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SIGUREN
failsafe movement

MotoSuiveur Solutions

Technology Overview

September 2021

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Contents

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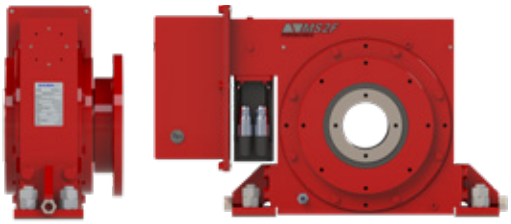
Introduction



MotoSuiveur Solutions were developed with a singular purpose: to enable industrial crane operators to do their most demanding work in the safest and most convenient conditions.

After an easy integration into any hoist, MotoSuiveur Solutions will inherently arrest unsafe hoist motion instantly, regardless of the type of failure: mechanical, control or electrical. MotoSuiveur Solutions thereby comprehensively protect the load, the crane and the plant personnel.

Crane professionals get all the advantages of a paradigm shift from "monitoring+emergency braking" reactive systems to fail-safe solutions that permit hoist motion only within secure boundaries and safely arrest and hold the load when faults occur.

These advantages include incredibly short arrest distances of 20 mm (100x less than reactive systems), the total eradication of overspeeds, extended life cycle for all crane components by safely capping static and dynamic overloads, remote load recovery even after hoist failure, light and easy maintenance and more.

Fail-safety is the highest form of safety, now it is finally accessible and easy to implement on all industrial hoists with minimal modifications. Costly and complex hoists replacements can be avoided while obtaining superior safety performance.

This white paper gives you the keys to how MotoSuiveur technology benefits your cranes and crane operators, takes you through the steps of retrofitting a MotoSuiveur Solution and demonstrates the advantages of operating a MotoSuiveur-Secured hoist.

Introducing MotoSuiveur Solutions.

Product Overview

MotoSuiveur-Secured Hoist
A hoist layout integrating a MotoSuiveur Solution in the kinematic chain and controls.

Key Features

Benefit from absolute Fail-Safety. Fail-safety is the highest form of safety. A fail-safe hoist will inherently default to a safe arrested state when its operation is disrupted by a fault condition.
Simply integrating a MotoSuiveur Solution renders any hoist fail-safe.

MotoSuiveur (MS) hoist fail-safety is:

- **Comprehensive** - All hoist fault conditions are covered.
- **Hoist-wide** - Hoist fail-safety is ensured regardless in which hoist component the fault condition occurs.
- **Instant** - No reliance on feedback loops means no reaction delay. Off-limits hoist motion inherently brings MotoSuiveur-Secured hoists to a safe arrest within 0,1s and 20 mm.

MotoSuiveur-Secured hoists benefit from 20 mm arrest distances in case of failures such as mechanical ruptures of the kinematic chain. That's up to 100x shorter than arrest distances for "state-of-the-art" detection-reaction systems relying on sensors, switches and brakes.

Unlock your hoist's capabilities. Current safety solutions inhibit hoists from being used to their full potential. Once your hoist is MotoSuiveur-Secured, previously impossible or complex operations become routine:

- protecting the kinematic chain with a torque limiter,
- recovering hanging loads during power failures,
- testing the hoist's arrest capacity to their full extent, etc.

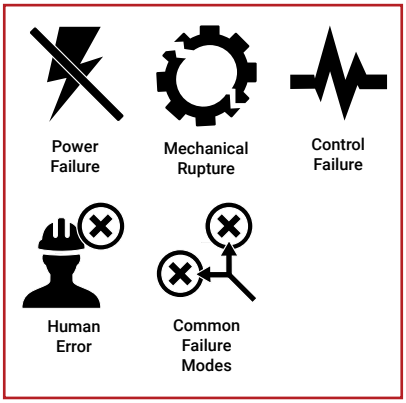
Simplify hoist modernizations with easy retrofits. Modernizing existing hoists has many upsides compared with full replacement but can be impossible in practice because of spatial constraints or regulatory requirements. Retrofitting a hoist with MotoSuiveur is exceptionaly convenient thanks to its compactness, flexibility and resulting superior safety.

Extend your hoist's lifecycle. With absolute fail-safety guaranteed, preserving the hoist and whole crane from overloads and shocks becomes possible without the risk of an uncontrolled lower. They can now be mechanically filtered out with a simple torque limiter. The MotoSuiveur Unit itself has an outstanding lifecycle as it has no wear parts.

Eliminate risk from hoist management. Maintaining and servicing your hoist is no longer safety-critical. This means that the worst that can happen is a safely immobilized hoist, never an uncontrolled lower of the load.

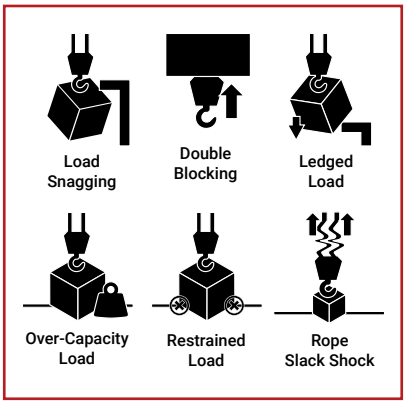
Covered Hoist Faults and Failures

MotoSuiveur-Secured hoists are comprehensively protected against fault conditions and failures that would otherwise lead to accidents.

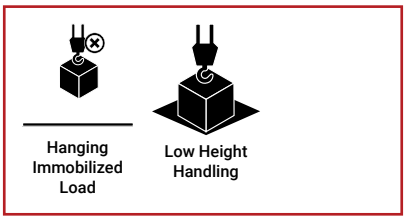


Hoist failure root causes.
Regardless of their origin, faults that disrupt hoist motion inherently result in safe arrests. Hoist fail-safety also means that the usual problem of common failure modes between hoist and the safety equipment is irrelevant for MotoSuiveur-Secured hoists.

Overspeed Prevention.
Overspeed is simply physically prevented on MotoSuiveur-Secured hoists. It cannot happen.



Overload scenarios.
Static and dynamic overloads and shock loads are mechanically capped to protect the hoist.

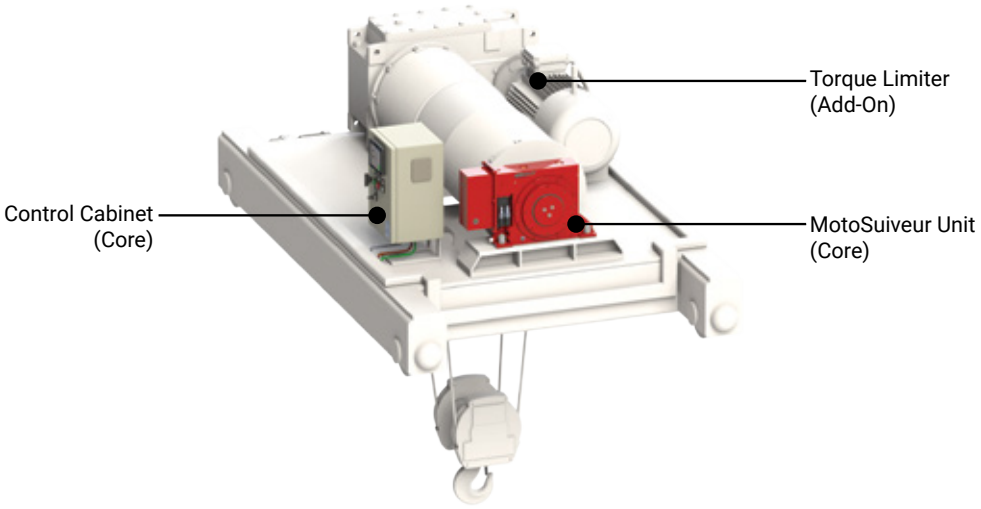


Hazardous situations become routine.
Risk is removed from what would otherwise be delicate or perilous situations requiring expert handling.

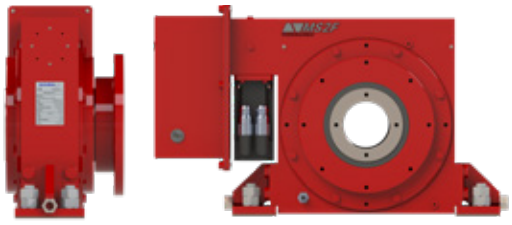
What is a MotoSuiveur Solution?

MotoSuiveur Solutions are composed of a MotoSuiveur Unit, its control cabinet and add-on systems. They are configured to the requirements of the hoist use case and interfaced with the hoist kinematic chain and controls.

MotoSuiveur Solution Core. The MotoSuiveur Unit inherently provides fail-safety to the hoist should fault conditions occur. During normal hoist operation and for load recovery, it is controlled by a dedicated Control Cabinet.



MotoSuiveur Units come in 8 different sizes according to the arresting torque they provide (see also p.10).



MS2F MotoSuiveur Unit
A hoist layout integrating a MotoSuiveur Solution in the kinematic chain and controls.

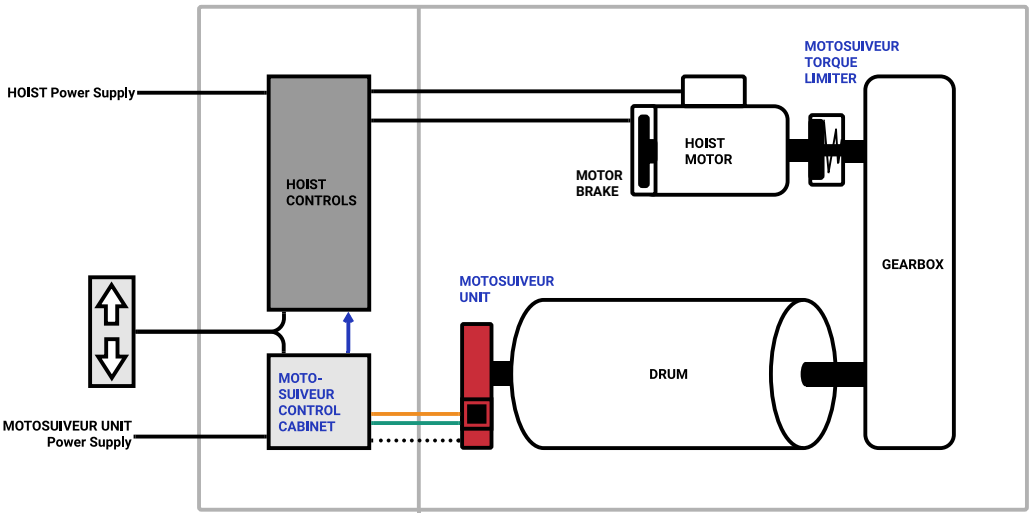
MotoSuiveur Unit Series	Maximal Arrest Torque	Speed at Drum Shaft
MS0F	2,400 Nm	Up to 80 rpm
MS1F	6,100 Nm	
MS2F	12,600 Nm	
MS3F	23,000 Nm	
MS4F	40,000 Nm	
MS5F	63,600 Nm	
MS6F	130,200 Nm	
MS7F	225,000 Nm	

Add-on Systems for MotoSuiveur Solutions. “Add-on” systems extend the MotoSuiveur Solution Core to take full advantage of the fail-safety it provides. They add groundbreaking functionalities to the hoist:

- Preserve the hoist from overloads with the MotoSuiveur Torque Limiter,
- Easily recover loads when the hoist’s kinematic chain is out-of-service with the Integrated Load Recovery Drive.

Mechanical Interface. MotoSuiveur Units need to be mounted on the trolley and connected to the hoist drive train. These “mounting” and “driving” mechanical interfaces are realized on a per-project basis according to customer needs and the existing hoist conditions.

Control Interface and Power Supply. MotoSuiveur Solutions controls are independent from the hoist’s.



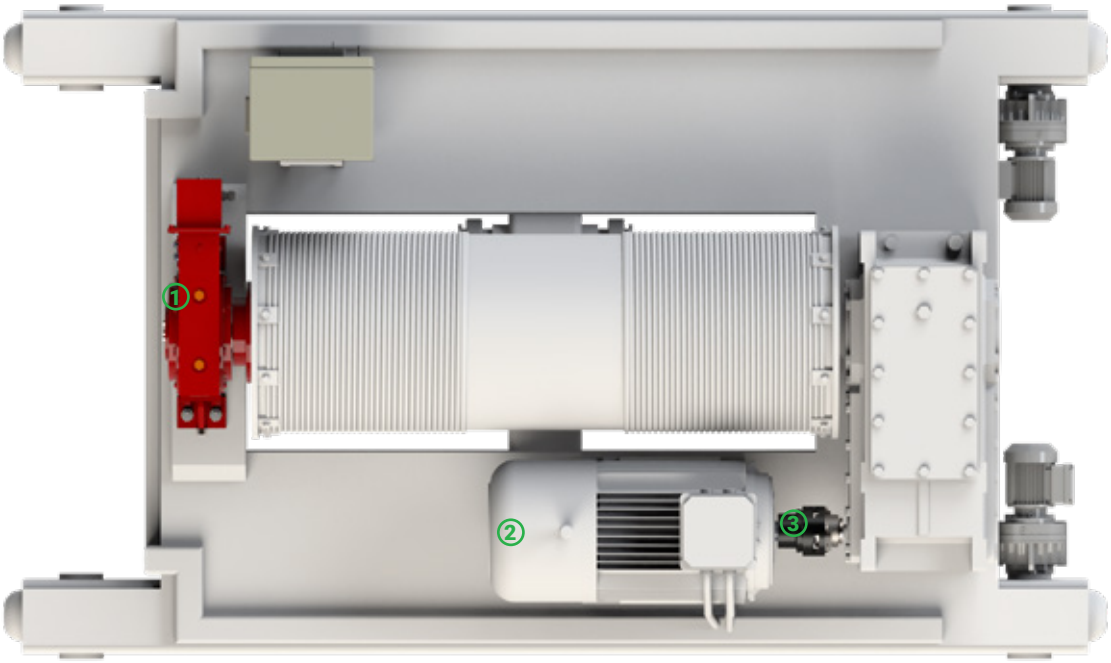
MotoSuiveur-Secured Hoist Kinematic Chain and Controls Diagram

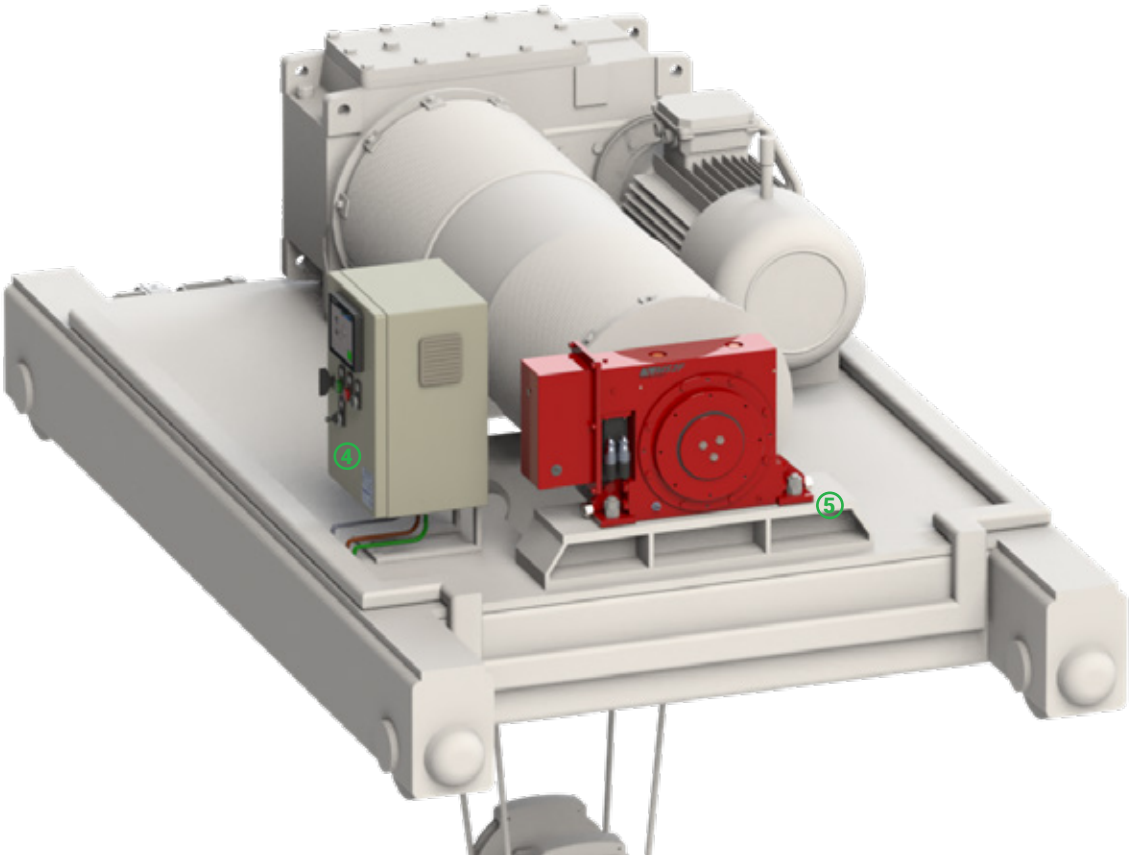
MotoSuiveur Control Cabinet
MotoSuiveur Status
Actionable information
Compact

User Interface. The user interface displays information about hoist operation and the MotoSuiveur Solution’s status. No inputs needed during normal operation.

