

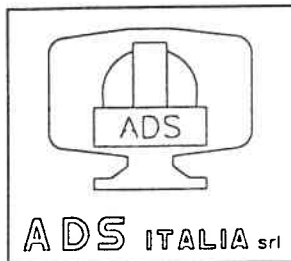
Technical Report #34

M2/f15 and M2/f9 Hexapod Data Package

D. Gallieni

July 1998





MMT CONVERSION

Doc.No. : H9-DP-AD-001
Issue : 1
Date : October 1998



Steward Observatory

**PROGRAMME : MMT CONVERSION
SECONDARY MIRRORS SUPPORT
M2/F15 and M2/F9 HEXAPOD**

CUSTOMER : Steward Observatory
The University of Arizona
Tucson - AZ 85721-0065 USA
Tel.: (520) 626-5231
Fax: (520) 621-9843

CONTRACTOR : ADS Italia s.r.l.
Corso Promessi Sposi 23/d,
23900 LECCO - ITALY
Tel.: +39-341-259231
Fax: +39-341-259235

DOCUMENT TITLE : M2/F15 and M2/F9 HEXAPOD DATA PACKAGE
Issue : 1
Date : 07/10/1998

DOCUMENT ID. : H9-DP-AD-001

DOCUMENT TYPE : DATA PACKAGE

ISSUED BY : D. Gallieni

ADS ITALIA
SISTEMI AVANZATI


Signature

07 OCT. 1998
Date



TABLE OF CONTENTS

1.	SCOPE OF THE WORK	4
2.	APPLICABLE DOCUMENTS	5
3.	HEXAPOD DESCRIPTION	6
4.	LINEAR ACTUATORS	7
4.1.	Parts and material list	7
4.2.	Assembly and Workshop Drawings	13
5.	HEXAPOD PLATFORMS	40
5.1.	Parts and material list	40
5.2.		42
	Assembly and Workshop Drawings	42
6.	COMPONENTS SELECTIONS AND MANUFACTURING DATA SHEETS	50
6.1.	Roller screw	50
6.2.	Ball Bearings	50
6.3.	DC Motor	53
6.4.	Optical Incremental Encoder	56
6.5.	LVDT and conditioning board	59
6.6.	Inductive Proximity Switch	59
6.7.	Brake	62
6.8.	Structural Parts	64
7.	ACTUATOR COMPONENTS TESTING AT MANUFACTURERS PREMISES	86
7.1.	Roller Screw	86
8.	ACTUATORS ACCEPTANCE TESTING IN AMBIENT CONDITION	103
8.1.	Test Equipment	103
8.2.	Test procedure	107



8.2.1.	Definitions	107
8.2.2.	Procedures	108
8.3.	Test results	111
8.3.1.	Actuators setting	111
8.3.2.	Results	112
8.4.	Results analysis	122
9.	DIMENSIONAL CONTROL OF HEXAPOD MECHANICAL ASSEMBLY AND COMPONENTS	123
9.1.	Linear Actuators	123
9.2.	Platforms	123
9.3.	Mechanical Assembly	128
10.	WEIGHT OF HEXAPOD MECHANICAL ASSEMBLY AND COMPONENTS	129
11.	ASSEMBLING PROCEDURE OF THE SINGLE ACTUATOR	130
11.1.	References	130
11.2.	Operative Procedures	130
12.	ASSEMBLING PROCEDURE OF THE HEXAPOD	133
12.1.	Reference	133
12.2.	Operative Instruction	133
12.3.	Actuators	133
12.4.	Lower interface ring assembly (DWG ADS 200508)	133
12.5.	Upper interface ring assembly (DWG ADS 200512)	133
12.6.	Hexapod final assembly (DWG ADS 200513)	134
13.	HANDLING, PACKING LIST	136
13.1.	Handling and transportation	136
13.2.	Packing list	137

	MMT CONVERSION	Doc.No : H9-DP-AD-001 Issue : 1 Date : Oct.1998	
--	-----------------------	---	--

1. SCOPE OF THE WORK

This document reports the informations related to the M2 Hexapod f9/f15 for the MMT upgrade.

Hexapod electromechanical parts are reported in terms of requirements fulfilment, parts and material list, assembly and workshop drawings, manufacturer's data sheets of commercial components, linear actuators testing in ambient conditions (test procedures and test results), installation and maintenance instructions and handling and transportation instructions for delivery.

	MMT CONVERSION	Doc.No : H9-DP-AD-001 Issue : 1 Date : Oct.1998	
--	----------------	---	--

2. APPLICABLE DOCUMENTS

- 1.1 W.Gallieni and R. Pozzi, «MMT CONVERSION - SECONDARY MIRRORS SUPPORT - M2/F15 and M2/F9 HEXAPOD DESIGN - TECHNICAL REPORT», Doc: D00001, Issue 3, January 1997;
- 1.2 Assembly drawings: 200505, 200513, 300931 and 300930.



3. HEXAPOD DESCRIPTION

The f9/f15 hexapod electromechanical parts include:

- seven (7) linear actuators (six + one spare);
- fixed and mobile platforms;
- six (6) interface supports for actuator joints fixture on the platforms.

The actuator is based by a direct drive configuration with frame-less motor and encoder on the same spindle axis.

The actuator nominal length (zero nominal stroke position) is 330 mm, measured between actuator's joints ledges.

The actuator nominal stroke is ± 10 mm from the zero position.

The max angular displacements of the flex joints is $\pm 1,0$ degree.

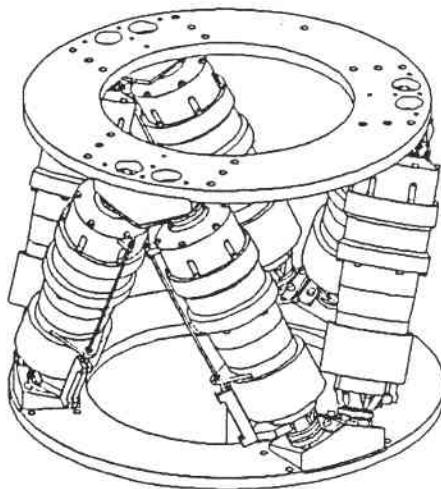
The satellite roller screw is of the re-circulating rollers type.

The motor gives 0,82 Nm continuous stall torque and 4,07 Nm peak torque.

The brake has 1,7 Nm static torque.

The incremental encoder has 3600 counts per revolution resolution, giving $0,28 \mu\text{m}$ linear resolution on the 1 mm pitch screw.

LVDT linear position sensor gains are reported in the functional test results.



	MMT CONVERSION	Doc.No : H9-DP-AD-001 Issue : 1 Date : Oct.1998	
--	-----------------------	---	--

4. **LINEAR ACTUATORS**

4.1. *Parts and material list*



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



MMT HEXAPOD M2-F15
 LINEAR ACTUATOR
 WORKSHOP LIST

ADS ITALIA S.R.L.
 SISTEMI AVANZATI
 Corso Promessi Sposi 23/d - 23900 Lecco



Parts list

Quantity	DESIGNATION	Format A	Item	MATERIAL	Piece weight (kg)	REMARKS	Mod.
1		3	01	ALSI 303	0.68	Dwg. n° 300933	B
4+3	FLEXURE FOIL (4 Dx. +3 Sx.)						
1	ENCODER HOUSING	4	02	UN1 Anticorodal 9006/4	0.2	Dwg. n° 400690	B
1	ENCODER-BEARING SUPPORT	4	03	ALSI 303	0.36	Dwg. n° 400691	B
1	FRAMELESS MOTOR SUPPORT	3	04	UN1 Anticorodal 9006/4	0.43	Dwg. n° 300934	A
1	BUSHING	4	05	ALSI 303	0.12	Dwg. n° 400692	A
1	DISTANCE RING	4	06	ALSI 303	0.025	Dwg. n° 400693	B
1	DISTANCE RING	4	07	ALSI 303	0.008	Dwg. n° 400694	A
1	BRAKE-BEARINGS SUPPORT	3	08	ALSI 303	1.85	Dwg. n° 300935	A
1	DISTANCE RING	4	09	ALSI 303	0.015	Dwg. n° 400695	A
1	COVER	4	10	ALSI 303	0.28	Dwg. n° 400696	A
1	PROXIMITY SUPPORT	3	11	UN1 Anticorodal 9006/4	0.1	Dwg. n° 300936	A
1	PROTECTION	4	12	UN1 Anticorodal 9006/4	0.045	Dwg. n° 400698	B
1	PROTECTION RING	4	13	UN1 Anticorodal 9006/4	0.035	Dwg. n° 400699	A
1	SATELLITE ROLLER SCREW SUPPORT	3	14	UN1 Anticorodal 9006/4	0.17	Dwg. n° 300937	A
Index		Number of assemblies :		7	ACTUATOR ASSEMBLY DWG N°200505		
Date		Weight for 1 ass. :		4.94	Kg.		
Name		Weight for all ass. :		34.58	Kg.		

MEDEA/CARO
 DA 3

9.9.98 OF

sheet 01 of 02
 FILE 400707/C

1) Quantity for 1 assembly 2) Quantity for execution



MMT CONVERSION

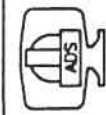
Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



Parts list

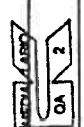
MMT HEXAPOD M2-F15
 LINEAR ACTUATOR
 COMMERCIAL LIST

ADS ITALIA S.R.L.
 SISTEMI AVANZATI
 Corso Promessi Sposi 23/d - 23900 Lecco



Quantity	DESIGNATION	Item	MATERIAL	Piece weight (kg)	REMARKS	Mod.
1						
2						
1	SATELLITE ROLLER SCREW (ROLLVIS RVR 20x1)	100	X46Cr13	~ 0.65	DWG.300939/C	
1	ENCODER (HEIDENHAIN ERO 1324)	101		0.145		
1	BALL BEARING (FAG 6000 Z15)	102		0.019		
2	SNAP RING FOR HOLES Ø26 UNI 7437	103	50 Cr V 4	0.001		
1	SELF LOCKING RING (GUK M12x1)	104	Steel R490N/mm ² Zinc plated	0.01		
3	GRUB SCREW M4x4 UNI 5923	105	INOX UNI 7323/8	0.002		
1	FRAMELESS BRUSHED MOTOR--ROTOR (INLAND)	106		1.08	Type QT-2404 "... WINDING	
1	FRAMELESS BRUSHED MOTOR--STATOR (INLAND)	107				
1	BRAKE (ELECTROID Type EFSB 15) Armature plate	108				
1	BRAKE (ELECTROID Type EFSB 15) Hub	109		0.54		
1	KEY 4x4x14 UNI 6604-A	110	Steel R590 N/mm ²	0.001	DWG.400750	
1	SELF LOCKING RING (GUK M20x1)	111	Steel R490N/mm ² Zinc plated	0.02		
2	AXIAL RADIAL BEARINGS (FAG B7004E.T.P4S.DBH)	112		0.07		
2	BELLEVILLE WASHER 25 GR 3 UNI 8737-B	113	50 Cr V 4	0.001		
Index			Number of assemblies :	6		
Date			Weight for 1 ass. :	4.15	Kg.	
Nome			Weight for all ass. :	24.9	Kg.	

