

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

- LIGO -

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

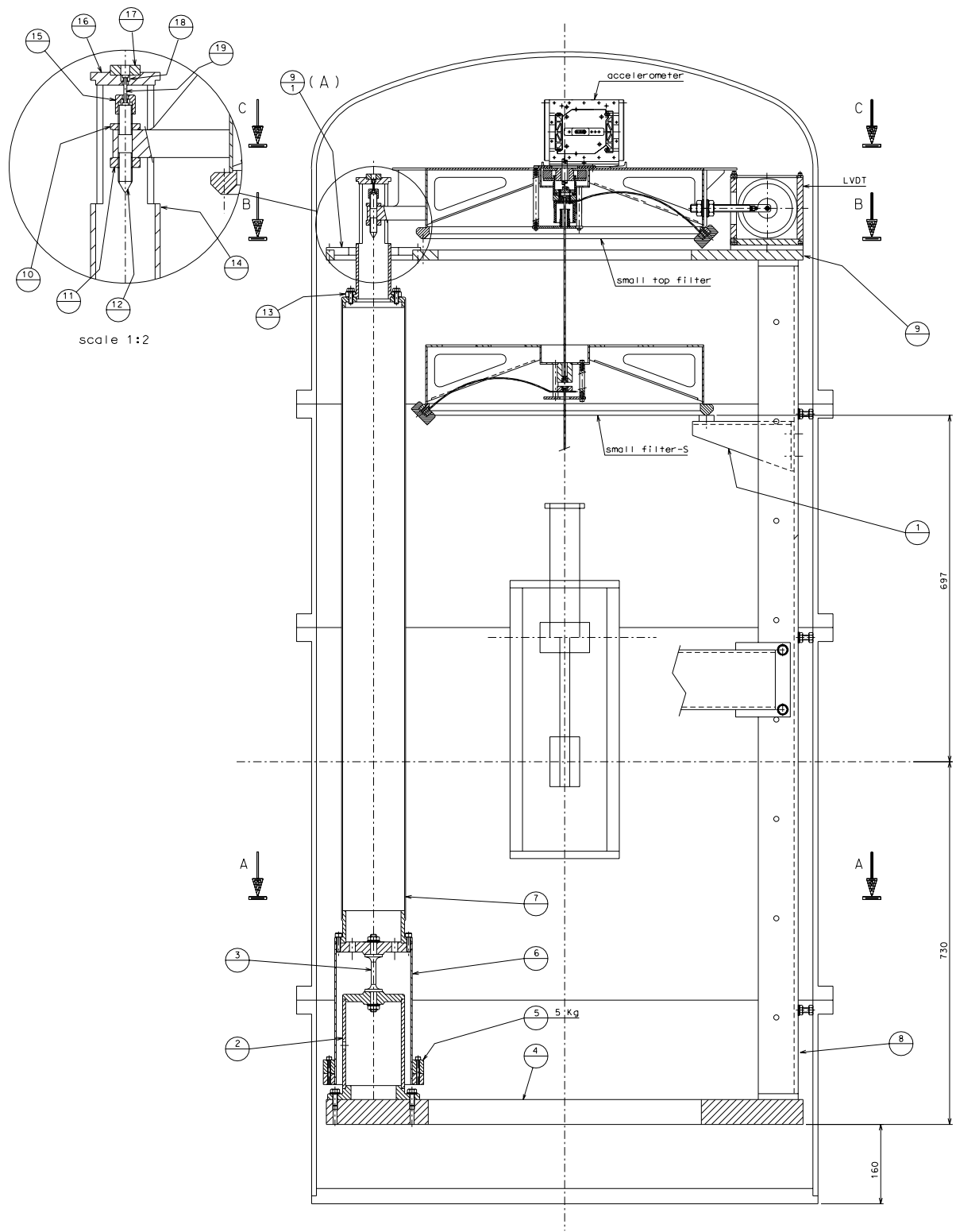
Document Type Technical Note	DCC Number LIGO-D-010249-00-R	Date 30 th October 2001
TAMA Seismic Attenuation System (SAS) tower		
Mechanical drawings		
Akiteru Takamori (LIGO and University of Tokyo), Gianni Gennaro, Tatiana Zelenova (PROMEC), Riccardo DeSalvo (LIGO)		

Distribution of this draft: TBD
This is an internal working note
of the LIGO Project.

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www: <http://www.ligo.caltech.edu/>



NOTE: preassembly sub assemblies with SS screws:
 deliver assembled do not tighten screws
 (Preassemblare con viti in inox non strette)

	9.1	016	safety ring	19	012	small flex joint
	9	016	top reference ring	18	012	1/2 cups
	8	014	safety strut	17	009	1/2 cup retainer
	7	011	leg	16	012	top disk
	6	010	c-weight bell	15	013	load nut
	5	010	counterweight	14	011	leg head
	4	015	interface disk	13	012	rotation flange
TAMA double pendulum	3	010	main flex joint	12	012	tuning stud
accelerometer	2	009	flex joint base	11	013	support tuning nut
small top filter	1	023	shelf	10	013	retainer nut
small filter	ref.	draw.	added legend	ref.	draw.	added legend

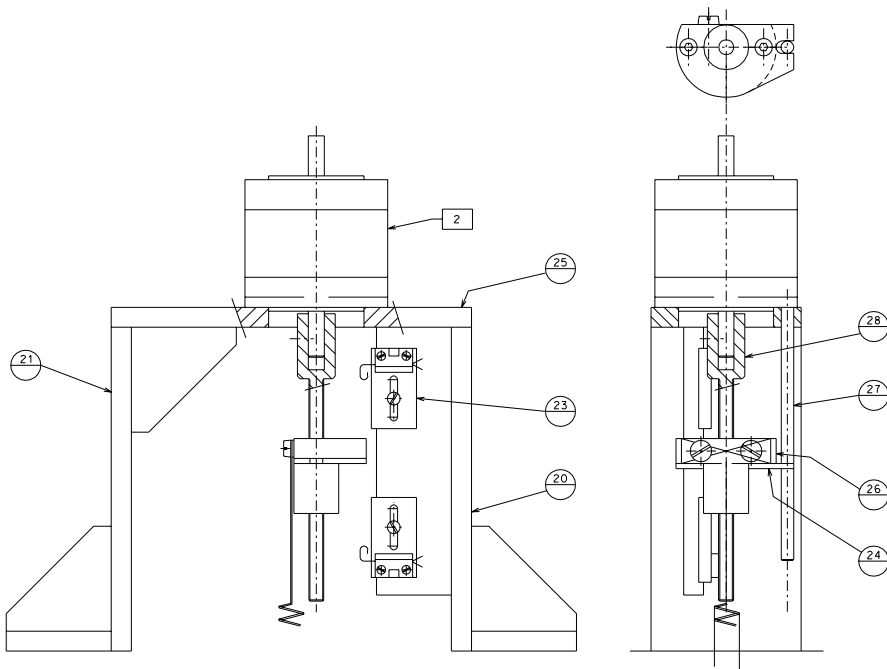
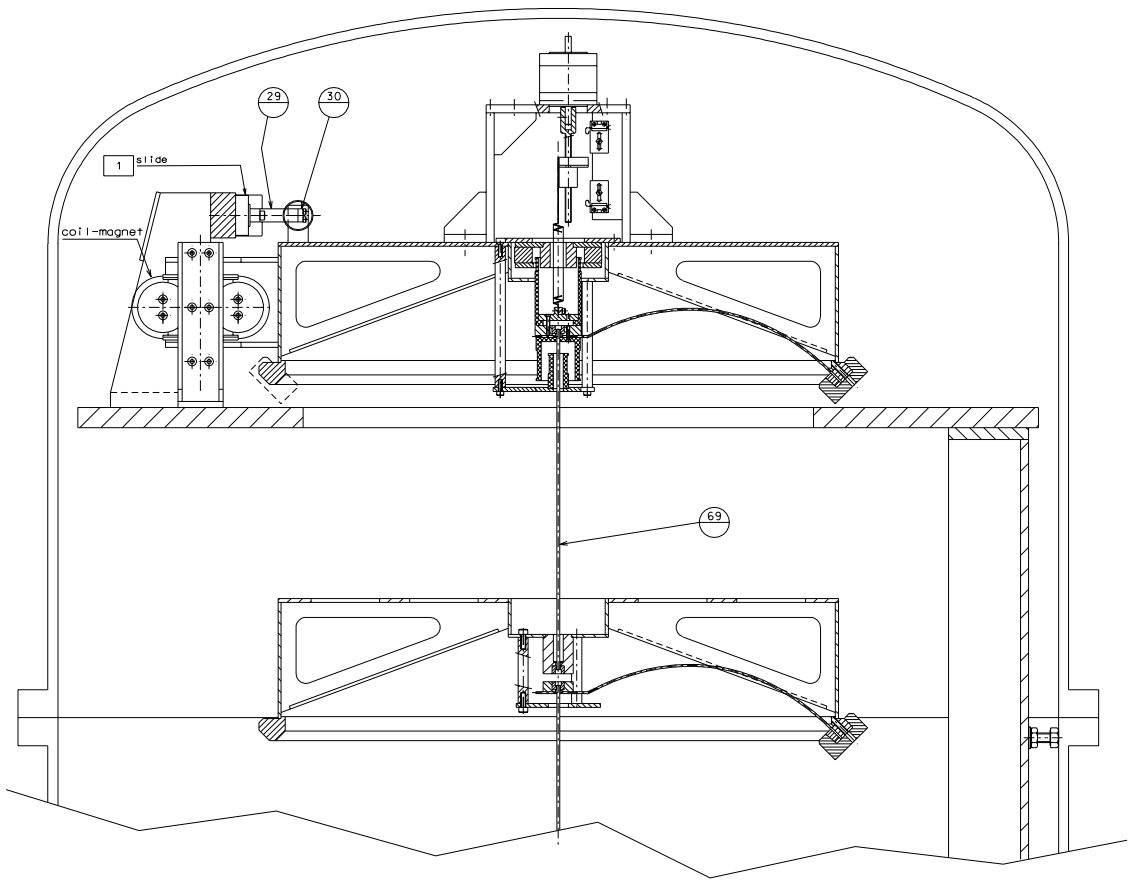
Size A1

ref.	name	date	signature
A	added safety ring	4-7-00	
modifications			

LIGO PROJECT

TAMA-SAS-TOWER-3
SECTION D-D

designer: R. De Salvo
 ass. num. Tama3.000
 draw. PRGMEC 17-6-00
 scale 1:4
 ref/revise dr. num.



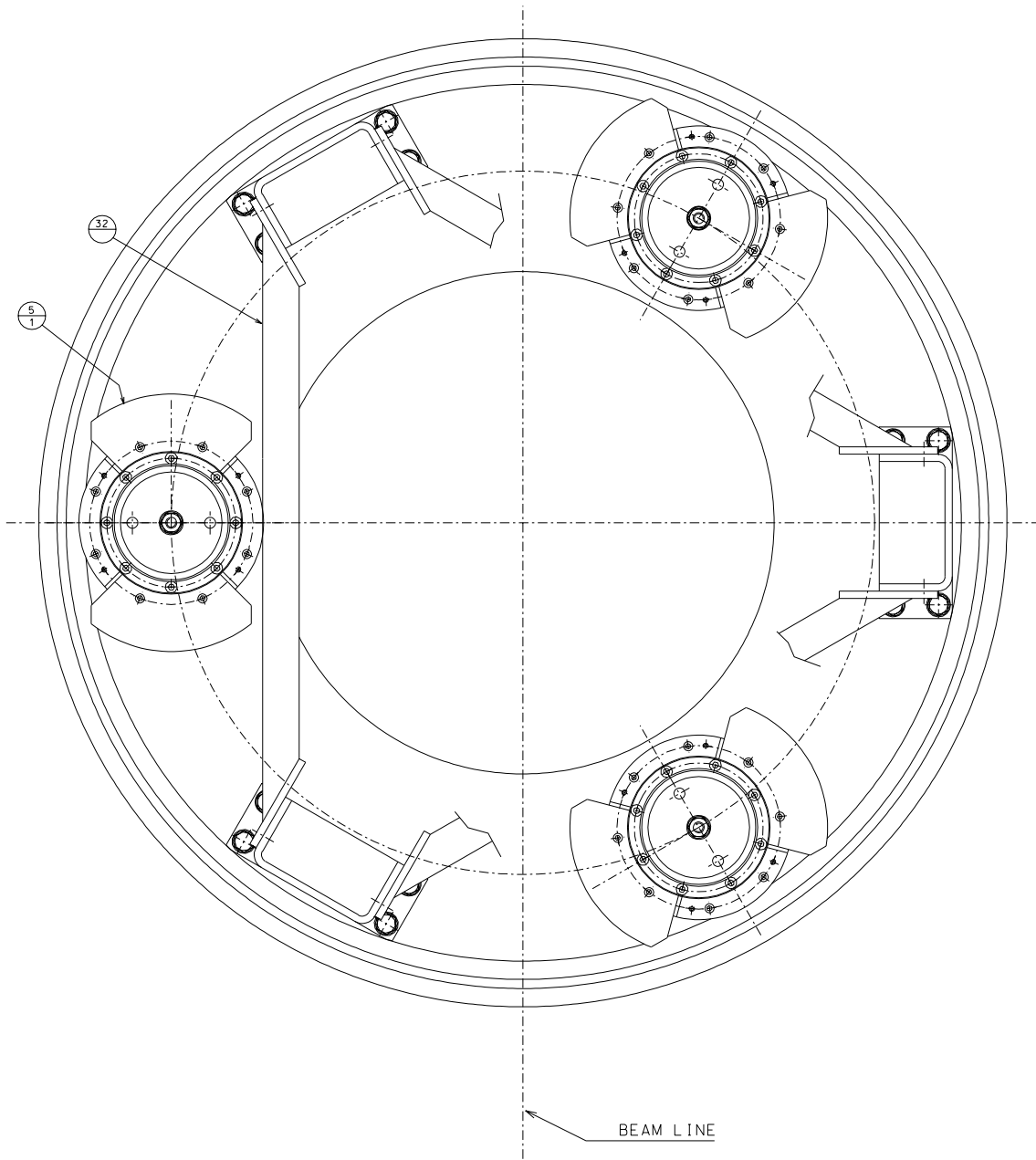
- 1 Doedal slide model MA 1500 travel 6" or Velmex MA 150 6 P40-S1.5 n°3 pieces
- 2 Stepper motor ORIENTAL MOTOR model PK266-01B, holding torque 0.9 N.m., A/phase 1, V DC 7.4, double shaft

ref.	note	date	signature
modifications			

26	018	nut	69	013	suspension wire
25	022	motor flange	30	018	spring support
24	018	torque plate	29	018	1. spring clamp
23	018	micro switch plate	28	017	screw
21	022	stand	27	017	torque plate
20	017	stand	ref.	draw.	called figure

LIGO PROJECT		designed for R. De Salvo
TAMA-SAS-TOWER-3		ass. num. Tama3.001
SECTION E-E		draw. PRGMEC 18-6-00
Scale 1:2.5		scale 1:2.5
Size A1		ref/issue dr. num.

Scale 1:1

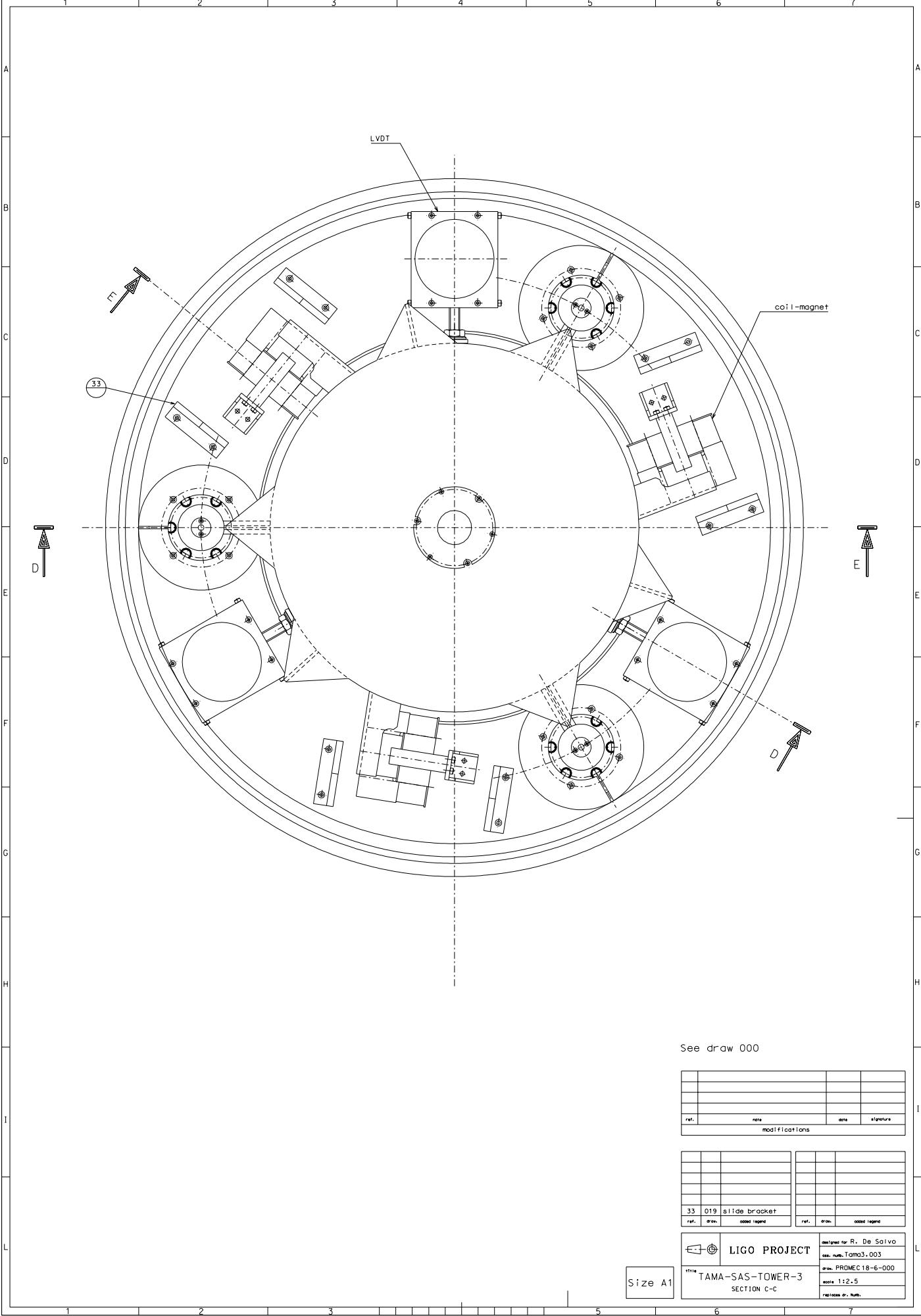


	Added detail 5.1	7-10-00	
ref.	note	date	signature
modifications			

5.1	010	counter weight			
32	023	stiffener			
ref.	draw.	added/removed	ref.	draw.	added/removed

	LIGO PROJECT	designed by R. De Saivo
		ass. num. Tama3.002
TAMA-SAS-TOWER-3 SECTION A-A		draw. PRGMEC 18-6-00
		scale 1:2.5
		ref/issue dr. Num.

Size A1



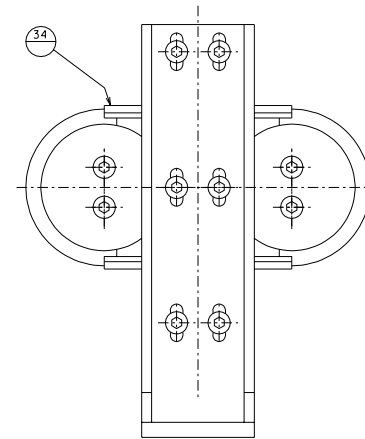
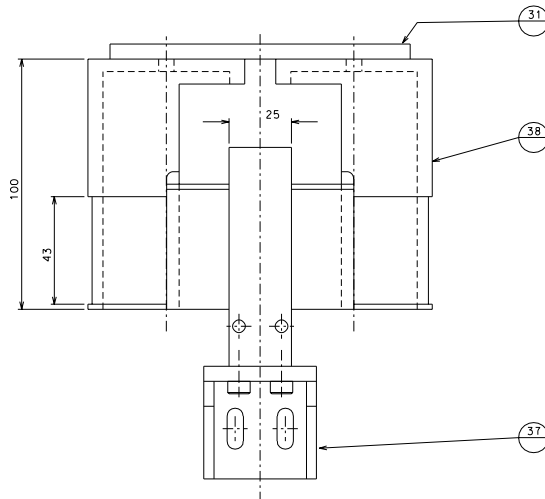
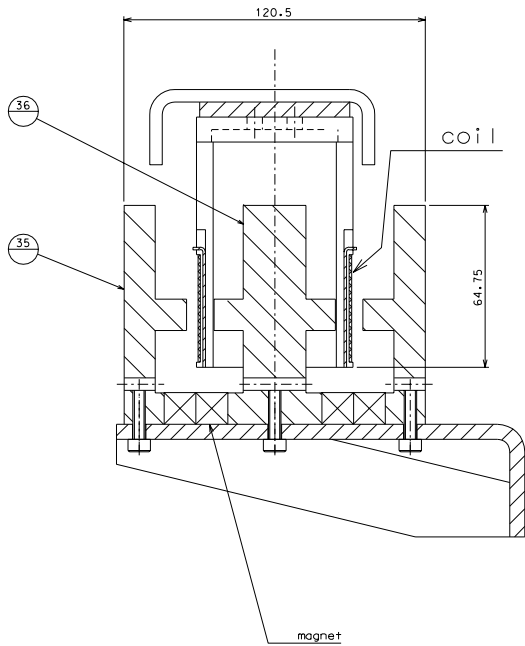
See draw 000

ref.	note	date	signature
modifications			

33	019	slide bracket					
ref.	draw.	added	replaced	ref.	draw.	added	replaced

	LIGO PROJECT	designed by R. De Saivo
		dra. num. Tama3.003
TAMA-SAS-TOWER-3		draw. PRGMEC 18-6-000
SECTION C-C		scale 1:2.5
		ref/issue dr. num.

