

### Key Features

- Five-channel Time-Interval Meter: One Start and Four Stops
  - 20 picosecond resolution single shot, < 5 ps averaged
  - 50 picosecond RMS jitter typ.
  - > 100 second range
  - 10 MHz sample rate per channel
- Common GATE input
- Input for external 10 MHz to 240 MHz reference
- 4 GPIO signals for communication to external equipment
- Easy & quick control via "Control panel web page" (only 10 seconds to connect your PC)
- 100 Mbit/s Ethernet and USB interface for remote control.
- Ultra-Compact package with optional mounting flanges



### Applications

- Time of flight mass spectrometry
- Lab / R&D Characterizations
- Fluorescent decay
- Real time, time stamping
- ATE (Automatic Test Equipment)
- Optical and magnetic disk timing
- Component Test
- Variation in Pulse Timing

### Description

The GFT2605 is a very precise Time Interval Meter. It has five channels: Channel 1 is used as the "Start" time reference for channels 2-5 being "Stops" events of the Time Interval measurement. Each channel can measure the time of the rising/falling edge of one electrical input, to 20 picoseconds resolution with > 100 second's range. Time Interval samples can be automatically processed to provide Mean, Max, Min and RMS/Jitter.

The instrument uses an internal 10 MHz oscillator or an external very stable 10 MHz to 240 MHz source.

The Instrument offers 4 GPIO (4 digital bi-directional signals) under software control for communication to external equipment.

The GFT2605 is an ultra-compact and low power instrument with Ethernet interface.

The instrument has a built in Web server that provides an easy remote control via a standard Web Browser. "Control panel Web page" from embedded web server provide an easy method to:

- Configure settings for each channel and Control operation and status of the instrument
- View the measurements (value and graphic form)
- Save the measurements in your file computer

## Specifications

<b>TIM channel</b>	
Number	1 Start, 4 Stops or 5-channel time interval counter / time stamper
Time resolution	20 picoseconds single shot, 1 ps averaged
Time range	> 100 seconds
Time Jitter	50 ps RMS typ. for short time intervals
<b>Channel Input (T1 to T5)</b>	
Edge trigger	Rising or falling
Input impedance / coupling	50 $\Omega$ / DC
Threshold	Programmable from -5 to +5 V, in step of 10 mV
Max safe input	$\pm 3.3$ V DC, $\pm 6.5$ V with pulses up to 10 ms width
<b>Gate Input</b>	
Level	Programmable from 0.1 to +5 V, in step of 10 mV, active high or low
Input impedance / coupling	50 $\Omega$ / DC
<b>Clock Reference</b>	
Internal	100 MHz, $\pm 1$ ppm stability, available as AC square output with level > 500 mV p-p into 50 $\Omega$
External	AC coupling, sine or square, 0 V threshold, internal 50 $\Omega$ , level min -10 dBm, typical 6 dBm, 10 MHz to 240 MHz, user programmable in steps of 0.25 MHz up to 120 MHz then user programmable in steps of 0.50 MHz
<b>Measurement</b>	
Measurement trigger mode	Single or Repetitive
Sample per measurement	1 to 1024 or fixed at 1026
Sample rate	Up to 10 MHz
Measurement type	Mean, Max, Min, RMS/jitter of samples Graphic form of samples Mean, Max, Min, RMS/jitter File of sample and mean measurement
<b>GPIO: Input or output lines</b>	
Number of GPIO signals	4 (digital bi-directional signal)
Signal level input	2.0 V High min, 0.8 V Low max
Signal level Output	2.4 V High min, 0.6 V Low max at 24 mA
<b>General specification</b>	
Control interface	10/100 MB/s Ethernet; USB
Software tools	Set of Ethernet commands Web page for Edge, Chrome, Firefox
Power supply	USB or External AC (80 - 264 V/47-63 Hz) to DC (5 V, 4 A)
Indicators	Power, Trigger, Busy
Connectors	Channel T1 to T5, Gate, Clock are SMB connectors Ethernet: RJ45, USB: micro-AB
Size / Weight	108 x 56.6 x 129 mm / < 1kg
<b>Option</b>	
Option 1: MF	Case with mounting flanges
Option 2: C	5" SMB to BNC cable
Option 3: CG	8" SUBD to GPIO cable

