

iProbes HR-Liquids / HR-MAS



User Manual

Version 001



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1 About This Manual

1.1 Policy Statement

It is Bruker's policy to improve products as new techniques and components become available. Bruker reserves the right to change specifications at any time.

Every effort has been made to avoid errors in text and figure presentation in this publication. In order to produce useful and appropriate documentation, we welcome your comments on this publication. Field Service Engineers are advised to check regularly with Bruker for updated information.

Bruker is committed to providing customers with inventive, high-quality, environmentally-sound products and services.

1.2 Symbols and Conventions

Safety instructions in this manual and labels of devices are marked with symbols.

The safety instructions are introduced using indicative words which express the extent of the hazard.

In order to avoid accidents, personal injury or damage to property, always observe safety instructions and proceed with care.

DANGER



DANGER indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
- ▶ This is the safety instruction.

WARNING



WARNING indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

This is the consequence of not following the warning.

1. This is the safety condition.
- ▶ This is the safety instruction.

CAUTION



CAUTION indicates a hazardous situation, which, if not avoided, may result in minor or moderate injury or severe material or property damage.

This is the consequence of not following the warning.

1. This is the safety condition.
- ▶ This is the safety instruction.

NOTICE

NOTICE indicates a property damage message.

This is the consequence of not following the notice.

1. This is a safety condition.
 - ▶ This is a safety instruction.

SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS are used for control flow and shutdowns in the event of an error or emergency.

This is the consequence of not following the safety instructions.

1. This is a safety condition.
 - ▶ This is a safety instruction.



This symbol highlights useful tips and recommendations as well as information designed to ensure efficient and smooth operation.

2 Introduction

2.1 Overview

2.2 Intended Use

The device has been designed and constructed solely for the intended use described here.

The Bruker iProbe is a high resolution NMR probe for measuring NMR samples in a spectrometer. The iProbe can only be operated when installed in a magnet, as described within this manual. Operating the iProbe outside the magnet is not permitted.

Intended use also includes compliance with all specifications within this manual.

Any use which exceeds or differs from the intended use shall be considered improper use.

No claims of any kind for damage will be entertained if such claims result from improper use.

2.3 Installation and Initial Commissioning



Initial installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

2.4 Limitation of Liability

All specifications and instructions in this manual have been compiled taking account of applicable standards and regulations, the current state of technology and the experience and insights we have gained over the years.

The manufacturer accepts no liability for damage due to:

- Failure to observe this manual.
- Improper use.
- Deployment of untrained personnel.
- Unauthorized modifications.
- Technical modifications.
- Use of inadmissible spare parts.

The actual scope of supply may differ from the explanations and depictions in this manual in the case of special designs, take-up of additional ordering options, or as a result of the latest technical modifications.

The undertakings agreed in the supply contract, as well as the manufacturer's Terms and Conditions and Terms of Delivery, and the legal regulations applicable at the time of the conclusion of the contract shall apply.

2.5 Warranty Terms

The warranty terms are included in the manufacturer's Terms and Conditions.

2.6 Customer Service

Our customer service division is available to provide technical information. See the chapter Contact for contact information.

In addition, our employees are always interested in acquiring new information and experience gained from practical application; such information and experience may help improve our products.

2.7 Product Safety and Electromagnetic Compatibility

The device complies with the standard

- IEC 61010-1 and with UL 61010-1 / CSA C22.2 No. 61010-1-04 Safety Requirements for Electrical Equipment.
- IEC 61326-1 for Electromagnetic Compatibility (EMC)

3 Safety

3.1 System Owner's Responsibility

System Owner

The term *system owner* refers to the person who operates the device for trade or commercial purposes, or who surrenders the device to a third party for use/application, and who bears the legal product liability for protecting the user, the personnel or third parties during the operation.

System Owner's Obligations

The device is used in the industrial sector, universities and research laboratories. The system owner of the device must therefore comply with statutory occupational safety requirements.

In addition to the safety instructions in this manual, the safety, accident prevention and environmental protection regulations governing the operating area of the device must be observed.

In this regard, the following requirements should be particularly observed:

- The system owner must obtain information about the applicable occupational safety regulations, and - in the context of a risk assessment - must determine any additional dangers resulting from the specific working conditions at the usage location of the device. The system owner must then implement this information in a set of operating instructions governing operation of the device.
- During the complete operating time of the device, the system owner must assess whether the operating instructions issued comply with the current status of regulations, and must update the operating instructions if necessary.
- The system owner must clearly lay down and specify responsibilities with respect to installation, operation, troubleshooting, maintenance and cleaning.
- The system owner must ensure that all personnel dealing with the device have read and understood this manual. In addition, the system owner must provide personnel with training and hazards information at regular intervals.
- The system owner must provide the personnel with the necessary protective equipment.
- The system owner must warrant that the device is operated by trained and authorized personnel as well as all other work, such as transportation, mounting, start-up, the installation, maintenance, cleaning, service, repair and shutdown, that is carried out on the device.
- All personnel who work with, or in the close proximity of the device, need to be informed of all safety issues and emergency procedures as outlined in this user manual.
- The system owner must document the information about all safety issues and emergency procedures in a laboratory SOP (Standard Operating Procedure). Routine briefings and briefings for new personnel must take place.
- The system owner must ensure that new personnel are supervised by experienced personnel. It is highly recommended to implement a company training program for new personnel on all aspects of product safety and operation.
- The system owner must ensure that personnel are regularly informed of the potential hazards within the laboratory. This is all personnel that work in the area, but in particular laboratory personnel and external personnel such as cleaning and service personnel.

- The system owner is responsible for taking measures to avoid inherent risks in the handling of dangerous substances, preventing industrial disease, and providing medical first aid in emergencies.
- The system owner is responsible for providing facilities according to the local regulations for the prevention of industrial accidents and generally accepted safety regulations according to the rules of occupational medicine.
- All substances needed for operating and cleaning the device samples, solvents, cleaning agents, gases, etc. have to be handled with care and disposed of appropriately. All hints and warnings on storage containers must be read and adhered to.
- The system owner must ensure that the work area is sufficiently illuminated to avoid reading errors and faulty operation.
- The system owner must ensure that the laboratory is equipped with an oxygen warning device, in case the device is operated with nitrogen.

Furthermore, the system owner is responsible for ensuring that the device is always in a technically faultless condition. Therefore, the following applies:

- The system owner must ensure that the maintenance intervals described in this manual are observed.
- The system owner must ensure that all (electrical, mechanical, etc.) safety devices are regularly checked to ensure full safety functionality and completeness.

3.2 Personnel Requirements



Only trained Bruker personnel are allowed to initially install, retrofit, repair, adjust and dismantle the unit!

3.2.1 Qualifications

This manual specifies the personnel qualifications required for the different areas of work, listed below:

Laboratory Personnel

Laboratory personnel are health care professionals, technicians, and assistants staffing a research or health care facility where specimens are grown, tested, or evaluated and the results of such measurements are recorded. Laboratory personnel are able to carry out assigned work and to recognize and prevent possible dangers self-reliant due to their professional training, knowledge and experience as well as profound knowledge of applicable regulations.

The workforce must only consist of persons who can be expected to carry out their work reliably. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited from carrying out work on the device.

When selecting personnel, the age-related and occupation-related regulations governing the usage location must be observed.

3.2.2 Unauthorized Persons



WARNING

Risk to life for unauthorized personnel in the work area

Unauthorized personnel who do not meet the requirements described in this manual will not be familiar with the dangers in the work area. Therefore, unauthorized persons face the risk of serious injury or death.

3.3 Location of the Safety Label



The laboratory supervisor is responsible for ensuring that all the warning labels are maintained in their proper place any time that the device is used.

3.4 Basic Dangers

The following section specifies residual risks which may result from using the device and have been established by means of a risk assessment.

In order to minimize health hazards and avoid dangerous situations, follow the safety instructions specified here as well as in the following chapters of this manual.

3.4.1 General Workplace Dangers

WARNING

Danger to life from nonfunctional or insufficient safety devices!

If safety devices are not functioning or are disabled, there is a danger of serious injury or death.

- ▶ Check that all safety devices are fully functional and correctly installed before starting work.
- ▶ Never disable or bypass safety devices.
- ▶ Ensure that all safety devices are always accessible.



CAUTION

Risk of injury and property damage due to incorrect handling of the iProbe.

- ▶ Do not hold the iProbe by its tube. Always hold it by its body.
- ▶ Never touch the pins of the connectors and plugs.

CAUTION

Accident hazard from pressurized air or nitrogen gas

There exists a small risk of injury when handling the gas supply of the iProbe incorrectly.

1. Pressurized air / nitrogen can enter the body via small skin injuries.
2. Pressurized air / nitrogen can cause eye injury or tinnitus.
 - ▶ Never cover the flush gas supply by hand.
 - ▶ Wear protective goggles and ear protection.

CAUTION

Danger of injury from tripping over dirt and scattered objects!

Dirt and scattered objects may cause people to slip or trip, resulting in personal injuries.

- ▶ Always keep the work area clean.
- ▶ Remove objects which are no longer required from the work area and particularly from the floor.
- ▶ Indicate unavoidable hazards using marking tape.



3.4.2 Dangers from Magnetic Fields

WARNING

Risk to life due to high magnetic fields

A magnetic field of more than 0.5 mT (5 Gauss) is life-threatening for people with pacemakers or active metal implants. Exposure to more than 8 T can cause damage to health. Duration of exposure (8 h/day) above the limit of 200 mT can cause damage to health. Ferromagnetic tools in the magnetic field are significantly hazardous. Disks and electronic devices may be damaged.

- ▶ Mark the magnetic field of more than 0.5 mT (5 Gauss) before start up.
- ▶ Keep people with active medical implants or heart pacemakers away from the 0.5 mT (5 Gauss) area.
- ▶ The permanent workplace of employees must be outside the 0.5 mT (5 Gauss) area.
- ▶ Do not stay or work at magnetic fields of more than 8 T.
- ▶ Prevent exposure of more than 200 mT for more than 8 h/day.
- ▶ Keep disks, credit cards and electronic devices away from the identified area.
- ▶ Do not use ferromagnetic tools or items within the identified area.
- ▶ Only use non-ferromagnetic transportation dewars or pressure cylinders for the cryogenic agents.
- ▶ Only use non-ferromagnetic ladders or steps.
- ▶ Remove magnetic items (jewelry, watches, pens etc.) before carrying out maintenance work.



The magnetic field of the device does not cause any personal injuries or property damage. For further information see the manual of the magnet used.

3.4.3 Dangers Due to High Temperatures

CAUTION

Accident hazard from contact with hot surfaces on the probe.

Contact with the hot surfaces of the probe may result in serious burns.

- ▶ Check the probe temperature in TopSpin.
- ▶ Put on gloves before handling the probe.

3.4.4 Danger from Chemical Substances

WARNING

Danger of injury from glassware or ceramics breakage

Broken glassware or ceramics may cause minor injuries or material damage, but may also result in a life threatening situation if hazardous substances are used.