Size A1

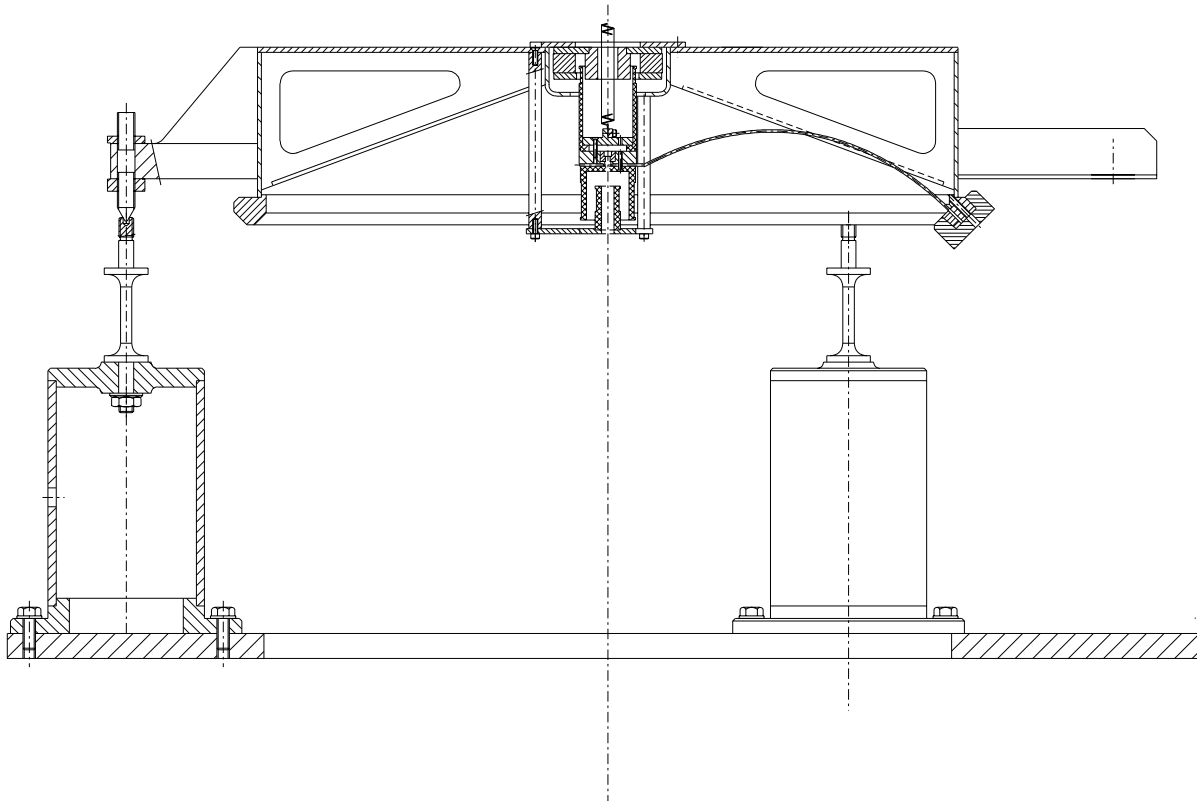


ref.	note	date	signature
modifications			

38	020	coil's spools					
37	021	magnet support					
36	020	central flux guide					
35	020	flux guides					
34	020	coil tray					
31	021	coil spool base					
ref.	draw.	date	signature	ref.	draw.	date	signature

		designed for R. De Salvo des. num. Tama3.005 draw. PROMEC 18-6-00 scale 1:1 ref. num. or. Num.
LIGO PROJECT TAMA-SAS-TOWER-3 COIL-MAGNET		

Side A1



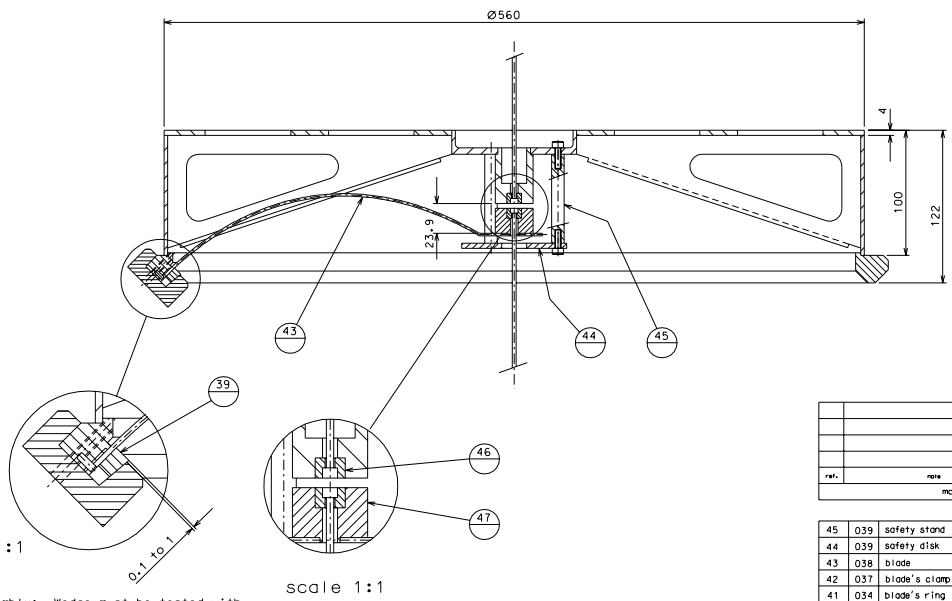
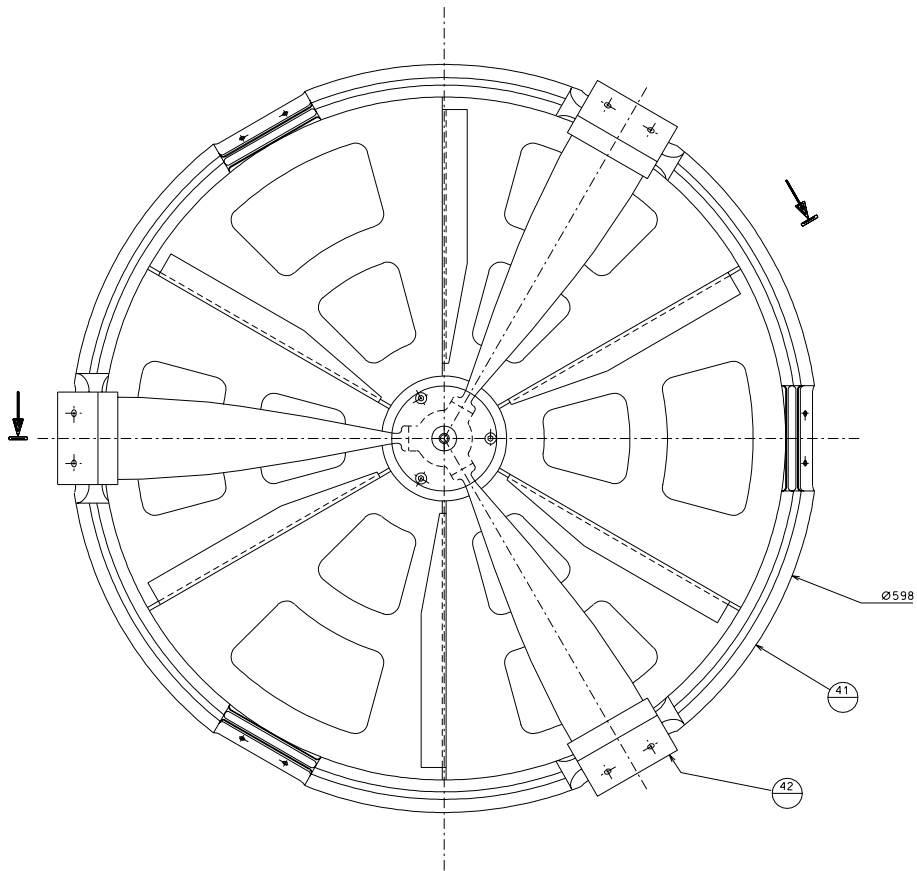
Assembly note: Use filter_0 with reference to align base column 2 on base disk 4

ref.	date	description	signature
modifications			

ref.	date	description	signature

	LIGO PROJECT		designed for R. De Salvo des. num. T03-006
	TAMA-SAS-TOWER-3 ASSEMBLY TOP FILTER		des. num. PROMEC 18-6-00 scale 1:2 revision or. Num.

Size A1



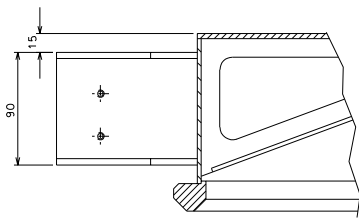
Note - Test assembly: Wedge must be tested with a blade section of the same thickness of the blade material. The wedge base must stick out 0.1 to 1.0 mm from the clamp surface

ref.	note	date	signature
modifications			

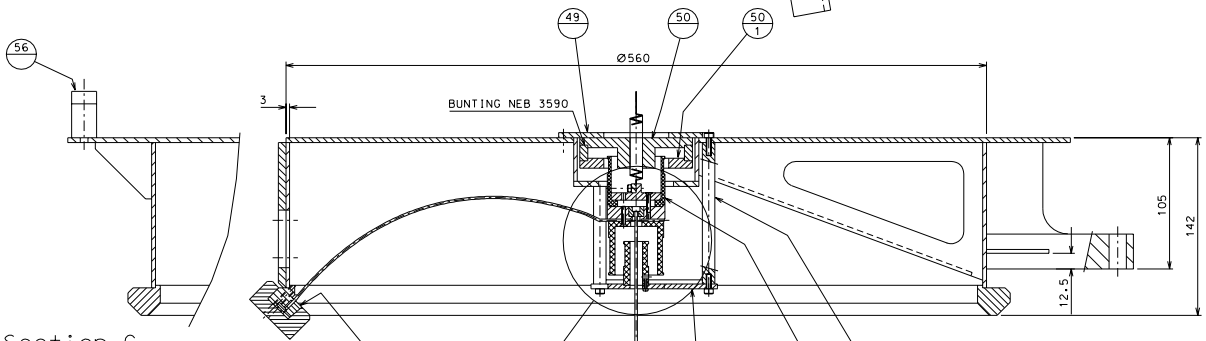
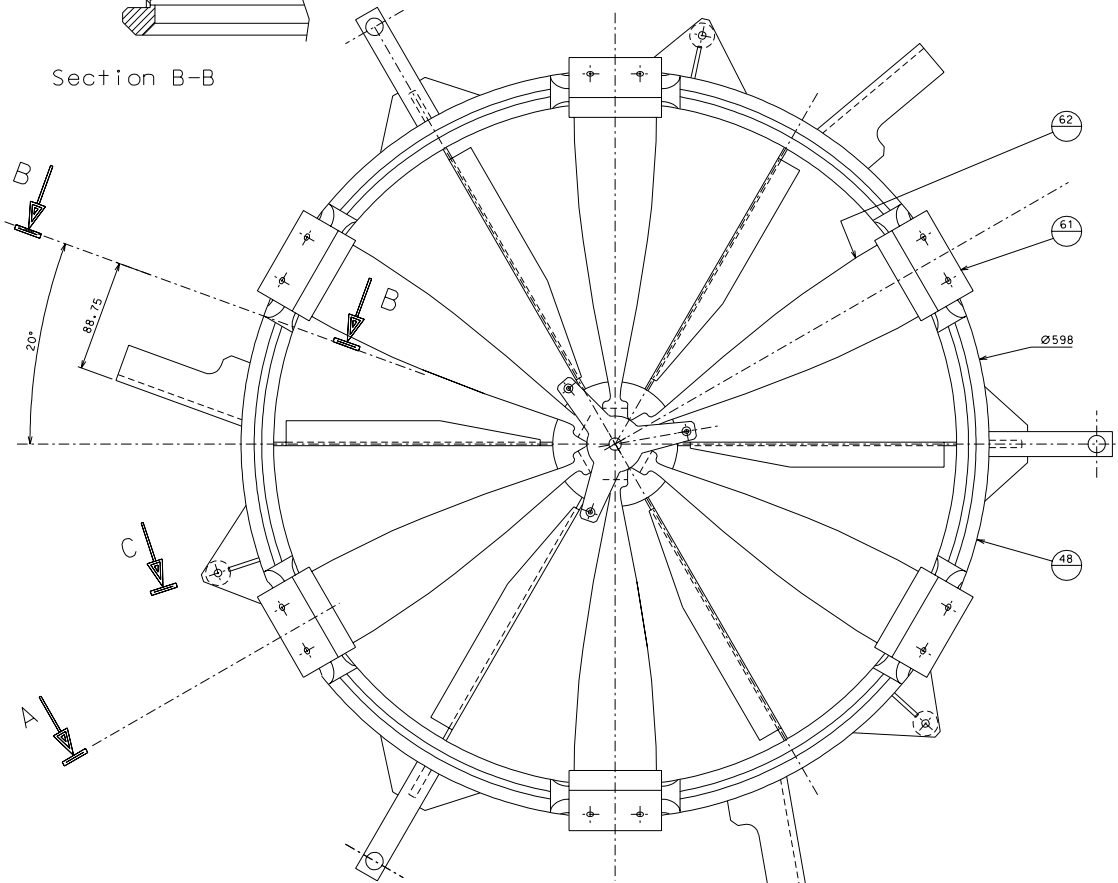
45	039	safety stand			
44	039	safety disk			
43	038	blade			
42	037	blade's clamp			
41	034	blade's ring	47	039	1/2 cup retainer
39	037	wedge	46	037	1/2 cup
ref.	draw.	called upon	ref.	draw.	called upon

	LIGO PROJECT	designed by R. De Saivo
		ass. num. Tama3.007
TAMA-SAS-TOWER-3 SMALL FILTER		draw. PRGMEC 3-7-00
		scale 1:2
		ref/issue dr. num.

Size A1

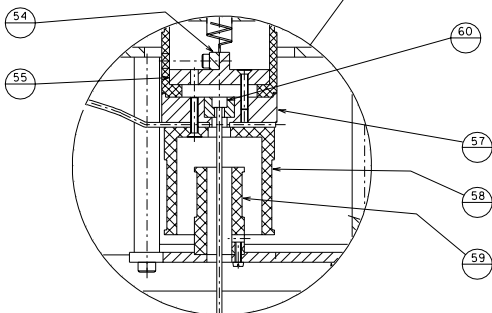


Section B-B



Section C

Note - Test assembly: Wedge must be tested with a blade section of the same thickness of the blade material. The wedge base must stick out 0.1 to 1.0 mm from the clamp surface



ref.	note	date	signature
modifications			

55	027	spring holder	63	029	wedge
54	027	spring clamp	62	032	blade
53	026	safety stand	61	029	blade's clamp
52	027	coil spool	60	027	1/2 cups
51	026	safety ring	59	027	LVDI primary
50.1	029	magnet	58	027	LVDI secondary
50	029	magnet	57	027	1/2 cup retainer
49	031	magnet support	56	026	spring's clamp
48	028	blade's ring			

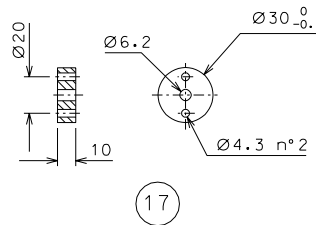
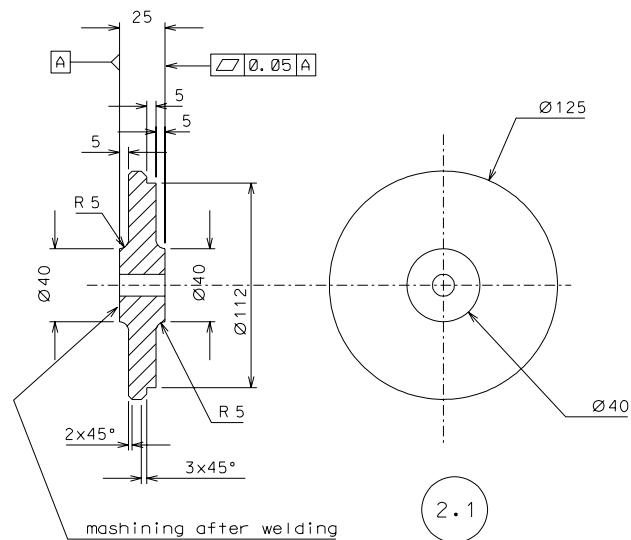
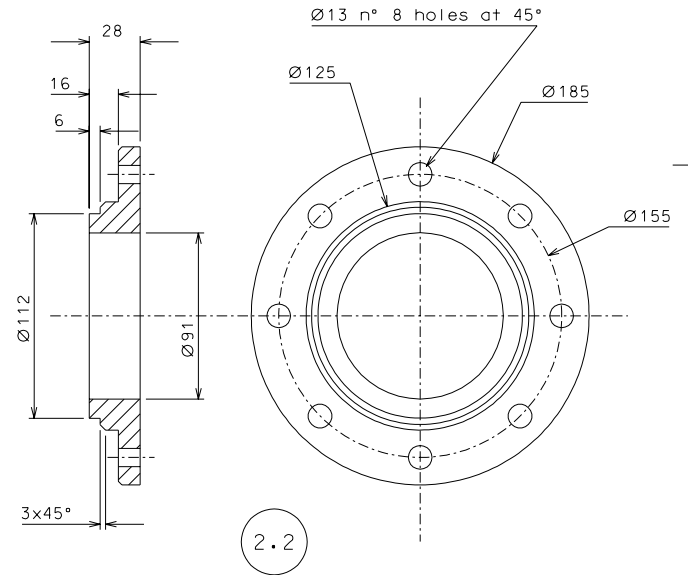
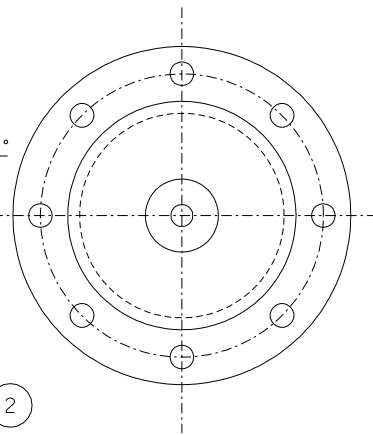
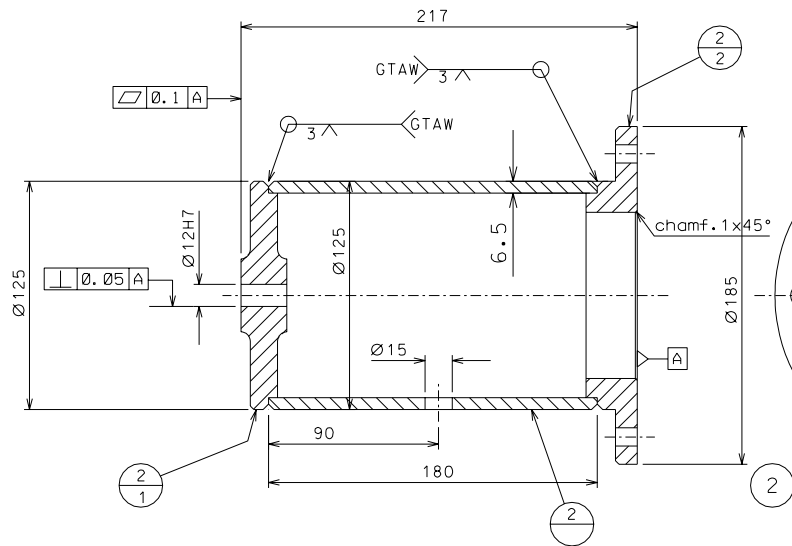
ref.	draw.	code	revis	ref.	draw.	code	revis


LIGO PROJECT

designed for R. De Saivo
 ass. num. Tama3.008
 draw. PRGMEC 1-7-00
 scale 1:2
 ref. num. or. num.

Size A1

TAMA-SAS-TOWER-3
SMALL TOP FILTER



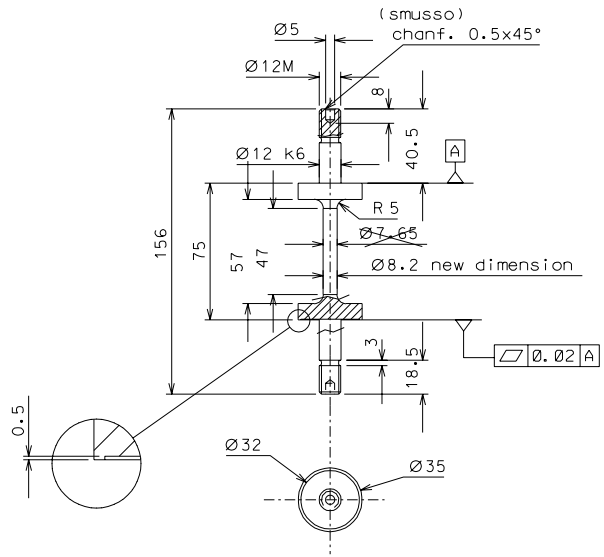
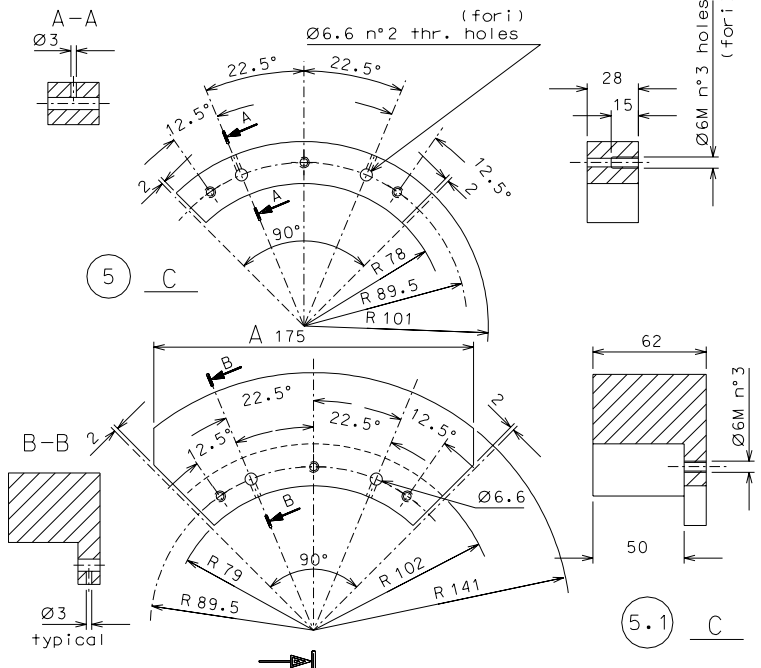
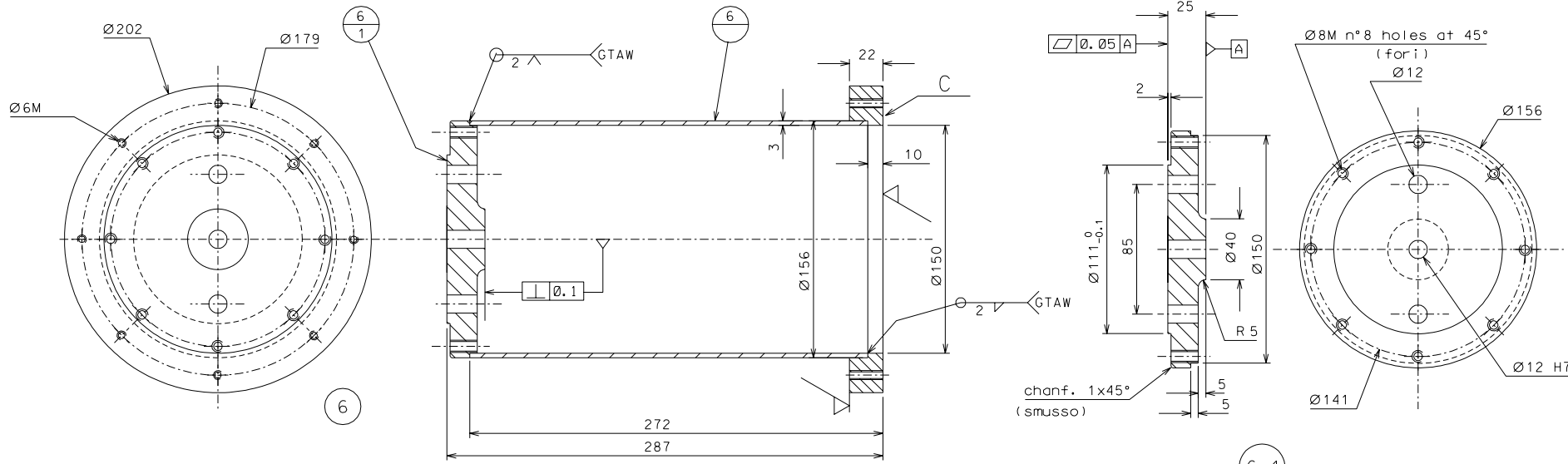
ref.	note	date	signature
modifications			

ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale
17	3	AISI 304 L	1:2				
2.2	3	"	1:2				
2.1	3	"	1:2				
2	3	"	1:2				

General machining tolerances UNI 5307-63							
Dimensions	< 6	6-30	30-120	120-315	315-1000	>1000-2000	>2000-4000
Linear Toli.	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	LIGO PROJECT N. Tama3.009	designed for R. De Salvo
		dra. PROMEC 23-6-00
title TAMA-SAS-TOWER-3 DETAILS		details from 000
		replaces dr. Num.

Size A2



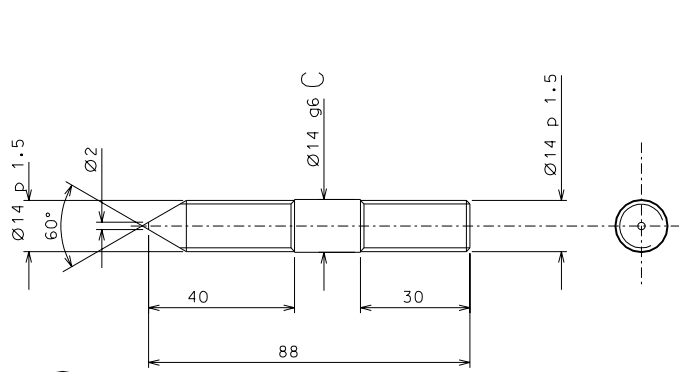
C	Modification detail	26-11-00	
B	Modification detail	26-10-00	
A	Cut corners	11-10-00	
	Added detail 5.1	7-10-00	
ref.	note	date	signature
modifications			

6.1	3	AISI 304 L	1:2				
6	3	"	1:2				
5.1	6	AISI 304	1:2				
5	12	AISI 304	1:2				
3	3	maraging A	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

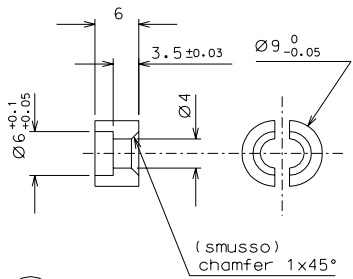
General machining tolerances UNI 5307-63								
Dimensions	< 6	6-30	30-120	120-315	315-1000	1000-2000	>2000-4000	>4000
Linear Toli.	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3
angular Toli.	±1	±30'	±20'	±10' referred to the shortest side				
LIGO PROJECT				designed for R. De Salvo N. Tama3.010				
title TAMA-SAS-TOWER-3 DETAILS				draw. PROMEC 19-6-00 details from 000-002 replaces dr. Num.				

