This catalogue gives an overview of Aker Kvaerner MH’s extensive product range. For more details, technical specifications and tailor-made solutions, please contact an Aker Kvaerner MH office.

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**Aker Kværner MH**

Aker Kværner MH has experienced significant growth during the last twelve months. The company has been awarded major orders from key clients and significantly improved market presence.

Long term contracts and client relationships have been established for the onshore as well as the offshore segment.

In 2005 Aker Kværner MH gained considerable market share in the growing and demanding deepwater drilling market.

In addition, Aker Kværner MH has been awarded significant and important technology development contracts with key clients. The technology will be based on operational experience and input from the client. The goal is to develop next generation drilling equipment, meeting next decade’s requirements with primary focus on safety, quality, reliability, operational uptime and minimisation of time to repair.

The goals of the above technology development contract perfectly match Aker Kværner MH’s overall objectives. We believe that our long and broad experience from some of the most demanding geographical drilling areas in the world will be an ideal platform for continued growth in the years to come.

In Aker Kværner MH we believe that the core objectives that are basis for our strategy are in line with current and future industry requirements.

**HSE**

Aker Kværner MH shall meet the highest HSE standards in our design/manufacturing process resulting in superior performance of the equipment/systems delivered.

**Totality**

Aker Kværner MH is more than an equipment supplier. Aker Kværner MH shall deliver complete drilling systems, projects and operational support.

**Quality**

Aker Kværner MH shall focus on quality deliveries and performance rather than quantity.

**Operational Uptime**

Aker Kværner MH shall strive to maximise operational uptime on the systems delivered through design, manufacture, project delivery, after sales support and working relations with the client.
Technology
Aker Kvaerner MH shall develop technology to meet future requirements to operational uptime, quality and time to repair. Technology shall preferably be developed in close co-operation with key clients.

Focus
Aker Kvaerner MH shall focus on high end solutions and equipment as well as demanding clients with similar strategic targets as Aker Kværner MH.

Efficiency
Aker Kvaerner MH shall deliver the highest drilling system efficiency available through first class products and project deliveries.

Smarter
Aker Kvaerner MH shall work together with key clients to develop key products, technology and smarter work processes.

Aker Kvaerner MH will increase its service organisation significantly in 2006 to support the current and expected growth, and to meet the anticipated after sales/operational support requirements. Improved international service bases and facilities are under construction and a doubling of the international service staff is planned and under implementation.

Aker Kværner MH’s extensive experience base, our current and balanced project portfolio and the initiatives we have initiated with respect to capacity and competence increase, make us confident that we will meet our commitments to our clients and continue to develop our capabilities and capacity successfully.

Aker Kværner Group
Aker Kværner MH is a fully owned subsidiary of Aker Kværner ASA.

Aker Kværner has aggregated annual revenues of approximately 8 USD billion and employs around 25,000 people in more than 30 countries.

The business within Aker Kværner spans a number of industries, including Oil & Gas, Refining & Chemicals, Mining & Metals, Power Generation and Pharmaceuticals & Biotechnology.
Drilling Rig Packages

**RamRig™**

In 2005 three new dual RamRigs were ordered by Eastern Drilling and Aker Drilling (2). All three are harsh environment, 10000 ft water depth, 6th generation drilling rigs. With these three units the number of RamRigs under construction and in operation total is nine.

RamRig™ have successfully operated in international waters for oil companies such as BP, Chevron Texaco, Amerada Hess, Marathon Oil, Conoco and Shell in the following locations: West Africa, Greenland, The Faeroe Islands, the UK, Ireland, Canada and Egypt.

The RamRig™ concept was introduced to the drilling industry in 1996. A year later the RamRig™ was awarded the ONS innovation award, and by the year 2002 Aker Kvaerner MH had delivered six rig packages based on this technology.

Aker Kvaerner MH's RamRig™ represents State of the Art technology with a well proven and successful operational track record since 1998. It can be applied to fixed and floating drilling platforms. The concept's inherent features make it especially competitive on deepwater rigs. The concept is available with single, double or triple stand rigs with capacities ranging from 150 to over 1,000 tons.

A dual RamRig™ is the ultimate deep water rig. These rigs, of which two are in operation, provide dual rig functionality at a significantly lower total operational cost than a comparable conventional dual rig solution.

**Main Features**

- Safety, fingerboard at drillfloor level. Less over-head operations.
- Documented lower weight, reduced space requirements and improved safety compared to conventional drilling packages.
- Lower centre of gravity increases variable deck load (VDL) capacity.
- Highly flexible and accurate integrated long stroke active/passive heave compensation and state-of-the-art control systems, improved operational efficiency.
- The impressive accuracy and built-in automated drilling function results in a smoother well path, less weight on bit (WOB) variations and optimization of the rate of penetration (ROP).
- No drawworks, considerably increased braking capacity and minimal risk of dropping the BOP/riser.

**Drill floor and Substructure**

Due to the unique design, all tubulars on the RamRig™ are racked vertically from drill floor to lower setback, saving valuable deck space without reducing the rig’s drilling capacities. The concept is therefore ideal for deepwater operations.

The vertical racking of tubulars has the following main advantages:

- All pipe handling functions are independent of the hoisting operations
- Opening and closing of the elevator always takes place at drill floor level, not at high level in the derrick.
- Simplified equipment for horizontal to vertical pipe handling.
- Reduced possibility of dropping objects.

The elevated drill floor also enables a very efficient and safe working environment for handling BOP and subsea equipment.
RamRig™ Key Components

The hoisting system on the RamRig™ consists of two or more cylinders (depending on capacity requirements) instead of the conventional drawworks and derrick. The hoisting lines are of fixed length, parallel lines with one end anchored at the drill floor, the other end at the Top Drive. The lines are run over the yoke sheaves, thereby transforming the push from the rams to upward lifting force to the Top Drive. Subsequently, the travelling distance and speed of the Top Drive is double the stroking of the rams. The stroking velocity of the rams is maximum 1 m/s (3.3 ft/s), which gives 2 m/s (6.6 ft/s) travelling speed for the Top Drive.

RamGuides

The RamGuides replace the derrick or mast used in a conventional drilling set-up, and are built for the purpose of guiding only, not for lifting. As the load is taken by the drill floor structure, and not from the top of a derrick structure, the RamRig™ concept provides a lower weight and center of gravity. With RamGuides installed, there is no need for crown block or travelling block.

Rams

The Rams, or cylinders, are of the same type as those used in the well known Aker Kvaerner MH crown compensators. The cylinders are coated with a non-corrodible and durable ceramic layer extending the operating lifetime of the cylinders. The Rams have a non-contact position measurement system with an accuracy of 1/100 mm.

Equalizer Assembly

The equalizer assembly at drill floor level absorbs uneven wire stretch and ensures even load stress of the wires during their lifetime.

Hydraulic System

The hydraulic system is used to power the hoisting, lowering and heave compensation operations. The system is comprised of a number of hydraulic pumps (normally 8) driven by diesel engines or constant speed AC motors, hydraulic reservoir, valves for mode selection and nitrogen accumulators. The system is highly flexible and redundant in configuration.

The heave compensation system has three modes of operation. In passive mode, the nitrogen bottles are directly connected to the Rams. In this mode, the system may operate continuously without use of electric power. In semi-active mode, nitrogen bottles and the hydraulic system work together to reduce system friction. In the truly active mode, the hydraulic system is used to compensate for the heave.
Conventional Drilling Rig Packages

Complete Derrick Equipment Sets (DES) and Drilling Support Modules (DSM) can be provided on an EPC basis. Aker Kvaerner MH draws upon well-qualified and experienced in-house resources to participate in and/or provide the following services as part of the complete drilling facilities delivery:

- Project management
- Conceptual design/front-end engineering design (FEED)
- Detail engineering and procurement
- Supply of complete drilling equipment/mud treatment packages, including third party supplies
- Fabrication, supervision and follow-up
- Commissioning, supervision and assistance
- Life cycle/operational support

Major Project References

Featuring recent projects, including RamRig® and conventional drilling rigs

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(F) = Floater
MH Pyramid, Inc.
MH Pyramid, Inc., a fully owned subsidiary of Aker Kvaerner MH AS, is a world leader in design and fabrication of land and offshore drilling structures. MH Pyramid has fabricated over 2,000 rigs since the early 1960s and has provided rigs for almost every major oil company and drilling contractor in the world.

With over forty years of experience, using innovative engineering, stringent quality control and a knowledgeable staff, MH Pyramid continues to be on the leading edge of modern rig design and fabrication.

MH Pyramid possesses a comprehensive rig portfolio and is unsurpassed in the industry, providing a variety of mast and derrick designs for platforms, semi-submersible rigs, jack-up rigs, drill ships and barges, as well as substructures, masts, work-over rigs, desert trailer rigs, rig moving equipment, rig skidding systems, helicopter rigs and slant hole rigs.

Also available for rig repairs, modifications, equipment retrofits, top drive installations and much more, MH Pyramid is able to serve customer needs in a variety of related areas.

MH Pyramid has a fully staffed, highly qualified engineering department, utilizing the very latest cutting edge computer design technology, 3D Modeling and Animation.

In addition, MH Pyramid provides field service technicians, welders and fitters, which are available to quickly respond and assist our customers at any location in the world.

MH Pyramid sells and services the complete line of Aker Kvaerner MH drilling equipment, including compensators, tensioners, pipe handling equipment, drilling control rooms, B.O.P. handling equipment, top drive systems and iron roughnecks.

Experience
MH Pyramid has a lifetime delivery record of over 2,000 rigs. Several large packages have been awarded to the company in recent years, including Dual Derricks, Derrick Equipment Sets and Land Rig Packages for clients all over the globe.

The MH Pyramid reference list includes:

- Offshore Derricks, Masts and Substructures
- Land Masts and Substructures
- Rig Moving Equipment
- Rig Skidding Equipment
- Structural Accessories
- Spare Parts
MH Pyramid Product Line

Offshore Structures

Derricks
Dynamic Derricks
Jack-Up Derricks
Standard Derricks

Masts
Telescoping Masts
Vertically Assembled Masts
On-Floor Cantilever Masts

Substructures
Derrick Substructures
Multi-Well Substructures (2-axis skidding)
Substructure Module Components

MH Pyramid designs, fabricates and installs offshore packages for drill ships, semi-submersibles, jack-ups, fixed platforms, tension leg platforms, spars, barges, work-over rigs and multi-well mast and substructure combinations.

Derricks, masts and substructures for offshore applications are custom designed and manufactured to meet customer drilling requirements. Careful consideration and analysis is given to customer specifications, such as weight, space, environmental loading conditions and operational capacities.

MH Pyramid works closely with our customers and other involved drilling equipment suppliers to achieve a successful structural integration of drilling components, such as top drives, automated pipe handling equipment, crown mounted compensators and other special equipment.

All MH Pyramid derricks can be designed to accommodate a Aker Kvaerner MH Vertical Pipe Handling System, featuring an MH Bridge Crane and an MH Pneumatic Fingerboard. Upon request, we will include optional pricing to fully support vertical pipe handling system in the derrick package, complete with structural supports and service piping. Upon request, MH Pyramid will take full integration responsibility on these packages.

Dynamic Derricks

Whether it is for semi-submersibles, drill ships, barges or floating vessel types, MH Pyramid can custom design and fabricate derricks to accommodate customer specific loading and operating conditions and parameters. Variables such as hook load, setback load, wind speed, top drive torque, roll, pitch, heave, list and center of rotation are all analyzed in combination with specific operating conditions and parameters.

MH Pyramid can design and fabricate welded or bolted dynamic derricks, while offering a virtually unlimited variety of custom derrick sizes, capacities, design variables and conditions. These custom structures allow the customer a greater flexibility for the design criteria for the specific rig.
**Jack-Up Derricks**

A variety of Jack-Up derrick designs are offered by MH Pyramid, which typically range from 800,000 lbs to 2,000,000 lbs static hook load. MH Pyramid has an in-house engineering group, capable of supplying a multitude of Jack-Up derrick designs, sizes, capacities and features.

These Jack-Up derricks can be designed with the ability to make infield moves with partial setback, while accommodating a variety of other customer-supplied equipment. The capability of design flexibility is our main strength.

The Vertical Beam-Leg Bottleneck Design arranges the derrick with vertical legs extending from the drill floor to above racking board elevation before sloping inward to the top of the derrick. This design expands the setback capacity, while improving driller visibility, and increasing productivity.

Straight Tapered Leg Design is common for many MH Pyramid Jack-Up derricks. This features straight tapered legs fabricated with angles or beams. In this design, all four legs of the derrick gradually slope inward from the base to the top of the derrick. This design occupies less space on the rig and reduces weight.

Custom Derrick Geometry allows MH Pyramid to design and fabricate custom designs for Jack-Up derricks. With Custom Derrick Geometry, whatever the customer specifications require, MH Pyramid can create it. This custom geometry includes Asymmetrical derricks, derricks with an offset well center to maximize racking capacity, and derricks with a straight taper on the fastline side with vertical legs on the other side. This flexibility allows the customer to decide which design would provide the most optimal scenario.

**Standard Derricks**

Over the years, MH Pyramid has fabricated and delivered well over 100 standard derricks worldwide to the oil industry. Standard derricks are suited for Jack-Ups and Fixed Platforms, where price is a major concern. MH Pyramid Standard derricks rely on a proven, simple design to reduce weight and size for the structure on the drill floor. This reduced weight allows the contractor to put focus on some other portion of the drilling rig to provide the most optimal solution, in order to increase productivity and profitability.

Standard derrick designs feature straight legs from the drill floor to the crown block. This design reduces weight on the rig, while maximizing strength and durability in the process. MH Pyramid standard derricks are field tested and proven reliable over many years on rigs all over the globe.
MH Pyramid Product Line

Offshore Masts
MH Pyramid offers a variety of structures for offshore rigs. In addition to specific derrick designs, offshore masts and substructures are also available for specific rigs. Offshore masts are designed according to customer specifications for Tender-Assisted, Fixed Platforms, Spar Platforms, Submersible Barges and Semi-Submersible rigs. Mast designs for offshore rigs include Telescoping masts, Vertical Assembled masts and On-Floor Cantilever masts. These structures are customized according to specific customer requirements.

- Vertical assembled masts
- Telescoping masts
- On-Floor Cantilever masts

Tender-Assisted Packages
Tender-assisted rig packages are designed specifically for easy water transportation and quick rig-up and rig-down on multi-well platforms. These rigs break down into small packages, of which depend on the size and capacities of the rig crane. They are particularly suited for drilling on small platforms. This particular mast may also be outfitted for top drive systems.

Some basic features for this rig include two-way skidding, low weight package lifts from tender to platform and vice-versa, wire line raised and vertically telescoped mast, included fluid tanks in lower substructure and optional cantilevered 100 bbl. mud tanks. The flexibility of the MH Pyramid designed packages for tender-assisted rigs allow contractors to utilize existing equipment in a productive manner. Thus reducing overhead and increasing profitability. The mast racking capacities are adjustable to different heights.
MH Pyramid offers a wide array of land rig packages and options. These packages include the Fast Moving Land Rig, multiple mast and substructure combinations and desert trailer rig packages. All of these structures are custom designed in accordance to customer specifications and requirements. Working closely with our customers and other involved drilling equipment suppliers, MH Pyramid is able to achieve a successful structural integration of drilling components.

