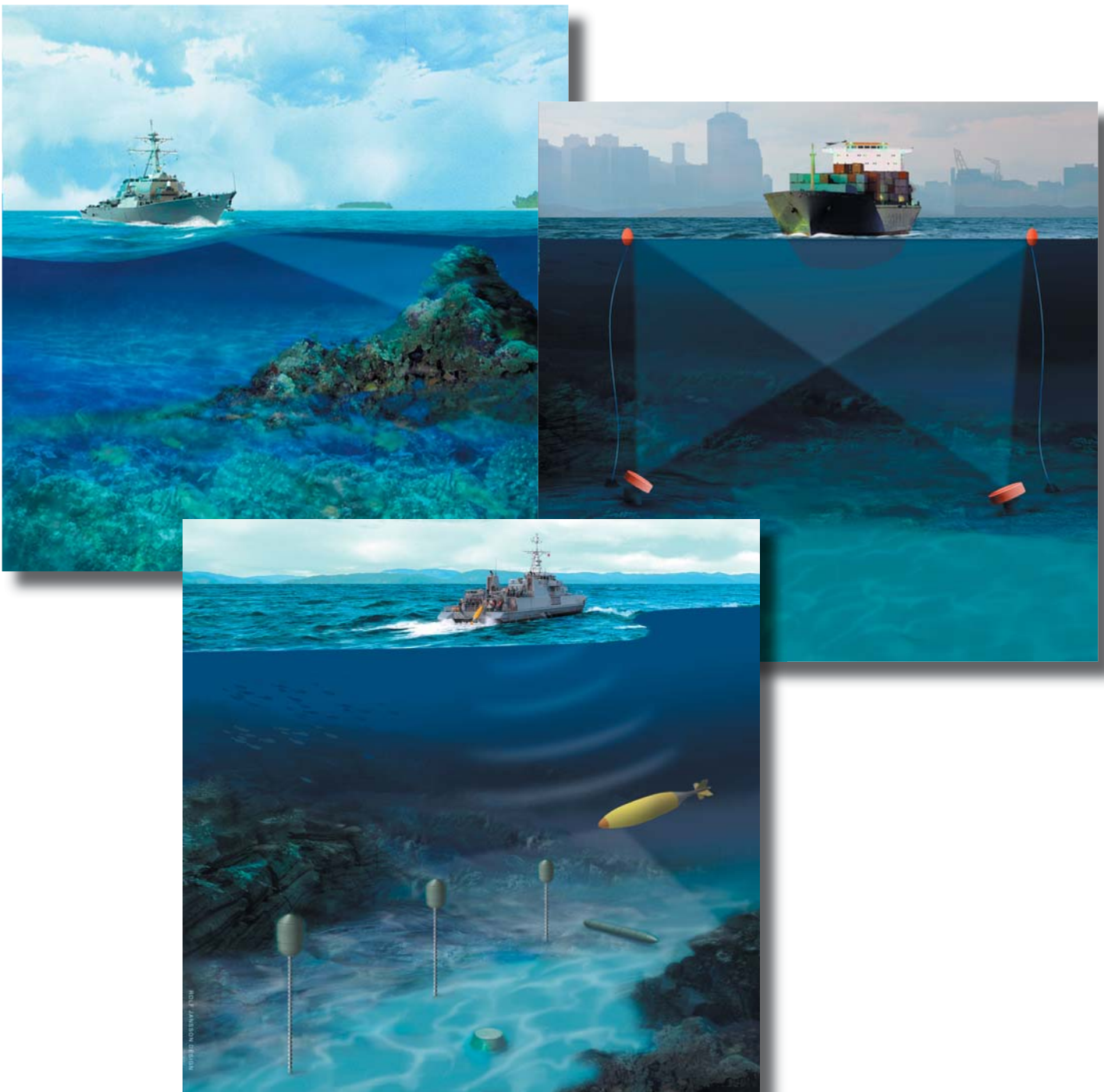




Underwater Security

Solutions

Protecting ships, offshore installations and security zones against unfriendly underwater activity



