



PURCHASE CONTRACT no. 151/OVZ/KS/2024

CONTRACTING PARTIES:

BUYER: **Palacký University Olomouc**
Public university established by Act. No. 111/1998 Coll., on Higher Education Institutions and on Amendments to Certain Acts (Act on Higher Education Institutions), as amended
Legal Address: Křížkovského 511/8, CZ-771 47 Olomouc, Czech Republic
Rector: prof. MUDr. Martin Procházka, Ph.D.
Person authorized to act in technical matters: [REDACTED]
phone no.: [REDACTED]
e-mail: [REDACTED]
Identification No.: 61989592
Tax Identification No.: CZ61989592
Bank Name: [REDACTED]
Bank Account No.: [REDACTED]
(hereinafter referred to as „Buyer”)

and

SELLER: **Magritek GmbH**
Legal Address: Philipsstrasse 8, Aachen 52068
Registration in Companies Register: Local Court Aachen – HRB13684
Statutory body: [REDACTED]
Person authorized to act in contractual matters: [REDACTED]
Person authorized to act in technical matters: [REDACTED]
Identification No.: HRB13684
Tax Identification No.: 201/5977/4323
Bank Name: [REDACTED]
Bank Account No.: [REDACTED]
(hereinafter referred to as „Seller”)

are closing on the bellow stated day, month and year according to provision of Section 2079 et seq. of the Act no. 89/2012 Coll., Civil Code, as amended, this purchase contract (hereinafter referred to as „Contract”).

The Buyer and the Seller enter into this contract due to the fact, that the Seller was selected by the Buyer in the procurement procedure entitled „**CATRIN/UPOL – Benchtop NMR**“ as the selected economic operator.



I. Subject of the Contract

1. The Seller undertakes under this Contract to deliver to the Buyer **The Spectrometer Spinsolve 80 MHz Ultra -Multi-X and accesories mentioned in the quote** (hereinafter referred to as the „Goods”) in type, quantity, quality and design according to specification, that is an integral part of this Contract as its Annex No. 1. The Seller is not entitled to deliver Goods in larger quantity as stated in Section 2093 of the Civil Code. Both parties to this Contract agreed that Section 2099 (2) of the Civil Code will not be applied.
2. The Seller hereby undertakes to surrender the Goods specified in Annex no. 1 to this Contract to the Buyer and allow him to acquire property rights to it, carry out the installation of the Goods, provide the training to the Buyer’s staff by qualified worker and provide the warranty service under the conditions stipulated by this Contract.
3. The Buyer agrees to take over the Goods and pay the Seller the purchase price in the way and in time agreed to in this Contract.
4. Part of the delivery of the subject of the Contract is transport and delivery of legal documents (Declaration of conformity or CE certificate, user manual in Czech or English).
5. The Seller declares pursuant to Section 2103 Civil Code, that the Goods is without any faults or defects.
6. The Goods shall be fully functional, new, unused, not refurbished, without any additional costs or expenditures necessary to be paid by the Buyer.

II. Term and place of delivery

1. The Seller undertakes to deliver and install the Goods at the place of delivery, including the delivery of all legal documents to the Goods, the execution of all tests verifying compliance with technical parameters given in this Contract, the training of the Buyer's staff by a qualified worker within the scope of Article V (2) of this Contract, no later than 120 calendar days after the effective date of this Contract.
2. Place of delivery is CATRIN (The Czech Advanced Technology and Research Institute), Palacký University Olomouc, Šlechtitelů 27 (building VTP A, ground floor), 779 00 Olomouc, Czech Republic.

Person authorised to take over the delivery on the basis of a handover protocol: [REDACTED]
[REDACTED] or a person authorised by him to take over the Goods.

3. Both parties agreed, that Section 2126 and Section 2127 Civil Code on self-help sale will be excluded and thus shall not be applicable in the case of delay in take-over of the Goods by the Buyer.

III. Purchase price

1. The purchase price is set in the amount of **3.735.753,00 CZK without VAT**. The Seller is not the payer of VAT.



2. The purchase price covers all the costs related to the supply of the Goods (in particular the transport to the place of delivery, insurance, customs duties, fees, licence fees and copyrights, installation and arranging for training, delivery of all legal documents to the goods, the warranty service).
3. The purchase price is set as a fixed price, the highest acceptable and maximal, covering all the costs related to the supply of the Goods.
4. The Seller takes the responsibility for the fact, that the VAT rate at the time of invoicing is stipulated in compliance with the legislation.

IV. Payment terms and conditions

1. Payment for the delivery of the Goods shall be made on the basis of a duly issued tax document (invoice), including all the prerequisites, within the due date of 30 calendar days from the date of the provable delivery to the Buyer. The invoice will be issued by the Seller at the earliest after delivery of the Goods, its proper and complete installation, delivery of legal documents, performance of all tests verifying compliance with technical parameters given by this Contract, basic operator training within the scope of Article V (2) of this Contract, which will be confirmed by a written signed protocol on the delivery and installation of the Goods. Proof of the proper fulfillment of the obligations stated in the previous sentence by the Seller is a written dated handover protocol provided with the signatures of the authorized persons of both contracting parties to act in technical matters.
2. Each invoice issued by the Seller must include all tax document prerequisites in accordance with Act No. 235/2004 Coll., on value added tax, as amended, and the prerequisites of a commercial deed pursuant to Section 435 of the Civil Code as well as identification of the Contract, on the basis of which the fulfilment has been provided. The Seller shall affix the invoice with the signature of the person authorised to issue the invoice. Each invoice issued will bear the number of this Contract.
3. If any invoice issued by the Seller does not contain any of the obligatory particulars or if the Seller incorrectly invoices the price or the VAT, the Buyer is entitled to return such invoice to the Seller before the expiration of its maturity date for the correction, stating the reason of its returning. The Seller shall correct it by issuing a new invoice. The initial maturity date stops running on the day of sending the incorrect invoice to the Seller and a new maturity day starts running on the day of the delivery of a new invoice to the Buyer.
4. The contracting parties agree that the obligation to pay the purchase price is fulfilled on the day when the given sum is sent from the Buyer's account to the Seller's account given above in this Contract.
5. The Seller shall ensure proper and timely fulfillment of financial obligations to its subcontractors, where proper and timely fulfillment is considered full payment of invoices issued by the subcontractor for performances provided to the Seller to fulfill obligations under the Contract, always no later than 15 days after receiving payment from the Buyer for specific performance (if the due date of the invoice issued by the subcontractor has not occurred before). The Seller undertakes to transfer the same obligation to other levels of the supply chain and to oblige its subcontractors to fulfill and spread this obligation also to



