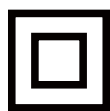


CE
EN50022
EN61036



Standardel®
Electrical Expert

Technical Manual

Version: 1408



SDT670 DIN Rail Power Analyzer

Shanghai Standardel Co., Ltd.

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1. General

SPD670 DIN rail power analyzer is designed special for energy management system (EMS). By its DIN rail installation, it is very suitable to be used with breakers, contactors. Besides electrical energies, it may measure all the parameters on the electrical networks, such as currents, voltages, active powers, reactive powers, apparent powers, frequency, power factors and 4 quadrant energies.

It doesn't need CT, but we may connect it to up to 100Amp directly. It has a 7 digits LCD display. By its front key and users may easily change display data. Every SDT670 has a RS485 interface and 2 impulse outputs, to transfer its measuring data to other master devices, such as PLC, data center computers.

SDT670 has good cost performance, as an intelligent unit and a digital electrical data collection unit, it has been widely used in many intelligent systems.

2. Functions

- Measuring 30 parameters on AC electrical network:
AL1, AL2, AL3(current senses), VL1, VL2, VL3, VL1-2, VL2-3, VL3-1, Fr,
PL1, PL2, PL3, PL,QL1, QL2, QL, SL1, SL2, SL3, SL, PF1, PF2, PF3, PF,
imp & exp kWh, L & C kvarh
- With 7 digits LCD.
- Input: 3x5A (Connect CT), 3x16A(20A), 3x32A(40A), 3x63A(80A), 3x100A;
- Line: 2P3L (2x110V/220V);
3P4L (3x120/220V, 3x220V/380V, 3x230V/400V);
3P3L (3x380V)
- The 3x5A type can be used with CT and CT ratio is programmable;
- With 2 impulse outputs (kWh, kvarh) and wire breakage alarm;
- With RS485 interfacer (Modbus-RTU protocol);
- 35mm standard DIN rail installation
- With Standardel PC software, the user may easily read and SDT670 data and program its parameters by computer.

3. Features

Technical Feature		Parameters
Input	Wiring	2P3L, 3P3L, 3P4L
	Voltage	2x110V/220V, 3x57.7/100V, 3x127/220V, 3x220V/380V, 3x230V/400V, 3x100V, 3x380V
		Consumption ≤5VA / line
		Rating: 0.9 ~ 1.1Un; maximal: 0.7 ~ 1.2Un
	Current	3x5A, 3x16A, 3x32A, 3x63A, 3x100A
		Minimal current 20mA
		Consumption ≤4VA / line
	Frequency	45 ~ 65Hz
	Precision	0.5% (kVarh 1%)
RS485 interface		2 cables RS485 (Modbus-RTU protocol)
Energy Impulse		2 impulse (open-collector) for kWh & kvarh
		Constant: [See side label]
		Width of pulse: 80ms±20ms
Isolation		2kVAC/min (input / output / power supply)
		input / housing and output / housing >50MΩ
Installation		Standard 35mm DIN rail
Standard		EN61036; EN50022
Environment		Work Temperature: -20C ~ +55C
		Storage Temperature: -40C ~ +70C
		Relative humidity: 5% ~ 95% (no condensation)
		Altitude: < 2500m
Others		Dimension: 126×89×74 (mm)
		Weight: 950g

