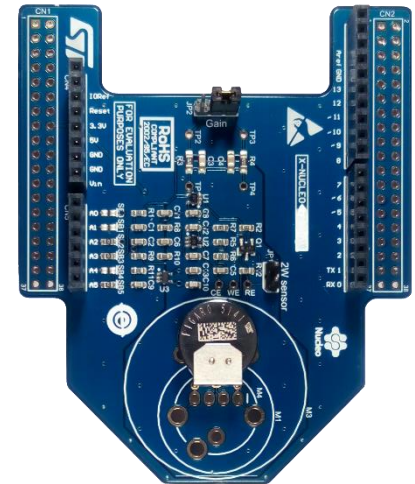


Quick Start Guide

Gas sensing expansion board for electrochemical sensors
(P-NUCLEO-IKA02A1)



Version 1.0 (February 1st, 2017)

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STM32 Nucleo multifunctional expansion board for gas sensors

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Documents & Related Resources

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Setup & Demo Examples

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STM32 Nucleo multifunctional expansion board for gas sensors

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Setup & Demo Examples

Electrochemical gas sensor expansion board

Hardware overview

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P-NUCLEO-IKA02A1 Hardware description

- The P-NUCLEO-IKA02A1 is an electrochemical gas sensor evaluation board.
- It embeds several footprints to host different types of the sensors and different target gas.
- The connectivity assured thanks to Arduino UNO R3 connector and ST morpho connector layout.

Key products on board

TSU111

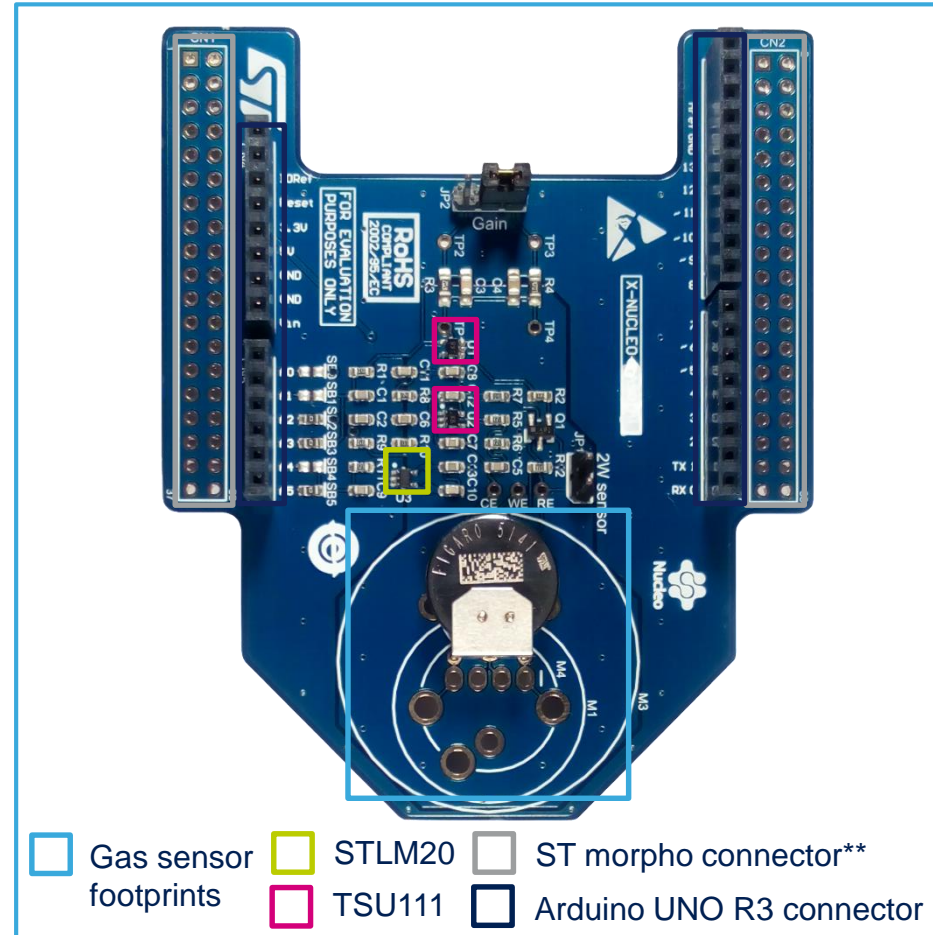
Nanopower (900 nA), high accuracy (150 uV) 5V operational amplifier