- ▶ If glassware or ceramics breaks, refer to the corresponding precautions and cleaning/disinfection instructions.
- ▶ Wear protective equipment.
- ▶ Perform all tasks with the glassware or ceramics carefully.
- ▶ Before carrying out any maintenance work, remove the samples and use dummy samples if necessary.
- ▶ Strictly observe the correct sample adjustment, i.e. the maximal sample depth.
- ▶ Always transport the glassware or ceramics with the cover, if applicable. Never turn the glassware or ceramics upside down or on its side.
- ▶ **The laboratory supervisor is responsible for:**
 - ⇒ Establishing and enforcing standard sample handling and cleaning procedures.
 - ⇒ Establishing and enforcing the use of protective clothing and equipment.
 - ⇒ Training laboratory personnel.
 - ⇒ Preparing an emergency procedure.

WARNING

Exposure and other health hazards to maintenance personnel.

If contaminated, the device must be cleaned before any maintenance work can be performed.

- ▶ Register all substances with which the device has come into contact.
- ▶ Sign a certification form verifying that the device has been properly cleaned if contaminated to protect maintenance personnel.
- ▶ Obviously contaminated, insufficiently cleaned units, as well as units without a signed cleaning certification will not be repaired and will be returned to the sender.

NOTICE

Material damage hazard from material contact with NMR solvents

Material damage may result when the device comes in contact with NMR solvents.

- ▶ Follow instructions provided in the manual for correct handling of solvents.
- ▶ If surface damage occurs, contact Bruker for repair of damaged parts.

3.5 Environmental Protection

NOTICE

Danger to the environment from incorrect handling of pollutants!

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- ▶ Always observe local environmental regulations regarding handling and disposal of pollutants.
- ▶ Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

The following pollutants are used:

Cleaning liquids	Cleaning liquids incorporating solvents contain toxic substances. They must not be allowed to escape into the environment. Disposal must be carried out by a specialist disposal company.
-------------------------	---

4 Transport, Packaging and Storage



Initial installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

4.1 Symbols on the Packaging

The following symbols are affixed to the packaging material. Always observe the symbols during transport and handling.


<p>Fragile</p>		<p>Marks packages with fragile or sensitive contents.</p> <p>Handle the package with care; do not allow the package to fall and do not allow it to be impacted.</p>
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Table 4.1: Symbols on the Packaging

4.2 Inspection at Delivery

Upon receipt, immediately inspect the delivery for completeness and transport damage.



Figure 4.1: Shock Watch

Therefore, check the Shock watch on the package of the iProbe. In case the sensor has been activated according to the description on the labels follow the procedure below.

Proceed as follows in the event of externally apparent transport damage:

- Do not accept the delivery, or only accept it subject to reservation.
- Note the extent of the damage on the transport documentation or the shipper's delivery note.
- Initiate complaint procedures.



Issue a complaint with respect to each defect immediately following detection. Damage compensation claims can only be asserted within the applicable complaint deadlines.

4.3 Packaging

About Packaging

The individual packages are packaged in accordance with anticipated transport conditions. Only environmentally friendly materials have been used in the packaging.

The packaging is intended to protect the individual components from transport damage, corrosion and other damage prior to assembly. Therefore do not destroy the packaging and only remove it shortly before assembly.

Handling Packaging Materials

Keep the original container and packing assembly, at least as long as the warranty is valid, in case the unit has to be returned to the factory. When the packaging material is no longer needed dispose of it in accordance with the relevant applicable legal requirements and local regulations.

4.4 Storage

Storage of the Packages

Store the packages under the following conditions:

- Do not store outdoors.
- Store in dry and dust-free conditions.
- Do not expose to aggressive media.
- Protect against direct sunlight.
- Avoid mechanical shocks.
- Storage temperature: 15 to 35 °C.
- Relative humidity: max. 60%.
- If stored for longer than 3 months, regularly check the general condition of all parts and the packaging. If necessary, top-up or replace preservatives.



Under certain circumstances, storage instructions may be affixed to packages which expand the requirements specified here. Comply with these accordingly.

5 Design and Function

5.1 Overview

The Bruker iProbe is a high-resolution NMR probe for measuring NMR samples in a spectrometer. The iProbe can only be operated when installed in a magnet, as described within this manual. Operating the iProbe outside the magnet is not permitted.

The ATMA (automatic Tuning & Matching) unit is integrated in the iProbe, therefore no extra unit has to be installed. Please refer to the section [ATMA \[29\]](#).

The following diagrams show the connections for the different applications of the iProbe and the necessary infrastructure around the magnet.

Setup with iProbe HR-Liquids

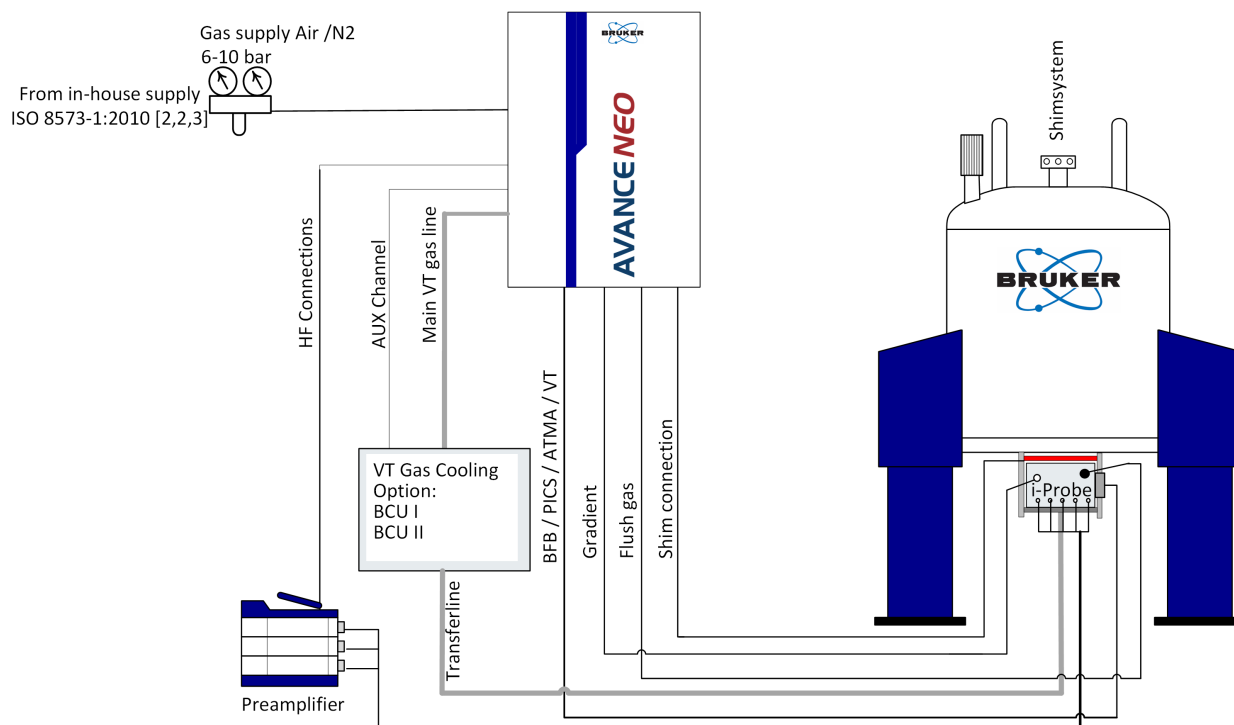


Figure 5.1: Diagram of a setup with iProbe HR-Liquids

Setup with iProbe HR-MAS

High Resolution Magic Angle Spinning (HR-MAS) is a technique for the analysis of samples with inhomogeneous magnetic susceptibilities, like, for example, semi-solids, gels, or tissues. By spinning at the magic angle, line broadening effects due to dipolar interactions and susceptibility differences within the sample are removed resulting in high resolution quality spectra.

HR-MAS probes are configured with a Z-gradient aligned along the magic angle enabling the researcher to access a wide variety of NMR experimental techniques including gradient enhanced solvent suppression and artifact free 2D homo-nuclear and hetero-nuclear experiments.

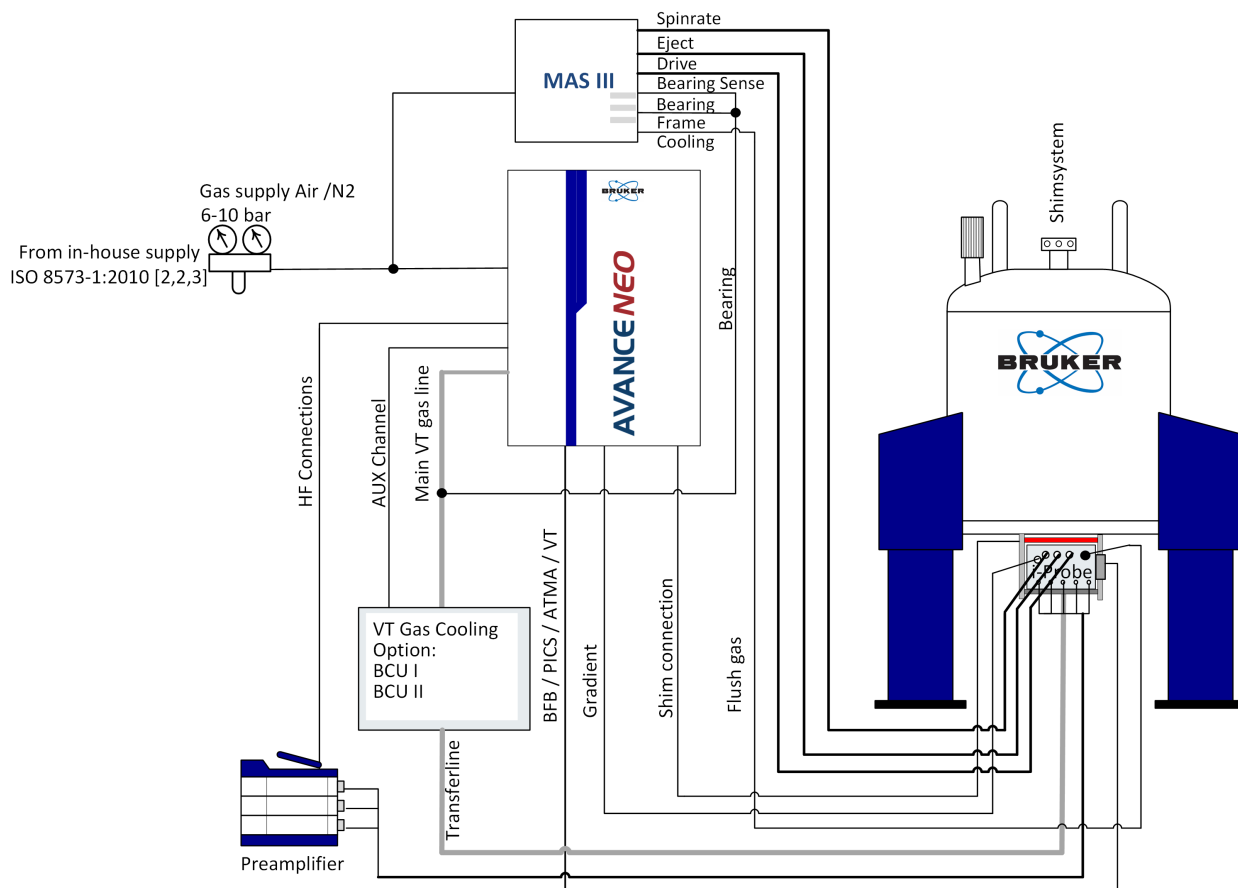


Figure 5.2: Diagram of a setup with iProbe HR-MAS

5.2 Brief Description



Figure 5.3: iProbe installed in the magnet

The full support of all functionality of the iProbe is guaranteed only for AV NEO and newer spectrometers. No external filters are required, unless differently stated in the documentation accompanying the iProbe.

