Electronic SYSTEMS spa
ELECTRONIC MEASURING SYSTEMS

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β GAUGE DEVICE

APPLICATION FOR REGISTRATION OF RADIATION DEVICE MODEL ISOSINT FOR RADIOACTIVE SOURCES Kr. 85 AND Sr. 90

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON DC. 20555 – 0001
UNITED STATES OF AMERICA

Momo (NO) ITALY – 12th. March 2003

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3.1 SUMMARY DATA

The device, subject of this application, is a measuring system suitable to measure the weight/thickness of plastic films, paper and rubber sheets.

One of the following sources can be used:

- n. 1 source Krypton 85
- activity 400 mCi - (14,8 GBq) Max.
- model KAC.10884
- Manufacturer for the source : AEA Technology QSA GmbH Germany

or

- n. 1 source Strontium 90
- activity 50 mCi - (1,850 GBq) Max.
- model SIF.1176
- Manufacturer for the source : AEA Technology QSA GmbH Germany

Manufacturer of the measuring system is :

ELECTRONIC SYSTEMS SPA
S.S. 229, Km. 12,200
28015 - MOMO - (No)
ITALY
Tel. ++39-0321-928220 / 30
Fax ++39-0321-926855

e-mail: sales@electronicsystems.it

Contacts: Mrs. Antonella Giuberchio Radiation Safety Officer
Mr. Paolo Calciati Radiation Safety Department

Identification code for the drawings: US -1000

3.1.0 Enclosures [figs.]

U.S.1001	plan of the measuring device
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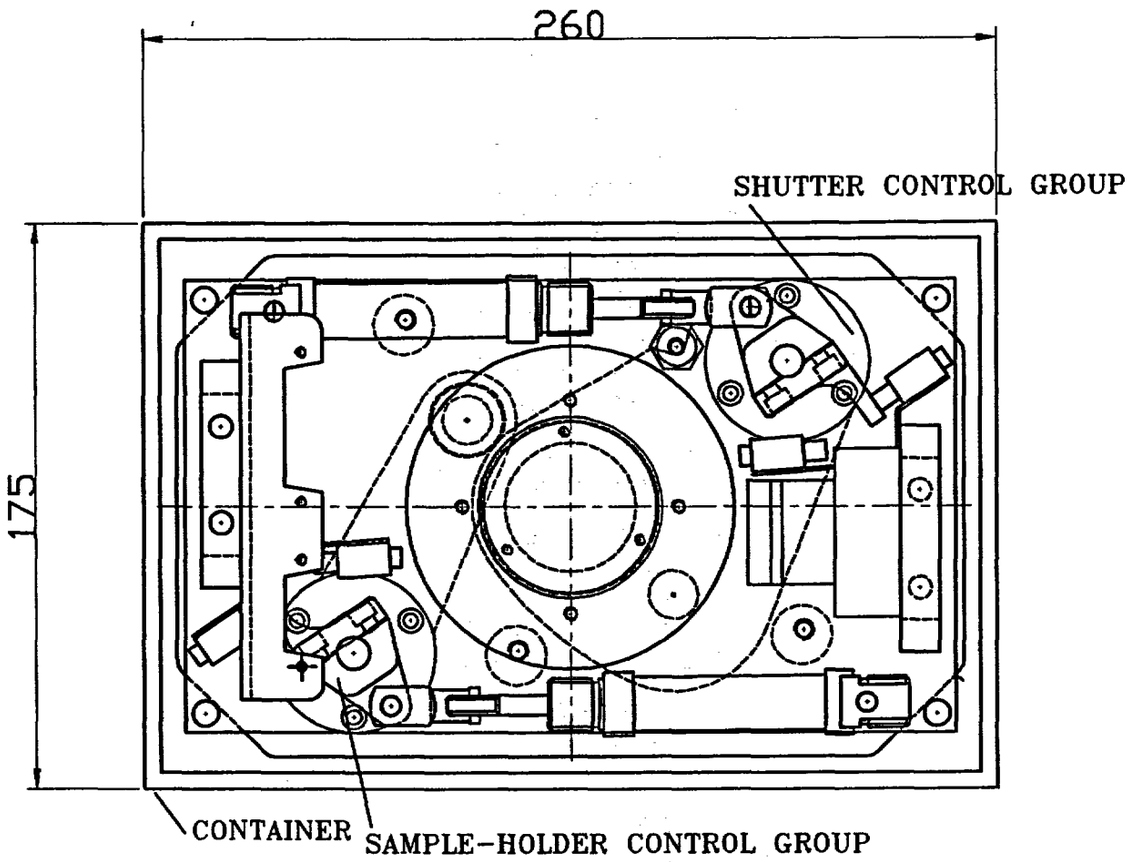
U.S.1021	detail of head support shoulder
U.S.1022	detail of limit switch support
U.S.1023	detail of shielding sheet
U.S.1024	detail of base plate
U.S.1025	detail of connector support
U.S.1026	detail of external base
U.S.1027	detail of lock pin
U.S.1028	detail of insulator
U.S.1029	detail of device lower closing plate
U.S.1030	detail of mylar lock ring
U.S.1031	detail of shutter insert
U.S.1032	detail of source-holder closing plate
U.S.1033	detail of source-holder base
U.S.1034	detail of source-holder cover
U.S.1035	detail of eccentric
U.S.1036	radioactive source id label

[enclosure A]	isodose curves of the device with shutter open/closed
[enclosure B]	list of commercial and mechanical components
[enclosure C]	diagram of control and electric system of indicator lights
[enclosure D]	radiation resistance of NBR butadiene-acrilonitrile
[enclosure E]	AEA Technology catalogue copies



SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	.	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT PLAN VIEW	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1001

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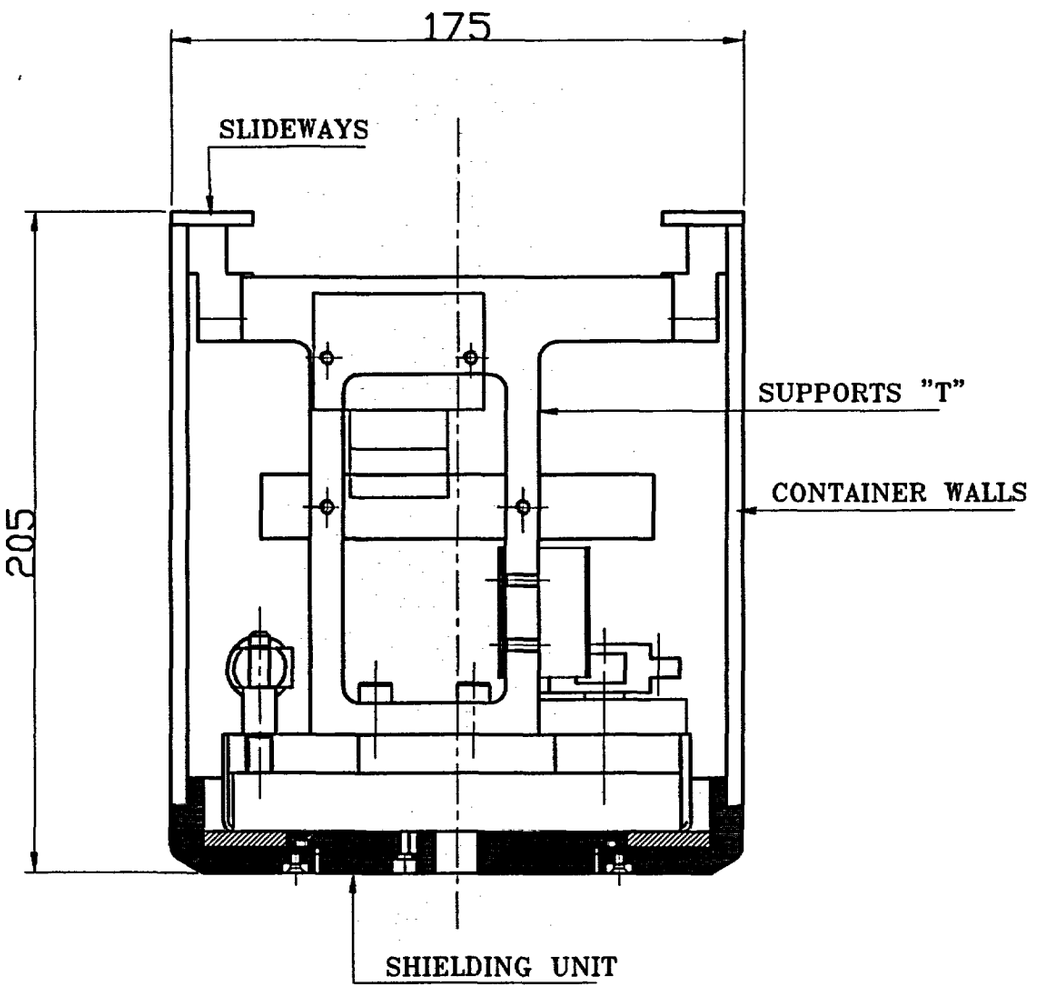

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THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	.		
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT TRANSVERSAL SECTION	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
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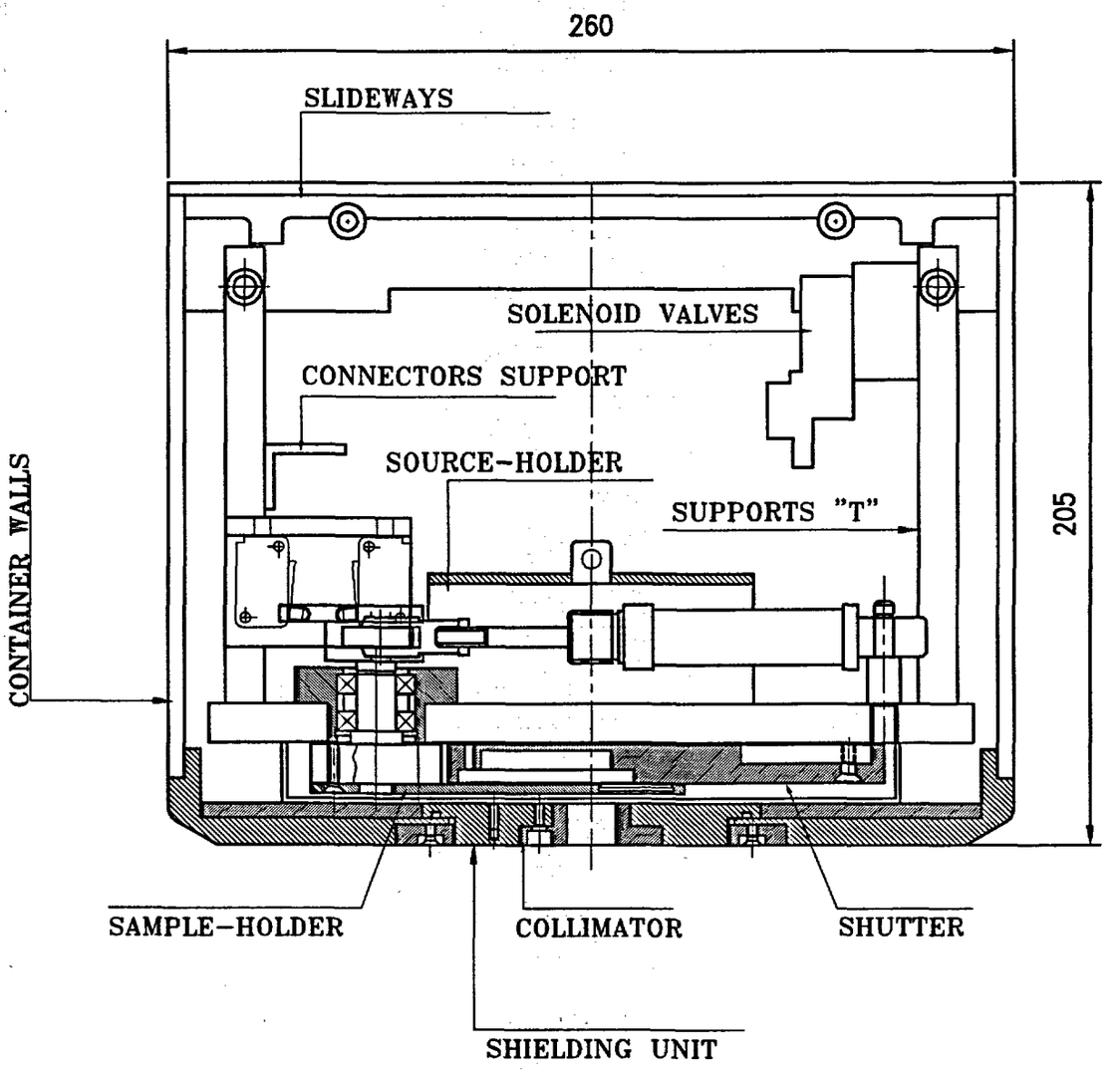

SURF.TREAT. .						
THERM.TREAT. .				MACHINE SCANNER - SINTEL9000		
MATERIALS .						
DES. TM	DESCRIPTION					
CHECKED TM	ISOSINT LONGITUDINAL SECTION					
APPROVED TF						
HD ARCHIVE						
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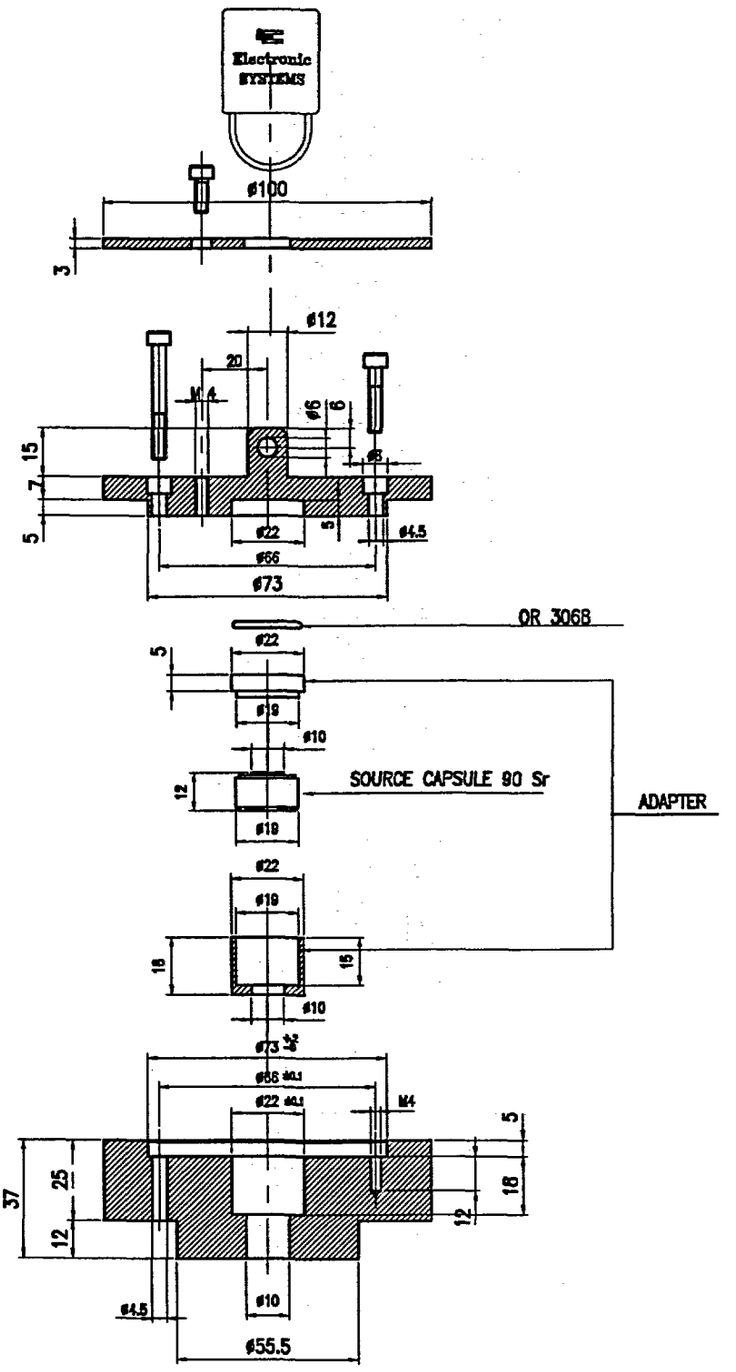

SURF.TREAT.	.		
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIAL	.		
DES.	TM	DESCRIPTION	ISOSINT EXPLODED VIEW FOR 90 Sr.
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

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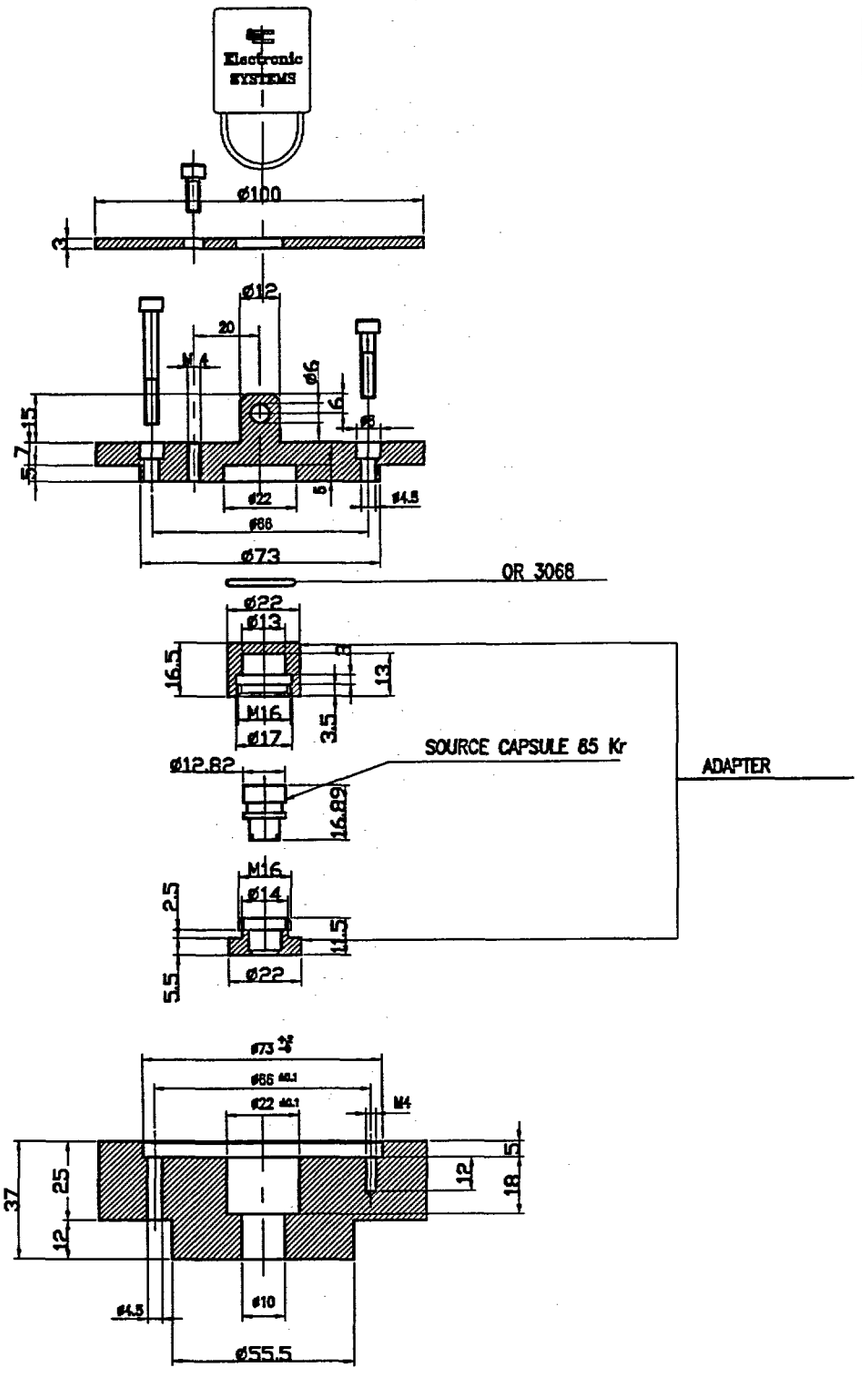

REV.	DATA	DESCRIZIONE DELLE MODIFICHE	DISEGNATORE
C	.	.	.
B	.	.	.
A	.	.	.

SURF.TREAT.	.
THERM.TREAT.	.
MATERIAL	.
MACCHINE	SCANNER SINTEL 9000
DES. TM	DESCRIPTION
CHECKED TM	ISOSINT EXSPLODED VIEW FOR Kr 85
APPROVED TF	
HD ARCHIVE	

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG. NO / DISEGNO: 1004/A

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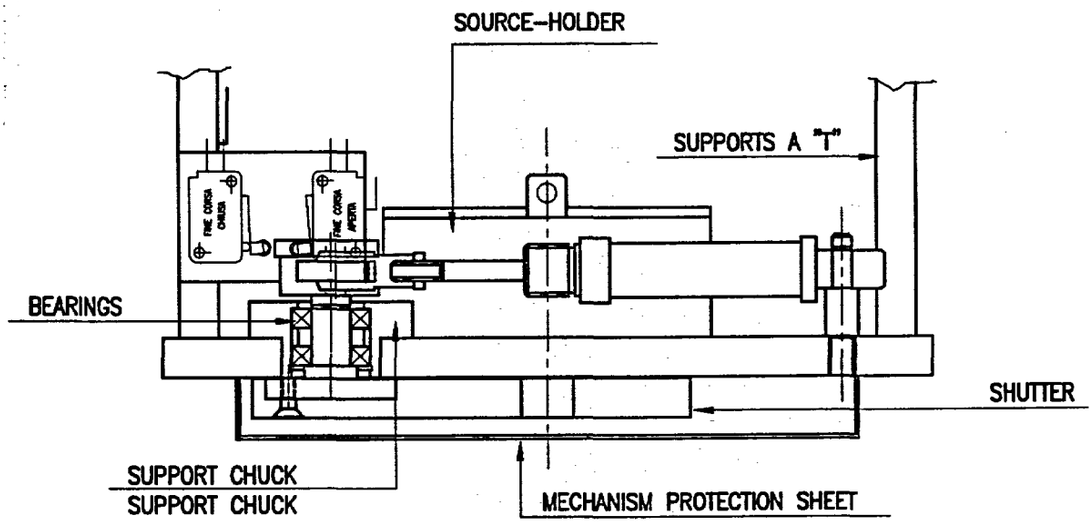

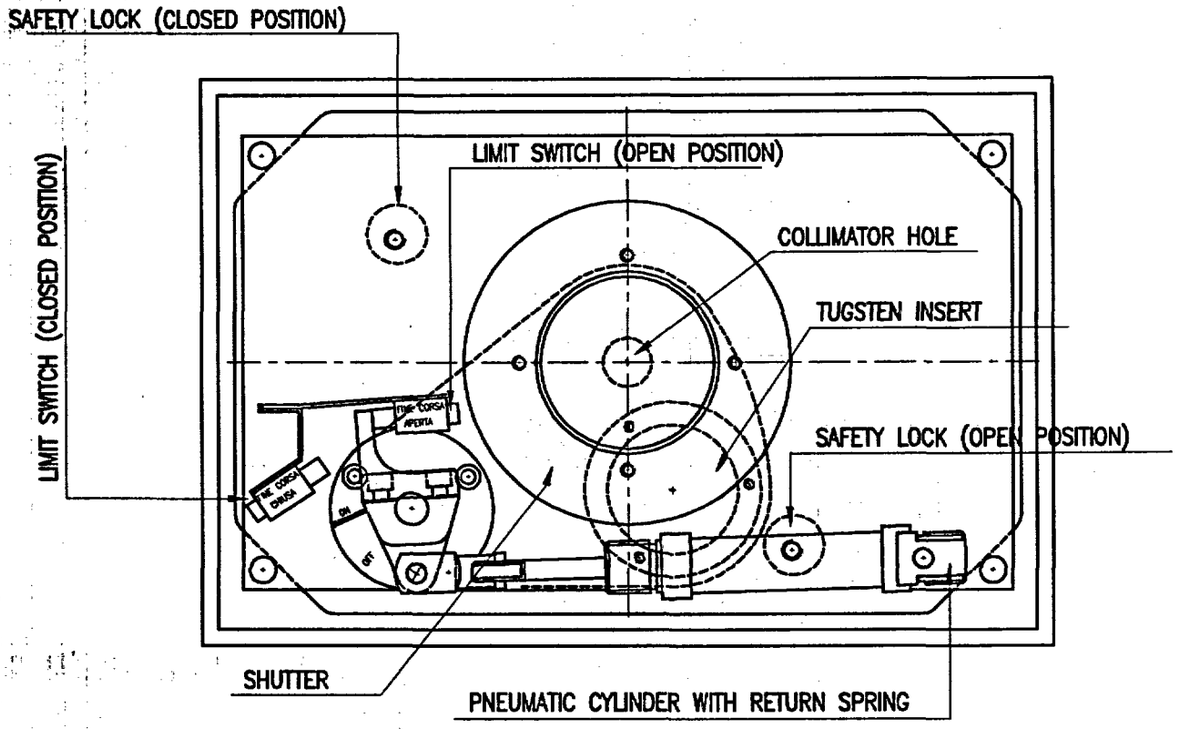

SURF.TREAT.	.		.
THERM.TREAT.	.	MACHINE	SCANNER - SINTEL9000
MATERIALS	.		
DES.	TM	DESCRIPTION	PLAN OF SHUTTER CONTROL GROUP IN OPEN POSITION
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1005

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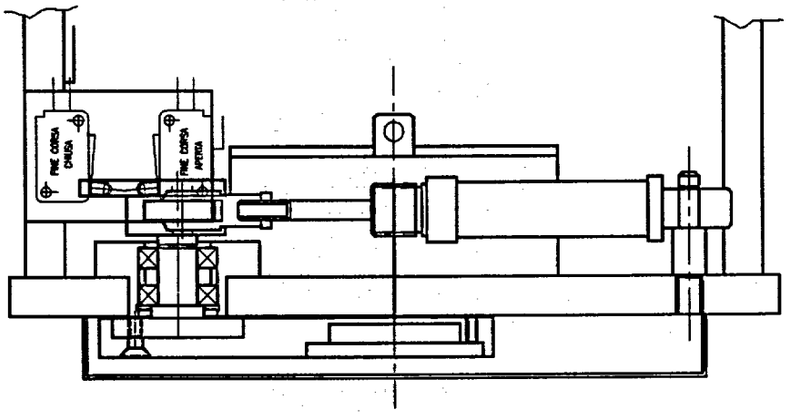

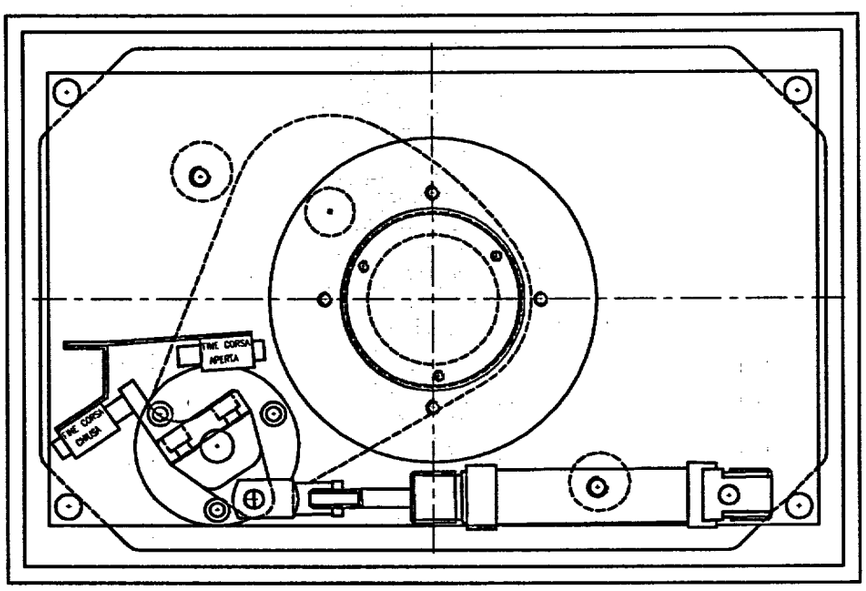

SURF.TREAT.	.		
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	.		
DES.	TM	DESCRIPTION	PLAN OF SHUTTER CONTROL GROUP IN CLOSED POSITION
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1006

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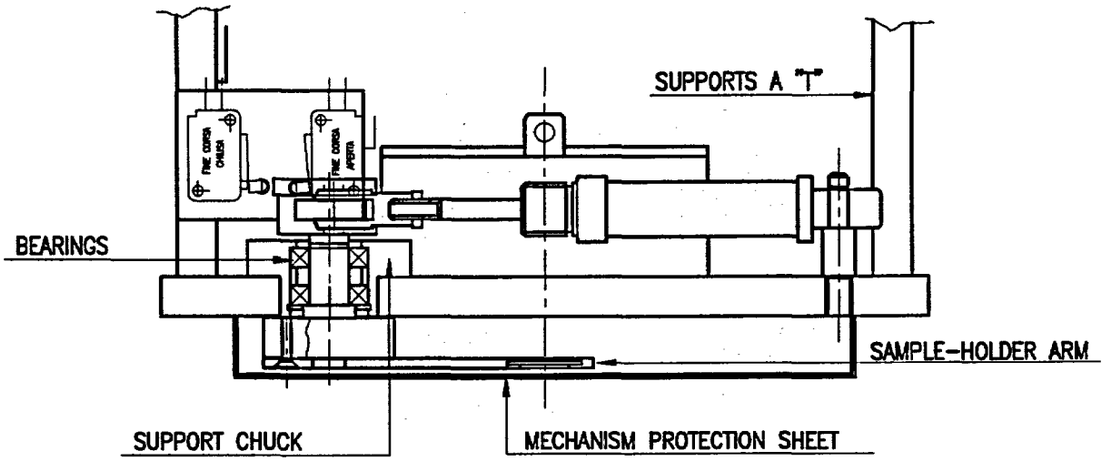

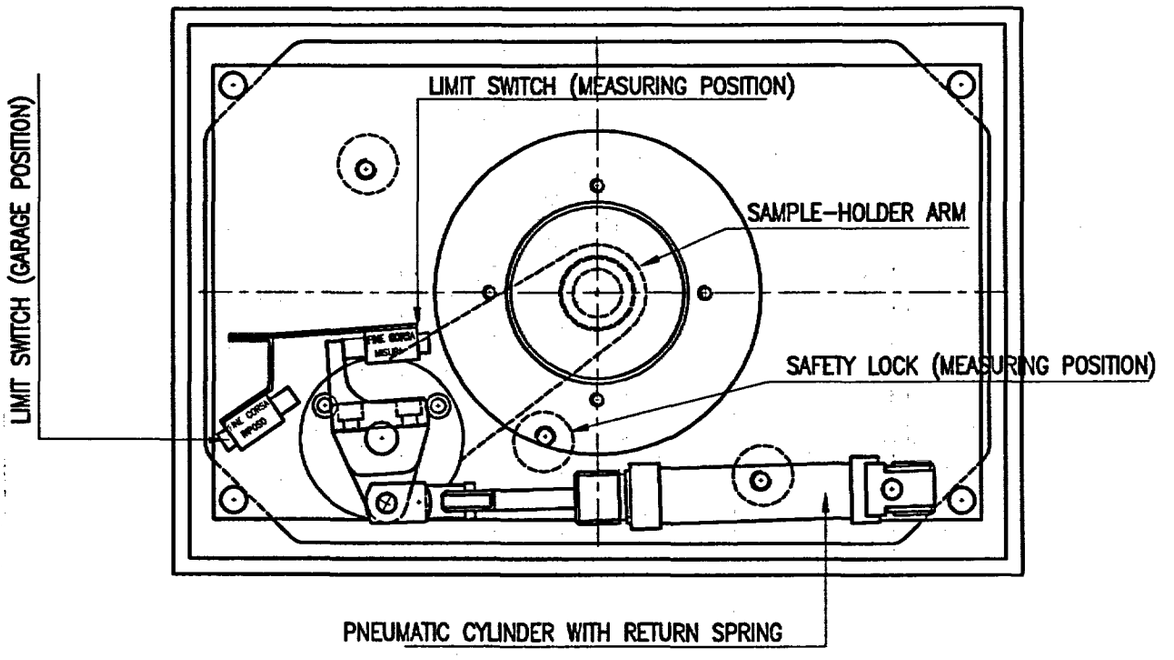

SURF.TREAT. .		.	
THERM.TREAT. .		MACHINE	SCANNER – SINTEL9000
MATERIALS .			
DES. TM	DESCRIPTION		
CHECKED TM	PLAN OF SAMPLE-HOLDER CONTROL GROUP IN GARAGE POSITION		
APPROVED TF			
HD ARCHIVE			

