

**ATOMINSTITUT  
DER ÖSTERREICHISCHEN UNIVERSITÄTEN**

*AT 8900013*

**REINSPECTION PLAN  
FOR THE TRIGA MARK-II REACTOR  
VIENNA**

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## **CONTENT**

### **Introduction**

- 1. Reactor Building**
- 2. Ventilation System**
- 3. Reactor Tank and Shielding Structure**
- 4. Reactor Core**
- 5. Reactor Safety System**
- 6. Primary and Purification System**
- 7. Secondary Cooling System**
- 8. Area Monitors, Off-Gas Monitor**
- 9. Fuel Element Handling**
- 10. Experimental Facilities**
- 11. Electricity and Emergency Supply**
- 12. Security System**

**Appendix A : Some examples of inspection forms**

**INIS-KEYWORDS:** In-service inspection  
Reactor maintenance  
TRIGA-2-Vienna reactor  
Reactor operation

**INIS-Subject Category:** E 22

**Abstract:** A summary is given of the type of inspections, the responsibility & the frequency carried out at the TRIGA Mark II reactor Vienna. All safety related systems and components to be inspected are listed.

## INTRODUCTION

In order to ensure safe operation of the TRIGA Mark-II reactor Vienna, periodic inspections of the reactor systems and components are necessary. These inspections have to be carried out in various intervals by the staff of the reactor operation group. In some cases, outside companies or governmental inspection authorities may carry out these inspections on the request of the Institute. The inspections are carried out with special inspection forms which have to be developed for each system or component separately and which contain the following informations: date, type of test, failures found, responsibility for repair, signature of inspector. A few examples of inspection forms are given in App. A.

### Abbreviations for inspection period:

y - yearly  
m - monthly  
w - weekly

### Responsibility for inspection:

I ..... Atominstitut  
G ..... Governmental Construction Office  
Co ..... outside companies  
IAEA ... Internat. Atomic Energy Agency  
O ..... others

### Type of inspection

R ..... Records  
T ..... Test  
On/off ... On/off-switch  
Ca ..... Calibration  
M ..... Measurement  
St ..... acc. to given standards  
Δp ..... differential pressure  
S ..... test with sample  
TR ..... test run  
Cl ..... cleaning  
V ..... visual inspection

### Explanation

1 - System/Component  
2  
2a - Inspection period  
2b - Responsibility  
2c - Type of inspection

# 1. REACTOR BUILDING

	1	2a	2b	2c		
1.1	Roof	2 x y	G	V		
1.2	Windows	1 x y	G	V		
1.3	Foundations	1 x y	G	V		
1.4	Service door	1 x m	I	V		
1.5	Other doors to reactor	1 x m	I	V		
1.6	Lights in hall	2 x y	I	V		
1.7	Other lamps	1 x w	I	V		
1.8	Crane	2 x y	Co	St		
1.9	Chains	1 x y	Co	St		
1.10	Fuel storage pits	2 x y	I	V	1 x y	IAEA

## 2. VENTILATION SYSTEM

	1	2a	2b	2c
2.1 Reactor Hall*				
Ventilation System		1 x y	I	TR
2.2 Beam Tube*				
Ventilation System		1 x y	I	TR
2.3 Control Room*				
Ventilation System		1 x y	I	TR
2.4 Central Heating or Air Condition		1 x y	I	TR
2.5 Blower, Valves		1 x y	I	TR
2.6 Underpressure Reactor Hall		1 x w	I	$\Delta p$

\*including inlet and outlet filters, ventilator belts etc.

### 3. REACTOR TANK

	1	2a	2b	2c
3.1 Tank, beam tubes thermal column		1 x y	I	V
3.2 Mechanical structure of core		1 x y	I	V
3.3 Under water lamps		1 x m	I	V
3.4 Condition of shielding concrete (cracks, paint)		1 x m	I	V

#### 4. REACTOR CORE

1	2a	2b	2c	
4.1 Fuel element position	1 x M	I	V	1 x y IAEA
4.2 Fuel dimensions control	1 x y	I	M	
4.3 Control rods (motors, microswitch)	1 x M	I	V, M, TR	
4.4 Control of excess reactivity	1 x M	I	M	
4.5 Rod calibration	2 x y	I	M	
4.6 Compressor for control rod	1 x M	I	TR, V	