9998 57
 sheet 01 of 03
 FILE 400707/C



1) Quantity for 1 assembly 2) Quantity for execution



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



Parts list

MMT HEXAPOD M2-F15
LINEAR ACTUATOR
COMMERCIAL LIST

ADS ITALIA S.R.L.
SISTEMI AVANZATI
Corso Promessi Sposi 23/d - 23900 Lecco



Quantity	DESIGNATION	Item	MATERIAL	Piece weight (kg)	REMARKS	Mod.
1	SELF LOCKING RING (GUK M10x0.75)	114	Steel R490N/mm ² Zinc plated	0.008		
1	LYDT Unit (SCHAEVITZ Type 500 MHR-Miniature)	115	ANSI 400 (Housing)	0.019		
2	PROXIMITY (BAUMER Type IFR 05.26.35/L)	116	ANSI 303 (Housing)	0.02		
20	SCREW M4x15 UNI 5931	117	INOX UNI 7323/B	0.018		
2	NUT M3 ISO 4032	118	INOX ISO 3506	0.015		
2	WASHER 3.2x7x0.5 UNI 6592	119	INOX UNI 7323/B	0.005		
6	SCREW M4x20 UNI 5931	120	INOX UNI 7323/B	0.020		
4	SCREW M3x40 UNI 7688	121	INOX UNI 7323/B	0.020		
6	SCREW M4x25 UNI 5931	122	INOX UNI 7323/B	0.025		
14	SCREW M5x12 UNI 5931	123	INOX UNI 7323/B	0.025		
8	SCREW M2.5x5 UNI 7688	124	INOX UNI 7323/B	0.005		
4	NUT M5 ISO 4032	125	INOX ISO 3506	0.020		
4	WASHER 5.3x8.5x1 UNI 6592	126	INOX UNI 7323/B	0.008		
2	SCREW M4x8 UNI 6107	127	INOX UNI 7323/B	0.001		

Index		Number of assemblies :	6
Date		Weight for 1 ass. :	4.15 Kg.
Name		Weight for all ass. :	24.9 Kg.

9998 *u*
 sheet 07 of 03
 FILE 400707/C

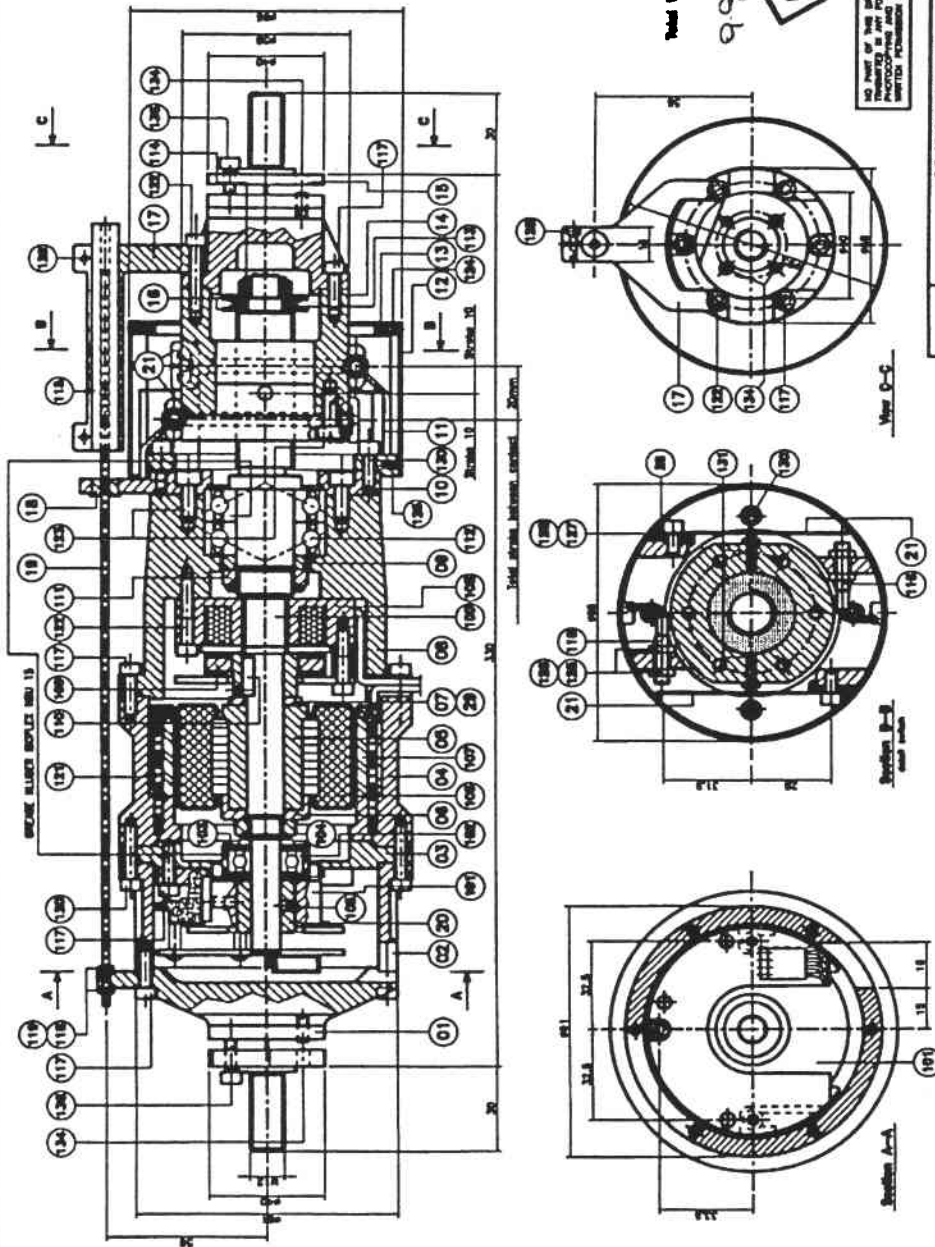
	MMT CONVERSION	Doc.No : H9-DP-AD-001 Issue : 1 Date : Oct.1998	
--	-----------------------	---	--

4.2. *Assembly and Workshop Drawings*



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



998
 LMB SY
 01A
 02A
 03A
 04A
 05A
 06A
 07A
 08A
 09A
 10A
 11A
 12A
 13A
 14A
 15A
 16A
 17A
 18A
 19A
 20A
 21A

PROJECT	ADS MMT CONVERSION		
DESIGNER	Alessandro Pizzoli		
CHECKER	Alessandro Pizzoli		
DATE	10/1998		
REV.	1	DESCRIPTION	MMT Conversion
REV.	2	DESCRIPTION	MMT Conversion
REV.	3	DESCRIPTION	MMT Conversion
REV.	4	DESCRIPTION	MMT Conversion
REV.	5	DESCRIPTION	MMT Conversion
REV.	6	DESCRIPTION	MMT Conversion
REV.	7	DESCRIPTION	MMT Conversion
REV.	8	DESCRIPTION	MMT Conversion
REV.	9	DESCRIPTION	MMT Conversion
REV.	10	DESCRIPTION	MMT Conversion
REV.	11	DESCRIPTION	MMT Conversion
REV.	12	DESCRIPTION	MMT Conversion
REV.	13	DESCRIPTION	MMT Conversion
REV.	14	DESCRIPTION	MMT Conversion
REV.	15	DESCRIPTION	MMT Conversion
REV.	16	DESCRIPTION	MMT Conversion
REV.	17	DESCRIPTION	MMT Conversion
REV.	18	DESCRIPTION	MMT Conversion
REV.	19	DESCRIPTION	MMT Conversion
REV.	20	DESCRIPTION	MMT Conversion
REV.	21	DESCRIPTION	MMT Conversion
REV.	22	DESCRIPTION	MMT Conversion
REV.	23	DESCRIPTION	MMT Conversion
REV.	24	DESCRIPTION	MMT Conversion
REV.	25	DESCRIPTION	MMT Conversion
REV.	26	DESCRIPTION	MMT Conversion
REV.	27	DESCRIPTION	MMT Conversion
REV.	28	DESCRIPTION	MMT Conversion
REV.	29	DESCRIPTION	MMT Conversion
REV.	30	DESCRIPTION	MMT Conversion
REV.	31	DESCRIPTION	MMT Conversion
REV.	32	DESCRIPTION	MMT Conversion
REV.	33	DESCRIPTION	MMT Conversion
REV.	34	DESCRIPTION	MMT Conversion
REV.	35	DESCRIPTION	MMT Conversion
REV.	36	DESCRIPTION	MMT Conversion
REV.	37	DESCRIPTION	MMT Conversion
REV.	38	DESCRIPTION	MMT Conversion
REV.	39	DESCRIPTION	MMT Conversion
REV.	40	DESCRIPTION	MMT Conversion
REV.	41	DESCRIPTION	MMT Conversion
REV.	42	DESCRIPTION	MMT Conversion
REV.	43	DESCRIPTION	MMT Conversion
REV.	44	DESCRIPTION	MMT Conversion
REV.	45	DESCRIPTION	MMT Conversion
REV.	46	DESCRIPTION	MMT Conversion
REV.	47	DESCRIPTION	MMT Conversion
REV.	48	DESCRIPTION	MMT Conversion
REV.	49	DESCRIPTION	MMT Conversion
REV.	50	DESCRIPTION	MMT Conversion
REV.	51	DESCRIPTION	MMT Conversion
REV.	52	DESCRIPTION	MMT Conversion
REV.	53	DESCRIPTION	MMT Conversion
REV.	54	DESCRIPTION	MMT Conversion
REV.	55	DESCRIPTION	MMT Conversion
REV.	56	DESCRIPTION	MMT Conversion
REV.	57	DESCRIPTION	MMT Conversion
REV.	58	DESCRIPTION	MMT Conversion
REV.	59	DESCRIPTION	MMT Conversion
REV.	60	DESCRIPTION	MMT Conversion
REV.	61	DESCRIPTION	MMT Conversion
REV.	62	DESCRIPTION	MMT Conversion
REV.	63	DESCRIPTION	MMT Conversion
REV.	64	DESCRIPTION	MMT Conversion
REV.	65	DESCRIPTION	MMT Conversion
REV.	66	DESCRIPTION	MMT Conversion
REV.	67	DESCRIPTION	MMT Conversion
REV.	68	DESCRIPTION	MMT Conversion
REV.	69	DESCRIPTION	MMT Conversion
REV.	70	DESCRIPTION	MMT Conversion
REV.	71	DESCRIPTION	MMT Conversion
REV.	72	DESCRIPTION	MMT Conversion
REV.	73	DESCRIPTION	MMT Conversion
REV.	74	DESCRIPTION	MMT Conversion
REV.	75	DESCRIPTION	MMT Conversion
REV.	76	DESCRIPTION	MMT Conversion
REV.	77	DESCRIPTION	MMT Conversion
REV.	78	DESCRIPTION	MMT Conversion
REV.	79	DESCRIPTION	MMT Conversion
REV.	80	DESCRIPTION	MMT Conversion
REV.	81	DESCRIPTION	MMT Conversion
REV.	82	DESCRIPTION	MMT Conversion
REV.	83	DESCRIPTION	MMT Conversion
REV.	84	DESCRIPTION	MMT Conversion
REV.	85	DESCRIPTION	MMT Conversion
REV.	86	DESCRIPTION	MMT Conversion
REV.	87	DESCRIPTION	MMT Conversion
REV.	88	DESCRIPTION	MMT Conversion
REV.	89	DESCRIPTION	MMT Conversion
REV.	90	DESCRIPTION	MMT Conversion
REV.	91	DESCRIPTION	MMT Conversion
REV.	92	DESCRIPTION	MMT Conversion
REV.	93	DESCRIPTION	MMT Conversion
REV.	94	DESCRIPTION	MMT Conversion
REV.	95	DESCRIPTION	MMT Conversion
REV.	96	DESCRIPTION	MMT Conversion
REV.	97	DESCRIPTION	MMT Conversion
REV.	98	DESCRIPTION	MMT Conversion
REV.	99	DESCRIPTION	MMT Conversion
REV.	100	DESCRIPTION	MMT Conversion