**Fast Moving Land Rig**

Designed to accompany the latest in modern technology, the MH Pyramid Fast Moving Land Rig (FMLR) generates fast rig moves, quick rig-up and rig-down time, decreased transportation loads and improved safety.

The FMLR can be transported in as few as four truck loads, which is a vast improvement over the industry average of triple that amount. With a rig-up time of two days, the FMLR cuts the industry average of four days in half. The mast and substructure are raised simultaneously using hydraulic raising cylinders. The use of these cylinders creates a faster swing-up time and a decreased safety concern, because it does not rely on drawworks power and wire lines as a raising system. Safety is also improved by setting the drawworks at truck bed height and allowing the mast to pin at a height of 3 feet above the ground.

MH Pyramid creates an optimal safety environment with this rig design. By reducing the time and resources needed for transport and rig-up, MH Pyramid also promotes productivity, thereby enhancing performance and profitability of the rig.

The FMLR is designed to work in conjunction with the latest in modern controls. This has the ability to adapt to the latest industry drilling control systems, remote-controlled drawworks, other remote systems and utilizing AC power to drive the rig.

As the latest addition to the vast range of rig designs for MH Pyramid, the FMLR creates a superlative solution, encompassing the best of all worlds into the design, creating the optimal solution for the next generation of land rigs.
MH Pyramid Product Line

**Swing-Up Mast and Substructure**

With the rising industry emphasis on safety and maximizing effectiveness, MH Pyramid designed the “Swing-Up” mast and substructure. Self elevating, Swing-Up masts and substructures are designed to provide a safer, more stable and durable mast and substructure. This is accomplished through state-of-the-art engineering and design principles.

Rig-up is accomplished at truck bed height, eliminating the need for a crane. All components may be assembled using a gin pole truck. Using the drawworks power, only two lifts are required. First, the mast and setback structure are simultaneously raised to the vertical position. Then the drawworks, rotary, flooring and doghouse are elevated to operating floor height. Both lifts utilize reliable sheave and wireline erection system.

Triangular side frame structure allows the drilling loads and vibrations to be transmitted directly to the bottom boxes. This results in a more stable drill floor. This structure has a large drill floor, free of A-frames. MH Pyramid masts have no A-frames or A-frame spreaders. Some land rigs require the mast to be pinned to the A-frame at a high level above the drill floor, creating a safety concern. MH Pyramid masts pin 6 feet above the ground for easy access and improved safety.

**Cantilever Mast w/ Box on Box Substructure**

Standard cantilever masts with box on box substructures are available in various configurations to handle a broad range of drilling capabilities. The box on box substructure is the product of recent design improvements, which allows for maximum flexibility, reduced rig-up and rig-down time. These added capabilities make this assembly available more quickly and economically than ever before, saving the customer valuable time and resources.

By eliminating most of the traditional diagonal bracing, this new substructure can accommodate accessories, such as windwalls, tool rooms and change rooms. This space-saving design reduces the number of individual structures needed on-site, thereby enhancing the efficiency of used space and materials over conventional designs. The open box concept also reduces interference with flowlines, BOP accessories and required maintenance. Durability, however, has not been sacrificed in this model. By design, this is much less susceptible to damage than any previous model, thereby reducing downtime and maximizing production.

The procedure for erecting this rig configuration eliminates the need for complicated mast foot ramps. This, in turn, saves the time consuming and dangerous work of bringing the mast up the ramps to drill floor height. Instead of cranes, gin-pole trucks are utilized to bring the mast into horizontal position from the ground level, reducing the overhead cost of the rig.
Desert Trailer Rigs
MH Pyramid designed Desert Trailer Rigs for the purpose of extremely fast rig moves under harsh desert conditions. These rigs utilize the latest in design techniques to move the mast, substructure and associated drilling equipment. The design of these rigs is based on a wheel mounted single or double trailer, fast rig-up and rig-down times (3-1/2 hours maximum), quick moving and the ability to be towed either forwards or backwards.

The mast, drawworks, rotary table, hydraulic power unit and substructure are completely contained on a single trailer with additional room for customer’s doghouse, air receiver, change house or compressor package and drill line spool.

A 22 foot high working floor substructure allows the rig to be moved on and off wells with up to a 23 foot high by 12 foot wide Christmas tree. The rig affords a 19 foot clear working height under the rotary support beams. Built in hydraulic screw jacks allow for fast leveling of the substructure.

This design allows the capability of extremely fast rig moves, which not only increases the effectiveness and profitability of the rig, but also increases the safety factor in the harsh desert conditions. The trailer is lowered onto high floatation tires by retracting the hydraulic jacks, which are retracted further to pick up the bearing pads. The rig may then move off the well.

The trailer can be pulled by a truck at the drawworks end with the mast erect or by a truck at the mast crown with the mast lowered and scoped in. This unit is adaptable to either mechanically driven or electrically driven drawworks.

Rig Moving Equipment
Customized rig moving packages are designed for “new-build” structures or retrofitted for existing structures. Rig moving equipment are highly specialized and designed according to the type of rig package to be moved, the environment and other customer requirements. Working with the customer, the staff of experienced engineers at MH Pyramid will take all factors into consideration and determine the safest and most efficient rig moving system design to meet the customer specifications, showing flexibility and determination to increase the effectiveness and profitability of the customer, as well as itself.
Lift and Roll Rig Skidding System
The MH Pyramid Lift and Roll Rig Skidding System transports the mast, substructure and setback along an in-line well pattern, while the rig is in vertical drilling position. The Lift and Roll Rig Skidding System is able to skid in X or Y direction, which means from drillers to off-drillers side or from drawworks to V-door side. This added flexibility increases operating efficiency and reduces downtime needed for infield moves.

The Lift and Roll Rig Skidding System consists of the following:

- Four 200 ton hydraulic lifting jacks
- Eight 20 ton rig push/pull skidding jacks
- Four 200 ton hardened roller assemblies for straight-line motion and with vertical guides.
- Four roller bases to support the rig on the location foundation and support for the rollers
- One set of substructure modification and support material to add to the substructure bottom boxes.

The system comes complete with a control console, which includes independent control valves for jacking and independent control valves for skidding. Valves are included to control BOP handling equipment. The control console has quick disconnects and hoses included to connect the hydraulic power unit to the rig. The versatility of this control console promotes greater effectiveness of the operator, which enhances the productivity of the rig. An electric power unit for rig skidding and BOP handling is also included. A skid mounted power unit with reservoir, pump and hose bracket completes this assembly.

Casing Stabbing Board
MH Pyramid Casing Stabbing Boards are designed for safe travel within the drilling structure and is known for long, proven operation service time in environments encompassing the globe. The casing stabbing board has a mono-rail track, which provides smoother carriage travel, better visibility and a greater freedom of movement, promoting efficiency of the rig. The boards are adjustable from 23 feet to 47 feet above the drill floor and designed to be mounted in a customer specified location. The design allows for carriage to be manually locked into any position for added safety.

Casing stabbing boards come with an ABS man riding certified winch with two automatic brakes to control travel. A deadman type control stops carriage travel when the operator releases the safety pull-cord. A dual over-speed device stops the carriage in the event of wireline failure. The casing stabbing board includes a full body harness, that attaches to a retractable overhead safety block by cable.

Space requirements for the system is reduced by the counterweight carriage platform that folds to storage position when not in use. The carriage platform provides a safe place for the operator to stand when carriage is in the stored position.
Structural Accessories and Spare Parts

In addition to providing an abundance of masts, substructures, derricks, rig movers, drilling equipment and other specialized equipment, MH Pyramid offers a wide range of structural accessories and spare parts to complement our customer’s equipment. See the list below for a sample of some of the items we supply.

### Structural Accessories

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<td>Tubing Boards</td>
<td>Racking Boards</td>
</tr>
<tr>
<td>Change Rooms</td>
<td>Ladder with Safety Cages</td>
<td>Rig Moving Equipment</td>
</tr>
<tr>
<td>Counter Weights</td>
<td>Mast Boom Kits</td>
<td>Rig Skidding Equipment</td>
</tr>
<tr>
<td>Crown Blocks</td>
<td>Mast Breakover</td>
<td>Safety Slides</td>
</tr>
<tr>
<td>Deadline Anchors</td>
<td>Mast Snubbing Equipment</td>
<td>Service Platforms</td>
</tr>
<tr>
<td>Derrick Man Assistors</td>
<td>Mast Head Rests</td>
<td>Slingline Equalizers</td>
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<tr>
<td>Fuel Tanks</td>
<td>Mast Levelling Equipment</td>
<td>Stairs</td>
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</table>

### Spare Parts

<table>
<thead>
<tr>
<th>Bearing Assemblies</th>
<th>Gauges</th>
<th>Pumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolts</td>
<td>Heat Exchangers</td>
<td>Raw Steel</td>
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<tr>
<td>Bumper Blocks</td>
<td>Hoses</td>
<td>Rollers</td>
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<tr>
<td>Canvas Material</td>
<td>Hydraulic Cylinders</td>
<td>Safety Belts</td>
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<tr>
<td>Climbing Equipment</td>
<td>Hydraulic Parts</td>
<td>Safety Pins</td>
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<tr>
<td>Couplings</td>
<td>Jacks</td>
<td>Seals</td>
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<td>Drive Pins</td>
<td>Load Cells</td>
<td>Shackles</td>
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<td>Fasteners</td>
<td>Motors</td>
<td>Shafts</td>
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<td>Fittings</td>
<td>Pipe Clamps</td>
<td>Sheaves</td>
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<table>
<thead>
<tr>
<th>Stand Pipe</th>
<th>Snatch Blocks</th>
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<tbody>
<tr>
<td>Storage Houses</td>
<td>Tires</td>
</tr>
<tr>
<td>Tong Back-Up Posts</td>
<td>Tools</td>
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<tr>
<td>Tong Counter Weights</td>
<td>Valves</td>
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<td>Trawelling Blocks</td>
<td>Wheels</td>
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<td>Trolley Beams</td>
<td>Winches</td>
</tr>
<tr>
<td>Water Tanks</td>
<td>Wire</td>
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</tbody>
</table>

### Engineering and Field Service

The engineering staff at MH Pyramid has a distinct specialization of designing equipment and solving problems associated with the development and manufacturing of a variety of oilfield, industrial and commercial products.

Utilizing years of effective experience, MH Pyramid works with the customers to develop the optimal solution. This flexibility ensures that the customer gets exactly what they need and we promote our effectiveness in optimizing and streamlining the development process for the project.

MH Pyramid field crew members are experienced with on-site construction and are highly skilled at their specialty fields. Field crews are capable of extensive structural and pipe fabrication, installation and repair. These crews consist of rig inspectors, project supervisors, welders and fitters. All welders are certified and can perform welding techniques ranging from basic to exotic procedures. Field service supervisors and engineering support are available for customers.
Portable Top Drives (PTD™)
Derrick Drilling Machines (DDM)
Ranging from 410 to 1000 tons

Aker Kvaerner MH hosts the largest range of Top Drives available; Hydraulic, DC or AC driven.

The Aker Kvaerner MH portfolio of Top Drives includes the DDM (Derrick Drilling Machine) and the PTD™ (Portable Top Drive), for both land and offshore use. The DDM includes conventional swivel, motor, gearbox, pipe handler and elevator. The DDM is mounted to a dolly and suspended from the travelling block or hook. The design is intended for permanent installation.

The PTD™ comprises similar features as the DDM, accommodating the size and performance requirements of compact offshore and land rig applications. The design is intended for temporary installation, or for use in compact derricks/masts that are not designed to take the load and size of a full scale Top Drive. The PTD™ is available with or without an integrated swivel.

PTD™/DDM Features

**Improves well conditions**
Aker Kvaerner MH Top Drives can easily be connected to the drill string while tripping. Circulation and rotation can start immediately to clean the well and thereby prevent stuck pipe.

**Efficient directional drilling**
Accuracy of the deviation is easier maintained, as the direction only has to be adjusted every 90 ft (27.4 m). The AC Top Drives include tool face orientation system for controlling the direction of the downhole motor.

**Time-saving**
The Top Drives reduce the number of connections by 2/3 while drilling with 90 ft stands (27.4 m).

**Core recovering**
The Top Drives increase the possibility of recovering a full core barrel up to 90 ft (27.4 m) without intermediate connections.

**Safety**
The Top Drives eliminate the hazard of rotating equipment on the drill floor level. By reducing the number of connections to one third, safety is improved.

**Pipe handler**
The Top Drives include a 360° rotating pipe handler with link tilt functions and Torque Wrench with the following dual ratings:
- Dual rating 60,000 ft/lb
- Dual rating 79,000 ft/lb
- Dual rating 127,000 ft/lb
Model PTD™ 410 and 500 ton SWL
The Aker Kvaerner MH series of Portable Top Drives, (PTD™) include the PTD™ 410 and the PTD™ 500, utilizing the existing swivel onboard the rig. The PTD™ system consists of one or two skid mounted units, depending on the torque and speed rating.

The standard PTD™ power unit is comprised of a diesel engine driven hydraulic pump unit. Alternative drive units are also available, such as AC, DC, and Rotary Table drives.

The Top Drive/Power Unit interface is equipped with quick disconnects for fast rig up/rig down. All top drive functions are remote operated from the Driller’s Cabin. The PTD™ has successfully been installed on land rigs, compact offshore rigs and drill ships.

The PTD™ can be adapted to helicopter rigs. A high speed version (600 rpm) is also available for slimhole drilling.

PTD™ 500 AC
- Equipped with the most compact 800, 1000 or 1200 HP AC motor available
- Integrated swivel
- Multi-functional pipe handler (remote controlled)
- 60,000 lbf ft make-up and break-out capacity on torque wrench
- Onboard hydraulic power unit
- Bidirectional link tilt system
- Fully adjustable tool face orientation system
- Variable frequency drive mounted in an air conditioned housing together with PLC and auxiliary electrical controls
- Modularized assembly of main components (simplifies maintenance & overhaul)

PTD™-S 500 HY
- Equipped with one variable 1000 ccm hydraulic motor
- Integrated swivel
- Multi-functional pipe handler (remote controlled)
- 60,000 lbf ft make-up and break-out capacity on torque wrench
- Bidirectional link tilt system
- Suitable for one or two motors diesel driven hydraulic power unit.
- Modularized assembly of main components (simplifies maintenance & overhaul)

Both of these PTDs are designed based on years of experience gained from its successful predecessors; the PTD™ 410 and the DDM. Aker Kvaerner MH has combined the best experience and design features from these two machines. The PTD™500 can be installed in 12 hours or less in the majority of existing masts and derricks.

