



SUBSEA OPERATIONS | **iXblue**

SUBSEA OPERATIONS

VISION

iXblue stands as a global leader in the design and manufacturing of innovative solutions for navigation and positioning markets.

iXblue stands as a global leader in the design and manufacturing of innovative solutions for navigation and positioning markets. Using its unique technologies, the company offers its customers turnkey high-technology solutions, enabling them to address increased challenges and carry out their operations with optimum efficiency and safety.

iXblue is recognized throughout the industry for its acoustic positioning systems with unrivalled performance whether in shallow or very deep waters and its range of fiber-optic gyroscope (FOG) inertial navigation systems (INS) which has revolutionized subsea navigation in the last decade, providing unequalled performance and cost of ownership benefits.

Underpinned by 30 years of expertise, iXblue is currently achieving an annual growth of 15-20%, with 80% of its business conducted in over 30 countries worldwide. The company can count on full value-chain expertise: all of its systems are produced internally, from design to manufacturing. Its success is especially informed by its specific know-how which pervades all critical activities from its engineering of offices to its production workshops.

Combining mastery of technology and agility to solve our customers' issues

At iXblue, we strongly believe that mastering technology is key to finding the answers to unsolved questions. We believe it is our responsibility to provide our customers with clear solutions. To that end, we are capable of pushing technology beyond the existing limits. Mastering technology also means being agile: in a complex and changing environment, iXblue is convinced that flexibility allows us to find the solutions that best fit our customers' needs.

Making technology accessible & adapting it to individual customer needs.

It is our responsibility not only to push technology forward but also to make it accessible to our customers. In addition to adapting it to their very specific needs we must make it easy to use, and easy to master. That is why we strive to make our solutions:

- Tailored to customers' specific needs
- Easy to integrate and deploy
- Compatible with third-party sensors
- Easy to use
- Reliable
- Cost-efficient

People at the heart of the company

Built on values of shared trust and empowerment of the employees, iXblue promotes the self-fulfillment of the employees as a means to reach collective goals.

The company also supports personal realization through work; it encourages and helps the development and progress of all.

Trusting iXblue experts to implement tomorrow's solutions

iXblue has always been an avant-garde high-technology company: it is in our DNA. By working with our experts, you choose to rely on our unique expertise and be visionary. You implement today's innovative solutions which will become tomorrow's standards. You embrace technological breakthrough. The trust you place in iXblue allows us to always go further and push technology beyond its limits.

AN INTEGRATED APPROACH TO SUBSEA NAVIGATION AND POSITIONING

With the widest range of INS on the market, unique USBL performance for shallow and deep-water operations as well as a new range of systems for LBL and sparse LBL, iXblue solutions are covering the full range of operations below the sea surface. Used alone or in combination with each other's, iXblue technologies provide solutions to every challenge. All integrated in a unified software architecture, iXblue solutions are easy to use and can be combined easily with third party equipments.

Since its creation iXblue has always put forward a different approach to subsea navigation and positioning, combining innovative concepts, proprietary technologies and solutions that aim to

make its products easier to implement and use, more performing and to allow substantial savings.

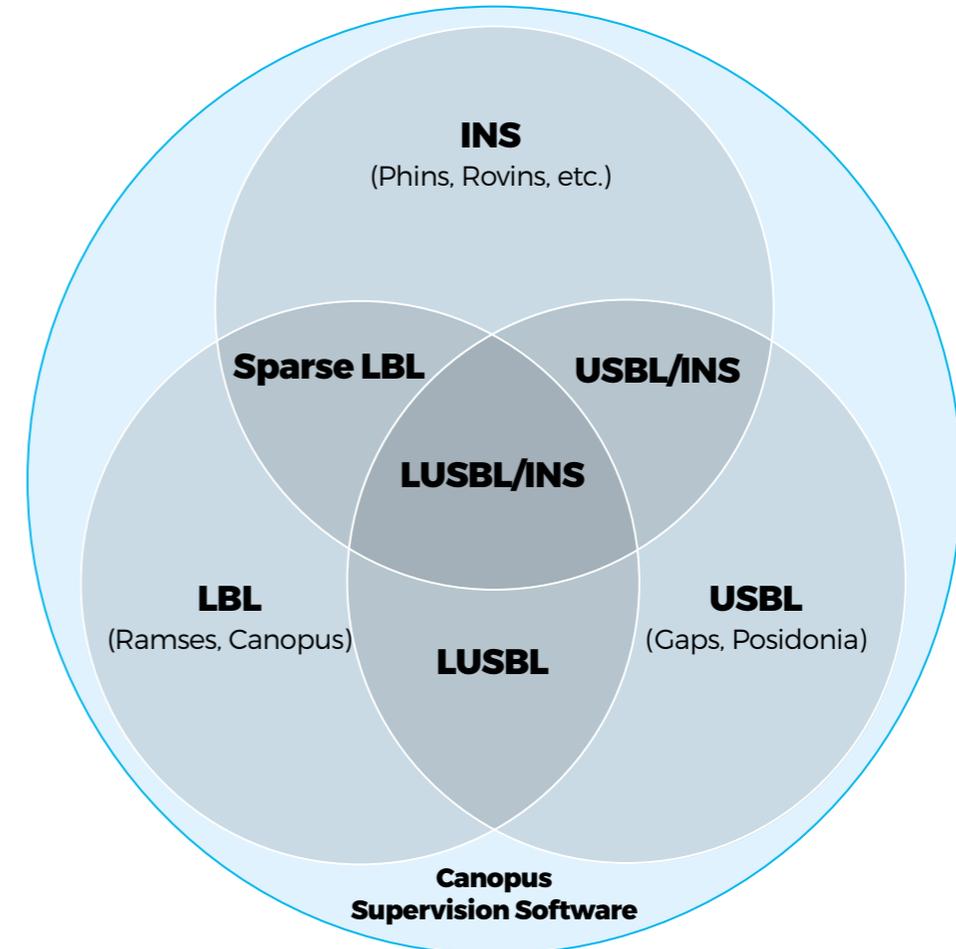
Take for example Gaps, the first USBL to incorporate an INS, Ramses and its unique sparse array/SLAM capabilities, Phins the first subsea INS based on fiber-optic gyroscopes as well as the whole range of iXblue inertial navigation systems.

To provide a more global answer to the requirements of subsea operations, iXblue is now adding Canopus. A full featured intelligent seabed transponder complimented by a unified integrated software approach. Together with iXblue range of INS, the next generation of Ramses and added features for Gaps,

Canopus provides solutions to control and improve positioning and navigation for all subsea operations.

iXblue systems are open systems, meaning the full interfacing documents and protocol libraries are available to all our customers. We actively encourage third party integration and strive to add interoperability to our systems.

Whether for work class ROVs, AUVs, tow fishes, metrology, construction or survey jobs, one or multiple vehicles at a time, iXblue global solutions allow you to save time, avoid errors and improve accuracy over all your operations.



AUTONOMOUS SOLUTION FOR HARSH ENVIRONMENT OPERATIONS

As the Unmanned Surface Vehicles sector is growing rapidly, iXblue launched a new multi-purpose autonomous surface craft. The goal is to provide a cost-efficient solution for our customers in the energy sector, not only by offering affordable platforms to a very costly and specialized array of assets, but also by expanding the working domains.

With proven offshore navigation capabilities, and a top speed unique in its category for fast mission reallocation, DriX takes the USV role in the energy industry several steps further.

In a nutshell

DriX reduces HSE hazard by reducing personnel in the field.

Fitted with USBL (Gaps or Posidonia) or LBL (Ramses) in a gondola, DriX suppresses the need for auxiliary ships for specific positioning applications resulting in huge cost savings.

DriX sails in line of sight (LOS) of a mother ship, according to international regulation. A mother ship (specialized vessel or not) can deploy several DriX at the same time, each working independently in different locations.