Electronic SYSTEMS S.p.a.					SCALE 1:2	DATE 08.10.02	F.TO A4
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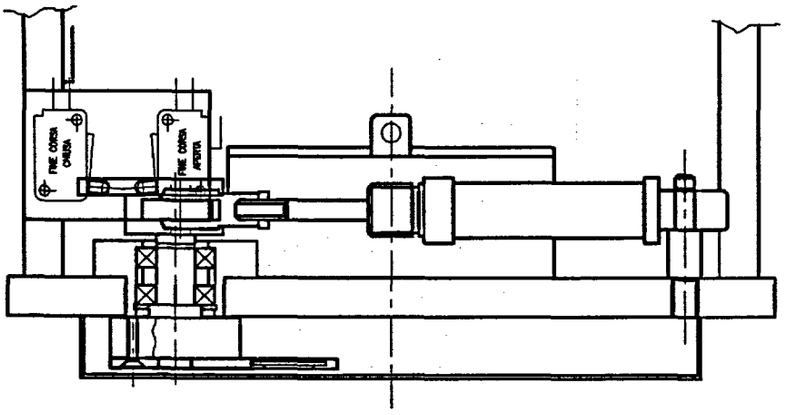

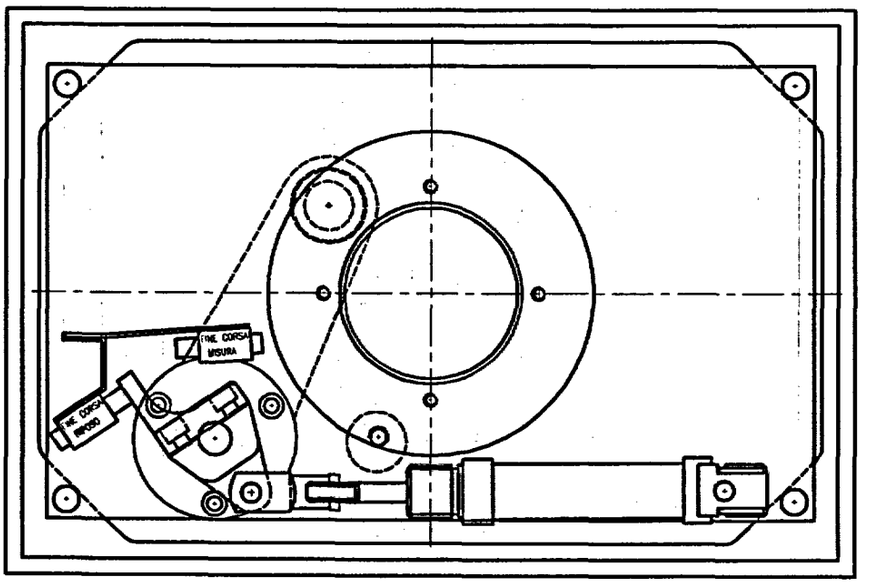

SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	.	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	PLAN OF SAMPLE-HOLDER CONTROL GROUP IN WORK POSITION
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO **U.S. 1008**

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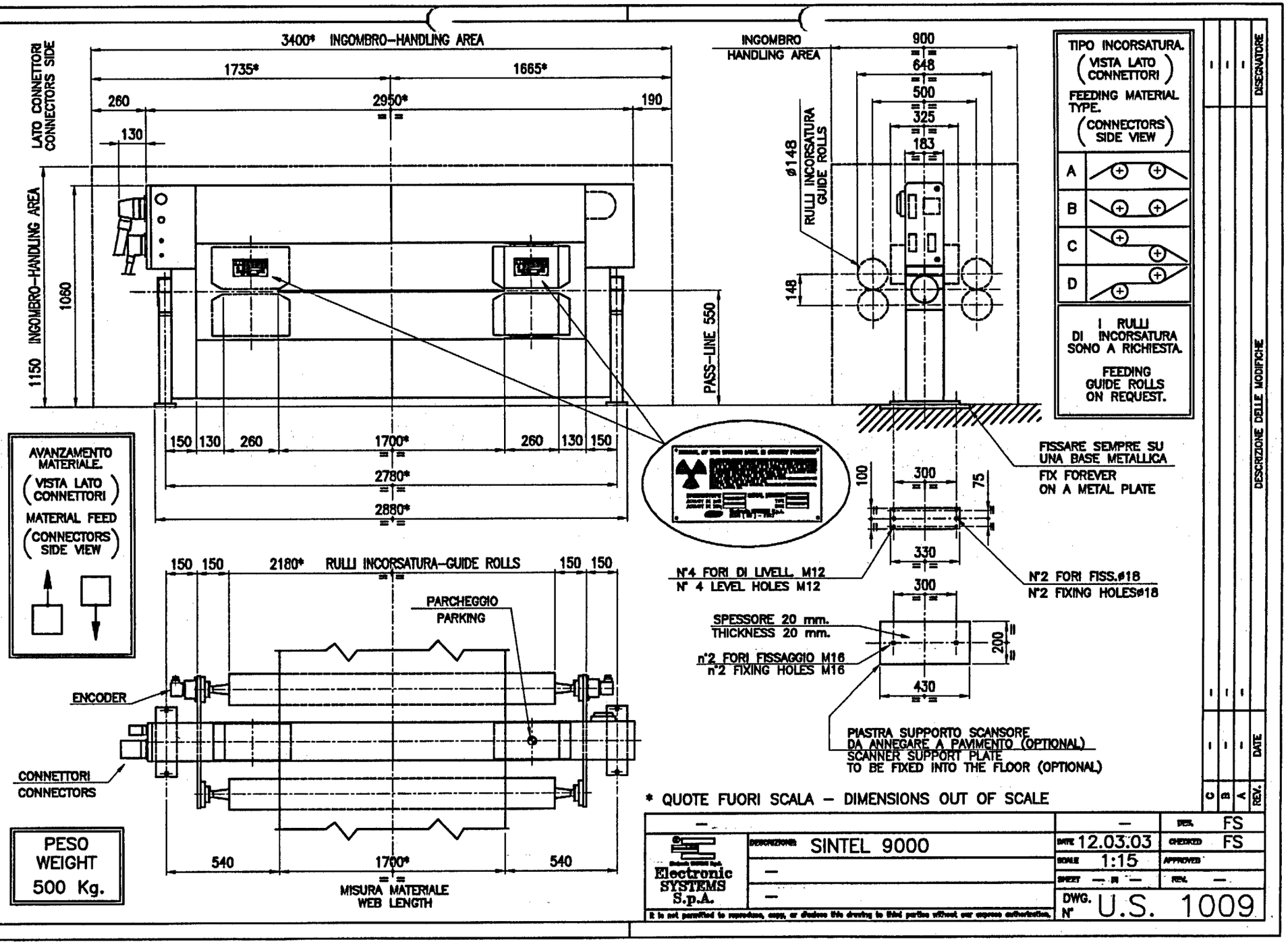
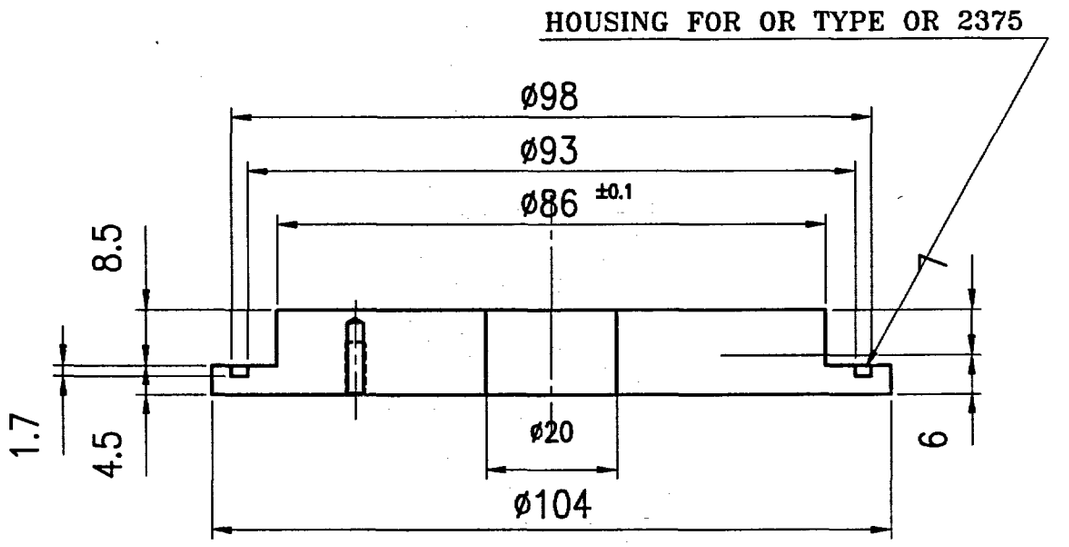
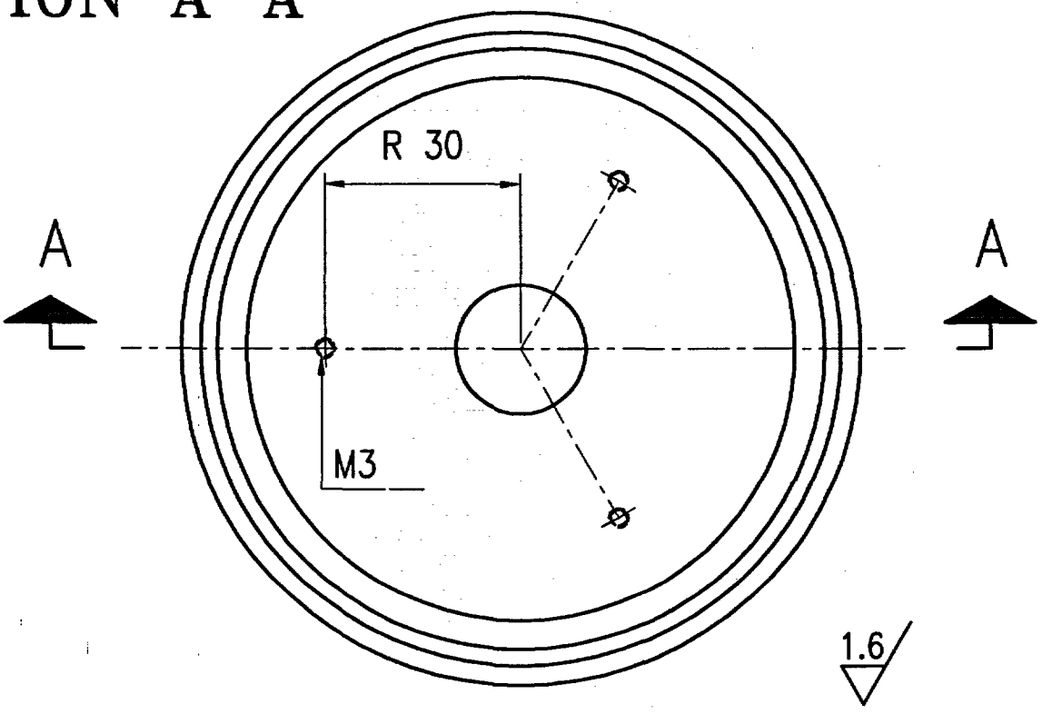

3400* INGOMBRO-HANDLING AREA
1735*
1665*
260
2950*
190
130
LATO CONNETTORI
CONNECTORS SIDE
1150 INGOMBRO-HANDLING AREA
1060
PASS-LINE 550
150 130 260 1700* 260 130 150
2780*
2880*
INGOMBRO
HANDLING AREA
900
648
500
325
183
ø148
RULLI INCORSATURA
GUIDE ROLLS
148
TIPO INCORSATURA.
(VISTA LATO CONNETTORI)
FEEDING MATERIAL TYPE.
(CONNECTORS SIDE VIEW)
A
B
C
D
I RULLI DI INCORSATURA SONO A RICHIESTA.
FEEDING GUIDE ROLLS ON REQUEST.
AVANZAMENTO MATERIALE.
(VISTA LATO CONNETTORI)
MATERIAL FEED
(CONNECTORS SIDE VIEW)
150 150 2180* RULLI INCORSATURA-GUIDE ROLLS 150 150
PARCHEGGIO
PARKING
ENCODER
CONNETTORI
CONNECTORS
540 1700* 540
MISURA MATERIALE
WEB LENGTH
PESO
WEIGHT
500 Kg.
FISSARE SEMPRE SU UNA BASE METALLICA
FIX FOREVER ON A METAL PLATE
100
300
75
330
N°4 FORI DI LIVELL. M12
N° 4 LEVEL HOLES M12
N°2 FORI FISS.ø18
N°2 FIXING HOLES ø18
300
SPESSORE 20 mm.
THICKNESS 20 mm.
200
n°2 FORI FISSAGGIO M16
n°2 FIXING HOLES M16
430
PIASTRA SUPPORTO SCANSORE
DA ANNEGARE A PAVIMENTO (OPTIONAL)
SCANNER SUPPORT PLATE
TO BE FIXED INTO THE FLOOR (OPTIONAL)
* QUOTE FUORI SCALA – DIMENSIONS OUT OF SCALE
DESIGNATORE
DESCRIZIONE DELLE MODIFICHE
DATE
REV.
C
B
A
Electronic SYSTEMS S.p.A.
DESCRIZIONE SINTEL 9000
DES. FS
DATE 12.03.03
CHECKED FS
SCALE 1:15
APPROVED
SHEET
REV.
DWG. N° U.S. 1009
It is not permitted to reproduce, copy, or disclose this drawing to third parties without our express authorization.



SECTION A–A

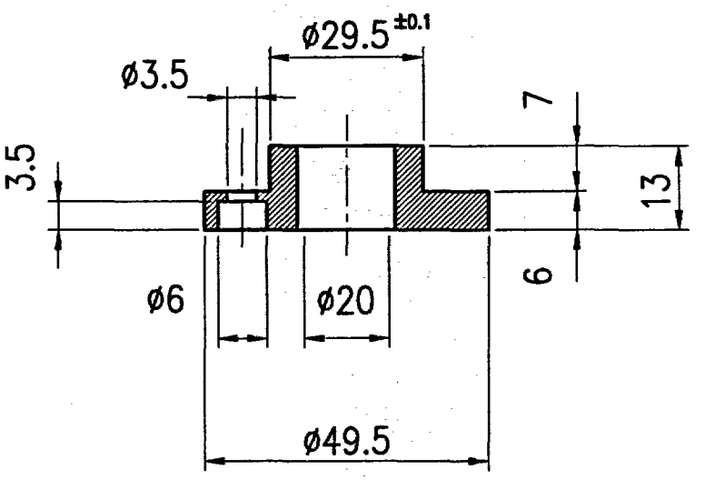


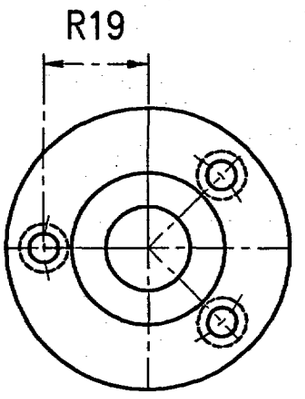
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	AVPR80 UNI 40SMnPb10-SAE1137	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	ISOSINT OUTPUT COLLIMATOR
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1010** REV. -





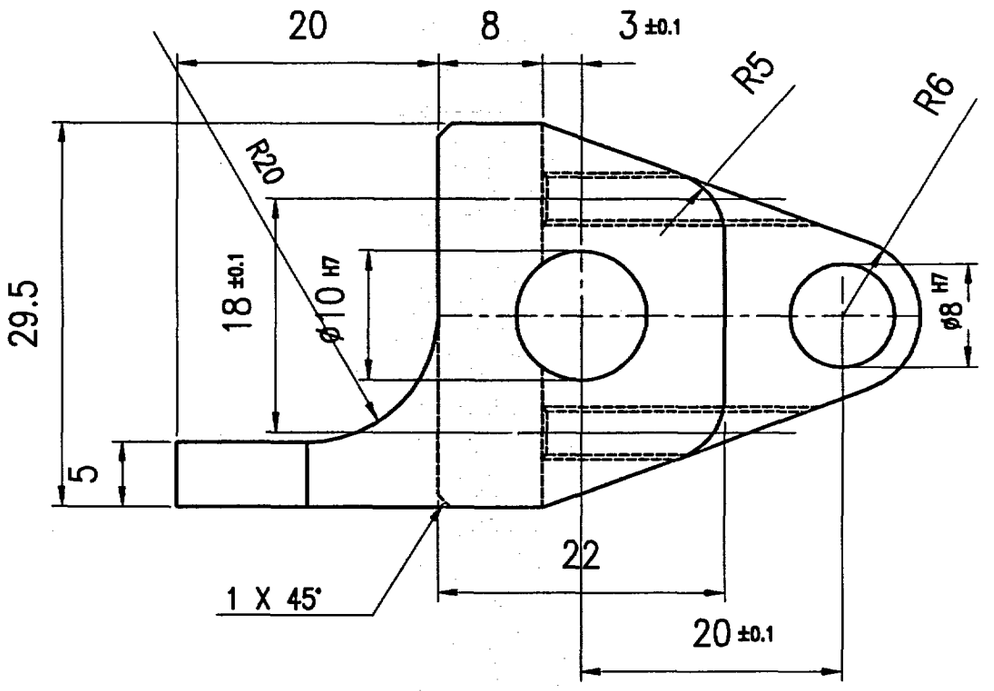
1.6

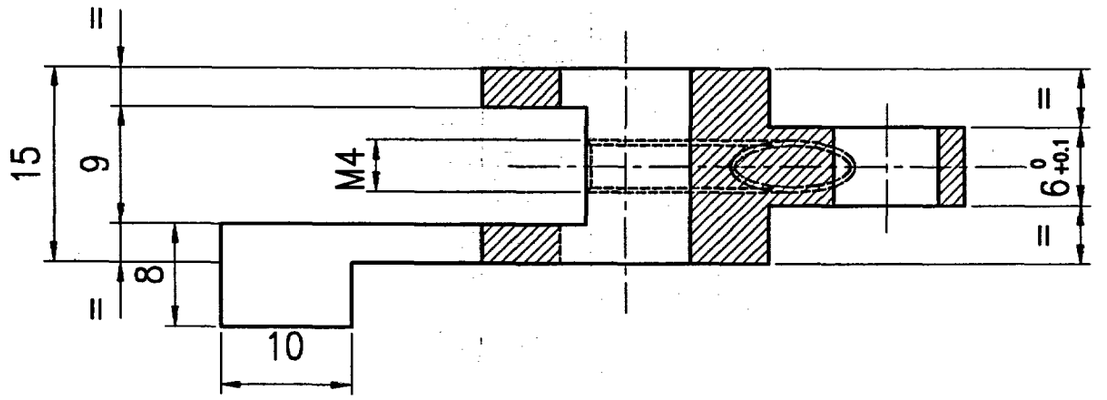
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. ALLUMINIUM ANTICORODAL	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	**ISOSINT – OUTPUT COLLIMATOR**	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1011** REV. -





1.6

SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. C40	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	**ISOSINT CONTROL LEVER**	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
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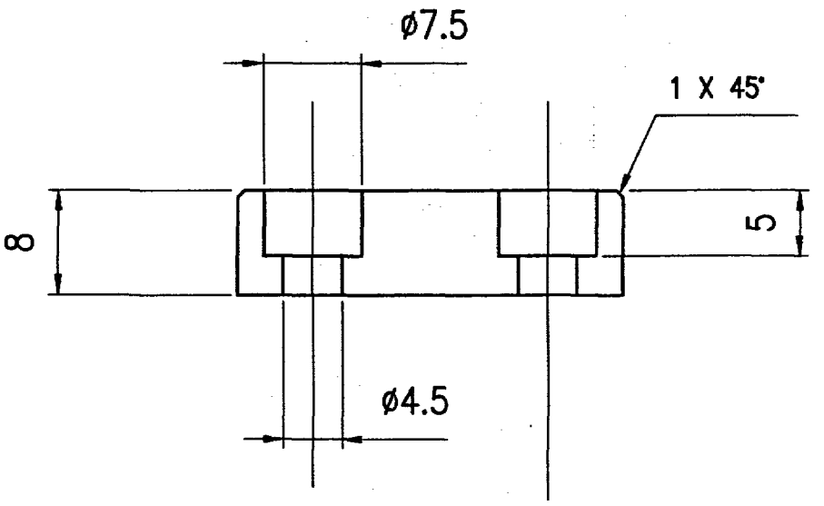
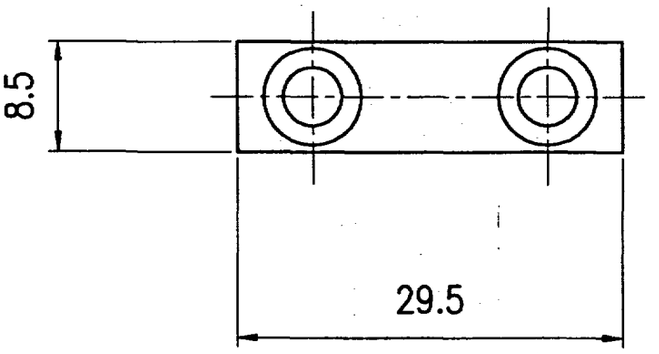
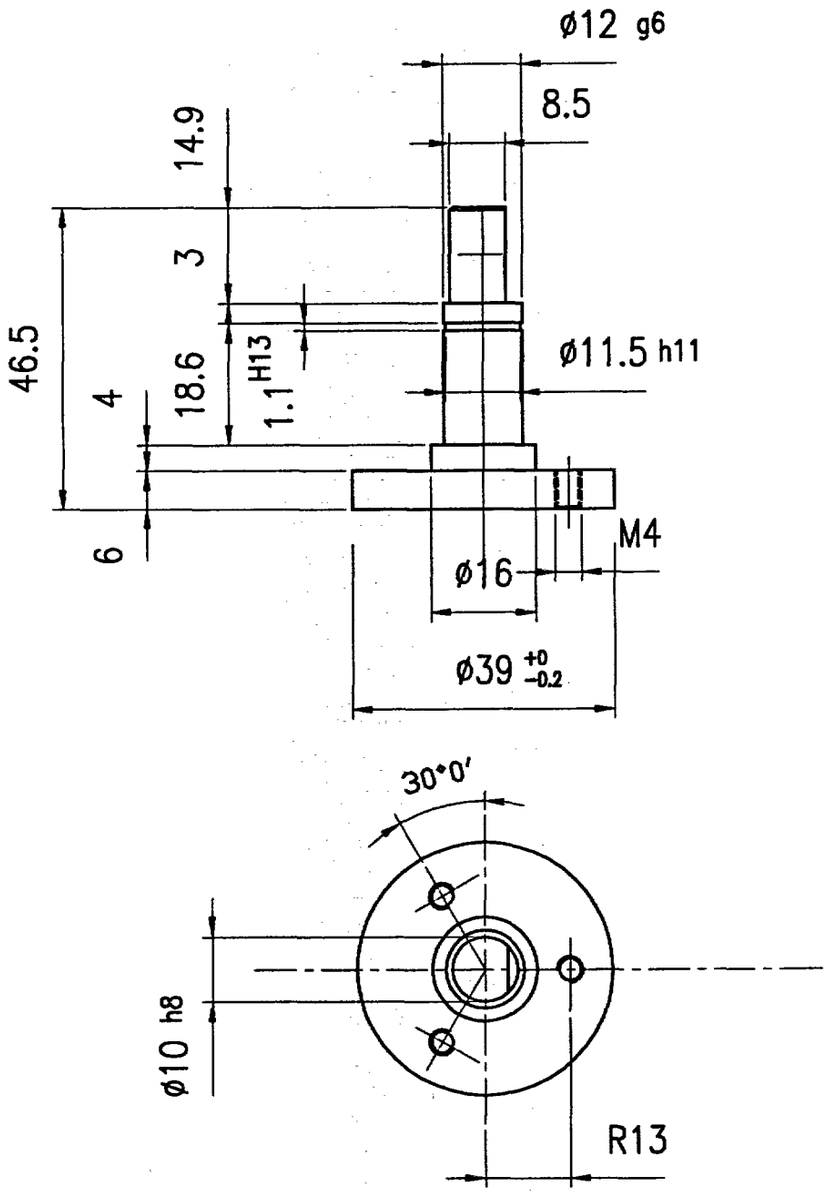
DWG.NO **U.S. 1012** REV. –





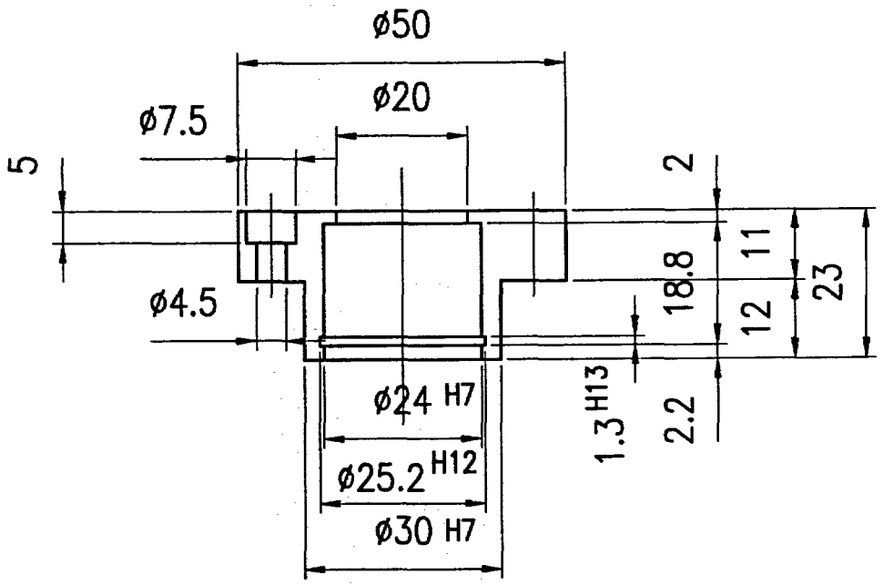
1.6

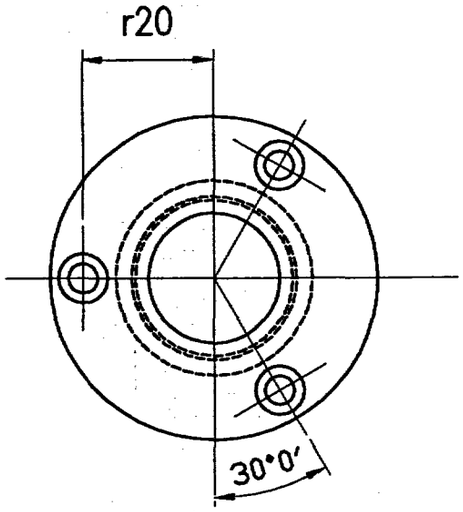
SURF.TREAT.	.						
THERM.TREAT.	.						
MATERIALS	. C40				MACHINE	SCANNER – SINTEL9000	
DES.	TM	DESCRIPTION					
CHECKED	TM	ISOSINT DETAIL OF BLOCK FOR CONTROL LEVER					
APPROVED	TF						
HD ARCHIVE							
Electronic SYSTEMS S.p.a.					SCALE 2:1	DATE 12.03.03	F.TO A4
			DWG.NO	U.S. 1013			REV. -



SURF.TREAT. .			
THERM.TREAT. .		MACHINE	SCANNER – SINTEL9000
MATERIALS . C40			
DES. TM	DESCRIPTION		
CHECKED TM	**ISOSINT SHUTTER CONTROL PIN**		
APPROVED TF			
HD ARCHIVE			

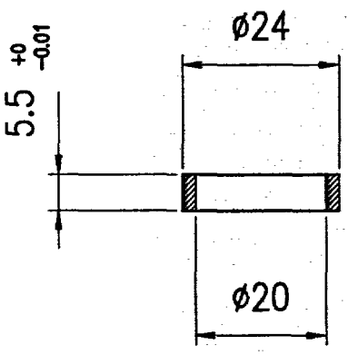
Electronic SYSTEMS S.p.a.	SCALE 1:1	DATE 12.03.03	F.TO A4
DWG.NO **U.S. 1014**			REV. -





1.6

SURF.TREAT. .							
THERM.TREAT. .							
MATERIALS . C40				MACHINE SCANNER – SINTEL9000			
DES. TM	DESCRIPTION						
CHECKED TM	**ISOSINT DETAIL OF CHUCK**						
APPROVED TF							
HD ARCHIVE							
Electronic SYSTEMS S.p.a.	TOLL. GENERALE DI LAVORAZIONE (VEDI REG.250)	SPIGOLI R=0,2÷0,4	RUGOROSITA' IN Ra	FILETTATURA QUALITA' MEDIA UNI 5545	SCALE 1:1	DATE 12.03.03	F.TO A4
	A TERMINI DI LEGGE E' VIETATO RIPRODURRE O COMUNICARE A TERZI IL CONTENUTO DEL PRESENTE DISEGNO	DWG.NO **U.S. 1015**					REV. -



1.6

SURF.TREAT.	.		
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	. C40		
DES.	TM	DESCRIPTION	ISOSINT SPACER FOR CHUCK
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

