



## CERTIFICATE OF TYPE APPROVAL

(EC Certificate of Type Examination - Module B)  
(Marine Equipment Directive - 96/98/EC, as amended\*1)

**Applicant:-**  
Kelvin Hughes Ltd  
New North Road, Hainault  
Ilford, Essex IG6 2UR  
United Kingdom

**Manufacturer:-**  
Kelvin Hughes Ltd  
New North Road, Hainault  
Ilford, Essex IG6 2UR  
United Kingdom

This is to certify that the applicant has submitted details of a:-

**Shipborne Radar Equipment (IEC 62388 Cat 1 & Cat 1C)**  
(COMMISSION DIRECTIVE 2009/26/EC – ITEM A.1/4.34 & ITEM A.1/4.38)

Of system types known and designated as:-

- a) SharpEye™ MantaDigital™ S-Band Marine Radar, CAT1 Systems
  - b) SharpEye™ MantaDigital™ S-Band Marine Chart Radar, CAT1C Systems
- (Comprising component parts and having technical characteristics shown in schedule 2 to 5)

and that these have been assessed, tested and when used in a combination of component parts as described in the attached schedules, is CERTIFIED as complying with the relevant parts of:

- IEC 62388 : 2008, "Marine Shipborne Radar Equipment"
- IEC 60945 : 2002, "General Requirements for Marine Navigation Equipment"
- IEC 62288 : 2008 "Presentation of navigation-related information on shipborne navigational displays"  
(being testing standards listed in column 5 of Annex A.1 of Directive 2009/26/EC for Item 4.34)

Note: The presentation standard of this equipment has been assessed against clauses in IEC 62388:2008 derived from IMO Resolution MSC.191(79) and which equate those published in IEC 62288:2008.

It is also RECOGNISED that the equipment conforms to performance standards not inferior to those adopted by the International Maritime Organisation, and which are contained in the relevant parts of Resolution MSC.191(79), Resolution MSC.192(79) and Resolution A694(17).

**SIGNED:**

**P J Goddard** Authorised Signatory  
for and on behalf of QinetiQ Ltd

**DATE of ISSUE:** 20<sup>th</sup> September 2010

**DATE of EXPIRY:** 19<sup>th</sup> September 2015

**Certificate Number:** QQ-MED-13/10-01

EU/USCG Mutual Recognition Agreement  
Council Decision 2004/425/EC

**USCG Approval Number:** 165.120/EC0191/1310-01  
(applies to Item A.1/4.34 ARPA (Tracking CAT1), display and function only)

This Certificate is Valid until expiry date shown, subject to the standard conditions of issue printed on page 6  
Kelvin Hughes Ltd are Module D registered with QinetiQ in accord with standard condition 3, ref; Certificate DQAS-06/01-KH001R4

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX



Maritime and Coastguard Agency  
The MCA is an Executive Agency of  
the Department for Transport

*Under the terms of the United Kingdom Statutory Instrument, No 1957 : 1999, QinetiQ Ltd has been Notified to the European Commission by the Maritime and Coastguard Agency as a Body authorised to conduct Conformity Assessment procedures under the provisions of the European Council Directive 96/98/EC (as amended) on Marine Equipment and issue Certificates of Type Approval.*



# Schedule 1

## Statement on New “Radar Systems” Standard IEC 62388

The International Maritime Organisation (IMO) adopted RESOLUTION MSC.192(79) on 6 December 2004 On the REVISED PERFORMANCE STANDARDS FOR RADAR EQUIPMENT. These standards are mandated to be implemented on or after 1<sup>st</sup> July 2008.

The Scope recognised that radar should provide the integration and display of radar video, target tracking information, positional data derived from own ships position (EPFS) and geo referenced data. The integration and display of AIS information should be provided to complement radar. The capability of displaying selected parts of Electronic Navigation Charts and other vector chart information may be provided to aid navigation and for position monitoring.

Contained within MSC.192(79) were details of the Differences in the performance requirements for various sizes/categories of ship/craft to which SOLAS applies, these were contained in TABLE 1.

