Operational Benefits of Gyro Roll Stabilisers for Offshore Vessels

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15th March 2019

AOG AUSTRALASIAN OIL & GAS EXHIBITION & CONFERENCE

VEEM

Presentation Overview

1. Introduction to Gyro Stabilizers
2. Operational Benefits for Offshore Vessels

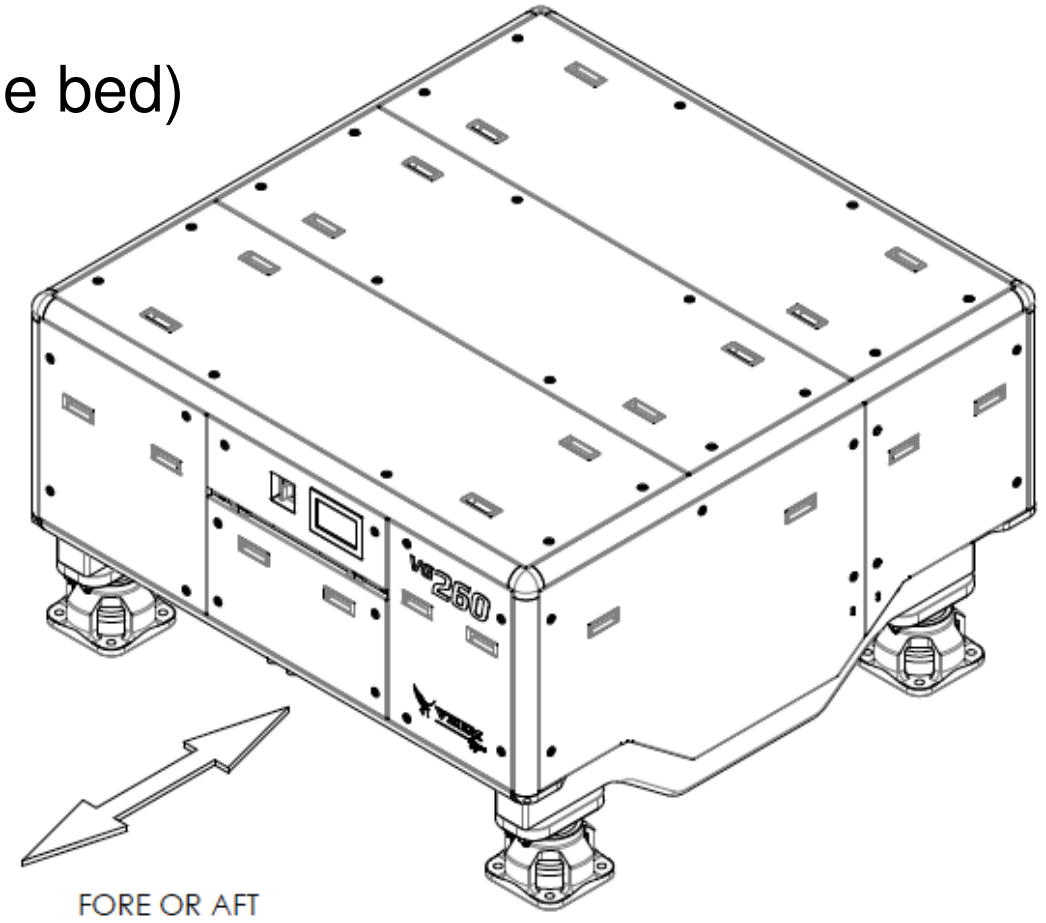
Introduction to Gyro Stabilizers

What is a Marine Gyro Stabilizer?

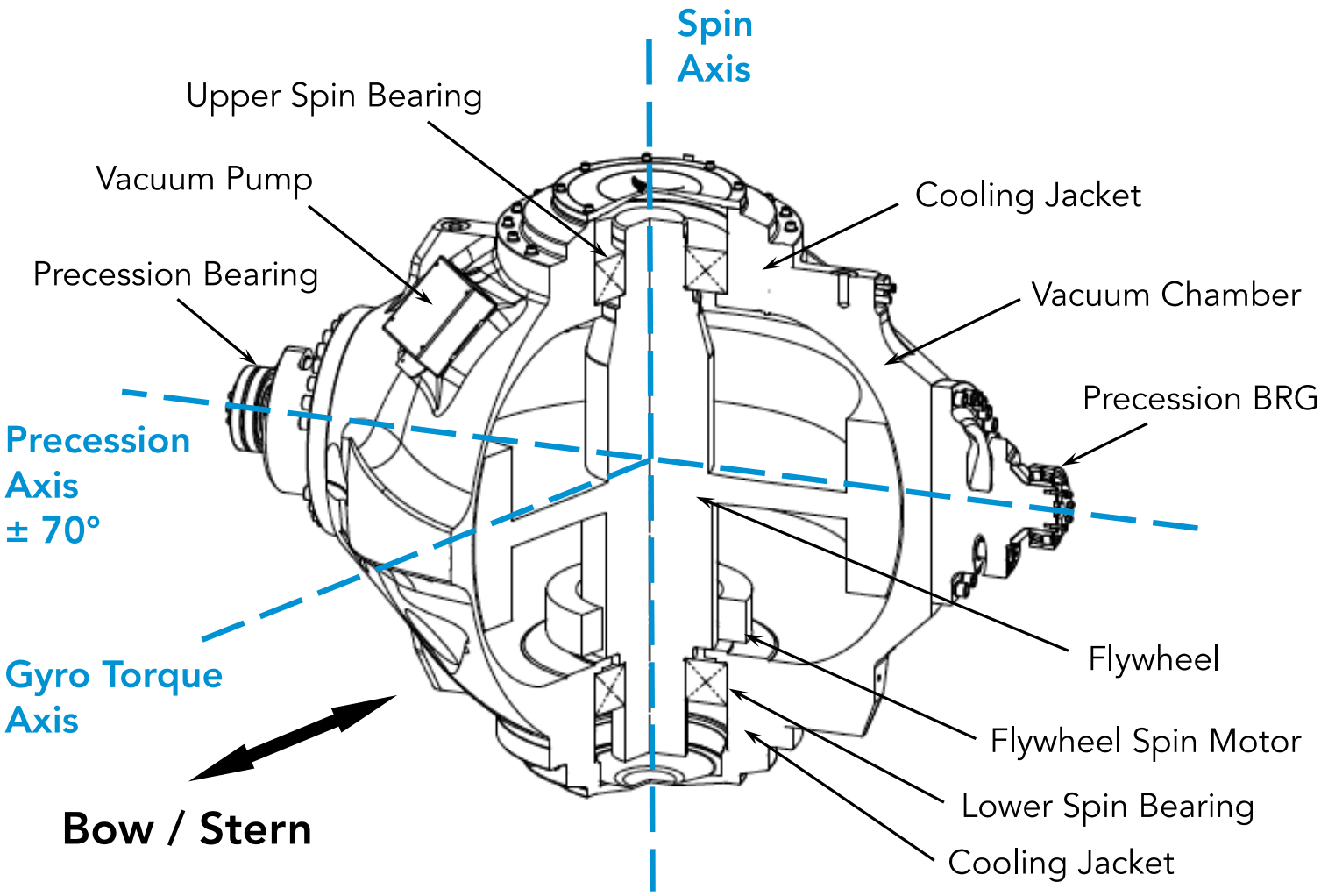
- Piece of mechanical equipment that bolts down to hull structure
- Purpose is to reduce rolling motion
- Use gyro-dynamics to create large torques to oppose rolling motion
- In engineering space or convenient location
- Nothing in contact with the water
- No appendages required
- Behavior readily predicted - no hydrodynamics
- Roll motion can be virtually eliminated at all speeds including zero speed

Vessel Interfaces

- Simple bolt down installation (like an engine bed)
- Cooling sea water
- 24 VDC
- 3-phase or 1-phase AC Power
- Touch Screen on bridge
- Can interface to ship control system
- Ethernet comms



