QAR50-OPC UA Interface
Project L2205045

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1. Usage and License Agreement for the software LisRT V3

of Löhnert Elektronik GmbH, Oskar-Sembach-Ring 18, 91207 Lauf a. d. Pegnitz, legally represented by the general manager Thomas Baum (hereinafter "Löhnert Elektronik")

§ 1 Scope

1. This Usage and License Agreement in the version applicable at the time of download by the user governs the legal provisions and conditions for using the LisRT V3 software from Löhnert Elektronik.

2. The user warrants that he is a resident of the European Union or the European Economic Area and that he is of full age and legal capacity and that, if acting as a representative, he has the appropriate power of representation.

3. This usage and license agreement is a valid contract between the user and Löhnert Elektronik.

§ 2 Subject matter of the contract

1. The contract is concluded exclusively between Löhnert Elektronik and entrepreneurs as defined by § 14 of the German Civil Code (BGB).

2. Use of the software by consumers as defined by § 13 BGB is not permitted.

3. The LisRT V3 software is a measurement and automation software specially developed by Löhnert Elektronik for test stand automation, measurement data acquisition and visualization, for compiling, testing and documenting test sequences, for processing accompanying data and organizing type variants of the test objects as well as for recording and displaying test results and measurement curves.

4. The LisRT V3 software is made available to the user by Löhnert Elektronik free of charge for testing purposes on the user's own systems. The user is not permitted to use the free test version in a productive environment.

5. The use of the LisRT V3 software in the user's productive environment for which a charge is made is governed by § 5 of this Usage and License Agreement.

§ 3 Conclusion of contract

1. By clicking "I Agree", when loading, accessing, installing or using the LisRT V3 software, the user agrees that

   ◦ this Usage and License Agreement is a legally binding agreement,

   ◦ he will comply with the terms and conditions set forth in this Usage and License Agreement; and

   ◦ he will take all necessary steps to ensure that the terms and conditions of this Usage and License Agreement are not breached by any person or entity under his control.

2. If the user uses the LisRT V3 software on behalf of an organisation, the user agrees to be bound by the terms and conditions of this Usage and License Agreement for that organisation.

3. If the user does not agree to these terms and conditions, the user may not load, access, install or use the LisRT V3 software.

4. The installation of the software by Löhnert Elektronik is not part of the contract.

5. Löhnert Elektronik is free to discontinue the provision offer (e.g. by download) at any time.

§ 4 Free license

1. Löhnert Elektronik is the owner of the copyright and other industrial property rights in the LisRT V3 software and reserves all rights in the LisRT V3 software, insofar as these have not been expressly granted to the user in this usage and license agreement.

2. Löhnert Elektronik grants the user a non-exclusive right to use the LisRT V3 software for a limited period of time (hereinafter referred to as the "License"). The License entitles the user to install the LisRT V3 software on a single computer and to use it for test purposes on the test environment.

3. All rights to the source code of the LisRT V3 software are the exclusive property of Löhnert Elektronik. Nevertheless, the source codes - with the exception of customer-specific parts which may be subject to secrecy - are publicly available for inspection. However, the user has no claim whatsoever to access to the source code or to the surrender of the source code. § Section 69e of the German Copyright Act remains unaffected.

4. The open source components are excluded from the above paragraphs (1) to (4) when viewed individually.

5. The user may acquire further rights of use to the software from the respective holders of rights to the open source components if he concludes license agreements with them under the terms of the respective open source license. The license texts of the open source licenses are attached to this agreement as an appendix and permit the processing and further distribution of the open source components within the scope of the respective license. In this case, the use of the software is not covered by this contract, but is governed solely by the terms of the respective open source license.

6. The License to the LisRT V3 software is transferable to a third party, who then has the status of user within the meaning of this License Agreement. The transfer of the LisRT V3 software is effected by the original owner permanently relinquishing all use of the LisRT V3 software and transferring all components of the LisRT V3 software to the new user. The software shall be completely deleted from the systems of the original owner. Existing rights of the original user shall expire at the time of transfer of the license to the LisRT V3 software.

