



The SUBSEA newsletter

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Season's Greetings



Kongsberg Maritime wishes to thank all customers and partners for a valuable collaboration throughout the year.

This holiday season the companies comprising Kongsberg Maritime have decided to donate the funds traditionally set aside for gift to business associates.

*SOS Children's Village have been
named as the recipients.*

New multibeam echo sounder chosen for Swedish icebreaker

Kongsberg Maritime has been awarded a NOK 20 million contract to provide an EM 122 1°x1° multibeam hydrographic echo sounder and one 3° SBP 120 sub bottom profiler to the University of Stockholm and the University of Gothenburg, Sweden. The Knut and Alice Wallenberg foundation have financed the purchase together with the Swedish Research Council.

The system is to be installed on the Icebreaker 'ODEN', which is owned and managed by the Swedish Maritime Administration, Norrköping, Sweden. ODEN, built by Götaverken-Arendal in Gothenburg in 1987 is a 107m icebreaker vessel with 19 crewmembers and a top-speed of 15 knots.

The EM 122 12 kHz multibeam echo sounder is designed to perform seabed mapping – bathymetry and seabed imagery – to full ocean depth with an unsurpassed resolution, coverage and accuracy. It represents a major improvement from previous models by offering

significantly larger swath width, improved data density, and greatly improved resolution. Beam focusing is applied both during reception and transmission and the EM 122 is equipped with a function to reduce the transmission power in order to avoid hurting mammals if they are close by.

The receive transducer is wideband. In conjunction with a separate low frequency transmit transducer; the EM 122 can deliver sub-bottom profiling capabilities with a very narrow beam-width, using the SBP 120 Sub-Bottom Profiler (optional). If fitted on an icebreaker such as ODEN, the system can be fitted with ice-windows to prevent the transducers from being damaged during ice-breaking.

ODEN is one of seven icebreakers operated by the Swedish Maritime Administration. Designed for escort ice-breaking and Arctic research operations, ODEN is very flexible, carrying scientific equipment, container labs, frozen storage, containers, and deep drilling equipment for geological purposes, etc. Her icebreaking capability



is 1.9 m level ice at 3 knots (5.5 km/h), 8 metre core ice.

ODEN has regularly carried out scientific expeditions to the central Arctic Ocean since 1991 and the new multibeam has been installed to enhance the icebreaker's scientific survey capability. The first multibeam mapping expeditions will take place in 2007 and include the completely unexplored areas north of Greenland.

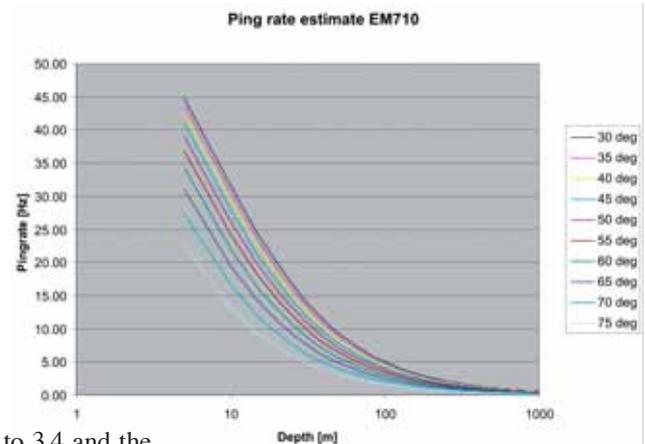
There is now an established cooperation agreement between National Science Foundation (NSF), the Swedish Polar Research Secretariat and the Swedish Maritime Administration concerning the Icebreaker 'ODEN' in Antarctic for the next season, opening the passage in to the American research center McMurdo, by the Ross Sea in Antarctic.

EM 710 0.5x1 is defining a new resolution standard for bathymetric surveys

One of the goals when we developed the EM 710 0.5x1 multibeam echo sounder system was to offer to the market a higher standard of resolution than previously possible. The improved resolution is provided by the 0.5 degree, focussed transmit beam - in combination with high density processing applied to the high number of dynamically focussed receive beams. The 0.5 degree transmit beam has a very small footprint, only 85cm long at 100m depth. So in order to ensure 100% bottom coverage even at high survey speeds we developed a new scheme by which 2 complete sounding profiles are generated for each ping cycle. By reducing the swath width, the operator can also increase the ping rate, see the graph.