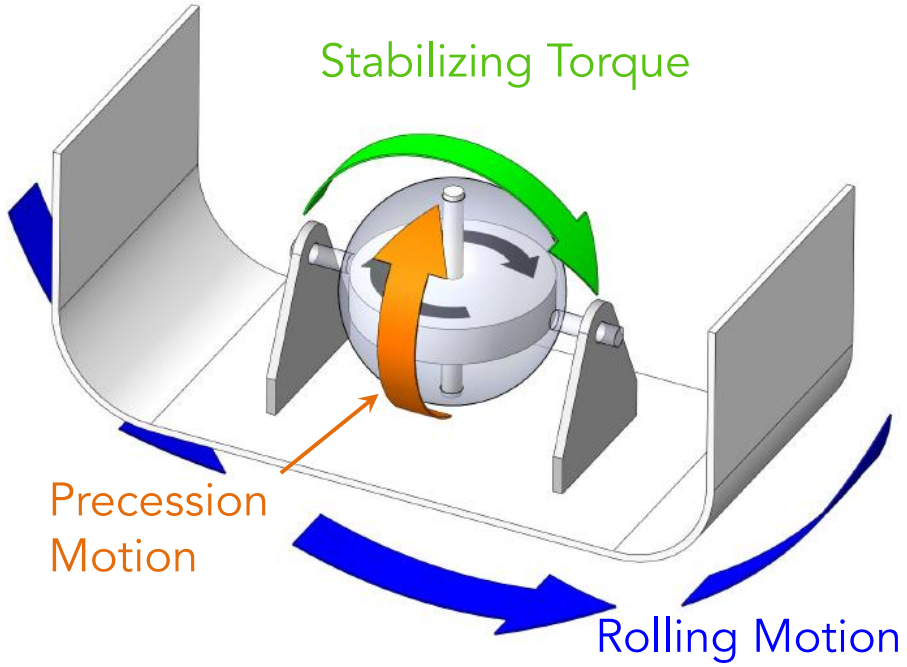
Components of a Gyro



Components of a Gyro

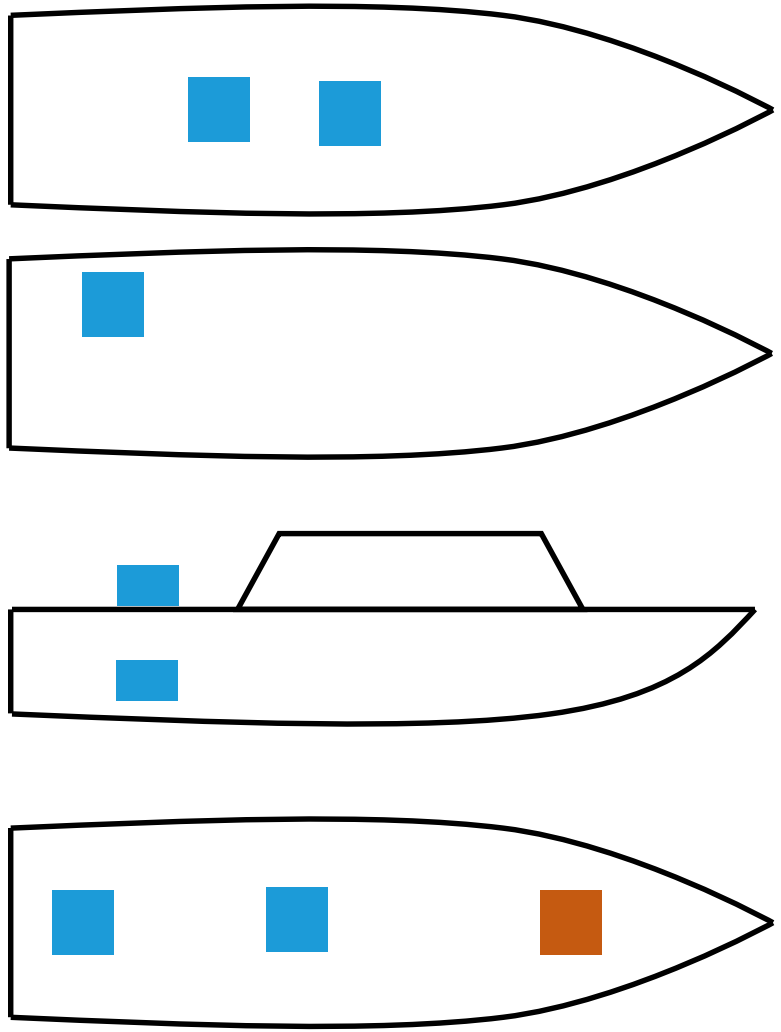
Principal of Operation

1. Flywheel RPM creates angular momentum (vector)
2. Waves cause the vessel to roll, applies rotation to flywheel in roll axis
3. Rolling motion combines with the spinning flywheel to create precession motion
4. Precession motion combines with the spinning flywheel to create stabilizing torque



Flexible Installation Location

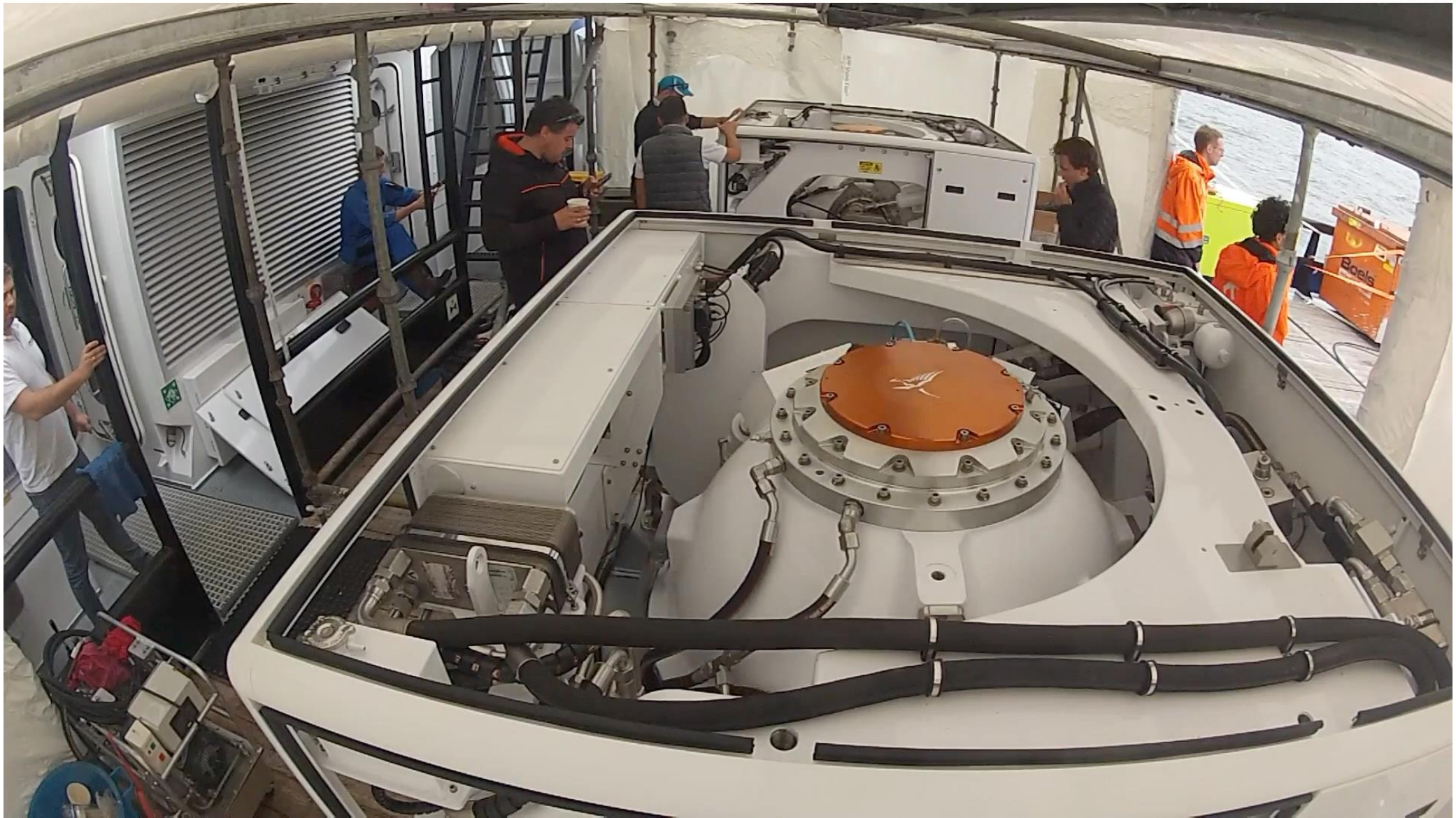
- ✓ Multiple units will work together
- ✓ Can be mounted off center-line
- ✓ Can be mounted high or low (structure dictates)
- ✓ Can be mounted forward or aft
  - Avoid forward location if slamming
  - Vessel trim dictates