5.3 Connections iProbe HR-Liquids

iProbe HR-Liquids Connections at the Front Panel

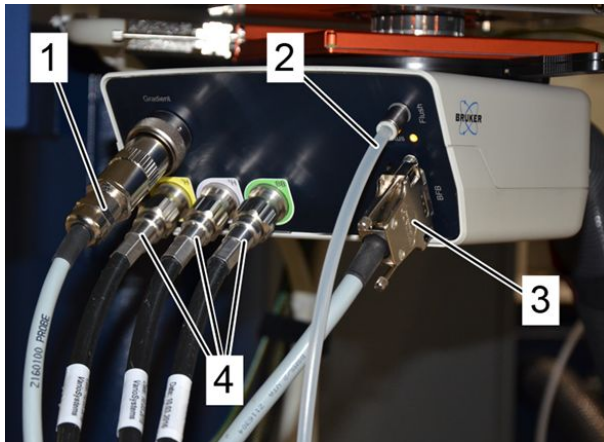


Figure 5.4: iProbe HR-Liquids connections at the front panel

1	Z-gradient	3	BFB-cable (Bruker Field Bus coming from the VT unit)
2	Flush gas	4	RF-cables

Connections at the Front

The BFB-cable (Bruker Field Bus) contains the electrical signals for ATM, PICS and the temperature control. The flush gas provides the RF-circuits with dry air for cooling. Read the Probe Instructions (P/N Z156810) about the flush gas supply use and requirements.

5.4 Connections iProbe HR-MAS

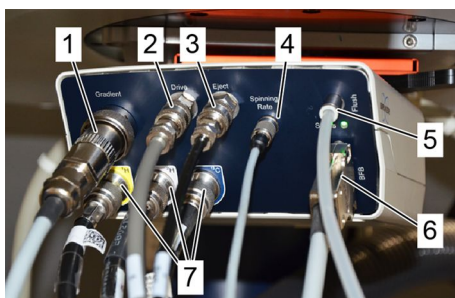


Figure 5.5: iProbe HR-MAS connections at the front panel

1	Z-gradient	5	Flush gas
2	Drive	6	BFB-cable
3	Eject	7	RF-cables
4	Spinning rate		

Connections at the Front

The BFB-cable (Bruker Field Bus) contains the electrical signals for ATM, PICS and the temperature control. The flush gas provides the RF-circuits with dry air for cooling. Read the Probe Instructions (P/N Z156810) for more information about the flush gas supply usage and requirements.

The iProbe HR-MAS uses only four pneumatic connections from the MAS Unit: Drive, Eject, Bearing and Frame Flush. Bearing is connected to the VT-gas line using a T-piece and Bearing Sens must branch off to the output of Bearing (see [Figure 5.2 \[▶ 18\]](#) for the system overview and [Installation of iProbe HR-MAS \[▶ 25\]](#) for the details of the installation).

5.5 Connections at the Rear Side of iProbes

At the rear side the VT-gas hose is connected with a Johnston connector.

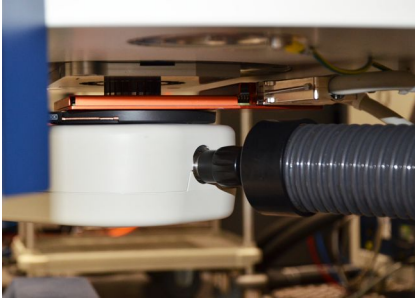


Figure 5.6: VT-gas hose with Johnston connector.

6 Installation



Initial installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

Prior to installing the iProbe, the quick-lock needs to be mounted on the magnet. Please refer to the following instructions.

6.1 Quick-Lock Mounting

Overview



Figure 6.1: iProbe installed in the magnet

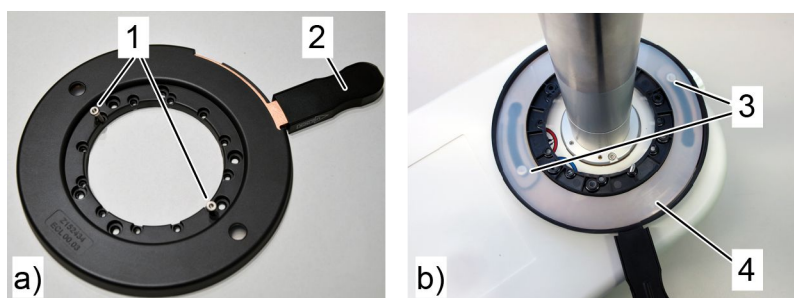
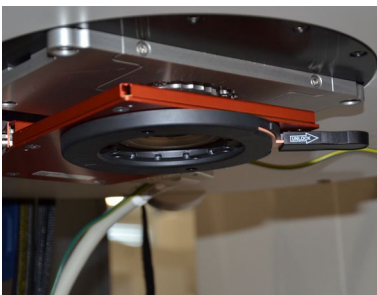
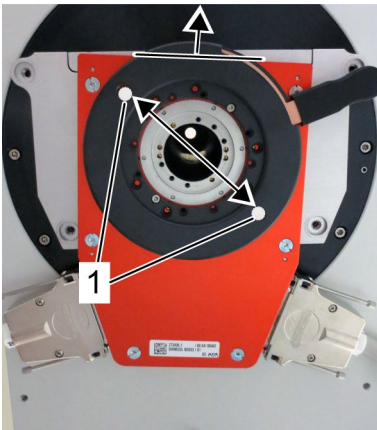
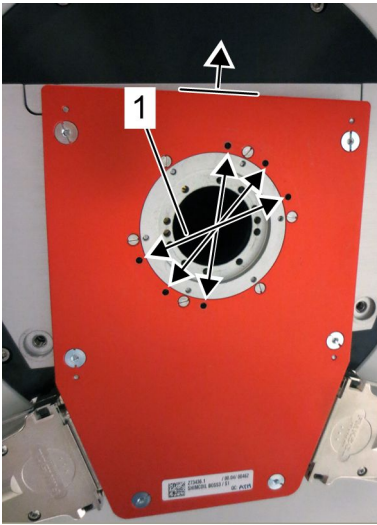


Figure 6.2: Quick-lock: a) Bottom view b) Top view of the iProbe

1	Fastening screws M3 x 13	3	Clip holders of the iProbe within the foreseen holes in the quick-lock
2	Lever for locking and unlocking	4	Teflon ring

Installation



- There are 3 pairs of equal threads arranged opposite to each other in the red bottom plate of the SB shim system as marked with the arrows (1). The quick-lock has to be mounted on one of these pairs with the fastening screws (M3 x 13).
- On the quick-lock a pair of opposite arranged holes on the inner ring has to match a pair of threads on the red bottom plate.

- The two holes for the clip holders (1) of the adapter determine the orientation of the iProbe. The orientation of the iProbe has to be set in order to attain an easy access to the VT-gas hose. In standard installations the front of the iProbe is oriented towards the left when facing the front of the magnet.
- The lever can be positioned to the right or the left side depending on your preference.

- Mount the quick-lock to the shim system with the two screws M3 x 13 using the enclosed non-magnetic Allen key.
- Make sure the Teflon ring is in place.

- The quick-lock has to be mounted level with the shim system.

6.2 iProbe Mounting with Quick-Lock

Overview

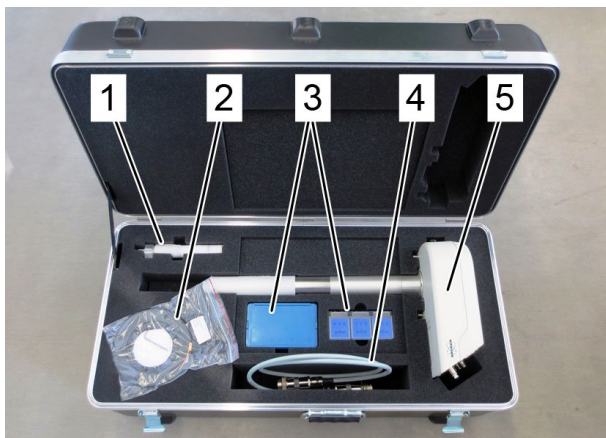


Figure 6.3: iProbe Transport box

1	Sample gauge (HR Liquids only)	4	Gradient adapter cable
2	Quick-lock	5	iProbe
3	Accessory for HRMAS		

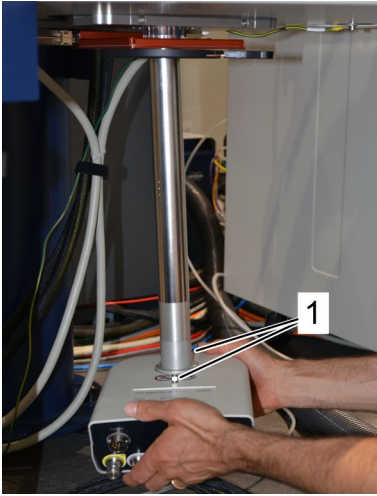


CAUTION

Risk of injury and property damage due to incorrect handling of the iProbe.

- ▶ Do not hold the iProbe by its tube. Always hold it by its body.
- ▶ Never touch the pins of the connectors and plugs.

6.2.1 Installation of iProbe HR-Liquids

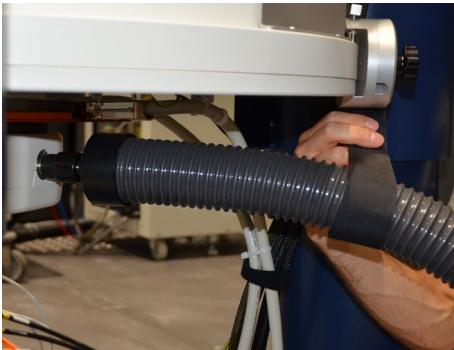


Prerequisite: The quick-lock is mounted to the lower part of the shim system according to the *Quick-Lock Mounting Instruction (Z166745)*.

- Take the iProbe HR-Liquids out of the transport box and remove the protection cap.
- Check that the quick lock lever is in the unlock position.
- Slide the iProbe HR-Liquids into the magnet. Mount the iProbe so that the clip holders (1) on the iProbe body fit exactly the holes for the clip holders in the quick-lock so that the iProbe is in the correct orientation.