Configuration and calibration. To match customer needs for hoist speed and arresting torque, a MotoSuiveur Solution is configured by mechanical, electronic and firmware adjustments.

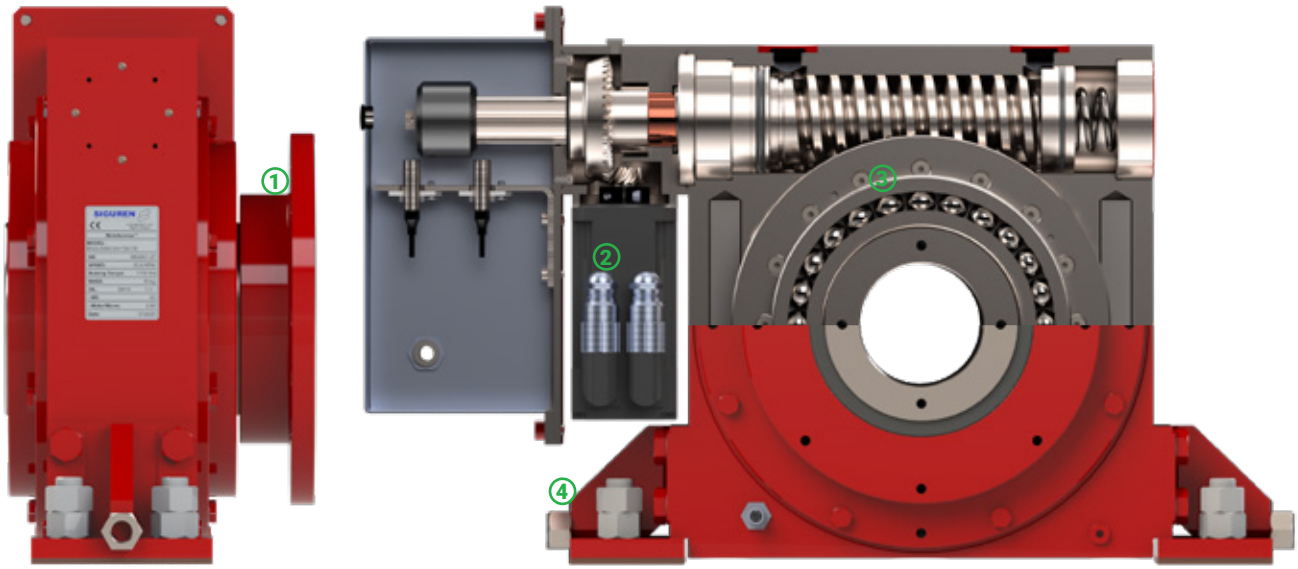
MotoSuiveur-Secured Hoist

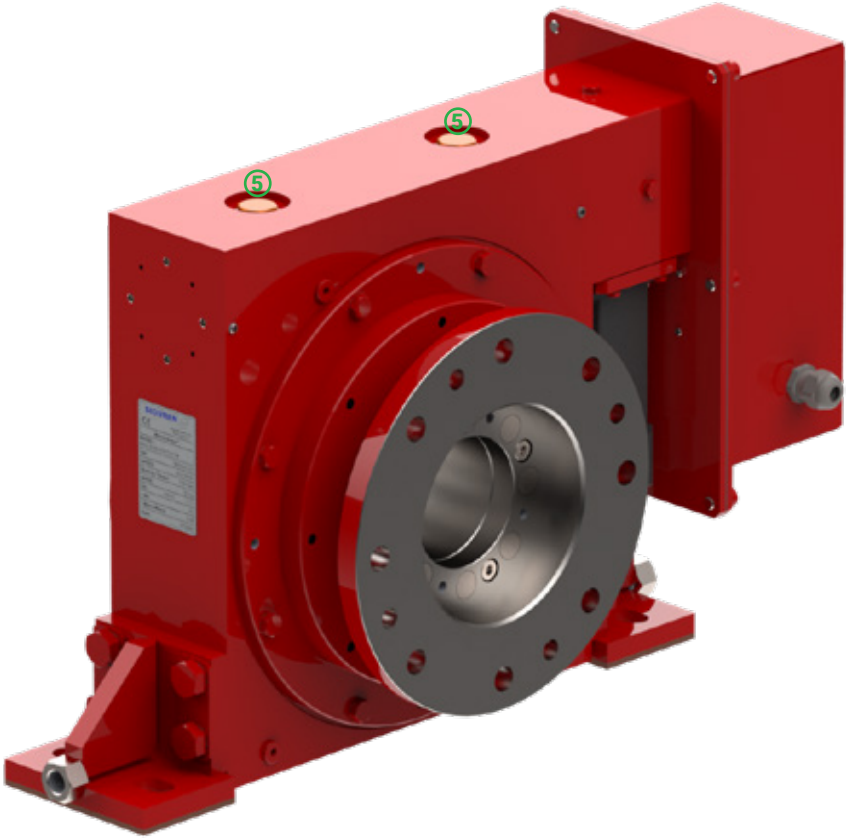




① MotoSuiveur Unit
② Hoist Motor with Brake
③ MotoSuiveur Torque Limiter
④ MotoSuiveur Control Cabinet
⑤ Mounting Seat

MotoSuiveur Unit





① **Drum adapter flange**
Custom for every application

② **Servo motor**
with Power and Resolver connectors

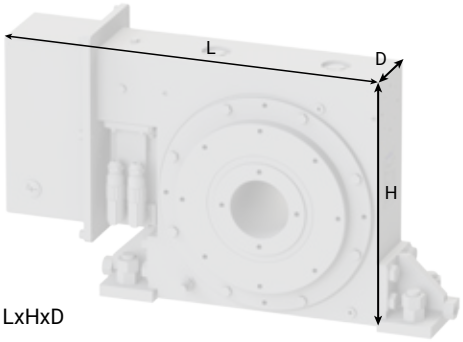
③ **Heavy-duty bearing**
For Drum Bearing by MotoSuiveur

④ **Mounting feet and Positioning sockets**

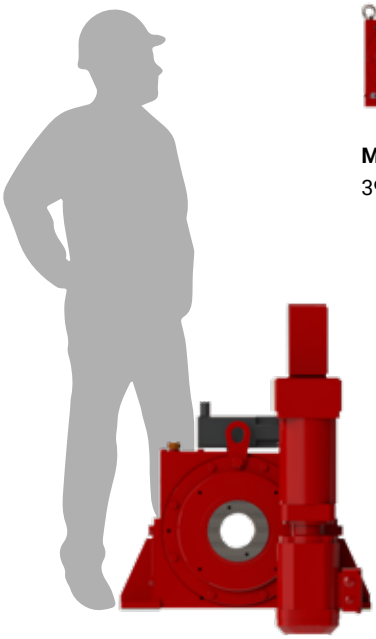
⑤ **Inspection and maintenance plug**

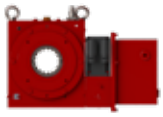
MotoSuiveur Unit Product Range

Please note:
The MotoSuiveur Units pictured here present various combinations of spatial configurations, mounting and driving interfaces.
They are intended to represent simultaneously the 8 sizes **and** the powerful customization possibilities of the MotoSuiveur Unit (see p.27).
The dimensions and weight featured beneath each size are for base models (in the configuration pictured in gray directly to the right) and are intended to give a general understanding of our products.

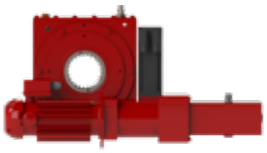


LxHxD

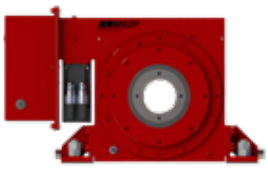




MotoSuiveur Unit MS0
391x239x117, 24kg

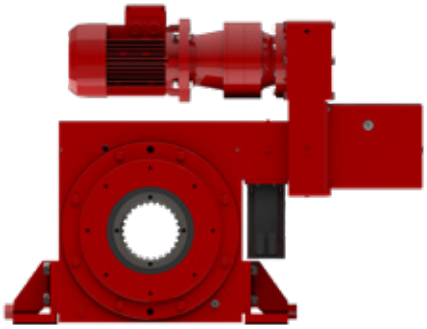


MotoSuiveur Unit MS1
432x300x130, 55kg

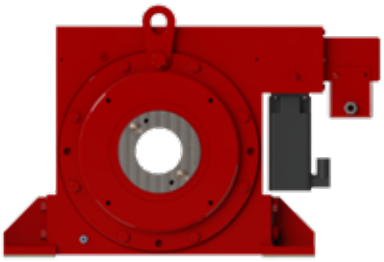


MotoSuiveur Unit MS2
531x375x163, 110kg

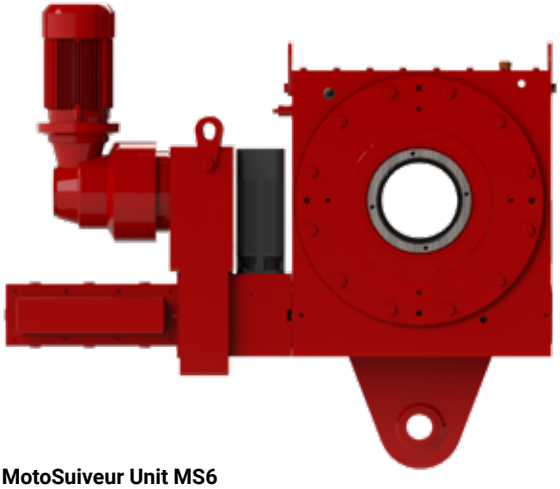
MotoSuiveur Unit MS3
594x450x183, 185kg



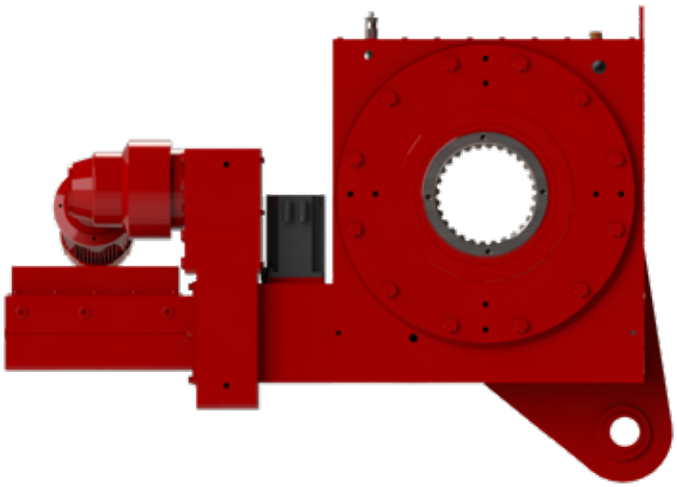
MotoSuiveur Unit MS4
691x525x220, 295kg



MotoSuiveur Unit MS5
761x600x254, 430kg



MotoSuiveur Unit MS6
892x750x305, 850kg



MotoSuiveur Unit MS7
1069x900x370, 1450kg

Safety Before Operation

The Case for Fail-Safe Hoists

MotoSuiveur technology is the result of an uncompromising approach to hoist safety, stated as:

Providing technical means to hoists to
strictly put safety before operation, safely manage load arrests,
while maintaining a simple and convenient hoist design.

Speed monitoring systems found wanting. Currently dominant “detection-reaction” systems monitor hoist operation electronically, look for signs of failure modes by comparing their measurements against target values and then decide whether to trigger emergency braking as a countermeasure. These complex systems demand meticulous maintenance to perform, provide only a partial coverage of hoist fault conditions and, finally, suffer from inherent delays that systematically translate into dangerous rope payouts.

Enter fail-safety. A hoist that “puts safety before operation” is, in effect, a fail-safe hoist. In the event of a failure, a fail-safe system inherently responds in a way that causes no harm to personnel, to other equipment or to its environment. A fail-safe hoist will actively permit only safe operation, and default to a safe arrested state when operation is disrupted.

Fail-safe systems are used in a very limited manner, for example in spring-applied brakes, but their incredible potential is virtually untapped. MotoSuiveur Solutions expand their benefits to the whole hoist.

MotoSuiveur hoist fail-safety is:

- Comprehensive - All hoist fault conditions are covered.
- Hoist-wide - Hoist fail-safety is ensured regardless in which hoist component the fault condition occurs.
- Instant - No reliance on feedback loops means no reaction delay. Off-limits hoist motion inherently brings MotoSuiveur-Secured hoists to a safe arrest.

Fail-safety is the highest form of safety, it is now available for all hoists thanks to MotoSuiveur Solutions.

Permissive-Mechanical-Passive Safety

Fail-Safety is delivered to the hoist by the four “core functions” of MotoSuiveur Solutions: two “Permissive” functions, one “Mechanical” and one “Passive”.

Combined, they provide the necessary and sufficient means for a MotoSuiveur-Secured hoist to fulfill its mission to “permit only safe operation, and inherently go to a safe arrested state when operation is disrupted”.

Permissive safety functions

Open-loop systems do not monitor nor measure the condition of their output signal as they have no feedback.

Open-Loop Mechanical Clearance

Open-Loop Electrical Power Cap

Open-Loop Mechanical Clearance.
Ensures that hoist motion is mechanically confined within safe boundaries by continually clearing the way for motion to proceed.

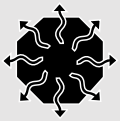
Open-Loop Electrical Power Cap.
Ensures that hoist speed is physically limited by capping the voltage input of the MotoSuiveur Unit’s motor. Ensures that MotoSuiveur Unit’s motor torque is insufficient to affect hoist motion.

Mechanical safety function

Driving Irreversibility

Driving Irreversibility.
Ensures that torque transmission is possible in only one direction: from the MotoSuiveur Unit to the hoist. In the opposite direction, transmission is physically impossible and the MotoSuiveur-Secured hoist self-locks mechanically.

Passive safety function



Embedded Energy Dissipation

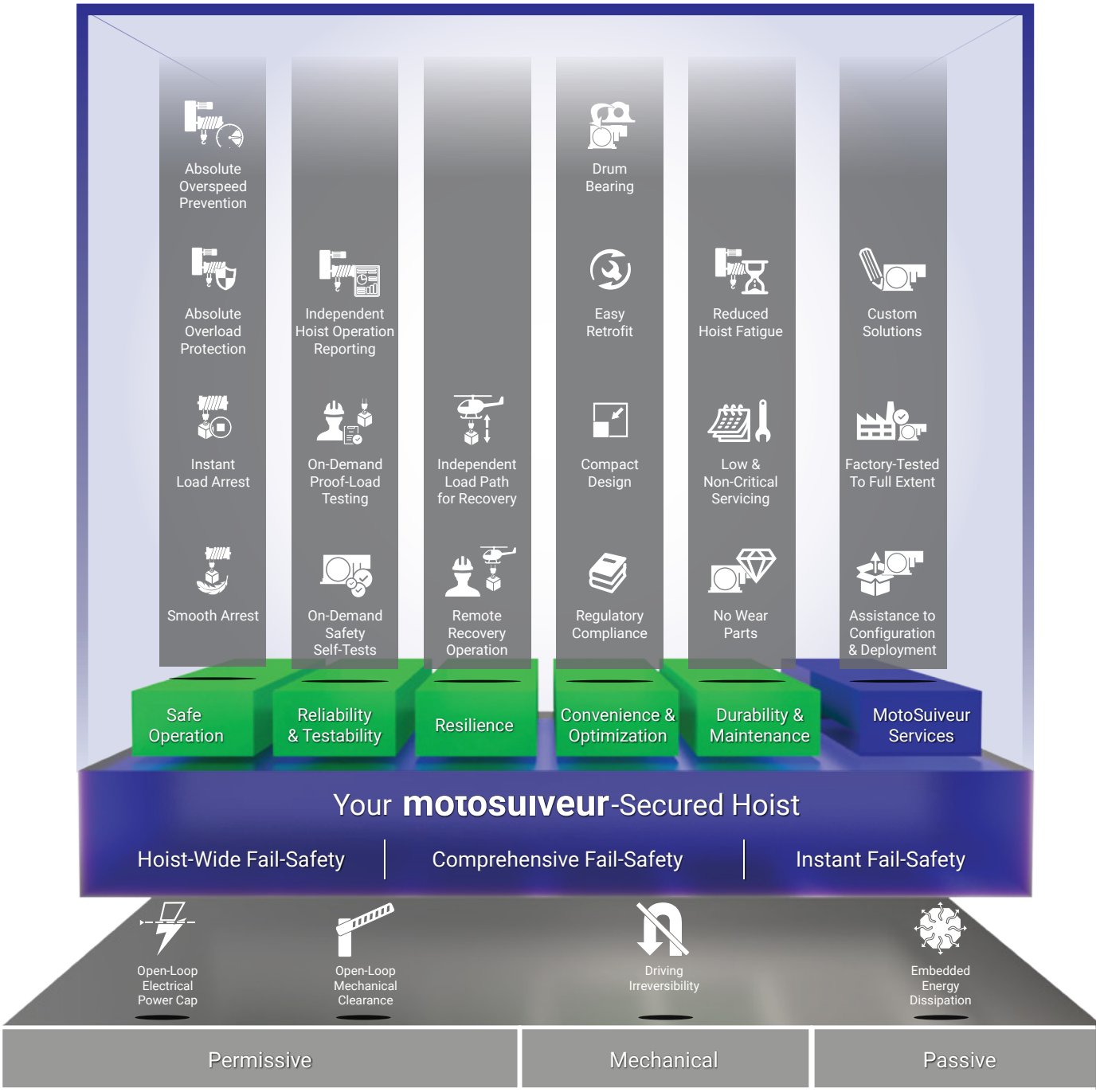
Embedded Energy Dissipation.
Ensures smooth arrest by efficiently dissipating excess kinematic energy whenever the MotoSuiveur-Secured hoist self-locks.