Note: Before assembling the actuator inside the housing, remove the safety screws item (13) and (13) inserted for transport and handling shock absorbing

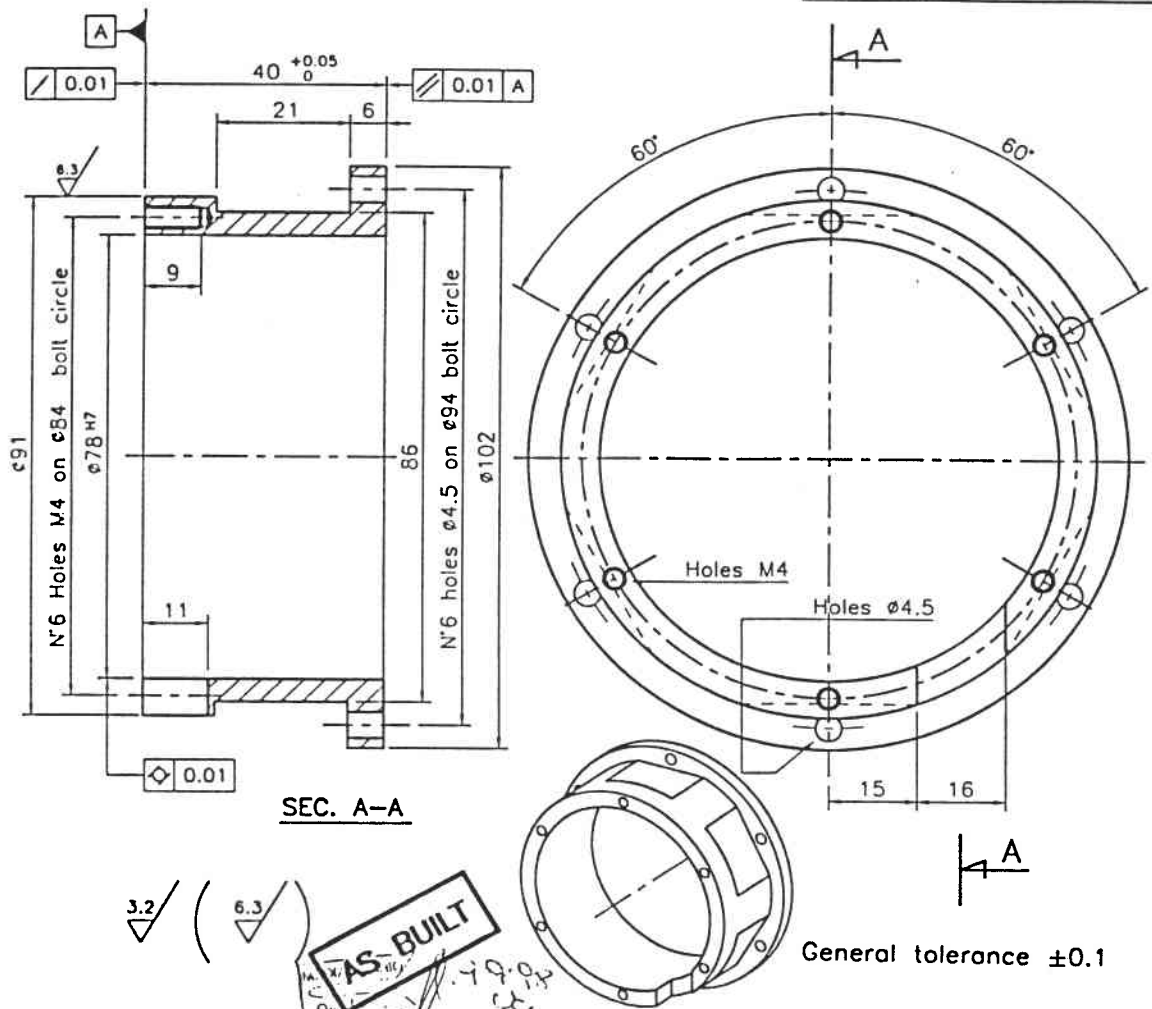


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Home Srl COMPANY.

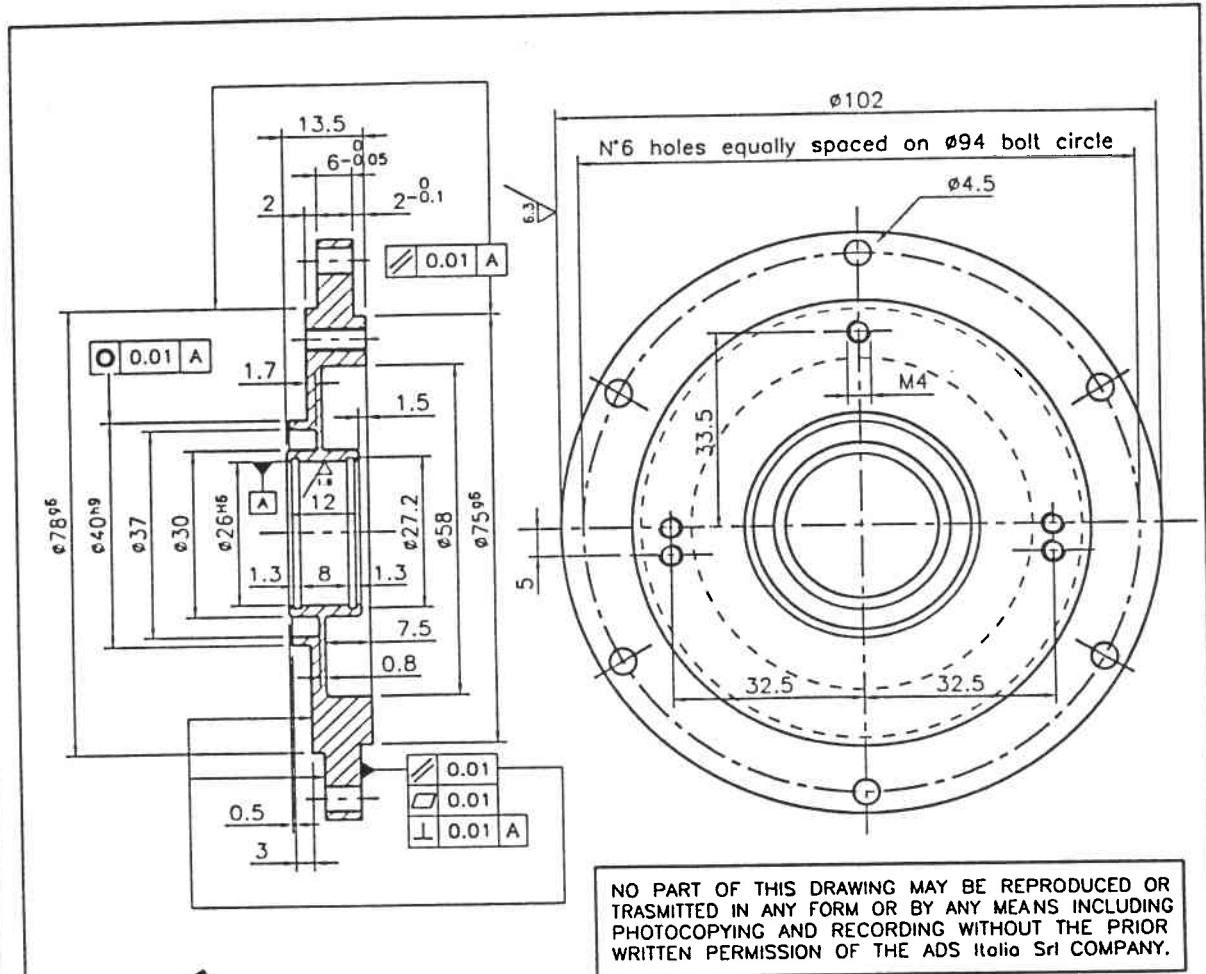


02	07	Encoder housing	Anticorodal	9006/4	0.2			
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST		
PROJECT		6,5 MMT CONVERSION				DRAWN	SCALE	
		Hexapod Five Axis Secondary Positioner				ADS-C.Pesco	1:1	
		MODIFICATION				CHECKED	DATE	
ISS.	SIGN.	DATE					APPROVED	23 09 1998
VARIATION	C							
	B							
	A							
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Sposi 23/d-1 - 23063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721					
MMT HEXAPOD			SOST.IL		OBTAINED			
ENCODER HOUSING			SOST.DA		CO.			
POS. 02			400690 B					



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



AS-BUILT

General tolerance ± 0.1 $\sqrt{3.2}$ ($\sqrt{1.6}$ $\sqrt{6.3}$)

03	07	Encoder - bearing - support	ISI 303		0.36	
pos.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
		MODIFICATION			CHECKED	DATE
ISS.	SIGN.	DATE				23 09
VARIAION	C					1998
	B					
	A					
		ADS ITALIA S.R.L.				
		SISTEMI AVANZATI		Steward Observatory		
		Corso Promessi Spesi 23/d1 - 22053 LECCO		University of Arizona - (520)621-7659		
		MMT HEXAPOD		933 N.Cherry Ave., Tucson, Arizona 85721		
		ENCODER-BEARING-SUPPORT		SOST.II	OBTAINED	
		POS. 03		SOST.DA	CO.	
				400691 B		

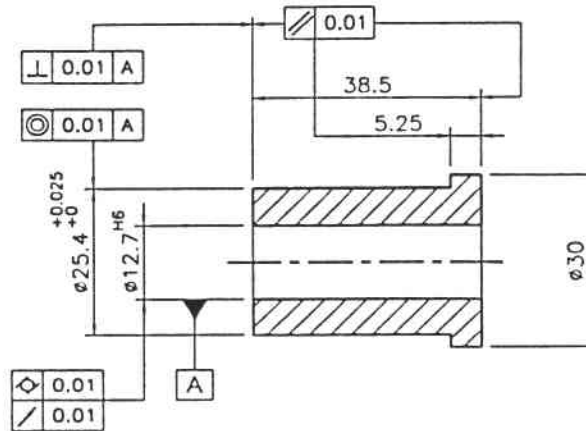


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2

AS BUILT
 4-0-98
 Ver

05	07	Bushing	AISI 303		0.12	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
		MODIFICATION			CHECKED	DATE
ISS	SIGN.	DATE				
C						
B						
A						
					APPROVED	23 09 1998
		ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spodi 23/d1 - 22053 LECCO		 Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721		
MMT HEXAPOD				SOST.IL	OBTAINED	
BUSHING				SOST.DA	CO.	
POS. 05				400692 A		



MMT CONVERSION

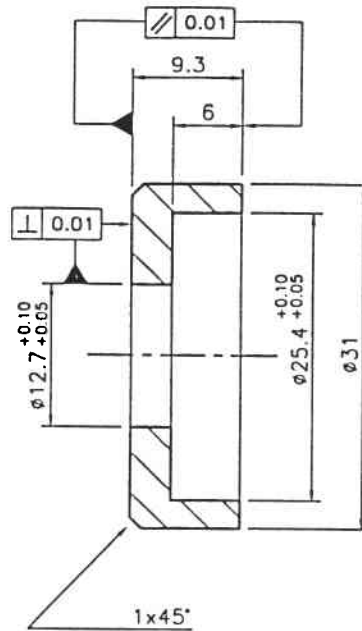
Doc.No : H9-DP-AD-001

Issue : 1

Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2 ✓

AS BUILT stamp with handwritten date 4-9-98 and initials.