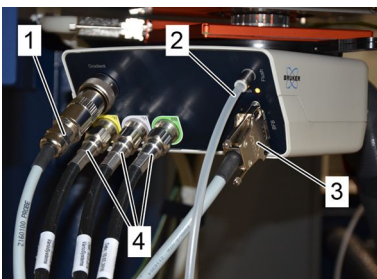


- Lock the iProbe HR-Liquids in the position using the quick-lock lever.



Connections at the rear side:

- Remove the white plastic cover and connect the Johnston connector of the VT-gas hose or the BCU to the rear side of the iProbe HR-Liquids.
- Mount the support clamp (Z53660) on the magnet as shown in the photo. Position and support the transfer line using the Velcro tape of the support clamp.



Connections at the front panel:

- The gradient connector on the iProbe is a male type and therefore the delivered gradient adapter cable must be interconnected to the gradient cable (also male connector).
- Connect the gradient (1), the flush gas (2), the BFB-cable (3) (Bruker Field Bus coming from the BVT) and the RF-cables (4).
- Read the iProbe Instructions (P/N Z156810) about the Flush Gas Supply use and requirements.

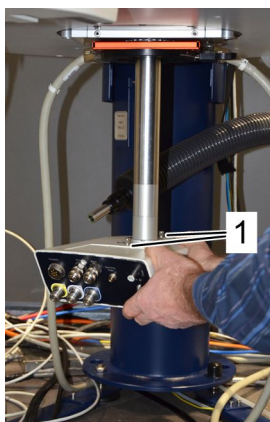
The installation of the iProbe HR-Liquids is complete and the iProbe HR-Liquids can be detected by the software with the command *edprobe*.

6.2.2 Installation of iProbe HR-MAS

NOTICE

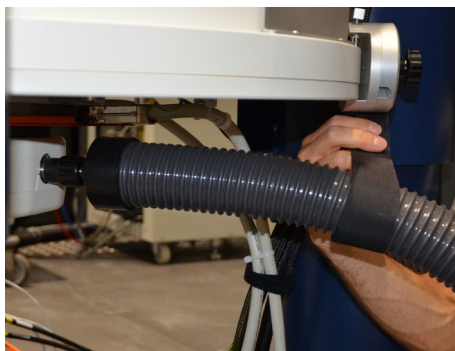
In the iProbe HR-MAS the bearing gas has two functions: supporting the rotor for spinning and regulating its temperature. There is no dedicated VT gas flow unless the probe is specified as DVT. In this last case, the setup of the VT GAS is analogous to the iProbe HR-Liquids.

The following instructions are intended for non-DVT probes only.



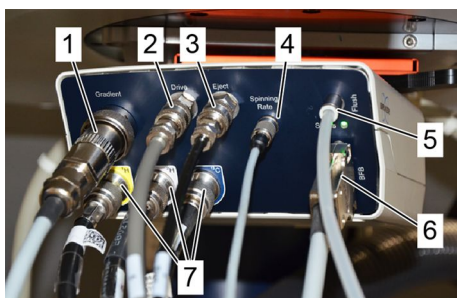
Prerequisite: The quick-lock is mounted to the lower part of the shim system according to the *Quick-Lock Mounting Instruction (Z166745)*.

- Take the iProbe HR-MAS out of the transport box and remove the protection cap.
- Check that the quick lock lever is in the unlock position.
- Slide the iProbe HR-MAS into the magnet. Mount the iProbe so that the clip holders (1) on the iProbe body fit exactly the holes for the clip holders in the quick-lock so that the iProbe is in the correct orientation.
- Lock the iProbe HR-MAS in the position using the quick-lock lever.



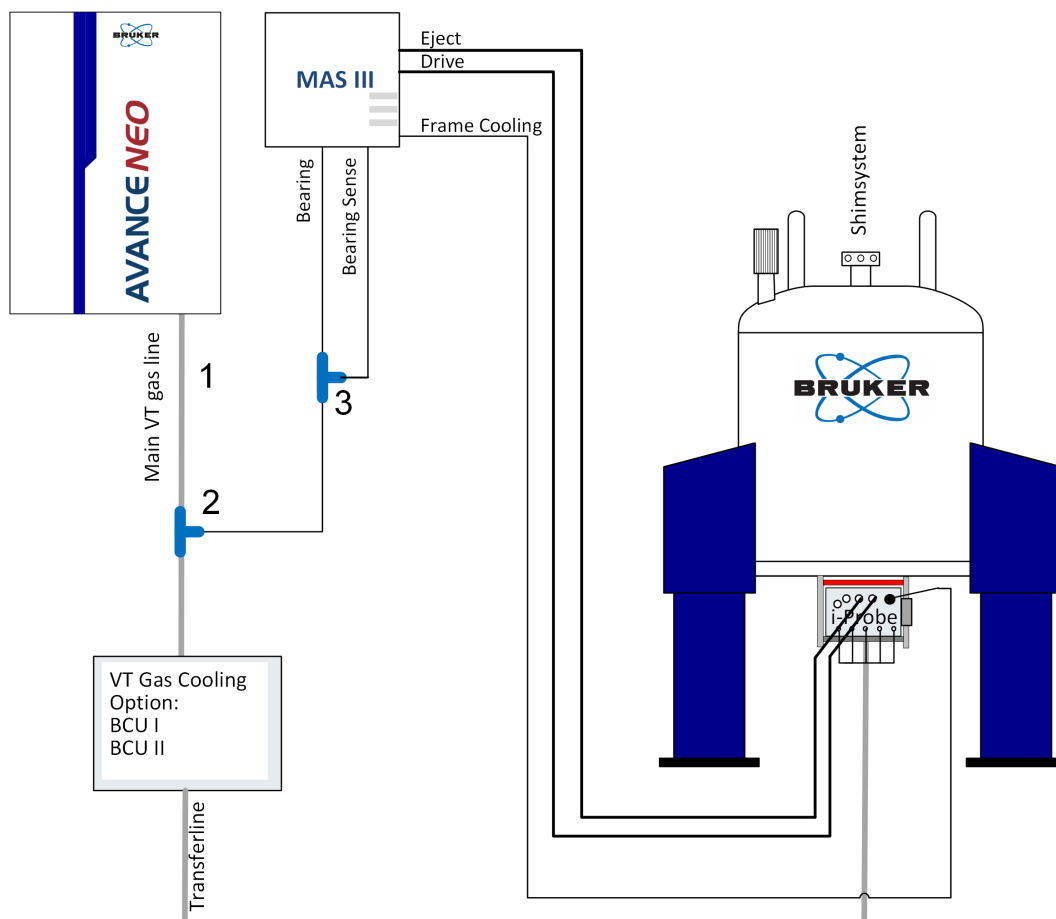
Connections at the rear side:

- Remove the white plastic cover and connect the Johnston connector of the VT-gas hose or the BCU to the rear side of the iProbe HR-MAS.
- Mount the support clamp (Z53660) on the magnet as shown in the photo. Position and support the transfer line using the Velcro tape of the support clamp.



Connections at the front panel:

- The gradient connector of the iProbe is a male type and therefore the delivered gradient adapter cable must be interconnected to the gradient cable (male).
- Connect the gradient (1), drive (2), eject (3), spinning rate (4), the flush gas (5), the BFB-cable (6) (Bruker Field Bus coming from the BVT) and the RF-cables (7).



- At the rear side of the MAS III unit, connect the drive, eject, the flush gas pipes and the spin rate cable. The corresponding connectors on the MAS III are labeled accordingly.
- The Bearing gas line must be connected to the Main VT-gas line (1) using a T-piece (2). Finally, the output of Bearing should branch off to Bearing Sens with another T-piece according to [Figure 5.2 \[18\]](#).
- The other end of the Main VT-gas line is connected to Main VT GAS on the rear side of the AvanceNEO console.

The installation of the iProbe HR-MAS is complete but the iProbe HR-MAS needs to be detected by the software with the command `edprobe`. Note also that additional changes in the VT and MAS III configurations need to be done. Please refer to the corresponding chapter ([Specific iProbe HR-MAS Hardware and Operations \[36\]](#)).

7 Operation

7.1 General Operating Guidelines

There are several general rules and procedures that should be observed while operating the device.

Warranty Limitations & Probe Instructions

NOTICE

Material damage hazard due to improper handling

- ▶ Follow the warranty limitations and probe instruction (Z156810) given for the probe carefully to achieve optimal performance and maximum lifetime of the probe.
- ▶ Always turn ON power check.
- ▶ Never exceed the maximum power level for short pulses as defined in PICS.
- ▶ Never exceed the maximum sample depth.

Temperature Changes

NOTICE

Material damage hazard due to significantly temperature changes

When the ambient temperature changes significantly (for example, after moving the probe from the stock room before mounting), wait at least 1 h until the device has achieved room temperature before turning on the probe.

7.2 Operating States of the iProbe

The meaning of the LED states and state types are listed below. The user should know them in order to operate the system correctly and safely.

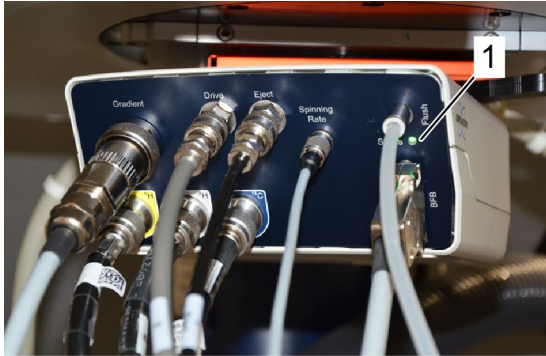


Figure 7.1: On the front of the iProbe shows an LED (1) the current status of the probe

LED	State	Meaning
Fast blinking green	Start	The probe is connected to the power line and in the starting phase but so far not recognized by the system.
Slow blinking green	Initialization	The probe has been recognized by the system and it is in the initialization phase.
Slow blinking yellow	Thermal regulation preparation	The probe will be prepared for thermal regulation.
Slow changes yellow / green	Standby	The thermal regulation is in standby mode.
Constant yellow	Thermal regulation	The thermal regulation is running.
Blinking Red	Thermal regulation problem	The thermal regulation failed.
Short yellow flashes	Error / Startup	The probe is connected to an auxiliary channel without heating power. Therefore, thermal regulation cannot run.

Table 7.1: Specific iProbe States

7.3 ATMA



ATMA for the iProbe

The ATMA unit is integrated in the iProbe, therefore no extra unit has to be installed.

ATMA - Automatic Tuning & Matching

The iProbe can only be operated with ATMA/2, which is already integrated in AvanceNEO spectrometers.

- After a restart of TopSpin, type the commands **edprobe** and **ii** before using **atma**. The next **atma** command can be executed by simply typing **atma**.
- Successful tuning and matching parameter will be saved automatically.

ATMM – Manual Tuning & Matching

The tuning and matching can be done by hand or via algorithms.

- To save the result of a manual tuning and matching process, an algorithm in ATMM must be started.
- ATMM saves the channel / core combination of the last setting and therefore after a new start the channel / core combination needs to be readjusted.

7.4 Properties of the iProbe

To view the properties of the installed probe within TopSpin™, type *edprobe* on the command line.

- Select the desired probe (if not automatically detected).
- Click on **View Properties** under the **Manage** menu on the top bar of the **Edprobe** window.
- The properties of the probe are shown for the installed probe.