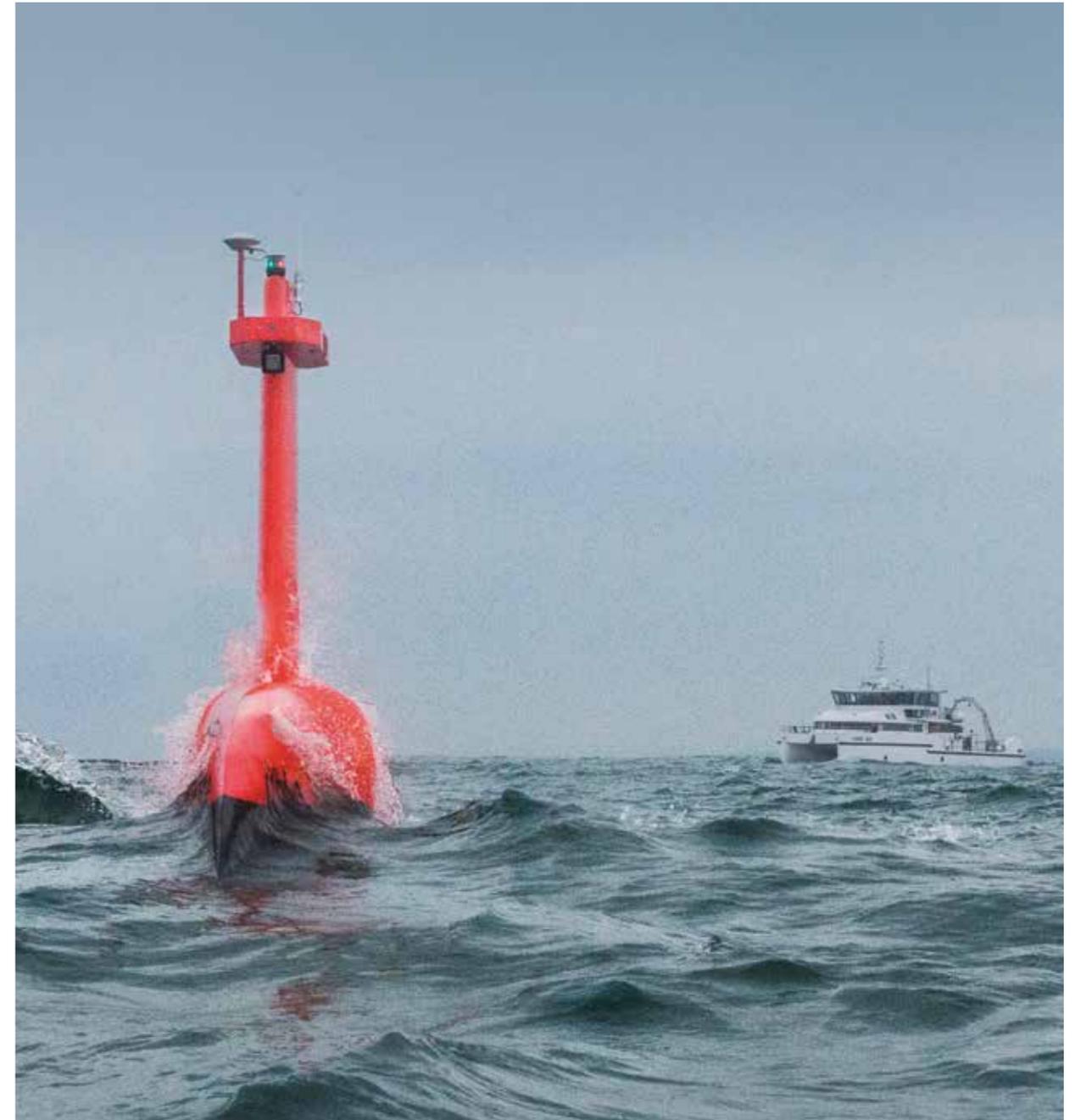
DriX is safe, reliable, fast, durable and ready for any demanding application in the challenging Energy environment.

Foreseen energy applications

DriX has already garnered strong interest from major companies in the market since its commercial launch in November 2017.

There is substantial interest for pre-site installation and Box-in with USBL or LBL, touchdown monitoring with USBL, AUV tracking and control command, inspection, METOCEAN and decommissioning.

Because of its third-party friendly open architecture, DriX is also ready for several other applications.



SHARING KNOWLEDGE THROUGH TRAINING AND SERVICES

Based at our Aberdeen facility, the Energy Circle Training and Service group offers our customers the opportunity to augment their existing knowledge with the experience of our in house survey and product specialists. Assistance implementing iXblue technology on your project is delivered by a dedicated team of experienced personnel who combine training duties with time spent offshore on your operations ensuring the training they deliver and the support they provide is always up to date.

Training

With a regular and developing program of training courses available throughout the year, we are able to offer:

- Gyro Workshops

- Inertial Workshops
- Canopus Workshops
- Acoustic release maintainance
- Inertial Theory and Operation
- Ramses Theory and Operation
- Gaps Theory and Operation
- Canopus Software Operator
- Canopus Software Planner
- Canopus Software Processor
- Delph INS
- Delph for Engineers
- Delph for Geophysicists
- DriX maintenance
- DriX Pilot

Services

With a team of experienced offshore surveyors, we are able to assist at every stage of your project.

While iXblue operation software includes

modules for array planning, iXblue understands you may need assistance before a commitment to use a specific system has been made. Our team of surveyors are able to provide an analysis of your positioning requirements and advice on how the iXblue range of products and systems could be utilized to allow you to meet your project specifications in the most cost effective way.

- Project Consulting - Positioning requirements analysis and equipment selection
- Project Planning - Detailed equipment requirements and acoustics layout
- Project execution - On board assistance mobilizing, setting to work, and operating iXblue systems and products

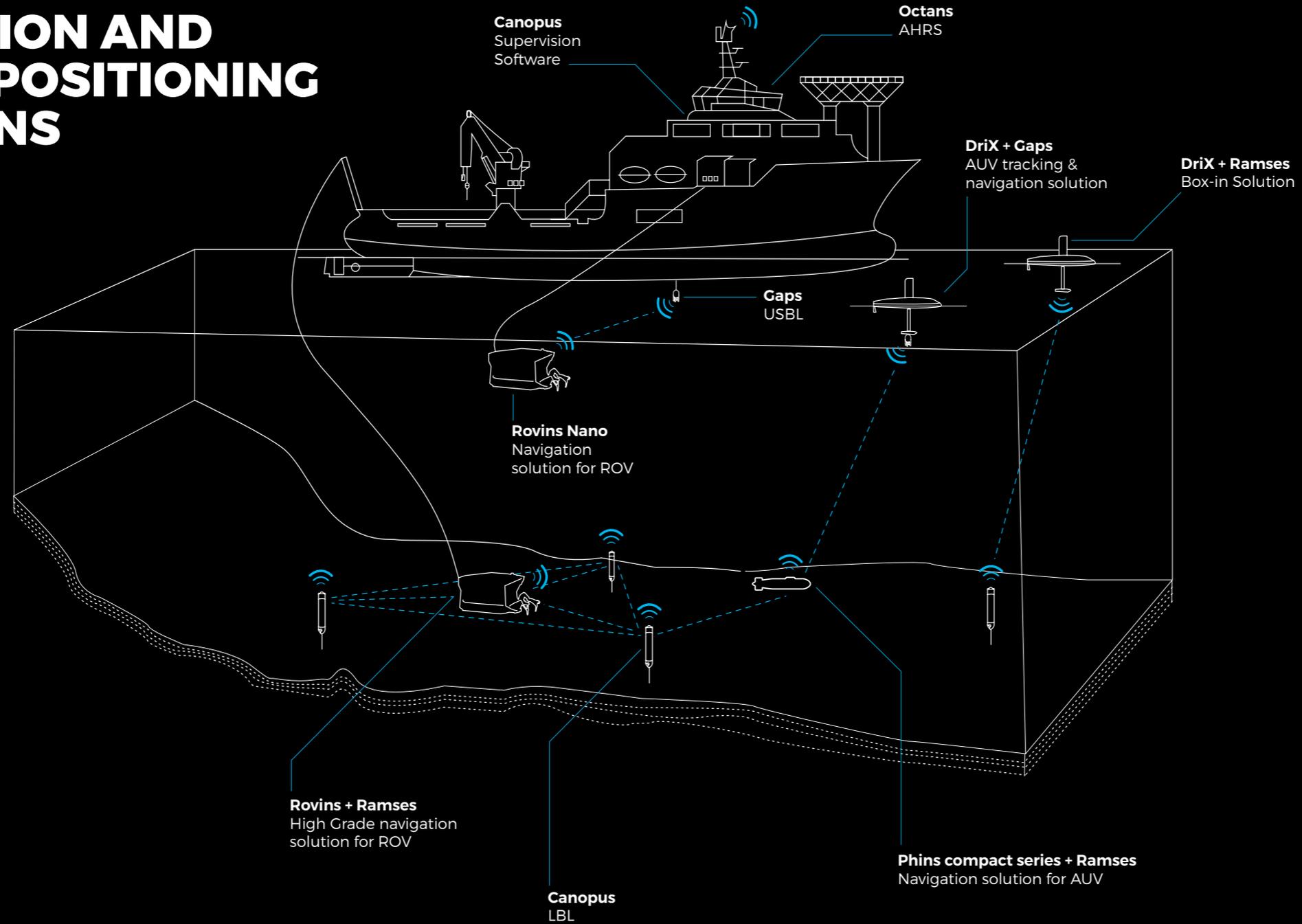
- On board training of eld staff
- Data Processing - Specialist data processing

24/7 Support

At iXblue we care about your peace of mind and we stand behind our products and systems. Our highly trained support teams offer 24/7 assistance and provide you with top quality service, helping you meet your day-to-day objectives.



