



Ministry of Defence

Defence Standard

66-4(PART 5)/Issue 3

19th June 1981

**WATCH, WRIST, ELECTRONIC,
NAVIGATOR, LUMINOUS AND
NON-LUMINOUS**

AMENDMENT RECORD

AMENDMENT NUMBER	DATE	SIGNATURE

REVISION NOTE

This Issue 3 is necessary because watches of the quartz electronic type are to replace the mechanical type watches which were specified in Issue 2 of this Standard.

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WATCH, WRIST, ELECTRONIC, NAVIGATOR, LUMINOUS AND NON-LUMINOUS

This Defence Standard supersedes DEF STAN 66-4 (PART 5) Issue 2, dated 4 July 1973 and, Navy Department Specification HYD/CHRON 206/80

1. This Standard relates to:
 - 1.1 Watch, wrist, electronic, luminous for navigational purposes, NATO Stock Number 6645-99-541-7362. It may be used in all departments of the Ministry of Defence except HM Submarines.
 - 1.2 Watch, wrist, electronic, non-luminous for navigational purposes, NATO Stock Number 6645-99-541-7363. It may be used 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.

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1. SCOPE

This Standard specifies the materials, construction, methods of test and other requirements for watches, wrist, electronic, navigator, luminous and non-luminous.

WARNING NOTE

- 1.1 This Standard calls for the use of substances and test procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves either the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use.
- 1.2 This Standard has been devised for the use of the Ministry of Defence and of its contractors in the execution of contracts for the Ministry and, subject to the unfair Contract Terms Act 1977, the Ministry will not be liable in any way whatever (including but without limitation negligence on the part of the Ministry its servants or agents) where the Standard is used for other purposes.

2. RELATED DOCUMENTS

- 2.1 Reference is made in this Standard to:

BS 970	'Wrought Steels'
Part 4	'Stainless, heat resisting and valve steels'
BS 3637	'Physical characteristics of wrist watches for general purpose use'
Part 1	'Anti-magnetic properties'
Part 2	'Water-resistant properties'
Part 3	'Shock-resistant properties'
DTD 5587	'Paint system, luminous, tritium activated'
BS 5113	'Time measuring instruments: Symbolization of control positions'
BS 3G 100	'General requirement for equipment for use in aircraft'
Part 2	'All equipment'
Section 2	'Magnetic influence'
DEF STAN 05-34/1	'Marking of Service materiel'
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

Specification DTD 5587 may be obtained from:

Her Majesty's Stationery Office
49 High Holborn
London
WC1V 6HE

3. GENERAL CONSTRUCTION

- 3.1 The watch shall be of the quartz electronic type, having a high stability quartz crystal oscillator, an integrated circuit and unidirectional rotary 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 day of the month is to be indicated by a figure which shall appear in an aperture in the dial at the 3 o'clock position.
- 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. DETAILED CONSTRUCTION

4.1 Watch movement

- 4.1.1 The watch is to embody a 24-30 mm diameter movement of the type described in clause 3. The calibre number is to be stamped or engraved on the movement so that it will be evident upon removal of the case-back.
- 4.1.2 The movement is to embody means for synchronizing the watch. When the crown is pulled out to the 2nd (intermediate) position and rotated, the calendar mechanism shall be made to advance rapidly. When the crown is pulled out to the 3rd position for resetting the hour and minute hands, the current to the motor shall be cut off, and a stop lever shall prevent the gears from rotating: the quartz oscillator shall continue to function. No special means for bringing the centre seconds hand to the zero position is required.
- 4.1.3 The power source is to be a silver oxide/zinc cell, the voltage of which shall comply with the watch manufacturer's specification. The cell must be capable of operating the watch for at least two years. It is to be retained in the watch solely by the screw type hatch, which is located in the case-back.