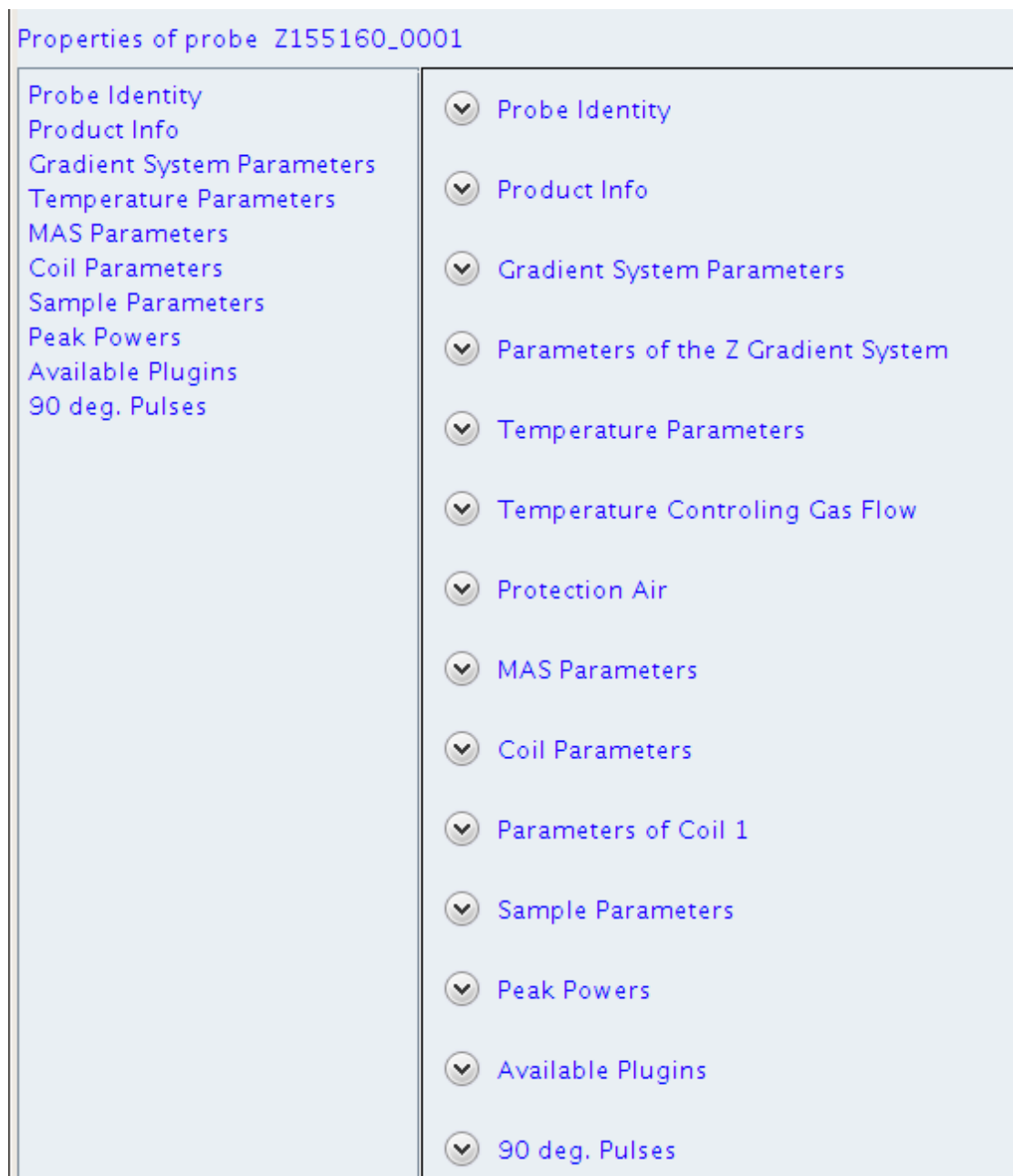


Figure 7.2: Window showing the properties of the selected probe.

- The shown properties in [Figure 7.2 \[▶ 30\]](#) and [Figure 7.3 \[▶ 31\]](#) vary depending on the probe type.

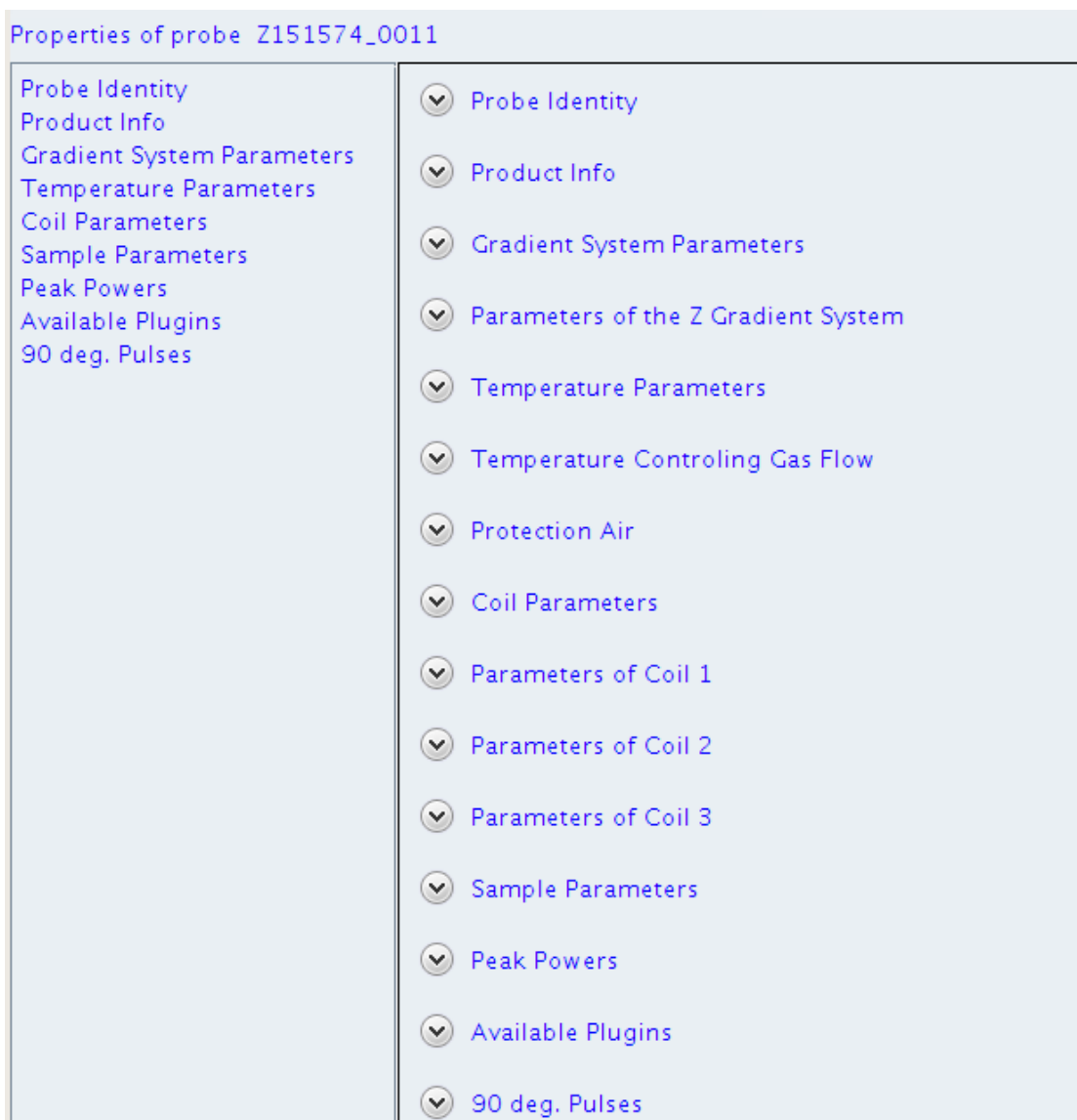


Figure 7.3: TopSpin **Properties of probe** window for another probe type.

- Depending on the probe the relevant parameters are presented. Further details can be seen when opening the different categories.
- Under **Probe Identity** the type of probe, part number and serial number are given.

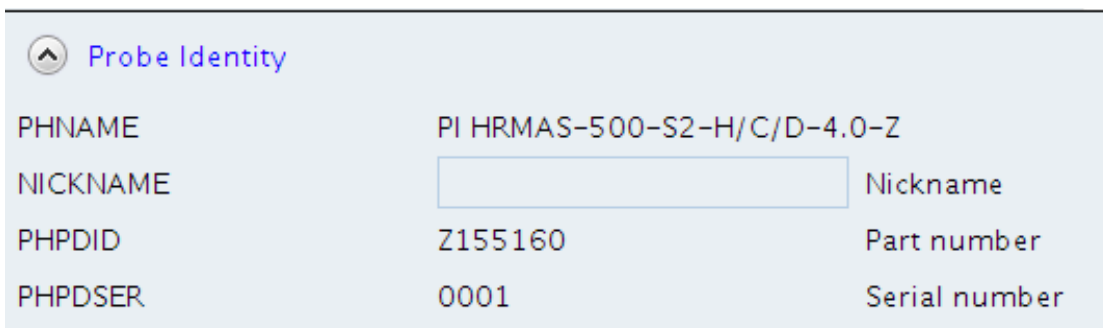


Figure 7.4: TopSpin **Probe Identity** window

- Further information is listed under **Product Info**.

Product Info		
PHTYPE	HRMAS	Type of probe
PHPDECL	00.10	Engineering change level
PHPDDAT	20160205	Production date
PHPDLOC	BCH	Production site
PHNFRQ [MHz]	500	Nominal (1H) frequency
PHDIAM	SB	Probe diameter
PHATMA	<input checked="" type="checkbox"/>	ATMA probe?
CYPROB	<input type="checkbox"/>	Cryo probe?

Figure 7.5: TopSpin Product Info window

- Information regarding the gradient system are provided under **Gradient System Parameters** window.

Gradient System Parameters		
PHGTYPE	Z	Type of gradient system
GRADNAME_X		name of X gradient field
GRADNAME_Y		name of Y gradient field
GRADNAME_Z	25	name of Z gradient field

Figure 7.6: TopSpin Gradient System Parameters window

NOTICE! Never exceed the maximum permissible current.

Parameters of the Z Gradient System		
PGMSZ	5.01	Gradient strength in Z direction [G/cmA]
PGMCZ	10	Maximum permissible current in Z direction [A]

Figure 7.7: TopSpin Parameter of the Z Gradient System window

- The **Temperature Parameters** of the probe can be found in the corresponding window.

Temperature Parameters		
PHTPTYP	Type_T	Type of temperature sensor
PHEATTEMPMIN	-274	Minimum allowed temperature of probe heater [°C]
PHEATTEMPMAX	400	Maximum allowed temperature of probe heater [°C]
PHTPMIN [degree]	-30	Minimum permissible temperature [°C]
PHTPMAX [degree]	80	Maximum permissible temperature [°C]

Figure 7.8: TopSpin Temperature Parameters window

- The recommended and range for the gas flow controlling the temperature settings can be checked within the related submenu.