7. Löhnert Elektronik reserves all rights to prohibit unauthorized use of the LisRT V3 software by the user, in particular by asserting claims for injunctive relief and damages.

8. Unauthorized use by the user may also lead to criminal prosecution in accordance with the relevant laws.

§ 5 License subject to costs

1. For the use of the LisRT V3 software in the productive environment, a license fee, the amount of which is to be agreed separately, shall be payable once for each end device of the user.

2. The user shall be obliged to notify Löhnert Elektronik of the use in the productive environment and to obtain written consent.

3. Löhnert Elektronik shall not unreasonably withhold consent to the extent that payment of the license fee specified in No. 1 has been made.

4. Prior to the written consent of Löhnert Elektronik, use shall be permitted solely for test purposes in the user's test environment within the scope of § 4 of this Usage and License Agreement.

5. The provisions of § 4 of this Usage and License Agreement shall apply accordingly.

§ 6 Sublicensing

1. The transfer of the subject matter of the contract shall require the written consent of Löhnert Elektronik.

2. Without the written consent of Löhnert Elektronik, the user shall not be entitled to transfer the software to third parties, in particular to sublicense or lease it.

3. Löhnert Elektronik shall grant its consent if the user, in its capacity as sublicensor, assures Löhnert Elektronik in writing that the third party declares its consent in writing to the sublicensor to the use and license agreement and the transfer conditions agreed herein.

4. The open source components are excluded from the above paragraphs (1) and (2) when viewed individually.

5. The sublicensor undertakes to comply with all provisions of the Apache 2.0 License, MIT License, BSD License and the Microsoft Public License and to pass on existing obligations to the sublicensee. In particular, the license conditions attached to this software shall be passed on.

6. In the event that the subject matter of the agreement is passed on, Löhnert Elektronik shall charge the sublicensee a license fee. The provisions of § 5 of this Usage and License Agreement shall apply accordingly.

§ 7 Further development / developer license

1. Further development of the LisRT V3 software requires the written consent of Löhnert Elektronik and the purchase of a developer license.

2. The developer license is free of charge and is based exclusively on the variant of the LisRT V3 software for use for free purposes as defined in § 4 of this Usage and License Agreement.

3. Further development of the paid version of the LisRT V3 software as defined in § 5 of this Use and License Agreement is not permitted.

4. The user (developer) is permitted to modify the LisRT V3 software and to supplement it for

further applications with his own or third-party program parts if he complies with the following conditions (5) to (7).

5. The name of the software remains "LisRT V3" with an addition by the user (developer) himself, so that it is still recognizable as LisRT V3 and, on the other hand, changes are apparent.

6. The components of LisRT V3 shall be marked with a copyright notice to Löhnert Elektronik GmbH and these license agreements. The user (developer) undertakes to observe all the requirements of the Apache 2.0 License, MIT License, BSD License and the Microsoft Public License and to pass on existing obligations. In particular, the license conditions attached to this software must be passed on.

7. Furthermore, the software must contain the automatic query for compliance with the license conditions in accordance with § 3 subs. 1 and thus draw the user's attention to this.

8. Löhnert Elektronik shall not assume any warranty or liability for defects or damage resulting from further development of the LisRT V3 software by a user (developer). Reference is made to § 8 subs. 4.

§ 8 Obligations of the user

1. The user is obliged to keep the LisRT V3 software in a safe place so that unauthorized access or unauthorized copying is prevented.

2. It is the sole responsibility of the user to set up a functioning hardware and software environment for the LisRT V3 software.

3. The user assumes all responsibilities and obligations with regard to the selection, installation and use of the LisRT V3 software.

4. The user is prohibited from using the LisRT V3 software in areas of particular risk which require fault-free continuous operation of relevant systems and in which failure of the LisRT V3 software could result in immediate danger to life, limb or health or in significant material or environmental damage. Löhnert Elektronik does not warrant or guarantee that the LisRT V3 software is suitable for use in areas of particular risk.

