MWS

AP 105B-05107-13

2nd Edition June 93
(Superseding AP 105B-05107-16C
and Superseding Relevant Pages
of AP 4515B Vol 3 Pt 1 Sect 2 Chap 15)

AIR RELEASE VALVE DOWTY AEROSPACE HYDRAULICS Part No C4076YMKC, C4076YMKE and C4076YMKF

GENERAL AND TECHNICAL INFORMATION (-1) PARTS CATALOGUE AND RELATED INFORMATION (-3)

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

Sponsored for use in the

ROYAL AIR FORCE BY DGSM (RAF)

Prepared by Dowty Aerospace Hydraulics,
Arle Court, Cheltenham, GL51 0TP, England

Dowty Aerospace Hydraulics is a business name of Dowty Aerospace Gloucester Limited

Publications authority: DDATP (RAF)

Service users should send their comments through
the channel prescribed for the purpose in:

AP100B-01, Order 0504 (RAF)

CONTENTS

GENERAL

CONTENTS

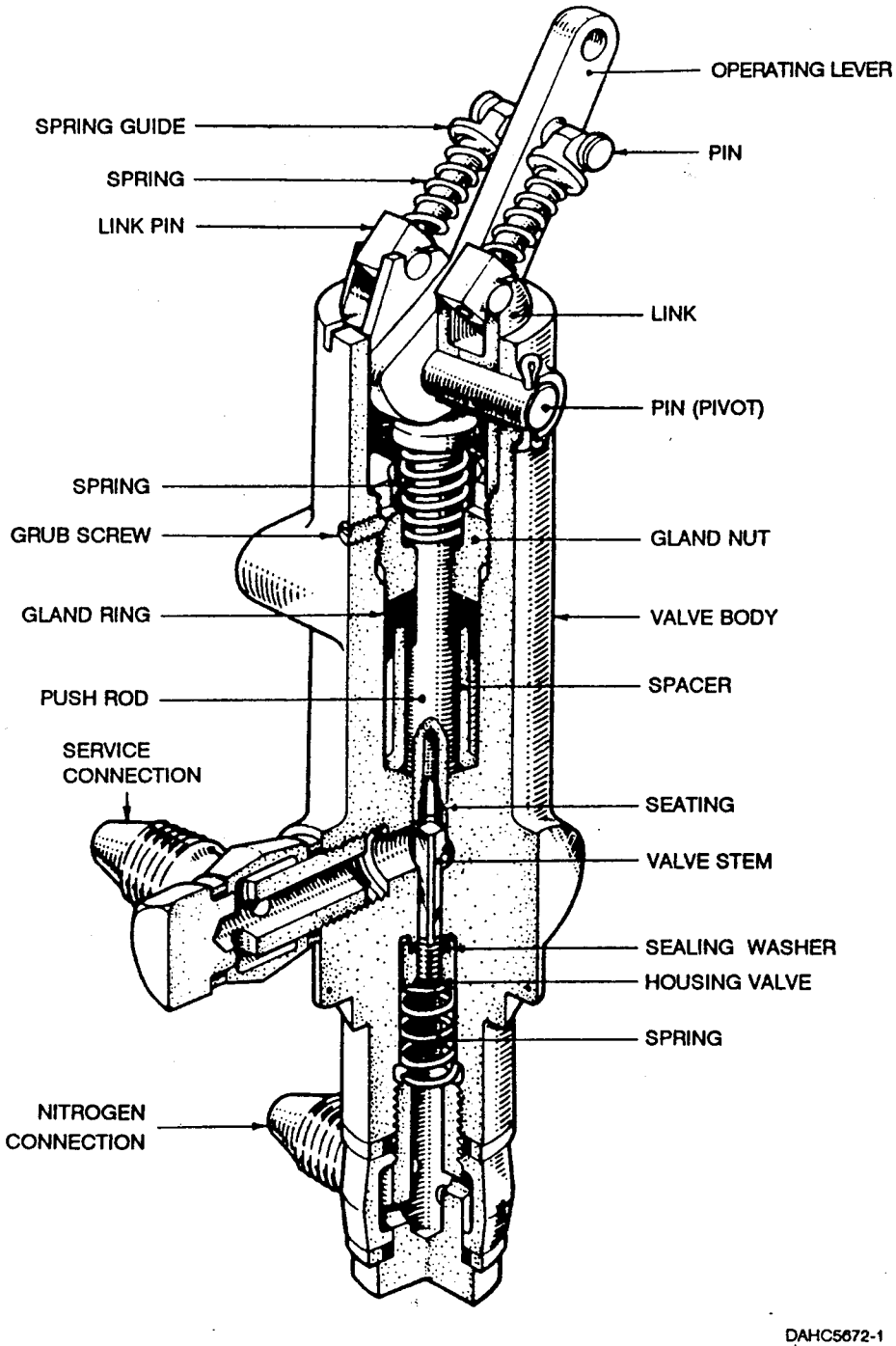


Fig 1 Air release valve

Leading particulars

1 Refer to the relevant annex for the leading particulars.

Modification state

2 Refer to the appropriate annex for the relevant modification state.

Introduction

3 The air release valve is a mechanically operated selector valve which functions as a stop cock. A basic unit is described and illustrated and variants are given in the annexes.

