



Floating Production Systems

Swivels and Related Marine Equipment

FOCAL™

Focal Technologies has had one focus over the years - responding to the global demands for power and data transmission solutions.

Focal provides a complete product line of rotary and electro-optic equipment for the swivel stacks of Floating Production Systems (FPS) including; Fiber Optic Swivels, Toroidal Fluid Swivels, Electrical Swivels, Wavelength Converter/Multiplexers and Ancillary Equipment.

Our approach to solving power and data transmission challenges is simple - innovation and performance in all that we do. That means products that consistently perform in the world's harshest environments, people that consistently exceed expectations, and innovative, custom solutions and services that set the pace in today's rapidly changing global markets. We have delivered **trusted technology products and services** to the offshore petroleum, oceanographic, seismic and maritime industries for more than 30 years. Working from our well-equipped facility in Halifax, Nova Scotia, Canada, we have earned a reputation for unsurpassed service and custom solutions.

From design to deployment, our experienced team of professionals specializes in **providing custom electrical, fiber optic and fluid swivels and optical multiplexer solutions** for the worldwide marine industry. Product features include hybrid packages that combine fiber, electrical and fluid swivels, packaging for harsh environments, certification for hazardous locations and adaptation to customer's size and mounting constraints.

We are the first stop for the design, manufacture and project management of marine and energy integrated power and data solutions.

Innovation and performance are incorporated in all that we do. From our ability and willingness to customize products, to our ISO 9001 certification, to our unmatched global capacity, we are defining and delivering custom integrated and **proven products for the harshest marine environments in the world.**



High Power Electrical Swivels

Powering subsea equipment, remote production platforms or powering a vessel from shore, we can supply the swivels that will meet your power transfer requirements.



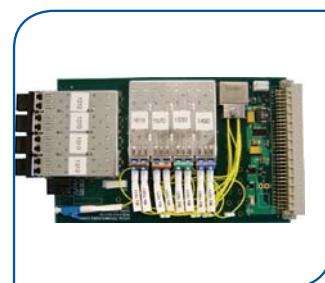
Electrical Swivels

Designed to function in harsh marine environments, our electrical swivels are used around the world for reliable power and signal transmissions in marine surface and subsea applications.



Electronics

Our multiplexers and media converters were developed to provide reliable fiber optic transmission of video and data signals in the demanding subsea applications of ROVs, robust defense systems, FPSOs, and other platforms operating in harsh marine environments around the world.



Toroidal Fluid Swivels

With a pedigree dating back to the mid 1970's, our toroidal fluid swivels have evolved to meet the extreme requirements of the oil and gas industry.



Fiber Optic Swivels

Our fiber optic rotary joints (FORJs) are recognized around the world for their performance and reliability in harsh marine environments.



Ancillary Equipment

Many of our products can be integrated into a single stack and tested at our factory. Included in this are cable and conduit assemblies, junction boxes, switches and performance monitoring equipment.



Product Features and Innovations



Fiber optic swivels

Up to 52 passes, singlemode, multimode or a combination



Circuit segregation

Use of barriers between circuits

Separate compartments in a single enclosure



Hazardous area

Flameproof, pressurized, fluid immersion, increased safety, intrinsic safety

ATEX, IECEx, AEx, Class/Div



High voltage

Several 36 kV swivels are in operation

Designs demonstrated to 145 kV

Reduced enclosure sizes using modelling software supported by HV tests



Integral toroidal fluid swivel support

Swivels carry weight and accommodate motions of the units above in the stack



Split swivels

Enables field replacement without disassembling the swivel stack

Split rings, bearings and seals

Segmented housing for large enclosures that can be assembled on-site



High hydraulic pressure

Up to 15 000 psi [1030 bar]

A Depth of Expertise



Leak collection

For environmental protection



Adjustable terminals

Provides for some leeway when terminating MV cables
Reduces installation time



Compressed Air Treatment System (CATS)

Ensures proper air quality for pressurized swivels
Backup air source
Instrumented