These "core functions" are achieved by the "core systems" (see p.14).

Capabilities of your MotoSuiveur-Secured hoist

Your hoist's true potential. Retrofitting your hoist with a MotoSuiveur Solution renders it fail-safe. With such a level of safety assured, we are free to to realize the full potential of your hoist with previously impossible capabilities (such as absolute overload protection and remote load recovery), design optimizations, an extended lifetime, more convenient maintenance, etc.

Your MotoSuiveur-Secured hoists are truly in a class of their own.



Tip: You can navigate this document by selecting icons on the visual above.

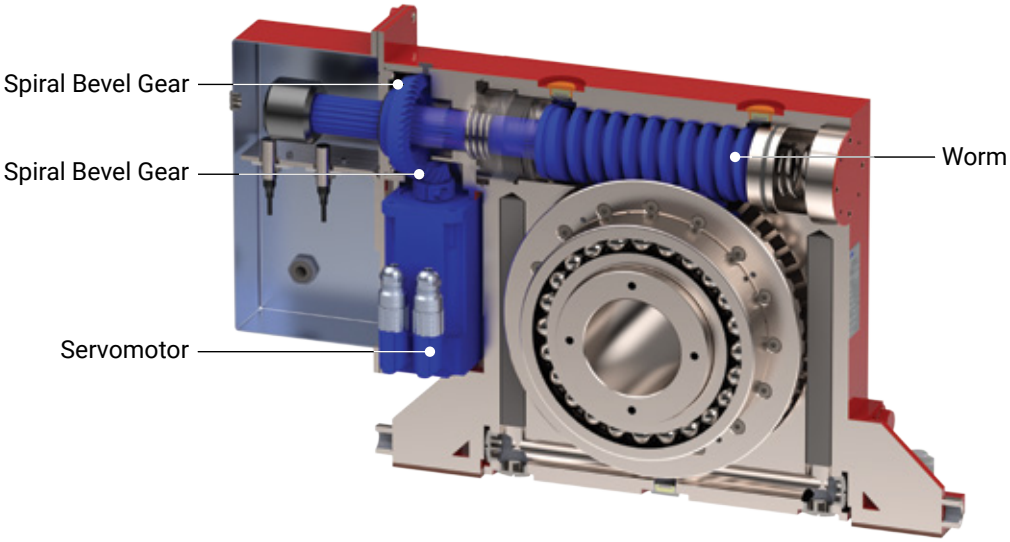
MotoSuiveur Core Systems

Engineering hoist fail-safety. The "core functions" of MotoSuiveur fail-safety are realized by the tight integration of 3 main electro-mechanical systems within the MotoSuiveur Solution. They are designed to fulfil their respective safety roles without reliance on sensors or switches. They are complemented by an additional system for positioning that is non-critical for safety.

Let's dive in.

Worm Driving System

The Worm Driving System consists of a brushless servomotor mounted to the casing of the MotoSuiveur Unit, with permanent magnets and resolver, driving the worm through a set of bevel gears. The bevel gear on the worm is axially free to translate along the worm shaft.



MotoSuiveur Controller
Controls the servomotor in Torque Mode to achieve "following"

Independent Following

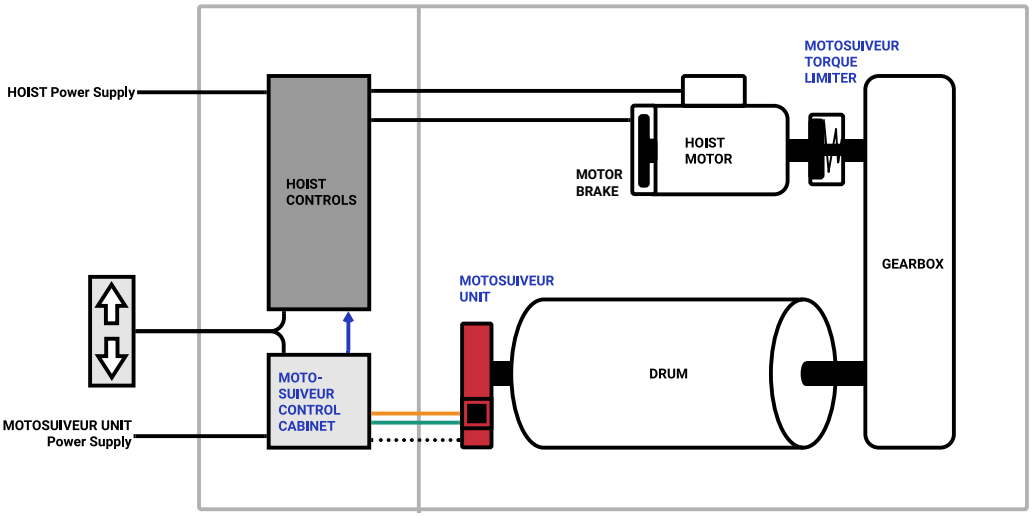
The servomotor is operated in torque mode, meaning that the servo controller will be actively maintaining the torque that the servomotor is imparting on the worm in an open-loop manner. By extension, this torque corresponds to the force that the worm is applying on the worm wheel. Hoist speed information is not received nor measured in any way and MS servo motor speed is not controlled.

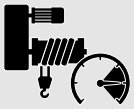
At start, the servo motor rotates the worm until it is in contact with the worm wheel and a given torque value is reached. By design, the maximum available servo motor torque is not enough to drive the worm wheel via the worm.

The MotoSuiveur Solution independently receives the same up/down direction command as the hoist motor, but no speed information. When the worm wheel rotates, the worm effectively follows the motion of the worm wheel by maintaining that torque value.

There is no feedback loop nor any kind of synchronization between hoist speed and worm speed, because it is not needed.

The force applied by the worm on the worm wheel stay thousands of times below the sizing criteria and does not wear the parts.





Absolute Overspeed Prevention

Overspeed Prevention

If not limited by the speed of the worm wheel, the servo motor is able to increase the rotational speed of the worm until it reaches a threshold speed. That threshold corresponds to the limit of the physical capability of the motor to overcome the oil shear and other frictional losses. Thus, the speed of the worm is physically limited by the voltage of the motor. The gearing is arranged such that this threshold speed is equivalent to an overspeed on the drive train of only 120%.

If the worm wheel speed exceeds the corresponding speed, it overtakes the worm causing the worm and worm wheel system to lock, safely arresting all motion. (see “Worm and Worm Wheel System”)

The net result is that MotoSuiveur Solutions physically restrict the hoist’s acceleration and speed, without monitoring them in any way. An inherent property that no erroneous command nor setting nor malfunction can circumvent to provoke a dangerous overspeed condition.

Worm and Worm Wheel System

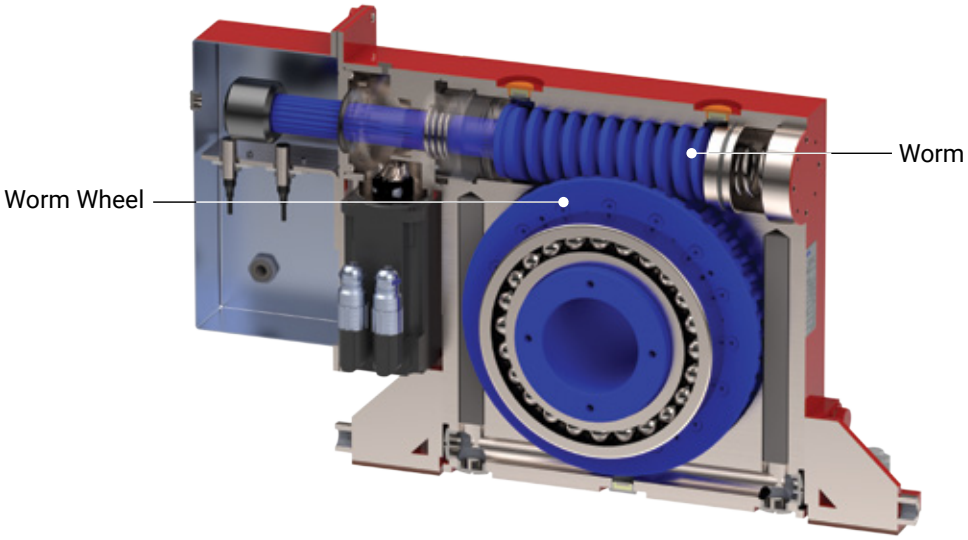
The worm wheel is connected to the hoist's drum via splines or a drum adapter flange to transmit torque.

The worm bears onto the casing and is thus supported laterally and radially. Axial restraint is provided by springs which hold the worm in place when the normal servo motor torque is applied.

Note: Both worm and worm wheel operate within a bath of oil or grease to maximize performance and minimize wear.

No Wear Parts

The worm wheel has generated teeth to increase the contact ratio between the worm and worm wheel teeth. This means that several teeth are in mesh at all times. This results in smooth operation during normal "Following" and increased load capacity when the full load is transferred to the MotoSuiveur Unit in case of arrests.



Driving Irreversibility

Crucially, the teeth lead angle is less than the static angle of friction, making the system physically irreversible. This means the worm cannot be back-driven by the worm wheel.

Instant Load Arrest

Self-Lock

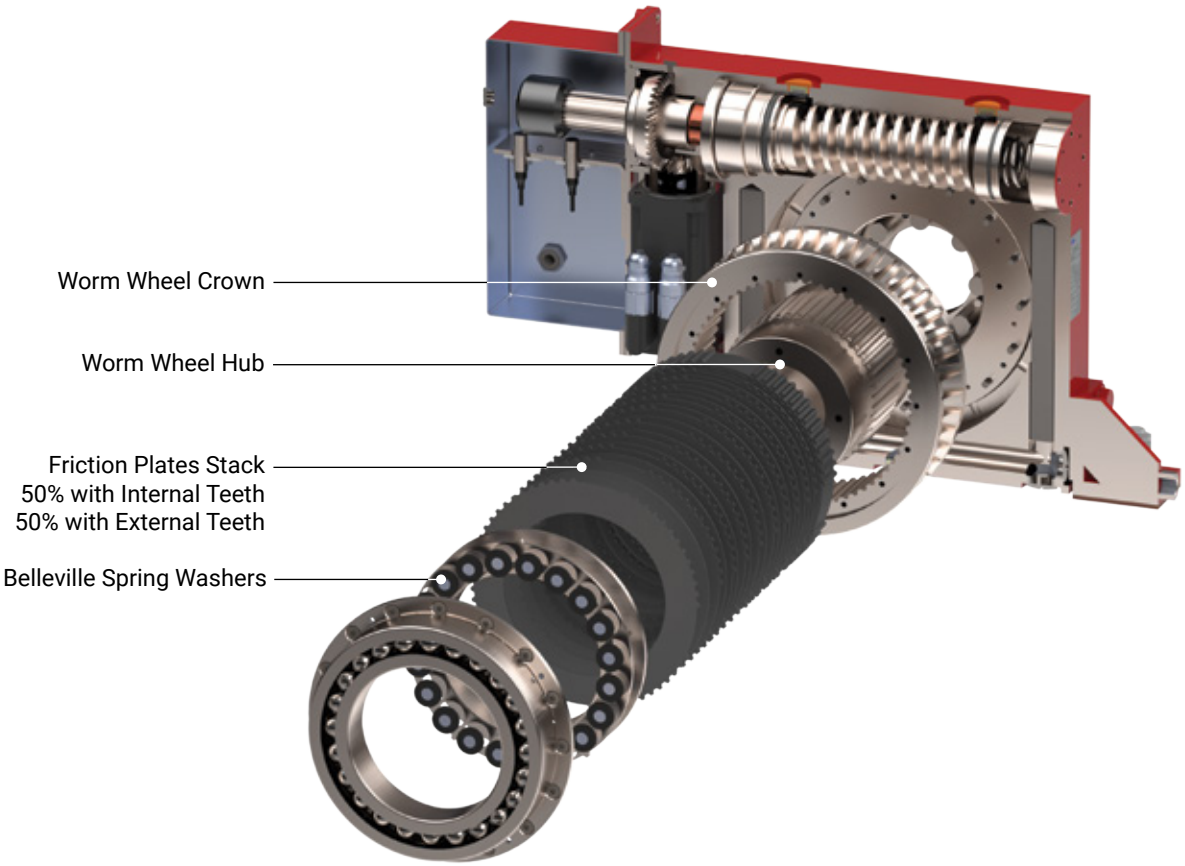
During normal operation, the worm is "Following" the worm wheel (see "Worm Driving System"). By following, the worm is also continuously "clearing the way" for the wheel to rotate. Conversely, in conditions where the worm is no longer able to follow the worm wheel's rotation, the worm wheel overtakes the worm and the system becomes a rack.

The worm wheel then pushes the worm axially against the casing: the system is self-locked. The accumulated kinetic energy is very low, and it is very quickly dissipated in the arrest system of the MotoSuiveur Unit. (see "Passive Friction Arrest System")

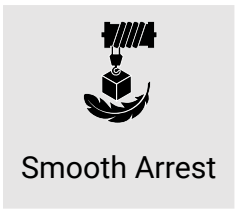
Once the arrest completed, the MotoSuiveur will hold the load safely in place thanks again to the irreversibility of the Worm and Worm Wheel System.

Passive Friction Arrest System

The worm wheel contains a stack of 55+ friction plates. They are pressed together by a set of powerful belleville spring washers. Their combined pressing force is factory-set to every particular application's requirements. This pressing force directly determines the slipping torque of the friction plates stack. This slipping torque is the MotoSuiveur Unit's arresting torque.



Half of the friction plates have internal teeth connecting them to the worm wheel hub. The other half have external teeth connecting them to the worm wheel crown.



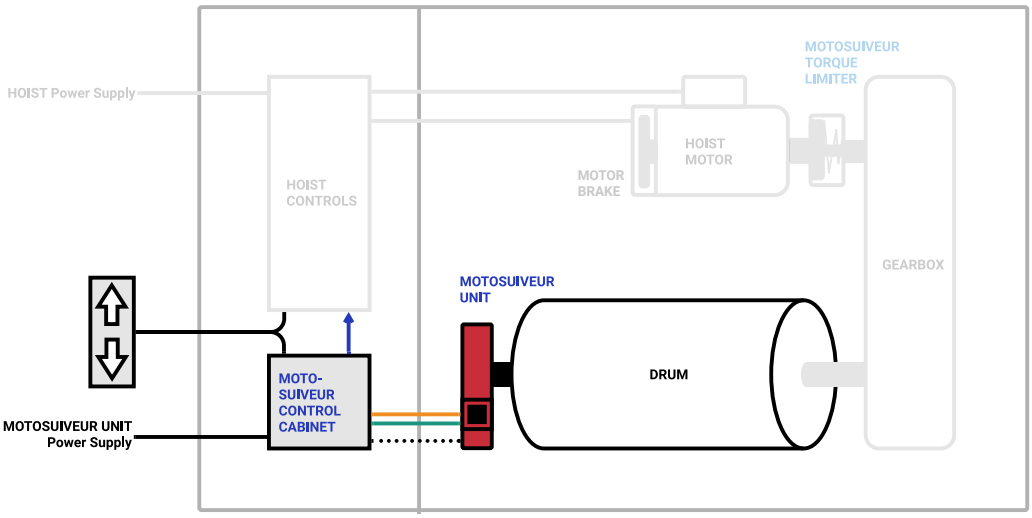
Kinetic Energy Dissipation

In arrest conditions, the worm and worm wheel system self-locks (see p.16). The wheel crown is thus not able to rotate while the worm wheel hub is bearing the torque from the hoist motor and/or load.

If this torque exceeds the slipping torque of the friction plates stack, the plates will dissipate the excess kinetic energy to smoothly arrest hoist motion. The MotoSuiveur Unit will hold the load safely in place.

Fewer than 20 mm of load descent. The MotoSuiveur Unit's arresting torque is delivered "in full" from when friction plate slipping starts until it ends, without delay or ramp. In effect, complete load arrest takes place within fewer than 20 mm of load descent.
This truly extraordinary capability is unique to MotoSuiveur-Secured hoists.

Better systems put out the fire when it is really small. With the delay necessarily incurred by the usual “Monitoring+Brakes” closed-loop systems before starting to brake, the kinetic energy they need to dissipate to stop the load is far greater since it grows with the square of speed. No such problems in MotoSuiveur-Secured hoists!