Constructional description (Fig 1 and 2)

4 A spring-loaded valve sub-assembly is retained in the valve body by a banjo bolt which also secures a banjo. A valve stem of the valve assembly is opposed by a push rod. The push rod is fitted with a rubber seating and operates through a gland ring, a spacer and a gland nut which is locked by a grub screw. In the normal position, the push rod is held away from the valve stem by a spring assembled under its head and any leakage of air past the valve is vented to atmosphere through the centre of the hollow push rod. Figure 1 shows the operating lever in the closed position, that is, no flow between the connections.

5 An operating lever, formed at its lower end as a cam and fitted between two links, is mounted above the head of the push rod on a pivot pin. Attached to the operating lever is a spring-link mechanism to restrain it in either the open or closed positions. The mechanism is located on both sides of the operating lever between a pin in the operating lever and the links mounted on the pivot pin. The mechanism consists of springs assembled on spring guides which are free to slide into link pins as the springs are compressed. The strength of the springs is sufficient to maintain the mechanism in a selected position.

6 The action of the springs is initially to resist movement, and the resistance is greatest when the springs are coincident with the centre line of the valve. Once this point is passed, any continued movement is assisted by the springs. The reverse movement is similarly resisted and then assisted. This is because the link pin centre is between the arc traced by the spring guide pin and the operating lever pin centre about which the operating lever turns. The tumbler mechanism is therefore at its maximum permitted extension when the operating lever is in the fully open or closed positions, and at the maximum compression when passing over the centre line.

7 Movement of the operating lever from the closed to the open position of the valve causes the cam to move the push rod and seating sub-assembly against the valve stem. The vent hole in the seating is sealed and the valve opened, permitting air to pass through to the service connection.

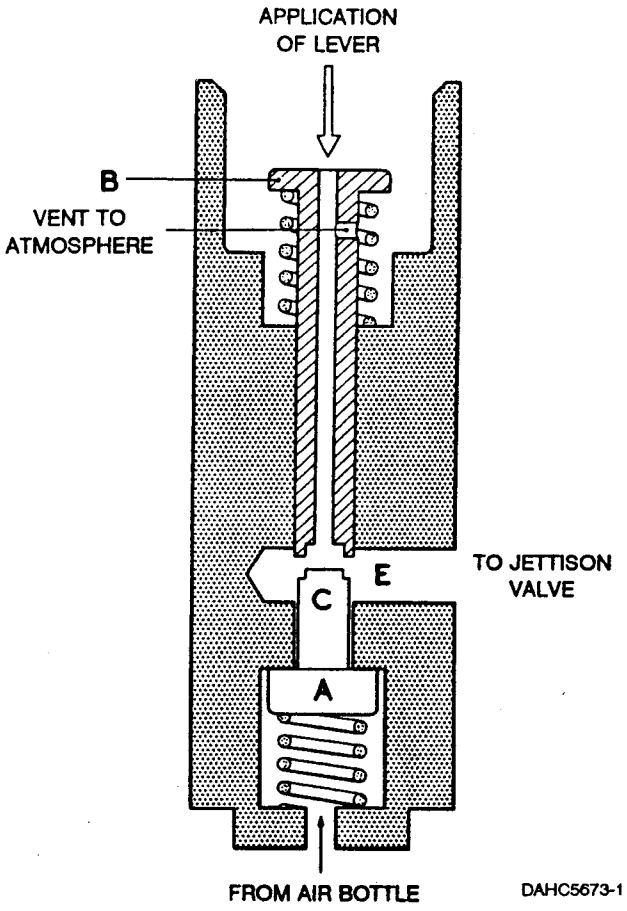


Fig 2 Functional diagram

Functional description (Fig 2)

8 In the closed condition, valve A is held against its seat by a spring and prevents the passage of air to the service. A spring also holds the push rod B clear of the valve stem C. If air escapes past the valve A, it will be vented to atmosphere through the hollow push rod to prevent a build-up of pressure in the pipe line at E.