Size of ship/craft	Cat 3	Cat 2	Cat 1
	<500 gt	500 gt to <10,000 gt and HSC<10,000 gt	All ships/craft ≥10,000 gt
Minimum operational display area diameter	180mm Dia.	250mm Dia	320mm Dia
Minimum display area	195 x 195 mm	270 x 270 mm	340 x 340 mm
Auto acquisition of targets	-	-	Yes
Minimum <b>acquired</b> radar target capacity	20	30	40
Minimum <b>activated</b> AIS target capacity	20	30	40
Minimum <b>sleeping</b> AIS target capacity	100	150	200
Trial Manoeuvre	-	-	Yes

In addition radar equipment can optionally conform to two other sets of performance criteria for High Speed Craft and/or for electronic chart display.

IMO resolution MSC.192(79) performance standard was taken by the International Electrotechnical Standards Organisation (IEC) and turned into the International Standard IEC 62388, first edition 2008.

IEC 62388 replaces 7 other standards that covered the various aspects of radar performance; these were IEC 60936-1, IEC 60936-2, IEC 60936-3, IEC 60936-5, IEC 60872-1, IEC 60872-2 and IEC 60872-3.

The Marine Equipment Directive (96/98/EC) details the European procedure for conformity assessment and approval for the range of IMO mandated marine equipment. The particular requirements for each equipment item is listed and the test requirement is detailed in the Equipment Annexes. Current version being contained in 5<sup>th</sup> Amending Directive, 2009/26/EC which contains the International Instruments and testing standards in their up-to-date version and allocated to existing MED equipment item numbers for radar equipment as detailed below.

MED Item.	Previous Description 4 <sup>th</sup> Amendment & earlier	IEC 62388 Category & 5 <sup>th</sup> Amendment listing	Radar Display area
A.1/4.34	Radar with ARPA	Cat 1	320mm Dia.
A.1/4.35	Radar with ATA	Cat 2	250mm Dia.
A.1/4.36	Radar with EPA	Cat 3 (EPA no longer accepted)	180mm Dia.
A.1/4.37	HSC with ARPA	Cat 1H	320mm Dia.
A.1/4.37	HSC with ARPA	Cat 2H	250mm Dia.
A.1/4.38	Chart Radar (HSC Radar with ATA No longer used)	Additional. Suffix 'C' on Cat 1, Cat 2, Cat1H or Cat 2H above	

### Presentation Standard – IMO Resolution MSC.191(79) and IEC 62288

IEC 62388 was also written to include all the appropriate Presentation criteria and performance standards for a shipborne navigation displays as detailed in IMO Resolution MSC.191(79) and therefore any radar assessed by the QinetiQ Notified Body as compliant with IEC 62388 is also deemed to have presentation standards compliant with Resolution MSC.191(79) and is also recognised as compliant with identical standards for presentation of Radar equipment contained in IEC 62288:2008.

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-13/10-01**



## Schedule 2a –Category 1 Radar

### SharpEye™, MantaDigital™ Radar Displays & Processor, CAT1 Systems

The applicant declared that the following units form the radar processing and display section of the system designation a), given on Page 1. These units have been assessed & tested, and satisfactory details of these units were included in the technical file.

The resultant radar systems are consistent with the Item Descriptions A1/4.34, given in Annex A1 of Commission Directive 2009/26/EC and Category 1 of MSC.192(79) and IEC 62388.

SYSTEM comprising of:-

MantaDigital™ 26" Display & Radar Processor (Pedestal Unit including Trackerball)	<b>MDD-A1-26</b>	<b>*1</b>
or MantaDigital™ 26" Desktop Display (including Trackerball)	<b>MDD-A30-26</b>	<b>*1</b>
and MantaDigital™ Radar Processor	<b>MDP-A1</b>	
or MantaDigital™ 26" Console Display	<b>MDD-A20-26</b>	<b>*2</b>
and MantaDigital™ Radar Processor	<b>MDP-A1</b>	
and MantaDigital™ Remote Trackerball	<b>MDD-A110</b>	<b>*2</b>
SOFTWARE:-		
MantaDigital™ Core Software (ZM-2144)	<b>Version 1.xx</b>	<b>*3</b>
Manta Transmitter interface Firmware (ZM-2114)	<b>Version 1.xx</b>	<b>*3</b>
Manta Transmitter interface FPGA (ZM-2160)	<b>Version 1.xx</b>	<b>*3</b>
Manta Display interface Firmware (ZM-2007)	<b>Version 1.xx</b>	<b>*3</b>
Manta Systems interface Firmware (ZM-2008)	<b>Version 1.xx</b>	<b>*3</b>