Unsollicited to hold the load after arrest
Holding the load after arrest

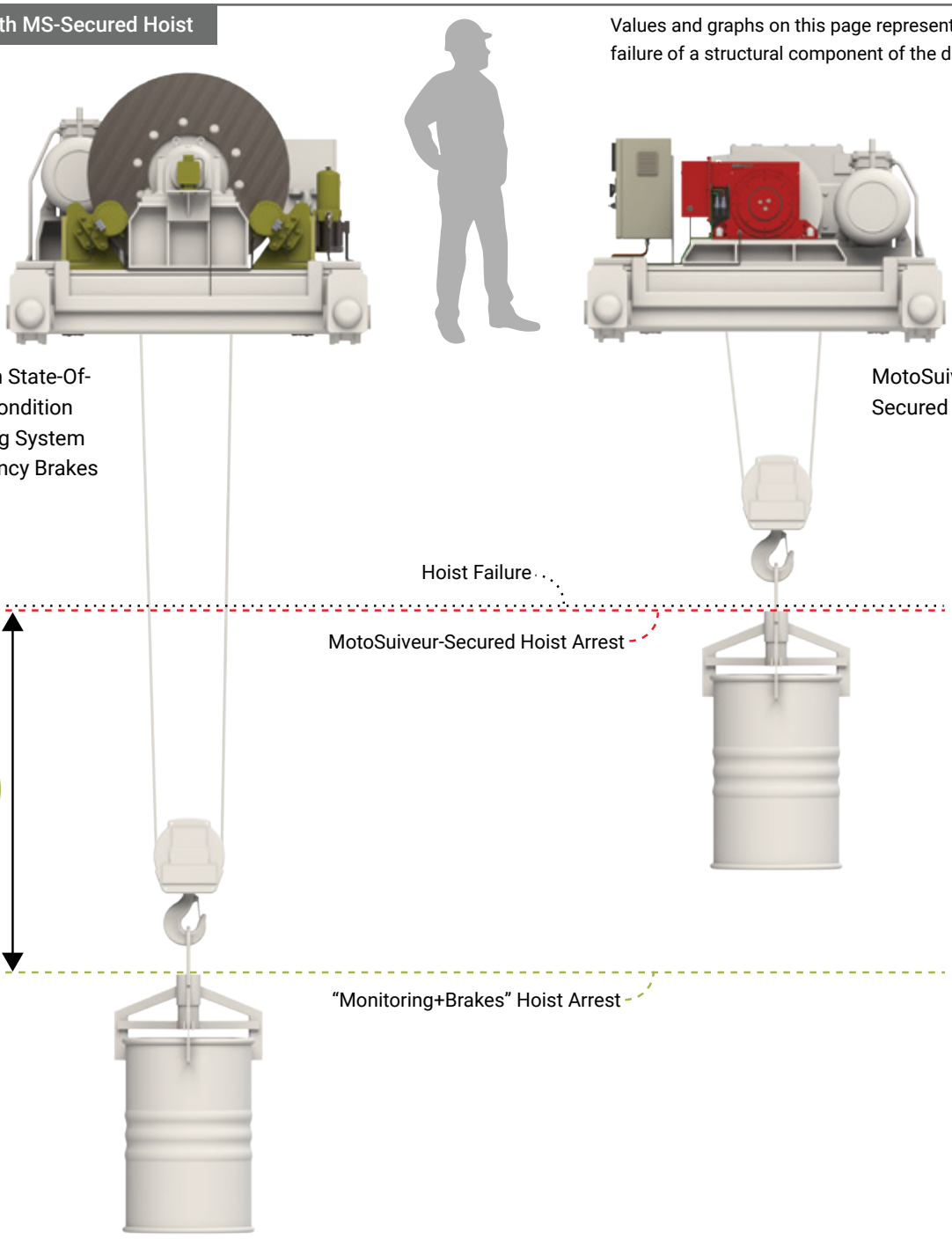
Holding the load safely. From the instant the worm and worm wheel system self-locks, the whole load is transfered from the hoist’s kinematic chain to the MotoSuiveur Unit. The kinematic chain is left free from tensions if equipped with a MotoSuiveur Torque Limiter (see p.21).
Crane operators have the following options:

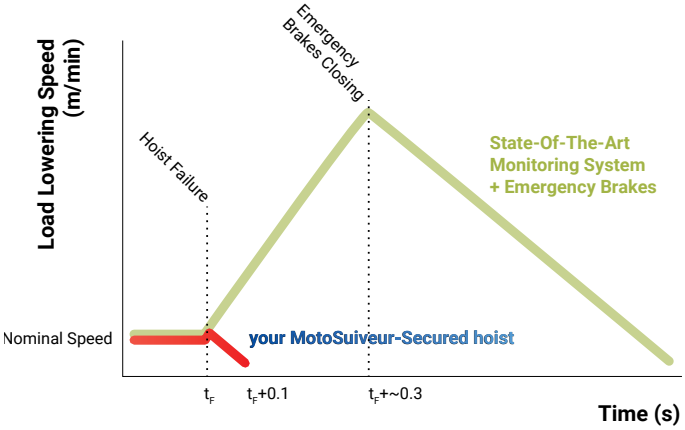
- Returning the load to the kinematic chain (if deemed safe) by a simple procedure (see p.40).
- Using their MotoSuiveur-Secured hoist’s load recovery capabilities (see p.23 and p.41)

N.B: During arrest, the friction plates do not wear as steel-on-steel friction in an oil bath does not produce abrasion. The stack’s slipping torque remains extremely stable throughout time and repeated use.

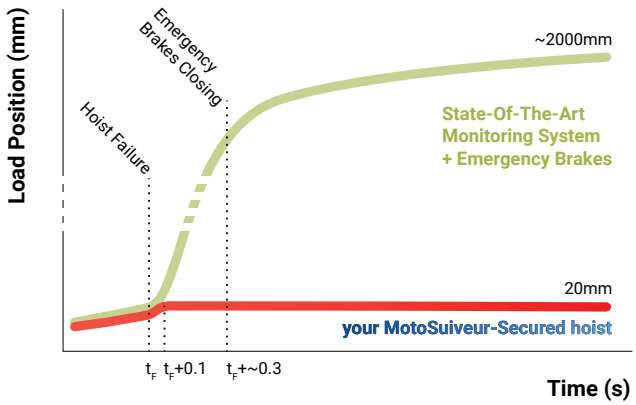
Load Arrest with MS-Secured Hoist

Values and graphs on this page represent the case of failure of a structural component of the drive train.





Load Speed after a failure of a structural component of the drive train.



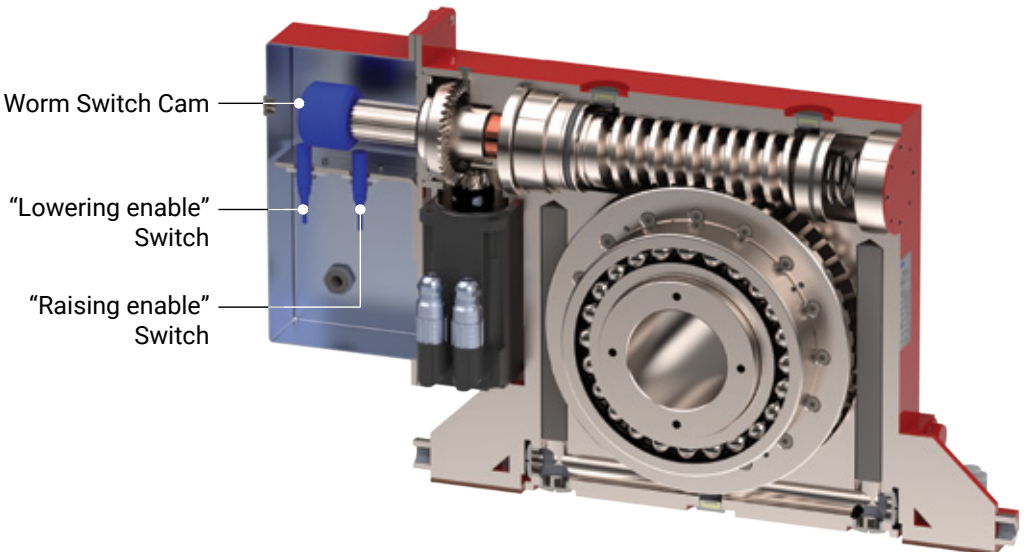
Load Position after a failure of a structural component of the drive train.

Worm Status System

This system has no fail-safety role. It is designed to enable/disable the main hoist functions according to the position of the MotoSuiveur Unit's worm, as a mean of protecting the kinematic chain on MotoSuiveur load arrest.

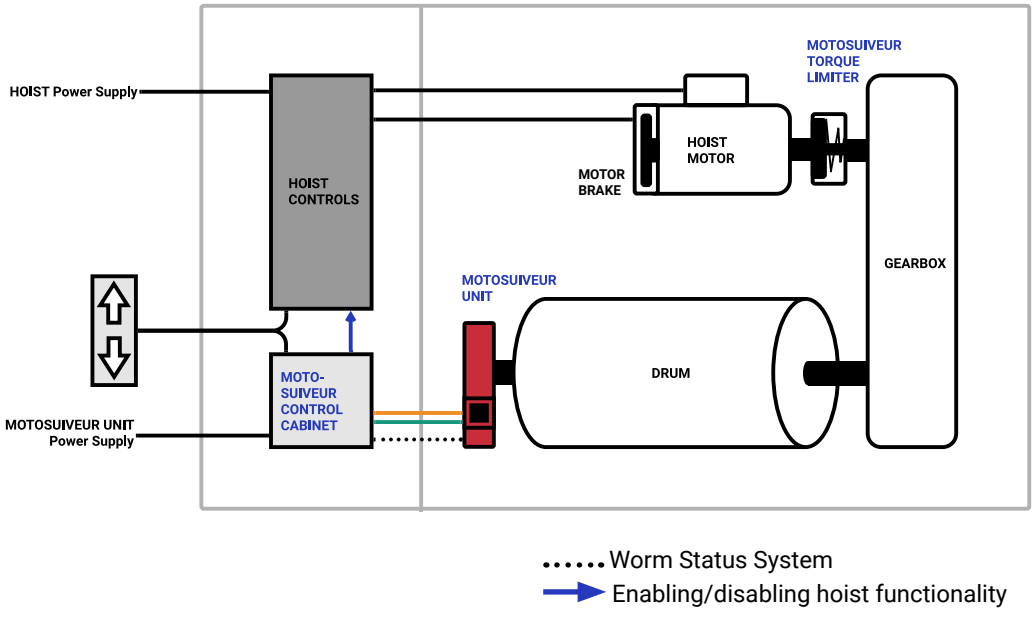
Therefore, the Worm Status System:

- Allows the hoist to operate only when the MotoSuiveur Unit is ready,
- Protects the kinematic chain from the hoist motor continuing to apply torque while MotoSuiveur Unit is preventing motion.



The Worm Status system consists of two proxy microswitches hardwired to the MotoSuiveur Solution's Control Cabinet and to the hoist controls, via volt free contacts.

Under normal conditions, each switch is set next to cam edges on the worm shaft. When the worm translates in either direction, indicating an arrest, the switches trip the interlock of the main hoist drive motor thereby stopping all hoisting functions and applying service brakes.



Add-on Systems

Add-on Systems provide more unique functionalities to MotoSuiveur-Secured hoists by further taking advantage of MotoSuiveur fail-safety.

Two major issues of lifting applications are solved: damages by static and dynamic overloads and the risks associated with recovering a hanging load on a defective hoist.

MotoSuiveur Torque Limiter
Pictured: TL63 Model

MotoSuiveur Torque Limiter

Static and dynamic overloads damage components of the kinematic chain and ropes, shortening their lifecycle and increasing the probability of catastrophic breakage. Additionally, traditional emergency braking constrains kinetic energy within the hoist's drive train with the resulting peak overloads reaching more than 5 times the static load torque.

This classic mechanical problem would usually be solved by disengaging the hoist motor from the kinematic chain above a certain torque. In lifting applications however, the risk of a malfunction or under-performance of the caliper safety brake is too high and hoist designers implicitly rely on the whole drive train and service brakes as a back-up, so it cannot be uncoupled safely.

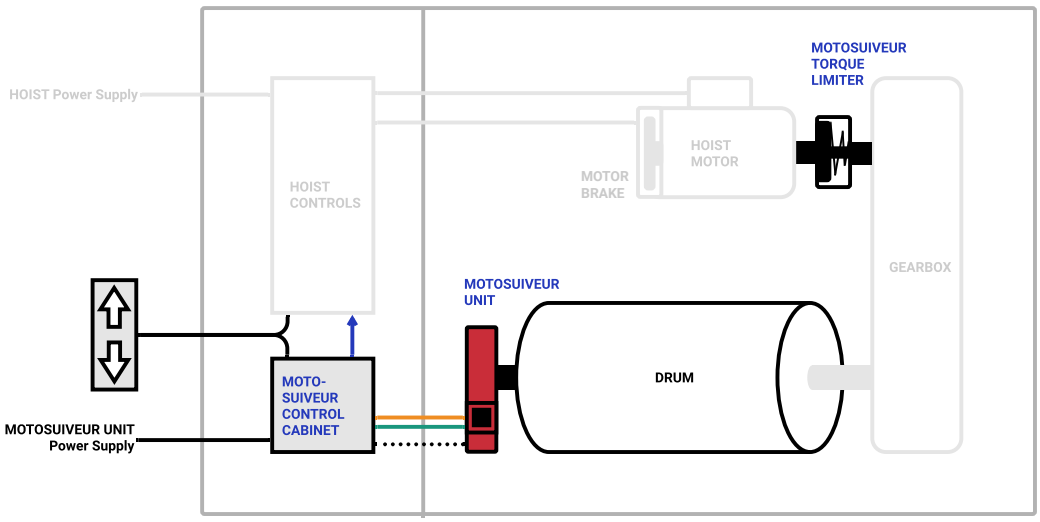
Absolute Overload Protection

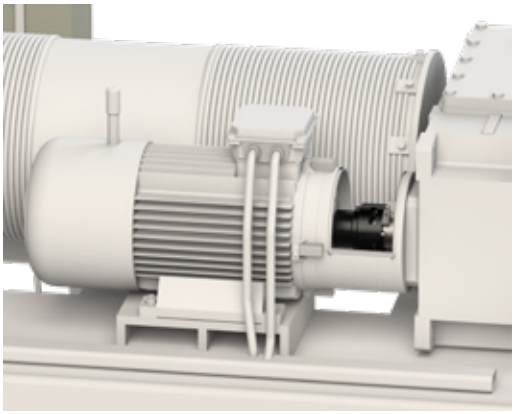
Reduced Hoist Fatigue

Solving Overloads

On a MotoSuiveur-Secured hoist, the hoist's kinematic chain plays no role in holding the load during and after emergency arrests. Integrating a torque limiter between the hoist motor and gearbox is now risk-free.

Static and dynamic overloads ocurring during hoist operation or during arrests are cut to the equivalent of 110% of Safe Working Load (SWL), efficiently preserving the integrity of the hoist and crane structure.





MotoSuiveur Torque Limiter
MotoSuiveur Torque Limiter is placed between the hoist motor and gearbox, preferably within a sealed bell.

MotoSuiveur Torque Limiter Features

Unfailing protection. MS Torque Limiters are set to slip at a nominal value of 110% SWL. This setting remains extremely stable even when friction linings are subjected to wear. This makes MS Torque Limiters the most reliable and efficient means of protection against overloads in hoists.

Tamper resistant. Human error risk is mitigated since slipping torque is adjusted according to the number of active springs – not through modification of spring pressure.

Proof load functionality. Temporary increase the torque by 25% to allow periodical proof load tests of the hoist (now easy and safe thanks to MotoSuiveur fail-safety) without changes to torque limiter's preset torque.

Plug-and-play retrofit. MS Torque Limiter is delivered bored and keyed to customer requirements. It features a PU insert for angular and torsional elasticity,

Factory tested to operational conditions. As with the MotoSuiveur Unit, the MS Torque Limiter undergoes rigorous factory testing to hoist operational conditions. The test report is included at delivery.

Arrangement for TL40, TL50, TL63, TL80 and TL100 models
Set by quantity and type of springs. No setting change possible without disassembly.

Arrangement for TL125 and TL160 models
Set by quantity of activated springs. Changing setting requires a special tool.

