


Bruker BioSpin

SampleMail •

Installation Guide

think forward

NMR Spectroscopy



This Manual was written by

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1	Installation instructions.....	6
2	User Training	43
3	Acceptance Test.....	Fehler! Textmarke nicht definiert.
4	Contact.....	44
	Appendix	45

1	Installation instructions.....	6
1.1	Precaution.....	6
1.2	Required Tools for the Installation.....	8
1.3	Hardware and Software Requirements	9
1.3.1	Hardware Requirements	9
1.3.2	Software Requirements	9
1.3.3	Requirements for Compressed Gas Supply	9
1.3.4	Compatibility with MAS	9
1.3.5	Compatibility with CRYO FIT	10
1.3.6	Compatibility with CryoProbes	10
1.4	Installing the MOUNTING UNITS on the Magnet.....	11
1.4.1	Safety Preparations	12
1.4.2	Installing the HAND SLIDER UNIT	13
1.4.3	Preparing the LINEAR AXIS MOUNTING UNIT BST SIDE.....	14
1.4.4	Installing the LINEAR AXIS MOUNTING UNIT BST SIDE	14
1.4.5	Preparing the LINEAR AXIS MOUNTING UNIT N ₂ NOZZLE SIDE	15
1.4.6	Installing the LINEAR AXIS MOUNTING UNIT N ₂ NOZZLE SIDE	16
1.5	Preparing the LINEAR AXIS UNIT	18
1.5.1	Adapt SampleMail to the Magnet Size.....	18
1.5.2	Measure the Dimensions of the Magnet	19
1.5.3	Position the End Stops	20
1.5.4	Adjusting Piston and Sensors at the HANDOVER POSITIONS	20
1.5.5	Adjusting the Unlock Piston	22
1.5.6	Adjusting the Transfer Slider Sensor.....	23
1.5.7	Adjusting the Spinner Present Sensor.....	24
1.6	Installing the LINEAR AXIS UNIT.....	26
1.6.1	Install the LONG TRANSPORT TUBE	29
1.7	Connecting Cables and Pressure Hoses.....	30
1.7.1	Connecting the Power Supply.....	30
1.7.2	Connect the Sensors at the HAND SLIDER UNIT	31
1.7.3	Connecting Supply Pressure Hoses and the Data Cable	31
1.7.4	Arrange the Cables and Pressure Hoses	34
1.8	Software Calibration and Testing	35
1.8.1	Update the ELCB firmware	35
1.8.2	Calibrate the Air Settings for the BST Only Operation Mode.....	38
1.8.3	Calibrate the Lift Valve Signal for Zero Flow.....	40
1.8.4	Chose the Motion Profile for SampleMail	41
1.8.5	Adjust the Speed of the TRANSFER SLIDER	41
1.8.6	Final Test	41
2	User Training.....	43

2.1	Special precaution working with CRYO FIT or MAS	43
3	Acceptance Test..... Fehler! Textmarke nicht definiert.	
4	Contact.....	44
	Appendix	45
A.1	Figures	45
A.2	Table of Magnet Dimensions	47
A.3	Magnet Information for SampleMail Preparation.....	48

1 Installation instructions

1.1 Precaution

⚠ VORSICHT/CAUTION

Use the protection lid to prevent items from being sucked in the Magnet

Metallic Items are attracted by the strong magnetic field and can fly into the magnet. They can damage the Probe Head and it's extremely difficult to get them out of the magnet again.

- Secure the slot in the magnet with the protection lid before starting the installation. Do not remove the protection lid until the installation is finished and all loose parts are removed from the magnet's surroundings.

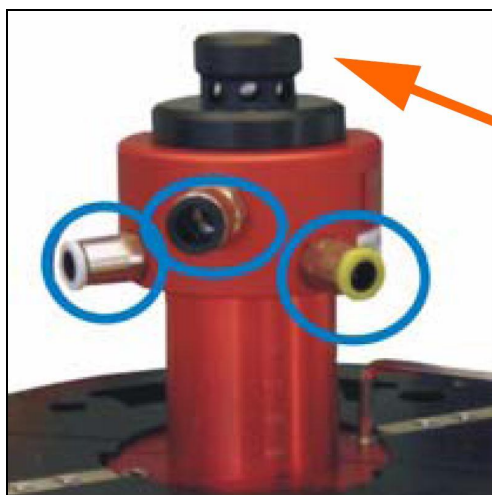


Figure 1.1: Magnet secured with the protection lid.

⚠ VORSICHT/CAUTION

Tighten all Screws to ensure the correct operation of SAMPLEMAIL

Sensors and End Stops might shift and interrupt the regular operation of SAMPLEMAIL



- Always tighten the screws holding the long end of the angled Allen key. If this is not possible then extend the short end of the angled Allen key with a tube or similar item to guarantee enough tightening torque.
- Torx screws are placed wherever the firm tightening is critical. Double check the tightening torque of all Torx screws after completing the installation. The Torx screws are flathead type. The Torx key should be handled carefully in order not to damage the screw head.



⚠ VORSICHT/CAUTION



Do not use the TRANSFER SLIDER TUBE to manually pull or push the TRANSFER SLIDER

TRANSFER SLIDER TUBE and the transfer slider bearings are not designed to withstand the large torques occurring on such an operation.

- Push or pull at the transfer slider bearing only.

1.2 Required Tools for the Installation

The SAMPLEMAIL Package comes with a set of special tools needed for the installation. Some additional standard tools are required as well. All required tools are listed below. All dimensions of the tools are metric system. Every time a tool is used it is marked in this manual by the “->” sign.

Position	Tool	Remarks
1	Angled Allen Key 2	
2	Angled Allen Key 2.5	
3	Angled Allen Key 3	
4	Angled Allen Key 4	With a short shaft and ball head
5	Angled Allen Key 5	
6	Angled Allen Key 6	
7	Screwdriver	
8	Flat Spanner 5	
9	Flat Spanner 7	
10	Flat Spanner 10	
11	Flat Spanner 13	
12	Adjustable Wrench	
13	Torx Key 25	Comes with the SAMPLEMAIL package Can be used instead of the Allen Key 4
14	Bubble Level	Comes with the SAMPLEMAIL package
15	Calibration Ring	Comes with the SAMPLEMAIL package
16	Tube Cutter	Comes with the SAMPLEMAIL package
17	Tube Cutting Bolt	Comes with the SAMPLEMAIL package
18	Heavy and light Spinners	For Testing
19	Knife: Scalpel or similar	For adjusting the cable channel
20	Side Cutter	For adjusting the cable channel

1.3 Hardware and Software Requirements

1.3.1 Hardware Requirements

- ELCB, ECL 05.01 or more recent (ECL 05.00 and below on request, ECL 02.00 and below are not compatible)
- BSVT (SPB or SPB-E) or SLCB (with PNK variant 3, 3s or 5)

1.3.2 Software Requirements

- TopSpin 2.0 or more recent
- ELCB Firmware 100426b or more recent
- SLCB Firmware 090206 or more recent

1.3.3 Requirements for Compressed Gas Supply

- SAMPLEMAIL can be operated with compressed air as well as with Nitrogen
- Operating Pressure: 5-7 bar
- Air Consumption during operation: 100 l/min at atmospheric pressure

1.3.4 Compatibility with MAS

SAMPLEMAIL is compatible with the newest version of MAS. Older versions of MAS without recess on the outer cylinder are not compatible.

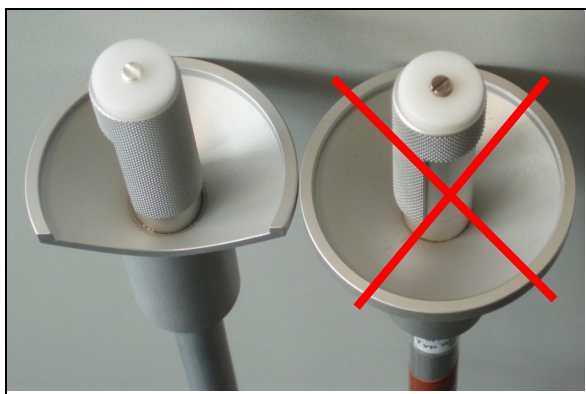


Figure 1.2: Compatible MAS (left)

1.3.5 Compatibility with CRYO FIT

Older versions of the CRYO FIT are not compatible with SAMPLEMAIL. Compatibility with the newer version of CRYO FIT is not confirmed yet and is subject to further investigation. A special conversion kit is necessary to operate CROY FIT together with SAMPLEMAIL.

1.3.6 Compatibility with CryoProbes

If SAMPLEMAIL is intended to be used in conjunction with a CRYOPROBE, the CRYOPROBE should be mounted during the installation. This prevents spacing conflicts between SAMPLEMAIL and the CRYOPROBE.

1.4 Installing the MOUNTING UNITS on the Magnet

This chapter instructs how to install the HAND SLIDER UNIT, the two LINEAR AXIS MOUNTING UNITS and the LINEAR AXIS UNIT on the Magnet. The instructions are divided into the sections “Preparing” and “Installing”. The aim of this division is to reduce the number of loose small parts that have to be handled on the Magnet. It should prevent them from dropping down and disappearing.

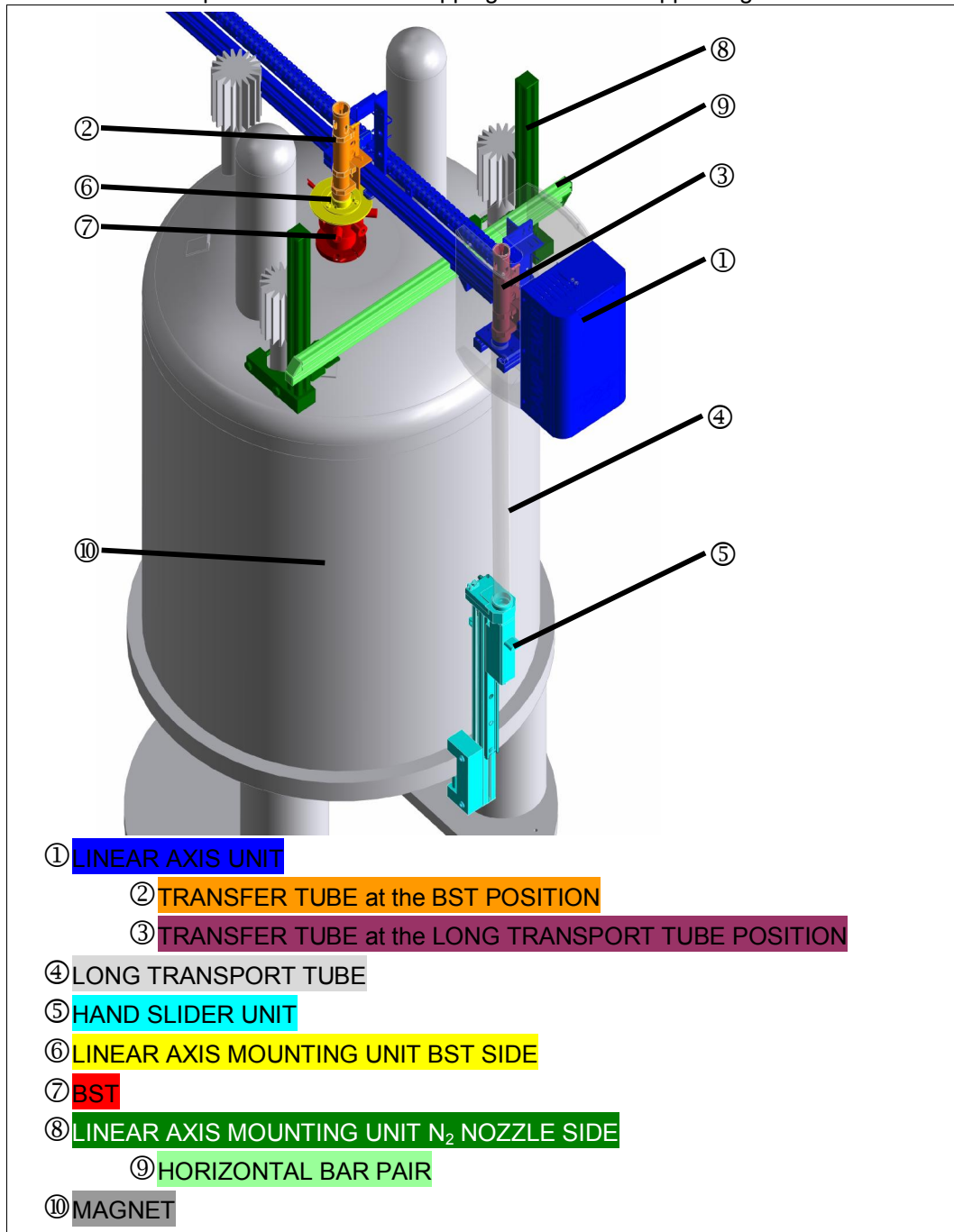


Figure 1.3: Overview Main Components of SAMPLEMAIL

- i** To remove covers from extrusion bars or brackets without damage: Use a screwdriver and push the cover very close to the knob in the center of the cover. You may also insert the tip of the screwdriver into the notches in the extrusion bars and push the cover in that way.