PROTECTION OF VESSELS

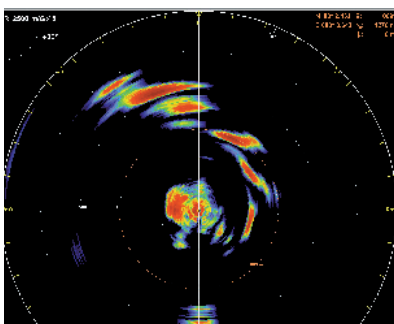
SSA 80 High Frequency Sonar

The new SSA 80 is an advanced high frequency sonar designed to increase vessel security by detecting potential underwater intruders, and obstacles along the route.

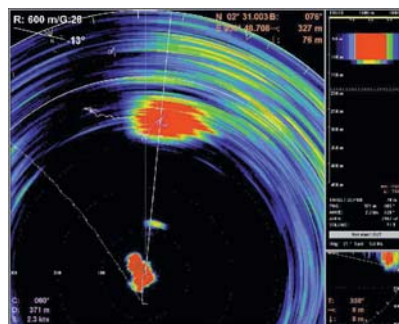
Applications

The SSA80 has two main functions:

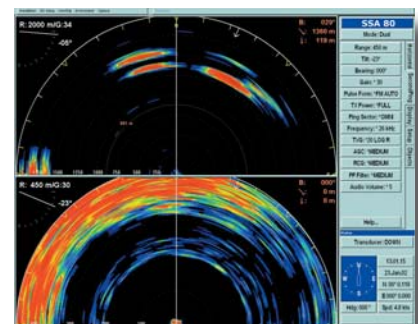
- A surveillance sonar with automatic detection of intruders, divers or underwater vehicles appearing as a possible threats to the vessel.
- An obstacle avoidance sonar detecting objects or shoals on the sea floor, presenting an operational risk for the vessel operation.
- An anti collision sonar.