The PTD™ 500 is designed with a continuous main shaft from the power swivel through the pipe handler. The weight of the drill string is transferred from the link hanger to the main shaft by means of a shoulder attached at the lower end of the shaft. The load rating is 500 tons for all load-carrying parts (except for the standard elevator links).
PTD™ 500 HY
Lifting capacity: 500 tons
Continuous torque: 57000 Nm (42000 lbf ft)
Torque at max. speed: 33200 Nm (24500 lbf ft)
Max. speed: 235 RPM
Speed at max. torque: 140 RPM
Power input max: 1066 kW (1430 HP)
Weight incl. guide dolly: 5700 kg (12600 lb)
Length: 3100 mm (10.2 ft)

Performance relates to two variable hydraulic motors and 2ea diesel engines.

PTD™ 500 HY
Lifting capacity: 410 tons
Continuous torque: 38000 Nm (28000 lbf ft)
Torque at max. speed: 19000 Nm (14000 lbf ft)
Max. speed: 200 RPM
Speed at max. torque: 90 RPM
Power input max: 533kW (715 HP)
Weight incl. guide dolly: 5600 kg (12300 lb)
Length: 3100 mm (10.2 ft)

Performance relates to one fixed and one variable hydraulic motor.

PTD™ 500 AC- 2M
Lifting capacity: 500 tons
Continuous torque: 81200 Nm (60200 lbf ft)
Torque at max. speed: 51000 Nm (37600 lbf ft)
Max. continuous speed: 216 RPM
Speed at max. torque: 143 RPM
Power input max: 1340 kW (1800 Hp) continuous.
1940 kW (2600 Hp) intermittent
Weight incl. guide dolly: 15000 kg (33000 lb)
Length: 5140 mm (16.8 ft)

PTD™-S 500 HY
Lifting capacity: 500 tons
Continuous torque: 50200 Nm (37000 lbf ft)
Torque at max. speed: 35600 Nm (26300 lbf ft)
Max. continuous speed: 210 RPM
Speed at max. torque: 154 RPM
Power input max: 1066 kW (1430 Hp) continuous.
Weight incl. guide dolly: 11300 kg (24900 lb)
Length: 5140 mm (16.8 ft)

PTD™ 500 AC
800 or 1000 HP
Lifting capacity: 500 tons
Continuous torque:* 40600 Nm (30100 lbf ft)
Torque at max. speed:* 25500 Nm (18800 lbf ft)
Max. continuous speed:* 216 RPM
Speed at max. torque:* 143 RPM
Power input max:* 670 kW (900 Hp) continuous.
970 kW (1300 Hp) intermittent
Weight incl. guide dolly:* 11400 kg (25100 lb)
Length: 5140 mm (16.8 ft)

* Performance shown for 800 HP

PTD™-S 500 HY
Lifting capacity: 500 tons
Continuous torque:* 59600 Nm (43900 lbf ft)
Torque at max. speed:* 40100 Nm (29500 lbf ft)
Max. continuous speed:* 208 RPM
Speed at max. torque:* 140 RPM
Power input max:* 970 kW (1300 Hp) continuous.
Weight incl. guide dolly:* 14000 kg (30800 lb)
Length: 5425 mm (17.8 ft)

* Performance shown for 800 HP

PTD™ 500 AC
1200 HP
Lifting capacity: 500 tons
Continuous torque: 59600 Nm (43900 lbf ft)
Torque at max. speed: 40100 Nm (29500 lbf ft)
Max. continuous speed: 208 RPM
Speed at max. torque: 140 RPM
Power input max: 970 kW (1300 Hp) continuous.
Weight incl. guide dolly: 14000 kg (30800 lb)
Length: 5425 mm (17.8 ft)
Top Drive Systems

DDM 650 L DC, 2 Speed
Lifting capacity: 650 tons
Power output: 783 kW (1050 Hp)
Continuous torque: 68350 Nm (50400 lbf ft)
Intermittent torque: 76900 Nm (56700 lbf ft)
Max. speed (max. Hp): 186 RPM
Max. speed at max. torque: 104 RPM
Continuous power input: 1200 A
Intermittent power input: 1435 A
Weight excl. Guide Dolly: 16000 kg (35300 lb)
Length: 6190 mm (20.3 ft)

DDM 650 L AC
Lifting capacity: 650 tons
Power output: 860 kW (1150 Hp)
Continuous torque: 86000 Nm (63400 lbf ft)
Intermittent torque: 123300 Nm (91000 lbf ft)
Max. speed (max. Hp): 268 RPM
Max. speed at max. torque: 93 RPM
Continuous power input: 1100 A
Intermittent power input: 1544 A
Weight excl. Guide Dolly: 16000 kg (35300 lb)
Length: 6190 mm (20.3 ft)

DDM 650 DC, 2 Speed
Lifting capacity: 650 tons
Power output: 783 kW (1050 Hp)
Continuous torque: 68350 Nm (50400 lbf ft)
Intermittent torque: 76900 Nm (56700 lbf ft)
Max. speed (max. Hp): 186 RPM
Max. speed at max. torque: 104 RPM
Continuous power input: 1200 A
Intermittent power input: 1435 A
Weight excl. Guide Dolly: 20400 kg (45000 lb)
Length: 6800 mm (22.3 ft)

DDM 650 AC
Lifting capacity: 650 tons
Power output: 860 kW (1150 Hp)
Continuous torque: 86000 Nm (63400 lbf ft)
Intermittent torque: 123300 Nm (91000 lbf ft)
Max. speed (max. Hp): 268 RPM
Max. speed at max. torque: 93 RPM
Continuous power input: 1100 A
Intermittent power input: 1544 A
Weight excl. Guide Dolly: 20400 kg (45000 lb)
Length: 6800 mm (22.3 ft)

DDM 650/750/1000 DC-2M
Lifting capacity: 650 tons / 750 / 1000 tons
Power output: 1640 kW (2200 Hp)
Continuous torque: 88000 Nm (65000 lbf ft)
*101820 Nm (75100 lbf ft)
Intermittent torque: 89000 Nm (63800 lbf ft)
*114500 Nm (84450 lbf ft)
Max. speed (max. Hp): 240 RPM / *207 RPM
Max. speed at max. torque: 163 RPM / *140 RPM
Continuous power input: 2x1250 A
Intermittent power input: 2x1435 A
Weight excl. guide dolly: 26500 kg (58400 lb)
Length: 6000 mm (19.7 ft)
* For DDM 750 & 1000

DDM 650/750/1000 AC-2M
Lifting capacity: 650 tons / 750 / 1000 tons
Power output: 1720 kW (2300 Hp)
Continuous torque: 110000 Nm (81000 lbf ft)
*127100 Nm (93900 lbf ft)
Intermittent torque: 113000 Nm (83800 lbf ft)
*180000 Nm (132700 lbf ft)
Max. speed (max. Hp): 272 RPM / *234 RPM
Max. speed at max. torque: 145 RPM / *125 RPM
Continuous power input: 2x1100 A
Intermittent power input: 2x1544 A
Weight excl. guide dolly: 26500 kg (58400 lb)
Length: 6000 mm (19.7 ft)
* For DDM 750 & 1000

* For DDM 750 & 1000
DDM 650 L HY
Lifting capacity: 650 tons
Continuous torque: (2000 ccm)
55000 Nm (40500 lbf.ft)
Option: Continuous torque: (2500 ccm*):
68800 Nm (50700 lbf.ft)
Option: Continuous torque: (3000 ccm*):
82600 Nm (60900 lbf.ft)
Torque at max. speed:
26500 Nm (19500 lbf.ft)
Max. speed:
265 RPM
Max. speed at max. torque:
120 RPM
Power input max:
\(\Delta p\) 330 bar/1600 l/min (4786 psi/422 gallon/min.)
Weight excl. guide dolly:
10000 kg (22000 lb)
Length:
3900 mm (12.8 ft)
* Larger hydraulic power unit required in order to obtain max. speed.

DDM 650 HY
Lifting capacity: 650 tons
Continuous torque (2000 ccm):
55000 Nm (40500 lbf.ft)
Option: Continuous torque (2500 ccm*):
68800 Nm (50700 lbf.ft)
Option: Continuous torque (3000 ccm*):
82600 Nm (60900 lbf.ft)
Torque at max. speed:
26500 Nm (19500 lbf.ft)
Max. speed:
265 RPM
Max. speed at max. torque:
120 RPM
Power input max:
\(\Delta p\) 330 bar/1600 l/min (4786 psi/422 gallon/min.)
Weight excl. guide dolly:
10000 kg (22000 lb)
Length:
3900 mm (12.8 ft)

DDM 750/1000 HY
Lifting capacity: 750 tons (option 1000 tons)
Continuous torque (2000 ccm):
78100 Nm (57600 lbf.ft)
Torque at max. speed:
52000 Nm (38500 lbf.ft)
Max. speed:
258 RPM
Max. speed at max. torque:
167 RPM
Power input max:
\(\Delta p\) 330 bar/2700 l/min (4786 psi/713 gallon/min.)
Weight excl. guide dolly:
21000 kg (46300 lb)
Length:
3900 mm (12.8 ft)

DDM-750/1000 AC
Lifting capacity:
750 tons or 1000 tons
Power output:
860 kW (1150 HP)
Continuous torque:
82000 Nm (60500 lbf.ft)
Intermittent torque:
115000 Nm (84800 lbf.ft)
Max speed (max HP)
220 rpm
Max speed at max torque
98 rpm
Continuous power input
1100 A
Intermittent power input:
1544 A
Weight excl dolly:
22500 Kg (49600 lb)
Length:
7000 mm (22.9 ft)
Option: Single AC motor
with up to 2000 HP

* Larger hydraulic power unit required in order to obtain max. speed.
Hydraulic Roughneck
1898 (Manual) and 1899 (Automatic)

The Hydraulic Roughneck (HRN) is a machine designed to spin in / make up / break out / and spin out drill pipe, drill collar and other drilling tools / drilling equipment, such as: drill bits, stabilizers, strainers and subs with sizes ranging from 2 7/8" up to and including 9 ¾" diameter, in well center and at both forward and backward tilted mouseholes.

The gateless Torque Wrench (TW) is equipped with multi size jaws for easy and quick alternations between different tooljoint sizes.

Optional features
• Revolving pipe spinner assembly (improves utilisation range and service access)
• Automatic lubrication system
• Inverted main frame
• Various rail systems (e.g. skiddable, hinged, bolted)
• Remote operated box end washer and doping unit
• Break out torque record gauge
• Stabbing guide arm
• Special jaws for odd tooljoint size / shape / material
• Control panel on machine
• Wireless remote control (radio)
• High friction remote control rollers available upon request

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Standard</th>
<th>Optional</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW min. make-up torque</td>
<td>11,500 [8,500]</td>
<td>5,425 [4,000]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW max. make-up torque</td>
<td>135,000 [100,000]</td>
<td>169,000 [125,000]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW min. break-out torque</td>
<td>170,000 [165,000]</td>
<td>229,000 [225,000]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW max. break-out torque</td>
<td>230,000 [225,000]</td>
<td>288,000 [285,000]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW min. stick-up height</td>
<td>700 [27,5]</td>
<td>700 [27,5]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>TW max. stick-up height</td>
<td>1,500 [59]</td>
<td>2,200 [86]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>SP max. speed (w/5 ½&quot; D.P)</td>
<td>0-160</td>
<td>0-80</td>
<td>rpm</td>
</tr>
<tr>
<td>SP max. torque (w/5 ½&quot; D.P)</td>
<td>2,750 [2,028]</td>
<td>5,500 [4,050]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>SP travel height</td>
<td>500 [19,7]</td>
<td>900 [35,4]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>Mousehole tilt</td>
<td>0-5° bwd</td>
<td>0-15° bwd / 0-8° fwd</td>
<td>Degr</td>
</tr>
<tr>
<td>Rail span (outside/inside)</td>
<td>1,850 [72.8]</td>
<td>1,120-2614 [44.1-102.9]</td>
<td>mm [inch]</td>
</tr>
</tbody>
</table>

Weight will vary from 5900 (13,000 lb) kg to 6300 kg (13,900 lb) depending on configuration and options.
Drill Floor Equipment

Hydraulic Roughneck 4160 (Light)

The Hydraulic Roughneck Light is designed to operate as the 1898 model, but due to its reduced size and weight it will fit on small sized drill floors (e.g. land rigs).

It is capable of handling tubular sizes ranging from 2 7/8” up to and including 8 ½” diameter in well center and mousehole.

The gateless Torque Wrench (TW) is equipped with multi size jaws, for easy and quick alternations between different tooljoint sizes.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Data</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW min. make-up torque</td>
<td>5,300 [3,900]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW max. make-up torque</td>
<td>84,000 [62,000]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW max. break-out torque</td>
<td>105,000 [77,500]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>TW min. stick-up height</td>
<td>700 [27.5]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>TW max. stick-up height</td>
<td>1,500 [59]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>SP max. speed (w/5 ½” D.P)</td>
<td>0-160</td>
<td>rpm</td>
</tr>
<tr>
<td>SP max. torque (w/5 ½” D.P)</td>
<td>2,750 [2,028]</td>
<td>Nm [lbf ft]</td>
</tr>
<tr>
<td>SP travel height</td>
<td>500 [19.7]</td>
<td>mm [inch]</td>
</tr>
<tr>
<td>Mousehole tilt</td>
<td>0-5°bwd</td>
<td>Degr</td>
</tr>
<tr>
<td>Rail span (inside/inside)</td>
<td>1,200 [47,2]</td>
<td>mm [inch]</td>
</tr>
</tbody>
</table>

Optional features
- Automatic lubrication system
- Break-out torque record gauge
- Special jaws for odd tooljoint size/shape/material
- Wireless remote control (radio)
The TorqueMaster™ is a patented and field tested machine made for making up and breaking out drill pipe, drill collars and casing ranging from 2 3/8” to 20”. This machine will be implemented on several installations during 2006 and on Maersk Contractor’s high efficiency Jack-up’s currently under construction. It is based on two tongs that can be separated and is thereby also capable of handling stabilisers and bits. In addition, the TorqueMaster™ has a make up (MU) and break out (BO) torque capacity of 68,000 Nm (50,000 ft-lbs) between its main tong (MT) and drillfloor (DF) and between the topdrive and its backup tong (BUT), giving a unique operational freedom. Integrated into the TorqueMaster™ design are also a spinner, casing guide and thread lubrication and washing system (optional).

The TorqueMaster™ is equipped with a computer monitoring and executing system. The monitoring system monitors and stores make up and break-out information. The executing system performs complete automatic sequences for making up and breaking out any kind of pipe, casing or tubular. Furthermore, this allows monitoring from any office connected to the system, even onshore.

The TorqueMaster™ travels on rails welded to the drill floor (hinged if required), thus reaching the centre of rotary table. The TorqueMaster™ is made retrofit to Aker Kvaerner MH deliveries, by using the same type and dimensions of rails. The wheels are hydraulically driven, thus giving positive drive for the travel by means of constant mesh sprocket to rail.