lower levels of the supply chain. The Buyer is entitled to request the submission of documents on payments made to subcontractors and contracts concluded between the Seller and subcontractors. Failure to fulfill the obligations of the Seller under this agreement of this Contract is considered a material breach of contract with the possibility of withdrawal by the Buyer from this Contract. Withdrawal from this Contract is in such a case effective by delivery of a written notice of withdrawal from the Contract to the other contractual party.

V. Installation and training of the staff

1. As part of the installation of the Goods at the place of delivery, the Seller is obliged to prove, but not exclusively, the full functionality and fulfillment of all the parameters of the Goods in accordance with the tender of the Seller, which forms an integral part of the Contract (Annex No. 1 of the Contract).
2. The Seller undertakes to provide basic operator training, which is a condition for the due handover and reception of the Goods within the following scope: Operator onsite training for delivered Goods in the minimal scope of 2 working days – 16 hours, for at least 3 persons of the Buyer. The training must be led by a qualified service technician or application specialist.
The training has to cover at least these activities:
 - Start/stop machine
 - Measurement of all analysis (with all nuclei)
 - Basic maintenance
 - Data transfer
 - Reaction Monitoring, Advanced Autoshim, Queue Manager
3. All trainings shall take place at the place, where delivered Goods have been installed, unless agreed otherwise in writing by the persons authorised by the contracting parties to act in technical matters. Precise dates of the respective trainings shall be agreed in a sufficient advance by the person authorised by the Buyer to act in technical matters. All the costs related with the above-mentioned trainings (including the stay of service technicians, application specialists or specialists of the economic operators of the accessories) are paid for by the Seller and are included in the purchase price.

VI. The Seller's responsibility for defects and warranty

1. The Seller provides a quality warranty for the Goods according to § 2113 et seq. Civil Code, for a period of 24 months from the date of signing the handover protocol pursuant to Article IV (1) of this Contract.
2. Seller guarantees promptness of service in the warranty period, ie. travel to the place of installation, conducting detection of defects and discussing the necessary service operations with person authorized by the Buyer to act in technical matters, during warranty period no later than within 10 workdays from the day of report of the defect, by visit from service technician. During the warranty period, the respective defects shall be removed within 15 workdays at the latest after the day of the start of the defect removal, unless otherwise agreed in writing by persons authorized by contracting parties to act in technical matters. The Seller is obliged to provide repairs in the place of delivery, in case it is technically impossible, Seller shall take over the „faulty part“ of the Goods in order to repair



it after signing a written protocol, stating suggested procedure agreed by the person authorised to act in technical matters for the Buyer. The contracting parties have agreed that § 2110 Civil Code shall not apply; the Buyer is therefore entitled to withdraw from the Contract for defects or demand the delivery of new Goods, regardless of whether he can return the Goods, or return them in the condition in which they were received.

3. Seller also undertakes to perform free full service of the delivered equipment and of control and evaluation software, including updates and staff training and regular service inspections prescribed by the manufacturer of the delivered equipment for the entire guarantee period, including all necessary spare parts (free warranty service of delivered goods). Seller further undertakes to provide unlimited and free remote diagnostics and service of the device through remote access and connection to the device. The costs of performing a full guaranty service of the delivered goods form part of the Seller 's offer price. During the warranty period, the seller is obliged to ensure at his own expense all legal inspections of goods.

VII. Contractual penalties

1. The contracting parties shall, in the event of a breach of the contractual obligation, agree on contractual penalties in the form provided for in the following paragraphs of the Contract. Neither contracting party considers that the contractual penalties are disproportionate in relation to the value of the individual contractual obligations.
2. The Seller undertakes to pay the Buyer a contractual penalty in the amount of 0,2 % from the purchase price without VAT for each commenced day of delay with the contractually set delivery date as per Article II (1) of this Contract.
3. The Seller undertakes to pay the Buyer a contractual penalty of 0,1 % from the purchase price without VAT for each even commenced day after the expiration of the period for initiation to repair or after the expiration of the period for repair defects during the warranty period in accordance with Article VI of this Contract, for each individual case.
4. The contracting parties have agreed that § 2050 of the Civil Code shall not apply, ie. contractual penalties are not included in the compensation for any damage incurred, which can be enforced separately in full in addition to the contractual penalty.
5. The maturity date of the charged contractual penalties is 30 calendar days from the day of delivery of their written statement to the given contracting party and the day of payment means the day of debiting the contractual penalty amount from the account of the given contracting party to the account mentioned in the statement of the contractual penalty.
6. The Buyer is entitled to set off the contractual penalties within the meaning of Section 1982 et seq. of the Civil Code against the Seller's outstanding claim for payment of the purchase price under this Contract.

VIII. Final provisions

1. With respect to the provision of Section 2 (e) of Act no. 320/2001 Coll., on the Financial Inspection in Public Administration, as amended, the Seller is a person obliged to



cooperate during the performance of the financial inspection. These Seller's obligations also apply to his contractual partners involved in the fulfillment of this Contract.