Full Screen presentation



Off Center presentation



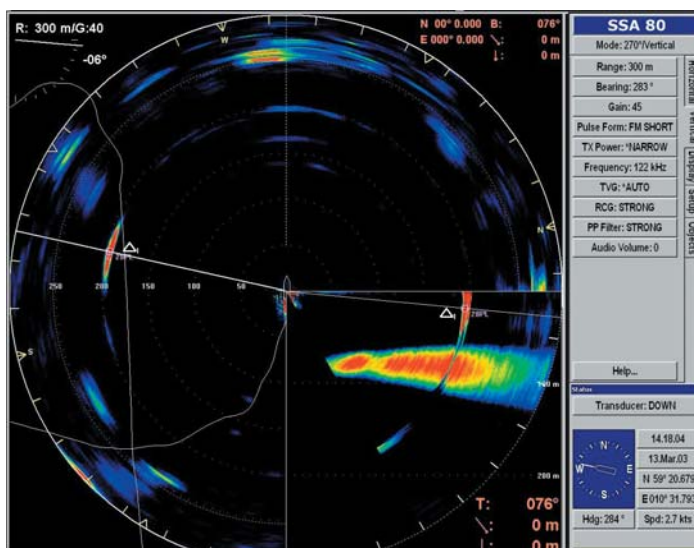
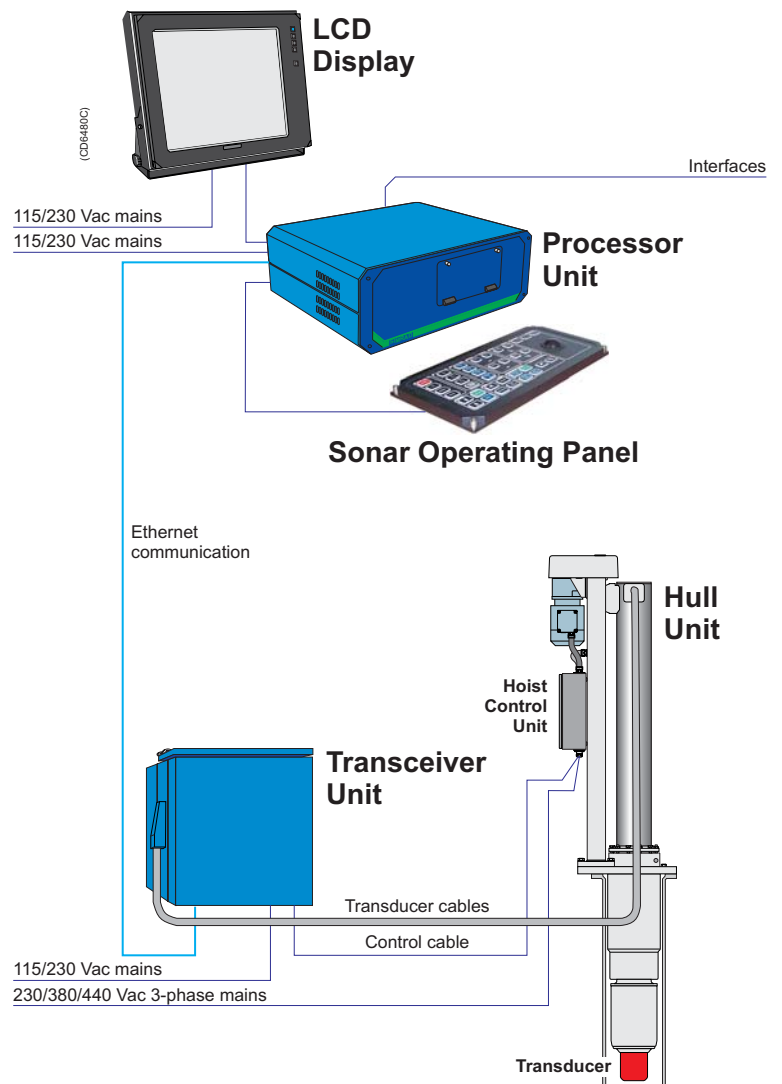
Dual mode

Operation

The SSA 80 sonar is easy to use with automatic target detection and alarm functions. The operation is based on a self explanatory menu system. Key functions are initiated using a specially designed keyboard with a trackball, or a standard computer mouse or pointing device. A comprehensive built-in on-line help may be retrieved when required.

Advanced functions

Computer Aided Target Acquisition (CATA) will detect an obstacle or a diver as a target, and assign a track. An alarm threshold based on computation of *Closest Point of Approach (CPA)* and *Time to Closest Point of Approach (TCPA)* may be set. Relevant information is presented on the display for further evaluation.



The SSA 80 operation display

The sonar display contains a large echo window and the menu. When not in use, the menu can be hidden from view. Several display modes are available:

- Bow up
- North up
- True motion
- 180° Horizontal with Audio
- 270° Horizontal and Vertical
- Bow up and Vertical
- True motion and Vertical
- Dual mode

The *Dual mode* presentation sets up the system as if two individual sonars were in use simultaneously, using different settings on each sonar.

PROTECTION OF SECURITY ZONES

EM 3002 Multibeam echo sounder

The new EM 3002 multibeam hydrographic echo sounder with a large number of beams and high resolution and ping rate is well adapted to improve the security of ports and other defined security zones by detailed mapping of the bottom, including detection of bottoms on the bottom.



A complete, fully equipped survey vessel may be supplied. The ConCat, a catamaran vessel, can be compacted and stored in a container when not in use, and mobilized in less than one hour.

The hull of passing vessels, entering security zones, may be scanned by establishing a security check point.

Two high resolution multibeam sonars are used to scan vessels with high resolution.



