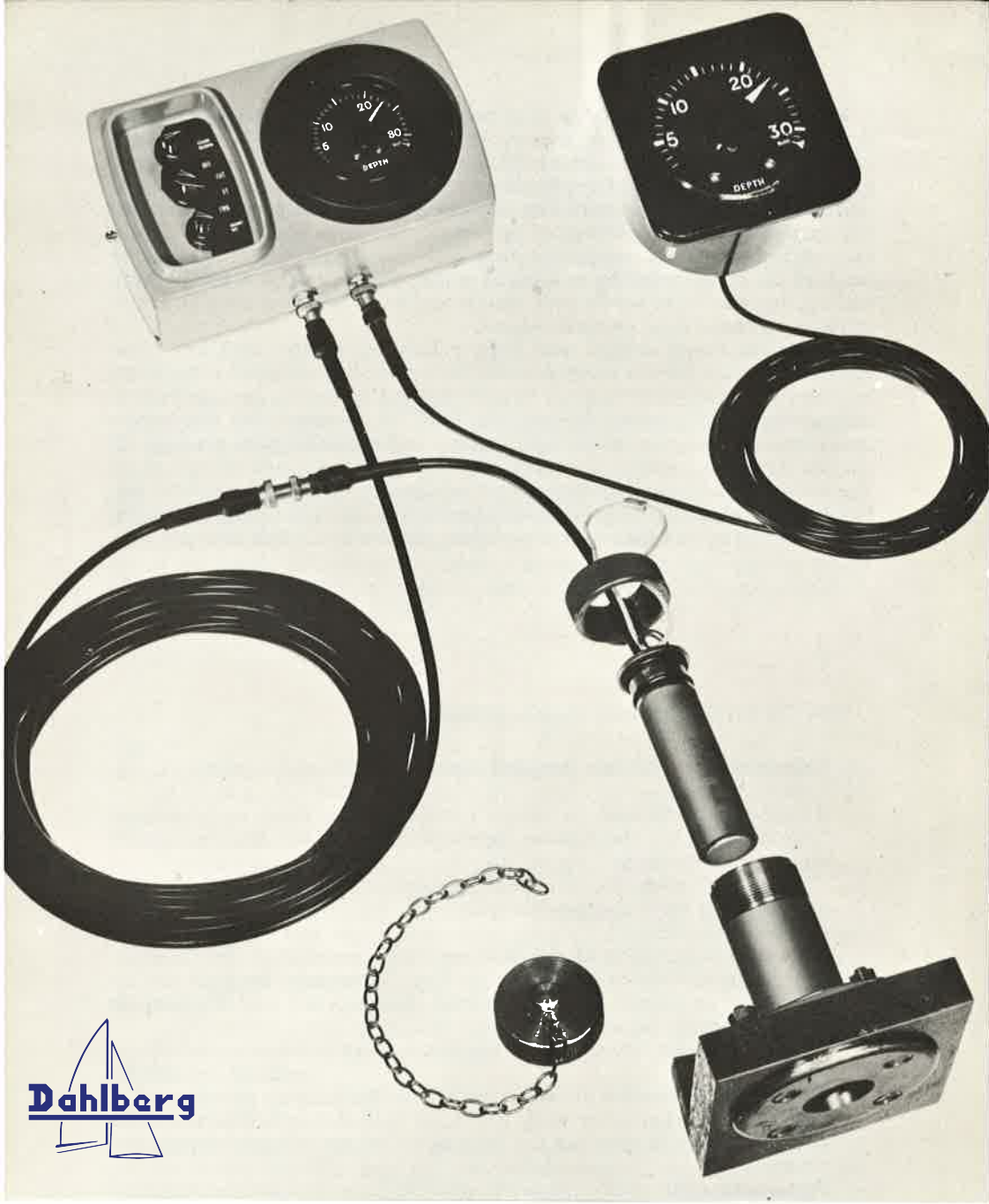

THE HECTA ... ECHO SOUNDER

BROOKES & GATEHOUSE LTD

The HECTA echo sounder is a portable transistorised instrument designed for use in a wide variety of small craft, at sea or in inland waterways, anywhere in the world. Its small size, robust construction and clear presentation of depth are essential features of an instrument which is intended for installation in sailing yachts and power boats. Its use extends from the pilotage of an estuary in fog to finding best depth for anchoring, from supplementing D.F. bearings when making a landfall in poor visibility to finding a safe depth across a bar. When racing, one can work safely over shoals and know where a deep channel with its stronger tidal current begins.