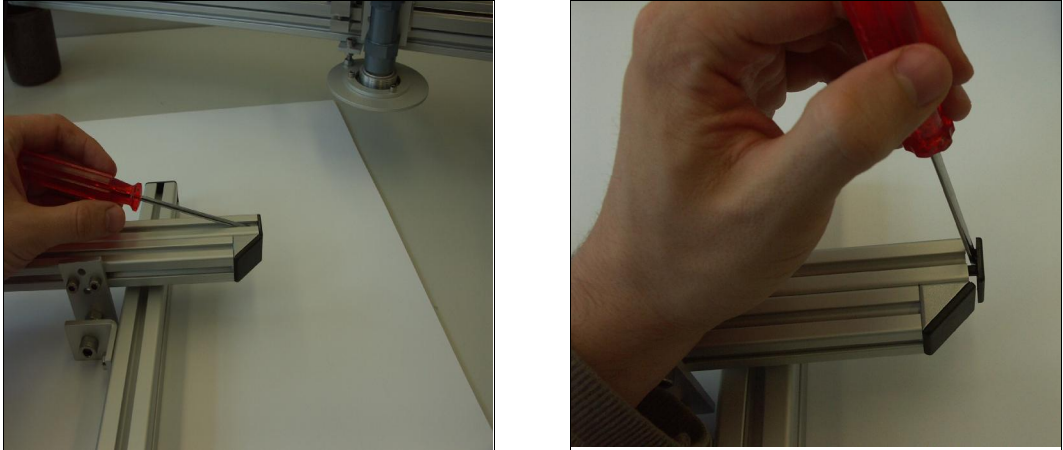


Figure 1.4: Removing Bracket Covers

1.4.1 Safety Preparations

- Switch off the magnets dampers and make sure the magnet is firmly anchored to its base.
- Secure the slot in the magnet with the protection lid.



Figure 1.5: Magnet secured with the protection lid.

1.4.2 Installing the HAND SLIDER UNIT

- Take out the scratch protector that is stored between the mounting clamp and the HAND SLIDER UNIT.
 - Allen Key 5

i It is possible to switch mounting clamp and HAND SLIDER UNIT in order to resolve intersections with the CRYOPROBE or other parts on the magnet.

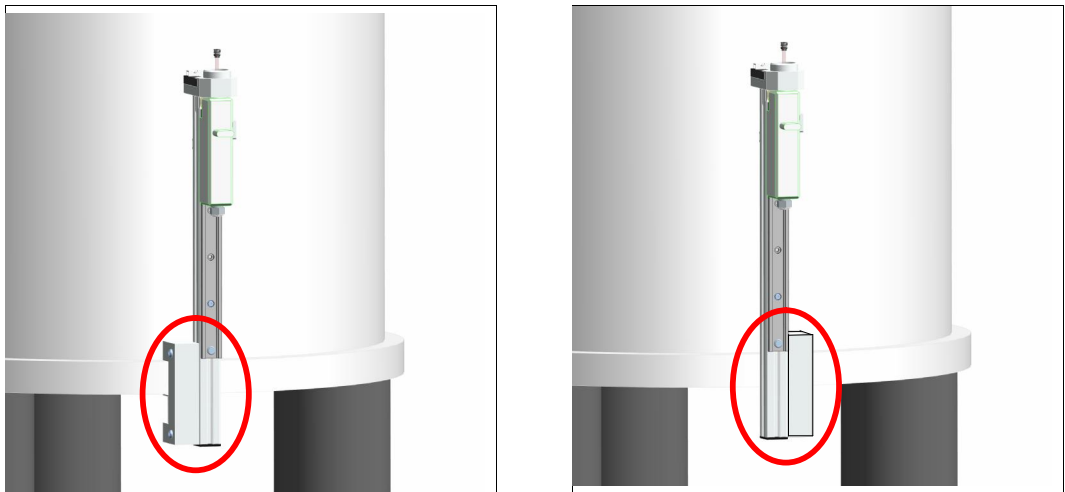


Figure 1.6: Mounting Clamp on both sides of the HAND SLIDER UNIT

- Attach the HAND SLIDER UNIT to the magnet using the mounting clamp. Put the scratch protector between the magnet ring and the headless screws.
 - Allen Key 5

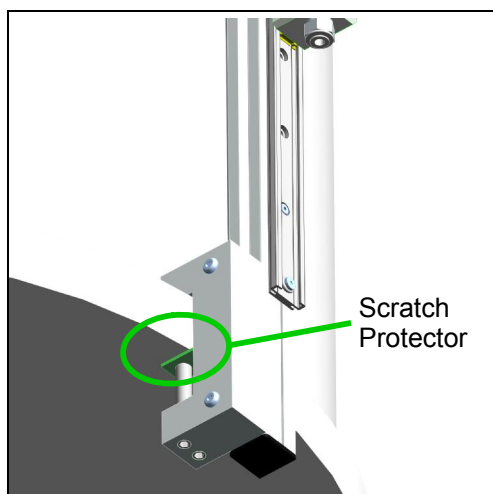


Figure 1.7: Mounting Clamp attached to the Magnet Ring

1.4.3 Preparing the LINEAR AXIS MOUNTING UNIT BST SIDE

- To control the smooth hovering of the spinner in the BST Only Operation Mode, there are 4 boreholes that can be covered with headless screws. Usually the best results are achieved when the two of the boreholes opposite of each other are covered by screws. This is the factory setting.
- For special occasions, screws may be added, removed or changed to improve the accessibility of the headless screws or to enhance hovering. If the used screws differ from the factory setting, the new setup has to be tested. (see chapter 1.7.2 Adjust the Air Settings for the BST Only Operation Mode)
 - Allen Key 2.5

1.4.4 Installing the LINEAR AXIS MOUNTING UNIT BST SIDE

- Use the two green marked M3x12 screws to attach the LINEAR AXIS MOUNTING UNIT BST SIDE. Leave the remaining screws loose for later adjustment of the mounting ring. Orient the LINEAR AXIS MOUNTING UNIT BST SIDE so that it does not press the BST lid switch.
- Allen Key 2.5

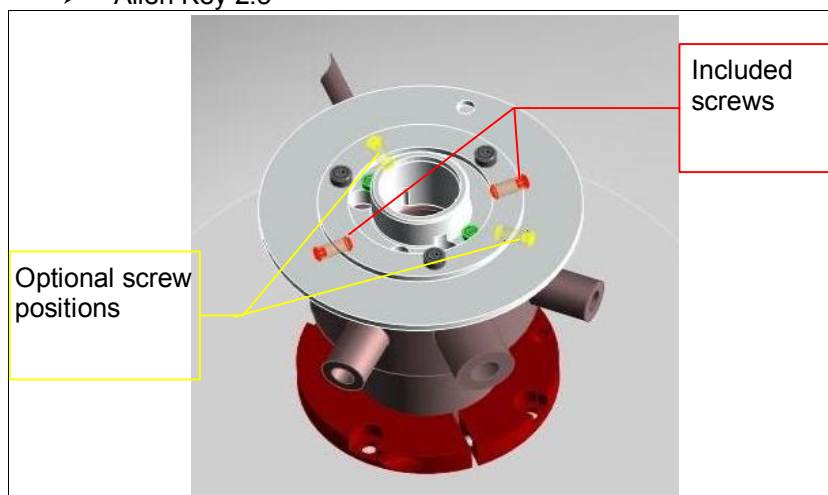


Figure 1.8: Installed LINEAR AXIS MOUNTING UNIT BST SIDE.



Figure 1.9: Do not cover the BST lid switch.

1.4.5 Preparing the LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE

- Remove the two unused threaded slot nuts from the mounting brackets of the LINEAR AXIS UNIT. Insert them into the upper bar of the HORIZONTAL BAR PAIR. Insert one slot nut into the front face slot and the other one into the rear face slot of the upper bar.
 - Torx Key 25
 - Screwdriver

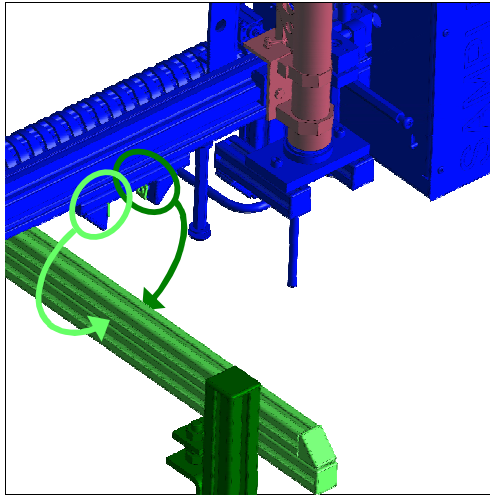


Figure 1.10: Attach the Slot Nuts from the LINEAR AXIS UNIT to the HORIZONTAL BAR PAIR.

- If the distance between the Nitrogen Nozzles is greater than the width of the horizontal bar pair, extend the bar pair by sliding them to the required width. If the bar pair was extended, one of the vertical mounts has to be attached to the upper bar. Accordingly, two of the threaded slot nuts in the bottom face of the lower bar have to be moved to the bottom face of the upper bar.
 - Torx Key 25

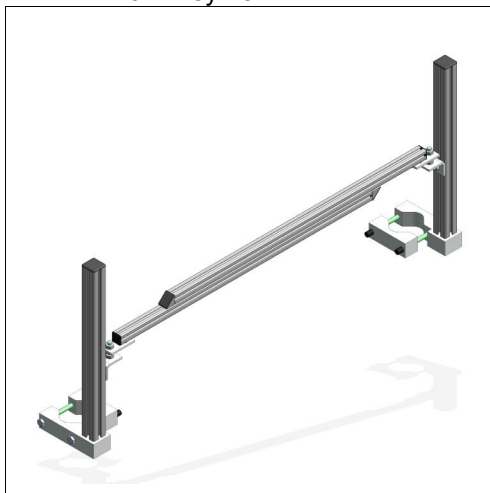


Figure 1.11: Extended HORIZONTAL BAR PAIR.

- Firmly tighten the 4 screws of the mounting brackets.
 - Torx Key 25

1.4.6 Installing the LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE

i For optimal stability, the LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE should be mounted with a large distance to the LINEAR AXIS MOUNTING UNIT BST SIDE. (A)
i At the same time, the horizontal bar pair should be installed close to the vertical bars. (B)
 See Figure 1.11 for details.

i If the height of horizontal bar pair has to be very low, it might be necessary to turn the brackets that connect the vertical and horizontal bars upside down.

- Attach the vertical bars to the Nitrogen Nozzles.
 - Flat Spanner 13

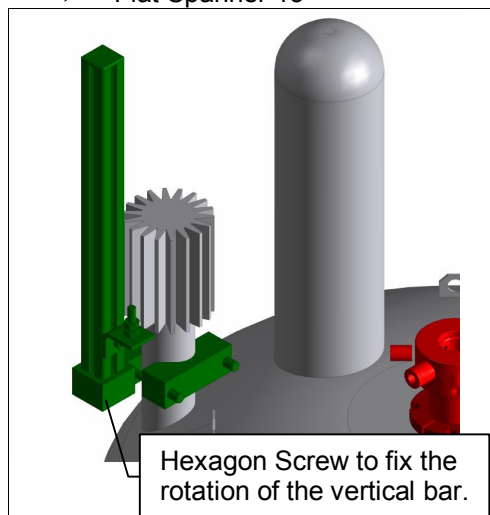


Figure 1.12: Vertical Bars attached to the Nitrogen Nozzles.

