



**SERCEL**

A Viridien Business

# Seal 428

MARINE SEISMIC ACQUISITION SYSTEM

# NEW GENERATION MARINE SEISMIC RECORDER

The Seal 428 is the new large capacity and high-resolution seismic data acquisition system designed for marine towed streamers acquisition. It derives its high reliability and versatility from Sercel's extensive experience in cable telemetry systems and from the use of the most advanced electronics and workstation technology.

The Seal 428 supports extremely long offset recording as well as an unlimited streamer number for increased productivity and data quality. The Seal 428 system has been designed to match the industry's expectations for true zero dead time continuous recording, crucial for multi-vessel acquisitions such as Wide Azimuth and undershooting.

The benefits from the most advanced software technology include a Client/Server architecture which allows the system to be fully accessible through the customer's intranet or via a secured internet login for monitoring or full control purpose.

Taking advantage of Sentinel<sup>®</sup>, the industry's only true solid streamer, and of Nautilus<sup>®</sup>, Sercel's streamer guidance and control system, and as a result of the outstanding noise performance when using this combination, the Seal 428 offers the highest efficiency and best quality seismic data recordable today.

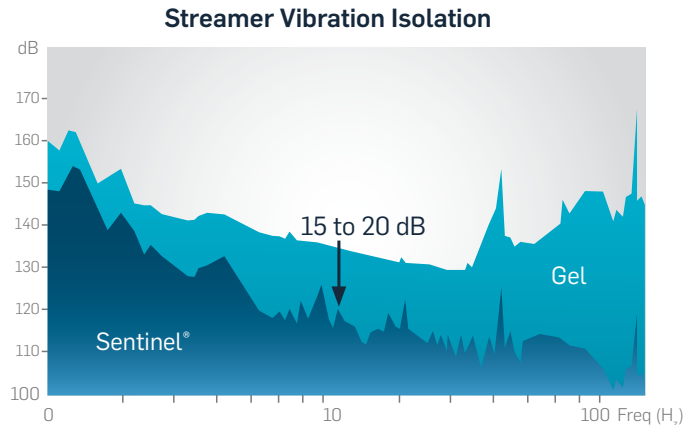
# FEATURES & BENEFITS

## IMPROVED DATA QUALITY

### Better signal

Sentinel is the only true solid streamer available in the market. The uniform ballast and the isolation techniques applied in Sentinel result in noise reduction, superior resistance to vibration and improved acoustic operation, resulting in excellent data quality in all types of weather conditions:

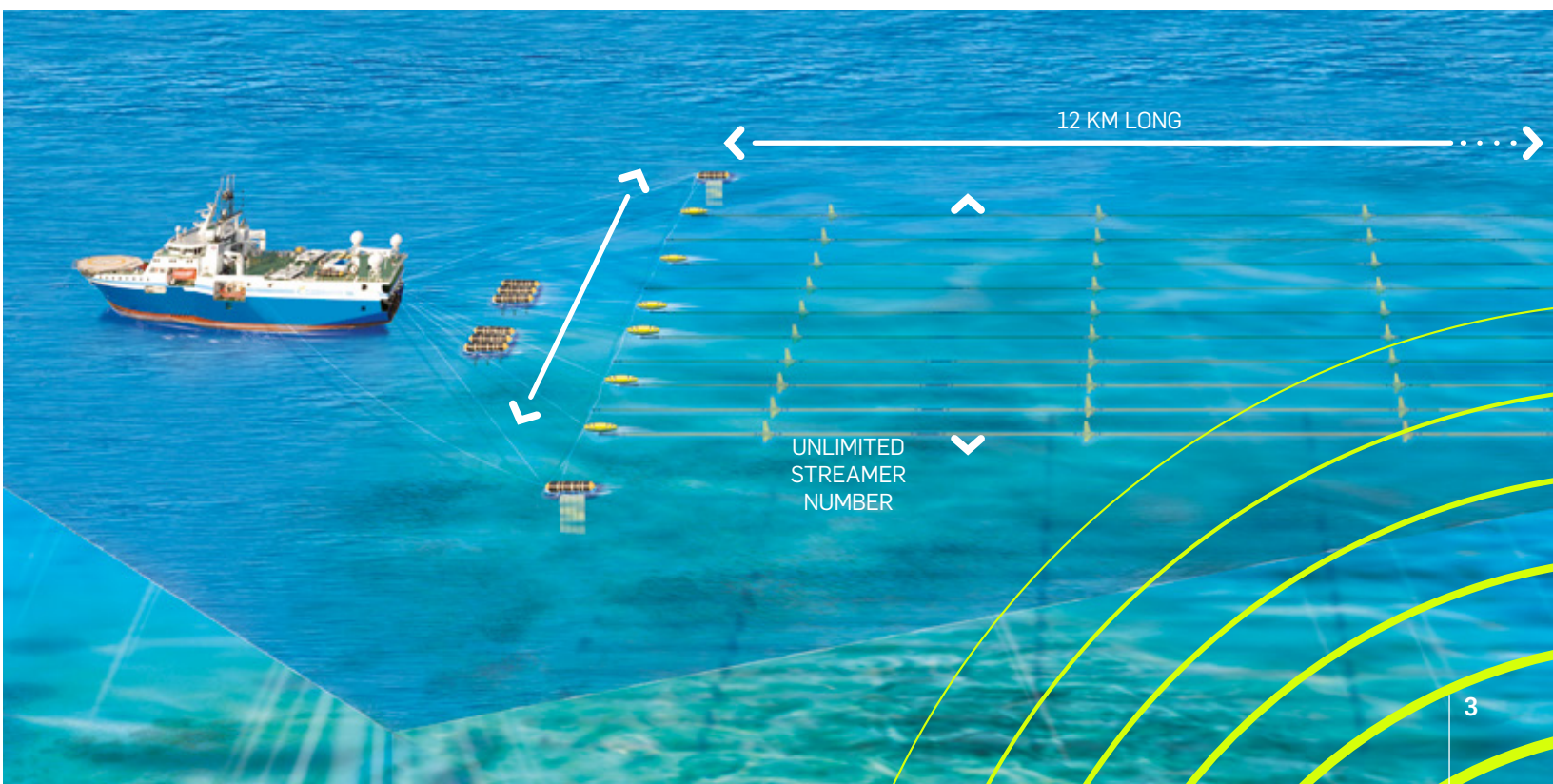
- Best signal/noise ratio compared to gel solutions
- Outstanding noise immunity in all sea states
- Unrivalled low frequency content



### Higher resolution

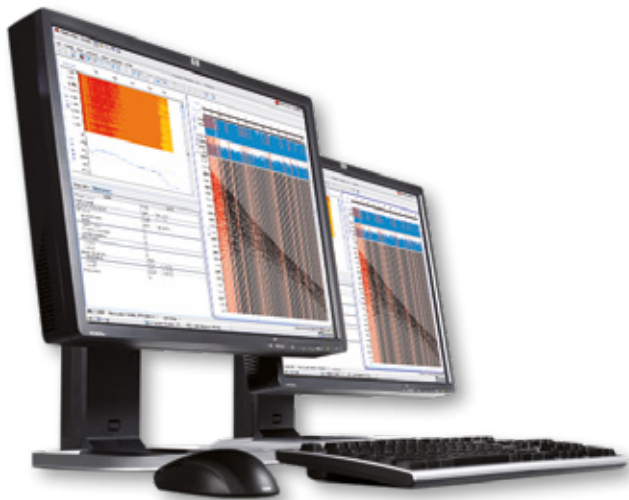
With an architecture based on an independent streamer philosophy, the channel limitation only depends on the server computation power.

Seal 428 is the only acquisition system able to manage an unlimited number of streamers for high density 3D purpose, and extremely long offset operations using streamers up to 12 km long.