STLM20

Ultra-low current 2.4 V precision analog temperature sensor

Gas sensor

4 different footprints for various electrochemical gas sensors (PCD 13,5mm, PCD 17mm, miniature, TGS5141)



Latest info available at www.st.com
P-NUCLEO-IKA02A1

** Connector for the STM32 Nucleo Board

Electrochemical gas sensor expansion board

Software overview

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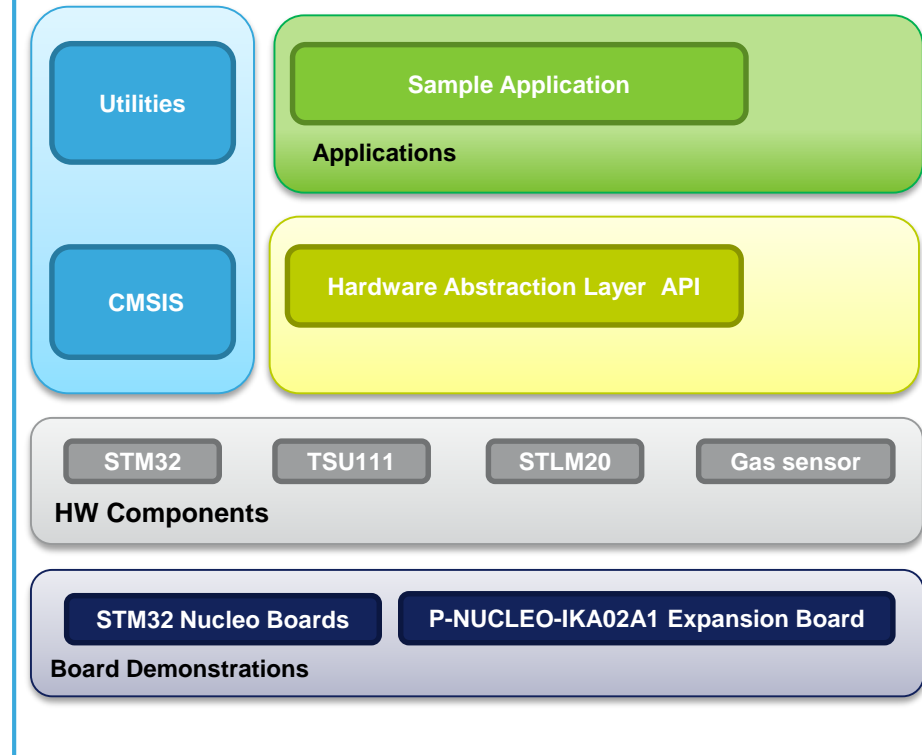
X-CUBE-IKA02A1 Software description

- The X-CUBE-IKA02A1 software package is an expansion for STM32Cube, associated with the P-NUCLEO-IKA02A1 expansion board.
- It is compatible with NUCLEO-F401RE, NUCLEO-L053R8.

Key features

- Complete middleware to build applications using electrochemical gas sensors with signal conditioning done by TSU111.
- Library uses STLM20 temperature sensor for compensation over temperature range.
- Easy portability across different MCU families, thanks to STM32Cube.
- Low-power optimization (suitable for the STM32L0 MCU family).
- Free, user-friendly license terms.

Overall Software Architecture



Latest info available at www.st.com
X-CUBE-IKA02A1

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STM32 Nucleo multifunctional expansion board for gas sensors

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Documents & Related Resources

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Setup & Demo Examples

All documents are available in the Design Resources tab of the multifunctional expansion board webpage

P-NUCLEO-IKA02A1 : Product webpage ([Link](#))

- Gerber files, BOM, Schematic
- data brief
- user manual

X-CUBE-IKA02A1: Product webpage ([Link](#))

- data brief
- user manual
- Software Setup File

Design Resources

Quick Links | [Product Specifications](#)

Technical Documentation

Product Specifications

Description	Version	Size
DB2668: Multifunctional expansion board based on operational amplifiers for STM32 Nucleo	1.0	296 KB

User Manual

Description	Version	Size
UM1955: Getting started with the multifunctional expansion board based on operational amplifiers for STM32 Nucleo	1.0	869 KB