MAINTENANCE

Special tools and equipment

9 The following special tools, equipment and materials are required to carry out the maintenance procedures detailed.

Part No	Description	Application
ST111/24	Tommy bar	Use with ST296
ST296	Tubular spanner	Dismantling/Assembling
ST297	Sleeve	Assembling

Part No	Description	Application
ST298	Dummy push rod	Testing
-	Trichloroethane (TS367D)	Cleaning
-	White spirit (BS245)	Cleaning
-	Oil OM15 (DTD585)	Assembling
-	Grease XG315 (DEF STAN 91-56)	Assembling
-	Corrosion preventative PX1	Preservation
-	Locking wire (DTD189A)	Locking parts

Safety and maintenance notes

10 Safety and maintenance notes or other general safety/maintenance requirements appropriate to the equipment, or to the main equipment, must be complied with where relevant throughout the work detailed in this publication.

BAY MAINTENANCE

Dismantling (Fig 1 and 2)

WARNING

SPECIFIC INTERNAL DETAILS OF THIS UNIT ARE SUBJECT TO SPRING PRESSURE AND CARE MUST BE EXERCISED WHEN DISMANTLING.

11 Discard all forms of sealing rings after removal from the unit.

11.1 Remove the two banjo bolts, bonded seals and the banjos.

11.2 Withdraw the spring and the valve sub-assembly from the body. The valve sub-assembly should not be dismantled further.

11.3 Remove the split pin, restrain the operating lever and remove the pivot pin. Separate the links, the link pins, the springs and the spring guides. Remove the pin from the end of the operating lever.

11.4 Withdraw the push rod and seating sub-assembly and the spring.

NOTE

The rubber seating at the end of the push rod should not be removed. If the rubber seating is worn, a new push rod and seating sub-assembly must be fitted.

11.5 Remove the grub screw: unscrew the gland nut using the tubular spanner ST296 and the tommy bar ST111/24. Remove the gland ring and the spacer.

Cleaning

WARNING

CLEANING AGENT SHOULD BE USED IN A WELL VENTILATED AREA, AWAY FROM NAKED FLAMES. CARE SHOULD BE TAKEN NOT TO BREATHE THE FUMES OR ALLOW UNDUE CONTACT WITH THE SKIN.

CAUTION

Chlorinated solvents can combine with minute amounts of water found in operating hydraulic systems to form hydrochloric acid which will corrode internal metallic surfaces. It is imperative that all internal surfaces are dry and free from any traces of residual solvent prior to assembly and installation. For those applications where it is difficult to remove all traces of solvent, clean unused white spirit is recommended.

12 To enable all items to be visually examined for damage and wear, each part must be thoroughly cleaned using the appropriate cleaning agents and methods. When cleaning is completed, parts must be dried using compressed air; clean, lint-free cloth or tissues and all subsequent handling must be with clean PVC or polythene gloves. If delays occur before assembly, parts must be suitably protected against corrosion using temporary corrosion preventative PX1.

Examination and checking

13 Visually examine all parts for damage and corrosion. Check parts for permissible wear in accordance with fits and clearances, paragraph 18.

Superficial damage

14 Superficial damage in the form of external isolated scores, smooth dents and abrasions free from cracks are to be regarded as negligible provided that internal dimensions are not affected and the damage is within the following limits:

14.1 Not exceeding 0.500 in long.

14.2 Not exceeding 0.010 in deep.

14.3 Not less than 0.250 in from any hole or bearing surface.

NOTE

Burrs must be removed and sharp edges blended out. Minor scores and abrasions in non-sealing bores may be ignored provided that proud portions of the abrasion are removed.

Checking data

15 Spring SP310-11

15.1 Number of working coils:

15.2 Wire size:

15.3 Free length:

15.4 Check length:

15.5 Load at check length:

16 Spring 379921

16.1 Number of working coils:

16.2 Wire size: 0.064 in (16 SWG)

16.3 Free length: 0.625 in

16.4 Check length: 0.225 in

16.5 Load at check length: 41 lbf

17 Spring 500Y385

17.1 Number of working coils: 11

17.2 Wire size: 0.0468 in

17.3 Free length: 1.110 to 1.150 in

17.4 Check length: 0.650 in

17.5 Load at check length: 12.750 to 15.750 lbf.

Fits and clearances

18 Check that the dimensions are within the specified limits.

TABLE 1

FITS, CLEARANCES AND REPAIR TOLERANCES

Ref No on Fig 3	Parts and Description	Dimension New	Permissible Worn Dimension		Permissible Clearance		Remarks
			Interchangeable Assembly	Selective Assembly	New	Worn	
1	PUSH ROD IN GLAND NUT AND BODY						
	Gland nut and body i/d	$\frac{0.2817}{0.2807}$	0.2830	0.2830	$\frac{0.0002}{0.0042}$	0.0055	
	Push rod o/d	$\frac{0.2805}{0.2775}$	0.2775	0.2762			
2	PIN IN BODY AND LEVER						
	Body and lever i/d	$\frac{0.3130}{0.3120}$	0.3150	0.3170	$\frac{0.0005}{0.0035}$	0.0075	
	Pin o/d	$\frac{0.3115}{0.3095}$	0.3075	0.3055			