06	07	Distance ring	AISI 303		0.025		
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST	
PROJECT		6,5 MMT CONVERSION				DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner				ADS-C.Pesco	2:1
		MODIFICATION				CHECKED	DATE
VARIATION	ISS.	SIGN.	DATE				
	C						
	CP		18/07/97	Modifica tolleranza $\phi 25.4$			
	A						
						APPROVED	24 09 1998



ADS ITALIA S.R.L. SISTEMI AVANZATI
Corso Promessi Spesi 23/d1 - 22053 LECCO



Steward Observatory
University of Arizona - (520)621-7659
933 N.Cherry Ave., Tucson, Arizona 85721

MMT HEXAPOD		SOST.IL	OBTAINED
DISTANCE RING			
POS. 06			
		SOST.DA	CO.
		400693 B	

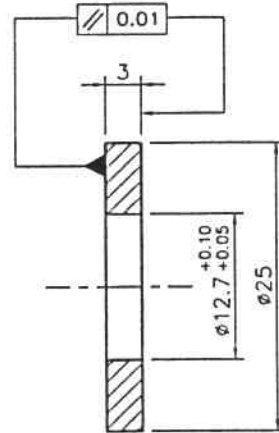


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2 ✓

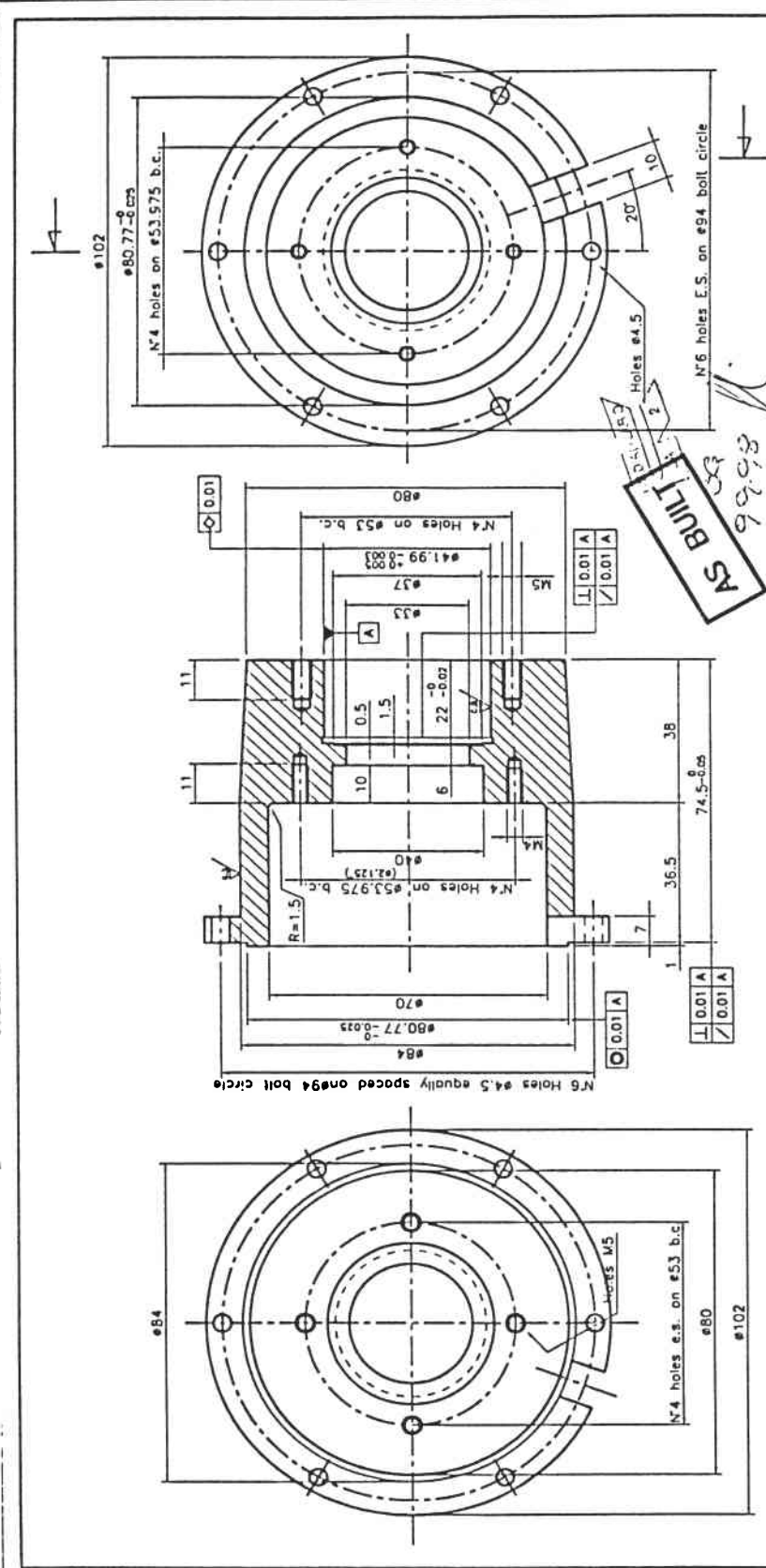
AS BUILT
 4.9.98
 [Signature]

07	07	Distance ring	AISI 303		0.008	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	2:1
		MODIFICATION			CHECKED	DATE
ISS.	SIGN.	DATE				
VAR.	C					
	B					
	A					
				APPROVED	24	09
						1998
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			SOST.IL		OBTAINED	
DISTANCE RING			SOST.DA		CO.	
POS. 07					400694	
					A	



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



08	07	Bearings support	ASI 303	MATERIAL	UNI	1.45	LIST
PROJECT		6.5 MMT CONVERSION					
Hexapod Five Axis Secondary Positioner		MODIFICATION					
ISSUE	SIGN.	DATE	CHECKED	APPROVED	DATE	SCALE	LIST
C					28	1:1	
B					08		
A					1998		

ADS ITALIA S.R.L.
 SISTEMI AVANZATI
 Corso Promessi Sposi, 23/d - 23900 Lecco

Steward Observatory
 University of Arizona - (520)621-7659
 933 N.Cherry Ave., Tucson, Arizona 85721

NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPIING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.

General tolerance ± 0.1

3.2 / (0.8 / 6.3)

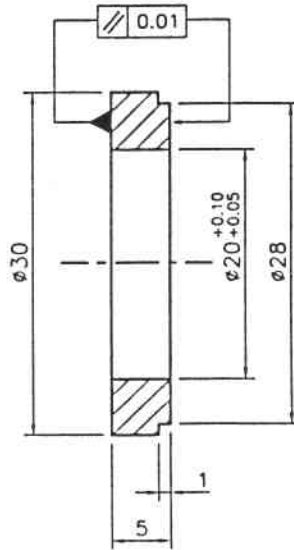


MMT CONVERSION

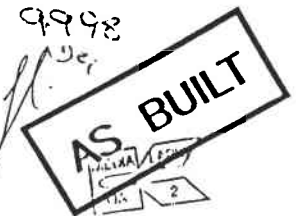
Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

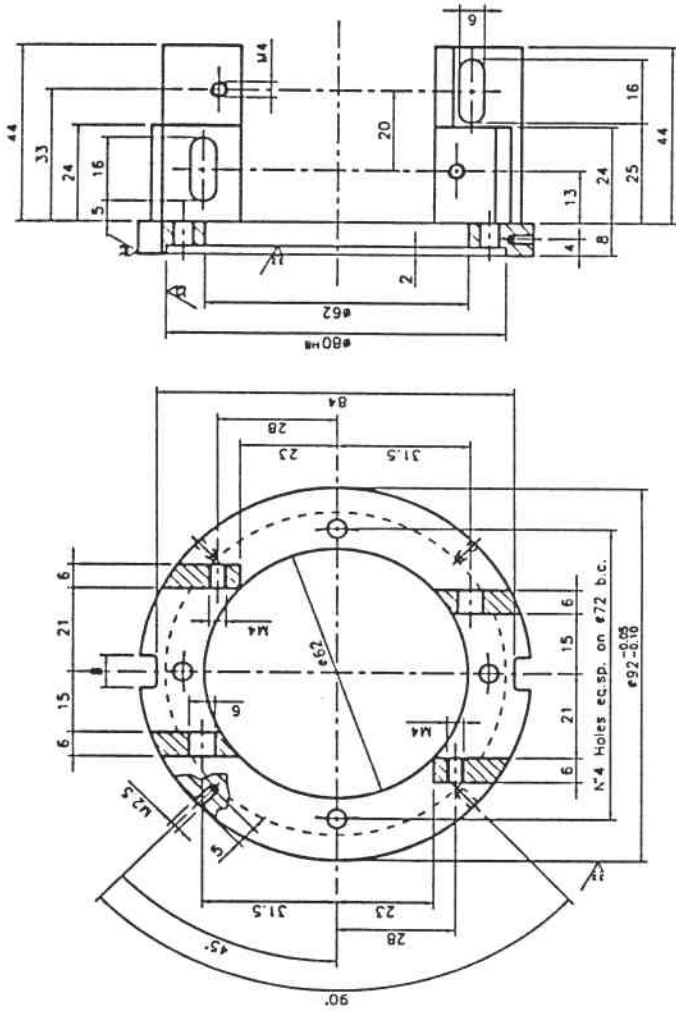


09	07	Distance ring	AISI 303		0.015	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	2:1
		MODIFICATION			CHECKED	DATE
VARIATION	ISS.	SIGN.	DATE		APPROVED	25 09 1998
	C					
	B					
	A					
		ADS ITALIA S.R.L.				Steward Observatory
		SISTEMI AVANZATI				University of Arizona - (520)621-7659
		Corso Promessi Sposi 23/d - 22063 LECCO				933 N.Cherry Ave., Tucson, Arizona 85721
		MMT HEXAPOD		SOST.II	OBTAINED	
		DISTANCE RING		SOST.DA	CO.	
		POS. 09		400695 A		



