1200MHz 1.9 mm HX MAS PROBE USER MANUAL H192708/0002

Bruker BioSpin

12/10/2023

CAUTION!

Probe must be operated only inside the magnet.

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1. Introduction

This is a Magic Angle Spinning (MAS) probe designed for solid-state NMR applications. This probe is equipped with one broadband channel together with a ^{1}H channel. The X channel can be tuned to the specified nuclei that have Larmor frequencies between ^{31}P and ^{13}C.

CAUTION!

Probe must be operated only inside the magnet.

2. Specifications

2.1. RF specifications

Maximum RF fields and maximum pulse durations.

Channel	Tuning range	Maximum field (kHz)	Maximum duration (ms)
1H	-	120	50
X	^{31}P	70	10
	^{13}C	60	

Table 1

*The tuning range of the Y channel depends on the resonance frequency of the X channel.

Calibrate the 1H power for each HX configuration separately. For example, do not use the 1H power value obtained with the probe in the 1H/13C configuration as the starting point when testing the probe in the 1H/15N configuration. If the HX configuration is changed, always calibrate the 1H 90° pulse starting from a low power value

2.2. Variable Temperature (VT) specifications:

Interface: Direct Variable Temperature (DVT)
VT range: -30°C to +70°C

2.3. Magic Angle Spinning (MAS) specifications:

Rotor diameter (mm)	Maximum spin rate (kHz)
1.9	42

Table 2

3. Probe interfaces

Figure 1

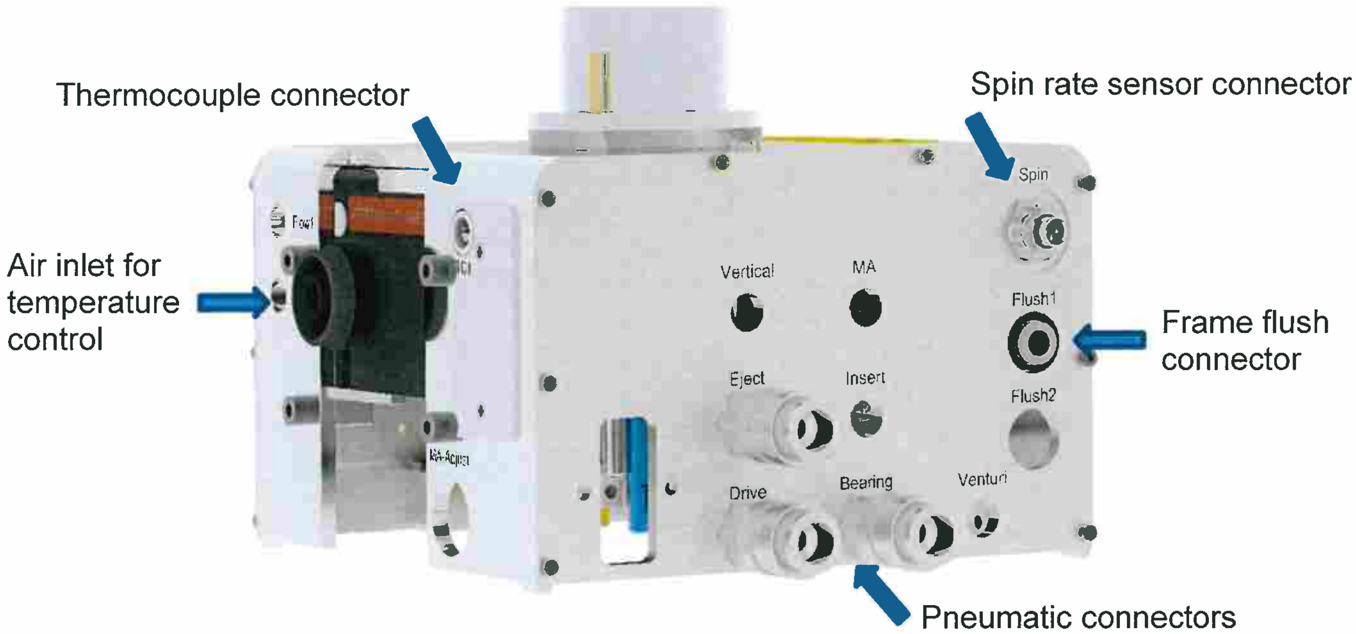


Figure 2

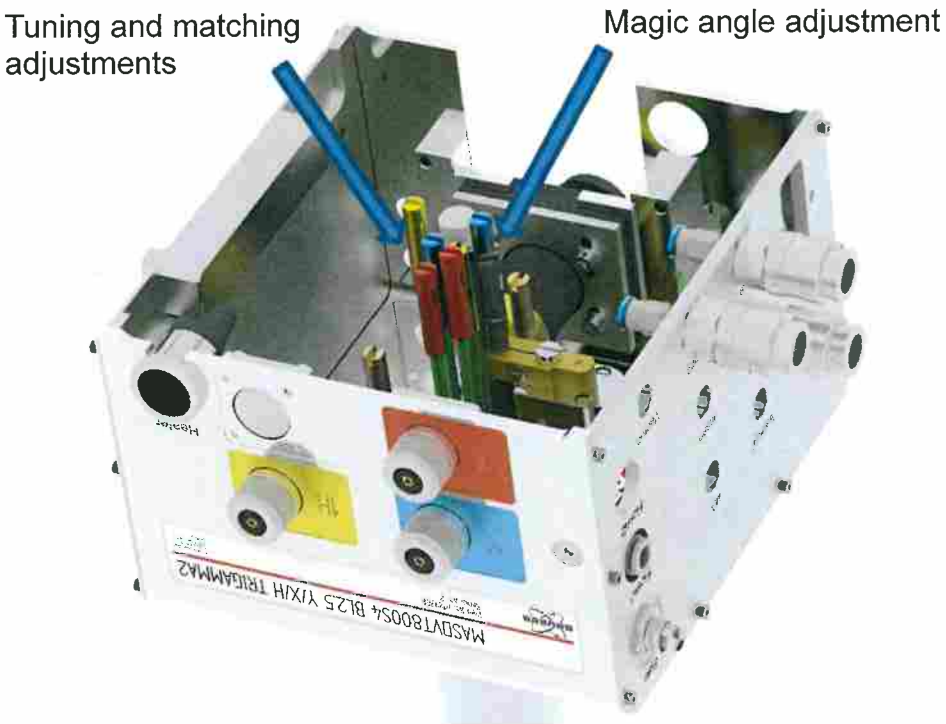


Figure 3

4. Tuning the probe

The first step is to select the appropriate inserts from the "R.F. Insert kit" by consulting the provided tables located at the end of this manual. A dash (-) in the table indicates that the corresponding port does not require an insert, and as such must be left vacant. Once the inserts have been connected, the probe can be tuned and matched to the desired frequencies by adjusting the tuning and matching knobs located at the bottom of the probe.

