Quick Reference

Thorlabs Instrumentation

Optical Power and Energy Meter

PM100D

2009

THORLABS

Safety

☝ Attention ☝

All statements regarding safety of operation and technical data in the instruction manual will only apply when the unit is operated corectly.
The power meter PM100D must not be operated in explosion endangered environments!
Sensor, photodiode and control inputs and outputs must only be connected with duly shielded connection cables.
Only with written consent from Thorlabs may changes to single components be carried out or components not supplied by Thorlabs be used.
Do not remove covers!
Refer servicing to qualified personal!

Table of Content

1 General Information

The PM100D Handheld Optical Power and Energy Meter is designed to measure the optical power of laser light or other monochromatic or near monochromatic light sources and the energy of pulsed light sources.
The space-saving, battery powered design and compatibility to all Thorlabs “C-Series” Photodiode, Thermal, Pyroelectric sensors, and custom Photodiode, Thermal and Pyroelectric detectors, combined with a fast USB device interface open a wide range of applications in Manufacturing, Quality Control, Quality Assurance, and R&D for stationary and field use.
Please refer to the user manual on the data carrier supplied with the unit for detailed function description.

2 Getting Started

2.1 Unpacking

Inspect the shipping container for damage.

If the shipping container seems to be damaged, keep it until you have inspected the contents and you have inspected the PM100D mechanically and electrically.

Verify that you have received the following items within the hard-case:

1. PM100D power/energy meter console
2. 1GB SD memory card – installed in PM100D
3. Plug-In power supply with Interchangeable primary plug for USA, UK, Europe, and Australia
4. USB cable, type ‘A’ to ‘mini-B’
5. Quick-start guide
6. USB memory stick with instrument drivers, user application and operation manual
7. Certificate of Calibration

2.2 Preparation

Configure the plug-in power supply with the primary plug for your local power supply.
Connect a suitable power or energy sensor. The sensors have a self-fixing mechanism. To plug or unplug a sensor slightly press from both sides on the pins in the connector housing.
Turn the unit on by pressing the power button in the side panel.
After switching on the unit, the graphics display will show the device status and then jump to the last measurement screen before power down.
The PM100D is immediately ready to use after turning on.

2.3 Physical Overview

Function Keys:

Navigation: ▼▲◀▶
Enter/Edit: **OK**

Wavelength: **λ**
Relative Measure: **Δ**
Backlight: ☼

Figure 1 Front Panel

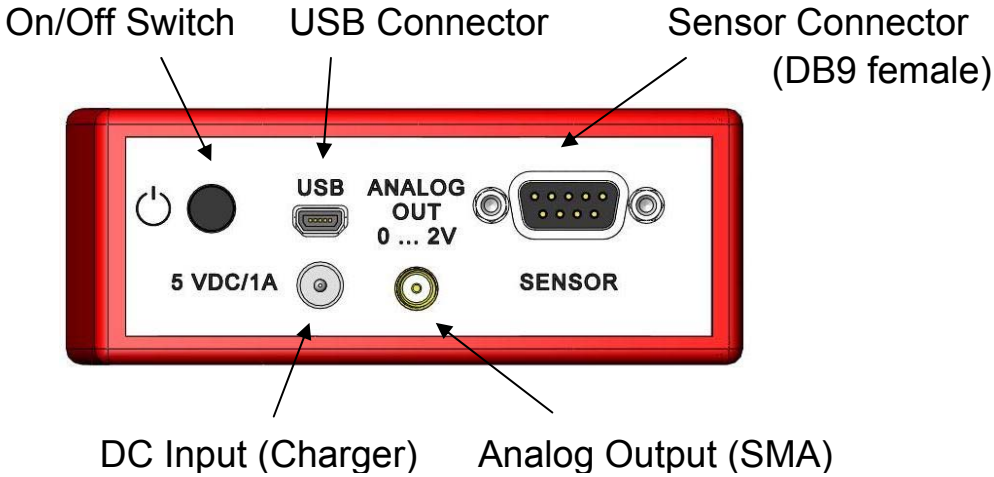


Figure 2 Side Panel

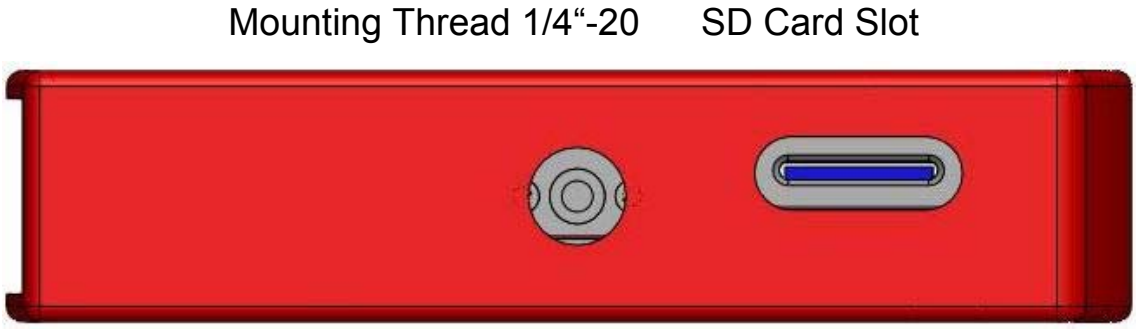


Figure 3 Bottom View

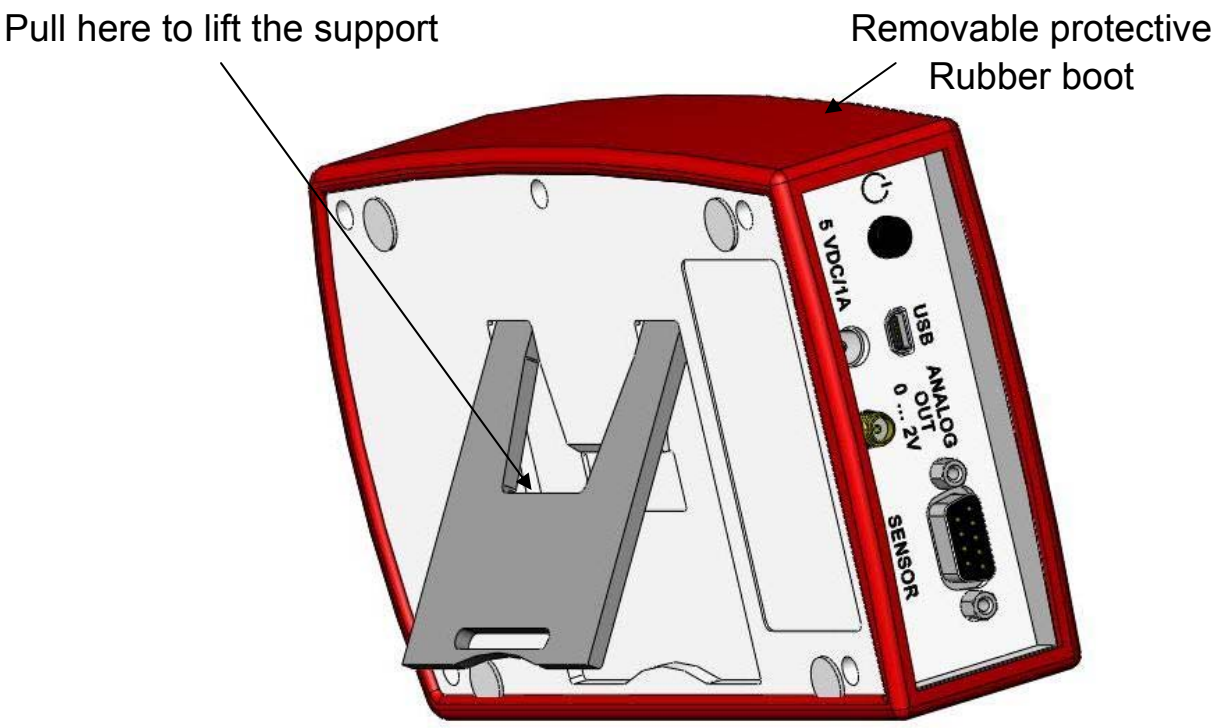


Figure 4 Rear View

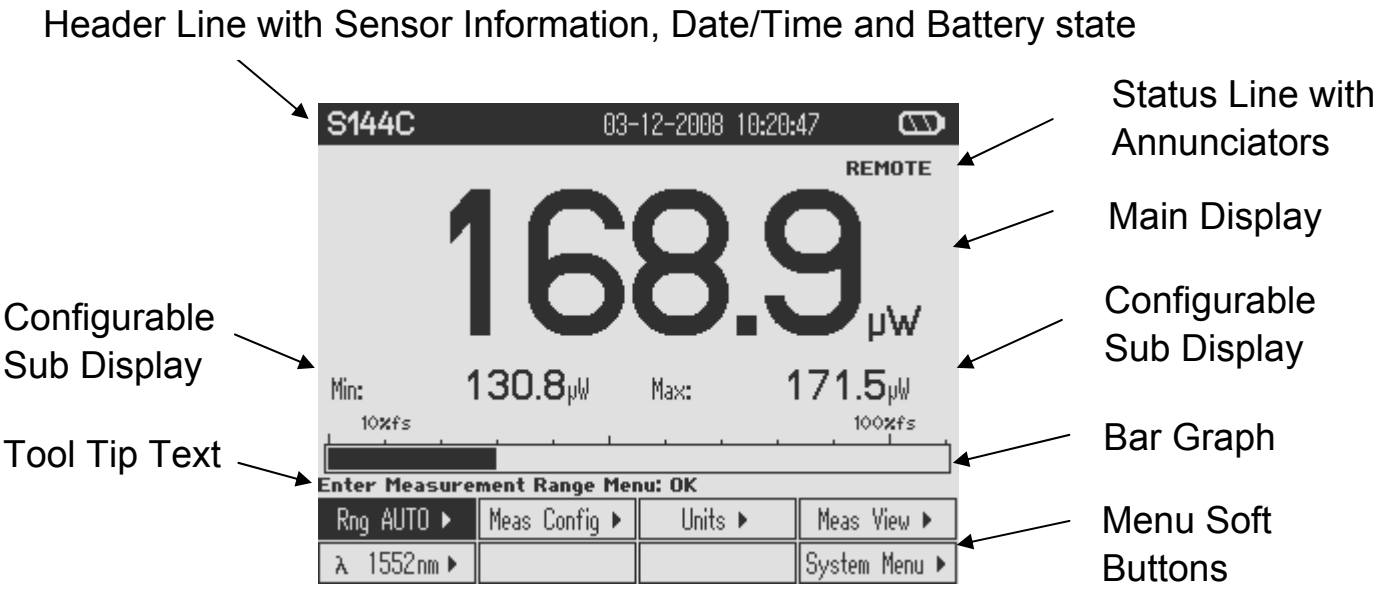


Figure 5 Numeric Display Setup

3 Operating the PM100D

3.1 Connecting a Power or Energy Sensor

The PM100D supports all Thorlabs 'C-Series' photodiode, thermal and pyroelectric sensors. These can easily identified against older versions of Thorlabs power or energy sensors by their red connector housing. The console will not recognize sensors from the 'A' and 'B' series. Please contact Thorlabs for upgrading of old sensors with 'C-Series' connectors.
To plug or remove a sensor slightly press the two bolts in the connector housing. Sensors can be 'hot-swapped' to the console, after recognizing a new valid sensor the type and calibration data will be downloaded to the console in approximately 2 seconds and the unit is ready to operate with the new sensor.

3.2 Controlling the PM100D

3.2.1 Navigating the Menus