Integration

Complete swivel stacks, assembled and tested in the factory



Condition monitoring system

On board sensor suite and data collection
Monitor environmental conditions and other parameters of your swivel
Live optical monitoring and fault detection



Materials and coatings

Stainless steel is standard. Inconel, titanium and other materials used when necessary



Advanced engineering tools

CREO/SIMULATE for design and FEA
Comsol for electric field and heat transfer analysis

OPT/ELECT/OPT (OEO) CONVERTORS

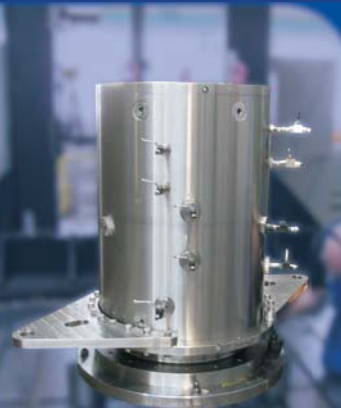
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MODEL 414

TOROIDAL FLUID SWIVEL

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MODEL 470

CONNECTORS, CABLE & CONDUIT

8



MODEL 491, 454

9

MEDIUM VOLTAGE SWITCH

6



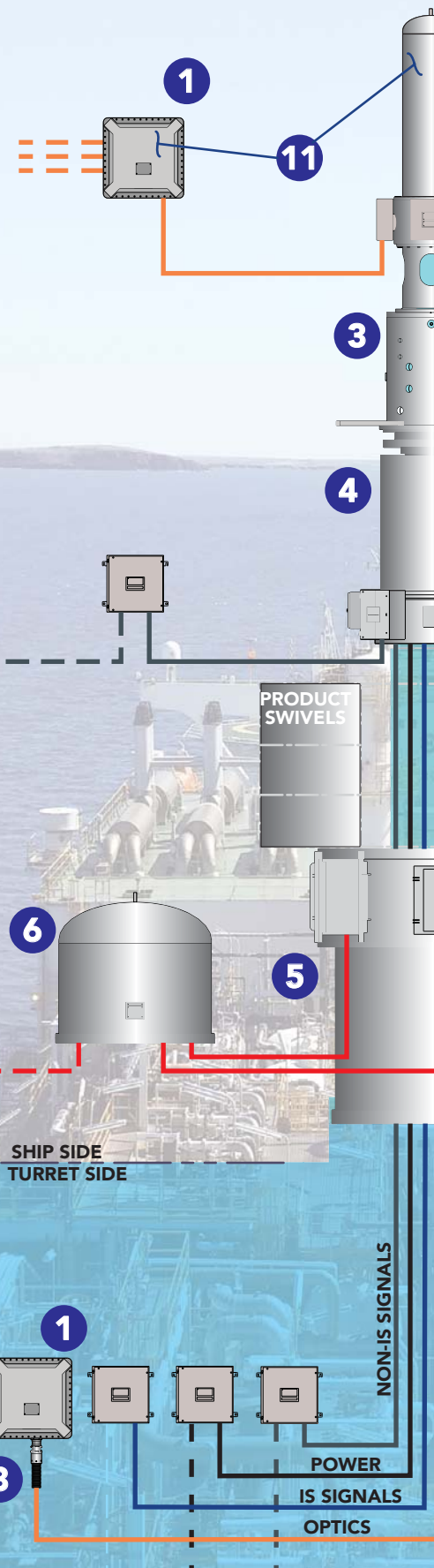
MODEL 415/417

CONDITION AND OPTICAL MONITORING SYSTEM

11

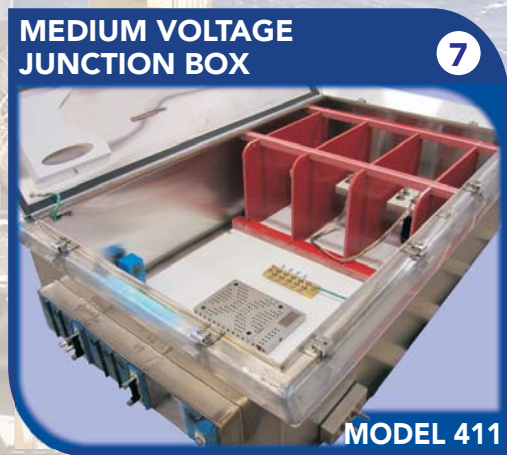
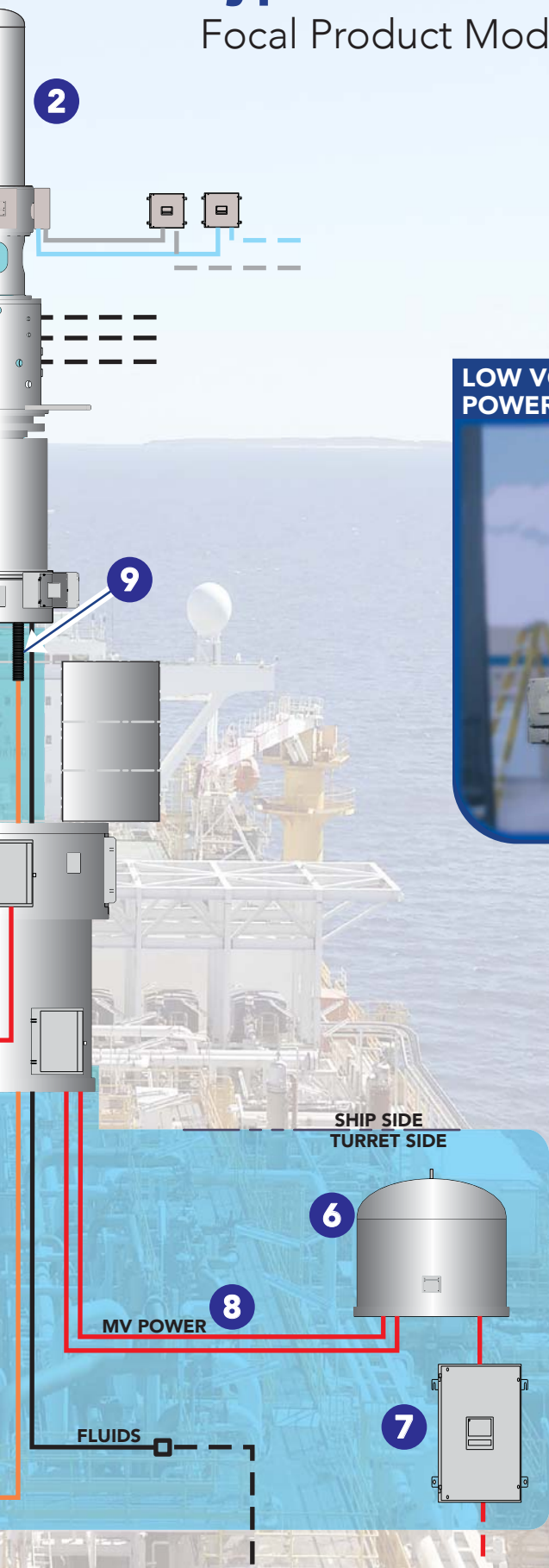