2. The Seller undertakes to ensure the legal employment of persons in the performance of this Contract and to ensure fair and decent working conditions for the employees participating in the performance of the Contract. Fair and decent working conditions are those working conditions that meet at least the minimum standards set by labor and wage regulations. The Seller is obliged to ensure compliance with the requirements of this provision of the contract with its subcontractors. Failure to fulfill the obligations of the Seller under this agreement of this Contract is considered a material breach of Contract with the possibility of withdrawal by the Buyer from this Contract. Withdrawal from this Contract is in such a case effective by delivery of a written notice of withdrawal from the Contract to the other contractual party.
3. The Buyer reserves the right to publish the contents of the Contract.
4. This Agreement is governed by the Civil Code and the legal order of the Czech Republic in matters not expressly regulated in it.
5. The provisions of this Contract are separable. If any part of an obligation under this Contract is or becomes invalid or non-enforceable, this shall not affect the validity and the enforcement of other obligations under this Contract and the contracting parties undertake to replace such invalid or non-enforceable part of obligation with a new, valid and enforceable part of the obligation, the subject of which will correspond at the best to the subject of the original obligation. If the contract does not contain a provision which would be justifiable for the determination of the rights and obligations, the contracting parties will make all the efforts to implement such provision in the Contract.
6. The contracting parties may modify or amend this Contract only in the form of written amendments numbered in the increasing order, expressly declared as amendments to this Contract and signed by the authorized representatives of the contracting parties.
7. The Buyer is entitled in accordance with § Section 2001 of the Civil Code, to withdraw from this Contract in following cases:
 - delay of the Seller with the delivery of Goods longer than 10 calendar days,
 - failure to comply with the technical specification of the Goods set out in the Seller's tender or if the Seller, in the tender submitted in the tendering procedure preceding the conclusion of this Contract, has provided information or submitted documents which do not correspond to reality and have had or could have had an influence on the selection of the Seller to perform the public contract,
 - the Seller's delay with starting to reape defects longer than 10 calendar days,The withdrawal from the Contract shall be made in a written form and becomes effective on the day of the delivery of the written notice to the other contracting party.
8. The Seller is not entitled to cede his rights and obligations under this Contract to a third party without the Buyer's approval.
9. With regard to the delivery of items relating to the performance of this Contract sent by the Seller using the postal service provider, § 573 of the Civil Code shall not apply



10. The Seller acknowledges that this Contract, including all its Annexes, is subject to mandatory disclosure under Act No. 340/2015 Coll., on special conditions of effectiveness of certain contracts, publication of these contracts and on the register of contracts, as amended.
11. This Contract shall enter into force on the date of its signature by the last participant of this Contract and become effective as of the date of publication of this Contract by Buyer in the Register of contracts pursuant to Act No. 340/2015 Coll., on special conditions of effectiveness of certain contracts, publication of these contracts and on the register of contracts, as amended.
12. This Purchase Contract is signed electronically.
13. The Seller is obliged to inform the Buyer if it becomes aware that it or its subcontractors or the performance which is the subject of this contract is subject to international sanctions.
14. The following Annexes form an integral part of this Contract:

Annex No. 1 – Seller's tender dated 22.04.2024

In Olomouc, on 28.06.2024

In Aache, Germany, on 25.06.2024

.....
prof. MUDr. Martin Procházka, Ph.D.
rector of Palacký University Olomouc

.....


Quotation

Your Contact Details:

Name	[REDACTED]	Phone	[REDACTED]
		Email	[REDACTED]

Quote Details:

Magritek Quote Number	331254-01	Payment Terms	Other (see additional notes)
Created Date	5/21/2024	Delivery	Incoterm - DAP - Delivered at Place
Expiration Date	12/31/2024	Delivery Place	779 00 Olomouc
		Estimated Lead Time from POA	16-20 Weeks

Your Organisation Details:

Account Name UPOL

Our Contact Details:

Prepared By	[REDACTED]	Prepared By (Mobile)	[REDACTED]
Company Name	Magritek GmbH	Email	[REDACTED]
Email Purchase Order To:	[REDACTED]		

Magritek GmbH Company Information:

Magritek GmbH - Company Registration: Aachen HRB 13684 - German Tax N° 201/5977/4323 - VAT N°: DE249181394 - EORI (Customs) N°DE6433634

Product Code	Product Description	Sales Price	Quantity	Total Price
	SPINSOLVE 80 Multi-X ULTRA (1H, 19F and X nuclei specified below) - Proton Frequency 80 MHz (1.9 Tesla) - Spectral Resolution @ 50/0.55/0.11% signal height < 0.2/10/20 Hz - Sensitivity (SNR) > 200:1 for 1% Ethylbenzene - Operating Temperature Range: 18 - 28 °C (65 - 82 °F) - External lock - No deuterated solvents required - 3D PFG for gradient-selected (gs) sequences - Uses 5 mm tubes - Weight 72 kg (158lb) - Dimensions 58 x 43 x 40 cm (23" x 17" x 16") (D x W x H) - Stray Field < 2 Gauss Outside the system			

