

Tomczak, Tammy

From: Craig Metzger <craig.metzger@gerdau.com>
Sent: Wednesday, September 26, 2018 4:33 PM
To: Craffey, Ryan
Subject: [External_Sender] RE: Source leak tests and pm.
Attachments: BertholdSourceHolderManual.pdf

Hi Ryan,

Here is the manual that Radiametrics will conduct the training to.

Thanks.

Craig Metzger
Regional Environmental Manager
Gerdau Special Steel – MI and IN Operations
734-384-6544 (Office)
734-818-7113 (Cell)

From: Jeff Balogh <jeff.b@radiametrics.com>
Sent: Monday, August 13, 2018 9:44 AM
To: Robert Edgar <robert.edgar@gerdau.com>; Craig Metzger <craig.metzger@gerdau.com>
Cc: Rogerio Mahl <rogerio.mahl@gerdau.com>; Stephen Sova <steve.sova@gerdau.com>
Subject: RE: Source leak tests and pm.

Sounds good.

From: Robert Edgar [mailto:robert.edgar@gerdau.com]
Sent: Monday, August 13, 2018 9:40 AM
To: Jeff Balogh; Craig Metzger
Cc: Rogerio Mahl; Stephen Sova
Subject: RE: Source leak tests and pm.

Still good to go. All of the sources have been moved to the mold room and locked up for the maintenance outage so planning on doing your work there.

Robert C. Edgar
Process Engineer

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From: Jeff Balogh [mailto:jeff.b@radiametrics.com]
Sent: Monday, August 13, 2018 9:02 AM
To: Robert Edgar <robert.edgar@gerdau.com>; Craig Metzger <craig.metzger@gerdau.com>

Cc: Rogerio Mahl <rogerio.mahl@gerdau.com>; Stephen Sova <steve.сова@gerdau.com>
Subject: RE: Source leak tests and pm.

Good morning, I just wanted to confirm that we are still on for Thursday 8/16. I am planning on being onsite at 10:00, please let me know if you need me there earlier or later.

Jeff

From: Robert Edgar [<mailto:robert.edgar@gerdau.com>]
Sent: Monday, August 6, 2018 10:15 AM
To: Jeff Balogh; Craig Metzger
Cc: Rogerio Mahl; Stephen Sova
Subject: RE: Source leak tests and pm.

The 16th would be fine with us

Robert C. Edgar
Process Engineer

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LBC

From: Jeff Balogh [<mailto:jeff.b@radiametrics.com>]
Sent: Monday, August 6, 2018 9:12 AM
To: Robert Edgar <robert.edgar@gerdau.com>; Craig Metzger <craig.metzger@gerdau.com>
Cc: Rogerio Mahl <rogerio.mahl@gerdau.com>; Stephen Sova <steve.сова@gerdau.com>
Subject: RE: Source leak tests and pm.

Rob, I just wanted to check in with you to see how we are looking scheduling wise for the outage next week. I can be available any of the days, but Tues. & Thurs. the 14th & 16th work the best for me. Please let me know.

Jeff

From: Robert Edgar [<mailto:robert.edgar@gerdau.com>]
Sent: Monday, July 9, 2018 3:39 PM
To: Jeff Balogh; Craig Metzger
Cc: Rogerio Mahl; Stephen Sova
Subject: RE: Source leak tests and pm.

Sorry Jeff, I was asking about AUGUST, not July. Maybe you typed it wrong in your reply?

Robert C. Edgar
Process Engineer

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LBC

From: Jeff Balogh [<mailto:jeff.b@radiametrics.com>]
Sent: Monday, July 9, 2018 1:11 PM
To: Robert Edgar <robert.edgar@gerdau.com>; Craig Metzger <craig.metzger@gerdau.com>
Cc: Rogerio Mahl <rogerio.mahl@gerdau.com>; Stephen Sova <steve.sova@gerdau.com>
Subject: RE: Source leak tests and pm.

That shouldn't be an issue. I can be out on 7/16, 7/19, 7/20 and possibly the 17th, whichever would work for you guys.

Jeff

From: Robert Edgar [<mailto:robert.edgar@gerdau.com>]
Sent: Monday, July 9, 2018 12:51 PM
To: Jeff Balogh; Craig Metzger
Cc: Rogerio Mahl; Stephen Sova
Subject: RE: Source leak tests and pm.

My records show we did this on the first Thursday in February (2/1). Is there any chance we can do this over our outage on August 12-21? That would fit with the 6 months.

Robert C. Edgar
Process Engineer

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LRc

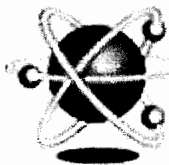
From: Jeff Balogh [<mailto:jeff.b@radiametrics.com>]
Sent: Monday, July 9, 2018 9:32 AM
To: Craig Metzger <craig.metzger@gerdau.com>; Robert Edgar <robert.edgar@gerdau.com>
Subject: Source leak tests and pm.

Rob/ Craig,
Good morning. How have you guys been? I was looking at my schedule and you guys are coming up on your six month interval for source leak tests and service. Are you guys still down on Thursdays? I might be able to make it out on the Thursday 7/19 and I am available the week of 7/30. Please let me know your thoughts.

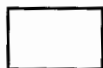
I hope all is well and take care,
Jeff

Jeffrey Balogh
Radiametrics Technologies
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fax: (440)245-5538
jeff.b@radiametrics.com
www.radiametrics.com





RADIAMETRICS TECHNOLOGIES



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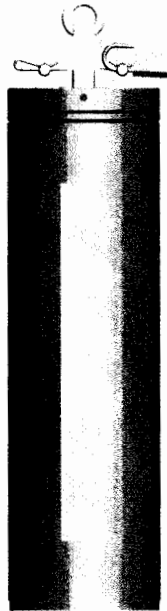
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LBc

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LP



Mould Level Shieldings

Manual
38907BA2

Rev. No.: 01, 06/2012

BERTHOLD TECHNOLOGIES GmbH & Co. KG

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1

About this Manual

1.1 Some Prior Remarks

The mould level shieldings for sources in continuous casting measuring systems (in the following referred to as mould level shieldings) is delivered to you by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co. KG in a complete and functionally reliable condition.

This manual demonstrates how to:

- dismount/install/replace
- store
- maintain
- clean
- and dispose of the mould level shieldings/source

Please read through the entire manual. We have tried to compile all information for safe and proper operation for you.

However, should questions arise which are not answered in this manual, please refer to BERTHOLD TECHNOLOGIES GmbH & Co. KG.

1.2 Structure of the Manual

This manual has been divided into chapters. The order of the chapters should help you to familiarise yourself quickly and properly with the operation of the Mould Level Shieldings.

1.3 Validity of the Manual

The manual is valid from the delivery of the system to the user until its disposal. Modification services are not carried out by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co. KG.

1.4 Copyright

This manual contains copyright-protected information. None of the chapters may be copied or reproduced in any other form without prior authorisation from the manufacturer.

1.5 Target Group

This manual is directed at qualified specialist personnel who are familiar with handling radioactive sources as well as with communication and measuring equipment.

Specialist personnel refers to those who can assess the work assigned to them and recognise possible dangers through their specialist training, knowledge and experience as well as knowledge of the relevant regulations.

1.6 Notation

In this manual, the following notations are used for illustrating the operation:

Identifier	Meaning	Example
Round brackets	Image reference	Connect the plug (fig. 1, pos. 1).

1.7 Symbols Used

The safety instructions point out possible dangers to you and instruct you on the operation. They apply to the whole document.



Danger

Possible consequences: Death or serious injury!

Points out a direct threat of danger. If the danger is not avoided, death or serious bodily injury are the consequences.

- Possible consequences are described.
- Measures for prevention are described.

Symbols Used (Continued)

Warning

Possible consequences: Serious injuries!

Points out a possibly dangerous situation. If the situation is not avoided, death or serious bodily injury could result.

- Possible consequences are described.
- Measures for prevention are described.



Caution

Possible consequences: Minor or moderate injury!

Points out a possibly dangerous situation. If the situation is not avoided, minor or moderate bodily injury could occur.

- Possible consequences are described.
- Measures for prevention are described.



Attention

Possible consequences: Material Damage!

Points out a situation which could result material damage if the instructions have not been observed.

- Possible consequences are described.
- Measures for prevention are described.



Note

Points out helpful information on the product or on handling the product.



Warning against radioactive substances or radiation (also attached to shielding containers)

2

Safety

2.1 Proper Use

The mould level shieldings has been developed as shielding/protective container for radioactive sources and may only be used for this purpose. If the mould level shieldings is used in a way not described in the present manual, dangerous situations may occur and the warranty claim becomes invalid.

BERTHOLD TECHNOLOGIES only accepts liability for / warrants the correspondence of the mould level shieldings to its published specifications. The mould level shieldings may only be used in an undamaged condition. Any restructuring or modifications are inadmissible.

The following constitutes proper use:

- Adhering strictly to the instructions and operation sequences and not undertaking any different, unauthorised practices which could endanger your safety and the operational reliability of the Mould Level Shieldings!
- Observing the given safety instructions!
- Carrying out the prescribed maintenance measures or having them carried out for you!

2.2 Improper Use



Attention

Injuries to person and material damage!

In the event of improper use, there is a threat of danger to

- the health of the user.
- the efficient operation of the mould level shieldings.
- the functional reliability of the mould level shieldings.

➤ Observe the instructions from the Proper use section.

Avoid the following circumstances:

- Applying conditions and requirements which do not conform to those stated in the technical documents, datasheets, operation and assembly instructions and other specific guidelines of the manufacturer.
- The usage after any repair carried out by employees who have not been authorised by BERTHOLD TECHNOLOGIES correspondingly.

Improper Use (Continued)

- Using the mould level shieldings in a damaged or corroded condition.
- Dismounting the unit while the radiation beam outlet is open (except for situations in which the locking mechanism is defective and the radiation beam outlet can no longer be locked).
- Operation without the safety precautions provided by the manufacturer, such as transportation bracket during transportation, installation and dismounting.
- Any modification to design and function, except for any activities provided for and described in the present manual.
- Manipulation or avoidance of existing safety arrangements.
- Transportation and handling while the radiation beam outlet is open.
- If the mould level shieldings is used in a way which is not described in the present manual, the mould level shieldings protective effect is compromised and the warranty claim becomes invalid.
- Any non-compliance with the present operating manual for the "38907BA2" mould level shieldings

Usually, the mould level shieldings contains a radioactive source. The notes on radiation protection contained in the present manual as well as any statutory requirements in this respect are to be strictly adhered to.

2.3 Ambient Conditions during Operation and Storage

Mould level shieldings have been developed with the aim of resisting the rough ambient conditions of a continuous casting plant. The compliance with the operating conditions mentioned below contributes to warranting the permanent functionality of the mould level shieldings and the prevention of damage.

Mould level shieldings containing radioactive sources are to be stored in a lockable storage room complying with the national requirements as regards the storage of radioactive substances.