Each measurement screen contains eight soft buttons that are arranged in 2 rows in the bottom of the graphics display. These can be controlled by the four navigation (▲▼◀▶), and the enter/edit (**OK**) key. An interactive help text above describes shortly the function of each selected button.
The soft buttons may be configured with the following functions:

Type	Indicator	Function when pressing 'OK'	Example
Menu	▶	Shows a sub menu, by rearranging the soft button labels	Meas Config ▶
Ring Control	▲▼	Scrolls up and down the ring with the up and down navigation buttons. The changes are valid immediately. A blinking button frame indicates that the control is active. Confirm with 'OK'	Range ▲▼
Func-tion key	Label in capitals	Proceeds the described function	RESET
Radio button	✓	Selects the function of the pressed key. The active key gets the 'checked' mark (✓)	✓ W
Numeric	Key label contains a number	The button goes in the 'edit' mode. This is indicated by a blinking frame and one digit with a blinking underline. With the ◀▶ buttons navigate the digit to change; with the ▲▼ keys increment or decrement the digit. Confirm with 'OK'	1.550µm

Button Appearance: Focus on Button [Text Negative] Edit Mode [Blinking frame]
All sub menus can be left by navigating to the [EXIT] button at the downright soft button location or to any empty [ ] button, and pressing the **OK** key.