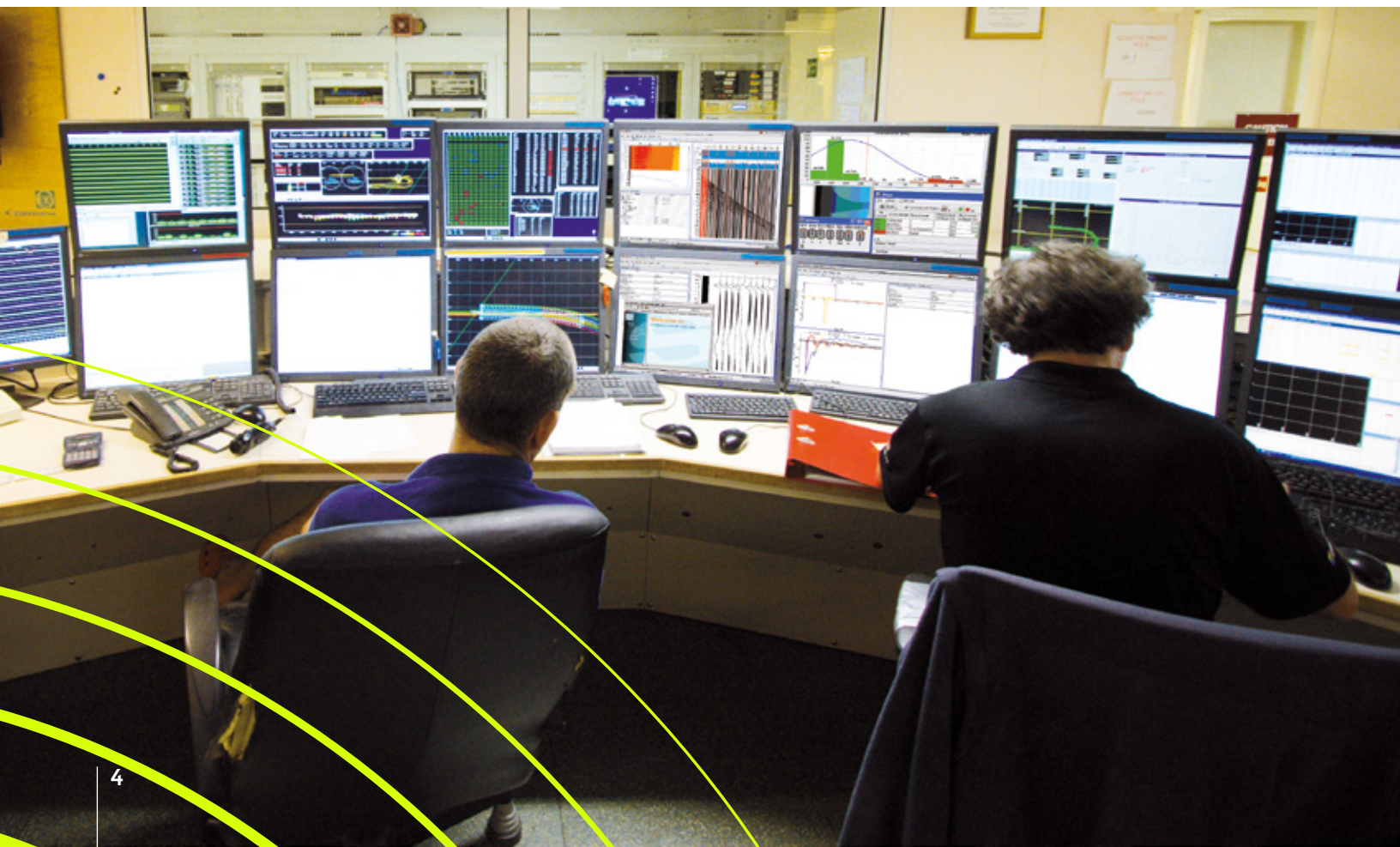
# HIGH QUALITY CONTROL



## Real-time QC

Keeping all the advantages provided by the Zero-Dead-Time architecture of the 400 Series and Seal central units, all QC functions are performed in parallel with the seismic data acquisition without slowing down 2D or 3D crew operations.

eSQC-Pro gives the ability to access and monitor the quality of the seismic data through the web from any authorized client computer.



