



User Guide

SC-000866-UG

AS6031-DK

Development Kit

V3 • 2020-06-30

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1 Introduction

1.1 Kit Content & Ordering Information

Figure 1: Kit Content

AS6031-Board V1.0 (Based on AS6031 in QFN48 package)



Cable connecting board and PICOPROG



PICOPROG V3.0 (Programmer and interface)



USB cable (Connects PICOPROG V3.0 to PC)



Please download the latest software for the kit from

<https://www.downloads.sciosense.com/as6031/>

Ordering Code	Part Number	Description
AS6031-DK V1.0	221020003	AS6031 Demo Kit including PICOProg and cables
AS6031-Board V1.0	221020002	AS6031 Reference board

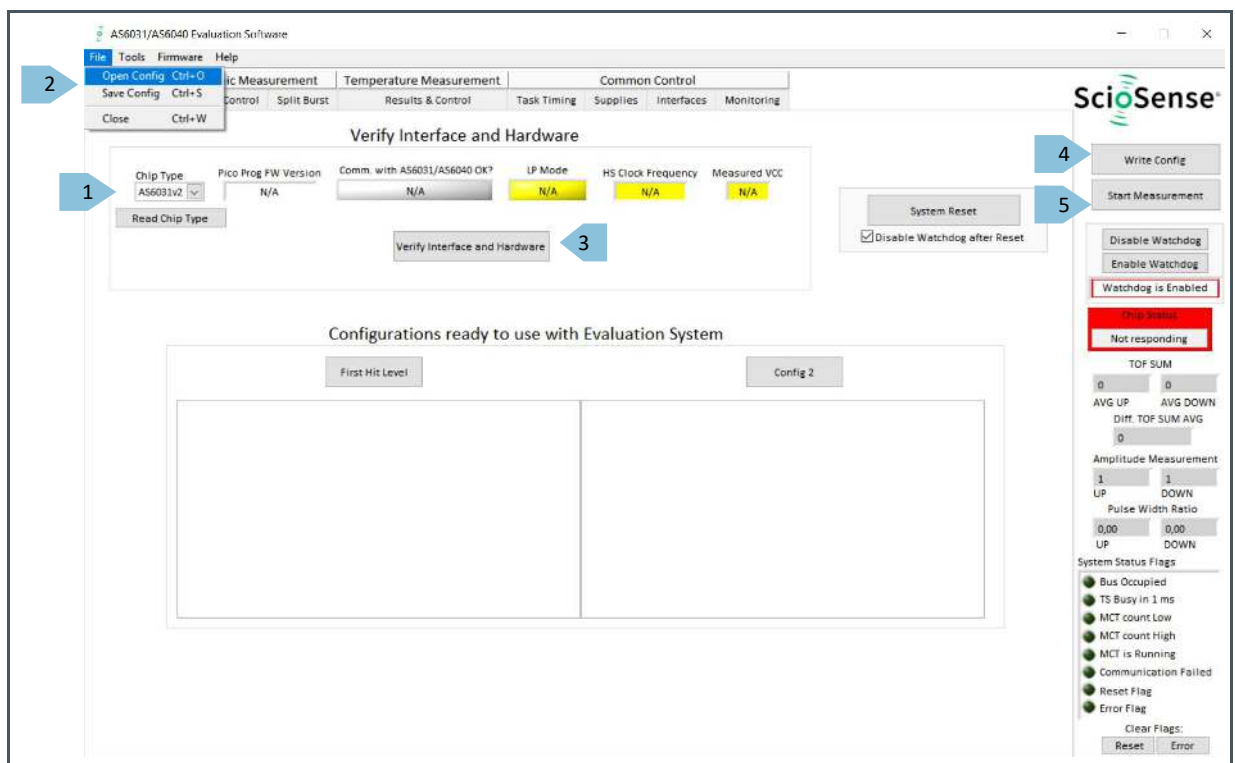
2 Quick Start Guide

This section describes how to quickly set up the AS6031-DK, establish basic operation and make measurements.

- It is crucial to install the software before connecting the evaluation kit to your computer:
<https://www.downloads.sciosense.com/as6031/>
- Unzip the package to the desired directory, open “setup.exe” and follow the instructions on the screen
- Connect the PICOPROG V3.0 to the computer using the USB cable. And connect the board to the PICOPROG using the DB15 connector cable.
- Connect your spool piece to US_UP and US_DOWN. US_UP fires upstream, means versus flow. US_DOWN fires downstream, with the flow.
- Quick Start for Initial Measurements

From the “Start” menu, go to “All Programs” and then to the “Sciosense” directory. Double click the “AS6031_AS6040_Frontpanel” icon (or newer versions, if available) to begin execution of the evaluation software. The following screen should appear:

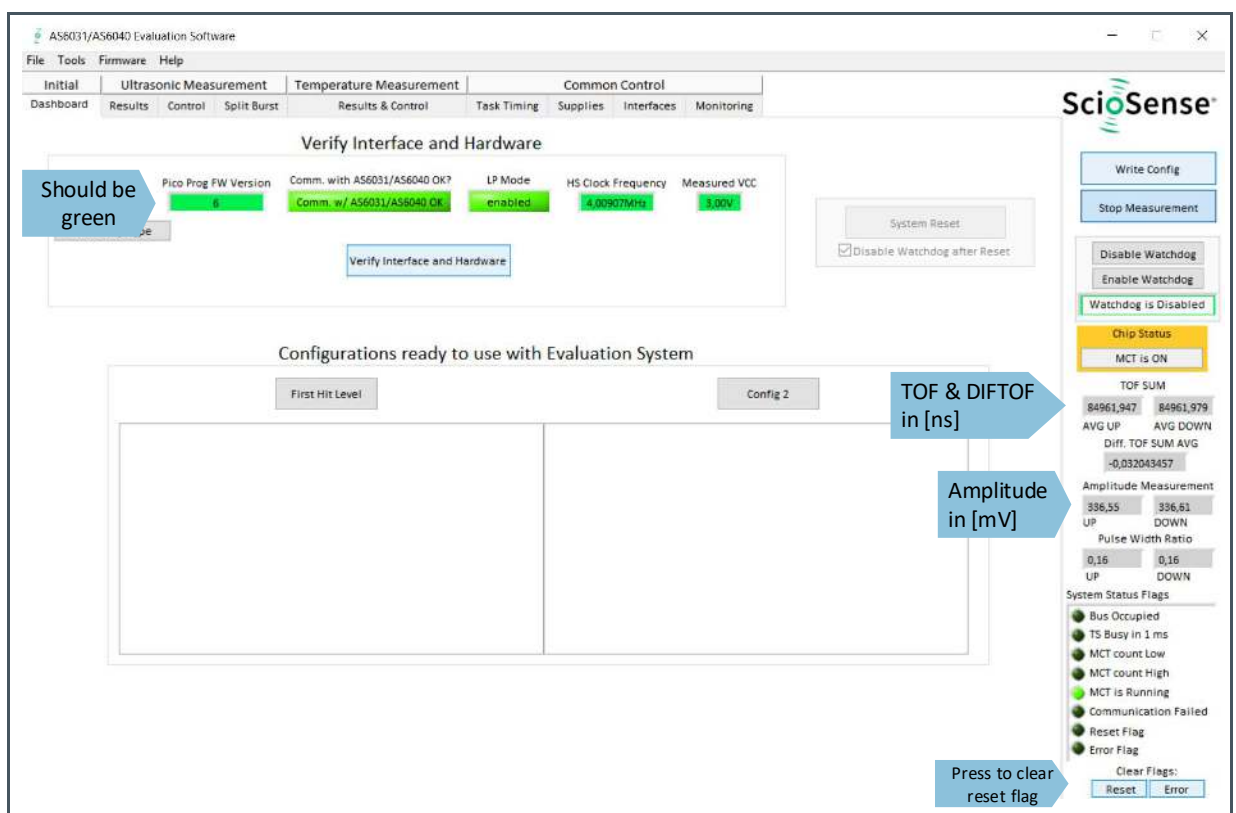
Figure 2 :
Opening Page



- Check for the right device, AS6031 or AS6040. Click the “Verify Interface” button to confirm communication between PICOPROG V3.0 and AS6031 is working. Both fields, “Pico Prog FW version” and “Comm. W. GP31/GP40 OK”, should become green.
- Next, open our configuration AS6031_water_meter_Demo_FHL.cfg and download it into the chip, pressing “Write Config”.
- Press “Start Measurement” to begin measuring.

At this point, after successful completion of the above steps, a basic operation of the EVA kit should be possible.

Figure 3:
Setup Window

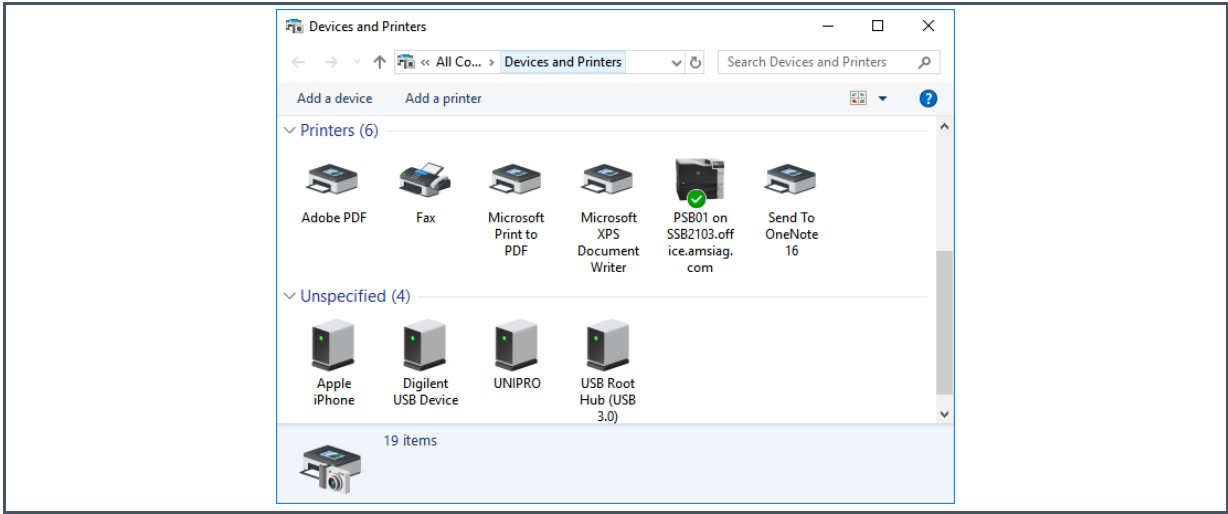


Clear the reset and error flags by pressing the buttons at the lower right. MCT Count Low and High should blink while the measurement is running.

2.1 Manual driver Installation

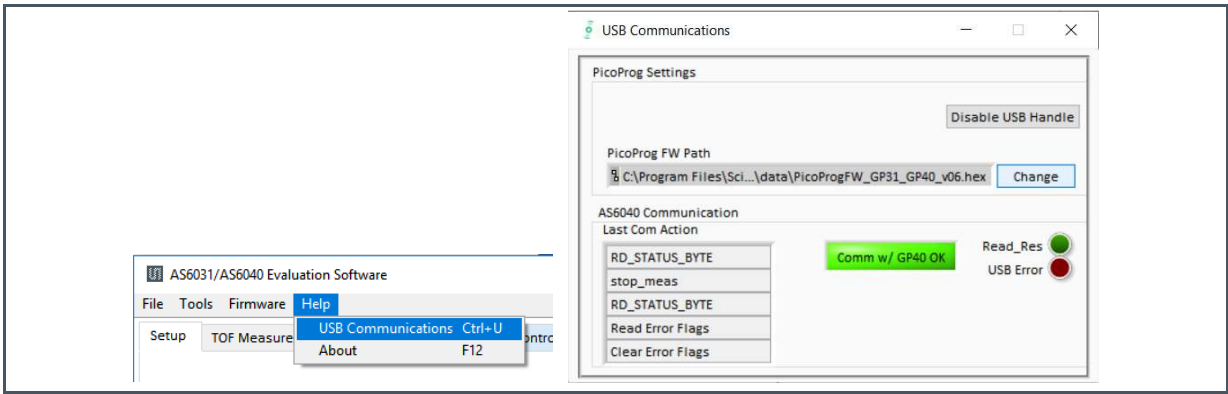
If PICOPROG is not displayed correctly then go to the drivers folder , e.g. C:\Program Files\Sciosense\AS6031_AS6040\drivers and install the driver for your operating system manually.

