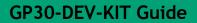




# GP30-DEV-KIT GP30-DEV-KIT-F01 Development Kit User Guide



Revision: 4 Release Date: 2023-05-16 Document Status: Production





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# 1 Introduction

The GP30-DEV-KIT is a platform for a quick and easy start-up and evaluation of the TDC-GP30 ultrasonic flow converter (UFC). It supports the QFN32 package, which offers the functionality need for standard water and heat meters. The development kit offers user-friendly configuration and extensive testing of the TDC-GP30, but also the complete assembler environment for programming the device. For a proper use of the evaluation system, we strongly recommend referring to the latest TDC-GP30 datasheets. The kit includes three elements:

GP30-DEMO-US / GP30-DEMO-US-F01 reference board, based on TDC-GP30YD (-F01) in QFN32 package



PicoProg Lite with USB-C – USB cable





## Figure 1: Functional Blocks

Please download the software for the kit from <u>https://downloads.sciosense.com/tdc-gp30/</u> and look for the latest revision of TDC-GP30\_EvalSW.

# 1.1 Ordering Codes

#### Table 1: Pin description

Ordering code	Part Number	Description
GP30-DEV-KIT	220260003	TDC-GP30YD Demo kit including PicoProg Lite and cable
GP30-DEV-KIT-F01	220260006	TDC-GP30YDF01 Demo kit including PicoProg Lite and cable





GP30-DEMO-US	220260002	TDC-GP30YD Reference board
GP30-DEMO-US-F01	220260005	TDC-GP30YD-F01 Reference board

# 2 Quick Start Guide

This section describes how to quickly set up the GP30-DEV-KIT, establish basic operation and make measurements.

## 2.1 Install the Software

It is crucial to install the software before connecting the evaluation kit to your computer. A default driver loading of your OS may interfere with correct installation.

- Download the latest zipped software installation package to the desired directory.
- Unzip the package to the desired directory.
- Open "setup.exe" from the unzipped directory.
- Follow the instructions on the screen.

## 2.2 Install the Hardware

- Make sure software is installed correctly before proceeding with this step!
- Connect your computer with the PicoProg Lite using USB cable.
- Connect PicoProg Lite and the evaluation kit reference board.
- The green LED on the evaluation kit should be on.
- Connect your spool piece to US\_UP and US\_DOWN

## 2.3 Quick Start for Initial Measurements

From the "Start" menu, go to "All Programs" and then to the "ScioSense" directory. Double click the "GP30\_v2\_0" icon (or newer versions, if available) to begin execution of the evaluation software. The following screen should appear:





ents	Ultrasonic Measurement Control	Temperature	Measurement Control	General Control Interfaces	Interrupt & Error Handling acam Fir	mware Parameters Firmware Error Counters No device detected
		Time of Flight	t Measurement			2-Wire Temperature Measurement
			Avg. Rate:	Avg. Rate:	Write Config	Current Temperature Sensor accuracy ppm/K
	# Name	Results / ns	Average/ns	Std. Dev./ps	Start Measurement	RC/Rref current T RH/Rref current T Open Graph
	1 TOF SUM AVG UP	59849.4	59849,5	91,8	Read Config from RAM first	() 1,0000
	2 TOF SUM AVG DOWN	60845,9	60845,9	81,2	(Use with GP30 Firmware only!)	0
	3 TOF1_UP	61843,2	61843,0	89,4	GP30 Status	Calculated Temperature Results
	4 TOF2_UP	62839,3	62839,2	91,0	GP30 is not responding	# Name Results Unit StD (mK) SNR (Bit) ^
	5 TOF3_UP	61344,4	61344,4	59,5		0 0 1 0 1 FR0
	6 TOF4_UP	59849,6	59849,4	98,6	Stop Measurement Cycle Timer and Disable Watchdog	
	7 TOF5 UP	60846,0	60845,8	96,1	and Disable Watchdog	Measurement Values
	8 TOF6_UP	61843,0	61843,0	93,7	System Reset	# Name Results Unit A Apply RDSON compensation
	9 TOF7_UP	62839,2	62839,2	80,5	System Reset	0 0 1 0 Apply Resolve Compensation
	10 TOFS UP	61344,5	61344,3	63,9	Disable Watchdog after Reset	
	11 TOF1 DOWN	-0,2480	0,0872	141,7	Release Bus Master after Reset	0 0 1 0 Mult. Gain Comp. 1,25
	12 TOF2 DOWN	-0,1106	0,0652	112,0		
	13 TOF3 DOWN	0,2594	0,0673	118,6	Disable Watchdog	0 0 1 0 ^ Offset 0,0001
	14 TOF4 DOWN	0,0839	0,0385	117,7	Enable Watchdog	0 0 1 0 Gain Factor 0,9998
	15 TOF5 DOWN	-0,0191	0,0657	80,2		
	16 TOF6 DOWN	0,0000	0,0000	0,0	Watchdog is Enabled	HS Clock
	17 TOF7 DOWN	0,0000	0,0000	0,0000		HS clk period in ps (ideal) HS clk period/ns Cal Factor HS clock
	18 TOF8 DOWN	0,0000	0,0000	0,0000	Verify Interface	His cik period in his (ideal)
	19 diff. TOF 1	0,0000	0,0000	0,0000	Pico Prog FW Version	
	20 diff. TOF 2	0,0000	0,0000	0,0000		according to setting in RAM Apply calibrated clock period to display values
	21 diff. TOF 3	0,0000	0,0000	0,0000	Comm. with GP30 OK?	
	22 diff. TOF 4	0,0000	0,0000	0,0000	No comm. w/ GP30	Amplitude Measurement
	23 diff. TOF 5	0,0000	0,0000	0,0000		Measurement Values
	24 diff. TOF 6	0,0000	0,0000	0,0000	Remote Interface	# Name Results / mV Std Dev. / mV With Result Avgd
	25 diff. TOF 7	0,0000	0,0000	0,0000	SPI - Interface	0 0 1 1 FR0
	26 diff. TOF 8	0,0000	0,0000	0,0000	OUART - Interface	0 0 1 1 FR1
	27 diff. TOF SUM AVG	0,0000	0,0000	0,0000 🗸		0 0 1 1 FR2 v
	Write TOF \	/alues to File			Baudrate 4800	Calibration Values
[	Open TOF Graph     OAll TOF	Calibration	Pulse Width Ratio UP 0,00	Pulse Width Ratio DOWN 0,00	Baudrate 115200 Selected Baudrate 4800	Image: Calibration Values           Image: Calibration Values

#### Figure 2: Functional Blocks

- Click the "Verify Interface" button to confirm communication between PicoProg Lite and TDC-GP30 is working. Both fields, "Pico Prog Lite FW version" and "Comm. With GP30 OK?", should become green.
- Next, open our initial configuration GP30Y\_config\_default\_03 and download it into the chip, pressing "Write Config".
- Connect your spool piece to pins US\_UP and US\_DOWN. Depending on the outline of the transducers changes of the configuration will be necessary.
- Press "Start Measurement" to begin measuring.