## Remote accessibility



E-MAINTENANCE



REMOTE  
TROUBLESHOOTING



DATA QC

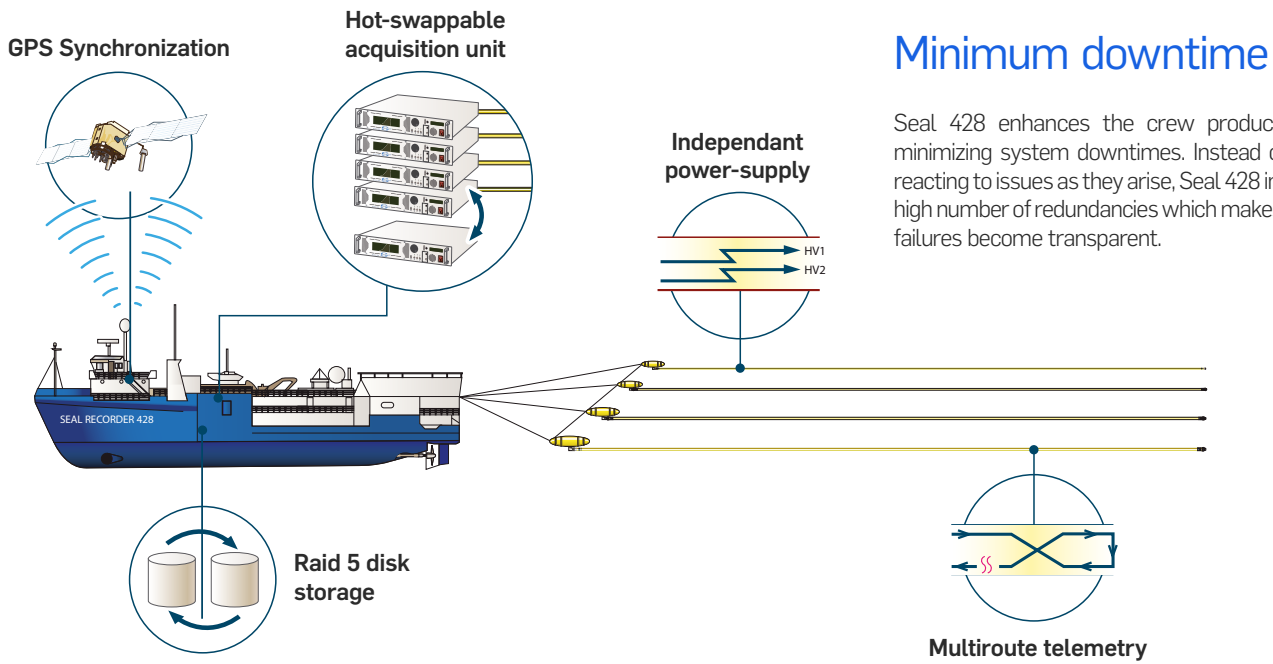


PARAMETERS AUDIT





# ENHANCED PRODUCTIVITY



## Minimum downtime

Seal 428 enhances the crew productivity by minimizing system downtimes. Instead of simply reacting to issues as they arise, Seal 428 includes a high number of redundancies which makes system failures become transparent.

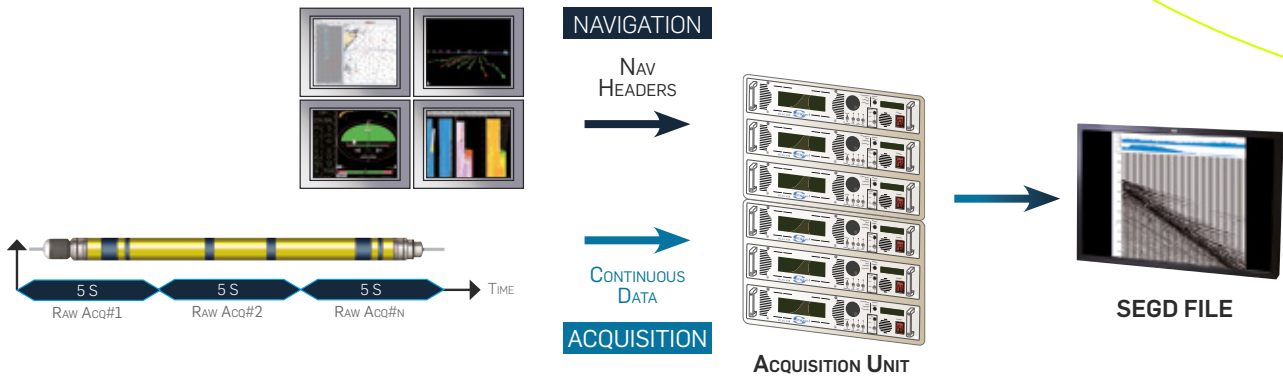
## Multi-vessel operation

To achieve an optimum image of the sub-surface, Seal 428 allows multi-vessel seismic acquisition thanks to GPS synchronized continuous recording.

- > UNDER-SHOOTING
- > WAZ 3D/4D

# CONTINUOUS RECORDING

- FULLY SYNCHRONIZED (GPS)
- NO EXTERNAL TRIGGER NEEDED
- SYNCHRONIZATION THROUGH NAV HEADERS MESSAGES DIFFERED RECEPTION



## Sentinel® reliability

Sentinel is the strongest marine streamer available today, capable of handling nearly twice the operating tension as traditional cables. Sentinel streamers are tough, with unmatched water-blocking, puncture and impact resistance, and a unique design that provides superior protection against hydrophone damage during retrieval and deployment. Routine maintenance and repairs can be performed on-board which means fewer spares required.