Interaction with Other Systems

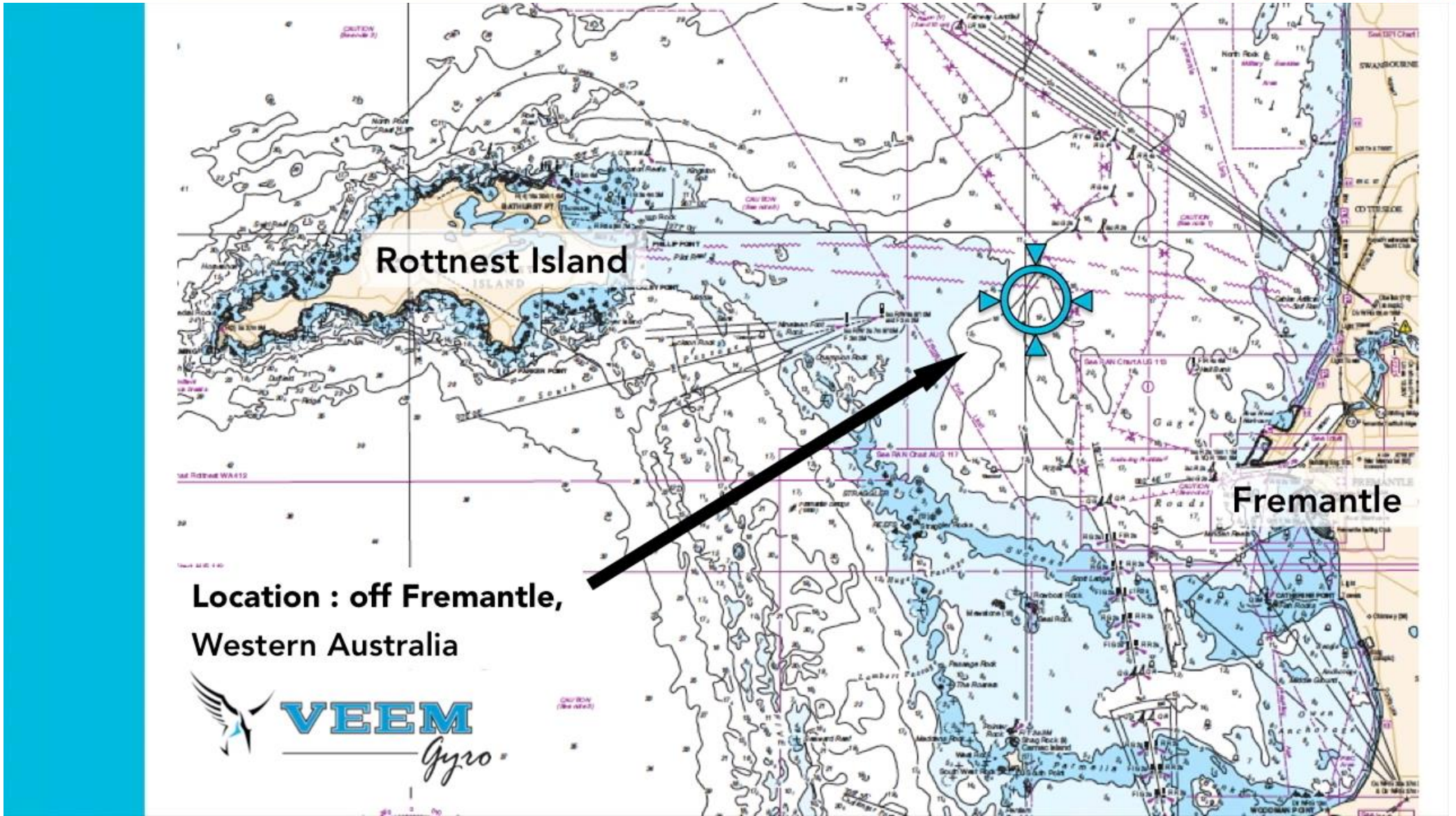
- Improves performance of heave compensation systems
- Improves performance of DP systems
- Will work with transom interceptors
- Will work with other stabilizers (flume tank, fins etc)
- Multiple gyros will work together
- Improves sonar and radar performance
- No interfacing required between systems

Gyros in Operation



Opposite Spin Direction

What Gyro Stabilisers Do – Tug Beattie



What Gyro Stabilisers Do – FCS5009

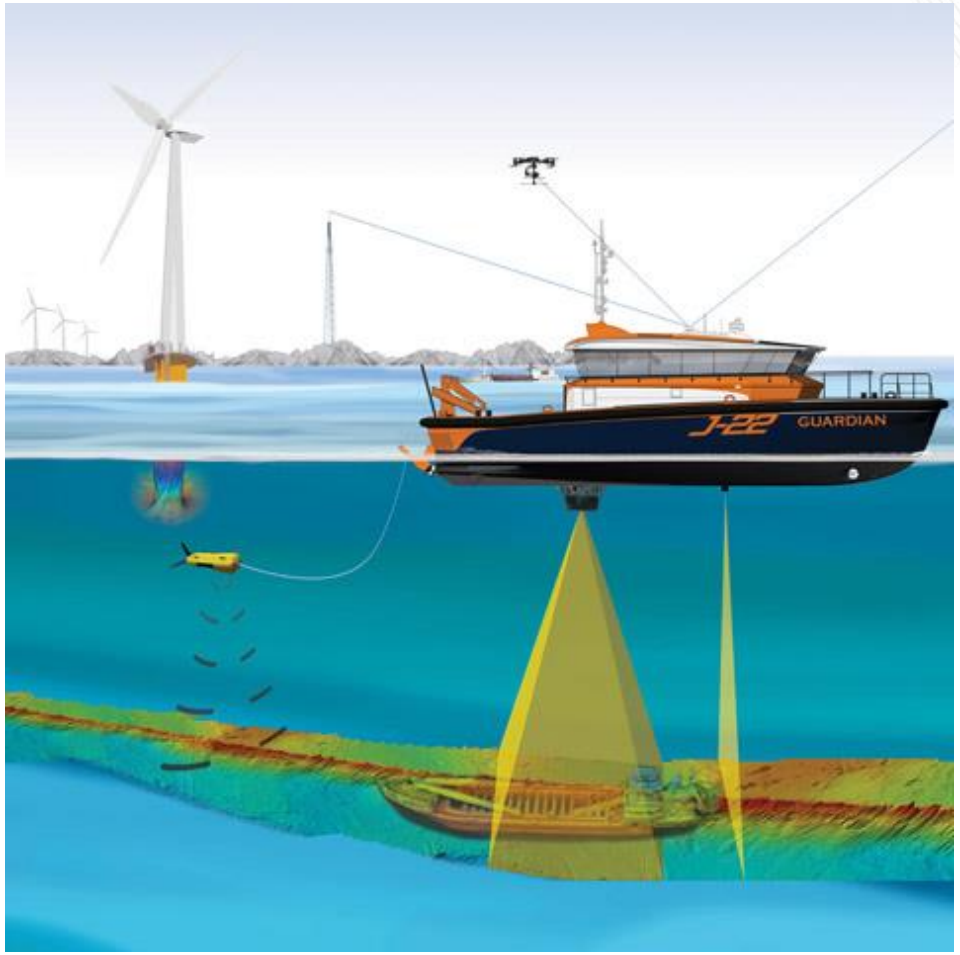
Operational Benefits of Gyro Roll Stabilisers for Offshore Vessels

Walk-to-Work

- Reduce motions that need to be compensated by articulated gangway
- Reduced power for gangway
- Increased operational window
- Increased comfort in transit

Survey Vessels

- Full stabilising torque available at survey speeds
- Improved data accuracy / quality
- Reduced lost data days
- Happier client team and survey crew
- Better decision making
- Smaller vessels possible

