FOCUSED TEST, INC.

FTI-5000

Safe Operating Area Test System

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System Introduction

The FTI-5000 test system is a fully integrated Safe Operating Area test system. The design applies a programmable amount of energy onto a discrete device under test (DUT), while making temperature related measurements. Testable device types include Diode, N and P type MOSFET, N and P type IGBT, NPN and PNP type Bipolar Junction Transistor (BJT) devices.

System test capability range from 0-150 Volt, 50m-200 Ampere, 10µ-10 Second pulses not to exceed 10,000 Watts.

The system pulse width capabilities can be found in the below figure 1.

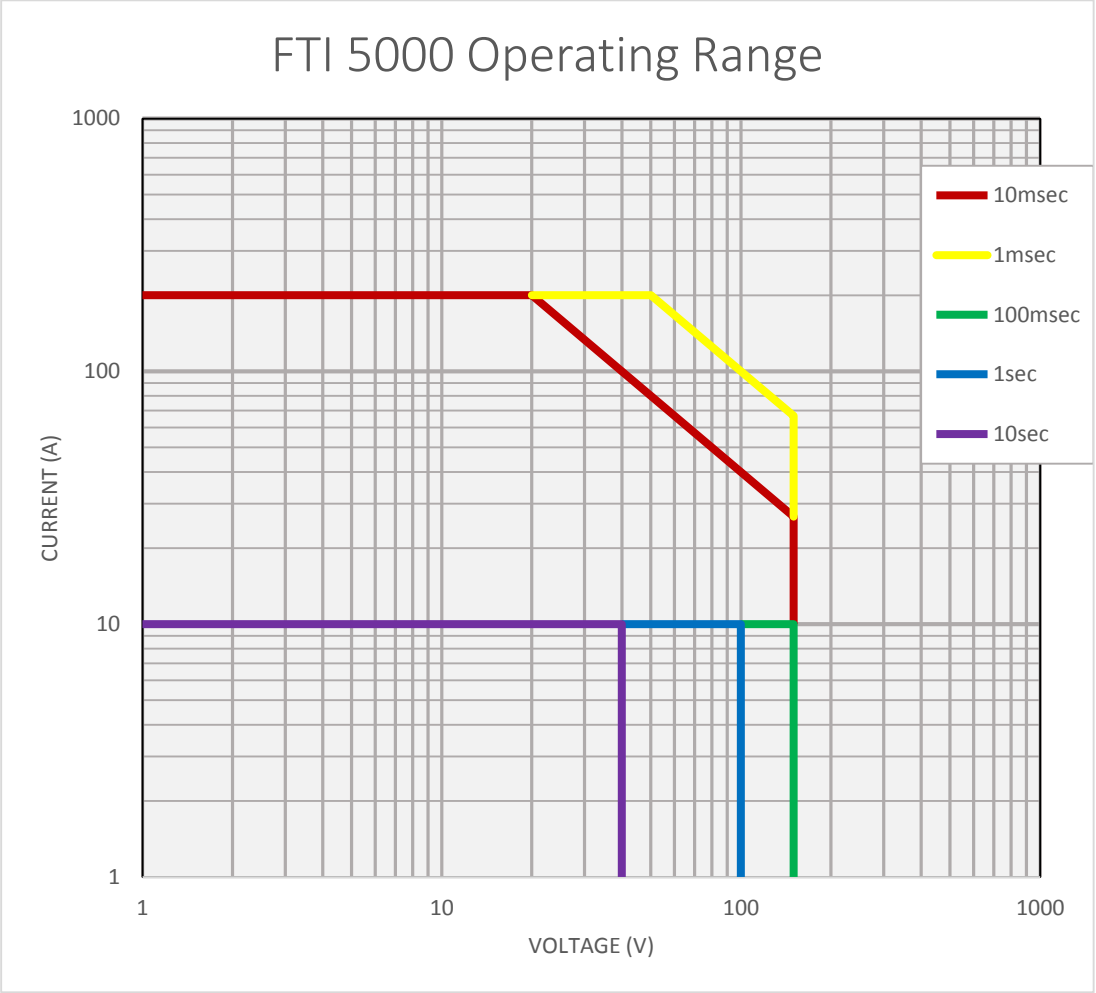

Figure 1

System Configuration Overview

Figure 2 shows the basic control scheme of the SOA system. All drivers, and test library instructions are processed on the desktop computer and sent to the CPU module via USB. The CPU organizes and sends the appropriate commands to each module which control the applied SOA pulse and measurement.