B (3) symmetric on both side
light nickel plated
(due estremita' simmetriche)

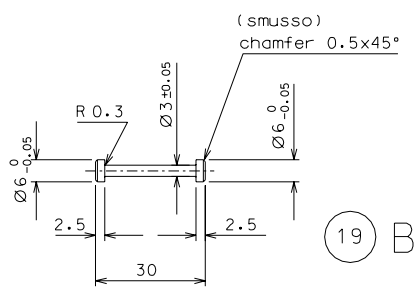
Size A2



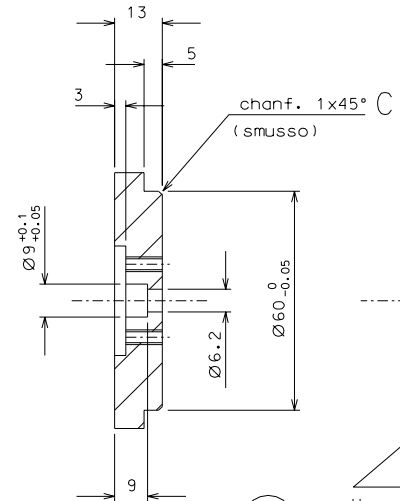
12 Check slip fit into holes in drawing 030
 Controllare l'inserimento senza gioco nel suo foro nel dis. 030



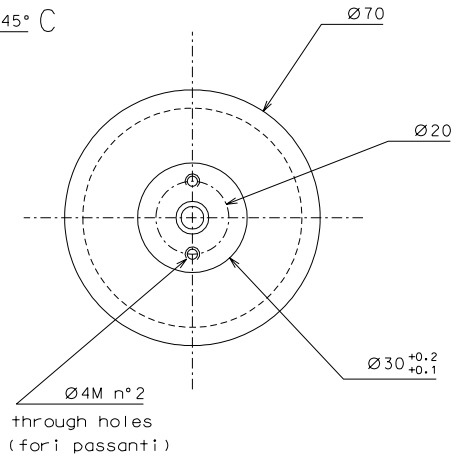
18 light nickel plated (nichelato leggero)



19 B

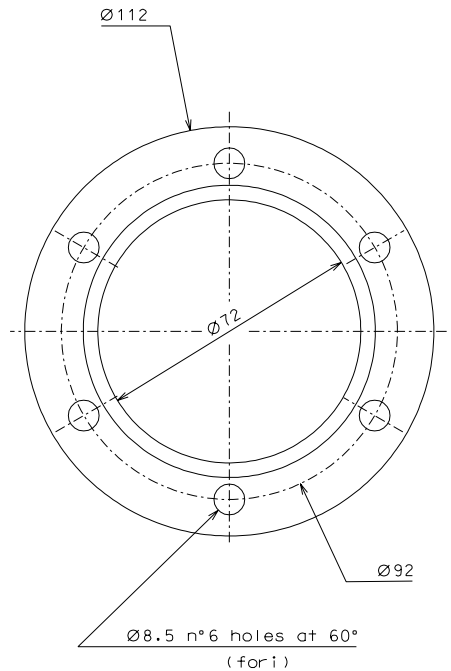


16

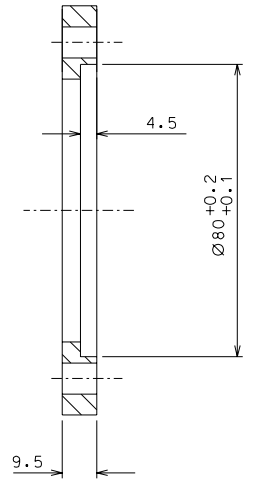


Ø4M n°2 through holes (fori passanti)

Size A2



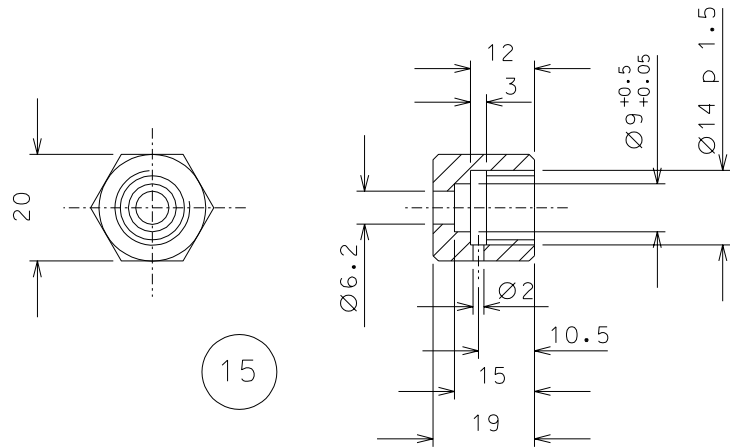
13



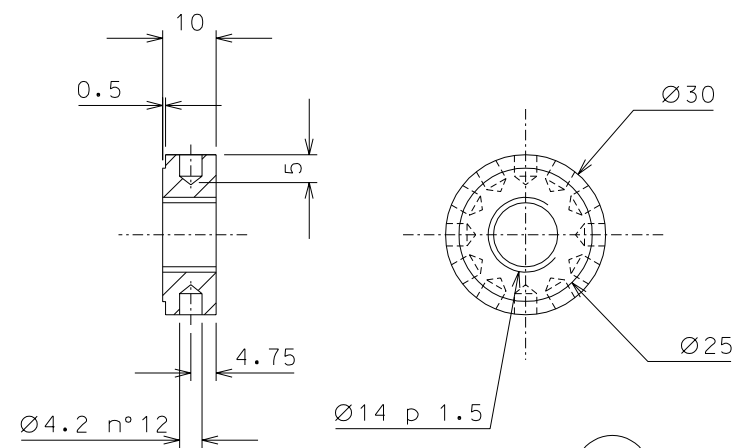
C	modifications	26.11.00		
B	change dimensions	26.10.00		
A	change num. piece	26.10.00		
ref.	note	date	signature	
modifications				

19	15	maraging	1:1				
18	15	"	2:1				
16	3	AISI 304	1:1				
13	3	"	1:1				
12	3	"	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

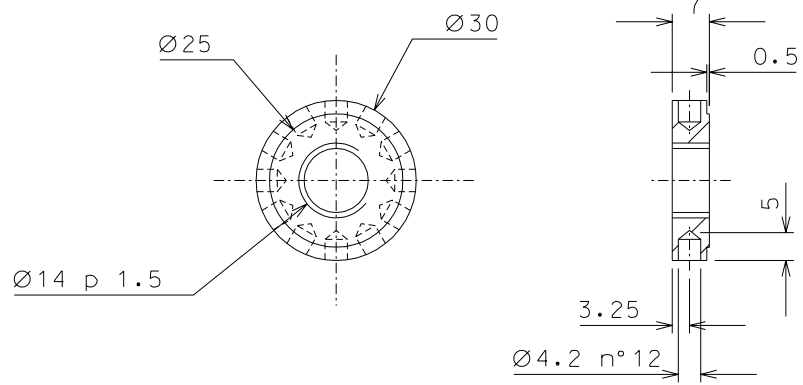
General machining tolerances UNI 5307-63								
Dimensions	< 6	6-30	30-120	120-315	315-1000	1000-2000	> 2000-4000	> 4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side				
LIGO PROJECT				designed for R. De Salvo				
TAMA-SAS-TOWER-3				N. Tama3.012				
DETAILS				draw. PROMEC 21-6-00				
DETAILS				details from 000				
DETAILS				replaces dr. Num.				



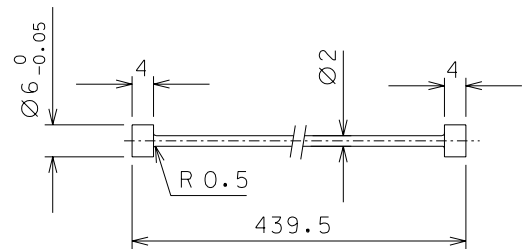
15



11



10



69

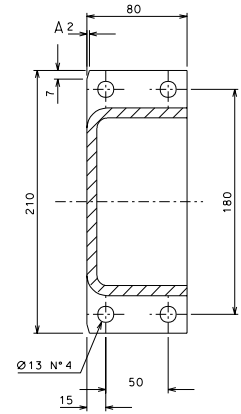
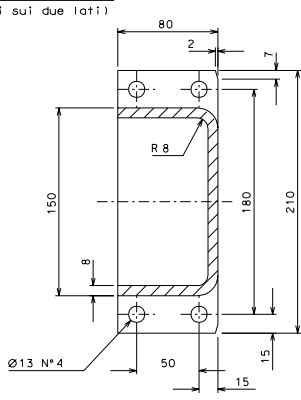
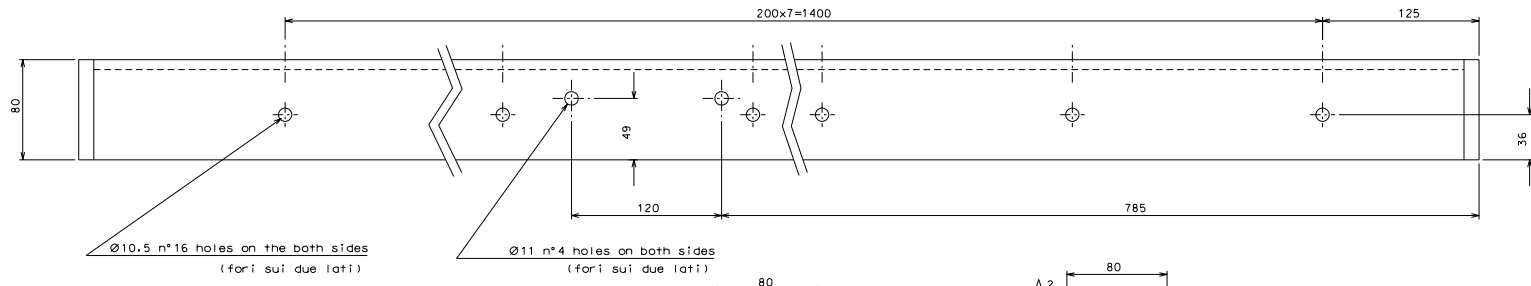
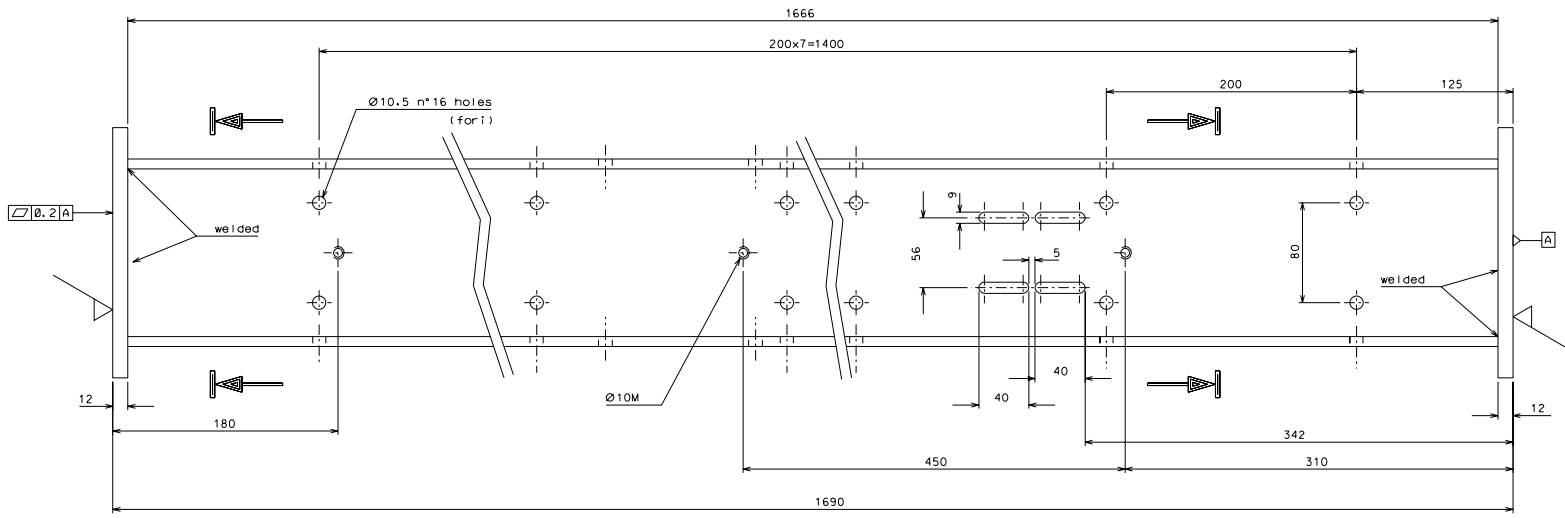
A	added wire	24-12-00	
ref.	note	date	signature
modifications			

11	3	AISI 304	1:1	69	1	maraging	1:1
10	3	"	1:1	15	3	AISI 304	1:1
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	>6-30	>30-120	>120-315	>315-1000	>1000-2000	>2000-4000	>4000
linear Toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toll.	± 1	± 30'	± 20'	± 10' referred to the shortest side				

	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.013
	title TAMA-SAS-TOWER-3	draw. PROMEC 21-6-00
	DETAILS	details from 000-022
		replaces dr. Numb.

Size A3



ref.	description	date	signature
A	modification	26-11-00	
modifications			

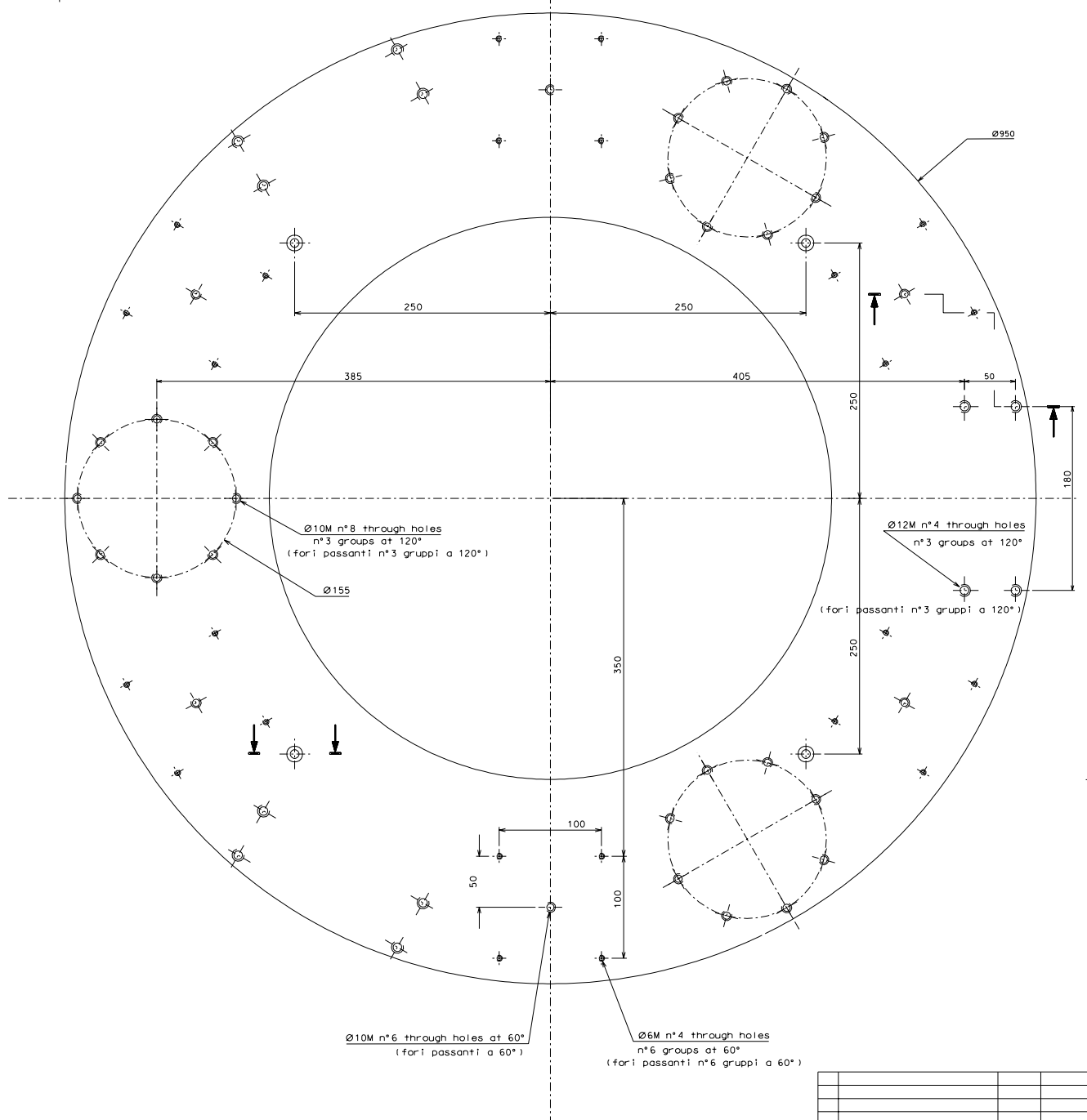
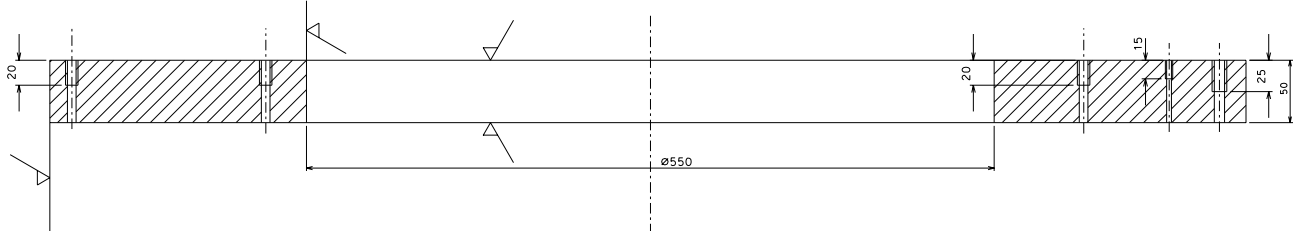
ref.	sheet	mat. and treatments	scale	ref.	sheet	mat. and treatments	scale
8	3	AISI 304 L	1:2				

General machining tolerances UNI 5007-63

Dimension	< 4	4-30	30-120	120-315	315-1000	1000-4000	> 4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
Angular Toli.	± 1'	± 30'	± 20'	± 10'	related to the smallest size		

LIGO PROJECT
 designed for R. De Salvo
 n. Tama3.014
 area. PROMEC 19-6-00
 details from 000
 replace or. Num.

Size A1

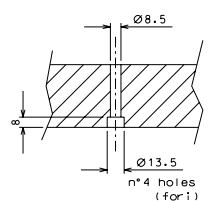


Ø10M n°8 through holes
n°3 groups at 120°
(for: passanti n°3 gruppi a 120°)

Ø12M n°4 through holes
n°3 groups at 120°
(for: passanti n°3 gruppi a 120°)

Ø10M n°6 through holes at 60°
(for: passanti a 60°)

Ø6M n°4 through holes
n°6 groups at 60°
(for: passanti n°6 gruppi a 60°)

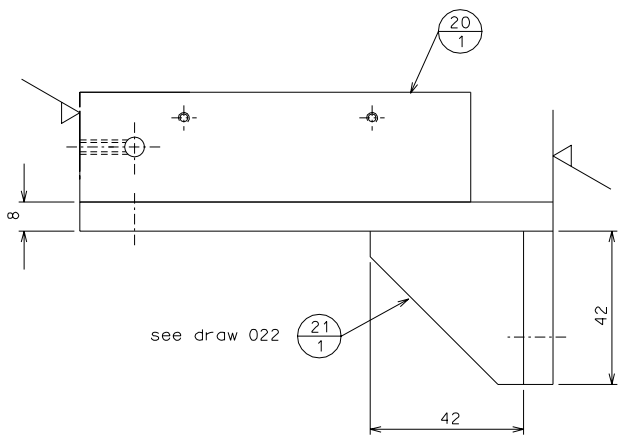
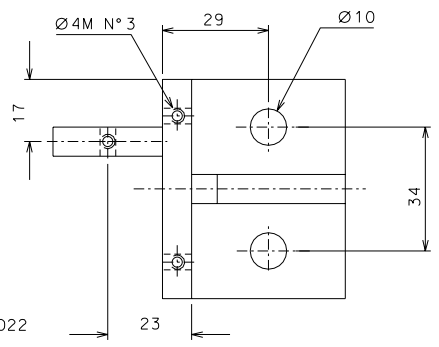
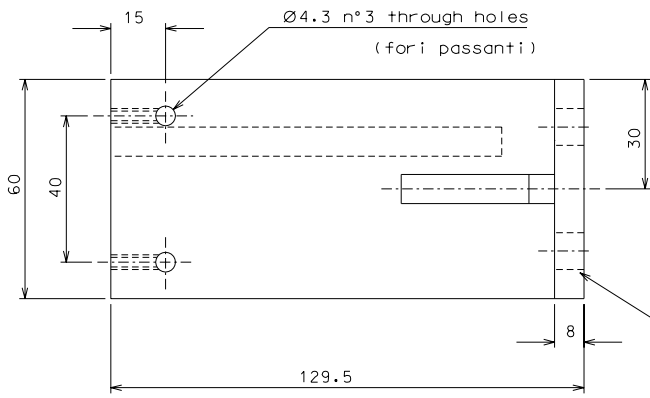


BEAM LINE

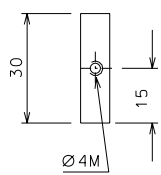
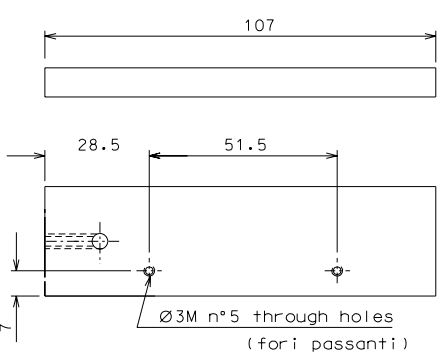
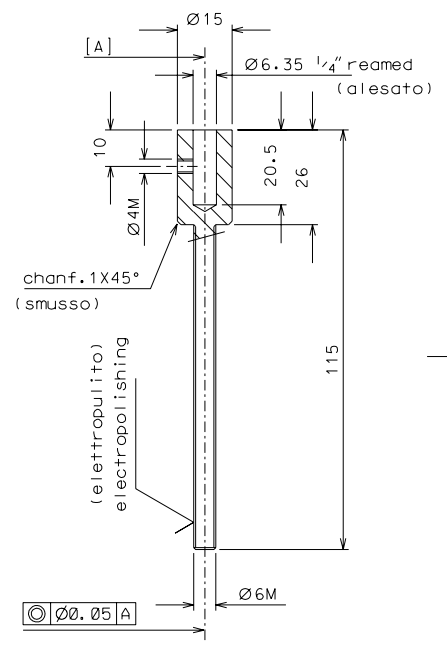
ref.	note	date	signature
modifications			

4	1	AISI 304	T22
ref.	pieces	mat. and treatment	scale

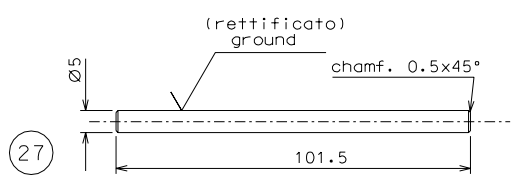
General machining tolerances UNI 5107-63								
Dimensione	< 6	6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
Tolleranza	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
Superficie	±0.1	±0.2	±0.3	±0.5	±1.0	relative to the shortest side		
LIGO PROJECT				designer: R. De Salvo n. campo3.015				
TAMA-SAS-TOWER-3				draw: PRGMEC 23-6-00				
DETAIL				details from: 000				
Side A1				realized by: null				



(20) welded structure (struttura saldata) $2 \sqrt{10-20}$ GTAW




(28)



ref.	note	date	signature
modifications			

28	1	AISI 304	1:1				
27	1	"	1:1				
20.1	1	AISI 304 L	1:1				
20	1	"	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

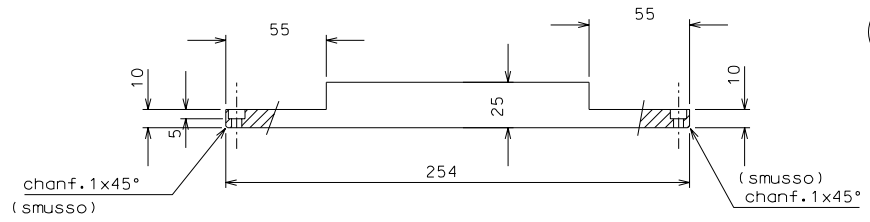
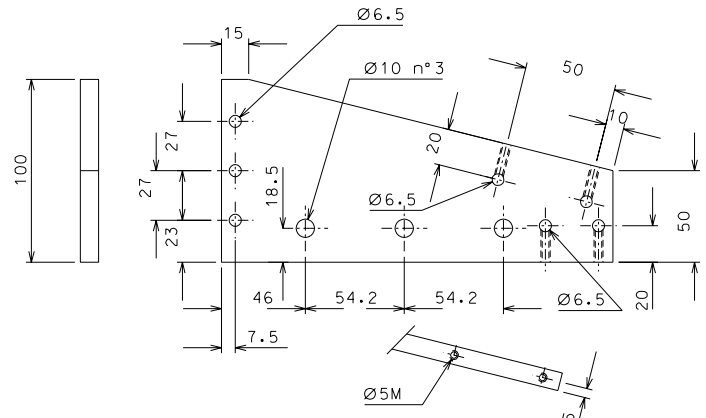
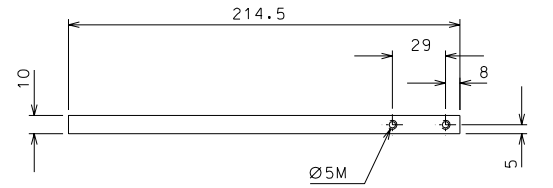
General machining tolerances UNI 5307-63							
Dimensions	< 6	>=6-30	>30-120	>120-315	>315-1000	>1000-2000	>2000-4000
linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			


LIGO PROJECT
 designed for R. De Salvo
 N. tama3.017
 draw. PROMEC 21-6-00
 details from 001
 replaces dr. Num.