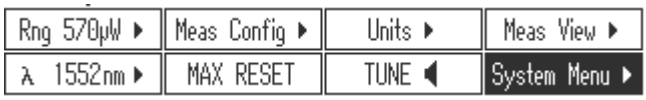
System Settings

[System Menu ▸] The following sub menus will appear:

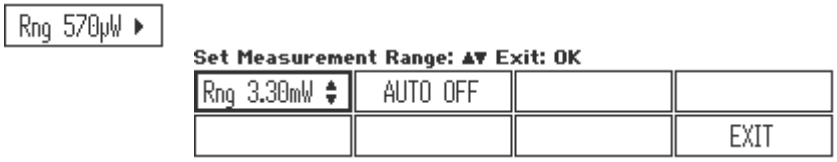
- Measurement Settings
  - Remote state — PM100D can be switched back to local mode
  - Line filter — Sets the unit to the local line frequency 50Hz/60Hz to avoid aliasing effects
  - Default sensor — Sets the PM100D in a mode to measure photo current, thermal voltage or peak voltage from a pyro-electric detector. See user manual.
- Console Settings
  - Language — User interface language setting
  - Backlight — Switches the LCD and key backlight on and off (Same function as the ☼ key)
  - Brightness — Sets the brightness of the LCD and key backlight. The setting range is 0 – 100% in 1% increments
  - LCD Contrast — Adjusts the LCD contrast. The setting range is 0 – 100% in 1% increments
  - Sound — Switches on and off the key and warning sounds
  - Shutdown — The unit automatically powers off in battery operation after a certain time without user action. This feature can be set to 10 minutes, 1 hour or switched off; and is not active when an external power supply (AC adapter or USB) is connected.
  - Firmware Upload — Needs to be ‘enabled’ before uploading a new firmware version. The function will automatically reset to ‘disabled’ when powering down.
- Date and Time — Enters a submenu to set date and time. It is possible to chose various date and time formats.
- Console Info — Shows the console related information.
- Sensor Info — Shows the related information of the currently connected power or energy sensor.

3.2.2 Power and Energy Measurement in the Numeric Display

The numeric display contains a large configurable measurement value, two small sub displays for additional measurement information, and a bar-graph that shows the saturation degree of the chosen measurement range. To control and configure the numeric display the soft buttons in the top level are arranged as following:

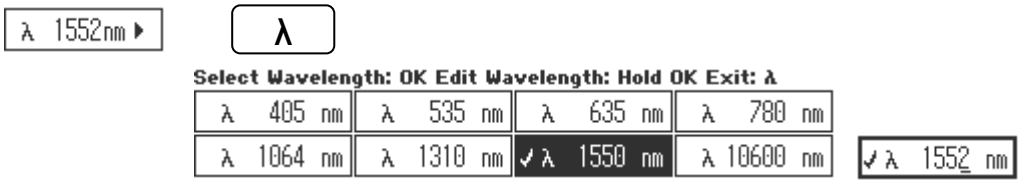


3.2.2.1 Range Control



Up to 6 power corresponding current and 4 power / energy corresponding voltage ranges can be chosen manually with the ▲ or ▼ keys. For power measurements an auto-ranging function is available.

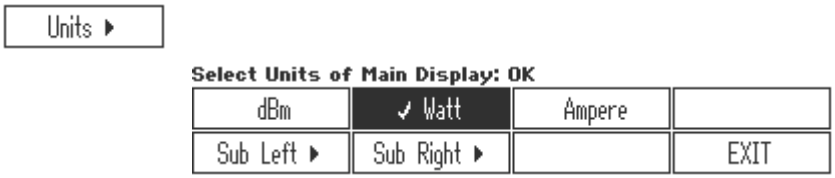
3.2.2.2 Wavelength Correction



The menu offers 8 individually configurable sensor independent wavelength settings.