4.1. Layout of the inserts in the "R.F. Insert kit"

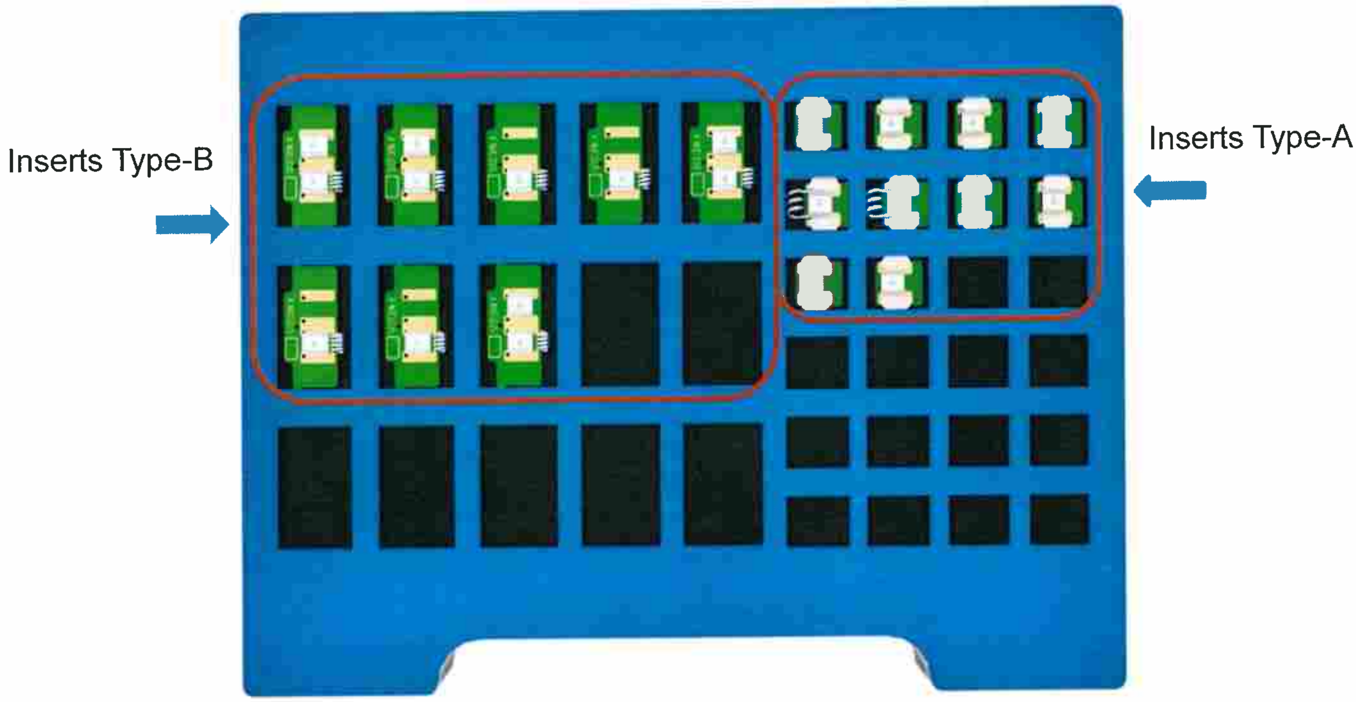


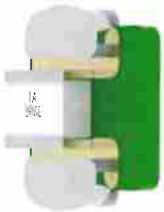
Figure 4: Layout of the inserts in the "insert kit".

4.2 Types of inserts

Two types of inserts are provided with the probe (Figure 5).

1. Type-A inserts.
2. Type-B inserts.

All inserts are delicate and must be handled with care.



1. A type-A insert.

2. A type-B insert.

Figure 5

Type-A inserts without a label are referred to by the value printed on the capacitor as shown in figure: 6.

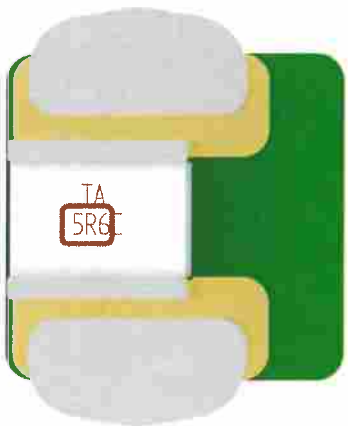
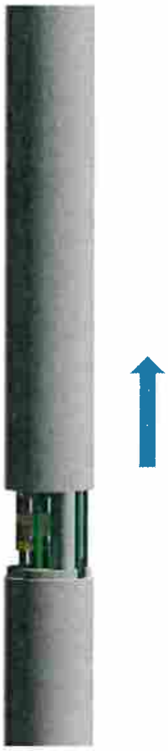


Figure 6: Value of the capacitor.

4.3 Removing the shield

1



2

3

Figure 7

1. Rotate the top part of the shield, from left to right to unlock the shield (Figure 7).
2. Slide the shield up without rotating.
3. Remove the top part of the shield completely to access the inserts.