MotoSuiveur Torque Limiter Model	Maximal slipping torque	Maximal motor shaft rotation speed
TL40	25 Nm	10,600 rpm
TL50	50 Nm	8,500 rpm
TL63	100 Nm	7,100 rpm
TL80	200 Nm	5,600 rpm
TL100	375 Nm	4,750 rpm
TL125	750 Nm	4,250 rpm
TL160	1,500 Nm	3,350 rpm

Independent Load Recovery

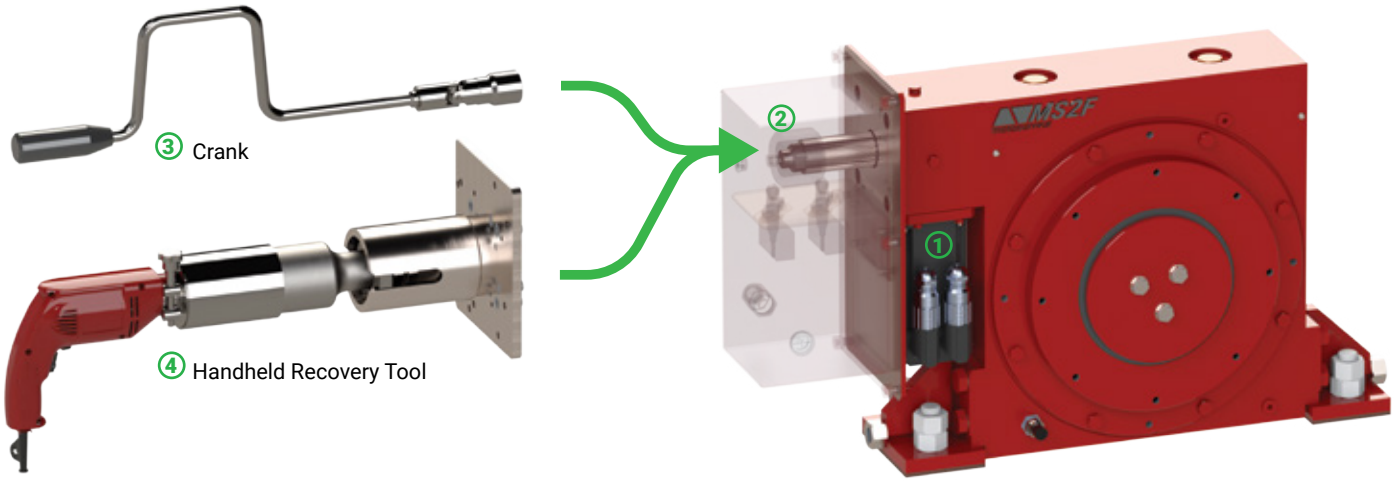
When a power or mechanical failure occurs, the hoist kinematic chain is rendered inoperative. For hoists that have a single load path, crane operators have little choice: they need to override the brakes and proceed to a load controlled lowering. This a complex and perilous operation that can turn into an uncontrolled load drop if not executed expertly.

Independent Load Path for Recovery

Solving Load Recovery

On a MotoSuiveur-Secured hoist however, crane operators effectively have a second independent kinematic chain. The MotoSuiveur Unit acts as a load path that will hold, lower and even raise the load in a completely safe and controlled manner.

This makes for amazingly resilient hoists that will withstand disruptions and still perform their main function: safely handling the load.



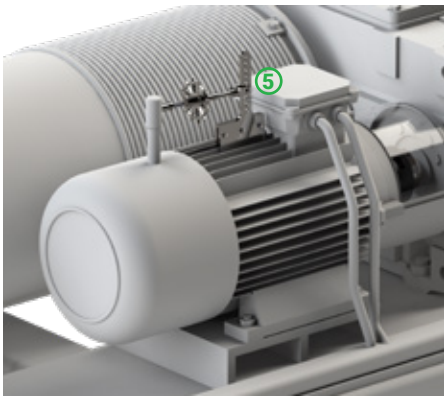
The worm and worm wheel system is irreversible (see p.16) which means that the worm bears the load without being back-driven. Conversely, by rotating the MotoSuiveur Unit's worm, crane operators will drive the worm wheel and be able to control the load.

Since, by design, the maximum available servo motor ① torque is not enough to drive the worm wheel via the worm ② (see p.15), the worm is rotated by other means for load recovery operations:

- a simple crank ③ (for MS0, MS1)
- a Handheld Recovery Tool ④ (up to MS4) or Portable Recovery Tool (for MS5, MS6, MS7)

If still active, the service brake will be set at the limit of slippage without any risk thanks to a Brake Release Tool ⑤.

N.B: Siguren Technologies strongly encourages using MotoSuiveur Independent Load Recovery systems only in post-failure load recovery situations to bring the load to the ground. Rapid consecutive or prolonged use of this functionality as a primary hoisting mechanism should be avoided.



Brake Release Tool
Used to set the motor brake at the slippage limit to facilitate worm rotation during recovery.

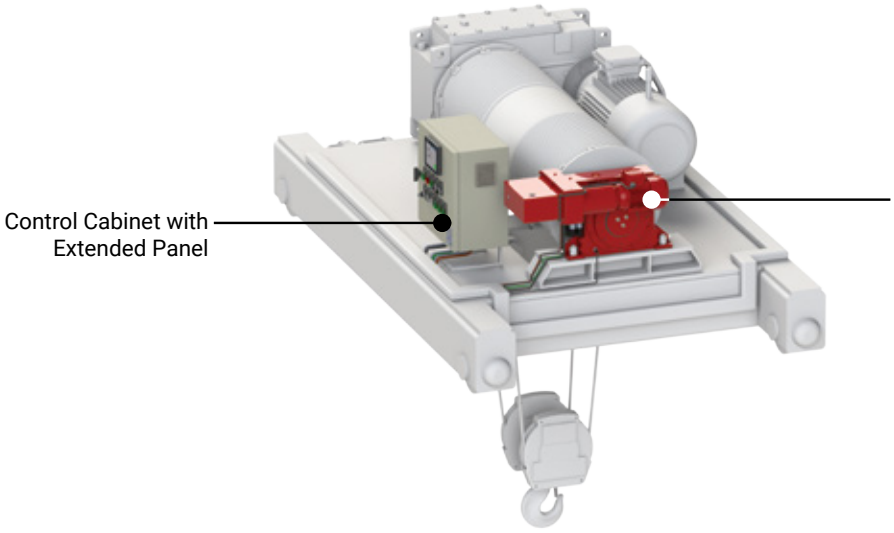
Remote Recovery Operation

Integrated Recovery Drive (MS-IRD) Add-On

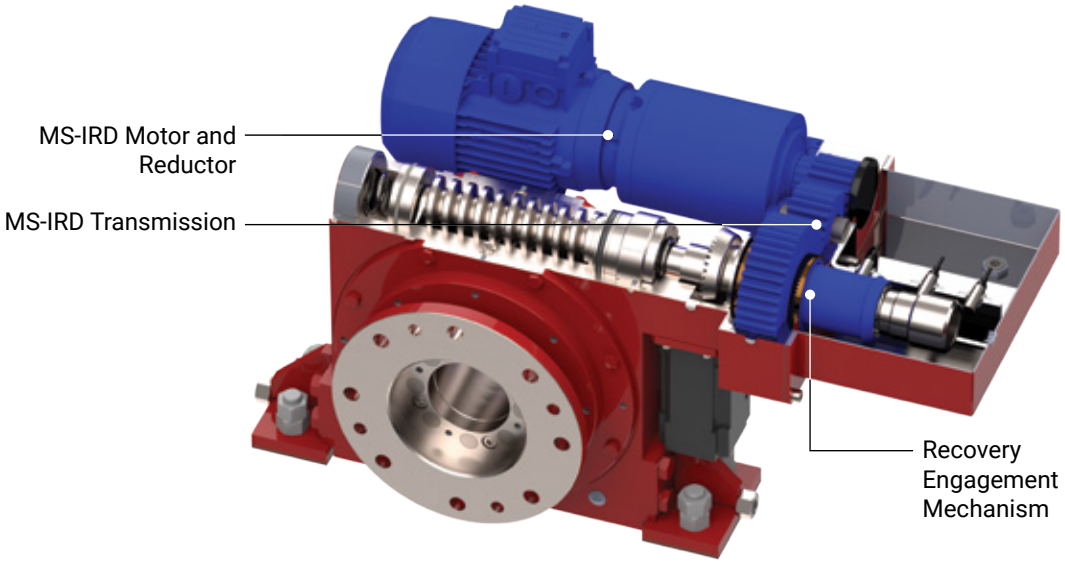
For lifting applications where access to the hoist is impractical or hazardous, the ability to remotely control the load after a hoist failure is critical. This is why we developped the Integrated Recovery Drive (MS-IRD) add-on for MotoSuiveur Solutions. With MS-IRD, crane operators can remotely recover the load safely and rapidly even after a hoist failure, independently of the state of the hoists' main drive.

No more worrying about dangerously hanging loads.

AC Drive for Integrated Recovery Drive Add-On
Schneider Altivar AC Drive range



MS-IRD consists of an independently powered and controlled AC motor, reductor, transmission and engagement mechanism.



Reliable Engagement. MS-IRD "takes/releases control" of the worm *via* a short automated sequence of worm rotations involving only the MS-IRD and MotoSuiveur motors. For resilience and reliability, no electronic actuators are involved in achieving engagement.

N.B: For further resilience, the MS-IRD can also be used with the MotoSuiveur's servo motor being unavailable. Engagement is then initiated by releasing the hoist brake.

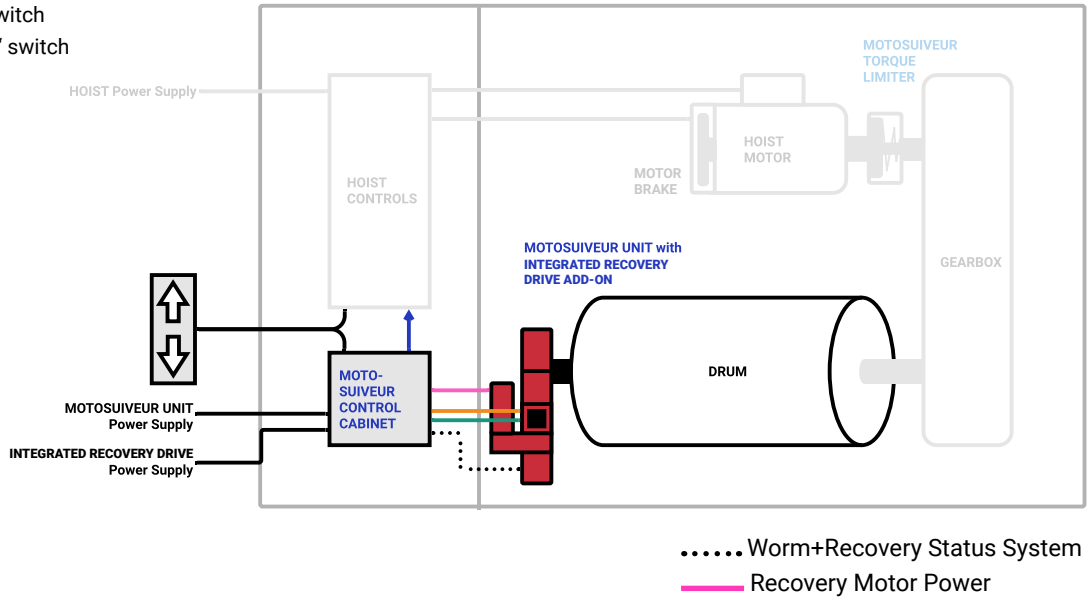
MotoSuiveur Control Cabinet Front Panel Extended for MS-IRD

① "Back-Up Recovery Off/On" switch
② "Back-Up Recovery Down/Up" switch
③ "Recovery Mode" lamp
④ "Recovery Engaged" lamp

MS-IRD Features

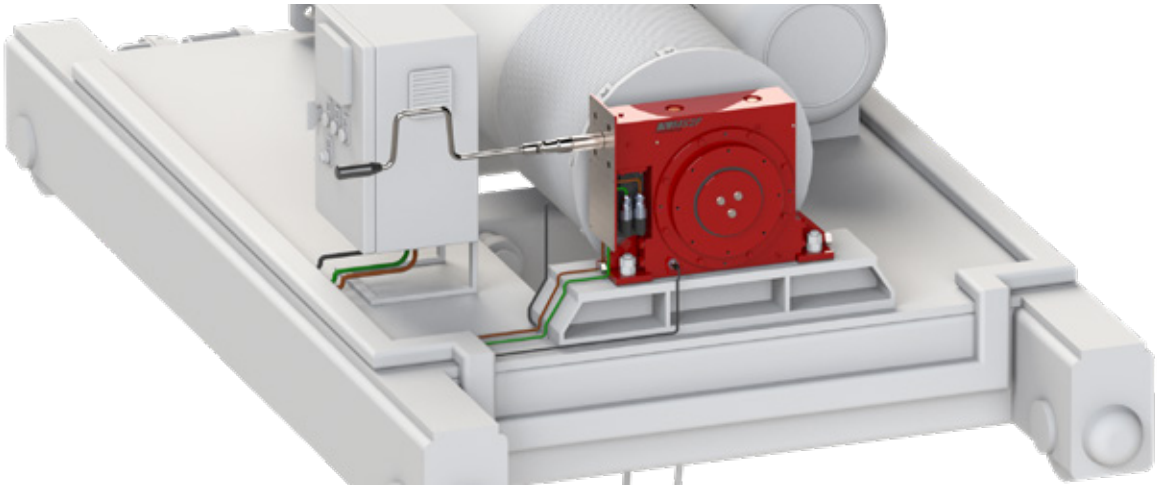
Simple Operation. Crane operators simply switch on Recovery Mode and MS-IRD completes its engagement procedure. From there on, only up/down commands are needed until the load is brought to safety. Command switches and visual information are present on the MotoSuiveur Control Cabinet front panel and can be doubled at the crane operators command station.

Independent Power Supply. The MS-IRD add-on has a completely separate power supply from the hoist motor and MotoSuiveur Unit's servo motor. If needed, it can be connected to emergency generators or UPS.

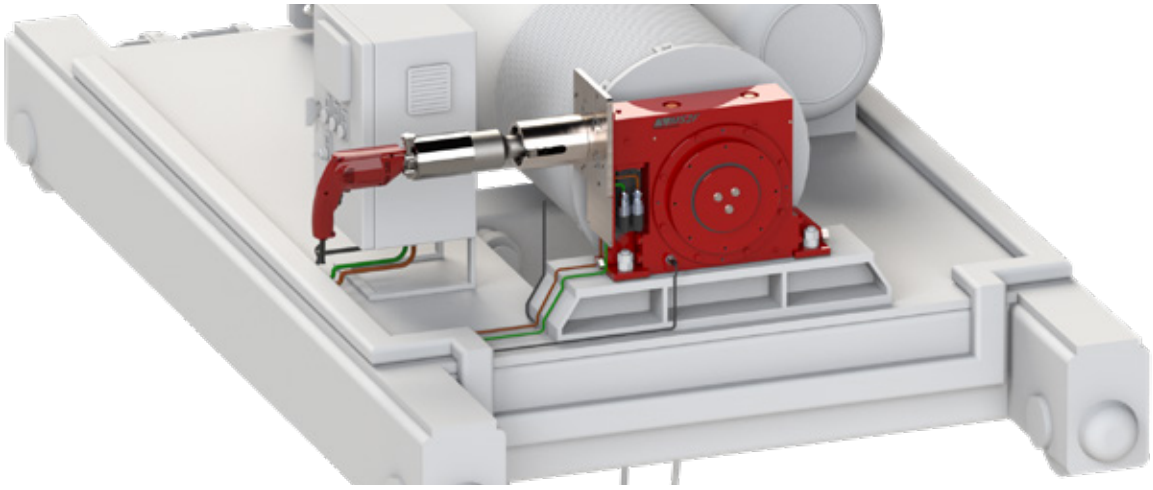


MotoSuiveur Unit Series	Lowering Recovery Speed (rpm@drum)	Raising Recovery Speed (rpm@drum)	Integrated Recovery Drive (IRD) Raising Capacity (Nm)
MS0	1.50	0.30	1,600 Nm
MS1	1.25	0.25	3,800 Nm
MS2	1.00	0.20	7,400 Nm
MS3	0.80	0.16	12,800 Nm
MS4	0.70	0.14	20,300 Nm
MS5	0.60	0.12	30,300 Nm
MS6	0.50	0.10	59,200 Nm
MS7	0.40	0.08	102,200 Nm

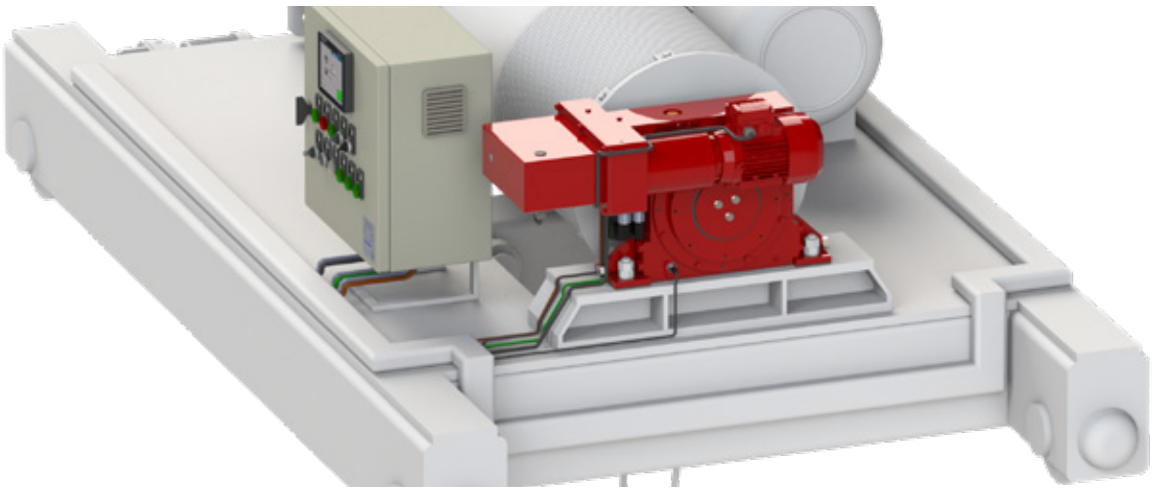
MotoSuiveur Load Recovery



Manual recovery with crank
(MS0, MS1)



Portable Recovery Tool
(up to MS4)



Integrated Recovery Drive (MS-IRD)
(for all MS sizes)

Hoist-MotoSuiveur Interfaces

Crane managers face technical challenges when planning to retrofit their hoists with new safety equipment: heavy modifications weakening the existing structure, complex rewiring of controls, lack of space, etc.