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



General tolerance ± 0.1

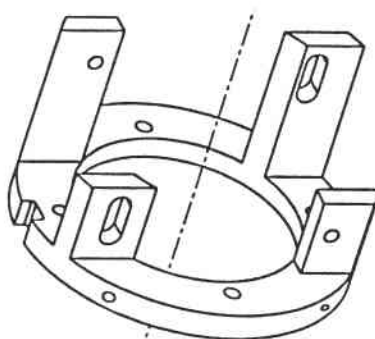
11	07	Proximity support	Antibonded	9006/4	0.1	LIST
POS.	QTY	DENOMINATION	MATERIAL	UNI	PROPR. N°	SCALE
PROJECT		6,5 MMT CONVERSION				
HEXAPOD		Hexapod Five Axis Secondary Positioner				
ISS.	SIGN.	DATE	MODIFICATION			
C						
B						
A						
VARIATION						
			APPROVED	DATE	1998	

ADS
ADS ITALIA S.R.L.
 SISTEMI AVANZATI
 Corso Promessi Sposi 23/d - 23900 Lecco

STUART OBSERVATORY
 University of Arizona - (520)621-7659
 933 N.Cherry Ave., Tucson, Arizona 85721

MMT HEXAPOD
 PROXIMITY SUPPORT
 POS. 11

300936/A



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



MMT CONVERSION

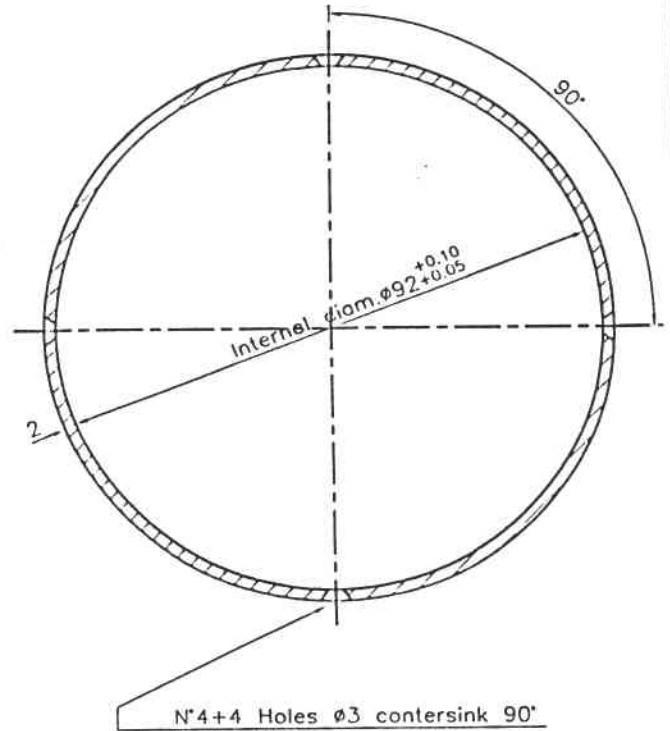
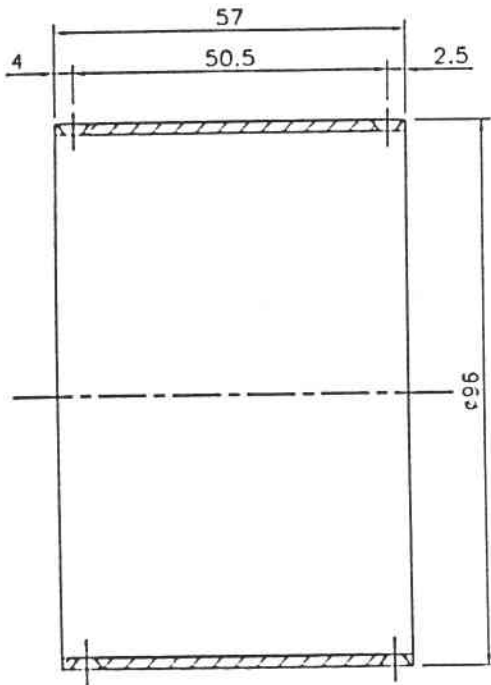
Doc.No : H9-DP-AD-001

Issue : 1

Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



AS BUILT

General tolerance ± 0.1



12	07	Protection	Anticorodal	9006/4	0.045	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		8,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesca	1:1
		MODIFICATION			CHECKED	DATE
VARIANTE	ISS.	SIGN.	DATE		APPROVED	28 09 1998
	C					
	B					
A						
		ADS ITALIA S.R.L.				
		SISTEMI AVANZATI		Steward Observatory		
		Corso Promessi Sposi 23/d - 23900 LECCO		University of Arizona - (520)621-7659		
		MMT HEXAPOD		933 N.Cherry Ave., Tucson, Arizona 85721		
		PROTECTION		SOST.IL	OBTAINED	
		POS. 12		SOST.DA	CO.	
				400698 B		

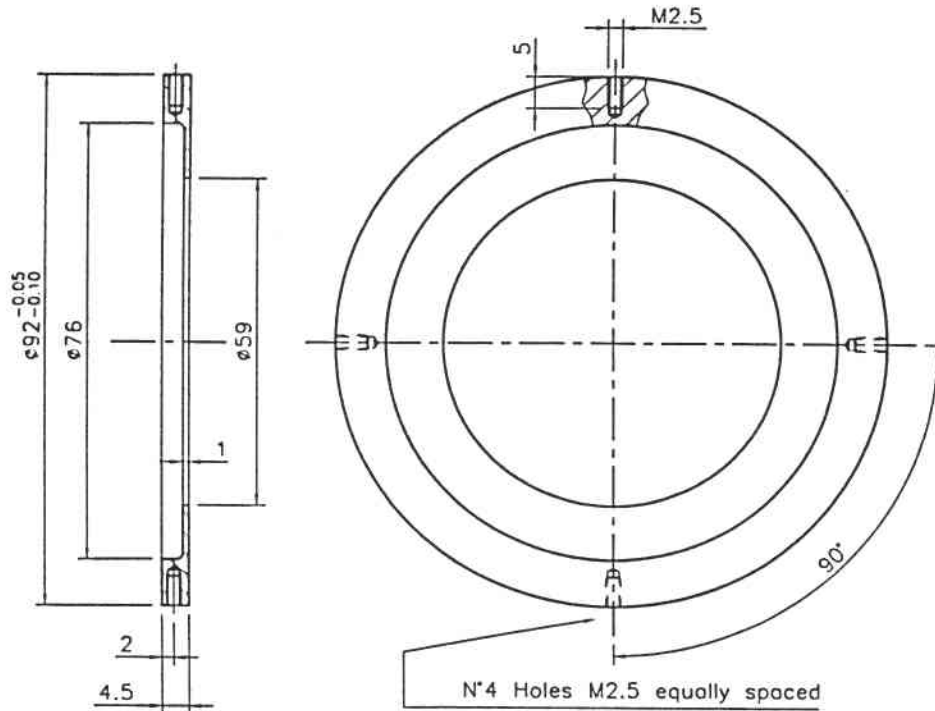


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2

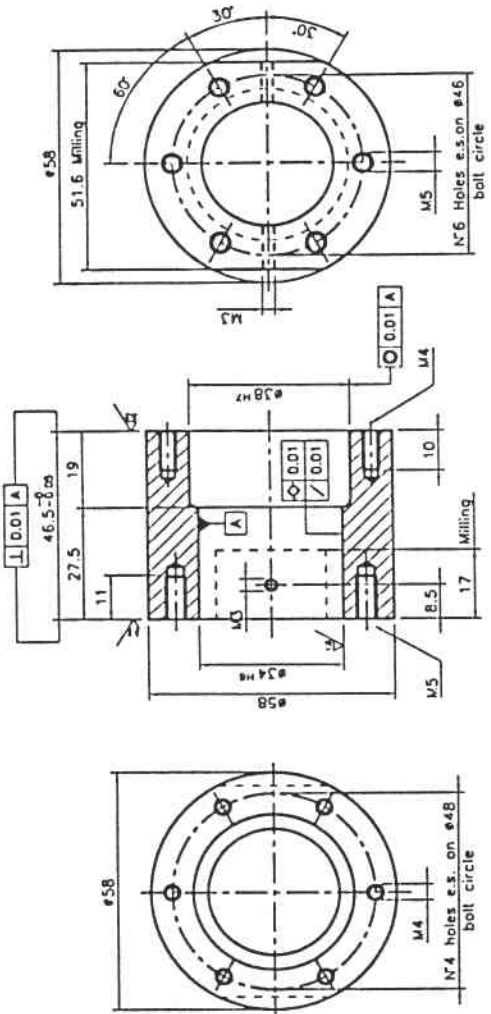
AS BUILT
 49.98
 1.27

13	07	Protection ring	Anticorodal	9006/4	0.035	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6.5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
VARIATION	ISS.	SIGN.	DATE	MODIFICATION		
	C					
	B					
	A					
					CHECKED	DATE
					APPROVED	27 09 1998
		ADS ITALIA S.R.L.				
		SISTEMI AVANZATI		Steward Observatory		
		Corso Promessi Sposi 23/d1 - 22053 LECCO		University of Arizona - (520)621-7659		
		MMT HEXAPOD		933 N.Cherry Ave., Tucson, Arizona 85721		
		PROTECTION RING		SOST.IL	OBTAINED	
		POS. 13		SOST.DA	CO.	
				400699 A		



MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



AS BUILT
 20/09/98
 LSA

NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPIING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS ITALIA S.r.l. COMPANY.

