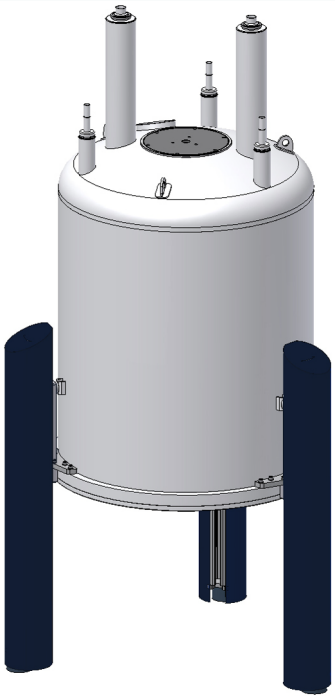
Magnet Stand H

Service Manual



Version 001

Accessories

Innovation with Integrity

This manual was written by

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© August 11, 2011: Bruker Corporation

Faellanden, Switzerland

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For further technical assistance on the Magnet Stand H, please do not hesitate to contact your nearest BRUKER dealer or contact us directly at:

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Please refer to the model No., serial No. and internal order No. in all correspondence regarding the NMR system or components thereof.

Contact

1 Introduction

1.1 General Information

This manual contains important information about the handling of the supplied magnet stand as a part of the magnet system used for NMR analyses. The compliance with all safety and handling instructions, the applicable local accident prevention and general safety regulations are necessary for safe work.

The manual is part of the product. It must be kept in the immediate vicinity of the magnet system and unimpeded access must be ensured at any time.

Read the manual carefully before handling the magnet system or its components.

1.1.1 Limitation of Liability

The information in this manual will take into account the current state of the technology.

The manufacturer assumes no liability for damages resulting from:

- non-compliance with the instructions and all applicable documentation,
- use for purposes not intended,
- not sufficiently approved persons,
- arbitrary changes or modifications and
- use of unauthorized spare parts or accessories.

1.1.2 Customer Service

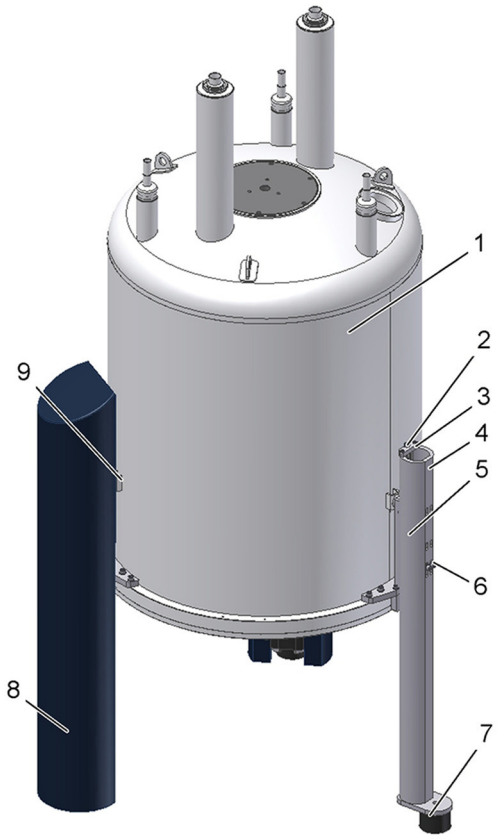
Technical support is provided by Bruker Service via telephone or e-mail. For contact information see page 5 of this document.

1.1.3 Warranty

The warranty terms can be found in the sales documents of the magnet system and in the Terms and Conditions of Bruker BioSpin AG.

1.1.4 Copyright

1.2 General View



1 Cryostat
2 Adjusting screw
3 Mounting bracket
4 Magnet stand ID
5 Pillar
6 Fixing screw
7 Isolator
8 Pillar cover
9 Support

Figure 1.1: General view of the magnet stand H

Description

The magnet stand allows access to the RT bore from the bottom side and protects the cryostat (1) from floor vibrations.

Components

- Pillars

The pillars (5) carry the cryostat and provide the correct distance from the ground.

- Support

The supports (9) connect the cryostat (1) to the three pillars.

- Adjusting screws

The adjusting screws (2) keep the cryostat on the predefined height.

- Fixing screws

The fixing screws (6) provide thorough contact between the pillars and the cryostat. The fixing screws serve as a backup in addition to the adjusting screws to prevent the magnet system from falling.

- Isolators

The isolators (7) reduce the transmission of floor vibration towards the cryostat.

2 Safety

The supplied magnet stand was designed and manufactured according to best available technical knowledge and practice, archived in over 50 years of experience of Bruker Corporation.

The magnet stand provides a free operation space between the bottom plate of the magnet system and the floor. For further safety instructions refer to the manual of the supplied magnet system.

Nevertheless non-compliance with the following instructions and safety advice may cause serious hazards and property damage.

2.1 Approved Persons

Bruker BioSpin AG identifies the following qualifications for personnel performing tasks on the magnet system or its components

Approved Customer Personnel

As a result of professional training by Bruker Service Personnel, experience and knowledge of applicable regulations these persons are qualified to perform the specific tasks on the magnet system and its components assigned to them in this manual. Approved Customer Personnel are qualified to identify possible hazards and risks associated with the tasks assigned to them and to perform all possible steps to eliminate or minimize these risks.

