

USER MANUAL

DTS541 Three-Phase Energy Meter (CT type)



Contents

1	Introduction	3
2	Reference standards	3
3	Specification	4
4	Meter Function	5
	4.1 Measurement	5
	4.2.2 Display	8
	4.2.3 Communication	10
5	Installation	11
	5.1 Nameplate	12
	5.2 Front view, side view and dimensions	12
	5.3 Mounting holes and dimensions	13
	5.4 Terminal box dimensions	13
	5.5 Connection diagram	14
6	Transportation/Storage	14

1 Introduction

This manual is for the DTS541 CT-connected three-phase energy meter. It should be used to guide the meter installation, usage, maintenance and for technical reference.

2 Reference standards

Standard	Description
AS62053.21 - 2005	Static Meters for Active Energy Class 1 & 2
AS 1284.1-2004	Electricity metering - General purpose induction watthour meters
AS 1284.10.2-2006	Electricity metering
AS 1284.11-1995	Electricity metering Single-phase multifunction watthour meters
AS 1284.12-1995	Electricity metering
AS 62052.11-2005	Electricity metering equipment
IEC62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
IEC62053-21	Electricity metering equipment (AC) - Particular requirements - Part 21: Static meters for active energy(classes 1 and 2)
IEC62056-21	Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange
IEC62056-61	Electricity metering - Data exchange for meter reading, tariff and load control - Part 61: Object identification system (OBIS)

3 Specification

Item	Sub-item	Parameter
Basic	Meter Type	Three Phase Four Wire CT Type
	Active Accuracy	Class 1 (IEC 62053-21)
	Rated voltage Un	3x 230/400 V Voltage Range: 0.75Un~1.2Un
	Operating frequency	50Hz
	Measuring current (A)	1 (5)A or 5 (15)A
	Starting current	0.002In
	Pulse constant	10,000imp/kWh
	Power consumption	Current circuit power consumption \leq 0.2VA Voltage circuit power consumption \leq 0.4W/0.8VA
	Operating temperature range	-25°C ~ +65°C
	Storage temperature	-40°C ~ +85°C
Type Testing	IEC Standard	IEC 62053-21 IEC 62052-11
Special Testing	Surge immunity test	6kV
	impulse voltage strength	12 kV
	Over voltage strength	440VAC / 48 hours
Communication	Local Comm. Port1	1 Optical port
	Local Comm. Protocol1	IEC62056-21 C mode
Measurement	Active Energy	See 4.1.1
	Instantaneous	Voltage of phase A Voltage of phase B Voltage of phase C Current of phase A Current of phase B Current of phase C Total active power Active power of phase A Active power of phase B Active power of phase C

LED&LCD Display	LED	One double-color LED (The LED flashes in red when $\sum Li$ is positive and in green when $\sum Li$ is negative)
	Energy	8 digital maximum (decimal point programmable)
	Display mode	<ul style="list-style-type: none"> - Manual scroll mode - Automatic scroll mode - Power-off display
	Display interval	See 4.2.2.3
	Display contents	Display contents are configurable, see 4.2.2.4
Mechanical	Terminal Box	BS Standard Entry Cable Diameter (mm): 6
	Enclosure protection	IP53
	Seal	2 Meter terminal cover seals, 2 Meter cover seals
	Meter Case	Polycarbonate
	Dimensions(LxWxH)	273mmx170mmx62.5mm
	Weight	Approx. 1.2kg

4 Meter Function

4.1 Measurement

4.1.1 Energy Measurement

1) Measurement mode

$$\sum Li = L1 + L2 + L3$$

(Import energy and export energy are metered separately. Energy data is registered in the export energy register when $\sum Li$ is positive and in the import energy register when $\sum Li$ is negative)

2) Class index: Class 1

3) The measurement contents are as below:

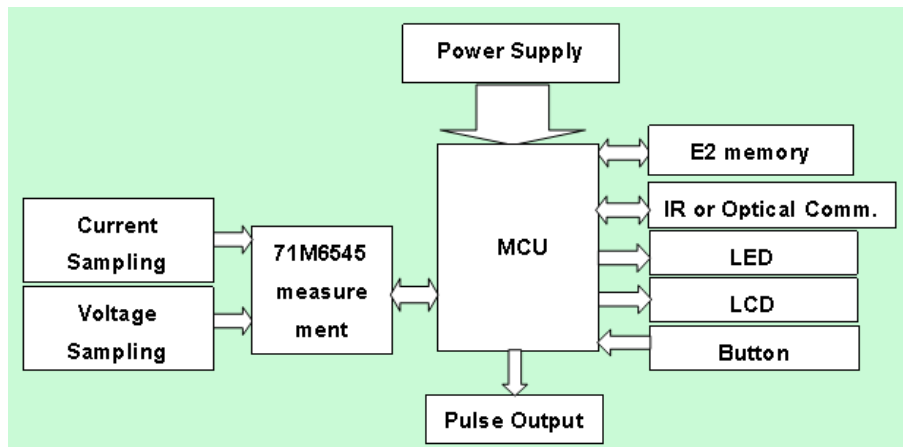
 Total positive active energy

 Total negative active energy

1) Metering Principles

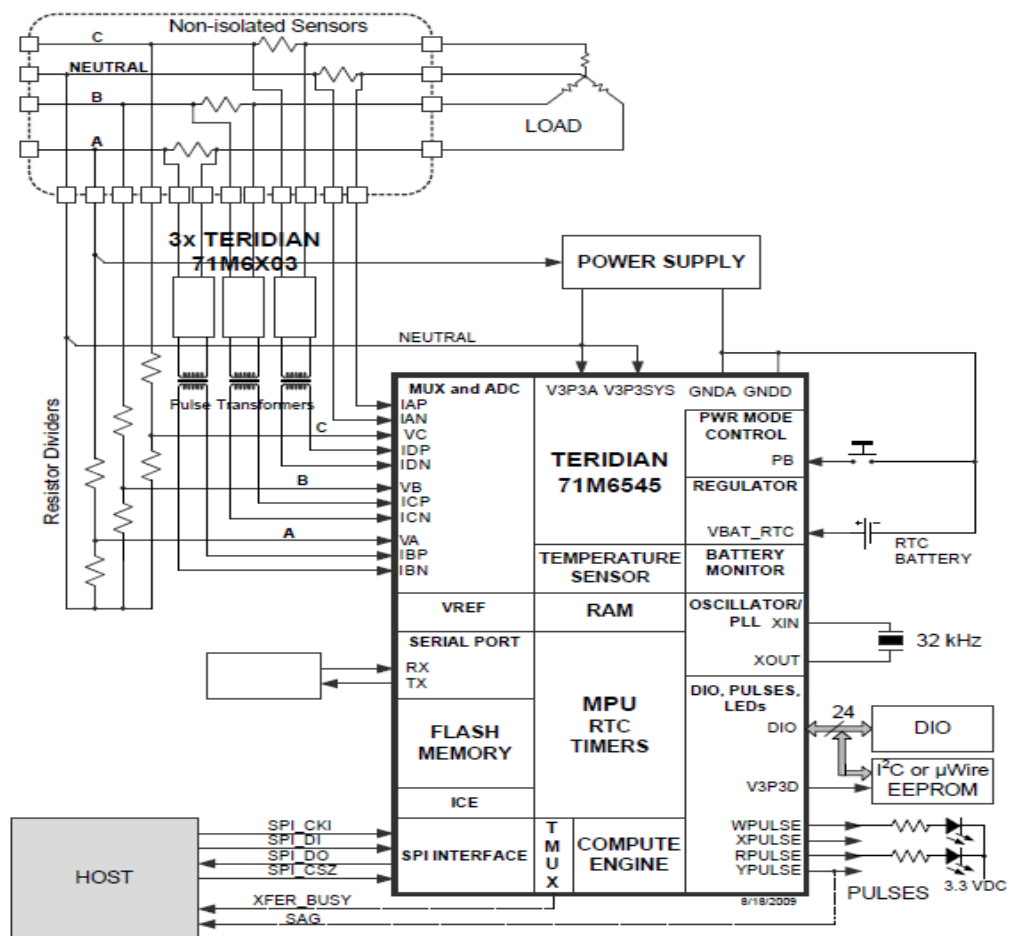
The metering system is based on A/D current and voltage conversion and their digital multiplication. Current is captured via the CT in the current path of the metering system, and voltage via the resistor divider in the voltage path of the metering system. Metering signals in analogue form are fed to the metering electronics, which provides for the digital conversion and multiplication.