14	07	Satellite roller screw support	Anticorodal	9006/4	0.17
POS.	0.7Y	DENOMINATION	MATERIAL	UNI	LIST
PROJECT		6.5 MMT CONVERSION			
Hexapod Five Axis Secondary Positioner		SCALE	1:1	DATE	27/09/1998
USE	SIGN.	DATE	MODIFICATION	CHECKED	APPROVED
C					
B					
A					
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d - 23900 Lecco		 Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD SATELLITE ROLLER SCREW SUPPORT POS. 14		POST. IL.	POST. NA.	CO.	300937 JA

General tolerance ± 0.1 ∇ ($\frac{3.2}{\nabla}$ / $\frac{1.6}{\nabla}$)

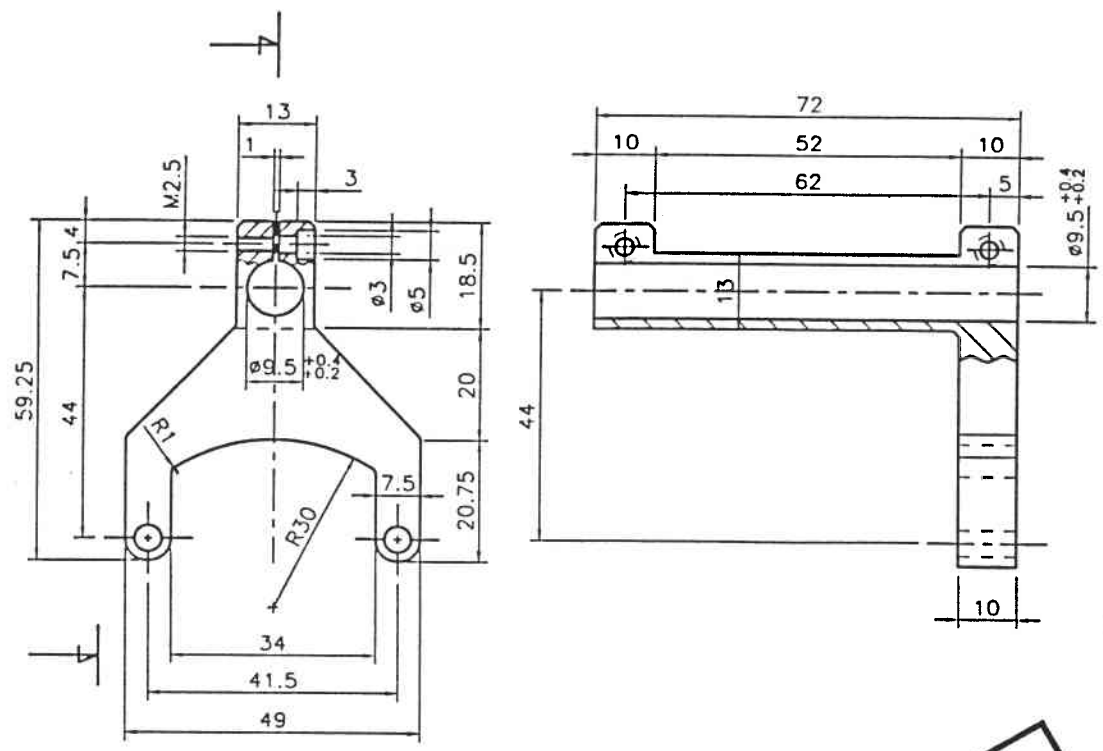


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

6.3

AS BUILT
 09/98
 09

17	7	LVDT Support	AISI 303	UNI	0.15	Weight Kg	LIST
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST	
PROJECT		6,5 MMT CONVERSION				DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner				ADS-C.Pesco	1:1
ISS.	SIGN.	DATE	MODIFICATION				
VARIAZION	C					CHECKED	DATE
	B					APPROVED	30 09
	A						1996
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721				
MMT HEXAPOD			SOST.IL		OBTAINED		
LVDT SUPPORT			SOST.DA		CO.		
POS. 17			400701 A				



MMT CONVERSION

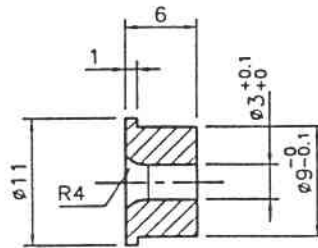
Doc.No : H9-DP-AD-001

Issue : 1

Date : Oct.1998

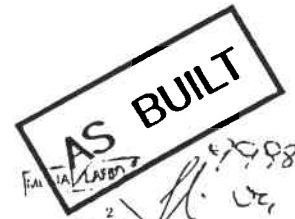


NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2



18	7	Bushing	B14		0.01	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	2:1
		MODIFICATION			CHECKED	DATE
VARIATION	ISS.	SIGN.	DATE		APPROVED	30 09 1998
	C					
	B					
A						
ADS ITALIA S.R.L. SISTEMI AVANZATI <small>Corso Promessi Sposi 23/d1 - 22063 LECCO</small>		Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721				
MMT HEXAPOD		FOUR DECIM	SOST.IL		OBTAINED	
BUSHING			SOST.DA		CO.	
POS. 18			400702 A			



MMT CONVERSION

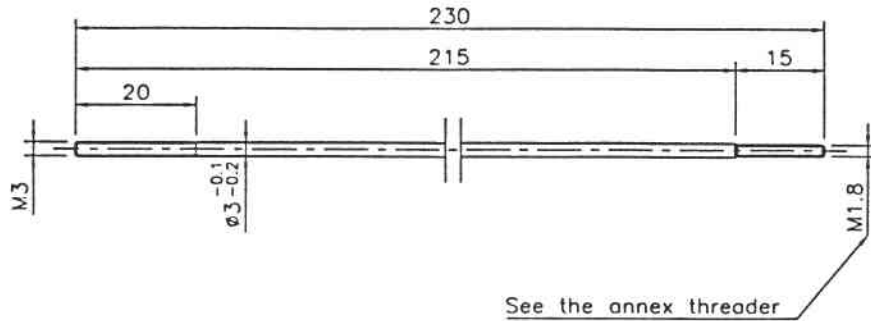
Doc.No : H9-DP-AD-001

Issue : 1

Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2

AS BUILT
9/9/98
UA 2

19	6+1	Stem	INVAR		0,015	
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6.5 MMT CONVERSION Hexapod Five Axis Secondary Positioner			DRAWN ADS-C.Pesco	SCALE 1:1
		MODIFICATION			CHECKED	DATE
VARIATION	C					
	B					
	A					
		APPROVED				30 09 1998
		ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d - 22053 LECCO		 Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721		
		MMT HEXAPOD STEM POS. 19		TAXI ORDER	SOST.JL	OBTAINED
					SOST.DA	CO.
				400703 A		

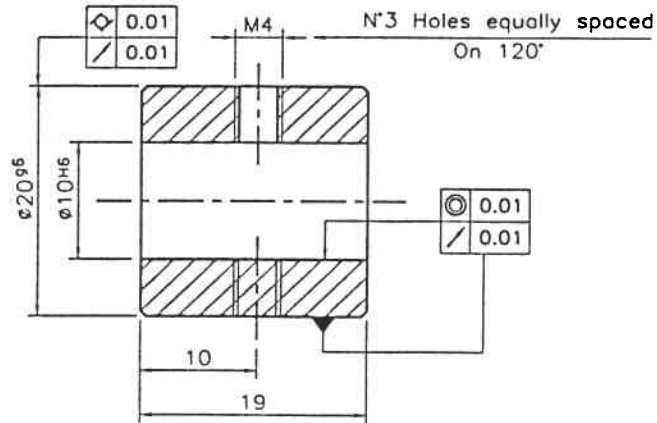


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2

AS BUILT
 9999

20	7	Bushing	AISI 303	0.03		
POS.	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg LIST	
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	2:1
		MODIFICATION			CHECKED	DATE
VARIATION	ISS.	SIGN.	DATE		APPROVED	30 09 1998
	C					
	B					
A						
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Sposi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			TYPE ORDER	SOST.IL	OBTAINED	
BUSHING				SOST.DA	CO.	
POS. 20				400705 A		

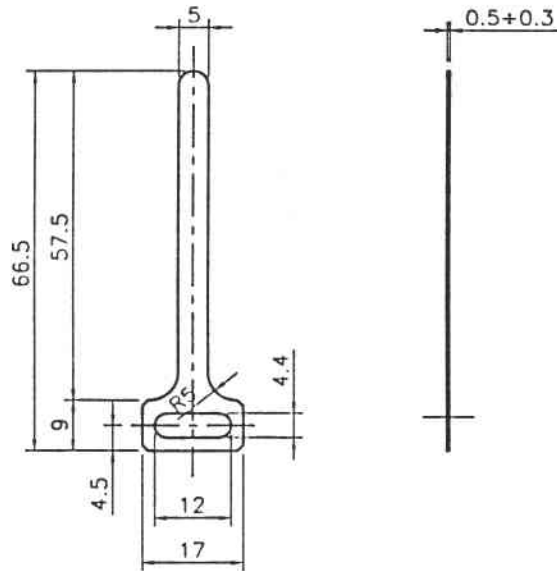


MMT CONVERSION

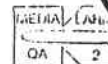
Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1



AS BUILT
 4998
 45

21	14	Flexure foil	50 Cr V 4	0.003		
POS.	PEZZI	DENOMINAZIONE	MATERIALE	UNI	Kg.	NOTE
PROJECT		6,5 MMT CONVERSION			DISEGNATO	SCALA
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
VARIAZIONI	IND	SIGLE	DATA	MODIFICHE		
	C					
	B					
	A					
				CONTROLLATO	DATA	
				VISTO	30	09
					1998	
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Sposi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			CONFERME	SOST.IL	RICAV.DA	
FLEXURE FOIL				SOST.DA	CO.	
POS.21				400704		
					A	

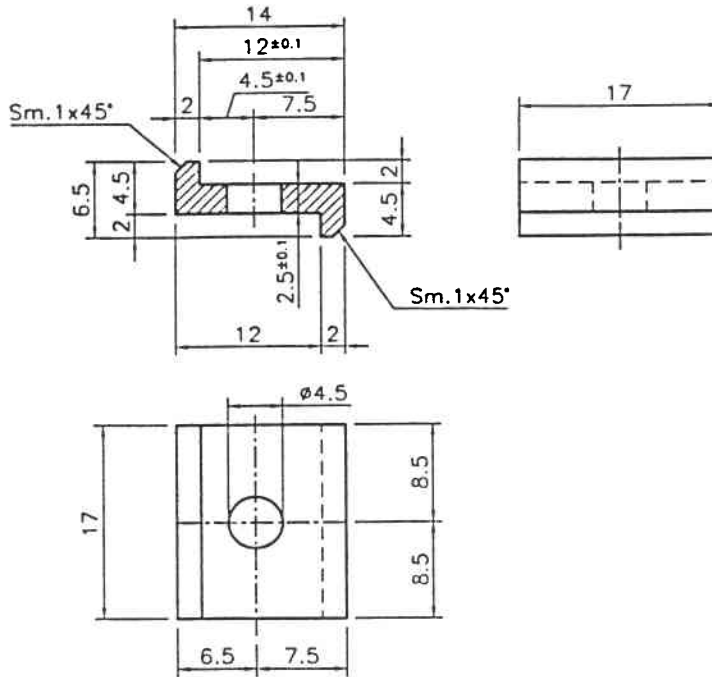


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct .1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

AS BUILT
 3.2
 RADIAL
 4.998
 0.01

28	14	Distance plate	AISI 304		0.08	
Item	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			Anoclerio	2:1
		MODIFICATION			CHECKED	DATE
ISS.	SIGN.	DATE				
C						
B						
A						
					APPROVED	09 09 1998
		ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d - 22053 LECCO		 Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721		
MMT HEXAPOD				SOST.IL	OBTAINED	
Distance plate				SOST.DA	CO.	
Item 28				400748		

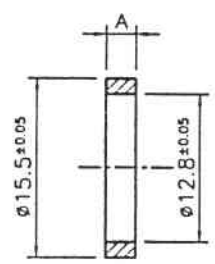


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.