Ambient Conditions During Operation and Storage (Continued)

Furthermore, the following prescribed ambient conditions are to be observed:

- The **minimum admissible operating/storage temperature** is -40°C . Below this temperature, the sealing rings of the mould level shieldings may become brittle. In such case, the impermeability of the mould level shieldings can no longer be warranted.
- The **maximum admissible operating/storage temperature** is $+100^{\circ}\text{C}$. Above this temperature, the sealing rings of the mould level shieldings may be destroyed. In such case, the impermeability of the mould level shieldings can no longer be guaranteed.
- The higher the **dust and dirt content** of the environment, the more likely stiffness or an entire blockage of the locking mechanism is. For this reason, the functional test intervals (see chapter 5.2) should be adjusted to the ambient conditions.
- **Highly combustible or explosive substances** must not be kept in the vicinity of mould level shieldings in order to prevent a fire from spreading to the radioactive substances.

2.4

Qualification of the Personnel



Note

A minimum requirement for all work on or with the mould level shieldings would be employees with general knowledge in the domain who are instructed by a expert or authorised person.

In various parts of this operating manual, reference is made to personnel with certain qualifications who can be entrusted with different tasks during installation and maintenance.

Employees with General Knowledge



Note

Employees with general knowledge must always be guided by an expert at the very least. When dealing with radioactive substances, a radiation safety officer must also be consulted.

Employees with general knowledge in the domain must always be guided by an expert at the very least.

Employees with general knowledge are e.g. technicians or welders who can undertake different tasks during the transportation, assembly and installation of the mould level shieldings under the guidance of an authorised person. This may also refer to construction site personnel. The persons in question must have experience in the transportation and assembly of heavy equipment.

Experts

Experts are persons who have sufficient knowledge in the required domain due to their specialist training and who are familiar with the relevant national health and safety regulations, accident prevention regulations, guidelines and recognised technical rules.

Expert personnel must be capable of safely assessing the results of their work and they must be familiar with the content of this manual.

Authorised Persons

Authorised persons are those who are either designated for the corresponding task due to legal regulations or those who haven been authorised by BERTHOLD TECHNOLOGIES for particular tasks. When dealing with radioactive materials, a radiation safety officer must also be consulted.

Radiation Safety Officer

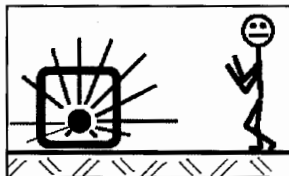
In order to ensure proper handling and compliance with the statutory requirements, the company has to appoint a radiation safety officer in accordance with the applicable national law (in Germany: Strahlenschutzverordnung [German radiation protection regulation]). The radiation safety officer must implement the statutory radiation protection requirements in order to protect employees against damage to their health caused by handling radioactive materials.

2.5 Radiation Protection

2.5.1 Basic Principles and Regulations

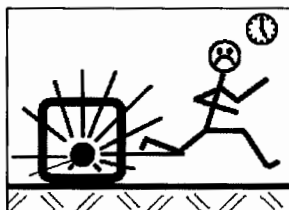
The amount of radiation absorbed by the body (exposure to radiation) is determined by three parameters from which the basic radiation protection regulations can be derived:

Distance



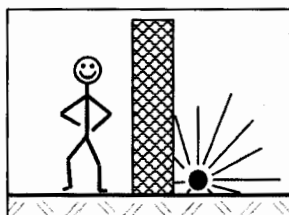
If work close to equipment containing radioactive substances is required, the largest distance possible is to be kept. In particular, this shall apply for employees which do not immediately participate in such work.

Time



Any work required in the vicinity of radiometric measuring equipment is to be prepared carefully and to be organised in a way that it can be executed as quickly as possible. Here, providing the correct tools and aids is particularly important.

Shielding



When mounting and dismounting the mould level shieldings, it is to be ensured in advance that the radiation beam outlet is closed.

2.5.2 Exposure of Employees to Radiation

During the commissioning and decommissioning of the mould level shieldings, exposing employees to radiation is unavoidable.

In order to keep such exposure as low as possible, the mould level shieldings with the source may only be mounted/dismounted by employees who have been authorised respectively. Such authorised staff is to be instructed as regards all rules of behaviour when handling radioactive substances in advance.

It is to be ensured that the locking mechanism of the mould level shieldings is closed and secured in order to prevent an unintentional escape of radiation. Modification or damages to the mould level shieldings must be avoided at all times and in any respect.

Any work may only be executed according to the instructions and under the supervision of the radiation safety officer, who furthermore has to calculate or estimate the exposure of the employees to radiation in order to ensure that the statutory dose rate limits are not exceeded.

2.5.3 Theft Protection

Radioactive substances or equipment containing radioactive substances must be secured in a way that they are protected against access by unauthorized persons. In the case of firmly installed equipment containing radioactive substances, the protection against unauthorized access is generally provided by the firmly attached installation.

Mould level shieldings with radioactive sources which are decommissioned for a certain period of time must be dismantled and securely stored in a storage room complying with the national regulations as regards the storage of radioactive substances.

Portable measuring equipment must never be left unsupervised. When this equipment is out of use, it is to be protected against access by unauthorised persons.

3

Product Description

3.1 Description of the System

The mould level shieldings is used for shielding the gamma radiation of the source; the shielding guides the gamma radiation via the radiation beam outlet through the mould so that a detector is able to detect the radiation for mould level measurement.

By using the mould level shieldings, it is warrantyd that the useful beam is kept as small as possible in order to avoid an unnecessary exposure of employees to radiation.

3.2 Types of Mould Level Shieldings

There are three types of Mould Level Shieldings:

- Operation shielding
- Transfer shielding
- Transport shielding

Normally, the source is installed in a **operation shielding** which has been designed according to the structure of the mould. Some applications require the source to be integrated directly into the mould.

In such case, a **transfer shielding** is used for the transport, storage and installation of the source.

If a source is delivered without a work or transfer shielding (e.g. a spare source for the replacement), a **transport shielding** is used.

In each case, the diameter of the mould level shieldings and thus the shielding effect for the respective source activity is adjusted in a way that the radiation protection requirements and any special requirements of the user can be complied with.

3.2.1 Operation Shielding

These mould level shieldings are designed with different diameters and lengths as well as different adjustments to the mould structure, depending on the respective requirements and source types. However, the basic structure is the same.

The operation shielding consists of a steel cylinder in which the shielding material is contained in a leak-proof way. Within this cylinder, another cylinder containing the source is positioned eccentrically and rotatable. By rotating it by 180°, the source is either positioned in the centre of the shielding or in the outer area. In the centre of the Operation shielding, the source is shielded towards all sides with the same degree of protection. This corresponds to the **"CLOSED"** position.

By rotating it into the outer position, the source is not shielded into one direction. This corresponds to the **"OPEN"** position.

Both positions are limited by an arrestor and equipped with a detent position. For rotating, a square (Fig. 1, pos. 8) is provided on top of the operation shielding on which a suitable key, hand wheel or another actuation mechanism can be fitted on-site.

During the transport or for mounting or dismantling the operation shielding in the mould construction, the respective transportation bracket (Fig. 1, pos. 1) is to be attached to the Operation shielding. This is only possible in the **"CLOSED"** position (Fig. 1, pos. 8); at the same time, the lock is arrested in this position. By doing so it can be ensured that handling the operation shielding is only possible in the **"CLOSED"** position. The equipment is secured by means of a padlock.

Operation Shielding (Continued)