Bruker Service Personnel

These persons are qualified by appropriate qualification and professional training and experience (including all necessary knowledge of applicable regulations and regulatory requirements) to perform specific tasks on the magnet system and its components. Bruker Service Personnel are qualified to identify possible hazards and risks and to perform all possible steps to eliminate or minimize these risks.

2.2 Customer Responsibilities

The customer must obey the security advice and the rules for safety, accident prevention and environmental protection correctly for the magnet system and for the magnet stand as a part of it. Furthermore, the customer is responsible for keeping the magnet system in correct technical condition.

In particular:

- The customer must determine additional dangers resulting from the working conditions at the site of the magnet system and provide applicable safety measures.
- The customer must ensure that the site plan meets the specified conditions for operating the magnet system and supplied site planning document.
- The customer must clearly define the responsibilities for operation.
- The customer must ensure that all employees working with the magnet stand have read and understood the manual.
- The customer has to provide the necessary personal protective equipment for his employees.

2.3 Key Words

DANGER

Indicates a hazardous situation which, if not prevented, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not prevented, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not prevented, may result in minor or moderate injury.

NOTICE

Hazard, which could result in property damage.

Information and links for efficient and trouble-free handling and operation.

2.4 Residual Risks

In the following section, the residual risks from the risk analysis according ISO 14971 are summarized. To prevent health hazards and hazardous situations obey all safety instructions and warnings in the manual.

2.4.1 Persons

⚠ WARNING

Risk of injury and property damage due to handling by not approved persons.

Incorrect handling of the magnet system by not approved persons may result in significant bodily injury and property damage.

Thus:

- Work must only be carried out by approved persons with applicable qualifications. The necessary qualifications are specified in the beginning of the relevant chapter.
- In case of doubt, contact Bruker Service. Contact information see page 5 of this document.

2.4.2 Intended Use

The supplied magnet stand is designed and intended only for carrying the related NMR magnet system. The magnet stand provides the required distance between the magnet system and the floor.

⚠ WARNING

Risk of damage to life and limb by incorrect use of the magnet system.

Incorrect use of the magnet system can lead to life-threatening situations and destruction of the magnet system.

Thus:

- Only use the magnet system as intended.
- Do not change the magnet system.
- Do not use the magnet system to demonstrate strong magnetic fields.
- Do not exceed specified values for operating the magnet system.

Damage claims from damages caused by other than the intended use of the magnet system are excluded and the customer is held liable.

2.4.3 Spare Parts

⚠ WARNING

Risk of injury and property damage from using incorrect or defective spare parts and accessories.

Incorrect or defective spare parts can cause serious injuries. They may cause damaging, malfunctioning and the destruction of the magnet system.

Thus:

- Use only original equipment manufacturer spare parts.
- Use only original equipment manufacturer accessories.

2.4.4 Signs and Labels

⚠ WARNING

Risk of damage to persons and property due to not readable signs and labels.

Signs and labels with advice may become not readable.

Thus:

- Maintain signs and labels in a readable state.
- Replace damaged or not readable signs and labels immediately. New signs and labels can be obtained from Bruker Service.

2.4.5 Technical Risks

Assembling

⚠ WARNING

Risk of damage to life and limb due to incorrect installation of the magnet stand.

Installation of the magnet stand requires approved persons with sufficient experience. Mistakes during installation cause life-threatening situations and property damage.

Thus:

- Do not install and move the magnet stand arbitrarily after attaching it to the magnet system. Contact Bruker Service for subsequent transportation.
- Ensure sufficient free space for installation.
- Never stay or work under a lifted magnet system.

Risk of Slippage

⚠ WARNING

Risk of injury from slippage.

The accumulation of condensed water on the floor and ladders causes slippery surfaces.

Thus:

- Always wear safety shoes with an anti slip sole.
- Be careful using ladders.
- Clean floor and ladders regularly.

Risk of Tilting

⚠ WARNING

Risk of injury due to tilting during assembling and disassembling of the magnet stand.

The magnet system with attached magnet stand is very sensitive against lateral forces. The timber bridge is sensitive against lateral forces. It may tilt.

Thus:

- Do not stack tilted timbers during assembling.
- Align the timbers in a rectangular orientation – edge to edge and face to face.
- Follow the instructions in the corresponding figures of this manual.
- Do not move the magnet system arbitrarily.

Heavy weights

⚠ WARNING

Risk of damage to life and limb caused from moving heavy weights.

Lifting and moving heavy weights is life-threatening due to falling or moving parts.

Thus:

- Do not stay or work under a lifted magnet system.
- All lifting equipment used must be applicable to carry the weight (see "Technical data of the Magnet Stand H" on page 44).
- Do not use damaged lifting equipment.
- Use lifting equipment only with updated check tag.
- Lifting only with approved qualification.
- Obey ergonomic guidelines while lifting heavy parts.
- Protect parts against falling.

Incorrect Transportation

⚠ CAUTION

Risk of injury and property damage due to incorrect transportation.

The box may tilt, movement may get out of control. Thus persons may get injured and the cryostat or further equipment may be damaged.