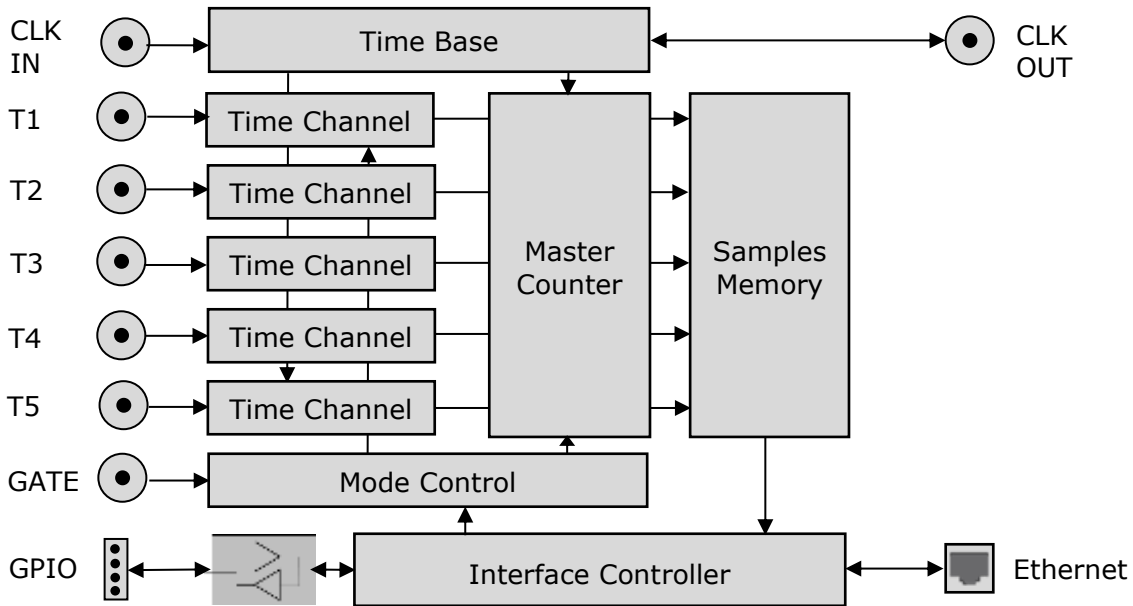
## Ordering Information

Model	Description
GFT2605	Base version: 5 channel Time Interval Meter
GFT2605-MF-C5	Adds mounting flanges and 5x 5" SMB to BNC cable

**Functional Overview**

**Block diagram**

The GFT2605 includes the 5 following functions: Time base, Time Channel, Master Counter and Samples Memory, Mode Control and Interface controller.



**Time base**

This function provides a low jitter time base locked on a 100 MHz internal reference or external reference. The internal reference is available on the rear panel.

**Time Channel**

Each channel as an input detector which recognizes rising (or falling) edge of incoming triggers. At trigger time a TDC measure "Time Channel" interval from trigger's edge to Time Base.

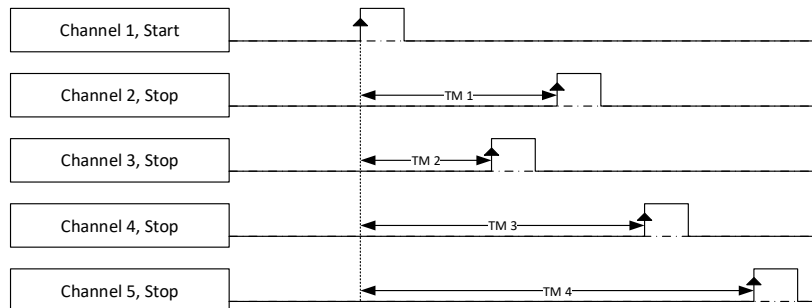
**Master Counter and Sample Memory**

This function is a master counter clocked from the Time base. At each trigger time the value of Master Counter is stored with the Time channel in the Sample Memory. Samples memory can store up to 1024 samples per channel at 10 MHz rate.

**Mode control**

The GFT2605 uses a relative mode controlled in this function: In this mode "Channel 1" is considered to be the Start with the "Channel 2 to 5" being Stop events of the time interval measurements. This function completes the number of samples selected then transfers samples to the Interface Controller. If the repetitive measurement is selected, the function collects a new series of sample (at the repeat period and up to the repeat count).

**GATE:** All channels (common command) can be set to be Enabled or Disabled from GATE input.



*TIM (Time Interval Measurement) timing principle*

**Interface Controller**

It manages internal functions, user Ethernet interface and process Sample Memory data. Process can be for each channel: Mean, Max, Min, RMS/jitter of samples. All the parameters and data can be remotely controlled via Ethernet or Internet (from embedded Web server).