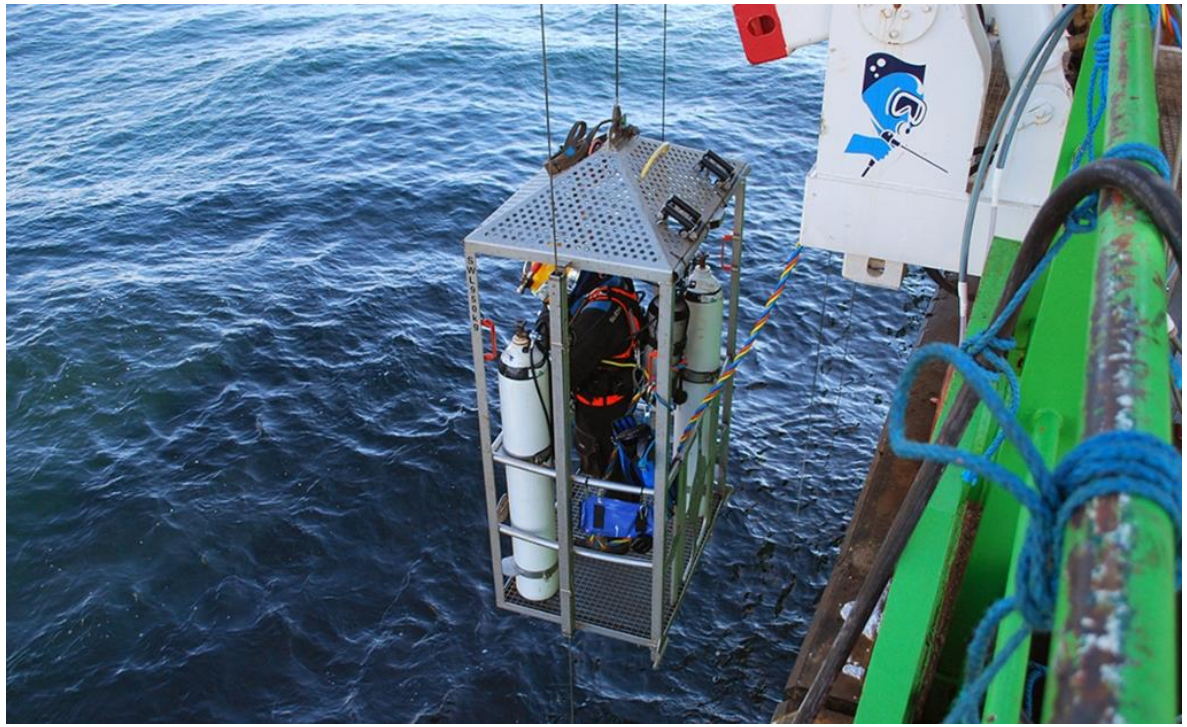


Windfarm Crew Transfer

- Reduced rolling reduces breakaway from bow transfer connection
- Improved comfort in transit
- Increased operational availability
- Safer transfers

Improved Diver LARS Operations

- Diver LARS operation in wider range of conditions
- Increased safety
- Reduced WOW
- More working days



Safer Crew Transfer

- Billy Pugh transfers without deck rolling
- Faster
- Safer
- Increased options for vessel orientation

Faster, Safer Boat Launch Ops

- Faster and Safer operations
- Increased weather envelope
- Range of headings now possible

  (head sea not required)
- Launch in lee of vessel while drifting

Wider Heli-Ops Window

- Extend the operability of Heli-Ops with decreased rolling motions
- Range of headings now possible

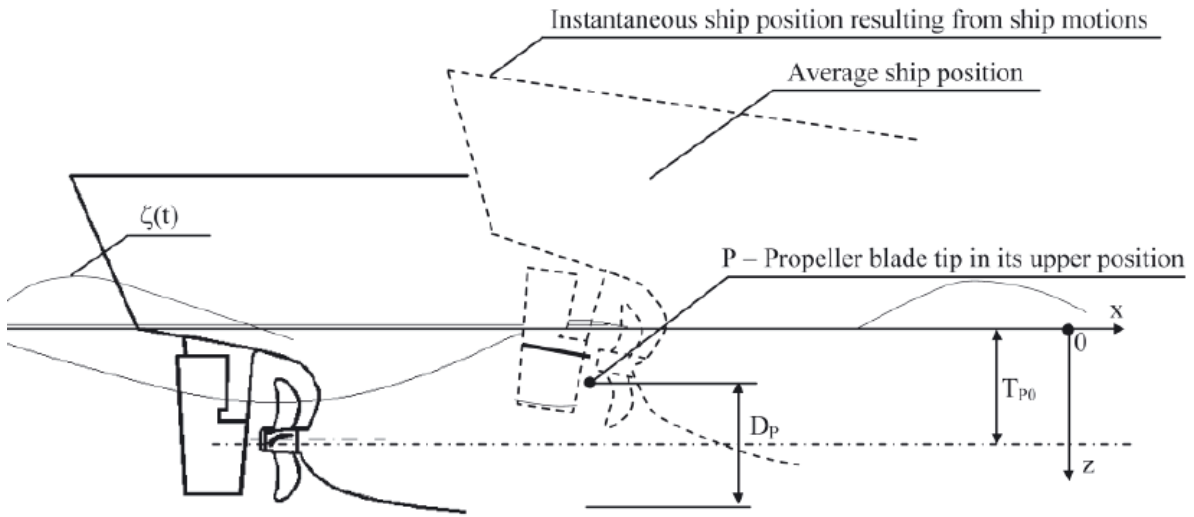
  (head sea not required)
- Faster and Safer operations
- Increased weather envelope availability
- All deck operations safer and faster

Superstructure Impact When Alongside

- Keep supply vessel upright
- Prevent superstructure impacts when alongside a rig or larger floater

Reduced Prop and Thruster Emergence

- Lower rolling reduces prop and thruster emergence
- Reduced load variation on propulsion / DP systems
- Lower fuel burn (or higher speeds) in waves



Improved Course Keeping

- Roll and Yaw and highly coupled
- Reduced rolling leads to lower heading variations
- Reduced load on steering machinery
- Lower fuel burn (or higher speeds) in waves

Increased Crew Comfort

- Reduced fatigue
- Better decision making
- Increased endurance
- Improved recruitment
  - better candidates
- Improved morale
- Reduced crew turnover

Thank You, Questions?

Thank you for your attention,

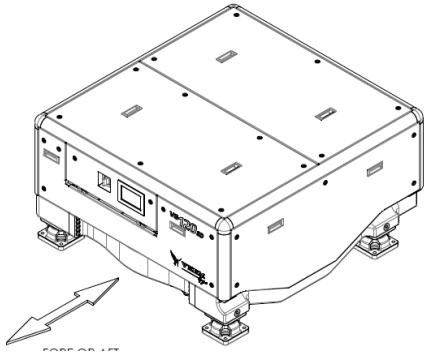
Any questions?

VEEM Gyro Stabilizers

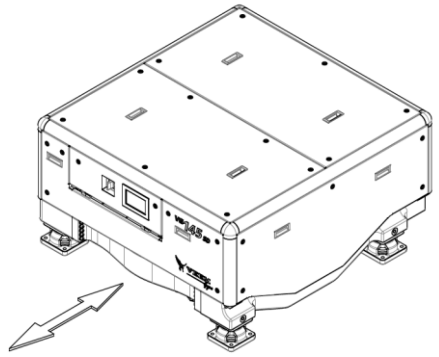
VEEM Gyro

VEEM Gyro Models

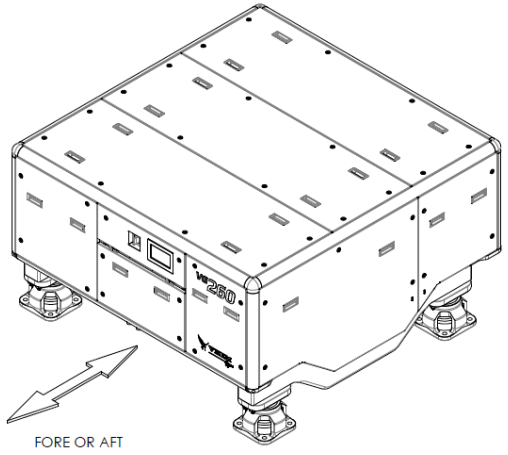
Four Models – Vessels from 65 tonne to 3000+ tonne