SP80HFMXU	<p>Permanent Spinsolve Software license including the protocols:</p> <ul style="list-style-type: none"> - 1D Proton (1H) with F-Decoupling - T1 and T2 Relaxation - 2D gs-COSY, gs-TOCSY, gs-JRes, gs-ROESY - Solvent Suppression Package (PRESAT, WET, WET-T2, WET-COSY) - 1D Fluorine with H-Decoupling - 2D gs-F-COSY, gs-F-JRes, gs-HF-COSY - X-Channel Protocols: see separated items - Reaction Monitoring - Advanced Autoshim - Queue Manager <p>Accessories included:</p> <ul style="list-style-type: none"> - Sample Holder/Depth Gauge - Shim Sample - 100 NMR Tubes - Manual 	1.00	zahrnuto v konečné ceně
SPCh13C	<p>Add CARBON (13C) to your X Channel</p> <p>Includes the following Spinsolve protocols:</p> <ul style="list-style-type: none"> - 1D Proton (1H) with F- and C-Decoupling - 1D Carbon NOE with H- and F-Decoupling - DEPT spectral editing with H-Decoupling - APT with H-Decoupling - 2D gs-HSQC, gs-HSQC-ME, gs-HMQC, gs-HMBC, and gs-HETCOR 	1.00	zahrnuto v konečné ceně
SPCh31P	<p>Add Phosphorus (31P) to your X Channel</p> <p>Includes Spinsolve permanent software license with the following protocols:</p> <ul style="list-style-type: none"> - 1D Proton (1H) with P-Decoupling - 1D Phosphorous (31P) with NOE (on/off) and proton decoupling (on/off) - 2D gs-HMBC - Polarization transfer and Proton Composite Pulse Decoupling for 31P 	1.00	zahrnuto v konečné ceně
SPCh11B	<p>Add Boron (11B) to your X Channel</p> <p>Includes Spinsolve permanent software license with the following protocols:</p> <ul style="list-style-type: none"> - 1D Proton (1H) with B-Decoupling - 1D Boron (11B) with NOE (on/off) and proton decoupling (on/off) - DEPT spectral editing with H-Decoupling - 2D HSQC and HMBC 	1.00	zahrnuto v konečné ceně
SPRMK2	<p>REACTION MONITORING HARDWARE KIT WITH GLASS FLOW CELL (RMK2)</p> <ul style="list-style-type: none"> - RMX advanced reaction monitoring software plug-in - Peristaltic pump (software controlled) - 2 x Glass flow cells - Spinsolve Stand <p>Connecting kit for the glass flowcell including: Fingertight PEEK Fittings:</p> <ul style="list-style-type: none"> - 4 x Idex P-135 	1.00	zahrnuto v konečné ceně

	<ul style="list-style-type: none"> - 4 x Idex XP-235 - 4 x Idex XP-132 - 2 x Idex P-757 - 2 x SC0714 Rubber tubing for peristaltic pump - Flexible connection tubing (PTFE 5 meters, OD 1,6 mm, ID 1,0 mm) 			
SPAS	SPINSOLVE AUTOSAMPLER <ul style="list-style-type: none"> - Automatic sample transfer to the spectrometer - Fully automated queuing of sample measurements via Spinsolve software. - Capacity: maximum of 20 samples - Type of NMR glass tubes: 5mm OD, 7" long - 20 sample holders 14 mm included - Mechanically actuated, reliable, and maintenance-free operation - Compatible with all Spinsolve models 		1.00	zahrnuto v konečné ceně
MNOVA-BU06AC0001	Mestrelab Mnova software Perpetual NMR + RM +qNMR for advanced data processing <ul style="list-style-type: none"> - Perpetual Licence - Academic Licence - Single Computer License - Includes Reaction Monitoring plug-in - Includes qNMR plug-in 		1.00	zahrnuto v konečné ceně
SPWAR1Y	SPINSOLVE FIRST YEAR WARRANTY One year parts and labor with return to factory for the full offered package.		1.00	zahrnuto v konečné ceně
SPWAR2Y	SPINSOLVE SECOND YEAR WARRANTY Second year parts and labor with return to factory for the full offered package.		1.00	zahrnuto v konečné ceně
SPINAS	ON-SITE ASSISTED INSTALLATION AND TRAINING <ul style="list-style-type: none"> - Customer unpacks and plugs in the system. - Instrument installation by Magritek - Magritek support engineer on-site for 1 day. - Includes training. 		1.00	zahrnuto v konečné ceně
SPSUPP1Y	SPINSOLVE SUPPORT PACKAGE (ANNUAL) <ul style="list-style-type: none"> - Software updates with new or improved protocols(only includes protocols applicable to purchased Spinsolve Model) and remote training sessions with software releases or updates - Remote assistance for configuring data acquisition and processing, scripting, and advanced features - Email, phone, and remote technical support. Customers to provide remote access using Teamviewer or a similar application 		3.00	zahrnuto v konečné ceně
SPSHIP	Shipping from Magritek factory to destination, including insurance.		1.00	zahrnuto v konečné ceně

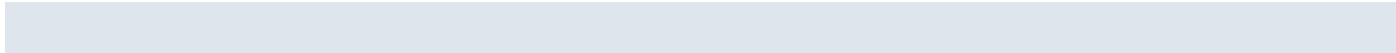
Totals:

konečná cena včetně všech položek CZK 3735753

Quote does NOT include VAT, Sales Tax, Duty or any other applicable Tax.

Additional notes:

Payments terms : 100% due 30 days net after the installation and certification of the specifications.



2 Technical specifications and software

2.1 Key features of the proposed Spinsolve

- The Spinsolve model proposed in this offer is the **Spinsolve 80 Multi-X Ultra (1H/19F/13C/31P/11B)**:

- The device is clocked at a proton resonance frequency of **80 MHz** (1.88 Tesla).

- The device features a dual-channel probe to measure the 6 cores mentioned¹ **H**,¹⁹ **F**,¹³ **C**,¹¹ **B** and³¹ **P**. Protocols for the various cores are optimized and calibrated at the factory. **Switching from one nucleus to another is fully automated**, i.e. successive analyses of different nuclei do not require **manual tuning of the probe** (and therefore human intervention). This also eliminates the need to recalibrate the instrument after manual tuning, which is difficult to reproduce (and can affect quantitative measurements), as well as enabling kinetic monitoring by rapidly alternating measurements of different cores.

- The device has a **sensitivity of over 200:1** for¹ H on a 1% ethylbenzene sample, measured on the quadruplet in a single scan (see dedicated paragraph **2.2**).