Thus:

- Do not move arbitrarily.
- Be careful while unloading and moving the boxes.
- Pay attention to any symbols on the boxes.
- Move the box in an upright position.
- Do not tilt the box.
- Prevent crossing thresholds, even if they are only a few millimetres high.
- Clear the transportation way before transporting the box.
- Unpack shortly before assembling.
- Only use the attachment points provided.
- The magnet stand must be protected from rain and other bad weather conditions during transportation.

2.5 Personal Protective Equipment

The personal protective equipment must be worn at any time while working on the magnet stand or on the cryostat and to avoid health hazards.

Protective Gloves

Used to protect the hands from injury caused by contact with extremely cold liquids or surfaces and for protection from injury caused by rough edges.

Safety Shoes

Used to protect the feet from injury from falling of heavy objects. An anti-slip sole protect from injury caused by slipping and falling on slippery floor and steps. Only use safety shoes with non-ferromagnetic toe caps.

2.6 Description of Signs and Labels

Signs and labels are always related to their immediate vicinity. The following signs and labels are found on the magnet system and in the vicinity.

Prohibition sign: No person with pacemakers!

People with pacemakers are endangered in the identified area of 0.5 mT (5 Gauss) and are not allowed to enter these areas.

Prohibition sign: No person with implants!

People with metallic implants are endangered in the identified area of 0.5 mT (5 Gauss) and are not allowed to enter these areas.

Prohibition sign: No watches or electronic devices!

Watches and electronic devices may be damaged in the identified area of 0.5 mT (5 Gauss).

Prohibition sign: No credit cards or other magnetic memory!

Credit cards and magnetic memory may be damaged in the identified area of 0.5 mT (5 Gauss).

Prohibition sign: Do not touch! Do not block!

Do not touch or block the identified area.

Hazard warning sign: Strong magnetic field!

- No magnetic memory.
- No jewelry.
- No metallic items.

Emergency exit!

- Always keep the emergency exit clear.
- Follow the arrows if necessary.
- Doors should push open in escape direction.

2.7 Safety Devices

For behavior in danger and emergency situations concerning the magnet system refer to the provided manual of the magnet system.

3 Transportation

The transportation is carried out only by Bruker Service or approved persons. However, it may happen that persons of the customer have to take the delivery of the transport box. In this case it is essential to obey the instructions in this chapter.

3.1 Safety

⚠ WARNING

Heavy Weights (see page 15)

Risk of Tilting (see page 15)

3.2 Packaging

The magnet stand is packed in a box.

3.3 Transportation Inspection

Investigate the delivery and pay regard to visible damage and completeness of packaging.

In case of damage

- Accept the delivery with reservation.
- Make a note of the extent of damage in the transportation documents.
- Start the reclamation process.
- Contact Bruker Service before installation.

The claim of damage expires after the fixed period.
Thus:
Report damages immediately after detection (see page 5 of this document for contact information).

3.4 Transportation by Forklift / Pallet Jack

Use a forklift / pallet jack approved for the load to move the box to the site.

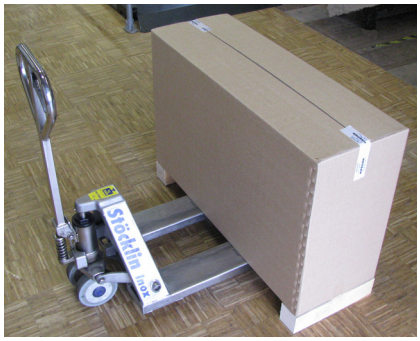
Persons

Approved forklift / pallet jack operator

Precondition

The forklift / pallet jack must be approved for the load.

Transport



1. Position the forks between the bars of the pallet as shown in Figure 3.1.
2. Check the projection of the fork at the back of the transport box.
3. Then lift the fork and move the pallet to the site.

Figure 3.1: Transportation of the magnet stand by a forklift / pallet jack

3.5 Transportation with a Crane

The box of the magnet stand must not be moved with a crane.

3.6 Storage

If it is necessary to store the box with the magnet stand prior to assembly, consider the following restrictions:

- Store the box in a closed, dry and dust-free room.
- Store the box upright.
- Do not tilt the box.
- Do not unpack the box.
- Prevent mechanical vibrations to the transport box.
- Storage temperature: 5 – 40 °C.
- Storage humidity: less than 50% @ 23 °C.

4 Assembling

4.1 Safety

Persons

The procedure described in this chapter must be performed by Bruker Service only.

Personal Protective Equipment

- Safety shoes
- Protective gloves

⚠ WARNING

Assembling (see page 14)

Risk of Tilting (see page 15)

4.2 Workflow

1. Unpack the box.
2. Put the cryostat on a timber bridge.
3. Adjust the timber bridge for mounting the pillars.
4. Mounting the pillars.
5. Arranging the cable routing.
6. Mounting the pillar covers.

Illustrations in this manual are intended for basic understanding, and may differ from the actual design. Some parts of the magnet stand may be preassembled.