- Attach the horizontal bar pair to the vertical bars. Figures 1.12 and 1.13 show the two valid ways for mounting the horizontal bar pair.
 - Torx Key 25
 - Flat Spanner 10
 - Allen Key 5
 - Allen Key 6

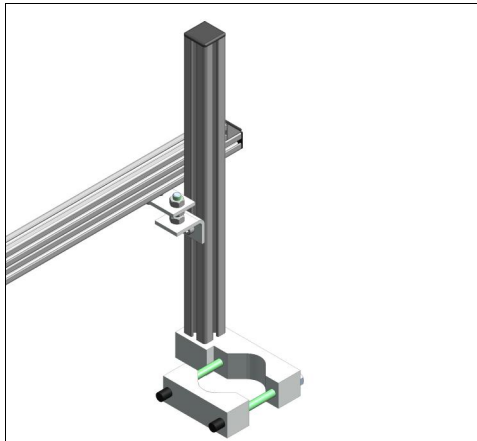


Figure 1.13: Mounting the HORIZONTAL BAR PAIR

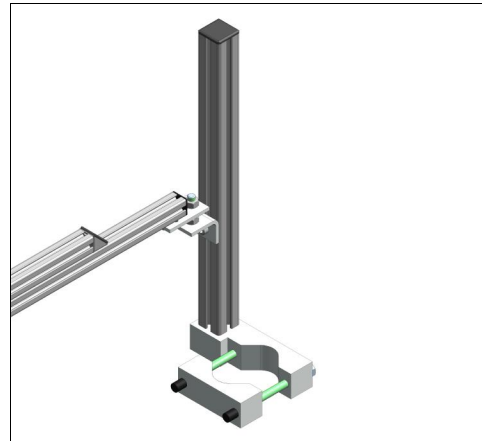


Figure 1.14: Mounting the extended HORIZONTAL BAR PAIR

- Roughly align the height of the horizontal bar pair to the LINEAR AXIS MOUNTING UNIT BST SIDE according to the Picture below.
- Roughly level out the horizontal bar pair.
 - Bubble Level

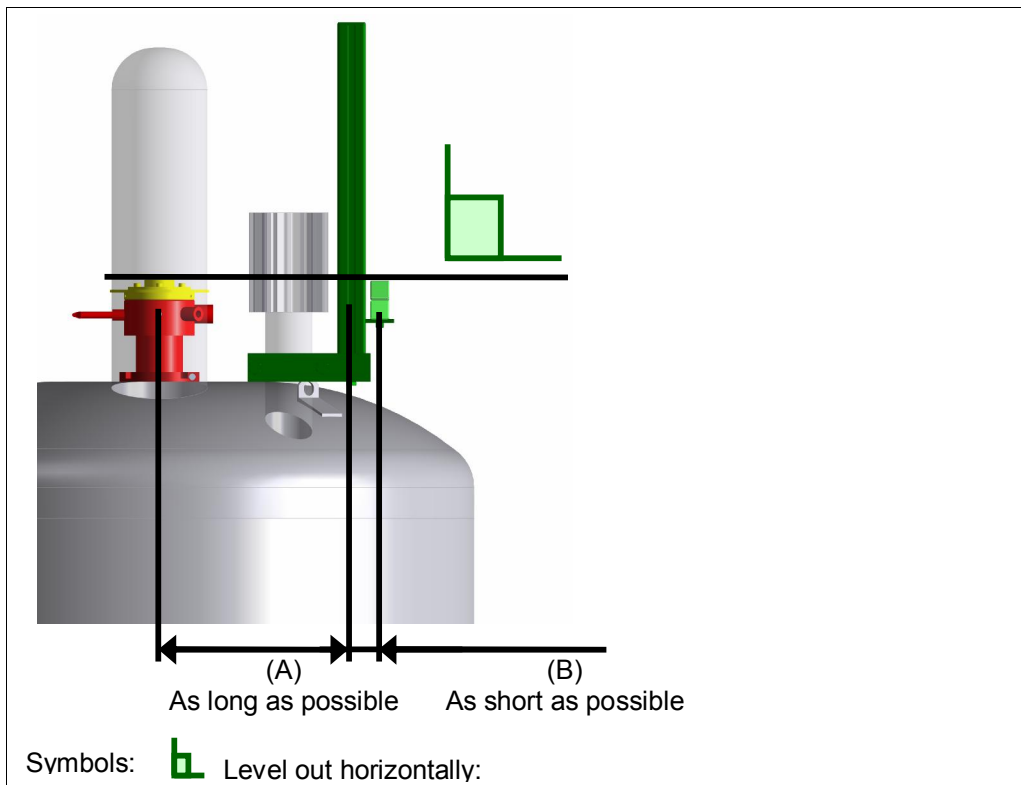


Figure 1.15: Adjust the height of THE LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE

i

Slot nuts can leave marks inside the extrusion bars. Those marks can complicate later fine adjustment. To ease fine adjustment, there are screws and counter nuts placed at all critical connections.

1.5 Preparing the LINEAR AXIS UNIT

- Remove the metal cover of the controller box
 - Allen Key 2
- Remove the transparent box covering the HANDBOVER POSITION at the LONG TRANSPORT TUBE
 - Allen Key 2
 - Allen Key 3
- Check, if the cable channel would intersect the helium nozzles or another part on the magnet. In order to resolve such intersections, it is possible to split the two parts of the cable channel and shift them along the pneumatic axis. It's even possible to cut some edges off the channel in order to make them fit to the magnet.
 - Knife
 - Side Cutter

i

It could be necessary to switch the slot nuts of a HANDBOVER POSITION with a bracket of the cable channel. Since the threaded slot nuts can't be removed easily, it might be necessary to interchange the slot nuts of the end stop with the slot nuts of the cable channel.

i

Skip the rest of this chapter if the SampleMail has already been adjusted for this magnet type. Continue with chapter 1.6 Installing the LINEAR AXIS UNIT

1.5.1 Adapt SampleMail to the Magnet Size

The installation procedure described in this manual allows the Sensors and End Stops of the LINEAR AXIS UNIT to be adjusted comfortably on a table instead on top of the magnet.

In order to adjust the Sensors and End Stops, it is necessary to know

- The Track Length (D) of the TRANSFER SLIDER between the two end stops
- The length of the LONG TRANSPORT TUBE

You can find these values either from the table 1A.2 Table of Magnet Dimensions or by measuring them according to 1.5.2 Measure the Dimensions of the Magnet.

1.5.2 Measure the Dimensions of the Magnet

- For the measurement, mount the HAND SLIDER UNIT so that there is some margin to move it in both directions: Closer to the magnet and away from the magnet. In this way, the measured magnet dimension will have a tolerance of roughly +/-5mm.
 - Allen Key 5
- Use any cord, tube or cable to measure the circumference of the magnet. Calculate the Track Length (D) according to the figure 1.15.

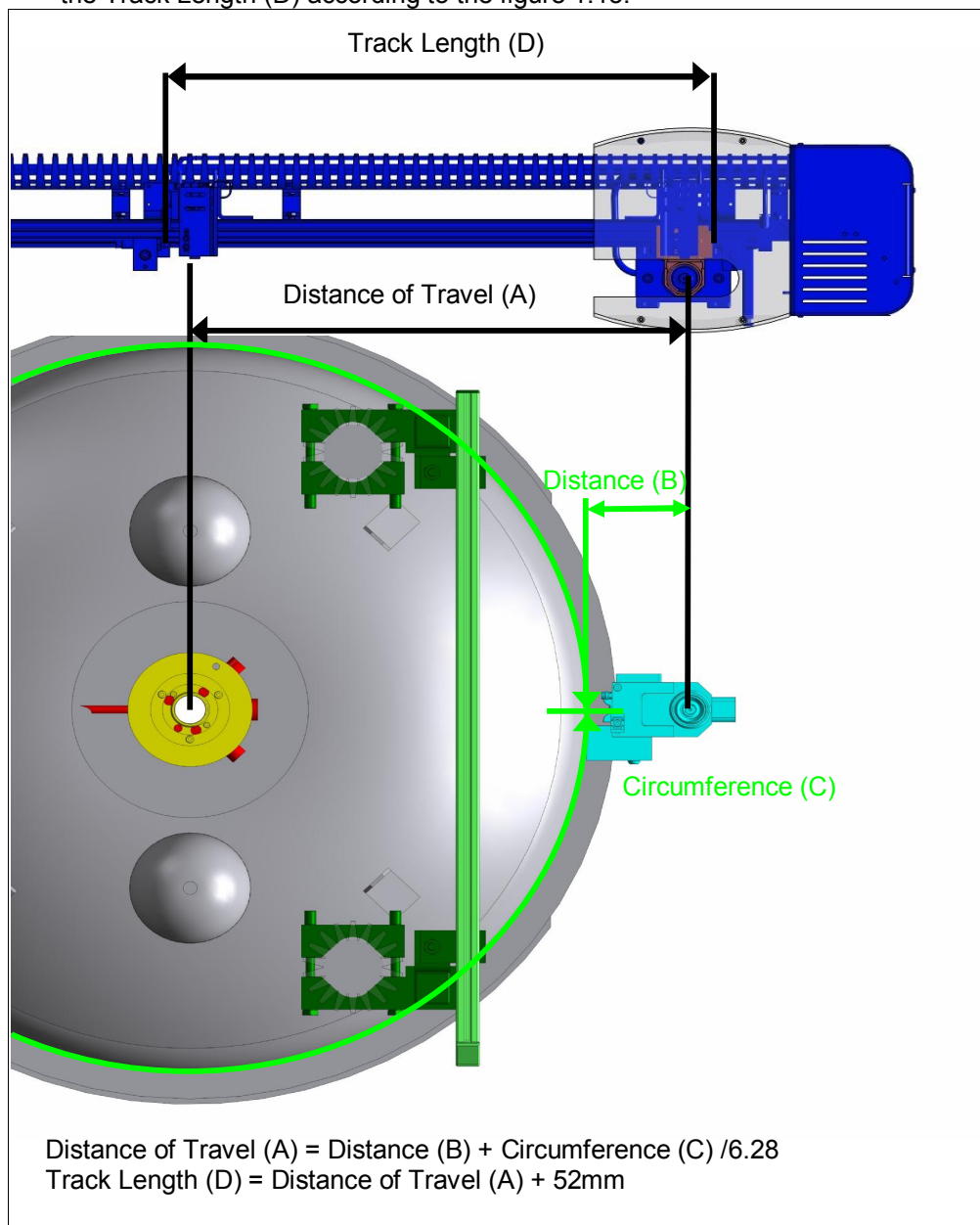


Figure 1.16: Preparing the LINEAR AXIS UNIT (Measures on MAGNET and LINEAR AXIS UNIT)

1.5.3 Position the End Stops

- Slide the End Stop at the BST SIDE to the calculated location with Distance of Travel (D) from the End Stop at the LONG TRANSPORT TUBE SIDE
 - Torx Key 25
- Hold the LINEAR AXIS UNIT up to the final position on the magnet. If the unused end of the LINEAR AXIS UNIT collides with parts on the magnet, the Controller Box has to be separated from the HANDOVER POSITION at the LONG TRANSPORT TUBE SIDE in order to clear the required space. If the HANDOVER POSITION at the LONG TRANSPORT TUBE SIDE was moved, all the sensors there have to be adjusted in addition to the sensors at the BST SIDE. In that case, perform all the steps from 1.5.3 Position the End Stop to 1.5.7 Adjusting the Spinner Present Sensor twice, once for each HANDOVER POSITION.

1.5.4 Adjusting Piston and Sensors at the HANDOVER POSITIONS

The following chapter applies to both the HANDOVER POSITIONS at the BST SIDE and at the LONG TRANSPORT TUBE SIDE.

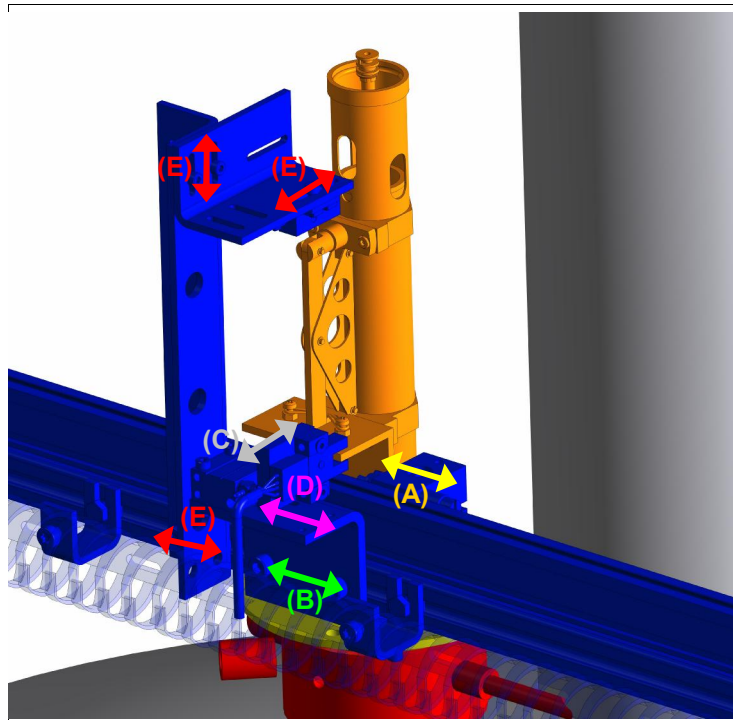


Figure 1.17: Adjustment possibilities and requirements at the HANDOVER POSITIONS

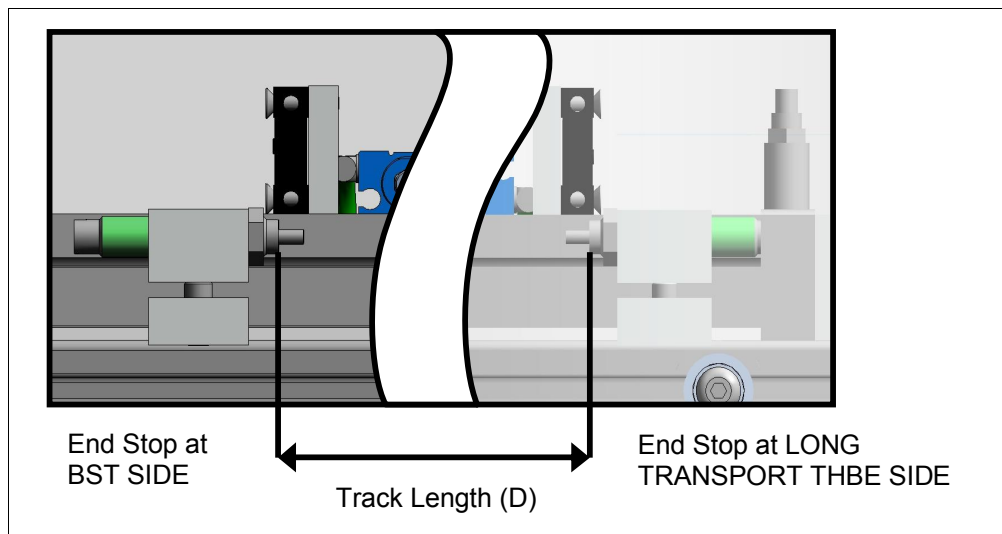


Figure 1.18: Preparing the LINEAR AXIS UNIT (Track Length (D))