- The device's superior magnetic field homogeneity (**ULTRA** range) gives it the best resolution on the market and, above all, **the best solvent suppression performance** (see dedicated section **2.3**). The system's resolution enables linewidths of less than **0.2, 10 and 20 Hz** to be obtained **at 50, 0.55 and 0.11% respectively**.

- The device is based on a modern, patented permanent magnet geometry (EP2144076A1 and US8148988). The Spinsolve 80 fits neatly on a bench (size 58 x 43 x 40 cm) and its low weight (72 kg) means it can be moved easily. If the instrument is to be moved frequently, it fits onto a cart and is robust against temperature variations thanks to a unique double-layer thermal regulation system (see section on stability **2.4**).



Left: photo of a mobile Spinsolve, mounted on a wheeled cart. Right: photo of a Spinsolve integrated into an automated flow chemistry system.

- The proposed device is equipped with **three-dimensional gradient coils optimized for signal suppression and coherence path selection** required in certain sequences such as gsCOSY or gsHSQC-ME. By having gradients along all three spatial directions, highly efficient elimination of unwanted signals (spoiler gradients) is achieved.

- The device operates with a **hardware AND external** magnetic field locking system, i.e. 1) **the presence of deuterated solvent in the samples is not mandatory** to record an NMR spectrum 2) **the device is permanently "locked" even without a sample, and reacts instantly to the introduction of a sample into the device to measure immediately, without manual intervention or prior spectra, the spectra appear at the correct chemical shift.**

- Sample measurements are carried out in tubes with a **diameter of 5 mm** and a minimum length of 7" (17.8 cm), which are the dimensions recognized as "standard" for an NMR tube.

- The device is drilled from top to bottom to allow easy insertion of NMR tubes, as well as flow-through cells such as those sold in our reaction monitoring kit (see paragraph **2.6**) or other "home-made" flow cells. NMR is a technique compatible with flow measurements.

- It's worth noting that Magritek offers **flexibility** thanks to an "upgrade" system, i.e. a later "hardware" change to add new capabilities (e.g. the addition of an excitation/detection core). In this way, the system can be upgraded to suit future new applications.

2.2 Sensitivity

Sensitivity is a key specification for qualifying an NMR spectrometer (benchtop or otherwise). It defines an instrument's ability to distinguish a signal from measurement noise. We then specify a *signal-to-noise* ratio (generally abbreviated SNR) of a reference sample measured under fixed conditions. The value most commonly used to characterize the sensitivity of benchtop NMR spectrometers is described in the following table, and is also the one we use to characterize the sensitivity of Spinsolve :

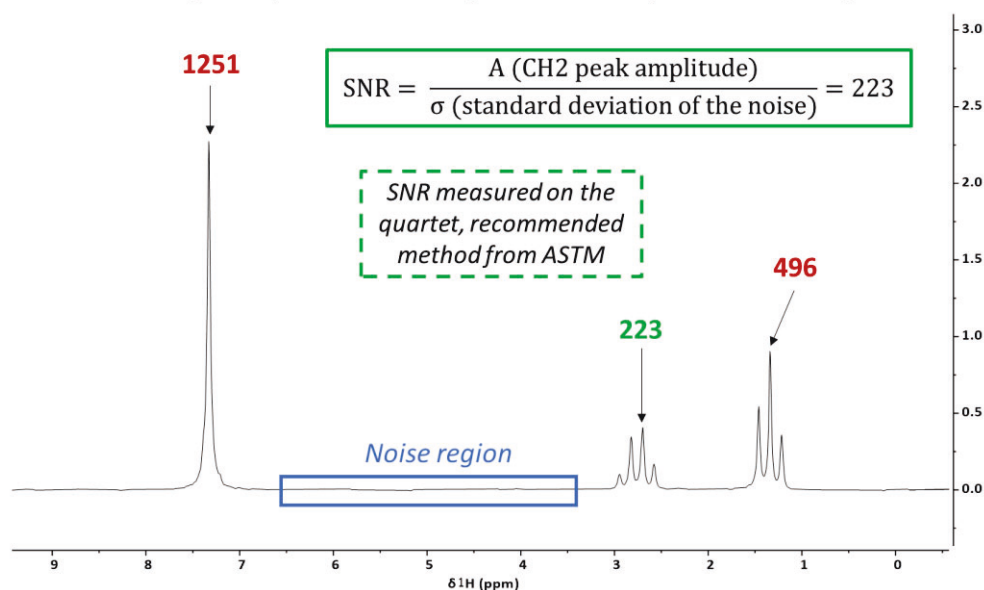
Sample : 1% ethylbenzene in CDCl ₃ + 0.1% TMS	
Experimental protocol : 1D proton	
Pulse angle : 90 degrees	
Number of scans : 1	
Increased resolution (by reference deconvolution, for example) :	Not used/not authorized
Apodization : Exponential with a factor of 1.0 Hz	

The calculation is performed using this formula: **SNR = A / σ**

A is the **peak** amplitude of **the quartet** with the largest amplitude and σ is the standard deviation in a noise region large enough to be representative, for example between 3.5 and 6.5 ppm. The SNR value for the proposed **80 Multi-X Ultra** is greater than **200:1**.