MODEL 490/928



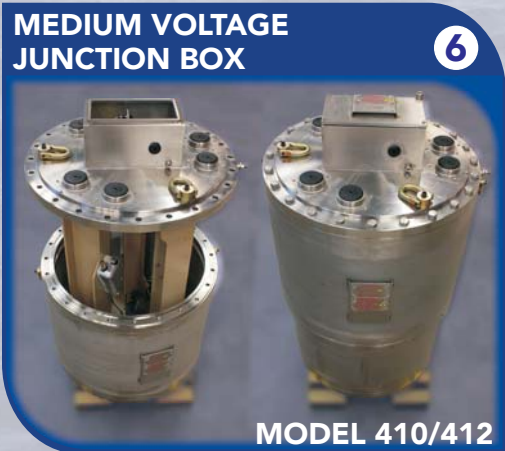
Typical Swivel Stack

Focal Product Models

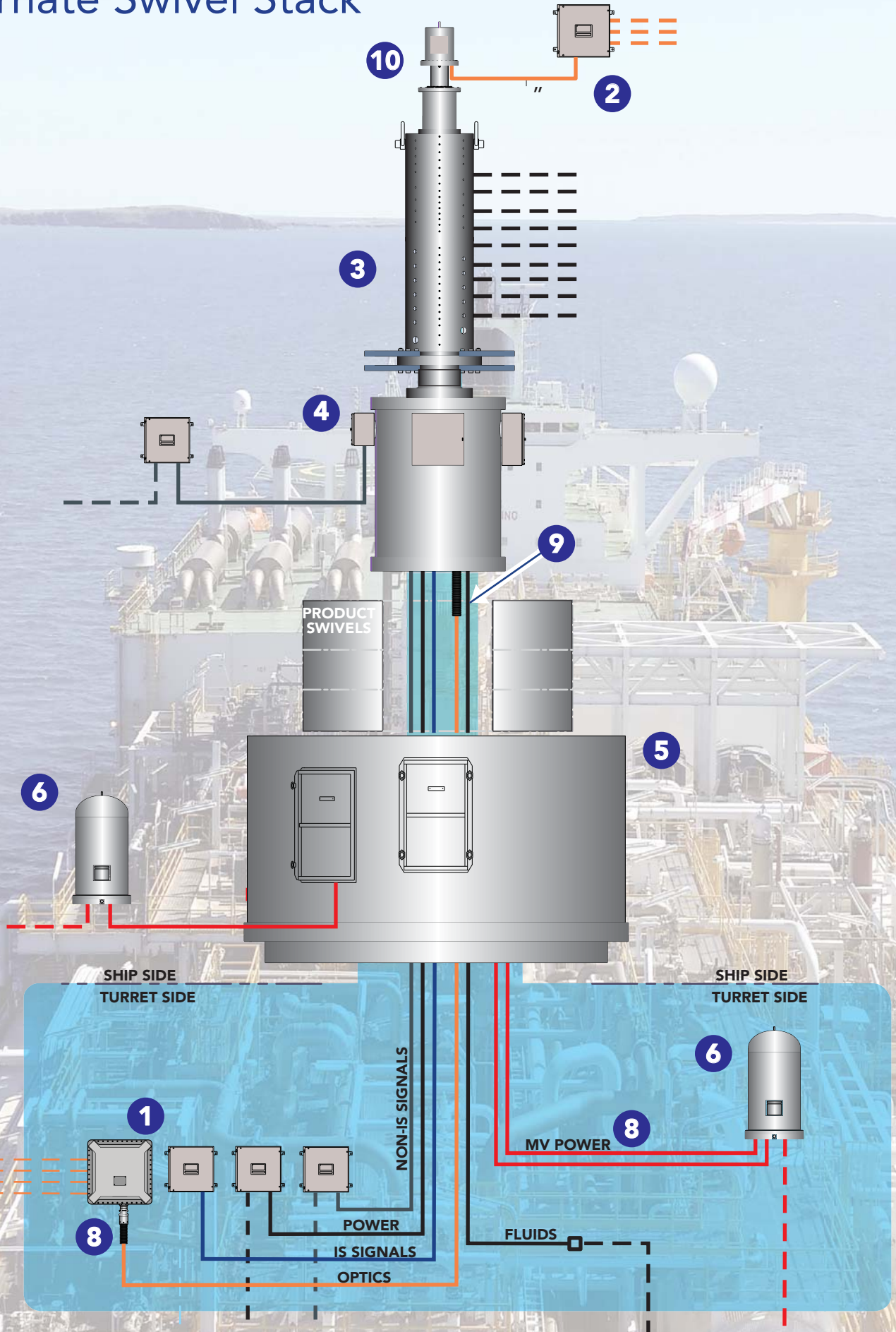


How Does Your Turret Stack Up? Focal Can Help You Optimize.