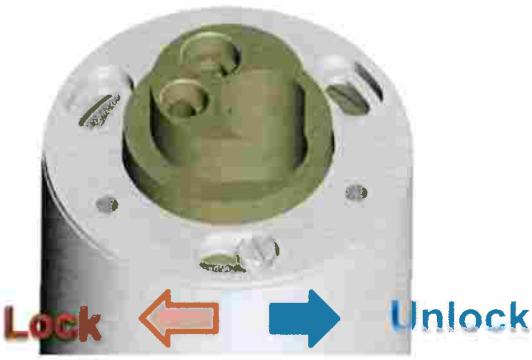


Figure 8

4.4 Locations of the inserts

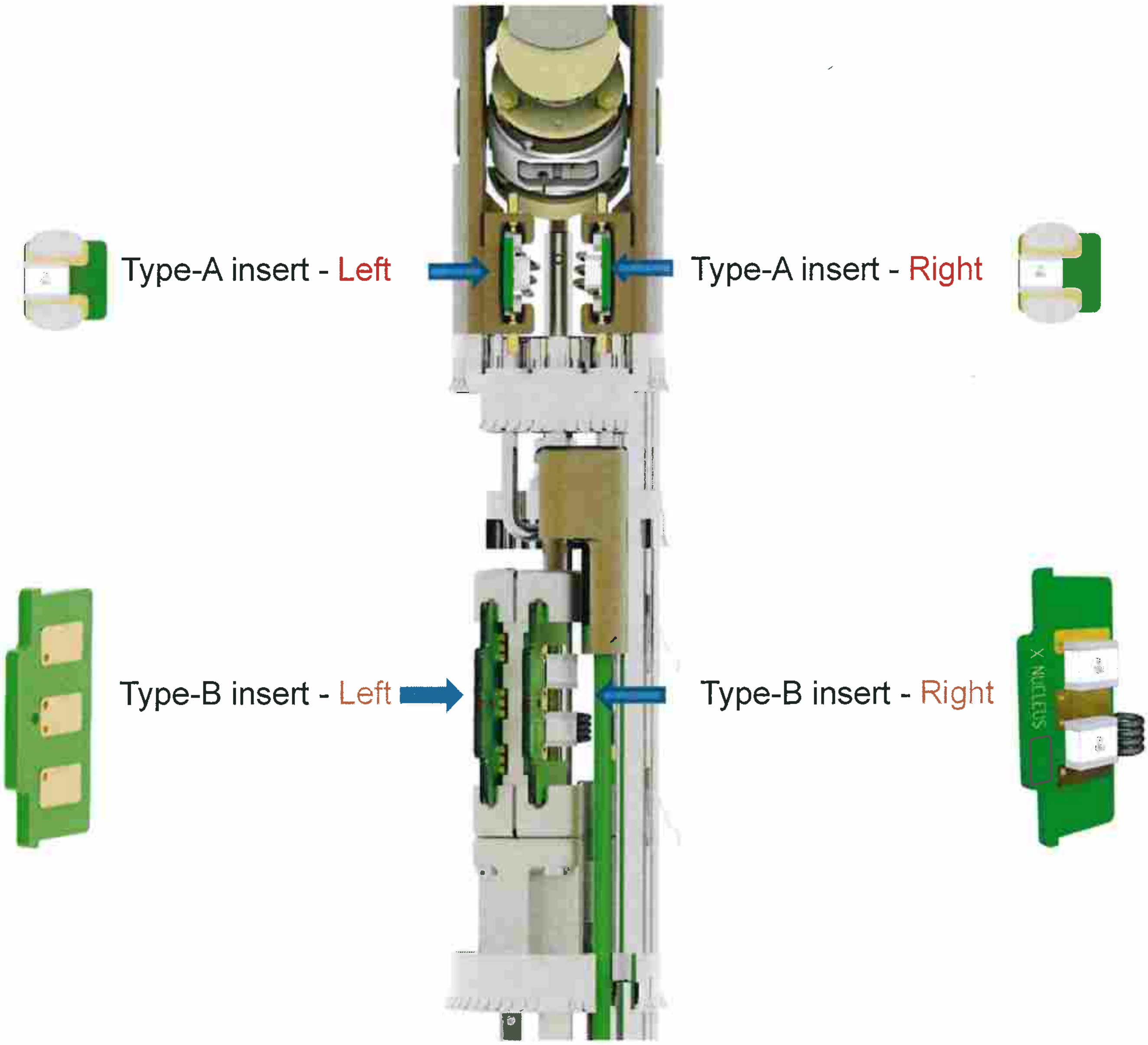
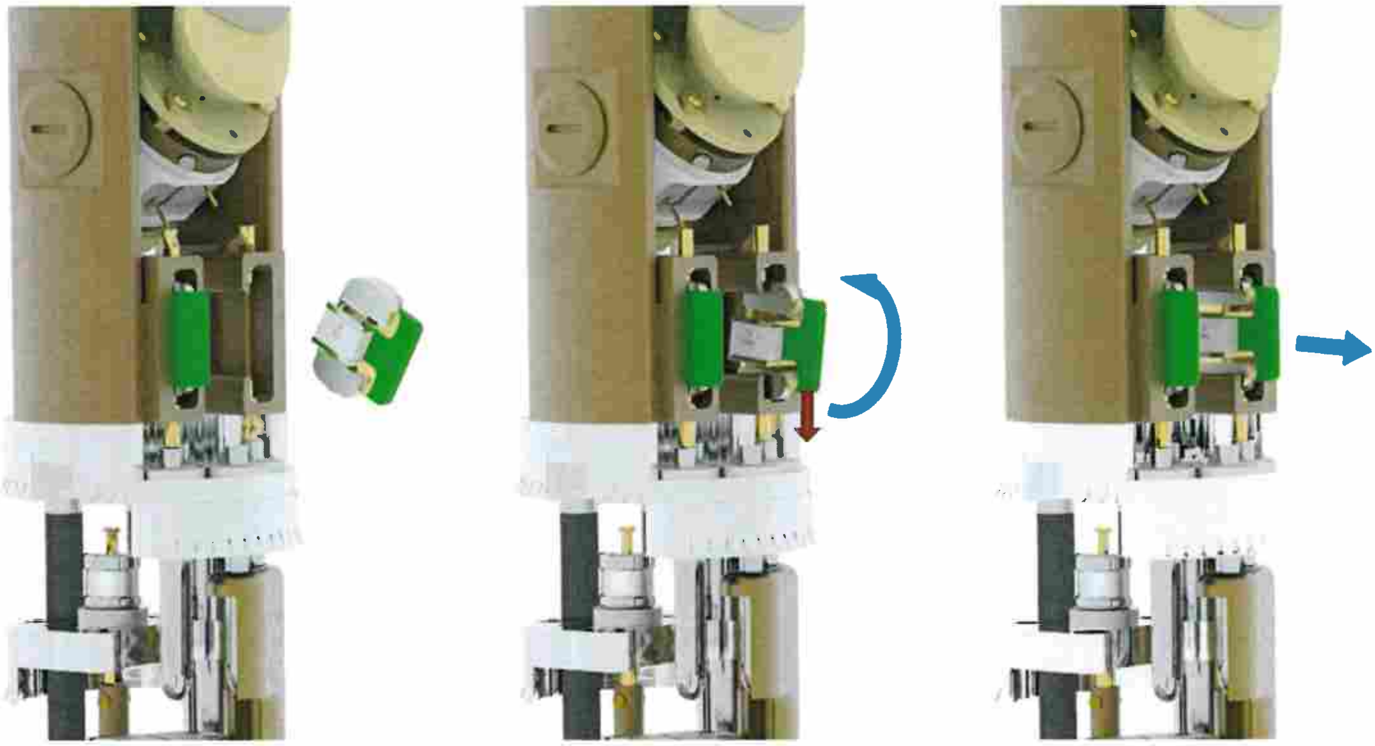