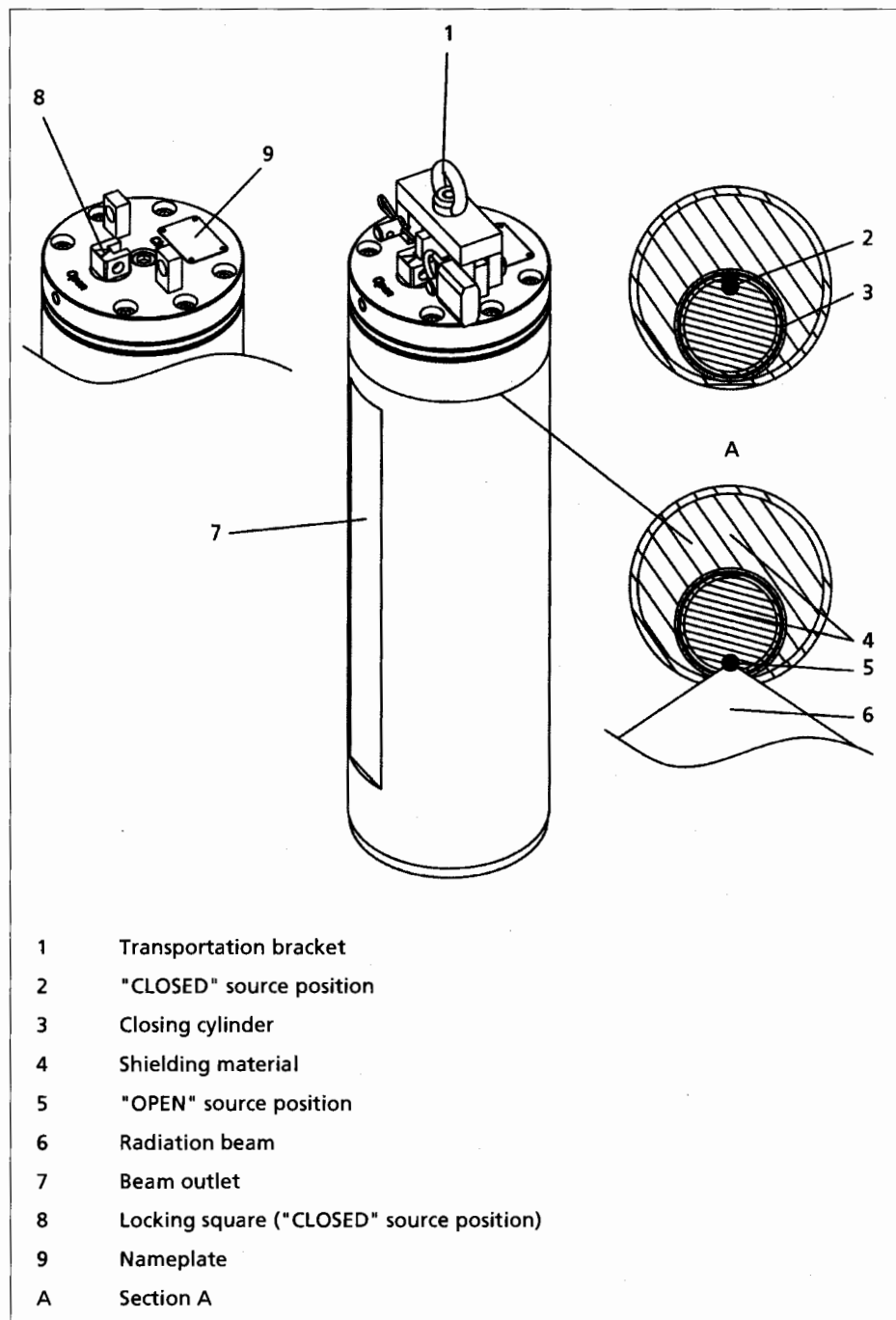


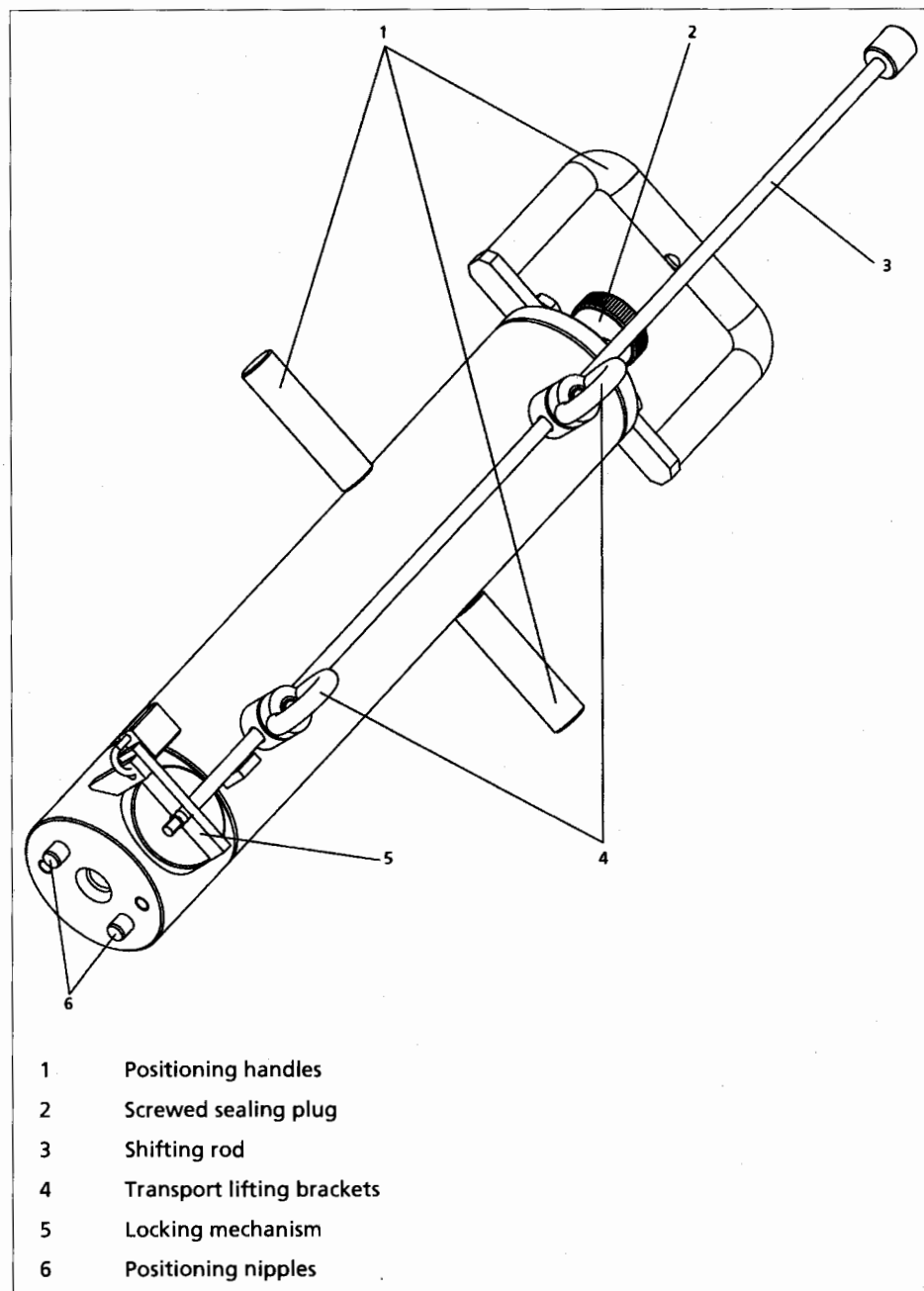
Fig. 1 Structure of the Operation shieldings

3.2.2 Transfer Shielding

In the case of certain mould constructions, it is necessary that the source is installed in a protective tube within the water box or directly in the copper plates of the mould.

The benefit of this arrangement is the fact that the installation of a mould level measurement system is possible even if the space given is limited. Another benefit is the fact that the source activity required for this arrangement can be very low.

The storage of the source as well as its mounting in and dismounting from the mould is executed using a LB 7680 transfer shielding. A shifting rod (Fig. 2, pos. 3) is provided for the safe mounting and dismounting of the source. The locking mechanism (Fig. 2, pos. 5) is located at the lower end of the transfer shielding. Two positioning nipples are located at the bottom of the shielding (Fig. 2, pos. 6). The positioning nipples fit into the respective bore holes in the mould head (to be provided by the customer) and ensure the correct and accurate positioning of the transfer shielding when mounting and/or dismounting the source.

Transfer Shielding (Continued)**Fig. 2** Structure of a transfer shielding

3.2.3 Transport Shielding

A transport shielding is used for shielding the source during transportation and storage.

The transport shielding is only used if sources are delivered without work or transfer shielding (e.g. spare source for the replacement).

A transport shielding consists of an internal and an external tube. The shielding material is located between the two tubes. The sources are kept in the internal tube. The transport shielding is sealed on both ends by means of an easily removable plug (Fig. 3, pos. 4). These plugs are secured against unintentional and/or unauthorised opening by means of a safety screw and a padlock.

For protection against damage or contamination, both ends are equipped with protective covers (Fig. 3, pos. 5). Optionally, a source magazine (Fig. 3, pos. 2) is available as insert for transport shieldings. The five reception tubes of the magazine are numbered and enable an easier identification of the source.

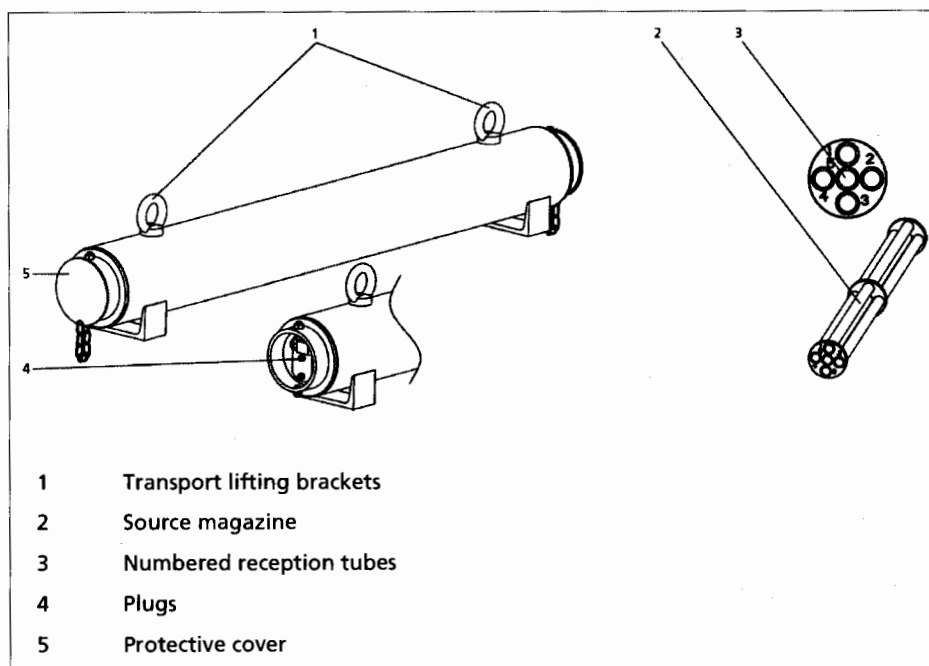


Fig. 3 Structure of the transport shielding

3.2.4

Nameplate

Notes on the design of the radioactive source and mould level shieldings can be obtained from the technical documentation and the nameplate (Fig. 4).

36867-00

+ **RADIOACTIVE** +

Nr. Datum
 no date 1

abgeschirmt/shielded

mm MBq 2

Dosisleistung in 1m Abstand $\mu\text{Sv/h}$ 3
 dose rate at 1m distance

BERTHOLD TECHNOLOGIES
GmbH & Co. KG

+ D-75323 BAD WILDBAD, GERMANY + 4

1 Date of manufacture of the source
 2 Isotope
 3 Dose rate within 1 m distance
 4 Manufacturer of the mould level shieldings
 5 Activity
 6 Shielding material
 7 Effective shielding thickness
 8 Source number

Fig. 4 Nameplate

4

Start-Up

4.1 Safety Instructions

During the entire start-up process, the following safety instructions must be observed:



Danger

Danger to life caused by falling components

If mould level shieldings are insufficiently secured, they may fall over or down and cause severe, irreversible injury or even death.

- Irreversible damages or death caused by falling components.
- Ensure that the transportation bracket included in the scope of delivery has been mounted and secured.
- Ensure the stability of the mould level shieldings.
- Loads of more than 25 kg are to be lifted with suitable lifting equipment.
- Wear head protection and safety shoes.
- Maintain a sufficient safety distance.



Caution

Radiation!

For mounting, direct contact with the mould level shieldings is required.



- Exposure to radiation
- Carefully plan the mounting process.
- Ensure that the locking mechanism is turned to the "CLOSED" position.
- If the locking mechanism is in the "OPEN" position, do not enter the beam path.
- Ensure that there are no persons in the beam path.



Caution

Radiation!

The transportation of the mould level shieldings may only be executed if the locking mechanism is in the "CLOSED" position.



- Exposure to radiation
- Ensure that the locking mechanism is turned to the "CLOSED" position until the start-up of the measuring system.
- Check that the shipping braces included in the scope of delivery are mounted.

Safety Instructions (Continued)**Radiation!**

Problems during the installation of the rod source by:



- Damage of the protective tube.
- Misaligned position of the protective tube.
- Immediately return the source into the mould level shieldings.
- Close the locking mechanism of the mould level shieldings.
- Secure the locking mechanism with the padlock provided.
- At the mould, look for causes of defect which may hinder the installation process.

4.2**Mounting the Mould Level Shieldings**

Depending on the mould design used, the start-up process differs. For example, the usage of a source without mould level shieldings is possible, as well.

In order to avoid unnecessary exposure to radiation, the mould level shieldings should be mounted as the last system component. The mounting is to be executed by employees with general knowledge and have been instructed by an authorized person.

If the mould level shieldings contains a radioactive source, the radiation safety officers must be present during the planning and execution of the installation.

4.2.1 Transportation to the Site of Installation

The transportation may only be executed by construction site personnel experienced in handling heavy components. The construction site personnel is to be instructed by at least by one authorised person. If the mould level shieldings contains a radioactive source, the radiation protection officer is to be consulted, as well!