1.5.5 Adjusting the Unlock Piston

- Pull the TRANSFER SLIDER firmly against the end stop. Then position the Unlock Piston so it hits the center of the unlocking lever. (B)
 - Torx Key 25
- Check the correct position of the retracted Unlock Piston:
 - The Unlock Piston should have some distance from the TRANSFER SLIDER LEVER and should not block the way of the TRANSFER SLIDER.
- Check the correct position of the fully extended Unlock Piston:
 - The locking pin should retract about 2mm beyond the wall of the TRANSFER SLIDER TUBE (C).
 - The lever should not touch its front end stop.
- Adjust the Unlock Piston if the check failed.
 - Screw Driver
 - Flat Spanner 5

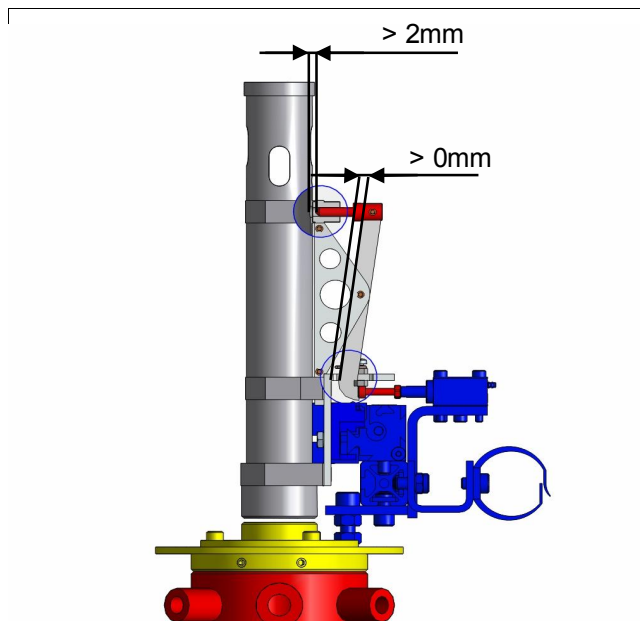


Figure 1.19: Adjusting the Unlock Piston (C)

1.5.6 Adjusting the Transfer Slider Sensor

- Adjust the Transfer Slider Sensor's trigger zone (D): When the screws are half tightened, the Sensor can be fine adjusted by rotating it using the Flat Spanner.
 - Put a 0.1mm feeler gauge in the gap between end stop and TRANSFER SLIDER. The LED on the sensor should be ON.
 - Put a 0.3mm feeler gauge between the end stop and the TRANSFER SLIDER. The LED on the Sensor should be OFF.
- Feeler Gauge or Paper Sheets
- Allen Key 2.5
- Optional: Flat Spanner 7 or Adjustable Wrench

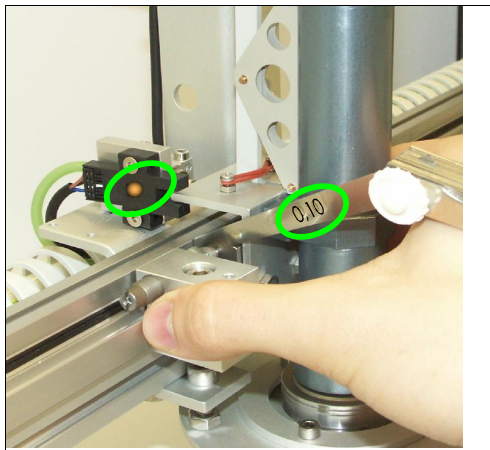


Figure 1.20: Adjusting the Transfer Slider Sensor. LED is off when the distance between TRANSFER SLIDER and End Stop is 0.1mm

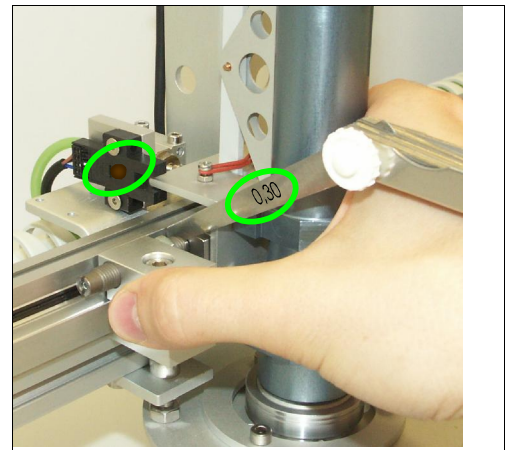


Figure 1.21: Adjusting the Transfer Slider Sensor. LED is on when the distance between TRANSFER SLIDER and End Stop is 0.3mm

i If no feeler gauge is available, use 3 sheets of paper instead. Paper sheets have an approximate thickness of 0.1mm

i The Sensor tends to shift a little, when the screws again. For fine adjustment, loosen one of the screws and slightly tilt the sensor bracket with an adjustable wrench.

1.5.7 Adjusting the Spinner Present Sensor

- Bring the cross lines on the reflection light barrier to the center of the sensor bore-hole in the TRANSFER SLIDER TUBE.
 - Torx Key 25
- Insert the Spinner into the tube of the TRANSFER SLIDER. Keep the TRANSFER SLIDER firmly pulled against the end stop.
- Test the function of the reflecting light barrier. The light barrier should trigger when the spinner or the TRANSFER SLIDER TUBE are tilted while the light barrier points on one of the spinners black surfaces. The light barrier should not trigger when the Spinner is lifted and the light barrier points on the blue end with the smaller diameter.
- If the test was not successful, adjust the position of the reflection light barrier relative to the TRANSFER SLIDER TUBE.
 - Angled Allen Key 2.5

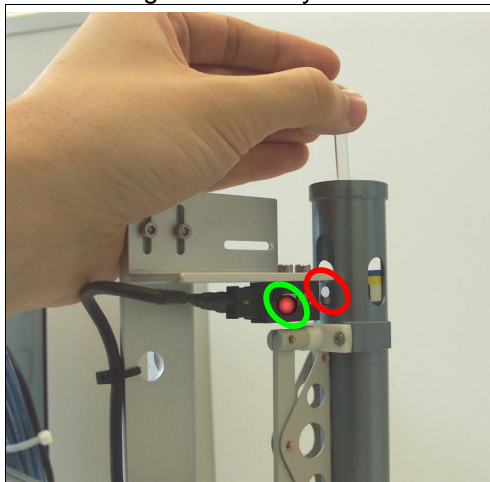


Figure 1.22: Spinner Present Sensor: Test the black tiles on the Spinner surface. They are the most critical ones.

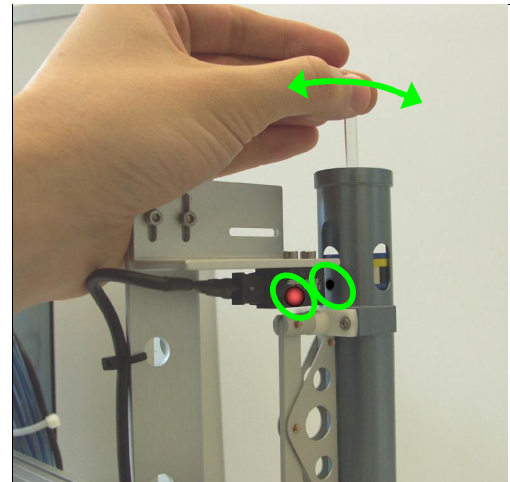


Figure 1.23: Spinner Present Sensor: Tilt the Spinner towards and away from the sensor. The control light should be ON.

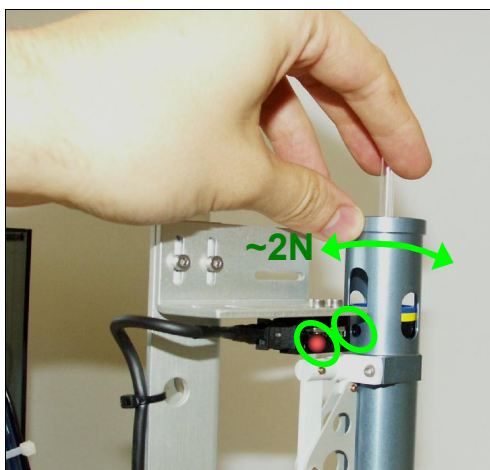


Figure 1.24: Spinner Present Sensor: Tilt the Transport tube towards and away from the sensor. The control light should be ON

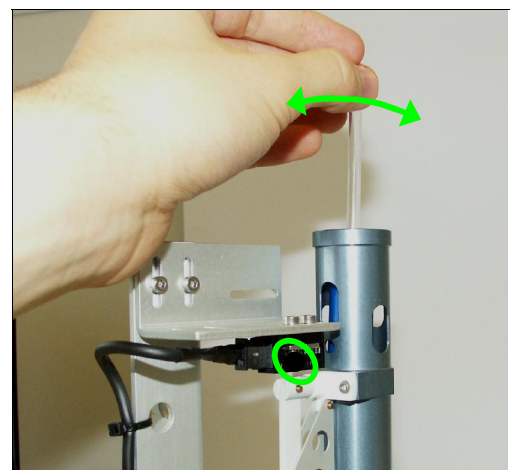


Figure 1.25: Spinner Present Sensor: Lift the Spinner up to the lock ring. Tilt it towards and away from the sensor. The control light should be OFF.

- Firmly tighten all the screws to fix the adjustments:
 - ① LINEAR AXIS MOUNTING UNIT BST SIDE end stop (1 screw)
 - ② TRANSFER SLIDER SENSOR and unlock piston bracket (2 screws)
 - ③ TRANSFER SLIDER SENSOR (2 screws)
 - ④ Unlock piston (1 counter nut)
 - ⑤ Vertical Spinner present sensor bracket (2 Screws)
 - ⑥ Horizontal Spinner present sensor bracket (2 Screws)
 - ⑦ Spinner present sensor (2 Screws)