4.2 Dial

- 4.2.1 The dial shall be made of an appropriate non-magnetic material and is to be round, flat, with strong dial feet. It is to be matt black with matt white numerals, minute circles and graduations, in accordance with Fig 1 for luminized dials and Fig 2 for non-luminous dials.
- 4.2.2 Luminized dials shall be in accordance with Fig 1. The capital letter of the type of luminous compound specified is to be indicated on the dial, enclosed in a white circle, ie T for Tritium. The word QUARTZ shall be placed below the centre of the dial above the figure 6: the letters must not be greater than 1 mm in height. The trade name or trade mark may appear on the dial above the centre. If in letters, these are not to be more than 1 mm in height.

4.3 Hands

All hands shall be of an appropriate non-magnetic material and are to be painted matt white. Luminized hour and minute hands shall be of the skeleton form. Non-luminized hour and minute hands shall conform to the shape shown at Fig 2. The centre seconds hand will be in poise, ie so that its equilibrium will not be affected by a change of position.

4.4 Luminous compound

The materials used shall consist of a Tritium - activated luminous compound, natural colour, mixed with an unpigmented paint medium, and applied upon a white undercoat paint. The brightness of the luminous compound, shall be to the satisfaction of the Quality Assurance Authority named in the contract. Adhesion of the luminous compound to the dial and hands to conform to DTD.5587.

4.5 Case

- 4.5.1 The two-piece case assembly shall be made of corrosion-resistant steel 303S41, in accordance with BS 970: Part 4 (for suitable dimensions see Fig 1).
- 4.5.2 The case is not to be polished, but may have a satin or brushed finish. It is to be shaped to afford protection for the crown.
- 4.5.3 The snap-on type case-back shall have a surface area sufficient to accommodate the markings specified in clause 7.
- 4.5.4 The case-back should incorporate a screw-type hatch with slot, to facilitate easy cell replacement. The case-back and hatch must have sealing rings to ensure that the whole assembly is water-resistant in accordance with BS 3637 Part 2.

- 4.5.5 Strap bars shall be inserted into holes drilled completely through the case lugs. The bars shall be made from a suitable corrosive-resistant steel which is compatible with the case and shall be hard soldered into position.
- 4.5.6 The complete case assembly must be free from sharp edges and sharp corners.
- 4.5.7 Location of the movement within the case must be positive and fixed in relation to the crown and stem. The movement must not be located by the dial alone. If a movement casing ring should be employed, then the movement is to be positively fixed to the ring, and the ring is to be positively secured to the case. Depending upon the design of the movement it may be necessary to fabricate from soft iron a movement casing/magnetic screen in order to comply with clause 6.3.

4.6 Crown

The crown, 5 mm diameter, shall be corrosion-resistant steel clad. It shall incorporate a seal to prevent water ingress.

4.7 Glass

The tension ring type glass (preferred dimensions 31.50 mm diameter, 1.6 mm thickness) shall be made from fully shrunk unplasticized polymethylmethacrylate, free from defects. It is to provide adequate clearance for the hands. The tension ring shall be made of a corrosion-resistant metal.

5. QUALITY ASSURANCE

5.1 General

The watches must be fitted with new cells in accordance with the watch manufacturer's specification before the start of the test series. The tests are to be performed in the order specified in clause 6.

5.2 Pre-production

A sample watch is to be subjected to all the tests specified in clause 6. In the event of failure, further samples are to be tested at the direction of the Quality Assurance Authority.

5.3 Production

All watches are to be subjected to Testing Sequence 1 at clause 6.2.

5.4 Contract

Normally 5% of the watches covered by each contract are to be additionally tested as specified in clause 6.4.

6. RATING AND TESTING

- 6.1 At an ambient temperature of 20°C the watch shall be placed upon a recently calibrated electronic rate recorder. In each of the six control positions specified in BS 5113, the instantaneous daily rate, in seconds per day, shall be recorded. The instantaneous daily rate shall not vary by more than one second per day between any two of the six positions.
- 6.2 The watch shall be rated in the CH position, for six days in each temperature according to the following Table. 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	± 0.5
2	Mean variation from 20°C	0	3
3	Mean variation from 20°C	-10	5
4	Mean daily rate	20	± 0.5
5	Mean variation from 20°C	35	1
6	Mean daily rate	20	± 0.5
7	Maximum variation between any two consecutive daily rates in the same period at 20°C	-	1

- 6.3 The watch shall be tested in an electro-magnetic field (strength 4800 A/m) in accordance with the requirements of BS 3637: Part 1.
- 6.4 The watch shall be immersed completely in the minimum depth of freshly distilled water contained in a glass reservoir which is capable of withstanding reduced pressure, and the air pressure above the water will be reduced to the equivalent of 238 mbar. There must be no visible leakage of air from any part of the watch under these conditions.