For lifting packages or mould level shieldings weighing more than 25 kg, suitable aids (e.g. forklift truck) are to be used. If mould level shieldings are lifted without transport packaging (wooden box or pallet), the provided fixing possibilities (lifting brackets) are to be used exclusively for attaching the sling gear.

Please observe the radiation protection regulations for the transportation of radioactive substances.

4.2.2 Installation Preparations

1. Carefully plan the installation process and assess the exposure to radiation.
2. Instruct the employees.
3. Clean the installation site in order to avoid slipping.
4. Lay out the required tools.
5. Remove all obstacles which may hinder the installation work (e.g. mould cover).
6. Check whether the scope of delivery of the mould level shieldings is complete (e.g. shipping braces) and ensure that all components have been cleaned. If required, clean the components.

4.2.3 Installation and Usage of a Operation Shielding

When mounting the operation shielding, please observe the following:

1. Carefully prepare the mounting process (see chapter 4.2.2).
2. Ensure that the operation shielding has been closed and secured (the arrow on the locking square must be pointed to the **"CLOSED"** position and the transportation bracket must be mounted).
3. Position the operation shielding directly above the site of installation.
4. Position the operation shielding in a way that the radiation beam outlet is directed towards the detector.
5. Slowly lower the operation shielding into the mounting tube at the mould (Fig. 6, pos. 2, A).
6. Secure the operation shielding with the existing fixing equipment. (the type and the design of the fixing equipment depends on the individual design of the mould level shieldings. Further details can be obtained from the design drawing.)
7. Remove the shipping braces and the transportation bracket and do not open the mould level shieldings until immediately before commissioning the measuring system.
8. In order to open it, turn the locking square into the "OPEN" position (fig. 5, pos. 2).
9. Reattach any covers of the mounting tube (depending on the mould construction)

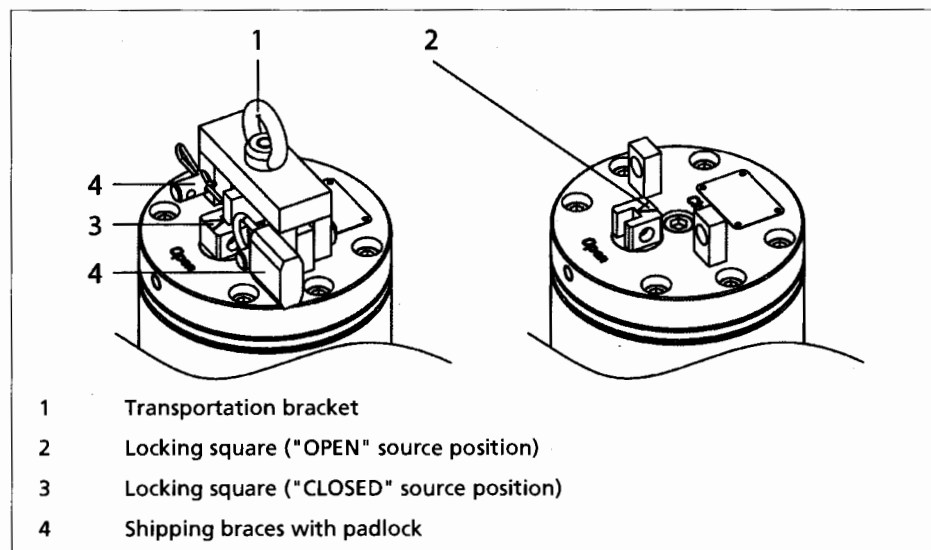
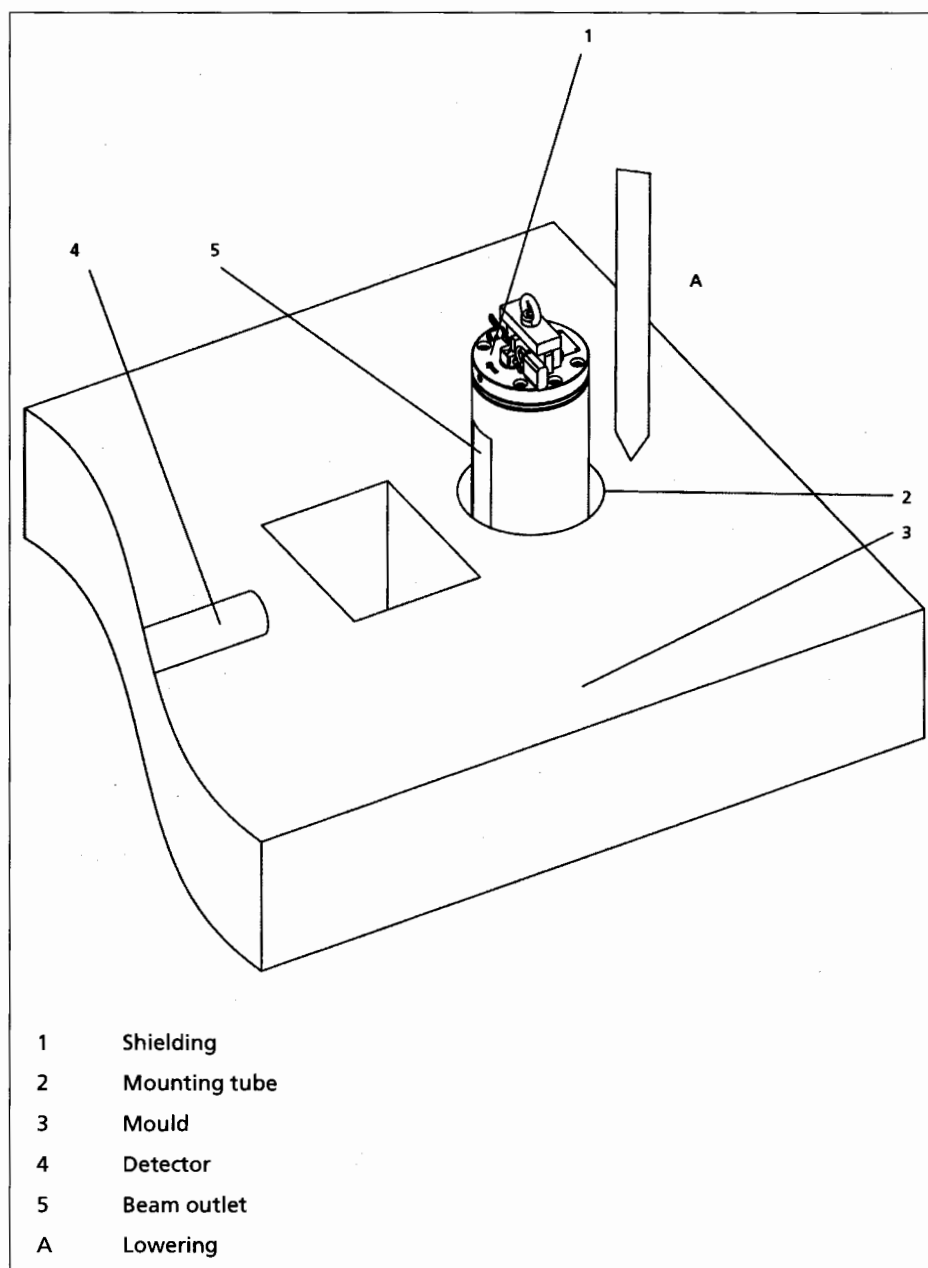


Fig. 5 Mould level shieldings with transportation bracket and source position left: "CLOSED", right: "OPEN"

Installation and Operation of a Operation Shielding (Continued)**Fig. 6 Installation of a Operation shielding**

4.2.4 Usage of a Transfer Shielding

Normally, sources which are operated without operation shielding in the mould are delivered in a **transfer shielding** in order to warranty a secure transfer of the source from the mould level shieldings to the mould.

1. Carefully prepare the mounting process (see chapter 4.2.2).
2. Ensure that the transfer shielding has been closed and secured (the locking mechanism must be in the "CLOSED" position (Fig. 7, pos. 3) and be secured by means of the shifting rod (Fig. 7, pos. 4). The screwed sealing plug located on top of the mould level shieldings must be mounted.
3. Direct the transfer shielding above the protective tube in a way that the positioning nipples (Fig. 8, pos. 6) fit into the positioning bore holes (Fig. 8, pos. 7) at the mould side.
4. Remove the screwed sealing plug on top of the transfer shielding.
5. Remove the shifting rod (Fig. 8, pos. 1,2) from the bracket and, from above, screw it into the head of the source within the transfer shielding.
6. Open the locking mechanism of the shielding (Fig. 8, pos. 3) and carefully insert the source into the protective tube within the mould by means of the shifting rod (Fig. 8, pos. 1, 2).
7. Ensure that the entire source is located within the protective tube (Fig. 8, pos. 5) and that the pin of the twist protection at the head of the source latches into the respective groove (Fig. 8, pos. 4).
8. Unscrew the shifting rod from the source and pull it upwards, out of the transfer shielding (Fig. 8, pos. 1, 2).
9. Carefully lift the transfer shielding off the mould.
10. Ensure that the source is in the correct position.
11. Close the mould head (e.g. by means of a screwed plug or cover plate) so that the source is safe and secured in this position.



Note

The dismounting process is executed in reverse order.

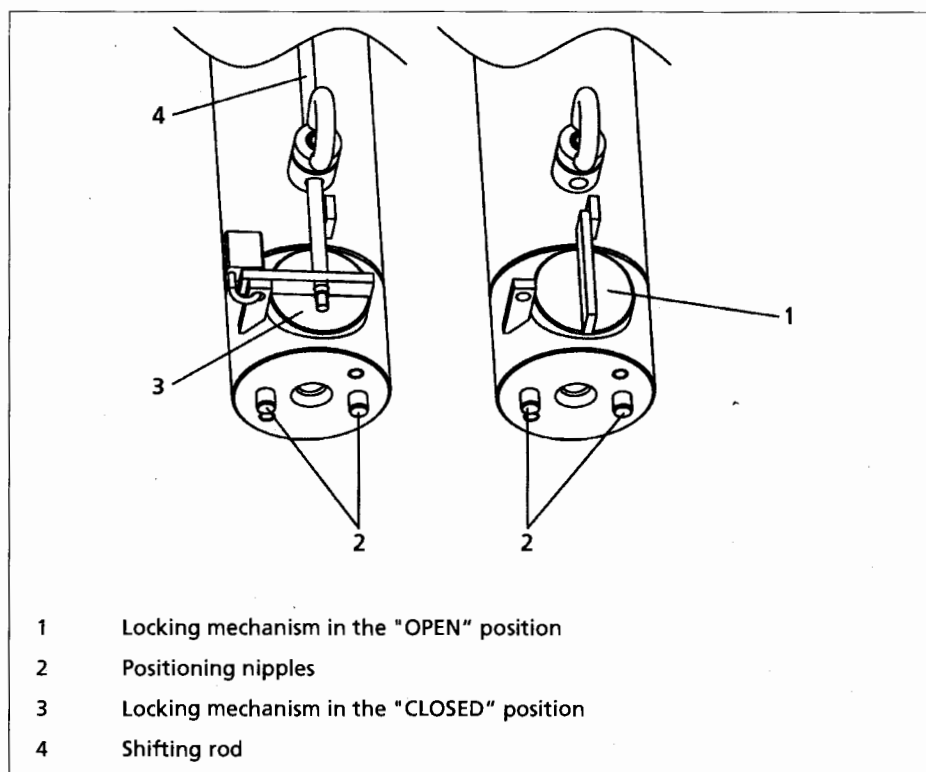
Usage of a Transfer Shielding (Continued)