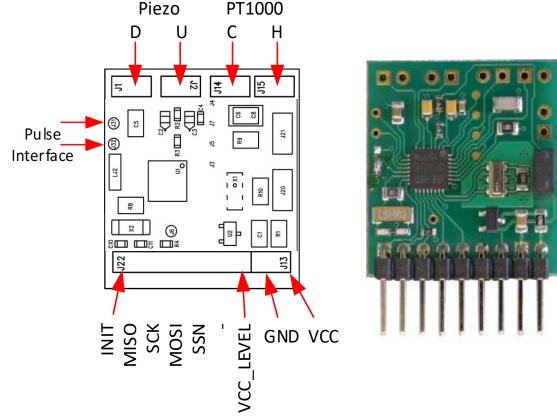
At this point, after successful completion of the above steps, a basic operation of the DEV kit should be possible. The following sections provide a detailed description of the hardware and software for advanced operation.



# 3 Hardware Description

# 3.1 Introduction

The GP30-DEV MODULE board, shown in Figure 3, 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). All ports of TDC-GP30 are available. Additional patch fields allow an easy extension with additional circuits. Those can be amplifiers or analog switches for operation in gas meter mode.



#### Figure 3: GP30-DEV MODULE

# 3.2 Communication Interface

The PicoProg Lite board is a USB-to-SPI converter box that interfaces all UFC evaluation systems.

The PicoProg Lite is registered by the operating system initially as "PicoProg LITE V1.0". To confirm, open "Control Panel" of your OS and click on "Devices and Printers" icon. The USB driver will be listed in "Unspecified" driver section.

The flat connector includes the power lines and the SPI or UART communication lines. The development kit with PicoProg Lite does not support UART communication.

On the demo board the communication interface is initially selected to SPI (by solder bridge LJ2). Pin VCC\_LEVEL is the voltage feedback for the former PICOPROG level shifters and is no longer used with PicoProg Lite.





# 4 Software Description

## 4.1 Measurement

When started, the software comes up with the main window, showing the "Measurements" tab.

ents	Ultrasonic Measurement Control	Temperature	Measurement Control	General Control	Interfaces	Interrupt & Error Handling acam F	Firmware Parameters Firmware Error Counters PicoProg Lite
		Time of Fligh	t Measurement				2-Wire Temperature Measurement
			Avg. Rate:	Avg. Rate:	7	Write Config	Current Temperature Sensor accuracy ppm/K
	# Name	Results / ns	Average/ns	Std. Dev./ps	~	Start Measurement	20,00 J 4000 DG/Red current T Open Graph
	1 TOF SUM AVG UP	59849.4	59849.5	91,8		Bard Car Car Car Bald Car	KOWIEJ CUITERE I
	2 TOF SUM AVG DOWN	60845,9	60845.9	81,2		Read Config from RAM first (Use with GP30 Firmware only!)	
	3 TOF1_UP	61843.2	61843.0	89.4	_	GP30 Status	Calculated Temperature Results
	4 TOF2 UP	62839,3	62839,2	91,0	_	Measurement Cycle Timer is ON	# Name Results Unit StD (mK) SNR (Bit)
	5 TOF3 UP	61344,4	61344,4	59,5	-	· · · · · · · · · · · · · · · · · · ·	0 0 1 0 1 FR0
	6 TOF4 UP	59849.6	59849.4	98,6	_	Stop Measurement Cycle Timer	
	7 TOF5 UP	60846.0	60845.8	96,1	_	and Disable Watchdog	Measurement Values
	8 TOF6_UP	61843,0	61843,0	93,7			
	9 TOF7_UP	62839,2	62839,2	80,5		System Reset	
	10 TOF8 UP	61344,5	61344,3	63,9		Disable Watchdog after Reset	0 0 1 0 Apply Gain compensation
	11 TOF1 DOWN	-0,2480	0,0872	141,7		Release Bus Master after Reset	0 0 1 0 Mult. Gain Comp. 1,25
	12 TOF2 DOWN	-0,1106	0,0652	112,0			
	13 TOF3 DOWN	0,2594	0,0673	118,6		Disable Watchdog	0 0 1 0 Offset 0,0001
	14 TOF4 DOWN	0,0839	0,0385	117,7		_	0 0 1 0 Gain Factor 0.9998
	15 TOF5 DOWN	-0,0191	0,0657	80,2		Enable Watchdog	
	16 TOF6 DOWN	0,0000	0,0000	0,0		Watchdog is Enabled	HS Clock
	17 TOF7 DOWN	0,0000	0,0000	0,0000			
	18 TOF8 DOWN	0,0000	0,0000	0,0000		Verify Interface	HS cik period in hs (ideal)
	19 diff. TOF 1	0,0000	0,0000	0,0000		Pico Prog Lite FW Version	230
	20 diff. TOF 2	0,0000	0,0000	0,0000		1.2.1	according to setting in RAM Apply calibrated clock period to display values
	21 diff. TOF 3	0,0000	0,0000	0,0000		Comm. with GP30 OK?	
	22 diff. TOF 4	0,0000	0,0000	0,0000		Comm. w/ GP30 OK	Amplitude Measurement
	23 diff. TOF 5	0,0000	0,0000	0,0000			Measurement Values
	24 diff. TOF 6	0,0000	0,0000	0,0000		Remote Interface	# Name Results / mV Std Dev. / mV With Result Avgd
	25 diff. TOF 7	0,0000	0,0000	0,0000		SPI - Interface	0 0 1 1 FR0
	26 diff. TOF 8	0,0000	0,0000	0,0000		OUART - Interface	0 0 1 1 FR1
	27 diff. TOF SUM AVG	0,0000	0,0000	0,0000	~		0 0 1 1 FR2 V
	Write TOF V	alues to File				Baudrate 4800	Calibration Values
	ODON'T w	rite to File	Pulse Width Ratio UP	Pulse Width Rati	- DOWN	Baudrate 115200	# Name Results
	Open TOF Graph Values f.	Calibration	0,00	0,00	5 DOWN	Selected Baudrate 4800	

#### Figure 4: Main Window

#### 4.1.1 First Step with Measurement Control Elements

A good first step is to load a working configuration and make measurements in frontend mode (without using the internal 32-Bit  $\mu$ P). ScioSense provides a sample configuration file named GP30Y\_config\_default\_03 which typically works well with DN20 spool pieces.