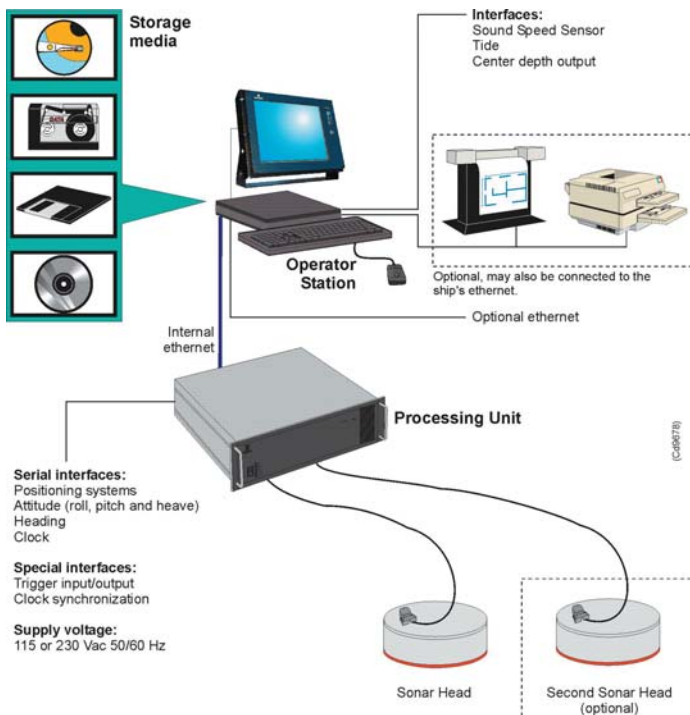
Vessel inspection in open sea

The hull of passing vessels may be inspected in open sea by fitting an EM 3002 multibeam sonar either to a ROV or to an over the side deployment unit.



Applications

- Hull inspection
EM3002 with its high density beams, high resolution and advanced signal processing is able to detect objects like limpets etc on ship hull before they enters certain waters, harbours etc. if mounted upside-down below the investigated ship. A possible solution is to arrange a check point with i.e. two EM3002 to cover a certain area/profile.
- Search and Rescue.
Surveillance of certain hazard Waters (mine-fields), Harbours, fjord inlets etc. may be performed by survey launches equipped with Survey package consisting of EM3002, Seapath 200, Radio link and steering system. Requires only boat skipper and a surveyor/operator on shore.
- Detailed mapping to monitoring changes at seafloor after incidents.



HUGIN HMRS

The Hugin AUVs can efficiently and with high resolution keep a large underwater area under surveillance. The vehicles have the capability of either supervised (from a support ship) operation or autonomous overt or covert operation. The vehicles can be used to monitor external imposed changes to own installations (minefields, etc), detect mine-threats deployed by external intruders, detect intruders in the form of free-swimming divers, submarines and other AUVs. For the underwater surveillance purposes the vehicles will be equipped with a range of application specific acoustic sensors (i.e. Synthetic Aperture Sonar, etc.) and optical laser sensor. For covert operation the vehicle may even be deployed from a shore base and transferred by



Hugin onboard KNM Karmøy

autonomous operation to the search area, perform the search operation and return to the shore base for data download and processing. Such capability has been demonstrated.

Covert data communication will be a future option allowing the vehicle to report back to the base station its status and critical objects detected.

Applications

The Hugin 1000 vehicle is an efficient tool for mapping of the seabed and imaging of the seabed/water volume.

The Hugin 1000 is basically designed for mine hunting, but as a flexible payload sensor platform the vehicle is also ideal for surveillance, marine research and environmental monitoring.

The Hugin 1000 vehicle is a key element in the HUGIN Mine Reconnaissance Program – HUGIN HMRS.

The main operations for HUGIN MRS are:

- High quality bathymetric mapping
- MCM route.
- Mine reconnaissance.
- Mine detection, classification and positioning.
- Overt and covert environment assessment.