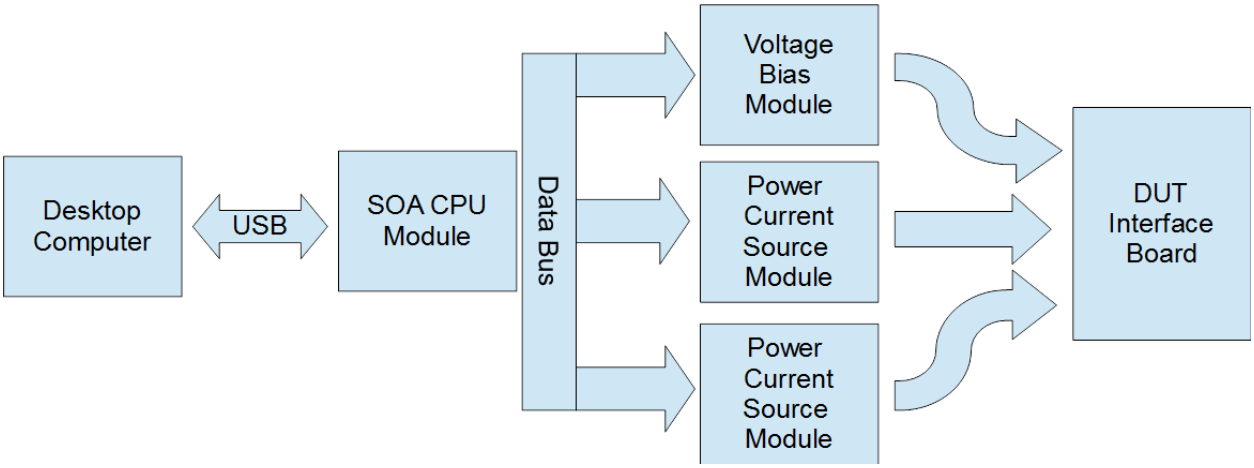

Figure 2

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Safe Operating Area Test Configurations

Safe Operating Area testing applies a programmable power to the DUT for a programmable pulse width. System hardware is configured based on device type, and test parameters.

-Diode device type configuration

For Diode type devices, the primary system current source directs the programmed current through the device for the programmed pulse width. IF measurement current is applied before and after the power pulse. Voltage across, and current through the device are sampled throughout the SOA pulse.

After test, the Voltage, Current, and temperature related information is logged, and displayed to the user.

Figure 3 shows the system hardware configuration for Diode device type testing, and the Diode SOA waveform.