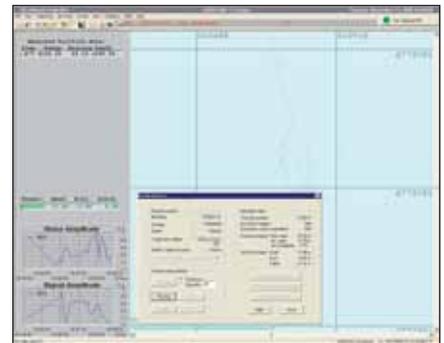
So at 100m depth, with full swath width +/-70 degrees the system has 2 pings per second, or 4 sounding profiles. The maximum survey speed while maintaining 100% bottom coverage is then 3.4 m/sec or 6.8 knots. By reducing the swath width to +/- 55 degrees, the ping rate is increased to 3.4 and the survey speed can then be raised to 11.5 knots. Each sounding profile consists of 400 soundings.

In spite of the relatively high production cost of this top model of the EM 710, the systems high performance has caught



a lot of interest. It seems that EM 710 0.5x1 will be the standard tool for hull mounted bathymetric sensor systems in the North Sea in the future, and also for many of our challenging users in North America.

Successful comparison of SSBL (USBL) systems by IFREMER



During five days in November 2006, IFREMER, French Research Institute for Exploitation of the Sea, tested both the Sonardyne Fusion BigHead system and the Kongsberg HiPAP 500 SSBL (USBL) system onboard the vessel L'Europe in the Mediterranean. The major goal of the trial was to evaluate and compare acoustic positioning system performance from different vendors. The quality and repeatability of the positioning was monitored and logged by Ifremer throughout the trial.

The HiPAP 500 system was mounted on an over the side pole designed and installed by Ifremer. High accuracy dGPS, heading, roll and pitch sensor data was interfaced to the HiPAP. A low power multifunction positioning transponder,

MPT399/DTR, with floating collar was deployed on the seabed. All positioning tests were done in water depths close to 1200m.

The unique HiPAP 500 transducer features many more elements than any of its competitors and provides a much larger operating area below the vessel (even upwards), increased acoustical and mathematical redundancy, improved noise suppression and by far the best accuracy. The angle accuracy of the HiPAP 500 is the same within the complete 200 degrees operating area.

The HiPAP system lived up to all its expectations during the complete trial with respect to friendliness in installation, configuration, calibration and

operation. Furthermore the HiPAP proved its accuracy, repeatability and positioning capabilities even in horizontal directions. At 1200m of water the transponder was positioned within a radius of 2,1m. During the mission the transponder was positioned within a range of more than 4200m, 74 degrees from vertical, and with accuracy within the specifications. When releasing the transponder the Ifremer crew was able to track the transponder all the way up to the surface, and even when it was floating horizontally at the surface waiting to be picked up.

For more information about the trial please contact Dr. Patrick Arzelies, arzelies@ifremer.fr, or subsea@kongsberg.com.



New Hydrographic product sales manager

Helge Uhlen has been appointed as the Product Sales Manager for KM Hydrographic products, starting from 1st December 2006.

Helge is 38 years old, he is educated

as an electronic engineer, and has several years of experience as a service engineer for hydrographic products. Presently he is Area Sales manager Scandinavia, Germany, UK, and Africa.

HUGIN – best in depth test



“The HUGIN is better, faster and less expensive than any other semi-submersible. It surveys the seabed at half the price and one quarter of the time used by other autonomous semi-submersibles,” according to Dave Alleman of the US offshore survey company C & C Technologies. His brother Pete agrees.

For C & C Technologies, the HUGIN has been an unmitigated success. About 5 or 6 years ago, they put their proprietary technology on the back burner and chose rather to concentrate on KONGSBERG’s HUGIN AUV 3000 (Autonomous Underwater Vehicle). They have never regretted it. They are currently buying their third HUGIN AUV, a HUGIN 4500 that can survey at depths all the way down to 4500 m.

HUGIN does it deeper

Kongsberg Maritime is the only player on the commercial market that can supply autonomous semi-submersibles to survey the seabed down to a depth of 4500 m.