- How to evaluate sensitivity on a benchtop NMR system ?
- Spinsolve 80 Multi-X (dual channel): 1% Ethylbenzene, Single scan, Apodization exp 1Hz

For this model, Magritek specifies sensitivity > 200:1, the system from this spectrum has **223:1**



Example of sensitivity measurement on a Spinsolve 80 Multi-X (dual channel)

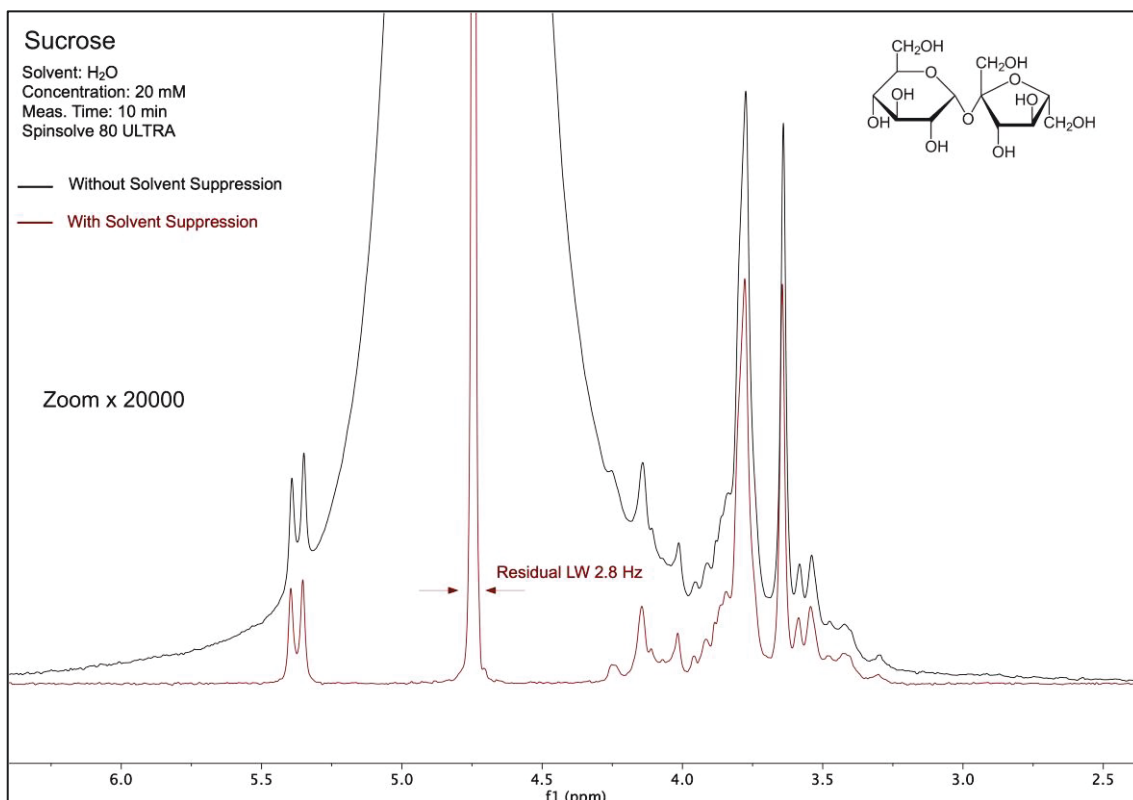
2.3 Solvent resolution and removal

A second key parameter is resolution, i.e. the ability to separate two close peaks. In NMR spectroscopy, resolution is a direct result of the homogeneity of the magnetic field in the sensitive volume, and therefore of the quality of the magnet. This homogeneity is determined by measuring the width of the reference peak at 50, 0.55% and 0.11% of its height on a chloroform sample, according to the following table:

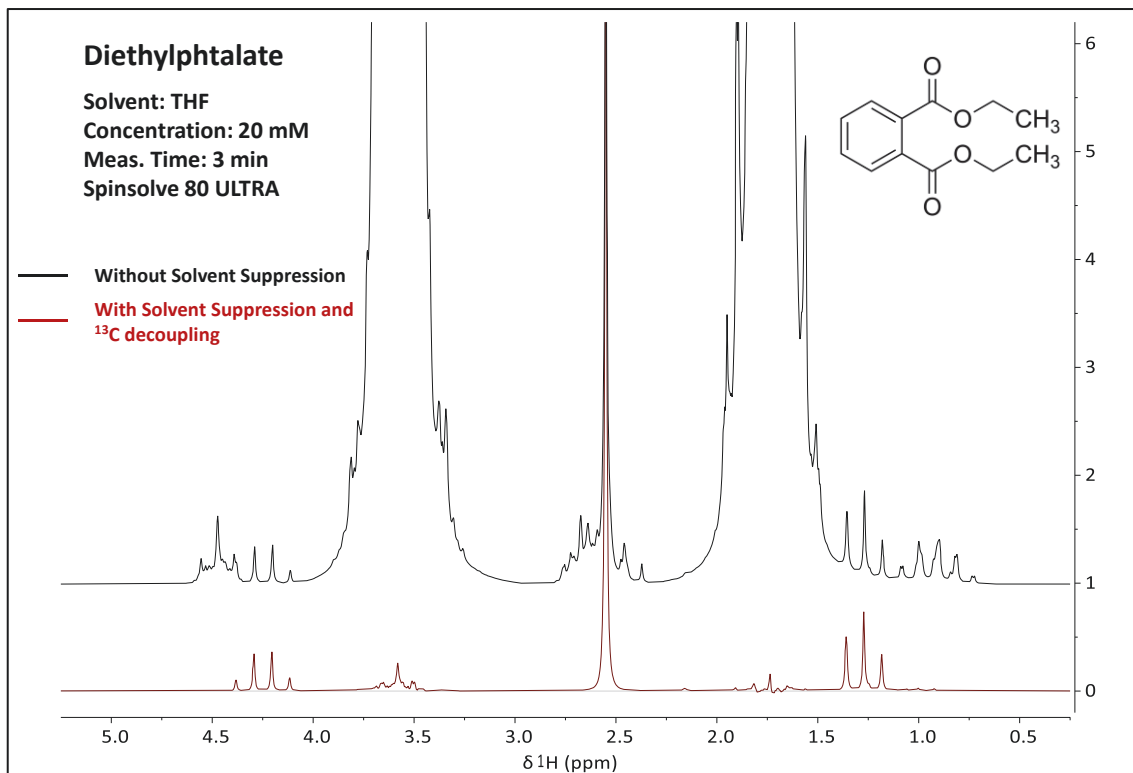
Sample : 20% CHCl ₃ in acetone-d ₆	
Experimental protocol : 1D proton	
Pulse angle : 90 degrees	
Number of scans : 1	
Increased resolution (by reference deconvolution, for example) :	Not used/not authorized
Apodization : Not used/not authorized	

This measurement is made after fine-tuning the shims, i.e. the additional adjustable coils used to compensate for inhomogeneities in the main magnetic field. Linewidth values. Linewidth values for the proposed **Spinsolve 80 Ultra** are less than **0.2, 10 and 20 Hz respectively at 50, 0.55 and 0.11%** of the reference peak.