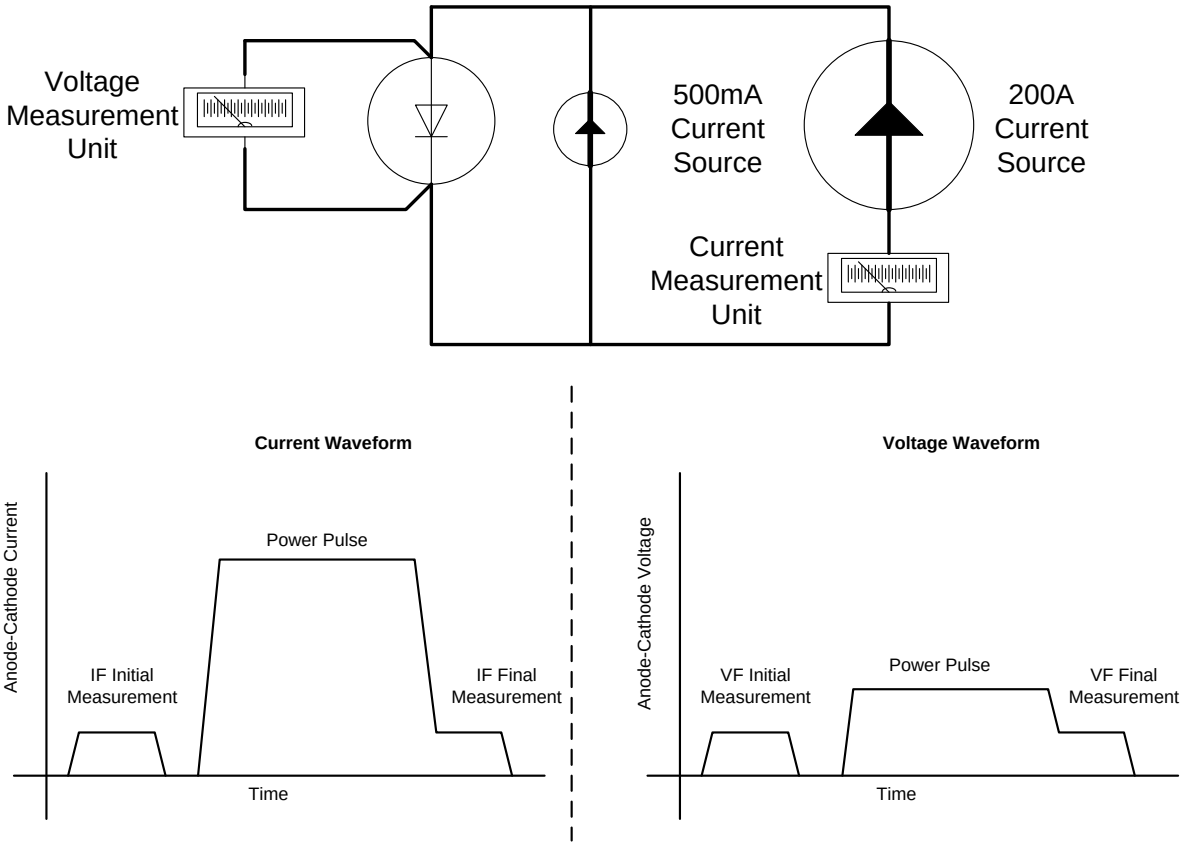

Figure 3

MOSFET and IGBT type configuration

For MOSFET and IGBT type devices, the Gate – Drain (or Gate – Collector) voltage bias is applied. The system primary current source then applies the programmed test current for the programmed pulse width. VSD/VEC measurement current (provided by the 500mA current source) is applied before and after the test power pulse. Voltage across, and current through the device are sampled throughout the pulse.

After test, the Voltage, Current, and temperature related information is logged, and displayed to the user.

Figure 4 shows the system hardware configuration for MOSFET and IGBT type testing, and the SOA waveform.