- > FIELD PROVEN PERFORMANCE
- > MOST RUGGED TRUE SOLID STREAMER

# Sentinel<sup>®</sup> RD

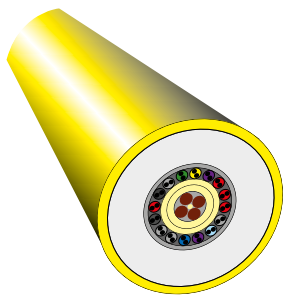
## Reduced Diameter Solid Streamer

- **CLEARER IMAGE**

Best signal-to-noise ratio at low frequency

- **HIGHER PRODUCTIVITY**

Outstanding noise immunity at all sea states



Sentinel RD

Sentinel RD has a reduced diameter, providing reduced cable drag and increased storage capacity onboard seismic vessels, which are some of the key aspects of the marine seismic operations. The new design of Sentinel RD also allows newly built vessels to be designed with smaller winches.

The latest member of the Sentinel family provides the same outstanding acquisition performance as its predecessor system, making it the best-in-class solid streamer available on the market today.

### Sentinel RD specifications

Nominal section length	150 m
Cable diameter	55 mm
Channels per section	12
Maximum operating depth	50 m
Maximum streamer length	15750 m

# Sentinel<sup>®</sup> HR

## High Resolution Seismic Streamer

- **BEST IMAGING**

3,125 m channel spacing

Best signal-to-noise hydrophone performance

- **BEST PRODUCTIVITY**

Up to 6,000 m streamer length

Comb spread design capability

- **UNRIVALED RELIABILITY**

Fully redundant design

Sentinel HR is the new Sercel solid streamer designed with a very short channel spacing for high resolution acquisition. It integrates the highest performing hydrophone configuration while benefiting from Sentinel's industry leading capabilities & reliability. It will provide the best imaging & will maximize your productivity.

Dedicated for shallow target applications and HR3D surveys, Sentinel HR will be an efficient tool for oceanology, geo-technical, civil engineering and reservoir characterization applications.

### Sentinel HR specifications

Section length	150 m
Section diameter	59.5 mm
Receiver group	3,125 m
Maximum operating depth	50 m
Maximum streamer length	6,000 m



# Sentinel<sup>®</sup> MS

## 3-C multi-Sensor Broadband Streamer

- **BROADBAND IMAGING**  
3-C recording
- **BEST LOW FREQUENCY PERFORMANCE**  
Class leading Sentinel hydrophone
- **ENHANCED PROCESSING CAPABILITY**  
Accelerometer raw data recording

Sentinel MS is a new member of the industry standard Sentinel product line to offer multi-sensor acquisition along with the very best low frequency, low noise, and highest reliability solid streamer available today.

In addition to the field proven hydrophone performance, unique in the industry, the new multi-sensor streamer features two additional acceleration components, providing directive measurement for both cross line and vertical wave front.

Improving data quality and providing wavefield gradient, this new solution enables receiver ghost removal and the most advanced seismic data processing techniques.

### Sentinel MS specifications

Section length	150 m
Section diameter	59.5 mm
Receiver group	3 collocated components : <ul style="list-style-type: none"><li>• 1 hydrophone group</li><li>• 1 vertical accelerometer group</li><li>• 1 crossline accelerometer group</li></ul>
Receiver group spacing	12.5 m
Maximum operating depth	50 m
Maximum streamer length with full redundancy and zero dead time	8,000 m*
Operational model	Same as Sentinel and Sentinel RD

\* With minimum compression ratio required : 53 % (figure depending on signal type, sea and environmental conditions)