Fig. 7 Left: Locking mechanism in the "CLOSED" position, secured by shifting rod, right: Locking mechanism in the "OPEN" position

Usage of a Transfer Shielding (Continued)

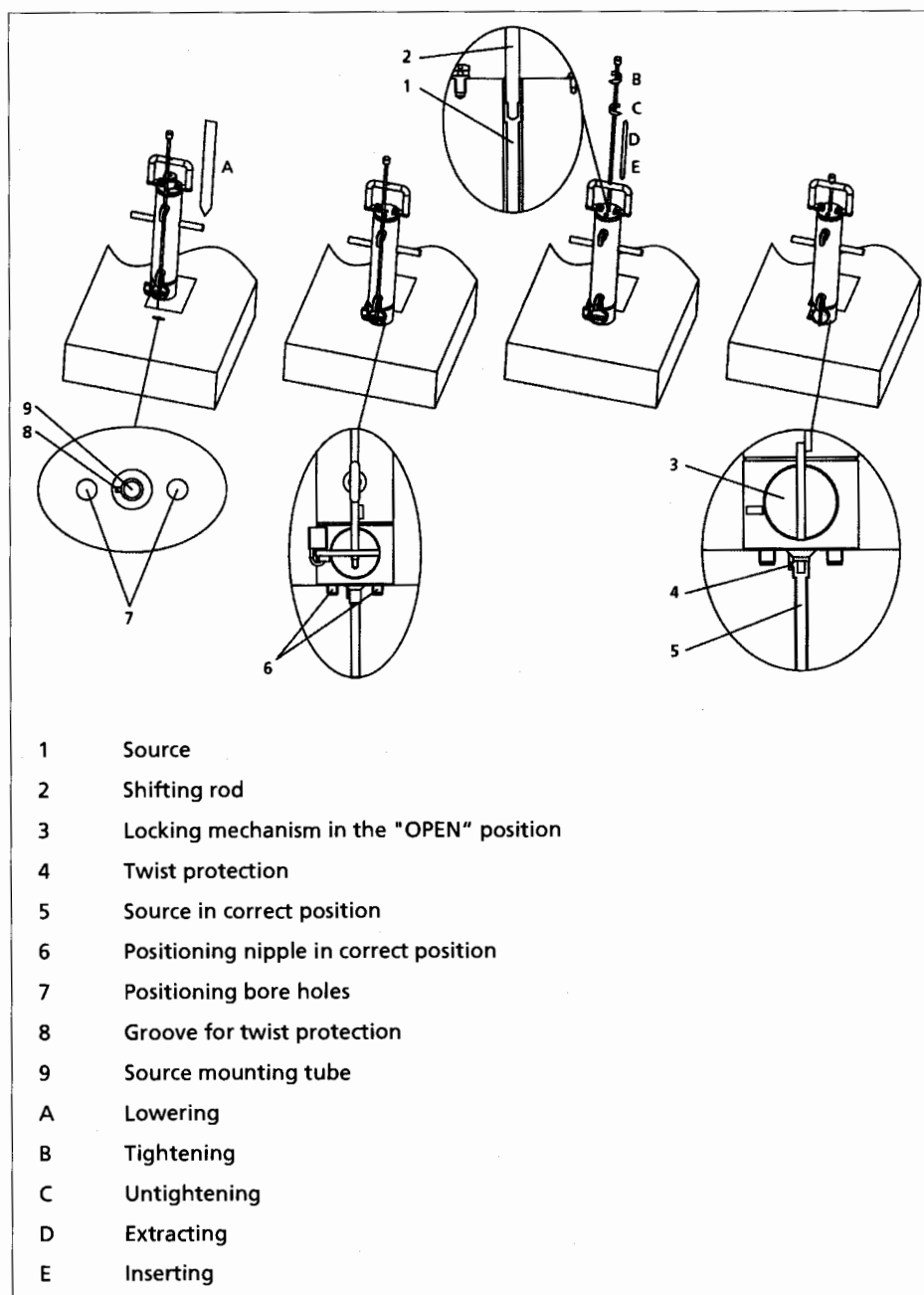


Fig. 8 Mounting the source

4.2.5 Usage of a Transport Shielding

1. Lay out a pair of tongs in order to be able to easily and securely grab the source.
2. Check the transport shielding for visible damage. (If you detect any damage to the source, the removal process must not be continued).
3. Lay out the transport shielding in direct vicinity of the respective site of usage of the source.
4. Remove the protective cover (Fig. 9, pos. 6) of the transport shielding.
5. Remove the plug (Fig. 9, pos. 5) of the transport shielding.
6. If the transport shielding contains several sources, the correct source is to be identified before the removal. Use the loading schedule included in the scope of delivery in order to determine the magazine tube housing the required source.
7. If the transport shielding is not equipped with a source magazine, the source number is to be obtained from the source itself. For this purpose, grip the source with the pair of tongs laid out and carefully extract the source from the transport shielding until you are able to read the source number (Fig. 9, pos. 1).
8. Sources which are not required are to be returned into the transport shielding immediately.
9. Once you have identified the source required, remove the source and mount it at its intended site of usage without undue delay (see chapter 5.4).
10. Close the transport shielding after removal.

Usage of a Transport Shielding (Continued)

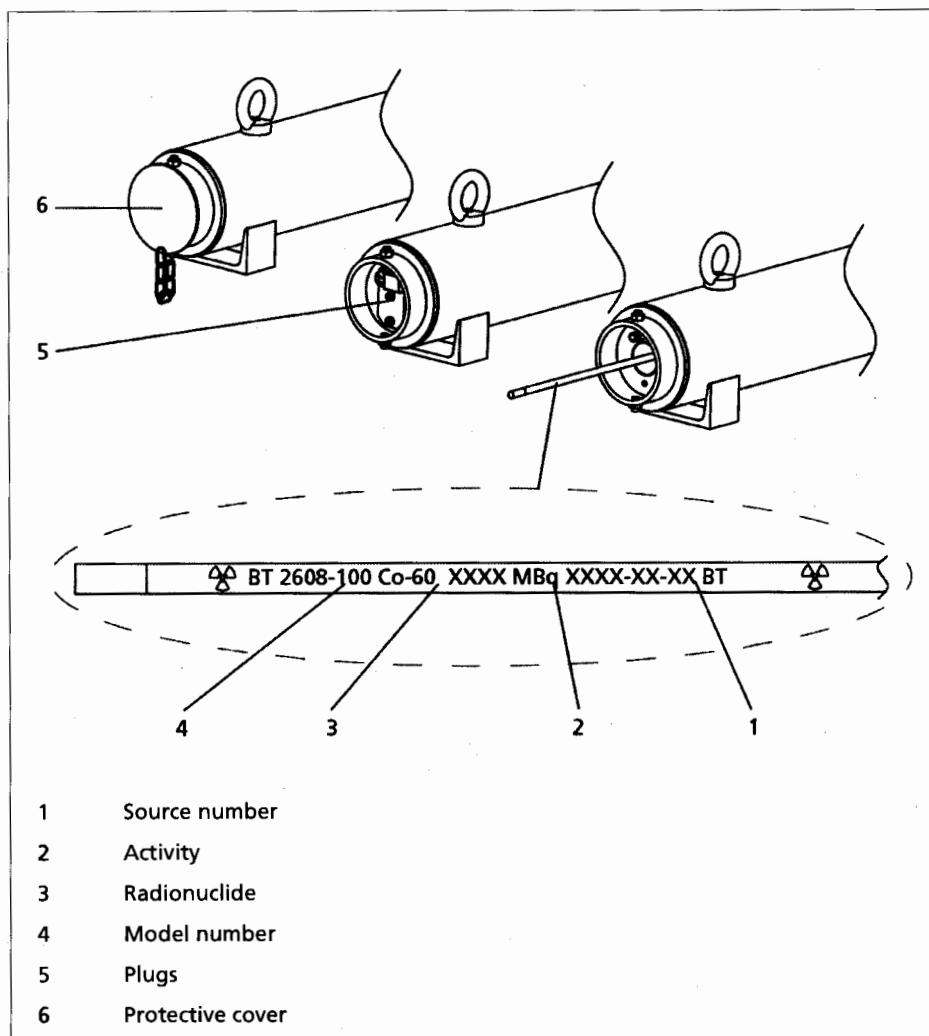


Fig. 9 Usage of a transport shielding

4.3 Installation Options

Depending on the respective application, the operation shielding containing the source is designed according to the respective mould design. The positioning of the operation shielding within the mould is already determined during the planning stage.

If the mould itself has a sufficient shielding effect, it is possible to directly mount the source without operation shielding (see chapter 4.3.3) into the copper plate or the water box of the mould.