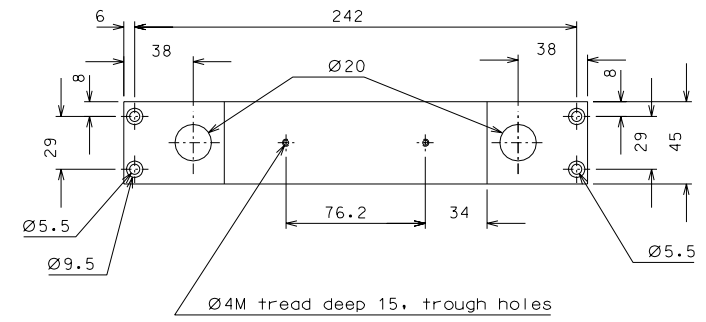
Side A2

title
TAMA-SAS-TOWER-3
 DETAILS

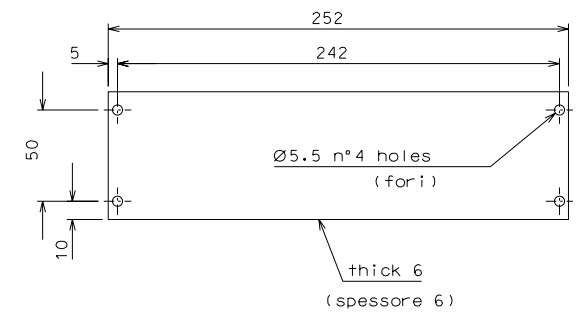
33



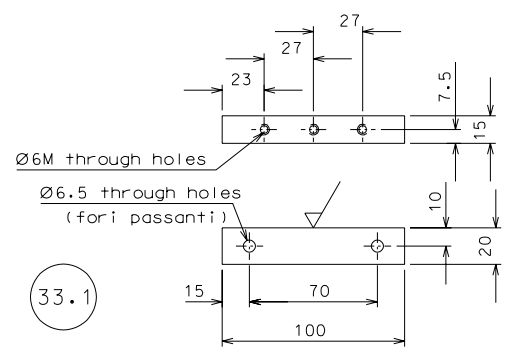
22



33.2



33.1



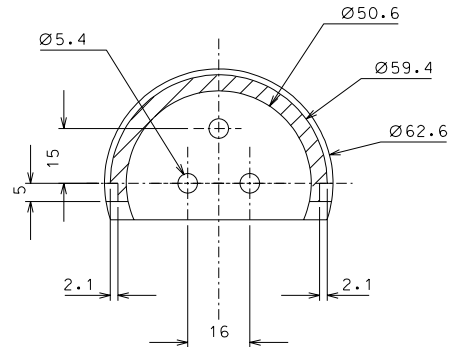
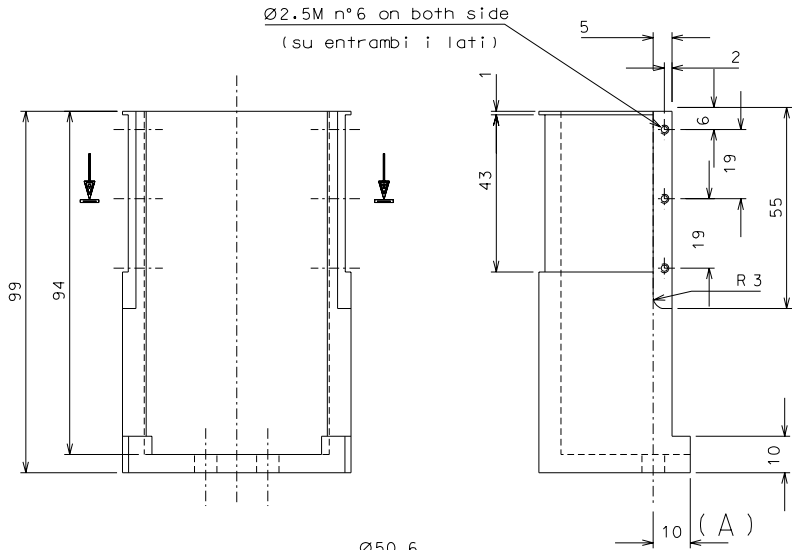
	Detail 22 modified	6-01-01	
ref.	note	date	signature
modifications			

33.2	3	AISI 304	1:2				
33.1	6	"	1:2				
33	6	"	1:2				
22	3	"	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

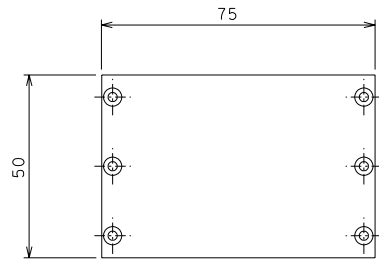
General machining tolerances UNI 5307-63							
Dimensions	< 6	>= 6-30	>= 30-120	>= 120-315	>= 315-1000	>= 1000-2000	>= 2000-4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

Size A2

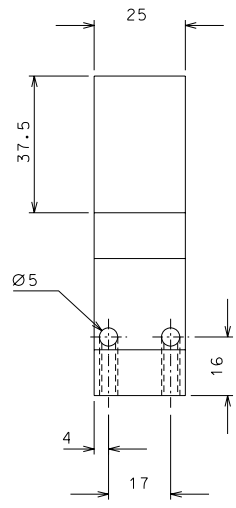
	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.019
title TAMA-SAS-TOWER-3 DETAILS		rev. PROMEC 24-6-00 details from 003-004 replaces dr. Num.



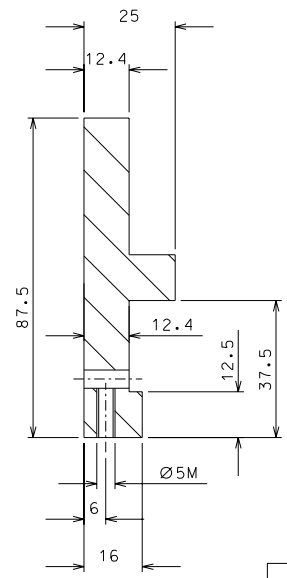
34



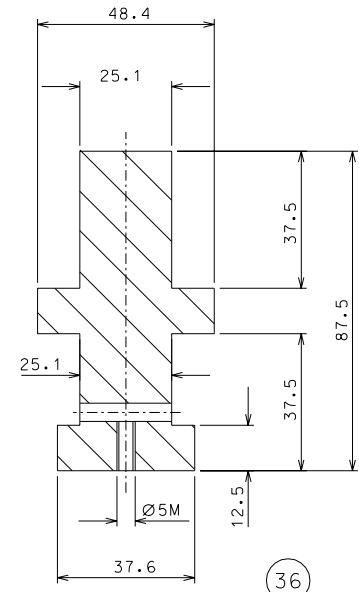
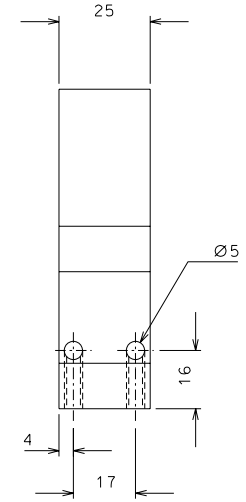
38



35



Side A2

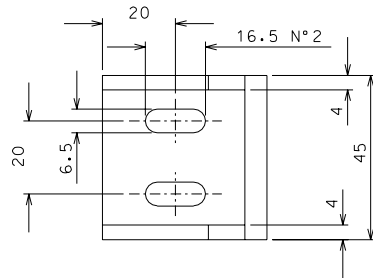
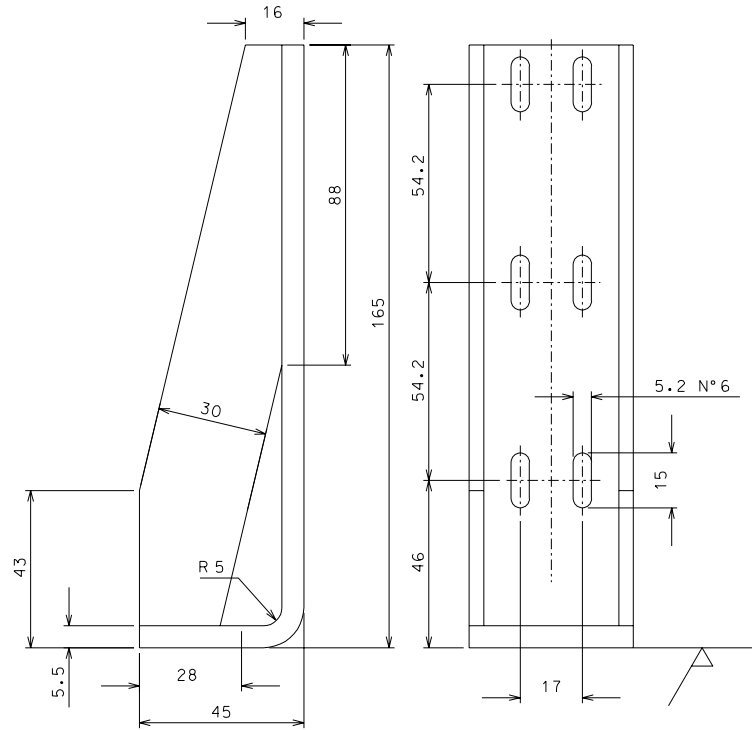


36

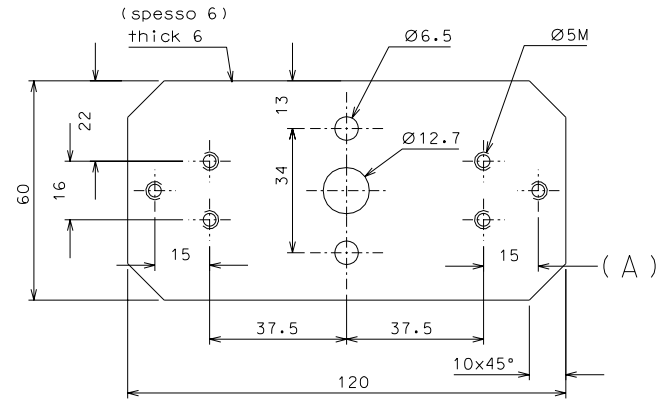
ref.	A	cutting base	5-7-00
note			
date			
signature			
modifications			

38	6	AISI 304	1:1				
36	3	ARMCO steel	1:1				
35	6	"	1:1				
34	6	bakelite	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63							
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			
LIGO PROJECT				designed for R. De Salvo n. tam3.020			
title TAMA-SAS-TOWER-3 DETAILS				draw. PROMEC 24-6-00 details from 005 replaces dr. Num.			



37



31

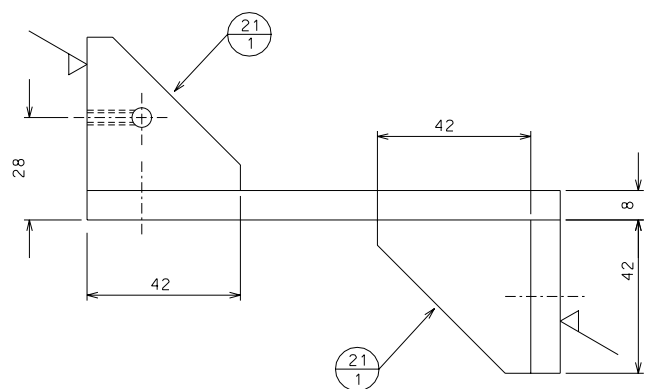
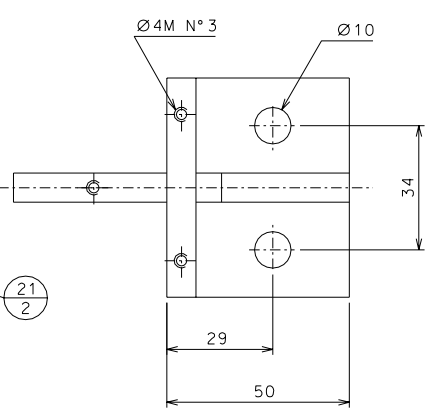
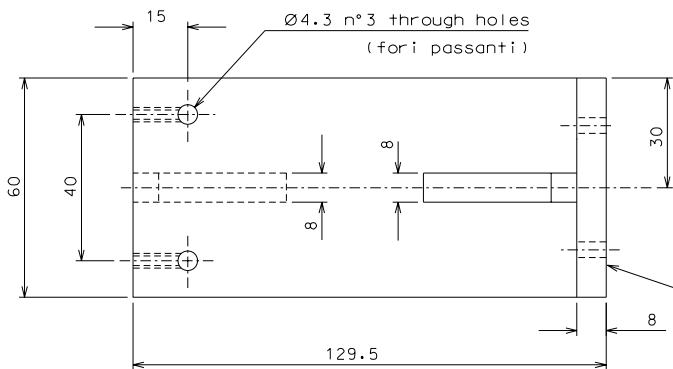
A	new hole	5-7-00	
ref.	note	date	signature
modifications			

37	3	AISI 304 L	1:1				
31	3	AISI 304	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

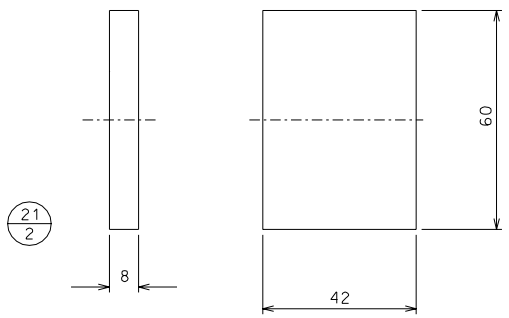
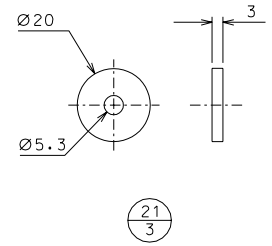
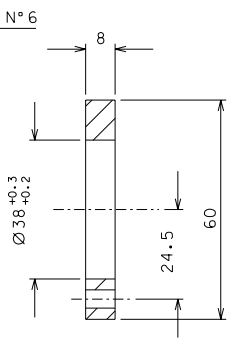
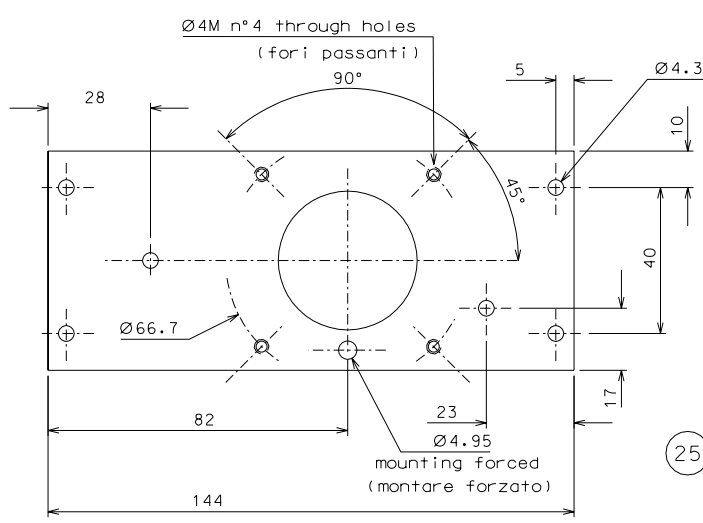
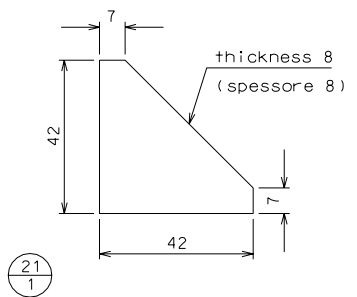
General machining tolerances UNI 5307-63							
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000
Linear Toli.	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	LIGO PROJECT	designed for R. De Salvo
		n. tama3.021
	title	arv. PROMEC 24-6-00
	TAMA-SAS-TOWER-3	details from 005
	DETAILS	replaces dr. Numb.

Side A2



21 welded structure (struttura saldata) $2 \sqrt{10-20}$ GTAW



Side A2

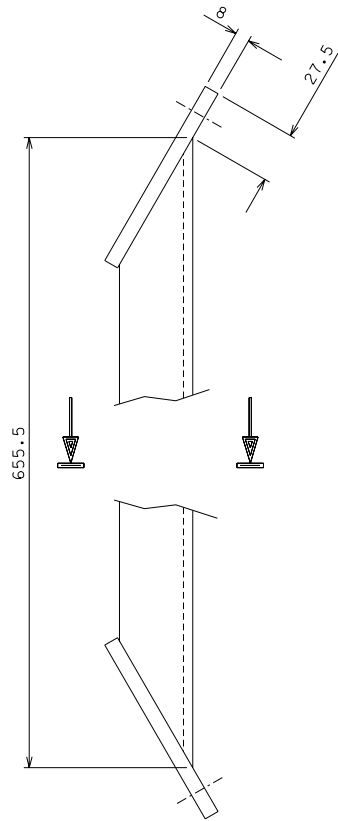
ref.	note	date	signature
modifications			

ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale
25	1	AISI 304 L	1:1				
21.3	4	"	1:1				
21.2	2	"	1:1				
21.1	3	"	1:1				
21	1	"	1:1				

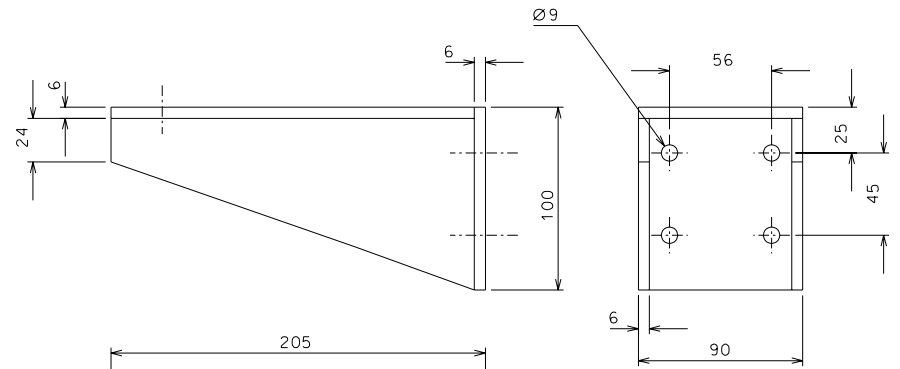
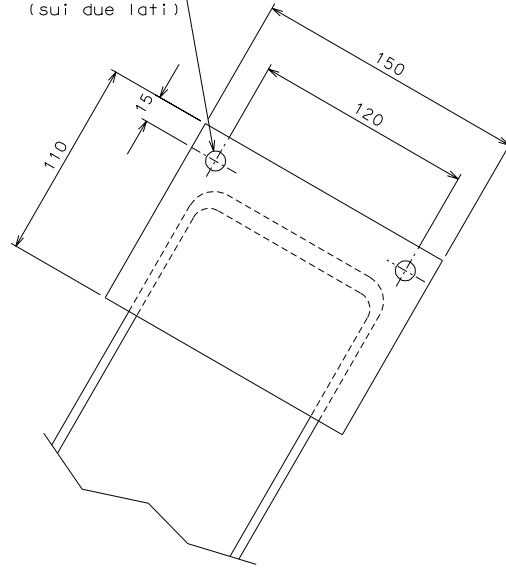
General machining tolerances UNI 5307-63

Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toli.	± 1	± 30'	± 20'	± 10'				

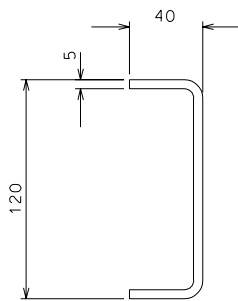
designed for R. De Salvo
 N. tama3.022
 draw. PROMEC 24-6-00
 details from 001
 replaces dr. Num.



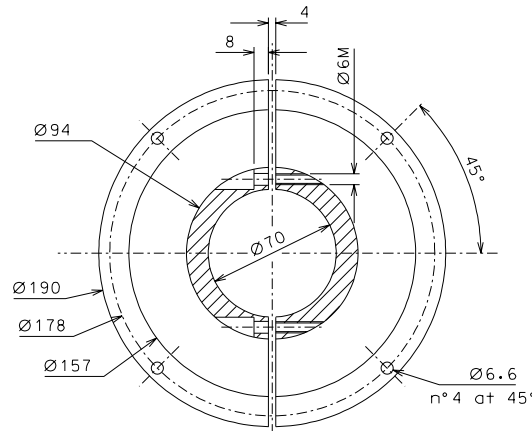
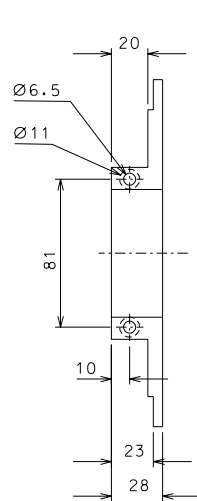
Ø11 on both side
(sui due lati)



1 welded structure
(struttura saldata)



32 welded structure
(struttura saldata)



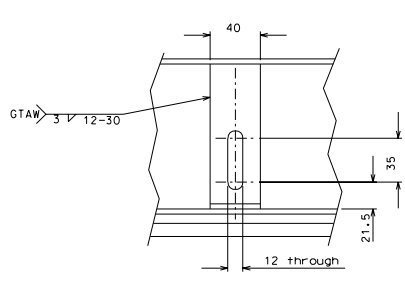
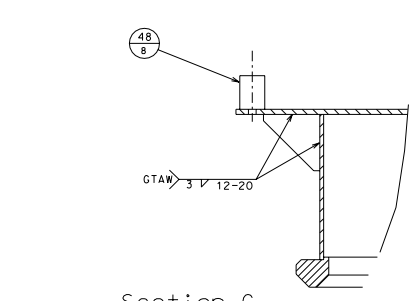
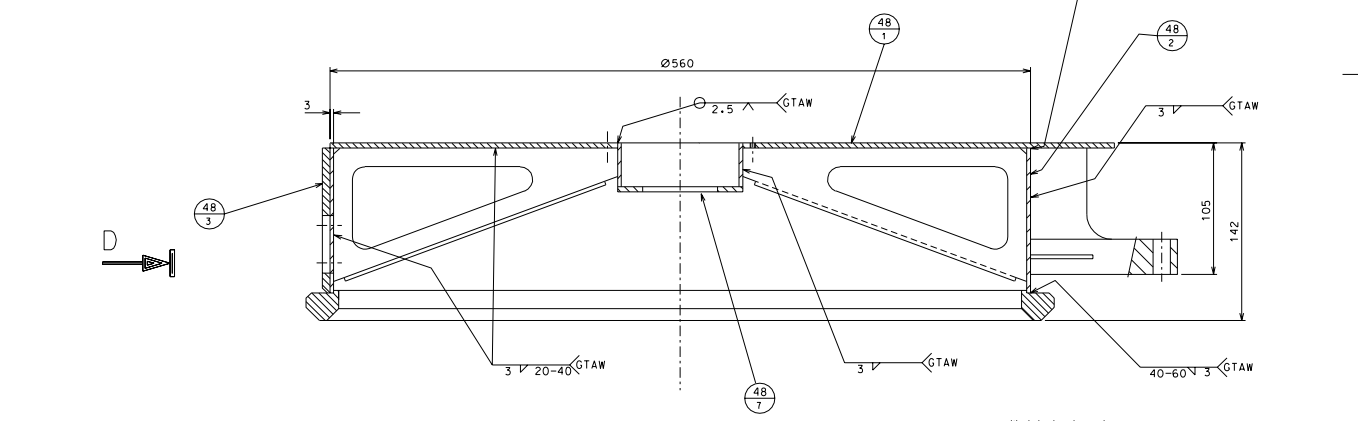
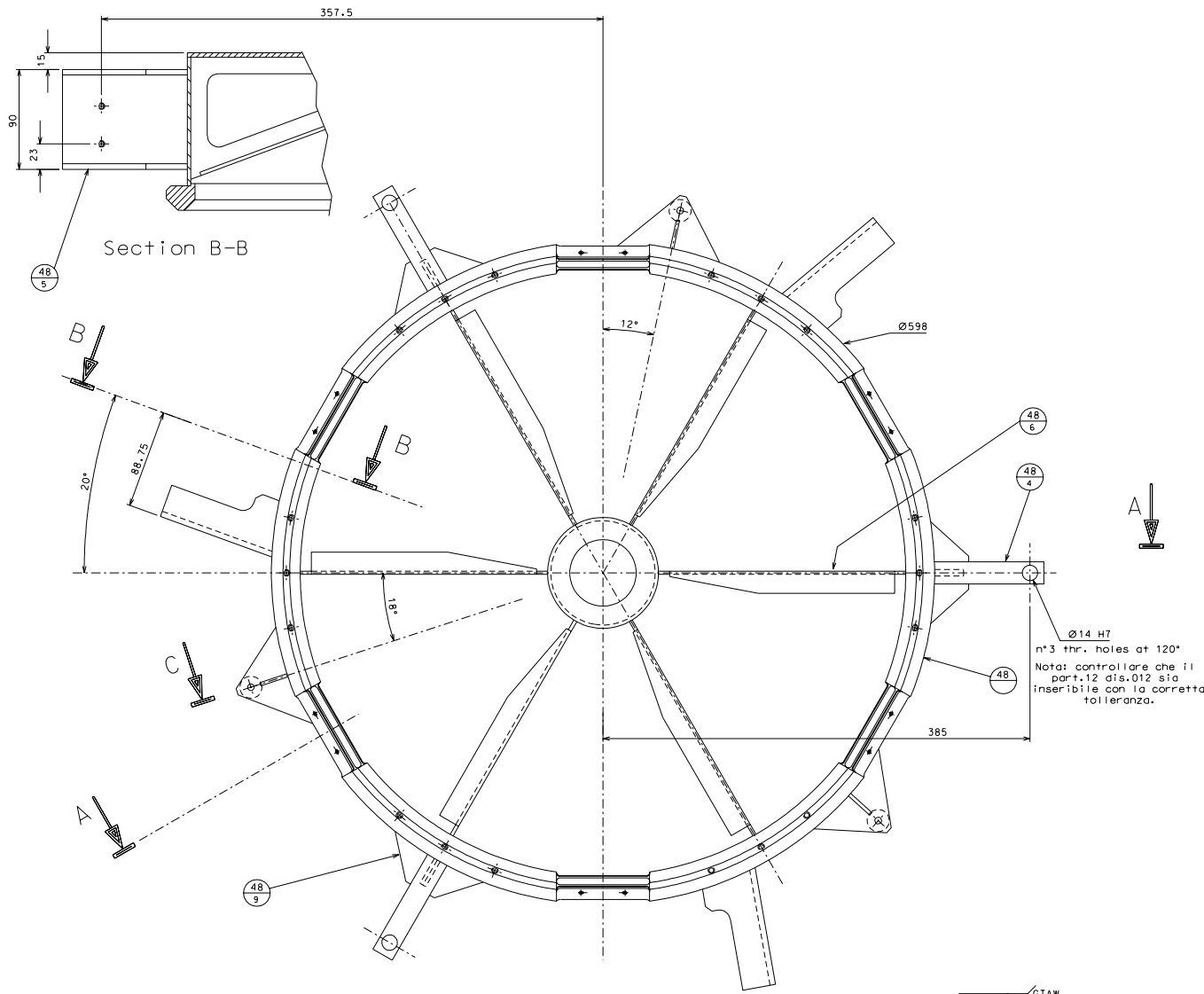
Side A2

ref.	note	date	signature
modifications			

TOOL	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale
3	3	AISI 304	1:2				
32	3	AISI 304 L	1:2				
1	3	"	1:2				

General machining tolerances UNI 5307-63							
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000
Linear Toli.	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.023
title TAMA-SAS-TOWER-3 DETAIL		draw. PROMEC 24-6-00
		details from 000-002
		replaces dr. Num.