**GPIO:** The general-purpose input output (GPIO) is intended for connecting to external equipment. It offers 4 digital bi-directional signals controlled from software commands.

### Software tools

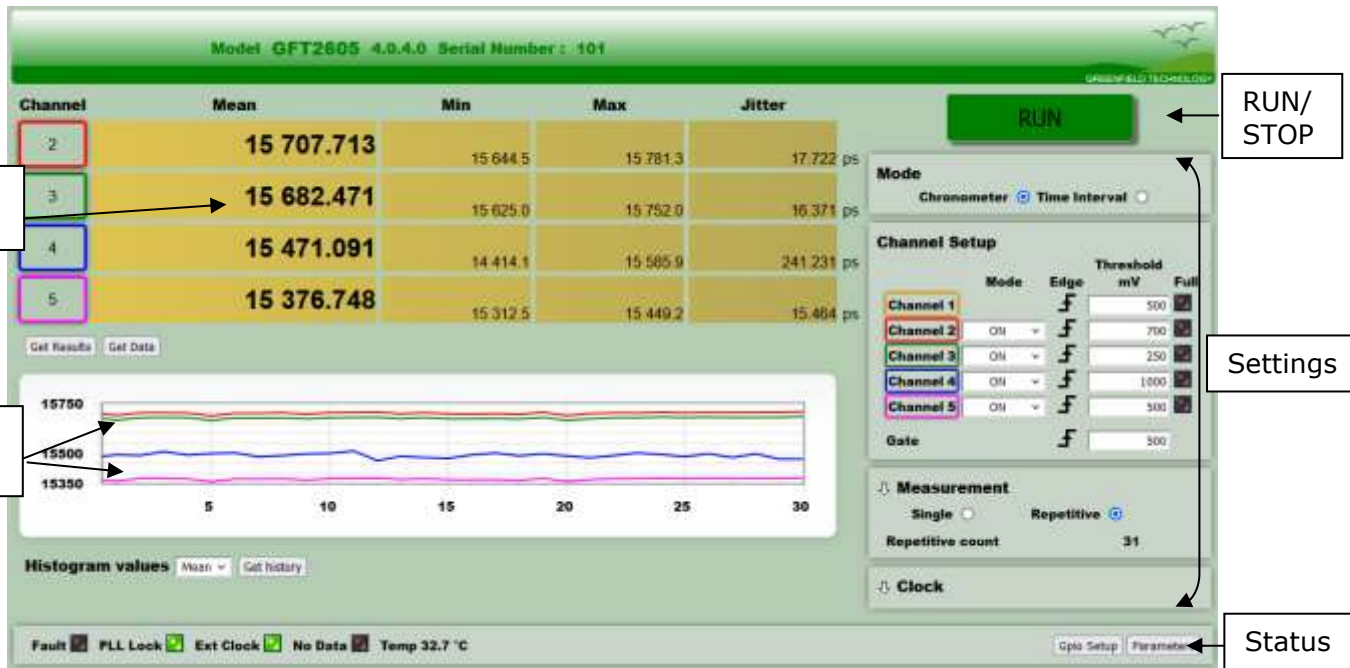
There are two ways to control the Time Interval Meter:

- “Quick way”** via Internet and control panel web page (see below). Web page from embedded server, provides an easy method to configure settings, to control operation, to display status of the instrument, to display measurement values and to save data (samples and measurements) in "RAW" data file format for off-line analysis. Measurement on each channel (identified by different color) can be viewed (Mean, Min, Max, Jitter) in real time and presented in graphic form (Time interval mean as function of repetitive count) in repetitive mode.
 

Graphic form: A Zoom of the graph is available in the upper part (defined by cursors on lower part) and each data of the graph can be displayed by clicking on it.

Repetitive mode runs like a recorder. So, it can be controlled in number of samples of measurement mean, in repetitive period and repetitive count of the measurement. All the measurements during the repetitive mode are stored in the equipment and then can be saved in your computer file.