Temperature Controlling Gas Flow		
PGFVTGASFLOWREC	400	Recommended flow at standard conditions [l/h]
PGFVTGASFLOWMAX	1800	Maximum allowed flow [l/h]
PGFVTGASFLOWMIN	200	Minimum recommended flow [l/h]

Figure 7.9: TopSpin **Temperature Controlling Gas Flow** window

- MAS related parameters are listed in the **MAS Parameters** submenu.

MAS Parameters		
MASFREQMIN	0	Minimum sample rotation frequency [Hz]
MASFREQMAX	15000	Maximum sample rotation frequency [Hz]
MASSPINSIGNAL	electrical	Type of spin rate signal
MASSTATORFLIP	Electric	Stator flip
MASINSERTAIR	<input type="checkbox"/>	Requires pressurized air for sample insert

Figure 7.10: TopSpin **MAS Parameters** window

- The coil parameters for an iProbe with one coil are listed as shown in [Figure 7.11 \[p 33\]](#)

Coil Parameters		
PHCGASC	air	Gas compensation
PHCOINO	1	Number of coils

Figure 7.11: TopSpin **Coil Parameters** window

- The nuclei of each coil can be viewed in the window **Parameters of Coil**.

Figure 7.12: TopSpin **Parameter of Coil** window

- The TopSpin **Sample Parameters** window for liquid samples show important information about the sample depth below the magnetic center or the sample filling height (see [Figure 7.13 \[p 34\]](#)). It is also possible to read this info by using **edprobe** within TopSpin. To adjust the sample, use the provided sample gauge.

Sample Parameters		
PHSDIAM [mm]	5	Sample diameter [mm]
PHSDPTH [mm]	22	Maximum depth below magnetic centre [mm]
PHSDPTHMIN [mm]	20	Minimum depth below magnetic centre [mm]
PHSDPTHREC [mm]	20	Recommended depth below magnetic centre [mm]
PHSDPHTHSUP [mm]	22	Depth below magnetic centre needed for best solvent suppression results [mm]
RECOMFILL [mm]	40	Recommended liquid filling height [mm]

Figure 7.13: TopSpin **Sample Parameters** window provides the specific parameters of the sample, e.g. liquid sample.

- The **Sample Parameters** window provides only the rotor diameter for iProbe HR-MAS.

Sample Parameters		
PHSDIAM [mm]	4	Sample diameter [mm]
PHSDPTHMIN [mm]	0	Minimum depth below magnetic centre [mm]
PHSDPTHREC [mm]	0	Recommended depth below magnetic centre [mm]
PHSDPHTHSUP [mm]	0	Depth below magnetic centre needed for best solvent suppression results [mm]
RECOMFILL [mm]	0	Recommended liquid filling height [mm]

Figure 7.14: TopSpin **Sample Parameter** window provides the specific parameters of the sample, e.g. HR-MAS sample

- The peak power of the iProbe can be checked under the related submenu.
NOTICE! Never use higher power settings than the given values and use the peak power only for short pulses, otherwise the iProbe can be damaged. Switch power check on in order to automatically limit the peak power to these values.

Peak Powers	
PHPOWER	<input type="button" value="Edit..."/> Peak powers
Available Plugins	
90 deg. Pulses	

Editor For Peak Power	
Probe Z155160_0001	
Nucleus	Peak Power [W]
1H	100.00
13C	300.00
79Br	300.00
2H	27.00
Nucleus	Peak Power [W]

Buttons: Add, OK, Cancel

Figure 7.15: TopSpin **Peak Power** window

7.5 Sample Carrier and NMR Tubes for HR-Liquids

NOTICE

Risk of material damage due to incorrect use of spinners and shuttles.

When setting up the experiments please make sure that the temperature specifications of both the NMR probe and the sample carriers (e.g. spinner/shuttle) are respected in order to avoid damage to the hardware.

- ▶ Consult the customer sample certificate to get information about the approved temperature range for your sample.
- ▶ Consult the Manual NMR Probes - Variable Temperature Control for NMR Probes (Z33073, Chapter 3, Table 3.4.) to get the information about the approved temperature range of spinners and shuttles.

	Spinner SB PLA (PCTFE) 5+2,5 A (H00177A) with black marking inside.
	Spinner SB CERAMICS 5mm TYP: A (H00804A).
	Spinner SB PLA (POM) 5+2,5 -A (Z42516A) with black marking inside.

Table 7.2: Allowed Spinner Types with Yellow Rings

Further information about available samples can be found under <https://store.bruker-biospin.com/>.

7.5.1 Glass Tubes

NOTICE

Material damage of glass tubes

- ▶ NMR tubes should always be handled carefully. In some rare cases they may break even without any force or impact e.g. when inserting an NMR glass tube into the iProbe.

7.5.1.1 Sample Depth and Filling Height

The values of sample depth and filling height are defined in PICS which is accessible via *edprobe* under TopSpin.

Sample Parameters		
PHSDIAM [mm]	5	Sample diameter [mm]
PHSDPTH [mm]	22	Maximum depth below magnetic centre [mm]
PHSDPTHMIN [mm]	20	Minimum depth below magnetic centre [mm]
PHSDPTHREC [mm]	20	Recommended depth below magnetic centre [mm]
PHSDPTHSUP [mm]	22	Depth below magnetic centre needed for best solvent suppression results [mm]
RECOMFILL [mm]	40	Recommended liquid filling height [mm]

Figure 7.16: TopSpin Sample Parameter for iProbe HR-Liquids.

NOTICE! Never exceed the maximum sample depth since this may damage the sample. For best performance use the recommended values for depth and filling height.

7.5.1.2 Sample Diameter

Never insert a sample with a larger diameter than the one the iProbe is intended for.

7.6 Specific iProbe HR-MAS Hardware and Operations

NOTICE

Material damage hazard due to improper handling of rotors

It is important that the rotors are correctly filled with the samples and that the rotor caps and the marker are in good condition. Otherwise the spinning can become unstable or the rotor could crash.

Never exceed the temperature ranges and the allowed spinning rate of the rotor - cap combination.

The setup of an HR-MAS iProbe contains an MAS unit as peripheral hardware. Additionally, some setting modifications have to be done on the variable temperature unit (VTU) and the gradient amplifier.

7.6.1 MAS Unit

The HR-MAS iProbe needs to be operated with at least a MAS III Unit, further details are provided in the MAS User Manual (H146901). Connect the MAS unit to the required gas (Nitrogen or Air) as defined in PICS according to [Figure 7.11](#) [▶ 33]. If the wrong gas is used, a deterioration of the line shape can be expected.

The stator is driven by an electromotor which allows to flip between eject and insert position. The movements from eject to insert and back last several seconds. The same motor is also responsible for the fine adjustment of the magic angle. The adjustment is done from the **Magic Angle** tab of the TopSpin™ MAS user interface shown in [Figure 7.17 \[p. 37\]](#) It is offered in two modes: an automatic and a manual adjustment.

- The automatic adjustment lasts typically several minutes. The side band used for automatic Magic Angle adjustment can be selected in the Configuration tab.

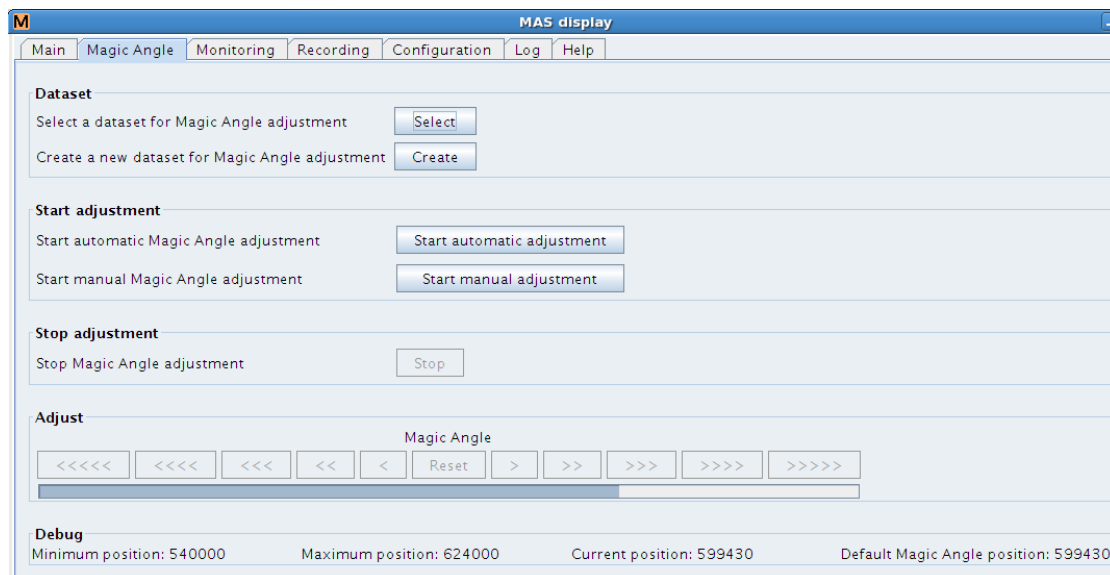


Figure 7.17: The **MAS Angle** tab of the TopSpin MAS user interface.

7.6.2 Transfer System

For manual sample insertion and ejection, the modular transfer line H169139 PIM CP MAS TRANSFER SYST 1.3-4.0MM S1-SA must be used ([Figure 7.18 \[p. 37\]](#)). The eject pressure has to be set to approx. 1.8 bar.



Figure 7.18: Transfer system

7.6.3 Variable Temperature Unit (VTU)

Since the MAS unit regulates the gas flow of the bearing gas, the VTU will only regulate the temperature but not the flow. Therefore, the VTU must be configured to external gas flow control in the Temperature Control Suite (VTU user interface) as highlighted in [Figure 7.19](#) [▶ 38].

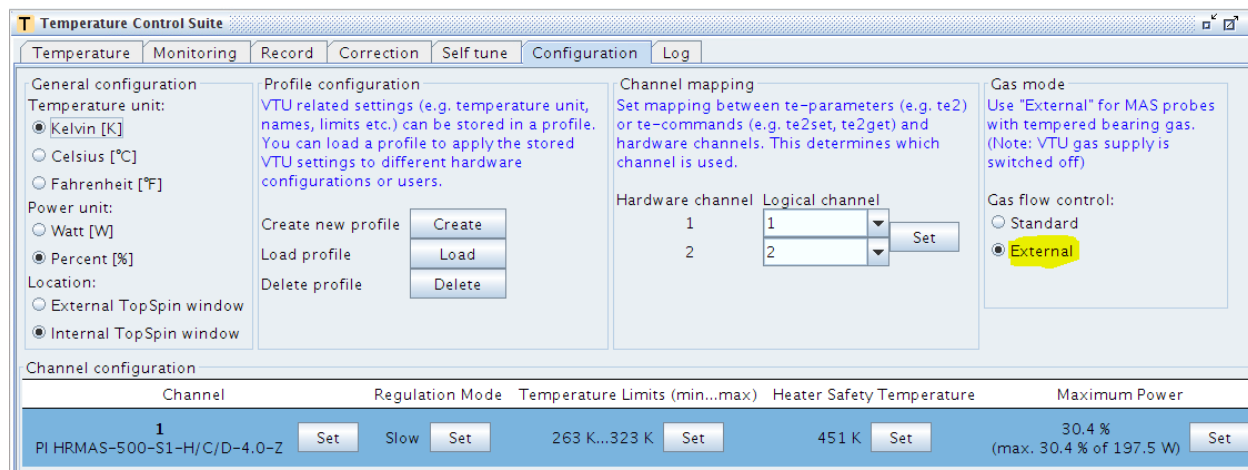


Figure 7.19: Temperature Control Suite (VTU user interface)

7.6.4 Gradient Amplifier

In order to minimize possible artefacts coming from gradient recovery time, it is recommended to switch on the pre-emphasis of the gradient amplifier.