The professional design and high reliability of the HECTA echo sounder account for the large number in service in such craft as inshore survey boats, Continental river barges, R.N.L.I. lifeboats, seagoing tugs, submarines and sidewall hovercraft. HECTA incorporates electronic computing techniques to provide a clear and unambiguous reading of the sea depth on a meter indicator. This system has the advantages over the conventional rotating-lamp type of display of being visible at all levels of ambient lighting (sunshine or darkness), of enabling repeater indicators to be installed and of avoiding the use of electric motors.

HECTA has the following distinctive features:—

Compactness and low weight—$8\frac{1}{4}'' \times 4\frac{7}{8}'' \times 3\frac{3}{8}''$; $4\frac{1}{2}$ lb. (21.0 × 12.4 × 8.6 cm.; 2.0 kgm).
Meter-type indicator, in which a pointer shows depth on a circular scale as clearly as a speedometer shows the speed of a car. Illumination for night use by "betalight" if specified.
"Expanded" scale for accurate soundings in shoal water and for enabling very small changes in depth to be seen (8 feet per inch of scale or 0.96 metre per cm.).
Remote presentation of depth. A separate repeater of 4″ dia. (as illustrated) can be fitted in any part of the ship. Illumination for night use by "betalight" or electric lamp, as required. This repeater may alternatively be of the pen-on-paper recording type.
Very low power consumption as shown in table below under "Description".
Immediate operation at switch-on (i.e. no warming-up period).
Very small transducer unit, practically flush-fitting to the hull. The transducer may be removed for cleaning or storage without slipping the vessel.
Automatic control of sensitivity according to the strength of the sea-bed echo, thus avoiding the need for frequent adjustment of the manual sensitivity control (U.K. Patent Application No. 32781/66).

DESCRIPTION

Control Unit

Four models are available. Their calibration and type of power supply is shown in the following table:—

MODEL	CALIBRATION	POWER SUPPLY
FB	2.5 to 32 feet 2.5 to 32 fathoms	Internal battery of four standard mercury cells, current drain 0.02 A. Average life 130 hours
FS	2.5 to 32 feet 2.5 to 32 fathoms 5.0 to 64 fathoms	Ship's D.C. supply of 12, 24, 32 or 36 volts. Current drain 0·10 A
MB	0.7 to 12 metres 3.5 to 60 metres	Internal battery as for model FB
MS	0.7 to 12 metres 3.5 to 60 metres 7.0 to 120 metres	Ships' D.C. supply as for model FS

Model FS or MS should always be specified for power boats, motor yachts and motor-sailers.

The ship's supply versions incorporate a transmitter of higher power than that in the battery-operated models which makes possible the use of a less sensitive echo receiver. Therefore the instrument is less liable to be affected by acoustic interference from the propellers and engines.

In all models the function switch has a "Battery Test" position which enables the meter to be used to measure the battery or ship's supply voltage.

In models FB and MB the battery cells are contained in a separate watertight compartment in the rear of the control unit. Spare cells (Mallory ZM9, Ever Ready ER9) may be kept on board without deterioration for at least one year.

The indicator has a dial of $2\frac{1}{2}''$ (6.3 cm.) diameter and the 260° scale is clearly graduated in white on a black background. The toughened glass window of the indicator is hermetically sealed around its edge.

A screwdriver-operated control is provided in the rear cover which one adjusts according to the depth at which the transducer is installed below the waterline, so that the instrument always records the true depth of water.

The sockets in the control unit and the cable plugs, by which external connections are made, are watertight and are either palladium plated or anodised to resist corrosion by sea water. A bracket in teak with stainless steel fasteners is provided, by means of which the control unit may be quickly fixed to a bulkhead.

The control unit case, which is die-cast in aluminium alloy and nylon-coated, is hermetically sealed to give an indefinitely long life to the electrical components in all climates and under all conditions of use. Sixteen transistors are employed, all of which are of silicon planar construction.