**Main features**

- The main tong is a gateless tong able to rotate 360 degrees continuously with a torque capacity of 203,000 Nm (150,000 ft-lbs).
- As a free floating equipment, the tong is able to measure torque via two load cells in a reaction system between the main tong and backup tong in accordance with API recommendations.
- In addition to being a conventional spinner, the spinner also holds a remote operated guide function.
- An automatic Casing Stabbing Guide ensures a fast and hands free operation of casing and tubular.
- Integrated into the design is also automatic thread lubrication and washing system for drill pipe (optional).

**Performance data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum make-up/break-up torque</td>
<td>203,000 Nm (150,000 lbf ft)</td>
</tr>
<tr>
<td>Maximum MU/BO torque between MT/DF and TD/BUT</td>
<td>68,000 Nm (50,000 ft-lbs)</td>
</tr>
<tr>
<td>Maximum vertical travel (tong/spinner)</td>
<td>1500 mm (59 in.)</td>
</tr>
<tr>
<td>Vertical independent spinner travel</td>
<td>600 mm (23.6 in.)</td>
</tr>
<tr>
<td>Minimum grip area</td>
<td>2 3/16 in.</td>
</tr>
<tr>
<td>Maximum grip area</td>
<td>20 in.</td>
</tr>
<tr>
<td>Maximum diameter stabilizers</td>
<td>36 in.</td>
</tr>
<tr>
<td>Maximum bit modem size (optional)</td>
<td>17 in.</td>
</tr>
<tr>
<td>Minimum MU/BO stick up</td>
<td>540 mm (21.3 in.)</td>
</tr>
<tr>
<td>Maximum distance between tongs</td>
<td>1500 mm (59 in.)</td>
</tr>
<tr>
<td>Hydraulic power requirements</td>
<td>207 bars (3000 Psi)</td>
</tr>
<tr>
<td>Rail span</td>
<td>500 l/min (132gal/min)</td>
</tr>
<tr>
<td>Weight</td>
<td>1850 mm (72.8 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>13,500 kg (29,700 lb)</td>
</tr>
</tbody>
</table>
Mud Bucket

The Mud Bucket is designed for safe and smooth transportation of drilling mud to the mud tank. It latches onto the drill string by means of two hydraulic cylinders. The mud bucket then leads the mud through the drain hose, to the low-built bend on the drill floor near the mud tank.

The extension arm suspends the Mud Bucket to the foundation. The foundation comprises a pedestal suspension with guiding column, bolted to a foundation plate. The extension arm enables extension and retraction of the bucket between parked position and the well centre by means of a hydraulic cylinder.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 7/8 in., 3 1/2 in., 4 in., 5 in., 5 1/2 in., 5 7/8 &amp; 6 5/8 in. DP</td>
</tr>
<tr>
<td>Time working cycle</td>
<td>1 – 2 sec.</td>
</tr>
<tr>
<td>open/close</td>
<td></td>
</tr>
<tr>
<td>Extend/Retract</td>
<td>6 - 9 sec.</td>
</tr>
<tr>
<td>Mud drain hose</td>
<td>6 in.</td>
</tr>
<tr>
<td>Hydrualic flow</td>
<td>Q = min. 50 l/min.(13 gallon/min.)</td>
</tr>
<tr>
<td>Working pressure</td>
<td>min. 160 bar (2320 psi)</td>
</tr>
<tr>
<td>Size</td>
<td>2000 x 800 x 2900 mm (L x W x H)</td>
</tr>
<tr>
<td></td>
<td>(79 x 31.5 x 114 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>1560 kg (3439 lb) (wire mounted)</td>
</tr>
</tbody>
</table>

Multi Manipulator Arms (MMA)
A large range of drill floor mounted MMAs are available. The arms are tailor made to ease and secure safe and handsfree operations in the drill floor area.

Main Functions
- Guiding the lower end of drill pipe and casing from V-door to well center
- Controlling/guiding riser, slip joint, etc. when being lifted with the drawworks
- Acting as a racking arm when other machines are occupied or out of commission
- Lifting bottom hole assembly components or similar, this operation may be done with a sling or with a gripping claw.

The machines may be delivered with several easily interchangeable tools, each specially designed for its task.
### Multi Manipulator Arms (continued)

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gripping head range</td>
<td>2 7/8 in. to 9.3/4 in.</td>
</tr>
<tr>
<td>Gripping head capacity</td>
<td>2000 kg (4400 lb)</td>
</tr>
<tr>
<td>Guide head range</td>
<td>32&quot; (25&quot; with adapter)*</td>
</tr>
<tr>
<td>Lifting capacity</td>
<td>5000 kg (11023 lb)*</td>
</tr>
<tr>
<td><strong>Main slew data</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum slewing moment</td>
<td>75000 Nm (55315 lbf ft)</td>
</tr>
<tr>
<td>Maximum push / pull force</td>
<td>30000 N (6740 lbf)</td>
</tr>
<tr>
<td><strong>Head slew data</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum slewing moment</td>
<td>90000 Nm (6630 lbf ft)</td>
</tr>
<tr>
<td>Slew</td>
<td>2 rpm</td>
</tr>
<tr>
<td>Sector</td>
<td>+/- 90°C</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
</tr>
<tr>
<td>MMA (including foundation)</td>
<td>dry 4790 kg (10560 lb)</td>
</tr>
<tr>
<td>(incl. gripper head)</td>
<td>operational approx. 850 kg (1874 lb)</td>
</tr>
<tr>
<td>Guide head 32&quot;</td>
<td></td>
</tr>
</tbody>
</table>

(*On lifting shackle with Gripping Head or Guiding head removed)

### Riser Tilting Arm

<table>
<thead>
<tr>
<th>Performance data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Service weight</td>
<td>6200 kg (13670 lb)</td>
</tr>
<tr>
<td>Max. gripper OD</td>
<td>60&quot;</td>
</tr>
<tr>
<td>Reach</td>
<td>7900 mm</td>
</tr>
<tr>
<td>Telescope</td>
<td>1415 + 1415 = 2830 mm (111 in.)</td>
</tr>
<tr>
<td>Push force</td>
<td>95000 N (70,000 lbf ft)</td>
</tr>
<tr>
<td>Pull force</td>
<td>48000 N (35,400 lbf ft)</td>
</tr>
<tr>
<td>Slew</td>
<td></td>
</tr>
<tr>
<td>CW / CCW</td>
<td>240000 Nm (177,000 lbf ft)</td>
</tr>
<tr>
<td>Tilt</td>
<td>16° up, 7.5° down</td>
</tr>
</tbody>
</table>

### Monkey Tail

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular sizes</td>
<td>ø 2 7/8 in. to ø 20 in.</td>
</tr>
<tr>
<td>Service weight</td>
<td>2285 kg (5640 lb)</td>
</tr>
<tr>
<td>Required oil flow</td>
<td>0-270 l/min</td>
</tr>
<tr>
<td>Required oil pressure</td>
<td>160 bar (2320 psi)</td>
</tr>
<tr>
<td>Reach</td>
<td>3.5m (11.5 ft)</td>
</tr>
</tbody>
</table>

Control functions may be incorporated in the Tubular Feeding Machine (TFM) on request, thus saving space at drill floor.
Hydraulic Cathead

The Hydraulic Cathead is a tool for making up and breaking out drill collar and drill pipe. It is a floor mounted unit, bolted to the floor. It can be delivered with a pneumatic or electric control system, and is equipped with integrated tong post and/or back-up post.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Standard</th>
<th>High Torque</th>
<th>Low Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pull</td>
<td>140,000 N (31,000 lb)</td>
<td>165,000 N (37,125 lb)</td>
<td>13,000 N (2,930 lb)</td>
</tr>
<tr>
<td>Maximum torque on pipe w/ 4 ft rig tong</td>
<td>170,000Nm (125,000 lbf ft)</td>
<td>200,000Nm (147,000 lbf ft)</td>
<td>16,000Nm (11,720 lbf ft)</td>
</tr>
<tr>
<td>Maximum torque on pipe w/ 5 ft rig tong</td>
<td>210,000 Nm (157,500 lbf ft)</td>
<td>250,000 Nm (185,000 lbf ft)</td>
<td>19,800 Nm (14,850 lbf ft)</td>
</tr>
<tr>
<td>Pull regulation</td>
<td>12,000 - 140,000 N (2,698-31,500 lbf)</td>
<td>20,000 – 165,000 N (4,500-37,000 lbf)</td>
<td>1300 – 13,000 N (290-2,900 lbf)</td>
</tr>
<tr>
<td>Stroke of wire</td>
<td>2000 mm (6.5 ft)</td>
<td>2000 mm (6.5 ft)</td>
<td>2000 mm (6.5 ft)</td>
</tr>
<tr>
<td>Line speed, pneumatically operated</td>
<td>0.15 m/sec. (0.49 ft/sec.)</td>
<td>0.15 m/sec. (0.49 ft/sec.)</td>
<td>0.15 m/sec. (0.49 ft/sec.)</td>
</tr>
<tr>
<td>Wire data</td>
<td>10.7m of ø 22 wire (35ft. of 7/8 in. wire)</td>
<td>10.7 m of ø 24 wire (35ft. of 7/8 in. wire)</td>
<td>10.7 m of ø 12 wire (35ft. of 7/8 in. wire)</td>
</tr>
<tr>
<td>Operational angle of swing sheave:</td>
<td>20° each side</td>
<td>20° each side</td>
<td>20° each side</td>
</tr>
<tr>
<td>Lug pull force</td>
<td>140,000 N (31,500 lbf)</td>
<td>165,000 N (37,100 lbf)</td>
<td>13,000 N (2,922 lbf)</td>
</tr>
<tr>
<td>Hydraulic flow, pneumatically operated</td>
<td>Q = min. 100 l/min. (26.4 gallon/min.)</td>
<td>Q = min. 100 l/min. (26.4 gallon/min.)</td>
<td>Q = min. 100 l/min. (26.4 gallon/min.)</td>
</tr>
<tr>
<td>Working pressure</td>
<td>140 bar (2030 psi)</td>
<td>140 bar (2030 psi)</td>
<td>140 bar (2030 psi)</td>
</tr>
<tr>
<td>Size</td>
<td>450 x 1950 x 830mm (18 x 77 x 33in.)</td>
<td>450 x 1950 x 830mm (18 x 77 x 33in.)</td>
<td>220 x 1950 x 500mm (9 x 77 x 20in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>710 kg (1565 lb)</td>
<td>710 kg (1565 lb)</td>
<td>95 kg (210 lb)</td>
</tr>
</tbody>
</table>

Optional features

- Electric remote control system.
- Low torque kit is available for installation on the left or right hand side. 2 meter (6.5 ft) stroke. Pull from 1300 N (290 lb) to 13,000 N (2,900 lb). Total weight is 100 kg (220 lb).
- Integrated low torque mode for Cathead (el. contr. only). Pull from 4,000N to 44,000 N (900 to 9900 lbf)
Winches
Aker Kvaerner MH’s portfolio covers complete Stand-Alone and Package Integrated Winch Units/Systems designed with special emphasis on safe, efficient and reliable operation:

- Utility Winches
- Manriding Winches
- Guideline Winches
- Podline Winches

Description
Aker Kvaerner MH’s winches are delivered as complete units, fully tested and ready for horizontal mounting by means of bolting to substructure and connection to hydraulic ringline systems.

Commonly, the winches comprise
- Gearbox
- Drum
- Failsafe brake system
- Hydraulic motor
- Counter balance valve
- Local control panel

Short-time installation is achieved as no special tools are required for this operation. All winches are fitted with lifting lugs for safe and easy handling.

Safe, smooth and user friendly operation & control is performed from the local control panel.

Due to high reliability, maintenance is briefly limited to periodic lubrication and filter replacements.

Optional
- Hydraulic remote control panel (portable or fixed)
- Portable wireless control panel
- Hydraulic Power Unit
- Wire spooling system
- Snatch block

An extensive range of alternatives & options completes our portfolio with the intention to suit any specific or special requirement.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>SWL</th>
<th>Rope dia. x length</th>
<th>Weight (Incl. Rope)</th>
<th>REF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>SWL</td>
<td>Rope dia. x length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MH UW - 5mT</td>
<td>5mT (11020 lbf)</td>
<td>19mm (0.74&quot;) 150m (492’)</td>
<td>1500 kg (3300 lbf)</td>
<td>CX04-SA00-0201</td>
</tr>
<tr>
<td>MH MW - 150 kg</td>
<td>0.15mT (330 lbf)</td>
<td>10mm (0.39&quot;) 140m (460’)</td>
<td>1050 kg (2300 lbf)</td>
<td>CX07-SA00-0201</td>
</tr>
<tr>
<td>MH GLW - 10mT</td>
<td>10mT (22050 lbf)</td>
<td>26mm (1.02&quot;) 1200m (3940’)</td>
<td>9600 kg (21150 lb)</td>
<td>YD10-SA00-0201</td>
</tr>
<tr>
<td>MH PLW - 10mT</td>
<td>10mT (22050 lbf)</td>
<td>26mm (1.02&quot;) 1200m (3940’)</td>
<td>9600 kg (21150 lb)</td>
<td>YD10-SA00-0202</td>
</tr>
<tr>
<td>MH GLWS - 10mT</td>
<td>10mT (22050 lbf)</td>
<td>19mm (0.74&quot;) 1500m (4925’)</td>
<td>9600 kg (21150 lb)</td>
<td>YD10-SA00-0301</td>
</tr>
</tbody>
</table>
Drill Floor Equipment

Drill Pipe Elevators
The Elevators are DnV type approved and designed in accordance with API specifications.

The well proven Drill Pipe elevator is pneumatically operated.

5" - rated to 350 tons - weight 550 kg (1220 lb)
3 ½" - rated to 350 tons - weight 570 kg (1270 lb)

Power Slips Frames
The Power Slips Frames consist of a frame with standard slip segments, ranging from 3 ½ in. to 7 in. An air pressure of 7 bar (125 psi) is required for operation. A foot pedal located in the Driller’s House is used for opening and closing. In combination with the Pipe Racking System, the result is fast and safe pipe handling.

Option: Power slips frames for Drill collar slips 3"-7" is available.

Hydraulic Rotary Tables
The Hydraulic Rotary Tables are based on a standard table for electric drive, modified to include one or four hydraulic motors.

Considerable weight and space is saved by installing a hydraulic rotary table instead of an electric one, as the electric motor requires an extended skid for installation of the transmission box, brake assembly and motor.

The Hydraulic Rotary Table can be driven by the same power unit as the hydraulic Top Drive 345 bar system, or can be hydraulically powered from the ringline 210 bar system. Considerable weight and space savings can be obtained for hydraulic power unit(s) if a hydraulically driven drawworks is installed, as these consumers do not require full power at the same time.