HUGIN 1000

The HUGIN 1000 AUV performs high-speed surveys with excellent navigation and payload data quality down to operating depths of 600 meters. The vehicle can be operated in either operator supervised, semi autonomous or full autonomous mode.

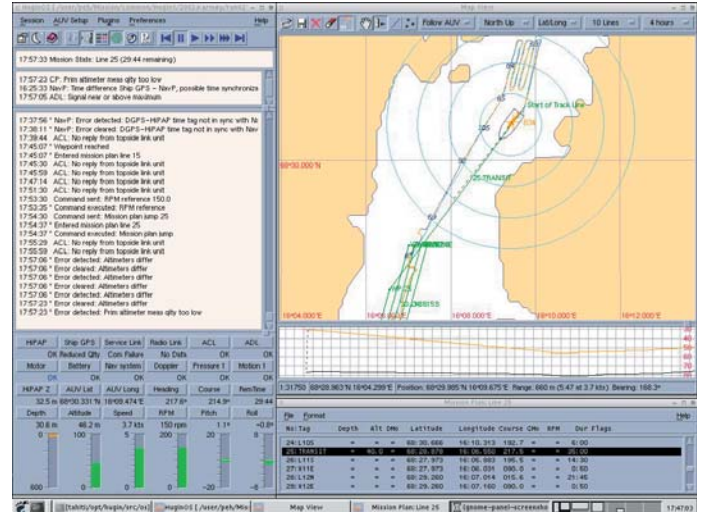
The HUGIN concept allows integration of alternative sensors for mine counter measure, environmental assessment, geophysical, search and inspection purposes to be implemented, subject to customer demands.

Navigation system

HUGIN 1000 is equipped with an advanced DVL Aided Inertial System (AINS). The navigation filter (Kalman filter) utilizes, in a mathematical optimal manner, the data from all the navigation sensors.

A range of AINS aiding navigation tools are available:

- Combined acoustic position/GPS/dGPS transmitted on acoustic link from support vessel to vehicle.
- GPS/dGPS aiding at surface.
- NavP-UTP Underwater transponder aiding to one or more transponders.
- Terrain based navigation.
- SAS micronavigation.

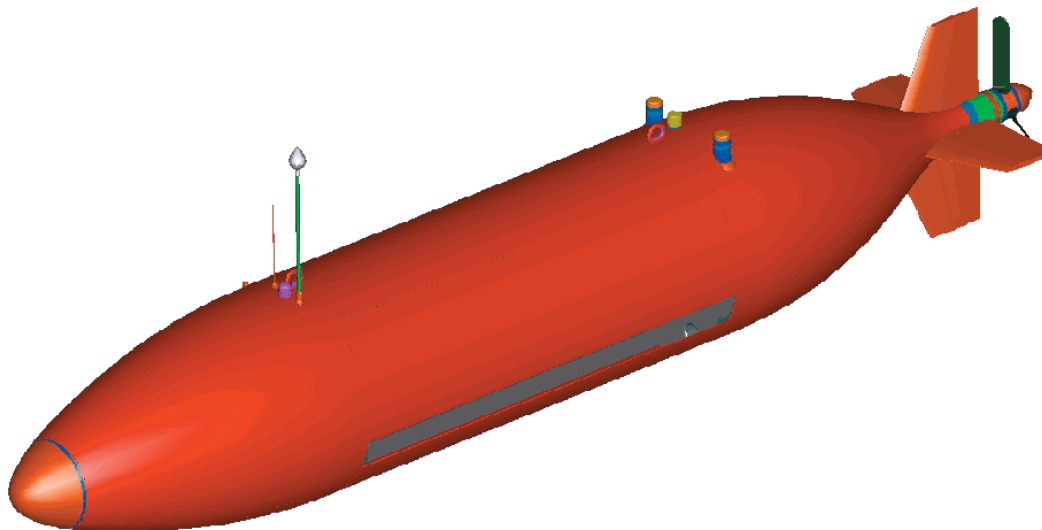


The Hugin Operator Station/ Operation and mission planning

Payload sensors with accessories

The payload sensors configuration for HUGIN 1000 is flexible and customer adjustable based on a plug and play philosophy.