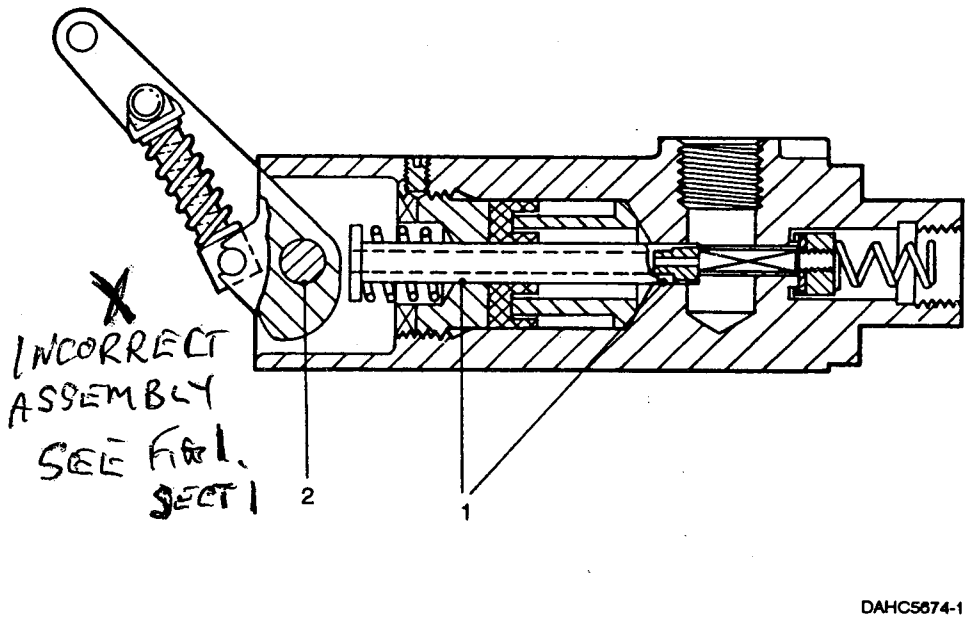


Fig 3 Fits and clearances

Assembling (Fig 1)

19 Lightly lubricate all sealing rings with grease XG315 before assembling the unit.

19.1 Position the valve sub-assembly, valve stem leading, in the body.

19.2 Insert the valve spring. Fit a bonded seal to each side of the banjo union for the air bottle connection and secure it with the banjo bolt screwed into the end of the body.

19.3 Assemble the spacer and the gland ring using sleeve ST297.

19.4 Lubricate the gland nut with grease XG315 and screw it into the body using the tubular spanner ST296 and the tommy bar ST111/24. Do not tighten the gland nut at this stage.

19.5 Lubricate the dummy push rod ST298 and the spring with grease XG315 and slide the spring over the dummy push rod ST298 against the head. Insert the dummy push rod ST298 through the gland nut and the gland ring.

19.6 Screw in the gland nut using the tubular spanner ST296 and the tommy bar ST111/24 until the grub screw will pick up the original dimple in the nut. If this is not possible, or if a new gland nut is being fitted, tighten the gland nut until it just compresses the gland ring. Screw it back by one quarter of a turn and then check that the dummy push rod ST298 will return to its normal position after it has been depressed.

19.7 Insert the pin in the outer end of the operating lever.

19.8 Position the links and fit the operating lever in the position as indicated in Figure 1. Insert the pivot pin, aligning the split pin holes of the pin and the boss on the body. Secure the pin with the split pin but do not lock.

NOTE

If a new body and pivot pin are being fitted they are to be drilled together on assembly.

19.9 Assemble the springs to the spring guides and insert the spring guides in the longest shouldered portion of the link pins. Engage the link pins with the sockets of the links and locate the spring guides to the pin in the outer end of the operating lever.

19.10 Fit a bonded seal to each side of the banjo union for the service connection and secure it to the side boss of the body with the banjo bolt.

19.11 Test the air release valve as detailed in paragraph 22.

19.12 Remove the split pin, restrain the operating lever and remove the pivot pin. Separate the links, the link pins, the springs and the spring guides.

19.13 Withdraw the dummy push rod ST298 and the spring.

19.14 Loosen the gland ring nut slightly using the tubular spanner ST296 and tommy bar ST111/24.

19.15 Lubricate the push rod and seating sub-assembly and the spring with grease XG315 and slide the spring over the push rod against the head. Insert the push rod and seating sub-assembly through the gland nut and the gland ring.