2) Meter Functional Block Diagram



Optimized PCBA design combined with high precision reliable components, so that ensure meter can keep high accuracy even under extreme temperature conditions ($-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$). The meter can work with high accuracy within life time.

3) Metering Element Design



The 71M6545 Metrology Processor is based on Teridian's 4th generation metering architecture supporting the 71M6xxx series of isolated current sensing products offering drastic reduction in component count, immunity to magnetic tampering and unparalleled reliability. The 71M6545 integrates Teridian's patented Single Converter Technology® with a 22-bit delta-sigma ADC, a customizable 32-bit computation engine (CE) for core metrology functions as well as a user programmable 8051-compatible application processor (MPU) core with 32K flash and 3K RAM.

An external host processor may access metrology functions directly through the SPI interface, or alternatively via the embedded MPU core in applications requiring metrology data capture, storage and pre-processing within the metrology subsystem. In addition, the 71M6545 integrates RTC, DIO and a UART.

4.1.2

Instantaneous quantities

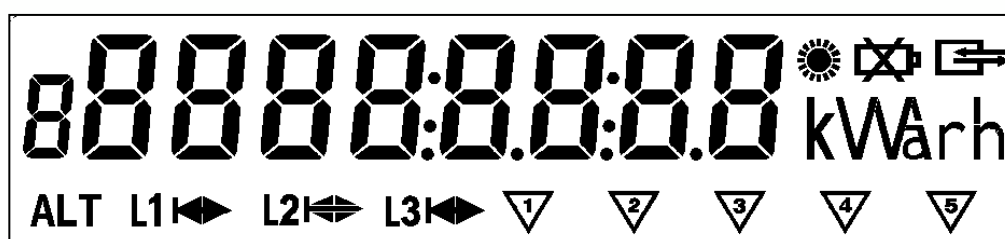
The instantaneous quantities are below:

- 1) Voltage (Phase A/B/C)
- 2) Current (Phase A/B/C)
- 3) Total Active Power
- 4) Active Power (Phase A/B/C)

4.2.2 Display











4.2.2.1 LCD display

- 1) The LCD full-screen display is as below:




- 2) LCD Symbol

LCD Symbol	Description
88888888.88.88.88	Display: for data such as energy, time, date, etc.
8	Sequence no. of the data displayed in the main displaying part
kWh	Unit of the data displayed in the main displaying part
	Daylight saving status (not used in this meter)
	Battery low alarm
	Communication symbol On: Meter is communicating Off: No communication
ALT	Alternate (Manual) Scroll Mode
	Voltage and current status of each phase - L1/ L2/ L3 on means meter working on the normal

L1  L2  L3 	voltage range - L1/ L2/ L3 Flashes means Li phase voltage is under $0.8 \cdot U_n$ or above $1.15 \cdot U_n$ - L1/ L2/ L3 off means Li phase voltage is less than 120V, which be regarded as phase loss
	Positive energy
	Negative energy
    	Status indicator (not used in this meter)

4.2.2.2 Display mode

- 1) Manual scroll display, Automatic scroll display and power-off display;

 Display mode can be changed by pressing the button for 3 s. In the mode of button-pressing display, if there is no pressing for 2 min, the meter will exit the mode and switch to automatic display.