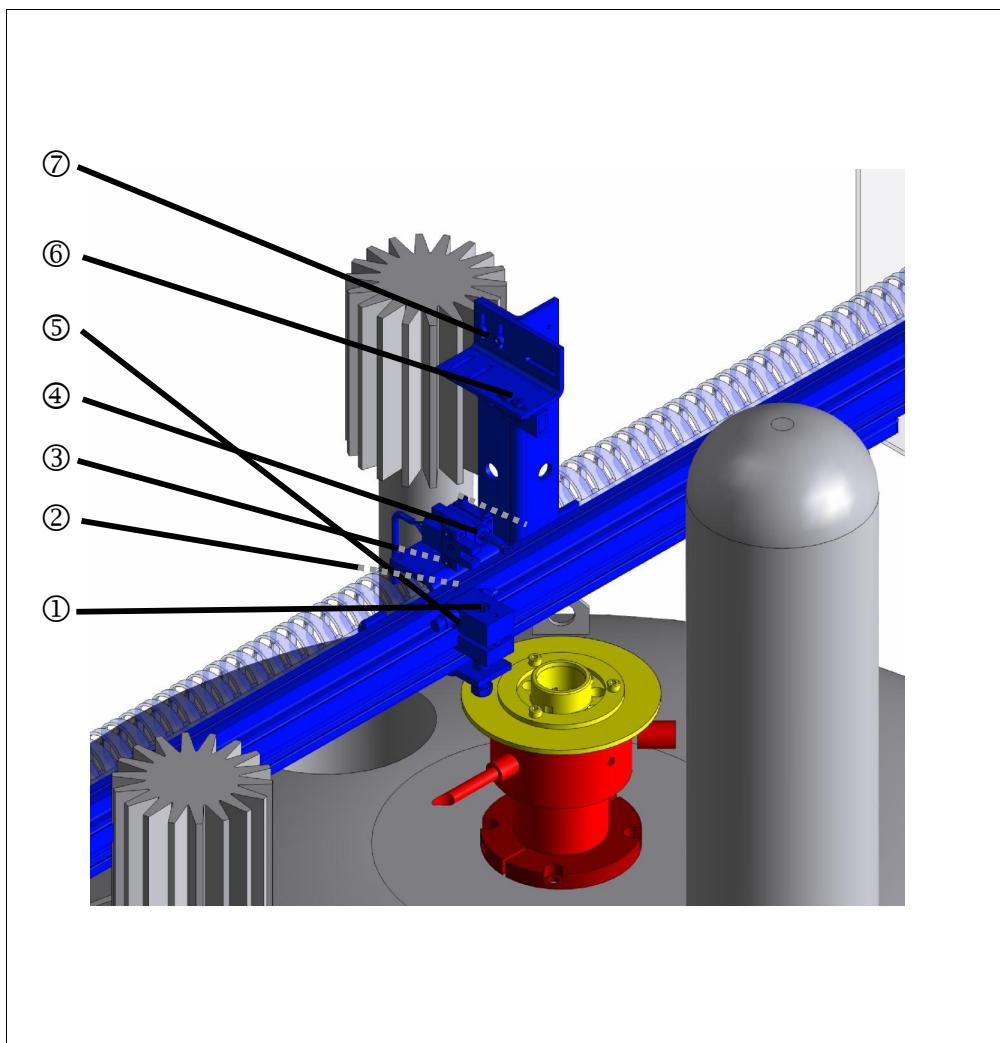


Figure 1.26: Critical screws to be tightened on the LINEAR AXIS UNIT

1.6 Installing the LINEAR AXIS UNIT

- Mount the LINEAR AXIS UNIT onto the MAGNET. Attach it to the LINEAR AXIS MOUNTING UNIT BST SIDE and the LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE.
Do not tighten any screws yet.
 - Torx Key 25
 - Flat Spanner 13
- Place the CALIBRATION RING on top of the BST.
- Position the TRANSFER SLIDER over the BST and fine adjust the position of the LINEAR AXIS UNIT until the following conditions are satisfied:
 - The HORIZONTAL BAR PAIR of the LINEAR AXIS MOUNTING UNIT N₂ NOZZLE SIDE is leveled out.
 - The LINEAR AXIS UNIT is leveled out
 - The LONG TRANSPORT TUBE roughly stands vertical (Later, you can move the HANDSLIDER UNIT to adjust the LONG TRANSPORT TUBE exactly)
 - The TRANSFER SLIDER is exactly centered over the BST. When the CALIBRATION RING is dropped from the TRANSFER SLIDER TUBE, it should fall down all the way without getting stuck at the gap between the BST and the TRANSFER SLIDER.
 - The gap between the MOUNTING UNIT BST SIDE and the TRANSFER SLIDER is even spaced and has a width between 0.1mm and 0.3mm. This corresponds approximately to 2 sheets of paper. Be careful that the TRANSFER SLIDER and the MOUNTING UNIT BST SIDE do not collide.
 - CALIBRATION RING
 - Flat Spanner 13
 - Flat Spanner 10
 - Torx Key 25
 - Allen Key 3
- Adjust the position of the HAND SLIDER UNIT so it is vertically below the HAND-OVER POSITION at the LONG TRANSFER TUBE SIDE.



If no feeler gauge is available, use 3 sheets of paper instead. Paper sheets have an approximate thickness of 0.1mm

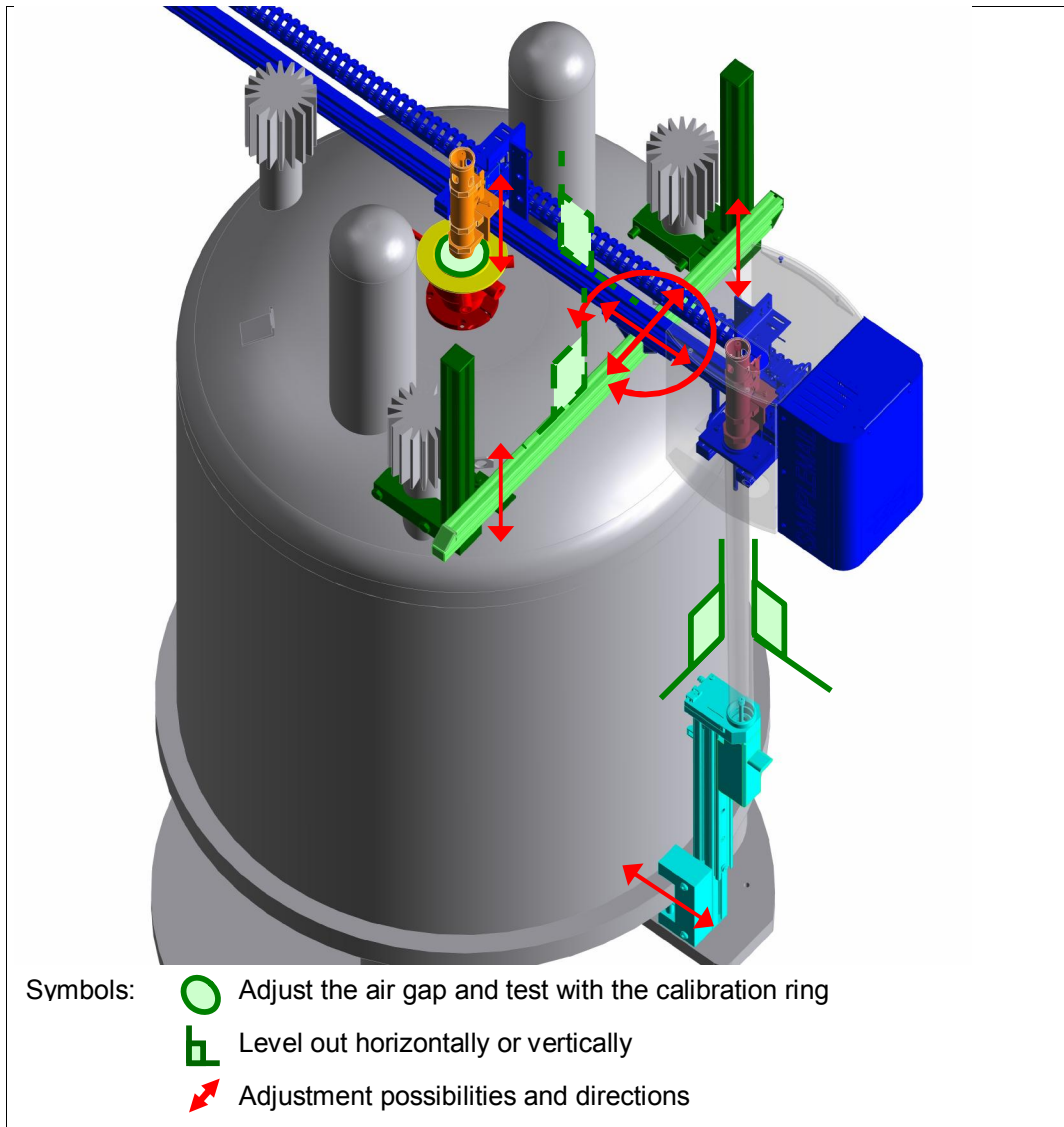


Figure 1.27: Adjustment possibilities and requirements for the LINEAR AXIS UNIT

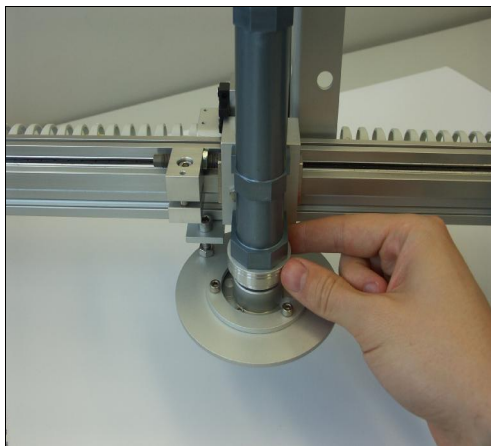


Figure 1.28: Usage of the CALIBRATION RING



Figure 1.29: Correct Adjustment: The CALIBRATION RING has dropped down

- Firmly tighten all the mounting screws, nuts and counter nuts. These screws are important for the reliable operation of SAMPLEMAIL. Pay special attention to:
 - ① Hand slider unit mount: headless screws (2 screws)
 - ② Fixation HAND SLIDER UNIT and hand slider mount (2 screws)
 - ③ Fixation of the vertical bars to the N₂ nozzles (6 screws)
 - ④ Fixation of the horizontal bars (6 screws)
 - ⑤ Fixation of the horizontal bars (2x2 counter nuts)
 - ⑥ Fixation of the LINEAR SLIDER UNIT (6 screws)
 - ⑦ LINEAR AXIS MOUNTING UNIT BST SIDE (2 screws)
 - ⑧ Fixation of the adjustment ring at the MOUNTING UNIT BST side (3 screws)
 - ⑨ Fixation of the vertical adjustment screw (2 counter nuts)
 - ⑩ Mounting bracket LINEAR AXIS MOUNTING UNIT BST SIDE (2 screws)

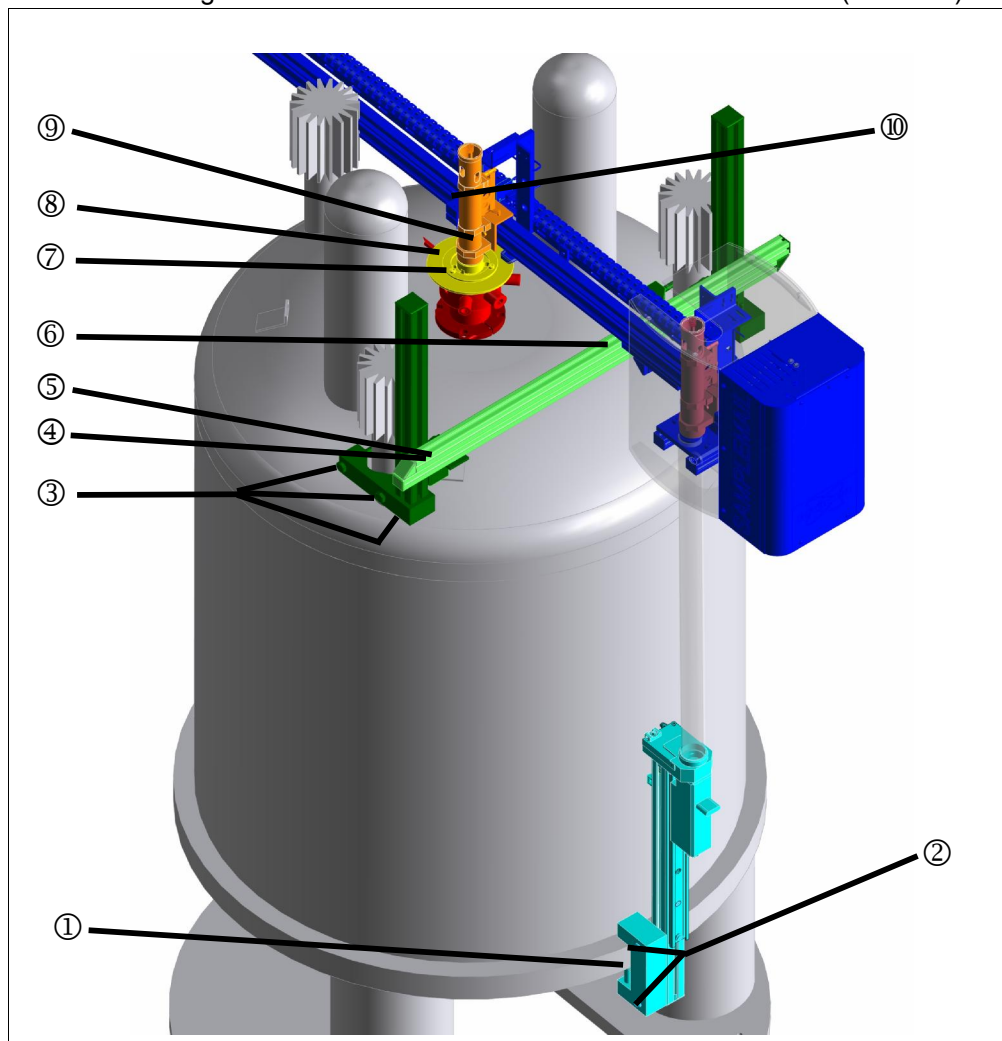


Figure 1.30: Critical screws to be tightened on the LINEAR AXIS UNIT


- Check the correct adjustment of the LINEAR AXIS UNIT once more.
 - CALIBRATION RING

1.6.1 Install the LONG TRANSPORT TUBE

- Cut the LONG TRANSPORT TUBE to the desired length. Insert the Tube Cutting Bolt into the LONG TRANSPORT TUBE and move it to the place where you like to cut. Use the Tube Cutter to cut the tube. It is advised to try a few cuts on the unused end of the tube before doing the final cut.
 - Tube Cutter
 - Tube Cutting Bolt
- Carefully deburr the cut end of the LONG TRANSPORT TUBE.
 - Knife
- Mount the LONG TRANSPORT TUBE between the LINEAR AXIS UNIT and the HAND SLIDER UNIT. Gently lift the HAND SLIDER UNIT until the LONG TRANSPORT TUBE is fixed.
 - Torx Key 25

1.7 Connecting Cables and Pressure Hoses

1.7.1 Connecting the Power Supply

- Use the Power Supply included in the SampleMail package (or any Power Supply that fulfills the requirements below):
- SampleMail Power Rating: 24V 0.7A 



- Recommended Power Supply: Output > 25W (Set at 24V DC)
- Connect the power supply to the SampleMail. Guide the power cable along the cable harness of the BST Lift.



Figure 1.31: Power Cable

1.7.2 Connect the Sensors at the HAND SLIDER UNIT

- Remove the bracket of the Hand Slider Closed Sensor. Remove the Sensor and attach the connector.
 - Torx Key 25
- Reassemble sensor and bracket. A mark on the HAND SLIDER UNIT indicates the correct position of the sensor.
- Connect the signal cable to the Spinner Present Sensor.



If you work careful, it is possible to connect the sensor without removing the bracket. However, to disconnect the sensor, the bracket must be removed.