Load Configuration File: File menu  $\rightarrow$  Open Config  $\rightarrow$  choose appropriate configuration file

- 1. Press "System Reset" button. Now the Pico Prog Lite FW version field should get green and the appropriate version should be displayed (1.2.1 or higher). Further, "Comm GP30 OK?" should get green to show that communication with TDC-GP30 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 TDCX-GP30.
- 4. Press "Start Measurement" button. Now the chip starts to measure and the software displays the results in the table "Time of Flight Measurements".

The user can now modify the configuration to fit it to his needs. Having done this, the user can store his own configuration files.



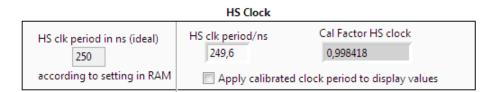
#### 4.1.2 Time of Flight Measurement Results

GP30 stores the first 8 hits of every TOF direction separately and also the averaged sum of all measured hits calculated by UI (in blue). These 9 results are displayed for both directions, as we call them up and down. The evaluation software additionally calculates the difference (in blue) between up and down stream, DIFF-TOF. In total, all 27 results are displayed in the "Results" column.

In the "Average" column the user can set the sample size for the averaging (<1000). The software calculates the rolling average of the results accordingly. In "Std. Dev." column the standard deviation, calculated over a variable sample size, is displayed. The number of samples can be chosen (e.g. 100).

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.

**Information:** The application of the highspeed calibration is off by default. This is more convenient when comparing measurement data. But when collecting data for calibration it is strongly recommended to have this active.



#### Figure 5: HS Clock Calibration

A graph to display TOF measurement results opens in a separate window by pressing "TOF Graph" button. It is possible to activate up to four plots. Each plot has various selections, e.g. TOF1UP, TOF2UP etc.. Always averaged values are displayed.

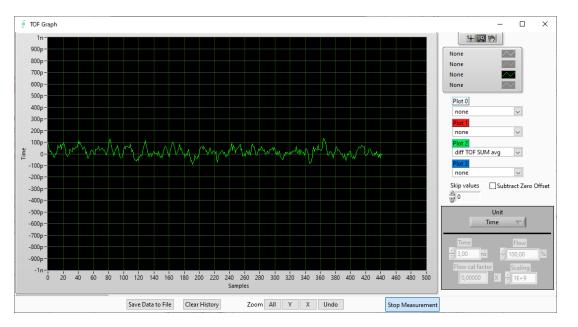


Figure 6: TOF Graph





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

	А	В	С	D	E	F	G	Н	I	J	K	L
1	08.08.2016 16:18	s Elapsed	diffTOFSu	sumTOFS	diffTOF1	sumTOF1	PW UP	PW DOW	AM UP	AM DOW	Status Re	gister
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		FFFFFFF
З	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		FFFFFFF
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		FFFFFFF
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		FFFFFFF
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		FFFFFFF

#### Figure 7: Data Export for Calibration

	Α	В	С	D	E	F	G		1	J	K	L			0								V			Z					AE	AF	AG	AH	AL
1	*****	s Elapse	TOFSun	TOFSum	TOF1up	TOF2 up	TOF3 up	TOF4 up	TOF5 up	TOF6 up	TOF7 up	TOF8 up	TOF1dov	TOF2 do	· TOF3 do	TOF4 do	TOF5 do	· TOF6 do	TOF7 do	TOF8 do	e diff. TOF	diff. TOF	diff. TOF	diff. TOF4	diff. TOF	PW UP	PW00w	AMUP	AMD0%	/ Status P	legister				
2	16:19:1	0 0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	8,89	9,10		FFFFFFFF
3	16:19:2	2 12,05	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	9,26	8,81		FFFFFFFF
4	16:19:2	2 12,30	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	9,26	8,81		FFFFFFFF
5	16:19:2	3 12,75	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	8,81	8,46		FFFFFFFF
6	16:19:2	3 13,30	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	8,18	8,41		FFFFFFFF
7	16:19:2	4 13,79	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	1,99	1,99	6,81	6,91		FFFFFFFF

#### Figure 8: Data Export Complete

#### 4.1.3 2-Wire Temperature Measurement Results

A graph to display temperature measurement results opens in a separate window by "Temperature Graph" button, similar to TOF graph.

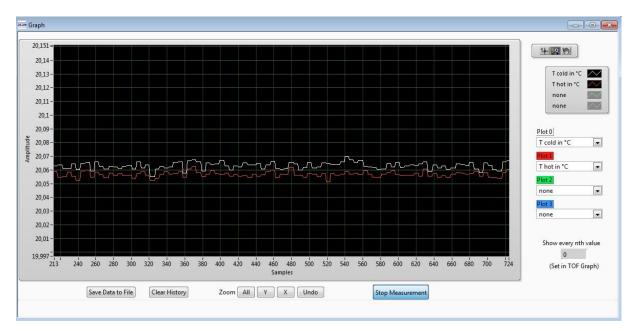


Figure 9: Temperature Measurement Results Graph (previous UI)