4.2.2.3 Display interval

- 1) Display interval is configurable, 1-99s of each item.
- 2) Power-off display mode: the LCD will start automatic display and shut off in 2 min. The meter can be awakened by pressing the button for 3 s.

4.2.2.4 Display contents

Button & automatic display are independent, display contents are configurable. The default display item is real time total energy when error occurs in configuration.

Display items	Description
Meter No.	0 88888888
Cumulative positive active energy	1 88888888 kWh
Cumulative negative active energy	2 88888888 kWh
Real time voltage of phase A	A 888.8 V
Real time current of phase A	A 888.888 A
Real time power of phase A	A 888.888 kW

Real time voltage of phase B	B 888.8 V
Real time current of phase B	B 888.888 A
Real time power of phase B	B 888.888kW
Real time voltage of phase C	C 888.8 V
Real time current of phase C	C 888.888 A
Real time power of phase C	C 888.888kW
Total Power	p 888.888kW

4.2.3 Communication

4.2.3.1 Optical communication

Optical port conforms to IEC62056-21 standard.

The communication protocol is IEC62056-21 C mode.

4.2.3.2 Data that can be read from the meter

Data	Data Format	Unit	Note
Software version	NNNNNNNNNNNNNNNNNN		Read only
Active positive energy	XXXXXXXX (Number of decimals can be set)	kWh	Read only
Active negative energy	XXXXXXXX (Number of decimals can be set)	kWh	Read only
Frequency	XX.XXXX	Hz	Read only
Voltage of phase A	XXXX.XX	V	Read only
Voltage of phase B	XXXX.XX	V	Read only
Voltage of phase C	XXXX.XX	V	Read only
Current of phase A	XXX.XX	A	Read only
Current of phase B	XXX.XX	A	Read only
Current of phase C	XXX.XX	A	Read only
Instantaneous active power	XX.XXXX	kW	Read only
Active power of phase A	XX.XXXX	kW	Read only
Active power of phase B	XX.XXXX	kW	Read only
Active power of phase C	XX.XXXX	kW	Read only

4.2.3.3 Data that can be configured to the meter

Data	Data Format	Note
Meter No.	NNNNNNNN	Read/Write
Password	NNNNNNNN	Read only
No. of integers and decimals	XX	Read/Write
No. of items to be displayed	XX	Read/Write
Interval of display	XX	Read/Write
Items to be displayed	NNNN*12	Read/Write
No. of items to be displayed in manual scroll mode	XX	Read/Write
Items to be displayed in manual scroll mode	NNNN*12	Read/Write