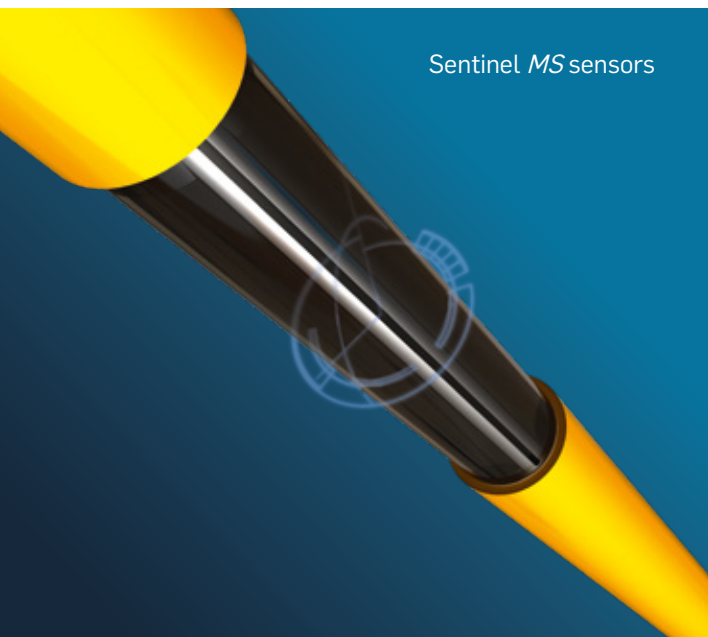
Hydrophone



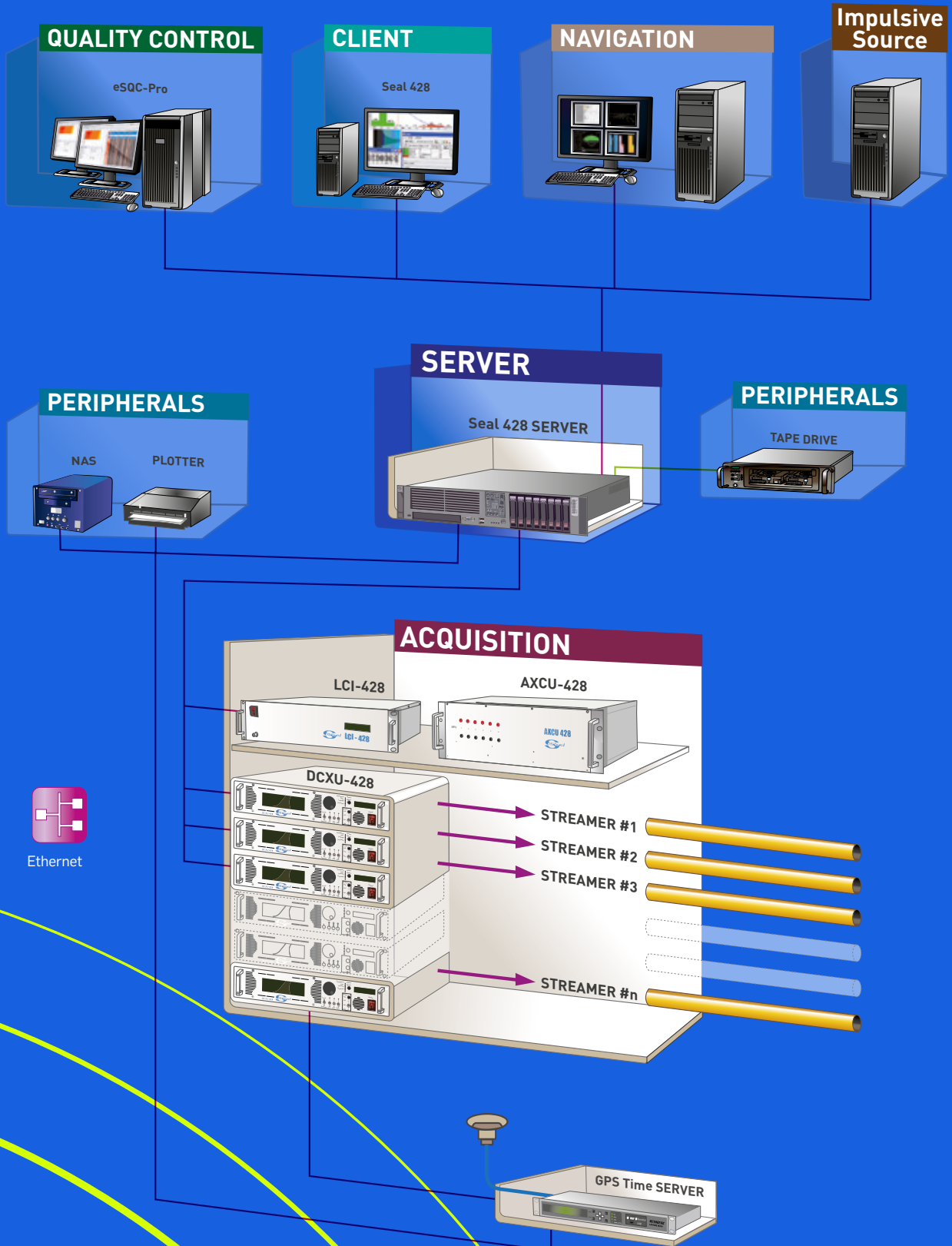
Accelerometer Y



Accelerometer Z



# SEAL 428 RECORDER



# DCXU-428

## STREAMER CONTROLLER

- Streamer oriented architecture: 1 unit per streamer
- Hot-swappable unit
- GPS-synchronization of seismic acquisition