## 5. REACTOR SAFETY SYSTEM

1	2a	2b	2c
5.1 Nuclear channels (power calibration)	2 x y	I	C <sub>a</sub>
5.2 Neutron source	1 x m	I	M
5.3 Recorders	1 x m	I	C <sub>a</sub>
5.4 Temperature channels	1 x y	I	M
5.5 Water level channels	1 x y	I	T
5.6 Power supply	1 x y	I	M
5.7 High voltage supply	1 x y	I	M
5.8 Indicator lamps	1 x m	I	V
5.9 Period and integrator channel	2 x y	I	C <sub>a</sub>



## 6. PRIMARY AND PURIFICATION SYSTEM

1	2a	2b	2c
6.1 Primary pump	1 x n	I	TR
6.2 Purification pump	1 x n	I	TR
6.3 Primary filter	1 x n	I	Δp
6.4 Valves and sensor (tightness)	1 x n	I	V
6.5 Flow indicator (primary, purification)	1 x n	I	M
6.6 Conductivity meter	1 x y	I	Ca
6.7 Temperature meter	1 x y	I	Ca
6.8 Differential pressure across heat exchanger	1 x n	I	V
6.9 Filter (purification system)	1 x n	I	Cl
6.10 pH-value	1 x n	I	M
6.11 Pipes and valves to empty the reactor tank	1 x y	I	V
6.12 Sump pump near heat exchanger	1 x n 1 x y	I I	TR Cl

## 7. SECONDARY COOLING SYSTEM

1	2a	2b	2c
7.1 Ground water wall	1 x m	G	V
7.2 Secondary pumps	1 x m	I	TR
7.3 Exchange switch pump 1 to pump 2	1 x m	I	on/off
7.4 Compressor for pressure increase system	1 x m 1 x y	I G	TR Cl
7.5 Pressure increase system tanks	1 x m	I	TR
7.6 Motor valve	1 x w 2 x y	I G	V TR
7.7 Flow measurement	1 x w	I	TR
7.8 Sand filter	1 x y	I	Cl
7.9 All valves (tightness)	1 x m	I	V
7.10 Sump pump	1 x m 1 x y	I G	TR Cl
7.11 Water meter	1 x m	I	R

8. AREA MONITORS, OFF-GAS MONITORS, WATER ACTIVITY MONITORS

1	2a	2b	2c
8.1 Set-points of alarm limits	1 x n	I	S
8.2 Control of instrument function with radioactive sample	1 x n	I	S
8.3 Portable dose rate meters	1 x n 1 x y	I I	S Ca
8.4 Primary water activity ( $\gamma$ -spectroscopy)	1 x n	I	M
8.5 Contamination wipe test reactor platform	1 x n	I	M
8.6 Contamination control of off-gas detectors	1 x y	I	M
8.7 Aerosol monitor reactor top	1 x n 1 x y	I I	S Ca
8.8 Water activity monitor (purification loop)	1 x n 1 x y	I I	S Ca
8.9 Water activity monitor (institute discharge)	1 x n 1 x y	I I	S Ca
8.10 Data logger	1 x n	I	S

## 9. FUEL ELEMENT HANDLING

9.1 Fuel element handling tool	1 x n	A	V
9.2 Fuel transfer container	1 x n	A	V
	1 x y	G	St

## 10. EXPERIMENTAL FACILITIES

	1	2a	2b	2c
10.1 Irradiation tubes (or Lazy Susan) Control of position, humidity, loading)		1 x n	I	V, TR
10.2 Central thimble		1 x n	I	V
10.3 Thermal column (motor and switches)		1 x n	I	V, TR
10.4 Pneumatic transfer system		1 x n	I	V, TR
10.5 Beam tubes		2 x y	I	V
10.6 Beam tube parts (doors, loading machine)		2 x y	I	V
10.7 Experimental tank		1 x y	I	V
10.8 Vacuum cleaner (function, location, spare parts)		1 x n	I	V

## 11. ELECTRICITY AND EMERGENCY SUPPLY

1	2a	2b	2c
11.1 Check of circuit breakers	1 x m	I	on/off
11.2 Emergency diesel	1 x m 1 x y	I G	TR St
11.3 Emergency batteries	1 x m	I	TR
11.4 Emergency lights	1 x m	I	TR
11.5 Uninterrupted power supply	1 x m	I	TR
11.6 Emergency hand lamps	1 x m	I	on/off