Hardware Resources

Board Manufacturing Specification

Description	Version	Size
X-NUCLEO-IKA01A1 gerber files	1.0	568 KB

Bill of Materials

Description	Version	Size
X-NUCLEO-IKA01A1 BOM	1.0	113 KB

1

STM32 Nucleo multifunctional expansion board for gas sensors

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Documents & Related Resources

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Setup & Demo Examples

Setup & demo examples

Hardware prerequisites

9

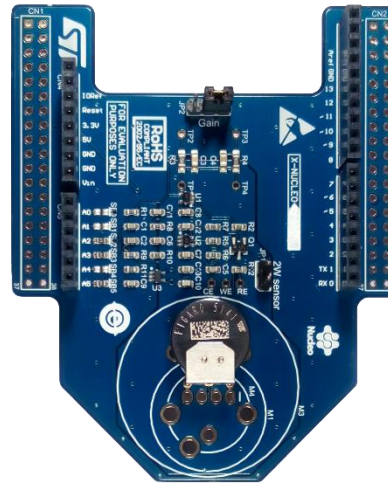
- 1x **P-NUCLEO-IKA02A1**
 - Electrochemical gas sensor expansion board
 - NUCLEO-L053R8
- Windows 8/7 - Laptop/PC
- 1 x USB type A to mini-B USB cable



NUCLEO-F401RE
NUCLEO-L053R8
NUCLEO-L476RG



Mini USB Cable



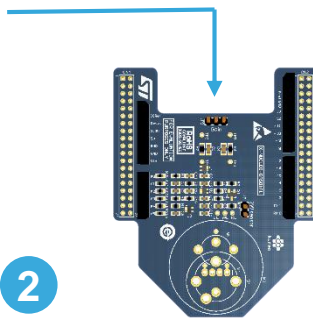
P-NUCLEO-IKA02A1

- **STSW-LINK008:** ST-LINK/V2-1 USB driver
- **STSW-LINK007:** ST-LINK/V2-1 firmware upgrade
- **X-CUBE-IKA02A1:**
 - Copy the .zip file content into a folder on your PC
 - The package contains source code examples (Keil, IAR, System Workbench) based on **NUCLEO-F401RE, NUCLEO-L053R8 or NUCLEO-L476RG**

X-CUBE-IKA02A1 for NUCLEO-F401RE, NUCLEO-L053R8 or NUCLEO-L476RG



1 www.st.com/x-nucleo

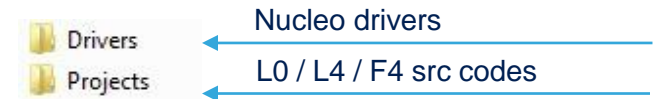


2 Select P-NUCLEO-IKA02A1

3

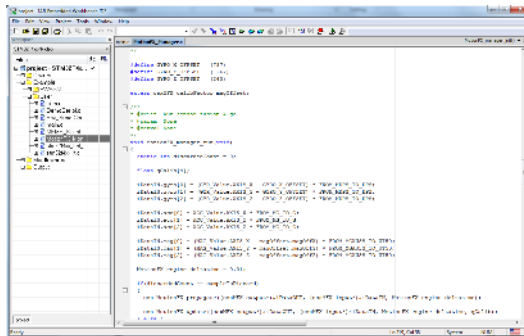
Download & unpack
X-CUBE-IKA02A1

X-CUBE-IKA02A1 package structure

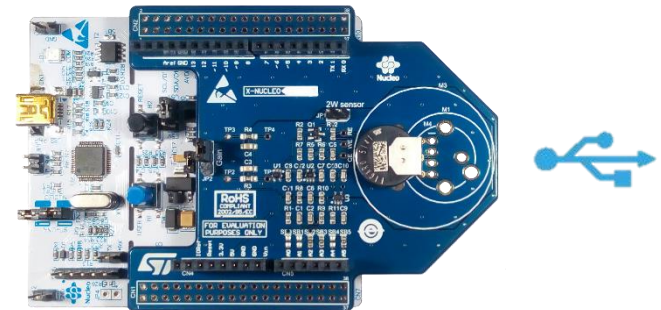


4

.\X-CUBE-IKA02A1_V1.0.0\Projects\Multi\Examples\Gas concentration reading



Flash and run the project.