Swivel stacks can take various configurations and at the design stage, the decisions are not always obvious. There are many factors in determining where components are best placed, and having supplied and integrated most components in swivel stacks, Focal is ideally positioned to help optimize those variables. Our goal is to always minimize stack cost, height and weight, while maximizing performance. We have developed design methods and tools that allow us to quickly consider space requirements through the bores, cable de-rating due to high temperatures, signal and optical data transmission, mechanical loading, and various other parameters. Engage us early in your project, when you're planning how your turret will stack up, and you will save time and money.



Alternate Swivel Stack



Focal has successfully delivered over 175 FPS swivel projects over the last 30 years.

Project Management (PM) - Components for Success

- PM system developed over many years to meet customer goals and objectives, with a focus on continuous improvement
- Annually audited by a third party and periodically by customers
- Responsive and experienced with international customers
- Dedicated certification and classification personnel
- Formal database and workflow processes for tracking project risks, lessons learned and actions
- Focus on design reviews to meet customer specifications
- Flexible system to meet varying customer expectations

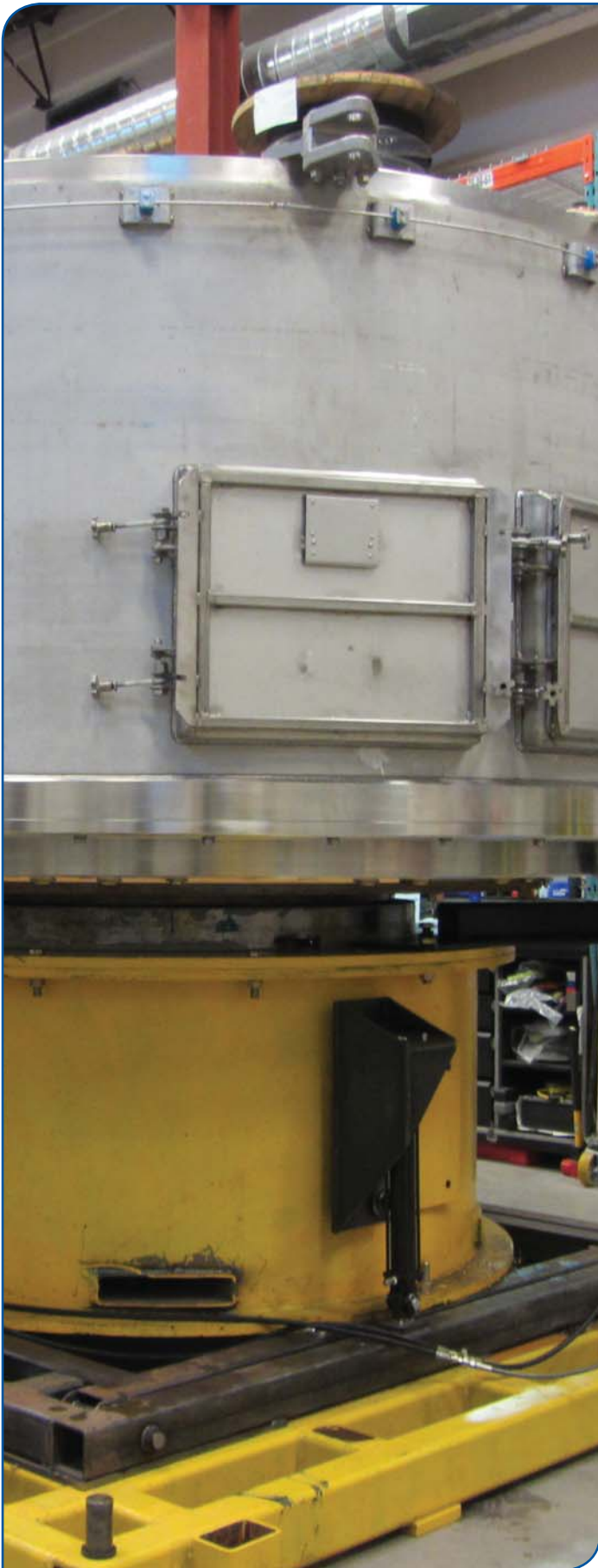
Tools/Techniques

- PM Best Practices within Moog Organization
- Master Certificate in Project Management
- MS Project Professional
- MS SharePoint Workspace

