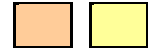# Transition Guide SGP30 to SGP41
Comparison of Specifications

This guideline is intended to help with the design transition from the older-legacy SGP30 sensors to Sensirion's next generation SGP41 sensor. It shows, where changes in design and programming are required to implement the SGP41 into an existing device using SGP30. Major changes are highlighted in orange, while minor changes with minimal impact on the application are highlighted in yellow. Care has been taken that only a minimum amount of adaptations need to be considered for replacement.
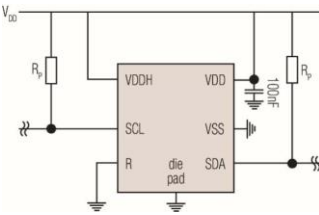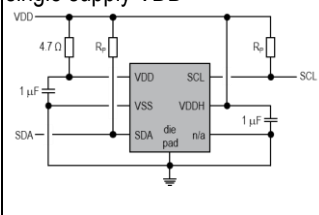
Actions highlighted in orange and yellow need to be considered:
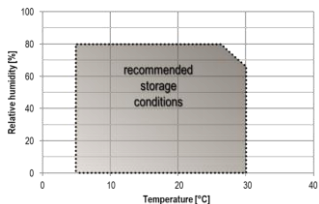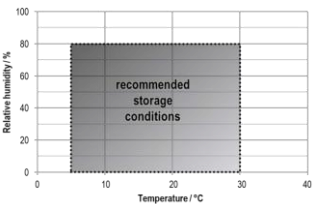
1   Gas Sensing Specifications
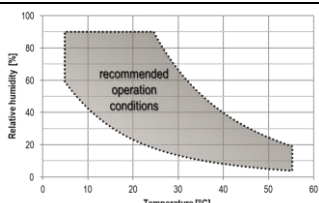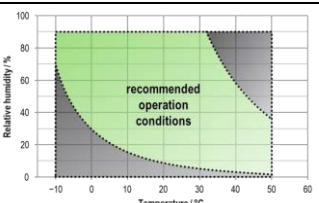
Parameter	SGP30	SGP41	Action/Remark
Processed signal outputs	TVOC signal in ppb CO2eq signal in ppm	VOC and NO_x Index signal (via external Gas Index Algorithm)	TVOC in ppb and CO2eq in ppm not available anymore
Raw signal outputs	SOUT px1 SOUT px3 (humidity compensated)	SRAW_VOC, SRAW_NOX (humidity compensated)	Two new raw signals are provided which are differently scaled compared to SOUT of SGP30
Measurement range	0–1'000 ppm of ethanol (TVOC signal) 0–1'000 ppm of H_2 (CO2eq signal)	0–1'000 ppm of ethanol (VOC signal) 0–10'000 ppb of NO_2 (NO_x signal)	No change wrt VOC signal
Specified range	0.3–30 ppm of ethanol (TVOC signal) 0.5–3 ppm of H_2 (CO2eq signal)	0.5–10 ppm of ethanol (VOC signal) 50–650 ppb of NO_2 (NO_x signal)	Smaller range wrt VOC signal
Accuracy	typ. 15 % m.v. (TVOC signal) typ. 10 % m.v. (CO2eq signal)	Not specified	Not part of specifications anymore
Long-term drift	typ. 1.3 % m.v. (TVOC signal) typ. 1.3 % m.v. (CO2eq signal)	Included in min/max spec of sensitivity	Not part of specifications anymore
Resolution	0.2 % m.v.	Not specified	Not part of specifications anymore
Device-to-device variation	Not specified	<±15 VOC Index points or <±15 % VOC Index m.v., the larger <±50 NO_x Index points or <±50 % NOx Index m.v., the larger	New specification
Repeatability	Not specified	<±5 VOC/NO_x Index points or <±5 % VOC/NO_x Index m.v., the larger	New specification
Limit of detection	Not specified	<50 ppb or <10 % of concentration setpoint (ethanol) <20 ppb or <10 % of concentration setpoint (NO_2)	New specification
Response time	Not specified	τ_{63} < 10 s (ethanol) τ_{63} < 250 s (NO_2)	New specification