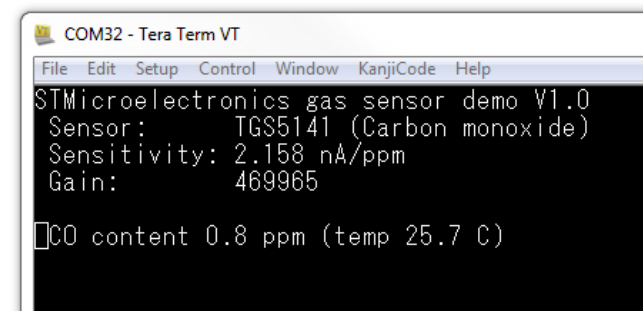
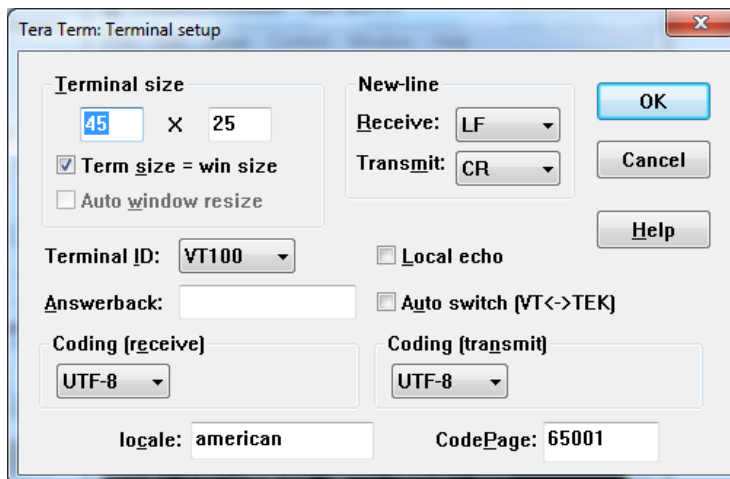
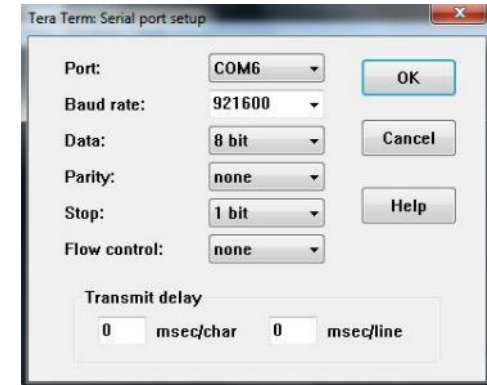
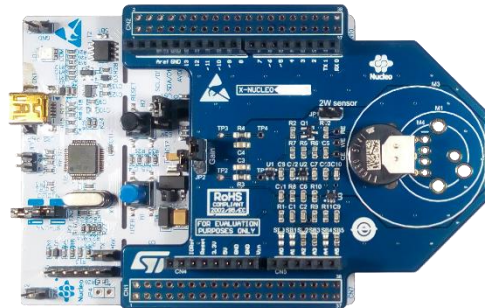
X-CUBE-IKA02A1 quick example 1/2