Improved resolution helps to refine the peaks obtained and increase the chances of separating them. Narrow linewidths at low levels (0.55 and 0.11%) enable efficient, selective solvent suppression. As previously mentioned, Spinsolve models do not require a deuterated solvent to record NMR spectra. However, a proton spectrum on a sample in a protonated solvent inevitably leads to large solvent signals that cover a wide area of the NMR spectrum. Thanks to the implemented solvent suppression protocols, it is possible to selectively suppress several signals simultaneously in order to reduce their interference on the spectrum. Decoupling¹³ C is also possible simultaneously to remove satellites that may overlap with signals of interest. The performance of Magritek's solvent suppression on ULTRA models is illustrated in the following spectra:



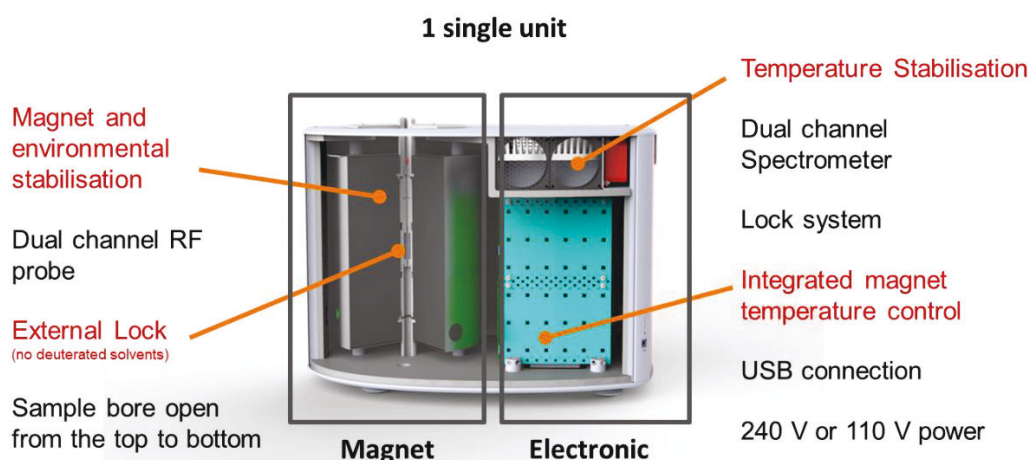
Spectrum¹ H with solvent suppression on a 20 mmol.L sucrose sample⁻¹ in distilled water, recorded with a Spinsolve 80 Ultra



Spectrum¹ H with solvent suppression on both THF peaks and with decoupling¹³ C on a 20 mmol.L diethylphthalate sample⁻¹ in THF, recorded with a Spinsolve 80 Ultra. Superimposed spectra are shifted vertically for better readability.

2.4 Stability

Stability is the third key parameter for qualifying an NMR instrument. The stability of an instrument in relation to its environment (mainly outside temperature) plays a major role in the quality of measurements. It is therefore crucial for the system to protect the magnet from temperature variations. On the Spinsolve, the magnet is inserted into a housing, whose temperature is actively controlled (heating and cooling) by a Peltier-type thermal regulation system (see diagram below). The magnet itself is also temperature-controlled. **This double layer of thermal regulation effectively decouples the magnet from the external temperature.** The device's operating range is from 18 to 28°C, and easily covers temperature variations of a few degrees between day and night, or other regular laboratory events (people entering the room, neighboring equipment in operation, etc.).



Sectional drawing of the Spinsolve instrument showing the system architecture.

This advanced and optimized magnet control allows: 1) installation of the Spinsolve in less than 24 hours 2) automated shimming (shim setting procedure) of the system in 2 minutes. All you need to do is shim the Spinsolve once or twice a day, even if you're changing tubes (important when you're running short analysis bursts on a large number of tubes). There's no need to preheat the sample before analysis. When not in use, the unit features a Standby mode that maintains system performance and enables direct use of the unit after a week or a month of inactivity (or more).

In addition to thermal insulation, Spinsolve instruments are magnetically insulated from their surroundings, to prevent measurements being disturbed by the movement of surrounding air or metal parts (e.g. elevators). The magnetic field around the instrument is of the order of 2 Gauss, protecting users from the magnetic field at the same time.