MotoSuiveur Solutions again radically stand out from the competition thanks to their light footprint and simple interfacing with the hoist structure, kinematic chain and controls. The retrofitting process is clear and short.

Mechanical Interface

Compact Design

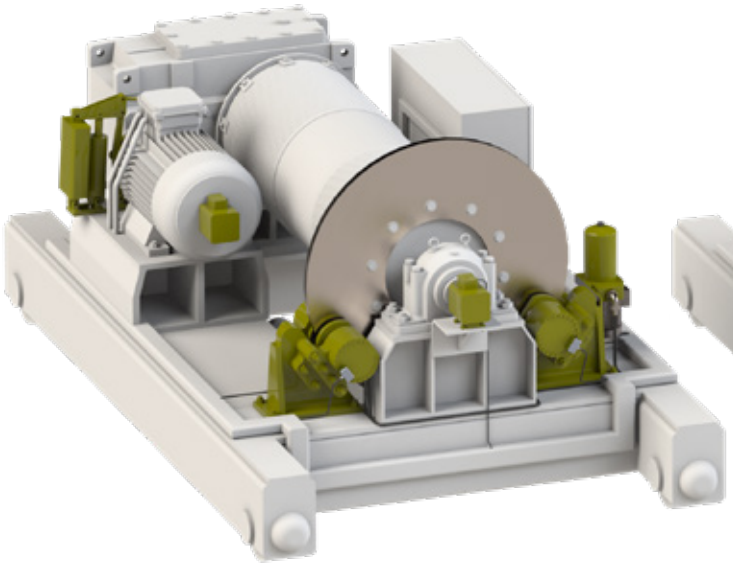
Easy Retrofit

Footprint and Integration

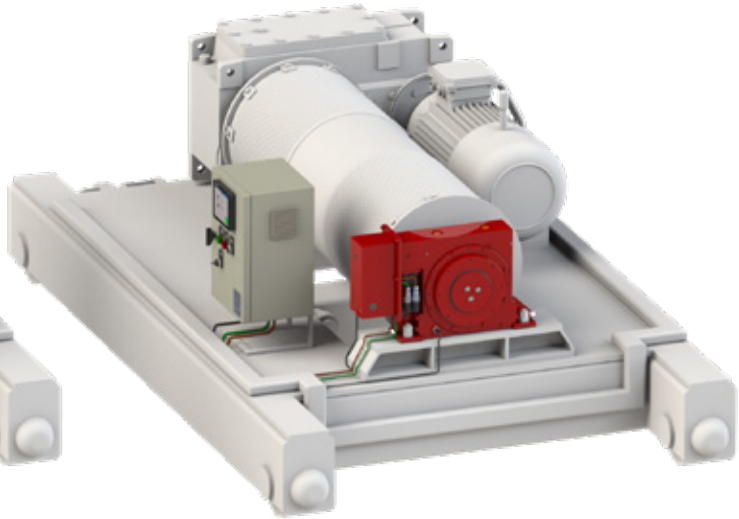
Optimal use of space. MotoSuiveur Units feature a uniquely compact design to make the best use of the restricted space available for hoist retrofits. Their flexibility of configuration accommodates virtually any existing hoist (see p.10 and p.33).

Light adaptation. The modifications of the existing hoist to integrate a MotoSuiveur Unit are minimal and do not weaken the hoist's components (drum) and structure.

Robust by design. With an hermetically sealed enclosure and no exterior moving parts, MotoSuiveur Units are ready to serve in difficult external conditions including dust, humidity and extreme temperatures.



Hoist equipped with:
- Service brake on motor shaft
- Speed monitoring and comparison system
- Emergency hydraulic caliper brakes

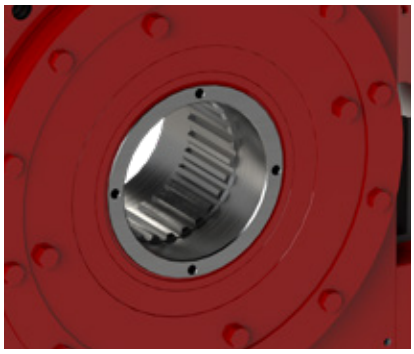


MotoSuiveur-Secured Hoist (with motor brake)

Driving Interface

The function of the driving interface is to transmit torque between the hoist's drum and the MotoSuiveur Unit's wheel.

Drum Adapter Flange



Splined Hub and Shaft

Bespoke drum flange adapter. Best suited for retrofitting MotoSuiveur Units to various drum geometries with minimal modifications.

Splined hub and shaft. Best suited for new MotoSuiveur-Secured hoists or in cases of retrofits where the drum is being replaced. Standard DIN 5480 splines.

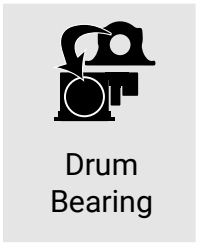
Mounting Interface

The function of the mounting interface is to bear the arrest torque and, if relevant to the use case, to bear the hoist's drum.

Shaft mounted with reaction arm. Reaction arm angle (see p.10) is chosen to suit trolley design and geometry. A reaction arm pin is added to the trolley.

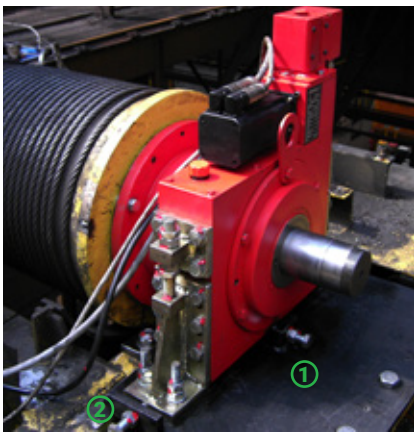
Feet mounted and drum bearing. The MotoSuiveur Unit spares the need for a plummer block as it is bearing the hoist's drum. This optimizes space allocation on the trolley, simplifying hoist retrofitting and maintenance.

In this case, a "seat adjustment" is necessary to precisely position the unit in its "seat blocks" ① that are welded to the crab end truck beam. Height is adjusted with a simple shim set welded to the trolley as well.



Drum Bearing

Plummer Block Prior to Retrofit



Retrofit with Drum Bearing MotoSuiveur Unit
① Longitudinal Seat Block
② Lateral Seat Block

Pictured (right): one of 12 40+ year-old 10t EOT craner retrofitted with MS2F MotoSuiveur Units with vertical worm configuration.
Application: Steel pipes warehousing.
Customer: Vallourec.

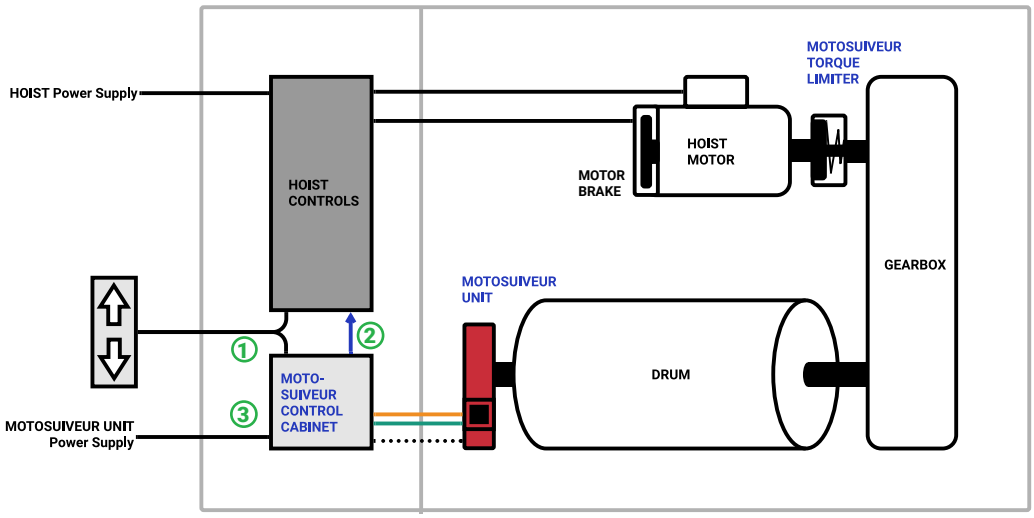
Electrical & Control Interface

Independent controls. The MotoSuiveur Solution independently receives the same up/down direction command as the hoist motor, but no speed information ①. There is no feedback loop nor any kind of synchronization between hoist speed and worm speed, because it is not needed.

Non-critical for safety. Human errors in controlling or supplying the hoist with power are eliminated as a source of risk. MotoSuiveur absolute fail-safety means that controls and power supply play a role only in permitting (i.e enabling ②) hoist operation.

Simple connections for minimal modifications. The modifications to your hoist's control cabinet are minimal and straightforward: MotoSuiveur controls only need to be able to switch off hoist controls ②.

Independent power supply. For best hoist operability, the MotoSuiveur Solution is supplied with power independently ③ from the main hoist controls.



① Operator Commands independently received by MS controls
② Hoist controls are enabled by MS controls
③ Independent power supply

User Interface

Crane operators do not need special controls for their MotoSuiveur-Secured hoist. Raising and lowering controls remain unchanged after a MotoSuiveur Solution retrofit.

The MS User Interface empowers users with clear information during hoist operation, actionable insights for maintenance and troubleshooting and additional controls for testing, troubleshooting and recovery operations.

The MS User Interface consists of a front panel, a 7-segments display and a touchscreen HMI (optional).

Front Panel

Crane operators receive clear visual information and access to powerful controls right on the front panel of the MotoSuiveur Solution's control cabinet.

MotoSuiveur Control Panel (Simple)

MotoSuiveur Control Panel with Integrated Recovery Drive (MS-IRD) Add-On

At a glance. Signal lamps clearly indicate MotoSuiveur status, allowed movement direction of hoist and recovery mode status.

Convenient and powerful controls. Local controls allow for swift access to MotoSuiveur functions outside of normal hoist operation: MotoSuiveur reset, override of hoist-enabling signal (protected by key), control of Backup/ Recovery mode. Optionally, controls can be transfered or mirrored at a remote location convenient to the crane operator.

7-Segments Display

Actionable insights. Crane operators can consult the symbols displayed by the MotoSuiveur Drive for precise and actionable information about :

- Status of the MotoSuiveur Solution during hoist operation (left).
- Status of the MotoSuiveur Solution during Self-Test.
- Maintenance milestones - Corresponds to milestones in the worm rotation count with associated inspections, cleaning and replacements (oil, grease, joints, etc).
- Assitance to troubleshooting - Controller internal errors and MotoSuiveur faults and warnings.

At rest	
Symbol	Description
0	Unscrewing enable switch sctivated
o	Screwing enable switch activated
-	Both commands activated
A	Maintenance "A"
b	Maintenance "B"
C	Maintenance "C"
d	Maintenance "D"
-	Rest (normal)

During movement		
Symbol	Description	Explanation
H	Centering	The worm is positioned to the center of its backlash, to prepare for the next movement
-	Screwing Tackling	Upward movement start
n	Unscrewing Tackling	Downward movement start
n	Screwing Following	Upward movement following
u	Unscrewing Following	Downward movement following
8	Near Overspeed	Starts blinking the more and more rapidly as the speed approaches the 'overspeed' threshold setting
H	Near Underspeed	Starts blinking the more and more rapidly as the speed approaches the 'underspeed' threshold setting
F	Fault	Fault detected

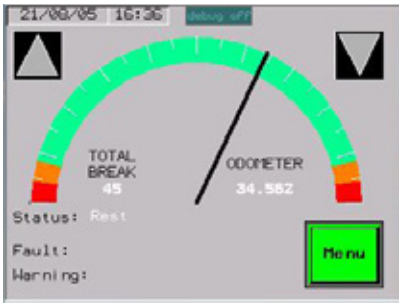
7-segments symbols for MotoSuiveur status during hoist operation
(Excerpt from MotoSuiveur manual)

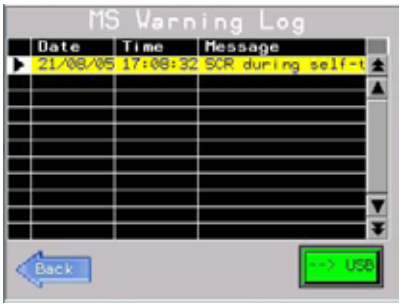
MS-HMI touchscreen on MS Control Cabinet
Schneider Magelis HMI STU 655/855 color graphic (5” or 7”)

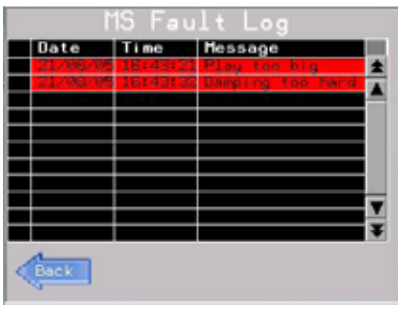
Graphical User Interface (MS-HMI)

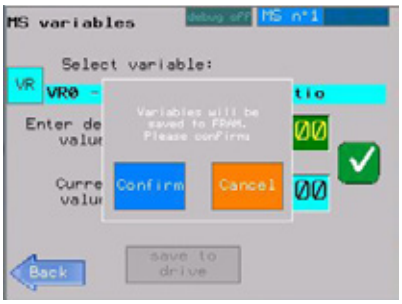
For intuitive interaction with MotoSuiveur controls and quick access to advanced functions, customers can opt for a MotoSuiveur HMI touchscreen terminal (MS-HMI).

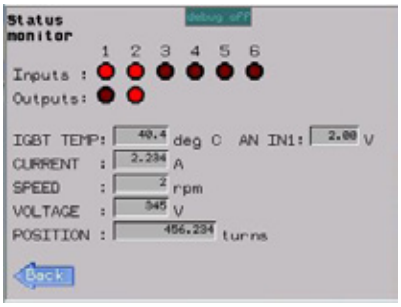
The MS-HMI terminal is located on the front panel of the MS Control Cabinet and communicates with MS controller via MODBUS RTU protocol. Alternatively, the MS-HMI can be transfered or mirrored at a remote location more convenient to the crane operator.

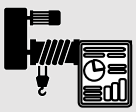












Independent Hoist Operation Reporting

Get complete hoist operation reporting. Displays your MotoSuiveur-Secured hoist’s operation data in the form of messages, event listings and graphics: speed, current functioning mode, state of the motion, authorization signal, fault history, mechanical functioning time

Actionable and precise maintenance information. Warning when approaching maintenance milestones (see p.43). Safe Working Periods (SWP) calculation according to FEM 9.755 “Measures for achieving safe working periods for motorized serial hoist units”.

Flexibility for power users. In-depth access to drive logs and variables. Configuration is managed by secure access code at different levels. Qualified operators can customize key variables such as overspeed threshold, acceleration, deceleration, etc.

Deploying MotoSuiveur Solutions to your Hoists

What to expect on the road to retrofitting your hoist with a MotoSuiveur Solution? To fulfill your hoist's specific technical and regulatory requirements, our project team will consult with you and go through a standard roadmap of selection, configuration, calibration and testing of your MotoSuiveur Solution. Accordingly, installation and commissioning will be planned for minimal downtime.

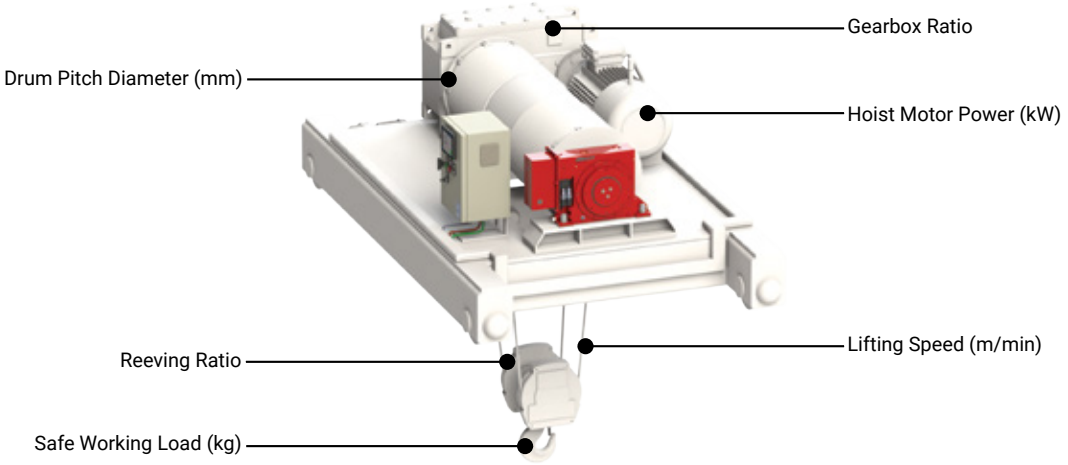
Assistance to Configuration & Deployment

Selection and Configuration

Selecting for Arrest Torque Capacity

Safety before operation. The main selection criteria for MotoSuiveur Units is being able to provide sufficient torque to arrest the full load: **CMS**. The starting point to define this torque is the full load static torque at the drum (or at the MotoSuiveur Unit), without taking into account the efficiency: **CS**.