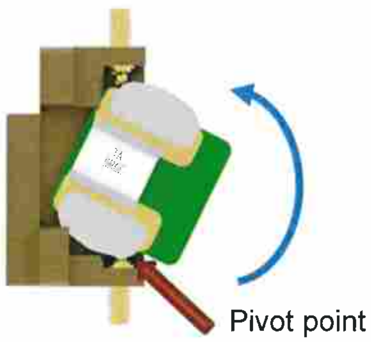
Figure 9

4.5 Exchanging inserts

4.5.1 Exchanging type-A inserts



1 2 3



2A

Figure 10

Do not push type-A inserts directly into the insert base.

1. Hold the type-A insert at angle as shown in figure 10–1. Mount the insert on the right-hand side first.
2. Rotate the insert while firmly pushing down on the bottom spring-loaded contact located in the insert base, as shown in figures 10–2 and 10-2A.
3. The insert can be removed by directly pulling on the insert.

4.5.2 Exchanging type-B inserts

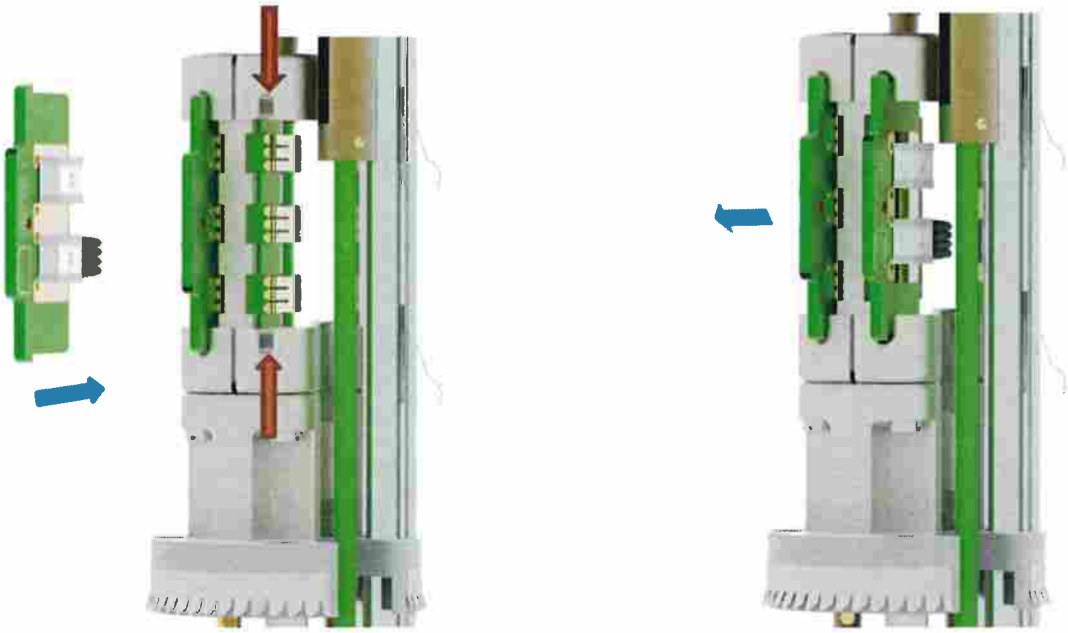


Figure 11

1. Align the type-B insert with the grooves on the “insert base”, indicated by the red arrows in figure 11.
2. Push the insert in until the notch on the insert comes into contact with the insert base.
3. The insert can be removed by simply pulling on the insert.

⚠ If you observe tuning or matching issues, make sure that the inserts are clean. Only use isopropanol to clean the surface of the inserts.