		Time until specifications are met:	
Switch-on behavior	Time until specifications are met: 24 h	<1 h (SRAW_VOC) <1.5 h (VOC Index) <7 d (SRAW_NOX) <6 h (NO$_x$ Index) Time until reliably detecting VOC/NO$_x$ events: <60 s	Much shorter switch-on time
Sensitivity	Not specified	SRAW_VOC: Min.: −710 ticks Typ.: −870 ticks Max.: −1'030 ticks SRAW_NOX: Min.: +950 ticks Typ.: +1'480 ticks Max.: +2'010 ticks (min./max. incl. drift over lifetime)	New specification

2 Sensor Integration

Parameter	SGP30	SGP41	Action/Remark
Supply Voltage VDD & VDDH	1.62–1.98 V	1.7–3.6 V	Wider range for supply voltage
Min/max rating for supply voltage	−0.3–2.16 V	−0.3–3.6 V	Wider range for supply voltage
Sleep/idle Current	Typical: 2 µA (sleep)	Typical: 34 µA (idle)	
Supply current under operation	Typical: 48.8 mA	Typical: 4.3 mA/ 1.8 V or 3.0 mA/ 3.3 V	
Size	2.45 x 2.45 x 0.9 mm^3	2.44 x 2.44 x 0.85 mm^3	Adapted size of the package
Footprint & pinout	2x3 pins DFN package, see datasheet	2x3 pins DFN package, see datasheet	Same footprint, same pinout, central die pad changed, no PCB layout change needed
Electrical interface	100 nF, VDD & VDDH must be connected to one single supply VDD 	2x 1 µF, add R inline, VDD & VDDH must be connected to one single supply VDD 	Change capacitors and add resistor in series. Connect VDD and VDDH to one single supply VDD before the RC low pass.
Pin size	0.4 x 0.55 mm^2	0.4 x 0.55 mm^2	No change
Pin pitch	0.8 mm	0.8 mm	No change

3 Handling

Parameter	SGP30	SGP41	Action/Remark
Soldering Instructions	See datasheet	See datasheet	No change
Recommended storage conditions			Wider accepted range for storage conditions
Min/max storage conditions	−40 to +125 °C 10 to 95 % RH (non-condensing) conditions valid for electrical integrity only, but not for gas sensing specs	short-term −40 to +70 °C 0 to 80 % RH. (non-condensing) conditions valid for both electrical integrity and gas sensing specs	Specifications much clearer now since it considers integrity of entire product (electrical parts and MOX)
Recommended operating conditions	 Area considers only maximum applicable relative humidity and range for which humidity compensation has been optimized for	 Green area marks conditions for which humidity compensation has been optimized.	Wider range for operating conditions
Min/max operating conditions	−40 to +85 °C 10 to 95 % RH (non-condensing) conditions valid for electrical integrity only, but not for gas sensing specs	−20 to +55 °C 0 to 90 % RH (non-condensing) conditions valid for both electrical integrity and gas sensing specs	Specifications much clearer now since it considers integrity of entire product (electrical parts and MOX)
Exposure to light	No instructions.	The SGP40 should not be exposed directly to either sunlight or artificial light sources during operation.	Adapt mechanical design according to Handling Instructions.
Dust protection membrane			Optical change, white spot now not centered, no functional change.

4 Sensor Operation

Parameter	SGP30	SGP41	Action/Remark
Operation mode	continuous	continuous	No change
Sampling interval	max.: – typ.: 1 s (optimized for baseline algorithm) min.: 25 ms (40 Hz)	max.: 10 s typ.: 1 s (needed for Gas Index Algorithm) min.: 0.5 s	Limited range of sampling interval
Humidity compensation	on-chip	on-chip	No change
Signal processing	on-chip (ppb output)	external (VOC/NO$_x$ Index output)	Gas Index Algorithm must be implemented on external MCU
Start-up	in sleep mode	in idle mode	
Built-in self-test (BIST)	on-chip	on-chip	No change