Figure 4:
Device Manager



In case of an upgrade of the software to a newer version please make sure that the software uses the latest driver. For manual installation open the USB communications window and check the firmware version of the PICOPROG. It should be version PicoProgFW_GP40_v02.hex or higher:

Figure 5:
PICOPROG Manual Installation

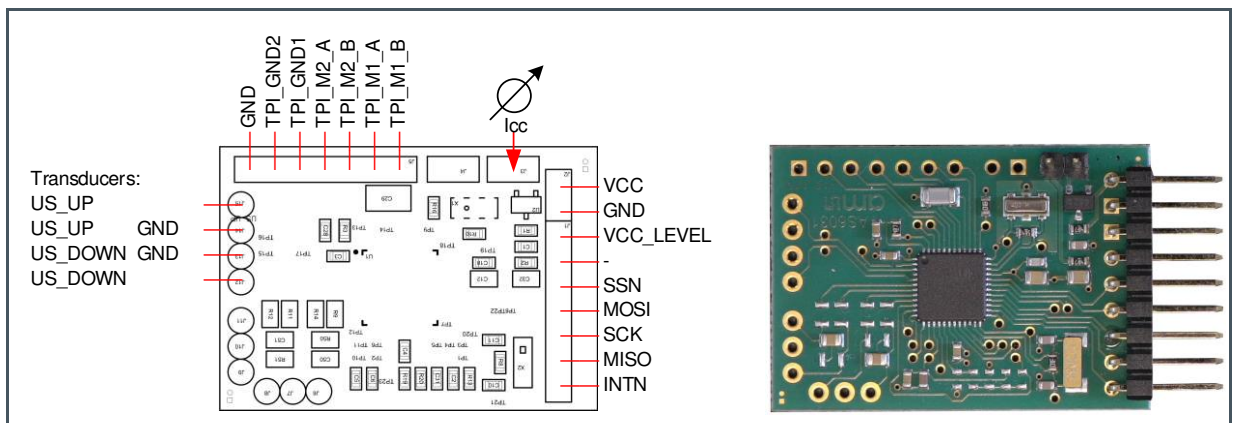


3 Hardware Description

3.1 Introduction

The AS6031-Board V1.0 board, shown in Figure 6, is a front-end for a water or heat meters. The transducers and temperature sensors are directly connected to this board. It comes with a 32.768 kHz quartz (X2) and a 4 MHz ceramic oscillator (X1).

Figure 6:
AS6031-Board V1.0



3.2 Communication Interface

The PICOPROG device is a USB-to-SPI converter box that interfaces all UFC evaluation systems. The PICOPROG is registered by the operating system initially as “PICOPROG v2.0 unprogrammed”. As soon as the AS6031-Board V1.0 evaluation software starts, a special firmware is written into the PICOPROG to handle the SPI communication with the AS6031-DK. The PICOPROG is now listed as “UNIPRO” in the device manager. For SPI communication only, PICOPROG version 2.0 is sufficient.

The flat connector connecting the PICOPROG and the AS6031-Board V1.0. includes the power lines and the SPI communication lines. VCC_LEVEL is the voltage feedback for the PICOPROG level shifters.

4 Software Description

4.1 A First Measurement

When started, the software comes up with the main window, showing the “Setup” tab. See Figure 3: Setup Window.

A good first step is to load a working configuration and make measurements in frontend mode (without using the internal 32-Bit μ P). **ScioSense** provides a sample configuration files, which you can select from the setup tab. You find them also in the data folder. They typically work well with DN20 spool pieces.

Load Configuration File: File menu → Open Config → choose appropriate configuration file

1. Press “System Reset” button. Now the PICOPROG FW version field should get green and the appropriate version should be displayed (20 or higher). Further, “Comm GP40 OK?” should get green to show that communication with AS6031-DK works.
2. If watchdog is not disabled by “System Reset”. Button → press “Disable Watchdog” button.
3. Press “Write Config” button to download the configuration settings into AS6031.
4. Press “Start measurement” button. Now the chip starts to measure and the software displays the major results on the right side.

You can now modify the configuration to fit it to his needs. Having done this, you can store your own configuration files.

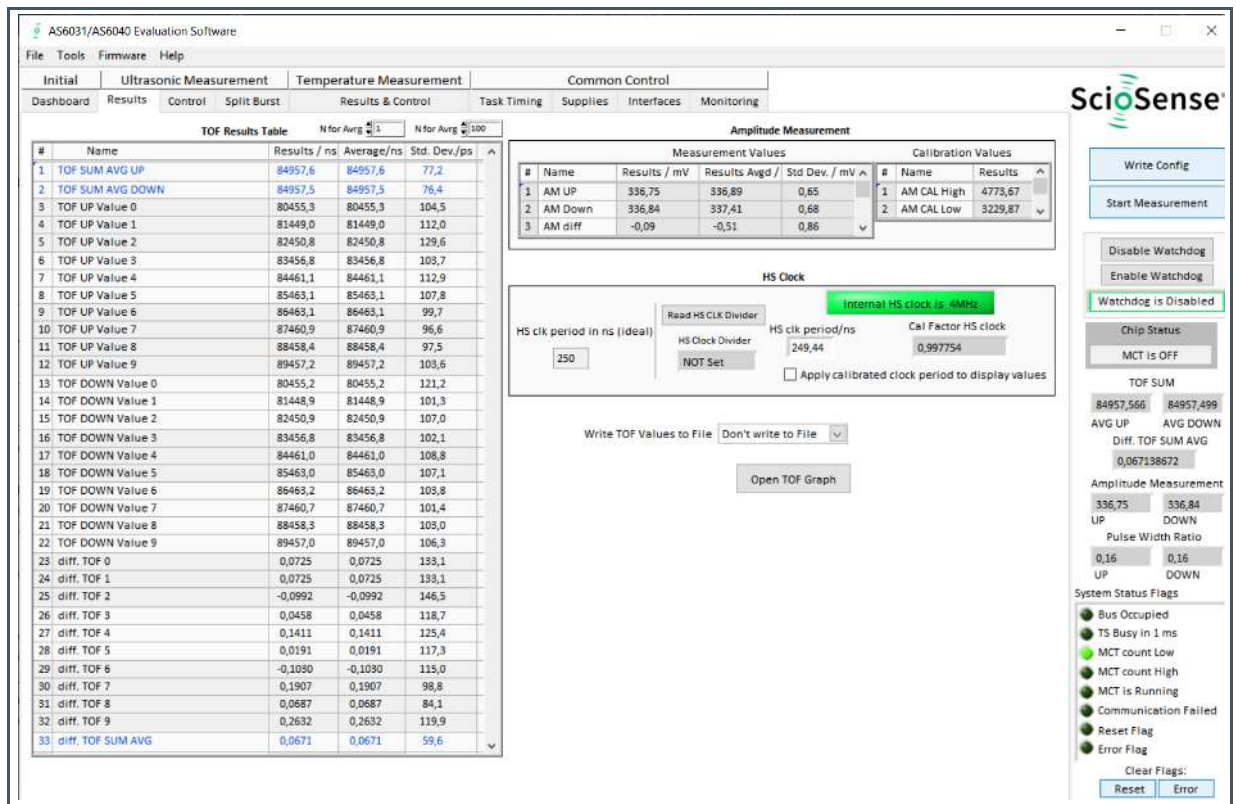
4.1.1 Time of Flight Measurement Results

The TOF Measurements page gives a complete overview of the individual TOF measurement results. AS6031 stores the first 8 hits of every TOF direction separately and also the average of all measured hits. These 9 results are displayed for both directions, as we call them up and down. The evaluation software additionally calculates the difference between up and down stream, DIFF-TOF. In total, all 27 results are displayed in the “Results” column.

In the “Average” column the sample size for the averaging is 100 by default. The same number of samples is used for the standard deviation.

The same is done with the amplitude values of the receiving signals and the pulse width ratio between first hit and start hit. The values for both directions are displayed.

Figure 7:
TOF Measurements



Information

The high speed calibration is by default off. This is more convenient when comparing measurement data. But when collecting data for calibration it is strongly recommended to have this active

The measurement data can be exported into text files, either the main values for calibration only, or the full data.

Figure 8:
Data Export for Calibration

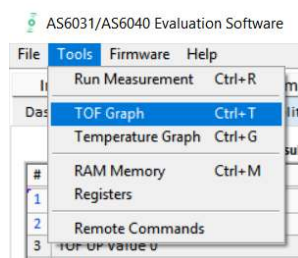
	A	B	C	D	E	F	G	H	I	J	K	L
1	08.08.2016 16:18	s Elapsed	diffTOFSu	sumTOFSu	diffTOF1	sumTOF1	PW UP	PW DOW	AM UP	AM DOW	Status Register	
2	16:18:50	0	0,000000	0,000000	0,000000	0,000000	1,992,187	1,992,187	7,168,211	6,991,830	FFFFFFFF	
3	16:19:03	13,69	0,000000	0,000000	0,000000	0,000000	1,992,187	1,992,187	7,152,268	7,215,327	FFFFFFFF	
4	16:19:04	14,03	0,000000	0,000000	0,000000	0,000000	1,992,187	1,992,187	7,152,268	7,215,327	FFFFFFFF	
5	16:19:04	14,49	0,000000	0,000000	0,000000	0,000000	1,992,187	1,992,187	8,988,957	9,103,998	FFFFFFFF	
6	16:19:05	15,02	0,000000	0,000000	0,000000	0,000000	1,992,187	1,992,187	9,177,363	9,125,247	FFFFFFFF	

Figure 9:
Data Export Complete

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	aj	ak		
1	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
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3	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
4	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
5	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
6	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
7	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
8	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF

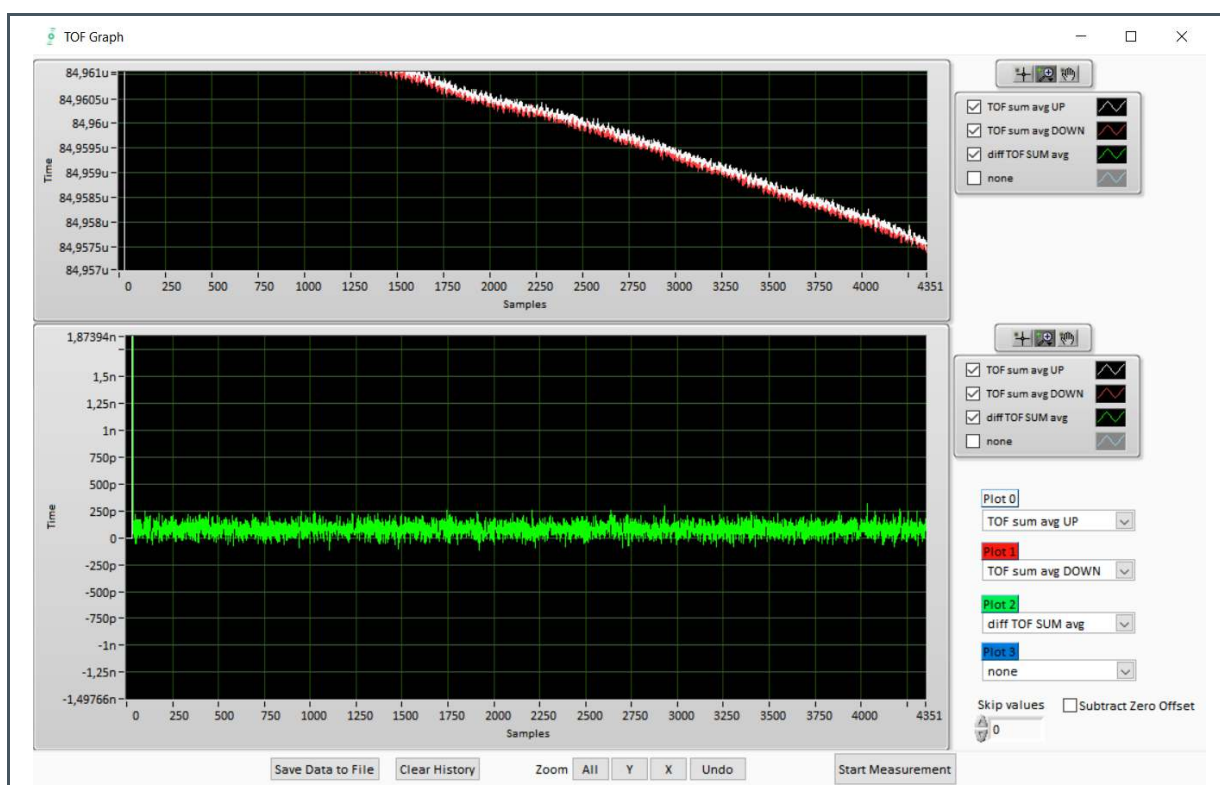
It is possible to display the results graphically, too. Open menu item “Tools/TOF Graph” to open this separate window.