Welded structure
(struttura saldata)

ref.	note	date	signature
modifications			

48.5	025	magnet support			
48.4	025	pendulum joint			
48.3	025	LVD support			
48.2	031	ferrule	48.9	025	backing strips
48.1	030	top plate	48.8	025	spring's support
48	028	ring for blades	48.7	026	central cup
			48.6	025	spoke
ref.	draw.	called upon	ref.	draw.	called upon

LIGO PROJECT designer for R. De Salvo
ass. num. Tama3.024

TAMA-SAS-TOWER-3 draw. PRGMEC 1-7-00

BODY OF FILTER scale 1:2

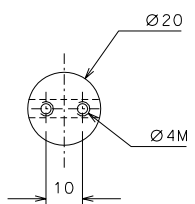
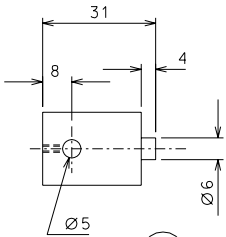
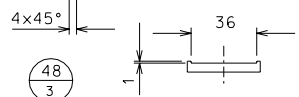
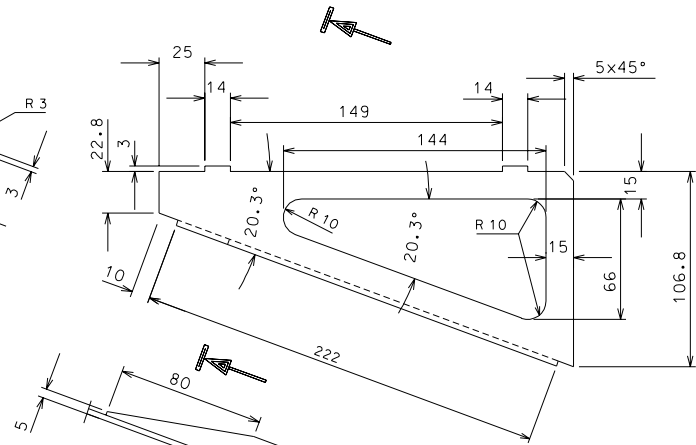
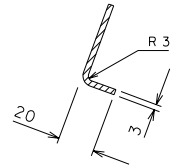
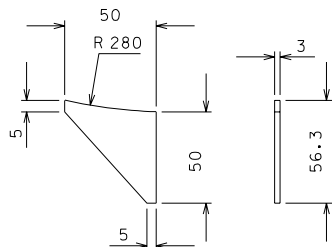
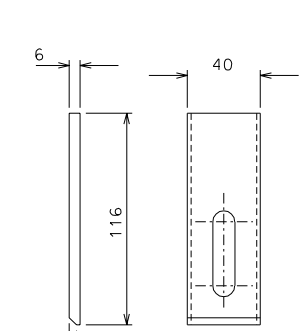
realizzato da: Num.

Size A1

View D
n°3 pieces at 120°
(n°3 pezzi a 120°)

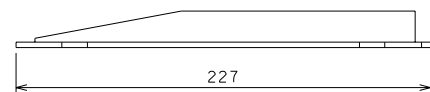
Section C

Section B-B

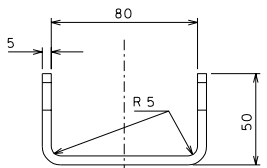
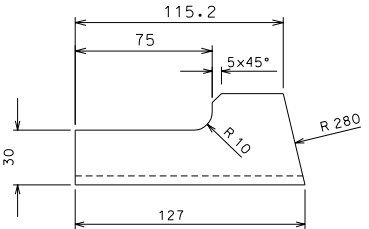


48
8

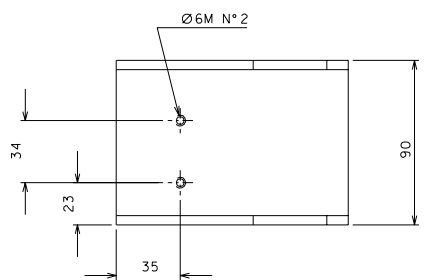
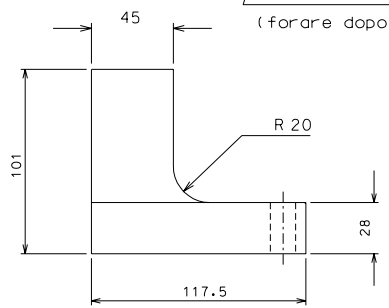
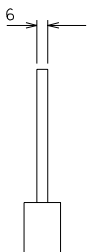
48
6



to drill after welding
(forare dopo saldato)



ref.	note	date	signature
modifications			



48
5

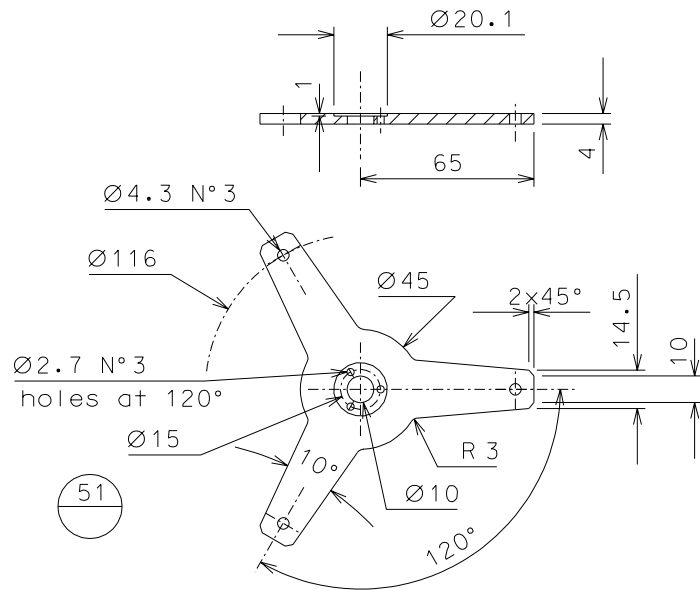
48
4

ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale
48.8	6	AISI 304 L	1:1				
48.6	6	"	1:2				
48.5	3	"	1:2				
48.4	3	"	1:2				
48.3	3	"	1:2	48.9	6	AISI 304 L	1:2

General machining tolerances UNI 5307-63								
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
Angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side				

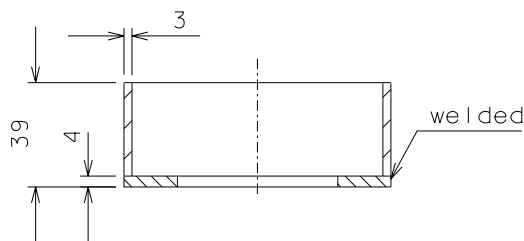
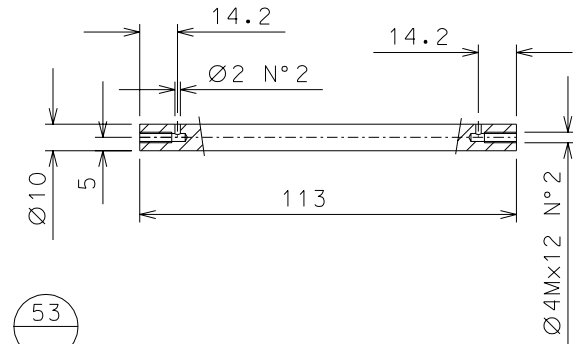
	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.025
title TAMA-SAS-TOWER-3 DETAILS		draw. PROMEC 2-7-00
		details from 024
		replaces dr. Num.

Size A2

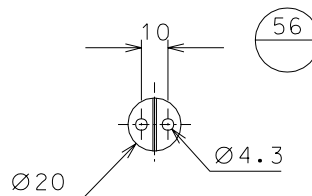


51

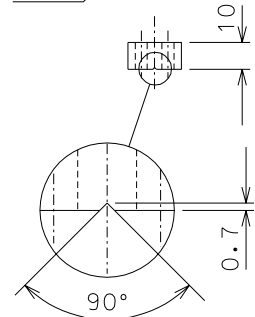
53



48
7



56



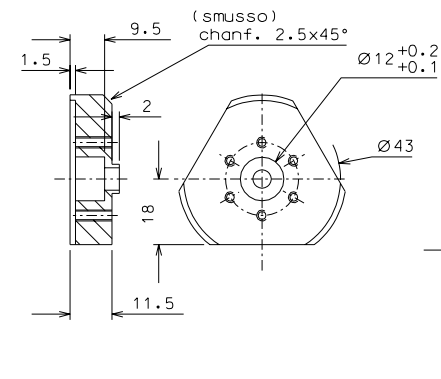
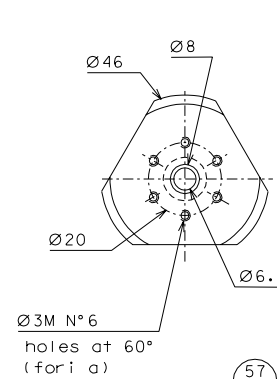
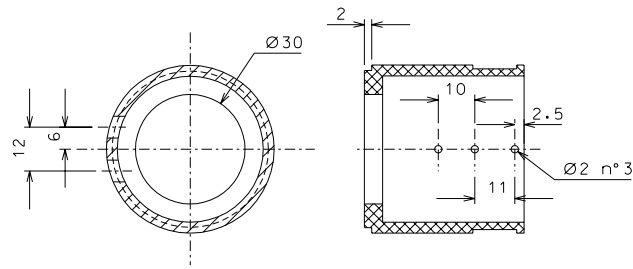
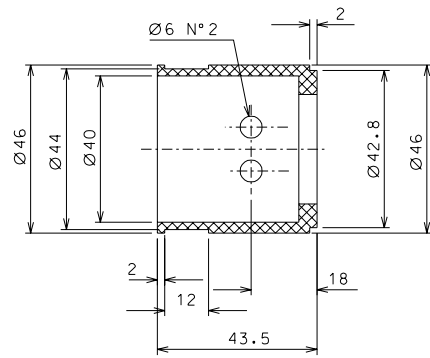
Size A3

ref.	note	date	signature
modifications			

56	6	AISI 304	1:2				
53	3	"	1:2				
51	1	"	1:2				
48.7	1	AISI 304 L	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

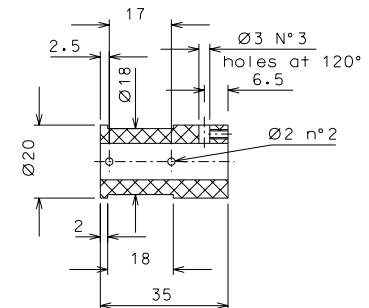
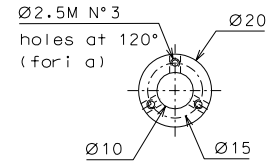
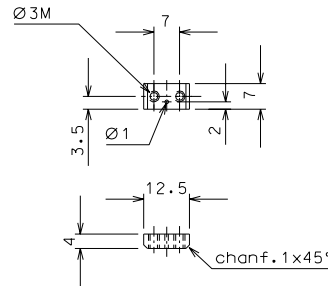
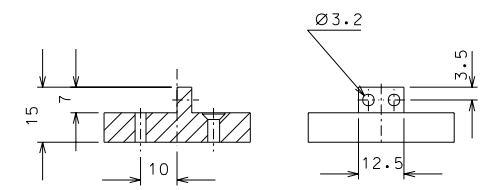
General machining tolerances UNI 5307-63								
Dimensions	< 6	>6-30	>30-120	>120-315	>315-1000	>1000-2000	>2000-4000	>4000
linear Toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toll.	± 1	± 30'	± 20'	± 10'				referred to the shortest side

	<h1>LIGO PROJECT</h1>	designed for R. De Salvo
		N. Tama3.026
		draw. PROMEC 2-7-00
		details from 008-024
title TAMA-SAS-TOWER-3 DETAILS		replaces dr. Numb.

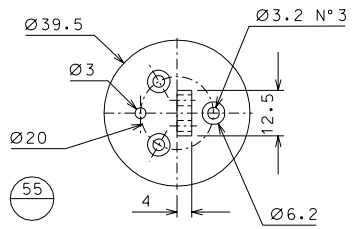


52 use tool n° 86, 86.1

57

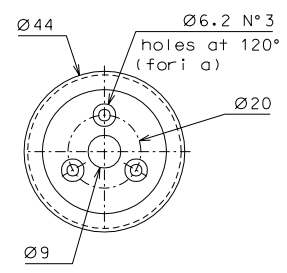
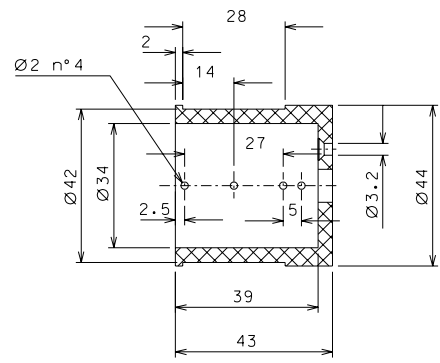


59 use tool n° 88



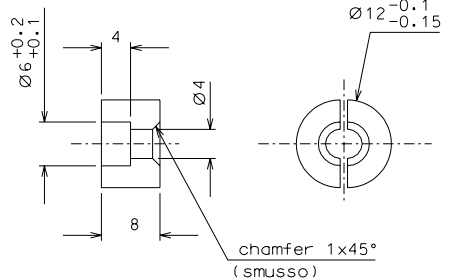
54

ref.	note	date	signature
modifications			



58 use tool n° 87

ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale
57	1	AISI 304	1:1	60	1	maraging	2:1
55	1	"	1:1	59	1	peek	1:1
54	1	"	1:1	58	1	"	1:1
52	1	peek	1:1				

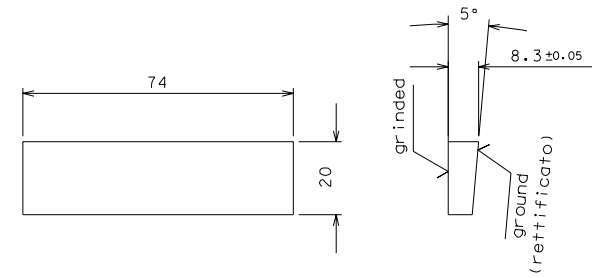
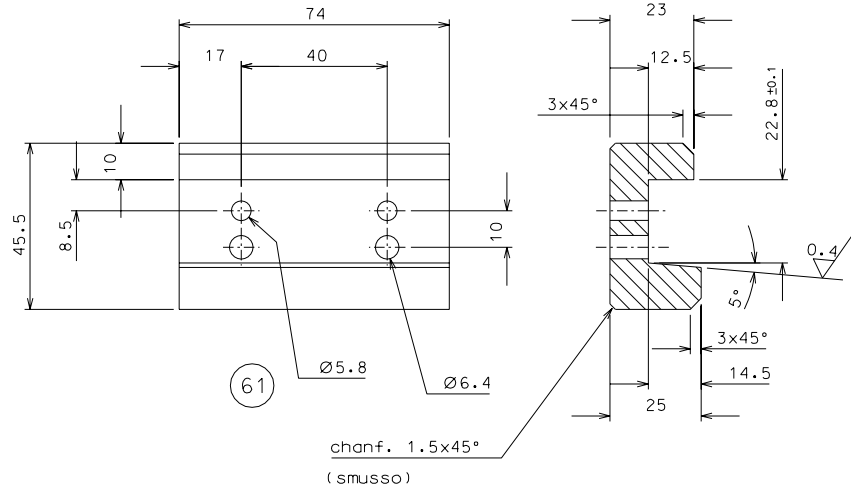


60 light nickel plated (nichelatura leggera)

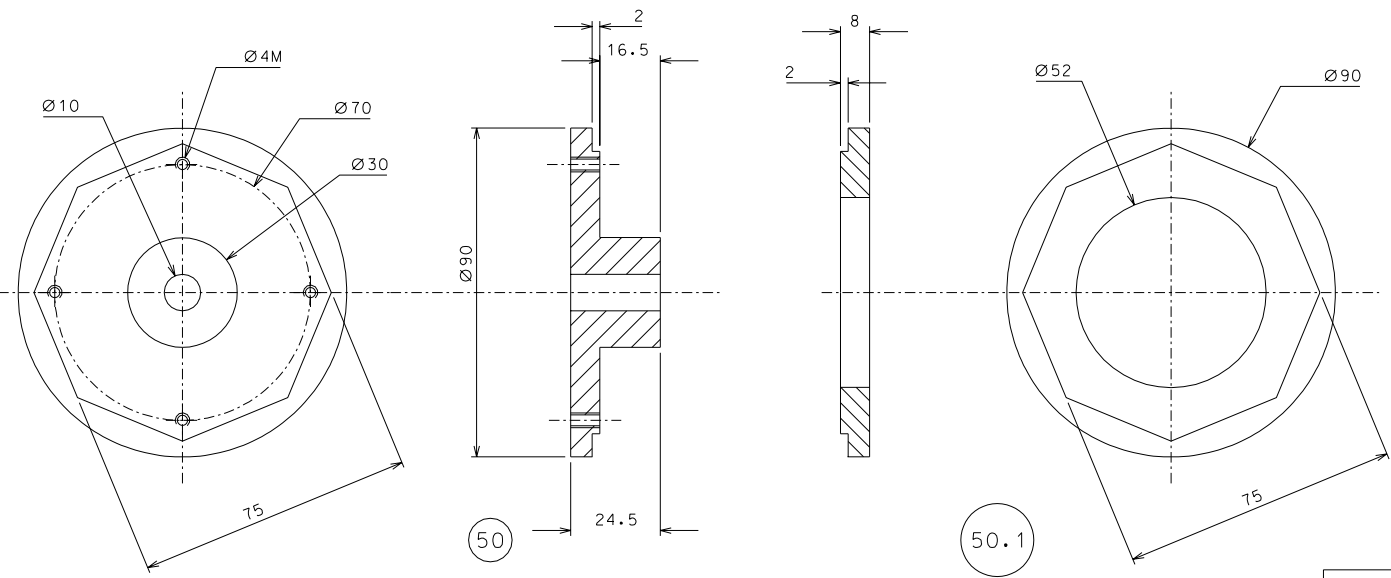
Size A2

General machining tolerances UNI 5307-63							
Dimensions	< 6	6-30	30-120	120-315	315-1000	1000-2000	>2000-4000
Linear Toli.	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	designed for R. De Salvo
	N. Tama3.027
	draw. PROMEC 2-7-00
TAMA-SAS-TOWER-3	
DETAILS	
replaces dr. Num.	



63 Height to be cut to fit blades into slots as specified on sheet 8



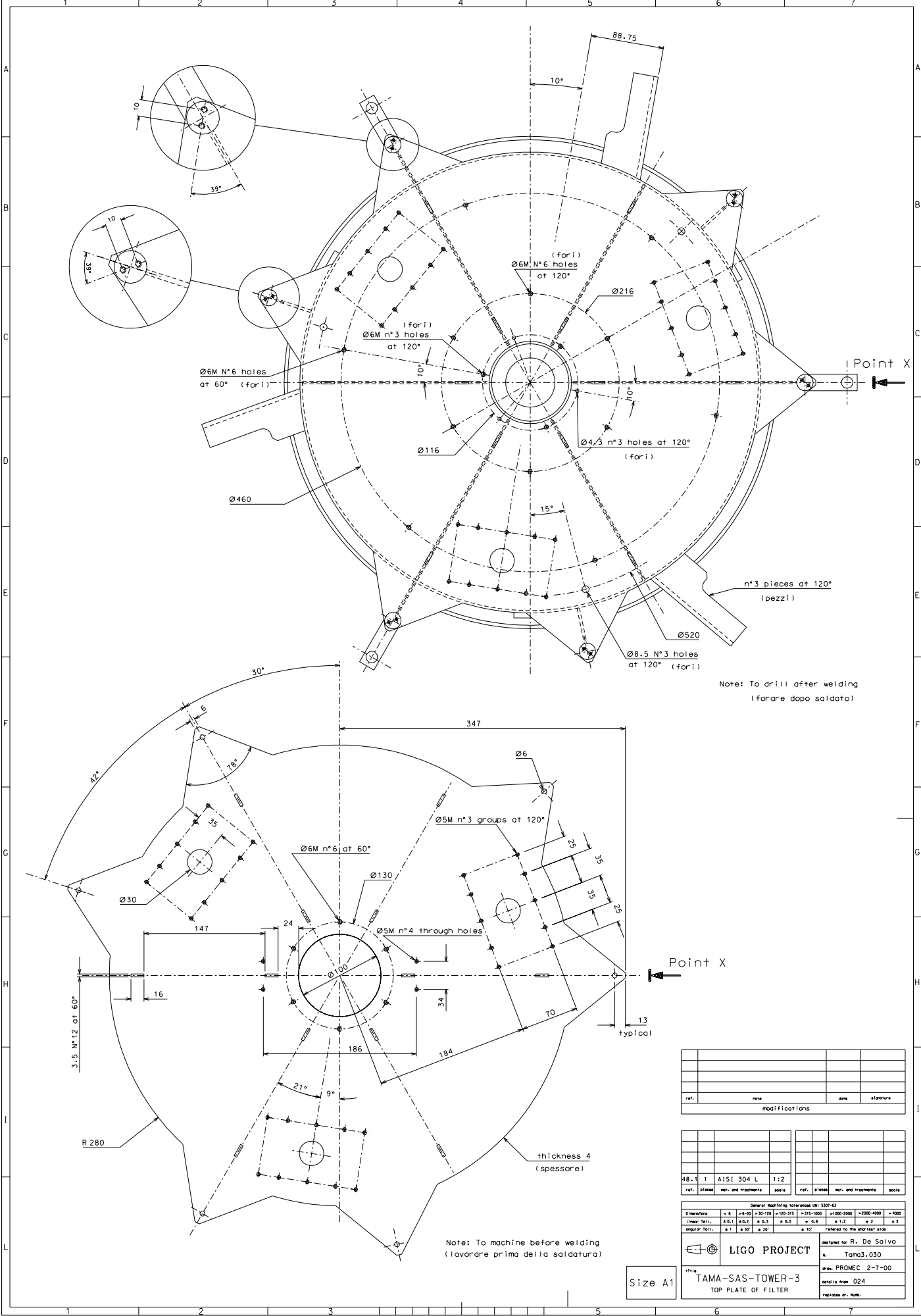
ref.	note	date	signature
modifications			

63	6	AISI 304	1:1				
61	6	"	1:1				
50.1	1	ARMCO steel	1:1				
50	1	"	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63							
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000
Linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 3
Angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.029
title TAMA-SAS-TOWER-3		draw. PROMEC 2-7-00
DETAILS		details from 008
		replaces dr. Num.