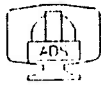


	A	Tolerance
1	2.64	± 0.02
2	2.67	± 0.02
3	2.73	± 0.02
4	2.46	± 0.02
5	2.63	± 0.02
6	2.60	± 0.02
7	2.70	± 0.02

General tolerance ± 0.1

3.2 METAL
 AS BUILT
 9.9.98
 [Signature]

29	7	Bushing	AISI 304		0.02	
Item	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			Anaclerio	2:1
		MODIFICATION			CHECKED	DATE
VARIATION	ISS.	SIGN.	DATE		APPROVED	09 09 1998
	C					
	B					
A						
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			FOUR ORDER	SOST.IL	OBTAINED	
Bushing				SOST.DA	CO.	
Item 29				400749		

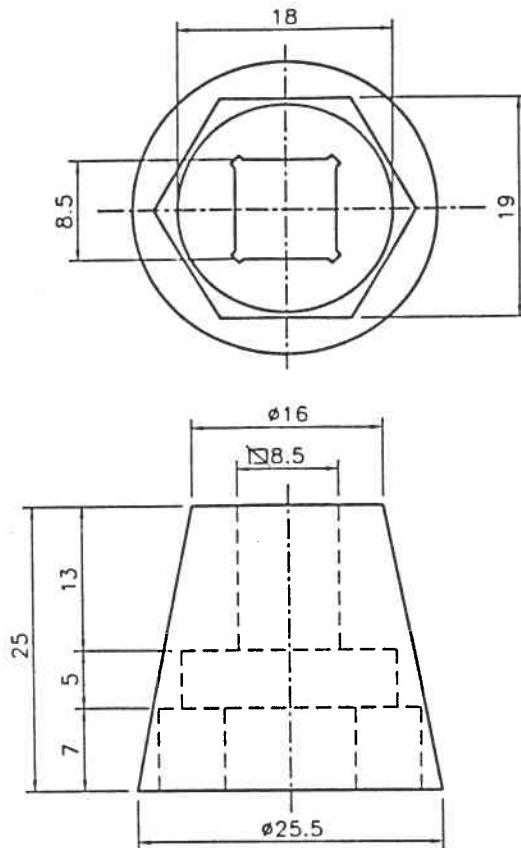


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

AS BUILT
 09/09/98

Item	1	Key	AISI 304			
	O.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT	8,5 MMT CONVERSION				DRAWN Anacletio	SCALE
	Hexapod Five Axis Secondary Positioner					CHECKED
VARIATION	ISS.	SIGN.	DATE	MODIFICATION		
	C				APPROVED	DATE
	B					09/09
	A					1998
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Spesi 23/d - 23900 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			SOST.IL		OBTAINED	
Key for mounting Hexapod screw (item 135)			SOST.DA		CO.	
					400751	

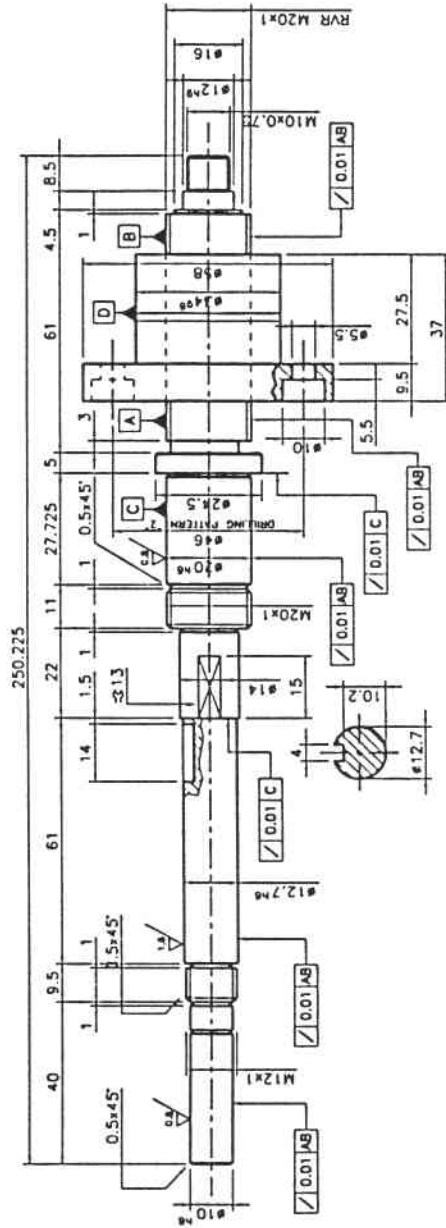


MMT CONVERSION

Doc.No : H9-DP-AD-001

Issue : 1

Date : Oct .1998



AS BMT
MEDICAL
C.A.

100/	6	RVR satellite roller screw M20x1	X48Cr13	MATERIAL	UNI	LIST
POS.	QTY	DENOMINATION				
PROJECT		6,5 MMT CONVERSION				SCALE
		Hexapod Five Axis Secondary Positioner				1:1
ISS.	SIGN.	DATE				DATE
VARIATION		MODIFICATION				1 10
						1998

ADS
ADS ITALIA S.R.L.
SISTEMI AVANZATI
 Corso Promessi Sposi, 23/d - 23900 Lecco - ITALIA

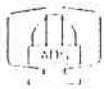
Steward Observatory
 University of Arizona - (520)521-7659
 933 N.Cherry Ave., Tucson, Arizona 85721

MMT HEXAPOD
 ROLLVIS SCREW
 POS. 100

BOFF.IL
 BOFF.SA
 CO.
 300939

General tolerance ± 0.1

$\sqrt{3.2}$ $\sqrt{1.5}$ $\sqrt{0.8}$

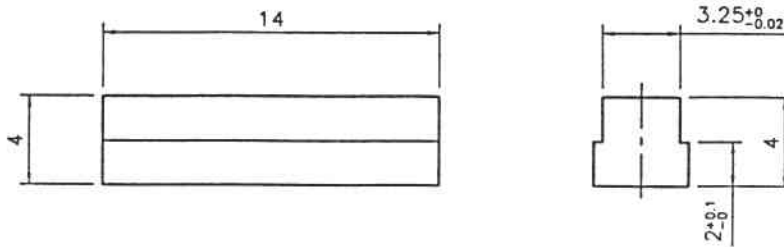


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct .1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1



AS BUILT
 09.09.98
 [Signature]

110	7	Key 4x4x14 UNI 6604-A	Steel R590 N/mm			
Item	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			Anaclerio	2:1
		MODIFICATION			CHECKED	DATE
VARIATION	C				APPROVED	09 09
	B					1998
	A					
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Sposi 23/d1 - 22053 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			POUR ORDER	SOST.IL	OBTAINED	
Bush				SOST.DA	CO.	
Item 110				400750		

5. HEXAPOD PLATFORMS

5.1. *Parts and material list*



5.2.

Assembly and Workshop Drawings

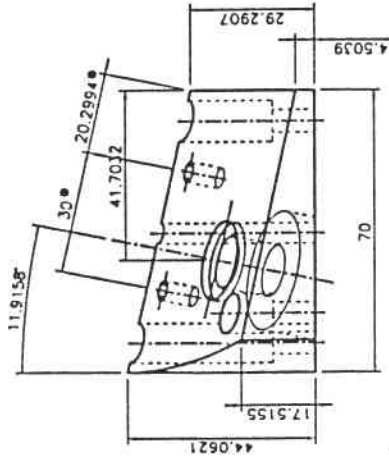


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998

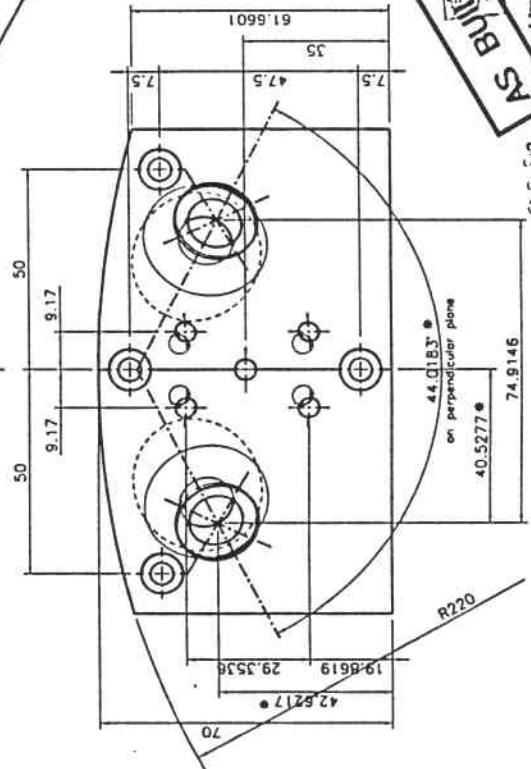
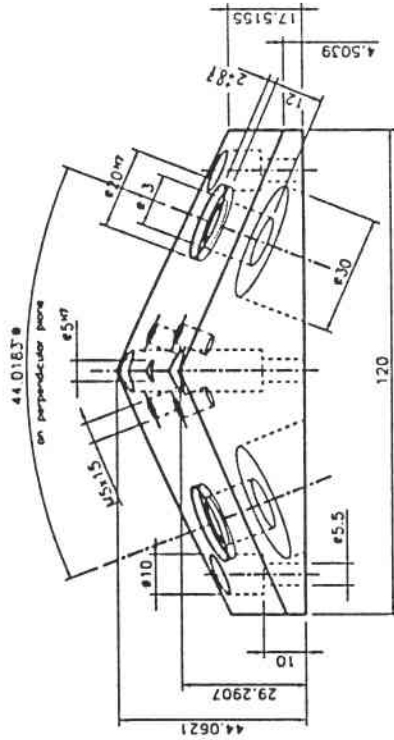
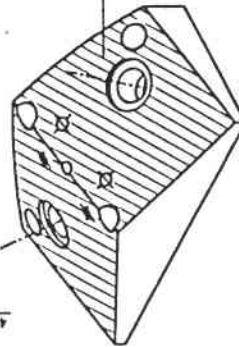


NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPIING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS S.p.A. COMPANY.



DIMENSION FOLLOWED BY * * *
 INDICATE THAT THEY ARE REFERED TO
 THE PLANE WHERE M5x15-ø20mm HOLES LAY

General tolerance ±0.05



23	03	Upper support	ASI 304	1.32
Item	D.T.Y	DECOMINATION	MATERIAL	UNIT
PROJECT		6.5 MMT CONVERSION		
Hexapod Five Axis Secondary Positioner		MODIFICATION		
ISS.	SIGN.	DATE	CHECKED	DATE
C	B			29 10 1998
A				
VARIATION		APPROVED		
		1998		

ADS ITALIA S.R.L.
SISTEMI AVANZATI
 Corso Promessi Sposi 23/d - 23900 Lecco

Steward Observatory
 University of Arizona - (520)621-7659
 933 N.Cherry Ave., Tucson, Arizona 85721

MTT HEXAPOD
 UPPER SUPPORT
 Item 23

AS BUILT

300943A

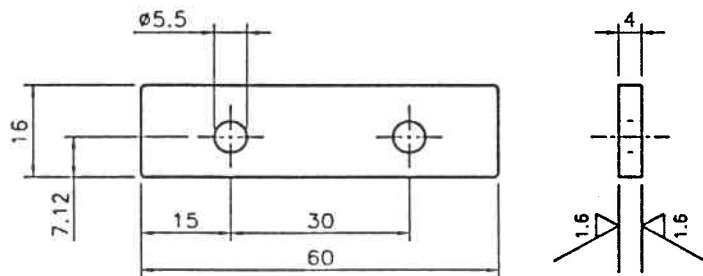


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.