Figure 10:
Opening a TOF Graph



It is possible to activate up to four plots. Each plot has various selections, e.g. TOF1UP, TOF2UP etc..

Figure 11 :
TOF Graph

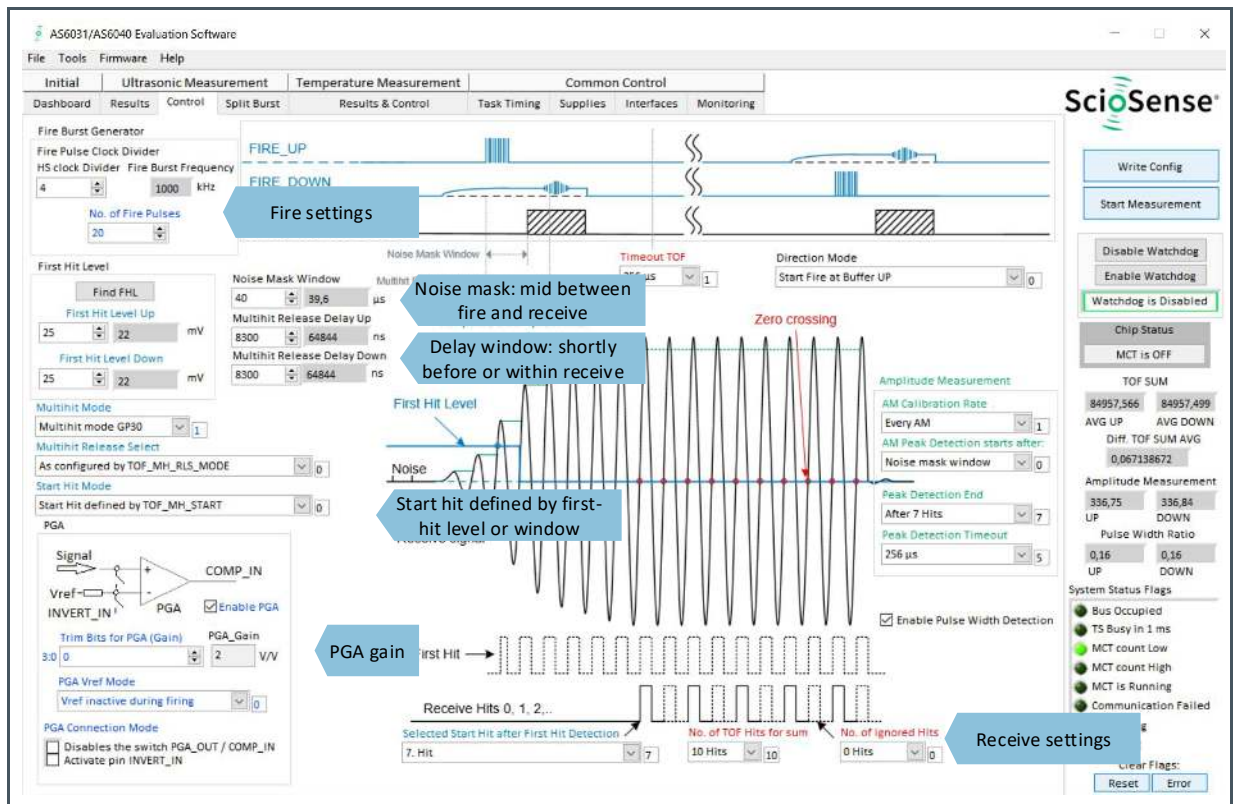


4.2 Ultrasonic Measurement Control

On this page the user makes all settings for an appropriate ultrasonic measurement. They group as follows:

- Time of Flight Sequence Control
- Time of Flight Hit Control
- Amplitude Measurement Control
- Transducer Interface Options

Figure 12 :
Ultrasonic Measurement Control Tab



The meanings of the various settings are displayed in clear text. For more details about the register settings please refer to the AS6031 manual.

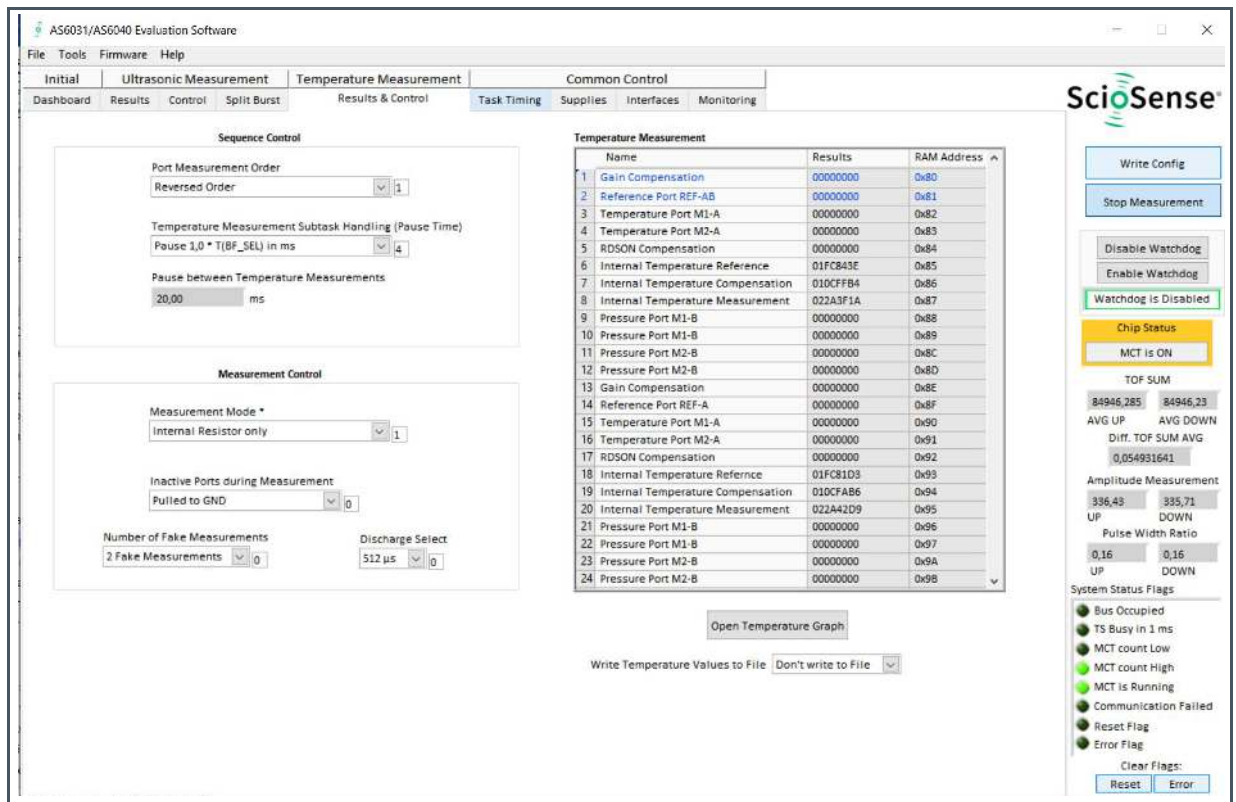
4.3 Temperature Measurement Control

All settings for an appropriate temperature measurement are done in this tab, which are grouped as follows:

- Sequence Control
- Measurement Control
- Temperature Measurement Cycle Time

On the right side, the individual measurements of the temperature measurement task are displayed numerically.

Figure 13 :
Temperature Tab



The meanings of the various settings are displayed in clear text. For more details about the register settings please refer to the AS6031 manual.

In addition, a separate window for a graphical display can be opened. In this window also the amplitudes and pulse width ratios can be displayed.

Figure 14:
Opening a Temperature Graph

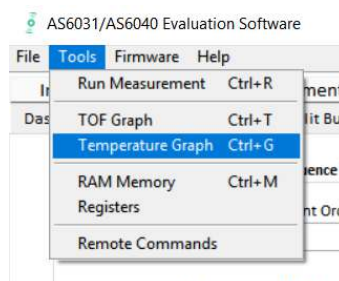
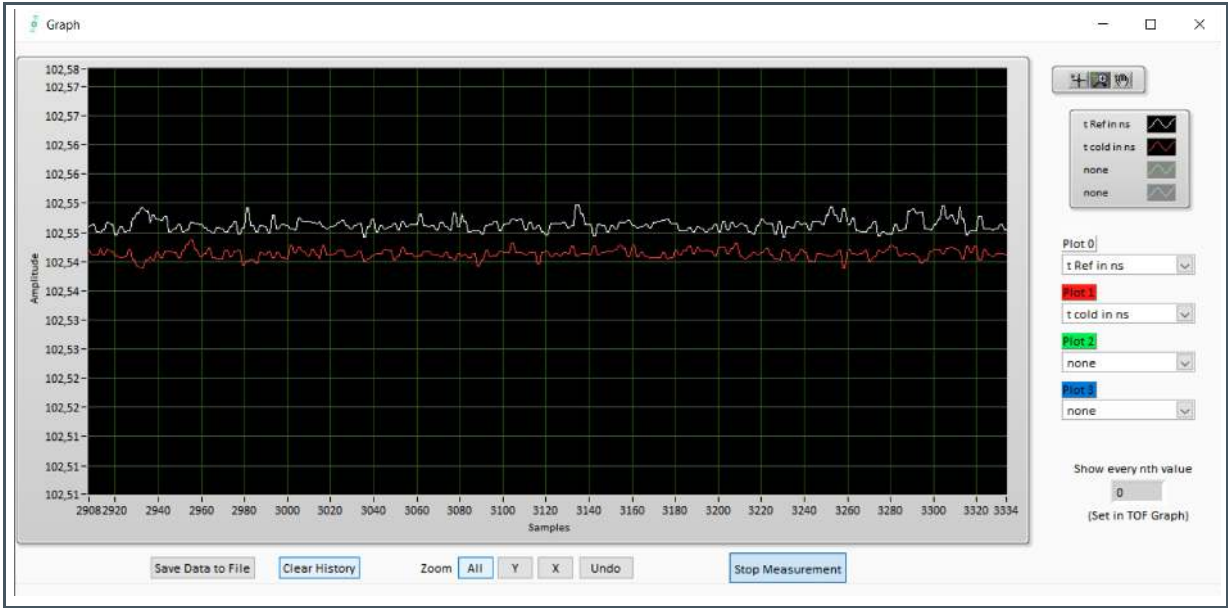


Figure 15:
Temperature Graph



4.4 Common Control

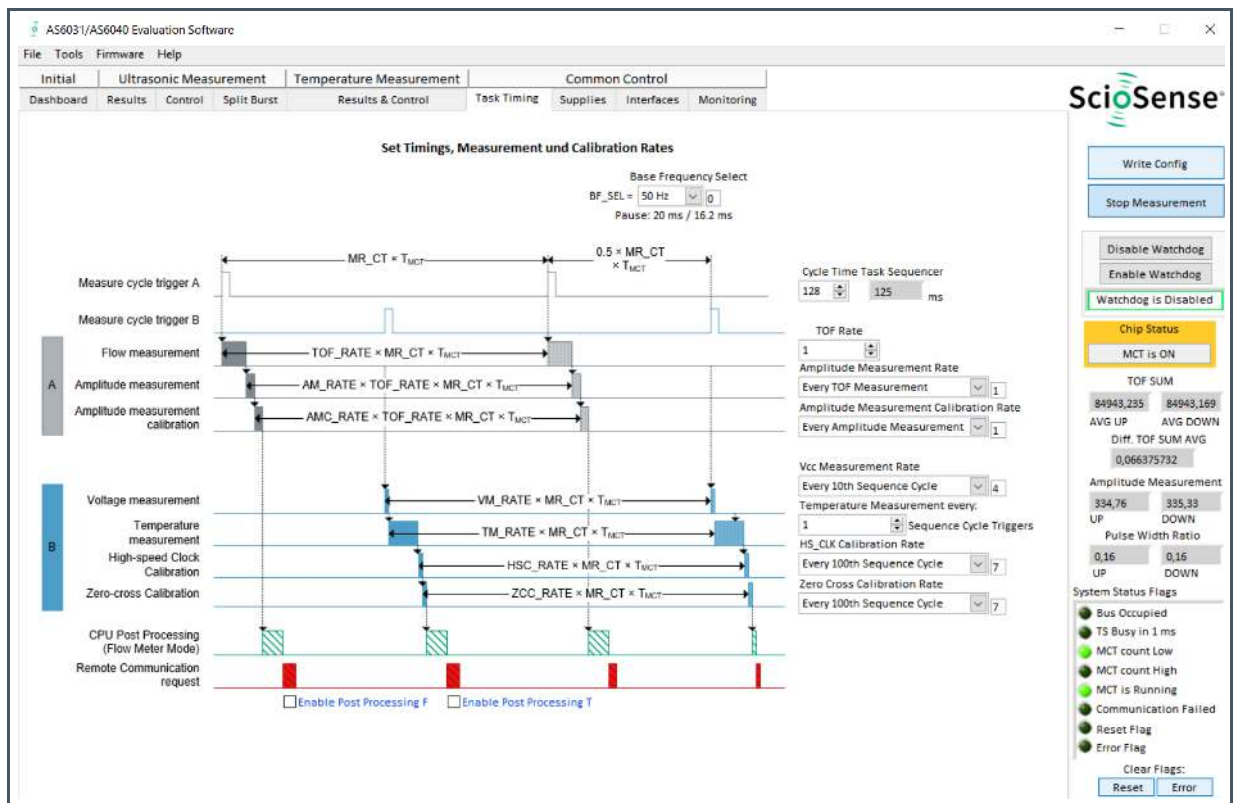
Under “Common Control” you find the settings for the timings, the supplies and the interfaces. Also the monitoring flags are set here.