# 4.2 Ultrasonic Measurement Control

In this tab 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

💈 GP30 Evaluat	ion Software												-	
File Tools Firm	nware Interfaces Help													
Measurements	Ultrasonic Measurement Control	Temperature M	easurement Control	General Control	Interfaces	Interrupt & Error H	andling acam	Firmware Parameters	Firmware Error Cou	unters	PicoProg Lite			
						Time o	f Flight: Sequence	e Control						
							Ultrasonic	Pause Handling			Direction M	Mode		
	TOF Rate		Number of Fire Pulse		Pause 1,0 *	* T(BF_SEL) in ms	<b>~</b> 4	Pause between TOF U 20,00		Toggle Direction	n with every Me	asurement	~ 2	
F	ire Pulse Clock Divider		Zero Cross Calibration	Rate							Time Of Flight	Edge Mode		
Register 3	Setting HS Clock Divisor	Every 50th 5	equence Cycle Trigge	r 🗸 6	40	Noise Mask Win		Timeout T 128 μs	OF 0	Positive Edge of	f TOF Hit	[	~ 0	
						Time Of Flight: Hit	Control							
		TOF Hit	s Stored in Front End o	lata Buffer		Start Hit Moo	le							
	No. of TOF Hits 12 Hits 12	Sum of All 1	OF and first 8 TOF valu	ies 🗹 1	Start Hit I	by First Hit Detection		85	First Hit Level Up 74,8	mV	First H Positive	lit Polarity		
					Selec	ted Start Hit after Firs	t Hit Detection							
	No. of ignored Hits 0 Hits	0	Start Hit Delay Windo	ns	9. Hit		~ 8	85	irst Hit Level Down	mV	🗹 Enable Pu	lse Width Detection		
						Amplite	ıde Measurement	t Control						
			Amplitude	Measurement Rat	e	Amplitude	Measurement Cali	ibration Rate	Amplitude Measur	ement Peak Detecti	ion End			
			Every TOF Measuren	nent	<b>×</b> 1	Every 20th Am	olitude Measureme	ent 🔽 5	After 8 Hits		× 8			
						Trans	ducer Interface O	ptions						
	Tra Fire Buffer 1 & Receive	ansducer Interface Path 1 Selected		-1	∃Enable Gas №	Meter Mode	Enable Prechar	Switches in both US buff rge Transistors in both US wn Transistors in both US cceive Path Transistors re Buffer	Buffer	Enable Ex	xternal Receive A	Amplifier (QFN 40 or	ıly)	
د														>

#### Figure 10: 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 GP30 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

🦉 GP30 Evaluat										-	×
	nware Interfaces Help Ultrasonic Measurement Control	Temperature Measurement C	Control General Control	Interfacer	Interrupt & Error Handling	acam.	Firmware Parameterr	Firmware Error Counters	PicoProg Lite		^
Measurements	oldasonie measurement control		General Control	interfaces	interrupt of Error Handling	acann	Thinware Parameters	Thinware Error Counters	Theoring the		
					Sequ	ence Cont	rol				
			Meas	urement Rep	petition Rate						
		То	mperature Measurement eve	0	Sequence Cycle	inner	Temperatur	e Measurement Subtask Handl	ing (Pause Time)		
		ie ie	inperature measurement eve	iy. U	Sequence Cycle	nggers	Pause	1,5 * T(BF_SEL) in ms	5		
			Po	rt Measurem	nent Order		Pau	se between Temperature Meas			
			1. Default Orde	r -> 2. Reven	sed 🗸 2			30,00 m			
					Measu	rement Co	ntrol				
			Wire Mode *		incusa	Port Co					
		2-Wire Measur	ement	~ 0	Number o		ontroi				
			Measurement Mode		3 Ports		× 1		er of Fake Measurements		
		Internal Resisto	Dr	× 1	Inactive Po	rts during	Measurement	2 Fake Measure	ements 🔽	0	
					Pulled to	SND	~ 0				
		* Current Software Relea	se supports only 2-wire Temp	perature Moo	de						
					Temperature N	extreme	nt Cucle Time				
					1024 µs	arge Select	<b>⊻</b> 1				
<											×
`											<b></b>

#### Figure 11: Temperature 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 GP30 manual.



## 4.4 General Control

#### The "General Control" tab covers configuration settings for

- Task sequencing
- High speed clock control
- Voltage measurement
- CPU handling
- Timer settings

🔮 GP30 Evaluation Software	-	$\Box$ ×
File Tools Firmware Interfaces Help		
Measurements Ultrasonic Measurement Control Temperature Measurement Control General Control Interfaces Interrupt & Error Handling acam Firmware Parameters Firmware Error Counters PicoProg Lite		^
Task Sequencing		
Set Cycle Time of Task Sequencer     Select Base Frequency for Pause Times     Image: Pause Times     Image: Pause Times     Bandgap Pulse Mode       Cycle Time Task Sequencer     Base Frequency Select     Task Sequencer Start Mode     Synchronized with task sequence       128     125     ms     BF_SEL = 50 Hz     0     Task Sequencer Start Mode     Synchronized with task sequence	er 🔽 1	
High Speed Clock Control		
Setting Time High Speed Clock Select HS_CLK Calibration	n Rate	
135 µs 🗸 2 4MHz 🗸 0 Every 20th Sequence Cycle	~ 5	
Voltage Measurement		
Ver medaled	Measured Vcc	
CPU Handling		
Enable Post Processing CPU Request Enable Post Processing Enable		
Post Processing Mode Enable General Purpose Timer Request Checksum Execution at	fter Bootloader	
Post Precessing only after TOF, AM, AMC, TM or HCC Measurement v		
Timer		
General Purpose Timer		
Update Mode for Time Stamp Value Checksum Timer		
Updated Automatically every second V 1 Checksum Every hour	× 1	
		~
¢		>

#### Figure 12: 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 GP30 manual

#### 4.4.1 Firmware

In case the TDC-GP30 has firmware, setting flag "Enable post processing" turns on the CPU (flow meter mode). Having this not set, the GP30 runs as front-end in time conversion mode.





## 4.5 Interfaces

The "Interfaces" tab covers configuration settings for

- Pulse interface including test option
- EEPROM interface
- GPIO control
- UART remote interface.

ments Ultrasonic Measurement Control Temperature Measurement	en control General control interfaces intern	upt & Error Handling acam Firmware Parameters	Firmware Error Counters PicoProg Lite			
Pulse Interface	G	PIOs	UART Interface Control *			
Pulse Interface Control			CRC Control			
Enable Pulse Interface	Input Pull Down	(SPI) or RxD (UART) Port	UART CRC Polynomial			
General Update Mode	GPIO 0	GPIO 1	1021			
Update by PI_UPD only		Configuration GPIO 1	UART CRC Reversed Order			
Output Mode	Configuration GPIO 0 Output	Output	UART CRC in Unreversed Order			
Forward and Backward Pulses on 1 Line			Initial CRC Value Initial CRC Value 1			
Pulse Width	Select GPIO 0 Pulse Interface->Pulse	Select GPIO 1	UART CRC Mode			
10 🗢 9,766 ms	Puise interface->Puise	Pulse Interface->Direction	Default Settings			
Pulse Interface Test	GPIO 2	GPIO 3				
Update Pulse Interface	Configuration GPIO 2	Configuration GPIO 3	UART Wake Up Command Enable			
No. of Pulses	Input Pull Up	Input Pull Up	Wake Up Command Enabled 🛛 🛁 1			
0,0000	Select GPIO 2	Select GPIO 3	Baud rate			
4,00000	General Purpose Out [2]	General Purpose Out [3]	UART High Baud Rate			
Minimum Distance 2 Pulses			19200 Baud			
10,742 ms	GPIO 4 (QFN 40 only)	GPIO 5 (QFN 40 only)	High Baud Rate Timeout			
Time Between Internal Updates	Configuration GPIO 4	Configuration GPIO 5	120 ms 7			
3 🔹 2,93 ms	Input Pull Up 🔰 1	Input Pull Up 🔽 1	UART High Baud Mode			
No. of Internal Upd. between General Upd.	Select GPIO 4	Select GPIO 5	High Baud rate controlled by remote controller 🕥 🛛			
	General Purpose Out [4]	General Purpose Out [5]				
	GPIO 6 (QFN 40 only)		Clear Mode for UART IRQ UART INT cleared by remote controller			
External EEPROM Interface Control			OAKTINT cleared by remote controller			
	Configuration GPIO 6 Input Pull Up		UART Data Message			
PROM Interface Mode EPROM Interface on GPIO 5/6	Select GPIO 6		Address Length			
	General Purpose Out [6]		0 🐳 0 🐳			
PROM Pull Up Enable			* Current Software Release supports only SPI Interface			
terface Pull Ups Enabled 🔽 1						
PROM Slave Address						