- 6.5 The watch shall be tested for water-resistance in accordance with BS 3637: Part 2.
- 6.6 The watch shall be tested for shock-resistance in accordance with BS 3637: Part 3.
- 6.7 With the watch in the 9 H position, a mass of 3.5 kg is to be suspended from the crown. The crown and stem must not become detached from the watch.
- 6.8 The watch shall be mounted in the 9 H position upon test apparatus and vibrated at a frequency of 8 Hz, amplitude 0.4 mm for a period of four hours. At the end of the test, the watch shall be examined to ensure that no component has become loose or detached: the daily rate of the watch shall have remained unchanged.
- 6.9 The watch shall conform to the manufacturer's specifications for all the following tests and shall be within the tolerance of $\pm 10\%$.
 - 6.9.1 The current consumption of the watch shall be measured with the crown in the Normal and Hand -set positions.
 - 6.9.2 The lower working voltage limit shall be measured.
 - 6.9.3 The pulse duration at motor drive stage shall be measured.
- 6.10 The watch shall be submitted to electro-magnetic comparability tests carried out in accordance with the general requirements of DEF STAN 59-41 and as directed by the Quality Assurance Authority.
- 6.11 The watch shall be submitted to compass safe distance tests in accordance with BS 3G 100 Part 2 Section 2 and as directed by the Quality Assurance Authority.

7. MARKING

The case-back is to be depth engraved with the following:-

- 7.1 The Government property mark, of length 2.5 mm in accordance with DEF STAN 05-34/1, Section D (3) Fig 1.
- 7.2 The following 13 digit NATO Stock Number measuring 2mm in height:
6645-99-541-7362.