19.16 Screw in the gland nut until the grub screw will pick up the original dimple in the gland nut. If this is not possible, or if a new gland nut is being fitted, tighten the gland nut until it just compresses the gland ring. Screw it back by one quarter of a turn and then check that the push rod and seating sub-assembly will return to its normal position after it has been depressed. Dimple the gland nut with the point of a drill inserted through the grub screw tapping. Lock the gland nut with the grub screw and centre-punch the grub screw to lock.

19.17 Position the links and fit the operating lever in the position as indicated in Figure 1. Insert the pivot pin, aligning the split pin holes of the pin and the boss on the body. Secure the pin with the split pin.

19.18 Assemble the springs to the spring guides and insert the spring guides in the longest shouldered portion of the link pins. Engage the link pins with the sockets of the links and locate the spring guides to the pin in the outer end of the operating lever.

19.19 After satisfactory testing, wirelock the banjo unions together.

TESTING

Special tools and test equipment

20 The following special tools and test equipment are required to carry out the test procedures detailed.

Part No	Description	Application
ST198	Dummy push rod	Testing (assembled during assembly procedure)
-	Static hydraulic test rig	Apply hydraulic pressure
-	Test circuits (as shown in Fig 4)	Test the unit
-	Container (with kerosene)	Leakage test

Testing the unit (Fig 1, 2 and 4)

21 Using the equipment specified in paragraph 20, carry out the following tests.

Hydraulic test

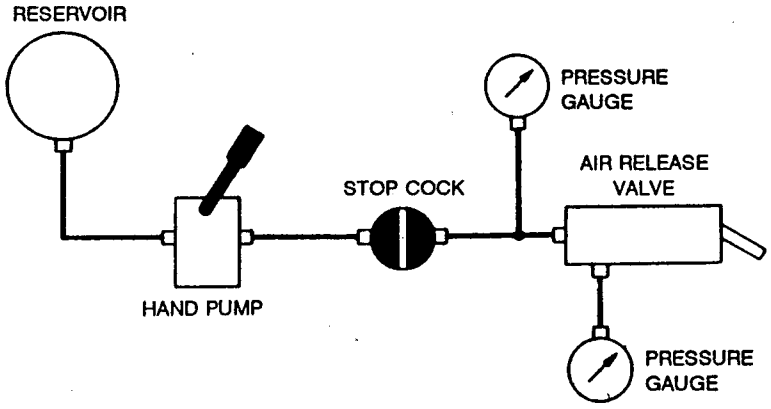
22 The dummy push rod ST298 must be fitted for this test, refer to Assembly, paragraph 19.

22.1 Connect the supply line of the hydraulic rig to the air bottle connection and a pressure gauge to the service connection.

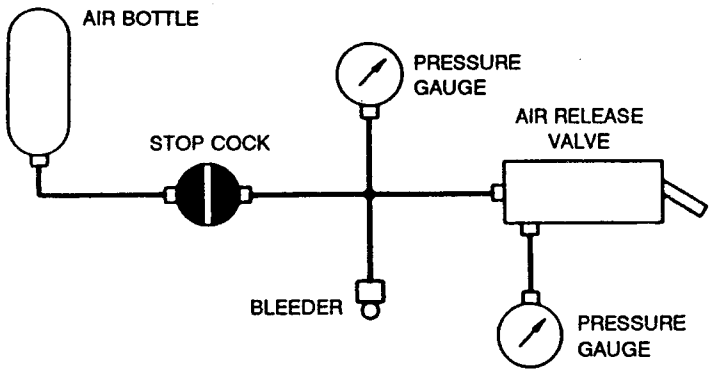
22.2 Move the lever to the open position and apply a pressure of 3000 lbf/in^2. The pressure should register on both gauges. Leakage must not occur.

22.3 Release the pressure, disconnect the supply line and remove the pressure gauge.

22.4 Continue with the assembly procedure recommencing at paragraph 19.12.



HYDRAULIC TEST RIG



AIR TEST RIG DAHC5674-1

Fig 4 Test rig circuits

Air test

23

23.1 Connect the supply line of the air test rig to the air bottle connection and immerse the unit in a container of kerosene.

23.2 Move the lever to the closed position, gradually apply a pressure of 50 lbf/in^2 and close the stop cock in the supply line. Leakage must not occur.

23.3 Open the stop cock and gradually increase the pressure to 2000 lbf/in^2 then close the stop cock. Leakage must not occur.