-----End of List-----

The system will include a suitable transceiver selected from Schedule 3 and may also include ancillary items from the list of optional items found in Schedule 4 on Page 6.

\* NOTES:-

- 1 The Trackerball unit integrated into the control area of this unit may be replaced with one of the other control options listed in Schedule 4.
- 2 These units are supplied separately for integrating into a ships bridge console. The Trackerball (MDD-A110) may be replaced with one of the other control options listed in Schedule 4.
- 3 This approval remains valid for equipment including subsequent Minor software amendments, as allowed by the N.xx format (xx represents numerals), where written details of any such modifications have been submitted to and accepted by QinetiQ.

#### Technical Characteristics

Notified Body 0191

PRESENTATION DISPLAY TYPE	26" Colour LCD	IEC 62288:2008 Category :- Full operational radar display Multi-function trackerball and on-screen controls allows quick & easy control functions and data entry.
RADAR DISPLAY CIRCLE	≥320mm	Effective Diameter
RADAR TARGET CAPACITY <b>ACQUIRED</b>	100 targets	40 minimum for Cat 1
AUTO ACQUISITION OF TARGETS	Yes	Required for Cat 1
TRIAL MANOEUVRE	Yes	Required for Cat 1
AIS TARGET CAPACITY <b>ACTIVATED SLEEPING</b>	≤500 ≤500 (500 max, any mix)	40 minimum for Cat 1 200 minimum for Cat 1
IEC 61162-1 SERIAL (NMEA) PORTS	Listener - 8 Talker - 8	Conformity to IEC 61162-1:2000. Configurable to IEC 61162-2 for AIS port.
TEMPERATURE RANGE Exposed & IEC 60945 CLASS Protected	-25°C to +70°C -15°C to +55°C.	-- Turning Units & Antenna -- All other units
POWER SOURCE	110 or 220V- AC, 50/60Hz	Internal UPS available or configure to external UPS (Kelvin Hughes recommended installation)

**Conditions of Issue of this certificate are printed on Page 8.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-13/10-01**



## Schedule 2b –Category 1C Radar SharpEye™, MantaDigital™ Displays & Chart Radar Processor, CAT1C Systems

The applicant declared that the following units form the radar processing and display section of the system designations b), given on Page 1. These units have been assessed & tested, and satisfactory details of these units were included in the technical file.

The resultant radar systems are consistent with the Item Descriptions A1/4.34 and A.1/4.38, given in Annex A1 of Commission Directive 2009/26/EC and Category 1 and 1C of MSC.192(79) and IEC 62388.

SYSTEM comprising of:-

MantaDigital™ 26" Display & Radar Processor (Pedestal Unit including Trackerball)	<b>MDD-A9-26</b>	<b>*1</b>
or MantaDigital™ 26" Desktop Display (including Trackerball)	<b>MDD-A30-26</b>	<b>*1</b>
and MantaDigital™ Radar Processor	<b>MDP-A9</b>	
or MantaDigital™ 26" Console Display	<b>MDD-A20-26</b>	<b>*2</b>
and MantaDigital™ Radar Processor	<b>MDP-A9</b>	
and MantaDigital™ Remote Trackerball	<b>MDD-A110</b>	<b>*2</b>
SOFTWARE:-		
MantaDigital™ Core Software (ZM-2144)	<b>Version 1.xx</b>	<b>*3</b>
Manta Transmitter interface Firmware (ZM-2114)	<b>Version 1.xx</b>	<b>*3</b>
Manta Transmitter interface FPGA (ZM-2160)	<b>Version 1.xx</b>	<b>*3</b>
Manta Display interface Firmware (ZM-2007)	<b>Version 1.xx</b>	<b>*3</b>
Manta Systems interface Firmware (ZM-2008)	<b>Version 1.xx</b>	<b>*3</b>

-----End of List-----

The system will include a suitable transceiver selected from Schedule 3 and may also include ancillary items from the list of optional items found in Schedule 4 on Page 6.