4.3.1 Within the Water Box of the Mould

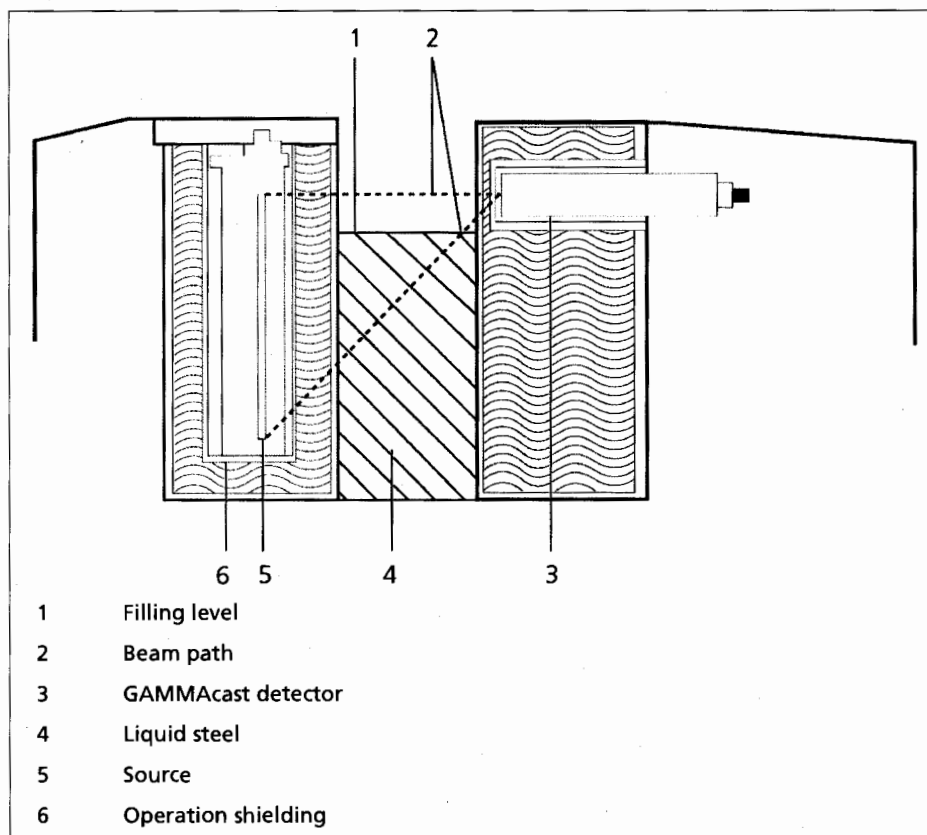


Fig. 10 Operation shielding within the water box of the mould

4.3.2 Outside of the Water Box of the Mould

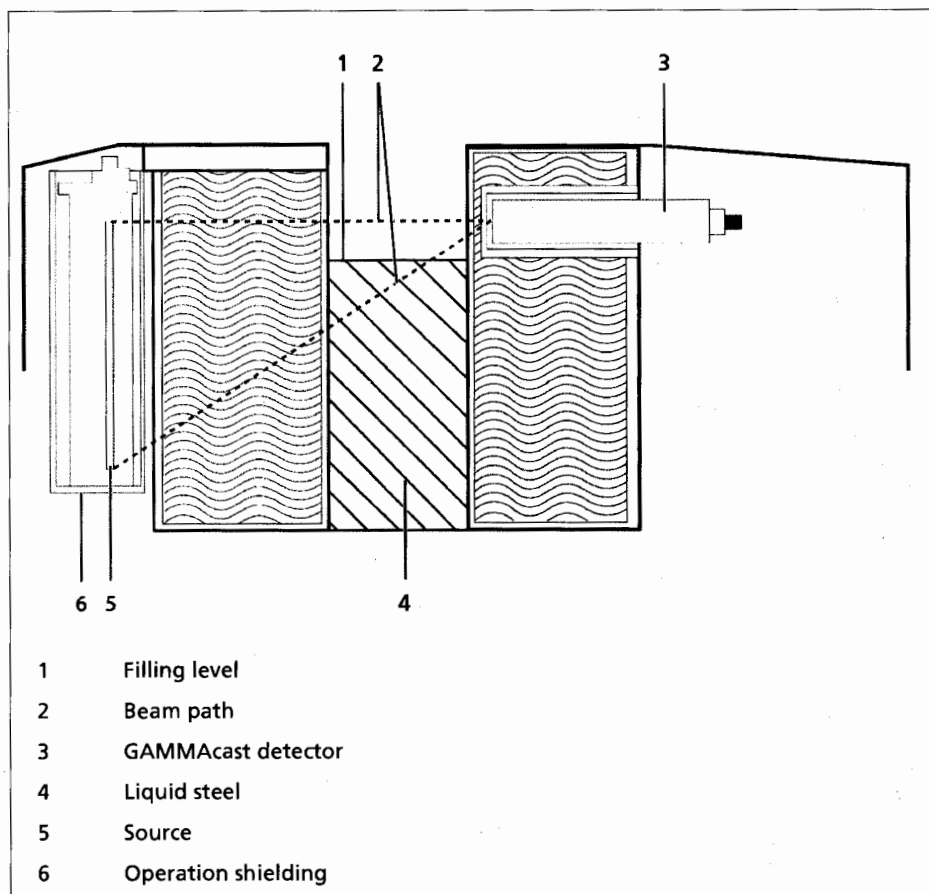


Fig. 11 Operation shielding outside of the water box of the mould

4.3.3 Without Operation Shielding within the Water Box of the Mould

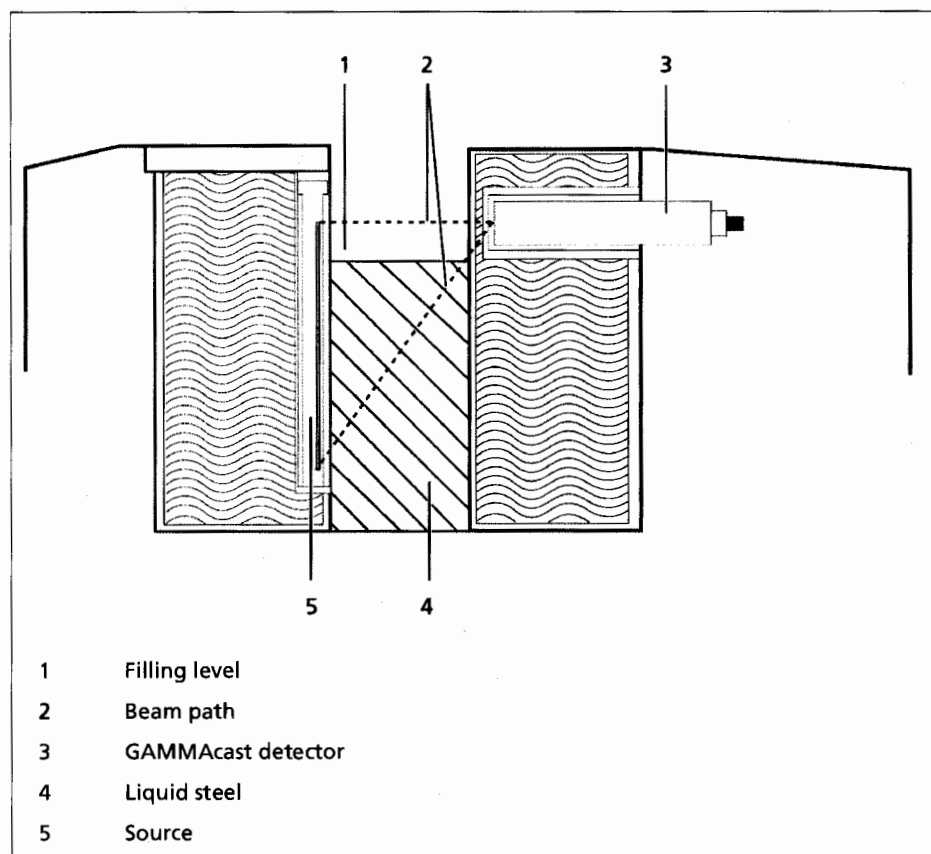


Fig. 12 Source without operation shielding within the water Box of the mould

5

Maintenance

The mould level shieldings are neither equipped with wear parts nor with mechanically moved components which would require maintenance services under normal operating conditions. For safety reasons, it must be possible at all times to close the useful beam.

For this reason, a functional test is to be executed in appropriate intervals, at least every 6 months. If, during these tests, defects of the mould level shieldings (e.g. at the sealings) or a stiff locking mechanism are identified, this is to be reported to the radiation safety officer immediately.



Radiation!

Any maintenance work requires direct contact with the mould level shieldings.



- Exposure to radiation
- Ensure that the locking mechanism is turned to the "CLOSED" position.
- In order to keep the exposure to radiation as low as possible, the work is to be planned in detail and, if required, trained with the employees.
- While testing the locking mechanisms, it is to be ensured that no persons are lingering in the beam path of the open mould level shieldings.
- Longer repair and maintenance work on mould level shieldings must not be carried out with the sources remaining installed. If a removal of the source is impossible, please contact the Berthold service department.
- The responsible radiation safety officer is to be consulted for all work during which an exposure to radiation cannot be excluded.

5.1 Visual Inspection

A visual inspection of the mould level shieldings is to be executed regularly, as a minimum requirement every six months. Check the mould level shieldings for obvious damages (dents, cracks, holes etc.) and corrosion.

If any defects are identified during the visual inspection, inform the radiation safety officer who will initiate the measures required for repairing the defects.

When determining the testing intervals for the visual inspection, the following conditions are to be considered:

- Ambient conditions (outdoors, rain, sunlight, wind)
- Operating conditions (degree of utilisation of the plant, misuse)

Visual Inspection (Continued)

A visual inspection is to be carried out before the initial start-up and with every repair that may be required.

All work carried out in the vicinity of radioactive sources are to be arranged in cooperation with the radiation safety officer. Any work directly affecting radioactive sources and their mould level shieldings are subject to the express authorisation and the supervision of the radiation safety officer.

For further information, please contact BERTHOLD TECHNOLOGIES.

5.2 Inspection and Cleaning of the Locking Mechanism

The locking mechanism is to be inspected every six months as a minimum requirement in order to warranty a secure locking of the source in the mould level shieldings.

Such maintenance work may only be carried out by employees who have been authorised respectively.



Note

The locking mechanism may be inspected with the source remaining installed.

The cleaning may only be executed **with the source being removed**.

Inspection of the Locking Mechanism

When inspecting the locking mechanism, please proceed as follows:

1. Ensure that no employees are present in the direction of the radiation beam outlet since, when opening the locking mechanism, they would be exposed to radiation.
2. Open and close the locking mechanisms several times.
3. Return the locking mechanism to its starting position.
4. Immediately report any malfunctions or stiffness of the locking mechanism to the radiation safety officer, and clean the locking mechanism.

Cleaning the Locking Mechanism at Operation Shieldings

For cleaning the locking mechanism, the locking cylinder must be removed. During this maintenance work, no radioactive source must be present in the Operation shielding.

When dismantling and cleaning the locking mechanism, please proceed as follows:

1. Ensure that the operation shielding does not contain any radioactive sources. If required, remove the source (see chapter 5.4).
2. Remove the transportation bracket (Fig. 5, pos. 1).
3. Untighten the fixing screws (Fig. 13, pos. 1) of the shielding cover and remove the shielding cover (Fig. 13, pos. 3).
4. Pull the locking cylinder upwards, out of its reception tube.
5. Clean the locking cylinder (Fig. 13, pos. 2) and the reception tube thoroughly.
6. Regrease the locking cylinder and insert it into the reception tube.
7. Remount the shielding cover (Fig. 13, pos. 3) and the transportation bracket.