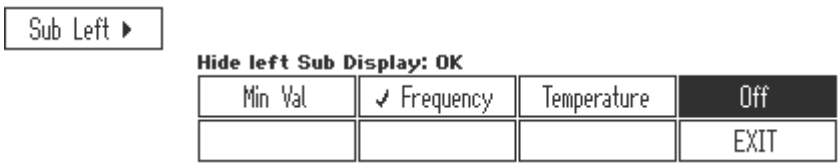
To edit a wavelength keep the **OK** key pressed for 1 second. Set the desired wavelength with the ▲▼◀▶ keys.

3.2.2.3 Readout Configuration



Depending on the connected sensor the units of measure for the large display can be configured to Watt, dBm, Joule, Volt or Ampere.

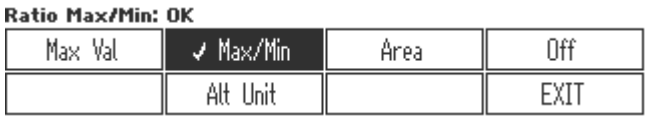
For additional information two small displays are arranged below the main display



Min Val: Minimum level until MAX RESET is pressed. Same unit as main display.

Frequency: Displays the frequency of a power signal or the repetition rate for pulsed laser sources
Temperature: Shows the sensor head temperature.
Off: Hides the left sub-display

Sub Right ▸



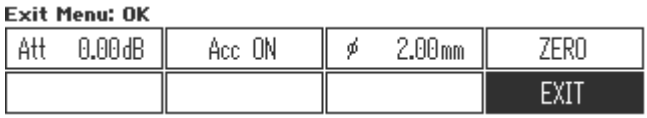
Max Val: Maximum level until MAX RESET is pressed in main display unit.
Max/Min: Ratio between maximum and minimum.
Area: Calculates power and energy density from the set beam diameter.
Alt Unit: Shows the measurement in its alternate unit (e.g. W – dBm)
Off: Hides the right sub-display

3.2.2.4 Measurement Configuration Menu

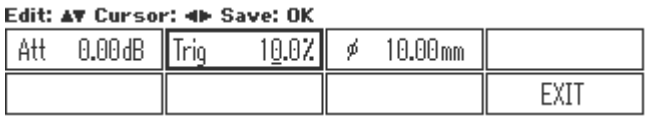
Meas Config ▸

Photodiode Sensor

Thermal Sensor



Pyroelectric Sensor



Att: Sets an attenuation or gain factor
BW: Sets the bandwidth of the photodiode input stage to High or Low
Acc: Switches the acceleration circuit for the thermal sensor input stage
Trig: Sets the trigger level for laser pulse detection.
∅ x.xxmm Set the input beam diameter for power or energy density calculation
ZERO Performs a zeroing for thermal sensors and dark current adjustment for photodiode sensors.

3.2.2.5 Max Reset Button

MAX RESET Sets back the Min, Max and Max/Min displays

3.2.2.6 Tuning Sound

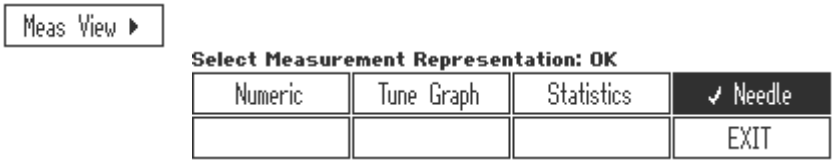
TUNE ◀ Switches on and off an audible tone for laser tuning support

3.2.2.7 Relative Measurements

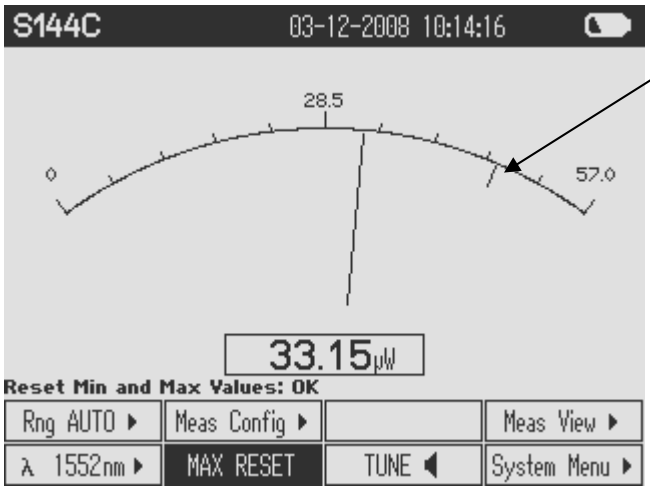
Δ Switches on and off the relative measurement mode

The main display will set to zero, the offset and the absolute power or energy value will be displayed in the sub displays. The bar graph and needle display will change to a measurement range from -10% to +10% of the set range.