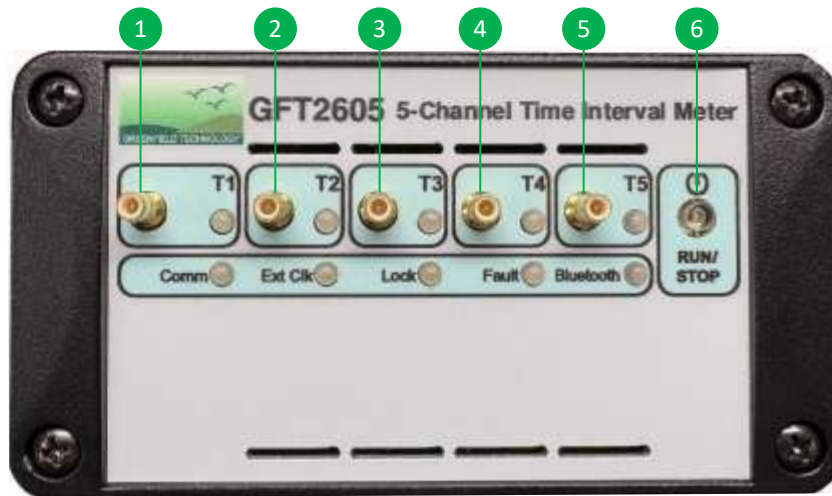
Internet connection: The web page can be quickly opened via standard browser like internet explorer, Mozilla Firefox or Chrome (without any DLL or specific software). After connecting a cable from the GFT2605's Ethernet port to your computer network, enter the GFT2605's IP address into your PC's browser (the IP address can be identified or assigned via the web page). The browser will automatically open the control panel web page on your PC.



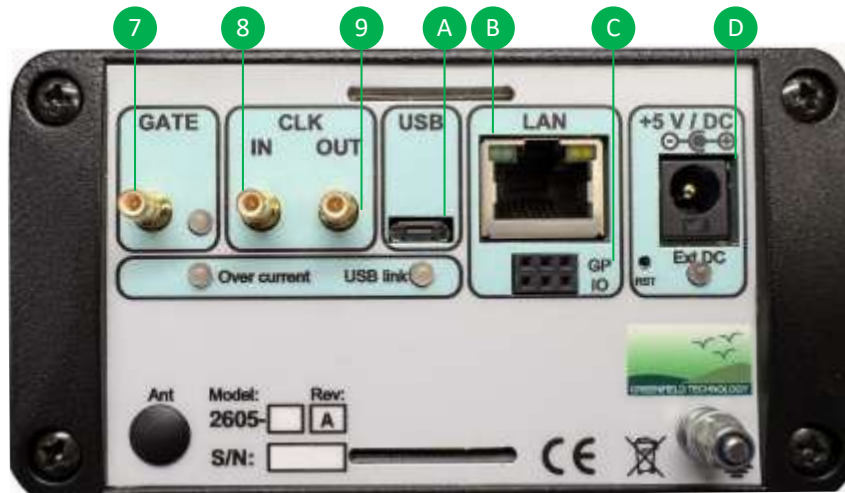
*Control panel web page*

- “General remote way”** via Ethernet and LabVIEW software application or other PC software application. GFT2605 offers a set of commands to configure settings for each channel and trigger, Read the measurements, Control operation and status of the instrument. Example of use is provided in a user’s manual.

**Input / Output**



*Front panel*



*Rear panel*

**Connector, Switch, Indicator**

Front panel		Rear panel	
	• Connector		• Connector
1	Start channel T1 input: SMB connector	7	Gate input: SMB connector
2	Stop channel T2 input: SMB connector	8	Clock input: SMB connector
3	Stop channel T3 input: SMB connector	9	Clock output: SMB connector
4	Stop channel T4 input: SMB connector	A	USB connection: micro-AB connector
5	Stop channel T5 input: SMB connector	B	LAN connection: RJ45 connector
	• Switch	C	GPIO: SHM-103 Samtec connector
6	Power On/Off or Run/Stop measurement	D	+5V DC power plug: Jack 2.10 mm
	• Indicators		
T1-5	Tilt at each trigger		

**Pulse shaping modules**

Model	Description
GFT101	Electrical-to-optical Pulse Converter
GFT200	Optical to electrical Pulse converter. Combined with GFT101 it allows to transmit pulse up to 1 km via FO
GFT300	Sub nanosecond Pulse Stretcher from pick up diode to provide GFT2605 clock reference
GFT644	4 independent channels, 150 MHz rate, 50 Ω line Driver Module with selectable threshold (-1 V / 0 V / +1 V), load 50 Ω / 1 kΩ) and polarity