4.2.1 Unpack the Box

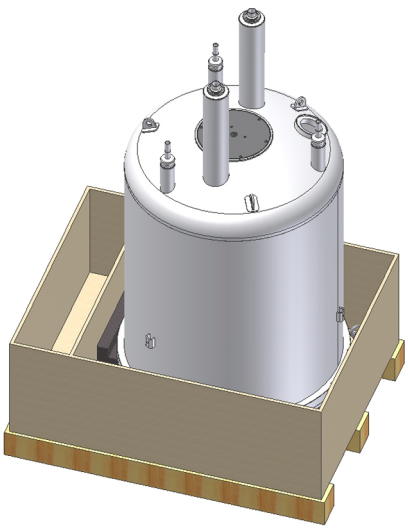
This section describes how to unpack and to assemble the magnet stand using the provided timbers and a pallet jack. The procedure does not require a crane to mount the magnet stand. However, in case an approved crane is available it is recommended to use the crane. Read this section carefully before starting to assemble the magnet stand.

The box of the magnet stand is supplied with six timbers (three pairs of timbers of equal size) denoted in the following description as timbers “No. 1”, “No. 2” and “No. 3”.

- 2 timbers (95 x 192 x 1200 mm) – “timbers No. 1”
- 2 timbers (95 x 192 x 600 mm) – “timbers No. 2”
- 2 timbers (95 x 192 x 400 mm) – “timbers No. 3”

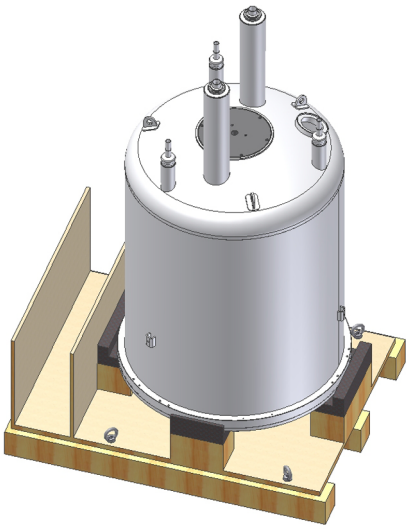
1. Unpack the box of the magnet stand.

Figure 4.1: Unpack the box of the magnet stand H



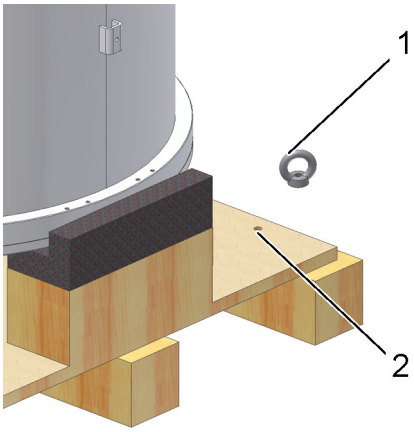
2. Take out all accessories from the box of the magnet system.

Figure 4.2: Unpack the box of the cryostat



3. Remove the side panels from the box of the cryostat.

Figure 4.3: Remove the side panels of the box



4. Remove the four ring nuts (1) and the screws (2) from the base of the box.

Figure 4.4: Remove the ring nuts from the box

4.2.2 Put the Cryostat on a Timber Bridge

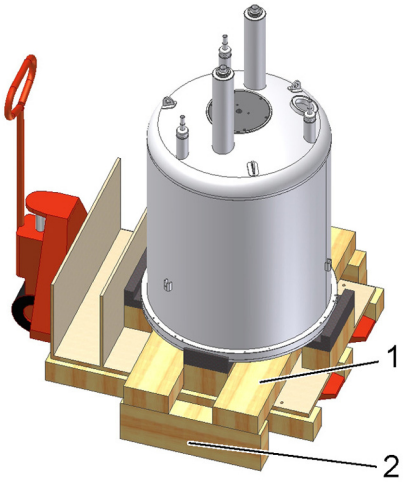


Figure 4.5: Making a timber bridge

1. Lift both the cryostat and the base of the box with a pallet jack. Slide in the pallet jack approaching from the side compartment of the box.
2. Insert the two timbers No. 1 (1) beneath the cryostat. Adjust the distance of the timbers No. 1 to fit to the length of the timbers No. 2 (2) as shown in Figure 4.5.
3. Put the timbers No. 2 in an upright and rectangular orientation beneath the timbers No. 1 as shown in Figure 4.5.

Figure 4.6: Remove the base of the transport box

4. Lower the pallet jack until the cryostat is set down on the timber bridge.
5. Use the pallet jack to pull out the base of the box.

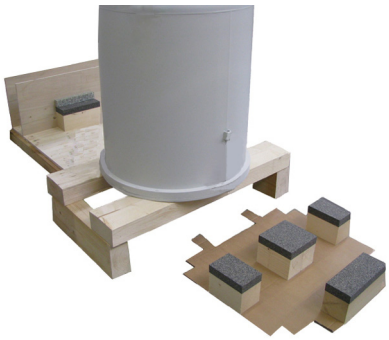


Figure 4.7: Removing upholstery material

6. The carton and the upholstery material will fall down.

4.2.3 Adjust the Timber Bridge for Mounting the Pillars

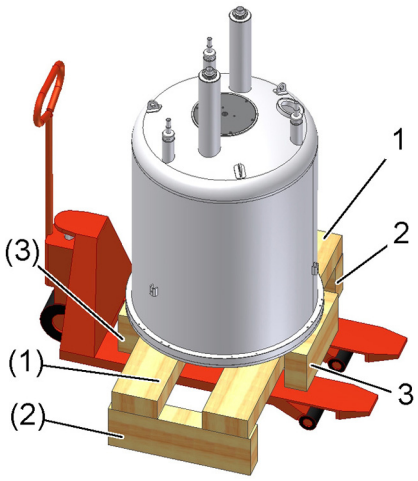


Figure 4.8: Remove the timber bridge

1. Move the pallet jack under the timber bridge.
2. Place the timbers No. 3 (3) on the forks of the pallet jack. The rear timber No. 3 should be placed above the rear wheels of the pallet jack.
3. Lift the pallet jack until the timbers No. 1 (1) and the timbers No. 2 (2) can be removed from the timber bridge.