4.5.3 Inserts provided in the “R.F. Insert Kit

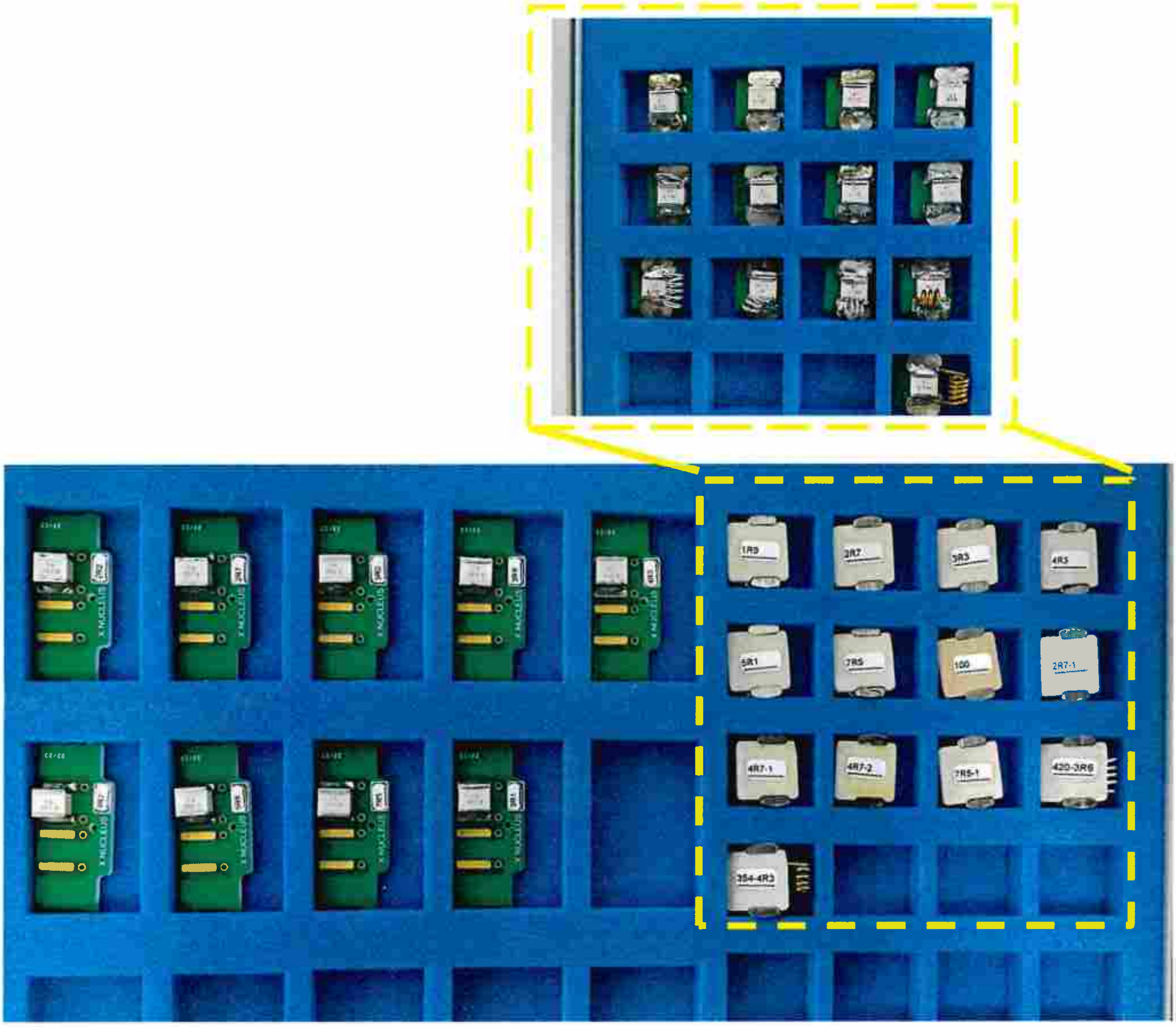


Figure 12: Type A and B inserts provided in the “R.F. Insert Kit”

5. Probe tuning table

X nucleus	Type-A insert Left	Type-A insert Right	Type-B insert Left	Type-B insert Right
^{31}P(485.8)	2R7-1	420-3R6	2R2	-
^{7}Li(466.4)	1R9	354-4R3	2R7	-
^{119}Sn(447.5)	2R7-1	354-4R3	2R7	-
^{117}Sn(427.6)	1R9	4R7-2	3R0	-
^{87}Rb(392.68)	2R7	4R7-1	4R3	-
^{115}Sn(392.66)	2R7	4R7-1	4R3	-
^{11}B(385.0)	3R3	4R7-1	3R9	-
^{125}Te(378.6)	3R3	4R7-1	4R7	-
^{141}Pr(367.5)	4R3	4R7-1	4R7	-
^{71}Ga(366.0)	4R3	4R7-1	4R7	-
^{65}Cu(340.9)	5R1	7R5-1	5R6	-
^{129}Xe(333.8)	5R1	7R5-1	7R5	-
^{81}Br(324.1)	7R5	7R5-1	5R6	-
^{63}Cu(318.2)	7R5	7R5-1	7R5	-
^{23}Na(317.5)	7R5	7R5-1	7R5	-
^{51}V(315.7)	7R5	7R5-1	7R5	-
^{123}Te(314.1)	7R5	7R5-1	9R1	-
^{27}Al(312.7)	7R5	7R5-1	9R1	-
^{13}C(301.8)	100	7R5-1	9R1	-

Table 3

- = No Insert

In some situations, impedance mismatch between filters and cables can lead to a spurious resonance appearing close to the ^{1}H resonance. This issue can be resolved by extending the length of the cable connecting the X channel of the probe to the preamplifier, using the connectors that are provided with the probe.

Figure 13

If you observe tuning or matching issues, make sure that the inserts are clean. Only use isopropanol to clean the surface of the inserts.