Transducer and housing

The active and electrical elements of the transducer are contained in a glass-fibre tube sealed to a bronze cap. The cap is fitted with neoprene O-rings to ensure a watertight fit in the transducer housing. The transducer may be inserted or withdrawn while the vessel is afloat. The standard length of coaxial electric cable supplied with the transducer is 20 ft. (6 m.) but any length can be supplied to order. There are five types of transducer housing available:–

1. The standard, valveless, housing which is used in most sailing yachts and shallow-draught vessels. The external diameter is $1\frac{5}{8}$" (4.1 cm.).
2. A rotary-valve type housing which permits the transducer to be inserted or withdrawn without admitting water. This type should always be specified for deep-draught vessels.
3. Similar to the above, but with a sliding sea valve, to meet Lloyd's requirements for passenger-carrying vessels.
4. A special valveless type housing with an external fairing block to accommodate a long-reach transducer. This housing is essential in high-speed power boats.
5. A valveless housing, without a flange, suitable for moulding-in to a G.R.P. hull during construction.

The standard type 1 above is available in four versions, designated by the angle of rake of the housing tube with respect to its flange. The angles are 0°, 10°, 20° and 30° which accommodate bilge deadrise angles varying from flat to 45° without the need to use packing wedges.

All housings are provided with a screw cap to seal off the housing when the transducer is not in place.

SELECTION OF TRANSDUCER

Sailing yachts—two transducers should be fitted, one on each side of the keel, and the appropriate housing should be selected to cause the axis of the tube to diverge by about 12° from the yacht's vertical centre-line. An automatically-operated switch is supplied which connects the lee-side transducer to the control unit when the yacht is heeled.

High-speed power boats—only one transducer is required. Since aeration often exists beneath the hull, the transducer must extend below the outer surface of the hull (by about 2" [5.1 cm.]) if soundings are to be obtained at moderate or high speeds. A special long-reach transducer is available which must be used with the powerboat housing, type 4 above.

Motor yachts of moderate to deep draught—one transducer in conjunction with the valve-type housing, 2 above. The axis of the transducer should be approximately vertical and its lower surface slightly projecting from the hull. This is achieved by fitting a packing piece inside the hull.

Motor yachts of shoal draught, lifeboats, etc.—a special long-reach transducer with matching housing and a teak fairing block which is sufficiently robust to withstand contact with a beach on grounding. Projection of the transducer from the bottom is necessary to penetrate the aeration layer in rough water.

The Repeater

A separate, slave, indicator of 4″ (10.1 cm.) dia., as illustrated on the front cover, can be fitted in any part of the ship; normally close to the helmsman. It is sealed to prevent the ingress of water and is illuminated by "betalights", which are fixed to the main graduations and to the pointer, or by a special electric lamp which can be supplied as an extra, if required. The case of the repeater is of corrosion-resistant, anodised aluminium alloy. A socket is provided on the control unit to provide connection to the repeater.

Principle of operation

The active part of the transducer, a disc of barium titanate, is used both as a loudspeaker and a microphone. It transmits pulses of ultrasonic sound at 177 kHz into the water at a constant repetition rate, and it receives echoes from the sea-bed at the same rate. The time difference between the transmission of a pulse and the reception of its echo is measured by electronic circuits which deliver current to the meter, the value of which is proportional to the time difference and hence to the depth of water. The instrument is calibrated for use in sea water, the velocity of travel of sound waves in this medium being taken as 4,900 ft./sec. (1,494.5 m./sec.). Instruments can be specially calibrated at the factory for use in fresh water.

SPECIFICATION

Size—

Transducer housing (Valveless type): $1\frac{5}{8}$″ outside diameter × 4″ long (4.1 × 10.1 cm.) Instrument case: $8\frac{1}{4}$″ × $4\frac{7}{8}$″ × $3\frac{3}{8}$″ overall (21.0 × 12.4 × 8.6 cm.).

Weight—

Transducer and housing (valveless type): $4\frac{3}{4}$ lb. (1.9 kgm.).
Instrument case: $4\frac{1}{2}$ lb. (2.0 kgm.).

Power Supply—

Internal 5.6 volt dry battery comprising four Mallory ZM9 or similar mercury cells. Current drain is 20 mA. Alternatively, ship's D.C. supply at 12, 24, 32 or 36 volts.

Accuracy—

$\pm 5\%$ of the depth, or 9″, whichever is the greater, subject to corrections for extremes of sea temperature and salinity.

Minimum Range—

2.5 feet (0.7 metre) below transducer.

Mechanical Design—

Hermetically-sealed case of aluminium alloy, type LM6, coated in nylon by fusion. All fastenings and the battery contacts are of stainless steel. Plugs and sockets are palladium plated brass. Transducer housing is in aluminium bronze.

GUARANTEED FOR THREE YEARS

BROOKES & GATEHOUSE LTD

Bath Road, Lymington, Hants, SO4 9YP, England. Tel.: Lymington 4252