5 Communication with Sensor

Parameter	SGP30	SGP41	Action/Remark
Protocol	I^{2}C	I^{2}C	No change
I^{2}C address	0x58	0x59	Change of I^{2}C address in driver software
Start-up time	400 ms	400 ms	No change
Start/Stop sequence	See datasheet	See datasheet	Reprogram according to datasheet
Initialization command	Hex. code: 0x20 03	Not provided	Not needed
Measure IAQ command	Hex. code: 0x20 08	Not provided	Not needed
Get IAQ baseline command	Hex. code: 0x20 15	Not provided	Not needed
Set IAQ baseline command	Hex. code: 0x20 1E	Not provided	Not needed
Get TVOC inceptive baseline command	Hex. code: 0x20 B3	Not provided	Not needed
Set TVOC baseline command	Hex. code: 0x20 77	Not provided	Not needed
Set humidity command	Hex. code: 0x20 61	Humidity values are provided as parameters together with the measure command	Reprogram according to datasheet
Execute conditioning command	Not provided	Hex. code: 0x26 12 Time = 45 ms Needed to condition the px2 after each restart of the sensor. The conditioning should be performed for 10 s before calling the first measurement command.	New command
Measure raw signal command	Hex. code: 0x20 50 Time = 20 ms The command is used for reading out the raw signals of px1 and px3.	Hex. code: 0x26 19 Time = 45 ms The command is used to start/continue the operation mode, performing a measurement, and returning the raw signal of px1 and px2. Additionally, temperature and humidity values must be provided along with the command at any time. For details, please refer to the datasheet.	This is the standard command which must be implemented for operating SGP41

Heater off command	Not provided	Hex. code: 0x36 15	Added function to enter idle mode from VOC+NO$_x$ measurement mode
Built-in self-test (BIST) command	Hex. code: 0x20 32 Time = 200 ms Returned result: 0xD4 00 if all tests successfully passed	Hex. code: 0x28 0E Time = 300 ms Returned result: 0xXX 00 (ignore XX byte) if all tests successfully passed	Reprogram according to datasheet
Soft reset command	Hex. code: 0x00 06	Hex. code: 0x00 06	No change
Get serial number command	Hex. code: 0x36 82	Hex. code: 0x36 82	No change
Get feature set command	Hex. code: 0x20 2F	Not provided	Feature dropped
CRC checksum	See datasheet	See datasheet	No change

6   Further Specifications

Parameter	SGP30	SGP41	Action/Remark
Environmental stability	Following JEDEC JESD47; MSL1	Following JEDEC JESD47; MSL1	No change
Shelf-life	not specified	It is recommended to further process the sensors within 1 year after date of delivery.	Shelf-life to be considered (Sensirion warranty is valid for 1 year after purchase)
Material contents	RoHS, REACH, Hal-free, WEEE compliant	RoHS, REACH, Hal-free, WEEE compliant	No change

Disclaimer:
This guideline has been made with care, it may, however, not be fully complete. For proper integration of SGP40, please also consult the latest version of the data sheet (available on VOC+NO$_x$ Sensor SGP41 | Sensirion).

Revision History

Date	Revision	Changes
March 2022	1.0	Initial release

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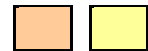info-cn@sensirion.com
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To find your local representative, please visit www.sensirion.com/distributors

Transition Guide SGP30 to SGP40
Comparison of Specifications

This guideline is intended to help with the design transition from the older-legacy SGP30 sensors to Sensirion's next generation SGP40 sensor. It shows, where changes in design and programming are required to implement the SGP40 into an existing device using SGP30. Major changes are highlighted in orange, while minor changes with minimal impact on the application are highlighted in yellow. Care has been taken that only a minimum amount of adaptations need to be considered for replacement.
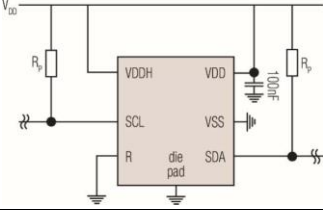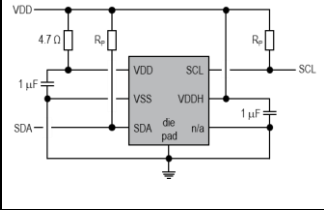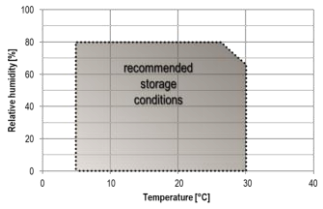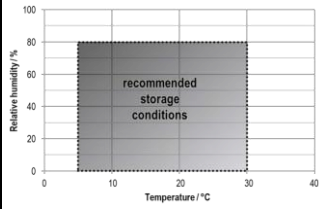
Actions highlighted in orange and yellow need to be considered:

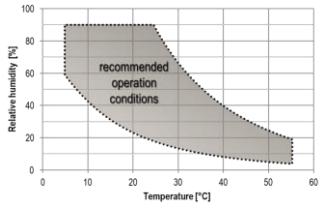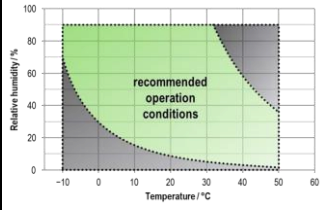# 1   Gas Sensing Specifications

Parameter	SGP30	SGP40	Action/Remark
Processed signal outputs	TVOC signal in ppb CO2eq signal in ppm	VOC Index signal (via external Gas Index Algorithm)	Only VOC Index available
Raw signal outputs	SOUT px1 SOUT px3 (humidity compensated)	SRAW_VOC (humidity compensated)	Only one raw signal is provided and it is differently scaled compared to SOUT of SGP30
Measurement range	0–1'000 ppm of ethanol (TVOC signal) 0–1'000 ppm of H_2 (CO2eq signal)	0–1'000 ppm of ethanol	No change wrt ethanol signal
Specified range	0.3–30 ppm of ethanol (TVOC signal) 0.5–3 ppm of H_2 (CO2eq signal)	0.5–10 ppm of ethanol	Smaller range
Accuracy	typ. 15 % m.v. (TVOC signal) typ. 10 % m.v. (CO2eq signal)	Not specified	Not part of specifications anymore
Long-term drift	typ. 1.3 % m.v. (TVOC signal) typ. 1.3 % m.v. (CO2eq signal)	Included in min/max spec of sensitivity	Not part of specifications anymore
Resolution	0.2 % m.v.	Not specified	Not part of specifications anymore
Device-to-device variation	Not specified	<±15 VOC Index points or <±15 % VOC Index m.v., the larger	New specification
Repeatability	Not specified	<±5 VOC Index points or <±5 % VOC Index m.v., the larger	New specification
Limit of detection	Not specified	<50 ppb or <10 % of concentration setpoint (ethanol)	New specification
Response time	Not specified	τ_{63} < 10 s τ_{90} < 30 s	New specification
Switch-on behavior	Time until specifications are met: 24 h	Time until specifications are met: <1 h Time until reliably detecting VOC events: <60 s	Much shorter switch-on time
Sensitivity	Not specified	Min.: −710 ticks Typ.: −870 ticks Max.: −1'030 ticks (min./max. incl. drift over lifetime)	New specification

2 Sensor Integration

Parameter	SGP30	SGP40	Action/Remark
Supply Voltage VDD & VDDH	1.62–1.98 V	1.7–3.6 V	Wider range for supply voltage
Min/max rating for supply voltage	−0.3–2.16 V	−0.3–3.6 V	Wider range for supply voltage
Sleep/idle Current	Typical: 2 μA (sleep)	Typical: 34 μA (idle)	
Supply current under operation	Typical: 48.8 mA	Typical: 3.5 mA/ 1.8 V or 2.6 mA/ 3.3 V	
Size	2.45 x 2.45 x 0.9 mm^3	2.44 x 2.44 x 0.85 mm^3	Adapted size of the package
Footprint & pinout	2x3 pins DFN package, see datasheet	2x3 pins DFN package, see datasheet	Same footprint, same pinout, central die pad changed, no PCB layout change needed
Electrical interface	100 nF, VDD & VDDH must be connected to one single supply VDD	2x 1 μF, add R inline, VDD & VDDH must be connected to one single supply VDD	Change capacitors and add resistor in series. Connect VDD and VDDH to one single supply VDD before the RC low pass.
Pin size	0.4 x 0.55 mm^2	0.4 x 0.55 mm^2	No change
Pin pitch	0.8 mm	0.8 mm	No change

3 Handling

Parameter	SGP30	SGP40	Action/Remark
Soldering Instructions	See datasheet	See datasheet	No change
Recommended storage conditions			Wider accepted range for storage conditions
Min/max storage conditions	−40 to +125 °C 10 to 95 % RH (non-condensing) conditions valid for electrical integrity only, but not for gas sensing specs	short-term −40 to +70 °C 0 to 80 % RH. (non-condensing) conditions valid for both electrical integrity and gas sensing specs	Specifications much clearer now since it considers integrity of entire product (electrical parts and MOX)
Recommended operating conditions	Area considers only maximum applicable relative humidity and range for which humidity compensation has been optimized for	Green area marks conditions for which humidity compensation has been optimized.	Wider range for operating conditions