⚠ WARNING

Risk of Tilting (see page 15)

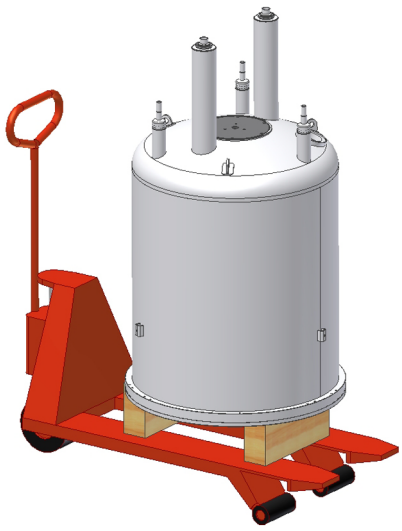
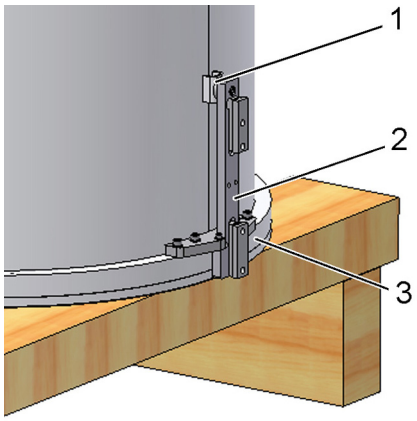


Figure 4.9: Move the cryostat to the site

4. Now the cryostat can be moved with the pallet jack to the site.

4.2.4 Mounting the Pillars



1. Attach the supports (2) at the upper fixing of the cryostat (1) and at the RT bottom flange (3). Apply Molykote to grease the screws before use. Tighten the M8 screws with a torque of 10 – 15 Nm.

Figure 4.10: Attach the support to the cryostat

2. Use the timber bridge to adjust the position of the cryostat. All three supports must be accessible for mounting the pillars of the magnet stand.
3. Lower the pallet jack.
4. Slide in the three pillars over the supports until they touch the floor.

Figure 4.11: Mounting the pillars to the cryostat

Figure 4.12: Insert the adjusting screw

5. Lift the pallet jack to maximum raise.
6. Check if the three pillars still touch the floor.
7. Insert the adjusting screw (1) until it touches the washer on the mounting bracket (2) at the top of the pillar.

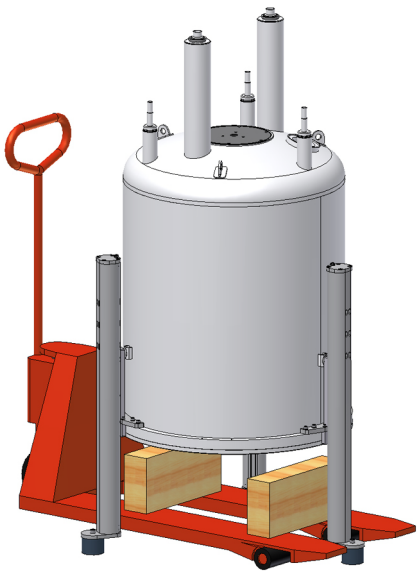
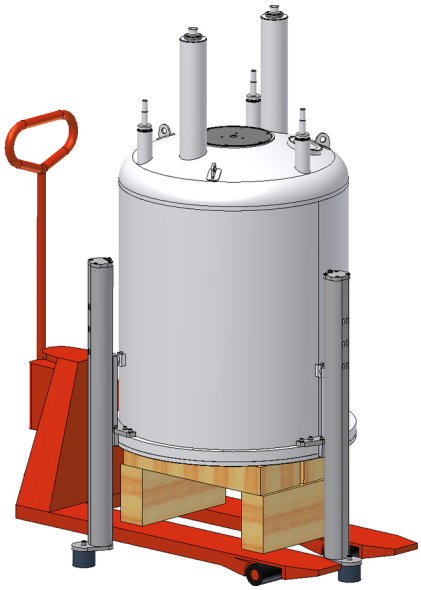