Inspection and Cleaning of the Lock (Continued)

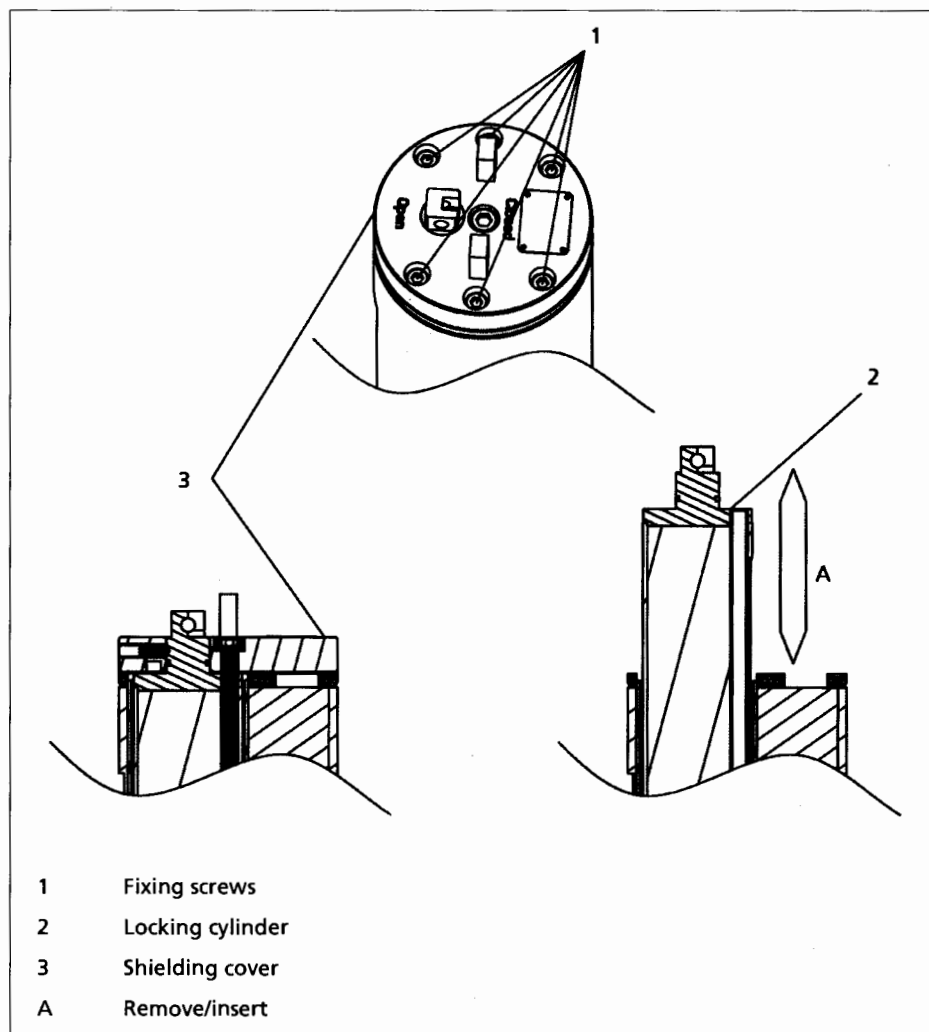


Fig. 13 Dismounting and mounting the locking cylinder of a Operation shield-ing

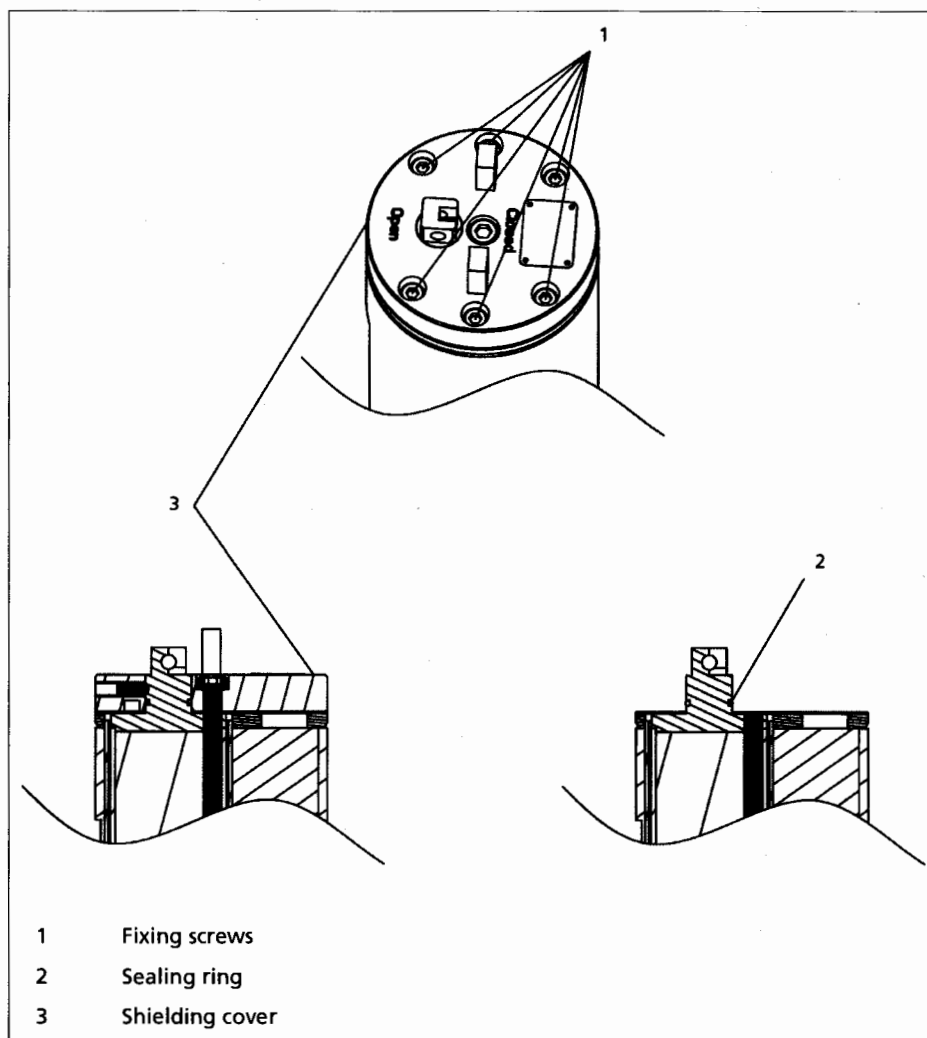
5.3 Inspection and Replacement of Sealing Rings of Operation Shieldings

An inspection or replacement of sealing rings (o-ring gaskets) is required if an overheating of these parts cannot be excluded.

Such maintenance work may be carried out with the source being mounted provided that it has been ensured that the locking cylinder remains in the operation shielding during the entire time. Such maintenance work may only be carried out by employees who have been authorised respectively.

When inspecting the sealings of the operation shieldings, please proceed as follows:

- Remove the transportation bracket (Fig. 5, pos. 1) and ensure that the locking mechanism is turned to the "CLOSED" position.
- Untighten the fixing screws (Fig. 14, pos. 1) of the shielding cover.
- Remove the shielding cover (Fig. 14, pos. 3).
- Check the sealing ring (Fig. 14, pos. 2) for damages and wear and replace it, if required.
- Remount the shielding cover and the transportation bracket.

Inspection and Replacement of Sealing Rings (Continued)**Fig. 14** Inspection and replacement of sealing rings

5.4 Replacement of a Source

Generally, the radioactive source used enables a service life between 5 and 10 years.

A replacement of the source is only required if the statistical fluctuations of the output signal are inadmissibly large and compensation by increasing the time constant is no longer possible (e.g. for regulation-technical reasons).

If a renewal of the source is required, when reordering the source, the manufacturer's number of the source used must be indicated. The length, activity and activity distribution of the new source must correspond to the original version. You can obtain the manufacturer's number from the nameplate (Fig. 4) at the top of the mould level shieldings.

The replacement of the source requires the direct handling of the unshielded source. Please clarify with the responsible supervisory authority in advance whether your license for handling radioactive substances comprises handling unshielded sources. In any case, the replacement of the source may only be carried out by authorised persons. The radiation safety officer must be consulted in such case, as well.



Note

In order to keep the exposure to radiation during the replacement of the source as low as possible, all persons involved should familiarise themselves with the exact procedure in advance.

- Only replace the source in areas with **closed floors** Any apertures which are larger than the external diameter of the source (7 mm) are to be covered before commencing any work.

When replacing the source of a Operation shielding, please proceed as follows:

1. Lay out the following tools:
 - two pairs of tongs (with which you can easily and safely grip the source).
 - one set of hexagon spanners
 - Teflon sealing tape
 - M3 threaded rod (approx. 50 mm long)
 - Nameplate of the new source.

Replacement of a Source (Continued)

2. Remove the transportation bracket of the operation shielding and ensure that the locking mechanism is in the "CLOSED" position.
3. Remove the screwed sealing plug of the source reception tube by means of a hexagon spanner.
4. Lay out the transport shielding with the new source and open the transport shielding (see chapter 4.2.5).
5. Screw the M3 threaded rod (Fig. 15, pos. 4) into the upper part of the source spacer of the old source (Fig. 15, pos. 6), and carefully extract the source from the operation shielding (Fig. 15, pos. B).

**Note**

Never directly touch the source; the pair of tongs and the M3 threaded rod are to be used **exclusively** for this purpose!

6. Without undue delay, insert the old source into the transport shielding (Fig. 16, pos. 9) so that only the spacer and a small part of the actual source protrude.
7. Grip the source with one pair of tongs and, with the other pair of tongs, unscrew the spacer (Fig. 15, pos. 7, D).
8. Grip the new source with one pair of tongs and, with the other pair of tongs, screw the spacer which has just been unscrewed from the old source, onto the new source.
9. Unscrew the M3 threaded rod (Fig. 15, pos. 8) from the spacer.
10. Insert the plug (Fig. 13, pos. 2) into the transport shielding in order to shield the sources as long as they are not required.
11. Check the operation shielding for damages and wear and repair it if required (see chapter 5.1 to 5.3).

Replacement of a Source (Continued)

12. Remove the nameplate (Fig. 4) of the old source from the operation shielding and rivet on the nameplate of the new source.
13. Remove the plug (Fig. 13, pos. 2) from the transport shielding.
14. Screw the M3 threaded rod into the upper part of the source spacer of the new source and carefully extract the source from the transport shielding.
15. Without undue delay, insert the new source into the operation shielding until only the spacer protrudes.
16. Hold the spacer (Fig. 15, pos. 6) with one pair of tongs and unscrew the M3 threaded rod (Fig. 15, pos. 8) with the other pair of tongs.
17. Close the transport shielding (see chapter 4.2.5).
18. Attach new Teflon sealing tape to the screwed sealing plug (Fig. 15, pos. 3).
19. Close the source reception tube of the operation shielding by means of the screwed sealing plug (Fig. 16, pos. 2).
20. Do not turn the locking mechanism of the operation shielding into the "OPEN" position until shortly before the start-up of the measuring system (Fig. 5, pos. 2).