§ 9 Liability

1. Regardless of the legal grounds, Löhnert Elektronik, its vicarious agents and its legal representatives shall be liable for damages insofar as such damages are culpably caused by Löhnert Elektronik and result from injury to life, limb or health.

2. Löhnert Elektronik, its vicarious agents and legal representatives shall be liable for material defects in the use of the LisRT V3 software for free testing purposes for direct damage caused to the user because a defect in the software was fraudulently concealed from the user and for consequential damage caused by intent or gross negligence on the part of Löhnert Elektronik, its vicarious agents or its legal representatives. Any further liability for material defects in the use of the LisRT V3 software for free test purposes is excluded.

3. In the case of use of the LisRT V3 software in the productive environment (§ 5) for which a charge is made, Löhnert Elektronik shall be liable - in addition to liability under § 9 subs. 1 and 2 - for slight negligence only in the event of breach of material obligations. In the event of a slightly negligent breach of an obligation, Löhnert Elektronik shall be liable at

most to the extent of the typically foreseeable damage.

4. Löhnert Elektronik shall not assume any warranty or liability for defects or damage resulting from a modification of the software by third parties (e.g. further development) or from a use not in accordance with the functions specified in the documentation or from failure to comply with the documentation.

5. The input of parameters and limit value data within the LisRT V3 software is not the responsibility of Löhnert Elektronik. Parameters and limit data within the LisRT V3 software are to be defined by the user at his own discretion and under his own responsibility by input.

6. Errors shall only be rectified on the basis of a separate support contract for which payment is to be made or - without obligation - by means of updates for as long as Löhnert Elektronik offers the LisRT V3 software.

7. Löhnert Elektronik is not aware of any legal defects in the software. In the event of defects of title, Löhnert Elektronik, its vicarious agents and its legal representatives shall only be liable for damages incurred by the user because a defect of title in the software was fraudulently concealed from the user. Any further warranty for defects of title is excluded.

8. Löhnert Elektronik, its vicarious agents and its legal representatives shall not be liable for any damage caused by inappropriate, improper or unintended use of the LisRT V3 software.

9. Liability under the German Product Liability Act remains unaffected by this Usage and License Agreement.

§ 10 Applicable law

The contractual relationship between the parties and all disputes arising from or in connection with this contractual relationship shall be governed by the laws of the Federal Republic of Germany. The United Nations Convention on Contracts for the International Sale of Goods shall not apply.

§ 11 Place of jurisdiction

Insofar as the user is a merchant, a legal entity under public law or a special fund under public law or has no general place of jurisdiction in Germany, or moves his place of residence or habitual abode out of Germany after conclusion of the contract or his place of residence or habitual abode is unknown at the time the action is brought, the exclusive place of jurisdiction for all disputes arising from and in connection with the contractual relationship between the parties shall in all such cases be the place of business of Löhnert Elektronik.

§ 12 Dispute resolution

Löhnert Elektronik declares that it is not prepared to participate in consumer arbitration proceedings in accordance with the Consumer Dispute Resolution Act, as the use of the LisRT V3 software by consumers is prohibited.

§ 13 Severability clause

Should one or more provisions of this Usage and License Agreement be or become invalid, this shall not affect the validity of the remaining provisions.

Appendix

Licenses of the open source components (Apache 2.0, MIT, BSD, MS-PL)

- www.opensource.org/licenses/Apache-2.0

- www.opensource.org/licenses/MIT

- www.opensource.org/licenses/BSD-3-Clause

- www.opensource.org/licenses/MS-PL

2. Release Notes

Version	Date	Notes
1.1.2	14.06.2023	• Bug fixes 　◦ Do not set evaluation window if X or Y is 0.0.
1.1.1	13.06.2023	• Bug fixes 　◦ Bump Loehnert.Lisrt.RohdeSchwarz.Qar package to 3.1.1, fixes double saving of results on the QAR50 (Issue #5917)
1.1.0	13.02.2023	• Features 　◦ Add *Measurement.ResultsToSave* node to OPC server (Issue #5498) 　◦ Bump Loehnert.Lisrt package to 1.9.0 • Bug fixes 　◦ Bug fix: QAR50 timeout error message does not disappear while QAR50 warm up (Issue #5445)
1.0.0	16.12.2022	This is the first official release.