Using serial line monitor – e.g. TeraTerm

Gas concentration reading example

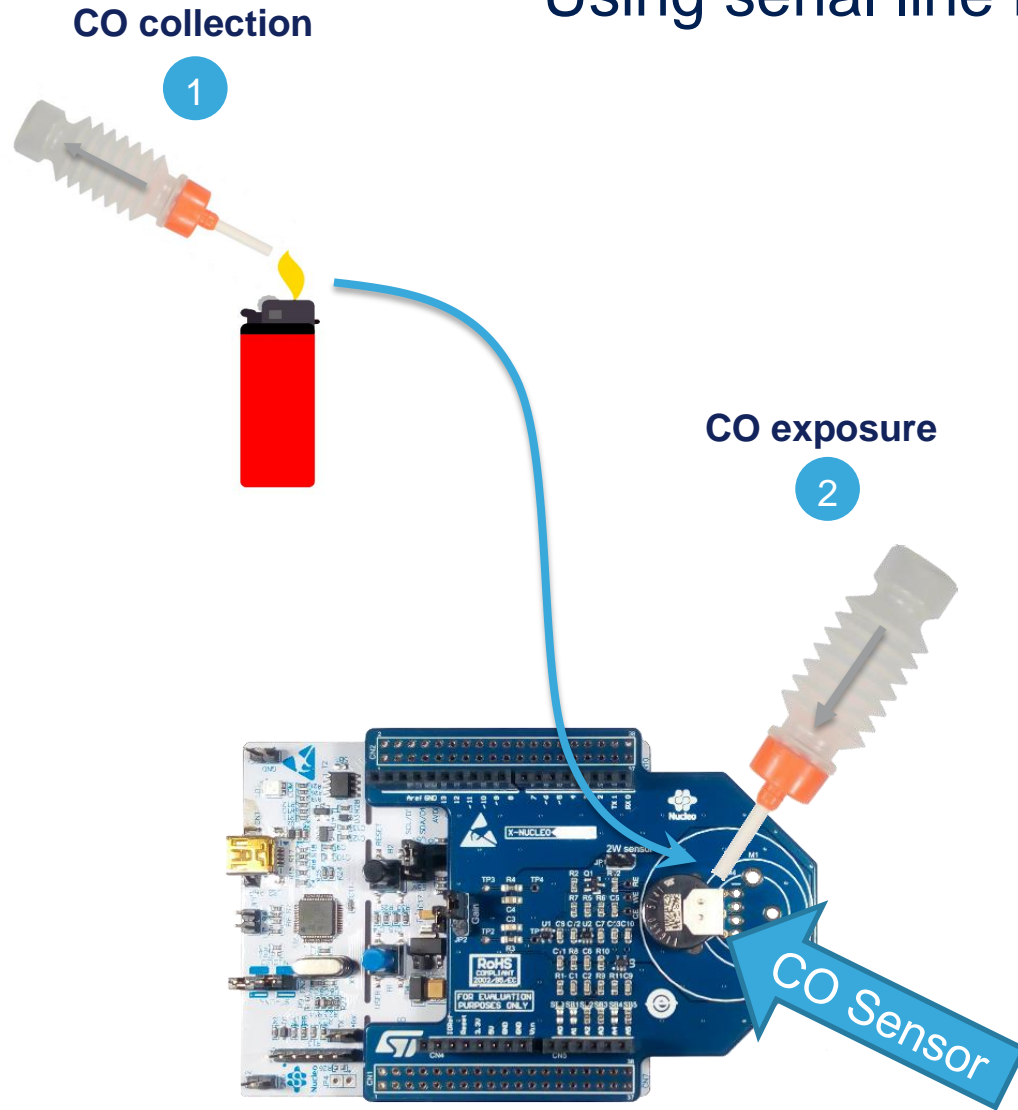
X-CUBE-IKA02A1 for NUCLEO-F401RE, NUCLEO-L053R8 or NUCLEO-L476RG

- Configure the serial line monitor (speed, LF)
- Press the **BLACK** user button on STM32Nucleo to restart MCU



X-CUBE-IKA02A1 quick example 2/2

Using serial line monitor – e.g. TeraTerm



NO CO detected

```
COM32 - Tera Term VT
File Edit Setup Control Window KanjiCode Help
STMicroelectronics gas sensor demo V1.0
Sensor: TGS5141 (Carbon monoxide)
Sensitivity: 2.158 nA/ppm
Gain: 100000
CO content 0.8 ppm (temp 25.7 C)
```

CO detected – ppm value

```
Tera Term - [disconnected] VT
File Edit Setup Control Window KanjiCode Help
STMicroelectronics gas sensor demo V1.0
Sensor: TGS5141 (Carbon monoxide)
Sensitivity: 2.158 nA/ppm
Gain: 100000
CO content 252.4 ppm (temp 25.7 C)
```