“There are other semi-submersibles, but none that can compete with the HUGIN in difficult areas or in waters at depths

all the way down to 4500 m. Nor is there any other underwater vehicle that can obtain such accurate readings from the seabed,” underlines Pete Alleman, the man in charge of seabed surveying at C & C Technologies. The US offshore survey company has used HUGIN to chart the seabed for oil companies that operate in West Africa, the Gulf of Mexico, Brazil, the Mediterranean and Australia. “Our job is to survey the seabed where the oil companies plan to build underwater installations. With HUGIN’s precision measurements, we can give the oil companies detailed information about the seabed and conditions there,” states Alleman.

In addition to significantly more accurate mapping facilities, the autonomous vessel operates considerably faster.

“What it used to take two to three weeks to survey, we do in five days with HUGIN. This helps to increase the efficiency of development projects and seabed installations,” continues Dave Alleman who is responsible for the procurement of the HUGIN 4500. C & C Technologies also uses the vessels to inspect subsea instal-

lations once they are in place. The Alleman brothers are convinced this will be a growth area in the years ahead.

More capacity

C & C Technologies has cooperated with Kongsberg Maritime on the development of the HUGIN 4500. Pete and Dave Alleman have been in Horten this autumn to test and pick up C & C’s third HUGIN. To make it easier for the customer to maintain the vessel, Kongsberg Maritime invited the brothers to take part in the setting up and testing.

“Together, we have just conducted a 48-hour test in the waters outside Horten. After we corrected the balance of the ballast, the vessel worked perfectly,” points out Karstein Vestgård, manager of the AUV department at Kongsberg Maritime.

Not only can the new HUGIN AUV 4500 dive 1.5 kilometres further down to survey the seabed at a depth of 4500 m, the technology has also been further improved.

“We have extended battery capacity by 30 per cent and installed more advanced sonar and echo sounder systems that feature higher resolution and more precise measurements.”

Altogether, HUGIN has surveyed a distance of 120,000 kilometres of seabed for offshore survey companies. That is equivalent to sailing around the world at the equator about three times over! Vestgård is confident that oceanography and environmental surveillance will be new and important markets for HUGIN, with special emphasis on the High North.

“One important step in the development of HUGIN is that it is geared towards several applications and markets, including military and commercial activities alike. These two markets are in a win-win situation due to continuous further development and improvements of the product,” explains Vestgård.

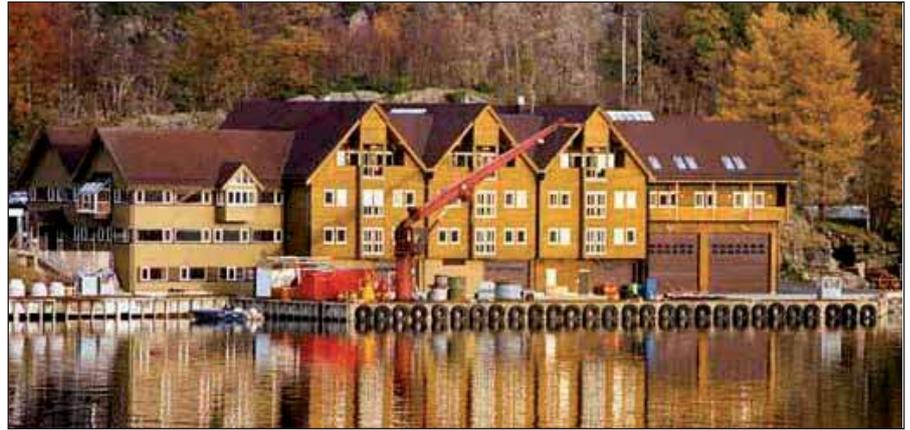
See www.kongsberg.com for further information about HUGIN.

Geoconsult AS

Geoconsult AS has placed a new order worth 18mill NOK for delivery of one EM 122 1x2, one SBP 120 6 degree and for two EM 710 0.5x1 systems. The first EM 710 is for delivery in December 2006, while the rest of the package will be delivered in 2007.

The equipment will be installed in a gondola on Geoconsult's newly acquired vessel, "GEOGRAF II".