3. Description

This program is an OPC UA interface for the R&S®QAR50 Quality Automotive Radome Tester.

4. Installation

This software can be installed on the R&S®QAR50 Quality Automotive Radome Tester PC or on any other PC with Windows 10 64-bit.

1. Install the .NET Framework 4.8 Runtime.

2. Install R&S®VISA

3. Extract the Zip archive, for example to *C:\Users\Public\Qar50OpcInterface*.

4. Add the file *Lisrt\bin\Qar50OpcInterface.exe* to the Startup Apps.

5. Start the *Lisrt\bin\Qar50OpcInterface.exe* and accept the license terms.

6. Restart the R&S®QAR50 Quality Automotive Radome Tester.

5. Configuration

The configuration file *station.config* is located in *Lisrt\WorkSpace\Configuration*.

6. OPC Server

- Port: 4840
- Encryption: none
- Authentication: none

6.1. Nodes

Node-ID	Type	Access Level	Description
ns=2;s=Qar50			
ns=2;s=Qar50.Measurement.Type	Measurement Type	Read, Write	Sets the measurement type
ns=2;s=Qar50.Measurement.EvaluationWindow.X	Float	Read, Write	Length of the horizontal side of the evaluation window in millimeters, from 10.0 to 100.0. Use 0.0 to not set the evaluation window.
ns=2;s=Qar50.Measurement.EvaluationWindow.Y	Float	Read, Write	Length of the vertical side of the evaluation window in millimeters, from 10.0 to 100.0. Use 0.0 to not set the evaluation window.
ns=2;s=Qar50.Measurement.ResultsToSave	ResultsToSave	Read, Write	Gets or sets a value indicating which results to save.
ns=2;s=Qar50.Measurement.ResultDirectory	String	Read, Write	Gets or sets the path to store measurement results on the QAR50 PC. An empty string doesn't change the path.
ns=2;s=Qar50.Measurement.Trigger	Boolean	Read, Write	A rising edge starts the current MeasurementType. The trigger is only accepted if the state is Ready.

Node-ID	Type	Access Level	Description
ns=2;s=Qar50.Measurement.Reflection.NormalizationRequired	Boolean	Read	Gets a value indicating whether normalization of transmission measurement is required.
ns=2;s=Qar50.Measurement.Transmission.NormalizationRequired	Boolean	Read	Gets a value indicating whether normalization of transmission measurement is required.
ns=2;s=Qar50.Measurement.State	State	Read	Gets the current state.
ns=2;s=Qar50.Result			Gets the results.
ns=2;s=Qar50.Result.State	ResultState	Read	Gets the state of the result.
ns=2;s=Qar50.Result.Reflection			Gets the reflection results.
ns=2;s=Qar50.Result.Reflection.Cluster1			Gets the reflection result measured with antenna cluster 1.
ns=2;s=Qar50.Result.Reflection.Cluster1.MeanBand1dB	Float	Read	Gets the mean value of band 1 in dB.
ns=2;s=Qar50.Result.Reflection.Cluster1.MeanBand1Percent	Float	Read	Gets the mean value of band 1 in percent.
ns=2;s=Qar50.Result.Reflection.Cluster1.MeanBand2dB	Float	Read	Gets the mean value of band 2 in dB.
ns=2;s=Qar50.Result.Reflection.Cluster1.MeanBand2Percent	Float	Read	Gets the mean value of band 2 in percent.
ns=2;s=Qar50.Result.Reflection.Cluster1.FResponseMinimumdB	Float	Read	Gets the response minimum value in dB.
ns=2;s=Qar50.Result.Reflection.Cluster1.FResponseMinimumPercent	Float	Read	Gets the response minimum value in percent.
ns=2;s=Qar50.Result.Reflection.Cluster1.FResponseMinimumFrequencyValue	Float	Read	Gets the frequency of the response minimum in hertz.
ns=2;s=Qar50.Result.Reflection.Cluster2			Gets the reflection result measured with antenna cluster 2.
ns=2;s=Qar50.Result.Reflection.Cluster2.MeanBand1dB	Float	Read	Gets the mean value of band 1 in dB.
ns=2;s=Qar50.Result.Reflection.Cluster2.MeanBand1Percent	Float	Read	Gets the mean value of band 1 in percent.
ns=2;s=Qar50.Result.Reflection.Cluster2.MeanBand2dB	Float	Read	Gets the mean value of band 2 in dB.