X-CUBE-IKA02A1 Unicleo GUI example

DataLogCustomLite example

X-CUBE-IKA02A1 for NUCLEO-F401RE, NUCLEO-L053R8 or NUCLEO-L476RG

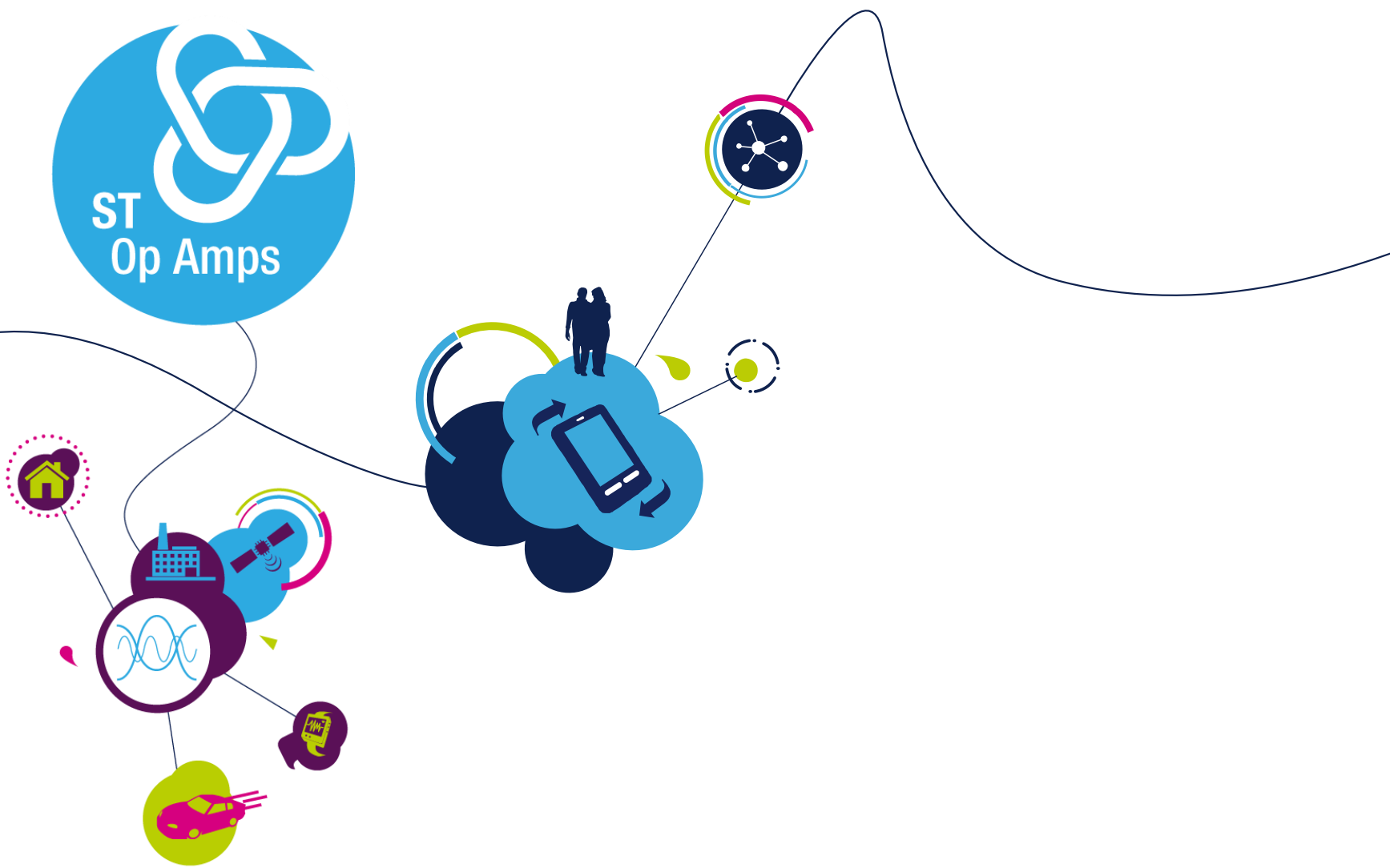
1 Press start

2 Open data log window

3 Apply CO

The screenshot shows the Unicleo-GUI software interface. The main window has a menu bar with 'Start', 'Stop', 'Settings', and 'Exit'. A red circle highlights the 'Start' button with the number '1' and the text 'Press start'. On the left sidebar, a red circle highlights the 'Custom Fields' icon with the number '2' and the text 'Open data log window'. In the foreground, a 'Custom Fields Plot' window is open, showing a 'Data log' graph with three data series: 'Compensated (ppm)' (red), 'Concentration (ppm)' (green), and 'Temp (degC)' (blue). A red circle highlights a peak in the graph with the number '3' and the text 'Apply CO'. Below the graph is a table of sensor data:

Figaro sensor	0	Sensitivity	2300	Compensated Concentration	15.4675
TGS5141	0	Gain	470000	Temperature	16.1636
	0	Raw ADC ref	556	Voltage	26.2505
	0	Raw ADC val	579		0.466593



www.st.com/stm32ode