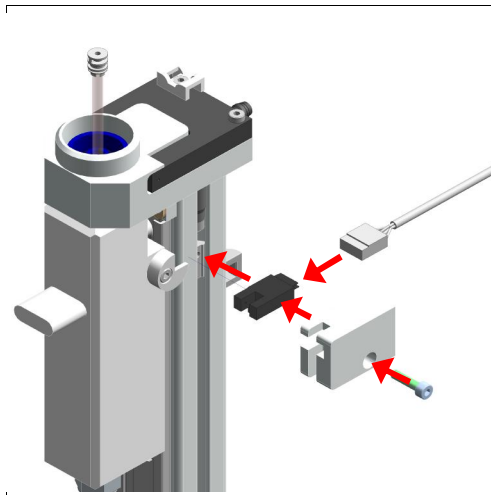


Figure 1.32: Connecting the Sensors at the HAND SLIDER UNIT

1.7.3 Connecting Supply Pressure Hoses and the Data Cable

- Remove the Variable Flow Supply Hose from the BST and connect it to the valve in the controller box.
- Attach the new Variable Flow Hose from the controller box to the BST
- Connect the Variable Air Flow Tube to the HAND SLIDER UNIT.
- Connect the Pressure Supply Hose with the Valve to the Supply Pressure Port.
- Connect the 10m RJ45 Data Cable to the TTY1 slot at the ELCB.
- Connect the Yellow-Green Ground Cable to the Grounding Point of the Magnet. If the magnet doesn't have any Grounding Point, connect the Ground Cable to the Grounding Point of the BSMS Console.

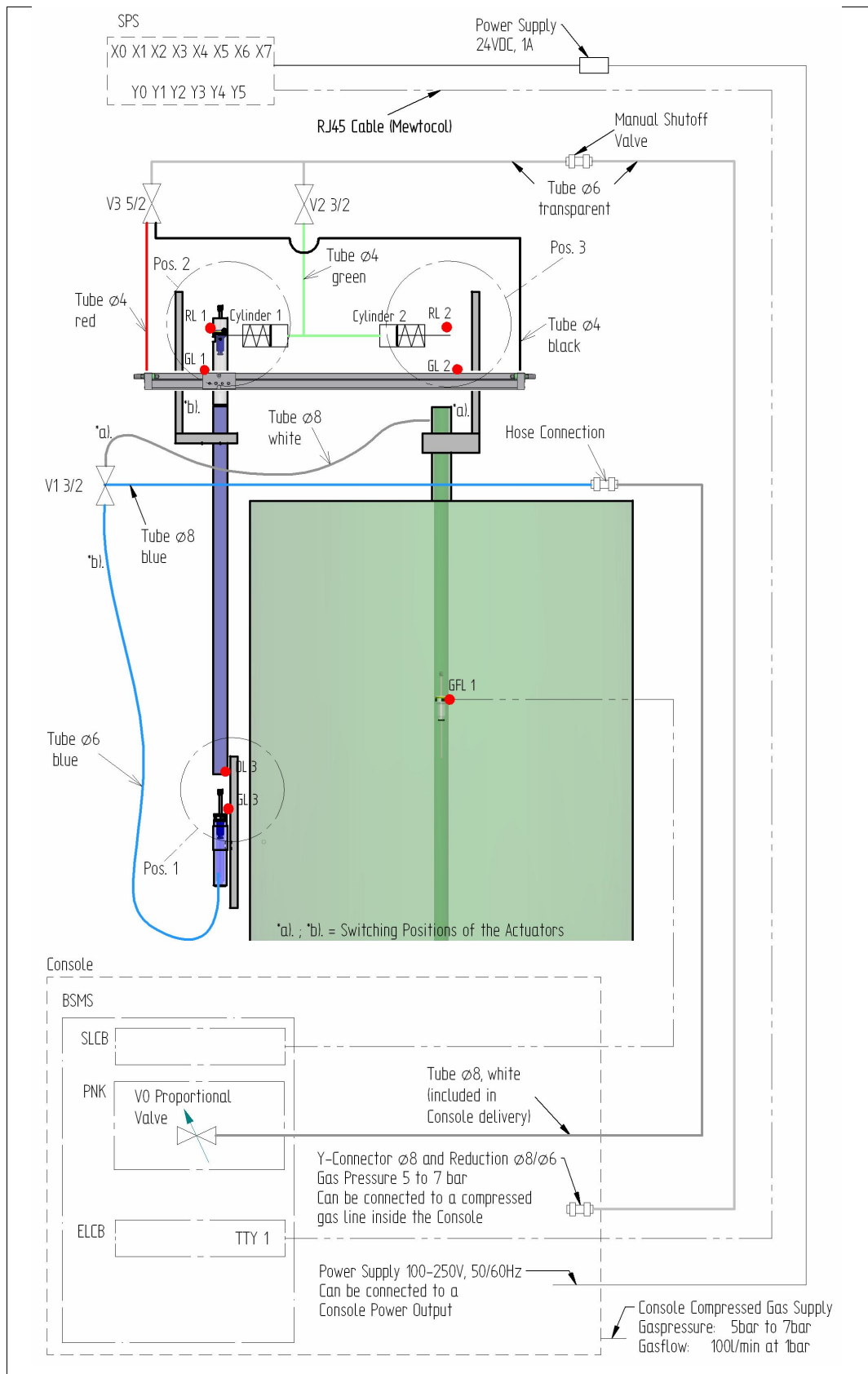


Figure 1.33: Schematics showing the Pressure Hoses

SPS			Sensors				
Analog In	Digital In	Label	Element	Function	Supply Voltage / Current Consumption	Output	P/N
—	X0						
—	X1	GL1	Fork Light Barrier NPN	Sliderposition Transferslider Pos.2	Supply Voltage = 5 to 24VDC; Current Consumption = max 0.015A	Transistor= max.50mA/ 30VDC	PM-K54
—	X2	GL2		Sliderposition Transferslider Pos.3			
—	X3	RL1	Convergent Reflective Light Barrier	Spinner presence detection Pos.2	Supply Voltage = 5 to 24VDC; Current Consumption = max 0.080A	Transistor=max. 100mA/30VDC Digital	PM2-LL10
—	X4	RL2		Spinner presence detection Pos.3			
—	X5	GL3	Fork Light Barrier NPN	Handslider position Pos.1	Supply Voltage = 5 to 24VDC; Current Consumption = max 0.015A	Transistor= max.50mA/30VDC	PM-F54
—	X6	DL3	Fork Light Barrier NPN	Spinner presence detection Pos.1	Supply Voltage = 10 to 30VDC; Current Consumption = max 0.035A	Transistor= max.200mA/30VDC	BGL 30A-002-S49
—	X7						

SPS			Actuators			
Analog Out	Digital Out	Label	Element	Function	Input	P/N
—	Y0 (PWM)		LED	SignalLED red	0.015A	LK20224
—	Y1	V1	3 Port Valve	Weiche Blasrohrluft<->Magnet	0/24VDC; <= 4.8W; 0.2A	EVT307-5D O-01F-F-G
—	Y2	V2	3 Port Valve	Spinner Unlock	0/24VDC; <= 0.55W; 0.023A	SYJ312-5GZ-M3-F-G
—	Y3	V3	5 Port Valve Bistable	Transferslider Direction BST	0/24VDC; <= 0.45W; 0.02A	SY3220-5GZ-C4-G
—	Y4	V3	5 Port Valve Bistable	Transferslider Direction User	0/24VDC; <= 0.45W; 0.02A	SY3220-5GZ-C4-G
—	Y5		LED	SignalLED green	0.015A	LK20224

- Total needed SPS-Inputs= 6 Digital In, 0 Analog in.
- Total needed SPS-Outputs= 6 Digital Out, 0 PWM Out, 0Analog Out
- Data transfer MUTOCOL over RJ45 Cable

Total Current Consumption at a Supply Voltage 24VDC:

$$1 \times \text{CPU} = 0.16A + 6 \times \text{Transistorinput} = 0.0043A + \text{Sensors} = 0.225A + \text{Actuators} = 0.293A = \mathbf{0.704A}$$

Figure 1.34: Sensors and Actuators connected to the SPS

1.7.4 Arrange the Cables and Pressure Hoses

- Neatly arrange the Pressure Supply Hose along the back of the magnet. Place the main Air Valve where it can be accessed easily.
- Use the cable binders to guide the cables of the HAND SLIDER UNIT to the controller box along the backside of the LONG TRANSPORT TUBE.
- Roll up the excess length of the tubes and fold up the cables inside the controller box. Do not roll up the cables in a circular shape. This would increase the electromagnetic inductance unnecessarily.
- Attach the transparent plastic cover
 - Allen Key 2
 - Allen Key 3
- Attach the metal cover of the controller box.
 - Allen Key 2



Figure 1.35: Nicely arranged Cables (ToDo: Add Picture)



Figure 1.36: Cables arranged along the backside of the LONG TRANSPORT TUBE

1.8 Software Calibration and Testing

Refresh Button and Auto Refresh Button:

The information on the Service Web pages needs to be Refreshed in order to be up to date.

i You can press the Refresh Button that you will find at the bottom of certain pages to Refresh the page once.

If available, you can also press the Auto Refresh Button. The page will then Refresh automatically about once a second. Press the Refresh Button to cancel Auto Refreshing. Be aware that any settings that were not stored by pressing the Set Button, are lost when the page is refreshed.

Reset Button and Error Handling:

When SampleMail detects any irregularity, it will stop and show an error message in the TopSpin Application and also on the Bruker Keyboard (if installed).

If such an error occurs, remove any sample or shuttle that might cause any further damage. You may leave the Shuttle as it is, if it is properly located inside the HAND SLIDER, BST or TRANSFER SLIDER.

If the Bruker Keyboard is installed, press the “Std By” Button to clear the error message and to reactivate the Keyboard.

i After you ensured the further safe operation of SampleMail, you may activate the error handling procedure. You can do this by pressing the LIFT ON/OFF Button on the Keyboard or on the SampleMail control page in the Service Web.

At any time, you can also force SampleMail to do the error handling procedure by pressing the Reset Button on the SampleMail control page.

Be patient! The error handling procedure takes about 30 seconds to complete. Check the FSM State on the SampleMail control page to get information about what SampleMail is doing. Wait while the FSM State is on “error handling” and wait until the signal light at the bottom of the CONTROLLER BOX turns to a stable green or red light.

After the error handling has finished, you may resume the normal operation by pressing the LIFT ON/OFF Button on the Keyboard or on the SampleMail control page.

1.8.1 Update the ELCB firmware

Update the ELCB firmware to the newest release.

1. On the PC (2) with TopSpin, type “ha” in the TopSpin command line.

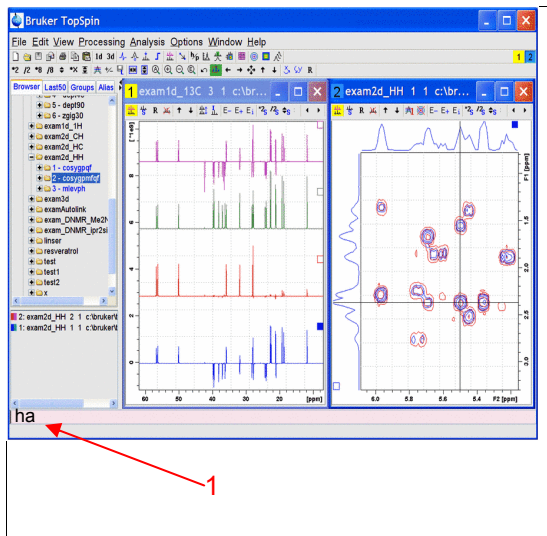


Figure 1.37: TopSpin – Command Line

2. Click the “Open” button for the BSMS at the bottom of the window.

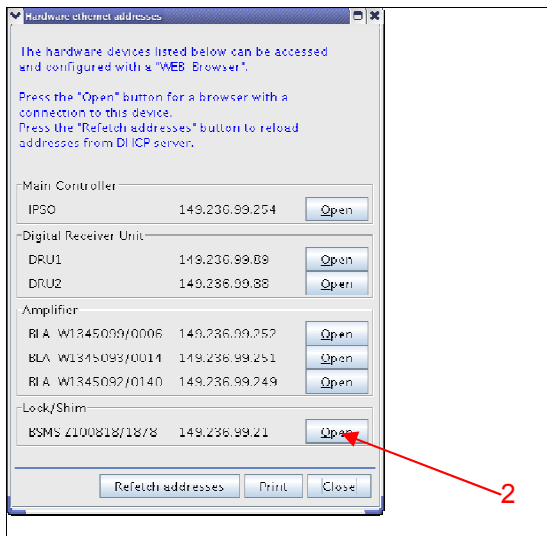


Figure 1.38: TopSpin - Hardware Ethernet Addresses

3. Open the “Device Setup” Link

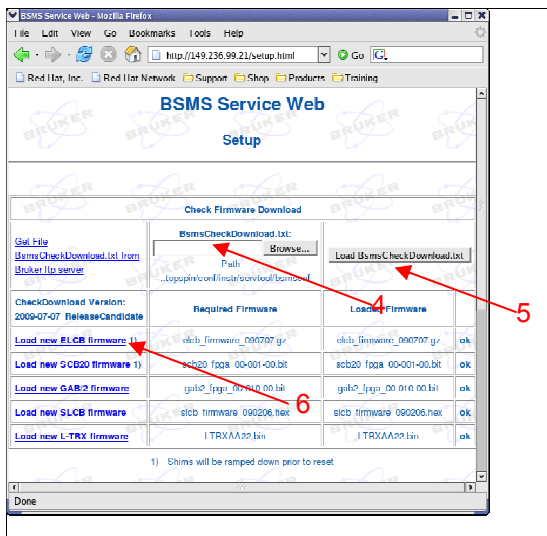


Figure 1.39: BSMS Service Web - Setup

4. Chose the new BsmsCheckDownload.txt File
5. Click the “Load BsmsCheckDownload.txt” button.
6. Open the “Load new ELCB firmware” link