#### Figure 13: Interfaces Tab

The meanings of the various settings are displayed in clear text. For more details about the register settings please refer to the GP30 manual.

#### 4.5.1 Pulse Interface

The pulse interface needs an appropriate firmware in the chip. The settings in the evaluation software only generate an artificial pulse to test the general functionality. The output is not related to any measurement.

## 4.5.2 UART

The UART is not supported in this software version.



# 4.6 Interrupt & Error Handling

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

© GP30 Evaluation Software			- 0	×
Hile Tools Firmware Interfaces Help Measurements Ultrasonic Measurement Control Temperature 1	Aeasurement Control General Control Interfaces Int	terrupt & Error Handling acam Firmware Parameters Firmware Error Counters PicoProg Lite		
File Tools Firmware Interfaces Help  Measurements Ultrasonic Measurement Control Temperature I	Aessurement Control       General Control       Interfaces       Interfaces         Selected Error Indicators         IDC Timeout         TDC Timeout         Amplitude Messurement Timeout         Temperature Open Circuit         Zero Cross Calibration Error         Low Battery Detect         Ultrasonic Sequence Timeout         Task Sequence Timeout         EEPROM Acknowledge Error         Checksum FWD Error         Checksum FWD Error         Checksum FWA Error	terrupt & Error Handling       eam       Firmware Parameters       Firmware Error Counters       PicoProg Lite         Interrupt Sources for Remote Interface <ul> <li>Grid of Task Sequencer</li> <li>End of Task Oct Load</li> <li>End of Boild Checksum</li> <li>Synchronous FW INT Request</li> <li>Debug Step Finished</li> <li>Error Flag</li> </ul>		
<				>

#### Figure 14: 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 GP30 manual.

## 4.7 acam

On this tab specific parameters are displayed, but for ScioSense internal use and analysis only.





# 4.8 Firmware Parameters and Firmware Error Counters

Those two tabs display and allow editing of parameters related to the ScioSense flow firmware. They are of use only for TDC-GP30-F01.

For details please refer to the application note TDC-GP30-F01 Flow Firmware (SC-001268-AN).

ients Otrasonic Measur	ement Control Temperature Measurement Co	introl General Control Interfaces I	nterrupt & Error Handling acam	Firmware Parameters Firmware Erro	r Counters PicoProg Lite
					Firmware Configuration
		Get Firmware parameters from FW Data	2 in "FW Download" Window		acam Firmware configuration register × 00000010
rature Measurements		Limits for Error D	etection	, 	PWL
		Pulse Width	SUM TOF	HSC calibration	Apply acam calibration method
e branch offset resistance	Amplitude Measurements		SUM TOP	HSC calibration	O Apply PWL calibration method
Ohm ×00000000	Miminum Level for amplitude in mV	Error threshold for deviation between	Error Threshold for deviation	Error Threshold for HSC calibration	TSENS
internal Reference	0,000 🚖 mV ×0000000	0,000 🚖 × 00000000	0,00 ≑ µs ×00000000	0 🗢 % ×0000000	Use temperature value from flow meas. for calibration coefficient
external reference resistor	No. of low Amplitude measurements	UP and DOWN pulse width ratio	of Sum TOF from former average		OUse temperature value from hot sensor meas. for calibration co
+ Ohm ×03E80000	32 🔹 × 00000020				VOL
	before Hardware Failure alarm				Don't apply flow volume storage protection     Apply flow volume storage protection
sensor resistance slope	Error threshold for deviation between				CApply flow volume storage protection FRR
Ohm/K ×0029F000	0,000 ÷ mV ×0000000				Disable average error counters
ensor nominal resistance	UP and DOWN measurement of Amplitude				OEnable average error counters
+ Ohm ×03C20000	· · ·				VLIM
		First Hit Level (	Disable control of speed of sound limits		
atio of Reverence Resistor	Trusted First Hit Level (B0)				OEnable control of speed of sound limits
+ Ohm × 00010000			Sum TOF Offset as Start / f	allback value of FHL (LSB=0,88mV)	FHL_RATIO
d sensor resistance at 0°C	FHL Ratio (B1/B0) × 00000000 0,0	000 🚖 × 00000000 0,000	🜩 μs ×00000000	0,00 🗢 mV × 0000000	<ul> <li>Interpret FHL-values as fixed voltage</li> </ul>
atio of Reverence Resistor	0,0000	for First Hit Level Tru	usted First Hit Level		OInterpret FHL-values as ratio to measured amplitude
÷ 0hm ×00010000	Zero Flow	Averaging and Ne	gative Flow	TOF Rate	FHL: Configuration of FHL regulation methods
t sensor resistance at 0°C					Method 1, fixed FHL
	Minimum Value for DiffTOF (raw TDC uni	ts) before No. N for 2^N to calcula	te the No. of TOF RATE use	ed by FW FWD_USM_PRC (addr. 116)	TESTMODE: Configuration for FHL regulation option C
	0,000 🗘 ns × 0000000		0000000 1	01000000	Enter FHL test mode regularly (each 32 measurements)     Enter FHL test mode only in error case
	temporary zero flow is assumed (calculation	ns stopped) flow values to be			PI ERROR
	Minimum Value for flow before		-		Don't signal no-water as error on pulse interface
	0,000 🗢 l/h × 00000000	Cutoff threshold for ne 0.00000    I/h	x 00000000 Factor for	TOF Rate Scaling in zero flow case	OSignal no-water as error on pulse interface
	long term zero flow is assumed	0,0000 V I/N	1	★ 00000001	NO PI ERR
					Signal error on pulse interface as configured in bit 22
	Pulse Inter	face and Watchdog Register		First Hit Level Test	O Never signal error on pulse interface
	Pulse Interface	Watchdog			FHL_ZEROFLOW
	Number of Pulses per Liter	Watchdog reg value		Test Configuration Value of	<ul> <li>With FHL regulation active, disable zero flow state</li> </ul>
	0 + ×0000000	× 00000000		× 00000000	O Apply zero flow state independently of FHL regulation
		Disable Configuration Restore (0)	00000000	R_USM_TOF for FHL method 4	2MAX_NOZERO
	Maximum permissible flow in I/h	O Enable Configuration Restore (0x		iet current CR USM TOF Value	<ul> <li>Set flow to zero when exceeding 2x maximum flow and signal e</li> <li>Flow remains even when exceeding 2x maximum flow</li> </ul>
	0 ÷ ×00000000	00: 11 11 10 10 1000 1000		er en Cosn Cross same	Contraction of the second seco
		<ul> <li>Disable Watchdog (0x48DBA399)</li> </ul>			PWL EXP PWL ADDR