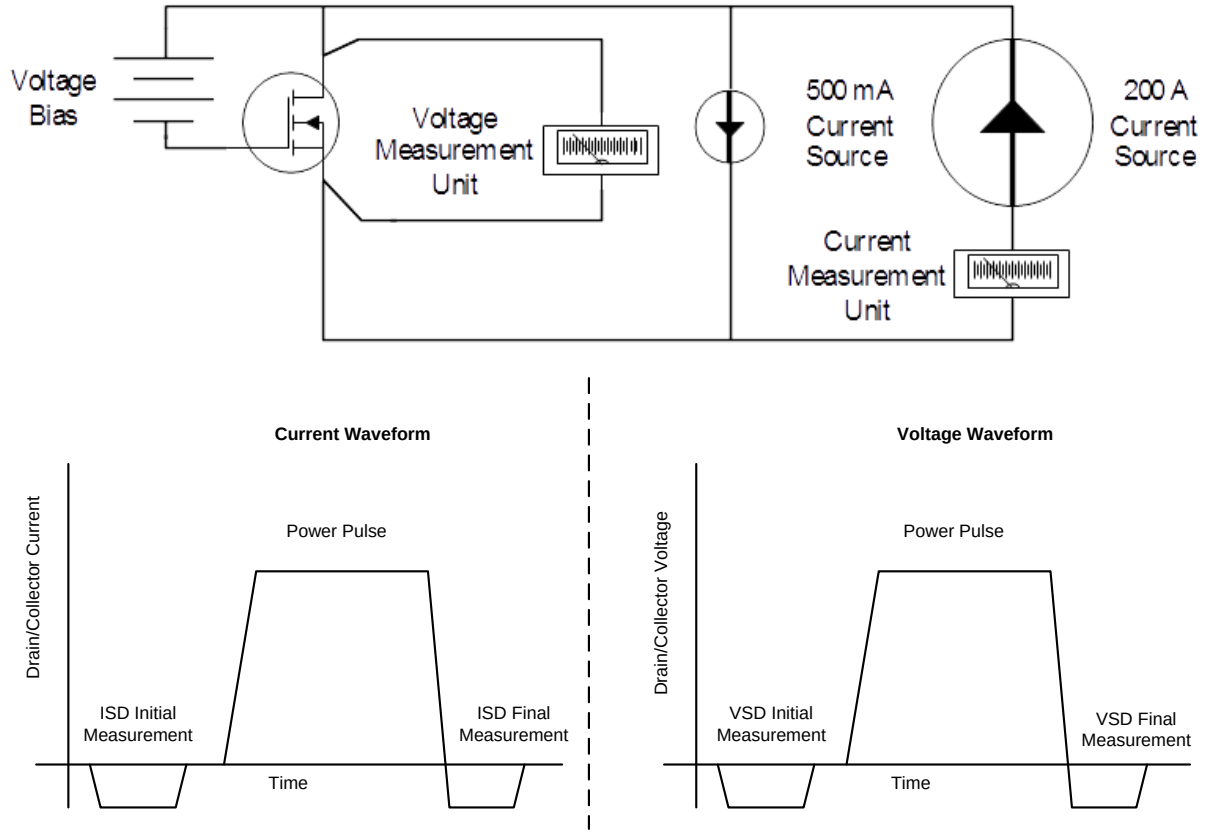

Figure 4

BJT type testing configuration

For BJT type devices, the programmed collector voltage is first applied. The base current source then applies the calculated base current for the programmed pulse width. Collector current is equal to the base current multiplied by the device gain. VBE is measured before and after the test power pulse. Voltage across, and current through the device are sampled throughout the pulse.

After test, the Voltage, Current, and temperature related information is logged, and displayed to the user.

Figure 5 shows the system hardware configuration for BJT type testing, and the SOA waveform.