4.4.1 Task Timing

On this page the settings for the major timings of the task sequencer are set.

- Cycle time of the task sequencer
- TOF rate
- Amplitude measurement rate
- Vcc measurement rate
- Temperature measurement rate
- High-speed clock calibration rate
- Zero-cross calibration rate

Figure 16:
Timing Control

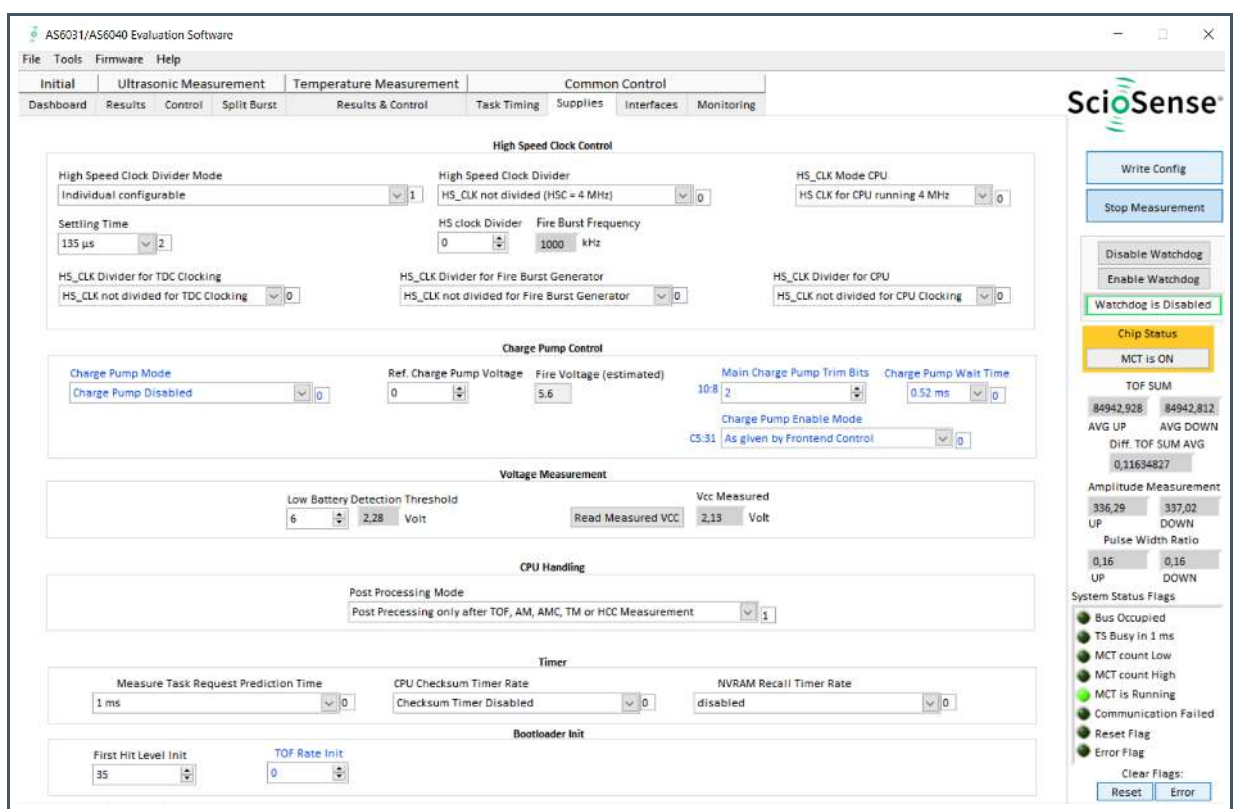


4.4.2 Supplies

The “Supplies” page covers configuration settings for

- High speed clock control
- Charge pump control (relevant for AS6040 only)
- Voltage measurement
- Timer settings
- Bootloader initialization values for FHL and TOF rate

Figure 17 :
General Control Tab

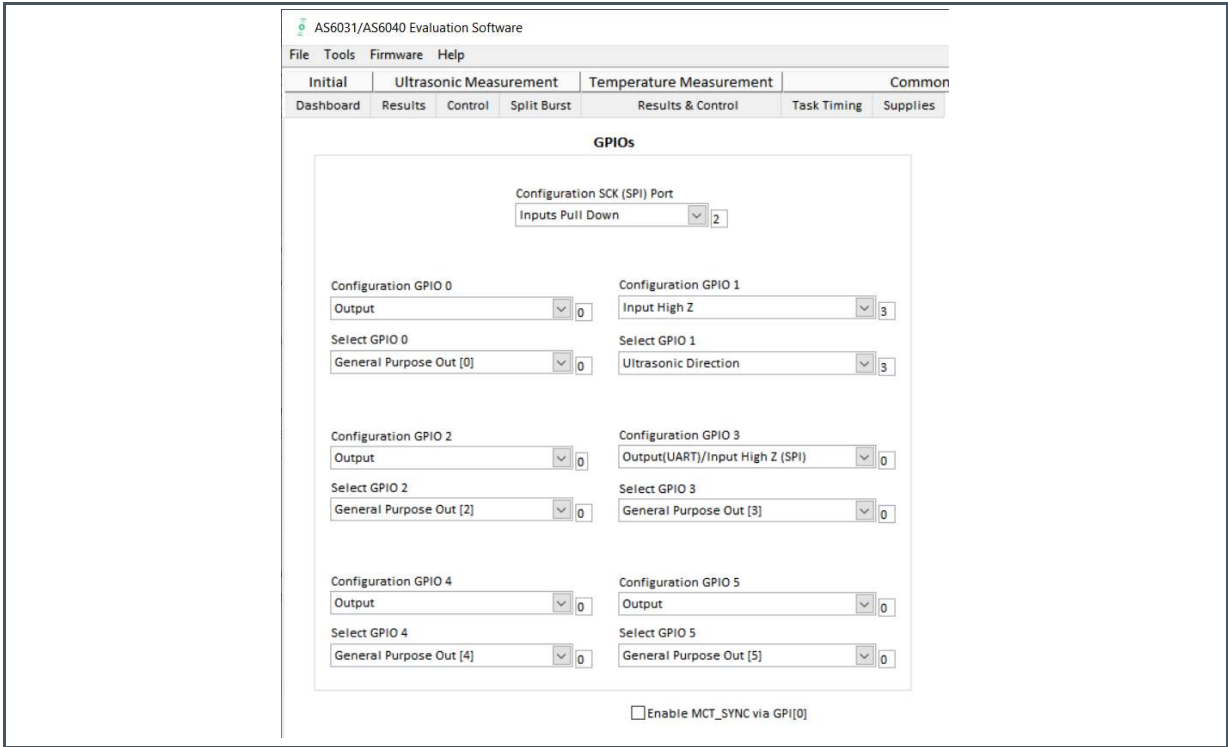


The meanings of the various settings are displayed in clear text. For more details about the register settings please refer to the AS6031 manual

4.4.3 Interfaces

The “Interfaces” tab covers configuration settings for the GPIOs.

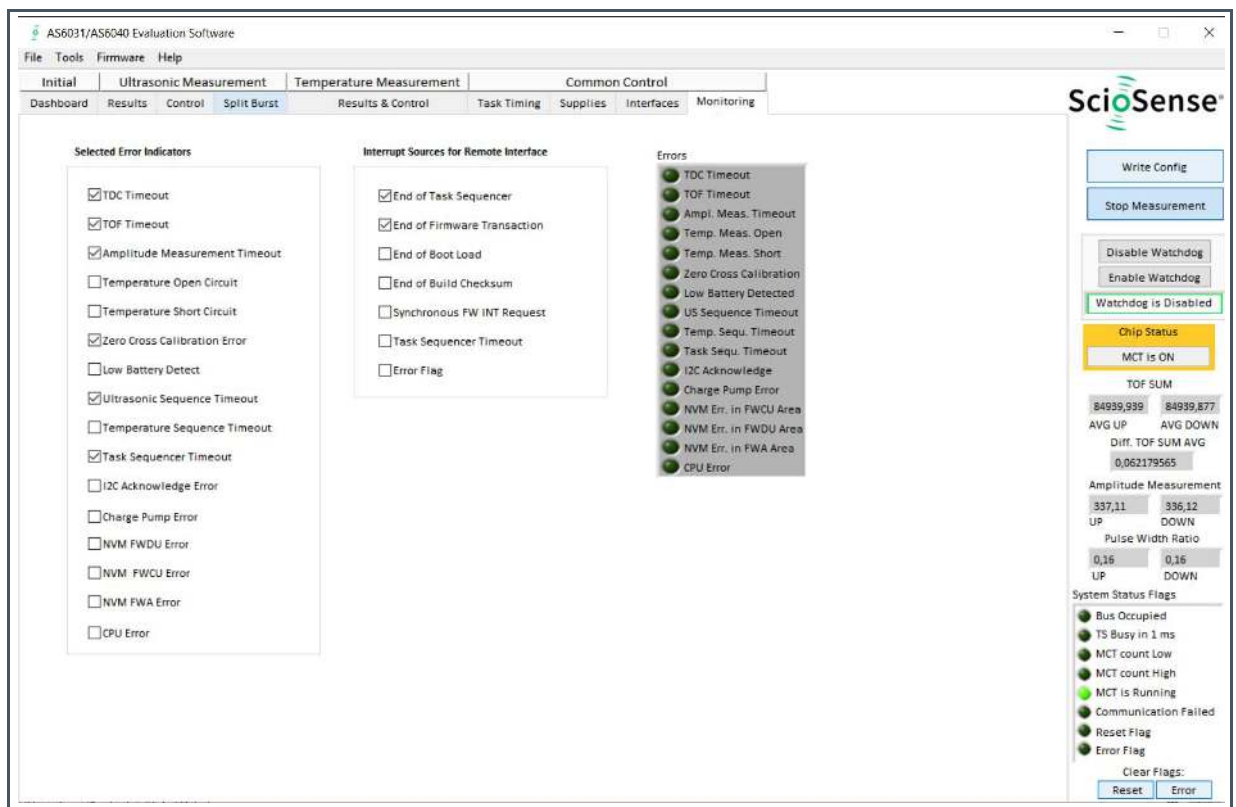
Figure 18 :
Interfaces Tab



4.5 Montioring

On this tab error indicators and interrupt sources for remote interface can be selected.

Figure 19 :
Interrupt and Error Handling



The meanings of the various settings are displayed in clear text. For more details about the register settings please refer to the AS6031 manual.

5 Software Menu

Beside main window, the software menu allows the opening of other windows. There are some menu items which are redundant to available buttons of main window.