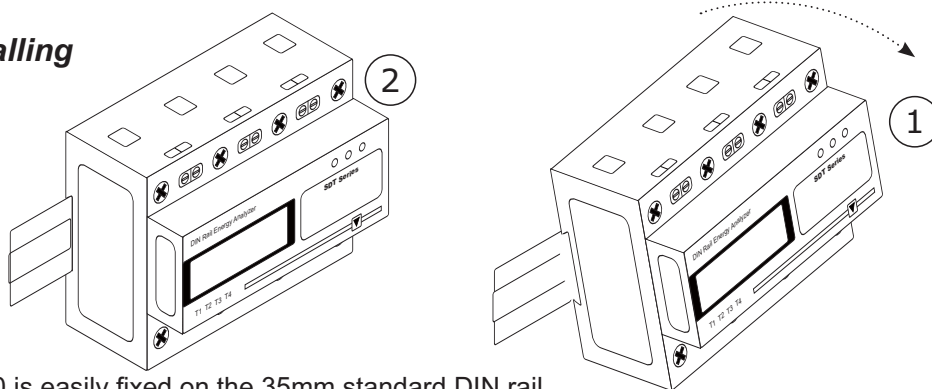


4. Installation

4.1 Dimension



4.2 Installing

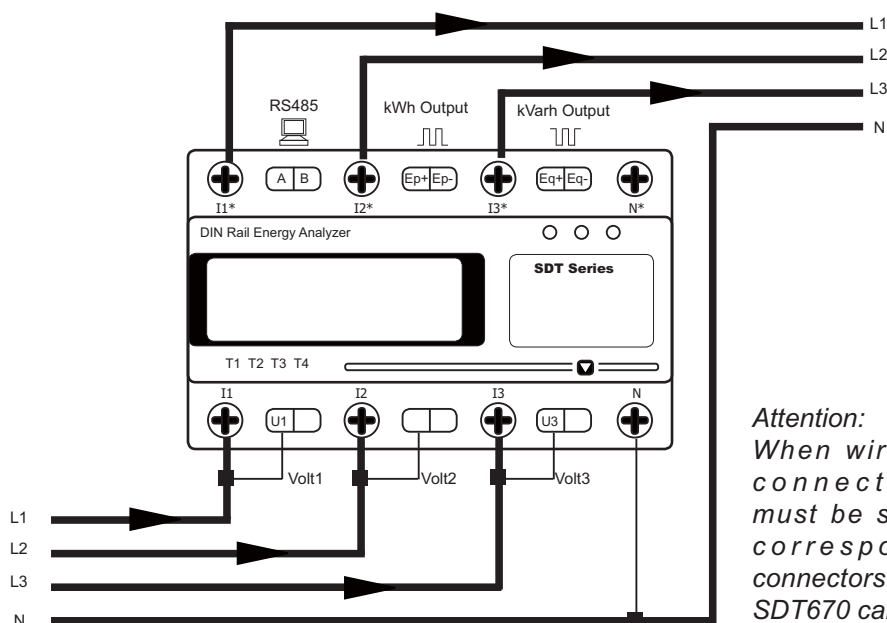


Note:

1. SDT670 is easily fixed on the 35mm standard DIN rail.
2. There are 2 seals points on their front transparent cover. After Wiring, mount seals, they can be good anti-stealing.
3. When the current is more than 80Amp, please use special connector  to make sure the wiring security.

5. Wiring

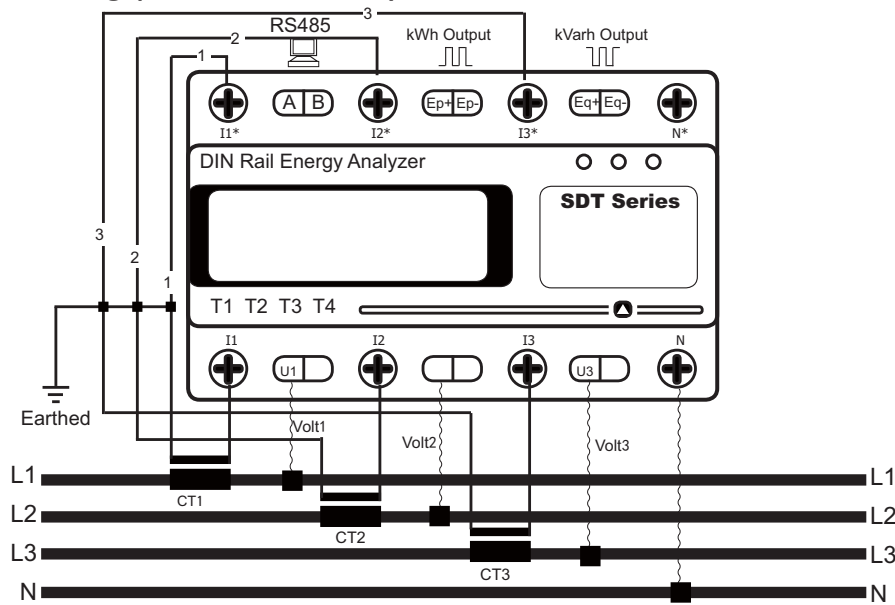
5.1 3P4L wiring (direct)