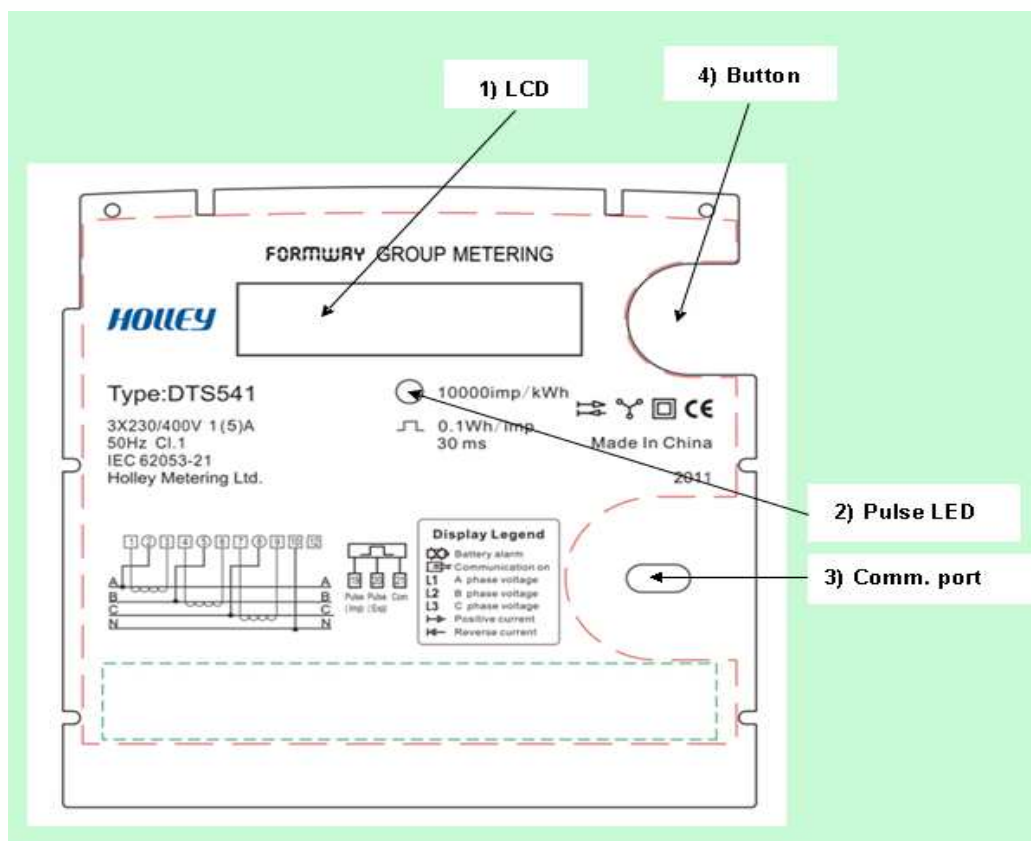
5 Installation

The meter has been inspected and sealed before leaving factory. Before installation, please check whether the sealing is complete. If so, user may install the meter. If there is no sealing or the meter has been stored for a long time, please submit the meter to utility for re-inspection. The meter can be installed at site after qualified by utility.

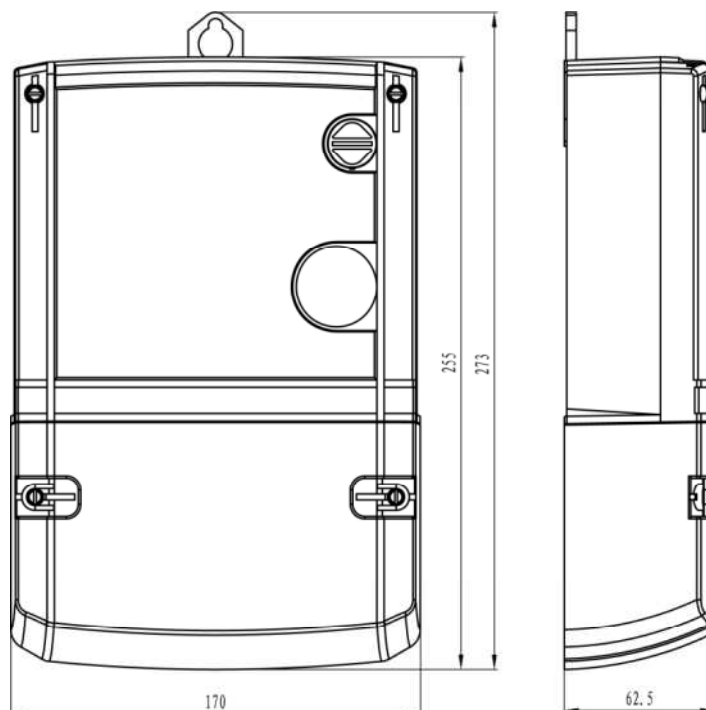
The meter shall be installed indoor under well-ventilated and dry place. The installation environment should be non-caustic and the meter should be protected from dust, salt and water.

There are two holes in the meter installation base, and use two screws to fix the meter. The two screws dimension is M6.