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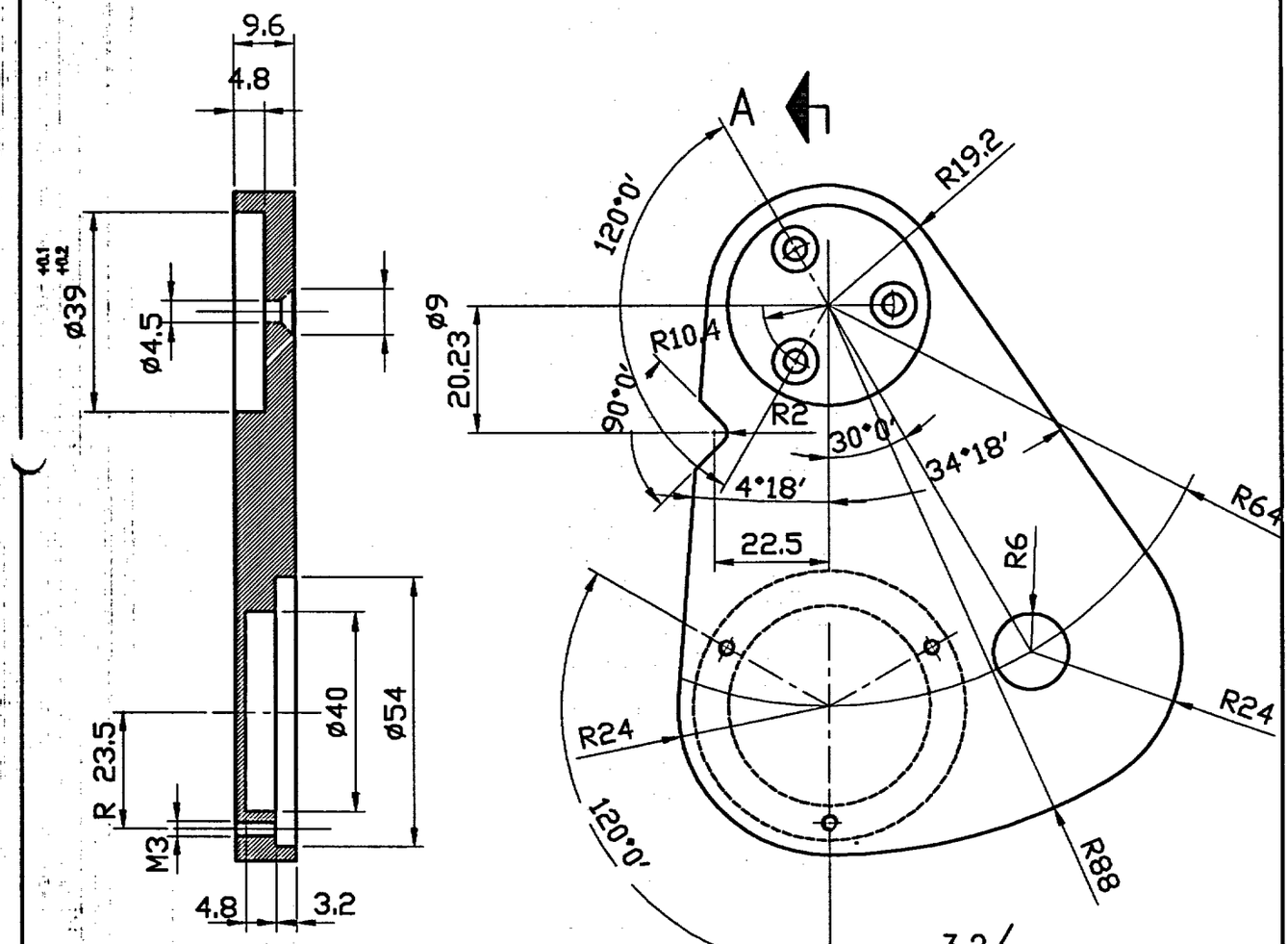
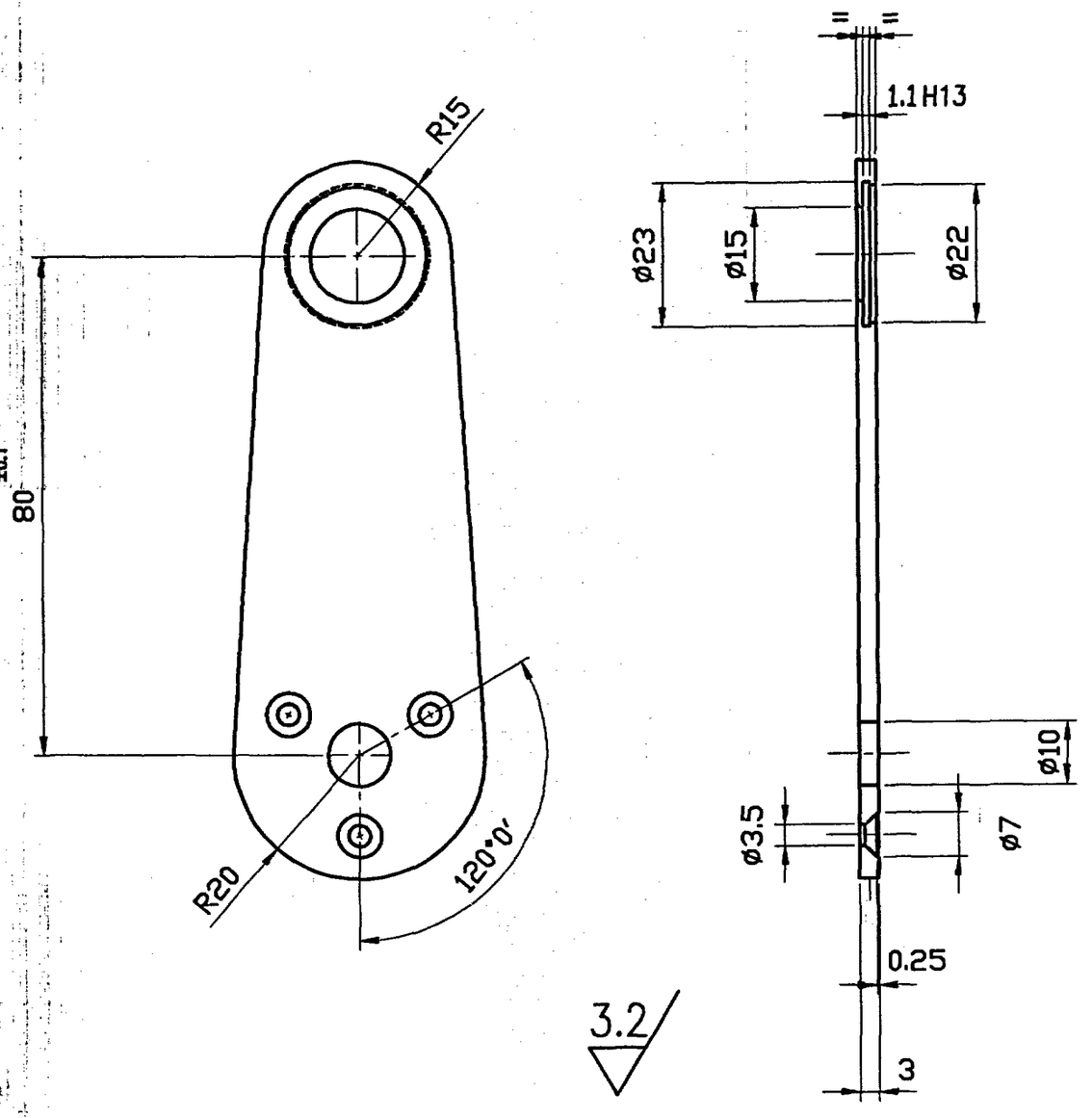


SURF.TREAT.	.				
THERM.TREAT.	.				
MATERIALS	AVPR80UNI40SMnPb10-SAE1137		MACHINE	SCANNER - SINTEL9000	
DES.	TM	DESCRIPTION			
CHECKED	TM	**ISOSINT SHUTTER**			
APPROVED	TF				
HD ARCHIVE					
Electronic SYSTEMS S.p.a.			SCALE 1:1	DATE 12.03.03	F.TO A4
		DWG.NO **U.S. 1017**			REV. -

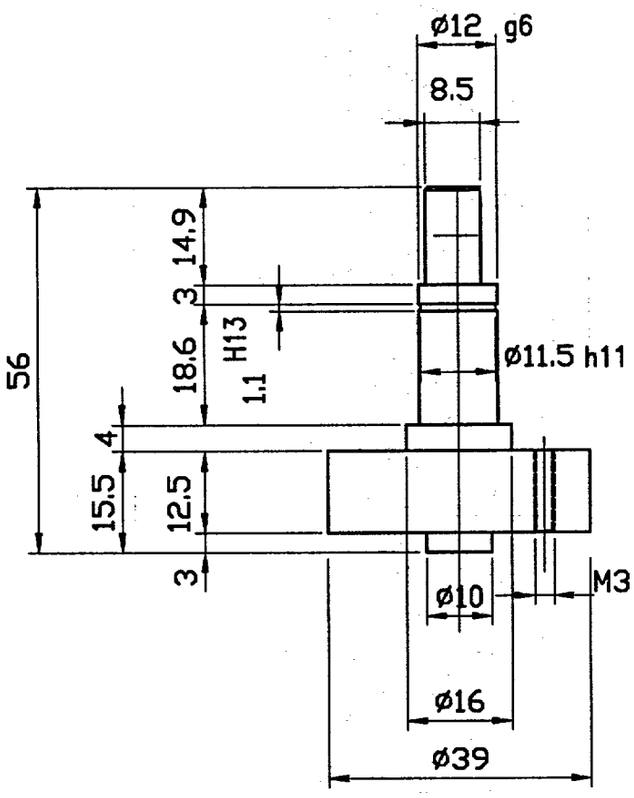


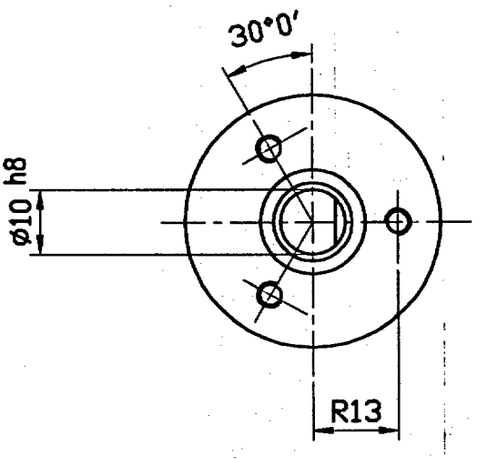
SURF.TREAT.	.		
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	. Al – ANTICORODAL		
DES.	TM	DESCRIPTION	ISOSINT SAMPLE-HOLDER
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1018** REV. -





1.6

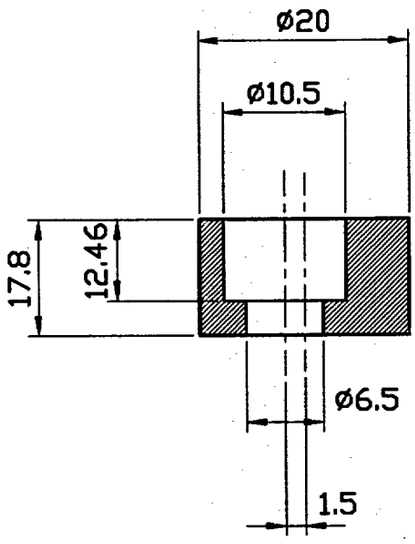
SURF.TREAT.	.		.
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	. C40		
DES.	TM	DESCRIPTION	ISOSINT SAMPLE-HOLDER CONTROL PIN
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

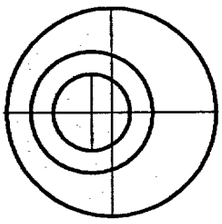
Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO U.S. 1019

REV. -





1.6

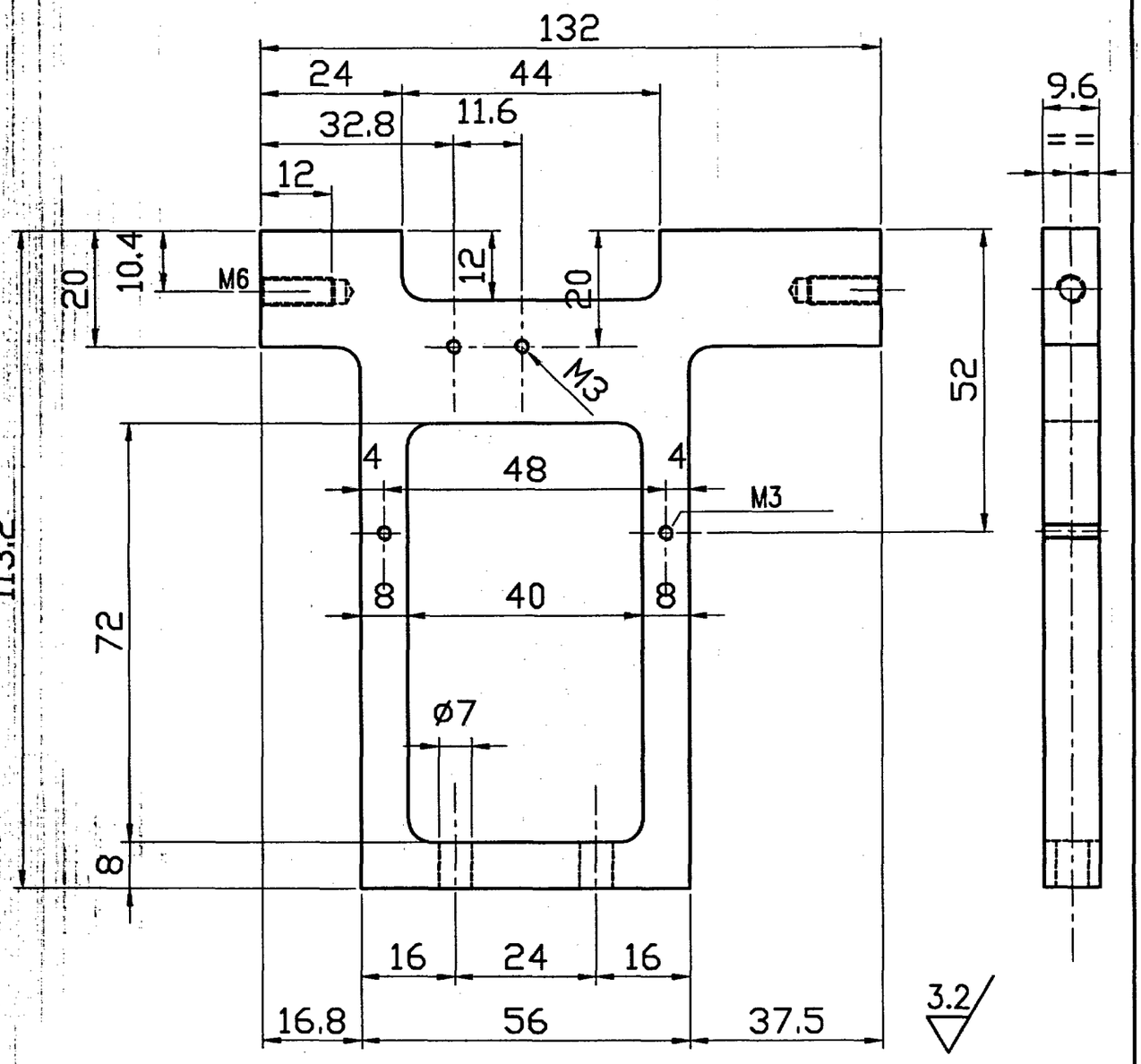
SURF.TREAT.	.		.
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	. Al ANTICORODAL		
DES.	TM	DESCRIPTION	ISOSINT LOCK ECCENTRIC
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
2:1	12.03.03	A4

DWG.NO U.S. 1020

REV. -

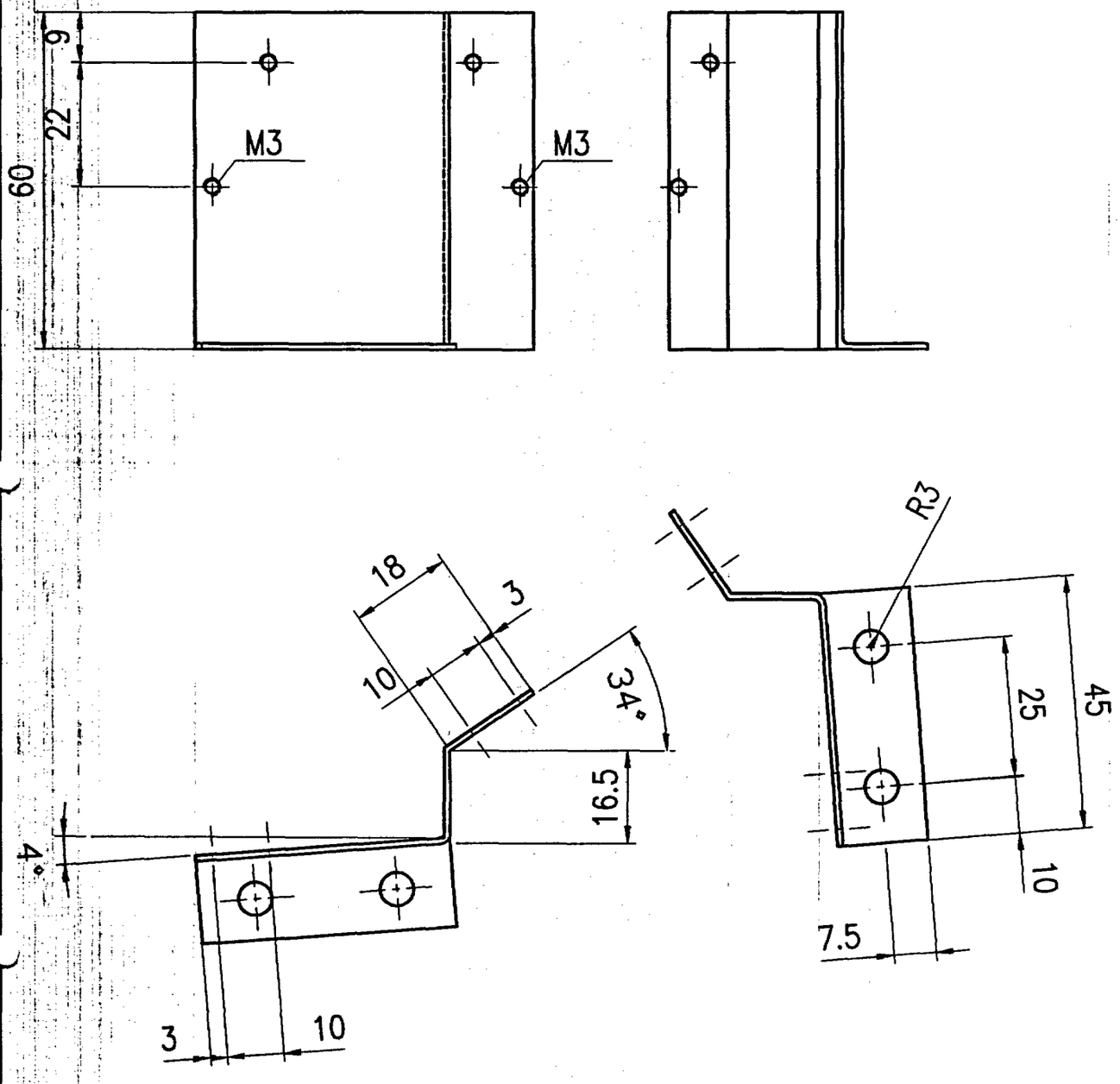


SURF.TREAT.	.		.
THERM.TREAT.	.	MACHINE	SCANNER – SINTEL9000
MATERIALS	. Al – ANTICORODAL		
DES.	TM	DESCRIPTION	ISOSINT HEAD SUPPORT SHOULDER
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

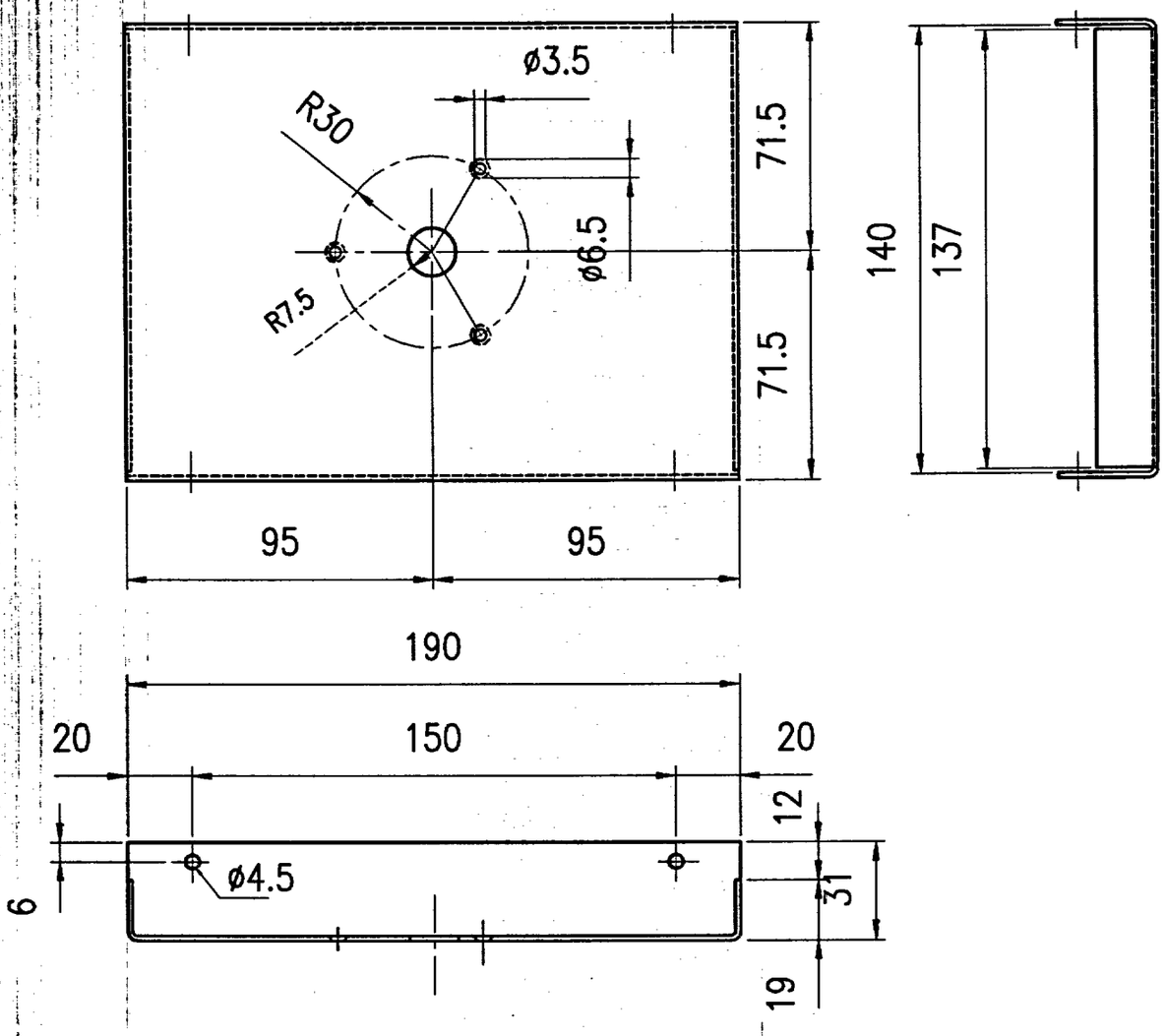
Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1021** REV. -



SURF.TREAT. .						
THERM.TREAT. .				MACHINE SCANNER - SINTEL9000		
MATERIALS . FE37B						
DES. TM	DESCRIPTION					
CHECKED TM	ISOSINT LIMIT SWITCH SUPPORT					
APPROVED TF						
HD ARCHIVE						
Electronic SYSTEMS S.p.a.				SCALE 1:1	DATE 12.03.03	F.TO A4
			DWG.NO U.S. 1022			REV. -

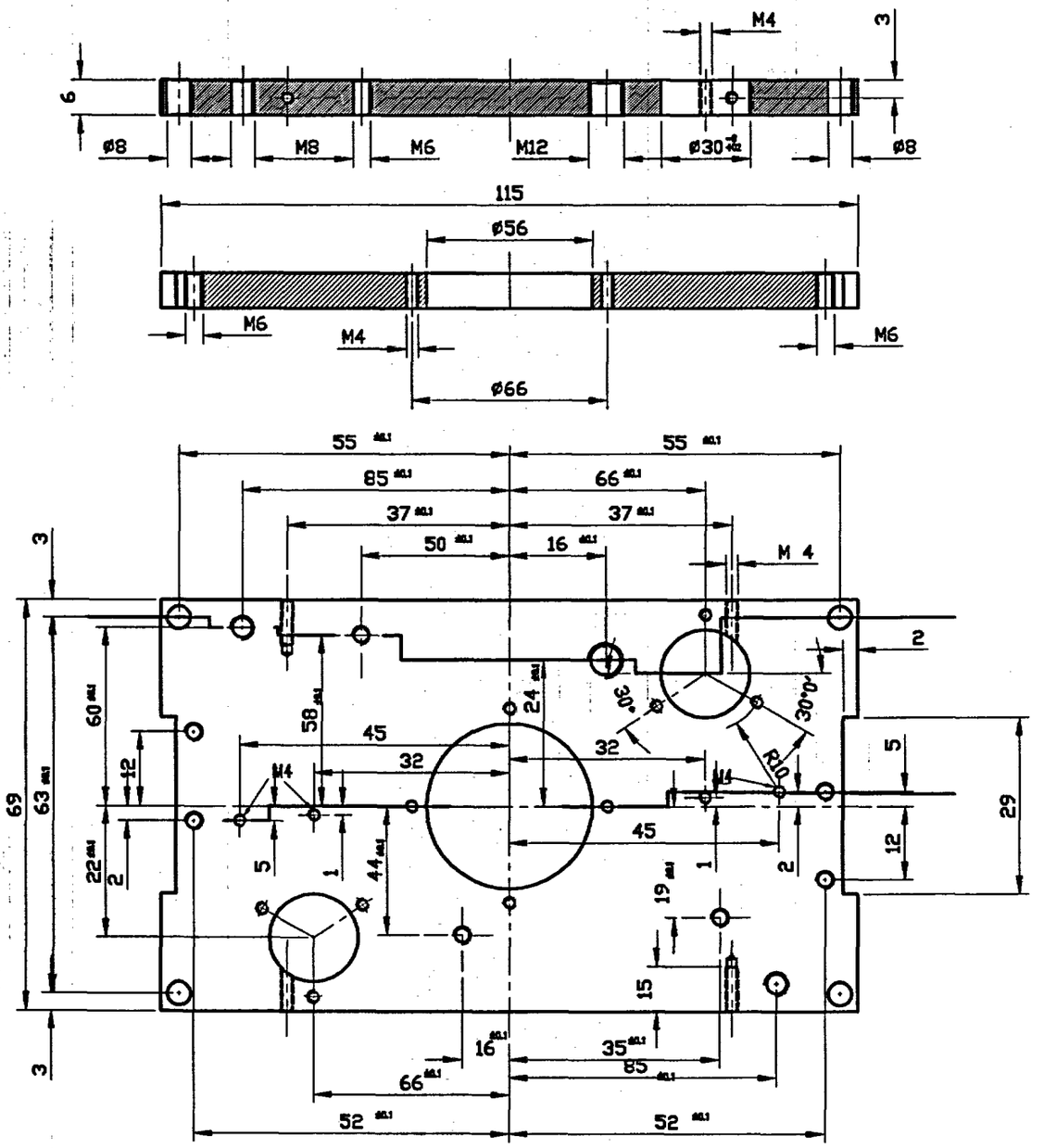


SURF.TREAT.	.		.
THERM.TREAT.	.		
MATERIALS	. AISI304 THICK.1.5mm	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT DETAIL OF SHIELDING SHEET	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO **U.S. 1023** REV. –



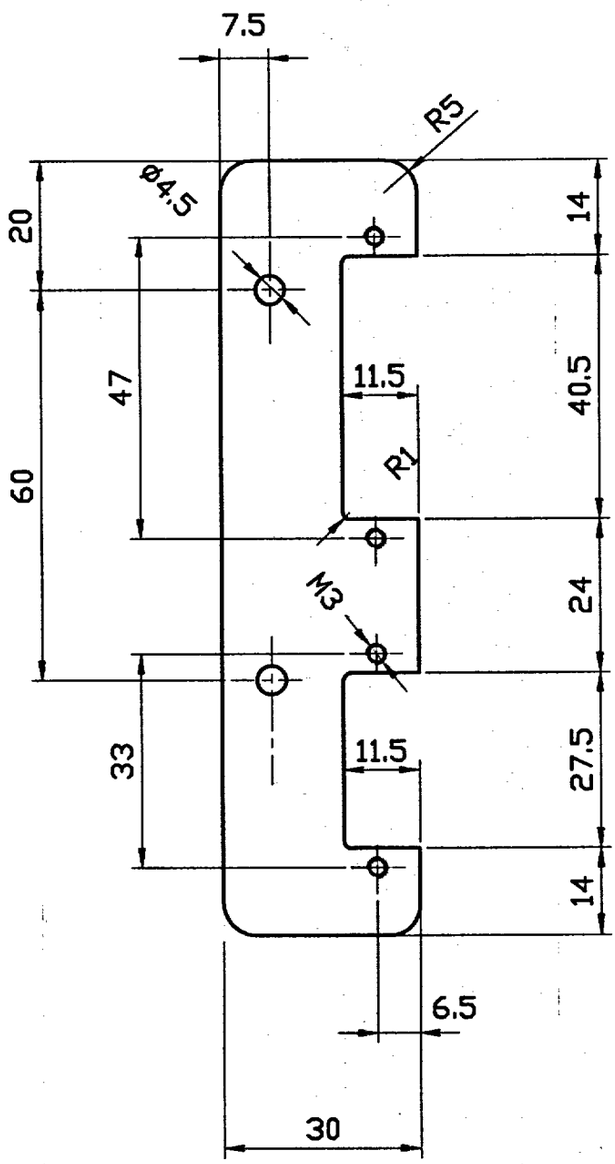
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. AVPR80UNI40MnPb10-SAE1137	MACHINE	SCANNER - SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT DETAIL OF BASE PLATE	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO U.S. 1024

REV. -



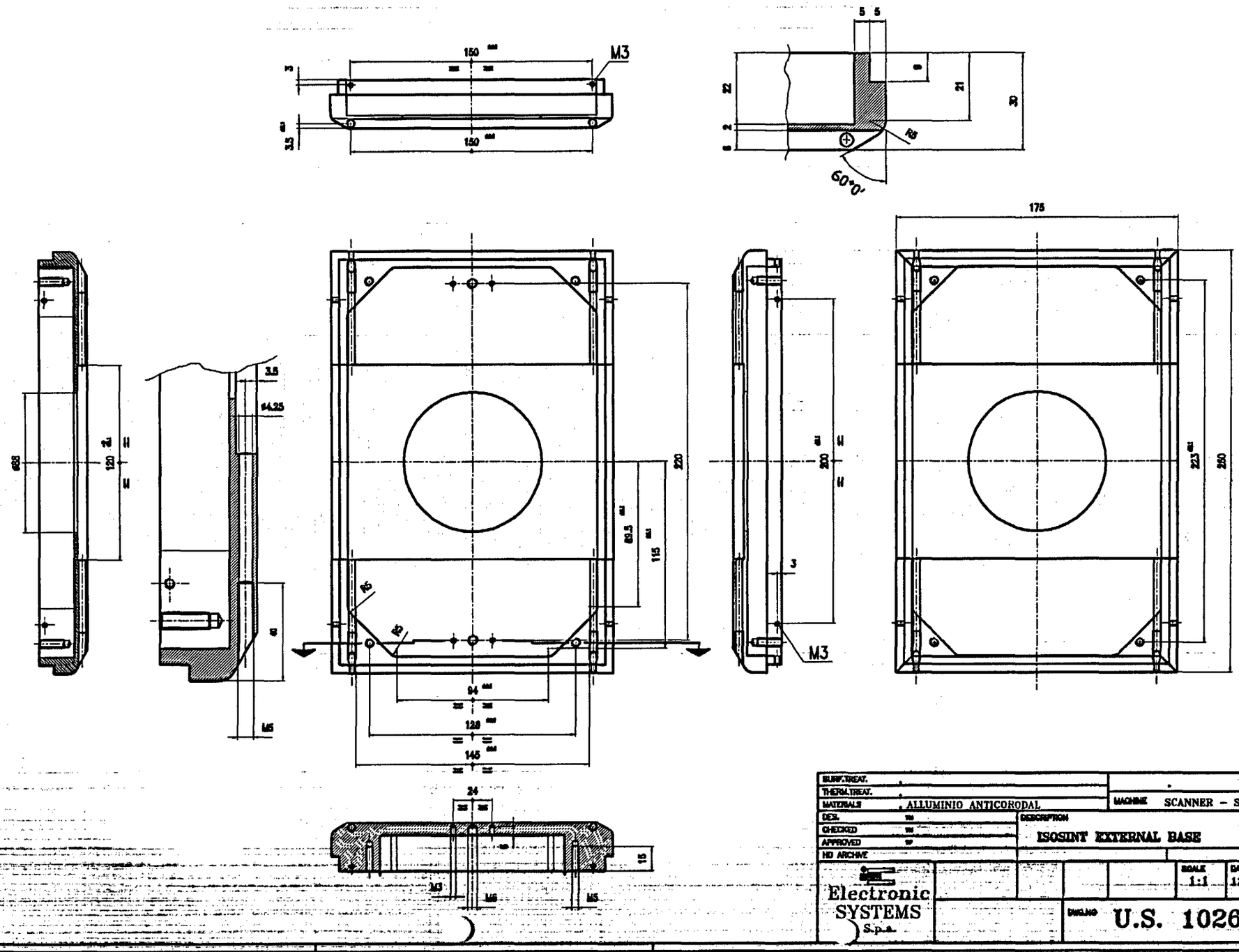
SURF.TREAT. .		.	
THERM.TREAT. .		MACHINE	SCANNER – SINTEL9000
MATERIALS . Al – ANODIZED			
DES. TM	DESCRIPTION		
CHECKED TM	ISOSINT CONNECTOR SUPPORT		
APPROVED TF			
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO U.S. 1025