Payloads interfaced are: Multibeam bathymetric Echosounder, Sidescan Sonar, Sub Bottom Profiler, Synthetic Aperture Sonar, Fishery Research Echosounder, CTD.



The Hugin 1000 vehicle

SSA 80

Functional specifications

| | |
|------------------------------------|------------------------|
| Operational frequency..... | 116 kHz |
| Range scale | 50 to 2000 meters |
| Tilt:..... | +10 to -60 deg |
| Source level..... | 210 dB / 1 µPa |
| Detection range, 0 dB target | 750 m |
| Transmitter channels | 240 |
| Receiver channels | 480 |
| Beam stabilisation..... | ±20 deg roll and pitch |

Hull unit

| | |
|----------------------------|------------|
| Transducer deployment..... | 1000 mm |
| Time to hoist | 23 seconds |
| Maximum vessel speed..... | 20 knots |

EM 3002

Operational specifications

| | |
|-----------------------------------|-------------------|
| Frequencies | 293, 300, 307 kHz |
| Number of beams: | |
| Single sonar head..... | Max 254 |
| Dual sonar heads..... | Max 508 |
| Maximum ping rate..... | 40 Hz |
| Maximum angular coverage: | |
| Single sonar head..... | 130 degrees |
| Dual sonar heads..... | 200 degrees |
| Pitch and roll stabilisation..... | Yes |
| Heave compensation | Yes |
| Depth range..... | 0.5 to 150 m |
| Depth resolution..... | 1 cm |
| Transducer geometry..... | Mills cross |

HUGIN

Basic vehicle specifications

| | |
|--|----------------------|
| Operational depth:..... | 0 to 600 m |
| Length: | 4 to 5 m |
| Volume: | 1.3 m ³ |
| Weight in air:..... | approximately 650 kg |
| Min / max speed:..... | 2 to 5 knots |
| Total energy content of battery: | Modular, 3 to 15 kWh |
| Vehicle endurance: | Up to 24 hours |

Communication links

- Acoustic control link and acoustic data link
- Acoustic emergency link (integrated with HiPAP)
- Radio Frequency link
- Satellite communication system (option)
- WLAN radio Ethernet link (option)

Transducer array

| | |
|-----------------------|--------------|
| Shape..... | Cylindrical |
| No. of elements | 480 |
| Horizontal beam..... | 9 or 360 deg |
| Vertical beam | 8 or 60 deg |

Interfaces

Speed log, Gyro, GPS, Echo sounder, Tactical system

Presentation

| | |
|----------------------------|----------------------|
| Display | 18" or 20" LCD |
| Colours..... | 16 or 64 |
| Echo presentation..... | Weak, Normal, Strong |
| No. of colour schemes..... | 7 |
| No. of display modes | 8 |

Beam pattern Equidistant or equiangular
Beamforming:

- Time delay with shading
- Dynamically focused receive beams

Seabed image data

- Composed from beamformed signal amplitudes
- Range resolution 5 cm.
- Compensated for source level and receiver sensitivity, as well as attenuation and spherical spreading in the water column.
- Amplitude resolution: 0.5 dB.

Navigation system and sensors

- Aided Inertial Navigation System
 - Inertial Measurement Unit
 - Doppler Velocity Log
 - Pressure Sensor
 - Acoustic Navigation transponder with transducers on top and underneath
- Separate altitude and forward-looking echo sounder
- Single or multiple transponder navigation system
- Differential Global Positioning System, dGPS
- Terrain navigation (option)
- SAS micronavigation (option)

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