# Figure 15: Firmware Parameters Tab

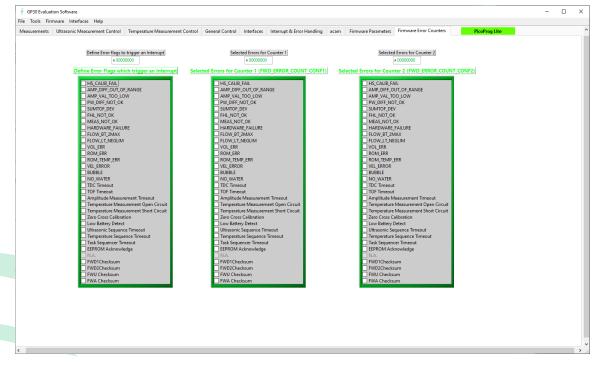


Figure 16: Firmware Error Counters



# 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 GP30. 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 GP30 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

Opens a window which allows single write and read accesses to random access area for addresses 0x000 - 0x0FF.

The random access area from 0x100 - 0x17F, containing the firmware data, can be accessed separately by "Firmware Download" window

·		
💈 RAM Memory	-	×
Read & Write Values in RAM Memory		
Access Memory Address		
RAM CCC EC		
Write Value Read Data		
1556 00 00 04 40		
Write RAM Read RAM		

Figure 17: Firmware Parameters Tab





• Registers

Opens a window, which shows the registers important for a proper configuration setting of the GP30. In the left column, the register contents correspond to the settings done in tabs of GUI main window. If the button "Read GP30 Register Settings" is pressed, the configuration settings located in TDC-GP30 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.

ster Settings User Interfa	ce	Register Settings GP30 RAM
Configuration Register UI		Configuration Register GP30
0xC0         * 00000000         CR_WD_DIS           0xC1         * 00034310A         CR_PLE2P           0xC2         * 8111144         CR_GP_CTRL           0xC3         * 10215000         CR_UART           0xC4         * 001470FF         CR_IH           0xC5         * 004ECAEB         CR_CPM           0xC6         * 0014080         CR_IMRG_TS           0xC7         * 00302824         CR_USM_PRC           0xC8         * 00802824         CR_USM_FRC           0xC4         * 0080210         CR_USM_TOF           0xC8         * 0000481         CR_USM_TOF           0xC8         * 0000481         CR_USM_TOF           0xC8         * 0000481         CR_USM_TOF           0xC6         * 0000421         CR_USM_TOF           0xC6         * 0000412         CR_USM_TOF           0xC6         * 0000421         CR_USM_TOF           0xC0         * 4840C47C         CR_TRIM1	Read Settings from GP30 RAM and Transfer to GUI Read and Transfer < Start Measurement	0xC0         *00000000         CR_WD_DIS           0xC1         *0034310A         CR_PLE2P           0xC2         *8111144         CR_GP_CTRL           0xC3         *10215000         CR_UART           0xC4         *001F03FF         CR_UART           0xC5         *0044CAE8         CR_CPM           0xC6         *001F03FF         CR_USM_PCC           0xC6         *00140800         CR_MRG_TS           0xC7         *0973400         CR_USM_PRC           0xC8         *00002210         CR_USM_PRC           0xCA         *0000210         CR_USM_AM           0xCC         *4400247C         CR_TRIM1           0xCC         *84A0C47C         CR_TRIM1
DxCE × 00270808 CR_TRIM3		0x CE × 00270808 CR_TRIM3
TOF Rate 1 Start Hit Delay Window 0 First Wave Level Up 85 First Wave Level Down 85		TOF Rate 1 Start Hit Delay Window 0 First Wave Level Up 85 First Wave Level Down 85

#### Figure 18: Registers

#### **Remote Commands**

This window summarizes some additional commands, which can be executed via remote interface. System Reset: Executes a complete system reset of GP30. 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 GP30
- SV Init: Clears the supervisor block in GP30
- FEP Init: Clears the frontend processing block in GP30
- Request/Release Bus Master: Allows the request of the bus master in GP30, 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 GP30, signalizing 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 GP30 CPU.

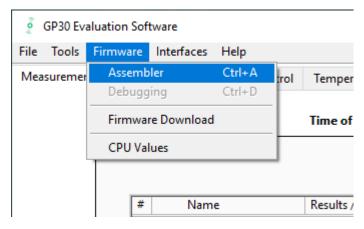
	Remote Commands	
	System Reset	
	System Init	
	CPU Init SV Init	
	FEP Init	
	🛛 Disable Watchdog after command	
	Request Bus Master	
	Release Bus Master	
	Measure Cycle Timer Off Measure Cycle Timer On	
	Clear Interrupt Flags	
	Communication Request	
	General Purpose Request	
Tag	System Reset	

Figure 19: Remote Commands

#### 5.3 Firmware

• Assembler

The TDC-GP30 assembler is integrated into the GP30 evaluation software. It is opened in the Firmware menu of the main program:



#### Figure 20: Firmware Menu

The following window comes up:





وَّ Assembler	_	×
File Edit Find Assembler Help		
□ ┢ ┠ Ⴞ 🗳 🖶 ち ♂ 🗶 🗎 🕯 🐹 📢 🗢 🔍 💸 🔠 🕅 🕅 🆓 🖓		
<u>Choose File to open</u> New File	1	
Open File		
Last File		
Output		

#### Figure 21: 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 (TDC-GP30-F01) the open source part. The FW Data 1 and 2 include firmware relevant coefficients and the configuration. The figure below shows an example for anTDC-GP30-F01 application. As free part of the user code firmware GP30Y\_A1.D2.11.04.hex is loaded. For the configuration and flow calculation data file GP30Y\_A1.A2.11.04.dat is loaded.