Geoconsult is a well known and highly skilled survey company located on the



western-coast of Norway, 8 km outside Bergen. The company was established in 1979 by Hans M. Gravdal. Today

Geoconsult has access to 17 vessels through the sister company Geoshipping AS.

Marin Mätteknik AB

The Oceanographic and Hydrographic Research Vessel M/V "Franklin", owned by Marin Mätteknik AB of Sweden, is to be fitted with a gondola mounted EM 710 0.5 x1 system with delivery in January 2007. This order follows two contracts for EM 3002 dual head systems fitted to their survey vessels "M/V Triad" and "Ping".

Established in 1976, Marin Mätteknik AB is a Swedish company located in Gothenburg, specialising in delivering high resolution bathymetry data. The company offers a wide range of high resolution technical solutions for seafloor and sub bottom mapping.



Norwegian Defence Research Establishment to replace EM 1002 for new EM 710

The Norwegian Defence Research Establishment (FFI) will replace the existing EM 1002 on the HU 'Sverdrup II' for an EM 710, 0.5 x 1.0 degree system. The transducers will be blister mounted in the vessel's hull, with delivery of the equipment scheduled for March 2007.

FFI is a leading world-class defence technology centre and is the prime institution responsible for defence-related research in Norway. Located at Kjeller, 2 km north of Lillestrøm and 25 km from Oslo, they also have a research unit in Horten.



HiPAP/HAIN delivers on the Atlantis Z-Node Placement &

Date	Oct 2005- Feb 2006
Field Operator	Bp
Main Contractor:	Fairfield Industries – Houston
Survey Co:	GeoCentury Inc / Canyon Offshore
Task:	Installation and fast recovery of remote seismic Z-nodes
Location:	Atlantis Field, Gulf of Mexico
Water Depth:	1,200 - 2,300 metres
Systems:	USBL HiPAP 500 & ROV mounted HAIN System/Doppler profiler/depth sensor
No of seismic nodes:	Total of 900 nodes were installed by ROV, at 1,800 pre-designated points on the seabed.
Type of ROV used:	Triton XLS Workclass ROV's on board the M/V Northern Canyon

General description of project

The Atlantis ocean bottom seismic (OBS) project collected wide-azimuth seismic data from the deepwater Gulf of Mexico locations using over 900 autonomous nodes, which were deployed & retrieved from the sea floor by ROV. The rugged seabed topography posed real challenges, since the Sigsbee Escarpment, which crossed the area, has depths that vary from 1,200m to 2,300m.

The project required precise and highly repeatable navigational data to position & retrieve the nodes efficiently. The navigation technique/solution selected was the HiPAP USBL/Hydro-acoustic Aided Inertial Navigation (HAIN) Subsea system, operating on two ROVs operating simultaneously. Detailed bathymetric data was required to allow the nodes to be positioned in relatively flat terrain, a maximum slope of 10 degrees being acceptable.

A total of nearly 1800 node seabed deployments and recoveries were made with the nodes being placed in a hexagonal pattern approx 400metres apart. Nodes were deployed and recovered in a 28 day cycle.

The quality and repeatability of the HAIN Subsea positioning throughout the project was monitored using comparisons between the deployed and recovered node locations.

The positional data gave no indication

of which ROV was employed either for deployment or recovery of the nodes and this created a remarkable cumulative data set that reflected various vessel headings, sea states, acoustic conditions and GPS satellite constellations. However regardless of the variations in these conditions as they prevailed during the derivation of the node seabed positions, the results indicated an extremely high quality of subsea positioning.



Triton XLS ROV: Canyon Offshore Triton XLS02 ROV with an attached seabed node skid



Seabed Z-Node

Integrated Subsea Navigation.

Navigation and the acquisition of survey and node data involved an innovative approach. Highly repeatable subsea positioning was required in deep water without the use of long baseline acoustics. To facilitate the real-time navigation accuracy required, the subsea positioning team employed a dual ROV HAIN system. The HAIN system accepted input from a large array of survey sensors: an inertial motion unit (IMU), a Doppler velocity log (DVL), an acoustic bathymetry unit, a subsea gyro, a pitch and roll sensor, and the vessel's HiPAP ultra short baseline (USBL) system. The HAIN system also took data input from the vessel's surface positioning: GPS, surface survey gyro, and motion reference unit (MRU). All this data is synchronized to UTC time using a GPS 1 pulse-per-second (PPS) signal

Initial checks on the HAIN Subsea Positioning

The quality and performance of the HiPAP/HAIN system was initially checked on location by comparison between a BP-provided control location (Well DC3 - 1300 metres depth) and a HAIN-derived position average. The HAIN solution was processed from data collected from a stationary ROV, offset and next to the well. Several approaches were made to the same well site. The difference in position was as shown in Table 1.