Node-ID	Type	Access Level	Description
ns=2;s=Qar50.Result.Reflection.Cluster2.MeanBand2Percent	Float	Read	Gets the mean value of band 2 in percent.
ns=2;s=Qar50.Result.Reflection.Cluster2.FResponseMinimumdB	Float	Read	Gets the response minimum value in dB.
ns=2;s=Qar50.Result.Reflection.Cluster2.FResponseMinimumPercent	Float	Read	Gets the response minimum value in percent.
ns=2;s=Qar50.Result.Reflection.Cluster2.FResponseMinimumFrequencyValue	Float	Read	Gets the frequency of the response minimum in hertz.
ns=2;s=Qar50.Result.Transmission			Gets the transmission results.
ns=2;s=Qar50.Result.Transmission.Attenuation			Gets the attenuation.
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanBand1dB	Float	Read	Gets the mean of band 1 in decibel.
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanBand1Percent	Float	Read	Gets the mean of band 1 in percent
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanBand2dB	Float	Read	Gets the mean of band 2 in decibel.
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanBand2Percent	Float	Read	Gets the mean of band 2 in percent
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanPhaseBand1Degree	Float	Read	Gets the mean phase of band 1 in degree
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanPhaseBand1Radian	Float	Read	Gets the mean phase of band 1 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanPhaseBand2Degree	Float	Read	Gets the mean phase of band 2 in degree
ns=2;s=Qar50.Result.Transmission.Attenuation.MeanPhaseBand2Radian	Float	Read	Gets the mean phase of band 2 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.StdDevPhaseBand1Degree	Float	Read	Gets the standard deviation of the phase of band 1 in degree.

Node-ID	Type	Access Level	Description
ns=2;s=Qar50.Result.Transmission.Attenuation.StdDevPhaseBand1Radian	Float	Read	Gets the standard deviation of the phase of band 1 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.StdDevPhaseBand2Degree	Float	Read	Gets the standard deviation of the phase of band 2 in degree.
ns=2;s=Qar50.Result.Transmission.Attenuation.StdDevPhaseBand2Radian	Float	Read	Gets the standard deviation of the phase of band 2 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.MaxDevPhaseBand1Degree	Float	Read	Gets the maximum deviation of the phase of band 1 in degree.
ns=2;s=Qar50.Result.Transmission.Attenuation.MaxDevPhaseBand1Radian	Float	Read	Gets the maximum deviation of the phase of band 1 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.MaxDevPhaseBand2Degree	Float	Read	Gets the maximum deviation of the phase of band 2 in degree.
ns=2;s=Qar50.Result.Transmission.Attenuation.MaxDevPhaseBand2Radian	Float	Read	Gets the maximum deviation of the phase of band 2 in radian.
ns=2;s=Qar50.Result.Transmission.Attenuation.FResponseMinimumdB	Float	Read	Gets the minimal attenuation in decibel.
ns=2;s=Qar50.Result.Transmission.Attenuation.FResponseMinimumPercent	Float	Read	Gets the minimal attenuation in percent.
ns=2;s=Qar50.Result.Transmission.Attenuation.FResponseMinimumFrequencyValue	Float	Read	Gets the frequency in hertz at which attenuation is minimal.

6.2. Data Types

6.2.1. MeasurementType

The data type MeasurementType is a sub type of Enumeration. Represents the measurement type of QAR50.

Value	Value (int)	Description
Measure	0	Standard radome measurement
NormalizeReflection	1	Normalize reflection
NormalizeTransmission	2	Normalize transmission

6.2.2. ResultsToSave

The data type ResultsToSave is a sub type of Enumeration. Specifies which results should be saved.