5.1 Nameplate

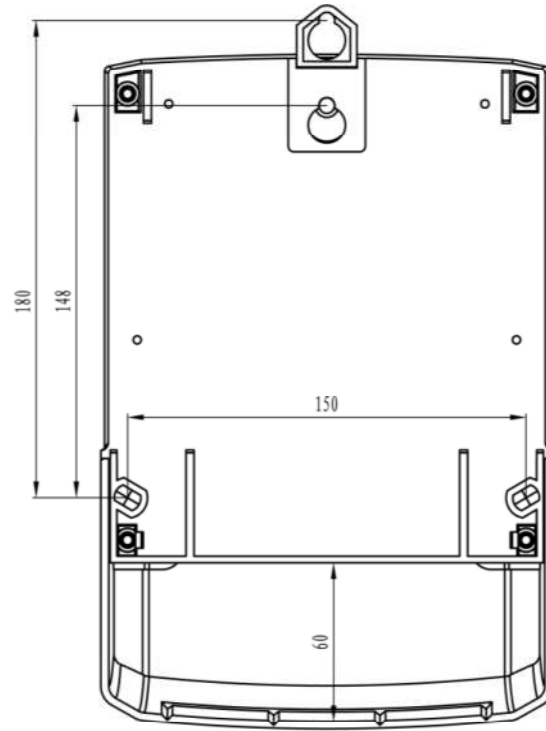


5.2 Front view, side view and dimensions



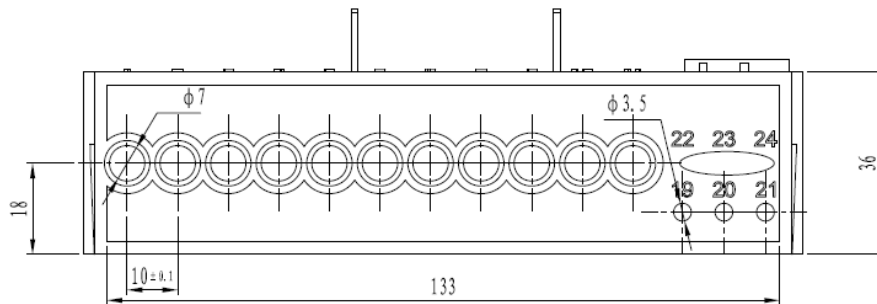
Meter Dimension

5.3 Mounting holes and dimensions



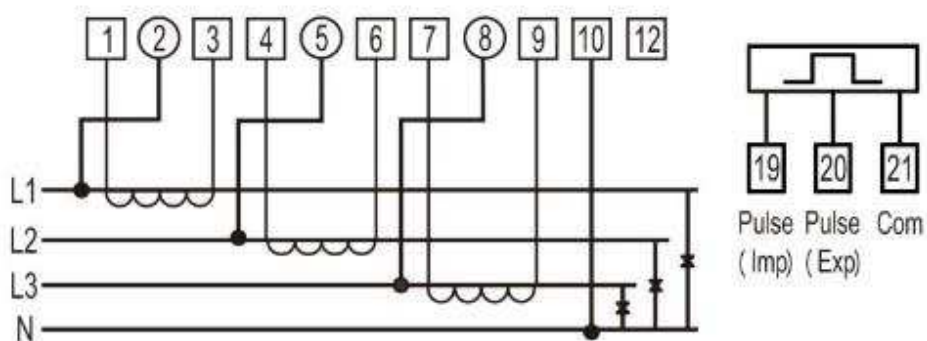
Installation Dimension

5.4 Terminal box dimensions



5.5 Connection diagram

The connection type conforms to BS standard.



6 Transportation/Storage

The meter shall be kept in the same packing for transportation and storage. The meter should be stored indoors, in a non-caustic environment and should be protected from dust, salt and water. There shall be no sharp change in ambient temperature and the relative humidity shall be less than 85%.