Ministry of Defence

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CHRONOMETER
CHRONOMETER, ELECTRONIC, QUARTZ

AMENDMENT RECORD

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DEF STAN 66-30/1

CHRONOMETER

CHRONOMETER, ELECTRONIC, QUARTZ

This Defence Standard supersedes Navy Department Specification HYD/CHRON 205/80 Issue 2 dated 23 July 1980

1. This Standard relates to chronometer, electronic, quartz for navigational use in all departments of the Ministry of Defence.

2. This Standard has been agreed by authorities concerned. It is to be implemented, wherever practicable, in all designs, contracts, orders, etc commencing after its date of publication. If a difficulty arises which prevents application of the Defence Standard, the Directorate of Standardization shall be informed so that a remedy can be sought.

3. Any enquiries regarding this Standard in relation to an invitation to tender or a contract in which it is invoked are to be addressed to the responsible technical or supervising authority named in that invitation to tender or contract.

LIST OF CONTENTS

1. SCOPE

This Defence Standard specifies the materials, construction, methods of test and other requirements for chronometer, electronic, quartz for Ministry of Defence use.

2. RELATED DOCUMENTS

2.1 Reference is made in this Standard to:

BS 3G 100:	'General requirement for equipment for use in aircraft'
Part 2	'All equipment'
Section 2	'Magnetic influence'
DEF STAN 59-41	'Electro-magnetic compatibility of equipments'

2.2 Reference in this Standard to any related document means, in any tender or contract, the edition current at the date of such tender or contract, unless a specific issue is indicated.

2.3 British Standard specifications may be obtained from:

British Standards Institution
Sales Branch
Newton House
101 Pentonville Road
London
N1 9ND

3. GENERAL CONSTRUCTION

3.1 The chronometer shall be of the quartz, electronic type, having a high stability quartz crystal oscillator, an integrated circuit and unidirectional stepping motor. Regulation of the daily rate is to be by capacitance trimmer.

3.2 The time shall be indicated by hour, minute, and centre seconds hands. The chronometer shall have a daily rate accuracy of 0.25 second or better, at 20°C.

3.3 The materials, parts, manufacture, assembly, workmanship and finish, are to be of a quality acceptable to the Quality Assurance Authority named in the contract.

4. MODIFICATION

Following the approval of a sample chronometer, no design modification affecting cost or performance shall be introduced without the prior approval of the Project Manager named in the tender or contract.

5. DETAILED CONSTRUCTION

5.1 Chronometer Movement

5.1.1 The high frequency of the oscillator is to be divided down to provide pulses which will finally rotate suitable gears to drive the hands. Backlash in the gears controlling the hour and minute hands shall be at a minimum in order to provide positive time indication. The centre seconds hand shall advance in steps of one second, and shall point precisely to each second mark on the dial.

5.1.2 A stop/start device shall enable the centre seconds hand to be synchronized with a time standard. With the movement running, the hour and minute hands must be able to be set to time, without affecting the centre seconds hand.

5.1.3 The movement shall be enclosed by a protective cover, from the outside of which, the stop/start mechanism and hand setting controls will be operated. Access to the trimmer, for regulation purposes, shall be through an aperture in the protective cover.

5.1.4 The power source shall be an alkaline manganese cell, which is to be stored in a compartment outside the movement protective cover. The cell shall be capable of operating the chronometer for at least two years.

5.1.5 The movement shall be firmly mounted within the case, and is to be positively locked against rotation.

5.1.6 Positive means shall be provided to prevent the cell becoming dislodged from the movement.

5.2 Dial

5.2.1 The dial shall be mounted securely in the case in such a position that there will be adequate clearance for the hands between the dial and the cover glass.

5.2.2 The dial shall be made of an appropriate non-magnetic material. It is to be matt black with matt white numerals and graduations, in accordance with Fig 1.

5.3 Hands

All hands are to be made of an appropriate non-magnetic material and shall be painted matt white. For shapes and proportions of all hands, see Fig 1. In order to avoid parallax error, the tips of the minute and second hands shall be curved downwards so that they are close to the dial markings.

5.4 Case

5.4.1 The square case shall be made of hard wood, which is to be finished with a protective satin polish. The overall external dimensions shall be 120 x 120 x 70 millimetres. The case-back shall be made of a suitable non-magnetic material which shall be acceptable to the Quality Assurance Authority.

5.4.2 A black ribbed rubber sheet shall be fixed to the external face of the case-back. The thickness of the sheet, and the method of fixing the sheet to the case-back, shall be approved by the Quality Assurance Authority.

5.4.3 The case-back shall be removable, in order to facilitate replacement of the cell, and to allow the hand setting and start/stop controls to be operated.

5.4.4 The fully assembled case, shall provide protection for the movement and cell against accidental splashing by water. This protection shall be to the satisfaction of the Quality Assurance Authority.

5.4.5 Any screws or fittings used in the construction of the case shall be of an appropriate non-magnetic material.

5.5 Glass

The clear sheet cover glass shall have a minimum thickness of 3 millimetres.

6. QUALITY ASSURANCE

6.1 General

Each chronometer shall be fitted with a new cell of the correct size in accordance with the manufacturer's specification, before the start of the test series. The tests are to be performed in the order specified in clause 7.

6.2 Pre-production

A sample chronometer is to be subjected to all the tests specified in clause 7. In the event of failure, further samples are to be tested at the direction of the Quality Assurance Authority.