Options: Kits for conversion or electrically driven rotary tables.
Range: 37 ½", 49 ½", 60 ½"
Drill Line Drum

The Drill Line Drum features hydraulically driven drums for the purpose of:

- Safe and reliably Drill Line handling in a heavy duty offshore working environment
- Enabling Safe and Smooth Slip & Cut operation

### Technical data

<table>
<thead>
<tr>
<th>MH 1780 095</th>
<th>MH 1780 096</th>
<th>MH 1780 097</th>
<th>MH 1780 098</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull capacity</td>
<td>11.2 kN</td>
<td>2 500 lb</td>
<td>11.2 kN</td>
</tr>
<tr>
<td>Rope speed (max.)</td>
<td>20 m/min</td>
<td>65 f/min</td>
<td>20 m/min</td>
</tr>
<tr>
<td>Drum capacity: Ø 35 (1 3/8&quot;)</td>
<td>1 950 m</td>
<td>6 400'</td>
<td>2 743 m</td>
</tr>
<tr>
<td>Drum capacity: Ø 38 (11/2&quot;)</td>
<td>1 646 m</td>
<td>5 400'</td>
<td>2 286 m</td>
</tr>
<tr>
<td>Drum capacity: Ø 42 (1 5/8&quot;)</td>
<td>-</td>
<td>-</td>
<td>1 829 m</td>
</tr>
<tr>
<td>Drum capacity: Ø 45 (13/4&quot;)</td>
<td>-</td>
<td>-</td>
<td>1 424 m</td>
</tr>
<tr>
<td>L x W x H (Excl. prot. cover)</td>
<td>2.0 x 2.2 x 2.3 m</td>
<td>6' - 7&quot; x 7' - 3&quot; x 7' - 7&quot;</td>
<td>2.2 x 2.2 x 2.4 m</td>
</tr>
<tr>
<td>Weight (excl. wire rope)</td>
<td>3 000 kg</td>
<td>6 600 lb</td>
<td>3 100 kg</td>
</tr>
</tbody>
</table>

### Description

The Drill Line Drum comprises a hydraulically driven Drum installed in a Cradle ready for installation on drill floor or another suitable location.

**Operator Friendly Overview**

Drum drive is done by means of a flange mounted short version type hydraulic motor with brake and brake valve. This system gives a smooth and easy drive during slip and cut operations. In addition, the drum has a manual parking brake.

The drum is operated locally by an operation handle, which gives a user-friendly overview during the operation.

The motor, brake, valves and instrumentation are bracket mounted on the cradle, which gives a user-friendly overview and easy access during inspection or maintenance.

An extensive range of alternatives & options completes the portfolio with the intention to suit specific or special requirements as for example:

- Wire cutter
- Pneumatically or electrically powered drum
- Automatic or remote operation and control depending on customer preferences
- Protective cover
- Aluminum weather protection
Travelling Blocks
The Travelling Blocks have a well-proven design and have been in the market for more than 30 years.

Travelling Blocks are available in various standard designs.

Deadline Anchor
The Deadline Anchors are DnV type approved and designed/manufactured in accordance with API specifications. They are built to accommodate tension type load cell.
Hydraulic Power Unit (HPU)

A reliable power source forms the core in every hydraulic system and is essential to ensure operability of the various connected equipment and systems.

Aker Kvaerner MH has provided the industry with more than 200 Hydraulic Power Units (HPU) of different sizes and configurations during the last decades, spanning from small single equipment units to large multiple ringline units, all designed with special focus on reliability, safety, maintenance and environment.

General features

Typically our electrically driven HPUs comprise modularised assemblies with AC motors and state-of-the-art axial piston pumps, either submerged or externally mounted on a suitable oil reservoir. Each unit is also equipped with necessary valves, regulators, filters and instrumentation in order to supply and maintain the required pressure and flow.

Alternatives & options

An extensive portfolio of alternatives & options completes our portfolio with intentions to suit any specific or special requirements as for example:

- Stainless Steel materials
- Noise Protective Cover/Housing
- Operator Panels*
- Coolers (Heat Exchangers)
- Additional Instrumentation
- Hazardous Area Design
- Heaters
- Starter Cabinets
- Customer configurations

* Local, Remote and PLC control available

Portfolio: Pending on operational needs and requirements, the following types are available:

<table>
<thead>
<tr>
<th>Model</th>
<th>Performance data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor</td>
</tr>
<tr>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td>kW/hp</td>
</tr>
<tr>
<td>HPU</td>
<td>CT02 1 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT03 2 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT05 3 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT06 4 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT07 5 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT11 1 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT31 1 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT32 2 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT33 3 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT34 4 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT35 5 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT36 6 MOTOR</td>
</tr>
<tr>
<td>HPU</td>
<td>CT37 7 MOTOR</td>
</tr>
</tbody>
</table>

Other performance data, and/or customer configurations are available upon request. a) @60Hz electric motor b) 50Hz el. motor

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Eagle/Eagle Light

According to statutory and oil companies’ requirements, modern drilling rigs are required to operate without manual intervention. Based on Robotic Motion Control (RMC), the Eagle/Eagle Light horizontal to vertical (HTV) equipment is fully automated and can be operated either from a separate control panel, or from the driller’s cabin (DC). The system has been designed with safety as a priority and the Eagle/Eagle Light is regarded as a highly reliable system.

The Eagle/Eagle Light machines are used for transfer of tubulars from a horizontal position at the catwalk, or angled at the pipe ramp. Tubulars are transferred to a vertical position in the derrick directly over the rotary centre line, or into the Mousehole and vice versa.

A slewing function can be implemented on jib/yoke. (Adjust pipe in well center/stand building).

The Eagle System is designed for stabbing casing & tubing and for building stands while drilling, and can assist in handling various tools.

### Eagle

**Technical data**

- Clearance between vertical guide rails: Typical 3m (10 ft)
- Tubular length: Max. 14.5m (47.5 ft)
- Tubular diameter: 2 7/8” - 20” (30”)
- Lifting capacity with gripper head: 3500kg (7770lb)
- Typical outreach: 11 m (36 ft)
- Lifting capacity without gripper head: 5000kg (11100lb)
- Hydraulic power consumption: 205 bar, 600 l/min. (3000 psi/160 gl/min)

### Eagle Light

**Technical data**

- Clearance between vertical guide rails: Typical 3m (10 ft)
- Tubular length: Max. 14.5m (47.5 ft)
- Tubular diameter: 2 7/8” - 20” (30”)
- Lifting capacity with gripper head: Max. 4500kg (9920lb)
- Capacity: 35 joints per hour
- Hydraulic power consumption: 205 bar, 300 l/min. (3000 psi/80 gl/min)

### Eagle Grip Heads

The Eagle light grip yoke is capable of handling tubulars of all sizes from 2 7/8” - 30”. The yoke has various configurations:

#### Grip Heads

- Size 1: 2 7/8 in. - 9 5/8 in.
- Size 2: 10 ¾ in. - 20 in.
- Size 3: 22 in. - 30 in.

#### Guide Heads

- Size 1: 2 7/8 in. - 20 in.
- Size 2: 20 in. - 30 in.

The tubular size is adjusted manually in accordance with a table at the “back up die” before any operation may start. The tubular centre will be at the same place each time, which is vital in order to reach stick-up within the tolerances. The grip heads are equipped with dies at the two moveable grip arms and at the back up die, to maintain proper grip.
Pipe Handling Equipment

Gantry Crane
The prime function of the Gantry Crane is to move drilling tubulars from their storage area to the catwalk machine and vice versa. The Gantry Crane is a self-contained unit with Operator’s Cabin, Hydraulic Power Unit, power distribution and Control System, all located on the crane. The crane is equipped with:
- 2 riser forks for handling riser, pup joints and casing
- 2 magnet yokes for handling drill pipes and other tubulars

Technical data
- Lifting capacity (SWL) 2 x 23 mT (2 x 25 tons)
- Gantry speed 0.4 m/sec (16.9 in/sec)
- Trolley speed 0.25 m/sec (9.84 in/sec)
- Hoisting speed 0.25 m/sec (9.84 in/sec)
- Max lifting height 11.9 m (39.04 ft.)
- Electrical power requirements 3 x 480 VAC 60 Hz (3 x 100 kW)
- Total weight 116 mT (128 tons)

Pipedeck Pipehandler
The Pipedeck Pipehandler is designed for safe handling of drilling tubulars from the piperack to the catwalk machine and vice versa. The crane is controlled either from a remote station or a mounted cabin. To simplify the operation, the control system is computerized.

Option: RMC. (See page 39 for further information.)

Pipedeck pipehandler is an excellent alternative on rigs with restricted area for rails, and where the elevation between pipe deck and tubular feeding machine is relatively high.

Technical data
- Lifting capacity (SWL)
  - Claws from 2 7/8” to 30” 0.8 - 9.0 mT (0.9 - 10 tons)
  - Pad eye twist gripper yoke 9.0 mT (10 tons)
  - Lifting equipment excl. yoke 12.0 mT (13 tons)
  
  (+/- 0.5m) (+/- 1.6 ft)
  max. 23.0m - min. 3.5m
  (max. 76 ft - min. 15 ft)

Riser Handling Crane
The Riser Handling Crane is designed for vertical handling of risers from the Riser Fingerboards to the Riser Chute machine where risers are conveyed to the Drill Floor. In addition, the RHC will be used to handle and rack the slip joint. The RHC is powered from a Rig Main Power Unit with hydraulic working pressure of 210 bar (3000 psi). Hydraulic and electric power are supplied by a drag chain, allowing the crane to travel on rails port/stb. along the fingerboards. A specially designed Service Basket, used for inspection of risers is included and is to be connected to the lifting telescope when gripper head is not in use.

Technical data
- Lifting capacity (SWL) 35 mT (38.6 tons)
- Gantry speed 0.25 m/sec (9.84 in/sec)
- Trolley speed 0.25 m/sec (9.84 in/sec)
- Hoisting speed 0.15 m/sec (6 in/sec)
- Max lifting height 17.5 m (57.4 ft)
- Total weight 132 mT (145.5 tons)
Pipe Handling Equipment

Piperack Crane
The Piperack Crane is designed for safe transportation of tubulars from the pipe deck to the Catwalk Machine, and vice versa.

The crane is a cantilever type crane, controlled from a cabin or platform located on the crane trolley. Remote control from the drill floor is also available.

The piperack crane is delivered with twist gripper as handling device. The control system ensures that the yoke is always kept horizontal during a sequence. The twist gripper yoke is designed to pick up tubulars out of centre, but the load will always be kept horizontal.

Piperack Crane w/telescope is mainly used on rigs with small elevation differences. The telescope increases the hook up flexibility.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Travelling speed</td>
<td>30 m/min (98 ft/min)</td>
</tr>
<tr>
<td>Lifting speed</td>
<td>20 m/min (65 ft/min)</td>
</tr>
<tr>
<td>Telescopic speed</td>
<td>20 m/min (65 ft/min)</td>
</tr>
<tr>
<td>Travelling length</td>
<td>41.3 m (135 ft/min)</td>
</tr>
<tr>
<td>Telescopic length</td>
<td>4.6 m (15 ft/min)</td>
</tr>
<tr>
<td>Lifting capacity</td>
<td>6.0 mT x 11.4 m (+/- 0.5 m eccentric) (6.6 tons x 37.4 ft +/- 1.6 ft eccentric)</td>
</tr>
<tr>
<td>Tubular length</td>
<td>3.5 - 14.6 m (11.5 - 48 ft)</td>
</tr>
<tr>
<td>Tubular diameter</td>
<td>2 7/8&quot; - 30&quot;</td>
</tr>
<tr>
<td>Twist gripper claws</td>
<td>2 7/8&quot; - 30&quot;</td>
</tr>
<tr>
<td>Installed weight</td>
<td>approx. 30 mT (incl. rail, gripper)(33 tons)</td>
</tr>
</tbody>
</table>

Catwalk/Tubular Feeding Machine
The Catwalk Machine/Tubular Feeding Machine (TFM) transfers tubulars between piperack crane and V-door/drill floor. It is designed for remote controlled mechanical handling of tubulars from 2 7/8" to max. 30" outside diameter. Riser and slip joints are handled by trolleys. The Catwalk Machine can be delivered with or without feeding arrangements, tailor-made to suit the actual rig.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>2 7/8&quot; - 30&quot;</td>
</tr>
<tr>
<td>Working rate</td>
<td>40-60 joints/hour</td>
</tr>
<tr>
<td>Drillpipe</td>
<td>210 bar (3045 psi)</td>
</tr>
<tr>
<td>Working Pressure</td>
<td>Depends on speed and operational requirements. Typical 150-300 l/min (40-80 gallon/min)</td>
</tr>
<tr>
<td>Hydraulic flow</td>
<td></td>
</tr>
<tr>
<td>Size incl. service platf.</td>
<td>Typical 1500x4000x15000[mm] (5x13x49 ft)</td>
</tr>
<tr>
<td>Weight</td>
<td>Varying 20 – 30 mT (22 - 33 tons)</td>
</tr>
</tbody>
</table>

Option: Kit for riser handling.
Bridge Crane Systems (BRC)
Aker Kvaerner MH has a comprehensive range of vertical pipe handling equipment and can deliver complete systems or individual, tailor made machines. The BRC systems are available both with and without synchro control system / Robotic Motion Control (RMC).

One-man Operated
RMC is a one-man operated pipe handling system which can be operated from the Driller's cabin, or from a separate Operator's cabin.

Increased Flexibility
The system is based on a standard Bridge Crane and a Lower Guiding Arm. Based on RMC the two handling arms can operate synchronously or independently, thus increasing flexibility. Fingerboard capacity: Up to 550 stands of drill pipe and 14 stands of drill collar.

Technical data
<table>
<thead>
<tr>
<th>Specification</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 7/8” to 9 3/4”</td>
</tr>
<tr>
<td>Racking capacity</td>
<td>470 stands within a 40x40ft Derrick</td>
</tr>
<tr>
<td>Lifting capacity</td>
<td>Max. 11,500 kg (25,353 lb)</td>
</tr>
<tr>
<td>Lifting height</td>
<td>Up to 5000 mm (196 in)</td>
</tr>
<tr>
<td>Hydraulic power cons.</td>
<td>210 bar/180 l/min - 250 l/min (3000psi/48-66 gallon/min)</td>
</tr>
</tbody>
</table>

Fingerboards
The DP/DC fingerboards with pneumatically operated locking fingers are designed to safely lock tubulars in the derrick. This can either be pneumatically or electrically remote controlled. The locking fingers are bolted assemblies accessible from the top with the actuating cylinder protected within the fingerboard structure.

Each fingerboard is individually fitted according to customer requirement and available space.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Pressure</td>
<td>7 barg (min) – 10 barg (max.) (100 - 145 psi)</td>
</tr>
<tr>
<td>Free Air Consumption</td>
<td>35 Nm3/h (intermittent) (1200 ft³/hr)</td>
</tr>
</tbody>
</table>
2-Arm System
The 2-Arm System is a derrick mounted Pipe Handling system. Racking board capacity of the 2-Arm System is up to 420 stands of drill pipes and 14 stands of drill collar. The 2-Arm system is available both with and without synchro control system / Robotic Motion Control (RMC).