- 1 The Trackerball unit integrated into the control area of this unit may be replaced with one of the other control options listed in Schedule 4.
- 2 These units are supplied separately for integrating into a ships bridge console. The Trackerball (MDD-A110) may be replaced with one of the other control options listed in Schedule 4.
- 3 This approval remains valid for equipment including subsequent minor software amendments, as allowed by the N.xx format (xx represents numerals), where written details of any such modifications have been submitted to and accepted by QinetiQ.

### Technical Characteristics

Notified Body 0191

PRESENTATION DISPLAY TYPE	26" Colour LCD	IEC 62288:2008 Category :- Full operational radar display Multi-function trackerball and on-screen controls allows quick & easy control functions and data entry.
RADAR DISPLAY CIRCLE	≥320mm	Effective Diameter Radar Circle and Chart area
RADAR TARGET CAPACITY <b>ACQUIRED</b>	100 targets	40 minimum for Cat 1
AUTO ACQUISITION OF TARGETS	Yes	Required for Cat 1
TRIAL MANOEUVRE	Yes	Required for Cat 1
AIS TARGET CAPACITY <b>ACTIVATED SLEEPING</b>	≤500 ≤500 (500 max, any mix)	40 minimum for Cat 1 200 minimum for Cat 1
IEC 61162-1 SERIAL (NMEA) PORTS	Listener - 8 Talker - 8	Conformity to IEC 61162-1:2000. Configurable to IEC 61162-2 for AIS port.
TEMPERATURE RANGE Exposed & IEC 60945 CLASS Protected	-25°C to +70°C -15°C to +55°C.	-- Turning Units & Antenna -- All other units
POWER SOURCE	110 or 220V- AC, 50/60Hz	Internal UPS available or configure to external UPS (Kelvin Hughes recommended installation)

**Conditions of Issue of this certificate are printed on Page 8.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-13/10-01**



## Schedule 3 – Category 1 & 1C Radar Transceivers SharpEye™, MantaDigital™ Radar & Chart Radar Systems

The applicant declared that in conjunction with a radar display/processing equipment selected from either Schedule 2a or 2b, the following radar Transceiver units form operational Radar/Chart Radar of the system designations given on Page 1. The resulting systems have been assessed & tested, and satisfactory details of these units were included in the technical file.

**S-Band Systems:-**

SharpEye™, Solid State Transceiver/Turning Unit  
and Drive control unit  
and 3.9m, S-Band Low Profile Antenna

DTX-A1 \*1  
GTX-A24 \*1  
LPA-A3

**SOFTWARE:-** Sharpeye™ Core Software (ZM-2165) **Version 1.xx** \*2  
Sharpeye™ DTX-A101 FPGA (ZM-2166) **Version 1.xx** \*2  
Sharpeye™ DTX-A201 FPGA (ZM-2234) **Version 1.xx** \*2, 3

----- End of List -----

**\* NOTES:-**

- 1 The rotational speed of the S-Band turning unit is set in the Drive control unit to 23RPM for standard speed craft.
- 2 This approval remains valid for equipment including subsequent Minor software amendments, as allowed by the N.xx format (xx represents numerals), where written details of any such modifications have been submitted to and accepted by QinetiQ.
- 3 Revised solid state transceiver module with increased receiver signal processing power.
- 4 This certificate supersedes and replaces certificate MED-QQ-16/08-05i dated 24<sup>th</sup> November 2008.