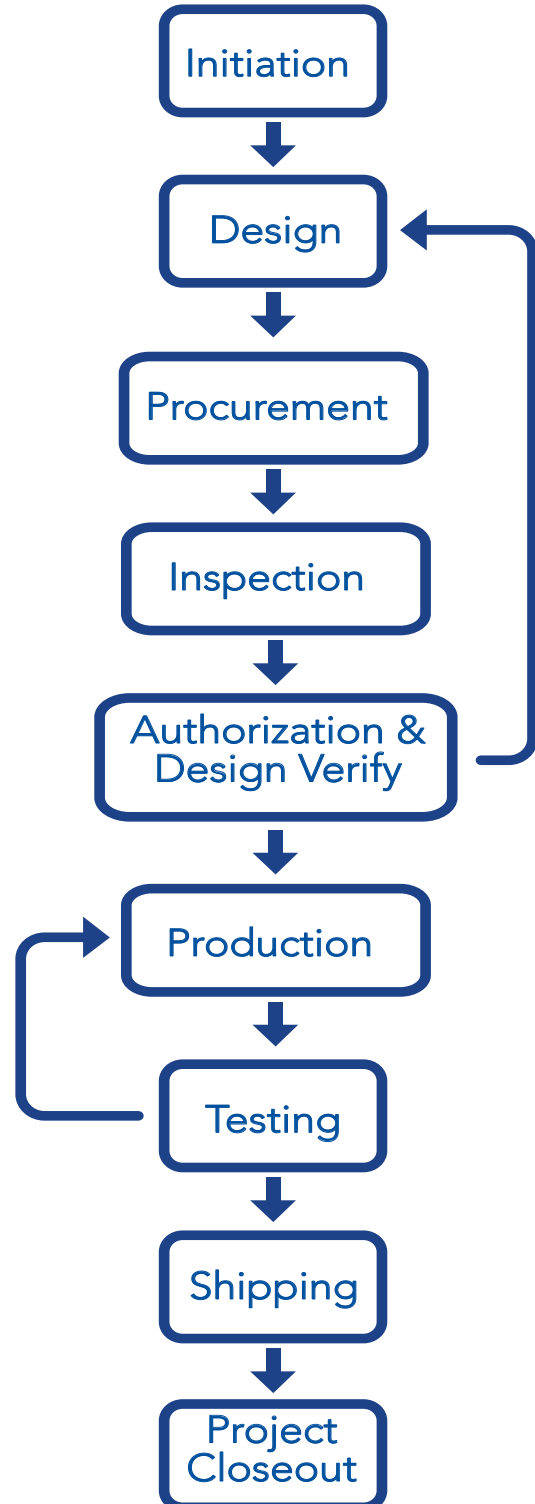
International Customer Base



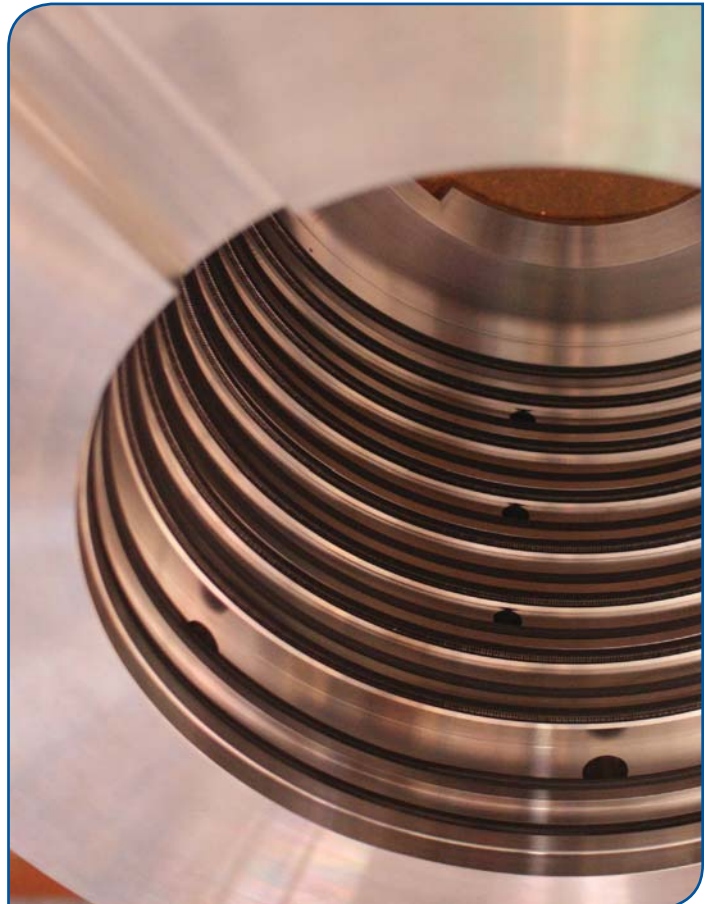
Australia | Brazil | Canada | China | Denmark | France | Italy | Malaysia | Mexico | Monaco | Netherlands | Norway | South Africa | United Kingdom | United States | Vietnam



There are typically nine phases to each project. Most projects within Focal flow in accordance with the following process and feedback loops after order receipt:



Our customers want to protect their investment. One of the most important things that they can do is ensure that equipment is installed correctly. We have a team of offshore **trained** and **certified technicians** and **engineers** that can provide proper installation and commissioning of our products. We will work with our client and others at the installation site to ensure that the installation is done **safely** with **quality workmanship** and in a timely manner.



Our offshore certified field team will ensure successful installation, commissioning and planned maintenance. Should the need for unplanned service arise, we provide a quick response to all inquiries and rapid mobilization worldwide.

Installation

- Mechanical – installation and verification
- Electrical – terminations, connections and testing
- Fiber Optic – terminations, connections, fusion splicing and testing
- Fluids – connections and testing
- Pressurization Systems – piping/fitting, configuration and testing
- Integration of multiple swivels in advance to simplify installation onto the turret

Commissioning

- Onshore and offshore
- Systems verification
- Troubleshooting
- Calibration / adjustments
- Mechanical, electrical, fiber optic and fluid completions

Service

- Onshore and offshore