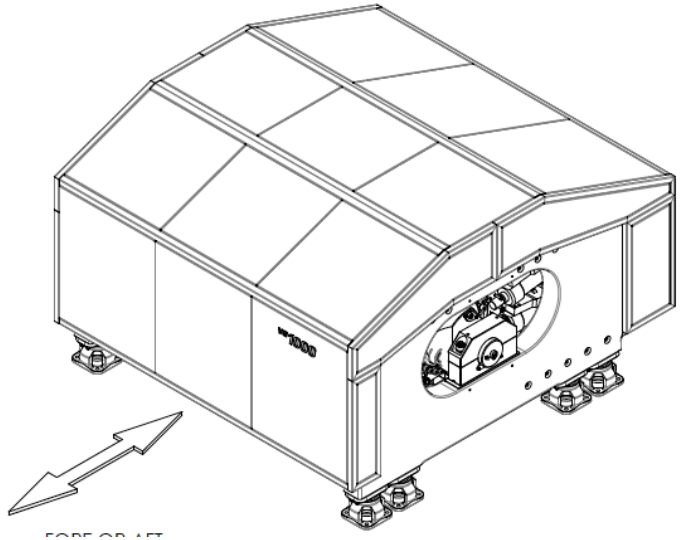
VG120SD
Applications
Vessel Displacement
65 – 120 tonne



VG145SD
Applications
Vessel Displacement
80 – 150 tonne



VG260SD
Applications
Vessel Displacement
100 – 300 tonne



VG1000SD
Applications
300 – 900+ tonne

Multiple units for
larger vessels

VG120SD

Application Vessel Displacement

65 – 120 tonne

Rated Stabilizing Torque	120 kN.m	**Mass**	2755kg
Angular Momentum	52 k.N.m.s	**Power**	16 ekW
Length	1.63 m (64″)	**Rated RPM**	4800
Width	1.56 m (61.4″)	**Cooling Water**	60 lpm
Height	1.15 m (45.3″)	**Noise Running**	57 dBA

VG145SD

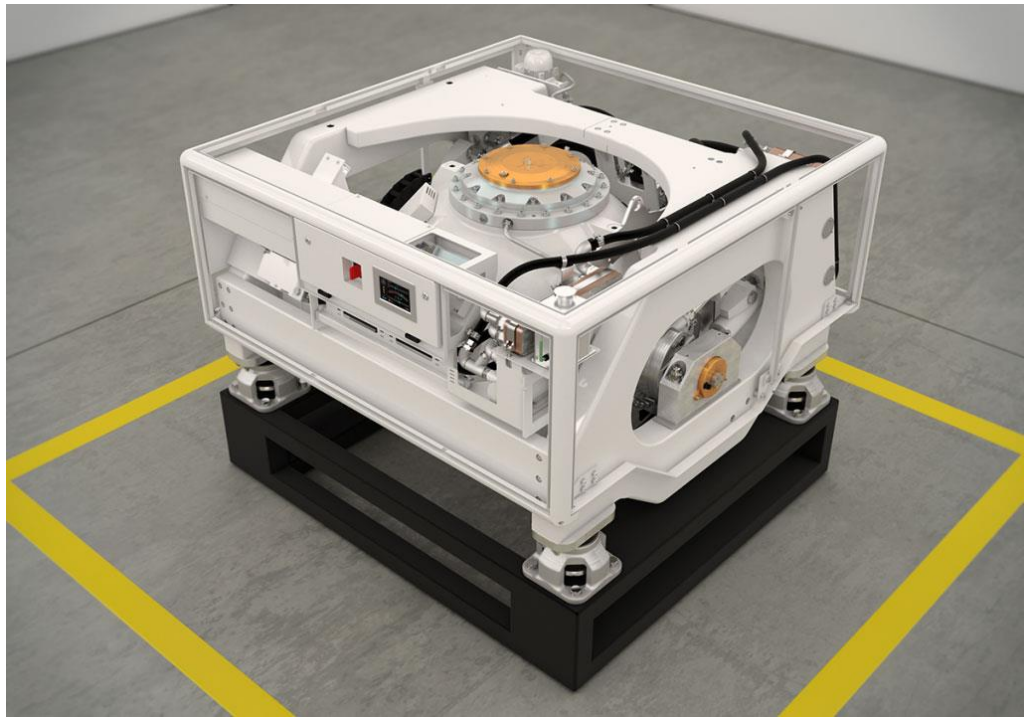
VG145SD

Application Vessel Displacement
80 – 150 tonne

Rated Stabilizing Torque	145 kN.m	**Mass**	3000kg
Angular Momentum	70 k.N.m.s	**Power**	16 ekW
Length	1.63 m (64″)	**Rated RPM**	4800
Width	1.56 m (61.4″)	**Cooling Water**	60 lpm
Height	1.15 m (45.3″)	**Noise Running**	57 dBA

VG260SD

VG260SD



Application Vessel Displacement
100 – 300 tonne

Rated Stabilizing Torque	260 kN.m	**Mass**	5650kg
Angular Momentum	100 k.N.m.s	**Power**	32 ekW
Length	2.1 m (6’ 9″)	**Rated RPM**	3000
Width	2.07 m (6’ 8″)	**Cooling Water**	120 lpm
Height	1.47 m (4’ 8″)	**Noise Running**	71 dBA

