SBM Offshore is a global leader in the supply of systems and services to the oil and gas industry. Some of the Company’s core products have been developed for Single Point Moorings (SPMs) which require the use of swivels to allow the flow of fluids between the fixed and rotating parts of the various systems.

In 1959, SBM Offshore pioneered the development of the first CALM system. Subsequently, the company has further developed the low pressure swivel technology used for the CALM systems into the high pressure swivels incorporated in the swivel stacks found in FPSOs. Since the late seventies, when SBM first entered the FPSO market, the company has become the world’s leading swivel stack supplier.

SBM Offshore is involved in every stage of the swivel stack supply, including the design, manufacture, testing, transportation, installation, commissioning, inspection and maintenance. Each swivel stack is tailor made to suit the requirements of the particular project and to date SBM has supplied over 70 swivel stacks to the industry.

SBM’s swivel technology has evolved through operational feedback from their FPSO fleet, as well as a continuous R&D program, the result of which are innovative solutions that meet the ever increasing demands from the industry for higher pressures and throughputs.
Fluid Swivels
Fluid swivels are used for the transfer of products such as oil, water and gas between the stationary part of the turret and the weathervaning vessel. Two types of fluid swivels exist: Pipe Swivels and Toroidal Swivels

Pipe Swivels
A pipe swivel (or in-line swivel) includes one fluid path and is the simplest and most cost effective fluid transfer system.

- Design Pressure: full vacuum to 525 bar
- Design Temperature: -46°C to 130°C
- Line Size: up to 24” nominal diameter

Toroidal Swivels
When more than one fluid path is required toroidal swivels are implemented. Due to their large diameter, a large number of paths can be accommodated by stacking several fluid toroidal swivels.

- Design Pressure: full vacuum to 525 bar
- Design Temperature: -46°C to 130°C
- Seal Diameter: up to 2800 mm
- Line Size: up to 24” nominal diameter

Utility Swivels
Utility swivels allow for the transfer of chemicals, hydraulics, air/gas, firewater and vents. Multiple small bore paths (up to 4”) can be arranged in single (up to 10 paths) or double (up to 20 paths) barrel utility swivels.

- Design Pressure: full vacuum to 525 bar
- Design Temperature: -46°C to 130°C
- Seal Diameter: up to 1000 mm
- Line Size: 3/8” to 4” nominal diameter

Electric and Optical Swivels
Electric and Optical swivels allow transfer of power and information.

Three types of these swivels exist:

Low Voltage Electric Swivel
- Maximum Voltage: up to 3 kV
- Current: up to 2000 Amp
- Short circuit level: up to 36 kA RMS during 1s and 90 kA peak
- Certification: IP 56, ATEX Ex d, Hazardous Area Zone 1, gas group IIA, Temperature Class T3

High Voltage Electric Swivel
- Maximum Voltage: up to 66 kV
- Current: up to 2000 Amp
- Certification: IP 66, ATEX Ex o, Hazardous Area Zone 1, gas group IIA, Temperature Class T3

Optical Swivel
- Up to 32 optical ways
- Certification: IP56 when mounted inside a Low Voltage Electric Swivel, IP 66 when stand alone

State of the Art
With over 35 years of experience, SBM has pioneered the design and driven the development of all types of swivels including fluid, utility, electric and optical.
SBM Offshore’s Quality System is implemented through each phase of manufacture and assembly. The system enables an easily accessible auditable trail, together with precise and efficient traceability of all materials.

A team of qualified specialists in various disciplines ensure that SBM’s swivels comply with all technical specifications and that they are manufactured to the highest standards in accordance with the Quality System. The modular design of an SBM swivel stack allows for each swivel to be manufactured and tested independently, resulting in an optimized manufacturing and testing schedule.

**Seals**

Seals are a critical item for the correct operation of swivels. In the early nineties SBM started designing, testing, validating and producing their own seals. Since then, continuous R&D has been performed to push the boundaries of technology to address the world’s harshest conditions.

**Bearings**

High precision three race roller bearings are generally used to enable the outer rotating part of the swivel to rotate around the fixed inner part.
All of SBM’s fluid, utility and electric/optical swivels are validated on specially designed test benches as part of a Factory Acceptance Test before final assembly on site. In certain cases, a trial fit of the whole swivel stack is conducted to validate the various interfaces.
From Installation to Maintenance

Each swivel stack adheres to SBM’s modular design philosophy in order to optimize the fabrication schedule, ease the installation work and limit the requirements for heavy lifting equipment.

During the integration of a swivel stack, a team of specialists supervises the assembly of all the modules, verifies the mechanical completion and oversees the commissioning. When in operation, SBM swivels require only minimal maintenance.

However should it be required, SBM specialists are available on short notice for inspection or intervention.
The swivel seals are a critical part of the swivel stack; they restrict the fluids to their respective fluid paths and ensure fluid path integrity under the most severe conditions. The seals are made from very resistant long life materials. However, due to the extreme conditions under which some seals operate, occasional replacement may be required. On most of SBM’s swivel stacks, spare seals are installed to enable rapid replacement by SBM specialists.

To allow this rapid replacement, the spare seals are pre-installed in protective enclosures between each swivel element. This is a key feature of the SBM swivel stack design which negates the need to interrupt the operation of the adjacent swivels and ensures minimum disruption in the event of an unplanned seal intervention.

When spare seals are not available on the swivel stack, the seals can be replaced in-situ using SBM’s patented and validated seal bonding technology. In order to perform a seal replacement, a shutdown of adjacent swivels is not required. To carry out the repair, the swivel is shut down, disassembled and the used seal removed. The ends of the new seal are then bonded together using an ATEX bonding tool. After bonding, the swivel is reassembled and the seal is pressure tested. Swivel service can then be resumed.
To meet the increasing demands of projects and clients, SBM’s swivel stacks have grown both in size and complexity. SBM’s high pressure swivel stack experience extends from the 30 tons swivel stack for the Udang FSO in 1977, to the 250 tons swivel stack for the BP FPSO Skarv. Swivel stacks are supplied as part of a turret mooring package or on a stand-alone basis.
SBM Offshore continues to improve its technology through continuous R&D.

Components, features and principles relating to the swivel stacks are tested and qualified in SBM’s laboratory on a daily basis.

Other development work on very high voltage swivels is currently in progress in order to meet the demands of tomorrow’s high power requirements. Development work is also underway on very high pressure (VHP) fluid swivels that will allow FPSOs to be used to exploit deeper HP/HT reservoirs.