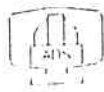


General tolerance ± 0.1



AS BUILT

24	06	Plate	AISI 303		0,03	
Item	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
VARIATION	ISS.	SIGN.	DATE	MODIFICATION		
	C					
	B					
	A					
				CHECKED	DATE	
				APPROVED	24	09
					1996	
ADS ITALIA S.R.L. SISTEMI AVANZATI Corso Promessi Sposi 23/d1 - 22063 LECCO			Steward Observatory University of Arizona - (520)621-7659 933 N.Cherry Ave., Tucson, Arizona 85721			
MMT HEXAPOD			SOST.IL		OBTAINED	
PLATE			SOST.DA		CO.	
Item 24					400708 A	

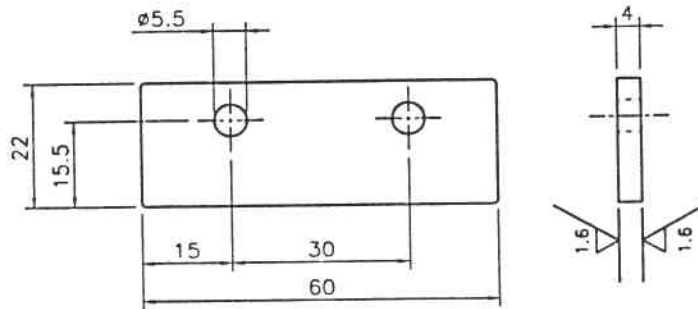


MMT CONVERSION

Doc.No : H9-DP-AD-001
 Issue : 1
 Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS INCLUDING PHOTOCOPYING AND RECORDING WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ADS Italia Srl COMPANY.



General tolerance ± 0.1

3.2

AS BUILT

25	06	Plate	AISI 303		0.04	
Item	Q.TY	DENOMINATION	MATERIAL	UNI	Weight Kg	LIST
PROJECT		6,5 MMT CONVERSION			DRAWN	SCALE
		Hexapod Five Axis Secondary Positioner			ADS-C.Pesco	1:1
		MODIFICATION			CHECKED	DATE
ISS	SIGN.	DATE				
C						
B						
A						
					APPROVED	24 09 1998
		ADS ITALIA S.R.L.				
		SISTEMI AVANZATI		Steward Observatory		
		Corso Promessi Sposi 23/d1 - 22063 LECCO		University of Arizona - (520)621-7659		
		MMT HEXAPOD		933 N.Cherry Ave., Tucson, Arizona 85721		
		PLATE		SOST.IL	OBTAINED	
		Item 25		SOST.DA	CO.	
				400709 A		

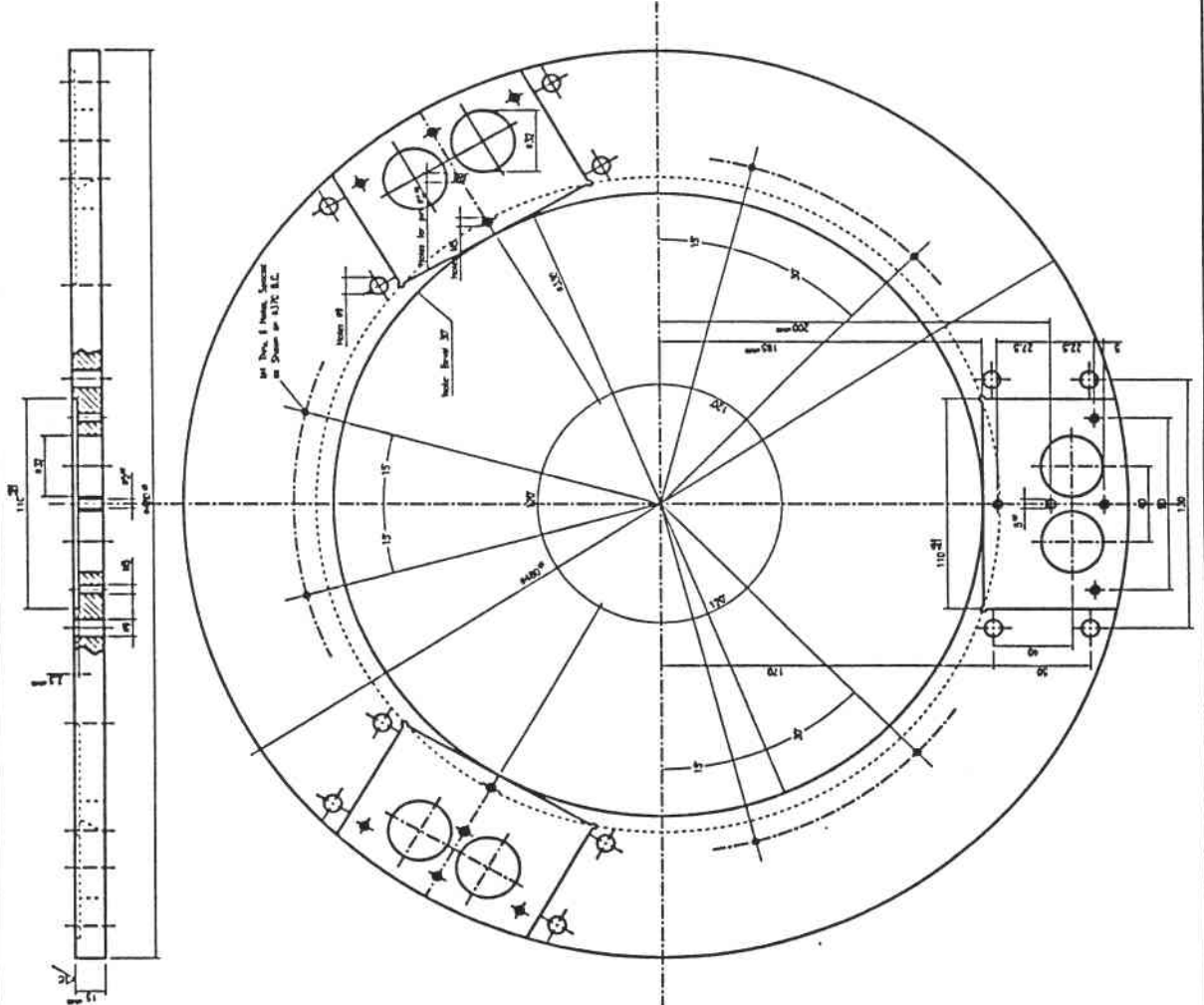


MMT CONVERSION

Doc.No : H9-DP-AD-001
Issue : 1
Date : Oct.1998



NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION OF THE ADS BOARD OF DIRECTORS.



99.33
MEDICAL LOGIC
ADS Srl
A

General tolerance ± 0.1

28	01	Lower plate	Artisan/Hand	ROOM/A	DATE	LEFT
PROJECT			DESCRIPTION	DATE	DATE	DATE
6.5 MMT CONVERSION			Hessapod Five Axis Secondary Positioner			
AD-01			AD-01			
AD-02			AD-02			
AD-03			AD-03			
AD-04			AD-04			
AD-05			AD-05			
AD-06			AD-06			
AD-07			AD-07			
AD-08			AD-08			
AD-09			AD-09			
AD-10			AD-10			
AD-11			AD-11			
AD-12			AD-12			
AD-13			AD-13			
AD-14			AD-14			
AD-15			AD-15			
AD-16			AD-16			
AD-17			AD-17			
AD-18			AD-18			
AD-19			AD-19			
AD-20			AD-20			
AD-21			AD-21			
AD-22			AD-22			
AD-23			AD-23			
AD-24			AD-24			
AD-25			AD-25			
AD-26			AD-26			
AD-27			AD-27			
AD-28			AD-28			
AD-29			AD-29			
AD-30			AD-30			
AD-31			AD-31			
AD-32			AD-32			
AD-33			AD-33			
AD-34			AD-34			
AD-35			AD-35			
AD-36			AD-36			
AD-37			AD-37			
AD-38			AD-38			
AD-39			AD-39			
AD-40			AD-40			
AD-41			AD-41			
AD-42			AD-42			
AD-43			AD-43			
AD-44			AD-44			
AD-45			AD-45			
AD-46			AD-46			
AD-47			AD-47			
AD-48			AD-48			
AD-49			AD-49			
AD-50			AD-50			
AD-51			AD-51			
AD-52			AD-52			
AD-53			AD-53			
AD-54			AD-54			
AD-55			AD-55			
AD-56			AD-56			
AD-57			AD-57			
AD-58			AD-58			
AD-59			AD-59			
AD-60			AD-60			
AD-61			AD-61			
AD-62			AD-62			
AD-63			AD-63			
AD-64			AD-64			
AD-65			AD-65			
AD-66			AD-66			
AD-67			AD-67			
AD-68			AD-68			
AD-69			AD-69			
AD-70			AD-70			
AD-71			AD-71			
AD-72			AD-72			
AD-73			AD-73			
AD-74			AD-74			
AD-75			AD-75			
AD-76			AD-76			
AD-77			AD-77			
AD-78			AD-78			
AD-79			AD-79			
AD-80			AD-80			
AD-81			AD-81			
AD-82			AD-82			
AD-83			AD-83			
AD-84			AD-84			
AD-85			AD-85			
AD-86			AD-86			
AD-87			AD-87			
AD-88			AD-88			
AD-89			AD-89			
AD-90			AD-90			
AD-91			AD-91			
AD-92			AD-92			
AD-93			AD-93			
AD-94			AD-94			
AD-95			AD-95			
AD-96			AD-96			
AD-97			AD-97			
AD-98			AD-98			
AD-99			AD-99			
AD-100			AD-100			



6. COMPONENTS SELECTIONS AND MANUFACTURING DATA SHEETS

6.1. Roller screw

Manufacturer	ROLLVIS (Swiss)
Screw Diameter	20 mm
Screw Lead	1 mm
Number of Thread Starts	1
Lead Error	Tolerance class G1 : $V_{300p}=6\mu\text{m}$, $e_p=6\mu\text{m}$
Type of screw	Satellite roller screw with recirculating rollers
Nut Type	Split nut preloaded flanged at one end
Nut Preload	450 N
Torque due to Preload	0.061 Nm
Direct Efficiency (lifting)	$\eta_1=0.737$
Indirect Efficiency (lowering)	$\eta_2=0.642$
Static Load Capacity	13.8 KN
Dynamic Load Capacity	9.1 KN
Nut Axial Stiffness	446 N/ μm
Material	Stainless steel X46Cr13
Lubrication	KLUBER ISOFLEX TOPAS NCA 52 (Rollvis roller screw standard grease)

6.2. Ball Bearings

- Screw central support bearings - part number 112 (see actuator assembly drawing):
 - Manufacturer : FAG (Aerospace and Super Precision Bearings Division) - The Barden Corporation.
 - Type : medium preloaded (nominal value 256 N) angular contact ball bearings pair in "O" configuration.
 - Tolerance class : high precision P4S (ABEC 7).
 - Material : carbon chrome steel for rings and balls.
 - Cage : made of bakelized cloth guided along outer ring.
 - Non separable and without shields.