VG1000SD

VG1000SD

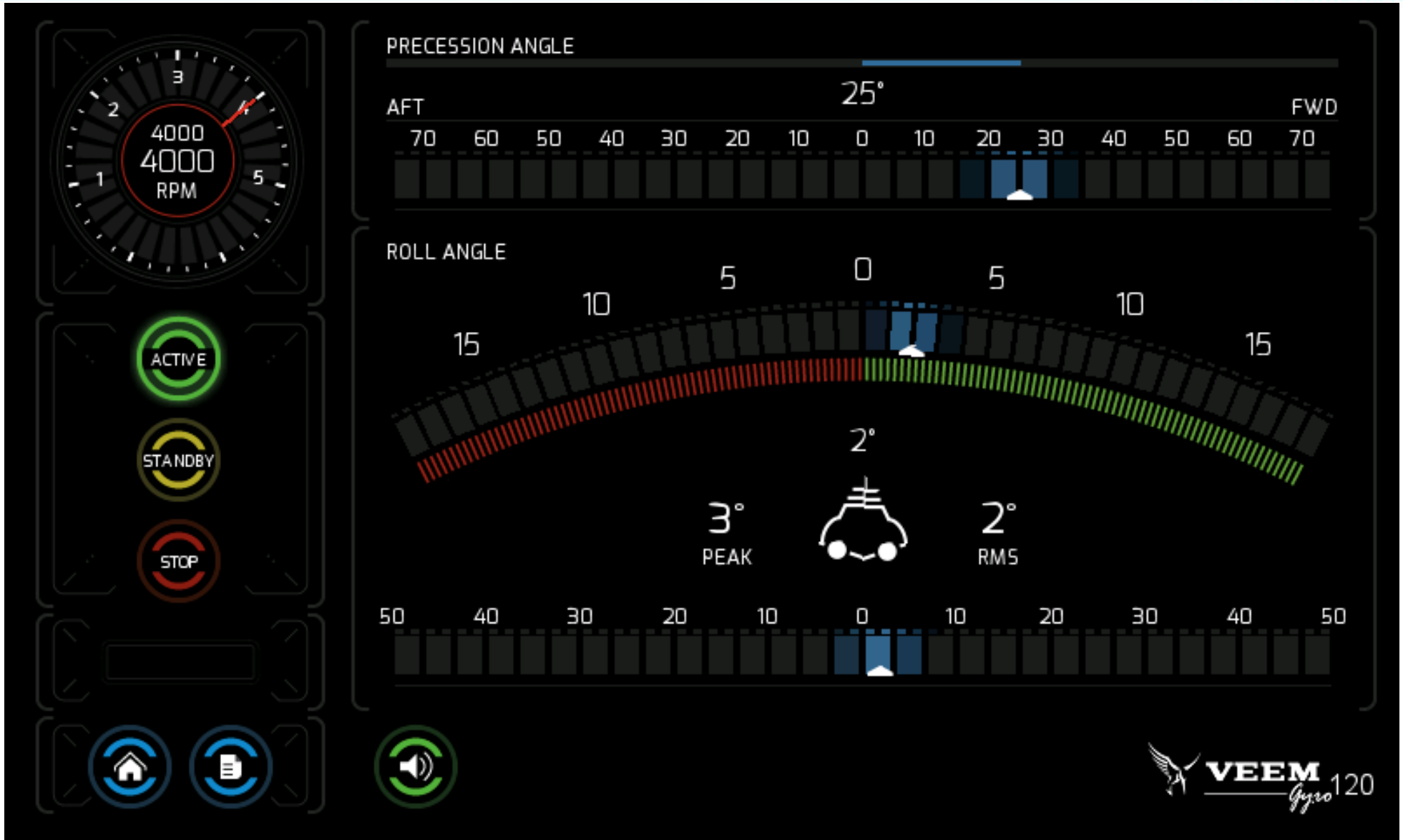
Application Vessel Displacement

300 to 900+ tonne

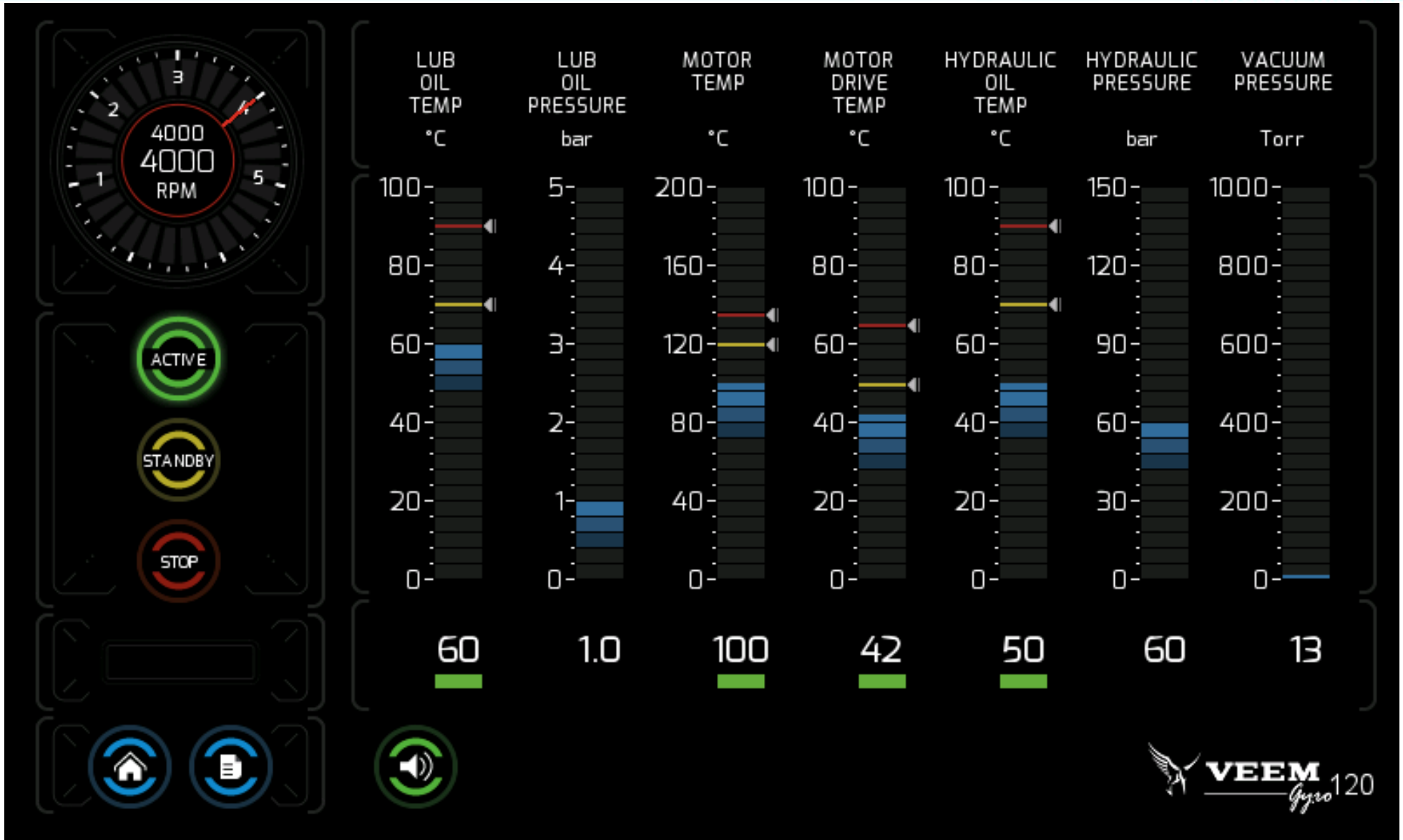
Rated Stabilizing Torque	1000 kN.m	**Mass**	20.1 tonne
Angular Momentum	520 k.N.m.s	**Power**	115 ekW
Length	3.35 m (11’)	**Rated RPM**	1940
Width	3.1 m (10’ 2″)		
Height	2.4 m (7’ 10″)	**Noise Running**	73 dBA

Touch Screen Control

Touch Screen Control



Touch Screen Control



VEEM Gyro Projects

Projects

Project Name	Customer	Description	Scope of Supply	Year
Beattie	VEEM	18m Harbour Tug	1 x VG120 Sea Trials	2015
MY Anemeli	Van Der Valk Shipyard, Holland	27m Motor Yacht	1 x VG120 At new build	2016
MY Lanakai	Yachting Developments, New Zealand	38m Motor Yacht	2 x VG120 At new build	2016
MY Tango	MY Tango	42.5m Motor Yacht	1 x VG120 Retrofit	2016
Hull 4015	Westport Yachts, USA	40m Motor Yacht	2 x VG120 At new build	2017
Hull # 120	Van Der Valk Shipyard, Holland	32m Motor Yacht	1 x VG145 At new build	2017
Powerplay	VEEM	64’ Sportfish	1 x VG120 Retrofit	2017
Hull #122	Van Der Valk Shipyard, Holland	28m Motor Yacht	1 x VG120SD At new build	2018
Spirit of Romo	Talsma Shipyard, Holland	Patrol Vessel converted to Motor Yacht	1 x VG120 Retrofit	2018

Continued over page

Projects

Project Name	Customer	Description	Scope of Supply	Year
Couach 3700	Chantier Naval Couach, France	37m Motor Yacht	1 x VG145 At new build	2018
FCS5009	Damen Ships, Holland	50m Offshore Supply Vessel	2 x VG260SD Sea Trials	2018
42m PB	Freire Shipyard, Spain	42m Patrol Vessel At new build	1 x VG260SD At new build	2018
Hull 706	Feadship De Vries, Holland	49m Motor Yacht	2 x VG145SD At new build	2018
Ovation	Jim Smith Boats, USA	100’ Sportfish	1 x VG145SD At new build	2018
MV Patriot	Braveheart Marine, Holland	25m Fast Crew Transfer Vessel	1 x VG120SD Retrofit	2018
FCS7011	Damen Ships, Holland	70m Fast Crew Transfer Vessel	1 x VG1000SD At new build	2018
116	Hargrave Yachts, USA	116’ Motor Yacht	1 x VG120SD	2018

