

TCXO shortage – Sigfox certification impacts

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CHANGES DESCRIPTION

[illegible]

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1. Introduction

Due to AKM manufacturing plant damage on 3 November 2020, production and distribution of TCXO will be impacted. It may be necessary for Device/module makers find a different solution for their products.

This document explains the impact on Sigfox certification if there is a TCXO change in a Sigfox certified product.

2. Warning

In the research of a new TCXO, partners must keep a particular attention to:

- TCXO starting time to achieve a compliance with Sigfox Spec (dynamic drift)
- TCXO phase noise (regarding reception sensitivity impacts)
- TCXO performance to achieve a compliance on device lifetime frequency selection

In any case, **the chosen solution must comply with Sigfox requirements**. This compliance must be shown with a test report with the needed tests (depending on the changes) as well as the documents associated with the new components and the associated changes.

Temperature Frequency tolerance added to Aging frequency tolerance and Static Frequency Tolerance must be less or equal to +/- 20 ppm during all the product life.

3. Replacement solution

We suggest 3 main possibilities:

- Another TCXO - equivalent in term of technical characteristics and PIN to PIN compatible
- Another TCXO - equivalent in term of technical characteristics but **not** PIN to PIN compatible
- Replace TCXO by a Quartz

The table below details what the partner must to do to be in conformity with Sigfox certification:

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Partner owner of a	Modification	Testing	Who test?	Certification
Certified Modular design (module or ref design)	New TCXO PIN to PIN compatible*	Reduced testing (test mode C and E). SDR dongle tests accepted**	Partner or accredited test house	Free upgrade
	New TCXO not PIN to PIN compatible*	full RF & protocol	Accredited test house	Free upgrade
	Replace TCXO by a Quartz*	full RF & protocol	Accredited test house	Free upgrade
Devices certified on full approach	New TCXO PIN to PIN compatible	Reduced testing (test mode C and E). SDR dongle tests accepted**	Partner or accredited test house	Free upgrade
	New TCXO not PIN to PIN compatible	full RF & protocol	Accredited test house	Free upgrade
	Replace TCXO by a Quartz	full RF & protocol	Accredited test house	Free upgrade
Certified devices using a modular approach (using a certified module or ref design)	Using the upgraded modular design (after the modular design maker did the upgrade certif)	N/A	N/A	N/A

* an upgrade is only possible when the output power remains the same (+2dB). In other case, the product is considered as a new product.

**In case test is done by the partner, delta testing with SDR dongle will be requested

- Test report with test mode C and E tests executed with certified solution
- Test report with test mode C and E tests executed with the new TCXO
- Both testing must be done at the same time (same day) and with the same SDR Dongle and same conditions.
- Test reports can be generated via build <https://build.sigfox.com/tools/rf-protocol-report-generator>

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4. Cost impact

- To help Sigfox partners to pass through this global shortage, we have relaxed the process to upgrade certificates **when choosing a Pin-to-Pin compatible TCXO**: delta testing with SDR dongle will be accepted (no need to do it in an accredited test house).
- If you need to perform RF & Protocol tests in an accredited test house, please contact them directly and request a quotation.
- The Sigfox upgrade certification via build will be for free, for any solution of TCXO replacement chosen.
<https://build.sigfox.com/>

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5. RSA test mode

On RSA, **test mode C** correspond to test:

- “UL – RF Analysis Minimum Voltage”
- “UL - RF Analysis Maximum Voltage”
- “UL - RF Analysis Nominal Voltage”

On RSA, **test mode E** correspond to test: “DL – Budget Link”

List of Test mode C and E tests (also available in Sigfox RF & Protocol documentation in Build):

<https://build.sigfox.com/sigfox-certification-baseline-CBL/#current-mandatory-cbl>

Requirement title	Test Setup	Test	U/C	Condition
[PRS-RFP-004] Static Frequency Tolerance	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-010] DBPSK Modulation	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-011] Phase Measurement	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-012] Extra symbols before the first Sigfox bit of the frame	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-013] Extra symbols after the last Sigfox bit of the frame	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-014] TX Max Symbol duration	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-015] Max TX Baudrate Cumulated Error	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-016] Power Spectral Density for class 0 and 1	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-017] Power Spectral Density for class 2 and 3	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-018] Transitional Frequency Dynamic Drift	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-019] Established Frequency Dynamic Drift	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-021] Sigfox Link Budget	TX/RX Test Setup	E	C	DOWNLINK
[PRS-RFP-070] Modulated Conducted Output Power	TX Test Setup - DBPSK Modulation Quality	C	U	
[PRS-RFP-073] I/Q Wave record	TX Test Setup - Demodulated Information	C	U	

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6. Conclusion

SCA remains available for any question/advice related to this topic certif@sigfox.com