5.1 File

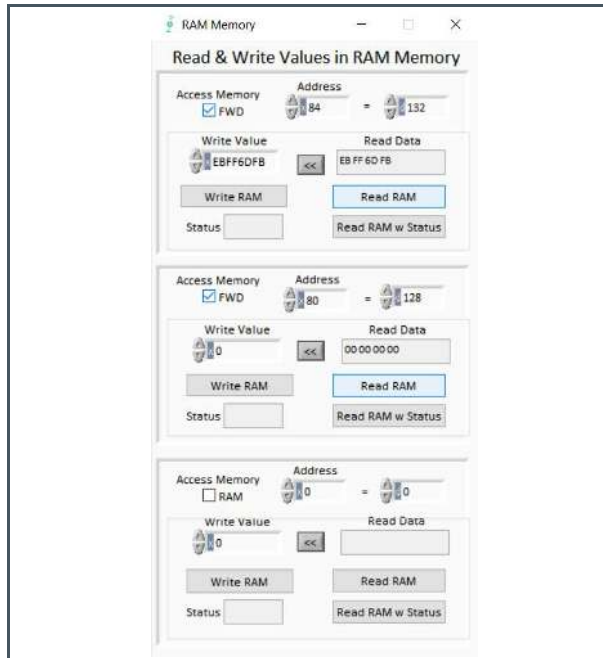
- **Open Config**
This dialog box allows the path selection of a configuration file, covering the register settings, necessary for a proper configuration of the AS6031. After opening this file, the control settings are updated in the GUI.
- **Save Config**
This menu item allows the saving of the current GUI control settings into a configuration file
- **Close**
Close all open windows of the AS6031F1 Evaluation software.

5.2 Tools

- **Run Measurement**
Same function as “Start/Stop Measurement” button in “Measurement” tab of main window.
- **TOF Graph**
Same function as “Open TOF Graph” button in “Measurement” tab of main window.
- **Temperature Graph**
Same function as “Open Graph” button for temperature measurement in “Measurement” tab of main window.

- RAM Memory

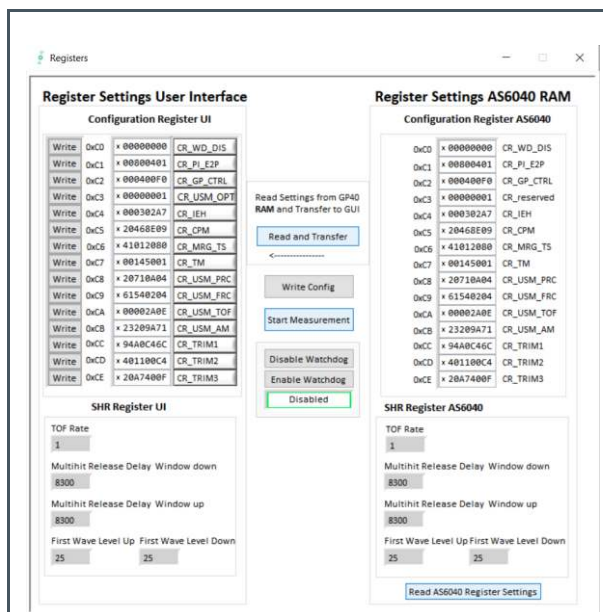
Figure 20:
RAM Memory Access



- Opens a window which allows single write and read access to random access area or to firmware data.
- Please refer to the AS6031 datasheet for the meaning of the individual addresses.

- Registers

Figure 21:
Registers

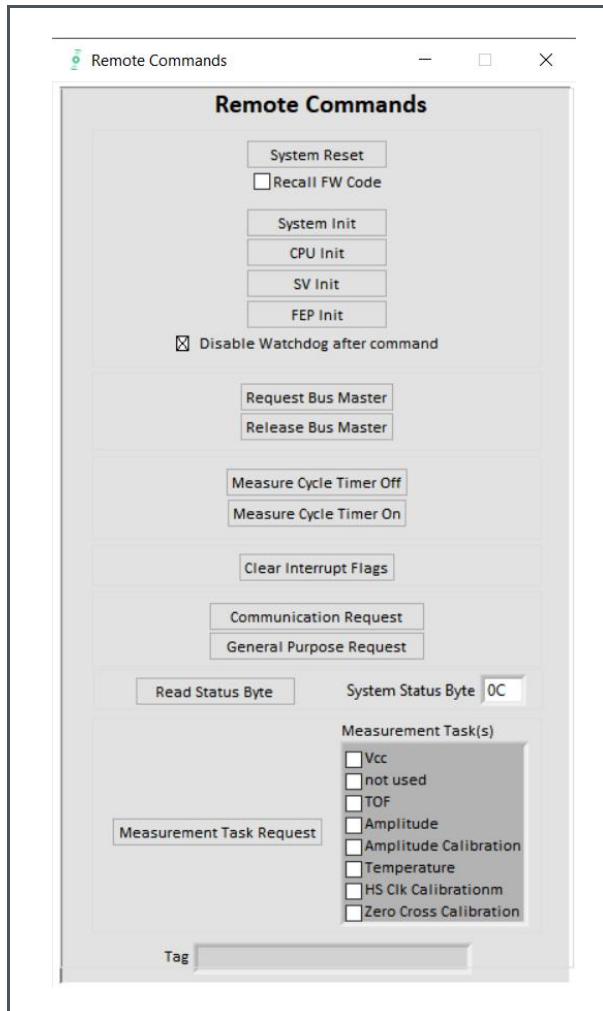


- Opens a window, which shows the registers important for a proper configuration setting of the AS6031. In the left column, the register contents correspond to the settings done in tabs of GUI main window. If the button “Read AS6031 Register Settings” is pressed, the configuration settings located in AS6031 registers are displayed in the right column, by pressing “Read and Transfer” button, the register settings in the tabs of main window and in the left column of this window are updated with the register settings from right column. Description of Position 2
- Red field indicate differences between user interface and AS6040 RAM.

- Remote Commands

This window summarizes some additional commands, which can be executed via remote interface.

Figure 22:
Remote Commands



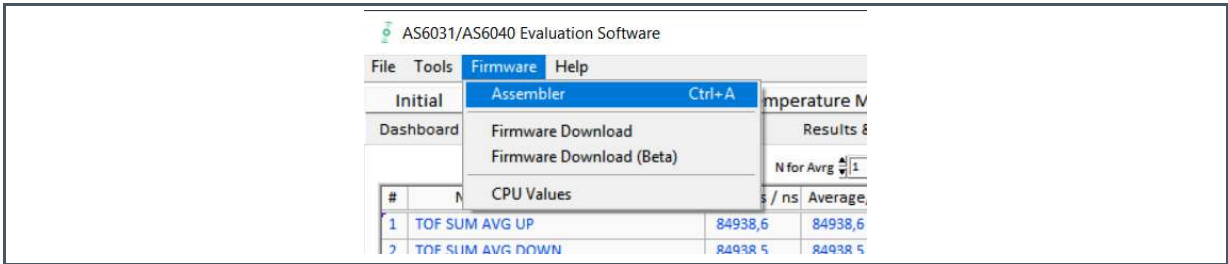
- **System Reset:** Executes a complete system reset of AS6031. Same function as “System Reset” button in “Measurement” tab of main window
- **System Init:** Same function as “System Reset” without clearing the configuration (CR_...) and the system handling (SHR_...) register.
- **CPU Init:** Clears the CPU block in AS6031
- **SV Init:** Clears the supervisor block in AS6031
- **FEP Init:** Clears the frontend processing block in AS6031
- **Request/Release Bus Master:** Allows the request of the bus master in AS6031, e.g. if the random access bus is blocked by a deadlock, caused by an improper firmware download.
- **Measure Cycle Timer Off/On:** Stop & start of the measure cycle timer
- **Clear Interrupt Flags:** Clears all bits in SRR_IRQ_FLAG register
- **Communication Request:** Allows an asynchronous demand by remote controller to get an interrupt by AS6031, signaling the time for remote communication.
- **General Purpose Request:** Allows an asynchronous request by remote controller to initiate a general purpose handling in in firmware of integrated AS6031CPU.

5.3 Firmware

- Assembler

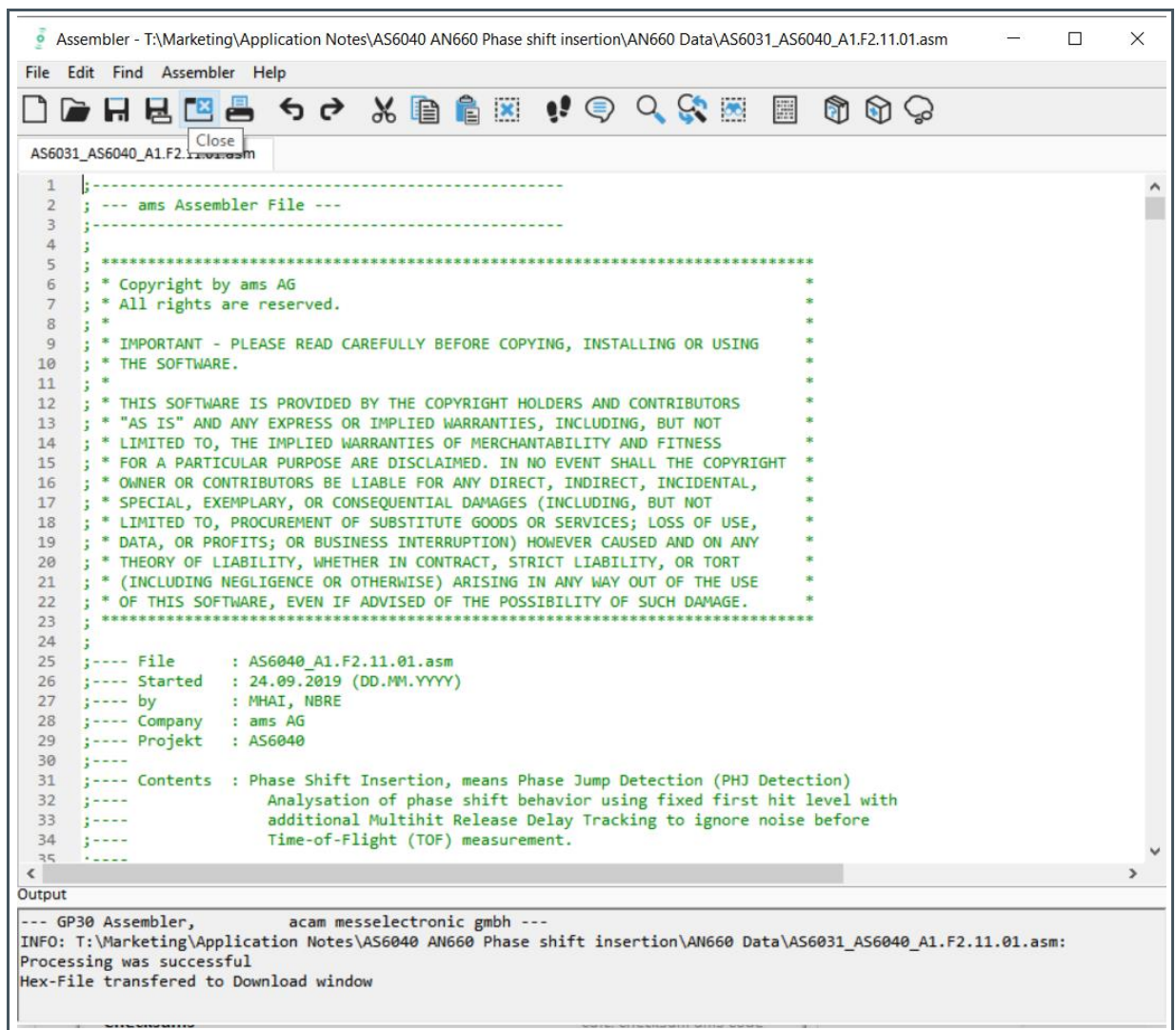
The AS6031-DK assembler is integrated into the AS6031-Board V1.0 evaluation software. It is opened in the Firmware menu of the main program:

Figure 23:
Opening the Assembler



The following window comes up:

Figure 24 :
Assembler Window



This is a comfortable editor with syntax highlighting, search and replace, copy and paste functions.

Under menu item “Assembler” the user finds the compile and download options. The download option effects, that “Firmware Download” window is opened (see also below).

