

# TCXO replacement solution

## TCXO replacement solution

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### CHANGES DESCRIPTION

Version	Description	Author	Date
1.0	Creation	L. Bordes	14/12/2020
2.0	Contact update; minor correction	A. Trombetta	20/09/2022

## TCXO replacement solution

### 1. Introduction

Since an industrial accident at a factory, TCXO production and distribution have been impacted. Device/module makers could be forced to find a different solution for their products.

This document explains the process to follow to replace the TCXO reference in your design.

### 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 all cases **the chosen solution must comply with Sigfox technical requirements**, and 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 see 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

## TCXO replacement solution

Below what the partner will have to do to be in conformity with Sigfox certification:

Partner owner of a	Modification	Testing	Who test?	Certification
Certified <b>Modular design</b> (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 <b>not</b> 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
<b>Devices</b> certified on <b>full approach</b>	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 <b>not</b> 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 <b>devices</b> using a <b>modular approach</b> (using a certified module or ref design)	Using the upgraded modular design (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 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 test 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	Condition
[ PRS-RFP-004 ] Static Frequency Tolerance	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-010 ] DBPSK Modulation	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-011 ] Phase Measurement	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-012 ] Extra symbols before the first Sigfox bit of the frame	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-013 ] Extra symbols after the last Sigfox bit of the frame	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-014 ] TX Max Symbol duration	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-015 ] Max TX Baudrate Cumulated Error	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-016 ] Power Spectral Density for class 0 and 1	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-017 ] Power Spectral Density for class 2 and 3	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-018 ] Transitional Frequency Dynamic Drift	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-019 ] Established Frequency Dynamic Drift	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-021 ] Sigfox Link Budget	TX/RX Test Setup	E	DOWNLINK
[ PRS-RFP-070 ] Modulated Conducted Output Power	TX Test Setup - DBPSK Modulation Quality	C	
[ PRS-RFP-073 ] I/Q Wave record	TX Test Setup - Demodulated Information	C	

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## 6. Conclusion

Sigfox Certification Authority remains available for any question/advice related to this topic at [sigfox-certification@unabiz.com](mailto:sigfox-certification@unabiz.com)