**Technical Characteristics**

FREQUENCY OF OPERATION	2.93 to 3.07 GHz – S-Band	20MHz instantaneous bandwidth
PULSE REPETITION FREQUENCY	1220Hz, 610Hz	
PULSE LENGTHS	0.1µs, 5µs, 30 µs, & -60µs	Pulse compression and coherent pulse Doppler
EMISSION CODE	20M0F3NAN	Solid State Transmitter
POWER CHARACTERISTIC: - S-Band	170W	(PEP)
TEMPERATURE RANGE Exposed & IEC 60945 CLASS Protected	-25°C to +70°C -15°C to +55°C.	-- Turning Unit & Antenna -- All other units
POWER SOURCE	110 or 220V- AC, 50/60Hz	The S-Band turning units use a 3 phase supply.

**Conditions of Issue of this certificate are printed on Page 8.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-13/10-01**



## Certificate of Type Approval - Schedule 4

### MantaDigital™ Radar Systems - Ancillary and Optional Units

The applicant declared that the following units may be added to the basic radar systems illustrated in schedules 1 to 4. These units have been assessed & tested in conjunction with MantaDigital™ and SharpEye™ series radar systems, and satisfactory details are included in the technical files.

ANCILLARY UNITS:-

MantaDigital™ Keyboard & Trackerball	<b>MDD-A101</b>	<b>*1</b>
MantaDigital™ Control Panel & Trackerball	<b>MDD-A102</b>	<b>*1</b>
MantaDigital™ Trackerball & pencil tray	<b>MDD-A100</b>	<b>*1</b>
MantaDigital™ Remote Keyboard	<b>MDD-A130</b>	<b>*1</b>
Ergonomic Trackerball (Ergopod, right handed)	<b>NRR-A18</b>	<b>*1</b>
Ergonomic Trackerball (Ergopod, left handed)	<b>NRR-A18-2</b>	<b>*1</b>
MantaDigital™ Radar Interswitch Unit (6 display x 6 transceiver)	<b>MDD-A12</b>	
Serial Interface Module (provides 8 additional ports)	<b>FSD-A198</b>	<b>*2</b>
Dual DNC Unit	<b>FSD-A10</b>	<b>*3</b>
Network Audio & Video Control Unit	<b>FSD-A13</b>	<b>*3</b>
NTI Audio & Video Switch Matrix	<b>IT-SM-8‡-AV-LCD</b>	<b>*3, 4</b>

-----End of List-----

\* NOTES:-

- 1 These are alternative/additional control options to the standard trackerball.
- 2 This option is an internal module installed inside the MDP-A10 or MDP-A9 processor unit.
- 3 These items form a display/control interconnection system and may be used to form an adaptive workstation system between units of the MantaDigital™ radar, SharpEye™ radar and MantaDigital™ ECDIS. The exact configuration enabled by this system is fixed on commissioning in accordance with an agreed ships operating plan.
- 4 The ‡ is a numeral in the range 2 to 8 and denotes the number of display units which can be included in the interconnection system.

**Notified Body 0191**

**Conditions of Issue of this certificate are printed on page 8.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number    **QQ-MED-13/10-01**



# Certificate of Type Approval - Schedule 5

## Statement on Spurious and Out of Band Emissions and the Boundary between these emissions

The following Radar Transceiver, represents part of the systems shown on earlier schedules, has been subject to a measurement procedure as detailed in IEC 60936-1, Annex D, as contained in Amendment 1, dated July 2002 and the guidelines contained in ITU-R Recommendation RM.1177-3. This standard defines the test method and requirements for shipborne radar to meet in order to comply with Appendix S3 of the Radio Regulations and ITU-R Recommendations SM.1539-1 and SM.1541-1.

The results of the measurement procedure were satisfactory and provide sufficient evidence that these Radar Transceivers are compliant with the criteria contained in the stated standards.