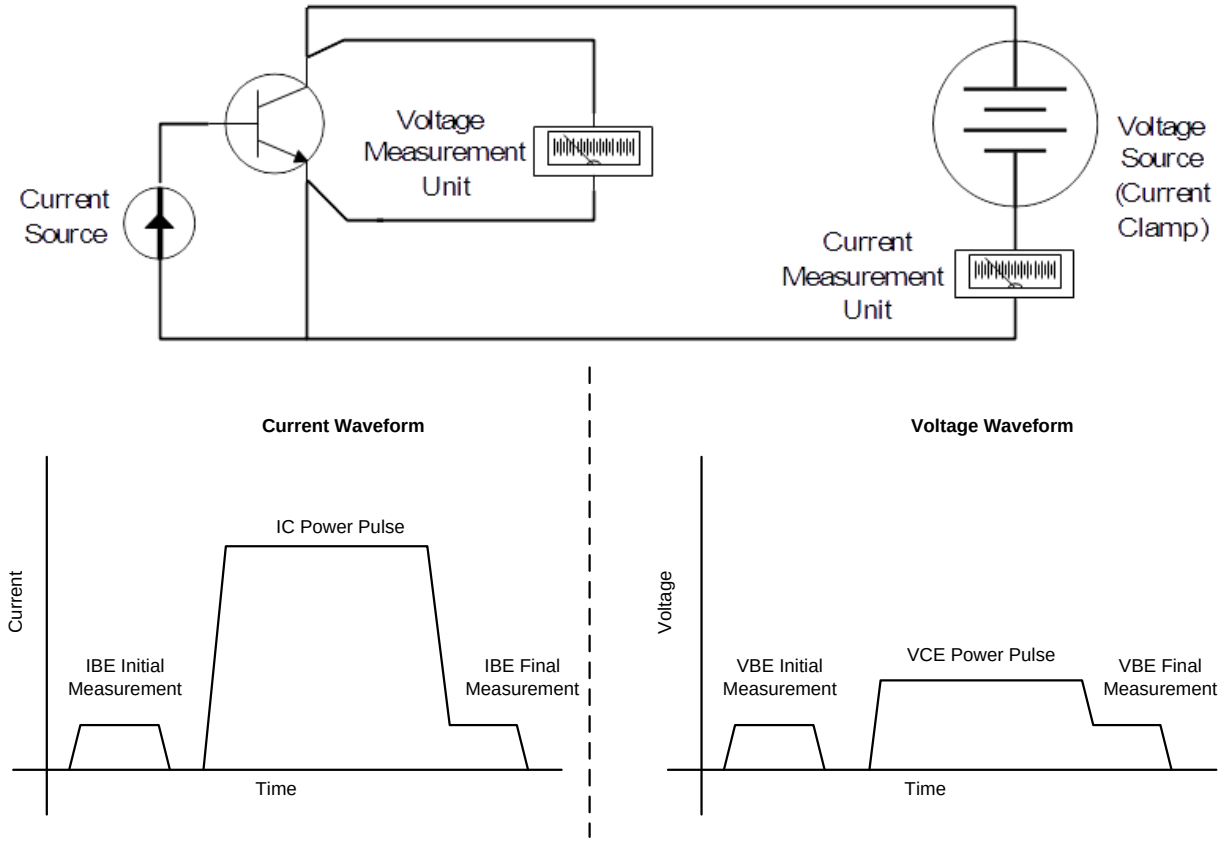

Figure 5

Example SOA test waveforms

The below captured waveform (figure 6) was taken while testing a MOSFET. This test programmed the 50V, 100A, 10uS pulse without VSD measured before or after the power pulse. Drain Current is shown from channel 2, and Drain to Source Voltage are shown from channel 1. The pulse width is measured from the 90% thresholds of the rising and falling current edges.