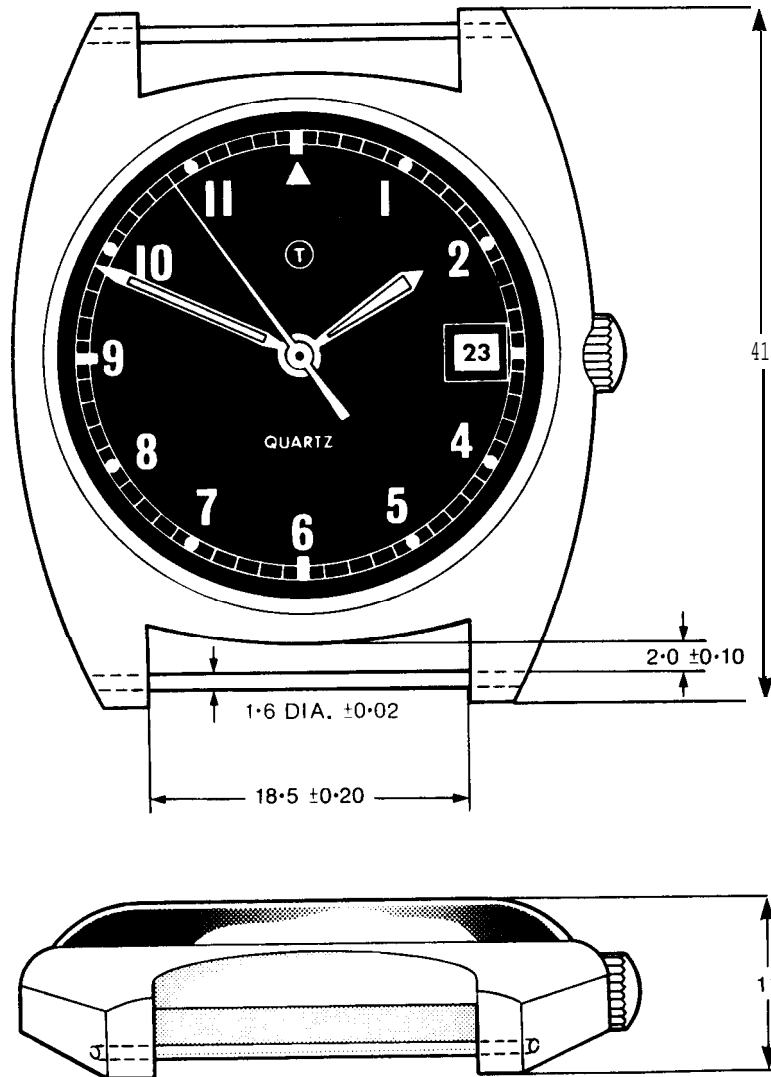
or

for the non-luminous watch: 6645-99-541-7363.

- 7.3 The serial number and year of manufacture measuring 2 mm in height.

8. PACKAGING

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



ALL SHARP EDGES TO BE REMOVED

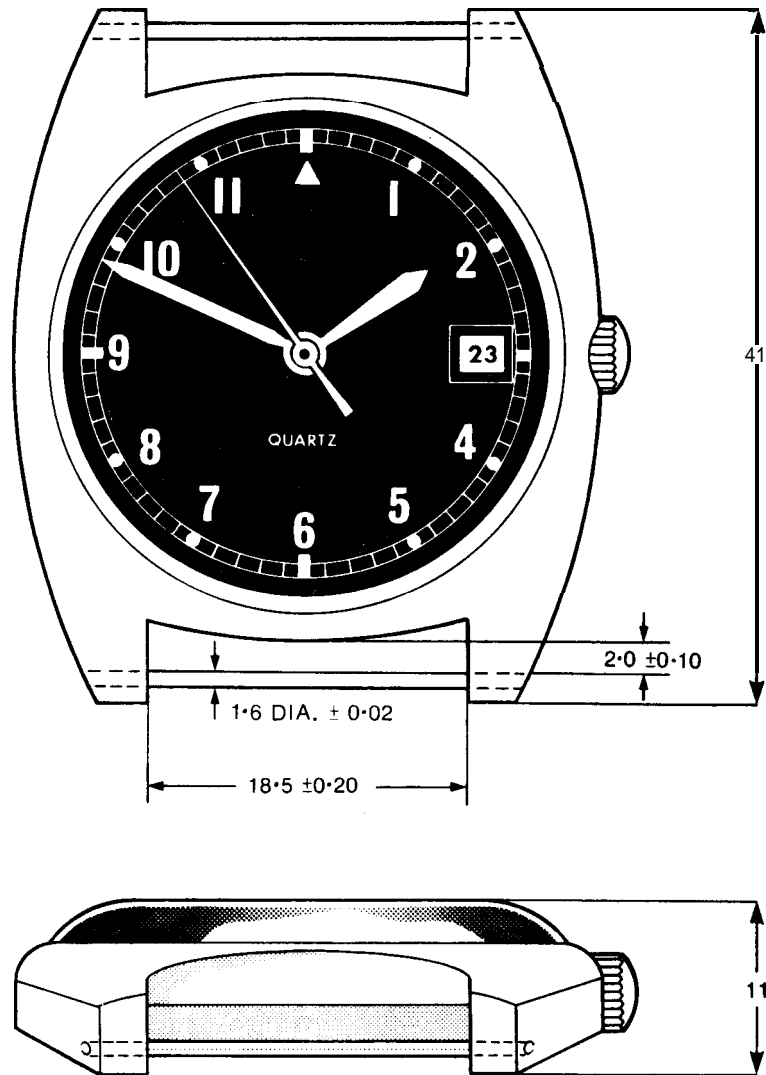
ALL DIMENSIONS ARE IN MILLIMETRES

BATONS AT 6.9 AND 12 TO BE LUMINISED 2 MILLIMETRES BY 1 MILLIMETRE.
DOTS AT OTHER NUMERALS TO BE LUMINISED 1 MILLIMETRE DIAMETER.
A LUMINISED TRIANGLE TO BE POSITIONED BELOW THE 12 O'CLOCK BATON,
SIDES OF TRIANGLE 2 MILLIMETRES. OTHER APPROVED CASE DESIGNS
WILL BE CONSIDERED