The Transceivers Measured were:-

Description	Model No.	Solid-State Transceiver Module	Rotary Joint
SharpEye™, S-Band, Transceiver/ Turning Unit Software:- Sharpeye™ Core (ZM-2165) Sharpeye™ FPGA (ZM-2166)	<b>DTX-A1</b> <b>V.1.00</b> <b>V.1.00</b>	DTX-A101	GTX-A150-2

The test reports detailing the tests and test results obtained are:-  
QinetiQ/IS/ICS/CR080251/1

These reports together with manufacturers drawings and declarations also detail the build standard regarding items such as Antenna, waveguide, rotary joint and any filters fitted to the test unit which the test results specifically apply. The Sharpeye™ Transceiver is a solid state design and technical parameters may be controlled/affected by software modification hence reference to the software version used in testing.

The measurement procedure as detailed in IEC 60936-1, Annex D has since the test report above has now been included in IEC 62388 as Annex B and the requirements and ITU-R document references are identical. This statement may be taken as applicable to IEC 62388, Annex B compliance.

Post these Spurious Emissions & OoB tests Kelvin Hughes have produced a modified version of the solid-state transceiver module (part No. **DTX-A201**) and upgraded the software for the FPGA processor to **ZM-2234**. They declare that the only changes are to the received signal processing and there is no change to the transmitter circuitry or software controlling the transmitter characteristics. On that basis QinetiQ are satisfied to accept the analogy to the above compliance.

**Conditions of Issue of this certificate are printed on Page 8.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-13/10-01**



Certificates of Type Approval  
Conditions of Issue

1. Each Certificate will be used in its entirety and not reproduced in part.
2. This certificate remains valid until the date shown (normally 5 years) unless cancelled or revoked, provided:-
  - i) the design and manufacture remain unmodified from the specimen tested and recorded in the Technical Construction File;
  - ii) any conditions contained in the schedule are complied with;
  - iii) Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply;
  - iv) and, the equipment remains satisfactory in service.
3. The mark of conformity may only be affixed to the equipment listed on this certificate and a manufacturer's Declaration of Conformity issued when the production Quality Assurance requirements laid down in Annex B, of the Directive (96/98/EC) is fully complied with and controlled by a written inspection agreement with a Notified Body. The use of the QinetiQ Notified Body Number (0191) in combination with the Wheelmark implies that the manufacturer is Registered with the QinetiQ Quality Assurance Scheme. A Certificate of Registration is issued to the manufacturer and should be made available on request. The manufacturer is responsible for ensuring that certification renewal and periodic surveillance are maintained.
4. USCG Approval Number, A Mutual Recognition Agreement (MRA) on marine equipment exists between the European Commission and the US Coastguard but only applies to equipment types included in the listing of marine equipment annexed to the MRA. For included equipment a USCG Approval number may be issued. This can be found under the MED certificate number on the first page and should be used on the main identity label of the equipment. Radio and Radar equipment continues to need separate or additional approval by the USA FCC.
5. This certificate does not confer any approval status to this equipment other than defined by, and tested according to the specifications listed on Page 1.
6. The labeling requirements of IMO Resolution A694(17) shall be met. Descriptions of each unit of apparatus forming part of the equipment will be as given on this Certificate. Each unit of equipment will be marked with the minimum safe distance at which it should be mounted from a standard and steering magnetic compass.
7. No unit of apparatus shall be advertised or labeled as "approved" or "certified" on behalf of the Maritime and Coastguard Agency, the Department of Transport or the QinetiQ Group in any sense other than that it is a type that has been assessed as satisfactory against the specification;
8. The manufacturer must advise QinetiQ of any intended changes to the design or production of the equipment which might affect the equipment performance.
9. Minor Modifications to the equipment will be considered on a case-by-case basis. QinetiQ will review any factory test results, in consultation if necessary, with the test facility that conducted the original Type Approval testing on the equipment. QinetiQ will advise the manufacturer if any further testing is required to maintain valid certification.
10. If an equipment manufacturer wishes to have the type approved equipment designated under alternative names (e.g. agent/distributor's name and model number), a separate application should be completed and sent to QinetiQ.

QinetiQ Ltd  
Marine Approval and Testing Service  
Cody Technology Park, Room 1005/A5  
Ively Road, Farnborough  
Hants, GU14 0LX  
United Kingdom