NAVIGATION AND SUBSEA POSITIONING SOLUTIONS



SOLUTIONS

challenges and solutions

Navigation and positioning information is a significant reference to the performance of the increasingly sophisticated sensors. Efficient, accurate and reliable navigation and positioning, in all environmental and operational conditions, is a key requirement for modern offshore operations. Protracted MTBF and service life, scalability and flexibility, interchangeability and life-cycle cost reductions through commonalities, low maintenance and obsolescence management are prevailing criteria applicable for satisfying customer's life of field operations.

Cutting edge technology:

iXblue systems leverage cutting edge technologies for efficiency and consistency of operation. Critical system components are all designed, developed and manufactured in-house as a result of intensive internal investment in R&D and manufacturing. Components are individually implemented once their technological maturity is fully demonstrated through intensive testing and trials. Leading-edge hardware and software, COTS and ruggedized.

Strong track record:

Hundreds of subsea vehicles operate all over the world with iXblue navigation and acoustic positioning technologies onboard. iXblue products have gained notoriety of being industry standards in their fields. They are recognized for their reliability, their capability to provide exquisite performance and their suitability for a wide range of operations.

Performance:

iXblue systems performance is the culmination of years of high level R&D investment. We aim at designing systems that meet not only one paramount performance but the whole set of critical and desirable requirements that make the systems perfectly suited to the most demanding usage. We refuse technological compromises and strongly believe that the most capable systems result from innovation and excellence. High Reliability and Availability is iXblue's mantra. The unrivaled MTBF of iXblue's FOG technology, far over 500,000 hours, has set the pace. Reliability, together with a minimal level of preventive maintenance, are key principles that govern iXblue technical choices in systems design. In addition, iXblue offers a 24/7 technical support service worldwide to guarantee the highest level of system operability for its customers.

Commonality, Scalability, Versatility:

iXblue offers scalable solutions for each type of platform to meet the most specific operational requirements. Within each family range, iXblue systems share strong commonalities with regards to hardware, software, and interfaces. This results in significant savings at fleet level in terms of integration, installation, configuration management, logistics, training and maintenance costs.

Open architecture:

iXblue systems collect and integrate internal and ancillary sensor data which makes it possible to get the best performance and features by combining several sensors together (inertial, acoustic positioning, depth sensor, Doppler, etc.). Furthermore, the implementation of open architectures, large protocol libraries and modular software make iXblue systems very versatile for interfacing to all types of external systems.

Ease of use:

At iXblue, we know that the man-machine interface is a predominant factor in ensuring best use and the resulting performance of any system. We design the most intuitive and clear interfaces to facilitate system installation, integration and operation and ultimately in order to make the most of the system's capabilities. User-friendly display layouts are standardized on all products for optimization purpose.

SUBSEA INERTIAL NAVIGATION

The industry reference in subsea inertial navigation

Based on Fiber-Optical Gyroscope technology mastered by iXblue over 30 years, iXblue offers a complete range of high-grade, attitude and heading reference systems (AHRS) and Inertial Navigation Systems (INS). A FOG is a genuine strapdown solid-

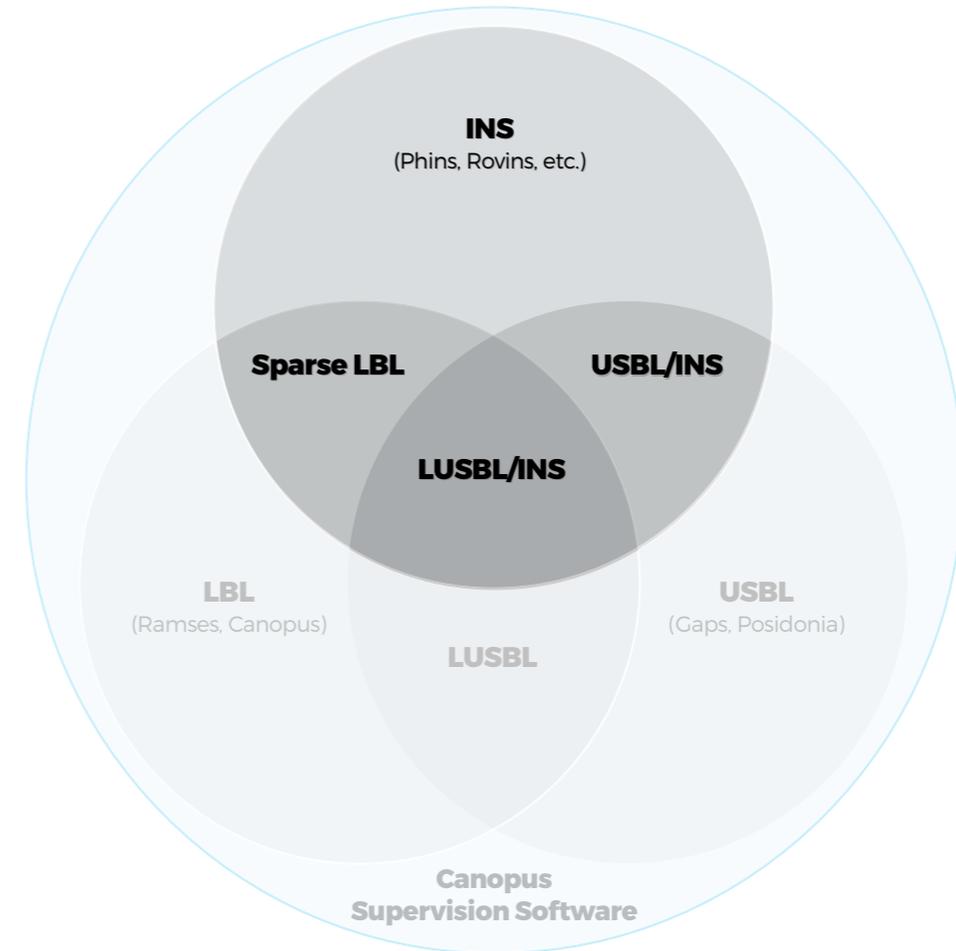
state gyroscope exempt from all the physical drawbacks that may affect other existing technologies. This results in unrivalled longevity and reliability as well as very low power consumption and silent operation.

A full and comprehensive range of products

Our technological advantage in this domain allows us to develop a complete range of products from navigation to survey grade. For a specific need, our customers always finds the right product. With 20 years of experience in subsea offshore navigation, iXblue is an active player on the market, with 80% of the market share.

For post-processing, iXblue provides Delph INS software for our Subsea product range.

We can also deliver our INS subsea with the customers choice of DVL in this instance our INS are pre-calibrated in-house with the DVL.



Navigation Grade solutions



Octans Nano

SMALLEST AND MOST ADEPT STATE-OF-THE-ART 4 000 M DEPTH RATED AHRS

Octans Nano is the smallest and most adept state-of-the-art 4 000 m depth rated attitude and heading reference system (AHRS). It is built on iXblue's renowned fiber-optic gyroscope (FOG) technology and offshore instrumentation expertise. Octans Nano offers an outstanding price/performance solution, with rugged titanium housing, meeting the most challenging requirements of subsea applications.



Rovins Nano

COMPACT AND COST-EFFECTIVE INS FOR ROV NAVIGATION

Rovins Nano merges the established high-grade iXblue inertial navigation system with our competitive IMU. It is built on iXblue's renowned FOG truly solid state technology and offshore instrumentation expertise. Rovins Nano offers the unbeatable stability and accuracy of the inertial position while simplifying the operation with its automatic and autonomous external sensor management. Rovins Nano is the ROV navigation solution you can rely on, bringing an additional level of safety in case of deficient aiding sensors.

Survey Grade and very deep water solutions



Octans Subsea

SURVEY GRADE GYROCOMPASS

Octans Subsea is a subsea survey-grade gyrocompass and complete motion sensor for water depths up to 3,000 m. Based on iXblue's fiber-optic gyroscope (FOG) technology it outputs heading, roll, pitch, heave, rate of turn and acceleration. Octans Subsea can be easily upgraded to full INS mode.