- Scheduled / planned maintenance
- Inspection / survey
- Spares
- Upgrades
- Refurbishment / seal replacement
- Requalification / recertification



Focal Technologies is a proud member of the Moog Inc. family. Moog designs and manufactures high-performance motion control solutions for a variety of applications including aircraft, plastics, metal forming, power generation, steel production, test and simulation, wind energy, motorsport and others.

With operations in more than 26 countries, Moog delivers a high level of service, support and collaborative expertise tailored to the requirements of machine builders and design engineers worldwide. Focal works closely with Moog divisions worldwide, increasing our ability to offer a large portfolio of leading-edge custom solutions and services that set the pace in today's rapidly changing global markets.

We can supply other products and systems for FPS vessels:

- Trittech International Ltd. RAMS® – for real-time monitoring of FPS mooring lines & risers
- Surveillance – high-quality, scalable physical-security and process monitoring solutions for extreme environments
- Valves – design and manufacture of high performance hydraulic valve products
- Vibration Suppression and Control Systems - to sense and suppress vibratory forces in structures and payloads
- Digital Data Transmission – multiplexing and media conversion for video and data systems
- Motion Control – complete motion control systems



Contact Us

We look forward to assisting you with your Floating Production System needs.

For more information, please contact:

- Web: www.moog.com/marine
- Email: focal@moog.com
- Tel: 902-468-2263

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