Projects

Gyro(s): 1 x ***VG260SD***

Vessel: 42m Aluminium
Fisheries Patrol

Images Courtesy of Freire Shipyard, Spain

Projects

Gyro(s): 2 x ***VG260SD***

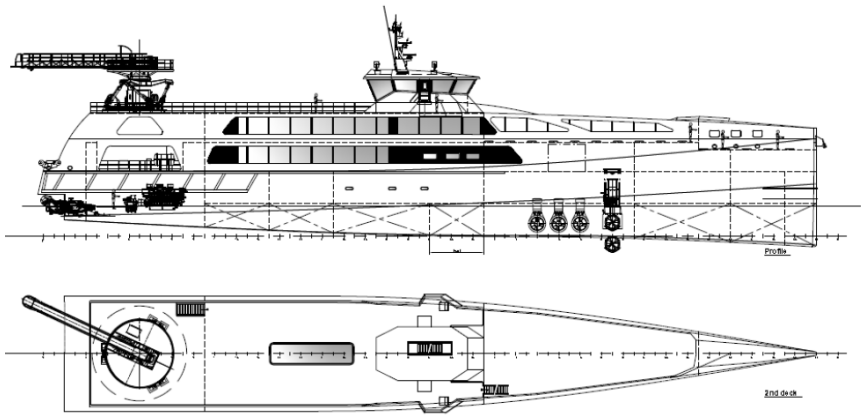
Vessel: 50m Steel
Damen Sea Axe

Images Courtesy of Damen Ships, The Netherlands

Projects

Gyro(s): 1 x ***VG1000SD***

Vessel: 70m Aluminium
Damen Sea Axe
Walk-to-Work

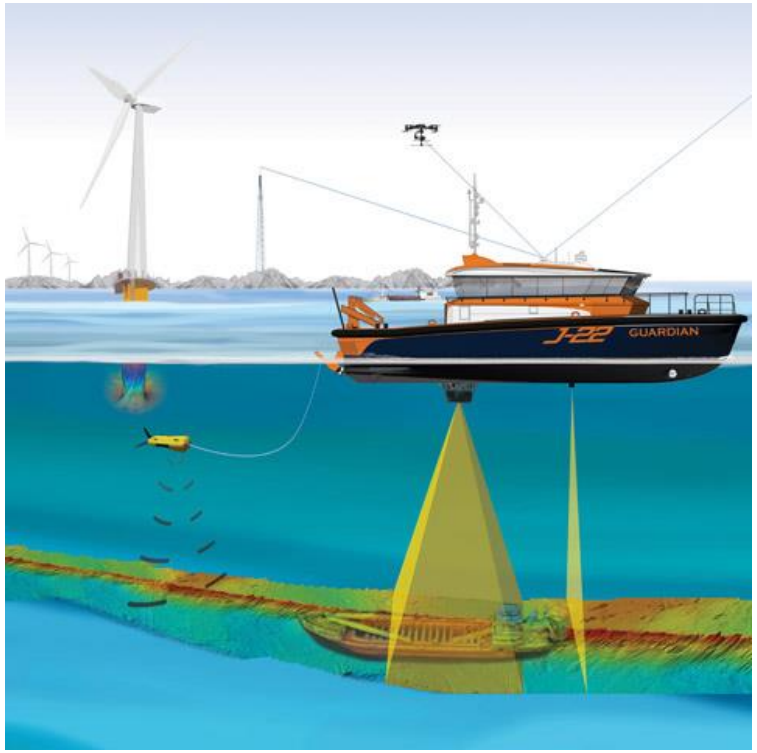


Images Courtesy of Damen Ships, The Netherlands

Projects

Gyros: 1 x ***VG120SD***

Vessel: Javelin 25.25
Multi-Purpose Vessel



Images Courtesy of Braveheart Marine, The Netherlands

Projects

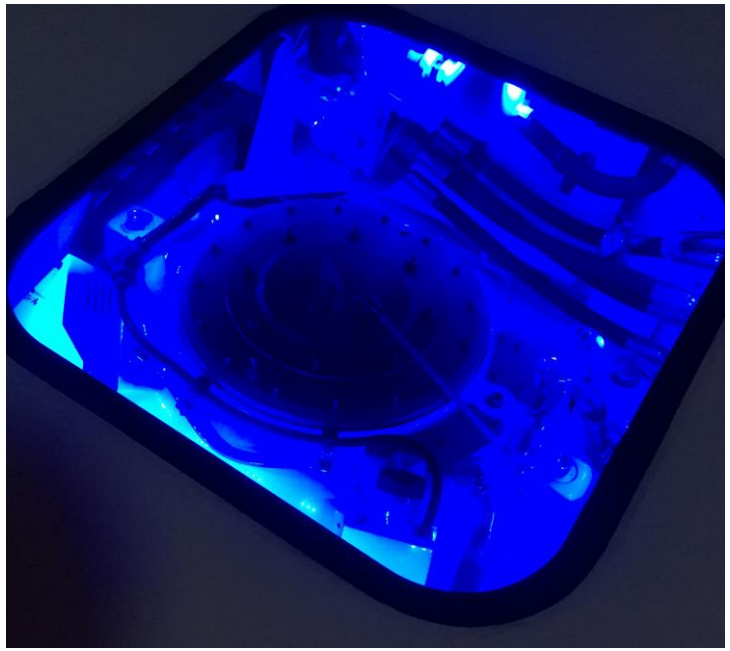
Gyro: 1 x ***VG120***

Vessel: MV Beattie
17m Steel Tug
In-house Testing

Projects

Gyro: 1 x ***VG120***

Vessel: ‘Powerplay’
VEEM Test Boat
Viking 64’