REV. -

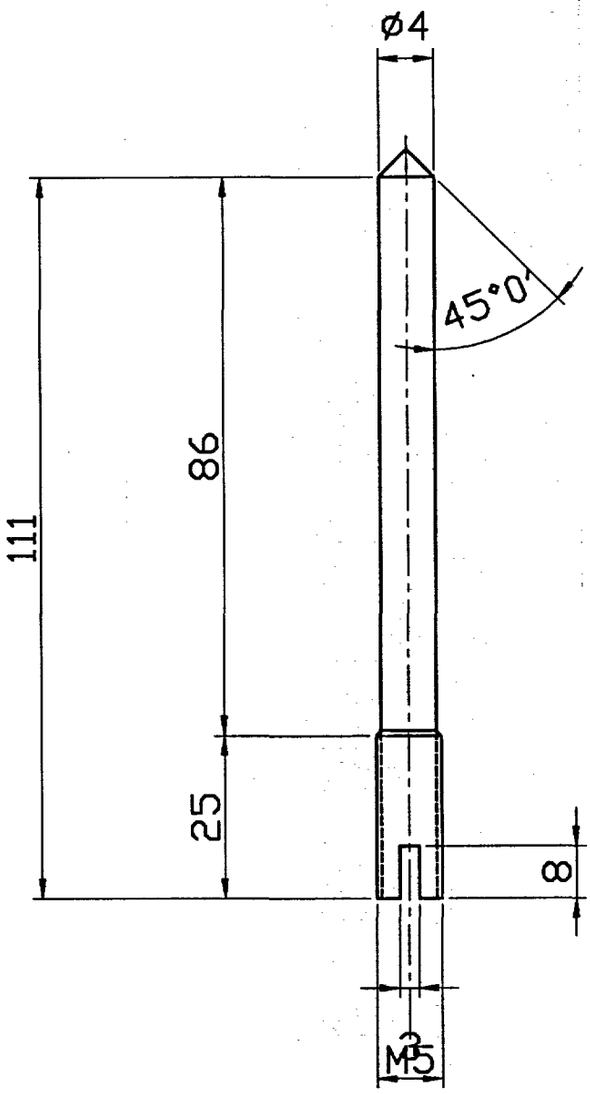


SURF.TREAT.			
THERM.TREAT.		MACHINE	SCANNER – SINTEL9000
MATERIALS	ALLUMINIO ANTICORODAL		
DES.		DESCRIPTION	ISOSINT EXTERNAL BASE
CHECKED			
APPROVED			
HD ARCHIVE			

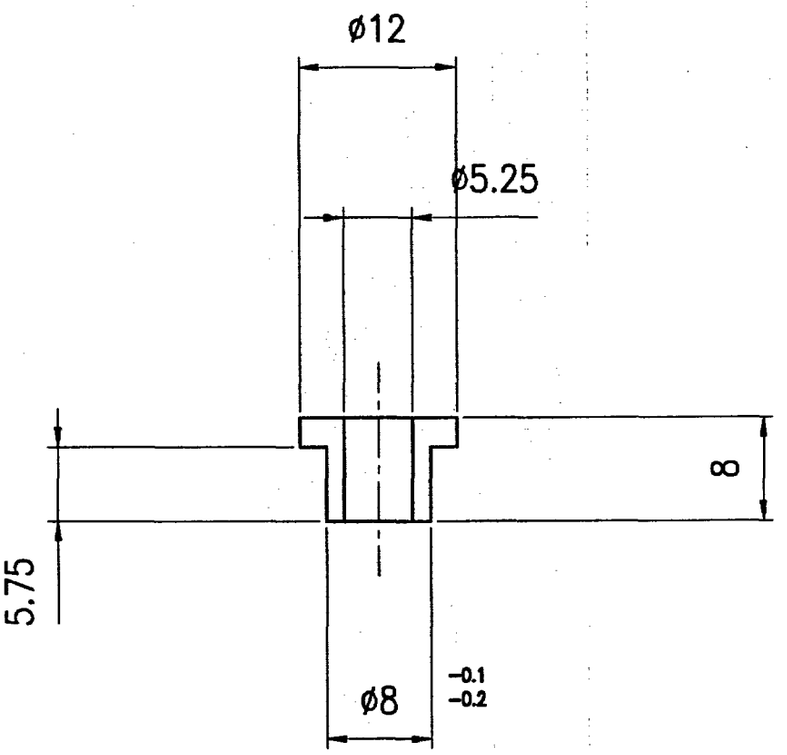
Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A1

DWG.NO **U.S. 1026** REV. –



SURF.TREAT. .						
THERM.TREAT. .				MACHINE SCANNER – SINTEL9000		
MATERIALS . C40						
DES. TM	DESCRIPTION					
CHECKED TM	ISOSINT LOCK PIN					
APPROVED TF						
HD ARCHIVE						
Electronic SYSTEMS S.p.a.				SCALE 2:1	DATE 12.03.03	F.TO A4
			DWG.NO U.S. 1027			REV. -



1.6

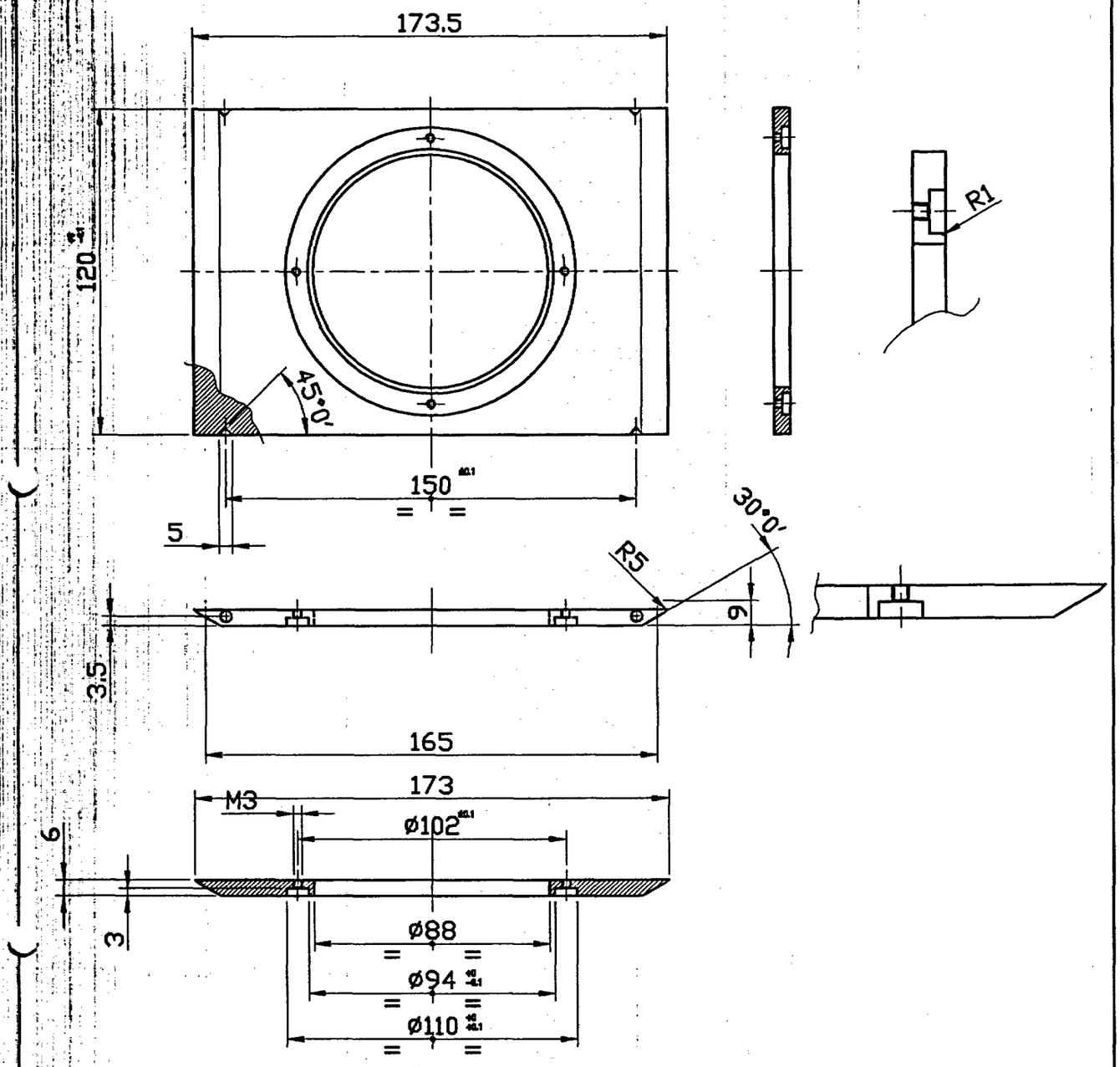
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. VETRONITE	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	ISOSINT INSULATOR
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1028

REV. -



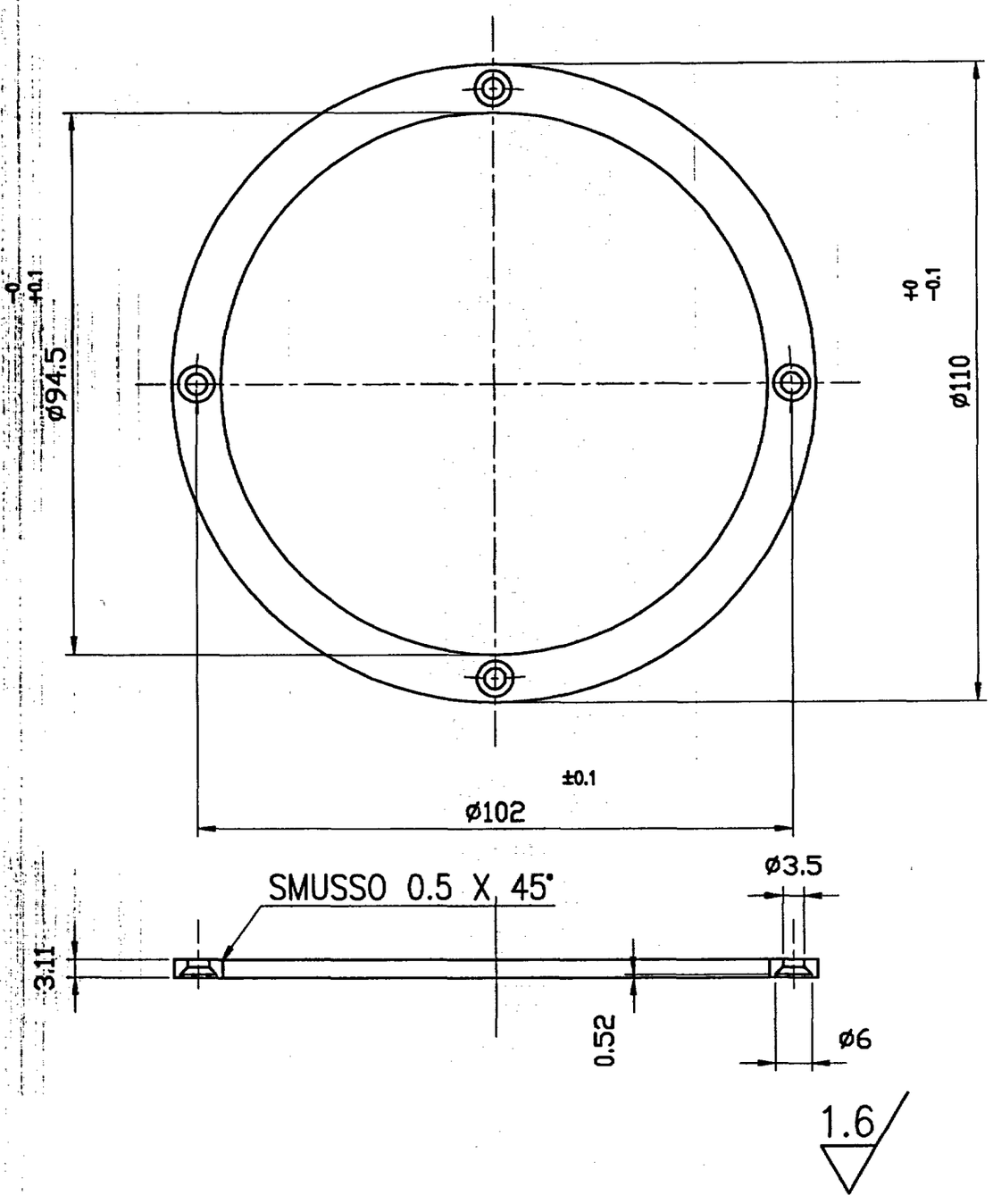
SURF.TREAT.			
THERM.TREAT.			
MATERIALS	ALLUMINIUM ANTICORODAL	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM		ISOSINT PLATE
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1029

REV. -

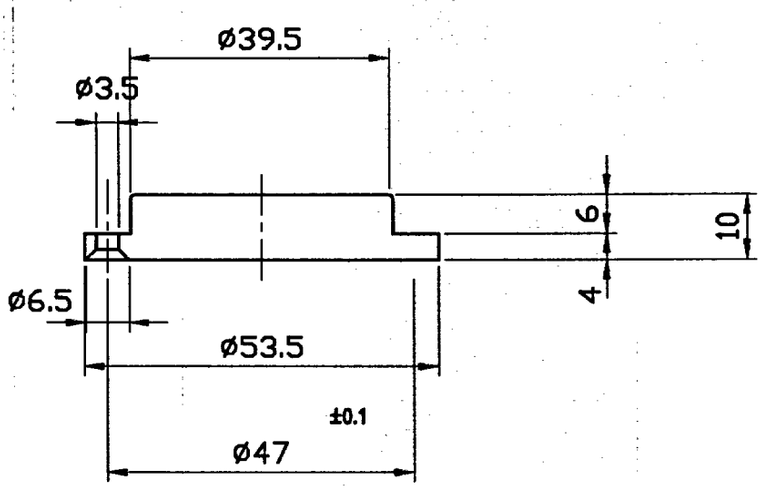


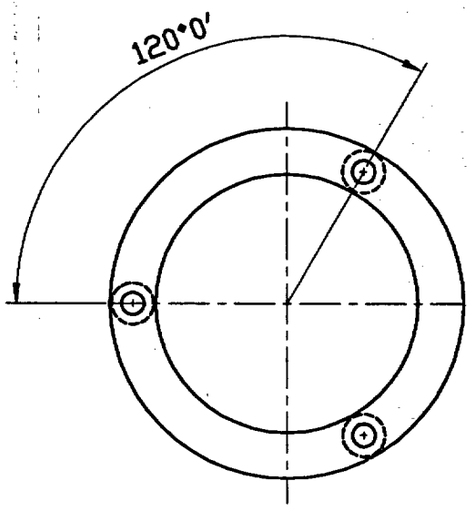
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. FE37B	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	ISOSINT MYLAR LOCK RING
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1030** REV. -





3.2

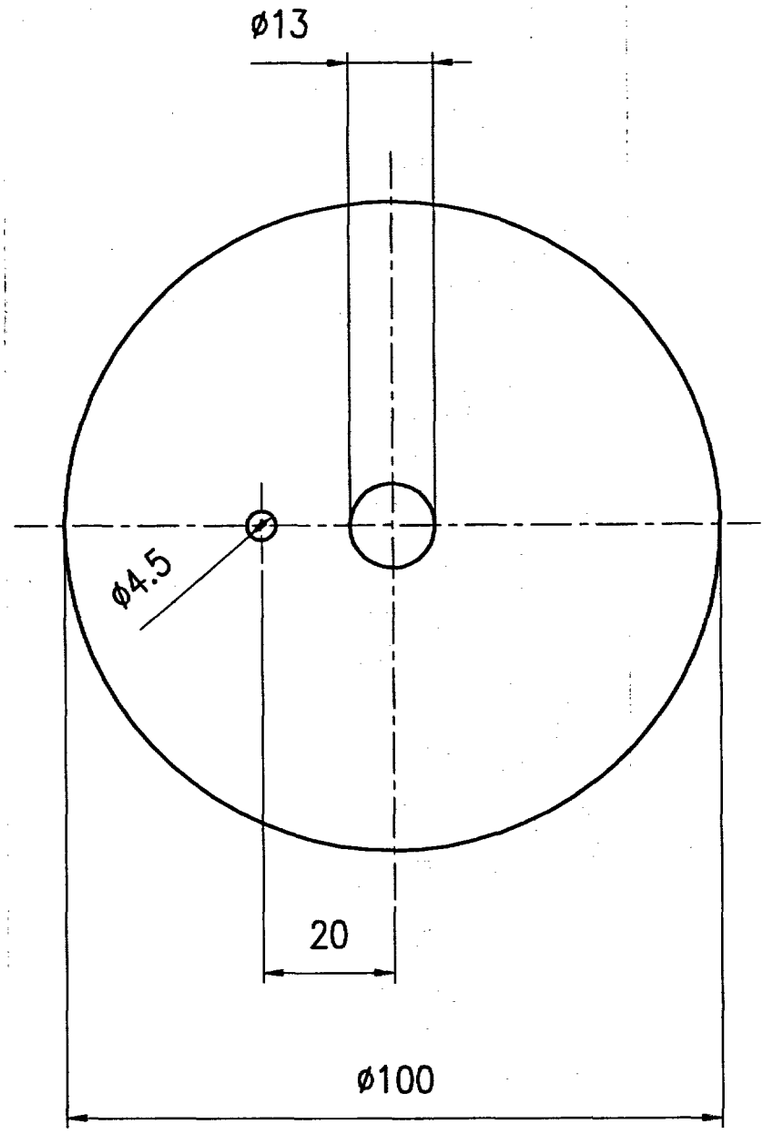
SURF.TREAT.	.	.	
THERM.TREAT.	.		
MATERIALS	. W/CUA25	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT SHUTTER INSERT	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO U.S. 1031

REV. –



3.2

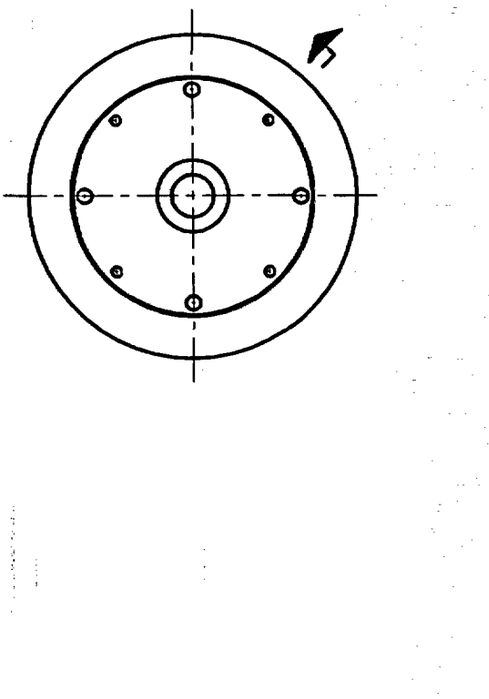
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. Al ANTICORODAL	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	ISOSINT SOURCE-HOLDER CLOSING PLATE
CHECKED	TM		
APPROVED	TF		
HD ARCHIVE			

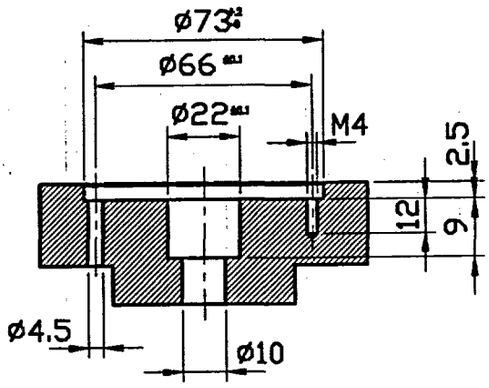
Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:1	12.03.03	A4

DWG.NO **U.S. 1032**

REV. –





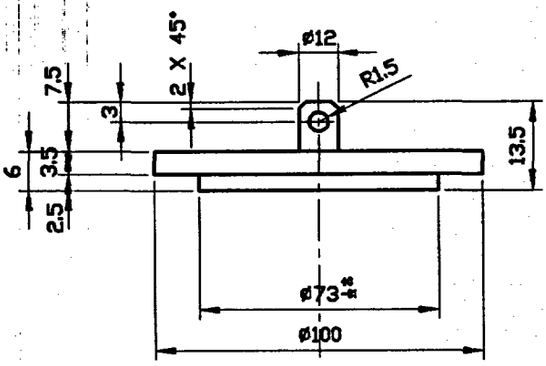
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. AVPR80UNI40MnPb10-SAE1137	MACHINE	SCANNER - SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT SOURCE-HOLDER	
APPROVED	TF		
HD ARCHIVE			

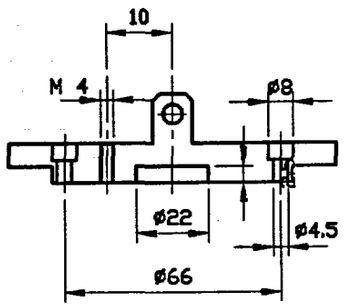
Electronic SYSTEMS S.p.a.

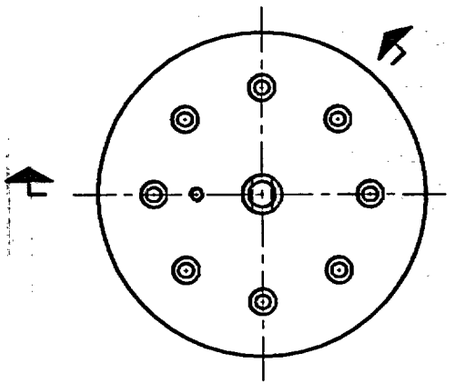
SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1033

REV. -







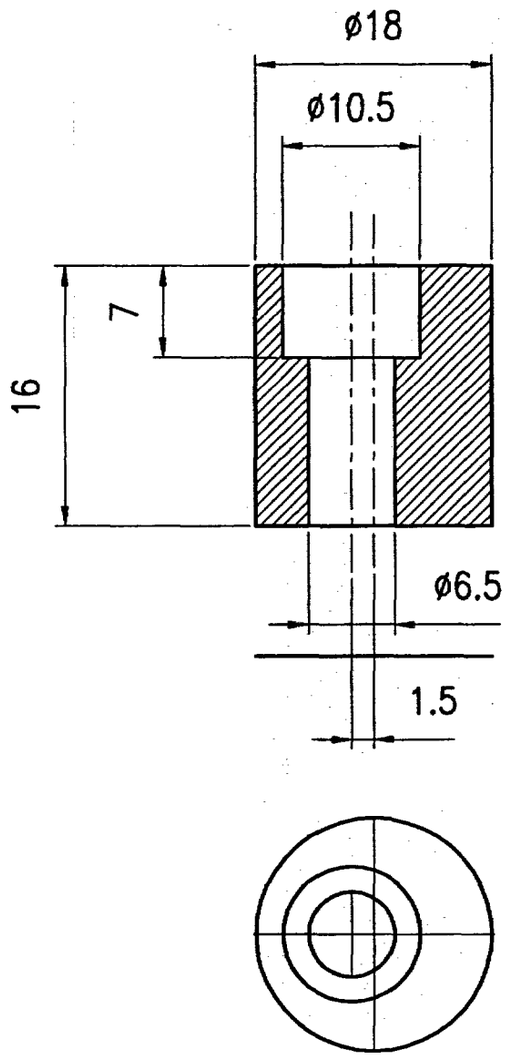
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. AVPR80UNI-40SMnPb10-SAE1137	MACHINE	SCANNER - SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT SOURCE-HOLDER COVER	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1034

REV. -



1.6

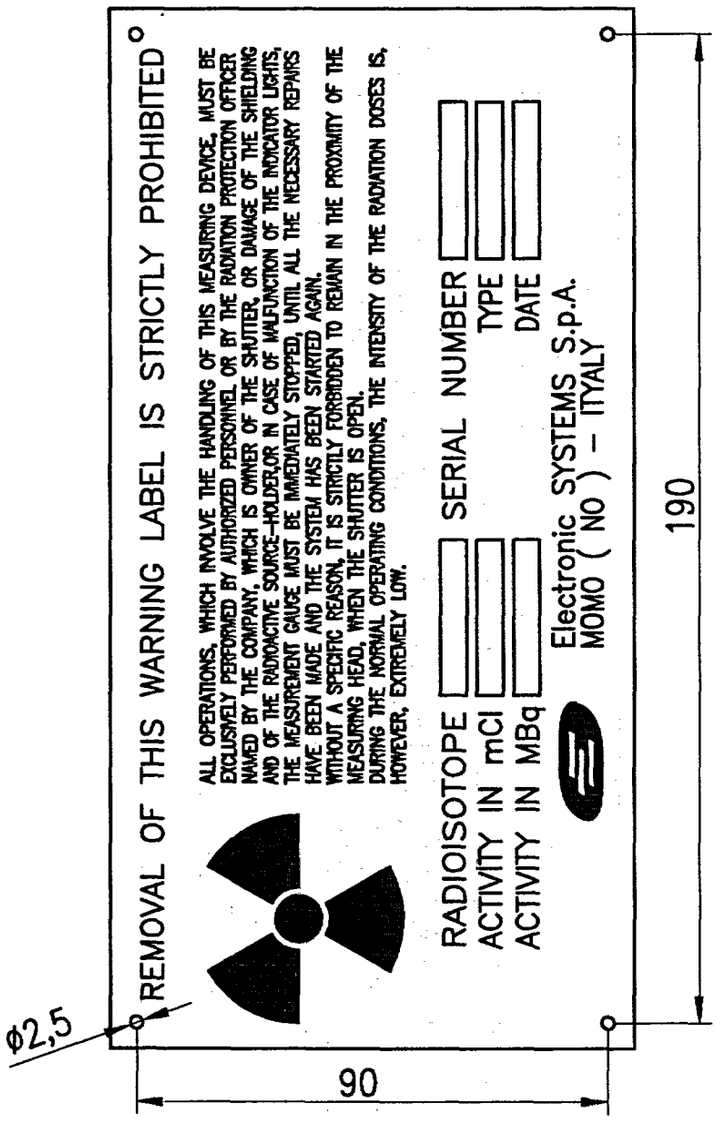
SURF.TREAT.	.		
THERM.TREAT.	.		
MATERIALS	. Al ANTICORODAL	MACHINE	SCANNER – SINTEL9000
DES.	TM	DESCRIPTION	
CHECKED	TM	ISOSINT ECCENTRIC	
APPROVED	TF		
HD ARCHIVE			

Electronic SYSTEMS S.p.a.