Rovins

SURVEY GRADE SUBSEA INS

Rovins is a survey-grade full featured inertial navigation system for water depths up to 3 000 m. Designed specifically for offshore survey and construction works, Rovins, thanks to its advanced Kalman filter, improves the efficiency of all operations where accurate position, heading and attitude are key benefits. Rovins is offered in stand alone or «DVL ready».



Phins Subsea

EXTREME PERFORMANCE AND DEEP WATER INS

Phins Subsea is a subsea inertial navigation system (INS) providing position, true heading, attitude, speed, depth, and heave for deep water operations. Its high-accuracy inertial measurement unit is coupled with an embedded digital signal processor that runs an advanced Kalman filter. The optional Phins DVL Ready is a Phins pre-assembled and pre-calibrated with a Doppler velocity log making the system easy to install and ready to use for more precise navigation.

The industry reference in subsea inertial navigation

- Best available performance on the market
- High reliability
- Maintenance free
- Plug and play interfaces to iXblue USBL and LBL systems as well to third-party systems



Octans Nano



Octans Subsea



Rovins Nano



Rovins



Phins subsea

	Octans Nano	Octans Subsea	Rovins Nano	Rovins	Phins subsea
TYPE	AHRS	AHRS	INS	INS	INS
HEADING ACCURACY	0,5 deg secant latitude	0,1 deg secant latitude	0,15 deg secant latitude (with USBL and/or DVL)	0,05 deg secant latitude (with USBL and/or DVL)	0,01 deg secant latitude (with USBL and/or DVL)
ROLL AND PITCH	0,1 deg RMS	0,01 deg RMS	0,05 deg RMS	0,01 deg RMS	0,01 deg RMS
HEAVE	N/A	2,5 % RMS	N/A	2,5 % RMS	2,5 % RMS
OPTIONAL AIDING SENSOR	N/A	N/A	USBL, LBL, DVL, GPS, Sparse Array (with Ramses)		
POSITION WITH DVL (DOPPLER VELOCITY LOG) CEP50	N/A	N/A	0,3 % traveled distance	0,2 % traveled distance	0,1 % traveled distance
WEIGHT (AIR/WATER) IN KG	10/6	15/6,2	10/6	15/6,2	23/13
DEPTH RATING	4 000 m	3 000 m	4 000 m	3 000 m	6 000 m

LBL AND SPARSE LBL POSITIONING

When you need LBL without the expenses

Highly precise and reliable, standard Long Baseline (LBL) systems offer a truly independent positioning source to aid and QC inertial navigation. However, deployment and maintenance costs remain huge as ranges to four or more transponders must be measured to produce a single position. With the use of INS in subsea vehicles becoming common, sparse-LBL navigation has become possible, achieving similar or better performance using less transponders, simply by fixing potential INS drift using the measured ranges to

seabed transponders while at the same time filtering acoustic ranges using INS data. Thanks to its fully embedded architecture, Ramses delivers the best possible acoustic aiding data to the INS, with perfect time-stamping and extremely reduced latency. This optimum data fusion brings amazing robustness to the positioning, easily allowing 90% savings on transponder batteries and ultimately allowing perfect navigation with one single transponder deployed. This is the iXblue Acoustic Synthetic Base Line concept (ASBL).

Using Ramses, both LBL and sparse-LBL features are natively offered to the operator depending on the number of available transponders:

- With 1+ transponder, sparse-LBL position is obtained from the fusion of acoustic ranges with navigation equations from the INS
- With 4+ transponders, embedded LBL algorithms provide high performing 100% acoustic navigation and efficient environmental QC

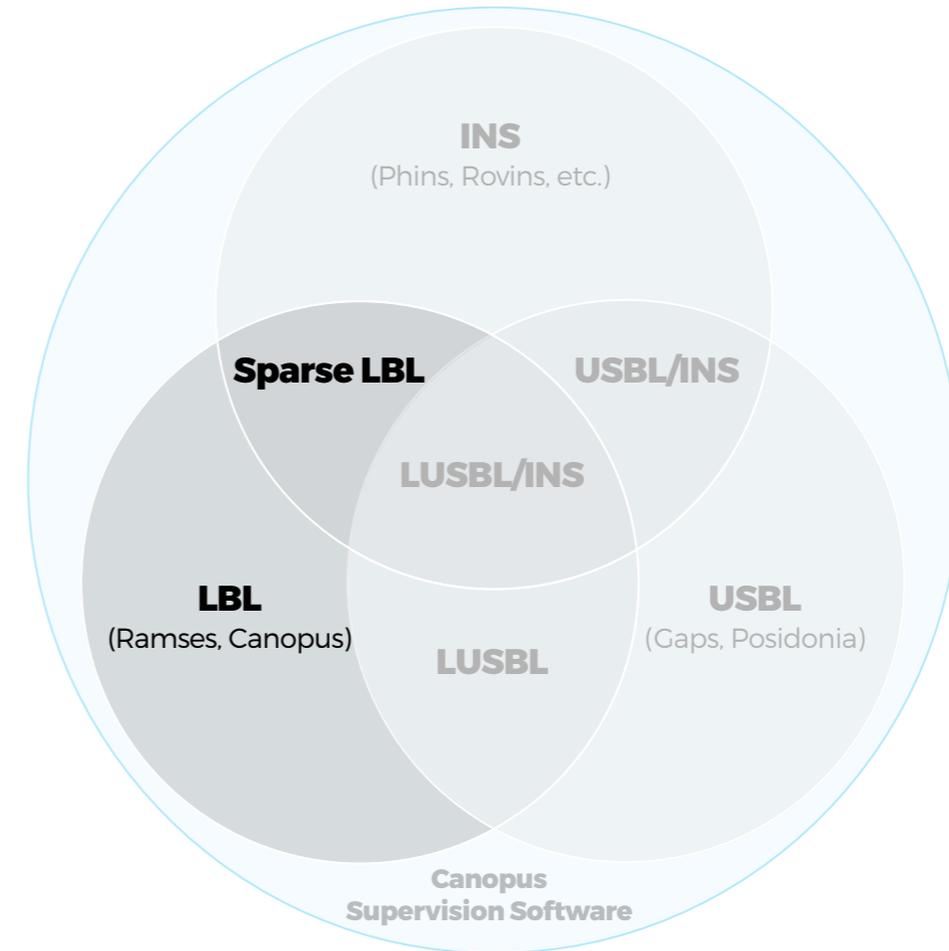
A revolutionary transponder at the heart of an integrated subsea positioning solution

In 2018 iXblue launched Canopus, a new generation of intelligent subsea device, combining the capabilities of a typical LBL transponder with communication capability of a high-speed modem and the intelligence to perform one way positioning, mesh communications, and autonomous logging, all in the standard device. During the configuration phases in factory or on deck, WiFi link allows the simultaneous setting of several

transponders, through a user friendly topside software, saving time by avoiding the need of physical and individual connection to each transponder.

Coupling Ramses, Canopus and a subsea INS, iXblue provides an integrated subsea positioning system allowing for precise subsea localization while maintaining a flexibility never seen before. Fusing the high update rate and smooth

track characteristics of INS with the precision of a seabed deployed acoustic array this complete solution can scale from a single observation vehicle operating in a limited area with only one reference transponder to full field operations with multiple vessels and vehicles all being managed remotely using Canopus topside software. Both Ramses and Canopus can communicate with third-party equipment.





Ramses

LBL AND SPARSE LBL INTELLIGENT TRANSCEIVER

Ramses is a flexible acoustic transceiver with self-contained computing, designed to perform full LBL or sparse LBL navigation capabilities to any type of underwater vehicle (ROVs, AUVs...). Tightly coupled with an inertial navigation system from iXblue, Ramses delivers extreme precision and robustness in challenging acoustic operational environments, even with a greatly reduced number of transponders compared to other LBL systems.

Thanks to increased compatibility and acoustic communication capabilities, Ramses is more versatile than ever, usable either as a stand-alone product to locate a vehicle or as a transceiver & positioning system in the global iXblue subsea positioning solution.

Being a key part of the iXblue subsea positioning offer, Ramses is distributed in two versions:

- A medium Frequency (MF) version, compatible with Gaps USBL as well as other USBL systems from the market. Suitable for most positioning applications
- A low Frequency (LF) version, for ultra-long-range applications. This LF version is fully compatible with Posidonia USBL.

With high-end environmental sensors, internal Li-ion batteries and other functions now integrated to Ramses pod, Ramses offers much more capabilities. The INS can use the depth and sound velocity sensors from the Ramses as well as making use of the acoustic modem, data logger and power backup.