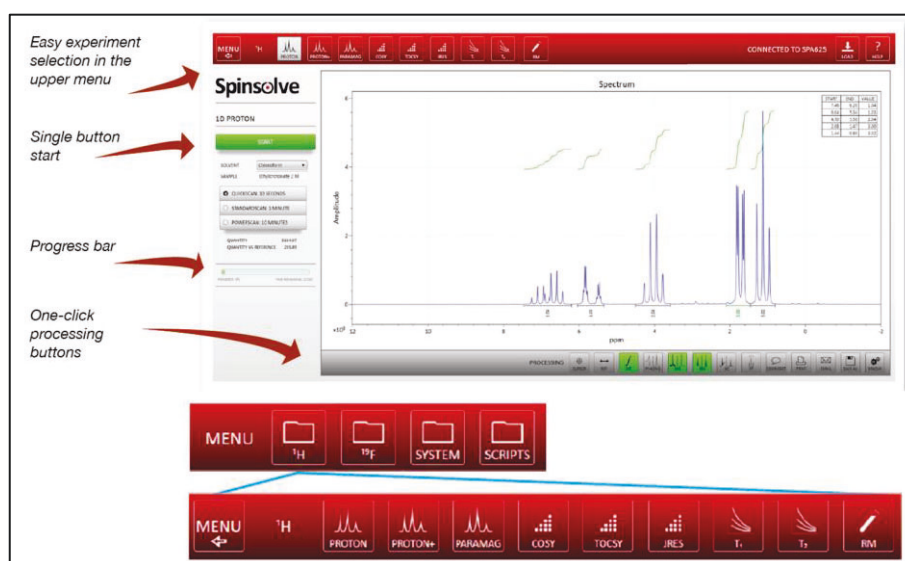
What's more, the design of the casing is such that the air current generated by the fans does not exchange with the air in the casing to prevent the introduction of dust (see diagram below, also protecting the electronics from damage caused by dust accumulated over time). The first Spinsolve units sold by Magritek 12 years ago are all still working at the time of writing.

2.5 Control and software

The Spinsolve can be operated from a PC connected via USB, enabling ergonomic control of the device. The choice of PC can be adapted to the space available and to use (portable PC if the Spinsolve is often moved, or a larger screen for greater comfort), and can be easily replaced in the event of need or breakdown. **A computer workstation (choice of format: laptop, all-in-one or tower) is not included in the offer.**

• Spinsolve

Magritek's offer includes dedicated Spinsolve software. This software is ergonomic and intuitive to use, as shown in the screenshot below for the "basic" mode of acquiring a 1D¹H spectrum (three possible options with a different number of scans), ideal for recording a fast spectrum. Different protocols are pre-programmed and pre-optimized, so you only need to choose a few parameters to adapt to your sample, and simply launch the desired spectra. Magritek's first training session will explain how to choose these parameters, and the application team will be on hand later if you need help choosing parameters (see technical support section [3.3](#)). Magritek's Spinsolve software lets you process spectra and create reports in just a few clicks, and can be installed on **an unlimited number of workstations. Spinsolve updates are guaranteed free of charge for 10 years.**



Screenshot of Spinsolve software, intuitive and easy to use

Spinsolve's various protocols can be triggered by non-proprietary external software or scripts such as Python or Labview. The data generated by Spinsolve is saved in a variety of formats, including jcamp.dx, which is considered a standard format for NMR data. As a result, the data can be opened by any NMR data processing software (proprietary or non-proprietary). Spectra can also be saved in csv format.

2.6 Compatible accessory: reaction monitoring kit (included in package)

NMR is a compatible technique for flow analysis. The Spinsolve is **drilled from top to bottom to allow easy introduction of a flow cell**. This makes the Spinsolve suitable for on-line monitoring of chemical reactions or (bio)processes. Magritek sells as an accessory (i.e. mountable on all Spinsolve systems, **can be ordered at a later date if flow projects materialize in the future**) a reaction monitoring kit to connect any compatible device (from a simple reaction flask to industrial-scale flow processes via chromatographic techniques) for reaction monitoring.

The kit contains two glass flow cells with an optimized design (see diagram below) for minimum volume and, in terms of detection, a sensitive volume similar to that of an NMR tube for maximum sensitivity. Thus, **the sensitivity specification described in paragraph 2.2 (> 200:1 for¹ H) is also valid for the flow cell**. The kit includes a software-controlled peristaltic pump. The kit includes connections (similar to those used in liquid chromatography) and 5m of PTFE tubing for coupling the flow cell to the desired device. No additional devices or units are required for on-line analysis, apart from a USB port to connect the pump to the computer.

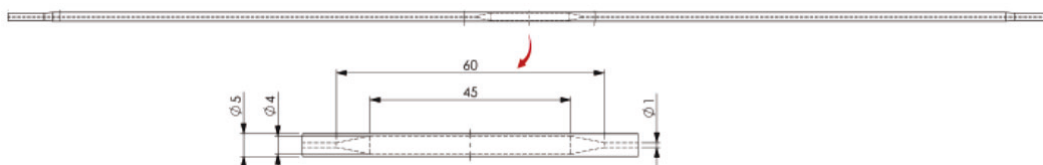


Diagram of the glass flow cell sold in the reaction monitoring kit.

The tracking kit includes the RMX plugin dedicated to kinetic tracking in the Spinsolve software, a screenshot of which is shown below. The software makes it easy to plan a sequence of experiments that will be repeated (loops) as the experiment progresses. Peaks of interest can be integrated into the spectrum, and the evolution of the integral is plotted in real time as a function of time. All data (spectra and graphs) can be exported for further processing.



Screenshot of the RMX plugin for planning and monitoring reactions or processes. Data is processed in real time.

2.7 Compatible accessory: sample changer (included in the offer)

To increase throughput, a sample changer (20 positions for 5 mm NMR tubes) can be easily fitted to the Spinsolve at any time (compatible with all models). Thanks to an intuitive software interface fully integrated into the Spinsolve software, protocols for each sample are added to the queue with a single click (protocol order can be easily modified). New samples can be added/deleted even while a queue is running, and a predefined series of experiments can be loaded from a previously saved list.



Photo of a Spinsolve equipped with the sample changer

3 After-sales service presentation

Magritek has a **team of application engineers dedicated to Spinsolve users**. All members are NMR specialists (chemists and/or physicists) and are in charge of the various after-sales services. All members, who can be contacted directly, **are daily Spinsolve users**. They use and develop various applications on the software and spectrometer every day, and are specialists in the functionalities and possible applications. There is **no intermediary** (distributor or subcontractor) **between the customer and the people who can explain NMR, develop an application or intervene in the event of a problem**, to guarantee fast, efficient assistance.