SCALE	DATE	F.TO
1:2	12.03.03	A4

DWG.NO U.S. 1035

REV. –



SURF.TREAT.	.						
THERM.TREAT.	.				MACHINE	SCANNER – SINTEL9000	
MATERIALS	. ALLUMINIUM						
DES.	TM	DESCRIPTION					
CHECKED	TM	RADIOACTIVE SOURCE LABEL					
APPROVED	TF						
HD ARCHIVE							
Electronic SYSTEMS S.p.a.					SCALE 1:1	DATE 12.03.03	F.TO A4
			DWG.NO	U.S. 1036			REV. -

Enclosure A

Isodose curves of the device with shutter open/closed

For:

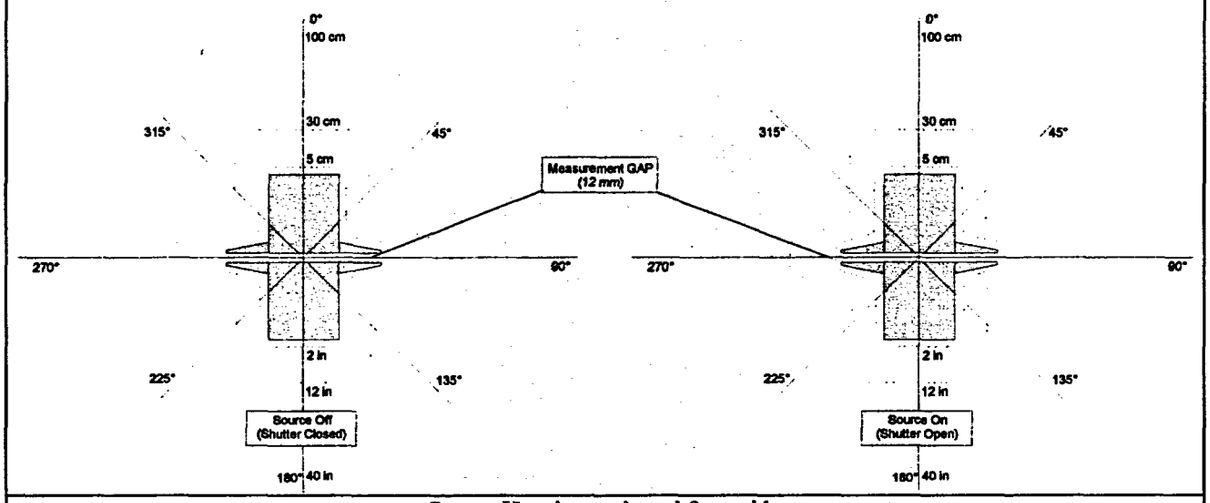
- n. 1 source of Krypton 85 (activity: 14,8 GBq)
- n. 1 source of Strontium 90 (activity: 1,85 GBq)

Electronic SYSTEMS S.p.A.
S.S. 229 - km 12,200
28015 MOMO (NO) - Italy

RADIATION PROFILE -

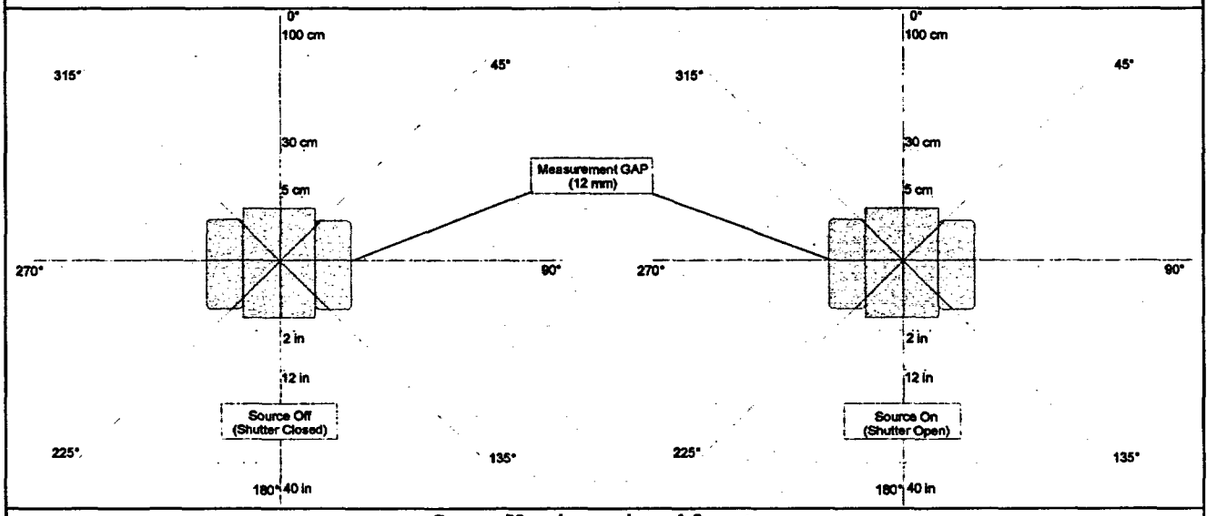
Model : recognized source RS 2003 - Source: Strontium 90

Activity : ❑ 400 mCi / 14.8 GBq; ❑ 200 mCi / 7.4 GBq;
❑ 100 mCi / 3.7 GBq; ☒ 50 mCi / 1.85 GBq



Source Housing – viewed from side

	Shutter Closed - Dose Rate in µSv/h								Shutter Open - Dose Rate in µSv/h								
cm.	0°	45°	90°	135°	180°	225°	270°	315°	0°	45°	90°	135°	180°	225°	270°	315°	cm.
5	BG		10.5		BG		10.5		BG		28.0		BG		28.0		5
30	BG		0.45		BG		0.45		BG		2.4		BG		2.4		30
100	BG		BG		BG		BG		BG		BG		BG		BG		100



Source Housing – viewed from top

	Shutter Closed - Dose Rate in µSv/h								Shutter Open - Dose Rate in µSv/h								
cm.	0°	45°	90°	135°	180°	225°	270°	315°	0°	45°	90°	135°	180°	225°	270°	315°	cm.
5	BG		10.5		BG		10.5		BG		28.0		BG		28.0		5
30	BG		0.45		BG		0.45		BG		2.4		BG		2.4		30
100	BG		BG		BG		BG		BG		BG		BG		BG		100

BG = Background; NA = Not Applicable

Momo, 25 April 2003

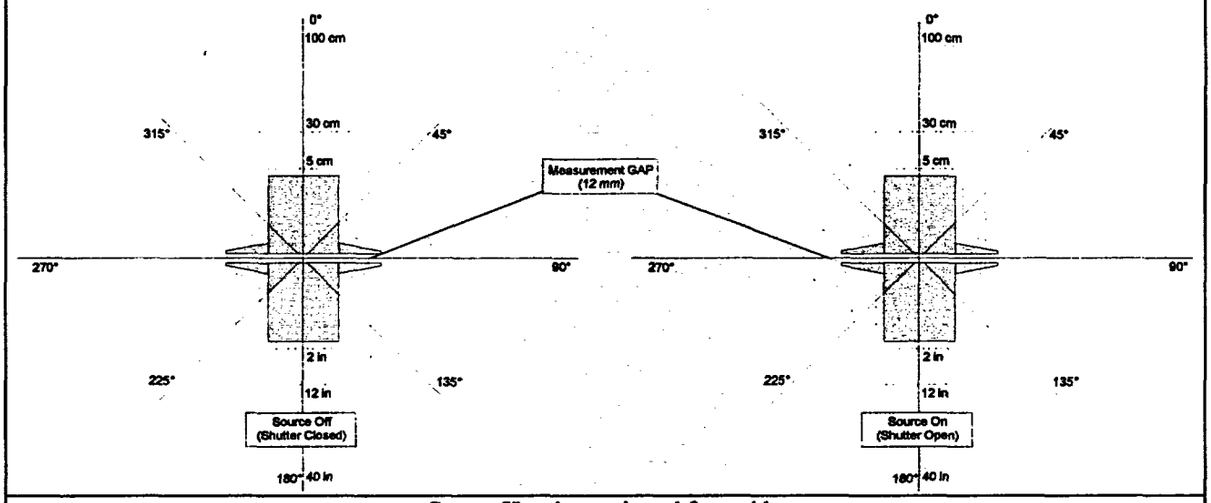
Written by	Checked by	Approved by
DR. FRANCO CIOCE	DR. FRANCO CIOCE	

Electronic SYSTEMS S.p.A.
S.S. 229 - km 12,200
28015 MOMO (NO) - Italy

RADIATION PROFILE -

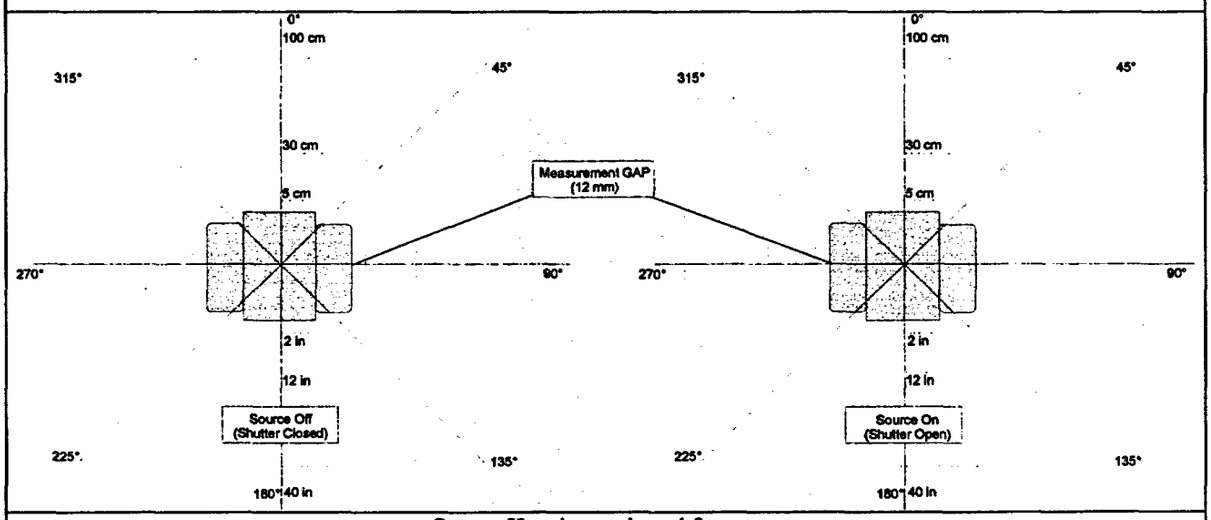
Model : recognized source RS 2003 - Source: Kripton 85

Activity : ☒ 400 mCi / 14.8 GBq; ☐ 200 mCi / 7.4 GBq;
☐ 100 mCi / 3.7 GBq; ☐ 50 mCi / 1.85 GBq



Source Housing – viewed from side

	Shutter Closed - Dose Rate in µSv/h								Shutter Open - Dose Rate in µSv/h								
cm.	0°	45°	90°	135°	180°	225°	270°	315°	0°	45°	90°	135°	180°	225°	270°	315°	cm.
5	BG		0.26		BG		16.0		BG		17.0		BG		16.0		5
30	BG		BG		BG		BG		BG		0.12		BG		0.11		30
100	BG		BG		BG		BG		BG		BG		BG		BG		100



Source Housing – viewed from top

	Shutter Closed - Dose Rate in µSv/h								Shutter Open - Dose Rate in µSv/h								
cm.	0°	45°	90°	135°	180°	225°	270°	315°	0°	45°	90°	135°	180°	225°	270°	315°	cm.
5	BG		0.26		BG		16.0		BG		17.0		BG		16.0		5
30	BG		BG		BG		BG		BG		0.12		BG		0.11		30
100	BG		BG		BG		BG		BG		BG		BG		BG		100

BG = Background; NA = Not Applicable

Momo, 25 April 2003

Written by	Checked by	Approved by
DR. FRANCO CIOCE	DR. FRANCO CIOCE	

Enclosure B

List of commercial and mechanical components

Electronic S.p.a. SYSTEMS

MACHINE **SINTEL9000**

SENSOR ISOSINT

DATE		PAPER	
12.03.03	TM	1 / 2	

N. OF DRAWING REF. FILE	Q.ty	DESCRIPTION	Material	SIZE
U.S. 1009	–	ASSIEME ASSEMBLY	–	–
U.S. 1010	1	PORTA COLLIMATORE COLLIMATOR–HOLDER	UNI	A4
U.S. 1011	1	COLLIMATORE USCITA OUTPUT COLLIMATOR	ALLUMINIUM	A4
U.S. 1012	2	LEVA COMANDO CONTROL LEVER	C40	A4
U.S. 1013	2	BLOCCO PER LEVA COMANDO CONTROL LEVER BLOCK	C40	A4
U.S. 1014	1	PERNO COMANDO OTTURATORE SHUTTER CONTROL PIN	C40	A4
U.S. 1015	2	MANDRINO CHUCK	C40	A4
U.S. 1016	2	DISTANZIALE PER MANDRINO SPACER FOR CHUCK	C40	A4
U.S. 1017	1	OTTURATORE SHUTTER	UNI	A3
U.S. 1018	1	PORTACAMPIONE SAMPLE–HOLDER	ALLUMINIUM	A3
U.S. 1019	1	PERNO COMANDO PORTACAMPIONE SAMPLE–HOLDER CONTROL PIN	C40	A4
U.S. 1020	3	ECCENTRICO PER FERMO LOCK ECCENTRIC	ALLUMINIUM	A4
U.S. 1021	2	SPALLA SUPPORTO TESTA HEAD SUPPORT SHOULDER	ALLUMINIUM	A3
U.S. 1022	2	SUPPORTO FINECORSA LIMIT SWITCH SUPPORT	FE 37B	A3
U.S. 1023	1	LAMIERA DI SCHERMATURA SHIELDING SHEET	AISI 304	A3
U.S. 1024	1	PIASTRA DI BASE BASE PLATE	ALLUMINIUM	A2
U.S. 1025	1	SUPPORTO CONNETTORI CONNECTOR SUPPORT	ALLUMINIUM	A4
U.S. 1026	1	BASE ESTERNA EXTERNAL BASE	ALLUMINIUM	A1
U.S. 1027	4	PERNO DI BLOCCO LOCK PIN	C40	A4
U.S. 1028	8	ISOLATORE INSULATOR	VETRONITE	A4
U.S. 1029	1	PIATTELLO PLATE	ALLUMINIUM	A2
U.S. 1030	1	ANELLO DI FERMO MAILLARD MAILLARD LOCK RING	FE 37B	A4
U.S. 1031	1	TAPPO CHIUSURA RADIAZIONI RADIATION CLOSING PLUG	W/CUA25	A4
U.S. 1032	1	COPERCHIO SICUREZZA SORGENTE SOURCE SAFETY COVER	ALLUMINIUM	A4
U.S. 1033	1	PORTASORGENTE SOURCE HOLDER	UNI	A4
U.S. 1034	1	COPERCHIO PORTASORGENTE SOURCE–HOLDER COVER	UNI	A4

Electronic S.p.a. SYSTEMS

MACHINE **SINTEL9000**

SENSOR ISOSINT

DATE		PAPER	
12.03.03	TM	2 / 2	

N. OF DRAWING REF. FILE	Q.ty	DESCRIPTION	Material	SIZE
	2	CILINDRO PNEUM. SEMPLICE EFFETTO SINGLE-ACTING PNEUMATIC CYLINDER		
		MOLLA ANTERIORE CORSA 25 mm. 25mm. STROKE FRONT SPRING	C85ø16-25	
	2	FORCELLA COMANDO CILINDRO CYLINDER CONTROL FORK	GKM6-12	
	3	FINECORSA LIMIT SWITCH		
	4	CUSCINETTI SKF BEARING SKF	61901	
	2	ANELLI SEEGER PER ALBERO ø 6 SEEGER RINGS FOR SHAFT DIA 6		
	2	ANELLI SEEGER PER ALBERO ø 12 SEEGER RINGS FOR SHAFT DIA 12		
	2	ANELLI SEEGER PER FORO ø 24 SEEGER RINGS FOR SHAFT DIA 24		
	1	LUCCHETTO ø STELO 4 STEM LOCK		

Enclosure C

Diagram of control and electric system of indicator lights

ELECTRONIC SYSTEMS S.p.A.
MOMO (NO) ITALY

SISTEMA DI MISURA
MEASURING SYSTEM
APPAREIL DE MESURE
DICKENMESSUNG
MEDIDOR DEL ESPESOR

U.S. LICENSE Comm: 0000

GRUPPO DISEGNO:
DRAWING GROUP:
GROUPE DESSIN:
FUNKTIONSBAUGRUPPE:
GRUPO DE DIBUJO:

=50

SCHEMA ELETTRICO:
ELECTRICAL DRAWING :
SCHEMA ELECTRIQUE:
SCHALTPLAN:
ESQUEMA ELECTRICO:

SCANNER -I2000 DSP

NR.	REVISION	DATE	NAME

DATE	00/0000	CUSTOMER	.. US LICENSE
DRAWN	BONINI A.		
CHKD	F. TRAFICANTE	FILE	0000X12
APPD	Ing. MORA P.G.	ARCHIVES	SIGRAPH/ET V 5.2

Electronic SYSTEMS spa

DESCRIPTION: S
FOGLIO INTESTAZIONE GRUPPO
TITLE SHEET

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		LOCATION	+SCANNER
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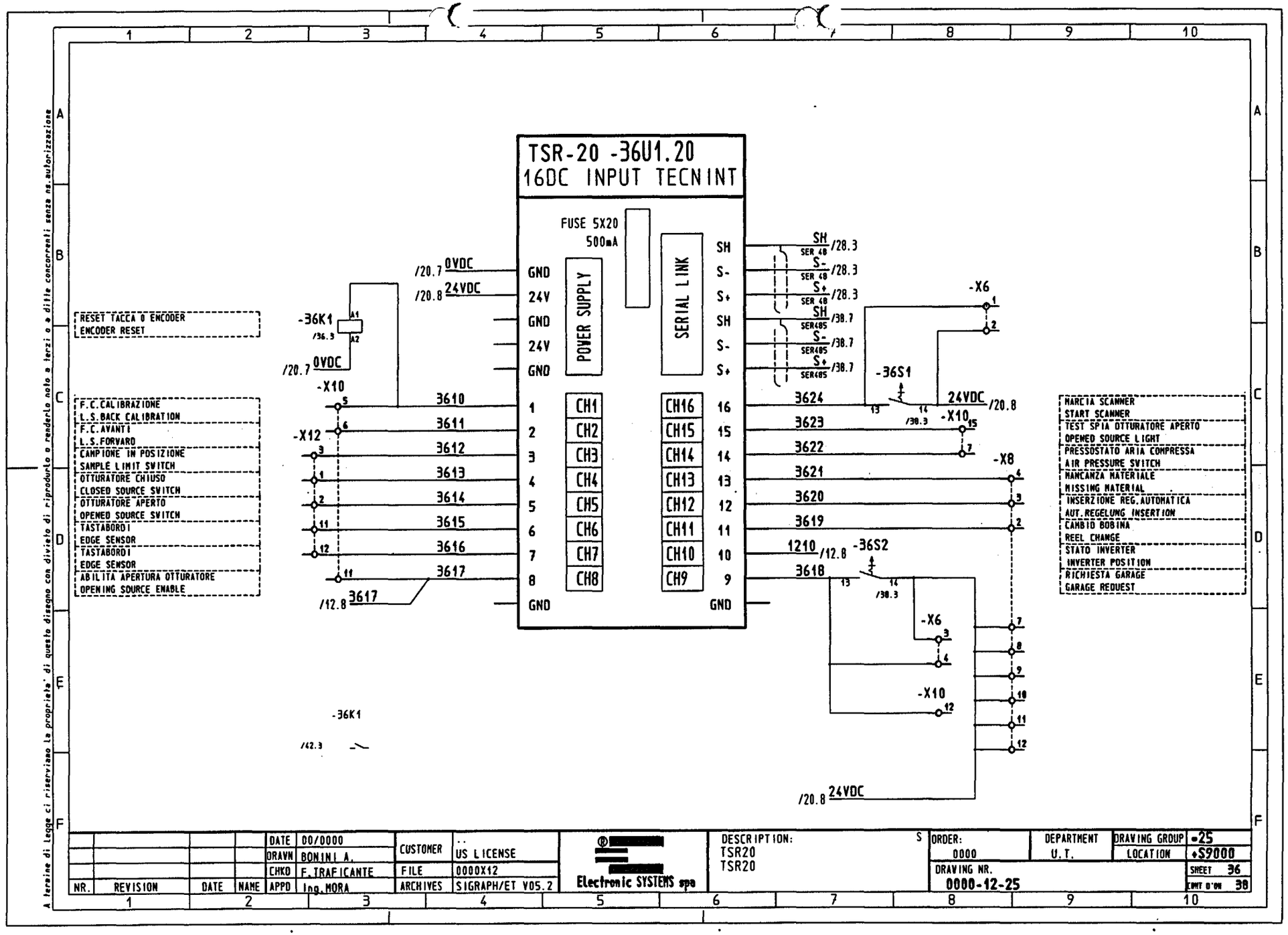

A termine di legge ci riserviamo la proprieta' di questo disegno con divieto di riprodurlo o renderlo noto a terzi o a ditte concorrenti senza ns.autorizzazione

NR.	REVISION	DATE	NAME

DATE	00/0000	CUSTOMER	.. US LICENSE
DRAWN	BONINI A.		
CHKD	F.TRAFICANTE	FILE	0000X12
APPD	Ing.MORA	ARCHIVES	SIGRAPH/ET V05.2

Electronic SYSTEMS spa

DESCRIPTION: S
TSR20
TSR20

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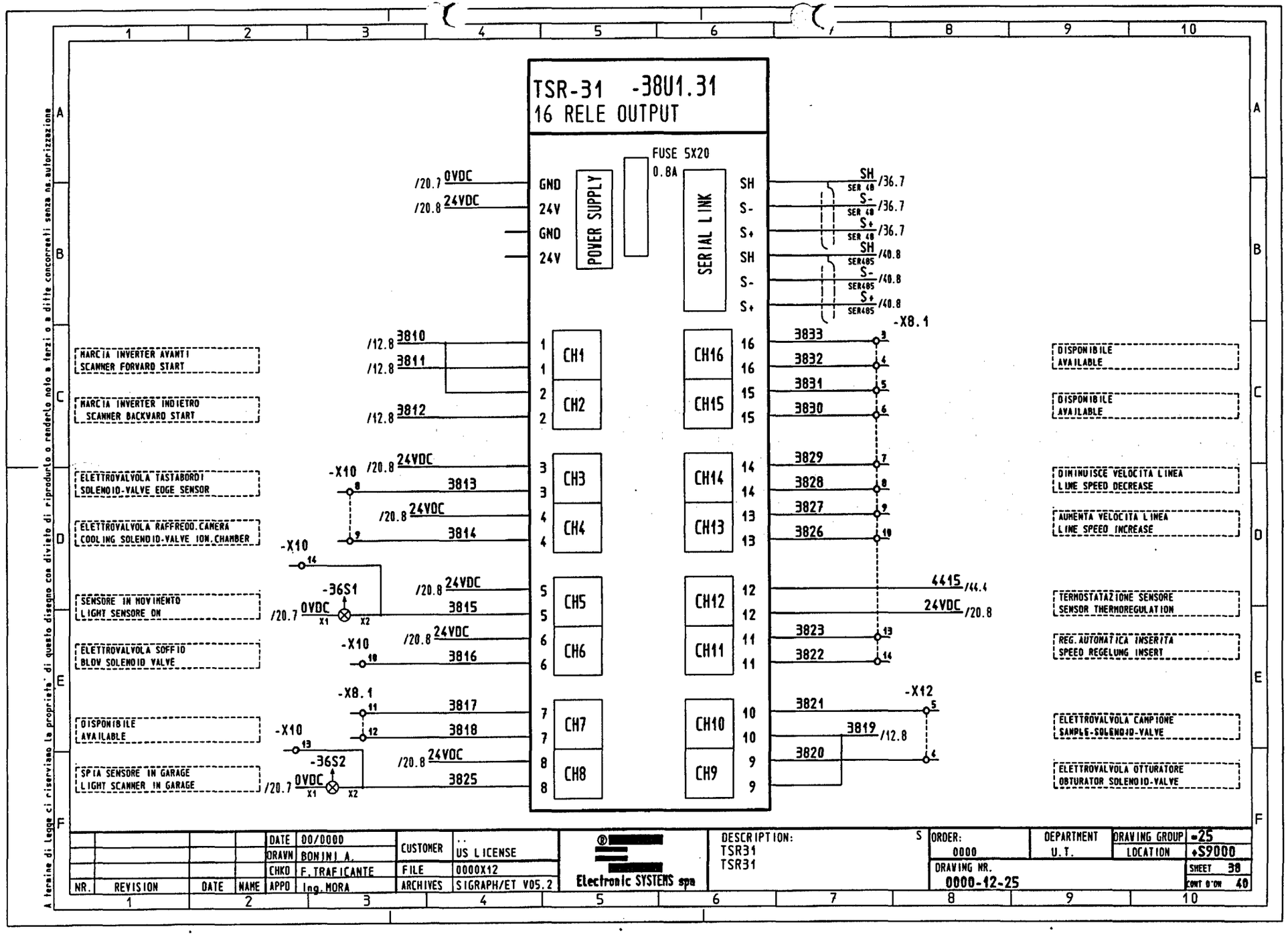
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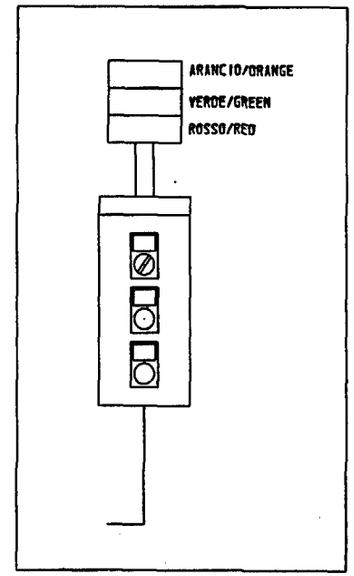
16 RELE OUTPUT
FUSE 5X20
0.8A
POWER SUPPLY
SERIAL LINK
GND
24V
GND
24V
SH
S-
S+
SH
S-
S+
/20.7 0VDC
/20.8 24VDC
SER 4B /36.7
SER485 /40.8
-X8.1
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CH16
CH15
CH14
CH13
CH12
CH11
CH10
CH9
MARCIA INVERTER AVANTI
SCANNER FORVARD START
MARCIA INVERTER INDIETRO
SCANNER BACKVARD START
ELETTROVALVOLA TASTABORDI
SOLENOID-VALVE EDGE SENSOR
ELETTROVALVOLA RAFFREDD.CAMERA
COOLING SOLENOID-VALVE ION.CHAMBER
SENSORE IN MOVIMENTO
LIGHT SENSORE ON
ELETTROVALVOLA SOFFIO
BLOW SOLENOID VALVE
DISPONIBILE
AVAILABLE
SPIA SENSORE IN GARAGE
LIGHT SCANNER IN GARAGE
-36S1
-36S2
-X10
-X12
DISPONIBILE
AVAILABLE
DISPONIBILE
AVAILABLE
DIMINUISCE VELOCITA LINEA
LINE SPEED DECREASE
AUMENTA VELOCITA LINEA
LINE SPEED INCREASE
TERMOSTATAZIONE SENSORE
SENSOR THERMOREGULATION
REG. AUTOMATICA INSERITA
SPEED REGELUNG INSERT
ELETTROVALVOLA CAMPIONE
SAMPLE-SOLENOID-VALVE
ELETTROVALVOLA OTTURATORE
OBTURATOR SOLENOID-VALVE
A terzine di Legge ci riserviamo la proprieta' di questo disegno con divieto di riprodurlo o renderlo noto a terzi o a ditte concorrenti senza ns.autorizzazione
NR. REVISION DATE NAME
DATE 00/0000
DRAWN BONJNJ A.
CHKD F.TRAFICANTE
APPD Ing.MORA
CUSTOMER ..
US LICENSE
FILE 0000X12
ARCHIVES SIGRAPH/ET V05.2
Electronic SYSTEMS spa
DESCRIPTION:
TSR31
TSR31
ORDER: 0000
DEPARTMENT U.T.
DRAWING GROUP -25
LOCATION +S9000
DRAWING NR. 0000-12-25
SHEET 38
CONT D'ON 40

/10.10 2014
/12.8 1215
/12.8 1210
/10.10 2013
/10.10 2012
/10.10 2011
/10.9 2010
/10.6 24VDC
/10.8 0VDC
/10.5 1020
/10.5 1021



-X140 1 2 3 4 5 7 8 9 10 11 12

1215 2014

-20N1 CS970 1 4 2 3

2015 24V

1021 1020 0V 24V 2010 2011 2012 2013 1210

-20S1 -20S2 13 14 -20S3 13 14 X1 X2 /20.4

-20H3 X1 X2 COLONNINA ARANCIO ORANGE

-20H2 X1 X2 VERDE GREEN

-20H1 X1 X2 ROSSA RED

STOP SENSORE
SENSOR STOP

ABILITA APERTURA SORGENTE
SOURCE OPENING ENABLE

SPIA SENSORE IN GARAGE
LIGHT SCANNER IN GARAGE

SENSORE IN MOVIMENTO
LIGHT SENSORE ON

SEGNALAZIONE SORGENTE APERTA
LIGHT SOURCE OPENED

RICHIESTA GARAGE
GARAGE REQUEST

SEGNALAZIONE SORGENTE CHIUSA
LIGHT SOURCE CLOSED

NR.	REVISION	DATE	NAME	APPO

DATE	00/0000	CUSTOMER	..
DRAWN	BONINI A.		US LICENSE
CHKD	F.TRAFICANTE	FILE	0000X12
APPD	Ing.MORA	ARCHIVES	SIGRAPH/ET V05.2

Electronic SYSTEMS spa

DESCRIPTION:
PULSANTIERA LOCALE
LOCAL PUSH BUTTON

$

ORDER: 0000	DEPARTMENT U.T.	DRAWING GROUP	=50
		LOCATION	+SCANNER
DRAWING NR. 0000-12-50		SHEET	20
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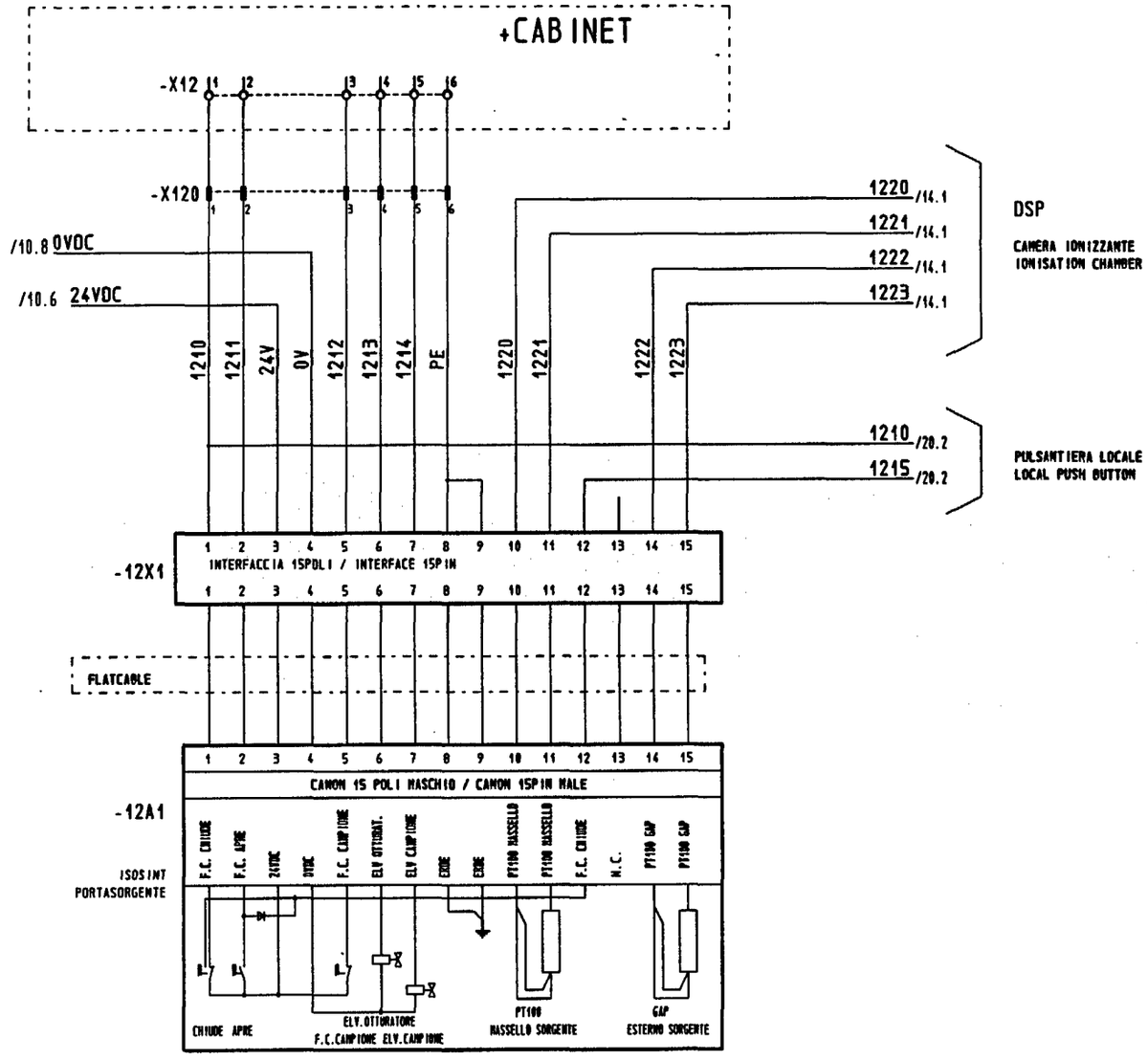


NR.	REVISION	DATE	NAME

DATE	00/0000	CUSTOMER	..
DRAWN	BONINI A.		US LICENSE
CHKD	F.TRAFICANTE	FILE	0000X12
APPD	Ing.MORA	ARCHIVES	SIGRAPH/ET V05.2

Electronic SYSTEMS spa

DESCRIPTION: S
SORGENTE
SOURCE

ORDER: 0000	DEPARTMENT U.T.	DRAWING GROUP	=50
DRAWING NR. 0000-12-50		LOCATION	+SCANNNER
		SHEET	12
		CONT D'ON	20

Enclosure D

Radiation resistance of NBR butadiene-acrilonitrile

Resistenza alle radiazioni dei materiali plastici e degli elastomeri

I grafici, sotto riportati, evidenziano i limiti di impiego dei diversi materiali plastici ed elastomeri, in funzione della dose di radiazioni gamma assorbita: (valori indicativi)