Note that the pre-emphasis should be set to OFF with compensated gradient coils (typically the case of iProbe-Liquids). Never exceed the allowed maximum current given in the TopSpin Gradient System Parameters window.

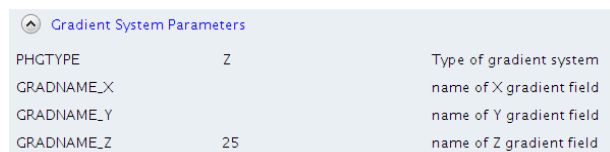


Figure 7.20: TopSpin Gradient System Parameters.

7.6.5 Tuning & Matching

Tuning & Matching of each channel is done with the **atma** or **atmm** command (see also [ATMA](#) [▶ 29]). Note that in order to see the wobble curve the stator must be in the insert position.

7.6.6 Shimming

In HR-MAS spectroscopy the rotor axis is oriented at the magic angle with respect to the magnetic field direction. As the spinning rates are typically at least a few kilohertz, which is much larger than the magnetic field inhomogeneity, the amplitudes of the sidebands generated from the magnetic field inhomogeneity are small. Therefore, shimming may be done with a restricted set of shims that is cylindrically symmetric about the MAS rotation axis (Z', Z2', Z3', etc.). To generate these *magic angle shims* a linear combination of the standard

laboratory frame shims (Z, X, Y, etc.) is necessary. This linear combination is mathematically expressed by a matrix that represents the change of reference frame from the *magic angle frame* with the Z' axis parallel to the rotational axis, to the laboratory frame, with the Z axis parallel to the main magnetic field.

The HR-MAS iProbe cannot be mounted in the magnet with the spinning axis in the XZ- or in the YZ-plane of the shim system. Therefore, we recommend the usage of TopShim, as it takes automatically into account the transformation from laboratory coordinates to magic angle coordinates. This operation consents to minimize the shim currents and to distribute the currents among several shim coils, minimizing the risk of overcurrent on a single shim coil.

To build the matrix transformation correctly, TopShim requires the input of the mounting angle of the probe, i.e. the orientation of the probe in the shim system. Please refer to section [Table 7.3 \[40\]](#) for more details.

Currently, TopShim offers only the manual mode for shimming in the laboratory frame. The development of an automated mode is in progress.

7.6.6.1 Mounting Angle

TopShim needs to know the angle at which the HR-MAS iProbe is mounted with respect to the Standard bore (SB) shim system. There are theoretically twelve possible angles, the most common being 340° (see [Figure 7.21 \[39\]](#)).

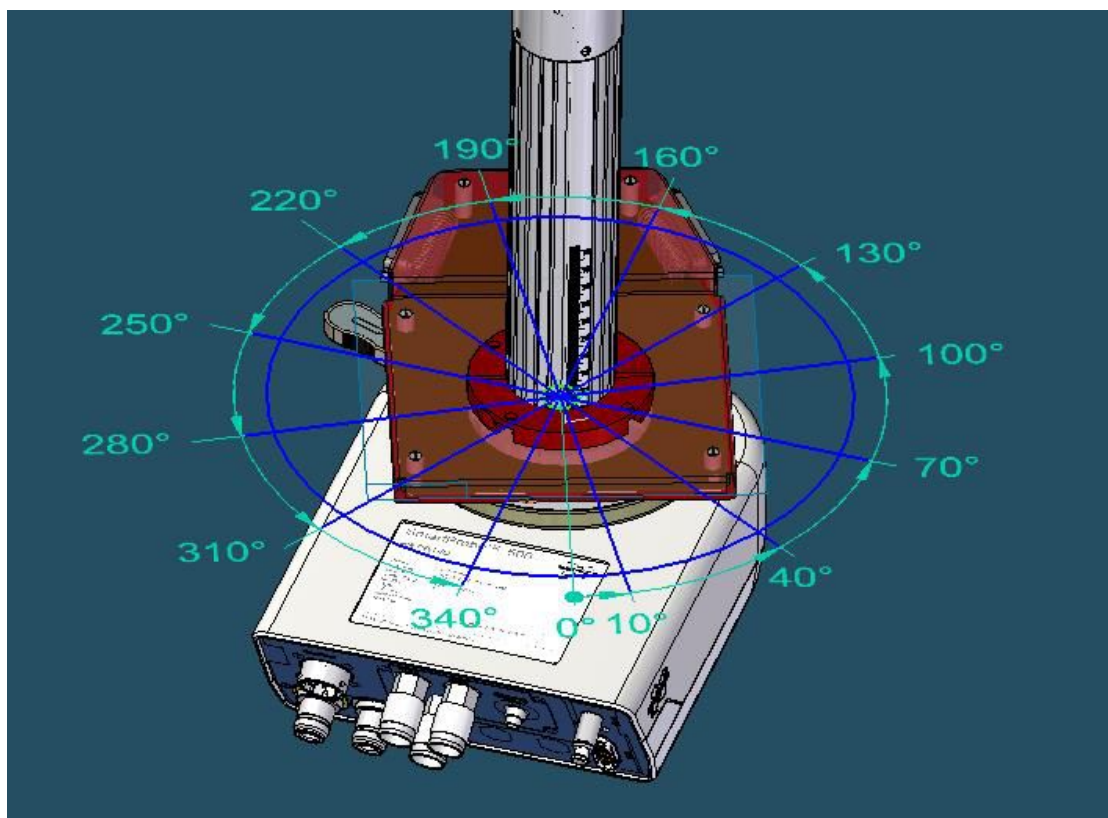


Figure 7.21: SB Shim System

The angle φ needed in TopShim is depending on the position of the X- and Y- axis of the installed shim system (Boss2/3-SB or Boss1-SB), therefore see [Table 7.3 \[40\]](#).

Mounting position of the iProbe for TopShim is dependent on the shim system (see Figure 7.22 [40])	Resulting angle ϕ_1 for TopShim in a Boss2/3-SB shim system	Resulting angle ϕ_2 for TopShim in a Boss1-SB shim system
340 ° (standard installation)	340 °	40 °
310 °	310 °	10 °
280 °	280 °	340 °
250 °	250 °	310 °
220 °	220 °	280 °
190 °	190 °	250 °
160 °	160 °	220 °
130 °	130 °	190 °
100 °	100 °	160 °
70 °	70 °	130 °
40 °	40 °	100 °
10 °	10 °	70 °

Table 7.3: Conversion of the mounting angle needed for TopShim dependent on the SB shim system type for various mounting angles.

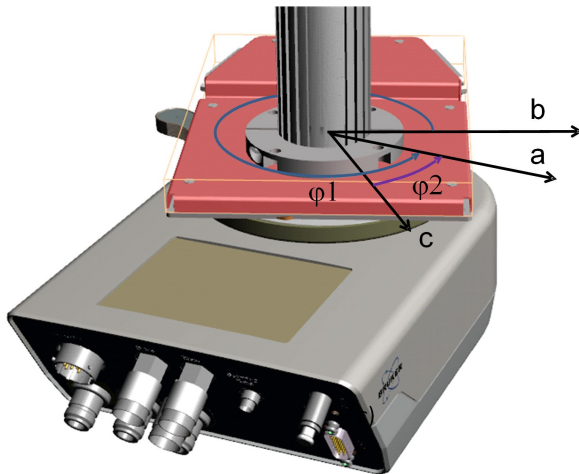


Figure 7.22: Standard Bore (SB) Shim System

a	Projection of the laboratory frame's Z'-axis	ϕ_1	Angle between X-axis Boss2/3 shim system and projection of laboratory frame's Z'-axis
b	X-axis Boss2/3 shim system	ϕ_2	Angle between X-axis Boss1 shim system and projection of laboratory frame's Z'-axis
c	X-axis Boss1 shim system		

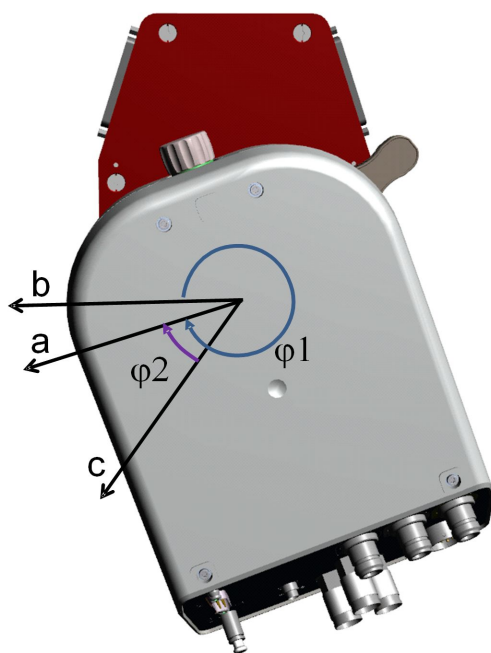


Figure 7.23: Standard Bore (SB) Shim System – View from Bottom

a	Projection of the laboratory frame's Z'-axis	$\phi 1$	Angle between X-axis Boss2/3 shim system and projection of laboratory frame's Z'-axis
b	X-axis Boss2/3 shim system	$\phi 2$	Angle between X-axis Boss1 shim system and projection of laboratory frame's Z'-axis
c	X-axis Boss1 shim system		

7.6.6.2 Shimming in the TopShim Manual Mode

Samples with a strong signal like H₂O are recommended for initial shimming. The sample must be rotating at a reasonable spinning rate.

- Set all shim values to 0 (BSMS panel or using **setsh** in TopSpin).
- Load the corresponding lock solvent with **lopo**. The lock should now be in sweep mode and the lock wiggles should be visible. Otherwise adapt Field and Gain accordingly. However, the lock wiggles will probably be too broad for locking.
- Run **topshim changemasshims** and set the angle when asked for according to [Table 7.3 \[▶ 40\]](#)

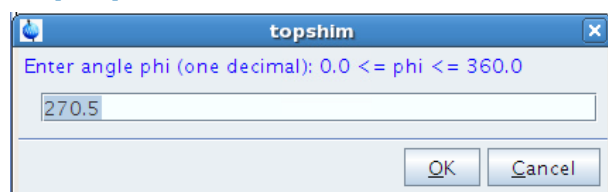


Figure 7.24: TopShim pop-up window, where the angle phi has to be entered.