6.3 Production

All chronometers are to be subject to testing sequences 1 and 7 at clause 7.2.

6.4 Contract

5% of the chronometers covered by each contract shall be subjected to testing sequences 1, 5 and 7. In the event of the results proving to be satisfactory, the percentage may be reduced at any stage to not less than 1%, at the discretion of the Quality Assurance Authority.

7. RATING AND TESTING

7.1 The chronometer shall be in the dial up position for all the tests.

7.2 It shall be rated in each temperature for six days. A further day shall be interposed between periods, to allow the instrument to assume the new ambient temperature.

TESTING SEQUENCE	DESCRIPTION	TEMPERATURE °C	MAXIMUM PERMISSIBLE ERROR (seconds)
1	Mean daily rate	20	± 0.25
2	Mean variation from 20°C	0	2.0
3	Mean variation from 20°C	-10	3.0
4	Mean daily rate	20	± 0.25
5	Mean variation from 20°C	40	2.0
6	Mean daily rate	20	± 0.25
7	Maximum variation between any two consecutive daily rates in the same period at 20°C		1

7.3 Electrical Tests.

The chronometer shall conform to the manufacturer’s specification (within ± 10%) for the following tests:

7.3.1 The average current consumption at 1.5v.

7.3.2 Minimum operating voltage.

7.4 Vibration Test.

7.4.1 The chronometer shall be mounted in the dial up position upon the test equipment and vibrated at a Frequency of 8.5 Hz, amplitude 0.4 mm for a period of 4 hours.

7.4.2 At the end of the test, the chronometer shall be examined to ensure that no component has become loose or detached: the daily rate of the chronometer shall have remained unchanged.

7.5 Electro-Magnetic Compatibility Tests

The chronometer shall be submitted to electro-magnetic compatibility tests carried out in accordance with the general requirements of DEF STAN 59-41 and as directed by the Quality Assurance Authority.

8. COMPASS SAFE DISTANCE TESTS

The chronometer shall be subjected to Compass Safe Distance tests, in accordance with BS 3G 100 Part 2 Section 2, and as directed by the Quality Assurance Authority.

9. PACKAGING

Packaging is to be in accordance with the tender or contract requirements.

10. MARKING

10.1 The method of marking the chronometer (NATO Stock Number, Serial Number etc.) shall be in accordance with the tender or contract requirements.

10.2 The following NATO Stock Number shall be marked on a metallised lable which is to be attached to the case of the chronometer: 6645-99-541-7361.

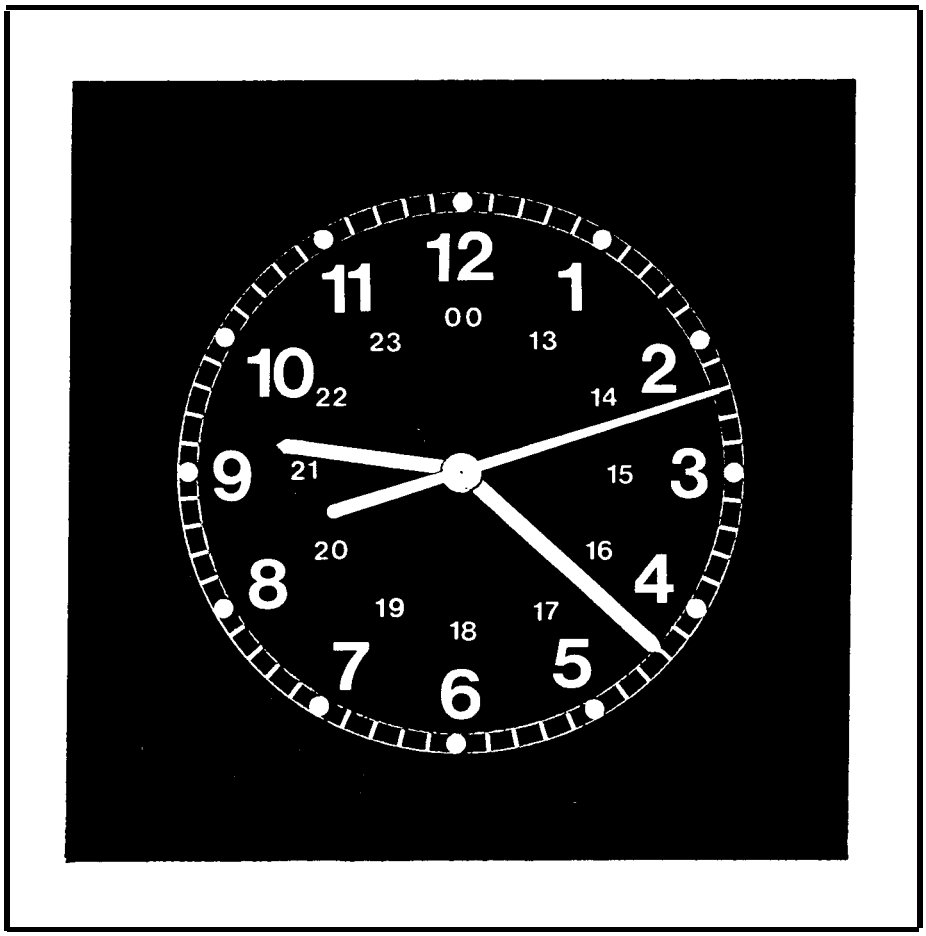

Fig. 1

General Arrangement for

Chronometer, Electronic, Quartz.