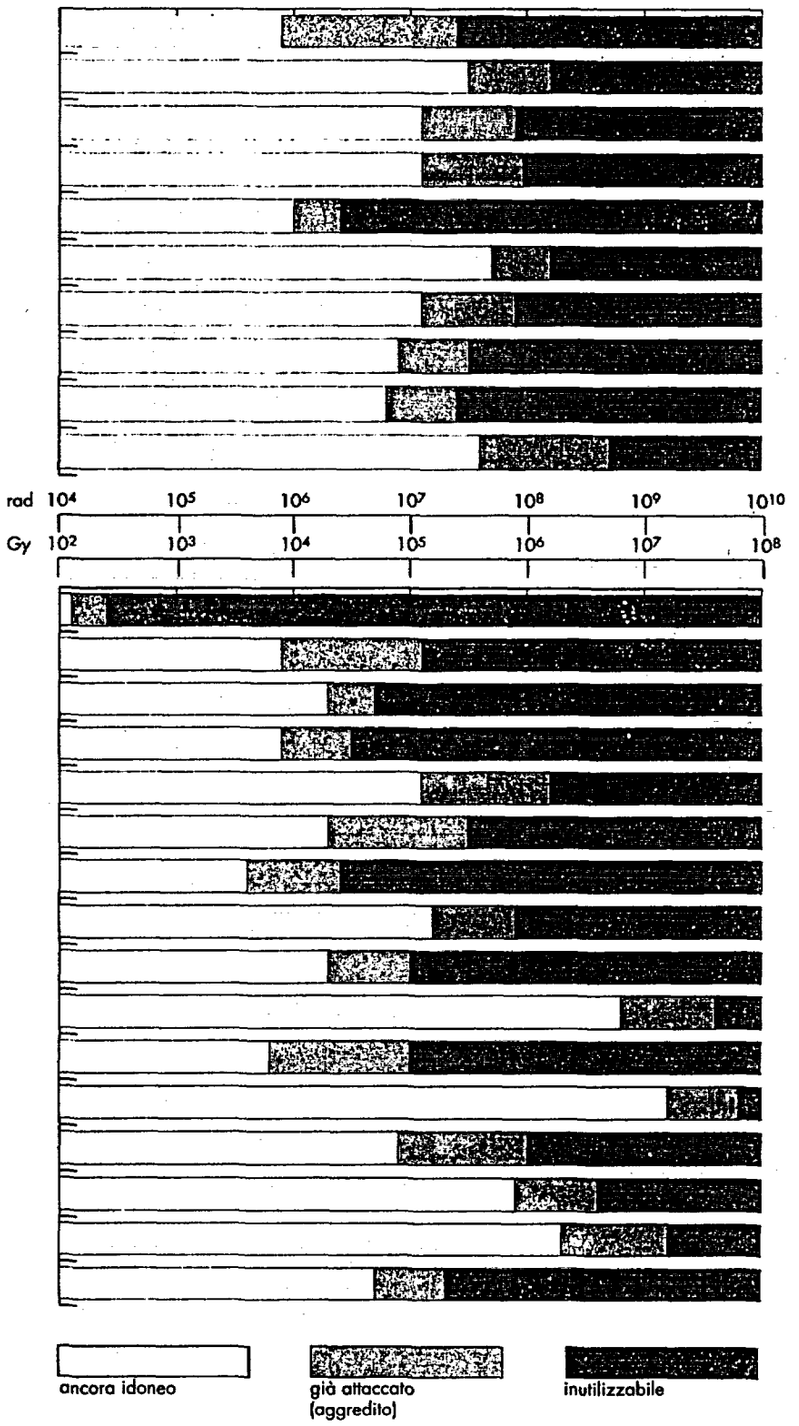
Unità di dose: rad
Nuova unità secondo il SI: gray (Gy) 1 Megarad = $1 \cdot 10^6$rad
1Gy = 1 J/kg = 100 rad 1 Megarad = $1{,}2 \cdot 10^6$r (roentgen)

Elastomeri

NR	Gomma naturale (Isoprene)
SBR	Stirene–butadiene
NBR	Butadiene acrilonitrile
CR	*Cloroprene*
IIR	Isoprene–isobutilene
EPDM	Etilene–propilene
CSM	Polietilene clorosolfonato
MQ	Silicone
FPM	Gomma fluorurata
PUR	Poliuretano

Materiali plastici

PTFE	Politetrafluoroetilene
PCTFE	Policlorotrifluoroetilene
FEP	Fluoro etilene–propilene
POM	Poliacetal
PETP	Polietilene–tereftalato
PC	*Policarbonato*
PA 6	Poliammide 6
PE	Polietilene
PP	Polipropilene
PS	Polistirene
PMMA	Polimetilmetacrilato
EP	Resina epossidica
PVC	Cloruro di polivinile rigido
PVDF	Polifluoruro di vinilidene
PI	Poliimide
PUR	Poliuretano (colato)



Enclosure E

AEA TECHNOLOGY QSA GMBH catalogue copies

Krypton-85

Beta Sources

Low bremsstrahlung, high output sources

Krypton-85 gas is encapsulated in welded titanium capsules with a 0.001" thick titanium window. Each capsule has a copper fill tube at the back, which is sealed by cold welding and then soldering. The inclusion of a welded back cap provides a secondary seal to protect the cold welded copper tube and provide improved mechanical strength.

A protective window shield is included with each source to protect the window during transportation and handling. It also absorbs the beta dose from the source making it easy for the user to handle and load into gauging devices.

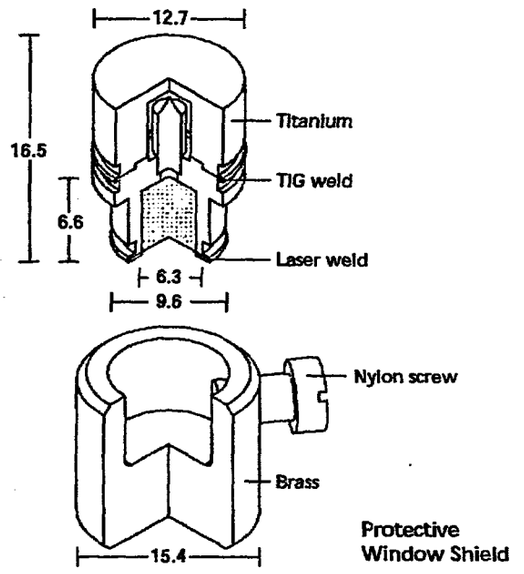
Nominal activity* GBq	mCi	Capsule type	Code
3.7	100	X.1088	KAC.10881
7.4	200	X.1088	KAC.10882
11.1	300	X.1088	KAC.10883
14.8	400	X.1088	KAC.10884

Recommended working life: 10 years

Quality Control
Leak test P

Internal Pressure
The X.1088 capsule is typical of capsules which can be pressurized up to 7 atmospheres.

X.1088



Safety performance testing

ANSI/ISO classification	Model no.
C43232	KAC.D3

United Kingdom: 329 Harwell, Didcot, OX11 0QJ, Tel: +44 1235 431267
United States: 40 North Avenue, Burlington, MA 01803, Tel: 781-272-2000
Germany: GmbH, Gieselweg 1, D-38110 Braunschweig, Tel: 0049 - (0) 5307 - 932113
Hong Kong: Suite 1208 12/F, Central Plaza, 18 Harbour Road, Wanchai, Tel: 00 852 2519 3966

Strontium-90 (+yttrium-90)

Beta Sources

Disc Sources (ceramic)

A strontium-90 compound incorporated on a ceramic insert, doubly encapsulated in stainless steel, capsule X.117.

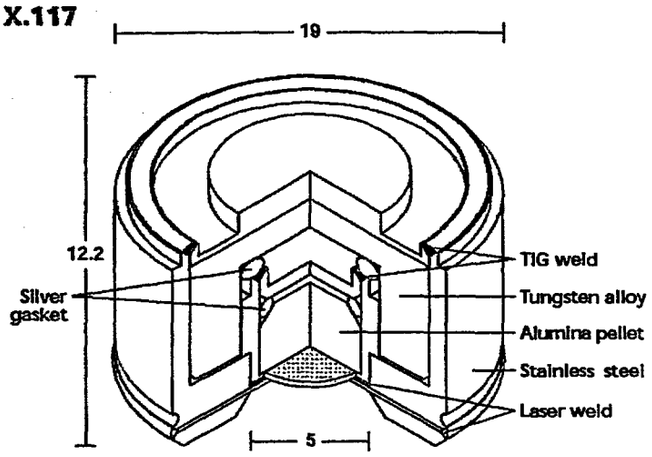
Nominal activity* MBq	mCi	Code
74	2	SIF.1171
370	10	SIF.1174
740	20	SIF.1175
1850	50	SIF.1176
3700	100	SIF.1177

*Tolerance ±25%

Recommended working life: 10 years

Quality Control
Wipe test A
Immersion test L

X.117



Safety performance testing

ANSI/ISO classification	IAEA special form	Model no.
C.64343	GB/171/S-85	SIF.D1

United Kingdom: 329 Harwell, Didcot, OX11 0QJ, Tel: +44 1235 431267
United States: 40 North Avenue, Burlington, MA 01803, Tel: 781-272-2000
Germany: GmbH, Gieselweg 1, D-38110 Braunschweig, Tel: 0049 - (0) 5307 - 932113
Hong Kong: Suite 1208 12/F, Central Plaza, 18 Harbour Road, Wanchai, Tel: 00 852 2519 3966

Source safety

Table 1. Classification of sealed source performance

Test	Class						
	1	2	3	4	5	6	X
Temperature	No test	-40°C (20 min) +80°C (1 h)	-40°C (20 min) +180°C (1 h)	-40°C (20 min) + 400°C (1 h) and thermal shock to 20°C	-40°C (20 min) +600°C (1 h) and thermal shock to 20°C	-40°C (20 min) +800°C (1 h) and thermal shock to 20°C	Special test
External pressure	No test	25kPa absolute to atmospheric	25kPa absolute to 2 MPa absolute	25kPa absolute to 7 MPa absolute	25kPa absolute to 70 MPa absolute	25kPa absolute to 170 MPa absolute	Special test
Impact	No test	50g from 1m or equivalent imparted energy	200g from 1m or equivalent imparted energy	2kg from 1m or equivalent imparted energy	5kg from 1m or equivalent imparted energy	20kg from 1m or equivalent imparted energy	Special test
Vibration	No test	3 times 10 min 25 to 500Hz at $49m/s^2$ ($5g_n$)[1]	3 times 10 min 25 to 50Hz at $49m/s^2$ ($5g_n$)[1] and 50 to 90Hz at 0.635mm amplitude peak to peak and 90 to 500Hz at $96m/s^2$ ($5g_n$)[1]	3 times 30 min 25 to 80Hz at 1.5mm amplitude peak to peak and 80 to 2000Hz at $196m/s^2$ ($20g_n$)[1]	Not used	Not used	Special test
Puncture	No test	1g from 1m or equivalent imparted energy	10g from 1m or equivalent imparted energy	50g from 1m or equivalent imparted energy	300g from 1m or equivalent imparted energy	1kg from 1m or equivalent imparted energy	Special test

1) Acceleration maximum amptitude

Notes to table 1.

1. Details of the testing procedures are given in ISO 2919 and ANSIN543-1977. A further class X can be used where a special test procedure has been adopted.
2. External pressure
   100kPa=1 atmosphere (approximate)
3. Impact test
   The source, positioned on a steel anvil, is struck by a steel hammer of the required weight; the hammer has a flat stricking surface, 25mm diameter, with the edges rounded.
4. Puncture test
   The source, positioned on a hardened steel anvil, is struck by a hardened pin, 6mm long, 3mm diameter, with hemispherical end, fixed to a hammer of the required weight.

Each test can be applied in several degrees of severity which is expressed as a five digit code representing the class numbers which describe the performance for each of the tests. The digits are preceded by the letter C or E indication respectively whether the activity of the source is greater or lesser than a prescribed amount. The limits depend on the toxicity etc of the active components (See ISO 2919) Compliance with the tests is determined by the ability of sealed source to maintain its leak tightness. The leakage tests are defined in ISO 9978 or in appendices to the American and British Standards.

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United States: 40 North Avenue, Burlington, MA 01803, Tel: 781-272-2000
Germany: GmbH, Gieselweg 1, D-38110 Braunschweig, Tel: 0049 - (0) 5307 - 932113
Hong Kong: Suite 1208 12/F, Central Plaza, 18 Harbour Road, Wanchai, Tel: 00 852 2519 3966

Source safety

2. Performance requirements for Typical Uses

Typical uses and minimum performance requirements (ISO 2919) are given in Table 2.

Table 2 Sealed source classification (performance) requirements for typical usage

Sealed source usage		Sealed source class, depending on test				
		Temperature	Pressure	Impact	Vibration	Puncture
Radiography-Industrial	Sealed source	4	3	5	1	5
	Source to be used in device	4	3	3	1	3
Medical	Radiography	3	2	3	1	2
	Gamma teletherapy	5	3	5	2	4
	Brachytherapy (6)[1]	5	3	2	1	1
	Surface applicators[3]	4	3	3	1	2
Gamma gauges (medium and high energy)	Unprotected source	4	3	3	3	3
	Source in device	4	3	2	3	2
Beta gauges and sources for low-energy gamma gauges or x-ray fluorescence analysis[3]		3	3	2	2	2
Oil-well logging		5	6	5	2	2
Portable moisture and density gauge (including hand-held or dolly-transported)		4	3	3	3	3
General neutron source application (excluding reactor startup)		4	3	3	2	3
Calibration source activity >1 MBq		2	2	2	1	2
Gamma irradiation sources	Category I[2] [3], [5]	4	3	3	2	3
	Categories II, III and IV[2]	5	3	4	2	4
Ion generators[3]	Chromatography	3	2	2	1	1
	Static eliminators	2	2	2	2	2
	Smoke directors[3]	3	2	2	2	2

1) Sources of this nature may be subject to severe deformation in use. Manufactures and users may wish to formulate additional or special test procedures.
2) Excluding gas-filled sources.
3) "Source in device" or a "source assembly" may be tested.

The requirements take into account normal usage but do not include exposure to fire, explosion or corrosion. The test specified do not cover all usage situations and where conditions do not match those specified in Table 2 appropriate tests on an individual basis may be required.

United Kingdom: 329 Harwell, Didcot, OX11 0QJ, Tel: +44 1235 431267
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Hong Kong: Suite 1208 12/F, Central Plaza, 18 Harbour Road, Wanchai, Tel: 00 852 2519 3966

Source safety

3. IAEA special form

Sealed sources which have passed the performance tests described in the IAEA Safety Standards Safety Series No. 6 Regulations for the Safe Transport of Radioactive Material 1985 Edition (as amended 1990) may be approved as Special Form Material by a National Competent Authority. Designation as Special Form allows an increase in the activity limits for shipment as a Type A package.

The Special Form Certificate (SFC) numbers are given against approved items in the catalogue.

4. Source Working Life

Recommended Working Life (RWL)

"The Recommended Working Life (RWL) is the recommendation by AEA Technology of the period within which the source should be replaced or a formal assessment made by the designer of its suitability for continued use." The RWL is not a statement of the maximum safe period of use.

The RWL has been assessed on the basis of such factors as, toxicity of the nuclide, total activity, source construction (e.g. capsule design, source insert type, etc.), half life of nuclide, application environments as defined by ISO for the intended application, operational experience, test performance data etc.

The assessment of 'Recommended Working Life' is based on the assumption that the sources are not used in adverse environments. It is the user's responsibility to regularly inspect and test the source in order to assess its suitability for continued use.

Advice should be sought regarding Recommended Working Life for sources that are used in adverse environments or for sources that, having completed the Recommended Working Life, appear satisfactory and may be suitable for an extended period.

United Kingdom: 329 Harwell, Didcot, OX11 0QJ, Tel: +44 1235 431267
United States: 40 North Avenue, Burlington, MA 01803, Tel: 781-272-2000
Germany: GmbH, Gieselweg 1, D-38110 Braunschweig, Tel: 0049 - (0) 5307 - 932113
Hong Kong: Suite 1208 12/F, Central Plaza, 18 Harbour Road, Wanchai, Tel: 00 852 2519 3966

3.1.1 Date

Date of the application : 12th. March 2003

3.1.2 Applicant

ELECTRONIC SYSTEMS SPA
S.S. 229, Km. 12,200
28015 - MOMO - (No) - ITALY -
Tel. ++39-321-928220 / 30 / 80
Fax ++39-321-926855

Electronic SYSTEMS spa is manufacturer of the following systems :
1 Continuous measurements, thickness / basis weight control regulation
2 Plant supervision with integrated systems for acquisitions, elaboration and optimisation of production and process data.
3 Web inspections systems (CCD Cameras)

Persons to be contacted regarding this application:

Mrs. Antonella Giuberchio
Radiation Safety Officer
Customers Care
Mr. Paolo Calciati
Radiation Safety Department
Tel. ++39-0321-928210 /20
Fax ++39-0321-926855

e-mail: sales@electronicsystems.it

Mr.Sergio Chiodini
R&D Department
Tel. ++39-0321-928290
Fax ++39-0321-926855

3.1.3 Device type

It is a THICKNESS MEASURING SYSTEM called " SINTEL 9000 " and the source-housing device is named as follows :

ISOSINT containing

- n. 1 source Krypton 85
- activity 400 mCi - (14,8 GBq) Max.

or

- n. 1 source Strontium 90
- activity 50 mCi - (1,850 GBq) Max.

and it is suitable for measuring and control the thickness of plastic films, paper and rubber sheets.

3.1.4 Model

- The series number for this THICKNESS DEVICE is US1009
- The model number is Sintel 9000
- Regarding the source-holder the model is ISOSINT

3.1.5 Other companies involved

This is the Company in the United State of America involved in this application:

MONTESINO TECHNOLOGIES INC.
1900 Superfine Lane, Suite 7
WILMINGTON DE 19802
U.S.A.

tel. [1] 302-888-2355
fax [1] 302-888-2350

Persons to be contacted regarding this application :

Mr. Peter J. SCHMITT - GENERAL MANAGER
tel. [1] 302-888-2355
fax [1] 302-888-2350

3.1.6 Radioactive source model designation

Will be installed one of the following sources:

- N. 1 (one) source of KRYPTON 85
- activity 400 mCi - (14,8 GBq) Max.
- Registration no. KAC.D3 (KAC.10884)
- ANSI classification C.43232

or

- N. 1 (one) source of STRONTIUM 90
- activity 50 mCi - (1,850 GBq) Max.
- Registration no.SIF.D1 (SIF 1176)
- ANSI classification 64343
- Special form no.GB/171/S-85(Issue 6)/I/2001

3.1.7 Radionuclides and maximum activity

- N. 1 (one) source of KRYPTON 85
- activity of 14,8 GBq (400 mCi) Max.

or

- n. 1 (one) source of Strontium 90
- activity 50 mCi - (1,850 GBq) Max.

General details of the source

<u>KRYPTON 85 source</u>

Type of source	sealed stainless steel capsules with 0.025 mm stainless steel window
Chemical and physical form	gas
β^-	E = 0.672 MeV (99.57%)
Activity of the source	400 mCi - toll. [±10%]
Capsule code	mod. X.1088
Source code	KAC.10884
ANSI Classification	43232
Leak test	**NOT** requested
Half-life of the source	10,73y

STRONTIUM 90 source

Type of source	^{90}Sr compound incorporated on a ceramic insert doubly encapsulated in stainless steel
Chemical and physical form	solid
β^-	E = 2.274 MeV (100%)
Activity of the source	50 mCi - tol. [-10 + 25%]
Capsule code	mod. X.117
Source code	SIF.1176
ANSI Classification	64343
Special form	GB/171/S-85(Issue 6)/I/2001
Leak test	every 6 months
Half-life of the source	28,6y

3.1.8 Leak test frequency

For the source of Kripton 85:
According to the United States Code of Federal Regulations LEAK TEST on solid source is requested, at installation and every six months thereafter.
It is not requested for the Krypton 85 source, as it is a gas.

For. The source of Strontium 90
According to the United States Code of Federal Regulations LEAK TEST on solid source is requested, at installation and every six months thereafter. The wipe test is performed to assure that none of the radioactive material has leaked out of sealed source capsule. This test can be performed by the costumer. buying directly from AEA TECHNOLOGY ENGINEERING SERVICES INC. – Pittsburgh, PA the Kowipe Leak Test Kit.

The Customer according to the instructions for using this Kit, will provide the leak test; Sr-90 radioactive source will not be touched. AEA TECHNOLOGY ENGINEERING SERVICES INC. – Pittsburgh, PA - will do the leak test analysis.

3.1.9 Principal use codes

According to "Appendix C" of your Guide the CODE is - E - (thickness measuring device). The device proposed for use is under a **GENERAL LICENCE**.

3.1.10 Custom device

NOT APPLICABLE

3.1.11 Custom users

NOT APPLICABLE

3.2 SUMMARY DESCRIPTION

The measuring system is suitable to measure the weight / thickness of plastic films, paper and rubber sheets.

It mainly consists of :

- The scanning frame will be installed FIXED on the production line with a measuring head with Krypton 85 source of 400 mCi (14,8 GBq Max.) or Strontium 90 source of 50 mCi (1850 GBq Max.) placed in their proper source-holder
- The range of the thickness to be measured is from 20 to 100 micron for the Kripton 85 source and 0.5 to 5 mm for the Strontium 90 source.
- The scanning frame is controlled by a video measuring unit. The unit is connected via a serial link.
- The source-holder moves during the use (it scans all over the material)

3.2.1 Written description

Figure U.S. 1009 shows the layout of the scanning system SINTEL9000.
Figures U.S.1001/1002/1003 show the side, front and plan views of the measuring head which will be installed on the SINTEL9000 scanner.
The head will accommodate a 85Kr source or Sr 90, assembled into its respective source holders, fig. U.S.1004 and U.S.1004/A.
The above device is a FIXED measuring instrument of material basic weight value [g/m^2]. Basic weight means the value of the material density expressed in [g/m^2].

The device is composed of [fig. U.S.1004 - U.S.1004/A]:

- source
- source-holder
- shutter control group
- sample-holder control group
- shielding unit
- container

The device, coupled to a detector, enables determination of the basic weight value on the basis of absorption variation of the particles emitted by a radioactive source as thickness of the material crossed varies.

The source is shielded and enclosed into a mechanical structure containing the mechanical devices for shutter opening and closing and safety limit switches [figs. U.S.1001/1002/1003].

The correlation between the current signal detected by the detector and the basic weight value of the material placed between the source and the detector is obtained by means of reference materials.

The measurement of basic weight is carried out instantaneously during the production cycle of the material. The source and the detector are mounted respectively on the lower and higher axle of a motorised mechanical structure named "scanning frame" [fig. U.S.1009]. The synchronised movement of the source and detector along the scanning frame enables to get the instantaneous basic weight value along the section of the material concerned.

- ANSI classification of the KRYPTON 85 source is 43232.
- ANSI classification of the strontium 90 source is 64343.

Description of the source-holder Isosint

The source-holder consists of a metallic case within which is fastened the radioactive source. [figs. U.S.1001/1002/1003/1004-1004/A].
The base of the source-holder and the closing plate are made of AVP; the plate is fixed to the base by means of [4] steel screws. The radioactive capsule is kept locked by an O-Ring which prevents any movement and dampers mechanical stresses.

Note: no systematic analysis of the problem was carried out as radiation resistance of the elastomer; the sealing ring is made of acrylonitril butadiene NBR [as shown in the Angst & Pfister catalogue abstract] is approximately one hundred times higher than radiation received by the sealing ring in contact with a 400 mCi 85Kr source and with a 50mCi 90Sr source over ten years [enclosure D].

The main physical characteristics of the AVP alloy [AVP R80 UNI 40SMnPb10 - SAE 1137] used for the source-holder construction are good resistance against mechanical stresses and good shielding level against β^- radiation.

The aluminium closing plate ANTICORODAL [ALLOY] is fixed to the structure by means of [1] steel screw.

To avoid tampering the source-holder is equipped with a safety lock which prevents unauthorised personnel from approaching the source or removing it from the device.

The source-holder is fixed on to the container base by means of [4] steel screws.

To this end, see device iso - doses [enclosure A].

DESCRIPTION OF THE SHUTTER CONTROL GROUP

The shutter control group [fig. U.S.1005/1006] is composed of:

- [no.1] shutter in AVP steel alloy with tungsten insert
- [no.1]steel support pin and [2] ball bearings
- [no.1] pneumatic piston with return spring
- [no.2] safety limit switches
- [no.2] steel reference locks

The shutter is a drawn AVP alloy plate.
It is placed in open position [ON] - that is, exposing the material to the source - by the mechanical movement created by pneumatic piston under pressure. If not pressure exists, the piston return spring moves the shutter to garage conditions - closed position [OFF].

To increase the source shielding level in garage conditions, a tungsten insert [W] has been added to the shutter in the area subject to the beam [fig. U.S.1017/1031]. The beam transit hole in the shutter has been dimensioned considering source actual dimensions to obtain good beam collimation and reduce gamma radiation level.

The conditions of open [ON] or closed [OFF] shutter are detected by [2] safety limit switches. The electric signal from limit switches controls [2] indicator lights; one of these is red [ON] and the other is green [OFF]. In case of malfunction the red [ON] indicator light, the electric control circuit prevents shutter opening by locking the pneumatic piston control solenoid valve [enclosure U.S.1005/06].

The mechanisms described are fixed on to the base of the device and protected with a steel sheet structure [fig. U.S.1023].

DESCRIPTION OF THE SHIELDING UNIT

The shielding unit [fig. U.S.1002/1003/1010] is an AVP cylinder with flat faces and drilled in the middle. It is fixed to the sheet structure by means of [3] steel screws. The shielding unit function is to absorb both not-collimated electrons and gamma radiation produced by the source.

DESCRIPTION OF THE SAMPLE-HOLDER CONTROL GROUP

The device has inside another control group similar to the one mentioned above [fig. U.S.1007/1008], whose function is to move a sample of material with a particular basic weight under the source for calibration operations. The measure sample control group is composed of:

- [no.1] sample-holder arm in aluminium alloy [CORODAL]
- [no.1] support pin and [2] ball bearings
- [no.1] pneumatic piston with return spring
- [no.1] safety limit switches
- [no.1] steel reference lock

The upper measuring head containing the source holder includes two mechanical pneumatically-operated systems which move respectively:

- the shutter to the open position [material exposed to the source beam] or to the closed position [source collimating channel fully closed]
- a material sample of correct weight to calibrate the gauge. Gauge calibration is carried out by the system with no need for head removal or other actions by the operator. Furthermore, calibration is carried out with the shutter closed as the sample holding arm is located exactly between the shutter and the source holder. The calibration frequency is a variable which will be entered in the gauge control software during set-up.

CONTAINER DESCRIPTION

The container is a metallic structure which encloses and further insulates the source-holder.

[2] aluminium alloy [ANTICORODAL] Π-shaped supports are fixed to the internal side of the container base [fig. U.S.1021] by means of [2] steel screws. The supports are fixed to each other by means of [2] vetronite bars.

The vetronite bars are the device retention element to the scanning frame. The slideways indicated in [fig. U.S.1002/1003] enables the device slide into the slots. The device is fixed in position by means of [4] steel screws.

Isodose curves [enclosure A] for the Kripton 85 and Strontium 90 sources, refer to the residual emission of the device source in the conditions of open [ON] and closed shutter [OFF].

DIMENSIONS OF COLLIMATOR AND SHIELDING GROUP

Figure U.S.1002/1003/1004-1004/A show the dimensions of radioactive source housing, primary collimating channel , shutter and shielding unit.

MECHANISMS FOR SHUTTER CLOSING AND OPENING AND SIGNALLING DEVICES

The shutter is the source control device.
It enables beam emission when open [ON], and beam shielding closed [OFF].

The shutter control is electro-pneumatic type [fig. U.S.1001/1002/1003/1005/1006]. In the "garage" position [OFF] the piston return spring keeps the shutter closed and the beam from the radioactive source is inhibited by the shielding.

Composition

- [no.1] shutter in AVP steel alloy with tungsten insert
- [no.1] steel support pin and [2] ball bearings
- [no.1] pneumatic piston with return spring
- [no.2] safety limit switches
- [no.2] steel reference locks

The shutter position is controlled by [2] safety limit switches [fig. U.S.1005/1006]; the limit switch signal is managed by the control electronics of the measuring device, which enable red [ON] and green [OFF]indicator lights.

In case of malfunction of the [ON] and [OFF] indicator lights, the device control system disables the control solenoid valve of the piston preventing shutter opening [enclosure C].
Maintenance is carried out by Electronic SYSTEMS S.p.A. qualified personnel. In case the electric system is deactivated and the device has to be opened, the shutter [ON] and [OFF] position is indicated by a reference plate on the pin [fig. U.S.1005].

The shutter movement is limited by [2] steel reference locks.

Inside the device there is another control group similar to the one mentioned above [fig. U.S.1007/1008], whose function is to move a material sample of particular basic weight under the source for calibration operations. The control group of the measuring sample is composed of:

- [no.1] sample-holder arm in aluminium alloy [CORODAL]
- [no.1] support pin and [2] ball bearings
- [no.1]pneumatic piston with return spring
- [no.1] safety limit switches
- [no.1] steel reference lock

The mechanisms described are fixed to the base of the device and duly enclosed in a steel sheet structure.

3.2.2 Drawings

SHIELDING MATERIALS

U.S.1004 exploded view of the source-holder and shielding group for Sr 90
U.S.1004/A exploded view of the source-holder and shielding group for Kr 85
[enclosure B] list of commercial and mechanical components

SHIELDING THICKNESS

U.S.1004 exploded view of the source-holder and shielding group for Sr 90
U.S.1004/A exploded view of the source-holder and shielding group for Kr 85
U.S.1010 detail of output collimator
U.S.1011 detail of output collimator
U.S.1012 detail of control lever
U.S.1013 detail of block for control lever
U.S.1014 detail of shutter control pin
U.S.1015 detail of chuck
U.S.1016 detail of spacer for chuck
U.S.1017 detail of shutter
U.S.1018 detail of sample-holder
U.S.1019 detail of sample-holder control pin
U.S.1020 detail of lock eccentric
U.S.1021 detail of head support shoulder
U.S.1022 detail of limit switch support
U.S.1023 detail of shielding sheet
U.S.1024 detail of base plate
U.S.1025 detail of connector support
U.S.1026 detail of external base
U.S.1027 detail of lock pin
U.S.1028 detail of insulator
U.S.1029 detail of device lower closing plate
U.S.1030 detail of MYLAR lock ring
U.S.1031 detail of shutter insert
U.S.1032 detail of source-holder closing plate
U.S.1033 detail of source-holder base
U.S.1034 detail of source-holder cover
U.S.1035 detail of eccentric

ON-OFF MECHANISM

U.S.1001 plan of the measuring device
U.S.1002 transversal section of the measuring device
U.S.1003 longitudinal section of the measuring device
U.S.1004 exploded view of the source-holder and shielding group for Sr 90
U.S.1004/A exploded view of the source-holder and shielding group for Kr 85
U.S.1005 plan of shutter control group in open position
U.S.1006 plan of shutter control group in closed position
U.S.1007 plan of sample-holder control group in garage position
U.S.1008 plan of sample-holder control group under measurement

ON-OFF INDICATORS

U.S.1005 plan of shutter control group in open position
[enclosure C] diagram of control and electric system of indicator lights

LABEL LOCATION

No.1 source identification plate is attached to the outer side of the measuring head containing the source holder. By "outer side" we mean the side parallel to the measuring head scanning direction. Identification plate and icon therein warning of the presence of a radioactive source (trefoil) is well visible on scanner side (see fig. U.S.1009).