23.4 Connect a pressure gauge to the service connection and, with the unit still immersed in the kerosene, move the operating lever to the open position and gradually apply a pressure of 2000 lbf/in^2. Minute leakage is only permissible through the vent hole in the push rod.

23.5 On satisfactory completion of operation 23.4 and maintaining a pressure of 2000 lbf/in^2, return the operating lever to the closed position. The test pressure at the air supply line should remain steady and the pressure on the gauge fitted to the service connection should drop sharply to zero. If this does not occur, binding of the push rod is indicated and the valve must be dismantled to ascertain the cause. This may be due to a faulty spring at the push rod head or to an overtight gland ring gland nut.

NOTE

If operation 23.5 is to be repeated, the pressure at the air bottle connection is to be released through the external bleeder of the supply line before the operating lever is re-set in the open position.

23.6 Remove the pressure gauge from the service connection and set the operating lever in the closed position. Apply a pressure of 2000 lbf/in^2 at the air bottle connection. Check that the torque required to move the operating lever to the open position and to release the pressure through the service connection does not exceed 30 lbf/in^2. Remove the air supply line.

Annex A

AIR RELEASE VALVE

DOWTY AEROSPACE HYDRAULICS - CHELTENHAM

PART NUMBER C4076YMKC

Leading particulars

1 Leading particulars for this unit are as follows:

1.1	Length	7.490 in max.
1.2	Connections	0.125 in BSP

Modification state

2 The information in this annex includes all appropriate modifications up to and including issue 11.

Introduction

3 This unit is similar to that described and illustrated in the general text except that the air inlet connection is an adapter with one bonded seal in lieu of a banjo bolt, banjo and two bonded seals. Dismantling and assembling procedures are affected accordingly. The outlet connection is orientated with the inlet connection.

Annex B

AIR RELEASE VALVE

DOWTY AEROSPACE HYDRAULICS - CHELTENHAM

PART NUMBER C4076YMKE

Leading particulars

1 Leading particulars for this unit are as follows:

1.1	Length	7.610 in max.
1.2	Connections	0.125 in BSP

Modification state

2 The information in this annex includes all appropriate modifications up to and including issue 12.

Introduction

3 This unit is similar to that described and illustrated in the general text except that the service connection is orientated towards the cone of the air inlet connection at an angle of 10 degrees from the body axis.

Annex C

AIR RELEASE VALVE

DOWTY AEROSPACE HYDRAULICS - CHELTENHAM

PART NUMBER C4076YMKF

Leading particulars

1 Leading particulars for this unit are as follows:

1.1	Length	7.610 in max.
1.2	Connections	0.125 in BSP

Modification state

2 The information in this annex includes all appropriate modifications up to and including issue 12.

Introduction

3 This unit is similar to that described and illustrated in the general text except that the inlet connection is set 180 degrees from that illustrated in Figure 1 and the outlet connection is orientated towards the inlet and parallel with the body axis.

PARTS CATALOGUE AND RELATED INFORMATION

FOR

AIR RELEASE VALVE

DOWTY AEROSPACE HYDRAULICS - CHELTENHAM

Part No C4076YMKC, C4076YMKE and C4076YMKF

MODIFICATION RECORD

Mod No	AL No	Mod No	AL No	Mod No	AL No	Mod No	AL No	Mod No	AL No	Mod No	AL No

* Incorporated in initial issue of Catalogue
NA Mod not applicable to this Catalogue
C Mod cancelled
AS Amendment Sheet

PARTS CATALOGUE AND RELATED INFORMATION (TOPIC 3)

MEMORANDUM OF INSTRUCTIONS

Demands

1 Requirements for demands are:

1.1 The demand must quote the appropriate Reference Number for each item. Unreferenced parts are not normally provisioned as spares and demands for such items must quote the maker's Part Number and the name and type of the equipment. The location of each part within the equipment should be clearly indicated.

1.2 Demands are to be prepared in accordance with the procedure laid down in AP 830 Volume 1 or BR4.

Local manufacture

2 Parts annotated 'LM' are to be manufactured from local resources. If the manufacture of such items is beyond the capacity of the Unit, the demand is to be endorsed 'Unable to manufacture locally'.

Major repair

3 'MR' indicates that an item is required for major repair purposes only and will not normally be held in store by Units other than those authorised to undertake major repair of the equipment.

Units per assembly

4 The number quoted is the quantity required per next higher assembly in the position shown except 'attaching parts' which quote the quantity required to attach one item. The letters 'AR' in the 'Units per Assy' column indicate that the quantity is 'as required'. Where applicable the quantity normally fitted is shown as a nominal figure, eg (Nom 3). Where an item is listed only for reference purposes the letters 'RF' are quoted.