FIG 1
GENERAL ARRANGEMENT FOR WATCH, WRIST,
(Electronic, Navigator)

NATO STOCK NUMBER 6645-99-541-7362

A710/2



ALL SHARP EDGES TO BE REMOVED

ALL DIMENSIONS ARE IN MILLIMETRES

BATONS AT 6.9 AND 12 TO BE 2 MILLIMETRES BY 1 MILLIMETRE.
DOTS AT OTHER NUMERALS TO BE 1 MILLIMETRE DIAMETER.
A TRIANGLE TO BE POSITIONED BELOW THE 12 O'CLOCK BATON.
SIDES OF TRIANGLE 2 MILLIMETRES.
OTHER APPROVED CASE DESIGNS WILL BE CONSIDERED

FIG 2
GENERAL ARRANGEMENT FOR WATCH, WRIST,
(Electronic, Navigator, Non-Luminous)
NATO STOCK NUMBER 6645-99-541-7363

A710/3

MINISTRY OF DEFENCE

WATCHES AND WRIST STRAPS

1. This document supersedes the Addendum to DEF STAN 66-4 (PARTS 1-11) and is associated with DEF STAN 66-4(PARTS 1-14).
2. Table II lists the items permitted only for maintenance purposes.
3. Items no longer to be provisioned are listed in Tables III(A) and III(B). Existing stocks of these items may be used until exhausted. The replacement items are listed in DEF STAN 66-4(PARTS 1-14) and DEF STAN 66-15(PARTS 1 and 2), latest issues.
4. All authorities concerned are to take appropriate action on this document.

Copies of this document and the Standards to which it relates may be obtained from:

Directorate of Standardization
Ministry of Defence
London.

TABLE II
ITEMS PERMITTED ONLY FOR MAINTENANCE PURPOSES
WATCHES

ITEM No	SERVICE REFERENCE NUMBER			ITEM NAME	ITEM DESCRIPTION	REMARKS
	NAVY Ø	ARMY	AIR FORCE			
	(a)	(b)	(c)			
1	HS 527-3634	-	-	CHRONOMETER	Marine, 2-day, boxed	For hydrographic, navigation, ground control, and survey purposes only
2	HS 527-3635	-	-	CHRONOMETER	Survey, 2-day, second contacts	
3	HS 527-3636	-	-	CHRONOMETER	Watch, boxed	
4	HS 527-3637	-	6BB/5273637	DECK WATCH	Boxed	
5	HS 527-3638	-	-	DASHBOARD WATCH	-	
6	HS 527-3639	-	-	POCKET WATCH	-	
7	HS 527-3640	-	-	STOP WATCH	Sidereal, side slide	
8	HS 527-3641	-	-	STOP WATCH	1/10 second, 30 second sweep, split	
9	-	W10/ 6645-99-521-3856	-	CHRONOGRAPH	Split second, survey	
10	-	-	6B/5209604	STOP WATCH, DASHBOARD	1/5 second, luminous, aircraft	

Notes:

1. Ø the reference numbers in the Navy column are Hydrographic Department reference numbers.
2. - indicates that the column heading does not apply.