Upper Racking Arm (URA)
The URA is installed between the Fingerboards. It is telescopic and slewable through 180 degrees and mounted on a trolley that travels in and out in track beams.

The URA is designed to handle and guide tubulars up to 9 1/2" o.d. between centre well to racking boards or vice versa.

Intermediate Racking Arm (IRA)
The IRA is installed between the set-backs at approx. 30 ft above the drill-floor. The IRA is telescopic and slewable through approx. 180 degrees, and is mounted on a trolley that travels in or out in track beams. The IRA is designed to lift and guide drill pipe and drill collars between centre well and setbacks or vice versa.

The IRA is similar to the URA, however the Rackerhead is mounted on an approximate 5.5m (18ft) long track beam for vertical guiding during lifting of the stands. The upper end of the track beam has a guide sheave for the standlift wireline.

Technical data for URA/IRA
All values are given for maximum pressure and flow. Speed control is proportional from stand still to maximum.

Telescope URA/IRA
<table>
<thead>
<tr>
<th>Stroke</th>
<th>2 x 1.435 m = 2.87 m (9.4 ft) (tailor made)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push/pull force</td>
<td>25 kN (5620 lbf)</td>
</tr>
<tr>
<td>Speed – out:</td>
<td>0.45 m/sec. (1.5 ft / sec.)</td>
</tr>
<tr>
<td>Speed – in:</td>
<td>0.45 m/sec. (1.5 ft / sec.)</td>
</tr>
</tbody>
</table>

Trolley Travel - URA/IRA
| Distance (dep. on Derrick) | 2.6 m (8.5 ft) |
| Push/pull force:           | 25 kN (5620 lbf) |
| Speed:                     | 0.5 m/sec. (1.64 ft/sec.) |

Slewing URA/IRA
| 90 deg - 90 deg          | 180 degrees |
| Slewing moment           | 40 kNm (29500 lbf. ft) / 80 kNm (59000 lbf. ft) |
| Speed                    | 3.83 rpm    |
| Max. sideforce of Rackerhead | 10kN (2250 lbf) at max. outreach |
| Lifting (IRA)            | 6300 kg (13890 lb) |

Weights
| URA                  | 4700 kg / 10360 lb |
| IRA                  | 5200 kg / 11460 lb |

URA and IRA systems
Robotic Motion Control (RMC)

RMC makes it possible to move huge and complex machines safely and efficiently using only one hand. RMC moves the machines along paths.

RMC is available for the following pipe handlers:
- Vertical Pipe handling (Bridge Crane System and 2-Arm System) - Synchro control system
- Eagle / Eagle Light
- Pipe Racking Machine
- Triplex Crane

Advantages

RMC features the following advantages:
- Easy to use; one hand operated
- Efficient and safe movement
- Minimal crew training required
- Movement in narrow areas is done fast and safely
- All cylinders and motors move in an optimal way
- Controlled oil consumption
- Vertical Pipe handling: The two racking arms and fingerboard are one-man operated allowing for simultaneous Roughneck operation.

User Interface

RMC is integrated into the user interface of the control system.

Technology

RMC utilises mathematics from the world of robot control to calculate the optimal movement of pipe handling systems. Cylinders and motors are equipped with absolute position sensors and the RMC uses these sensors to achieve the correct positioning.

The RMC controlled machines move along calculated 6 axis paths. The first three axes (X,Y,Z) define the position of the load. The last three axes (a,b,l) define the orientation of the load. This gives a great flexibility with respect to requirements given by the rig layout.

Safety

- RMC ensures that no cylinders or motors are moved in such a manner that load can be dropped:
  - The path that is calculated takes into account all hindrances along the way to the destination
  - The load is kept as low as possible above deck
  - Running pattern repeated
  - Vertical Pipe handling: The two machines are synchronised, hence safer operation
  - Eagle / Eagle Light moves outside working area of travelling assembly/top drive when transporting tubulars to vertical position
  - Triplex Crane: The yoke is under full control and is kept horizontal and correctly aligned at all times

RMC contains continuous monitoring of all sensors and of the control system itself. This well-proven system detects and reacts to a large number of critical situations:
- Sensor failures
- Valve failures
- Computer failures
- Calculation failures
- Operator failures

RMC can easily be included in a zone management system to ensure inter-machine safety.
Derrick Pipe Handling

Drill Floor Manipulator Arm (DFMA™)
The DFMA™ is designed for guiding/handling of various tubular sizes including risers and other items. The DFMA™ can be prepared for mounting underneath the Topdrive Guiderails or pedestal mounted on Drilloor.

The DFMA® can be prepared for hydraulic/electrical/radio remote control panel.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>3 ½&quot; to 60&quot;</td>
</tr>
<tr>
<td>Push/pull force</td>
<td>30 kN (6700 lb)</td>
</tr>
<tr>
<td>Max. l/min. working out-reach</td>
<td>10m/2.8m (32ft/9ft)</td>
</tr>
<tr>
<td>Slewing</td>
<td>360°</td>
</tr>
<tr>
<td>Tilt</td>
<td>10° up /45° down</td>
</tr>
<tr>
<td>Hydraulic power consumption</td>
<td>140 bar/160 l/min (2030psi/42 gallon/min)</td>
</tr>
</tbody>
</table>

Access Basket

The Access Basket is designed for safe access when performing maintenance and/or working tasks in places that are hard to reach. The basket can easily be installed in the derrick, moonpool area or other areas, either directly with the mounting bracket, or by means of various optional interface kits.

All the basket controls, including emergency stops, can be operated from inside the basket and/or Remote Control Stand.

• Casing stabbing boards are also available
• Special version can be delivered for BOP maintenance
• Rail mounting

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. free working height</td>
<td>17.2m (56.4 ft)</td>
</tr>
<tr>
<td>Max. permitted load</td>
<td>300 kg (660 lb)</td>
</tr>
<tr>
<td>Hydraulic power consumption</td>
<td>207 bar, 50 l/min (3000 psi/13 gal./min)</td>
</tr>
<tr>
<td>Tilt</td>
<td>± 60 degrees</td>
</tr>
<tr>
<td>Rotating</td>
<td>± 90 degrees</td>
</tr>
<tr>
<td>Max. weight</td>
<td>4000 kg (8800 lb)</td>
</tr>
<tr>
<td>Telescoping</td>
<td>3400 mm (11.2 ft)</td>
</tr>
<tr>
<td></td>
<td>4600 mm (15.1 ft)</td>
</tr>
<tr>
<td></td>
<td>5600 mm (18.4 ft)</td>
</tr>
</tbody>
</table>

The Access basket can be supplied with one or two-man basket.
Pipe Racking Machine

The Pipe Racking Machine is designed for safe handling of tubulars in singles and as 60° & 90° stands. The machine operates between the setback, well centre and the catwalk machine. The machine consists of one guiding arm and one lifting arm which are connected to a single closed column.

The arms can be operated in a synchronous or independent mode (RMC). The column is attached to a lower and an upper carriage for rail travel and slewing up to 270 degrees.

The large hoisting range for the lifting arm and a specially designed gripping head with integrated stabbing function gives the Pipe Racking Machine a fully integrated HTV-function. The unique gripper head arrangement has three rotational axes and pick up pipes from arbitrary angles.

The Pipe Racking Machine can change from HTV-mode to VPH-mode without manual interruption. The machine can build stands offline while drilling, and handle miscellaneous equipment within the drill-floor area.

Because of the simple geometry of the arms, the machine is controlled by one operator, either manually or automated through a control system. The machine is suitable for XY- and parallel racking configuration.

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubular range</td>
<td>2 7/8&quot; to 20&quot;</td>
</tr>
<tr>
<td>Racking capacity</td>
<td>4.6 m (15 ft) x 2</td>
</tr>
<tr>
<td>Lifting capacity</td>
<td>11.0 mT (12 tons)</td>
</tr>
<tr>
<td>Hoist stroke</td>
<td>20.0 m (65 ft)</td>
</tr>
<tr>
<td>Installed weight</td>
<td>35.0 mT (incl. rails) (38.5 tons)</td>
</tr>
<tr>
<td>Overall height</td>
<td>32.0 m (104 ft)</td>
</tr>
<tr>
<td>Slewing sector</td>
<td>270°</td>
</tr>
<tr>
<td>Slewing speed</td>
<td>5 rpm</td>
</tr>
<tr>
<td>Time for 90°</td>
<td>4 sec.</td>
</tr>
<tr>
<td>Travel speed</td>
<td>0.5 m/s (1.6 ft/sec)</td>
</tr>
</tbody>
</table>
Cabins
Aker Kvaerner MH supplies quality Cabins for various drilling and pipe handling operations.

These are:
• Derrickmans Cabin
• Assistant Drillers Cabin

Both Cabins are designed and built as optimal, safe and comfortable workplaces to suit various operations. They are self-supported steel structures with suitable lifting arrangements.

The operator is situated in an ergonomic chair with unobstructed view to all necessary equipment and operations. All main windows have efficient wiper and washer facilities. The windows are made of tinted, laminated safety glass for optimal view and safety.

The Cabin interior is heated and ventilated with an efficient de-frost / demist function on the windows. Both Cabins are designed to meet the most stringent noise level requirements.

Aker Kvaerner MH can deliver Cabins for location in both safe and hazardous areas.

Derrickmans Cabin
The Derrickmans Cabin is, during normal operation, the main operation control position for the Upper Racking Arm or Bridge Crane and the fingerboards.

Assistant Drillers Cabin
The Assistant Drillers Cabin is normally used as the secondary operating position for the pipe handling in the upper part of the Derrick. It can also be used for operation of singular machinery such as a Multi Manipulator Arm or equal.
Compensators and Tensioners

Top Mounted Drill String Compensators

Due to its special design, the Top Mounted Compensator addresses hook load variations directly to the crown block. The Drill String Compensator’s unique angle approach keeps the vertical force virtually constant, thereby decreasing weight-on-bit fluctuations to a minimum.

System
- Single Unit Top Structure
- Two Compensator Units (including cylinder, accumulator and control valve block)
- Dual Rocker-Arm system
- Crown Block
- Air Pressure Vessels
- HPU
- Control system

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Type: 270 - 20</th>
<th>Type: 270 - 25</th>
<th>Type: 454 - 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. compensating</td>
<td>270 Tonnes (595 kips)</td>
<td>270 Tonnes (595 kips)</td>
<td>450 Tonnes (992 kips)</td>
</tr>
<tr>
<td>Static load</td>
<td>590 Tonnes (1300 kips)</td>
<td>590 Tonnes (1300 kips)</td>
<td>725 Tonnes (1597 kips)</td>
</tr>
<tr>
<td>Stroke</td>
<td>6.1 m/20 feet</td>
<td>7.62 m/25 feet</td>
<td>7.62 m/25 feet</td>
</tr>
<tr>
<td>Gas volume required</td>
<td>7 x 1,000 l (265 gal)</td>
<td>8 x 1,000 l (265 gal)</td>
<td>8 x 1,500 l (396 gal)</td>
</tr>
<tr>
<td>Design pressure</td>
<td>210 bar/3000psi</td>
<td>210 bar/3000psi</td>
<td>210 bar/3000psi</td>
</tr>
</tbody>
</table>

Passive deadline and inline compensators are also available.

PistonTrack (Floating Piston Positioning System)

Sensing the accumulator piston position will increase safety significantly in virtually all kinds of compensator systems, enabling warning signals to prevent fatal failure.

Aker Kvaerner MH has developed a patented stand alone sensor system based on alternating magnetic fields technology to detect piston position.

- Standard sensor applicable for all kinds of accumulators
- Easy to mount, strap on
- Minimum rig downtime
- Modularised concept

Sensors will normally be supplied in sensor bars of 100 cm length, each with 3 sensor units. One 12mm cable per sensor bar is connected to the Eex-d junction box for interfacing to standard industrial display units.

The mounting is strapped on the outside of the accumulator, using either a steel band or a fibre band, finalising the mounting by sealing the sensor off using silicone at the perimeter of the sensor. The Central Processing Unit can be interfaced to most industrial standard interfaces. 1 central processing unit covers up to 24 sensors in a rack, making it possible to get semi-continuous measurement when desired.
Active Heave Compensator (Top Mounted)
The Active Heave Compensator is designed for installation on semi-submersibles and drillships with top (crown block) mounted Drill String Compensator. The Active Heave Cylinder is mechanically connected to the crown block ensuring minimum load and relative motion variations. It is mainly used when landing BOP’s, X-mas trees, during under-reaming and during other downhole operations requiring a minimum of motion.

The Active Heave Compensator system enables the passive system to handle subsea equipment in an extended weather window. Drilling and wire line mode is also available.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Compensator stroke</th>
<th>Max. dynamic force</th>
<th>Max. heave velocity</th>
<th>Design pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.62 m (25 ft)</td>
<td>+/- 24 Tonnes (53 kips)</td>
<td>1.0 m/s (3.3 ft/sec)</td>
<td>320 bar (4640 psi)</td>
</tr>
</tbody>
</table>

Active Heave Compensator (In-Line)
The In-Line Active Heave Compensator system is based on installing an active compensator cylinder unit in the passive in-line compensator system. The In-Line Active Heave Compensator unit comprises a combined cylinder and accumulator whereas the active cylinder interacts directly with the piston in the accumulator, thus minimising the load variations.

A motion reference unit (MRU) and a compensator position sensor provide input signals to the control system of the active cylinder’s control valve block. Drilling & wire line mode is also available.

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Max. compensating load</th>
<th>Compensating stroke</th>
<th>Maximum dynamic force</th>
<th>Design pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>226-360 Tonnes (500-800 kips)</td>
<td>5.4-7.62 m (18-25ft)</td>
<td>23.5 Tonnes (52 kips)</td>
<td>320 barg (4640 psi)</td>
</tr>
<tr>
<td></td>
<td>@ 12 sec. period (1 m/s (3,3 ft/s) heave velocity)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Marine Riser Tensioners

The Riser Tensioners utilise the hydro pneumatic principle using plunger cylinder with dynamic seal elements at the cylinder gland and on the accumulator piston.

The cylinder is single acting ram type and features a sling-shot valve. Anti Recoil System and Powered Deadman Drum can be provided.

The Riser Tensioners can be arranged as single or dual units.

**Capacities**

- 45 Tonnes (100 kips)
- 54 Tonnes (120 kips)
- 73 Tonnes (160 kips)
- 91 Tonnes (200 kips)
- 113 Tonnes (250 kips)
- Line travel 15.2 m (50 ft)
- Line travel 18.3 m (60 ft)
- Line travel 19.8 m (65 ft)

**Guideline and Podline Tensioners**

- 7.3 Tonnes (16 kips)
- 11.3 Tonnes (25 kips)
- Line travel 12.2 m (40 ft)
- Line travel 15.2 m (50 ft)

Other special configurations for Conductor and Production Riser Tensioners are also available.