# GPS TIME SERVER

## GPS RECEIVER USED FOR SYSTEM SYNCHRONIZATION

- Propagation of GPS time reference
- Tolerance to loss of PPS signal



# Seal 428 SERVER

## SEISMIC DATA RETRIEVAL, FORMATING, PROCESSING & EXPORT

- Read hat linux Operating System
- Up to 15TB RAID-6 local storage and power-supply redundancy



# LCI-428

## LINE ACQUISITION UNIT

- Electrical interface with navigation when using a physical  $T_0$
- Management of auxiliary channels



# AXCU-428

## AUXILIARY CHANNEL UNIT

- Digitization of analog auxiliary channels
- 12 channels, extension available up to 60



# NAS

## COMPLETE STORAGE SYSTEM SELF-CONTAINED IN A HOUSING CASE

- Up to 2 TB disk capacity
- 125 h of seismic data - 1000 ch@2 ms
- Raid 1 Disk feature





## LEAD-IN

### ARMoured ELECTRO OPTICAL CABLE

- Traction resistance: up to 570 KN
- Length: up to 1900 m



## SHS2

### SHORT HEAD SECTION

- Flexible section
- Acceleration sensor for noise monitoring
- 2 Nautilus transducer
- 1 coil acoustic
- Length: 6 m



## STIC

### STREAMER TAIL INTERFACE CABLE

- Interface with the tail buoy
- Contains a breakable link
- Length: 25 m



## HAU-428

### HEAD AUXILIARY UNIT

- Streamer tensile stress measurement
- Head buoy power supply as an option (HAPU-428)
- Length: 0,277 m



## RVIM

### RADIAL VIBRATION ISOLATION MODULE

- Isolation of vessel vibrations
- Length: 17,5 m



## TES

### TAIL ELASTIC SECTION

- Isolation of tail buoy vibrations
- Length: 50 m



## LAUM-428

### LINE ACQUISITION UNIT MODULE

- Data routing and power supply of active channels (60 ch max)
- Internal temperature monitoring
- Length: 0,256 m



## TAPU-428

### TAIL ACQUISITION AND POWER UNIT

- Data routing and power supply of the last active channels
- Tail buoy power-supply
- Length: 0,335 m



## SSAS

### SENTINEL ACTIVE SECTIONS

- Data acquisition sections
- Field repairable
- Customizable hydrophone group spacing
- Length: 150 m



## SNS2

### SHORT SECTION

- Short flexible section
- Ø70 mm / Ø50 mm and Male / Female option for use in Head or Tail
- Length: 0,717 m
- Nautilus transducer



# SOFTWARE

## Seal 428

### Data acquisition software

Seal 428 software is a package that completely controls the seismic instrument spread and operations. It also performs all the requested computations before recording data onto tapes or disks. Taking benefits of its client/server architecture, Seal 428 allows secured remote access through Internet connections.



## eSQC-Pro

### Quality control software

eSQC-Pro is a powerful integrated tool for real-time QC of seismic data acquisition without slowing down production. Its client/server architecture allows real-time QC display on a remote standard PC through a secure Internet connection.



## SGA

### Signal graphic analyzer

SGA is the latest generation of Signal Graphic Analyzer QC Tool. Featuring a new user-friendly graphical interface and being able to work in real-time or standalone mode, SGA can be installed on any computer to perform detailed signals analysis. The software supports a wide range of graphical displays (amplitude, spectrum, distortion, phase,...) and is compatible with the latest SEG-D file revisions (rev 2.1 and 3.0).