For the project, the HAIN system em-

Recovery Project

Table 1: Differences between well and HAIN-derived positions

	Depth	Easting (UTM) m	Northing (UTM) m
Provided DC3	1300m	793720.08	3017469.77
HAIN-Derived DC3		793720.77	3017469.31
Difference		+0.69 m	-0.46 m

ployed a modified Kalman filter process designed to accept the variable stop-and-go dynamics of an ROV. The HAIN software had originally been designed for platforms with relatively constant velocities, low accelerations, and intermittent stops. This project involved inconsistent velocities, rapid accelerations and decelerations, and a lot of stops to deploy and recover the seabed node.

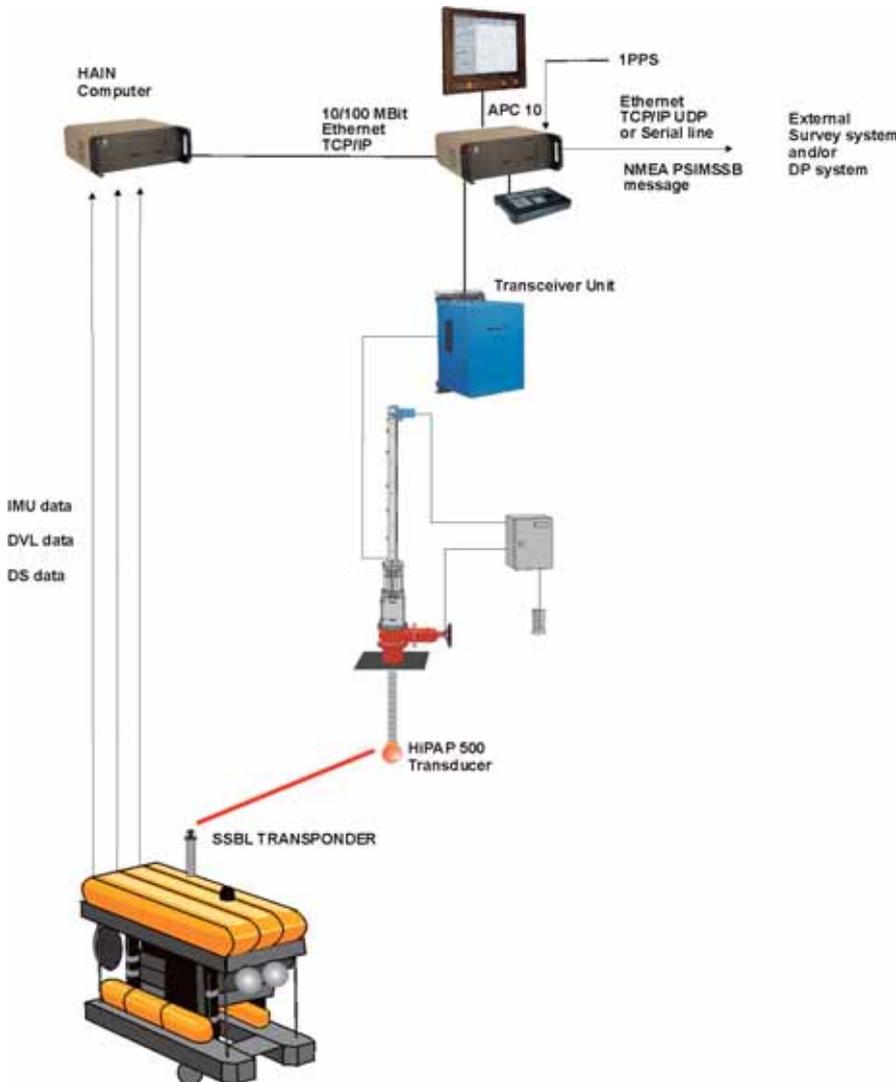
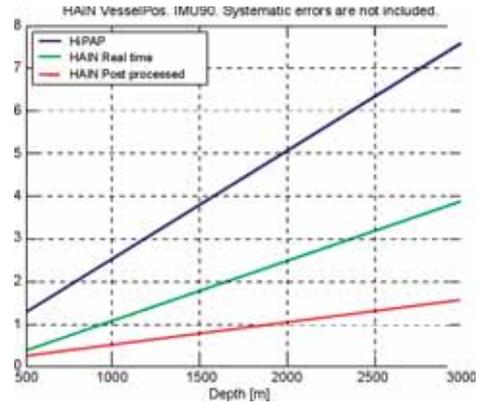
This level of relative accuracy was measured in terms of comparing the horizontal positions reported between the