Direct Action Tensioners

- Tension capacity up to 5,000,000 lbs
- Do not occupy working deck space as traditional wireline tensioners
- Advanced and proven Riser Anti Recoil System
- Piston rods made from carbon steel with stainless steel weld overlay
- Can be integrated with a Riser-Mover
- Low weight and low C.O.G
- Designed to operate with two cylinders out of operation
- Maintenance work reduced to a minimum due to few moving parts
Compensators and Tensioner

Through Tubing Drilling Compensator (TTDC)

The TTDC should be used when the RamRig™ hoisting system is running in high speed active compensation mode. This mode will reduce the DDM vertical movement to an estimated ± 20 cm. The compensator is a passive system, with an adjustable preload functionality around mid stroke. Movement of the Bottom Hole Assembly is given directly by the DDM position, unless the load is changed above/below the preload limits.

Aker Kvaerner MH Horten Compensation Dept.

The department represents a world class compensation equipment supplier.

The primary assets are

- World class compensation technology know-how
- Employees recognised as leading compensation experts
- Broad client network
- Attractive workshop (e.g. high power availability, multifunction test tower, HPU, crane capacity 100T)

Compensating equipment manufacturing site

- Workshop area 3000 m²
- Height under roof 22m
- Height under hook 16m
- Hook capacity 2 x 55t
BOP Handling Equipment

Tailor-Made Systems
All the BOP Handling Systems are designed to suit the customer's requirements / rig limitations, are tailor made to any specification and are built from one or more standard products:

- BOP Transporters / Trolleys
- X-mas Tree Transporters / Trolleys
- Overhead Cranes
- Baseplate Trolleys
- Skidding Systems
- Over / Underhull Guiding Systems

Upon receipt of information Aker Kvaerner MH can give a system proposal, and suggest additions that can be made to give the most efficient handling system.

Systems can be delivered with capacities up to 400 mT (440 tons)

The prime function of the BOP/X-mas Tree Handling Systems is to safely transport/lift/guide the equipment from the parked/stor-
age position to the well centre, or vice versa.

BOP Transporter/ Two-Stack system
The BOP “Forklift” Transporter shown can be used for a “two stack system” with the main frame design allowing a skidding system to be adopted for placing the BOP stack(s) alongside the transporter on the cellar deck storage area.

Capacities for the equipment range from 170mT to 400 mT (187 - 440 tons) with lifting heights from 3.0 m to 10.0 m (10 - 33 ft).

BOP Trolley for one/two stack system
The BOP Trolley shown allows the stack to be transported from the parked position to the well centre along the moonpool or vice versa and is generally used together with an overhead crane of the same capacity as the trolley to allow the stack to be lifted to the storage position.

Overhead Cranes/Gantry Cranes
The Overhead Cranes/Gantry Cranes are designed to suit the customer's requirements. Both hydraulic and electro hydraulic cranes are available. The latter option includes an on-board power unit. Most units can be designed with transverse travel, although this may be limited by rail span and height. The controls are usually cabin mounted or pendant.

See page 40 for information on Access Baskets.
BOP Guide Systems
The Guide Systems provide guidance and horizontal restraint for the BOP when being lifted by the drawworks. Guide systems can be adapted to either Transporter or Overhead Crane Systems, and mounted on deck, under deck, or connected to the transporter. The systems can be fixed, hinged, or sliding. Both conventional tube spear type systems and rubber buffer roller type systems are available.

Base Plate Trolleys
The Base Plate Trolleys are designed as auxiliaries to most systems, and their main function is to handle temporary and permanent guide bases. The Trolleys are strong enough to support the LMRP. Their unique design allows the unit to enter within the guide lines, making trolleys ideal as a service platform at the drill string centre.

The Trolleys can be adapted for handling BOP’s and X-mas trees with capacities ranging from 30 mT to 300 mT (33 - 330 tons).

BOP Carrier
The BOP Carrier is installed on each side of the moon pool and the BOP is located on foldable hang of arms in between the two units. The folded BOP Carrier is able to pass a BOP in the well centre. The two independent units are driven by rack & pinion along the moon pool, and lifting is performed by hydraulic cylinders.

Both travel and lifting functions are controlled by a PLC program. The BOP Carrier is equipped with a wireless remote control. This BOP Carrier is very light and requires less space in the moon pool area than other solutions.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>150 mT (165 tons) SWL</td>
</tr>
<tr>
<td>Length</td>
<td>2400 mm (7.9 ft)</td>
</tr>
<tr>
<td>Height</td>
<td>8000 mm (26 ft)</td>
</tr>
<tr>
<td>Width</td>
<td>3000 mm (10 ft)</td>
</tr>
<tr>
<td>Weight</td>
<td>40 mT (44 tons)</td>
</tr>
<tr>
<td>Travel speed</td>
<td>1 m/min (3.3 ft/min)</td>
</tr>
<tr>
<td>Lifting speed</td>
<td>1 m/min (3.3 ft/min)</td>
</tr>
</tbody>
</table>

BOP Transporter
Includes sliding retractable test stump arrangement. Mechanical safety locking system.

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>400 mT (440 tons) SWL</td>
</tr>
<tr>
<td>Lifting height</td>
<td>up to 9m (30 ft)</td>
</tr>
</tbody>
</table>
Electrical Drawworks
Aker Kvaerner MH offers state of the art, high quality electrical drawworks in co-operation with WIRTH. For more than 50 years chain driven drawworks were the norm in the industry. They have now been superseded by improved models featuring the following advantages:

- Four quadrat drive mode
- Higher safety
- Higher life-time and endurance
- Higher speeds by use of a frequency-controlled AC-motor
- Integrated autodriller
- Compact design with a width of only 2.5-3.0 m (8.2-9.8 ft)
- Drive options: DC, AC, hydraulics
- Full material traceability is standard

Gear Driven Drawworks feature the following benefits

- High performance
- High availability
- Lower weight
- Less noise and vibration

The main features of the standard feed off control system, 26kW

- AC frequency controlled drive

Optional feed off control system 45 kW/emergency hoisting

- max. lowering or hoisting speed up to 75 m/h
- max. hook load up to 520 t

Benefits of the feed off control system

- Reduces wear of bit
- Achieves optimum rate of penetration
- Maximises drilling efficiency
- Smooth block control for safety
- Minimising downtime for semi sub operation
- Redundancy for the SRC-DRIVE
- Automatic drilling operation

Summary

Drawworks and mud pumps are available in two different versions. First of all the ‘High End Line’ designed for Offshore application to suit special customers requirements and specifications.

The second is the ‘Classic Line’ designed for Onshore application to suit the requirements existing on typical Land drilling rigs at lower costs but providing the same quality standard as the ‘High End Line’
## Multi-speed

<table>
<thead>
<tr>
<th>Drawworks with 4-Q-Drive</th>
<th>Type</th>
<th>GH 1250 EG DC-LV</th>
<th>GH 1500 EG AC-SV</th>
<th>GH 2000 EG AC-LV</th>
<th>GH 2000 EG AC-SV</th>
<th>GH 2500 EG DC-LV</th>
<th>GH 2500 EG DC-SV</th>
<th>GH 2500 EG DC-SV</th>
<th>GH 2500 EG DC-SV</th>
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</thead>
<tbody>
<tr>
<td>Power rating</td>
<td>HP</td>
<td>1250</td>
<td>1500</td>
<td>2000</td>
<td>2000</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Hook load</td>
<td>kN</td>
<td>2776</td>
<td>2961</td>
<td>4536</td>
<td>5189</td>
<td>4536</td>
<td>5189</td>
<td>4766</td>
<td>5611</td>
</tr>
<tr>
<td>lbs x 1000</td>
<td></td>
<td>624</td>
<td>665</td>
<td>1019</td>
<td>1166</td>
<td>1019</td>
<td>1166</td>
<td>1067</td>
<td>1261</td>
</tr>
<tr>
<td>Max. hook speed</td>
<td>m/s</td>
<td>1.81</td>
<td>1.81</td>
<td>1.54</td>
<td>1.32</td>
<td>1.54</td>
<td>1.32</td>
<td>1.73</td>
<td>1.73</td>
</tr>
<tr>
<td></td>
<td>ft/s</td>
<td>5.9</td>
<td>5.9</td>
<td>5.0</td>
<td>4.3</td>
<td>5.0</td>
<td>4.3</td>
<td>5.6</td>
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</table>

## Multi-speed

<table>
<thead>
<tr>
<th>Drawworks with 4-Q-Drive</th>
<th>Type</th>
<th>GH 3000 EG AC-LV</th>
<th>GH 3000 EG AC-SV</th>
<th>GH 4000 EG DC-SV</th>
<th>GH 4500 EG AC-LV</th>
<th>GH 4500 EG AC-SV</th>
<th>GH 5000 EG DC-SV</th>
<th>GH 6000 EG AC-SV</th>
<th>GH 6000 EG AC-SV</th>
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</thead>
<tbody>
<tr>
<td>Power rating</td>
<td>HP</td>
<td>3000</td>
<td>3000</td>
<td>3750</td>
<td>4500</td>
<td>4500</td>
<td>5000</td>
<td>6000</td>
<td>6000</td>
</tr>
<tr>
<td>Hook load</td>
<td>kN</td>
<td>6698</td>
<td>7663</td>
<td>6951</td>
<td>7953</td>
<td>8881</td>
<td>10161</td>
<td>7816</td>
<td>8942</td>
</tr>
<tr>
<td>lbs x 1000</td>
<td></td>
<td>1505</td>
<td>1722</td>
<td>1562</td>
<td>1787</td>
<td>1996</td>
<td>2283</td>
<td>1756</td>
<td>2097</td>
</tr>
<tr>
<td>Max. hook speed</td>
<td>m/s</td>
<td>1.54</td>
<td>1.32</td>
<td>1.54</td>
<td>1.32</td>
<td>1.75</td>
<td>1.5</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>ft/s</td>
<td>5.0</td>
<td>4.3</td>
<td>5.0</td>
<td>4.3</td>
<td>5.7</td>
<td>4.9</td>
<td>5.7</td>
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</table>

## Single-speed

<table>
<thead>
<tr>
<th>Drawworks with 4-Q-Drive</th>
<th>Type</th>
<th>GH 1500 EG AC-1G</th>
<th>GH 3000 EG AC-1G</th>
<th>GH 6000 EG AC-1G</th>
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</thead>
<tbody>
<tr>
<td>Power rating</td>
<td>HP</td>
<td>1500</td>
<td>3000</td>
<td>6000</td>
</tr>
<tr>
<td>Hook load</td>
<td>kN</td>
<td>1720</td>
<td>2025</td>
<td>2815</td>
</tr>
<tr>
<td>lbs x 1000</td>
<td></td>
<td>386</td>
<td>455</td>
<td>632</td>
</tr>
<tr>
<td>Max. hook speed</td>
<td>m/s</td>
<td>1.29</td>
<td>1.075</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>ft/s</td>
<td>4.23</td>
<td>3.52</td>
<td>3.22</td>
</tr>
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</table>

## Two-speed

<table>
<thead>
<tr>
<th>Drawworks with 4-Q-Drive</th>
<th>Type</th>
<th>GH 2800 EG DC-2G</th>
<th>GH 3000 EG AC-2G</th>
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</thead>
<tbody>
<tr>
<td>Power rating</td>
<td>HP</td>
<td>2800</td>
<td>3000</td>
</tr>
<tr>
<td>Hook load</td>
<td>kN</td>
<td>4349</td>
<td>4975</td>
</tr>
<tr>
<td>lbs x 1000</td>
<td></td>
<td>1249</td>
<td>1429</td>
</tr>
<tr>
<td>Max. hook speed</td>
<td>m/s</td>
<td>1.24</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>ft/s</td>
<td>4.06</td>
<td>3.06</td>
</tr>
</tbody>
</table>
Drilling Fluid (Mud) Equipment

Aker Kvaerner MH aim to provide an effective and efficient project management and supply of service to the industry, using the highest quality equipment from the industries most respected suppliers to design and build solutions for specific project requirements.

STEP Offshore AS, a subsidiary of Aker Kvaerner MH AS, was established in 2004. STEP Offshore is a global supplier of products and services for drilling fluid (mud) packages.

Scope of supply includes:

**Bulk / Mud Mix Equipment**
- Bulk tanks
- Pressure Vessels
- Surge tanks
- Surge Tanks feeders
- Dust cyclones & collectors
- Rock catchers
- Mud mixers / hoppers
- Big bag units
- Liquid dosing
- Caustic mixers
- Agitators
- Tank cleaners
- Mud guns
- HP Shear units
- Centrifugal pumps

**Solids Control Equipment**
- Shale Shakers
- Desander / Desilter
- Degassers
- Mud Cleaners
- Centrifuges
- Screw conveyors
- Cuttings transport
- Slurrification units
- Cuttings re-injection

**Control Systems & Interfaces**
- Custom made PLC based control systems
- HMI systems
- Local or remote operation
- Automatic / manual
Triplex Mud Pumps -
high power for high performance

Main features
- Optimal smoothness of operation
- Pump drive units for permanent-load operation, with a high degree of stability
- Power-end frame of fabricated steel
- Fluid ends in stainless steel (optional) for increased lifetime
- Gear wheels and drive shaft of wear-resistant heat treated steel
- A double helical toothing ensures a high smoothness of operation and prevents the axial load from being exerted onto the pinion shaft and crank-shaft outer bearings
- Crank-shaft of heat-treated cast steel with a high degree of rigidity
- Material combination between crosshead and slide ways in accordance with the most recent state of technology
- Pressure circulation lubrication system for all moving parts
- High lifetime wearparts
- Surveillance and control elements for early recognition of failures
- Drive options: AC, DC
- Drive transmission options: gear-, chain- or belt driven
- Full material traceability as standard

Mud Pumps

<table>
<thead>
<tr>
<th>Discharge flow max.</th>
<th>TPK 7 1/4&quot; x 8 1/2&quot; 800-1000</th>
<th>TPK 7&quot; x 10&quot; 1300</th>
<th>TPK 7 1/2&quot; x 12&quot; 1600</th>
<th>TPK 7 1/2&quot; x 12&quot; 2000</th>
<th>TPK 7 1/2&quot; x 14&quot; 2200</th>
</tr>
</thead>
<tbody>
<tr>
<td>l/min</td>
<td>2 762</td>
<td>3 043</td>
<td>3 126</td>
<td>3 126</td>
<td>3 444</td>
</tr>
<tr>
<td>US gall. p.m.</td>
<td>730</td>
<td>804</td>
<td>826</td>
<td>826</td>
<td>884</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Operating pressure max.</th>
<th>Bar</th>
<th>psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>345</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>345</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>345</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>517</td>
<td>7500</td>
</tr>
<tr>
<td></td>
<td>517</td>
<td>7500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input power requirement</th>
<th>kW</th>
<th>HP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>597-746</td>
<td>800-1000</td>
</tr>
<tr>
<td></td>
<td>970</td>
<td>1 300</td>
</tr>
<tr>
<td></td>
<td>1 193</td>
<td>1 600</td>
</tr>
<tr>
<td></td>
<td>1 492</td>
<td>2 000</td>
</tr>
<tr>
<td></td>
<td>1 640</td>
<td>2 200</td>
</tr>
</tbody>
</table>

Triplex Mud Pump TPK 2200
- AC driven, single top mounted
- AC motor with double extended shaft to achieve 85 dBa
- less noise
- less maintenance
- less expensive

Triplex mud pumps feature hydraulic auxiliary tools
A speciality of the mud pumps are the hydraulic auxiliary tools which have been designed by Wirth for easy handling and quicker exchange of wear parts. Technical patents from 1967 cover these advantages.