For further enhanced capabilities, Ramses also smoothly integrates with the Canopus software, tightly coupling with other iXblue products to form an integral part of a comprehensive subsea positioning system offering:

- Smooth integration for ROV and AUVs.
- LBL navigation accuracy, with reduced arrays and superior precision.
- Flexible array deployment thanks to SLAM.
- High speed Acoustic communications.

	Ramses (MF)	Ramses (LF)
ACCURACY	< 5 cm	< 5 cm
OPERATING FREQUENCY	18-36 kHz	8-17.5 kHz
ANTENNA APERTURE	Omnidirectional	Omnidirectional
DATA TELEMETRY	yes	no
DATA LOGGING	4 Gb	no
CONSTRUCTION	Aluminum	Titanium
SIZE (ODxL) IN MM	180x730	126x505
ENVIRONMENTAL SENSORS	yes	no
INTERNAL BATTERY	yes	no
WEIGHT (AIR/WATER) IN KG	16/6	11/5
WATER DEPTH	4,000 m	6,000 m
COMPATIBILITY	Gaps, Canopus, iXblue INS, third-party acoustic systems	
OPTIONS	OEM version	OEM version



Canopus

LBL AND SPARSE LBL INTELLIGENT TRANSPONDER

Canopus is the new intelligent seabed transponder providing the most advanced LBL capabilities to iXblue positioning and navigation solutions.

Every Canopus transponder embeds environmental sensors for temperature and depth measurement and can be enhanced with a range of options for specific needs (high accuracy depth sensor, sound velocity sensor). A data logging feature allows the recording of internal or external sensors on the internal 4Gb memory. For more flexibility, each transponder can be connected to an external device through USB or serial interface.

It provides extremely accurate range measurement (better than 1 cm accuracy) as well as high speed modem and acoustic telemetry interlaced with positioning (500bits/s per burst) allowing automatic calibration of subsea networks, on the fly control/command and data transmission.

Used either in sparse array mode, with Ramses and iXblue INS, or in full LBL mode depending on the requirements of the operation area, Canopus provides the highest positioning accuracy with the added advantage of reducing the number of transponders required.

With very low power consumption and up to

1,000,000 pings capacity at maximum sound level, it has an autonomy of several weeks or even months. The autonomy in listening mode is 2 years.

Thanks to its hundreds of acoustic codes for interrogation and reply (MFSK and QPSK), Canopus can be used on the most complex fields with the guarantee to avoid any acoustic interferences.

Canopus has been designed from the start with user in minds which means compatibility with industry standard accessories, easy to use software and unique WiFi remote configuration capability to ease preparation of jobs with large numbers of transponders.

Canopus transponder

ACCURACY	<1 cm
OPERATING FREQUENCY	20-30 kHz
AUTONOMY (PING AT MAXIMUM SOUND LEVEL)	1,000,000
AUTONOMY (LISTENING)	2 years
DATA TELEMETRY	yes
DATA LOGGING	4 Gb
CONSTRUCTION	Aluminum
LOAD CHARACTERISTICS (SWL/RL) IN KG	250/250
WEIGHT (AIR/WATER) IN KG	28/16
SIZE (ODxL) IN MM	180x1060
WATER DEPTH	4,000 m
COMPATIBILITY	Gaps, Ramses, iXblue INS, third-party systems
OPTIONS	SV Sensors, Paroscientific™ Depth Sensors

USBL POSITIONING

From shallow water to greater depths USBL systems

With Gaps and Posidonia iXblue delivers a complete USBL offer with extensive track record of successful use from very shallow water (15 m) to greater depths (10 000 m). By combining acoustic and inertial technologies fully owned and mastered by the company, Gaps offers a unique portable and pre-calibrated USBL

solution easily transferable from one vessel to the other. Following iXblue philosophy, Gaps and Posidonia are based on an open architecture with serial and Ethernet connectivity and Web control command. All our USBL are compatible with third-party equipment.

Acoustic data communication

Control/Command your AUV

Gaps enables simultaneous tracking and acoustic coms without the need to install a dedicated modem transducer on the AUV or on the surface vessel. You can now track, send commands and receive AUV status, all with the same equipment.

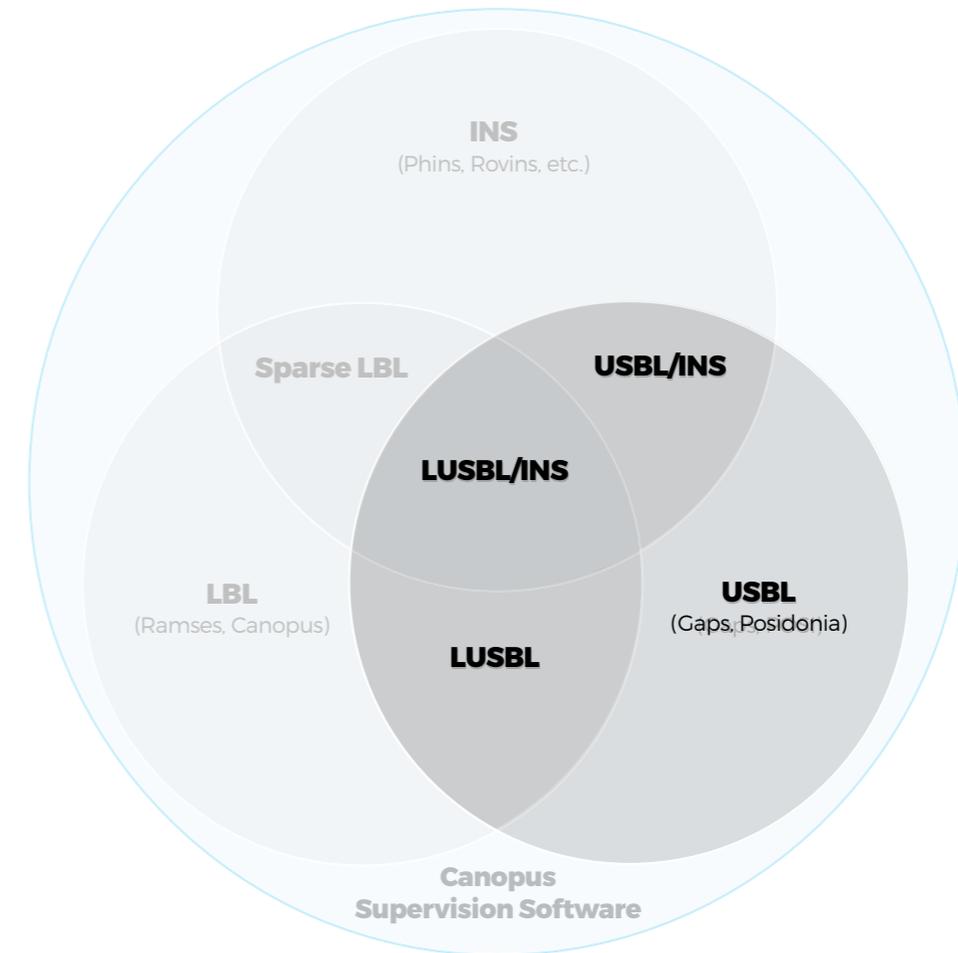
Position telemetry

For AUV tracking or AUV based INS DVL calibration and ROV applications, Gaps enables a position to be sent acoustically to a subsea INS:

- Gaps estimates the position of the beacon (USBL)
- Gaps sends its position to the beacon
- The beacon broadcasts the position to the subsea INS

Collect data from any subsea sensor

Any sensor can be interfaced to a subsea beacon. The beacon broadcasts the measurements to the Gaps through the acoustic channel. Gaps outputs the information on serial or Ethernet communication port.





Gaps

MF USBL

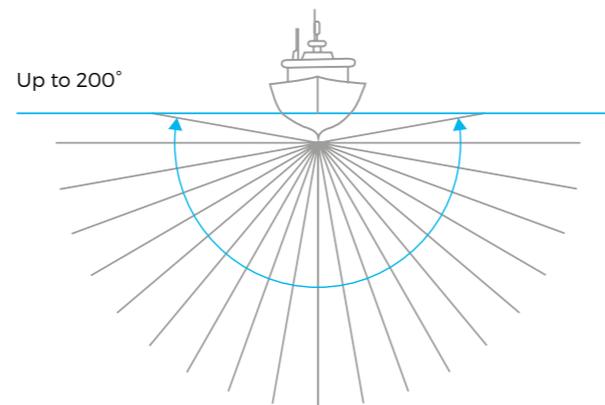
Gaps takes advantage of the unique expertise in both acoustic positioning and inertial navigation that iXblue has built up over the years. Gaps fuses the unique acoustic elements with cutting edge inertial navigation resulting in an extremely flexible system for any marine applications operating in the medium frequency band.