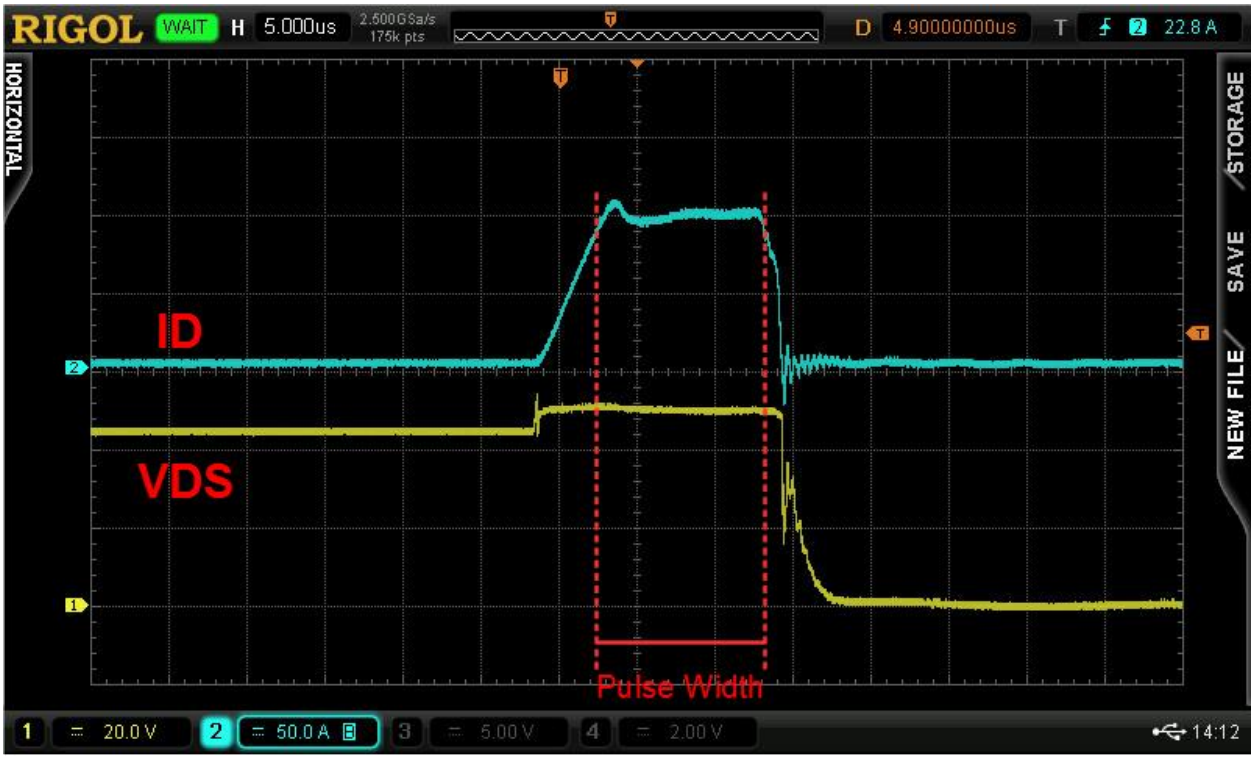

Figure 6

Specifications

Item	Type	Spec	Accuracy
General			
	Power	Pmax = 10kW	
	Power Time	10uS - 9.99S	+/-(0.1%+1uS)
	Forcing Current	0.01A - 9.99A	+/-(1%+5mA)
		10.0A - 99.9A	+/-(2%+50mA)
		100A - 199A	+/-(2%+0.5A)
		Trise Min = 1uS	+/-(5%)
	Measurement Current	1mA - 399mA	+/-(2%+1mA)
	Measurement Delay After Power Pulse	10uS - 999uS	+/-(0.1%+1uS)
	Energy	Per Figure 1	
	Forcing Voltage	1V - 150V	+/-(0.2%+0.2V)
Device	BJT	PNP/NPN	
		IB Max = 20A	
		IC Max = 200A	
		VCB Max = 150V	
		Pulse Width @ power = within Figure 1 area	
		IC Trise = 1uS min	
		Vbe measurement current max = 399mA	
		Vbe measurement voltage max = 10V	
	MOSFET	P-Chan/N-Chan Enhancement type	
		ID Max = 200A	
		VDS Max = 150V	
		Pulse Width @ power = within Figure 1 area	
		ID Trise = 1uS min	
		VSD measurement current max = 399mA	
		VSD measurement voltage max = 10V	
	IGBT	P-Chan/N-Chan Enhancement type	
		IC Max = 200A	
		VCE Max = 150V	
		Pulse Width @ power = within Figure 1 area	
		ID Trise = 1uS min	

		VSD measurement current max = 399mA	
		VSD measurement voltage max = 10V	
	Diode	Rectifier	
		IF Max = 200A	
		Pulse Width @ power = within Figure 2 area	
		*System power must be supplied from a 50A 240VAC Circuit breaker	
Power			