3.2.3 Display Options

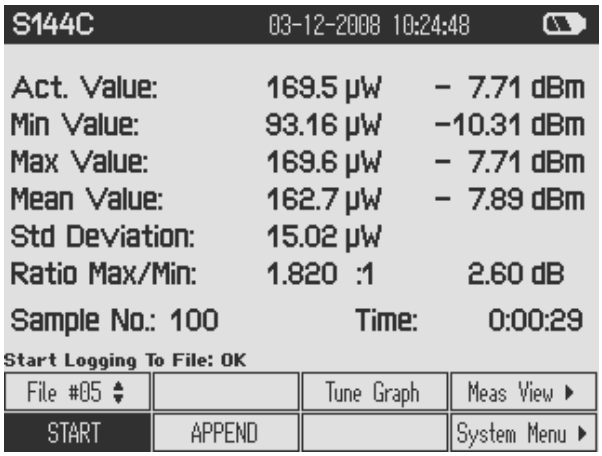


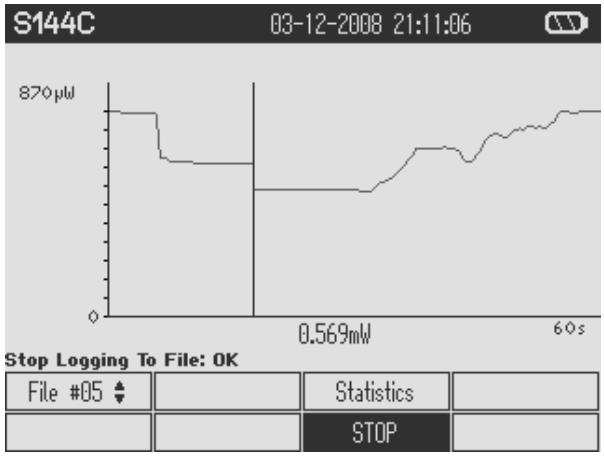
3.2.3.1 Needle Display



Max value indicator

3.2.3.2 Data Logging Screens





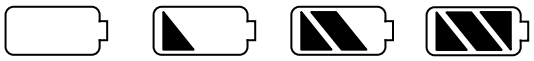
After pressing the START button the data that are sampled in these screens will be stored to the built in SD memory card on the selected file until STOP is pressed. With START the selected file will be overwritten.

3.2.4 Analog Output

The analog output provides the amplified photo-diode current or the amplified thermal or pyroelectric sensor voltage.
The signals from the analog outputs are not wavelength and zero corrected. The analog output voltage is range dependent and can be calculated to:
$U_{Analog\ Out}$ = 2V / full scale range value x measurement value
The analog output voltage can range from -0.3V to +2.3V.

3.2.5 Battery Charging

The PM100D is powered by a 1 cell $LiPo^{+}$ battery that needs to be recharged intermittently by plugging the AC adapter or plugging the USB cable to a computer. To fully charge the battery it takes approximately 3-4 hours. A built in charging circuit automatically regulates and terminates the charging.
Following battery icons in the display header show the charging state from empty to full battery



The empty battery symbol starts blinking for one minute until the unit shuts off.
When an external power supply is plugged the symbols above change sequent until the battery is fully charged.

3.3 Computer Interface

The PM100D optical power meter contains a USB 2.0 interface. When connecting the PM100D to the PC first time, a new hardware will be found. For proper installing the PM100D it requires a NI-VISA runtime version on the PC (available on the National Instruments website www.ni.com) or from the data carrier that comes with the instrument. Allow installing and follow the dialog instructions.
The PM100D comes with a utility software that easily enables remotely operating the PM100D (also PM100A and PM100USB) and visualizing and logging measurement data. Perform the setup.exe and follow the installing instructions.
The LabVIEW source code of this application is included on the data carrier as well and can be used to build own applications or to modify the utility program to specific requirements (LabVIEW 8.5.1 or higher required).

4 Addresses

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