Size A2



(for i)
 Ø6M N°6 holes
 at 120°

(for i)
 Ø6M n°3 holes
 at 120°

Ø6M N°6 holes
 at 60° (for i)

Ø460

Ø216

Ø116

Ø4.3 n°3 holes at 120°
 (for i)

Ø520

Ø8.5 N°3 holes
 at 120° (for i)

n°3 pieces at 120°
 (pezzi)

Note: To drill after welding
(forare dopo saldato)

30°

42°

78°

347

Ø6

Ø5M n°3 groups at 120°

Ø6M n°6 at 60°

Ø130

Ø5M n°4 through holes

Ø100

Ø30

147

24

34

186

184

21°

9°

16

10

13
 typical

R 280

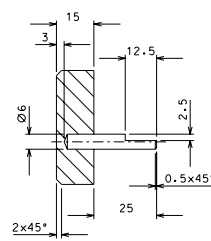
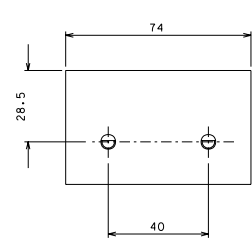
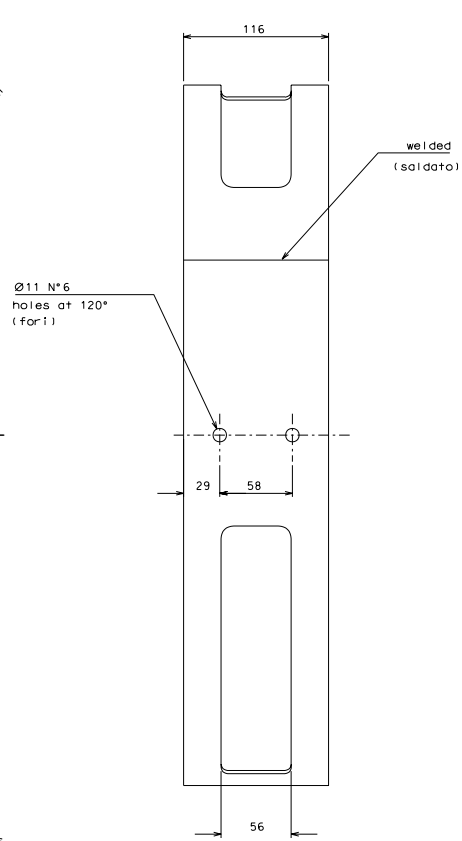
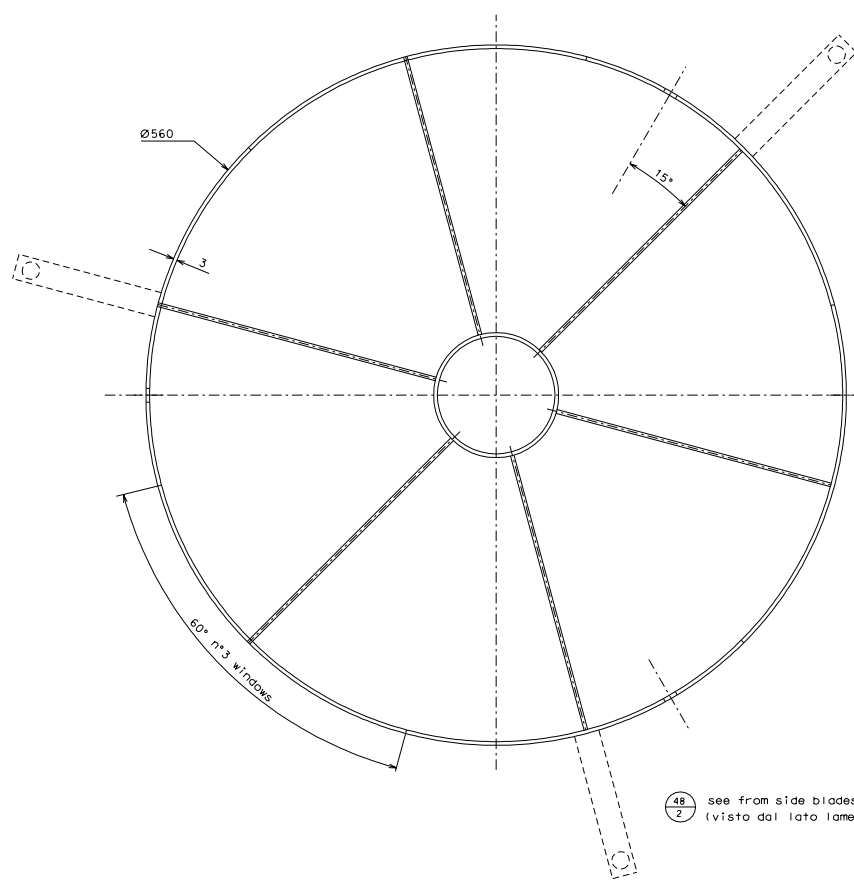
thickness 4
 (spessore)

Note: To machine before welding
(lavorare prima della saldatura)

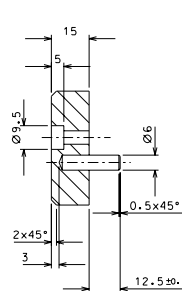
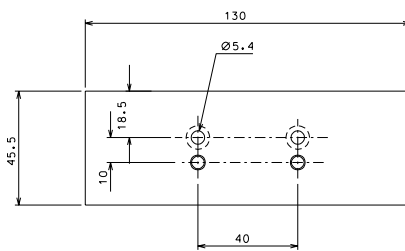
ref.	note	date	signature
modifications			

48.1	1	AISI 304 L	1:2	ref. piece	ref. piece	ref. piece	ref. piece
------	---	------------	-----	------------	------------	------------	------------

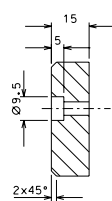
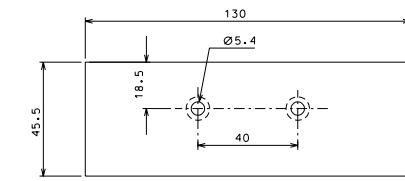
General machining tolerances UNI 5107-63								
Dimensione	< 6	6-30	30-120	120-315	315-1000	1000-2000	2000-4000	> 4000
Linear tol.	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
Angular tol.	±1'	±30'	±20'	±10'	referred to the smallest side			
designed for R. De Salvo n. Tama3.030						draw. PRGMEC 2-7-00		
Title TAMA-SAS-TOWER-3 TOP PLATE OF FILTER						details from 024		
Size A1								



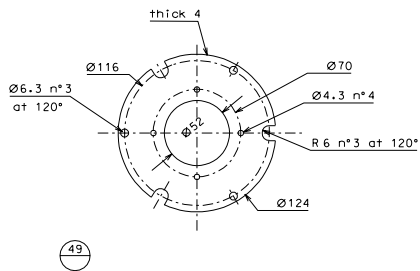
Tool type 1: n°3 pieces inox



Tool type 2: n°3 pieces inox



Tool type 3: n°3 pieces inox



ref.	note	date	signature
modifications			

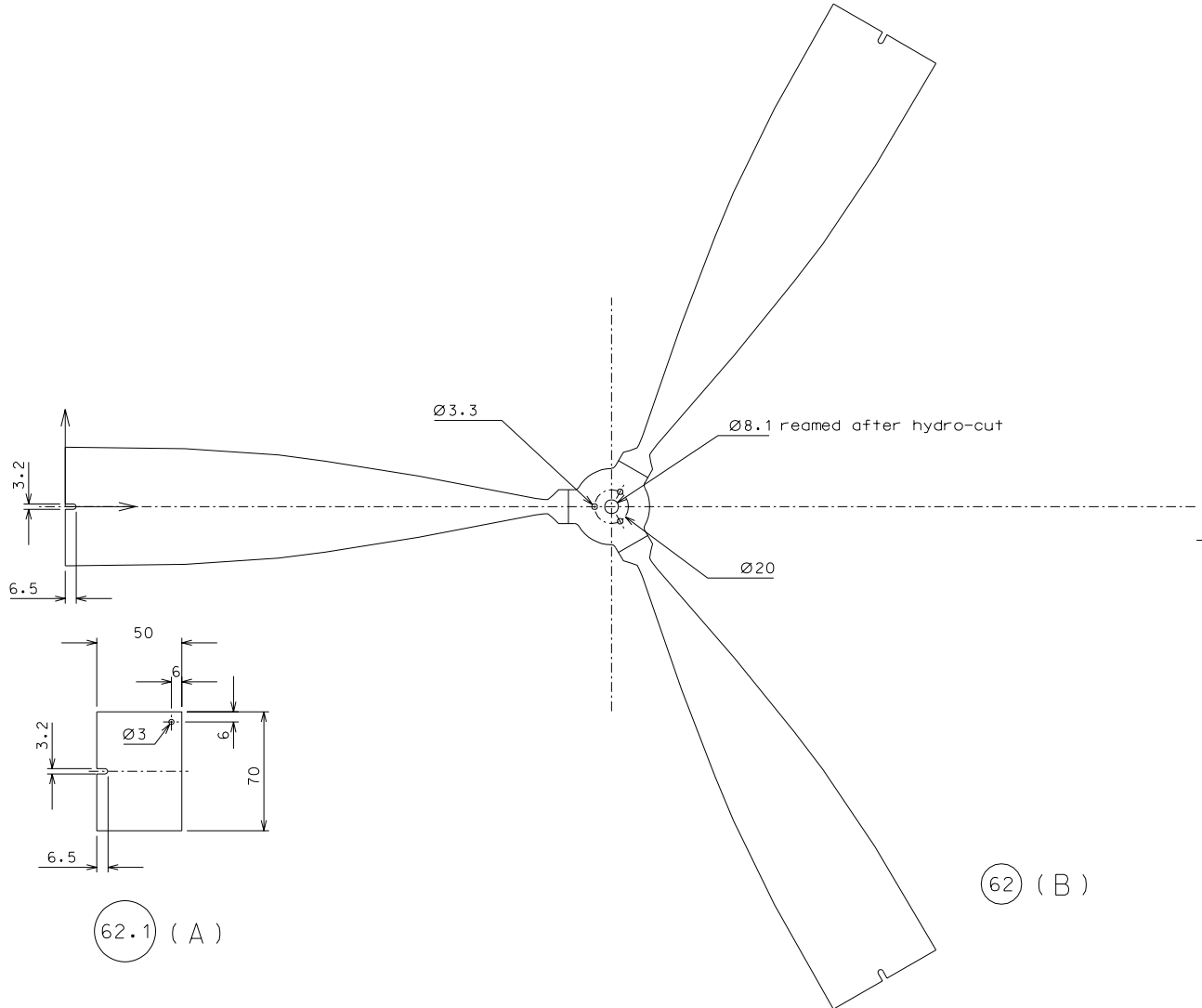
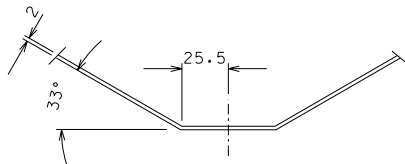
ref.	pieces	mat. and treatment	size	ref.	pieces	mat. and treatment	size
49	1	AISI 304	1x2				
48.2	1		1x2				

General machining tolerances UNI 5201-63							
Dimensione	< 6	6-30	30-120	120-315	315-1000	1000-2000	>2000-4000
Forma	±0.1	±0.15	±0.2	±0.3	±0.5	±1.2	±2
Angolo	±1°	±1.30°	±2°	±3°	±5°	±10°	±15°

designer for R. De Salvo
n. Tama3.031
draw. PRIMEC 2-7-00
details from 008-024
realized by: Sutti.

Size A1

LIGO PROJECT
TAMA-SAS-TOWER-3
DETAILS



62.1 (A)

62 (B)

X	Y
0	32.5
69.572	31.66
123.71	28.11
150.799	24.88
204.937	16.80
272.589	4.53
277.90	3.88
279.95	3.88
283.33	7
286.33	10
291	10
317.5	0 center

Surface treatment: Electropolishing and light nickel-plating
 (Trattamento superficiale: Elettropulitura e nichelatura leggera)

Thermal treatment: Baking at 435° for 100 hours in argon atmosphere
 (Trattamento termico: Riscaldamento a 135° per 100 ore in atmosfera di argon)

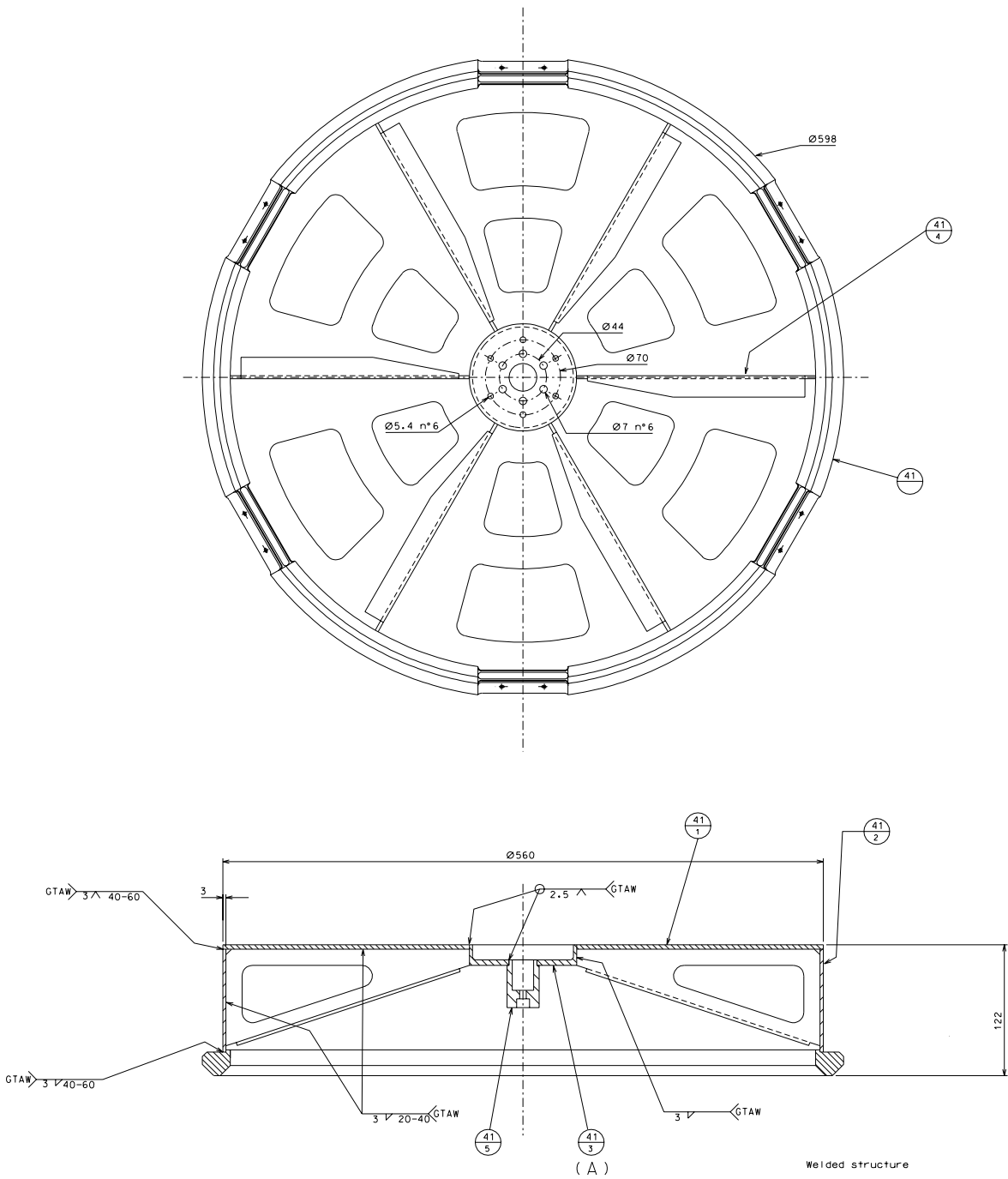
62.1	3	maraging	1:2				
62	1	maraging	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	>6-30	>30-120	>120-315	>315-1000	>1000-2000	>2000-4000	> 4000
linear toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular toll.	± 1'	± 30'	± 20'	± 10'				referred to the shortest side

Size A2

B	modification detail	26-10-00	
A	new detail	9-7-00	
ref.	note	date	signature
modifications			

LIGO PROJECT
 Title: TAMA-SAS-TOWER-3
 BLADE
 designed for R. De Salvo
 N. Tama3.032
 draw. PROMEC 2-7-00
 details from 008
 replaces dr. Numb.



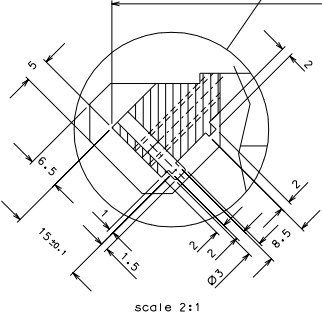
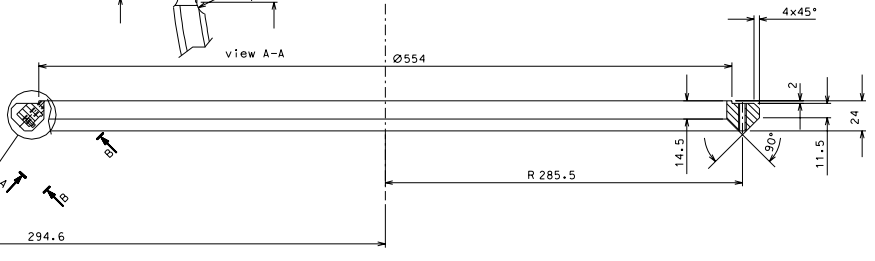
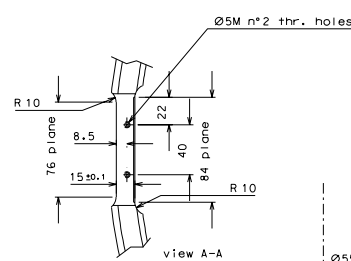
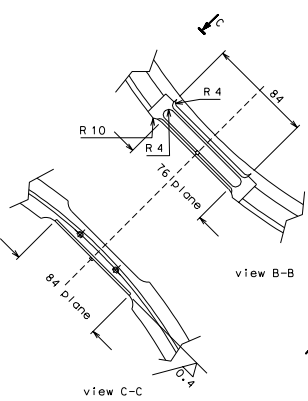
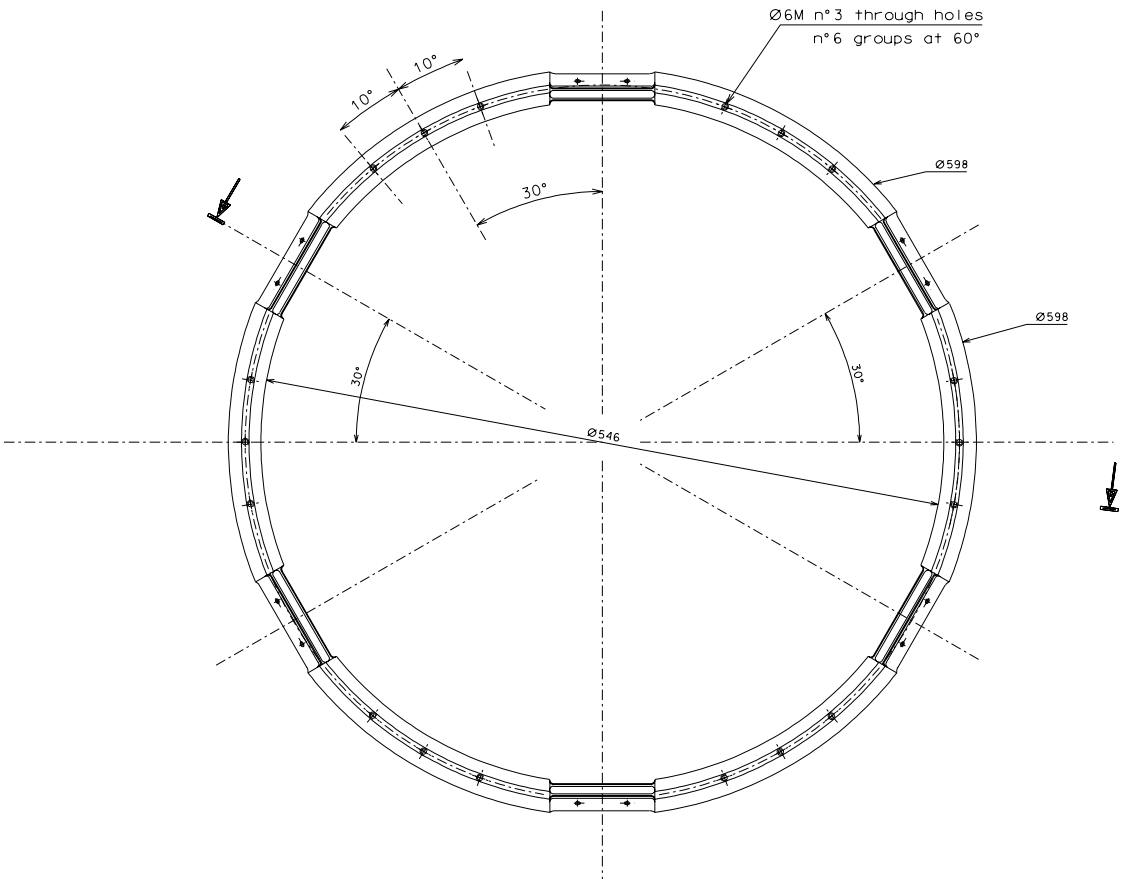
Welded structure

ref.	note	date	signature
modifications			
A	machined	9-7-00	

41.5	037	1/2 cup retainer			
41.4	036	spoke			
41.3	036	central cup			
41.2	035	ferrule			
41.1	035	top plate			
41	034	ring for blades			
ref.	draw.	called figure	ref.	draw.	called figure

	LIGO PROJECT	designed for R. De Saivo
		ass. num. Tama3.033
Title TAMA-SAS-TOWER-3 BODY OF STANDARD FILTER		draw. PRGMEC 3-7-00 scale 1:2 ref/issue dr. num.

Size A1



scale 2:1
To insert a pin forced d=3x8 (A)
(inserire spine forzate d=3x8)

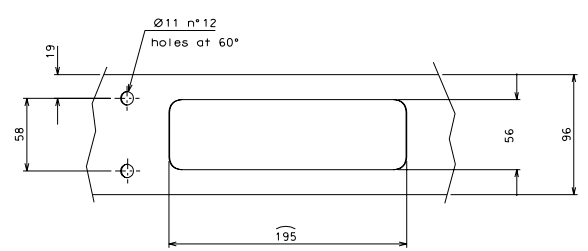
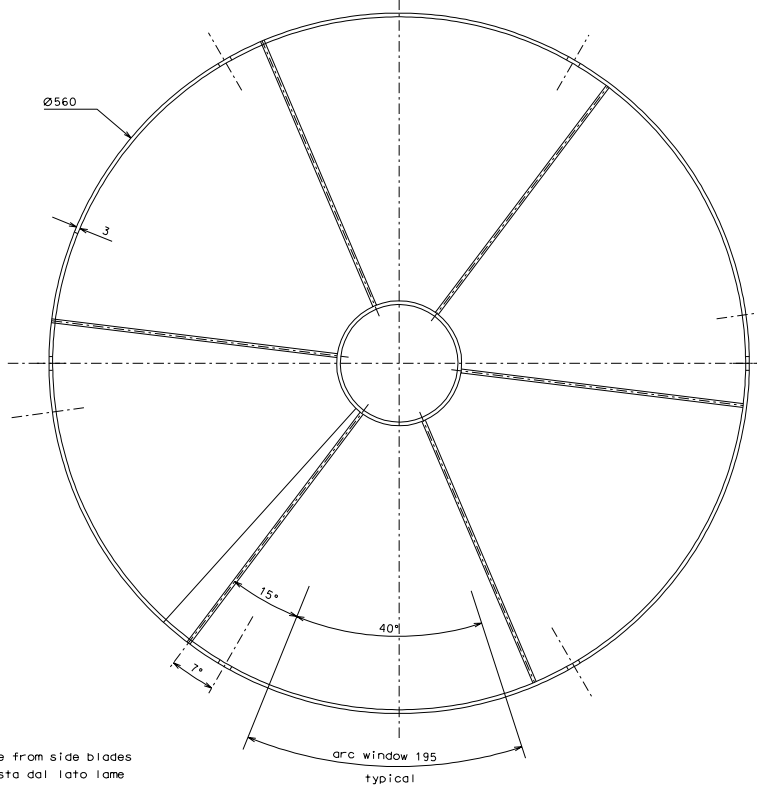
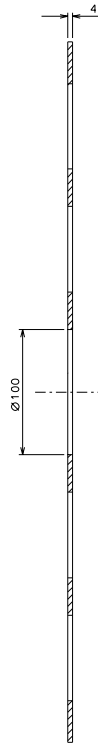
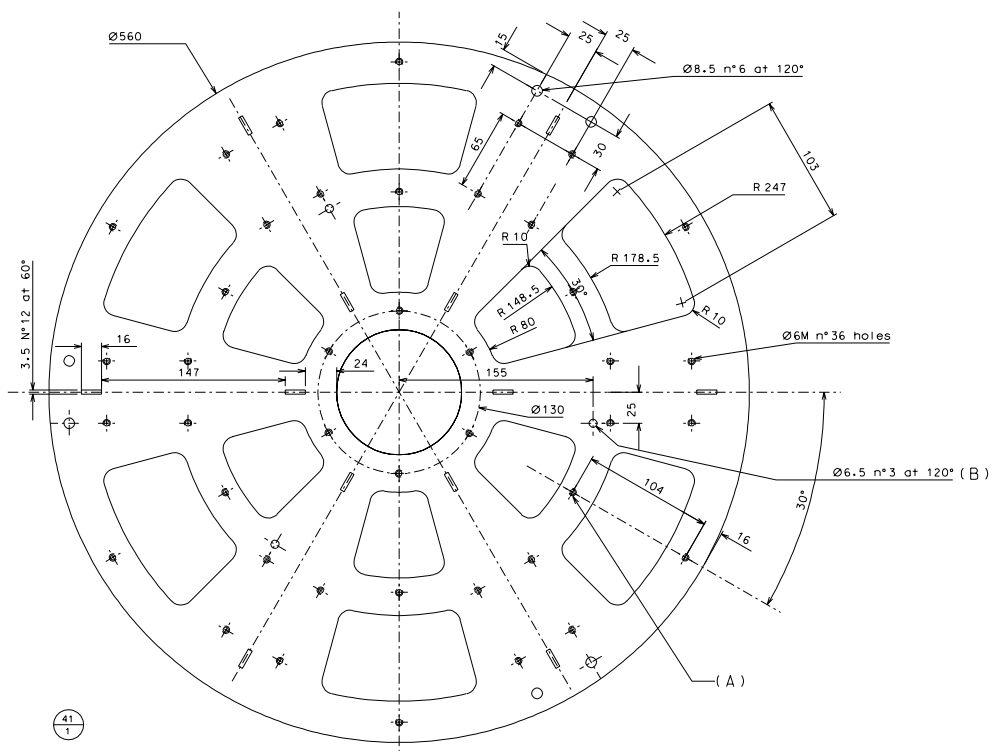
Note: To mill after welded on the body

ref.	description	date	signature
	modification radii	9-7-00	
	note		
	modifications		