Classification of equipment

5 The Class of Store is indicated by a single letter as laid down in AP 830 Volume 1 or BR4.

Fitting code (FC)

6 The FC is indicated by one of the following letters and is only quoted against parts which are not directly interchangeable:

V Open up holes on assembly
W Partially assembled
X Ream or machine on assembly
Y Drill or drill and tap on assembly
Z Trim on assembly

Obsolescent stock

7 An asterisk in the 'Part No' column indicates that no further purchases of the item will be made but the part is to be used until stocks are exhausted.

Modifications

8 When items are affected by a modification the 'Mod No' is quoted in the description. Modifications incorporated in the catalogue are listed in the Modification Record.

Manufacturers NATO code

9 The NATO supply code for manufacturers is an alpha-numeric code for non-US based approved manufacturers and a numeric code for US based approved manufacturers. Manufacturers details related to a specific code are contained in the following publications available from DCA, Kentigern House, 65 Brown Street, Glasgow G2 8EX.

99-H4-1 Name to Code
99-H4-2 Code to Name

Usage code

10 The usage code column is normally left blank indicating full applicability of all items. Where a code letter is shown, it indicates that all items with that letter form part of the same assembly or sub-assembly.

INDEX OF PART NUMBERS

Part Number	DMC	Reference Number	Fig/Index	C of S or LM	FC
AGS1186B	28F	5330-99-9428453	1-2 1-2A	C	
AGS1213B	28F	4730-99-9143383	1-1 1-1A	C	
AGS596A	28N	5340-99-9128964	1-30	C	
C3747Y2			1-29		
C4076YMKC	27QM	4820-99-4117882	1	P	
C4076YMKE	27QM	4820-99-4117906	1	P	
C4076YMKF	27QM	4820-99-4117907	1	P	
C4076Y1MKB			1-7		
SP228-9			1-25		
SP310-11	27Q	5360-99-4117900	1-8	C	
SP758B	27Q	4730-99-4117585	1-4	C	
SP9C6		5315-99-1006943	1-13	C	
1644Y1	27Q	4730-99-4140192	1-3 1-3A	C	
2000Y15		5340-99-4170071	1-5	C	
2000Y55			1-6		
3305Y2	27Q	4820-99-4117894	1-22	C	
3305Y3	27Q	4820-99-4117893	1-21	C	
3747Y3	27Q	4820-99-4117887	1-26	C	
3747Y4	27Q	5365-99-4117898	1-28	C	
3747Y5			1-21A		
3747Y8			1-22A		
379921	27Q	5360-99-4117899	1-24	C	
394816			1-10		
403322	27Q	5310-99-4117905	1-11	C	
4076Y10	27Q	4820-99-4117884	1-19	C	
4076Y11	27Q	4820-99-4117885	1-15	C	
4076Y7	27Q	4820-99-4117886	1-16	C	
4076Y8	27Q	5315-99-4117889	1-20	C	
4076Y9	27Q	4820-99-4117890	1-17	C	
42153			1-12		
42158	27Q	5330-99-4117892	1-27	C	
42635	27Q	5310-99-4117891	1-14	C	
500Y385	27Q	5360-99-4117901	1-18	C	
54255	27Q	4820-99-4117895	1-23	C	
56752	27Q	4820-99-4117902	1-9	C	