initial placement and the subsequent recovery of a seabed node location. The dual ROV HAIN system approach provided the precise location of the seabed nodes demanded to minimize the installation and recovery time. Routine unaided USBL positioning would not have provided this level of positioning repeatability.

After an initial offshore trial and system configuration, the HiPAP/ HAIN Sub-sea system delivered a consistent relative position solution of better than one

meter in water depths of 2,000 m.

Kongsberg Maritime wish to thank GeoCentury Ltd for their permission to use extracts from their own project paper which was presented at OTC 06, Paper no 17980.



Acergy AS



A high resolution EM 710 system has been purchased by Acergy AS for use in the North Sea. The EM710 system will be fitted to the new build vessel "Acergy Viking". Scheduled for delivery in May 2007, the transducers will be fitted to the hull of the vessel.

This new addition to the Acergy fleet, currently under construction at Norwegian shipyard Flekkefjord Slipp & Maskinfabrikk AS, confirms the company's strong commitment to the Inspection, Maintenance and Repair (IMR) market in the North Sea where they currently operate the "Acergy Petrel" and the "Normand Mermaid".

Acergy are a seabed-to-surface engineering and construction contractor specialising in the worldwide offshore oil and gas industry.

Events calendar 2007:

January

09 - 12	HOMSEC, Madrid, Spain
21 - 23	InterSec, Dubai, UAE
24 - 27	Sinaval, Bilbao, Spain
30 - 31	Underwater Battle space, London, UK
30/1 - 1/2	UI, New Orleans, USA

February

18-22	IDEX, Abu Dhabi, UAE
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March

05-09	CARIS, Kuala Lumpur, Malaysia
27-29	Global Security, Singapore, Asia
27-29	Marine Construction Europe, London, UK
28-30	OMC, Ravenna, Italy

April

7-11	Hydrographic Conference, Monaco, France
16-18	Gulf Maritime, Dubai, UAE
30/4 - 3/5	OTC, Houston, Texas

May

14-17	U.S. Hydro, Virginia, USA
15-18	Imdex Asia, Singapore, Asia

June

05-07	UDT, Naples, Italy
05-08	Caspian Oil & Gas, Baku, Azerbaijan
12-14	Seawork, Southampton, UK
18-21	Oceans Europe, Aberdeen, UK
19-22	Brazil Offshore, Macae, Brazil

September

04-07	Offshore Europe, Aberdeen, UK
11-13	CIS Offshore, St. Petersburg, Russian
11-14	DSEI, London, UK
24-27	NEVA, St. Petersburg, Russian
27-28	UUUV, Southampton, UK

October

02-04	Oceans MTS/EEE, Vancouver, Canada
24-27	Kormarine, Busan, Korea

November

11-16	MAST, Genoa, Italy
06-09	Europort, Rotterdam, Holland

December

04-08	LIMA, Langkawi, Malaysia
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Welcome to FEMME 2007

During the autumn we sent out invitations to FEMME 2007. FEMME is Kongsberg Maritime's forum for all users of our multibeam echo sounder systems.

The objective of the conference is to improve the skills of the users, and the performance of the Kongsberg Multibeam Systems. We aim to achieve this through the exchange of experience and ideas among the users and the hydrographic team at Kongsberg Maritime.

Information and registration

You can find information about the program and register by using the registration form on the web page: <http://www.viaregi.no/Femme07>

Registration and submission of paper abstracts –deadline 20.12.2006 .

We hope to see you in Amsterdam in March!

Kongsberg Maritime, The Hydrography Team



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