TABLE III(A)
ITEMS NO LONGER TO BE PROVISIONED
WATCHES

ITEM NO	SERVICE REFERENCE NUMBER			ITEM NAME	ITEM DESCRIPTION	NATO STOCK NUMBER OF REPLACING ITEM WITH DEF STAN (LATEST ISSUE)
	NAVY	ARMY	AIR FORCE			
	(a)	(b)	(c)			
1	0552/3	-	-	STOP WATCH	1/5 second, slide operated	6645-99-523-9007 DEF STAN 66-4(PART 14)
2	0552/3169	-	-	STOP WATCH	1/5 second, crown operated	6645-99-521-3169 DEF STAN 66-4(PART 7)
3	-	W10/VC2530	-		1/5 second, Mk 2	
4	-	W10/VC8267	-		1/5 second, Mk 2/1	
5	-	-	6B/117		1/5 second, Mk 3	
6	-	-	6B/221		1/5 second, Mk 3A	
7	-	W10/6645-99-910-1001	6B/9101001		1/5 second	
8	0552/160231	-	6B/2918		STOP WATCH	
9	-	W10/VC2534	-	STOP WATCH	1/10 second	6645-99-910-1002 DEF STAN 66-4(PART 6)
10	0552/160180	-	6B/4196	STOP WATCH	1/100 second	6645-99-916-0180 DEF STAN 66-4(PART 3)
11	0552/6	-	-	STOP WATCH	6 seconds, secs/yards	6645-99-520-9365 DEF STAN 66-4(PART 8)
12	-	-	6B/3249		AP6, secs/yards	
13	-	W10/LDN 35123	-	WATCH, WRIST	Blancpain, diver's	6645-99-923-7697 DEF STAN 66-4(PART 1)
14	0552/160647	-	-	WATCH, WRIST	Diving supervisor's	6645-99-523-8390 DEF STAN 66-4(PART 4)
15	-	W10/VB10028	-		International	
16	-	W10/VB10033	-		Omega	
17	-	W10/VB10034	-		Record	
18	-	W10/VB10036	-		Timor	
19	-	W10/6645-99-910-1000	6B/9101000		General service, DEF-3-A	
20	HS 10	-	-		Waterproof	
21	HS 11	-	-		-	
22	0552-961-4045	W10/6645-99-961-4045	6BB/9614045	General service		
23	-	-	6B/346	WATCH, WRIST	Navigator's, Mk XI	6645-99-521-1430 DEF STAN 66-4(PART 5)
24	0552/308	-	-	WATCH, POCKET	-	6645-99-520-8049 DEF STAN 66-4(PART 11)
25	-	-	6B/2739	STOP WATCH	-	No replacement required
26	0552/4	-	6B/4223	STOP WATCH	1/5 second, split second hands	6645-99-521-6482 DEF STAN 66-4(PART 9)
27	0552/9243305	-	-	CHRONOGRAPH, WRIST	Luminous	6645-99-924-3306 DEF STAN 66-4(PART 2)
28	0552/9203305	-	-		Luminous	
29	-	-	6B/551		Luminous	
30	-	-	6B/4352141	STOP WATCH, DASHBOARD	1/5 second, luminous, aircraft	6645-99-520-9604 DEF STAN 66-4(PART 12)

Notes: 1. - indicates that the column heading does not apply.

2. Interim NATO Stock Numbers have been allocated as follows:

(W10/VB10028-9999-99-445-5890
(W10/VB10033-9999-99-445-2031
(W10/VB10034-9999-99-445-9830
(W10/VB10036-9999-99-445-9855

APPENDIX TO DEF STAN 66-4(PARTS 1-14)
TABLE III(A)

TABLE III(B)

ITEMS NO LONGER TO BE PROVISIONED

WRIST STRAPS

	SERVICE REFERENCE NUMBER			ITEM NAME	ITEM DESCRIPTION	NATO STOCK NUMBER OF REPLACING ITEM WITH DEF STAN (LATEST ISSUE)
	NAVY	ARMY	AIR FORCE			
	(a)	(b)	(c)			
1	0552/160648	-	-	STRAP	Diving supervisor's	6645-99-124-2986 (Nylon) DEF STAN 66-15(PART 1)
2	-	W10/ 6645-99-910-1003	-		Webbing	
3	-	-	6B/321		Fabric	6645-99-527-7059 (Nylon/Leather) DEF STAN 66-15(PART 2)
4	-	-	6B/169		Leather	
5	-	-	6B/2763		Bracelet, Bonklip, 17.5 mm clip	
6	-	-	6B/3224		Bracelet, Bonklip, 19.0 mm clip	
7	-	-	6B/3033		Bracelet, Bonklip, 20 mm clip	
8	-	-	6B/2594		Webbing	

Note:

- indicates that the column heading does not apply.

APPENDIX TO DEF STAN 66 - 4 (PARTS 1-14)
TABLE III(B)