DETAILED PARTS LIST

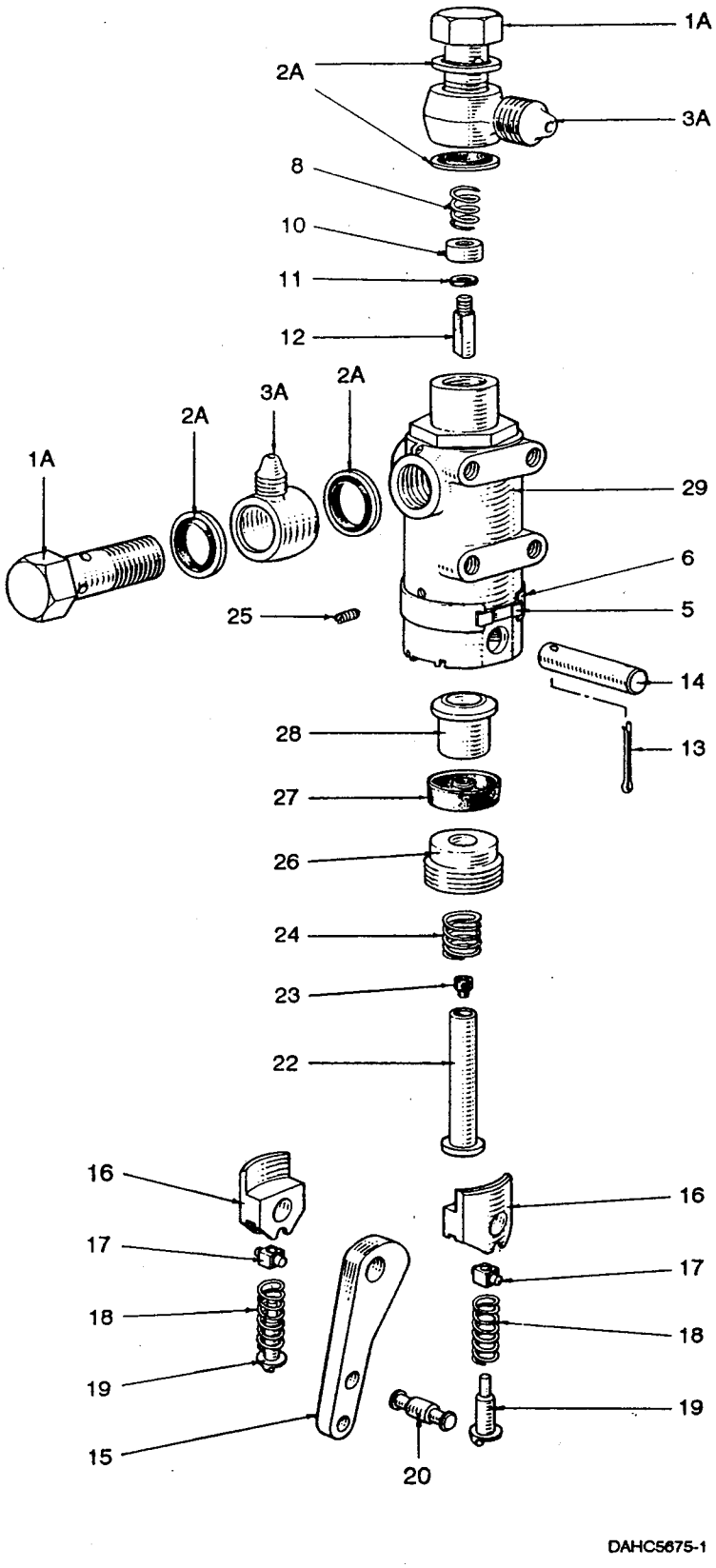


Fig 1 Air release valve

AIR RELEASE VALVE

Fig/ Index No	Part No	1 2 3 4 5 6 Nomenclature	Mnfrs NATO Code	Usage Code	Units per Assy
1+	C4076YMKC	Release valve, air		A	RF
1	C4076YMKE	Release valve, air		B	RF
1+	C4076YMKF	Release valve, air		C	RF
-1+	AGS1213B	. Bolt, banjo		A	1
-1A	AGS1213B	. Bolt, banjo		BC	2
-2+	AGS1186B	. Seal, bonded		A	3
-2A	AGS1186B	. Seal, bonded		BC	4
-3+	1644Y1	. Banjo		A	1
-3A	1644Y1	. Banjo		BC	2
-4+	SP758B	. Adapter		A	1
-5	2000Y15	. Strap			AR
-6	2000Y55	. Nameplate			1
-7+	C4076Y1MKB	. Valve assembly, release			1
-8	SP310-11	. . Spring			1
-9+	56752	. . Valve sub-assembly			1
-10	394816	. . . Housing, valve			1
-11	403322	. . . Washer, sealing			1
-12	42153	. . . Stem, valve			1
-13	SP9C6	. . Pin, split			1
-14	42635	. . Pin			1
-15	4076Y11	. . Lever, operating			1
-16	4076Y7	. . Link			2
-17	4076Y9	. . Pin, link			2

+ Item not illustrated

AIR RELEASE VALVE

Fig/ Index No	Part No	1 2 3 4 5 6 Nomenclature	Mnfrs NATO Code	Usage Code	Units per Assy
1-18	500Y385	. . Spring			2
-19	4076Y10	. . Guide, spring			2
-20	4076Y8	. . Pin			1
-21+	3305Y3	. . Push rod and seating sub-assembly (Alternative)			1
	or				
-21A+	3747Y5	. . Push rod and seating sub-assembly			1
-22	3305Y2	. . . Rod, push (Alternative)			1
	or				
-22A+	3747Y8	. . . Rod, push			1
-23	54255	. . . Seating			1
-24	379921	. . Spring			1
-25	SP228-9	. . Screw, grub			1
-26	3747Y3	. . Nut, gland			1
-27	42158	. . Ring, gland			1
-28	3747Y4	. . Spacer			1
-29	C3747Y2	. . Body, valve			1
-30+	AGS596A	. Cap, dust (Storage and transit)			1
					2

+ Item not illustrated