Since 1959 the valve seats of the Wirth mud pumps have been pressed out hydraulically. For that purpose, hydraulic oil is pressed in between housing and valve seat by means of a manual pump. O-rings provided at the upper and the lower end of the conical seat ensure absolute tightness of the seat surfaces. High end line & classic line available.
Overview
A key element on a modern drilling rig is the control system. Aker Kvaerner MH is one of the largest suppliers of state of the art Drilling Control and Monitoring System (DCMS). The building blocks and main features of these systems are:

- Local equipment controls / PLCs
- DrillView, Data acquisition, presentation and control system
- CADS; Configurable Automatic Drilling System
- Necessary computer hardware
- Drilling Control Rooms (DCRs)

All the delivered equipment and third party equipment; i.e. Drawworks, Mud pumps, Cementing unit, Mud logger, Mud control, BOP etc. can be integrated into the DCMS and be monitored and/or controlled from the DCR.

The DCMS is designed and manufactured according to industry standards and the highest standards related to HSE and Human-Machine Interface. The DrillView system can accommodate any level of automation;

- Remote control of equipment/systems
- Synchronization of various equipment
- Fully automatic mode
- Fully automatic mode with synchronized CCTV operation and predefined drilling operation sequences (CADS)

Configurable Automatic Drilling System (CADS)
The CADS system was developed to create a user-friendly and superior control system with respect to efficiency and safety. The result is a highly flexible and user configurable system, accessible for the drilling contractor’s personnel for on site adoptions. The system includes predefined drilling operator sequences, thereby standardising operations and improving safety.

Safe operation is an integral part of the system with SZMS (Smart Zone Management System). Necessary set-points, interlocks, anti-collision, fully automated CCTV controls and other safety features are built into the software.

The DrillView/CADS system is based on touch screens and a state-of-the-art computer system.

Extended Testing
In order to reduce testing time on site, and ensure timely delivery, Aker Kvaerner MH integrates equipment tests with tests on the DCMS and operator’s chair.

Prior to testing on site, the Drilling Control Monitoring System (DrillView) and operator’s chair are tested in the laboratory by means of simulation.

During this extensive testing, Aker KVaerner MH may give practical equipment training of the customer’s operators and service personnel.

DrillView Overview

![DrillView Overview Diagram](image)
DrillView

Get your rig connected
The DrillView system provides a user friendly interface for acquisition, logging, storage, distribution and display of drilling data, as well as set-up and remote control of drilling equipment. DrillView integrates your drilling systems into one common control and monitoring centre. Real time drilling data can be shared between the driller, rig offices, shorebase or other locations accessible by telecommunications.

Integration in practice
Based on drilling operational experience, the system offers a completely integrated platform designed for the entire drilling rig. User friendly screen arrangements cover all normal drilling operations, such as drilling, tripping, mud system storage, mudlogger interface and circulation, kicks, string and hole data, make-up torque logs and others. The user can monitor the status of the individual drilling equipment via “equipment status screens” that then form the basis for efficient trouble shooting, or planning of maintenance. Information is easily accessible due to the system’s versatility and flexibility.

The user can easily set up trend charts from a large selection of direct and computed variables. All data stored from previous wells can be replayed for analysis, and all drilling data is available for off line reports using standard office tools like Microsoft Access or Excel. The drilling data is stored in an SQL real time database. A central alarm system provides the rig with distributed status information.

Industry standard basis
The DrillView system is based on a number of industrial-type workstations running Windows 2000 in a client/server environment. Field level interface (sensors, actuators, and other automation systems) is by Programmable Logic Controllers (PLCs), normally in a Profibus type network.

Web server integrated
The DrillView system has a built in Web server, which means that all data can be made available on the LAN / WAN / Internet as read only or full control instantly.

Interface your drilling equipment
DrillView contains all the mechanisms required to interface with drilling equipment for control purposes. Typical examples are control of pumps and valves on mud system schematics, control of hydraulic power units, control and priority setting of starters, assignment of SCRs and others.

Remote diagnostics
The DCMS offshore can be linked via the Internet to the remote diagnostics center in Kristiansand. Thus, trouble-shooting can be carried out in co-operation with customer service personnel without requiring Aker Kvaerner MH personnel to travel offshore. If necessary, our personnel will carry out software modifications according to set procedures.
On-shore work station
To enable active operator support, a fully integrated workstation with integrated CCTV may be established in an onshore operation center.

Intelligent Operator Chair (IOC)
New user-friendly features include:
- A “sit down/stand up” function for optimum ergonomics. The chair may be adjusted both horizontally and vertically to suit individual needs.
- Full multi-user selection; select between operation modes such as drilling, pipe handling etc., or single equipment such as DDM, RT, DW, and HRN. This can of course be selected on all installed chairs. Choose between driller, assistant driller, pipe handling mode etc.
- IOC v. 2005 available for safe area and Ex Zone 1.
- Great flexibility: Add functionality by means of software upgrades and adjustments as opposed to hardwiring and hardware upgrades.
- Efficient installation and commissioning due to comprehensive FAT-testing. Reduced hardwiring and extensive use of touch screen technology.

Using only the best sources
The DrillView system can be delivered with a sensor package containing all required measurements with state of the art accuracy, reliability and response time. The extremely fast update on the DrillView clients has made it possible to replace conventional instrumentation in DCRs, with computers. The typical response time for critical data is 200ms.

E-tally
The electronic tally book system keeps track of all items passing through the V-door and it does not require any tagging of the pipe. The system uses the length measuring capabilities of the tubular feeding machine. The operator must give input regarding the pipe type. From this information the system calculates all information needed to replace the conventional tally book. In addition the E-tally system keeps track of the pipe’s location inside the fingerboard or its position in the drill string. The system is also capable of tracing casing.

And scaleable too...
DrillView is designed to suit all levels of complexity, from systems with small sensor package and one workstation, to large drilling control systems with multiple sensors, control systems, communication links, workstations and users.

Decision support, trend monitoring, advanced alarms, interfaces, drilling data management, drilling equipment control, data distribution, easy to use and good graphics are keywords for a good drilling data system. DrillView covers these requirements, and more. The DrillView system is drilling instrumentation for the next generation, available today.

The DrillView System can be delivered to rigs independent of additional Drilling Equipment, and it is designed to facilitate interface between various types of equipment.
Drilling Control Room

Each Drilling Control Room (DCR) is designed to give an optimal solution for the individual drill floor. The DCR can be designed for 1, 2 or even 3 operators, depending on your requirements.

The exterior

The DCR is a self supporting, welded steel construction mounted on vibration dampers. All windows are sun-filtered and contain laminated safety glass with protection grating above the top windows. A specially developed, mud-resistant washer/wiper system is used to enable efficient window cleaning.

The interior

The interior is designed to the highest standards with regard to view, noise reduction, air quality, light, reflections and colours. The DCR can be delivered fully Ex or safe by ventilation. The data floor has space for cabling and HVAC ducting.

Built to last

Built to the highest standards of workmanship, the Drilling Control Room is the right choice for rigs that are competing for the advanced drilling operations of the future.

Interface cabling

When using DCR together with the Ex Intelligent Operator Chair and the DrillView system, a minimum of interface cabling is required. Extensive use of fibre cabling makes connection in zone easy and inexpensive.

Equipment room

An equipment room adjacent to the DCR can be delivered. This is particularly useful in safe by ventilation installations.
Workshop and Assembly Testing Facilities

The Aker Kvaerner MH workshop assembles and tests all types of Aker Kvaerner MH products.

Representing top competence in several areas, the workshop labour force consists of automation personnel, automation mechanics, industrial mechanics and electricians.

This comprehensive competence enables the workshop to perform relevant tasks in other departments, such as follow-up commissioning, installation and service. Moreover, this helps the workshop personnel become more flexible, while at the same time increasing the overall competence level of the workshop.

Excellent testing facilities

The workshop at Aker Kvaerner MH is able to run a complete test of most systems. The inside workshop area features the following testing facilities:

- 2 ea DDM/PTD testing towers for testing of rotating equipment. Underneath the testing tower there is a rotary table used to obtain torque onto the DDM/PTD.
- 4 ea Hydraulic Roughneck test skids for complete make-up and break-out sequence drive equipped with a large range of drill pipe dimensions.
- 1 ea Torque Master test skid for complete make-up and break-out sequence drive for both drill pipe and casing.
- Frequency converter for running of large AC operated DDP/PTD
- Available voltage in the workshop area:
  - 500 V - 930 kW, 690 V - 2600 kW, 400 V - 800 kW x 2
- The workshop has a 5 motor ring line HPU (Hydraulic Power Unit) with a capacity of 1600 l/min 210/350 bar (350.9 gal/min).
- Additionally, the Torque Master test stand is equipped with a 4 motor HPU and the Top Drive is tested with a separate 4 motor HPU, with a capacity of 900 l/min 450 bar.
- The workshop controls 3 ea portable 4 motor HPUs (400VAC), of which one is skid mounted encased in a luminous cell.

The workshop can perform pressure testing using air, oil and glycol.

A large girder has been cast into the floor of the hall that is used for welding test foundations. This girder can draw 30 metric tonnes (33.1 short tons).

Additionally, the workshop has flushing units allowing flushing of pipes and hoses up to 1800 l/min (475.5 gallons per minute). The workshop has HPUs in order that all MH equipment can be run.
Workshop and Assembly Testing Facilities

Outside testing
The outside work shop area is equipped with test foundations designed to handle a wide range of pipe handling tests.

- 1 ea concrete crane foundation for complete testing of Pipedeck Pipehandler crane handling a working radius up to 25m. (All concrete foundations contain possibilities for handling oil spill, which is sent to an oil separator).
- 1 ea concrete HTV foundation (26 m/85 ft tall) for complete testing of Eagle Light and Tubular Feeding Machine in full sequence drive. Mouse-hole test in vertical position is also included on top of the HTV tower.
- 1 ea 40 x 25 m (131 ft x 82 ft) VPH testing foundation in concrete, including derrick (13m x 18m x 20m / 42.6ft x 55.8 ft) for complete testing of the VPH system as well as a possibility of an ECT-test. The VPH system is tested using all relevant machines in the system installed (Bridge Crane, Lower Gripping Arm, Fingerboard).
- 4 ea test containers with large windows for operation from two chairs from each. The containers are sound proof, and include light and heating.

All Aker Kvaerner MH test facilities are constructed and operated with considerable attention to HSE.

The workshop contains spray painting halls for painting, a welding shop, a hose pressing room/pipe shop, a calibration room, a tool shack, a hydraulic bench for courses, an electrical workshop room for courses and a washing hall.

Additionally, the workshop has two bridge cranes with a total lifting capacity of 45 metric tonnes (49.6 short tons) - 1 x 15 metric tonnes (16.5 short tons) and 1 x 30 metric tonnes (33.1 short tons).

The total base of the workshop is approximately 1600 square metres (1913.6 square yards), whereas the outside testing plate has a base of approximately 800 square metres (956.8 square yards).
The Aker Kvaerner MH Operations division, a part of the "One Aker Kvaerner" corporation, provides the range of services required and expected, to ensure an excellent lifecycle performance and safe operation of Aker Kvaerner MH drilling equipment on drilling rigs globally.

Customer Service Center
Your 24 Hour gateway to professional support is channeled through our Customer Service Center. Your inquiry is efficiently being processed by 1st level support, and directed to your designated Technical Customer Expediter for 2nd level technical, operational, or spare parts support.

Contact information:
Customer Service Center + 47 380 57911
24 hr Technical and Operational Support + 47 911 91530
24 hr Spare Parts Support + 47 958 32146

Following services are provided:
The technical and operational support is provided by a team of competent and multidiscipline Technical Customer Expediters.

Complex troubleshooting is supported by a team of Senior Service Engineers covering all disciplines, such as mechanical, hydraulic, electro/ instrument and software.

The Remote Diagnostic is an on line support available through a service contract, providing a remote operational and troubleshooting support.

Aker Kvaerner MH Anywhere is a tool for extending senior engineering support to our Service Engineers or the client's staff on board/ on site. The personnel on site carry a camera to the work site, transmitting live images to the senior engineers at the HQ, enabling them to "see through the service engineer's eyes".

Aker Kvaerner MH Condition Based Maintenance is introduced and represents the future maintenance philosophy for Aker Kvaerner MH drilling equipment. On line continuous monitoring of "real time" condition of the drilling machines, drastically reduce the risk of unforeseen interruption in the operation.

Spare Parts
The Aker Kvaerner MH global network of strategic regional spare parts inventories combined with a main inventory at the headoffice in Norway, to ensure availability of critical, recommended and consumable spare parts. Spare parts orders are handled by experienced expediters and a team of logistics specialists are complementing the spare parts supply services in order to deliver at the right time.
Overhaul and Repair
Aker Kvaerner MH offers professional overhaul services at the main workshop in Norway, and at our regional support centers. The work is supervised by experienced and competent engineers, based on international industry standard, internal procedures, original manufacturing drawings and documentation, using original AKMH spare parts. Third party certification institutions, such as DnV, ABS are involved where required.

Completion Services
The department provides services such as installation, testing and commissioning of new equipment and upgrades/ modification projects. A team of senior supervisors are available at the head office and at our regional support centers.

Training Center
A key success factor for trouble free and safe operation of drilling equipment is adequate training on operation and maintenance. Major investments have been made by Aker Kvaerner MH in order to achieve a high level of quality on our training course portfolio. Highly competent training instructors combined with the latest in presentation technology ensure professional training according to our clients’ demands and governmental regulations.

Main and Regional Support Centers
Aker Kvaerner MH’s main support center is located in Kristiansand, Norway (Head office).

Regional support centers at the following locations;
• Norway (Stavanger)
• Azerbaijan (Baku)
• UK (Aberdeen)
• Iran (Teheran)
• USA (Houston)
• Brazil (Macae)
• India (Mumbay)
• Singapore

Further local representation provided through the “One Aker Kvaerner” alliance.
Upgrade Kits

Based on customer feedback, Aker Kvaerner MH has made improvements on parts of the drilling equipment and systems.

The idea is that improvements on the equipment and systems will be more available and visible in the market by means of productifying, standardising and/or modularising Upgrade Kits and present them in an easy understandable way.

Key advantages

- Increase equipment and system reliability
- Increase equipment and system efficiency
- Increase safety / HSE
- Reduce operation expenditures (OPEX)

Upgrade Kits help ease customer planning and budget review

- Fixed prices and delivery times
- Minimise shut down time
- Standardised and well proven upgrade solutions

This results in reduced or no down time during installation, and improves spare parts availability.