Gaps is an all-in-one system which provides absolute georeferenced positioning of any subsea vehicle or object. Our USBL offers a very accurate heading and attitude for the surface vessel along with the highest accuracy and unrivalled performance in shallow or extreme shallow water depth with omnidirectional beams.

Gaps is a all-in-one calibration free and portable system with

a light weight and reduced size which does not require any complicated installation and permit to be operate in harsh and noisy conditions. It features very high performance thanks to data fusion of acoustic, inertial and GPS technologies and finally, has no limit in terms of operational area from shallow and deep water, horizontal and vertical channel, short or long range.

A wide range of transponders are available for Gaps for all kind of operations, including compatibility with some other manufacturers beacons. Its latest firmware release includes data telemetry functionality which enables Gaps to communicate via wireless communication with other iXblue products including Canopus transponders.



Posidonia

LF USBL

Posidonia is the long range / high accuracy USBL system designed to track subsea vehicles down to 6,000 m water depth and at ranges more than 10,000 m (depending on noise/ environment conditions). Based on USBL technology with advanced acoustic modulation and digital signal processing technology, Posidonia operates in the low frequency band.

Since its first release, Posidonia has been installed on numerous vessels throughout the world for long range tracking operations (deep tow, deep sea vehicles) and is a market proven solution available today. Depending on the mode of installation and application Posidonia is available with

a flush USBL antenna designed for permanent installation under a ship, or a deployable antenna for vessel of opportunity or installation through the hull on an iXblue HISYS deployment machine. A range of low frequency transponders is available for all kinds of subsea vehicles, from reduced size for small vehicles to full size / battery operated releasable seabed transponders.



Gaps



**Posidonia
(deployable antenna)**



**Posidonia
(flush antenna)**

	Gaps	Posidonia (deployable antenna)	Posidonia (flush antenna)
RANGE NOMINAL	4,000	10,000	10,000
ACCURACY	0,06% x range	0,2% x range	0,2% x range
OPERATING FREQUENCY	20-30 kHz	14-18 kHz	14-18 kHz
ANTENNA APERTURE	200 deg	70 deg	100 deg
DATA TELEMETRY	yes	no	no
CONSTRUCTION	Carbon fiber	Stainless steel	Stainless steel
SIZE (MM)	Ø 295 x 638	Ø 580 x 420	Ø 800 x 320
TRANSPONDERS	iXblue MF transponder Canopus Third party transponder	iXblue LF range	iXblue LF range

MF TRANSPONDERS					
	RTA2500S Light / MF-R	ETA62S-R	MT9x2S series	ZTA02C	MTBx2-OEM
BEST- SUITED WITH	Gaps, Ramses-MF	Gaps, Ramses-MF	Gaps	Gaps	Gaps
CONSTRUCTION	Duplex SS	Duplex SS	316L SS	Composite and Aluminum	Aluminum
WATER DEPTH	6 000 m	6 000 m	1 000 or 3 000 m		4 000 m
WEIGHT (AIR/ WATER) IN KG	22 / 16	21 / 15	1000 m : 4.4 / 2.3 3000 m : 5.7 / 3.8	5.1 / 2.7	2.5
SIZE (ODxL) IN MM	130 x 768	130 x 678	91 x 377	396 x 98	120x382
LOAD CHARACTERISTICS (SWL / RL) IN KG	2500 / 500	N/A	N/A	N/A	N/A
OPTIONS	Remote Transducer	Remote Transducer	Remote Transducer	N/A	N/A

**LF
TRANSPONDERS**



RT2500S Light



ET861S-R



MT861S/HD-R



RTA61CS-R



**RTA2500S
Universal / LF**



ETA61S-R



MT931S/HD-R

BEST- SUITED WITH	Posidonia	Posidonia	Posidonia	Ramses-LF	Ramses-LF	Ramses-LF	Ramses-LF
CONSTRUCTION	Duplex SS (Titanium optional)	Duplex SS (Titanium optional)	Duplex SS	Duplex SS (Titanium optional)	Duplex SS	Duplex SS	316L SS
WEIGHT (AIR/ WATER) IN KG	26 / 18	25 / 16	7 / 5	25 / 18.5	27 / 21	24 / 17.5	4.5 / 2.5
SIZE (ODxL) IN MM	130 x 725	130 x 782	70 x 450	126 x 652	126 x 757	126 x 607	91 x 375
LOAD CHARACTERISTICS (SWL / RL) IN KG	2500 / 500	N/A	N/A	2500 / 500	2500 / 2500	N/A	N/A
OPTIONS	Remote transducer; Pressure sensor	Remote transducer; Pressure sensor	Integral transducer; Pressure sensor	Remote Transducer	Remote Transducer	Remote Transducer	Integral transducer

PLANNING AND SUPERVISION SOFTWARE

Supported by iXblue training and assistance services, Canopus supervision software is the new hub for subsea positioning operations providing an easy way to:

- Plan the operations (optimize TPs deployments, estimate performance expected,...)
- Deploy the devices (configure equipment, share global settings,...)
- Operate the integration (calibrate the devices, automatic switch to TP in line of sight,...)
- Manage the operations (positioning quality check, ...)

Compatible with the full range of iXblue subsea positioning products.

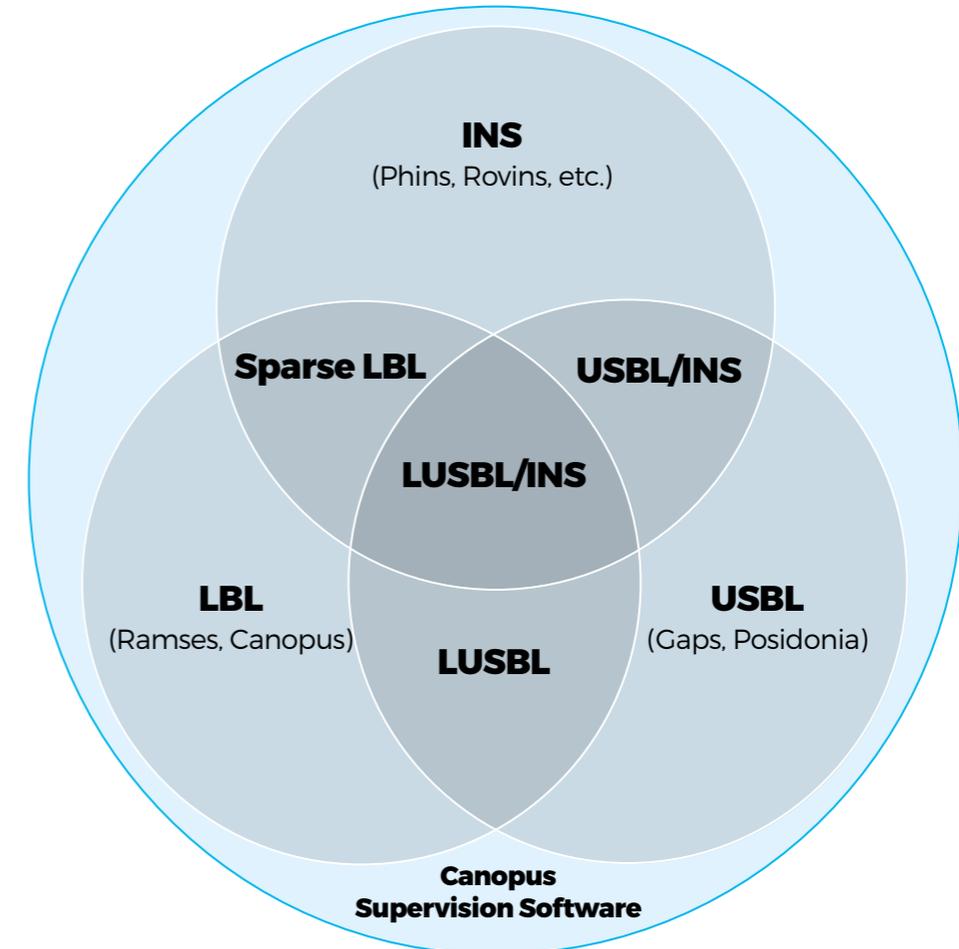
Depending on the area of operation, the safety and accuracy requirements in different portions of the field and the type of operations to be done, the number of transponders to be used on the seabed and their locations, the interrogation rates and the resulting transponder autonomy are all variable. Setting the right transponder position while at the same time warranting the success of the operations and saving unnecessary transponder calibrations can be difficult.