Download_GP30_FW.vi						- 🗆 ×
	Firmware User Code		Firmware Da	ta		
Download Firmware						
Code and Data		Open File	FW Data 1		FW Data 2	
Coue and Data	Open File	Reload File	# Value 0 00000000	# Value 32 00000000	# Value 64 00000000	# Value 96 0000000
		Save File	1 00000000	33 00000000	65 00000000	97 0000000
Start Measurement	Reload File	Transfer Configuration Settings	2 00000000 3 0000000	34 00000000 35 00000000	66 00000000 67 00000000	98 00000000 99 00000000
		Configuration from GUI to FW Data 2	4 00000000	36 00000000	68 00000000	100 00000000
System Reset	Download FW Code	Configuration from FW Data 2 to GUI	5 0000000 6 0000000	37 00000000 38 00000000	69 0000000 70 0000000	101 00000000 102 00000000
		Transfer Calibration Parameters	7 00000000	39 00000000	71 00000000	103 00000000
		Calibration Parameters from File to FW Data 2	8 0000000	40 00000000	72 00000000	104 00000000
Check Status Flags		(opens file dialog)	9 0000000	41 0000000	73 00000000 74 00000000	105 00000000
Watchdog Disabled		Transfer Firmware Parameters	11 0000000	42 00000000 43 00000000	75 0000000	107 0000000
		From FW Parameters sheet to FW Data	12 00000000	44 00000000	76 00000000	108 0000000
FW Unlocked			13 00000000	45 00000000	77 00000000	109 00000000
	¥	To FW Parameters sheet from FW Data	14 00000000	46 00000000	78 0000000	110 00000000
	Checksums	Set Bootloader Release Code	15 00000000	47 00000000	79 00000000	111 00000000
	Checksums	Set Boottoader Release Code	16 0000000	48 0000000	80 0000000	112 00000000
Download FW Code & Data	Calculated by Software	Download FW Data	17 0000000 18 0000000	49 00000000 50 00000000	81 00000000 82 00000000	113 0000000 114 0000000
	Calculated by GP30 0 GP10 FAIL		19 0000000	51 00000000	83 0000000	115 0000000
System Reset and Start Measurement	Read from FWD2 0 G FAIL	Recall FW Data	20 00000000	52 00000000	84 00000000	116 00000000
after Download	Read from FWD2	Read FW Data	21 00000000	53 00000000	85 0000000	117 0000000
Lock FW after Download	0 User FW Revision 0 User FW Range	Checksums FWD1	22 00000000	54 00000000	86 00000000	118 00000000
			23 00000000	55 00000000	87 00000000	119 00000000
		Calculated by Software 0	24 00000000	56 00000000	88 0000000	120 00000000
	Firmware Acam Code	Calculated by GP30 0 FAIL	25 00000000	57 00000000	89 00000000	121 00000000
Verify FW		Read from FWD2 0 FAIL	26 0000000	58 0000000	90 00000000	122 00000000
	Checksums	CL 1	27 0000000	59 0000000	91 0000000	123 0000000
	Calculated by GP30 0	Checksums FWD 2	28 0000000	60 00000000 61 00000000	92 00000000 93 00000000	124 00000000
	Read from FWD2 0 G FAIL	Calculated by Software	30 0000000	62 0000000	94 0000000	126 0000000
Erase FW	Kead from FWD2 20 FAIL	Calculated by GP30 0 FAIL	31 00000000	63 00000000	95 00000000	127 00000000
Erase FW	0 Checksum FWA manual entry 0 acam FW Revision	Read from FWD2				
	P	· · · · · · · · · · · · · · · · · · ·				
<						>

#### Figure 22: Firmware Download

- With "Check Status Flag", the watchdog and the lock state of the GP30 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 GP30 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 GP30 when downloading firmware to GP30. 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 GP30 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.





Firmware Acam Code	Calculated by GP30 11CC	PASS		0001635 00002C4A		i8 0097C276	90 0000004	121 401723CF	
Checksums		Read from FWD2 11CC	PASS		00002C4A			91 0000000A	123 ABCD7654
		Checksums FWD 2		28 0	000054A4	6	0 00000F5C	92 00000BB8	124 000011CC
Calculated by GP30 x 6A445			r	29 0	00012170	6	1 000004BD	93 FFFA0000	125 00005B28
Read from FWD2 0 FA	FAIL	Calculated by Software 5B28		30 0	0000000	6	2 FFFA3B9B	94 000000B	126 00000000
		Calculated by GP30 5B28	PASS	31 1	1B193E25	6	i3 FFFA3B9B	95 00008000	127 00000000
0 Checksum FWA manual entry	4 acam FW Revision	Read from FWD2 5B28	o PASS			_		p	

#### Figure 23: Firmware ScioSense Code

So copy manually the calculated checksum for the ScioSense 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.

Firmware Acam Code	Calculated by GP30 TILC PASS	26 00003C40 58 0007C376 00 00000010 133 00370808
Checksums	Read from FWD2 11CC OPASS	27 000040AD 59 0000724A 91 000000A 123 ABCD7654 28 000054A4 60 00000F5C 92 00000B8 124 000011CC
Calculated by GP30_6A445 Red Hfom FWD2_6A445 PASS	Calculated by Software 5828	29         00012170         61         000004BD         93         FFFAQ000         125         00005B28           30         00000000         62         FFFA3B98         94         00000008         126         0000000           5         31         1B193E25         63         FFFA3B98         95         0008000         127         00064443
Checksum FWA manual entry		

Figure 24: Verification by Calculated Checksum

- In the "Firmware Acam Code" section, the checksums for the ScioSense firmware code are also checked and displayed after a "Verify FW". The ScioSense firmware code cannot be modified by user. Therefore a checksum calculated by software field is missing in this section.
- A lock state of GP30 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.
- 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.