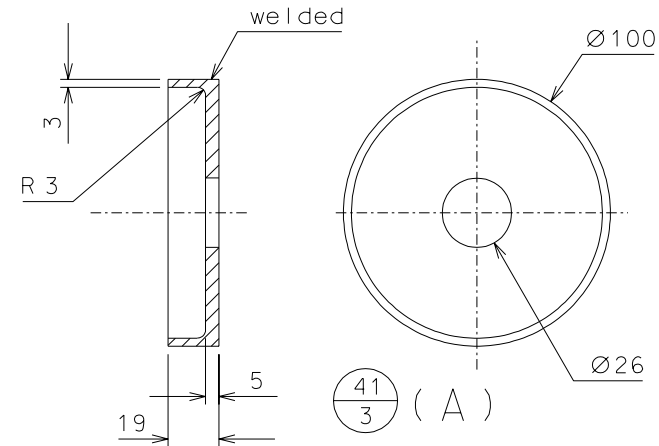
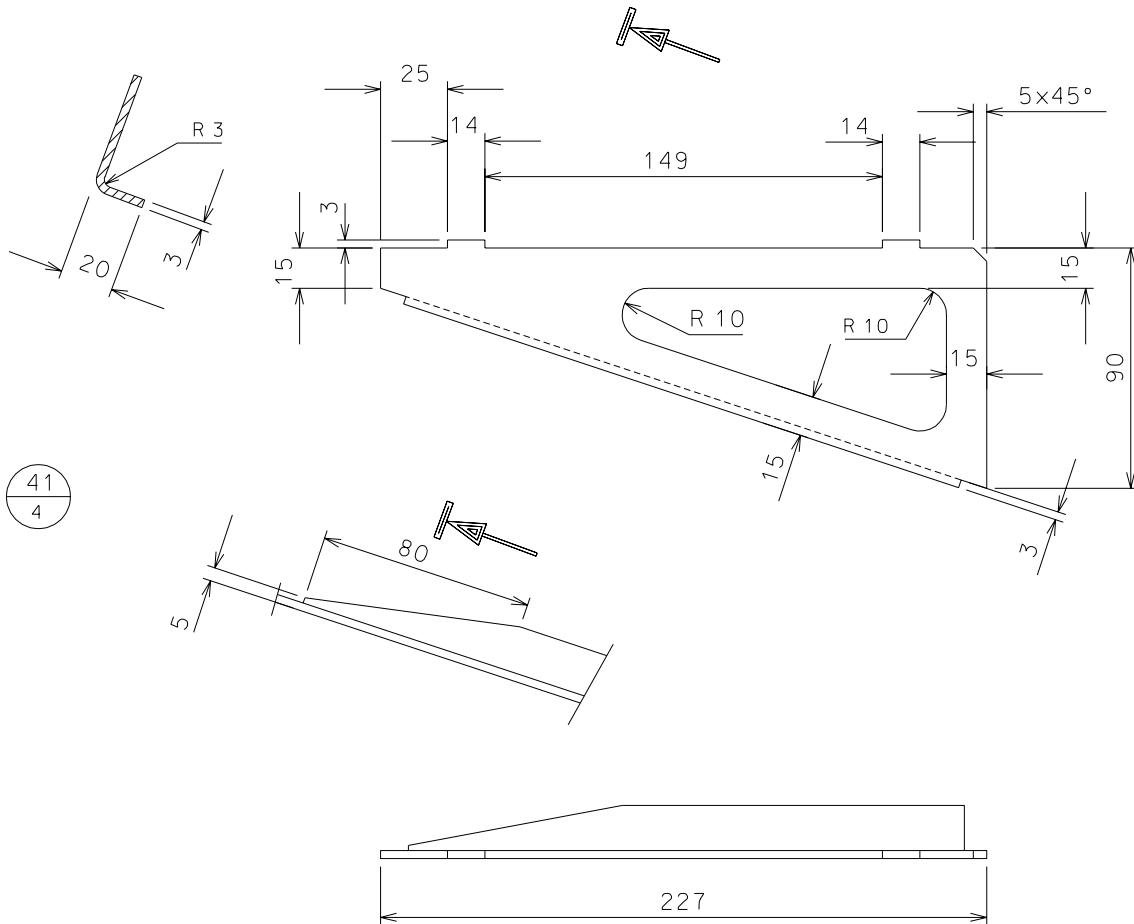
41	1	AISI 304 L	1x2				
ref.	pieces	mat. and treatments	size	ref.	pieces	mat. and treatments	size

General machining tolerances UNI 5307-63							
Dimensione	< 6	6-30	30-120	120-315	315-1000	1000-2000	> 2000-4000
Forma	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
Angolo	±1°	±30'	±20'	±10'	refered to the nearest size		
designed for R. De Salvo n. Tama3.034 draw. PRIMEC 3-7-00 details from 007-033 realizzo dr. Nullo.						Title TAMA-SAS-TOWER-3 BLADE'S RING OF FILTER-S	

Size A1



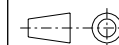
B	added holes	10-12-00						
A	added holes	1-8-00						
	added holes	17-7-00						
ref.	date	signature						
modifications								
41.2	1	AISI 304 L	1:2					
41.1	1		1:2					
ref.	date	ref. to the detail side						
ref.	date	ref. and treatment	scale					
General machining tolerances UNI 5307-63								
Dimensione	< 6	6-30	30-120	120-315	315-1000	1000-2000	2000-4000	> 4000
Tolleranza	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
Angolo file	± 1'	± 30'	± 20'	± 10'	referred to the detail side			
LIGO PROJECT		designer for R. De Saivo						
		n. Tama3.035						
Title		TAMA-SAS-TOWER-3			draw. PRIMEC 3-7-00			
Size A1		DETAILS FILTER_S			detail from 033			
					realized by: Ruffi			



A	machined		9-7-00	
ref.	note	date	signature	
modifications				

41.4	6	AISI 304 L	1:2				
41.3	1	"	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	>6-30	>30-120	> 120-315	> 315-1000	>1000-2000	>2000-4000	> 4000
linear Toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toll.	± 1	± 30'	± 20'	± 10'				referred to the shortest side



LIGO PROJECT

designed for R. De Salvo

N. Tama3.036

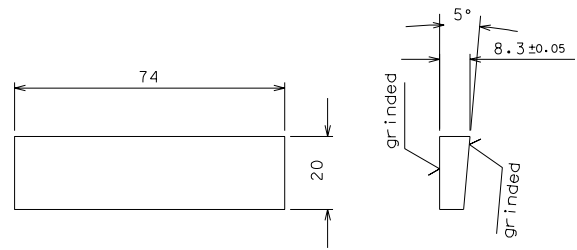
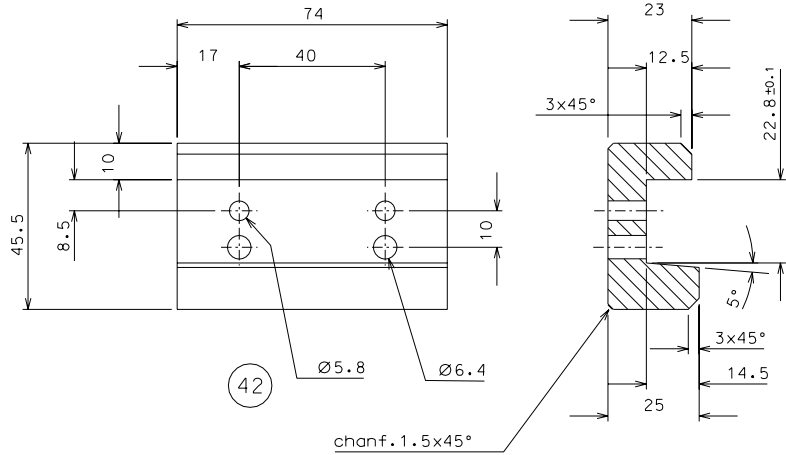
draw. PROMEC 3-7-00

details from 033

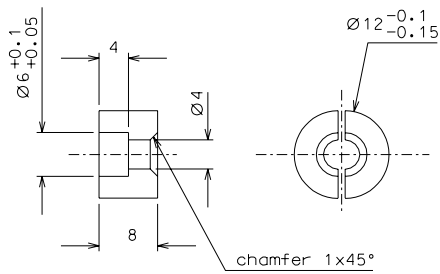
replaces dr. Numb.

title
TAMA-SAS-TOWER-3
DETAILS FILTER_S

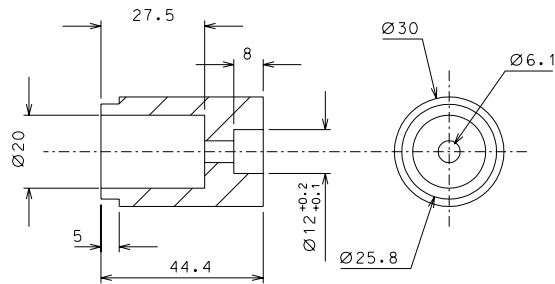
Size A3



39 Height to be cut to fit blades into slots as specified on sheet 7



46 light nickel plated



41.5 (A)

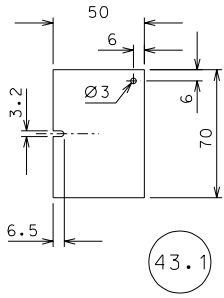
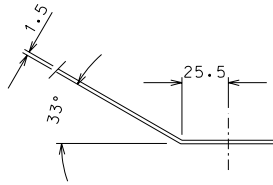
(A)	modification dimension	9-7-00	
ref.	note	date	signature
modifications			

46	1	maraging	2:1				
42	3	AISI 304	1:1				
41.5	1	"	1:1				
39	6	"	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

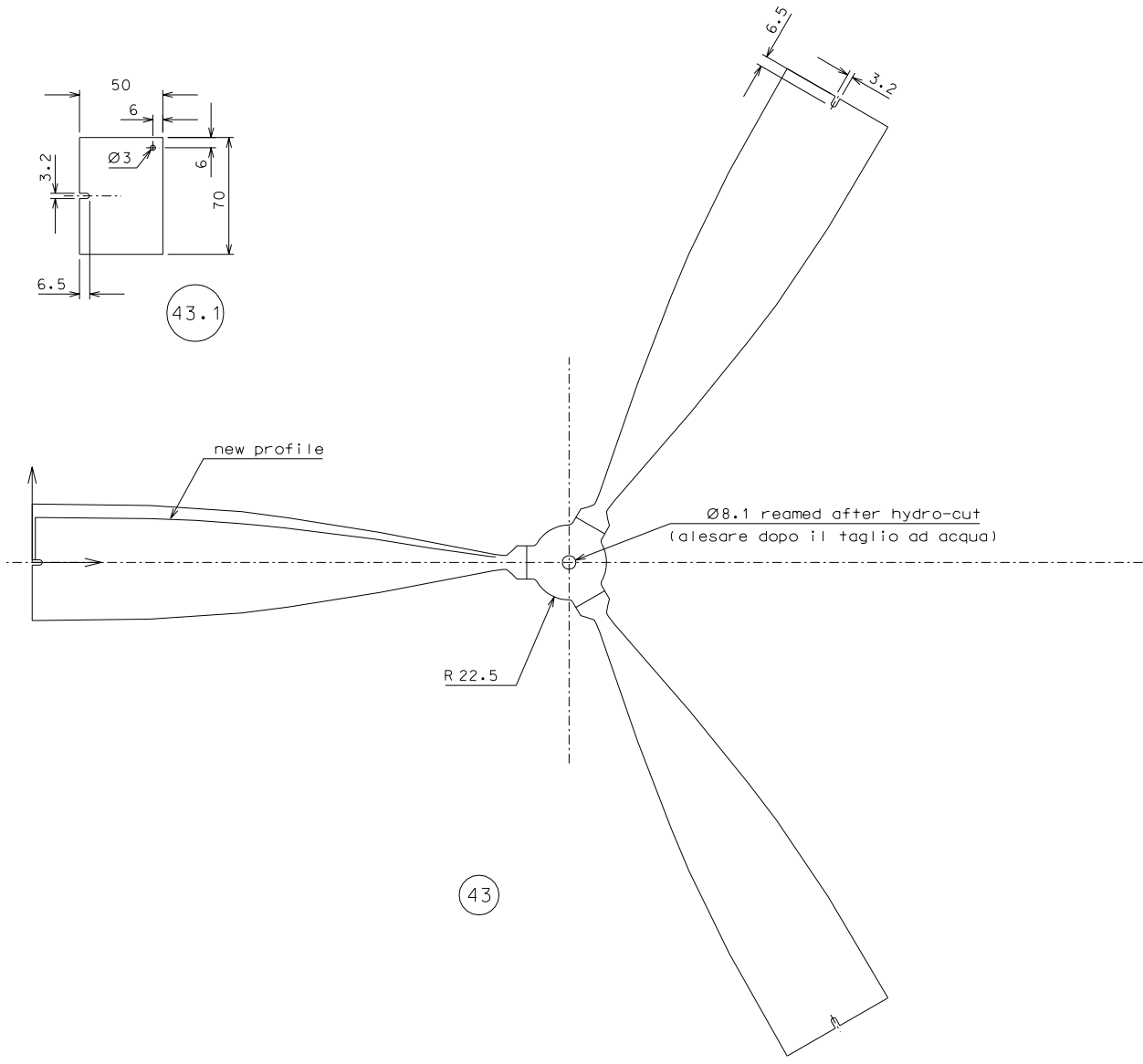
General machining tolerances UNI 5307-63							
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000
Linear Toli.	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 3
angular Toli.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.037
title		draw. PROMEC 3-7-00
TAMA-SAS-TOWER-3		details from 007-033
DETAILS FILTER_S		replaces dr. Num.

Size A2



43.1



X	Y	X	Y	X	Y	X	Y
0	34.96	0	34.96	0	24.45	2	26.895
69.189	34.12	69.572	34.72	69.572	23.86	71.075	26.246
123.03	30.29	123.71	30.29	123.71	21.18	124.826	23.298
149.97	26.81	150.799	26.81	150.799	18.75	151.722	20.625
203.81	18.10	204.937	18.10	204.937	12.66	205.473	13.926
271.09	4.88	272.589	4.88	272.589	3.41	272.642	3.751
276.40	4.18	277.90	4.18	277.90	2.92	277.915	3.212
278.45	4.18	279.95	4.18	279.95	2.92	279.95	3.212
281.83	7	283.33	7	283.33	7	283.33	7
284.83	10	286.33	10	286.33	10	286.33	10
289.5	10	291	10	291	10	291	10
316	0	317.5	0	317.5	0	317.5	0
center		center		center		center	

Surface treatment: Electropolishing and light nickel-plating

Thermal treatment: Baking at 435° for 100 hours in argon atmosphere

43.1	3	tool for blade	1:2				
43	1	blade	1:2				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63							
Dimensions	< 6	>6-30	>30-120	>120-315	>315-1000	>1000-2000	>2000-4000
linear toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
angular toll.	± 1'	± 30'	± 20'	± 10' referred to the shortest side			

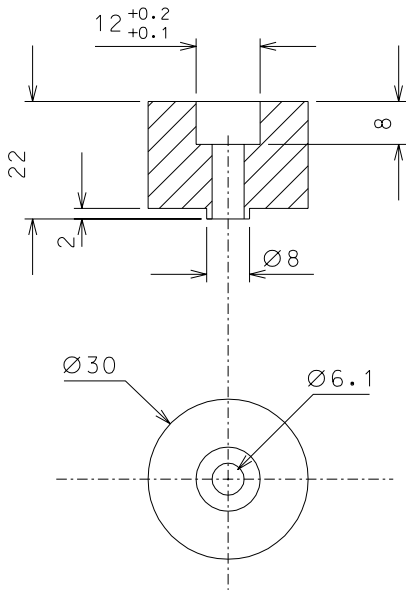
Size A2

	new profile	11-01-01		
B	new dimensions	26-10-00		
A	new hole	9-7-00		
ref.	note	date	signature	
modifications				

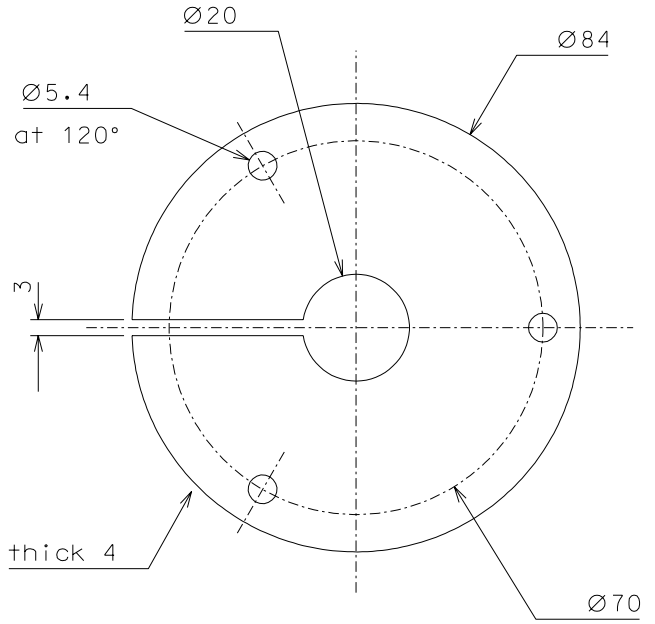
LIGO PROJECT

TAMA-SAS-TOWER-3
BLADE FILTER-S

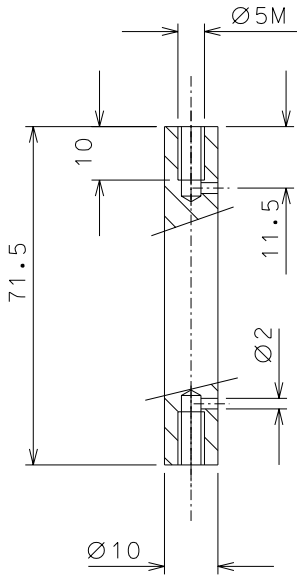
designed for R. De Salvo
N. Tama3.038
draw. PROMEC 3-7-00
details from 007
replaces dr. Numb.



47



44



45

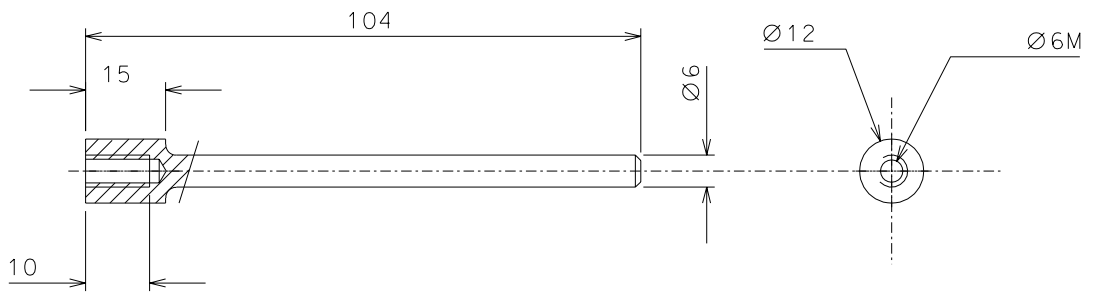
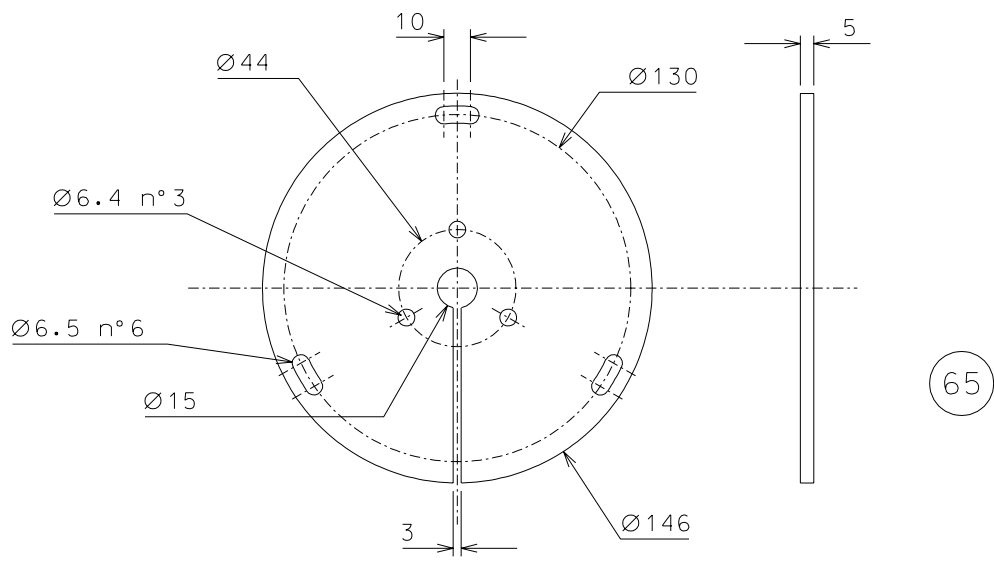
Size A3

ref.	note	date	signature
modifications			

47	1	AISI 304	1:1		
45	3	"	1:1		
44	1	"	1:1		
ref.	pieces	mat. and treatments	scale	ref.	pieces
				mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
linear Toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toll.	± 1	± 30'	± 20'	± 10'				referred to the shortest side

	LIGO PROJECT	designed for R. De Salvo
		N. Tama3.039
		draw. PROMEC 3-7-00
		details from 007
title TAMA-SAS-TOWER-3 DETAILS FILTER_S		replaces dr. Numb.



66

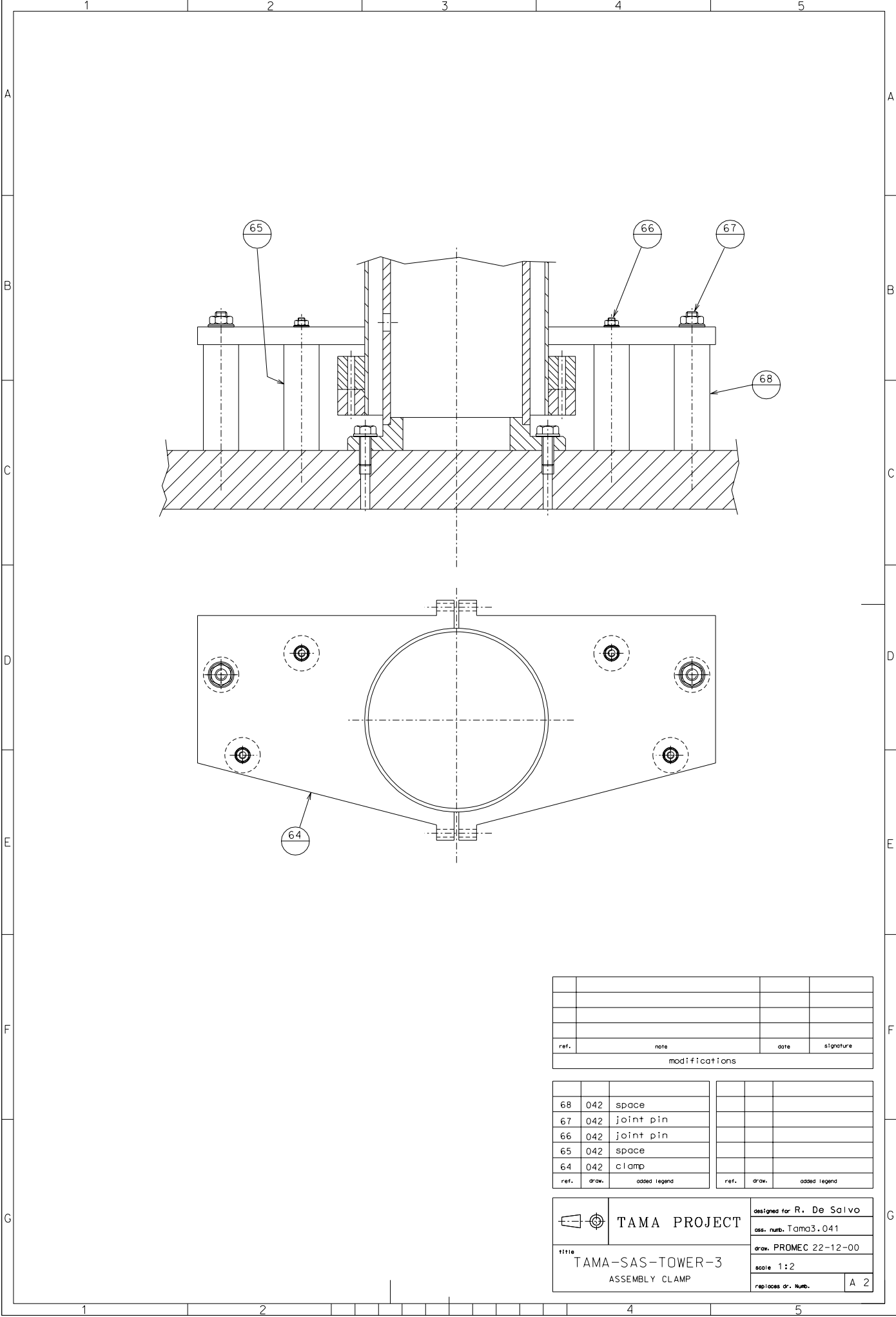
ref.	note	date	signature
modifications			

66	3	AISI 304	1:1		
65	1	"	1:2		
ref.	pieces	mat. and treatments	scale	ref.	pieces
				mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
linear Toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Toll.	± 1	± 30'	± 20'	± 10' referred to the shortest side				


Size A3

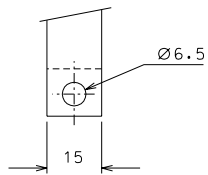
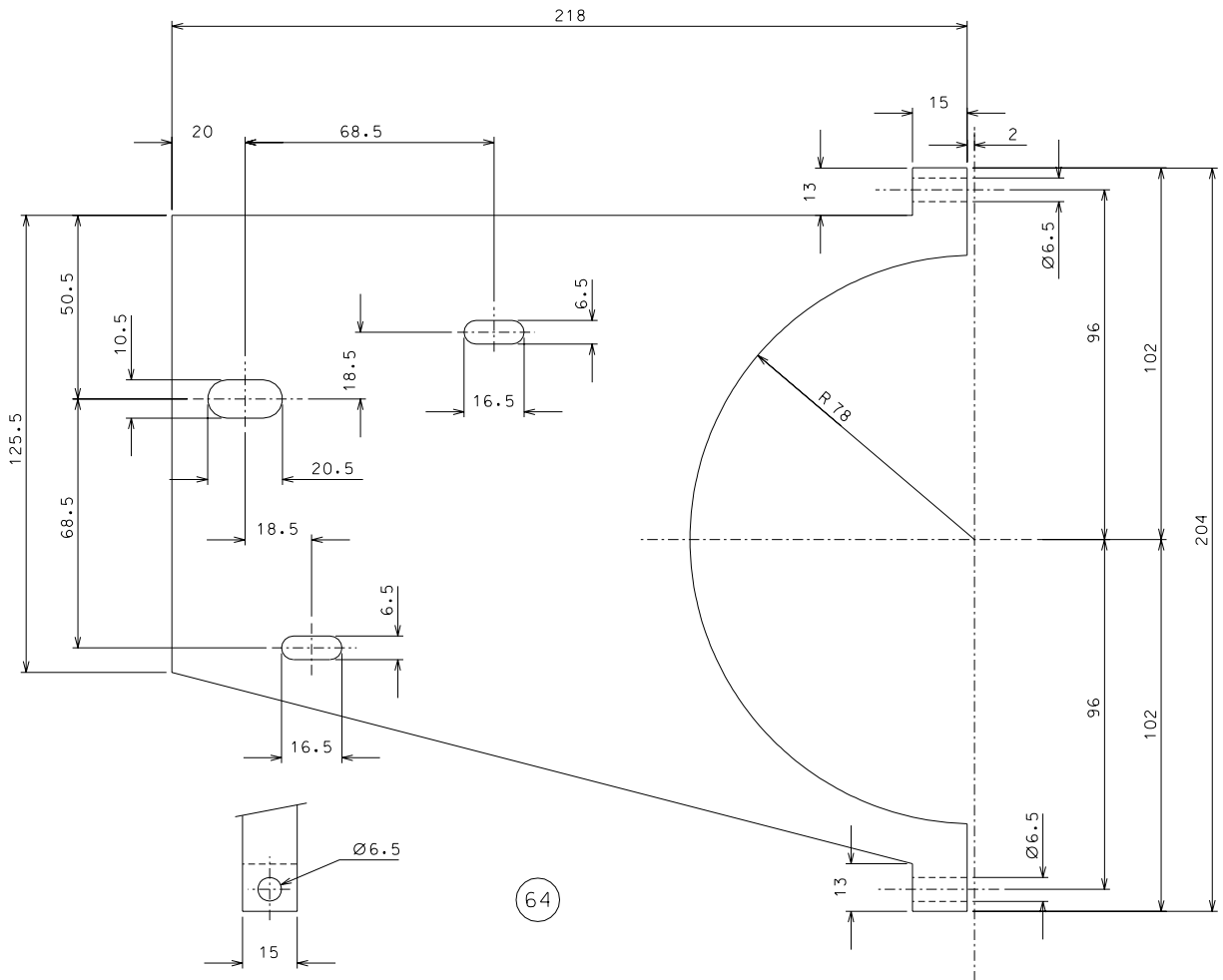
	LIGO PROJECT		designed for R. De Salvo
	title TAMA-SAS-TOWER-3 TOOL FOR FILTER_S		N. Tama3.040
			draw. PROMEC 3-7-00
			details from
			replaces dr. Numb.