Complex operations subsea can involve tens of transponders on the seabed, multiple subsea vehicles equipped with a range of sensors as well as several ships with acoustic positioning and communication systems. All these systems have to be configured in a consistent

way so that errors are minimized and detected when they appear.

During the operations, the accuracy of the different systems has to be monitored. Alarms have to be raised if the performance falls below requirements and corrective measures have to be applied if possible on the fly. When needed either for QC or to increase the precision of the measurement, appropriate post-processing has to be applied to the data.

iXblue planning, configuration and supervision software along with training and services make all these operations simpler, more error free and faster to execute. The operators can concentrate on the job in hand with the right visual indications and leave all the repetitive mechanics to be done automatically.



Planning

Using all available environmental information the Canopus supervision software combines proposed beacon locations, with the expected sound velocity profile at the site and the digital terrain model of the seabed topography in order to estimate the acoustic coverage.

Once the acoustic coverage is available and the expected equipment list is generated, accuracy estimations can be conducted. Expected accuracy achieved can be tuned by adjusting the acoustic array parameters.

Transponder autonomy can be calculated based on expected acoustic recurrence, which in turn is a function of the INS in use, the acoustic array layout and the desired accuracy. Each of these variables may be tuned in order of priority to either extend battery life or increase autonomy.

Plan

Prepare the job (how many TP's, where, expected performance, etc).

Deploy and calibrate

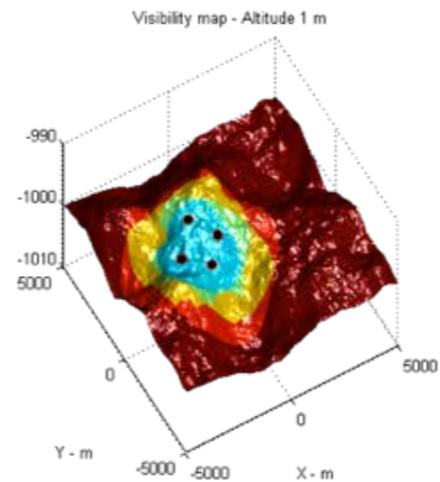
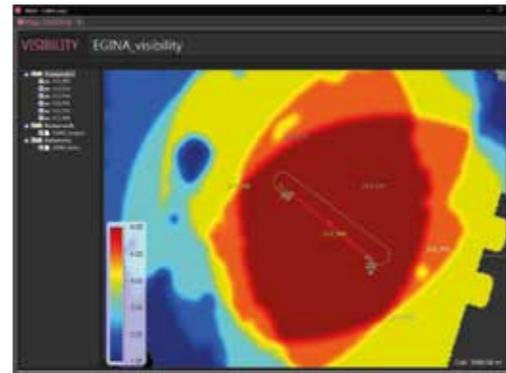
Configure and calibrate.

Operate and monitor

Produce QA/QC, reach expected performance. Raise alarms.

Post-process

Improve performance and additional QC.



Deploying and calibrating

Thanks to the built-in networking capability, deploying the system becomes very straight forward. Beacons are programmed over WiFi when they are turned on prior to deployment. INS systems and acoustic transceivers (LBL or USBL) can be configured automatically over Ethernet as they are added to the system.

Once the equipment is deployed on the seabed the acoustic array calibration may be conducted. Calibration may be conducted via traditional GPS aided box-in process, Rapid USBL aided SLAM, and/or Mutual array calibration methods. By constantly monitoring the quality of the calibration the system can propose appropriate box-in trajectories for array geo-referencing. Calibration information will finally be shared between all configured equipments.

Plan

Prepare the job (how many TP's, where, expected performance, etc).

Deploy and calibrate

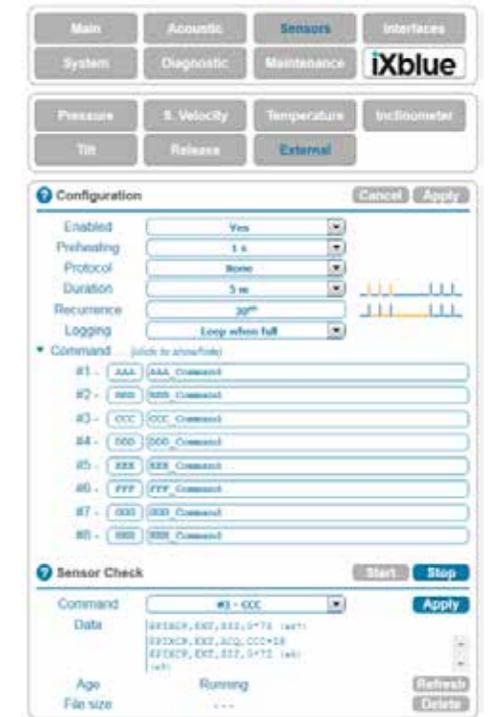
Configure and calibrate.

Operate and monitor

Produce QA/QC, reach expected performance. Raise alarms.

Post-process

Improve performance and additional QC.



Operating and monitoring

In operation, the Canopus supervision software can dynamically change the acoustic array parameters, turning beacons on and off and managing Ramses recurrence rate to ensure the vehicles INS is always in receipt of enough transponders to ensure desired accuracy levels. In the event of multiple beacons in the area Canopus supervision software allocates beacons and time slots as necessary.

Monitoring of positioning performance is continuous with alarms generated if performance falls below requirements.

Data outputs to third party equipment are all managed by the Canopus supervision software, either from the individual INS and transceivers, or from the optional Canopus Topside Interface box.

Plan

Prepare the job (how many TP's, where, expected performance, etc).

Deploy and calibrate

Configure and calibrate.

Operate and monitor

Produce QA/QC, reach expected performance. Raise alarms.

Post-process

Improve performance and additional QC.



Post-processing

Whether because of a requirement for improved accuracy, a need to change the settings used in real time, or to remove specific sensor data from the positioning solution, it is often necessary to post-process the data recorded during the operations.

Delph INS delivers a complete set of dedicated tools for post-processing, navigation improvement and QA/QC analysis. It includes powerful export tools to make it compatible with industry standard software as well as with custom software.

Thanks to the advanced forward-backward processing algorithms it can improve significantly on the performance obtained in real time specifically for portions of the operations where some of the sensors or measurement were not fully available.

Plan

Prepare the job (how many TP's, where, expected performance, etc).

Deploy and calibrate

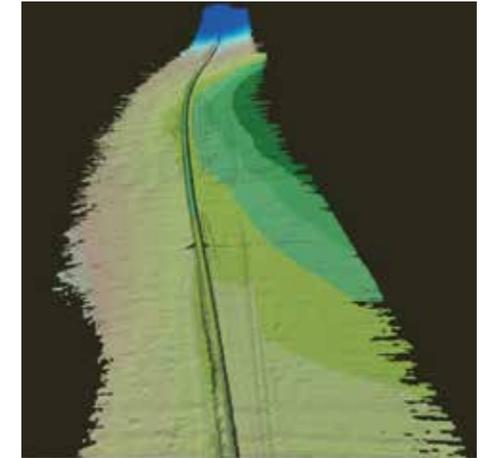
Configure and calibrate.

Operate and monitor

Produce QA/QC, reach expected performance. Raise alarms.

Post-process

Improve performance and additional QC.



OEM SOLUTIONS

A navigation solution for all AUVs

By engaging with leading manufacturers since our inception, we've now developed a range of Original Equipment Manufacturer (OEM) solutions that can be

easily integrated with our customers' pressure housing for AUV navigation. The OEM range allows manufacturers the flexibility to integrate our class-leading solutions and make the most effective use

of the space. Our team is here to assist you every step of the way for engineering services, testing, trialling and training services.

The industry reference in subsea INS for OEM

Phins Compact Series has been designed to offer AUV industry the ability to choose an inertial navigation system adapted to their vehicle, whatever their size and mission, from accurate navigation to survey grade.

They are fully scalable systems with a similar architecture and interface. The three products include the same algorithm and software which enables seamless re-use of the control system on any

vehicles sizes or types. Modern interfaces such as Ethernet help reducing integration and non-recurring costs.

A complete embedded LBL solution

We also designed transponders for custom subsea housing. They are fully compatible with our LBL and USBL positioning systems. They provide

advantages to reduce size, weight and the need for interface cabling without compromises for performance. The same LBL and telemetry capability

is available with the same performance when positioning the transponder with our Ramses LBL.