Generally **CMS ≥ 1.4 x CS**



Hoist data required for MotoSuiveur Unit Selection and Configuration

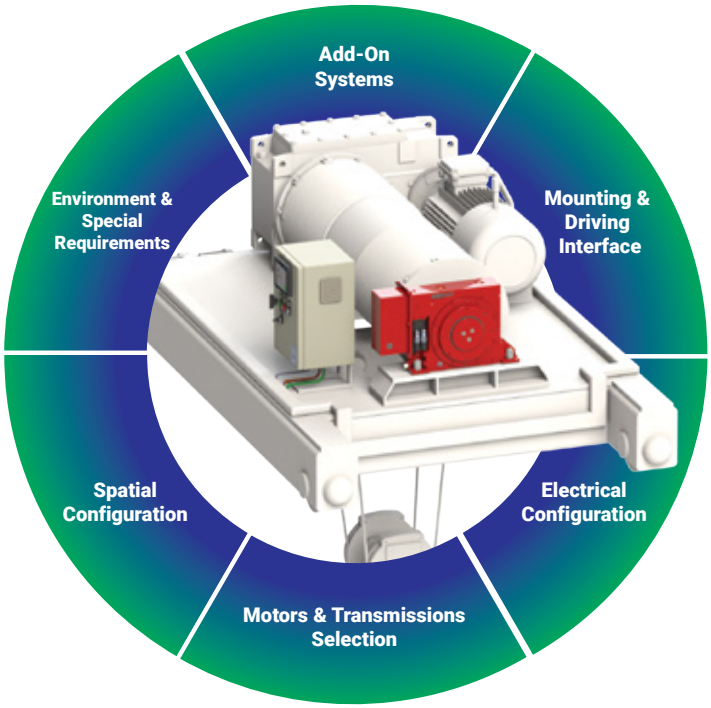
The speed at the MotoSuiveur Unit wheel can be **up to 80 rpm**, for all sizes.

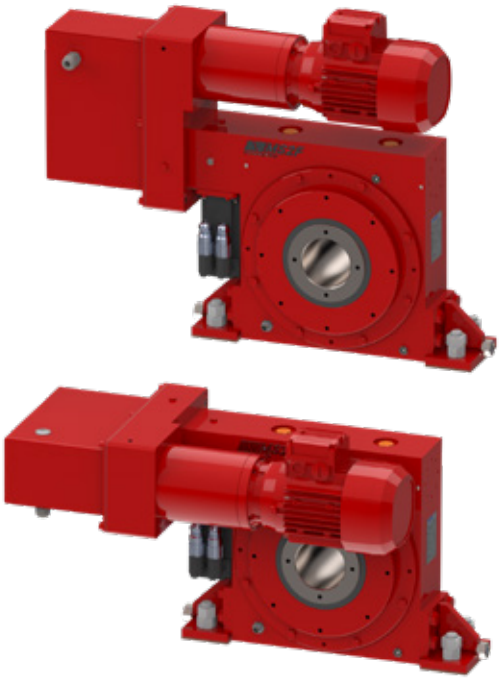
Hoist duty cycle rating does not directly factor in MotoSuiveur selection as MotoSuiveur Unit sees no effort/torque during operation.

Custom Solutions

Configuring for Your Hoist's Specificities

The goal of the configuration step is to adapt the selected MotoSuiveur Unit to the hoist's specificities for optimal hoist operation and ease of installation and maintenance.





See p.10 for more examples of spatial configuration

Add-On Systems. Choosing which add-on systems (TL and MS-IRD) to keep or discard for best hoist functionality. In many use cases, add-on systems are advisable as they allow to take full advantage of the fail-safety of MotoSuiveur-Secured hoists.

Mounting and Driving Interfaces. Positioning and integrating the MS Unit and Torque Limiter in the hoist layout. Keeping modifications to the hoist's trolley and drum to a minimum. Verifying the resulting design's capacity to withstand arrests.

N.B: MotoSuiveur-Secured hoists themselves can be further optimized by simplifying parts of the layout (typically when removing the plummer block).

Electrical Configuration. MS Control Cabinet is configured with necessary I/O, power supply, cable length, etc.

Motors & Transmissions Selection. Selecting MotoSuiveur servomotor and Integrated Recovery Drive motor and their transmissions according to use case requirements. MS servomotor is selected to be physically unable to reach speeds above a certain mark. De-rating of motors if necessary.

Spatial Configuration. Optimizing MotoSuiveur Unit positioning and setup for best space utilization (see p.10). Testing with CAD models.

Environment & Special Requirements. Options such as heaters for MS Unit, IP ratings for MS Unit and MS Control Cabinet, MS Unit coating, etc.

Regulatory Compliance

Regulatory Requirements

Lifting Safety

Securing a hoist with a MotoSuiveur Solution goes a long way towards satisfying the most demanding safety specifications.

EN 14492-2
Cranes - Power driven winches and hoists
Part 2: Power driven hoists
Annex B: Additional requirements for the transport of molten material

MotoSuiveur-Secured hoists "prevent the load from falling in the event of failure of any structural component of the drive train (kinematic chain)."

IEC 61508
Functional Safety of Electrical/ Electronic/Programmable Electronic Safety-related Systems

Integrating a MotoSuiveur Solution eliminates costly and complex SIL functional safety circuits (up to level 4) from the hoist such as condition monitoring circuits including controllers, sensors, switches, actuators.

Office for Nuclear Regulation (ONR) (United Kingdom)
Technical Assessment Guide 56 for Nuclear Lifting Operations

BTR/BTS EDF High Safety Lifting

NUREG-0554, NUREG-0612

KTA 3902 Design of Lifting Equipment in Nuclear Power Plants

MotoSuiveur Solutions meet all the recommendations and requirements of nuclear industry in addressing the following challenges: Load arrest, Overspeed, Drop height, Overload Independent recovery, Flexibility.

MotoSuiveur-Secured cranes for nuclear applications are in operation in France, the UK, Belgium, China.

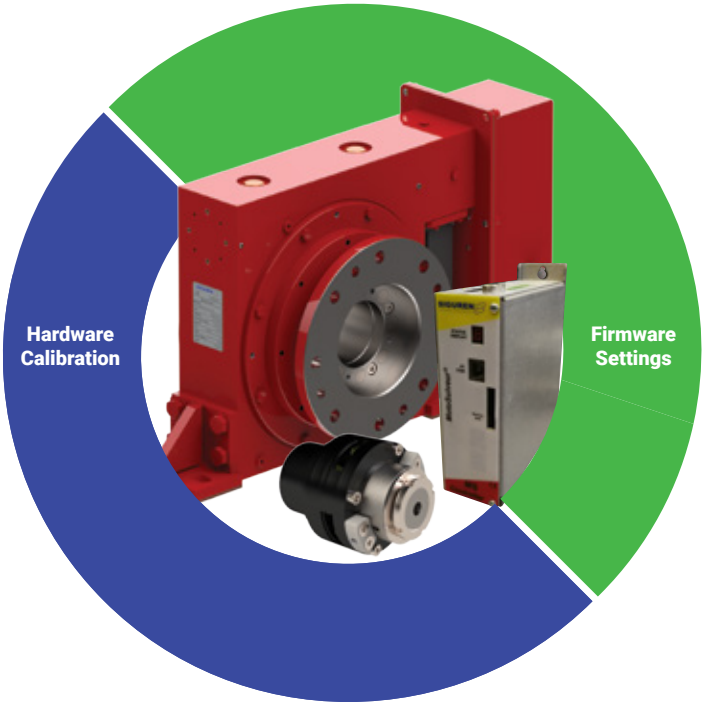
Design Standards

MotoSuiveur Solutions are in designed and manufactured in conformity with the following standards and directives:

- EN ISO 12100:2010 – Safety of Machinery
- IEC 61439-2 – Low-voltage switchgear and controlgear assemblies - Part 2: Power switchgear and controlgear assemblies
- Directive 2006/42/EC – Machinery
- Directive 2014/35/UE – Low Voltage
- Directive 2014/30/UE – Electromagnetic Compatibility (EMC)
- CE marking of conformity affixed to equipment

Calibrating and Testing

Once the MotoSuiveur Solution components are selected and configured, they are fine-tuned by adjusting their mechanical and firmware parameters. Customers receive MotoSuiveur Solutions fully set and factory-tested to their lifting application's requirements.



Calibrating for Precision and Stability

Hardware calibration. Load Arrest torque is mechanically set on the MS Unit and slippage torque is mechanically set on the Torque Limiter. The MotoSuiveur Solution's performance for, respectively, arresting the load and preventing overloads depend only on these two mechanical calibrations.

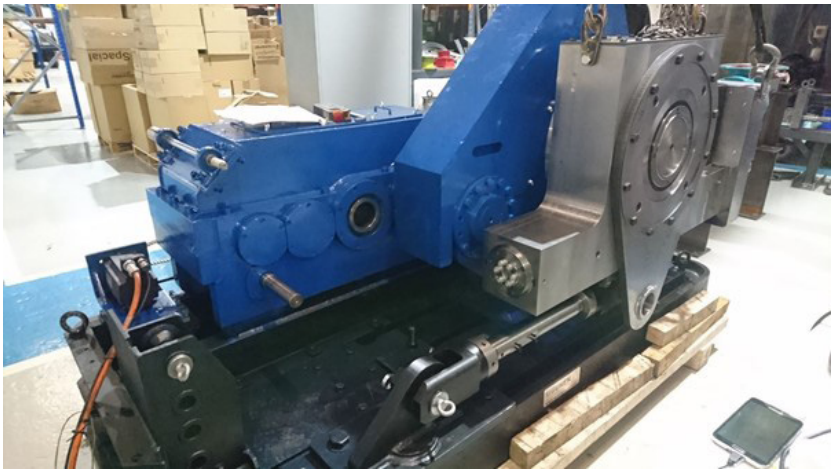
Stable calibration for low servicing. The mechanical settings of the MS Unit and Torque Limiter do not deteriorate over time since, for both, they depend on types and quantities of springs rather than on adjustments of spring pressure.
Furthermore, no parts of an MS Unit are subject to wear during load arrests and the reduction of the slipping torque of Torque Limiters due to friction linings wear is negligible.

Firmware Settings. The lifting application's overspeed threshold, acceleration, deceleration and other parameters such as maintenance milestones are set in MS drive firmware.
It must be noted that firmware settings do not play a role in MotoSuiveur fail-safety as the MS servo motor is selected to be physically unable to reach speeds above a certain mark. Rather, they constitute an additional layer of "soft safety" that can be easily fine-tuned within the physical limits of the selected servo motor.
Firmware settings remain accessible to users with authorized access. Siguren Technologies should be consulted prior to modifications to these settings.

Factory-Tested
To Full Extent

Testing for Verification

Factory testing to full extent. Another unique feature of MotoSuiveur Solutions is to be delivered tested to the full extent of your lifting application's operating conditions.
MotoSuiveur Solutions go through a battery of tests designed to simulate the full range of routine and emergency use cases of the end user's hoist. These tests take place on a simulation bench developed for that purpose.



MotoSuiveur Unit (size MS7) mounted on simulation bench for factory acceptance tests

Factory Acceptance Tests (FAT)

Load Tests	Verifying that the arrest torque measured during several consecutive arrests in simulated full speed and full load conditions satisfies requirements.
Start-Up - Stopping - Reversing Sequence Check	Verifying that the worm positions and accelerates correctly during routine hoist operations.
Long Distance Run Test	Validating raising and lowering movements for the planned speeds and checking for ill-timed braking.
Self-Diagnostic Test	Carrying out the internal Self-Diagnostic Test procedure of MS Unit multiple times and validating results. Notably Play Measurement.
Fault Detection Features Check	Validating detection of underspeed and overspeed. Validating.
Load Recovery System Engagement Tests	Validating Integrated Recovery Drive engagement/ disengagement and operation without load.
Load Recovery Operation Tests	Validating Integrated Recovery Drive's capacity to lower and raise the load according to requirements.

MotoSuiveur Solutions are delivered with a Factory Acceptance Test certificate, including FAT Report Sheets.

Installation and Commissioning

Efficient Installation

Thorough preparation for minimal downtime. An Installation and Commissioning Strategy is prepared by Siguren technologies based on detailed documentation, measurements, and photos of the installation. This strategy is submitted to the crane operator's maintenance team early in the hoist modernization project.

Light modifications. The installation strategy includes the modifications of the hoist required to integrate the MotoSuiveur Unit. These modifications are very light: holes to plug the drum flange on the drum and to mount the MotoSuiveur Unit on the trolley. can include a structural analysis of the hoist's trolley and/or drum. A structural analysis study of the hoist's trolley and/or drum can be made by Siguren Technologies if deemed necessary.

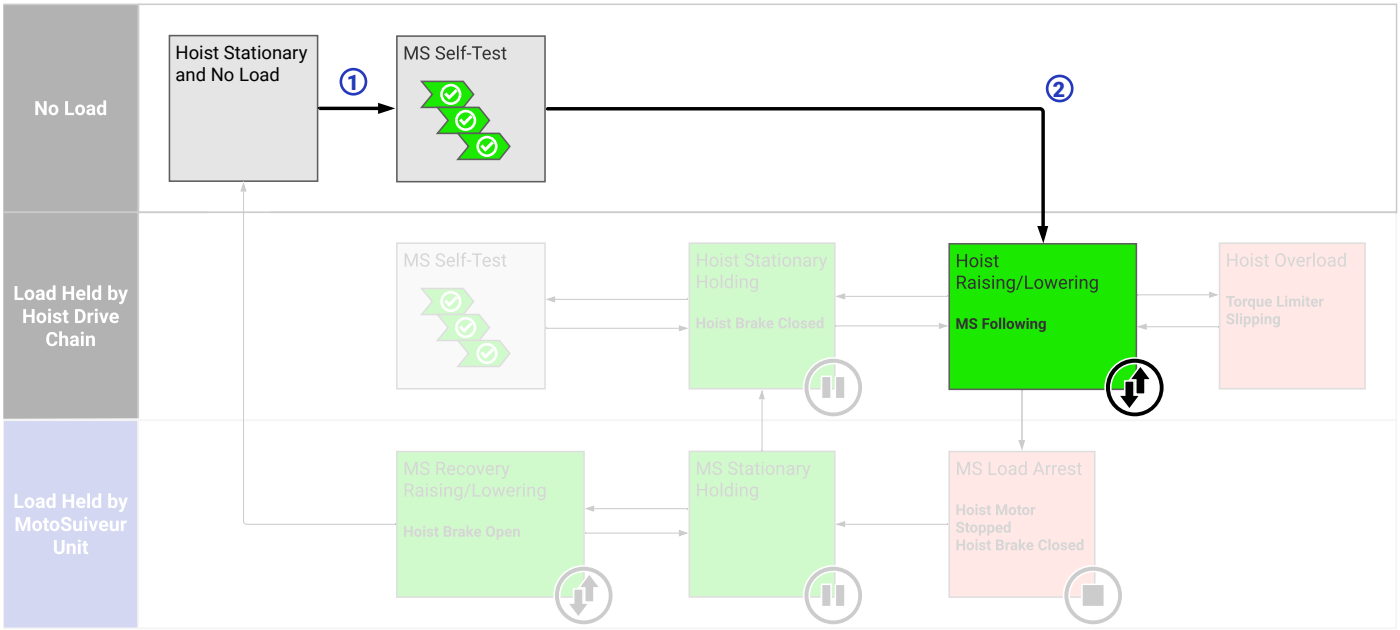
Commissioning

On-demand safe testing. During the MotoSuiveur-Secured hoist commissioning process, the full-extent tests can be repeated on-site with loads provided by the customer without presenting any risk for the personnel or the installation.

On-site assistance. Siguren Technologies offers to provide on-site assistance to mechanical and electrical installation and commissioning operations as well as training, according to the agreed-upon Installation & Commissioning Strategy.