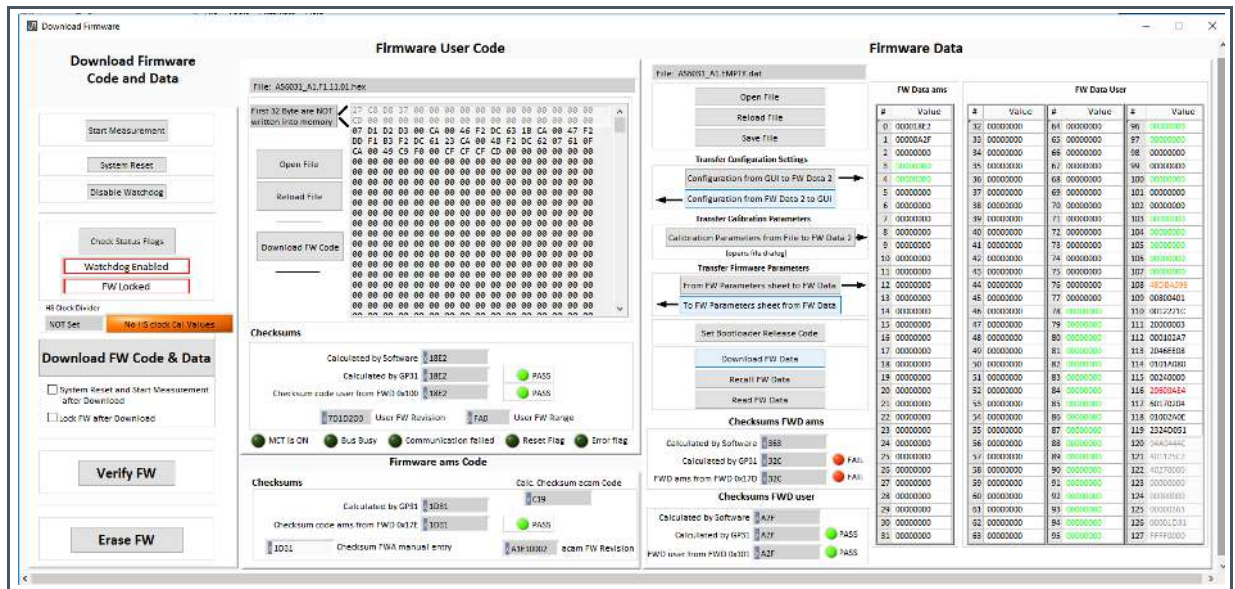
Whether the call of these functions was successful or not is indicated by the messages at the bottom of the assembler window.

- Firmware Download

This window allows the download of the user code and firmware data, including the configuration, to the non-volatile memory. In case the bootloader release code is set, the configuration from the FW Data 2 section is copied into the configuration registers.

“Firmware User Code” is either one of **ScioSense** firmware examples, either the customers code or in case of chips with **ScioSense** firmware (AS6031F1) the open source part. The FW Data 1 and 2 include firmware relevant coefficients and the configuration. The figure below shows an example for an AS6031 applicatin. As free part of the user code firmware AS6031_A1.F1.11.01.hex is loaded. For the configuration and other data file AS6031_A1.EMPTY.dat is loaded.

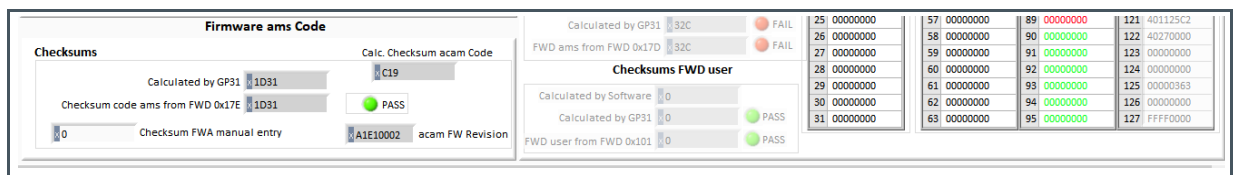
Figure 25 :
Firmware Download



- With “Check Status Flag”, the watchdog and the lock state of the AS6031 can be checked. Please make sure that the watchdog is disabled before starting a download or other transactions in this window
- In the “Firmware User Code” section, a firmware user code file (*.hex), which is typically generated by the assembler tool and intended for the user part of 4Kx8 Program NVRAM, can be loaded by pressing “Open File”.
- In the “Firmware Data” section, a firmware data file (*.dat), which is intended for the 128x32 Data NVRAM, can be loaded by pressing “Open File”. This section also contains some additional transfer options from GUI to FW Data 2 fields and from AS6031 back to FW Data 2 fields. The configuration can be exchanged between the GUI of the evaluation file and the data file. Calibration can also be exchanged between GUI and data file.
- By pressing “Download FW Code & Data” both files are stored in the corresponding NVRAMs. This action takes a few seconds. After the download, both files are located in the volatile as well in the non-volatile part of the appropriate NVRAMs. The download can be combined with a lock option of the firmware.
- When pressing “Download FW Code & Data” any running firmware program is stopped. If a new proper auto running firmware program is downloaded, this firmware can be started again by performing a system reset. A select box allows to reset and restart measurement automatically after download.

- The last four addresses of the FW Data 2 section contain the checksums which are stored to AS6031 when downloading firmware to AS6031. These fields are directly updated, when firmware files are loaded or content of firmware data fields are changed.
- Pressing the “Verify FW” button after downloading compares the content of the NVRAMs with the given files by their checksums. The software calculates the checksum of the given files and reads the calculated checksums of AS6031 as well as the stored checksums at the end of FWD2 section. Note: The firmware data file word 127 is by default empty, not knowing the checksum of the on-chip **ScioSense** firmware.

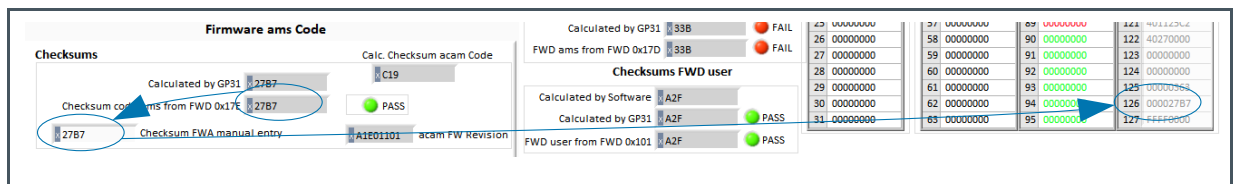
Figure 26 :
Firmware ams Code



The screenshot shows the 'Firmware ams Code' window. It includes sections for 'Checksums' with fields for 'Calculated by GP31' (1D31), 'Calc. Checksum acam Code' (C19), 'Checksum code ams from FWD 0x17E' (1D31), and 'Checksum FWA manual entry' (0). There are also 'Checksums FWD user' fields for 'Calculated by Software' (0), 'Calculated by GP31' (0), and 'FWD user from FWD 0x101' (0). A table on the right displays data for addresses 25 to 127, with some values highlighted in red (e.g., 89: 00000000, 121: 401125C2).

So copy manually the calculated checksum for the **applied** (ams) code into the field “Checksum FW manual entry”. Word 127 in the data will be updated and after downloading again the verification will pass for all.

Figure 27 :
Verification by Calculated Checksum

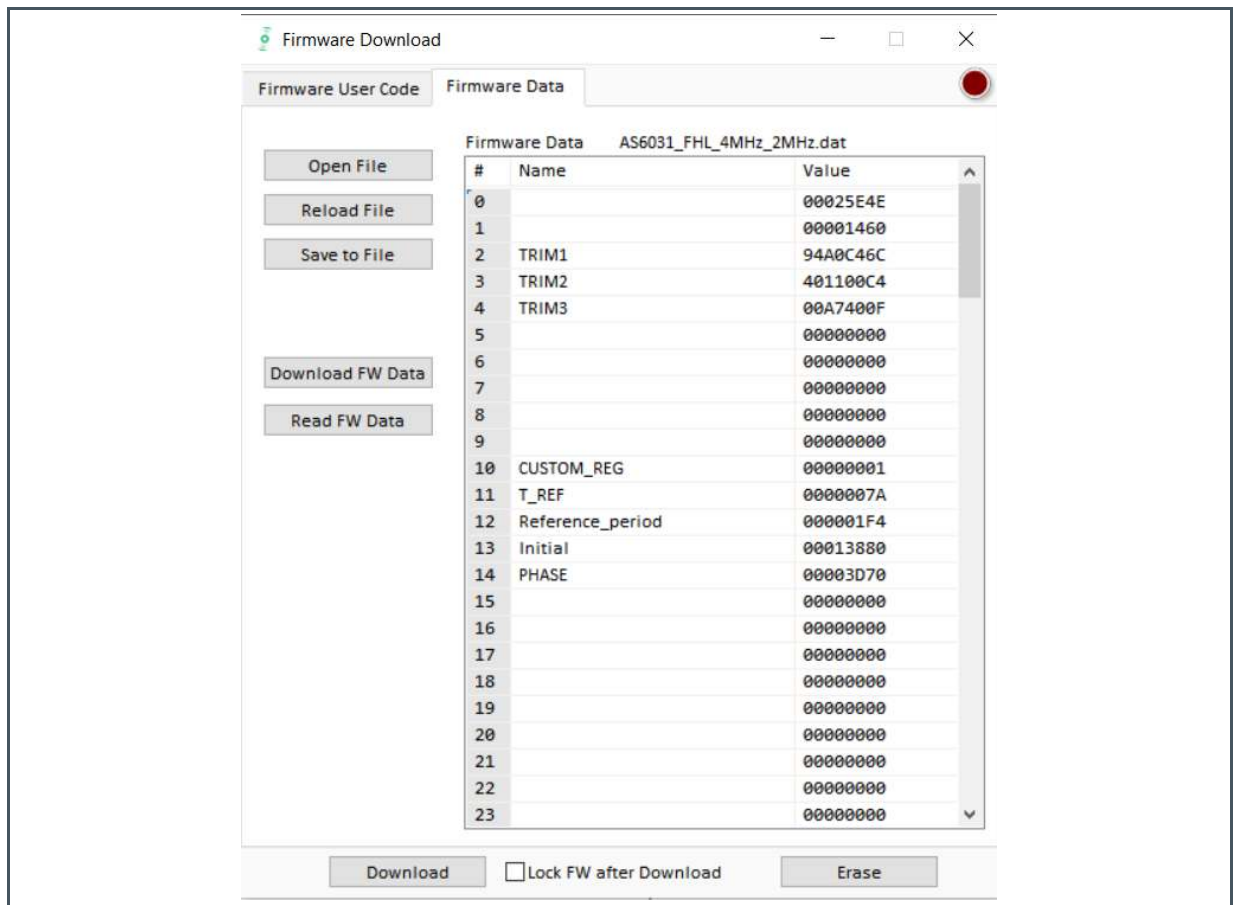


This screenshot is similar to Figure 26 but with blue annotations. Arrows point to the 'Checksum code ams from FWD 0x17E' field (1D31) and the 'Checksum FWA manual entry' field (27B7). Another arrow points to the 'Checksums FWD user' section, specifically the 'Calculated by GP31' field (A2F) and the 'FWD user from FWD 0x101' field (A2F). The table on the right shows updated values, with word 127 now containing 'FFFF0000'.

- In the “Firmware ams Code” section, the checksums for the **applied** firmware code are also checked and displayed after a “Verify FW”. The **applied** firmware code cannot be modified by user. Therefore a checksum calculated by software field is missing in this section.
- A lock state of AS6031 or a hang-up, caused by a faulty firmware user code can be dissolved by pressing “Erase FW” button. After that, a new firmware (user code & data) need to be downloaded again.