Phins Compact C3



Phins compact C5



Phins compact C7

	Phins Compact C3	Phins compact C5	Phins compact C7
PERFORMANCE			
HEADING	0.15 deg secant latitude RMS	0.05 deg secant latitude RMS	0.01 deg secant latitude RMS
ROLL PITCH	0.05 deg RMS	0.01 deg RMS	0.01 deg RMS
POSITION ACCURACY WITH DVL CEP 50	0.3% DT	0.2% DT	0.1% DT
POWER CONSUMPTION	12 watts	20 watts	20 watts
ENVIRONMENTAL CHARACTERISTICS			
WEIGHT	1.6 kg	4.7 kg	3.5 kg
VOLUME	0.4 L	5.9 L	4.6 L
DIAMETER	140mm	154mm	200mm
ELECTRICAL INTERFACES			
SERIAL	RS 232	RS 232/422	RS 232/422
ETHERNET	UDP /TCP	UDP /TCP	UDP /TCP
PULSE	TTL	TTL	TTL

From 2 to 5 independant input data flows

UNMANNED SURFACE VEHICLE

An unrivalled Seaworthiness

DriX operates from the surface into the depth. Thus, for DriX positioning is of the utmost importance, as is the stability of its communications with the surfaced world. In order to be able to deliver those most demanding qualities DriX brings:

- A long endurance (ranging from 5 to 10 days depending on the speed and the maritime environment, thanks to its energy-saving hydrodynamic design);
- Excellent manoeuvring capabilities and a wide range of speed (from 2 to 14 knots)
- Specific kinematics for missions which require "hovering" capabilities
- An excellent platform stability up to sea state 4 and higher (in order to reduce the impact of the difference between the roughness of the surface and the calm of the depth and expand the working domain)
- A number of applications and payloads Thanks to its removable and replaceable gondola, DriX will enable any customer to use his own sensors and to adapt them to the mission at hand.

A number of applications and payloads

DriX really is a Swiss army knife. For subsea positioning and tracking tasks, DriX can be fitted with a standard iXblue gondola integrating our acoustic systems: Gaps, Ramses, or Posidonia depending on the needs delivering the capability to:

- Box-in of seabed transponder arrays;
- ROV tracking for Touch Down Monitoring (pipe and cable laying);
- AUV tracking and control/ command
- Ultra-deep tow fish tracking
- ...

A safe asset for your subsea positioning missions

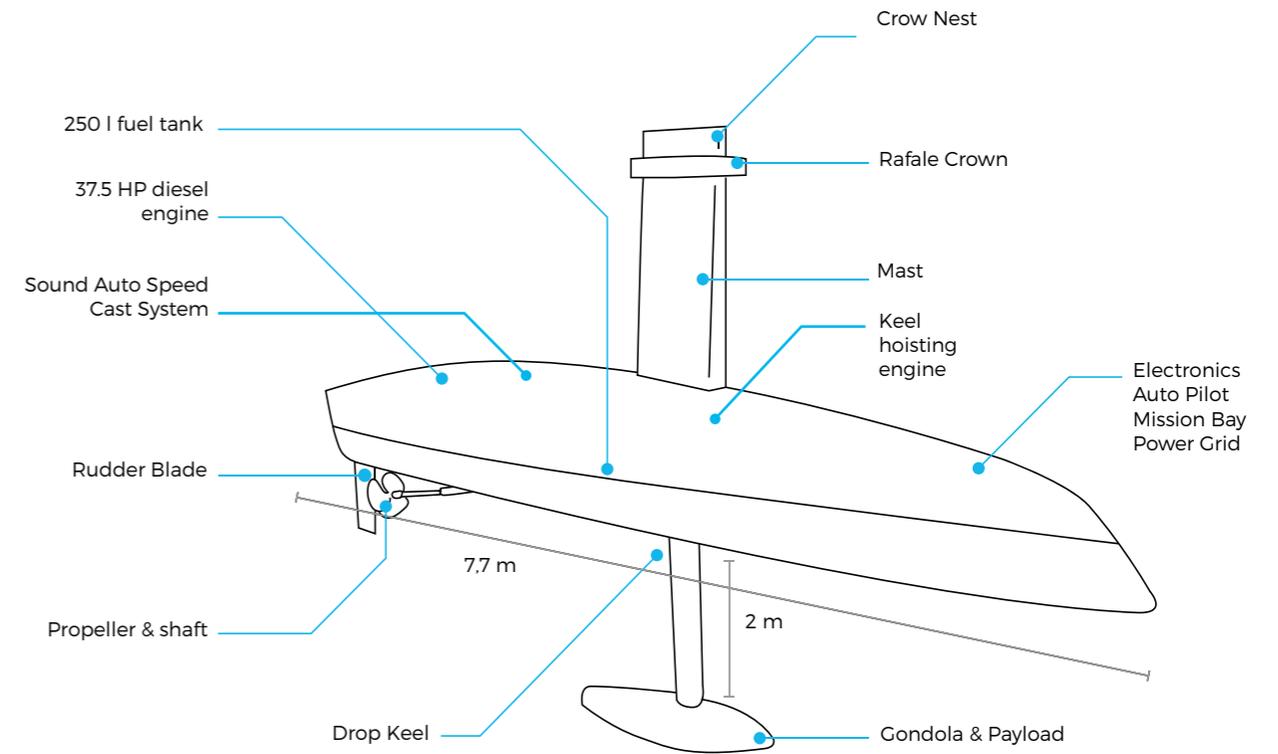
DriX seaworthiness provides all the right capabilities to perform an excellent subsea positioning mission over an extended period of time in environmental conditions exceeding those of a traditional support vessel. DriX is a safe asset. Being unmanned, it keeps people out of harm's way. They operate it from a distance and gather the benefits without the

risks. As an autonomous platform, it is designed to be as safe as possible. A number of software and physical layers have been superposed to provide the means to override it at any time. And because we are fully aware that working within a complex spread of equipment and vessels entails operating in close proximity, DriX is fitted with safety Never-to-exceed

distances and obstacle avoidance systems which will avoid any risk of collision with another participating asset. Finally, DriX comes with a Launch And Recovery System (LARS), which reduces the manpower needed to bring it back on board. Before the end of 2018, the LARS will also be fitted with a replenishment at sea capability.



DISPLACEMENT	1.4 tons
BEAM	0.7m
HEIGHT	4.26 m (DK extended) / 3.66 m (DK retracted)
ENDURANCE	Up to 7 days
CONTROL	Fully autonomous, semi-autonomous, direct remote control
COMMUNICATIONS	Line of sight (WiFi, radio, contact us for SATCOMS)
PAYLOAD POWER	1.9 to 3.7 kW
GONDOLA	Tailor-made for your equipment
TYPES OF PAYLOADS	USBL, MBES, Towed array light sonar, Side Scan Sonar, Sub Bottom Profiler
SPEED	2 to 14 knots



Worldwide Footprint



International sales and support

iXblue bv

A. Hofmanweg 5a
2031BH, Haarlem
Netherlands
Phone: +31 23 750 5113

iXblue Inc

1792 W Sam Parkway N
77043, Houston
United States
Phone: +1 781 937 8800

iXblue Pte Ltd

15A Changi Business Park
Central 1 #04-02 Eigthrium
486035, Singapore
Singapore
Phone: +65 6747 4912

iXblue China

43 Bei San Huan Xi Lu
100 086, Beijing
China
Phone: +86 10 6211 4716

iXblue JLT

Tiffany Tower
Jumeirah Lakes Tower
PO Box 127531, Dubai
United Arab Emirates
Phone: +971 50 6648390

iXblue Pty Ltd

30 North Road,
4178, Wynnum West,
Australia
Phone: +61 7 339 088 99

iXblue GmbH

Obenhauptstraße 7
22335, Hamburg
Germany
Phone: +49 40 22 63 47 132

iXblue Ltd

Unit G5, The Enterprise Centre
AB23 8CX, Aberdeen
United Kingdom
Phone: +44 1224 355 160

iXblue SAS

34 rue de la Croix de Fer
78100, Saint-Germain en Laye
France
Phone: +33 1 30 08 88 88

iXblue Inc

11 Erie drive
01760, Natick
United States
Phone: +1 888 600 7573

iXblue Ltda

Av. Presidente Wilson, 231/912
20030-905, Centro,
Rio de Janeiro
Brazil
Phone: +55 21 3578.5526

iXblue SDN BHD

Plaza Hamodal,
Floor 1st. Suite 1.05
Lot 15, Jalan 13/2, Seksyen 13
46200 Petaling Jaya, Selangor,
Malaysia

EMEA: +33 1 30 08 88 88
AMERICAS: +1 888 600 7573
APAC: +65 6747 4912

www.ixblue.com

ixblue