Value	Value (int)	Description
Default	0	Results to be saved are configured in the QAR50 software.
Numerical	1	Numerical results are saved.
ResultsImages	2	All results and images are saved.
ResultsImagesVolumeData	3	All results, images and 3D data are saved.

6.2.3. State

The data type State is a sub type of Enumeration. Represents the state of the QAR50 OPC interface.

Value	Value (int)	Description
NotInitialized	0	
Initializing	1	
Ready	2	
Measuring	3	
Processing	4	After measuring the QAR50 must process the measured data, this takes several seconds.
Error	5	The QAR50 device is in an error state.

6.2.4. ResultState

The data type ResultState is a sub type of Enumeration. Represents the state of the measurement results.

Value	Value (int)	Description
NotValid	0	Measurement result is not valid.
Valid	1	Measurement result is valid.
Failed	2	An error occurred while measuring.

7. Timing

The state *Measuring* for normal measurements usually takes 500ms. But it takes several seconds if the evaluation window changes. The DUT can be removed, when the state changes to *Processing*.

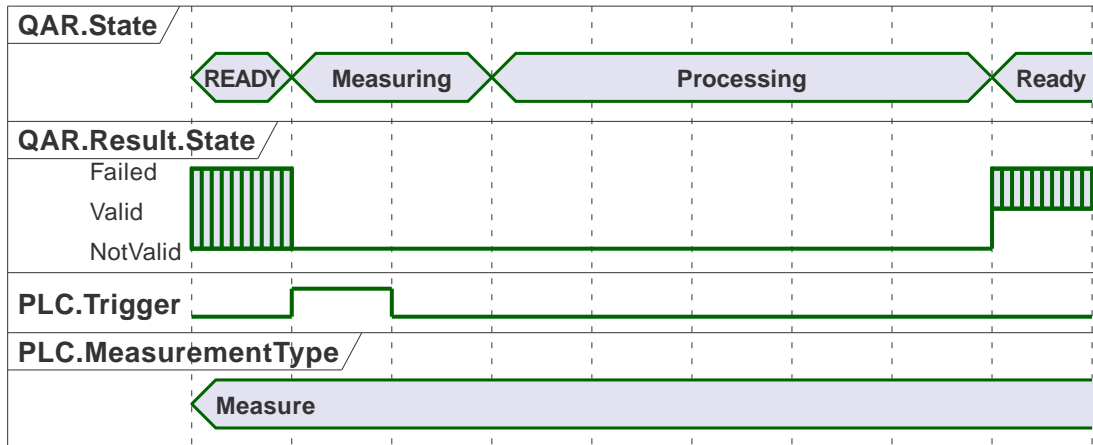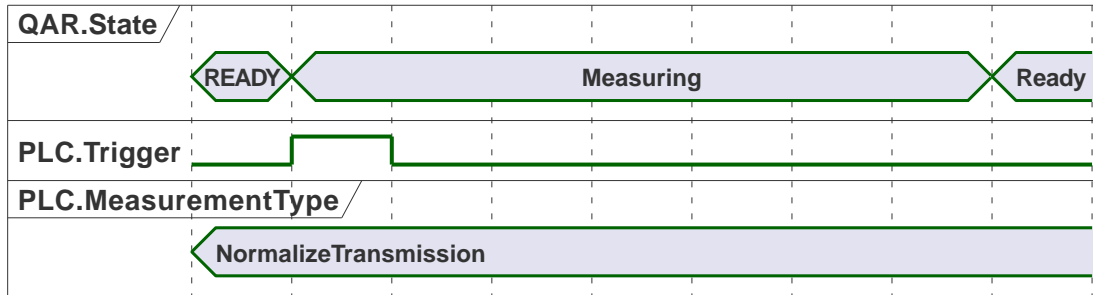*Figure 1. Timing diagram of a measurement*

Figure 2. Timing diagram of normalization of transmission

Glossary

DUT

Device **U**nder **T**est