (thanks to a pressure sensitive switch).

* lifetime : very frequently superior to 1 million operations. The working stress has been chosen so as to be inferior to the fatigue limit.
* the « Auto-Lock » system necessitates extremely clean hydraulic circuits.
* the protection of the rod is indispensable in any corrosive environment and with shock risks (iron and steel industry, civil engineering works).
APPLICATION FIELDS OF AUTO-LOCK

Application examples
The fields of application of the system come in a great number and variety.


APPLICATION FIELDS OF AUTO-LOCK


auto-lock with linear and rotating jacks

Positioning and locking the bedplate of a heavy milling machine. Grafenstaden.

auto-lock without jack

STUDY OF A CASE

Requirement:
to lift and lower a load with long lasting locking between two successive movements.

Lifting of load
* feeding of the «Lock» through charging of the EV1 and EV2 coils.
* when the unlocking pressure is reached, the pressure sensitive switch Pm cuts off the supply of EV2 and allows the charging of ED1. The jack functions like a normal jack.
* stopping of the movement through cutting off ED1.
* locking of the «lock» through cutting off EV1.

Lowering of load
* re-pressurising of the jack on the thrust side in order to avoid the sliding of the rod during unlocking of the «Lock».
The pressure sensitive switch Pm has memorised the initial pressure in the jack. Once this pressure is reached, the switch Pm communicates the information and allows the unlocking of the «Lock».
* charging EV1 and EV2 up to the unlocking pressure.
* the pressure sensitive switch cuts off EV2 and allows charging of ED2.
* stopping of the movement through cutting off ED2.
* locking of the «lock» through cutting off EV1.
Machine-tools - clamping sytems
* Positioning plate 2 and 3 axis
* Anti-vibrating stops on machine-tool
* Adjusting and positioning of machine-tool
* Locking of press bearings
* Adjusting and locking of pressure pad
* Locking of rolling mill housings
* Clamping systems

Material handling - Transport
* Tippers of steam generators
* Handling and locking of loads on ships
* Launching pad
* Special elevators

* Door lifting
* Handling of paper coils
* Locking of material handling trucks on drilling platforms
* Personnel elevators in a gallery
* Wagons for special heavy transport
* Lifting of trains of wagons
  (replacing of axles)
* Lifting of underground trains
  (replacing of axles)
* Locomotives with axles with variable spacing
* Positioning of mobiles appliances

Civil engineering works
* Prestress benches (manufacturing of beams)
* Positioning of blades on dozer

Test benches
* Loading bench for gearings
* Test bench for dampers
* Test bench for landing gear
* Marine test bench for couplings
* Reactor test bench
  (fixed point silencers)
* German-Dutch wind tunnel
* Wind tunnel test bench
* Test bench for car dampers

Graffenstaden for (Peugeot) forest Liné
Bema for Alsthom-Atlantique
De Dietrich - Renault
Arques Crystal and Glass Making
ACB
Spiertz
Steel factory of Nouve-Maison
Krupp (W. - Germany)
Caillard for Technicatome
French Navy
Hydro Air, SNIAS
Bracq-Laurent (for COGEMA La Hague)
Verboom (for COGEMA La Hague)
La Rochette Cenpa
TOTAL OIL (Scotland)
S.D.E.M.
Remafer - STSI
SOTRAMEF - TRANSFESA
SOTRAMEF - MATRA-VAL
SOTRAMEF
Marrel
PPB Saret
GTM

BOET, AIR-FRANCE, SNECMA
NMF (Netherlands)
ONERA
SOPEMEA

▲ Axles with variable spacing. The AUTO-LOCK system ensures the variation of the spacing and the locking into position (SOTRAMEF patent).
▲ Change of gauge for train wagons at Hendaye and Cerbère (next to Spanish border).
The Hydraulic department.

Quiri's hydraulics department has more than 25 years experience in industry. It forms an important division of an industrial group that has more than a hundred years of age and is internationally renowned for the conception and realization of industrial refrigerating installations.

A complete catalogue of components and hydraulic appliances.

The first standard jack in France was manufactured by QUIRI. It used to be called a name known by many: LUKAS. Then LUKAS became QUIRI 500, which now covers a range of 89 jacks for all uses from 6 to 500 tons.

Apart from the QUIRI 500 range, the division proposes components and classical appliances: jacks, distributors, pumps... which cover most of the users' needs. Three ranges of very performant products are the highlights of the catalogue: automatically controlled jacks and two self-locking high safety jacks: AUTO-LOCK and SECURI-LOCK.

An engineering and design department dedicated to factory automation and robotics

Using QUIRI - or other trademarks - components and appliances, the engineers and technicians of the engineering and design department are at your disposal.
A production unit centered on quality.

In addition to the workshops situated near the registered office, QUIRI has a new factory site situated near Strasbourg.

The factory is equipped with ultra-modern machines, some with numerical control. The machining and assembling sections, the test station, the metallization installations as well as sand blasting, pickling, painting, stocking ... are served by mobile bridges weighing from 3 to 10 tons and allowing the implementation of the biggest equipments. All implementation phases, from material checking to acceptance tests after assembly, are supervised by a « Quality-Insurance » Engineer and a Test Engineer. The latter also supervises, in collaboration with the engineering and design department, all operation, endurance and check-out tests and trials of the new materials.

Thanks to this set of procedures, we are able to ensure that our customers are served with the quality they are looking for.

Stocks and after-sales service.

Our factories keep in permanent stock jacks and other standard appliances as well as the parts they are made of, all of which are delivered upon receipt of order or, in case of emergency, after a simple phone call or telex.

The after-sales and breakdown services are ensured either on our factory site or on the site on which the equipment is being used.