Replacement of a Source (Continued)

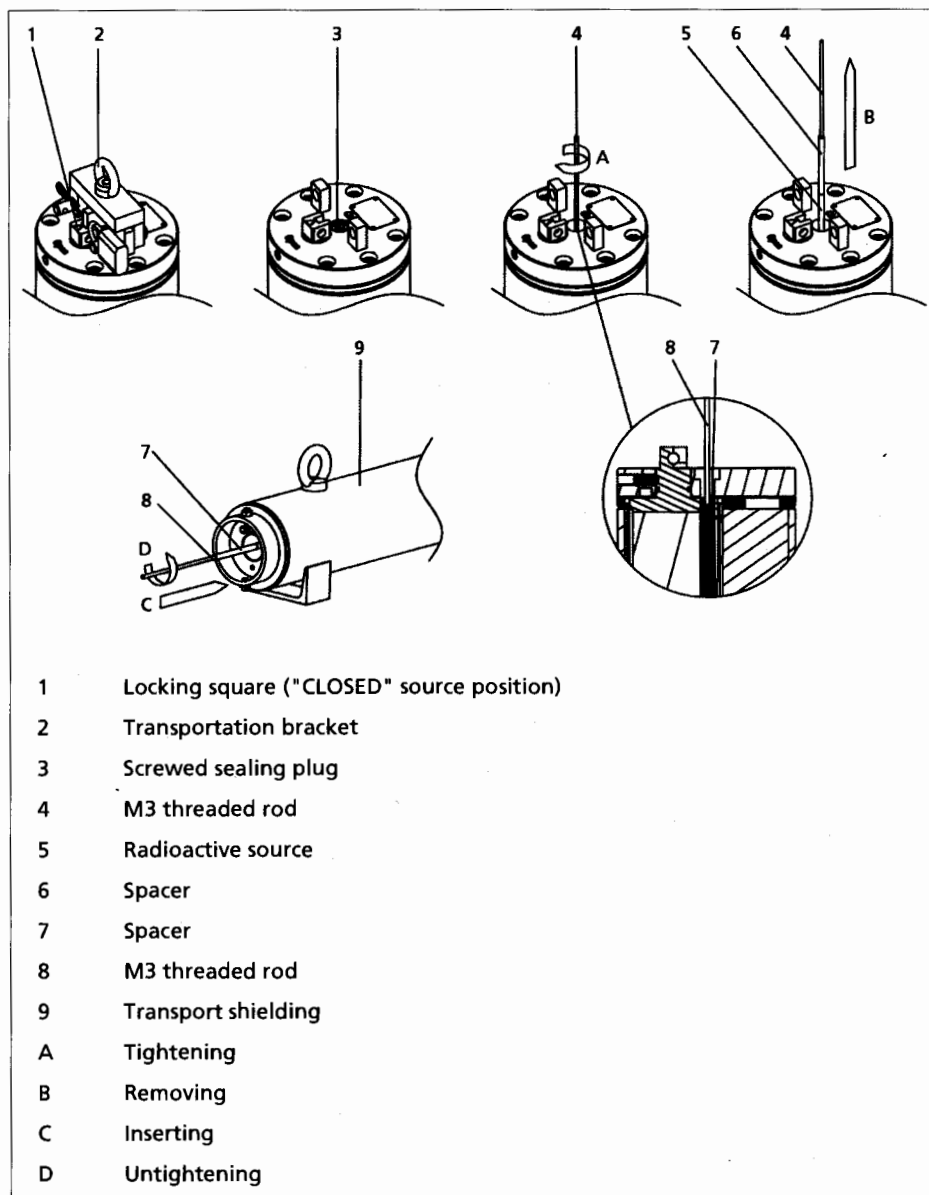
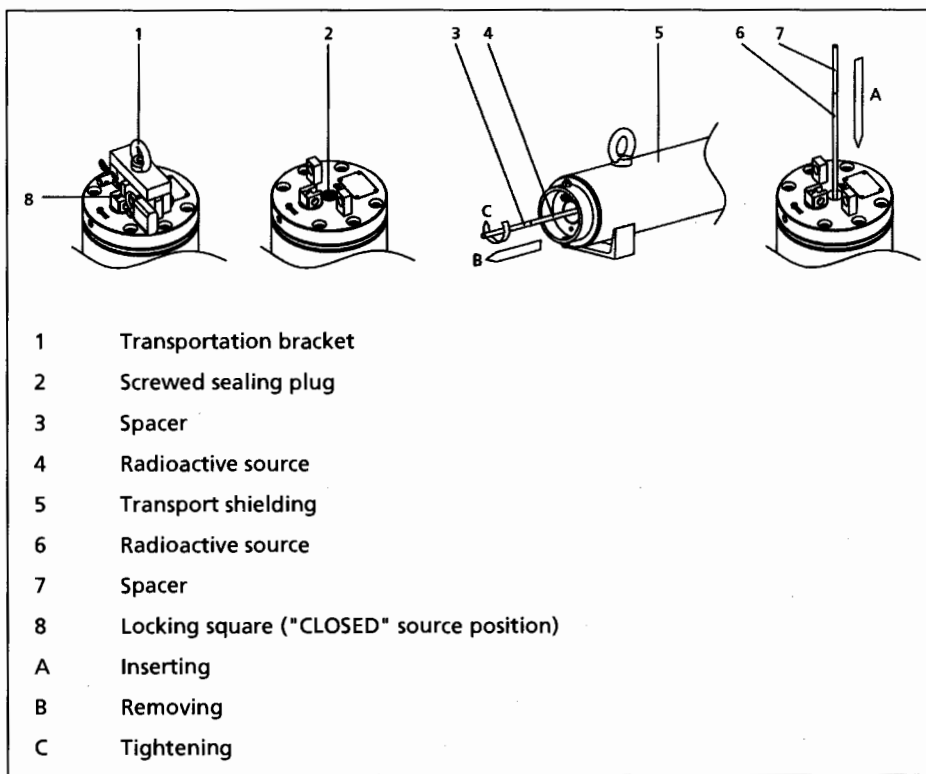


Fig. 15 Removal of the radioactive source from a Operation shielding

Replacement of a Source (Continued)**Fig. 16** Installation of the radioactive source into a Operation shielding

6

Decommissioning



Caution

Radiation!

For decommissioning, a direct contact with the mould level shieldings is required.



- Exposure to radiation
- Carefully plan the decommissioning process.
- Ensure that the locking mechanism is turned to the "CLOSED" position.
- If the locking mechanism is in the "OPEN" position, do not enter the beam path.
- Ensure that there are no persons in the beam path.

When decommissioning the system, please proceed as follows:

1. Turn the locking mechanism of the mould level shieldings to the "CLOSED" position (fig. 5, pos. 3).
2. Mount the transportation bracket and secure it by means of the shipping braces (Fig. 5, pos. 4).
3. Store the mould level shieldings containing the source in the dedicated storage room exclusively until its reuse, handing over to the manufacturer or disposal. The storage room must comply with the national requirements regarding the storage of radioactive substances.

6.1 Disposal of Sources/Mould level Shieldings

Generally, each country has a depot where radioactive material is accepted and can be disposed of.

However, if you wish to send radioactive material back to us, the international regulations as regards the transportation and labelling as well as the dose rate of the radioactive material and the national statutory regulations must be complied with. It is the full responsibility of the dispatching party to comply with these regulations.

Please also note the following:

- Dose rate at the surface of the packaging: < 2000 $\mu\text{Sv/h}$.
- Dose rate within a distance of 1m from the surface of the packaging: < 100 $\mu\text{Sv/h}$.
- Labelling of the UN number with the caution mark for hazardous goods on each package.

- Furthermore, transport documents with the correct description of the content as well as an accident procedures sheet according to the ADR regulations are required.
- The packaging must conform to the applicable ADR regulations.

Should you have any questions regarding the transportation or disposal of radioactive substances, please contact our department for the disposal and repair of sources.

In such case, we kindly ask you to indicate the number of the source in order to be able to identify the source.

We would like to highlight the following points in particular:

- Radioactive substances and their mould level shieldings must not be damaged in any way and a respective, valid seal test certificate must be present. The seal test certificate issued before the arrival of the radioactive substances in Germany may not be older than 6 months.
- If radioactive sources with isotope Am-241 or Cm-244 are returned, the special form certificate must be attached.
- At all times, any radioactive material sent to us must be sufficiently labelled with your name and address. If we have sent you a quotation in advance, our quotation number must be indicated, as well.
- Any radioactive substances may only be returned after the respective approval of BERTHOLD TECHNOLOGIES has been received. We are pleased to send you a quotation regarding the costs of disposal in such case.
- Radioactive substances must be sent to Bad Wildbad carriage paid. BERTHOLD TECHNOLOGIES does not assume any costs for customs clearance or transportation.
- BERTHOLD TECHNOLOGIES is to be informed about any return transport in advance. BERTHOLD TECHNOLOGIES reserves the right to reject any radioactive substances sent to Berthold without prior notice. Any storage costs accrued in such case shall be borne by the supplier.
- A copy of the attached notice form and the seal test certificate must be attached to each mould level shieldings that includes a radioactive source. The original is to be included in the transport documents.
- Beforehand, the documents are to be sent via fax or email to our department for the disposal of sources.

On the following pages, please find a notice form which you may use for returning a source or mould level shieldings to us.

Notice formfor the disposal of radioactive sources

Sender:	Person responsible:
Address:	Telephone:
P.O. box / city or town	Country:

Source number	Isotope	Activity	
		mCi	MBq

☐ Source is returned for the purpose of disposal

☐ Further instructions (please fill in):

.....

.....

.....

☐ Shielding is to be disposed of

- ☐ The shielding is to be loaded with one or several new sources
Order number of the sender:/ or our order number
- ☐ The shielding is to be returned to the sender
- ☐ The shielding is to be returned to the address or after repair
Order number of the sender:/ or our order number
- ☐ Return of a rented shielding
Order number of the sender:/ or our order number

☐ Further instructions or remarks:

.....

.....

.....

.....

The sender herewith confirms:

a) Source and shielding are not contaminated

b) Labelling and packaging correspond to ADR regulations

Place and date:

Signature and title:

7

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Tomczak, Tammy

From: Pelke, Patricia
Sent: Thursday, September 27, 2018 11:46 AM
To: Tomczak, Tammy
Cc: McCraw, Aaron; Craffey, Ryan
Subject: Please have all of the attached emails (with attachments) placed into ADAMS and process as an amendment to the license; FW: Gerdau
Attachments: [External_Sender] RE: Source leak tests and pm.; [External_Sender] RE: [External_Sender] Gerdau Monroe License Amendment; [External_Sender] Gerdau Monroe License Amendment

Hi Tammy,

The licensee submitted various documents to Ryan via emails – please have them scanned and added to ADAMS (each email as separate ADAMS ML) and then all placed into an amendment for the subject licensee. We will have to go back for clarification and further confirmation once assigned to a license reviewer. Thanks - Patty

From: Craffey, Ryan
Sent: Thursday, September 27, 2018 9:41 AM
To: Pelke, Patricia <Patricia.Pelke@nrc.gov>
Cc: McCraw, Aaron <Aaron.McCraw@nrc.gov>
Subject: Gerdau

Good morning Patty,

The RSO at Gerdau forwarded an amendment request to me in several pieces yesterday. I know you prefer they correspond directly with MLB, and I did ask him to do so on several occasions, but he decided to send it to me anyways. Sorry.

Ryan Craffey

Health Physicist
US Nuclear Regulatory Commission
Materials Inspection Branch, Region III
(630) 829-9655