Parameter	SGP30	SGP40	Action/Remark
Min/max operating conditions	−40 to +85 °C 10 to 95 % RH (non-condensing) conditions valid for electrical integrity only, but not for gas sensing specs	−20 to +55 °C 0 to 90 % RH (non-condensing) conditions valid for both electrical integrity and gas sensing specs	Specifications much clearer now since it considers integrity of entire product (electrical parts and MOX)
Exposure to light	No instructions.	The SGP40 should not be exposed directly to either sunlight or artificial light sources during operation.	Adapt mechanical design according to Handling Instructions.
Dust protection membrane			Optical change, white spot now not centered, no functional change.

4   Sensor Operation

Parameter	SGP30	SGP40	Action/Remark
Operation mode	continuous	continuous	No change
Sampling interval	max.: – typ.: 1 s (optimized for baseline algorithm) min.: 25 ms (40 Hz)	max.: 10 s typ.: 1 s (needed for Gas Index Algorithm) min.: 0.5 s	Limited range of sampling interval
Humidity compensation	on-chip	on-chip	No change
Signal processing	on-chip (ppb output)	external (VOC Index output)	Gas Index Algorithm must be implemented on external MCU
Start-up	in sleep mode	in idle mode	
Built-in self-test (BIST)	on-chip	on-chip	No change

5   Communication with Sensor

Parameter	SGP30	SGP40	Action/Remark
Protocol	I²C	I²C	No change
I²C address	0x58	0x59	Change of I²C address in driver software
Start-up time	400 ms	400 ms	No change
Start/Stop sequence	See datasheet	See datasheet	Reprogram according to datasheet
Initialization command	Hex. code: 0x20 03	Not provided	Not needed
Measure IAQ command	Hex. code: 0x20 08	Not provided	Not needed
Get IAQ baseline command	Hex. code: 0x20 15	Not provided	Not needed
Set IAQ baseline command	Hex. code: 0x20 1E	Not provided	Not needed
Get TVOC inceptive baseline command	Hex. code: 0x20 B3	Not provided	Not needed
Set TVOC baseline command	Hex. code: 0x20 77	Not provided	Not needed

Set humidity command	Hex. code: 0x20 61	Humidity values are provided as parameters together with the measure command	Reprogram according to datasheet
Measure raw signal command	Hex. code: 0x20 50 Time = 20 ms The command is used for reading out the raw signals of px1 and px3.	Hex. code: 0x26 0F Time = 25 ms The command is used to start/continue the operation mode, performing a measurement, and returning the raw signal of px1. Additionally, temperature and humidity values must be provided along with the command at any time. For details, please refer to the datasheet.	This is the standard command which must be implemented for operating SGP40
Heater off command	Not provided	Hex. code: 0x36 15	Added function to enter idle mode from VOC operation mode
Built-in self-test (BIST) command	Hex. code: 0x20 32 Time = 200 ms Returned result: 0xD4 00 if all tests successfully passed	Hex. code: 0x28 0E Time = 300 ms Returned result: 0xD4 XX (XX byte to be ignored) if all tests successfully passed	Reprogram according to datasheet
Soft reset command	Hex. code: 0x00 06	Hex. code: 0x00 06	No change
Get serial number command	Hex. code: 0x36 82	Hex. code: 0x36 82	No change
Get feature set command	Hex. code: 0x20 2F	Not provided	Feature dropped
CRC checksum	See datasheet	See datasheet	No change

6 Further Specifications

Parameter	SGP30	SGP40	Action/Remark
Environmental stability	Following JEDEC JESD47; MSL1	Following JEDEC JESD47; MSL1	No change
Shelf-life	not specified	It is recommended to further process the sensors within 1 year after date of delivery.	Shelf-life to be considered (Sensirion warranty is valid for 1 year after purchase)
Material contents	RoHS, REACH, Hal-free, WEEE compliant	RoHS, REACH, Hal-free, WEEE compliant	No change

Disclaimer:
This guideline has been made with care, it may, however, not be fully complete. For proper integration of SGP40, please also consult the latest version of the data sheet (available on VOC Sensor SGP40 | Sensirion).

Revision History

Date	Revision	Changes
December 2020	1.0	Initial release
March 2022	1.1	Editorial changes

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