APPROXIMATE DIMENSIONS

U.S.1001	plan of the measuring device
U.S.1002	transversal section of the measuring device
U.S.1003	longitudinal section of the measuring device
U.S.1004	exploded view of the source-holder and shielding group for Sr 90
U.S.1004/A	exploded view of the source-holder and shielding group for Kr 85

3.3 DETAILS OF CONSTRUCTION AND USE

3.3.1 Conditions of use

work temperature	-10 +70 °C
humidity	max 90 % - rel. humidity
corrosion	use of treated materials; the device hermetic seal limits environmental agents corrosive power
vibrations	the source is encapsulated into a case made of AVP steel alloy.1%Pb and locked in its seat by means of an O-Ring; the possibilities of environmental pollution are negligible even in the case the device is strongly stressed.

USE OF THE DEVICE

The use of measuring device is strictly reserved the machine operators duly trained by ELECTRONIC SYSTEMS S.p.A qualified personnel.

PLACE OF USE

The measuring device will be mounted onto a scanning frame, in an industrial environment, by ELECTRONIC SYSTEMS personnel.

EXPOSURE TO RADIATION BEAM

The device is constructed and assembled in Italy by Electronic SYSTEMS S.p.A. except for the source which is supplied by AEA TECHNOLOGY QSA GMBH. The installation of the source into the device will be carried out by ELECTRONIC SYSTEMS S.p.A. laboratories by qualified personnel.

Hazard of exposure of the operators to the source direct beam is to be excluded since it is impossible to expose any part of the body to the source direct beam. The distance between the source and detector in work position is 12 mm for the Kripton 85 source and 25 mm for the Strontium 90 source.

The control system and boards are placed at due distance from the measuring group. Iso - dose curves enclosed prove that the hazard of exposure of operators to direct beam as well as secondary products is minimum.

One would suppose that the worker assigned to the line intervenes immediately and that such an intervention should take place in the radiation field and also that an incredible and improbable electrical failure and black-out would require operating with the shutter open; in such an event, the maximum dose that the operator concerned could receive to the extremities is strictly related to the time that the hands are exposed to the direct beam.

Taking into account the maximum recorded level of the average radioactive source (230 mRem/h) - referred to a kripton 85 source - 14.8 GBq - and hypothesising exposure of the extremities under the radiating beam for 20', the maximum equivalent dose absorbed would be 76.6 mRem operating in contact with the gauge, with the opening at 12 mm.

Taking into account the maximum recorded level of the average radioactive source (2.5 mSv/h) - referred to a Strontium 90 source - 50 mCi - and hypothesising exposure of the extremities under the radiating beam for 20', the maximum equivalent dose absorbed would be 0.833 mSv/h operating in contact with the gauge, with the opening at 25 mm.

Therefore more importance should be given to the procedure standards for operators in case of line accidents.

- e.g. the maintenance of the radioactive thickness gauge must be undertaken with the radioactive source disconnected and by authorised personnel - Electronic SYSTEMS
- company personnel must report any scanner anomalies to their supervisor
- company personnel must not remove protective systems or warning signs from the scanner without prior authorisation
- company personnel must not undertake operations or manoeuvres which can put the safety of others at risk
- any modifications to the conditions of use which may cause variations in the associated risks, must be agreed upon previously
- unauthorised persons are prohibited from touching or approaching the gauge heads which contain the radioactive source
- workers concerned with scanner activity must report any dangerous conditions that they notice to their supervisor
- during periods when the radioactive sources are not being used, they must be kept in rest conditions, with the shutter closed and the machine switched off

Workers:

- must immediately report to their supervisor, any device failure or security and protection inadequacy, as well as any dangerous conditions which come to their attention
- must not remove or modify the devices or any other means of security, protection, measurement or warning without the due authorisation
- must not undertake any operation or movement for which they are not registered competent and which may compromise protection or security

the above standards must be displayed in places frequently used by all staff members.

The structure and source type have been chosen according to the materials to be analysed; Electronic SYSTEMS S.p.A. forbids any other use differing from the one mentioned above.

The device itself lasts generally 10 years.

3.3.2 Details of construction

3.1.0 at page 4 shows the list of documents attached to the report. Each drawing contains the following information:

- materials used [cod.UNI - type]
- dimensions of construction details
- codes of commercial components used

The radioactive capsule is placed into the source-holder housing [fig. U.S.1004-1004/A) and locked in position by means of an O-Ring.
The clamping of closing plate [fig. U.S.1032] to the source-holder by means of [4] steel screws locks the source in position, preventing any movement due to external mechanical stresses. The O-Ring dampers the mechanical stresses to which the measuring device is subject during scanning.
The source-holder is fixed to the base plate U.S.1024 by means of [4] steel screws.
The closing plate U.S.1032/1033/1034 is fixed on to the upper part of the closing plate by means of [4] steel screws.

To avoid tampering or possible direct contacts of operator with the source during maintenance, the source-holder has been equipped with a safety lock which prevents unauthorised personnel from approaching the source or removing it from the measuring device.

The shielding unit mounted on the device reduces the possibilities of operator direct contact with the main and deflected beam from the source.

The work position of operator is outside dangerous areas; the indicator lights of active [ON] or shielded [OFF] source are mounted directly on the scanning frame. No manoeuvring is required by the operator near the measuring device.

Control boards are placed at due distance from the measuring device.

The conditions of open [ON] or closed [OFF] shutter are detected by [2] safety limit switches. The electric signal from the limit switches controls the [2] red [ON] and green [OFF] indicator lights. In case of red indicator light [ON] malfunction, the electric control circuit prevents shutter opening by locking the pneumatic piston control solenoid valve [enclosure C].

The indicator is always installed close to the scanning frame and it is visible from 30 mt distance (shape as a small traffic-light)

operation	shutter	type of signalling
calibration	open	light : orange + red
measurement	open	light : orange + red
lock	closed	light : green

SUPPLEMENTARY DETAILS ABOUT ENCLOSURE C

Description of the wiring diagrams attached

Shutter open warning lamp [red] malfunction

The red warning lamp wiring diagram is included in Fig. [sheet 20]. When the warning lamp is working properly, output [4] of card CS970 is at +24V. The connection marked [2014] connects pin 4 of card CS970 to input CH15 of card TSR20, see Figs [20 group 50] and [36 group 25].
In case of red warning lamp failure, card CS970 brings output [4], and consequently input CH15 of card TSR20-36U1.20, down to 0 V.
The control software reads card inputs, disables shutter opening and consequently stops measuring. In this case, not only the software forces the shutter to the closed position, but also brings the measuring head back to the rest [garage] position.

Lack-of-material analogical signal management

The gauge management software includes control of special lack-of-material input, namely CH13 of card TRS20-36U1.20. See Fig. [36]. Inputs [13] connect into the proximity sensor which allows to detect if there is any material. Should material break during production or scanning be started without any material, card TSR20 stops shutter opening until normal operating conditions are reset.

3.3.3 Labelling

All the Electronic SYSTEMS devices have [1] warning label with TREFOIL symbol and caution wording attached. It is a screw-attached metal plate that must be maintained in good condition once attached.

Wording on the label :

- the radioisotope
- the activity (in mCi and in MBq)
- Electronic Systems' internal serial number (referred to the radioactive source)
- type of radioactive capsule
- the date of the relative measurement

The source identification plate is attached to the outer side of each measuring head containing the source holder. By "outer side" we mean the side parallel to the measuring head scanning direction.
Identification plate and icon therein warning of the presence of a radioactive source (trefoil) is well visible on the scanner side.

3.3.4 Testing of prototypes

Here below is the list of isodose distribution graphs for the measuring device in the open shutter [ON] - closed shutter [OFF] conditions [enclosure A].

The measuring head moving mechanisms are included into Electronic Systems SpA production standards. Since long, our Company applies the head moving principles shown in Figure U.S.1009. Simple manufacture and component reliability allowed Electronic Systems SpA to considerably increase the scanner autonomy hours, with no need for maintenance or repair. Under normal working conditions long-lasting autonomous operation and total safety in case of accident can be guaranteed.

- The lab prototype of the ISOSINT was submitted to mechanical efficiency tests over a total of 280,000 full shutter open/close and calibration sample location cycles
- Breakage of the source envelope due to mechanical stresses from gauge operation [even anomalous] is to be excluded. In fact, the stresses to which it will be submitted are definitely lower than the ISO test conditions for source [enclosure E]. The OR seal placed between the adapter [aluminium cylinder sized to contain the radioactive pad] and its seat [recess in the source holder where the adapter is to be fitted] increases the mechanical stress absorption capacity under normal working conditions.

STANDARDS ADOPTED GUARANTEE PERFECT SYSTEM EFFICIENCY AND TOTAL OPERATOR SAFETY UNDER NORMAL WORKING CONDITIONS

Several scanners similar to the one in question were built and wear of there moving elements checked after 1500 hours of operation at maximum scanning speed [100% equal to 15 m/min] under normal working conditions.
At test end, no damage or excess wear were found. Sliding guides and drive belt adjustment was carried out once after 250 hours of operation following to the scanner mechanical settling.

The drive system is fully panelled for safety purposes against any direct contact by the operator. Mechanical parts should be cleaned every 1500 hours of uninterrupted operation. The mechanical and electrical checks should be carried out every 5000 hours - 250 hours first time after the installation.

Similar beta gauge devices are manufactured by Electronic SYSTEMS since 8-10 years. (our Company started the production of the Beta gauge devices in 1983).

3.3.5 Quality control

Electronic SYSTEMS is approved to the International Quality Management Systems Standard ISO.9001, which are maintained by Electronic SYSTEMS to all stages of the thickness/weight measuring systems production process, from systems specifications, through design, manufacture, test, delivery and after sales service.

The measurement device is subject to the following controls

testing of shutter control circuit

type of stress	shutter opening - closing
duration	150 h
temperature	climatic room at 60 °
humidity	90 % rel. humidity
stress frequency	20 stresses / min
controls	shutter superficial condition and shielding mechanical wear operation of shutter opening-closing control circuit

Thickness and weight measuring systems are manufactured in accordance with a strict quality assurance program - details can be obtained on demand.

[ENCLOSURE] ISO 9001 QUALITY CERTIFICATE.

3.3.6 Radiation profiles

Here below is the list of diagrams of enclosure A for iso - dose emissions of the source used.

- source emission with shutter open / closed at 5 cm
- source emission with shutter open / closed at 10 cm
- source emission with shutter open / closed at 100 cm

Doses in the direct beam were measured on the same sealed source, in contact with the radiating beam exit window with the help of a lithium fluoride detector positioned in a thin plastic casing of 7 mg/cm2 thickness. The obtained results were equal to 2.5 Sv/h (250 R/h). A KODAK type X-OMAT-MA radiograph has been placed in contact with the beam exit window and exposed for 5 minutes; the beam is in the form of a circle with a diameter of 30 mm.
The Isodose tests have been made inside of an apropriate room of Electronic Systems SpA - located at 28015 Momo (Novara), Strada Statale 229 - Km 12,200 - which, as to the radiologic risk, is classified as "Surveyed Area" in conformity to the law in force (Law Decree No. 230/95) and in accordance with the conditions below:

Measuring instrument:	Ionization chamber VICTOREEN 450 B. Radiation types detected: Beta above 1 MeV, Gamma and X-Rays above 25 keV. Operating range: 0 - 5 R/h. Detector: 200 cc volume air ionization chamber pressurized at 6 Atm. Calibration certificate AGIP RADI of May 1997: correction factor 1.033.
Room features:	Test and research room; total area of about 24 sqm (4.80 x 5 mts); perimeter walls of concrete; wall thickness of 30, 20 and 10 cmts.
Environmental conditions	Room inside temperature of approx. 18 degrees C. Natural background of radiations equal to 0.3 µSv/h max., the day of instrumental detection. After a preliminary check on the absence of other radioactive material and therefore of "exposure" values that could affect the measurement, the head containing the radioactive source has been placed at the center of the room. Evaluation of the natural background of radiations on approx. 30 minutes time.
Operating conditions:	Inside of the suitably equipped bunker, positioning of the radioactive source into the measuring head. Positioning of the measuring head, with closed shutter, onto a metal support frame. Positioning of the measuring head detection chamber onto the counter front. Positioning of the VICTOREEN ionization chamber onto a graduated support frame. Check of irradiation conditions and measurement in good geometry (removal of diffusing objects). Presetting of instrument in "freeze" test conditions (memorization and indication of the maximal value of the dose rate). Evaluation of the exposure intensity at different distances, 5, 10, 100 cm: stay time for each measuring point:10 minutes. All tests and checks have been made sideways and facing the measuring head.

3.3.7 Installation

The installation and maintenance of the measuring device have to be carried out only by Electronic SYSTEMS S.p.A.

The measuring device is mounted fixed on a motorised mechanical structure named "scanning frame" [fig. U.S.1009]. The synchronised movement of source and detector along the scanning frame enables to get the value of instantaneous basic weight along the whole section of the material concerned.

The VETRONITE bars fixed to the device slide into special guides positioned on the scanning frame [fig. U.S.1002/03]. The device is fixed in position by means of [4] steel screws.

Connection cables run into special guides inside the scanning frame.

Plexiglas barriers are available only on request, and they can be installed in front, or around, the scanning frame. They are rarely requested directly from the Customers Radiation Protection Officers, after having carried out the measurement around the gauge and checked the operative conditions around the production line.

Electronic SYSTEMS will be responsible for the following works :

- mechanical installation
- electrical installation (cabling)
- installation of the measuring head containing the radioactive source
- check of safety procedures
- calibration of measurement signals
- calibrations on the product
- training of the machine Operators
- training of the maintenance Operators

3.3.8 Radiological safety instructions

The radiation hazard associated with most gauging devices is relatively low because of the small size of the sources and the fact that the sources are installed in a shielded device so there is limited access to any radiation beam.

Operators need not to be radiation or gauges specialist; person who meet normal job qualifications for work in the facility are suitable. They are expected to operate and maintain the gauges in accordance with the safety procedures established by the organisation and the gauge manufacturer.

Training can normally provided in a few hours to a few days in accordance with the recommendations of the manufacturer or appropriate radiation safety organisation in that Country. The organisation responsible for servicing maintenance and repairs should be chosen in the Country, directly by the end-user of the gauge, and generally is called RPO (Radiation Protection Officer).

Electronic SYSTEMS authorised technicians can be reached at any time for emergency procedures, suggestions and advises.

The RPO (Radiation Protection Officer) or an established Organisation should help the end-user of the gauge for such operations.

The installation of the measuring head (device) is carried out ONLY by Electronic SYSTEMS authorised and qualified personnel during the start-up of the system.

Gauges should be periodically checked, serviced and maintained as recommended by the manufacturer or the competent Authority to assure that they are not damaged and that the "ON-OFF" mechanism and shutter are working properly.
If any repairs has to be done in the vicinity of the measuring system or in the vicinity of the device, the operator must be sure the light is green, which indicates that there is no radiation emission.

Damaged or malfunctioning devices should be removed from service until repairs are completed.

The shutter device mechanism will turn [OFF] automatically during the following operative conditions :

- indication of absence of film (in this case the shutter turns [OFF] automatically and the measuring head returns to the " garage position"
- air pressure absence (the shutter turns [OFF] automatically)
- power supply absence (the shutter turns [OFF] automatically)

Under no circumstances may the devices disassembled or a radioactive source capsule be handled in any way without written permission and authorisation of the Radiation Safety Officer or the specialist of Electronic SYSTEMS.

Such works has to be done ONLY by a specially trained and licensed radiation source worker. No exception are allowed.

Do not attempt any procedure which requires removal of the source-housing from the device without prior approval of the Radiation Protection Officer or the manufacturer of the gauge.

Operators should never attempt to examine or repair a potentially damaged gauge.

The primary concern in an emergency involving a gauge is to restrict access and obtain assistance from the manufacturer or other local experts.

A typical emergency plan for a situation involving a potentially damaged gauge would be as follows:

- Do not approach the gauge
- If a Krypton 85 source (GAS) is involved, turn on all fans and blowers in the area to increase ventilation and fresh air exchange. If possible, vent to the outdoors

- Clear the area and establish a restricted area
- Do not allow persons who may have been contaminated by a ruptured source to leave the facility
- Record the names of all persons. No one shall leave the restricted not-contaminated area until checked and released by the Radiation Protection Officer
- Contact the RPO (Radiation Protection Officer), and the gauge manufacturer or other qualified expert for assistance
- If a device were missing, the first step would be thorough search of the site using a very sensitive radiation detector. If this is unsuccessful the possibility of burglary must be considered and it may necessary to involve the police, possibly followed by direct appeals to the public.

For the source 90Sr the following steps shall be taken:

- The contaminated source must immediately be contained in a plastic bag or any other suitable sealable container
- Close all the windows and turn off all the fans and air conditioners in the immediate area.
- Access to the contaminated area must be prohibited until the Radiation Protection Officer has assessed the accident, established the area and prepared a decontamination plan.
- Injured persons shall be checked for contamination from the RPO who will arrange the necessary medical attention.
- If a device were missing, the first step would be thorough search of the site using a very sensitive radiation detector. If this is unsuccessful the possibility of burglary must be considered and it may necessary to involve the police, possibly followed by direct appeals to the public.

Should the source be removed for repair or disposal, shipping must be carried out in compliance with the International Standards in agreement with the end-user.
The original packaging we supply can be used for reshipment.

The Customer will inform Electronic SYSTEMS for the disposal of gauge containing radioactive source. Electronic SYSTEMS, observing the standards and rules of the Competent Authority in Italy, will dispose the radioactive source.

Gauges will be shipped in accordance with all applicable D.O.T. rules, regulations and procedures.

An engagement letter for re-take the sources back to Electronic SYSTEMS is enclosed.

With the use of scanners bearing a radioactive source, the risk of internal contamination can be excluded as they deal with radioisotopes known as "sealed or contained sources" (however, on the other hand, a dosimeter "badge" would not be capable to reveal this type of radiation).

Instead, an evaluation of external radiation shows that when the device is mounted on the scanner and the scanner is placed on the production line, the absolute minimum distance allowed between the radiation source and the operator is at least 70 cm (beside the scanner).

In normal working conditions (front line) an operator stands at least 100 cm from the radiation source.

Using iso-dose curves developed by Electronic SYSTEMS, it has been revealed that the maximum sustainable dose is:

- at 100 cm, with gap = 12 mm and the shutter open is 1.5μSv/h (referred to a 85kR source - 14.8 GBq); with the shutter closed there is no increase whatsoever in the level of natural base Radiation.
- In the unlikely hypothesis that an operator is stationed 70 cm from the radiation source for 30 minutes a day, and for 250 working days a year, there is the risk of absorbing an annual dose equal to 0.19 mSv from the source.
- at 100 cm, with gap = 25 mm and the shutter open. is 5.5 μSv/h (referred to a 90Sr source - 1,850 GBq); with the shutter closed there is no increase whatsoever in the level of natural base Radiation.

- In the unlikely hypothesis that an operator is stationed 100 cm from the radiation source for 30 minutes a day, and for 250 working days a year, there is the risk of absorbing an annual dose equal to 687.5 μSv from the source.

This value corresponds to 1/5 of the amount indicated as maximum value for the population and less than 10% of the value for exposed workers expressed in the document :

ICRP PUBLICATION 60
1990 RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION
Page 72, parag. S25, Table S4 - recommended dose limits.

Table S-4 – Recommended dose limits

Application	*Dose Limits Occupational*	*Public*
Effective dose	*20 mSv per year averaged over defined period of 5 years*	*1 mSv in a year*
Annual equivalent dose in		
the lens of the eye	*150 mSv*	*15 mSv*
the skin	*500 mSv*	*50 mSv*
the hands and feet	*500 mSv*	—

The limits apply to the sum of the relevant doses from external exposure.

Consequently, under these operating conditions the use of a personal dosimeter is not significant. In fact, the document ICRP 60, par. 7.5.1., specifically reads:

(266) In occupational exposure, it is usually feasible to monitor the dose received by individuals. Often However, there is no clear-cut line between workers closely involved with radiation sources and others who are exposed only casually, either because they are rarely present in the relevant locations or because they are remote and receive only trivial doses. To avoid a wasteful use of resources in monitoring and record keeping, it is necessary to identify groups of worker for whom individual monitoring is needed.

(267) The decision to provide individual monitoring for a group of workers depends on many factors. Some of these are technical and others are concerned more with industrial relations.

3.3.9 Documentation accompanying the device

Gauge containing radioactive source will contain a copy of the following :

- (for the Kripton 85 source):copy of the Test Report providing the date and results of the most recent test (Krypton emanation test P = the source is held under reduced pressure for 24 hours. The contents of the chamber is analyzed for Krypton by scintillation counting. The test is repeated after at least 7 days).
  Sources are tested from AEA TECHNOLOGY before despatch in accordance with BSI/ISO standards
- (for the Strontium 90 source): copy of the certificate providing the date and results of the most recent leak test
- (for the Strontium 90 source): Sources are leak tested from AEA TECHNOLOGY before despatch in accordance with ISO standards
- (for the Strontium 90 source): Special Form before despatch.

- (For all sources) reports of the radiation surveys performed at the time of internal test before the shipment of the gauges (Calibration Certificate – Quality Control)

Transportation documents are the following:

Shipper's declaration for dangerous goods
Dangerous goods acceptance check sheet
Pro-forma invoice
Radioactive Source Test Report
Special Form (for Strontium - 90 only)
Emergency Response Number (24 hours service)
Gauge Operation and Maintenance Manual (shipped with the thickness measuring system)

Special Form for the Strontium - 90 (Sr-90) is issued by the following Authority :

Secretary for State of Transport
United Kingdom Competent Authority
for the Transport of Radioactive Material

The Special Form, according to AEA TECHNOLOGY confirmation, meets the requirements of the U.S. Code of Federal Register. (Special Form Certificate N. GB/171/S-85)

Type A Package

The type of package used for radioactive materials is "TYPE A Package" designed to retain the integrity of containment and shielding under the normal conditions of transport.
Regulations and Standards of IATA, International Air Transport Association Resolution n. 618, are conforming to the IAEA International Atomic Energy Agency which develops recommended procedures for the safe transport of radioactive materials.
Standards adopted by the Italian Authorities, concerning radioactive material packaging, meet the "*Regulations for the Safe Transport of Radioactive Material 1985 Edition (As Amended 1990) Safety Series n. 6, IAEA, Vienna 1990*"

Package "Type A" used by Electronic SYSTEMS meets the requirements described at §173.410 and §173.412 of the Code of Federal regulations – Transportation – issue 49 parts 100 to 185 – revised as October 1, 1996. - So, packaging and shipment will be in accordance with DOT rules and regulations.

3.3.10 Servicing

Services offered to the Customers are generally the following :

- Radiation survey at the time of installation (included in the Sales Contract)
- Repairs : free of charge during the guarantee period
- Source replacement : if requested and at Customers' charge
- Relocation : Electronic SYSTEMS 'Personnel on Customers' demand
- Training of Operators : this service is always included in any Sales Contract

Electronic SYSTEMS, if requested can carry out these operations at Customers' charge.

Electronic SYSTEMS will be responsible for the maintenance of the gauges, especially when a failure occurs on the source-holder containing the radioactive source.
Small and ordinary maintenance will be carried out by the Customer's Personnel, after a proper training on site.
Opening or repairing of source-holder will be performed by Electronic SYSTEMS, manufacturer of the gauge.

3.3.11 Leak-testing

Not requested for the Krypton 85 source.

For the Strontium 90 source, This operation will be carried out, every 6 months directly from the Customer, who will buy from **AEA TECHNOLOGY QSA – 40 North Avenue Burlingham Massachusetts 01803 (Tel. – 0781-272 2000 - Fax 0781-229 2279)** – the KOWIPE leak - test kit.

According to the instruction for using this kit, the costumer will provide the leak test.

90Sr radioactive source will not be touched.

AEA TECHNOLOGY QSA – 40 North Avenue Burlingham Massachusetts 01803 (Tel. – 0781-272 2000 - Fax 0781-229 2279) – will do the leak test analysis.

3.3.12 Safety analysis

Appendix "D" has been carefully analysed including the main safety features of the device, such as :

- Source-holder
- ON-OFF shutter mechanism
- Shielding
- ON-OFF mechanical indicators inside the device
- ON-OFF electrical indicators (installed on the scanning frame - shape as a traffic-light)
- Safety lock for the source-holder

Furthermore, the following International Standards are considered :

IEC 45-16	Nuclear Equipment Construction standards to guarantee protection of Personnel against ionising radiation
IEC 45-17	Standards for electrical measuring equipment using radioactive sources

As requested, the description of the device, mentioned in this Application, is in accordance with NRC Rules and Regulations, paragraphs 31.5 and 32.51 (a)(2).

Messrs.

Subject : Re-take of sealed source / Letter of Commitment

We hereby confirm that Electronic SYSTEMS commit themselves to re-take the following source :

N. 1 (one) source	of KRYPTON 85	(Kr85)	14,8 GBq
Or			
N. 1 (one) source	of Strontium 90	(Sr90)	1,850 GBq

that we are going to deliver you, on behalf and in according to the
Contract N. _____ dated _____ we received from _____
Working N. _____

It is however to be understood that all costs involved in this re-take and final disposal, will be at your charge charge.

Yours Sincerely

Electronic SYSTEMS spa

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and SQS
hereby certify that the organization

Electronic Systems S.p.A.
IT-28015 Momo (NO)

Certified area

Whole company

Field of activity

Research and development of measurement tools, control and automation systems
Design and manufacturing of measurement tools, control and automation systems

has implemented and maintains a

Management System
which fulfils the requirements of the following standard

ISO 9001:2000

Scope No: 19

Issued on: 20.10.2001
Validity date: 19.10.2004

Registration Number: ***20225-01***

Dr. Fabio Roversi
President of IQNet

Theodor Zahner
Managing Director SQS

Members of IQNet (registered association):

AENOR *Spain* AIB-Vinçotte International *Belgium* APCER *Portugal* CISQ *Italy* CQS *Czech Republic* DQS *Germany* DS *Denmark* ELOT *Greece* FCAV *Brazil* FONDONORMA *Venezuela* HKQAA *Hong Kong* ICONTEC *Colombia* IRAM *Argentina* JQA *Japan* KEMA *Netherlands* KFQ *Korea* MSZT *Hungary* NCS *Norway* NSAI *Ireland* ÖQS *Austria* PCBC *Poland* PSB *Singapore* SFS *Finland* SII *Israel* SIQ *Slovenia* SQS *Switzerland*

IQNet is represented in the USA by the following members: AIB Vinçotte International, CISQ, DQS, KEMA and NSAI

The Swiss Association for Quality and Management Systems

SQS herewith certifies that the company named below has an appropriate management system which meets the requirements of the international standard for quality management and quality assurance (ISO 9001) and issues the company

Electronic SYSTEMS spa

ELECTRONIC MEASURING SYSTEMS

IT-28015 Momo (NO)

the

SQS Certificate ISO 9001:2000

on the basis of the audit result

Certified area

Whole Company

Field of activity

Research and development of measurement tools, control and automation systems
Design and manufacturing of measurement tools, control and automation systems

CH-3052 Zollikofen, 20 October 2001
This SQS Certificate is valid up to and including 19 October 2004
Scope number 19
Registration number 20225-01

Managing Director SQS — T. Zahner

President SQS — Prof. Dr. H. D. Seghezzi

SCES 002. 023

Member of IQNet

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SIT SERVIZIO DI TARATURA IN ITALIA
Calibration Service in Italy

Il SIT è uno dei firmatari dell'Accordo Multilaterale della European cooperation for the Accreditation (EA) per il mutuo riconoscimento dei certificati di taratura

SIT is one of the signatories to the Multilateral Agreement of EA for the mutual recognition of calibration certificates.

CENTRO DI TARATURA N. 65/R
Calibration Centre

istituito da
established by
ENEA

COMECER Srl
Via Emilia Ponente, 390
48014 Castel Bolognese (RA) - Italy
Tel. ++39/0546/656375 - Fax ++39/0546/656353
E-mail: comecer@comecer.com - http://www.comecer.com

CERTIFICATO DI TARATURA N. 2159/S/06/01
Certificate of Calibration No.

- Data di emissione *date of issue*	28.06.2001
- destinatario *addressee*	FRANCO CIOCE
- richiesta *application*	
- in data *date*	
Si riferisce a *referring to*	
- oggetto *item*	RADIAMETRO
- costruttore *manufacturer*	VICTOREEN
- modello *model*	450-SI
- matricola *serial number*	1370
- data della misure *date of measurements*	28.06.2001
- registro di laboratorio *laboratory reference*	

Il presente certificato di taratura è rilasciato in base all'accreditamento SIT N. 65/R concesso dall'Istituto Metrologico Primario competente in attuazione della legge n. 273/1991 che ha istituito il Sistema Nazionale di Taratura (SNT). Tale Istituto, nei campi di misura ed entro le incertezze precisate nell'accreditamento stesso, garantisce:
- il mantenimento della riferibilità degli apparecchi usati dal Centro a campioni nazionali delle unità del Sistema Internazionale della Unità (SI);
- la correttezza metrologica delle procedure di misure adottate dal Centro.

This certificate of calibration is issued in accordance with the accreditation SIT No. 65/R guaranteed by the relevant Primary Metrological Institute in enforcement of the law No. 273/1991 which has established the National Calibration System. The Institute, for the measurement ranges and within the uncertainties stated in the approval, guarantees:
- the maintenance of the traceability of the apparatus used by the Centre to national standards of the International System of Units (SI);
- the metrological correctness of the measurement procedures adopted by the Centre.

I risultati di misura riportati nel presente Certificato sono stati ottenuti applicando le procedure riportate alla pagina seguente insieme ai campioni di prima linea che iniziano la catena di riferibilità e ai rispettivi certificati validi di taratura.

The measurement results reported in this Certificate were obtained following the procedures reported in the following page together with the first line standards which begin the traceability chain and their valid certificates of calibration.

Le incertezze di misura dichiarate in questo documento sono espresse come due volte lo scarto tipo corrispondente, nel caso di distribuzione normale, a un livello di confidenza di circa 95%).

The measurement uncertainties stated in this document are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to a confidence level of about 95%).

p. Il Responsabile del Centro
Head of the Centre
Fabrizio Briccoli

comecer 2.jpg (1232x1649x256 jpeg)

SIT SERVIZIO DI TARATURA IN ITALIA
Calibration Service in Italy

Centro di Taratura
Calibration Centre
SIT n. 65 / R COMECER srl

Istituito da
Established by
ENEA

Certificato N. 2159/S/06/01 Pagina 2 di 2

Strumento tipo: VICTOREEN 450-SI Matricola N. : 1370

Rivelatore tipo: Matricola N. :

Codice fascio (1)	En. media radiazione riferimento (keV)	Valore di riferimento KERMA (mGy) (2)	Valore di riferimento RATEO KERMA (mGy/h) (2)	Fattore di taratura F Valore riferimento / Valore lettura	Unità di misura Lettura	Fondo scala	Fattore di taratura adimensionale	Incertezza complessiva percentuale su F (3)	Codice Procedura (4)
Am-241	60	-	-8.61D-03	9.45D-04	uSv/h		.94	7.0	4
Cs-137	660	-	5.07D-02	9.11D-04	uSv/h		.91	4.6	4
Co-60	1250	-	1.66D-01	9.17D-04	uSv/h		.92	3.5	4

I risultati di misura riportati nel presente Certicato sono stati ottenuti applicando le procedure indicate in colonna (4)
The measurement results reported in this Certificate were obtained following procedures reported in column (4)

La catena di riferibilità ha inizio dai campioni di prima linea N. A3/193; A4/218; PTW-LS01/1349; PTW-B23344/713
Traceability is trought first line standards N.

muniti di certificati validi di taratura rispettivamente N. 55/PL; 79/PL; 80/SL; 68/PL
validated by certificates of calibration N.