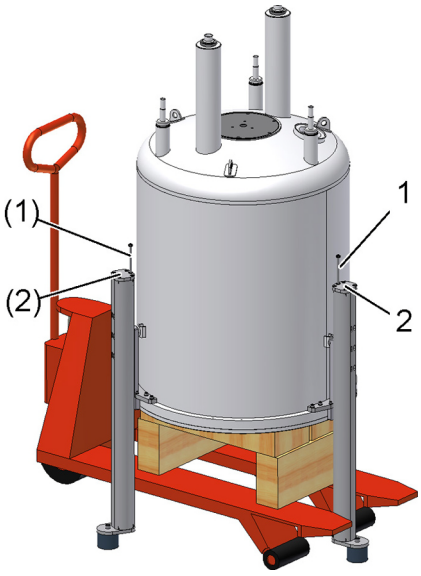
Figure 4.13: Lower the pallet jack

8. Lower the pallet jack.



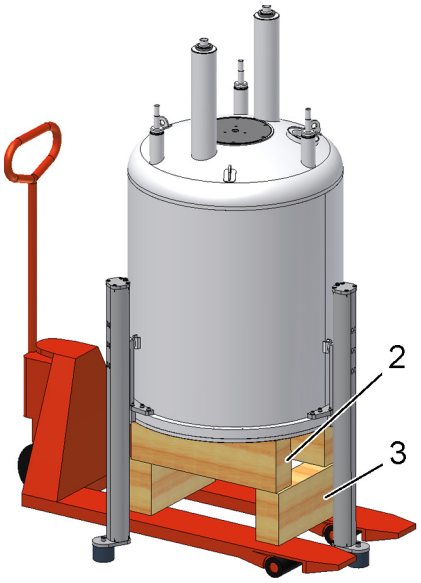
9. Put the timbers No. 2 in a rectangular orientation on timbers No. 3 as shown in Figure 4.14.

Figure 4.14: Place the timbers No. 2 beneath the cryostat



10. Lift the pallet jack to maximum raise. Thus the adjustment screws (1) will be pushed through the mounting bracket (2) of the magnet stand.
11. Screw in the adjustment screws (1) until they touch the washers on the mounting bracket (2) of the magnet stand. Do not yet tighten the screws.
12. Lower the pallet jack.

Figure 4.15: Lift the pallet jack to maximum raise

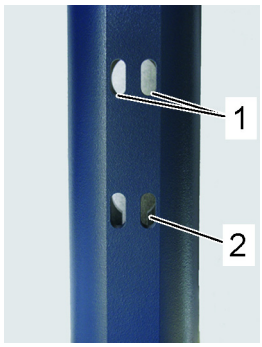


13. Change the timbers No. 2 (2) from the flat position into an upright position on top of the timbers No. 3 (3).

Figure 4.16: Change the position of the timbers to lift the cryostat

14. Check the required height of the cryostat above the floor before starting the final adjustment of the magnet stand (see Table "Technical data of the Magnet Stand H" on page 44).

Figure 4.17: Check the height of the cryostat



15. Use the oval holes (1) at the front and the holes at the rear of the pillar (2) to check for alignment.

Figure 4.18: Alignment via oval holes in the pillars

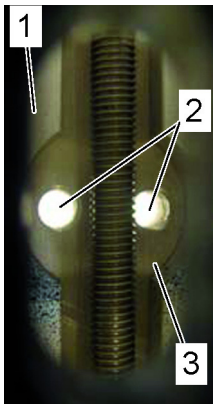


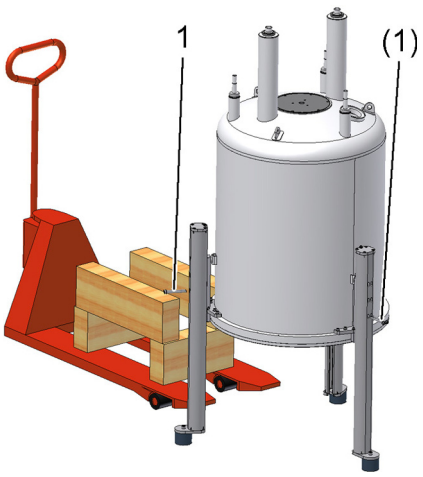
Figure 4.19: Alignment of the magnet stand

16. Align the oval hole (1) of the pillar and the two threaded holes (2) in the support (3).

Figure 4.20: Leveling the cryostat

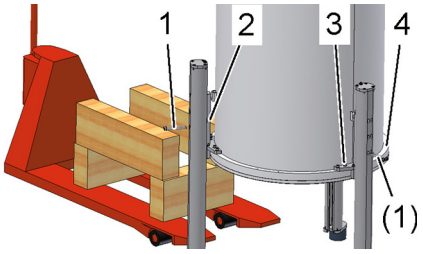
17. Lower the pallet jack and check for alignment as described in step 16 (see Figure 4.19).
18. Check the leveling of the cryostat with a spirit level placed on the RT bottom flange.
19. To change the leveling of the cryostat lift the pallet jack until the adjusting screws are released.
20. Use the three adjusting screws to level the cryostat.
21. Lower the pallet jack and check again the leveling of the cryostat.

Each full turn of the adjusting screw lifts the cryostat by 1.25 mm.



22. Repeat this procedure until the cryostat is correctly leveled.
23. Check whether the threads in the support are accessible to screw in the fixing screws M8x90 (1).

Figure 4.21: Check for accessibility of the threads in the support



24. Screw in the six fixing screws M8x90 (1) with washers into the support (2) and tighten the screws.
25. Put the protective covers M8 on the screws M8x30 (3) at the RT bottom flange (4).
26. Remove the pallet jack and the timbers.