Alternative Window

Figure 28:
Firmware Download version2

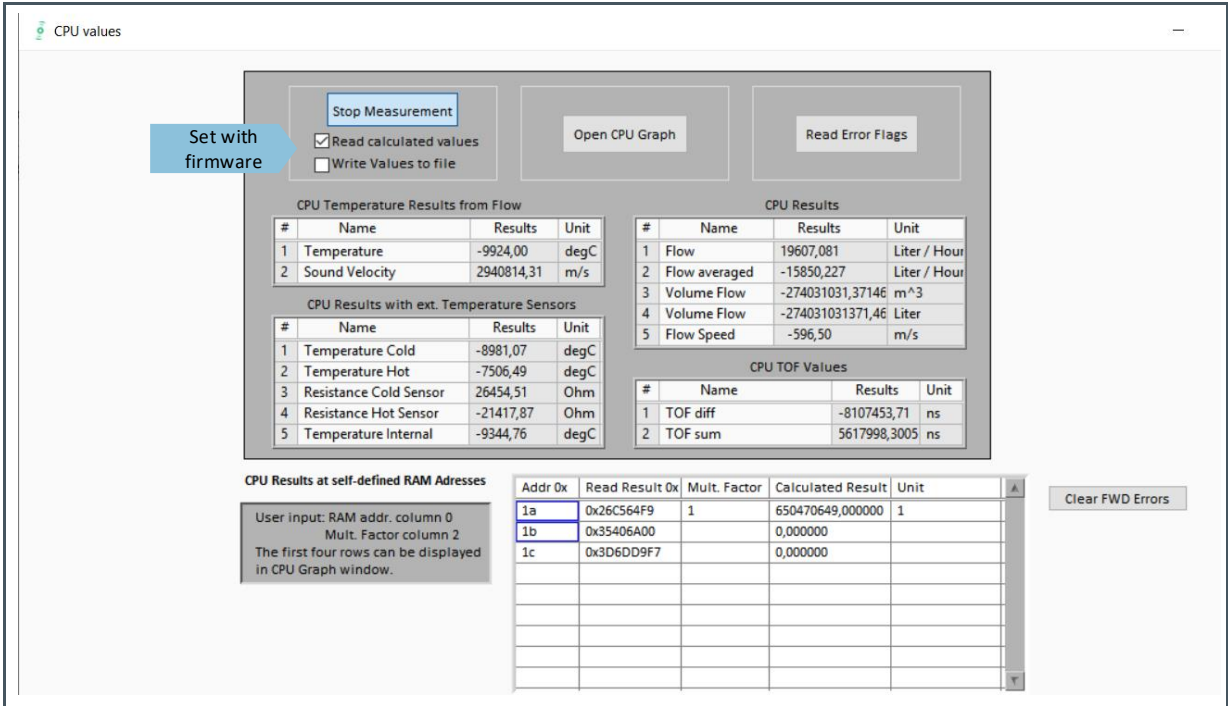


- CPU Values

This tab is only for customer who uses the ScioSense firmware for flow calculation. It reads out some important CPU values like water temperature, flow, velocity, etc. To enable the readout the “Read calculated values” checkbox has to be set.

The lower sections allows to read from any RAM addresses.

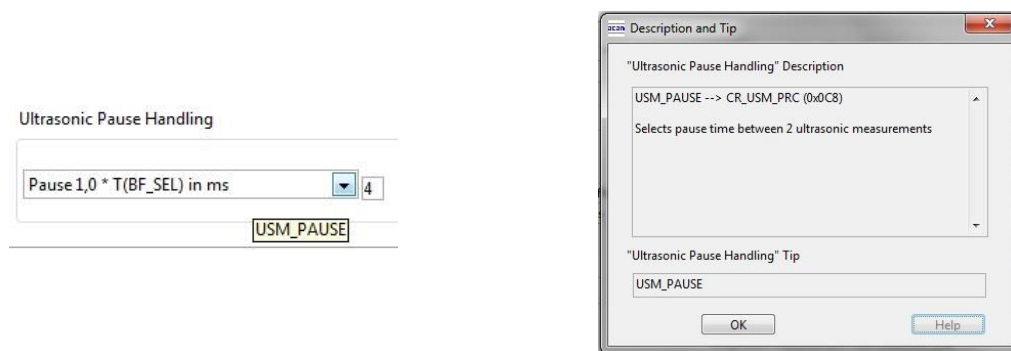
Figure 29 :
 Flow Calculation Tab



5.4 Help

When moving the cursor over the values in tabs of main window, the parameter name (used in the AS6031 manual) is displayed. By right-click and selection of “Description and Tip”, a window is opened showing additional description of the value.

Figure 30:
Description and Tip Window

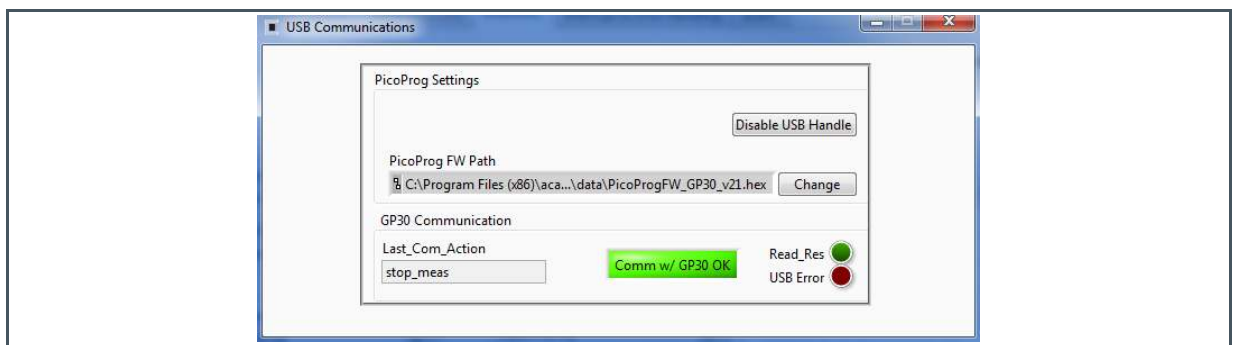


- Help Contents

Not supported in this software revision.

- USB Communication

Figure 31:
USB Communication



As described in chapter “Software Installation”.

- About

Displays software version number together with general information about software and **SciSense**.

6 Schematics, Layers and BOM

Figure 32:
AS6031-Board V1.0Schematics

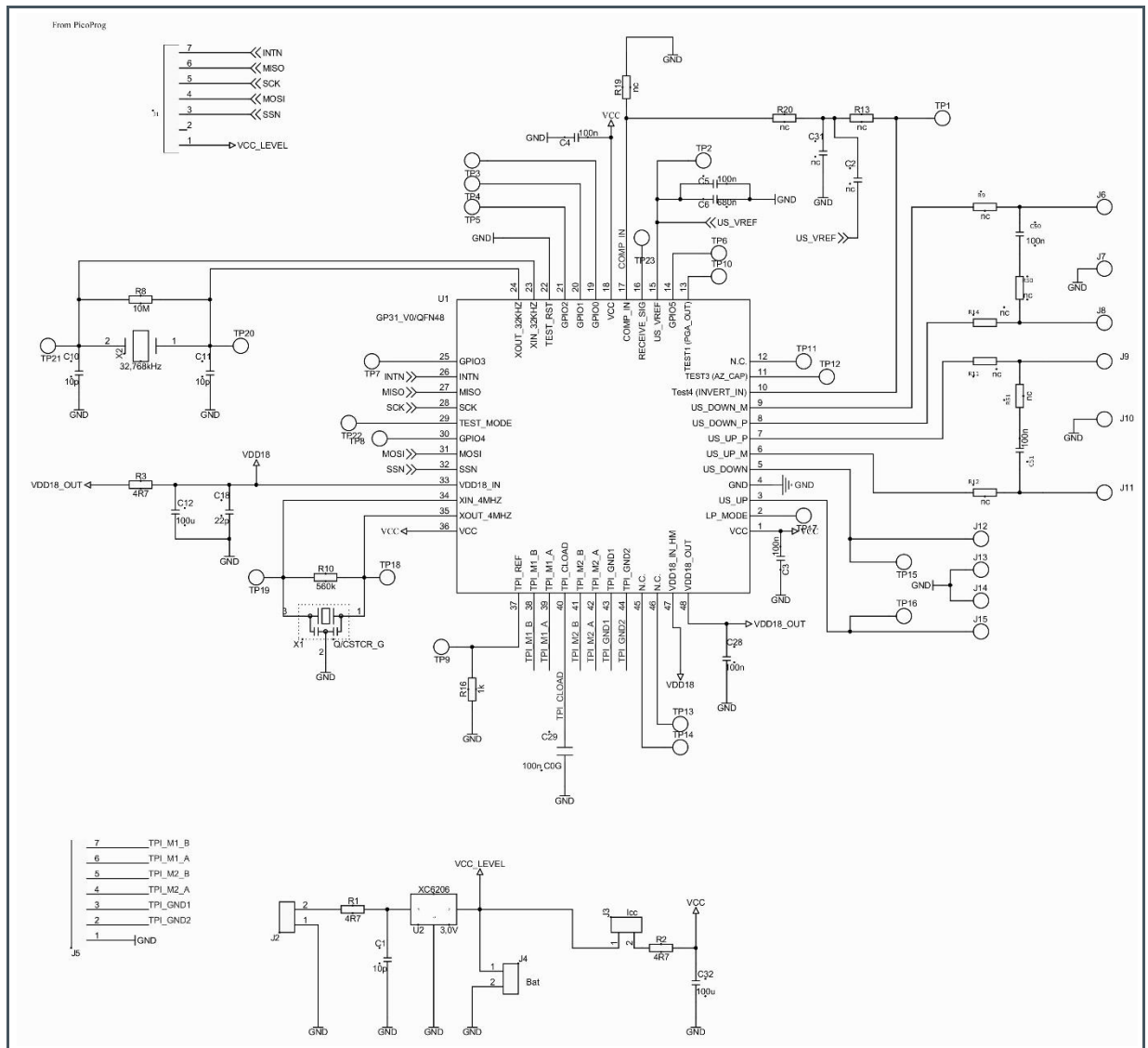


Figure 33:
AS6031-Board V1.0 Assembly

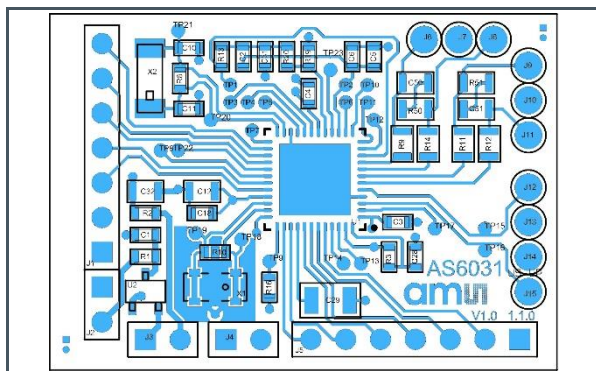


Figure 34:
AS6031-Board V1.0 Layout

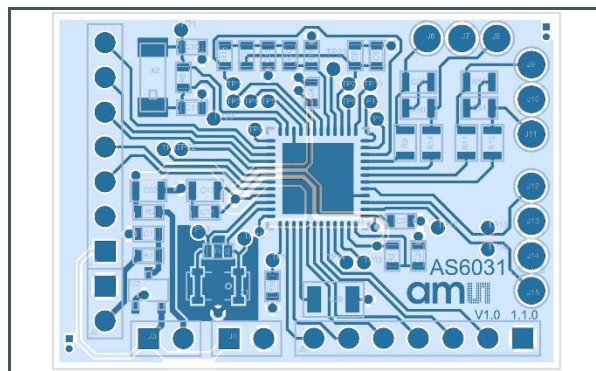


Figure 35:
Bill of Materials for AS6031-Board V1.0

Item	Qty	Reference	Value	Part Desc	Type
1	1	U1	AS6031	QFN48	AS6031 UFC ScioSense
2		U2	3.0 V	XC6206	Voltage regulator
3	1	X1	4 MHz	CSTR_G	Ceramic resonator Murata
4	1	X2	32.768 kHz	KX-327XS	Quartz crystal Geyer
5	3	C1,C10,C11	10 pF	0603	Chip capacitor
6	1	C18	22 pF	0603	Chip capacitor
7	4	C3,C4,C5,C28	100 nF	0603	Chip capacitor
8	1	C6	680 nF	0603	Chip capacitor
9	2	C50, C51	100 nF	0805	Chip capacitor
10	2	C12, C32	100 µF	0805	Chip capacitor
11	1	C29	100 nF	1206	Chip capacitor C0G
12	3	R1, R2, R3	4.7 Ω	0603	Chip resistor
13	1	R16	1 kΩ	0603	Chip resistor
14	1	R10	560 kΩ	0603	Chip resistor
15	1	R8	10 MΩ	0603	Chip resistor
16	1	J1	7 x 1 x 180°		2.54
17	1	J2	2 x 1 x 180°		2.54
18	1	J3	2 x 1 x 90°		2.54

7 Reference Modules and Transducers

7.1 Modules

SciSense has a close cooperation with Qingdao iESLab to support customers with complete ultrasonic flow modules for water and gas. For water, iESLab offers pipes made of brass and made of plastic and modules can be ordered un-calibrated or calibrated. The gas meter modules are made of plastic and come un-calibrated, because the final housing will have a major impact on the calibration.

7.1.1 Water Meter Modules

iESLab offers modules for DN15, DN20 and DN25, made of brass or composite.