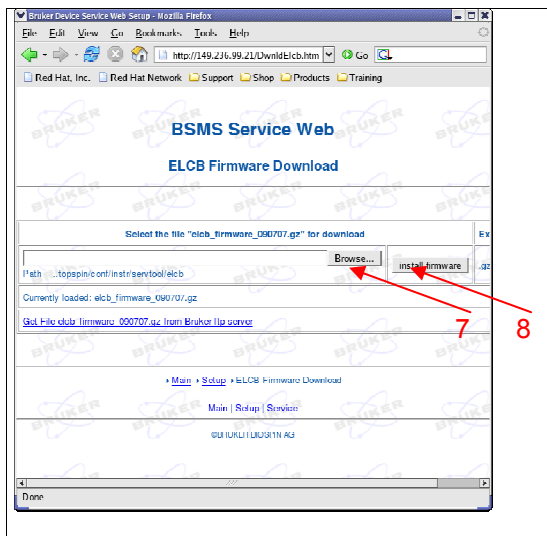


Figure 1.40: BSMS Service Web ELCB - Firmware Download

7. Select the newest of the “elcb_firmware_*.gz” files.
You can find them on the Bruker FTP Server:
<ftp://ftp.bruker.ch/NMR/download/servtools/firmware/elcb/>
8. Click the “install firmware” button
9. Wait for the ELCB to restart. The page “BSMS Service Web - Main” will be displayed once the new firmware has been updated completely.

1.8.2 Calibrate the Air Settings for the BST Only Operation Mode

If available, test the setting with a light plastic spinner and a heavy ceramic spinner. They should both be transported safely and reliably.

10. Browse to the service page.
11. Login as service user.
User: Service
Password: 1964
12. Go back to “BSMS Service Web - Main”. Browse to the SLCB page.

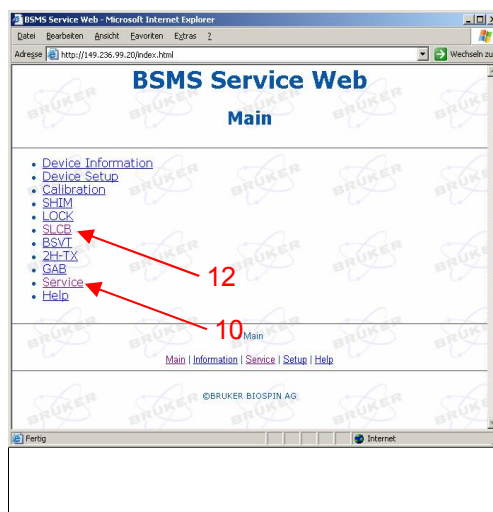


Figure 1.41: BSMS Service Web - Main

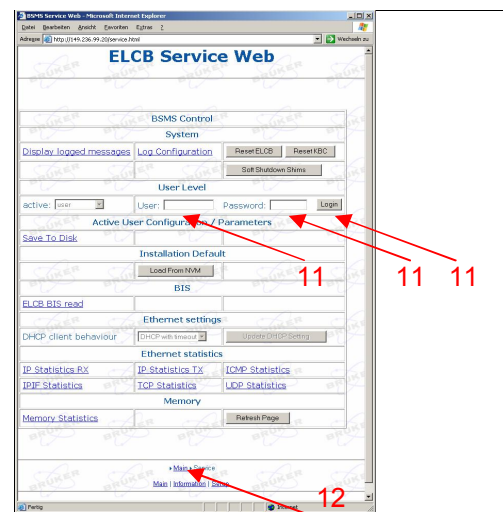


Figure 1.42: BSMS Service Web - Service

13. Browse to the SampleMail Control page.
14. Chose the Lift Mode “Standard BSMS Lift”
15. Uncheck “Auto “Lift Off” on Slider close” to disable this feature.
16. Press the “Set” Button
17. Press the “Refresh” Button. Double check, if the new settings were stored correctly.
18. Browse to the “SLCB Lift Control” page.

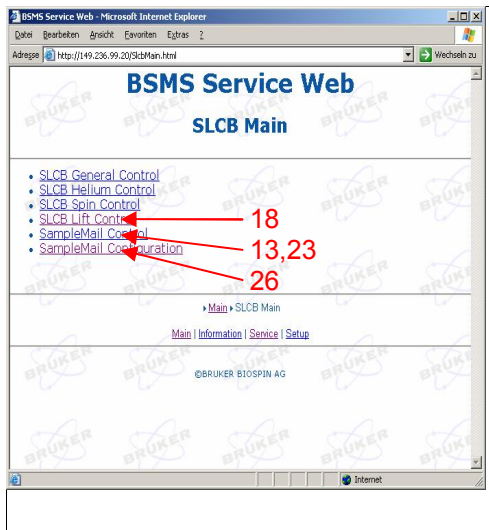


Figure 1.43: BSMS Service Web - Main

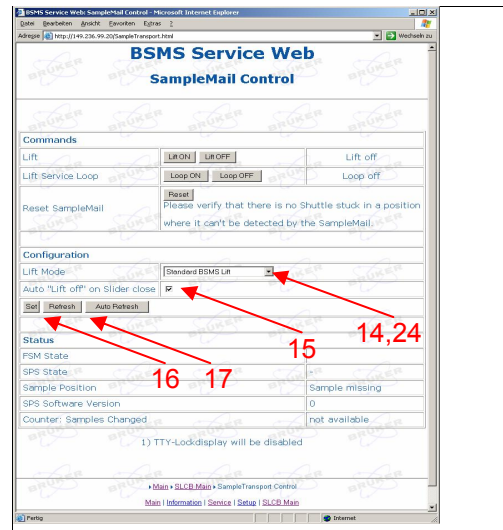


Figure 1.44: BSMS Service Web – SampleMail Control

19. Shut the main pressured air valve of SampleMail. You should now be able to move the TRANSFER SLIDER by hand.
20. Follow the instructions on the “SLCB Lift Control” to calibrate the BST Lift Flow parameters. At the end of this calibration, the Spinner should hover steadily at the top of the LINEAR AXIS MOUNTING UNIT BST SIDE.
The LINEAR AXIS MOUNTING UNIT BST SIDE has an influence on the airflow in the BST. So even if the BST Lift Flow parameters were tuned earlier, you should tune them again now.
21. Remove any Shuttle from the BST
22. Carefully open the main pressured air valve of SampleMail. The TRANSFER SLIDER will return to one of its end positions.

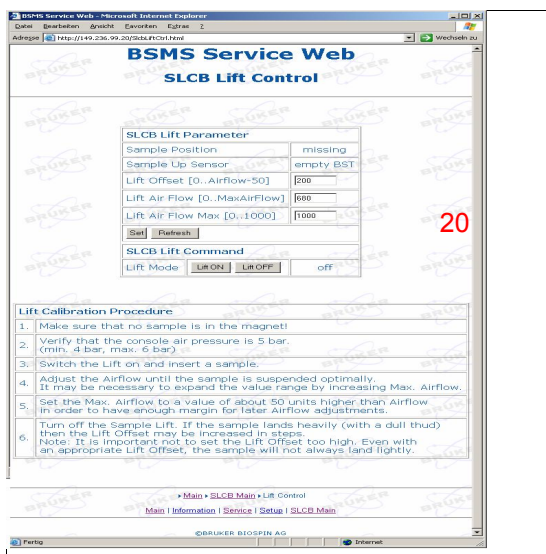


Figure 1.45: BSMS Service Web - SLCB Lift Control

23. Browse to the SampleMail Control page.
24. Chose the Lift Mode “SampleMail on TTY1”

1.8.3 Calibrate the Lift Valve Signal for Zero Flow

Goal of this calibration is to measure at what signal level the Variable Lift Valve completely shuts and turns off the air flow. This is typically not the case at Flow Signal = 0 but at a Flow Signal between 200 to 500.

There are two known mistakes that can fool the measurement. 1. The Airbuffer still had a high air pressure at the beginning of the measurement. The measured Signal will be very low. 2. The Shuttle does not properly seal the airflow. For example because there is no sample inside. The measured Signal will be relatively high. If in doubt, repeat the measurement twice. If the measured Flow Signal levels differ less than +-10 units from the previous ones, the calibration should be good enough.

If the calibrated Signal level is too high or too low, the landing of the shuttle in the magnet may be slightly rougher and louder than usual. If so, repeat the calibration once more.

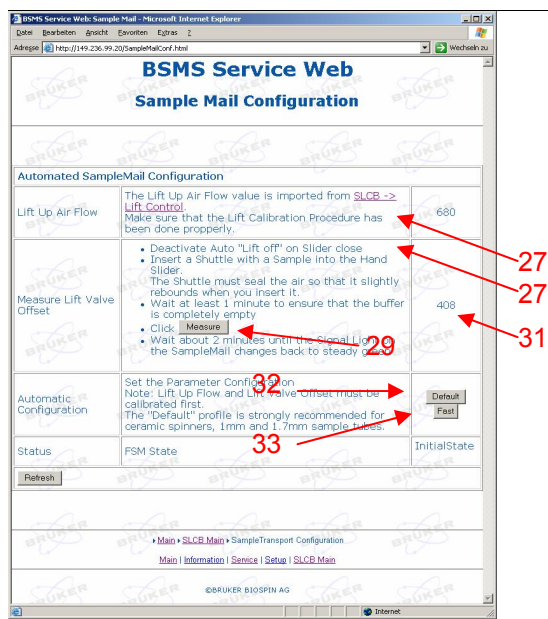


Figure 1.46: BSMS Service Web - SLCB Lift Control

25. Go back to “BSMS Service Web - Main”. Browse to the SLCB page.
26. Go to the SampleMail Configuration page.
27. In the last chapter 1.8.2, you have calibrated the Lift Up Air Flow and you have deactivated “Auto “Lift off” on Slider close”. So you can skip those steps at this point.
28. Insert a Shuttle into the HAND SLIDER. The Shuttle should fit nearly air tight in the HAND SLIDER. It should take a few seconds until the enclosed air escapes and the shuttle is fully inserted into the HAND SLIDER.
29. Press the “Measure” Button
30. To find the valve signal that gives the minimal (zero) air flow, the ELCB will very slowly open the Lift Valve until the Shuttle lifts off a few millimeters and then turn it off again. This process takes about one to two minutes.

31. Once this process has finished, the signal light at the bottom of the CONTROLLER BOX will turn to green. The new Lift Valve Offset should be between 100 and 500.

1.8.4 Chose the Motion Profile for SampleMail

32. Activate the new calibration by pressing the “Default” button.
33. You may also use the fast profile (press the “Fast” button). Be aware that the fast profile is only allowed, if following requirements are fulfilled:
 - The customer wishes a quick operation and accepts the slightly rougher handling of the samples.
 - Only plastic shuttles are used
 - No 1.0mm or 1.7mm (lose) samples are used
 - The System type is 600MHz or smaller

1.8.5 Adjust the Speed of the TRANSFER SLIDER

- The speed of the TRANSFER SLIDER is adjusted in the manufactory. No further calibration is necessary.

1.8.6 Final Test

- Start the loop mode from the user menu
- **The Spinner should pass the gap between Magnet and TRANSFER SLIDER TUBE smoothly without banging or jamming.** The smooth passing of the Spinner is essential for the long-term reliability of the device. If in doubt, repeat the adjustment steps described in the chapters 1.5.3 Position the End Stop and 1.5.6 Adjusting the Transfer Slider Sensor
- Watch the SampleMail until the shuttle was loaded into the magnet for at least 10 times.
 - The shuttle should move smoothly from the TRANSFER SLIDER to the LONG TRANSFER TUBE or the BST.
If the stops or bangs loud near these transitions, use the calibration ring to check the transition and readjust it if necessary.
Also try to push the LONG TRANSFER TUBE upwards to check if it has any play. Remove the play by lifting the HAND SLIDER UNIT.
 - If the shuttle is not detected properly inside the magnet and the error message “Insert Sample failed!” appears, the vt gasflow might be set too high. Check the vt gasflow with the TopSpin utility. Type “edte” into the TopSpin command bar. Reduce the vt gasflow until the shuttle is detected correctly.
 - Moving upwards, the shuttle should be caught in the TRANSFER SLIDER after less than 8 seconds.
If it takes longer than this, the air supply might be weak and the AIR GAP below the TRANSFER SLIDER has to be reduced from 0.3mm to 0.2mm or even 0.1mm (2 or 1 sheets of paper). If this doesn’t help yet, you may use a screw to cover one additional borehole in the MOUNTING UNIT BST SIDE.