Figure 4.22: Tighten the fixing screws

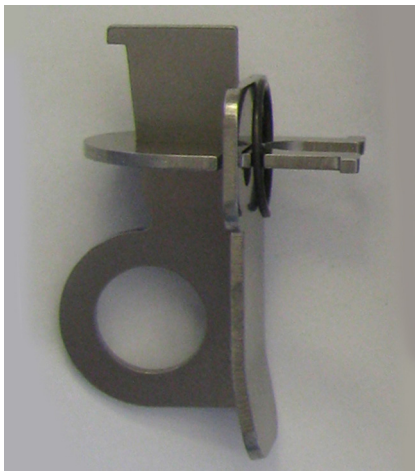
4.2.5 Arranging the Cable Routing

1. Use Velcro Fastener (1) to attach the cable on top of the cryostat to one of the N_2 turrets (2).

Figure 4.23: Arranging the cable routing at one of the N_2 turrets

2. Remove one of the two fixing screws (1) to insert the cable in the pillar.
3. After inserting the cable as shown in Figure 4.24 attach the fixing screw to the pillar and tighten it.

Figure 4.24: Guide the cable through the pillar



4. Prepare to insert the clamp at the back of the pillar.

Figure 4.25: Clamp for cable routing – overview

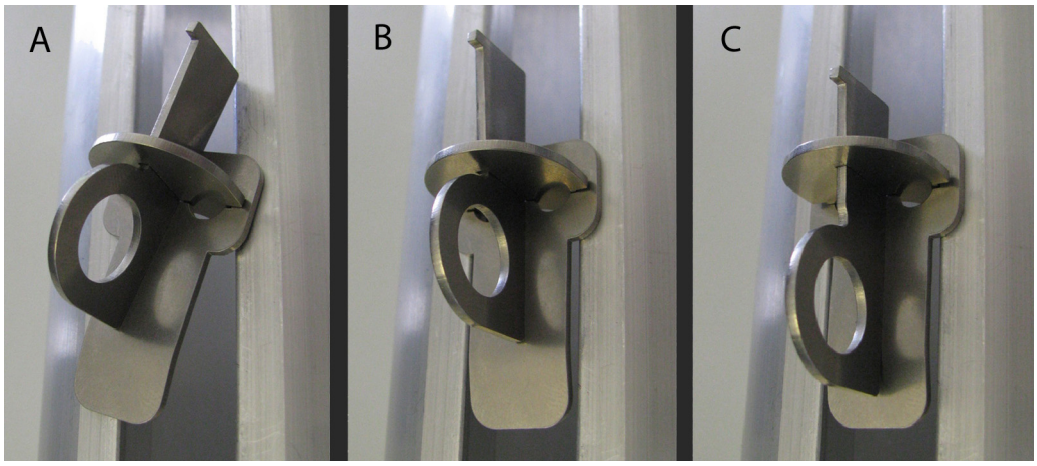


Figure 4.26: (A) Insert the clamp into the opening slit at the back of the pillar. (B) Turn the clamp into a vertical position. (C) Pull down the ring to lock the clamp.