Projects

Gyro: 1 x ***VG120***

Vessel: MY Anemeli
27m Motor Yacht

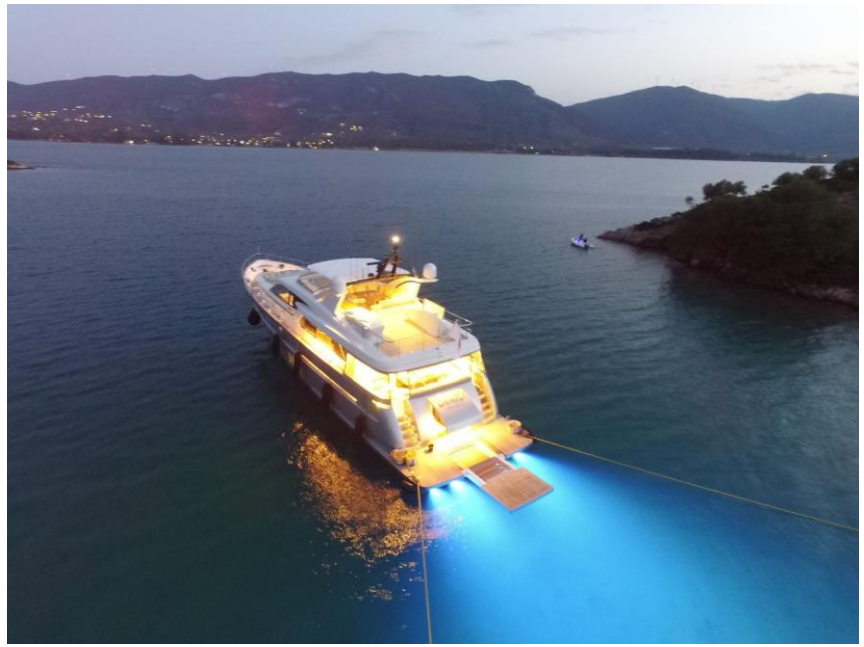


Image Courtesy of MY Anemeli

Image Courtesy of Van Der Valk Shipyard, The Netherlands

Projects

Gyro: 1 x ***VG145***

Vessel: 32m Motor Yacht
Van Der Valk
Raised Pilot House

Images Courtesy of Van Der Valk Shipyard, The Netherlands

Projects

Gyro: 1 x ***VG145***

Vessel: 28m Motor Yacht
Van Der Valk
Raised Pilot House
Explorer Yacht

Images Courtesy of Van Der Valk Shipyard, The Netherlands

Projects

Gyro(s): 1 x ***VG120***

Vessel: MY Tango
42.5m Motor Yacht

Projects

Gyro(s): 2 x ***VG120***

Vessel: 40m Westport MY

Images Courtesy of Westport Yachts, USA

Projects

Gyros: 2 x ***VG120***

Vessel: MY Lanakai
38m Sportfish

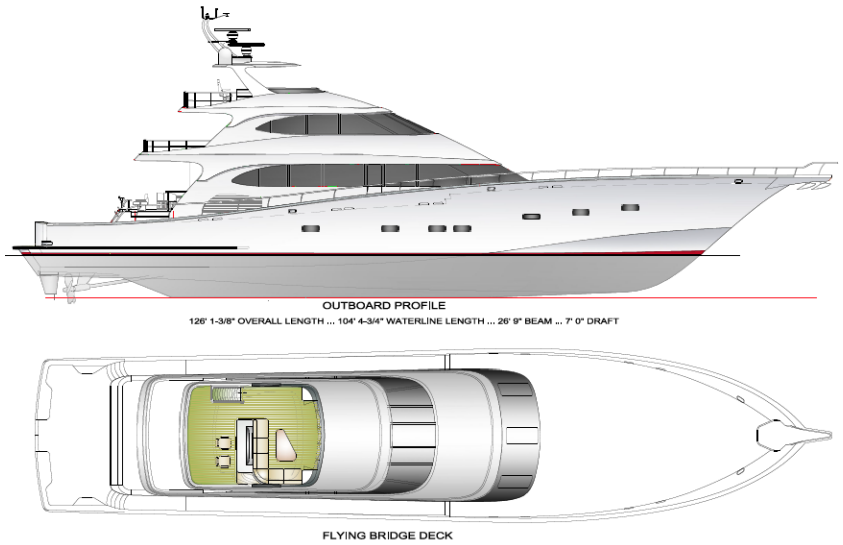


Image Courtesy of Michael Peters Yacht Design, USA

Image Courtesy of MY Lanakai

Projects

Gyros: 1 x ***VG145SD***

Vessel: Ovation
100’ Sportfish

Image Courtesy of Jim Smith Tournament Boats, USA

Projects

Gyros: 1 x ***VG145***

Vessel: Chantier Naval Couach
3700 Fly
37m Motor Yacht

Images Courtesy of Chantier Naval Couach, France

Projects

Gyros: 2 x ***VG145SD***

Vessel: Feadship De Vries
49m Fast Motor Yacht

KONINKLIJKE
DE VRIES
SCHEEPSBOUW

Projects

Gyros: 1 x ***VG120***

Vessel: Spirit of Romo
25m Patrol Vessel
Motor Yacht Conversion

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Web Links

http://www.veem.com.au/

http://veempropellers.com/

http://veemgyro.com/

http://www.veem247.com/

http://www.timcasthollowbar.com

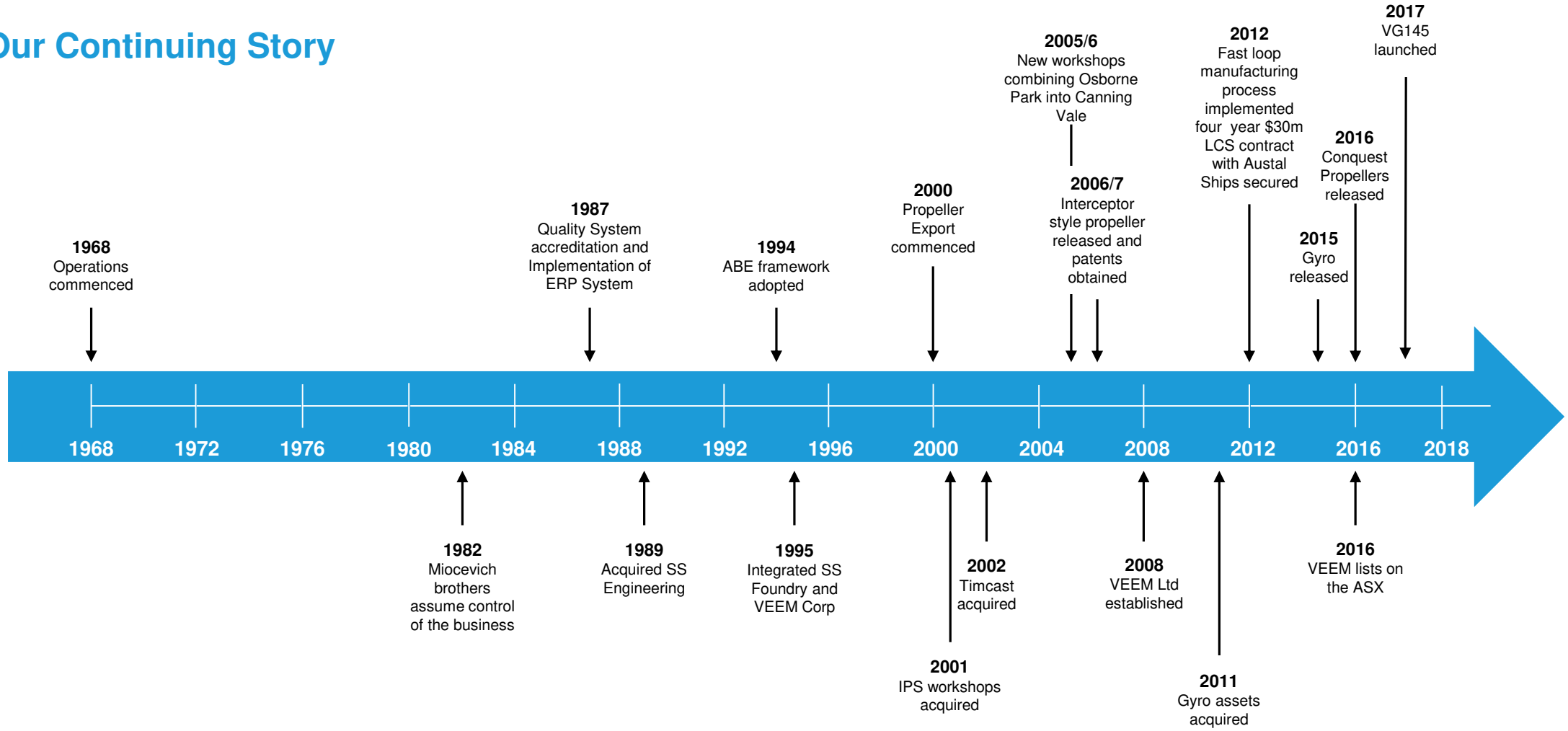
Gyro Stabilizer Videos

https://vimeo.com/veemgyro

Introduction to VEEM Ltd

VEEM's History

Our Continuing Story



About VEEM

We are a **Manufacturer of Sophisticated Marine Products**. To build on that - we have taken a two-prong approach to meet the needs of the growing local and international SuperYacht, commercial, naval and recreational sectors:

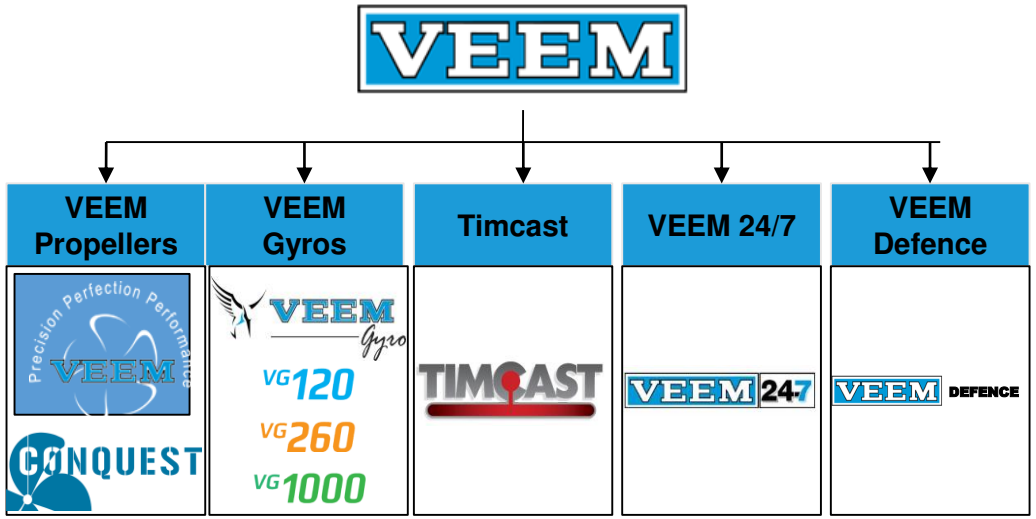
1. Meeting the needs of the marine industry supply-chain by being a reliable supplier, specifically for high compliance requirement products.
   - Generally where there are stringent standards such as Class survey, DEF-STAN, NAVSEA, NES standards.
   - Unique products – Precision and high spec castings and components requiring flexible manufacturing.
   - Over years build capacity to handle up to 25 tonne assy, cast to 16 tonne.
2. Developing sophisticated marine products which have a high technical and capital barrier to entry.

VEEM high speed propellers fitted to the Armidale Class Patrol Vessels

What and Who We are Today

Australian high technology marine equipment specialist

- VEEM is a Perth based high-technology specialist manufacturer of premium marine propulsion and gyro-stabilisation systems
- Passionate about design and engineering excellence
- An industry leader with an outstanding brand and reputation built over 50 years
- A long term investor in R&D and technology, which has created significant intellectual property and barriers to entry
- VEEM operates the world's most advanced fixed pitch propeller manufacturing facilities.
- VEEM has released a range of large, heavy duty gyro stabilizers for boats between 80 and 3000 tonnes



Facility Overview

- HQ and factory located in Perth, Western Australia
- ASX VEE
- 2 hectare site (additional site under development)
- Dedicated project management offices
- Factory area - 11,000 m^2 under roof
    - 2 additional sites for assembly and storage
    - Being relocated in Q4 in a new facility
- 50 years in business (established in Oct 1968)
- Annual sales activity approx $45M
- Staff approx 160
- ISO 9001 certified