Operating a MotoSuiveur-Secured Hoist

Initiating Hoist Operation

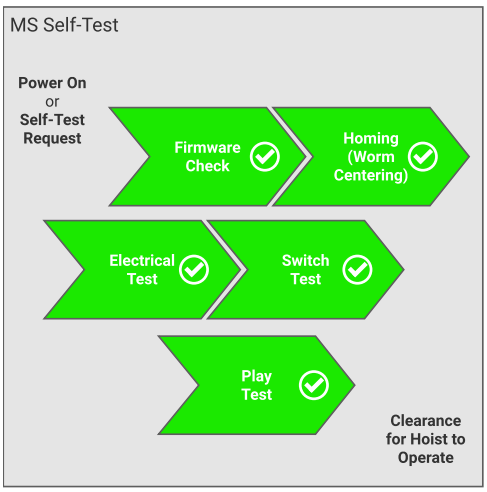


Self-Testing. At every power-on ①, the MotoSuiveur Solution runs a Self-Test procedure to :

- validate the positions of its mechanical components (wheel and worm wheel system),
- the availability of its electronic components,
- and the validity of its firmware parameters.

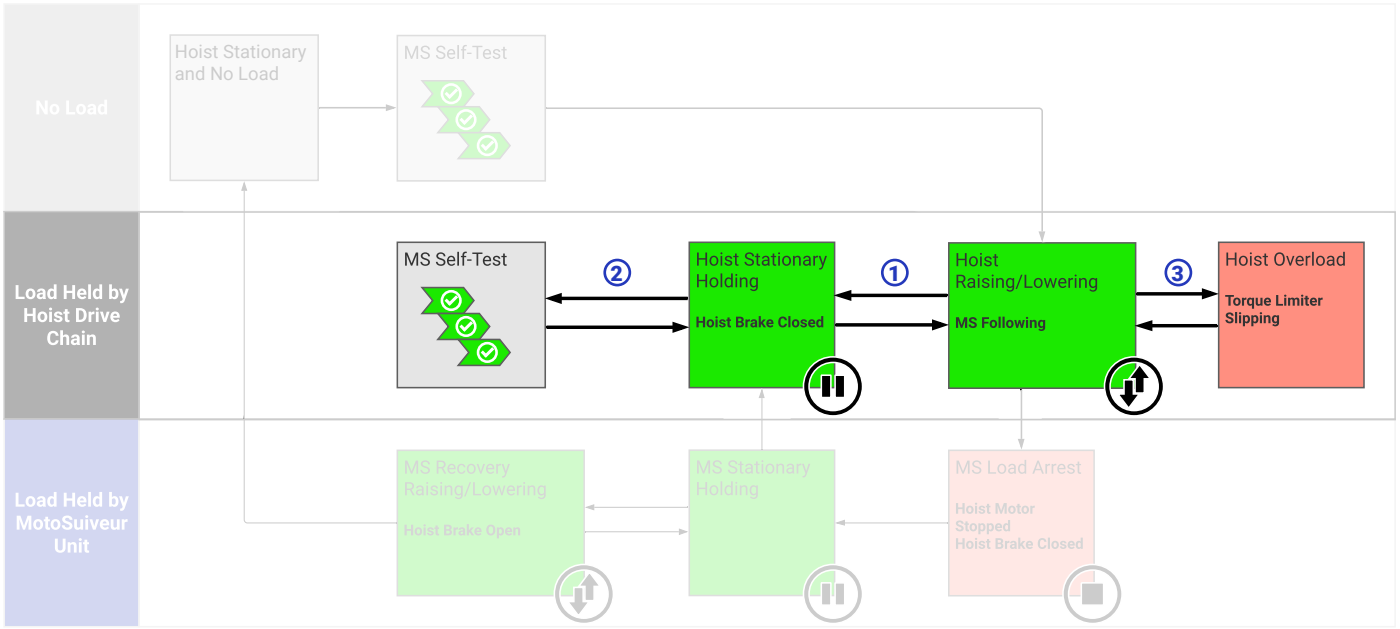
Once the Self-Test is passed, MotoSuiveur controls authorize hoist operation to proceed ②.

MotoSuiveur Self-Tests can be ran on-demand and last approximately 20 seconds. This unique feature gives the crane operator the certainty to be operating in optimal conditions.



MotoSuiveur Self-Test Procedure Steps

During Hoist Operation



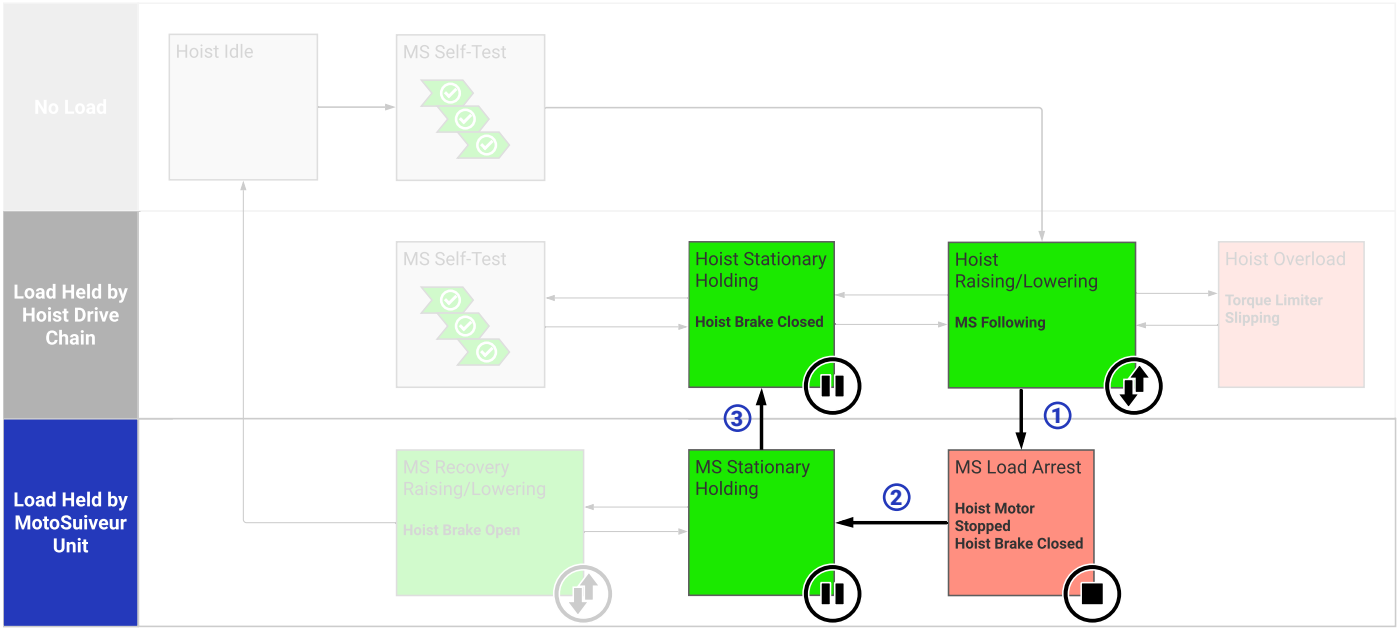
Hoist Raising and Lowering. During normal operation, the MotoSuiveur Solution is effectively following the motion of the hoist, whether it is lowering or raising, without interfering in it. The worm allows the worm wheel and drum to rotate at any speed within the hoist's normal operating parameters.
The load is held by the hoist's motor, the MotoSuiveur Solution is transparent and sees no torque, except what the worm is applying on the worm wheel which is thousands of times below the sizing criteria.

Hoist Stationary Holding. Service brakes play their role in slowing, positioning and holding the load at zero speed ①.

On-Demand Self-Test. Self-Test procedures can also be ran while the hoist service brake is holding the load stationary ②.

Absolute Overload Protection. Should an overload occur, the Torque Limiter will slip to protect the kinematic chain ③.

During and After Emergency Load Arrest



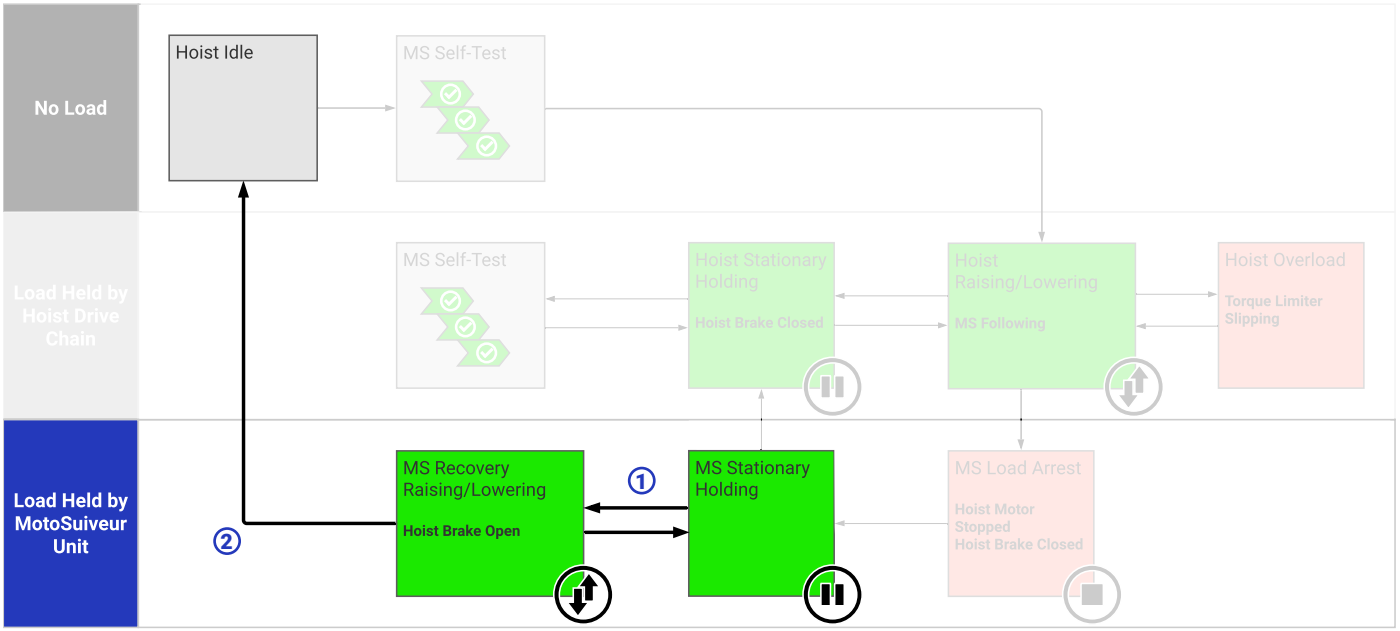
Instant load arrest. If the MotoSuiveur-Secured hoist undergoes any fault condition that puts the load into free-fall (such as a mechanical rupture, power failure, control failure, human error, etc), the MotoSuiveur Unit instantly self-locks (see p.16) and the Passive Friction Arrest System (see p.17) absorbs any impact force thereby safely arresting the load within 20 mm of load descent ①.

Overspeed prevention. By following hoist motion, The MotoSuiveur Unit is “open-loop monitoring” the actual speed of the drum (see p.15). Should an overspeed occur, the MotoSuiveur will act on the hoist controls. If the hoist controls fail to stop the movement, MotoSuiveur will arrest the load ①.

MotoSuiveur holding the load. After the load has been transferred to the MotoSuiveur Unit in a controlled manner, it will be held safely and the hoist's main kinematic chain is free of any load ②.

Resuming hoist motion after arrest. With the load held safely by the MotoSuiveur Unit, crane operators estimate whether the hoist's kinematic chain is able to resume normal operation. If yes (for example after an overspeed that led to a MotoSuiveur arrest), the load is transfered back to the kinematic chain through a simple procedure ③.

Using Load Recovery Capabilities



Hoist resilience. Load recovery after an emergency arrest is a straightforward and absolutely safe operation on MotoSuiveur-Secured hoists. The Worm and Worm Wheel System of the MotoSuiveur Unit is designed to serve as a redundant and completely independent load path. This capability is unique to MotoSuiveur-Secured hoists and provides unmatched resilience and safety in cases of hard hoist failures such as power failure or mechanical rupture of the main drive chain.

Always ready. With the load safely held by the MotoSuiveur Unit after an emergency arrest, crane operators need only to free the main drive chain by opening the hoist's service brake ①, assuming it has remained functional during the failure and is applied. This can be done remotely or require access to the hoist, in which case Siguren's simple Brake Release Tool for motor brakes is useful.

Simple and Fail-Safe operation. Crane operators simply access and rotate the MS Unit worm to lower the load safely ②. The irreversibility of the Worm and Worm Wheel system makes this a fail-safe operation devoid of any risk of uncontrolled lower.

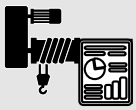
Complementary recovery strategies. According to the situation, crane operators can choose to use a brake-controlled (with MS following) or an MS-driven (with brake open) recovery strategy.

Fully remote operation. With an Integrated Recovery Drive (MS-IRD) add-on system (see p.24), load recovery can be achieved remotely without the crane operator leaving his control station. MS-IRD is engaged and disengaged through a short sequence (<10s) involving only the MotoSuiveur and IRD motors, no actuators. After engagement, MS-IRD is able to lower and, if needed, even raise the load at low speed.

Servicing & Maintenance

Low &
Non-Critical
Servicing

On-Demand
Proof-Load
Testing



Independent
Hoist Operation
Reporting

Hoist Maintenance

"De-risked" maintenance. Crane operators and plant managers benefit from the certitude of operating a fail-safe hoist. This means that the stakes of hoist maintenance are drastically lowered since an human error or oversight cannot have other consequences than a safely arrested load.

Protection against overloads. With the hoist's kinematic chain safe from overloads at all times (see p.21), all hoist components instantly benefit from significantly increased life cycles. Regular costly parts replacements for risk of mechanical rupture are avoided.

On-demand proof-load testing. Crane operators can test their hoist at will in full load and full speed arrest conditions. MotoSuiveur-Secured hoists are the only hoists to allow for such tests in complete safety and without risk of damaging the hoist.

Independent hoist operation reports. By strictly following hoist motion, MotoSuiveur Solutions independently record all hoist usage data and present crane operators with useful information (see p.30).
MotoSuiveur Solutions use FEM 9.755 “Measures for achieving safe working periods for motorized serial hoist units” to calculate hoist Safe Working Periods (SWP).

MotoSuiveur Solution Maintenance

"De-risked" stable performance. Thanks to fail-safety being at the core of MotoSuiveur Solutions, the safety performance (load arrest within 20mm of descent) is guaranteed and does not depend on maintenance.
In MotoSuiveur Solutions, maintenance is needed to ensure smooth following (see p.14) during the hoist's normal operation.
In contrast, disc-braking based safety solutions require strict servicing to maintain safety performance: air gap verification, pad wear compensation, cleaning of pads and disc, control of hydraulic circuit pressure, etc. The responsibility for the safety performance of these systems falls entirely on crane operators and plant managers.

Light maintenance. MotoSuiveur Units need only light maintenance since:

- MS Units are hermetically sealed,
- MS Unit are not loaded during normal hoist operation,
- no MS Unit parts are worn during load arrests.

MS Unit part life cycles are guaranteed with 150 million drum turns before considering the first part replacement (see table below).

On-Demand Safety Self-Tests

On-demand self-testing. MotoSuiveur Solutions can run their self-test procedure as often as requested by crane operators (see p.38).

Built-in diagnostics. Whenever a maintenance milestone is reached, the MotoSuiveur Solution notifies the crane operator through its user interface (see p.30). Maintenance milestones correspond to numbers of worm rotations (i.e drum rotations). These milestones are associated inspections, cleaning and replacements (oil, grease, joints, etc).

Maintenance Operations Intervals

Adapter to hoist drum	Visual inspection. Fasteners check.	Annually or 75E6 worm rotations
Mounting to hoist trolley	Visual inspection. Fasteners check.	
MS Motor Transmission Grease (Repsol NLGI 00)	Add or Replace.	
MS Oil SQ32	Level inspection. Add if Necessary.	
Worm Outer Piston	Replace with spare part.	Every 5 years or 150E6 worm rotations
MS Oil SQ32	Replace. Clean magnet plugs.	Every 10 years or 450E6 worm rotations
Worm Wheel Lip Seal	Replace with spare part.	Every 10 years or 900E6 worm rotations
O-rings	Replace with spare part.	

GET STARTED WITH MOTOSUIVEUR SOLUTIONS

Need advice on which MotoSuiveur Solution is best suited to your requirements ?
Our team will help you get started in no time.

With some key specifications of your project, we will be able to preselect a MotoSuiveur Unit :

SPECIFICATIONS	VALUES
Safe Working Load (kg)	
Barrel pitch diameter (mm)	
Reeving ratio	
Gearbox ratio	
Speed at high-speed shaft (rpm)	
Selected hoist motor power (kW)	
Lifting speed (m/min)	

Do not worry if some data is missing or not yet definitive, we only need a few of these to preselect a MotoSuiveur Unit for you.

TALK TO OUR TEAM

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SIGUREN technologies aims to to revolutionize the way hoists are designed and operated by making the highest levels of lifting safety accessible and easy to implement.
We are based in Plovdiv, Bulgaria.

siguren.com

PRODUCT RANGE
CUSTOMER CASE STUDIES
TECHNICAL INFORMATION
CONTACT

Learn about the MotoSuiveur® Solutions applied by our customers to deliver lean and efficient cranes satisfying the highest safety requirements.

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