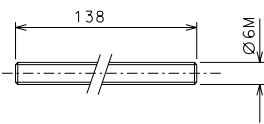
ref.	note	date	signature
modifications			

68	042	space			
67	042	joint pin			
66	042	joint pin			
65	042	space			
64	042	clamp			
ref.	draw.	added legend	ref.	draw.	added legend

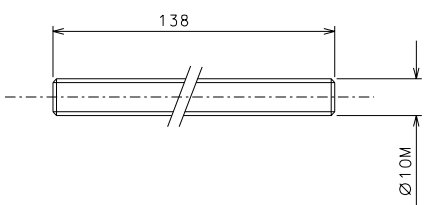
	TAMA PROJECT	designed for R. De Salvo
		ass. numb. Tama3.041
		draw. PROMEC 22-12-00
		scale 1:2
TAMA-SAS-TOWER-3 ASSEMBLY CLAMP		replaces dr. Numb. A 2



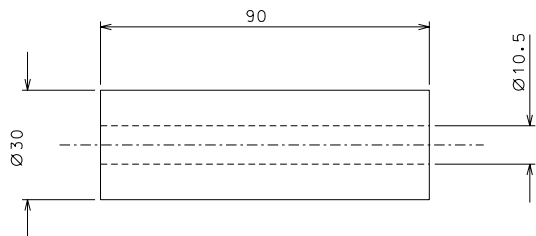
64



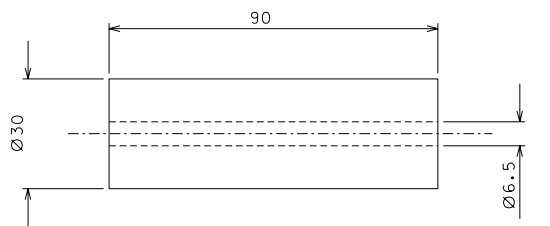
66



67



68

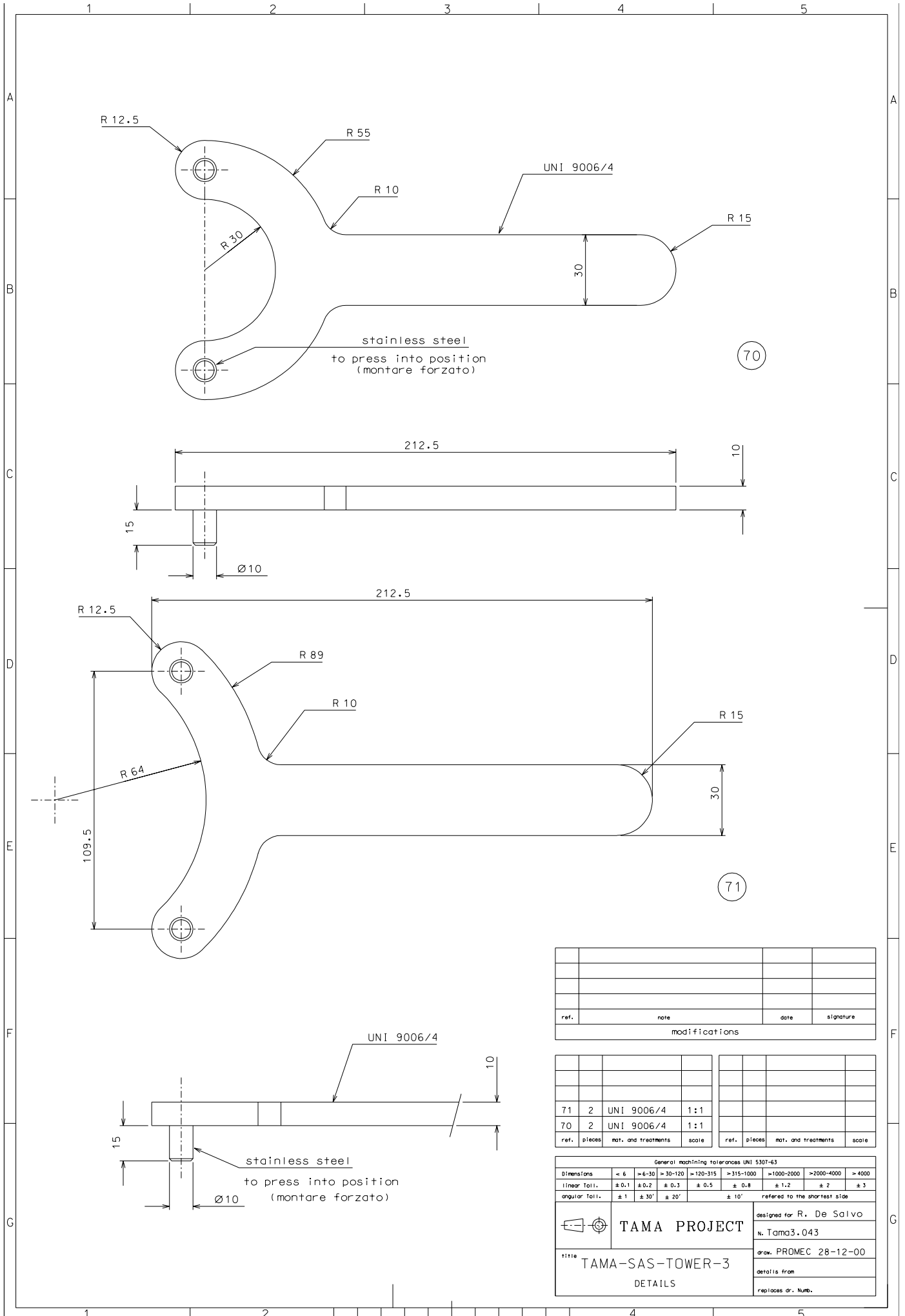


65

ref.	note	date	signature
modifications			

68	6	UNI 9006/4	1:1				
67	6	stainless steel	1:1				
66	12	stainless steel	1:1				
65	12	UNI 9006/4	1:1				
64	6	UNI 9006/4	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63							
Dimensions	< 6	>=6-30	>=30-120	>=120-315	>=315-1000	>=1000-2000	>=2000-4000
linear Toli.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
angular Toli.	± 1'	± 30'	± 20'	± 10'			
referred to the shortest side							
TAMA PROJECT				designed for R. De Salvo N. Tama3.042			
title TAMA-SAS-TOWER-3				draw. PROMEC 22-12-00			
CLAMPS				details from replaces dr. Numb. A 2			



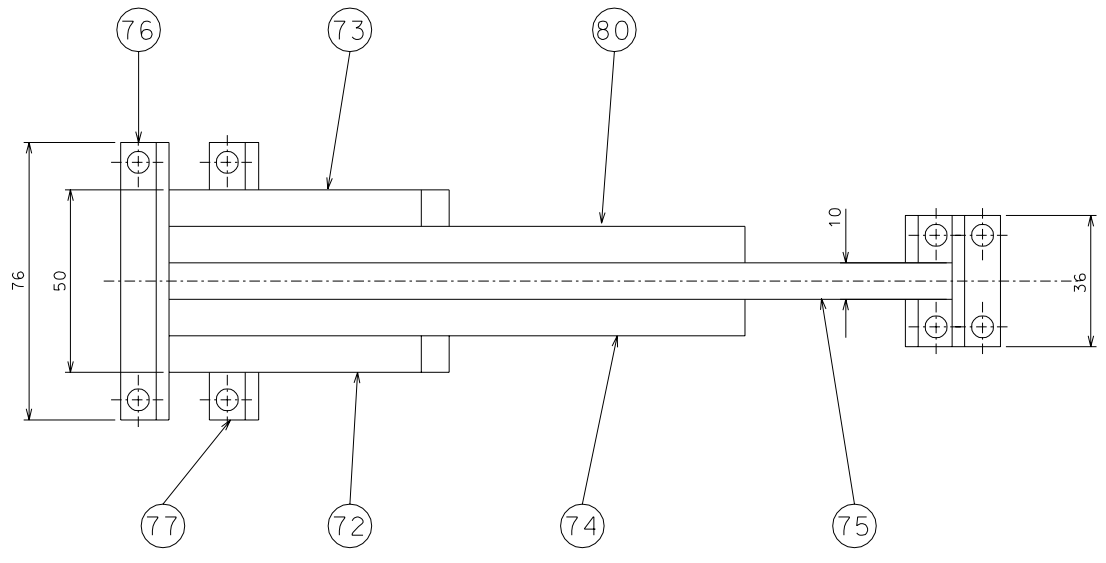
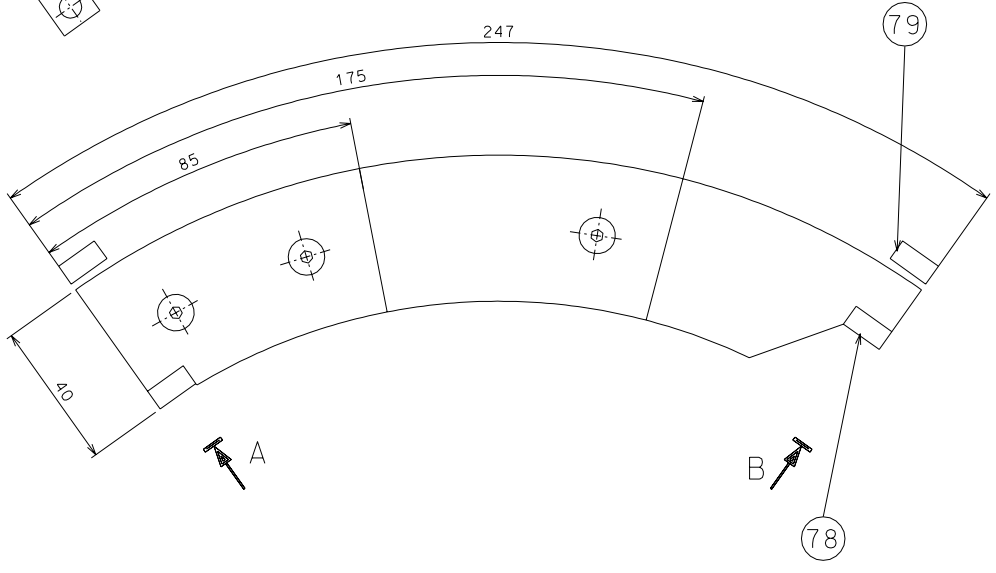
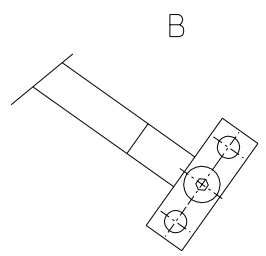
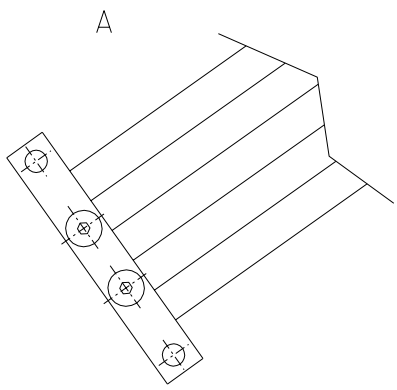
70

71

ref.	note	date	signature
modifications			

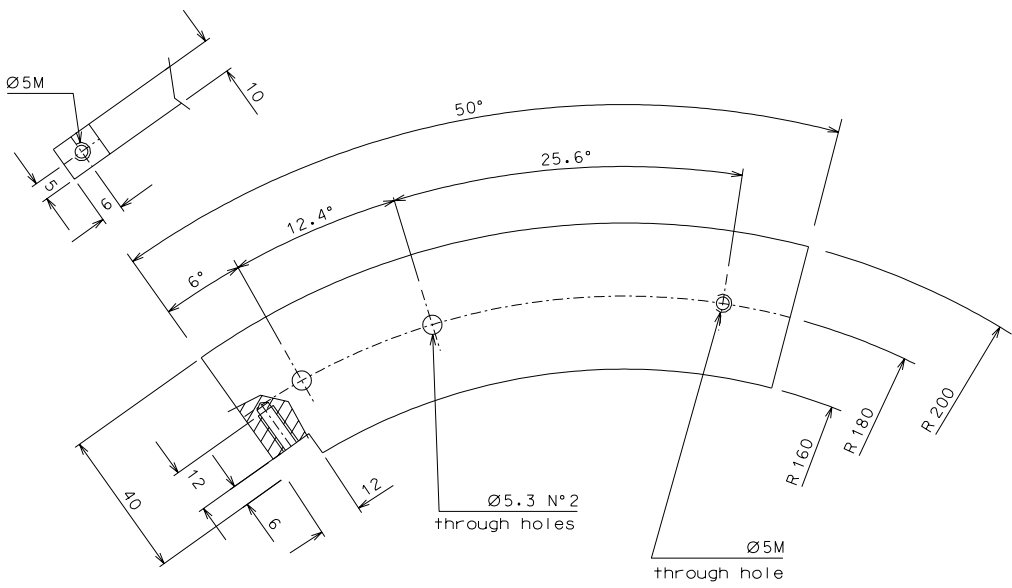
71	2	UNI 9006/4	1:1		
70	2	UNI 9006/4	1:1		
ref.	pieces	mat. and treatments	scale		

General machining tolerances UNI 5307-63								
Dimensions	< 6	6-30	30-120	120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
linear Tol.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular Tol.	± 1' ± 30"			± 20"	± 10' referred to the shortest side			
			TAMA PROJECT			designed for R. De Salvo N. Tama3.043		
title TAMA-SAS-TOWER-3 DETAILS			draw. PROMEC 28-12-00 details from			replaces dr. Numb.		

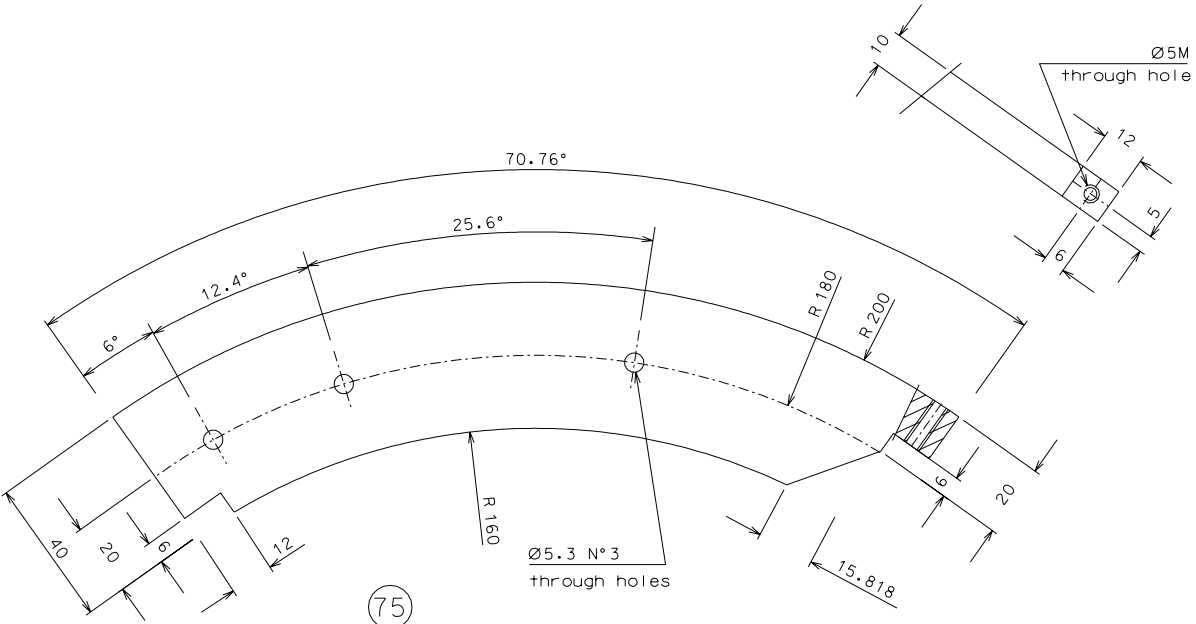


77	046				
76	046				
75	045				
74	046			80	045
73	046			79	045
72	046			78	045
ref.	draw.	added legend		ref.	draw.
					added legend

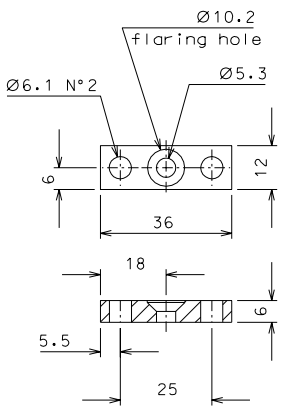
	LIGO PROJECT		designed for R. De Salvo
			ass. numb. Tama3.044
			draw. PROMEC 3-04-01
			scale 1:1
title TAMA-SAS-TOWER-3			replaces dr. numb.



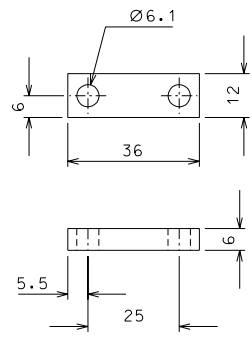
80



75



79



78

Size A2

ref.	note	date	signature
modifications			

79	1	bronze	1:1				
78	1	bronze	1:1				
75	1	UNI 9006/4	1:1				
80	1	UNI 9006/4	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63

Dimensions	< 6	> 6-30	> 30-120	> 120-315	> 315-1000	> 1000-2000	> 2000-4000	> 4000
linear toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular toll.	± 1' ± 30'			± 20'		± 10'		

referred to the shortest side

LIGO PROJECT

title
TAMA-SAS-TOWER-3
DETAILS FILTER_S

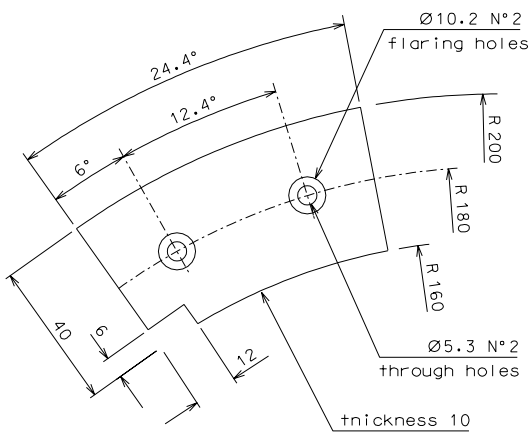
designed for R. De Salvo

n. Tama3.045

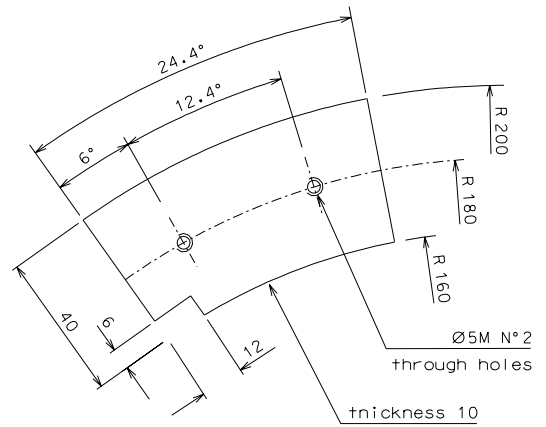
draw. PROMEC 3-04-01

details from 044

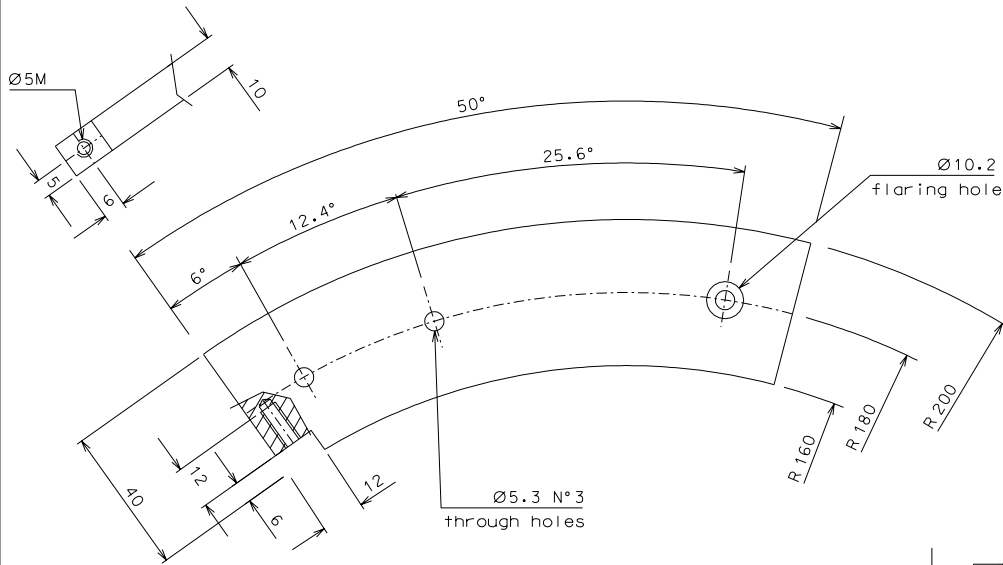
replaces dr. Numb.



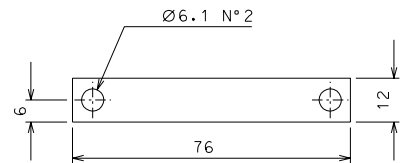
72



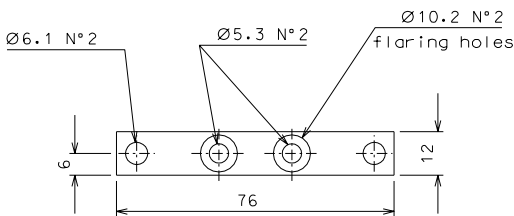
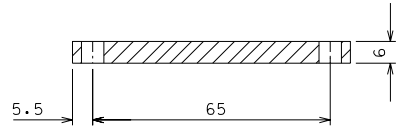
73



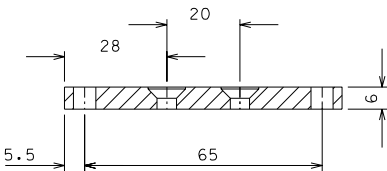
74



76



77



ref.	note	date	signature
modifications			

77	1	bronze	1:1				
76	1	bronze	1:1				
74	1	UNI 9006/4	1:1				
73	1	UNI 9006/4	1:1				
72	1	UNI 9006/4	1:1				
ref.	pieces	mat. and treatments	scale	ref.	pieces	mat. and treatments	scale

General machining tolerances UNI 5307-63								
Dimensions	< 6	>=6-30	>=30-120	>=120-315	>=315-1000	>=1000-2000	>=2000-4000	>=4000
linear toll.	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3
angular toll.	± 1' ± 30'			± 20'		± 10'		

designed for R. De Salvo
 N. Tama3.046
 draw. PROMEC 3-04-01
 details from 044
 replaces dr. Num.

LIGO PROJECT

TAMA-SAS-TOWER-3
 DETAILS FILTER_S

Size A2