## 12. SECURITY SYSTEM

1	2a	2b	2c
12.1 Door surveillance	1 x w	I	V
12.2 Intercom system	1 x w	I	TR
12.3 Alarm system	1 x w	I	TR
12.4 Telephone system	1 x m	G	T
12.5 Security system	2 x y	I	T
12.6 Fire extinguisher	1 x m	I	V
12.7 Keys and locks	1 x m	I	on/off
12.8 Gate to compound and TV-surveillance	1 x m	I	V, TR
12.9 Emergency equipment	1 x m	I	V
12.10 Internal alarms	1 x m	I	TR
12.11 Emergency drill exercise	1 x y	I	TR
12.12 On-duty officer control	4 x y	I	TR

## APPENDIX A

Some examples of inspection forms are given in Appendix A. These sheets cannot be standardized as they depend strongly on local conditions and they have to be prepared for each facility individually. For more complex systems as the primary cooling system or the ventilation system it is advisable to add a schematic diagram of the system where all components to be checked are numbered one by one and these numbers are contained in the inspection form.



3.1 Tank, beam tubes, thermal column

**3.1 TANK, STRAHLROHRVERBINDUNGEN,  
THERMISCHE SÄULE**

Blatt:

Zuständigkeit: A      Prüfintervall: 1xj      Datum: .. .. ..  
Responsabilty: I      Inspection period: 1xy      JJ MM TT  
Date

---

<b>visuelle Überprüfung im Tank</b> (visual inspection of tank)	
<u>A</u>	beam tube A
<u>B</u>	B
<u>C</u>	C
<u>D</u>	D
<u>THS</u>	Thermal column
<u>Neutronen</u> <u>Radiograph.</u>	Neutron radio- graphy facility

---

**Tankboden abgesaugt** (Tankbottom cleaned by pump)  
**an**

---

**Bemerkungen** (Remarks)

---

**Unterschrift** (Signature)

---

## 4.3 ABSORBERSTABANTRIEBE

Blatt:

Zuständigkeit: A      Prüflintervall: 1xm      Datum: .. .. .  
 Responsibility      Inspection period      Date      JJ MM TT

Stabstellungsanz. (Rod position indicators)

oben	up
R	reg.rod
T	shim rod
I	transient rod
unten	down
R	reg.rod
T	shim rod
I	transient rod

Verfahrzeit [s] time intervall in /s/ from down to up

R	reg. rod
T	shim rod
I (Stoßdämpfer)	shock absorber of transient rod

fehlerhafte Anzeigen failure of indicator lamps at push buttons

R	T	I
↓	↓	↓
↑	↑	↑
⊥	⊥	M
T	⊥	↓
Scram	Scram	M
		↑

Druck (bar) am Kompressor vor Ausgleichgefäß nach Ausgleichgefäß

Impulsstab  
 pressure of transient rod at different locations

Stoßdämpfer  
 Ölverlust tightness of shock absorber (Oil leakage ?)

Kontrolle control of magnets

Kontaktmagnete

R	_____
T	_____

0-Punkt für Stabstellungsanzeige Zero-point for position indicators

R	_____
T	_____
I	_____

Führung im Core-Bereich (visuell) optical inspection of rod guide tubes in the core

R	_____
T	_____
I	_____

Bemerkungen remarks

Unterschrift signature

6.3. PRIMARY FILTERS

**6.3 PRIMÄRFILTER**

Blatt:

Zuständigkeit: A  
Responsability

Prüfintervall: 1xm  
Inspection period

Datum: .. ..  
Date JJ MM TT

---

visuelle Überprüfung  
auf Dichtheit      visual inspection of housing tightness

---

Druckabfall  
 $\Delta p$  (maximaler Meß-  
bereich 2,5 bar)      pressure drop across filters

---

Filter zu  
tauschen      filter to be replaced ?