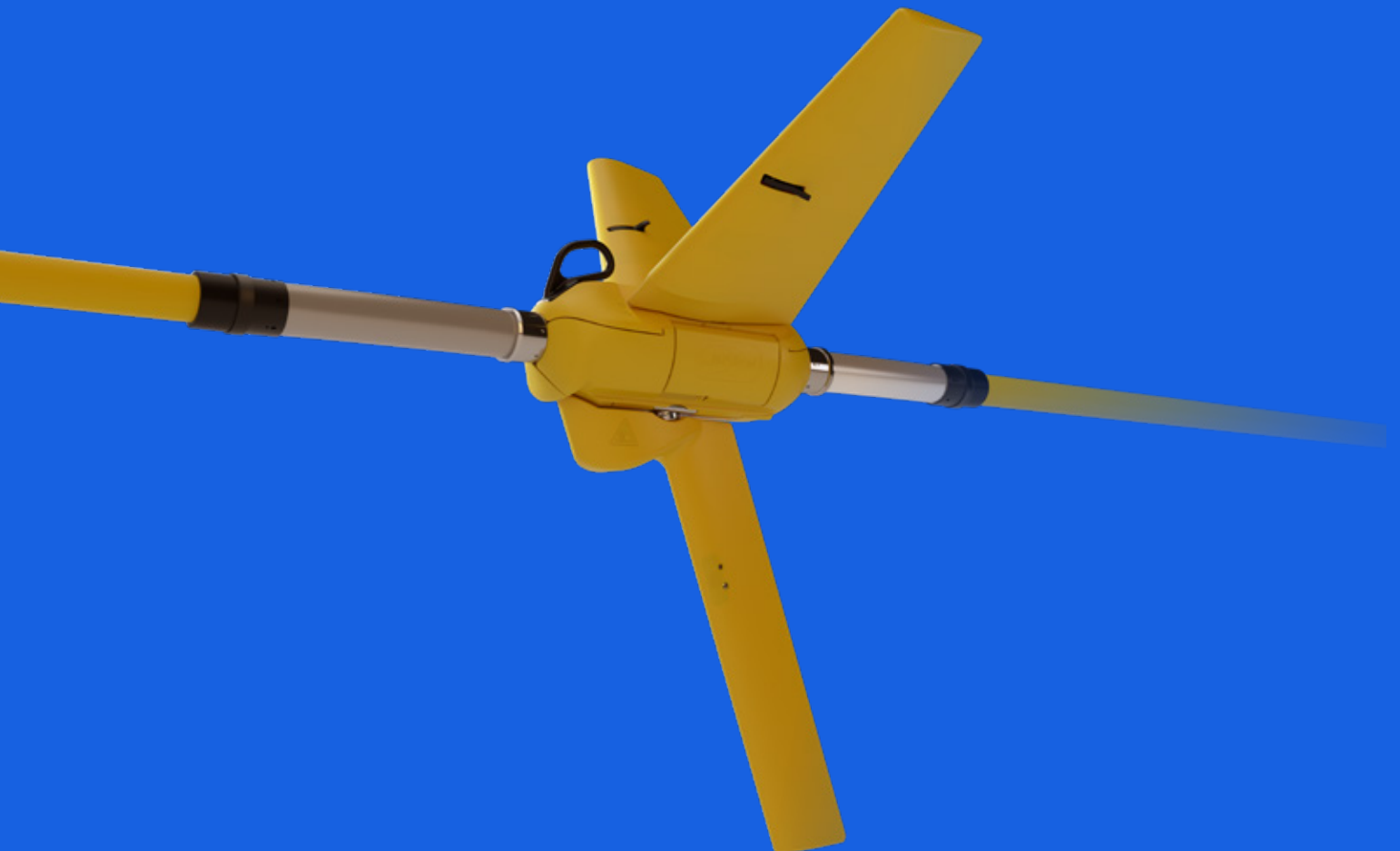
# NAUTILUS

## FULLY INTEGRATED STREAMER STEERING SYSTEM

The three-in-one Nautilus device offers acoustic positioning, depth control and automatic steering in a single unit. Fully integrated and compatible with the whole Sentinel® products range, Nautilus is directly powered by the streamer and eliminates the costly need to service the battery.

With ultimate battery power conservation, and a much greater steering force, Nautilus reduces the line change and keeps a better control of any streamer configuration (3D, high resolution, fan mode, variable depth), resulting in maximum production with minimum infill acquisition to be performed.

Its in-line and revolutionary design reduces noise compared to conventional birds and allows quick installation during deployment.



### **SERCEL - FRANCE**

16 rue de Bel Air  
B.P. 30439 - 44474 CARQUEFOU Cedex  
Téléphone : (33) 2 40 30 11 81  
E-mail : [sales.nantes@sercel.com](mailto:sales.nantes@sercel.com)  
SAS au capital de 25 000 000 €  
Siège Social : 16 rue de Bel Air - 44470 CARQUEFOU  
378.040.497 R.C.S. Nantes Code APE 2651B

### **SERCEL INC. - U.S.A.**

17200 Park Row  
Houston, Texas 77084  
Telephone : (1) 281 492 6688  
E-mail : [sales.houston@sercel.com](mailto:sales.houston@sercel.com)

[www.sercel.com](http://www.sercel.com)

© Sercel 06/24

Produced according to the Sercel environmental printing standard