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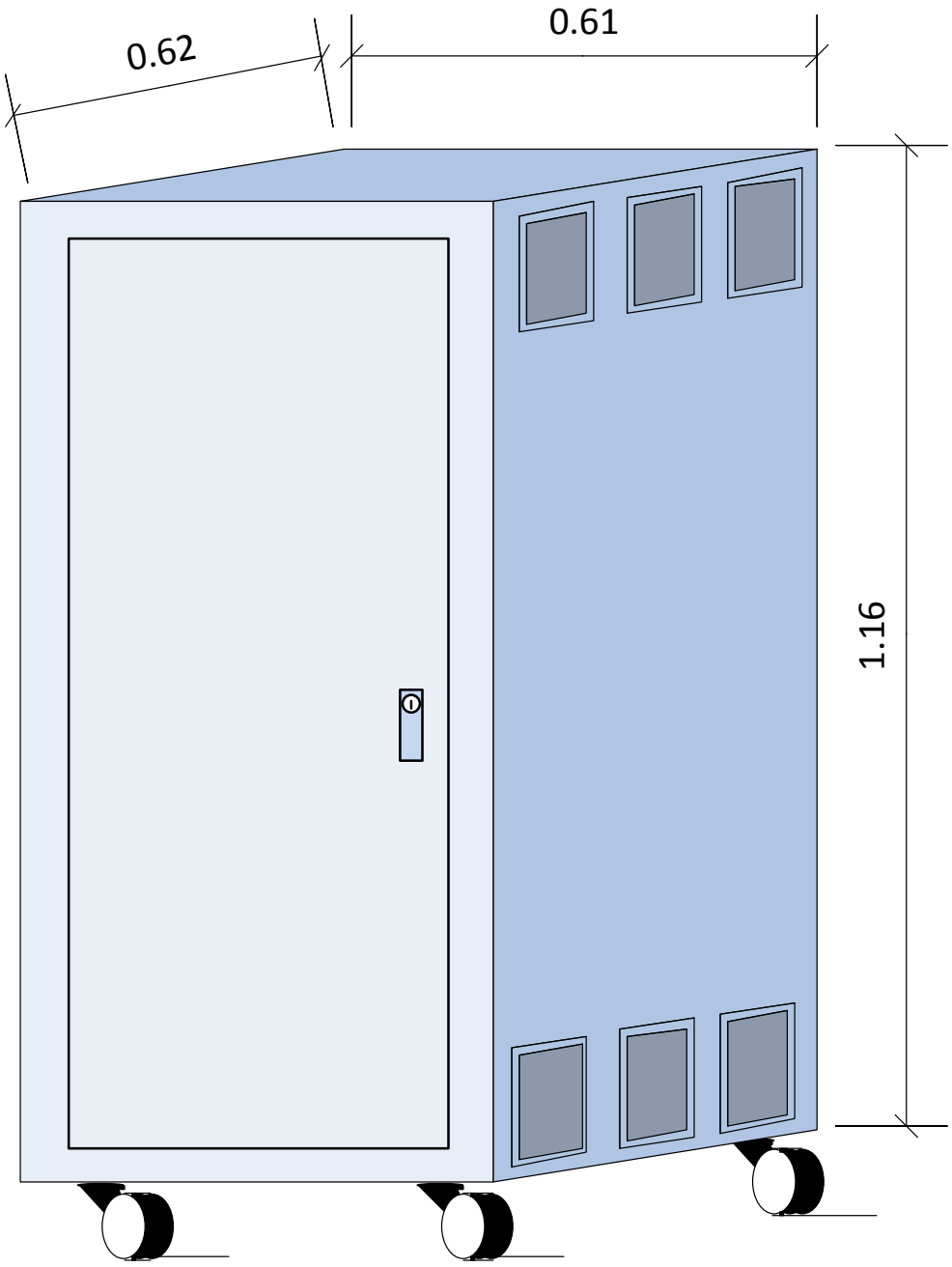
Primary mechanical dimensions



Dimensions shown in meters