Legenda

(1) I codici e le caratteristiche dei fasci di riferimento sono riportati in allegato
(2) Grandezza di riferimento : kerma in aria. Condizioni ambientali di riferimento . $T_0 = 293.15$ K $P_0 = 101.3$ kPa
(3) Incertezza valutata ad un livello di confidenza del 95 %
NOTE : *Il fattore di taratura F del presente certificato può essere convertito in termini delle grandezze H*(10) e H'(0.07,0) moltiplicandolo per i rispettivi fattori di conversione ISO riportati nella tabella allegata.*

Il Responsabile delle misure
Fabrizio Briccoli

CASTEL

Copy of the requested operating and safety instructions

Momo, ...

Messrs.

Company:	
Address:	
ZIP code-City	
Attention:	

Radionuclide Characteristics

	**Radioactive Material**	
installed radionuclides		**Kr- 85 (Kripton – gas)**
amount of radioactivity at a specified reference date	**..... mCi (..... MBq) on ..... See test report)**	**..... mCi (..... MBq) on ..... See test report)**
source identification code		
manufacturer	**AEA TECHNOLOGY**	**AEA TECHNOLOGY**

Physical monitoring of population and labor protection against ionogenic radiation.

BASIC WEIGHT GAUGE
model ..... serial no. .....

Definitions ***(of general interest and with reference to administrative and technical regulations)***

1) ***ionogenic radiation***: radiation consisting of photons or particles capable of determining ion formation either directly or indirectly.
2) ***activity (A)***: dN quotient divided by dt, where dN is the number of spontaneous nuclear transformations of a radionuclide that occur during the time dt.
3) ***becquerel (Bq)*** : special name referring to the S.I. unit of measure for activity.

1 Bq or $1s^{-1}$. (*one disintegration per second*)

Conversion factors to be used when activity is expressed in Curie (Ci) are as follows:

1 Ci = 3.7×10^{10} Bq (exactly)
1 Bq = 2.7027×10^{-11} Ci

4) ***dose absorbed (D)*** : dE quotient divided by dm, where dE is average energy released by ionogenic radiation into the matter in a volumetric element, and dm is the mass of the matter contained into the volumetric element.
5) ***gray (Gy)*** : special name referring to the S.I. unit of measure for the dose absorbed

1 Gy = 1 Joule x Kg^{-1}

Conversion factors to be used when the dose absorbed is expressed in rad are as follows:

1 rad = 10^{-2} Gy
1 Gy = 100 rad

6) ***radiation source*** : apparatus that generates ionogenic radiation (*radiogenic machine*) or radioactive material, even if enclosed into equipment, or devices in general whose activity, radionuclide concentration, or radiation emission cannot be neglected in view of radio-protection.
7) ***sealed source*** : source composed of radioactive materials firmly integrated into solid and actually inactive matters, or sealed into an inactive container offering sufficient resistance to avoid, under normal conditions of use, leakage of radioactive materials exceeding the values established by the applicable proper technical norms.
8) ***exposure*** : all exposure types, both internal and external, of people to ionogenic radiation.
9) ***sievert*** : special name referring to the S.I unit of measure for the dose. If change factor product is 1:

$$1\ Sv = 1\ Joule \times Kg^{-1}$$

When the equivalent dose is expressed in rem, the following relations apply:

$$1\ rem = 10^{-2}\ Sv$$
$$1\ Sv = 100\ rem$$

10) ***dose limits*** : limits established for the doses in case of exposure of exposed workers, apprentices, students and persons of the public.
Dose limits apply to the sum of the doses received following external exposure over the period considered and doses deriving from introduction of radionuclides in the same period.

Characteristics of the radiation source and source-holder; operating principle.

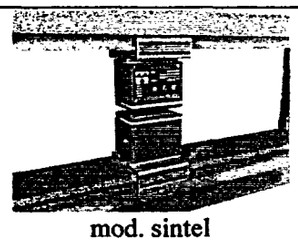
Electronic SYSTEMS S.p.A. always and exclusively uses sealed-type radiation sources in its measure systems.
In its measure systems, Electronic SYSTEMS S.p.A. normally uses sources that can be manufactured by:

- AEA TECHNOLOGY

Main features are shown in the table below:

AEA Technology	
Radionuclide	**Kr 85**
Radiation source type	KAC 1088...
Chemical and physical form	gas
ISO rating of the sealing	C.43232

AEA Technology	
Radionuclide	**Sr 90**
Radiation source type	X.117
Chemical and physical form	solid
ISO rating of the sealing	C.64343


mod. sintel

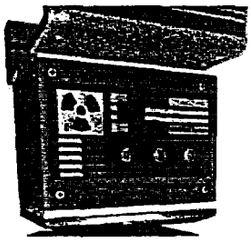

twin scan

The supplier is requested to supply all radiation sources complete with their respective sealing certificates (**TEST-REPORT**). The sealing certificate will be handed over upon delivery of the source at the installation site.
Instant stop buttons that immediately halt measure head movement and cause the shutter to close, are located on both the scanner desk and warning light column.

Electronic SYSTEMS skilled technicians carefully place the radiation sources into their respective shielded source-holders, each of which is composed of the following elements:

outer structure	• aluminum container • lead source-holder and shutter	
control systems	• open shutter RLS • closed shutter RLS	
with ON / OFF type work positions, such as	• shutter open (measure)	
	• shutter closed (garage)	
positions are shown on the source-holder and on the line side by means of graphic indications and/or color warning lamps	• red (the shutter is open)	
	• green (the shutter is closed)	

Should the "open shutter" red warning lamp fail, the system automatically performs the following safety procedures:



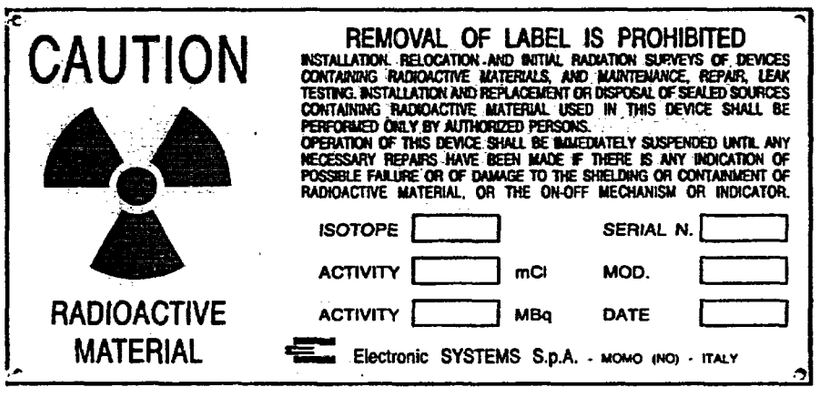
- immediate shutter closure
- activation of the "closed shutter" indication (green lamp "ON")
- alarm warning through a screen prompt

Source-holder shutter operation is enabled when the electrical control signal and compressed air supply are both present.

When the *open shutter* solenoid valve is energized, compressed air is injected into the cylinder and the *shutter* moves to the *"open"* position.
When the solenoid control valve is de-energized, a return spring brings the *shutter* back to the *"closed"* position.

Should any fault occur in the power circuits and/or air supply lines, the source-holder *shutter* automatically returns to the *"closed"* position.

<u>The following information is always marked on the source-holder:</u>



- ionogenic radiation danger sign;
- type of the radionuclide installed, its activity and reference date;
- E.S. construction data;
- list of forbidden actions.

See documentation attached.

Precautionary measures to be taken to prevent undue exposure

1. thickness gauge maintenance shall be carried out with the radiation source disconnected and by personnel holding a radiological hazard certification;
2. the personnel of your Company shall inform the person in charge about whatever fault that might occur to the scanner;
3. the personnel of your Company shall not remove the protection and warning systems from the scanner without previous authorization;
4. the personnel of your Company shall not carry out operations or maneuvers that may affect the safety of bystanders;
5. the personnel of your Company shall scrupulously comply with protection and safety standards;
6. any changes in the conditions of use that involve a change of the associated risk shall be agreed upon with the Qualified Engineer in charge beforehand;
7. it is forbidden to unauthorized people to touch or approach the measure heads containing the radioactive sources;
8. workers involved in this activity shall inform their Manager or person in charge of any dangerous conditions that they may come to know;
9. when the scanner is not in use, it shall be kept inoperative (garage) with the shutter closed.
10. the workers shall:
    - immediately inform their Employer, Manager or person in charge of any inadequacies in the safety and protection means as well as of any other dangerous conditions that they may come to know;
    - not remove nor change the safety, warning, protection and measure devices and means without authorization;
    - never carry our operations or maneuvers on their own initiative that do not pertain to them or that may impair protection and safety;
11. the above mentioned norms shall be made available for consultation in the places usually attended by the workers.

Precautions

We manufacture our source-holder units also with the precise intent of protecting the workers and population against ionogenic radiation hazard.

Radiancy values reached (with the shutter closed or open) are such to allow the workers to be classified as **"not exposed to ionogenic radiation hazard"** under normal working conditions, without detriment to the presence of other radiation sources already installed and used (smoke detectors, lightning rods, ECD devices, RX tubes, etc.).

However, we deem it opportune to point out the following:

- subordinate workers or equivalent (contractors, apprentices, students) must be forbidden from handling the detector source-holder assembly and all actions on the source-holder, if required, must be carried out exclusively by Electronic SYSTEMS technicians;

- barriers made of suitable material (metal plate, etc.) must be installed to create a physical limit (**no trespassing**) during system operation;
- such barriers will also constitute an **appropriate physical boundary to the Zone under control and/or surveillance**;
- contact your Qualified Engineer in charge for all administrative requirements;
- contact us directly at our offices for all operating requirement in the person of :

A. Giuberchio tel. +39 - 0321 - 928210; 928220; 928230 - fax +39 - 0321 - 926855
e-mail: sales@electronicsystems.it

Electronic SYSTEMS will be glad to provide any further explanation you may require.

Electronic SYSTEMS spa

ELECTRONIC MEASURING SYSTEMS

P15 PROCEDURE FOR THE MANIPULATION, HANDLING, LOADING-UNLOADING, RECEIVING, PACKAGING, TESTING, TRANSFER AND CHARGING OF RADIOACTIVE MATERIAL

Compiled by:	**signature** _____	**date 05/08/02**
Approved by	**signature** _____	**date 05/08/02**
Issued by	**signature** _____	**date 05/08/02**

LIST OF ANNEXES/DOCUMENT FILING

Table of Contents

1. PURPOSE AND FIELD OF APPLICATION

This procedure describes how our company manages radioactive sources.

2. DEFINITIONS

Source Holder	A source holder is a cylinder-shaped metal container (lead and/or steel) which houses a radioactive source.	
Transmitter Module	The transmitter module contains: (1) the source holder, (2) the shutter used to screen the ionising radiation when the measuring instrument is in the parking or alarm phase, (3) the shutter's control actuators, (4) the central unit interface connector, (5) the electrical and compressed-air cables, (6) the shutter position's red/green mechanical light: **Red = shutter open; Green = shutter closed.**	
Glove Box	An extraction hood inside which radioactive material can be manipulated in total safety.	

Monitored Zone	A Monitored Zone is a work environment where one of the relevant limits established for the public may be exceeded during the solar year and which is not a Controlled Zone. Currently, it corresponds to the room where the access door to the Bunker is located. The Monitored Zone may be used to carry out tests involving the measuring head containing radioactive material.	
Controlled Zone	A work environment subjected to special regulations to ensure protection against ionising radiation. Currently, it corresponds to the Bunker, where the radioactive sources are stored before selling, packaging, testing etc.	
Radioactive Source	Radiation source: radioactive material, also contained in apparatuses or devices in general, whose activity or radionuclide concentration or radiation emission cannot be neglected in order to ensure radioprotection.	
AEA Container	This term refers to the enclosure which contains the radioactive sources purchased from AEA TECHNOLOGY	

Transport Packaging	The enclosure in which the transmitter module charged with the radioactive source and the receiver module are placed for transportation **(authorised carrier)**. For IAEA and ADR purposes, this packaging is defined as type "A" and has undergone specific resistance tests.	
SN or Serial Number	It is the number assigned by Electronic Systems to a radioactive source and it is associated with the measuring system's registration number/work order. The same measuring system may be associated with more than one source and therefore with more than one SN. The SN must be written also on the transmitter module's plate.	

3. ACTIVITIES

3.1 PRELIMINARY ACTIVITIES

No.	Activity	Employees Involved	Notes	Actions
1	Plan source dispatches.	Mr. Calciati		Notify the following persons: (1) Fresa or Durante; (2) Sarai.
2	Organise the receiving of the goods.	Mr. Fresa **To be instructed** Mr. Mognetti Mr. Tasso	Person currently authorised to enter the **Controlled Zone.**	1) Ensure that there is still space in the source storage safe located inside the bunker **(Controlled Zone).** (1) Prepare all the necessary equipment to receive and store the sources. (2) Ensure that the warning lights in the two work zones are in full working order.
3	Ask the Administration Department the SNs of the radioactive source to be stored.	Mr. Sarai		Prepare the **"SN Reference List"** and give it to the personnel in charge of receiving the goods.

3.2 ARRIVAL OF RADIOACTIVE MATERIAL

No.	Activity	Employees Involved	Problems/Consequences	Actions
1	Arrival of radioactive material.	Mr. Fresa	1) The details on the label and the document do not match or label is missing. 2) Documents are missing. 3) The haulier is not an Authorised Carrier.	1) Call the supplier before accepting the radioactive material. 2) Reject delivery. 3) Report the event and the haulier's details to the Qualified Expert – DO NOT REJECT DELIVERY.
2	Get the keys for the Monitored Zone and the source room from: **Service Dep. (Mr. Fresa ext. 289)** to gain access to both zones; **Sales Dep. (Mrs. Giuberchio ext. 222)** to gain access to both zones and to the storage safe.	**To be instructed** Mr. Tasso Mr. Mognetti **Mr. Sarai (only for actions 1 and 2)**		
3	Use the specific source-carrying trolley to take the radioactive material to the Monitored Zone. Close the room. Sign the documents for receipt. Return the keys.	**Mr. Calciati (only for action 3)**		
4	Promptly supply the documents to the Administration Department for registration.		Administration Department is closed.	Keep the documents until it reopens.

No.	Activity	Employees Involved	Problems/Consequences	Actions
5	Register take-over.	Administration Department	**Failure to record take-over entails serious criminal and administrative actions against the company.**	

3.3 ACCESS TO THE MONITORED ZONE AND THE CONTROLLED ZONE

No.	Activity	Employees involved	Problems	Actions
1	Get the necessary keys for access to the work zones from: **Service Dep. (Mr. Fresa ext. 289); Sales Dep. (Mrs. Giuberchio/Mr.Calciati ext. 222) for the activities described under paragraph 3.4.**	Mr. Fresa **To be instructed** Mr. Tasso Mr. Mognetti	The person required cannot be found.	Wait for him.
2	Always wear correctly the personal dosimeter before entering the room.		1. The dosimeter is not there.	1. Request one from Mr. Calciati
3	Switch the light and the ventilation system on by pressing the pushbutton located to the right of the door leading to the Controlled Zone. The red light located above the door, to the right, must come on.		The light does not come on.	Inform the relevant persons and change the bulb.
4	If the right-hand red light is already on:		Inform the relevant person.	**You may work as long as you do not use water under any circumstances.**
5	Place the key into the lock and open the source storeroom (Controlled Zone). The ventilation system must be on.		The ventilation system has not come on.	Do not enter and inform the relevant persons **(Mr. Fresa or Mr. Durante)**

No.	Activity	Employees Involved	Problems	Actions
6	The central neon light connected to the ventilation system must be on.	Mr. Fresa **To be instructed** Mr. Tasso Mr. Mognetti	The light does not come on. If you are sure that the ventilation system works, you may perform your tasks after informing the relevant person that the light does not work and then changing the bulb.	Change the neon light's bulb.
7	Remove the key from the lock and put it in your pocket. Enter the Controlled Zone.			**Always comply with the "Internal Safety and Protection Regulations" affixed inside the Controlled Zone.**

3.4 UNLOADING THE TROLLEY IN THE CONTROLLED ZONE

No.	Activity	Employees Involved	Problems	Actions
1	Enter the Controlled Zone following the instructions provided in paragraph 3.3	Mr. Fresa **To be instructed** Mr. Tasso Mr. Mognetti		
2	Take the trolley containing the radioactive material into the bunker.			
3	Use the indelible marker pen kept in the bunker to write on each transport container the Serial number (SN) listed on the **"SN Reference List".**			
4	Open the storage safe, place the containers inside and close the safe.		There is not enough space or there is no space.	Leave the containers next to the storage safe and inform the management.
5	Leave the Controlled Zone following the instructions provided in paragraph 3.11.			
6	Return the SN identification list.	Mr. Calciati		

3.5 CHARGING THE SOURCE HOLDER

No.	Activity	Employees Involved	Problems	Actions
1	Enter the Controlled Zone following the instructions provided in paragraph 3.3.	Mr. Bozzola Mr. Rappellini Mr. Chiodini Mr. Cioce		
2	Turn on the glove box's extraction system.		It doesn't work.	You may not work. Leave the Controlled Zone and inform the relevant persons **(Mr. Durante; Mr. Fresa)**.
3	Prepare the necessary empty holders and place them in the glove box. Remove any objects from the work table and make sure that the remote-controlled manipulator works correctly.		1. The remote-controlled manipulator is not available. 2. The remote-controlled manipulator is broken.	1. Do not use any other implement. 2. Ask for a replacement manipulator. Do not use any other implement.
4	Open the storage safe, take one of the radioactive source containers still in their original packaging and place it on the work table situated in the Controlled Zone.			
5	Open the cardboard box containing the radioactive source		The cardboard is broken (only for Kr-85).	Carry on without any problem.
6	Pick up the secondary metal container and place it on the above-mentioned table. Remove the cardboard from the work table.		The container is broken (only for Kr-85).	Place immediately the container inside the glove box.

No.	Activity	Employees Involved	Problems	Actions
7	Open the container, pick up the the primary container and place it inside the glove box.	Mr. Bozzola Mr. Rappellini Mr. Chiodini Mr. Cioce		
8	Open the empty holder to be charged with the radioactive source.			
9	Open the primary container which hosts the radioactive source and use the remote-controlled manipulator to place the radioactive source inside the open holder.			
10	Quickly close the holder and ensure that all the screws are tightly secured.			
11	Write the relevant SN on the holder's cover (or ensure that it is already written).			
12	The holder charged with the radioactive source must be placed in the storage safe (or inside the transmitter module - see paragraph 3.8).			
13	Repeat the same operations for the other holders.			
14	Once you have finished your job, follow the instructions provided in paragraph 3.11.			

3.6 TESTING

No.	Activity	Employees Involved	Problems	Actions
1	Enter the Controlled Zone following the instructions provided in paragraph 3.3.	**All the employees authorised to enter the various areas.**		
2	Turn on the glove box's extraction system.		It doesn't work.	You may not work. Leave the Controlled Zone and inform the relevant persons.
3	Enter the Controlled Zone (bunker) and take inside the trolley carrying the transmitter module.		The trolley is not available.	If the trolley is not available the transmitter module may be carried by hand.
4	Place the empty transmitter module inside the glove box.			
5	Open the storage safe and take a holder containing the radioactive source.			
6	Quickly place the holder inside the glove box.			
7	Write on the yellow label affixed on the transmitter module the SN for the radioactive source contained in the holder. Close the safe.			

No.	Activity	Employees Involved	Problems	Actions
8	Place the source holder in the specific seat on the transmitter module. Fix the base with screws and lock the safety padlock.	**All the employees authorised to enter the various areas.**		
9	Ensure that the shutter is positioned on **"CLOSED"**. Close the transmitter module.		The shutter is open and you can't close it.	Replace the transmitter module and inform the Testing Manager **(Mr. Durante)**. If no other transmitter modules are available, place the source holder back in the storage safe and interrupt the job.
10	Remove the transmitter module charged with radioactive material from the glove box.			
11	Position the transmitter module on the trolley.		The trolley is not available.	You must find it. Otherwise you may not proceed with your job.
12	Give the trolley to the employee who requested the material, close the bunker and return the keys.		The employee is not there.	Get someone to look for him/her immediately. If he/she does not turn up within a few minuets, close the Controlled Zone with the trolley inside it and inform the Testing Manager (Durante).
13	Position the receiver module on the scanner previously prepared.	**All the employees having the technical competence required.**		

No.	Activity	Employees Involved	Problems	Actions
14	Position the transmitter module charged with the radioactive material on the scanner previously prepared.	**All the employees authorised to operate Electronic System's devices equipped with radioisotope sources.**		
15	Connect all the electrical and compressed-air cables.			
16	Connect the warning lights.			
17	Enclose the scanner's area using the chains kept in the Monitored Zone.		The chains are not there.	Find them.

3.7 AFTER THE TESTING

No.	Activity	Employees Involved	Problems	Actions
1	Remove the chains which enclosed the scanner's area and disconnect the warning lights and the electrical and compressed-air cables.	**All the employees authorised to operate Electronic System's devices equipped with radioisotope sources.**		
2	Ensure that the shutter is positioned on **"CLOSED"**.			
3	Remove the transmitter module charged with radioactive material from the scanner.			
4	Position the transmitter module on the trolley.			
5	Give the trolley to an employee authorised to enter the Controlled Zone.		The employee is not there.	Get someone to look for him/her immediately. If he/she does not turn up within a few minuets, close the Controlled Zone with the trolley inside it and inform the Testing Manager **(Mr. Durante)**.
6	Enter the bunker following the instructions provided in paragraph 3.3.	Mr. Fresa		
7	If it is possible and there is enough room place the whole transmitter module into the storage safe and proceed as from item 11.	**To be instructed**		
8	Position the transmitter module containing the source holder in the glove box.	Mr. Tasso Mr. Mognetti		

No.	Activity	Employees Involved	Problems	Actions
9	Open the transmitter module and remove the source holder (from inside the glove box).	Mr. Fresa **To be instructed** Mr. Tasso Mr. Mognetti		
10	Place the source holder in the storage safe.			
11	Once you have finished your job, follow the instructions provided in paragraph 3.11.			

3.8 PACKAGING THE MEASURING HEADS

No.	Activity	Employees Involved	Problems	Actions
1	Enter the bunker following the instructions provided in paragraph 3.3.	**All the employees authorised to enter the various areas.**		
2	Take from the storage safe the transmitter module bearing the SN stated on the "SN Reference List".		The transmitter module bearing the SN stated on the list is not available.	Get a new transmitter module from the store room and proceed as described in paragraph 3.6 from item 2 to 10.
			The holder with the SN stated on the list is not available.	Inform the management for further directions.
3	Prepare one of the correctly-marked (type A) authorised containers (packaging), stored near the storage safe.			.
4	Place the transmitter module "charged" with radioactive material inside the container (packaging) previously prepared.		Note that there are two aluminium boxes for the final packaging:	The screen-printed box shall be used for the transport of transmitter modules containing holders charged with **Kr-85** radioactive sources. The other box shall be used for the transport of transmitter modules containing holders charged with **Sr-90** radioactive sources.

No.	Activity	Employees Involved	Problems	Actions
5	Place the bottom part of the polystyrene shell inside the aluminium box.	**All the employees authorised to enter the various areas.**		
6	Place No. 2 lead sheets on top of the polystyrene shell.			They can be found inside the equipment cabinet situated in the Controlled Zone.
7	Place a layer of sponge on top of the two lead sheets.			Its purpose is to soften the sensor's shocks during handling.
8	Cover the transmitter module with the top part of the polystyrene shell.			
9	Close the container with the aluminium cover.			
10	Secure the cover using the screws provided.			
11	Seal with two strips of adhesive tape both the cover and the box.			The two strips are the SAFETY SEAL.
12	Identify the transport category and transport index (see paragraph 3.10) and fill in the two appropriate labels.			

No.	Activity	Employees Involved	Problems	Actions
13	Position the two labels, duly filled in, on two opposite sides of the container.	**All the employees authorised to enter the various areas.**		
14	Leave the packaged material inside the bunker, in the Controlled Zone, near the unit containing the radioactive material.			
15	Once you have finished your job, follow the instructions provided in paragraph 3.10.			
16	Transmit the data described under item 12 for the preparation of the transport documents.			
17	Prepare the documents in compliance with the ADR/RID/IATA regulations.	Mr. Fratta Mrs. Tanelli Mr. Calciati		

3.9 GLOVE BOX

No.	Activity	Employees Involved	Problems	Actions
1	If you need to use the "glove box", first press the button located at the top of the box, to the right: 1) The local extraction system must turn on. 2) The central extraction system must turn off. 3) The hood's neon light must turn on.		1) The local extraction system doesn't work. 2) The central extraction system doesn't work. 3) The light doesn't come on.	1) You may not use the hood. Inform the relevant person. 2) You may not use the hood. Inform the relevant person. 3) Inform the relevant person.

3.10 PACK AND OVER-PACK CATEGORIES

CONDITIONS			CATEGORY
Transport Index	**Maximum *radiation level* at every point of the external surface**	**Maximum *radiation level* at a distance of 1 meter.**	
0[a]	Lower than 0.005 mSv/h (0.5 mR/h).	Lower than 0.05 mSv/h (5 mR/h)	WHITE-I
Higher than 0 and lower than 1[a]	Higher than 0.005 mSv/h and lower than 0.5 mSv/h.	Lower than 0.01 mSv/h (1 mR/h)	YELLOW-II
Higher than 1 and lower than 10	Higher than 0.5 mSv/h and lower than 2 mSv/h.	Between 0.01 mSv/h (1 mR/h) and 0.1 mSv/h (10 mR/h)	YELLOW-III
Higher than 10	Higher than 2 mSv/h and lower than 10 mSv/h.	Higher than 0.1 mSv/h (10 mR/h).	YELLOW-III[b]

[a] If the TI is not higher than 0.05, the value shown may be zero.
[b] It must also be transported under *exclusive use* conditions.

label white-I **label yellow-II** **label yellow-III**

Transport Index

Identify the maximum *level of radiation* in millisievert per hour (mSv/h) at a distance of 1m from the external surface of the *pack*, the *over-pack* or the *goods container* depending on which is the point in contact with the external surface having the highest exposure level.

The value so determined must be multiplied by 100 and the resulting figure is the *transport index* (if the measuring instrument is set in milliR, the value determined must be used as it is).

3.11 ONCE YOU HAVE FINISHED YOUR JOB..... (FINAL SUMMARY)

No.	Activity	Employees Involved	Problems	Actions
1	If you have used the glove box, press the hood switch: 1) The neon light must turn off. 2) The local extraction system must turn off. 3) The central extraction system must turn on.		1) It doesn't turn off. 2) It doesn't turn off. 3) It doesn't turn on.	1) Inform the relevant person. 2) Inform the relevant person. 3) Inform the relevant person.
2	Press the pushbutton near the door: 1) The central extraction system must turn off. 2) The main light and the red light above the door to the right must turn off.		1) It doesn't turn off. 2) It doesn't turn off.	1) Inform the relevant person. 2) Inform the relevant person.
3	Insert the key in the hole and lock the door with one turn. Ensure that the door is locked.			
4	Return the Monitored Zone and Controlled Zone's keys to the person who gave them to you.			

4. ACCIDENT PROCEDURES

These "Accident Procedures" have been designed keeping in mind the following variables:

I) Characteristics of the radioactive sources handled (sealed).

II) Type of radionuclides and their toxicity levels (Kr-85; Sr-90). We only considered Kr-85 and Sr-90 radionuclides, which are employed for testing, selling and research activities. Other radionuclides are kept exclusively for research purposes and the manipulation of the sources or their enclosures is currently not planned.

III) Activities which may involve radionuclides.

IV) Time schedule and work load related to the above-mentioned activities.

V) Seriousness and probability of minor and major accidents which may involve employees and radioactive material (fall of the radioactive source and breakage of the containment enclosure).

VI) Risk sources (remote-controlled manipulator, weight of the enclosures, etc.).

In consideration of the above, the rules described below have been established. All employees involved shall comply with such rules at all times:

Item	Actions
1	FALL OF AN ENCLOSURE CONTAINING A RADIOACTIVE SOURCE FROM A HEIGHT LOWER THAN 1 m
1.1	For radiance categories other than "White I", wear lead coat and gloves.
1.2	Ensure that the enclosure's external surface has not been ripped or squashed (if it has, inform the manager, the relevant person and the Qualified Expert).
1.3	Pick up the enclosure and put it back in its original place.

Item	Actions
2	FALL OF AN ENCLOSURE AND ESCAPE OF THE RADIOACTIVE SOURCE FROM THE CONTAINER
2.1	Immediately wear the lead coat and gloves and the safety glasses.
2.2	Find the source. If it is not visible, use the ionising chamber device and position it in different directions until you find the maximum exposure level.
2.3	Once you have found the source, get hold of the container from which the source escaped, keep it open and be ready to place the source back inside it.
2.4	With the aid of a remote-controlled manipulator (min. length 50 cm), carefully get hold of the source, pick it up and quickly place it in the open container, using maximum care.
2.5	Close the container and place it back in a safe place.
2.6	(ONLY FOR SR-90) Measure surface contamination on the spot where the source was found and on the remote-controlled manipulator's grip point.
2.7	Draw up a record of the event explaining what happened and how the source was picked up and inform the manager, the relevant person and Electronic Systems' Qualified Expert).

Item	Actions
3	FALL AND BREAKAGE OF A SOURCE CONTAINING Kr-85
3.1	In this case the gas Kr-85 may leak out. This gas however has no similarities with the human body and the only danger is due to possible inhalation.
3.2	If you find yourself nearby, hold your breath and immediately get as far away as possible from the broken container and the gas leaked out.
3.3	If it is possible, close all doors behind you. Prevent access to the area for at least 3 hours.
3.4	Evacuate nearby areas and direct people outside (outdoor).
3.5	Wait several hours before attempting access to the affected area (the natural change of air in the room where the container broke must be such as to ensure dispersion and dilution of the gas towards the outside). Wearing a lead coat and gloves and anti-X protective glasses is of little use. Instead, wear a self-breathing apparatus or a mask with suitable filters and always carry a measurement system.
3.6	Draw up a record of the event explaining what happened and what was done and deliver it to the manager, the relevant person and Electronic Systems' Qualified Expert).

Item	Actions
4	FIRE IN THE CONTROLLED ZONE
4.1	If the fire can be easily controlled, try and put it out before it affects the radioactive sources. Avoid using a direct jet of water on the radioactive sources. Instead, use the powder or foam extinguisher kept in the room.
4.2	If you can, close the Controlled Zone's fire doors (REJ 120), evacuate the room and press the fire alarm button located near the Controlled Zone's exit. Immediately call the Fire Brigade (tel. 115) and co-ordinate measures with Electronic Systems' Prevention and Protection Manager.
4.3	Inform immediately the manager, the relevant person and Electronic System's Qualified Expert.
4.4	When the Fire brigade arrive, inform them of the presence of radioactive material in the area on fire and recommend they use self-breathing apparatuses or masks with suitable filters.
4.5	Draw up a record of the event explaining what happened and deliver it to Electronic Systems' Management and Qualified Expert.

5 RESPONSIBILITIES

All the responsibilities are assigned within the procedure's individual paragraphs.

6 REFERENCES

Legislation related to the handling of radioactive sources (P2).