- When the sample moves down to the HAND SLIDER UNIT it can get stuck only a few millimetres above the sample sensor (DL3). The sample should not be stuck for more than 2 seconds before the sample sensor reacts. To correct this, release the fixation of the HAND SLIDER UNIT slightly move it left, right, forwards and backwards until the sample settles quickly. Also check the bottom of the LONG TRANSFER TUBE for burrs that need to be removed.

2 User Training

⚠ VORSICHT/CAUTION

Error recovery is not intended for daily use



- When the Signal Light of the SampleMail flashes red/dark or when you press the reset button in the web interface, the SampleMail will lose track of Samples that are stuck in the middle of the LONG TRANSFER TUBE or the BST. Therefore, make sure there is no such sample before resuming operation after an error and before pressing the reset button.
- If errors repeatedly occur during normal operation, there might be some problem with the adjustment or air supply. In this case Bruker BioSpin AG should be contacted to fix the problem.

2.1 Special precaution working with CRYO FIT or MAS

⚠ VORSICHT/CAUTION

Disable SAMPLEMAIL when working with CRYO FIT or MAS

An unintended motion of the TRANSFER SLIDER would destroy the capillary of the CRYO FIT

- Shut the main pressured air supply valve when working with CRYO FIT or MAS.

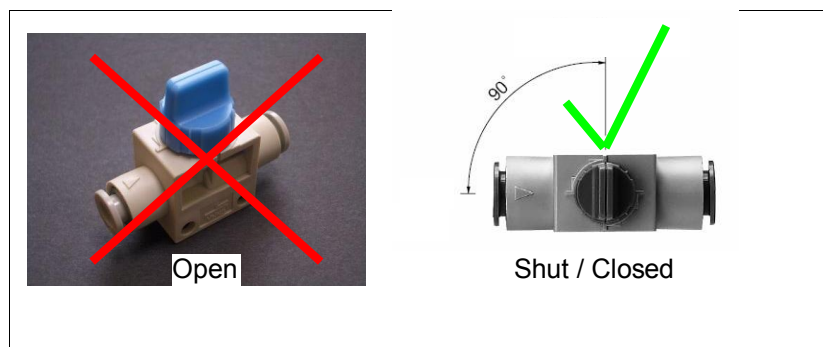


Figure 2.1: Shut main pressured air supply valve

3 Contact

Manufacturer:
Bruker BioSpin AG
Industriestrasse 26
CH-8117 Fällanden
Schweiz
Phone: +41-44-825-91-11
Fax: +41-44-825-96-16
<http://www.bruker.com>

Please refer to the Model No., Serial No. and Internal Order No. in all correspondence regarding the MR system or components thereof.

Appendix

A.1 Figures

Figure 1.1:	Magnet secured with the protection lid.....	6
Figure 1.2:	Compatible MAS (left)	9
Figure 1.3:	Overview Main Components of SAMPLEMAIL.....	11
Figure 1.4:	Removing Bracket Covers.....	12
Figure 1.5:	Magnet secured with the protection lid.....	12
Figure 1.6:	Mounting Clamp on both sides of the HAND SLIDER UNIT	13
Figure 1.7:	Mounting Clamp attached to the Magnet Ring	13
Figure 1.8:	Installed LINEAR AXIS MOUNTING UNIT BST SIDE.	14
Figure 1.9:	Do not cover the BST lid switch.	14
Figure 1.10:	Attach the Slot Nuts from the LINEAR AXIS UNIT to the HORIZONTAL BAR PAIR.	15
Figure 1.11:	Extended HORIZONTAL BAR PAIR.....	15
Figure 1.12:	Vertical Bars attached to the Nitrogen Nozzles.	16
Figure 1.13:	Mounting the HORIZONTAL BAR PAIR.....	17
Figure 1.14:	Mounting the extended HORIZONTAL BAR PAIR	17
Figure 1.15:	Adjust the height of THE LINEAR AXIS MOUNTING UNIT N ₂ NOZZLE SIDE.....	17
Figure 1.16:	Preparing the LINEAR AXIS UNIT (Measures on MAGNET and LINEAR AXIS UNIT)	19
Figure 1.17:	Adjustment possibilities and requirements at the HANDOVER POSITIONS20	
Figure 1.18:	Preparing the LINEAR AXIS UNIT (Track Length (D)).....	21
Figure 1.19:	Adjusting the Unlock Piston (C).....	22
Figure 1.20:	Adjusting the Transfer Slider Sensor. LED is off when the distance between TRANSFER SLIDER and End Stop is 0.1mm	23
Figure 1.21:	Adjusting the Transfer Slider Sensor. LED is on when the distance between TRANSFER SLIDER and End Stop is 0.3mm	23
Figure 1.22:	Spinner Present Sensor: Test the black tiles on the Spinner surface. They are the most critical ones.	24
Figure 1.23:	Spinner Present Sensor: Tilt the Spinner towards and away from the sensor. The control light should be ON.	24
Figure 1.24:	Spinner Present Sensor: Tilt the Transport tube towards and away from the sensor. The control light should be ON	24
Figure 1.25:	Spinner Present Sensor: Lift the Spinner up to the lock ring. Tilt it towards and away from the sensor. The control light should be OFF.	24
Figure 1.26:	Critical screws to be tightened on the LINEAR AXIS UNIT.....	25

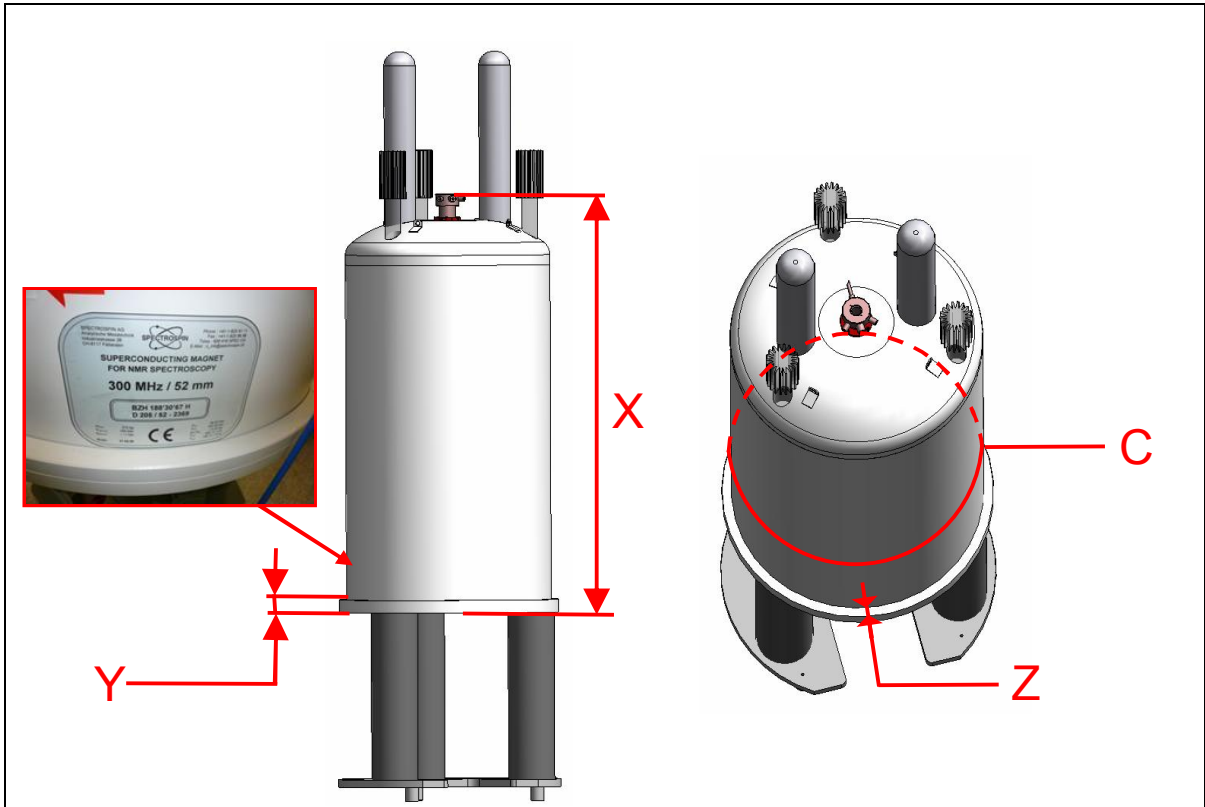
Figure 1.27:	Adjustment possibilities and requirements for the LINEAR AXIS UNIT.....	27
Figure 1.28:	Usage of the CALIBRATION RING.....	27
Figure 1.29:	Correct Adjustment: The CALIBRATION RING has dropped down	27
Figure 1.30:	Critical screws to be tightened on the LINEAR AXIS UNIT.....	28
Figure 1.31:	Power Cable	30
Figure 1.32:	Connecting the Sensors at the HAND SLIDER UNIT	31
Figure 1.33:	Schematics showing the Pressure Hoses	32
Figure 1.34:	Sensors and Actuators connected to the SPS	33
Figure 1.35:	Nicely arranged Cables (ToDo: Add Picture)	34
Figure 1.36:	Cables arranged along the backside of the LONG TRANSPORT TUBE...	34
Figure 1.37:	TopSpin – Command Line.....	36
Figure 1.38:	TopSpin - Hardware Ethernet Addresses.....	36
Figure 1.39:	BSMS Service Web - Setup	37
Figure 1.40:	BSMS Service Web ELCB - Firmware Download.....	37
Figure 1.41:	BSMS Service Web - Main.....	38
Figure 1.42:	BSMS Service Web - Service.....	38
Figure 1.43:	BSMS Service Web - Main.....	39
Figure 1.44:	BSMS Service Web – SampleMail Control	39
Figure 1.45:	BSMS Service Web - SLCB Lift Control.....	39
Figure 1.46:	BSMS Service Web - SLCB Lift Control.....	40
Figure 2.1:	Shut main pressured air supply valve	43

A.2 Table of Magnet Dimensions

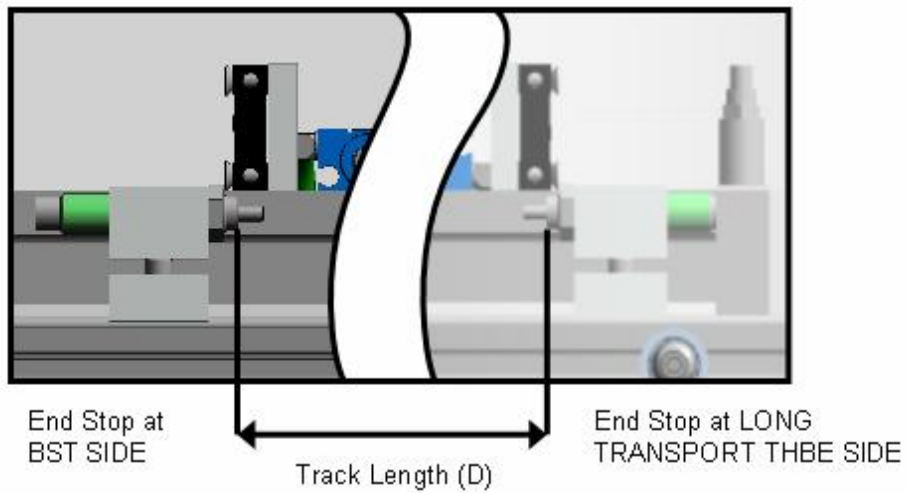
Magnet Type	Material No.	Track Length (D)	Transport Tube Length
300MHz 54mm			
US LH	Z100601	480	838
US ULH (1Year H)	Z100602	480	1194
400MHz 54mm			
US+ LH	Z101355	545	957
US+ ULH	Z101363	545	1221
US LH	Z100603	480	1230
US ULH	Z100604	480	1403
500MHz 54mm			
US+ LH	Z101356	545	1292
US+ ULH	Z102688	595	1465
US LH	Z100605/Z54933	520	904
US ULH	Z102686	595	1353
600MHz 54mm			
US+ LH	Z101339	595	1507
US LH	Z100606	575	1077
700MHz 54mm			
US LH	Z100607	802	1735
US+ LH	Z103372	670	1581
800MHz 54mm			
US+ Compact / US2+	M1008040	760	1874
US2	M1008020/M108US200	964	2334
US+ LH	Z103381	802	1734
UltraStabilized	M1008000	760	2314
850MHz 54mm			
US2	M1008520	964	2334
900MHz 54mm			
US2	M10902/M1009020	964	2334
UltraStabilized	M10900/M1009000	964	2334
950MHz 54mm			
US2	M	964	2334

Table 3.1: Magnet Dimensions

A.3 Magnet Information for SampleMail Preparation



		[mm]
X	Measure between upper plane BST and lower plane Magnet flange	
Y	Measure between upper plane and lower plane Magnet flange	
Z	Measure of the Magnet flange depth	
C	Measure of the circumference of the Magnet hull	
Photo		Please attach a Photo of the type label on the magnet.



- a. When measure flange depth (Z) < 28mm, use formule:
Track Length (D) = Circumference (C) / 6.28 + 146mm
- b. When measure flange depth (Z) is > 28mm, use formule:
Track Length (D) = Circumference (C) / 6.28 + flange depth (Z) + 118mm

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