---

Bemerkungen      remarks

---

Unterschrift      signature

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**8.5 WISCHPROBEN**  
(laut beiliegenden Plan)

Blatt:

Zuständigkeit: A  
responsability

Prüfintervall: 1xm  
inspection period

Datum: .. ..  
Date JJ MM TT

Bereich Control room  
Kanzel

1 \_\_\_\_\_

2 \_\_\_\_\_

Bereich  
Reaktorplattform  
reactor platform

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

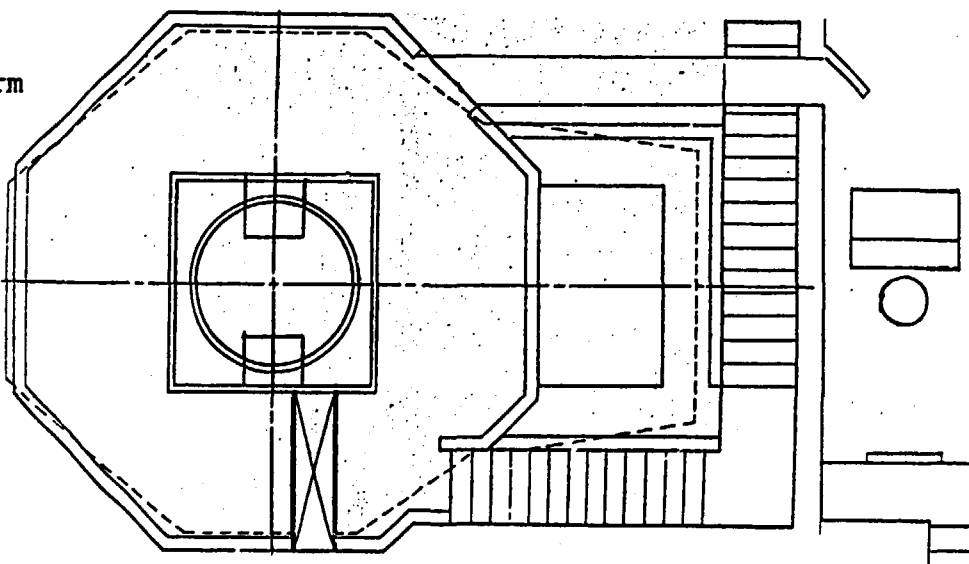
4 \_\_\_\_\_

5 \_\_\_\_\_

6 \_\_\_\_\_

7 \_\_\_\_\_

8 \_\_\_\_\_



Dekontamination durchgeführt am \_\_\_\_\_ von \_\_\_\_\_  
Decontamination carried out on \_\_\_\_\_ by \_\_\_\_\_

Bemerkungen remarks

The control room is checked on two spots, the platform at 8 spots  
the position of the checked spots has to be marked at the drawing

Unterschrift signature

**10.4. ROHRPOSTSYSTEM**  
(siehe beiliegenden Muffenplan)

Blatt:

Zuständigkeit: A  
Responsability

Prüfintervall: 1xm  
Inspection period

Datum: .. ..  
Date JJ MM TT

---

Lage der            Check of support of tubings along its pathway  
Rohrleitungen

---

Dichtheit der Muffen (1xj)    tightness of tube fittings

---

visuelle Kontrolle            visual control in core  
der Position in Core

---

Filter-Druckluft gewechselt    filters to be replaced ?

---

Probeschuß    test run

  ein      sample in \_\_\_\_\_

  aus      sample out \_\_\_\_\_

---

Kapsel feucht            capsule dry/wet ?

  ja      yes \_\_\_\_\_

  nein      no \_\_\_\_\_

---

Bemerkungen    remarks

---

zur Reparatur            repair work ordered  
beauftragt

---

Unterschrift            signature

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## 10.6 STRAHLROHRZUBEHÖR

Blatt:

Zuständigkeit: A  
responsabilityPrüfintervall: 2xj  
inspection periodDatum: .. ..  
Date JJ MM TT

---

**Aufbewahrungsort** where are the beam tube doors stored  
**der Strahlrohrsüben**
A beam tube AB BC CD D


---

**Zustand der** Condition of door gaskets  
**Dichtungen**
A AB BC CD D


---

**Zustand der** Condition of movable lead plugs  
**Bleischuber**
A AB BC CD D


---

**Bemerkungen** Remarks

---

**zur Reparatur** repair work ordered  
**beauftragt**


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**Unterschrift** signature

**AIAU-Berichte**

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