5. Arrange the cable routing at the bottom of the cryostat.
6. Use cable ties to fix the cable to the clamp.

Figure 4.27: Fix the cable to the clamp in the opening slit of the pillar

4.2.6 Mounting the Pillar Covers

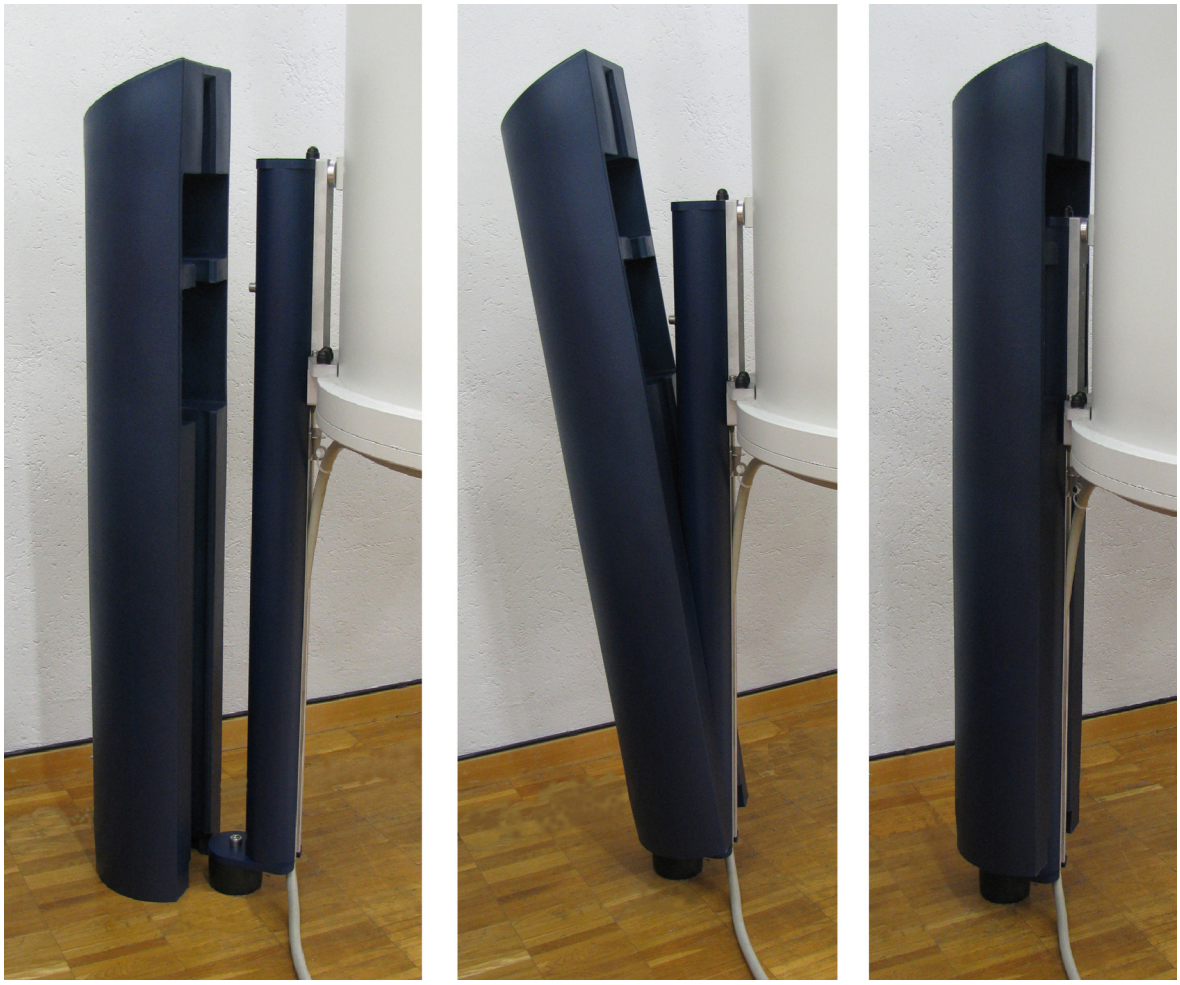


Figure 4.28: Mounting the pillar covers at the magnet stand

7. Slide the covers over the lower part of the pillars as shown in Figure 4.28. Then snap the upper part of the pillar covers.
8. Check for correct positioning of the pillar covers close to the isolators.
9. Push the pillar covers towards the floor. A small gap will remain between the pillar covers and the floor.

10. Check for correct cable routing through one of the pillars.

Figure 4.29: Cable routing after mounting the pillar covers

11. Insert the black rubber cover into the slit on the back of the pillars.
12. Cut off any excess length of the black rubber cover.

Figure 4.30: Mounting the flexible cover at the rear of the pillar

5 Operation

To operate the magnet stand no special knowledge is required.

6 Troubleshooting

If the magnet stand is assembled correctly, no troubleshooting work should occur.

Problem Indicators	Possible Reasons	Solution	By
The NMR spectrum shows massive vibrations	Floor vibrations	Replace the magnet stand H by a magnet stand with pneumatic isolation system	Bruker Service

Table 6.1: Troubleshooting during operation

7 Maintenance

The magnet stand requires low maintenance work.

- Once per year approved persons must check the isolators for wear and tear.
- Once per year approved persons must check the connectors between the cryostat and the magnet stand for corrosion and abrasion.

Any parts of the magnet stand showing corrosion or abrasion must be replaced by Bruker Service.

8 Disassembling

8.1 Safety

Persons

Bruker Service only

Personal Protective Equipment

- Safety shoes
- Protective gloves

⚠ WARNING

Incorrect disassembling

8.2 Workflow

1. Take off the pillar covers.
2. Release the cable routing.
3. Push the pallet jack with the supplied timbers under the cryostat.
4. Release the fixing screws at the pillars.
5. Release the adjusting screws.
6. Lower the cryostat step by step using the supplied timbers in reverse order.
7. Put the cryostat on the timber bridge.

A Appendix

A.1 Warning Signs

Danger

Warning

Caution

Notice

A.2 Figures

A.3 Tables

A.4 Glossary

Used term	Description
Box	Any kind of package used to protect sensitive parts during transportation.
Cryostat	The collective of all parts providing a temperature of 4 K inside for the superconducting magnet. The cryostat also provides the safety devices and the access ports for the cryogenic agents and electricity. The superconducting magnet inside the cryostat is not energized.
Magnet System	The collective of all parts necessary for the intended use. The superconducting magnet inside the cryostat is energized.

Table A.1: Glossary

Abbreviations	Description
ID	Identification Plate
RT	Room Temperature; used as prefix of parts at room temperature (e.g. RT bore)

Table A.2: Abbreviations

A.5 Technical Data

Magnet Stand	Cryostat (Dimension)	Isolator (Description)	Height [mm]	Weight [kg]
H 550–720 Mat. No. Z123639	D315 / D325	Ø 75 x 55 45 Shore	550–570	20
			625	20
			720	20

Table A.3: Technical data of the Magnet Stand H

A.6 Index

Revision History List

Index:	Date:	Alteration Type:
00	Nov. 2010	First release
01	May 2011	Updated layout in accordance with Corporate Guidelines; removed earthquake security option.

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