cait Operate 10	DOIS	Window Help							
			leasurement	:5		Open CPU	J Graph		
		CPU Temperature Results f	rom Flow				CPU Result	ts	
	#	Name	Results	Unit	#	Name	Resul	ts	Unit
	1	Temperature	30,28	°C	1	Flow	0,000		Liter / Hour
	2	Sound Velocity	1510,36	μs	2	Flow averaged	-0,062		Liter / Hour
23		CDU D			3	Volume Flow	0,00000	0	m^3
		CPU Results with ext. Ten	THE REAL PROPERTY OF A DESCO		4	Volume Flow	0,000		Liter
	#	Name	Results	Unit	5	Flow Speed	-0,00		m/s
	1	Temperature Cold	0,00	°C	-		UTOFICE		
		Temperature Hot	0,00	°C			U TOF Valu		
	-	Resistance Cold Sensor	0,00	Ohm	#	Name		Result	
	4	Resistance Hot Sensor	0,00	Ohm	1	TOF sum		141777,25	5 ns
	5	Temperature Internal	0,00	°C	2	TOF diff		-0,0648	ns
		Address 1	* 9	Mult. Factor	1	AM Adresses Calculated i = 0 Calculated = 0 Calculated	Result 2		
		0	*	0	-	= 0	(		

Figure 25: Flow Calculation Window (previous UI)

# 5.4 Help

When moving the cursor over the values in tabs of main window, the parameter name (used in the GP30 manual) is displayed. By right-click and selection of "Description and Tip", a window is opened showing additional description of the value.

Ultrasonic Pause Ha	ndling
Pause 1,0 * T(BF_SEL) in ms	between TOF Up and 20,00 ms
Description and Tip	×
"Ultrasonic Pause Handling" Description USM_PAUSE> CR_USM_PRC (0x0C8) Selects pause time between 2 ultrasonic measurements	^
	~
"Ultrasonic Pause Handling" Tip	
USM_PAUSE	
ОК	elp

Figure 26: Description and Tip Window

• Help Contents Not supported in this software revision.





• USB Communication

💈 USB Communications		-		$\times$
PicoProg Settings				
		Disa	ble USB H	andle
PicoProg FW Path				
립 C:\Program Files (x86)\_G\	data\PicoProgFW_GP30_v	21.hex	Cha	nge
GP30 Communication				
Last_Com_Action			Read_Re	s 🔵
FW check rd RAM 0xE9	Comm w/ GP30 OF		USB Erro	r Ŏ

#### Figure 27: USB Communications

• About

Displays software version number together with general information about software and ScioSense.



# 6 Schematics, Layers & BOM

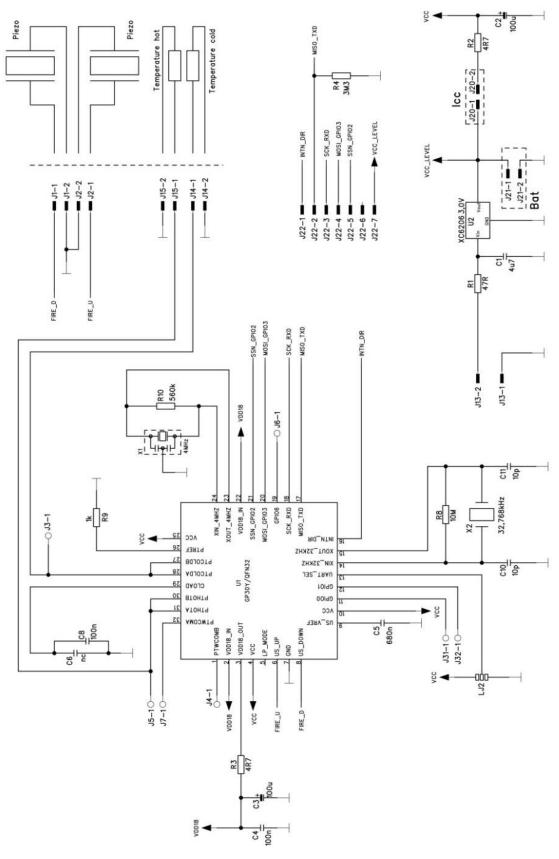


Figure 28: GP30-DEMO MODULE Schematics





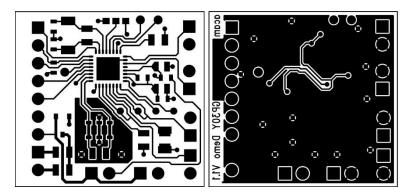
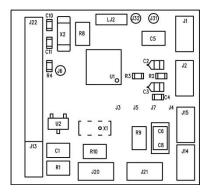


Figure 29: GP30-DEMO MODULE layout 2:1



# Figure 30: GP30-DEMO MODULE assembly 2:1

## Table 2: Bill of materials for GP30-DEMO MODULE

Quantity	Designator	Value	Comment	Footprint
1	U1	TDC-GP30	TDC-GP30YD	QFN32
	U2	3.0 V	Voltage regulator	XC6206
1	X1	4 MHz	Ceramic resonator Murata	CSTR_G
1	X2	32.768 kHz	Quartz crystal Geyer	KX-327XS
1	C1	4.7 µF	Chip capacitor	C805
2	C2,C3	100 µF	Solid tantalum	F95_P
1	C4	100 nF	Chip capacitor	CC603
1	C5	680 nF	Chip capacitor	C805
1	C6	Nc	Chip capacitor	C805
1	C8	100 nF	Chip capacitor	C1206

CONTENTS PAGE



2	C10, C11	10 pF	Chip capacitor	CC603
1	R1	47 Ω	Chip resistor	R805
2	R2, R3	4.7 Ω	Chip resistor	R603
1	R4	3.3 MΩ	Chip resistor	R603
1	R8	10 MΩ	Chip resistor	R805
1	R9	1 kΩ	Chip resistor	R805
1	R10	560 kΩ	Chip resistor	R805
1	J13	2.pol	Connector for power supply (combined with J22)	ST/254_2
1	J22	7.pol	Connector for SPI interface (combined with J13)	ST/254_7_ 1R
1	J20	2.pol	Jumper for current measurement of Vcc	ST/254_2
1	LJ2	3 pol.	Solder bridge to select between SPI & UART	QFN32





# 7 RoHS Compliance & ScioSense Green Statement

**RoHS:** The term RoHS compliant means that Sciosense B.V. products fully comply with current RoHS directives. Our semiconductor products do not contain any chemicals for all 6 substance categories, including the requirement that lead does not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, RoHS compliant products are suitable for use in specified lead-free processes.

ScioSense Green (RoHS compliant and no Sb/Br): ScioSense Green defines that in addition to RoHS compliance, our products are free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material).

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# 9 Revision information

#### Table 3: Revision history

Revision	Date	Comment	Page
4.0	2023 May 16	PICOPROG V3.0 replaced by PicoProg Lite	all
		UART is not supported	

#### Note(s) and/or Footnote(s):

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



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