- (Use the command **topshim calreset** to reset the angle phi.)
- Optimize the Z' shim until locking is successful by using rather large steps (e.g. 1'000 units).

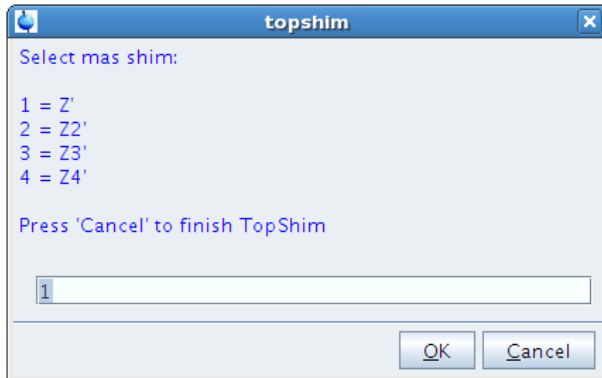


Figure 7.25: TopShim window to select the corresponding laboratory frame mas shim gradients Z' , $Z2'$, $Z3'$, and $Z4'$.

- Continue to optimize the $Z1'$ – $Z4'$ shims by looking at the lock signal and also at the line shape.
- Once the iProbe has successfully passed the initial shimming, this shim file can be used as a base for all other samples. In most cases only the Z' and $Z2'$ will then need an adjustment.

8 Maintenance

8.1 Cleaning

8.1.1 Before Cleaning

1. Stop the NMR experiment and remove the sample.
2. Switch *vtudisp*
3. Disconnect all cables and connections that are described in the chapter iProbe Mounting with Quick-Lock.
4. Remove the iProbe from the magnet according to the chapter iProbe Mounting with Quick-Lock.

8.1.2 Cleaning the Outer Shell of the Device

NOTICE

Material damage hazard

- ▶ Use only a lint-free cloth dampened in ethanol or isopropanol as a cleaning fluid to clean the outer shell of the device.
- ▶ Do not clean the sample cavity and prevent any objects or particles from entering it.
- ▶ Do not disassembly the device for cleaning.

8.1.3 Other Cleaning Operations

For all other cleaning operations contact Bruker service for advice and support. It may be necessary to return the device for a cleaning service.

The device is not protected from contamination in case of leaking samples. Bruker accepts no responsibility for any damage which may occur when samples containing radioactive or other hazardous materials are used.

In case of an accident involving toxic, radioactive, explosive, or biologically active substances, the device and associated equipment must be cleaned in such a way that no danger emanates from the device and associated equipment. If a device has to be cleaned of all remaining traces of a substance for safety reasons, contact Bruker service for advice and support.

Note that under certain circumstances Bruker cannot guarantee the decontamination of the device and its accessories, contact Bruker service for details.

9 Troubleshooting

ATM Error

- If the ATM does not work or returns an error, the ATM server software may need to be restarted. To do this, simply quit TopSpin and restart it.

iProbe HR-MAS Errors

- If the communication with the MAS-Unit fails, reset the MAS-Unit and restart TopSpin.
- If no wobble dip is visible: Make sure the stator is not in the eject position. If it is, flip the stator into the insert position by checking / ticking the insert button in the MAS display.
- If there is still no dip in the wobble curve, the correct routing of the current experiment should be checked with the command **edasp**.

Problem with iProbe in TopSpin

- If a problem with TopSpin occurs during the iProbe installation, use the command **savelogs** to collect information about the installation setup and send it to your local Bruker support.

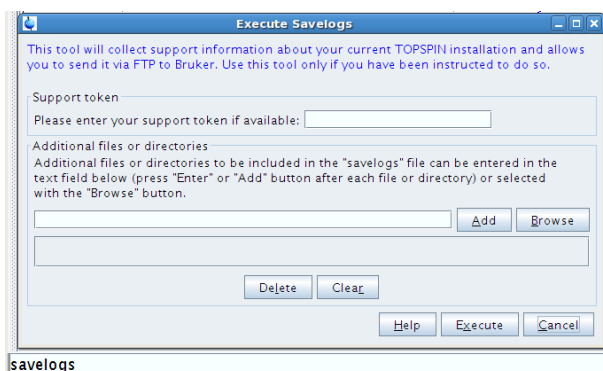


Figure 9.1: TopSpin savelogs command

9.1 Specific for iProbes HR-MAS

Poor Line Shape

The magic angle is very critical for good shimming and line shape.

- If the line shape has deteriorated: Check the magic angle setting.

NOTICE! Sample preparation is equally critical. The presence of air bubbles inside the rotor or leakage of the sample degrades the quality of the spectra significantly.

10 Replacement of Parts



Only trained Bruker personnel are allowed to initially install, retrofit, repair, adjust and dismantle the unit!

10.1 Returning the Unit for Repair

If the Bruker Hotline diagnoses an instrument failure that requires a part to be returned for repair, please follow the procedure listed here:

1. Contact your local Bruker office to start the repair process (see Contact). Repair is always handled by your local Bruker office. Their reply will contain all necessary information for the subsequent repair process steps.
2. They will provide you with details on the shipping address, and also in most cases a "Return Merchandise Authorization" number (RMA number) that allows references to the repair case. Always refer to this RMA number in case of questions.
3. Send the defective part to the local Bruker office and include the following documents:
 - RMA sheet (if RMA number was assigned).
 - Signed Equipment Clearance Form (BBIOF002/H152631). The Equipment Clearance Form will be sent to you as part of step 1 (see above) with information about the returned part (part number, serial number, your contact details) already filled in.
4. Attach the relevant papers to the *outside* of the packaging, for instance in a transparent polybag.



The unit should be returned using the original container and packing assembly. If this packaging is no longer available, contact your local Bruker office for further instructions.

11 Dismantling and Disposal



Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by Bruker Service or personnel authorized by Bruker. Damage due to servicing that is not authorized by Bruker is not covered by your warranty.

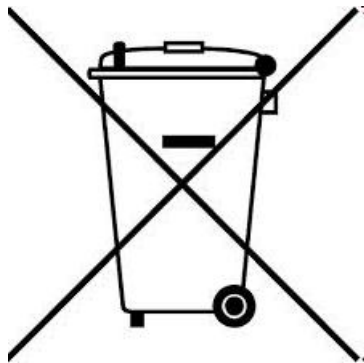
11.1 Dismantling

Before starting dismantling:

1. Shut down the device and secure to prevent restarting.
2. Disconnect the power supply from the device; discharge stored residual energy.
3. Remove consumables, auxiliary materials and other processing materials and dispose of them in accordance with the environmental regulations.
4. Clean assemblies and parts properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

11.2 Disposal Europe

Environmental information for laboratory and industrial customers within the EU (European Union)



This laboratory product is developed and marketed for Business-to-Business (B2B), so does not fall under article 6 clause 3 of the German Act ElectroG. To meet the demands of the European Directive 2012/19/EU WEEE 2 (Waste of Electrical and Electronic Equipment) and the national Equipment Safety Act, electrical and electronic equipment that is marked with this symbol directly on or with the equipment and/or its packaging must not be disposed of together with unsorted municipal waste or at local municipal waste collecting points. The symbol indicates that the equipment should be disposed of separately from regular industrial/ domestic waste.

Correct disposal and recycling will help prevent potential negative consequences for the environment and risk to personal health. It is your responsibility to dispose of this equipment using only legally prescribed methods of disposal and at collection points defined by government or local authorities in your area.

The WEEE register number can be found on the product label of the equipment. If you need further information on the disposal of equipment or collection and recovery programs available, contact your local Bruker BioSpin sales representative. Local authorities or professional waste management companies may also provide information on specific waste disposal services available in your area.

Disposal - End of Life (EoL) information: the common procedure as defined in the sales contract with Bruker BioSpin

After the lifespan of an electrical and electronic product, Bruker BioSpin takes responsibility for final disassembly and correct disposal in accordance with the European directive 2012/19/EU WEEE 2.

Bruker BioSpin offers to take back the equipment (only for deliveries after 23.03.2006) after termination of use at the customer site upon request by the customer. This request must be affirmed when the equipment is ordered from Bruker BioSpin. Additional costs for dismantling and transport service will apply!

Only 100% pre-decontaminated equipment can and will be accepted by Bruker BioSpin. A release document for decontamination can be inquired from your nearest Bruker BioSpin contact site, also to be used when repairs, going back to Bruker sites, are requested.

In compliance with WEEE II directive: **2012/19/EU**

11.3 Disposal USA and Other Countries

Disposal of these materials may be regulated due to environmental considerations. For disposal or recycling information, please contact our local office or your local authorities, or in the U.S.A., contact the Electronics Industry Alliance web site at www.eiae.org.

12 Technical Data

12.1 General Information

Data	Value	Unit
Weight	3	kg
Length	27	cm
Width	18	cm

Table 12.1: Technical Data: Size

Flush Gas Supply

Always use the same type of gas as for the VT gas, but from a separate source (dry clean air or nitrogen gas at room temperature with a dew point below $-50\text{ }^{\circ}\text{C}$), flow rate about 2-5 l/min. For low temperature measurements use nitrogen gas only. Use the Supply Kit P/N Z111126 to couple the gas source with the Flush gas connector on the iProbe.

12.2 Environmental Conditions

Environment

Data	Value	Unit
Temperature range		$^{\circ}\text{C}$
Relative humidity at $31\text{ }^{\circ}\text{C}$, maximum		%
Decreasing linear til relative humidity $< 50\%$ at $40\text{ }^{\circ}\text{C}$, maximum		%

Table 12.2: Operating Environment

For the appropriate temperature see also the Bruker site planning guides on the BASH CD (Bruker Advanced Service Handbook):

Manual	Bruker Part Number
Site Planning for AVANCE Systems 300-750 MHz	Z31276
Site Planning for AVANCE Systems 800-950 MHz	Z31686

Table 12.3: Bruker Site Planning Guides

12.3 iProbe Type Plate

The type plate is located on the iProbe and includes the following information:

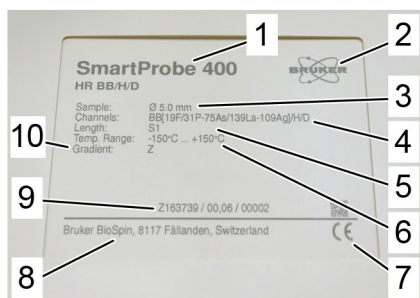


Figure 12.1: iProbe Type Plate

1	Type	6	Temperature range
2	Manufacturer logo	7	CE Symbol
3	Sample type to use with the iProbe	8	Manufacturer address
4	Channels	9	Part number / ECL: Engineering Change Level / Serial number
5	Length type of the Probe	10	Gradient

13 Contact

NMR Hotlines

Bruker Corporation provides dedicated hotlines and service centers. Please select the NMR service center or hotline you wish to contact from our list available at:

<https://www.bruker.com/service/information-communication/helpdesk.html>

Contact our NMR service centers, so that our specialists can respond as quickly as possible to all your service requests, application questions, software or technical needs.

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