Figure 36:
Water Meter Module, Brass

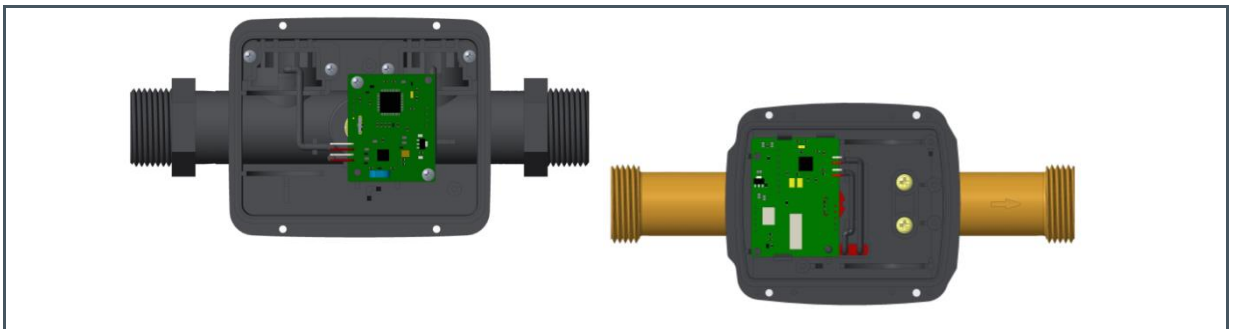


Figure 37: Ordering Information Code	Description	Part Number	Markup Information ⁽¹⁾
	With brass pipeline (with calibration parameter)	IA-UWM-1-GP30-DNxx	IA-UWM-1-GP30-DNxx- YYMMDD-SSSS
	With brass pipeline (without calibration parameter) [®]	IA-UWM-2-GP30-DNxx	IA-UWM-2-GP30-DNxx- YYMMDD-SSSS
	With Composite Material (with calibration parameter)	IA-UWM-3-GP30-DNxx	IA-UWM-3-GP30-DNxx- YYMMDD-SSSS
	With Composite Material (without calibration parameter)	IA-UWM-4-GP30-DNxx	IA-UWM-4-GP30-DNxx- YYMMDD-SSSS

(1) YYYY = year, MM = month, DD = day, SSSSSS = product serial number that day

Figure 38:
Measurement Characteristics

Nominal Diameter (DN)	15	20	25
Starting Flow (m ³ /h)	0.002	0.003	0.005
Minimum Flow Rate Q ₁ (m ³ /h)	0.010	0.016	0.025
Transitional Flow Rate Q ₂ (m ³ /h)	0.016	0.025	0.040
Permanent Flow Rate Q ₃ (m ³ /h)	2.5	4.0	6.3
Overload Flow Rate Q ₄ (m ³ /h)	3.125	5.0	7.875
Flow Range Ratio (Q ₃ /Q ₁)	400、250 (default)		
Accuracy Class	Class 2		
Temperature Classes	T50 [®] / T30(default)		
Sample Rate	8Hz~32Hz, 8Hz (default)		
Maximum Admissible Pressure	1.6MPa / 1.0MPa		
Pressure Loss Range	<63KPa / <40KPa		
Flow data storage	Accumulation flow(90 days)		

7.1.2 Gas Meter Modules

Those residential and industrial modules come with tubes made of plastic and the electronics are based on AS6031.

Figure 39:
Gas Meter Module brass

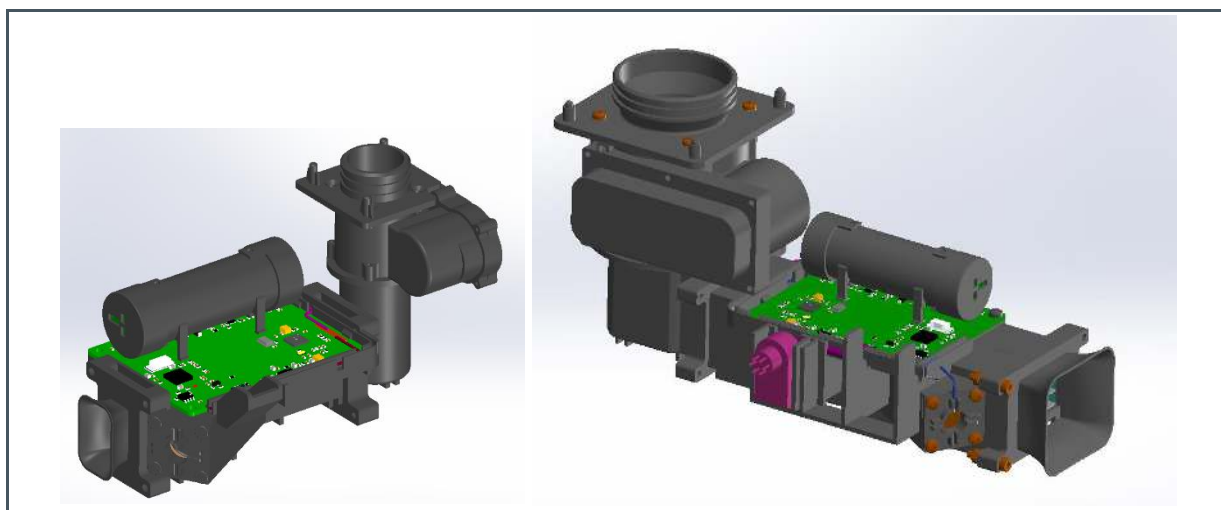


Figure 40:
Ordering Information

Ordering Code	Description	Part Number	Markup Information ⁽¹⁾
	Gas meter module residential	IA-UGM-1	IA-UGM-1-YYYYMMDD-SSSSSS
	Gas meter module industrial and commercial	IA-UGM-2	IA-UGM-2-YYYYMMDD-SSSSSS

(1) YYYY = year, MM = month, DD = day, SSSSSS = product serial number that day

Figure 41:
Measurement Characteristics

Application	Residential	Commercial & Industrial
Flow Range	G1.6 to G4	G6 to G25
Flow Range Ratio	R250	R350
Accuracy Class	Class 1.5	Class 1.5
Temperature Range	-25°C to 55°C	
Pressure Range	60 to 150 kPa	
Sampling Frequency	0.5 to 16 Hz @ working mode	
Outputs	Temperature, pressure (optional), flow under working condition and standard condition	
Auto-calibration for Gas	Yes	
Compensation	Temperature and pressure	
Power Consumption	< 50μA @ 8 Hz sampling rate	

Contact information:

Qingdao iESLab Electronic Co., Ltd.
17th Floor, Building A2-3, Hanyu Jingu, High-tech Zone, Jinan City, Shandong, China
<http://www.qd-ies.com>

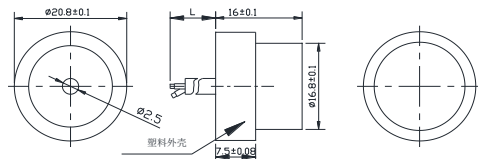
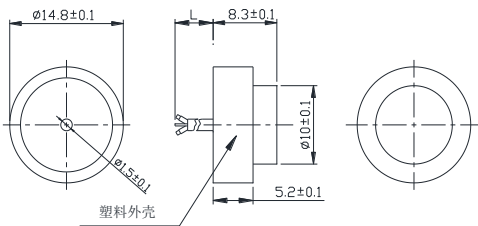
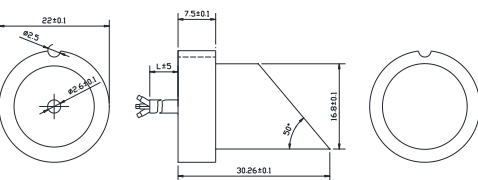
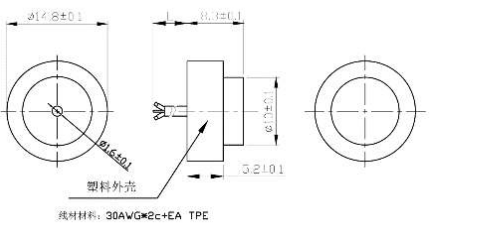
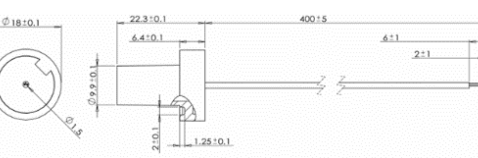
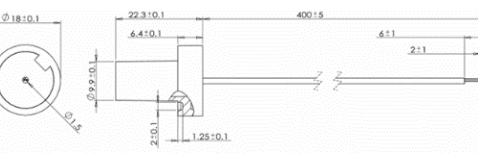
MR. Yang Shuo
Mobile: +86 131-7665-5636
Email: yangshuo@ieslab.cn
ysieslab@qq.com
WeChat: deltonys

7.2 Transducers

For transducers we can recommend products from Zhejiang Jiakang Electronics Co., Ltd.:

Figure 42:
Zhejiang Jiakang Ultrasonic Transducers

Part number	Frequency	Part number
Gas Meters		
PSC500K018060H2AD2-B1	<p>f: 500 ± 10 kHz</p> <p>Cp 470 pF ± 10%</p> <p>Top -35 to 70 °C</p>	
PSC200K018102H3AD0-B1	<p>f: 200 ± 10 kHz</p> <p>Cp 2000 pF ± 20%</p> <p>Top -35 to 70 °C</p>	
PSC200K018102H3AD1-B1	<p>f: 200 ± 10 kHz</p> <p>Cp 430 pF ± 20%</p> <p>Top -35 to 70 °C</p> <p>Angle 12° (average)</p> <p>Q 2.9 ± 0.3 g</p>	
PSC200K016191H2AD1-B1	<p>f: 200 ± 10 kHz</p> <p>Cp 600 pF ± 20%</p> <p>Top -35 to 70 °C</p> <p>Angle > 6° (half angle)</p>	
Water Meters		
PSC1.0M020100H2AD0-B0/PSC1.0M020107H2AD0-B0	<p>f: 1.0 ± 0.1 MHz</p> <p>R1MHz 100 to 350 Ω</p> <p>Cp 1300 pF ± 20%</p> <p>Top -40 to 85 °C</p> <p>S >800mV</p> <p>(@ 2Vpp, 110mm)</p>	
PSC1.0M019168H2AD2-B0	<p>f: 1.0 ± 0.1 MHz</p> <p>R1MHz 150 to 400 Ω</p> <p>Cp 1000 pF ± 20%</p> <p>Top -40 to 85 °C</p> <p>S >700mV</p> <p>(@ 2Vpp, 110mm)</p>	

Part number	Frequency	Part number
PSC1.0M020160H2AD1-B0	f: 1.0 ± 0.1 MHz R1MHz 150 to 350 Ω Cp 1200 pF ± 20% Top -40 to 85 °C S >800mV (@ 2Vpp, 110mm)	
PSC1.0M014083H2AD2-B0	f: 1.0 ± 0.1 MHz R1MHz 500 to 1500 Ω Cp 600 pF ± 20% Top -40 to 85 °C S >450mV (@ 2Vpp, 110mm)	
PSC1.0M022300H2AD4-B0	f: 1.0 ± 0.1 MHz R1MHz 150 to 500 Ω Cp 1300 pF ± 20% Top -40 to 85 °C S >700mV (@ 2Vpp, 110mm)	
PSC2.0M014083H2AD2-B0	f: 2.0 ± 0.1 MHz R1MHz 100 to 400 Ω Cp 1200 pF ± 20% Top -40 to 85 °C S >450mV (@ 2Vpp, 110mm)	
PSC2.0M018223H2AD2-B0	f: 2.0 ± 0.1 MHz R1MHz 150 to 500 Ω Cp 1100 pF ± 20% Top -40 to 85 °C S >200mV (@ 3Vpp, 140mm)	
PSC4.0M018223H2AD2-B0	f: 4.0 ± 0.2 MHz R1MHz 30 to 150 Ω Cp 2050 pF ± 20% Top -40 to 85 °C S >200mV (@ 3Vpp, 140mm)	

Tstrg = -40 to 85°C for all parts

Contact data:

Zhejiang Jiakang Electronics Co., Ltd.
No.1188 Jiahang Road, Jiaxing City, Zhejiang Province, China
<http://www.jkelec.com/>
dym@jkelec.com T. 13967380228
ayq@jkelec.com T. 13857347855

Overseas markets:
sally.ma@jkelec.com M+15906738799

8 Revision Information

Changes from previous version to current revision v3-00	Page
Document umber changed from ams UG000421 to SciSense SC-000866-UG	all
	all

- Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
- Correction of typographical errors is not explicitly mentioned.

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