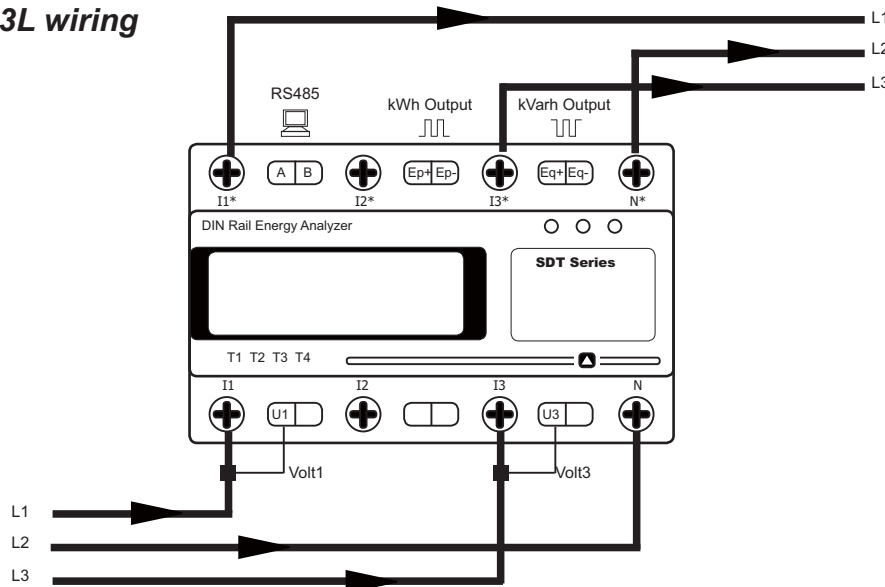
Attention:

When wiring directly, volt connectors U1, U2, U3 must be shorted with their corresponding current connectors I1, I2, I3, Otherwise SDT670 can't work!

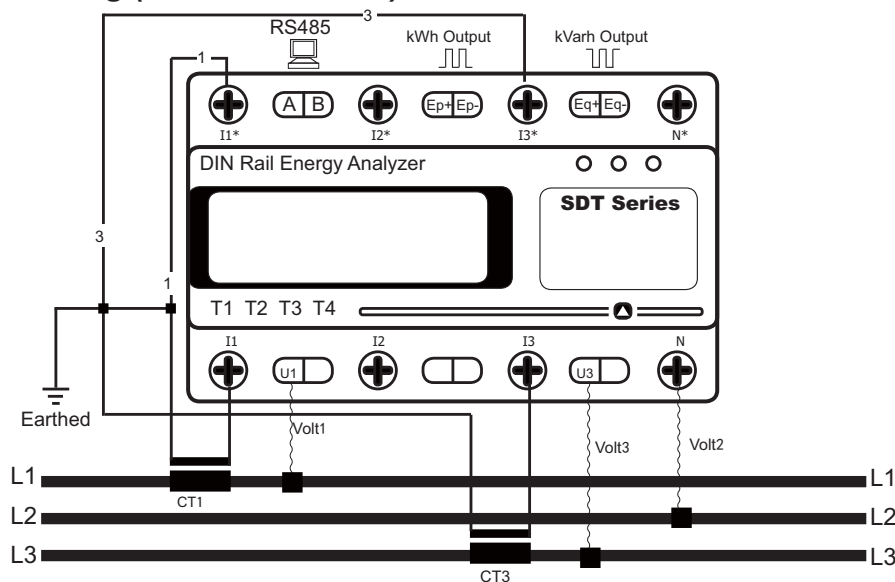
5.2 3P4L wiring (with external CT)



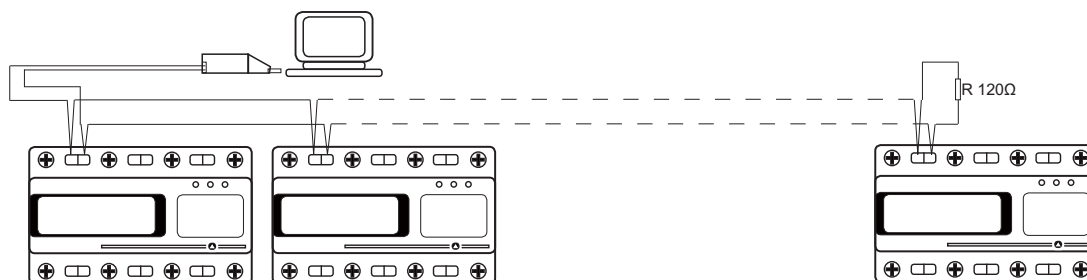
5.3 3P3L wiring



5.4 3P3L wiring (with external CT)



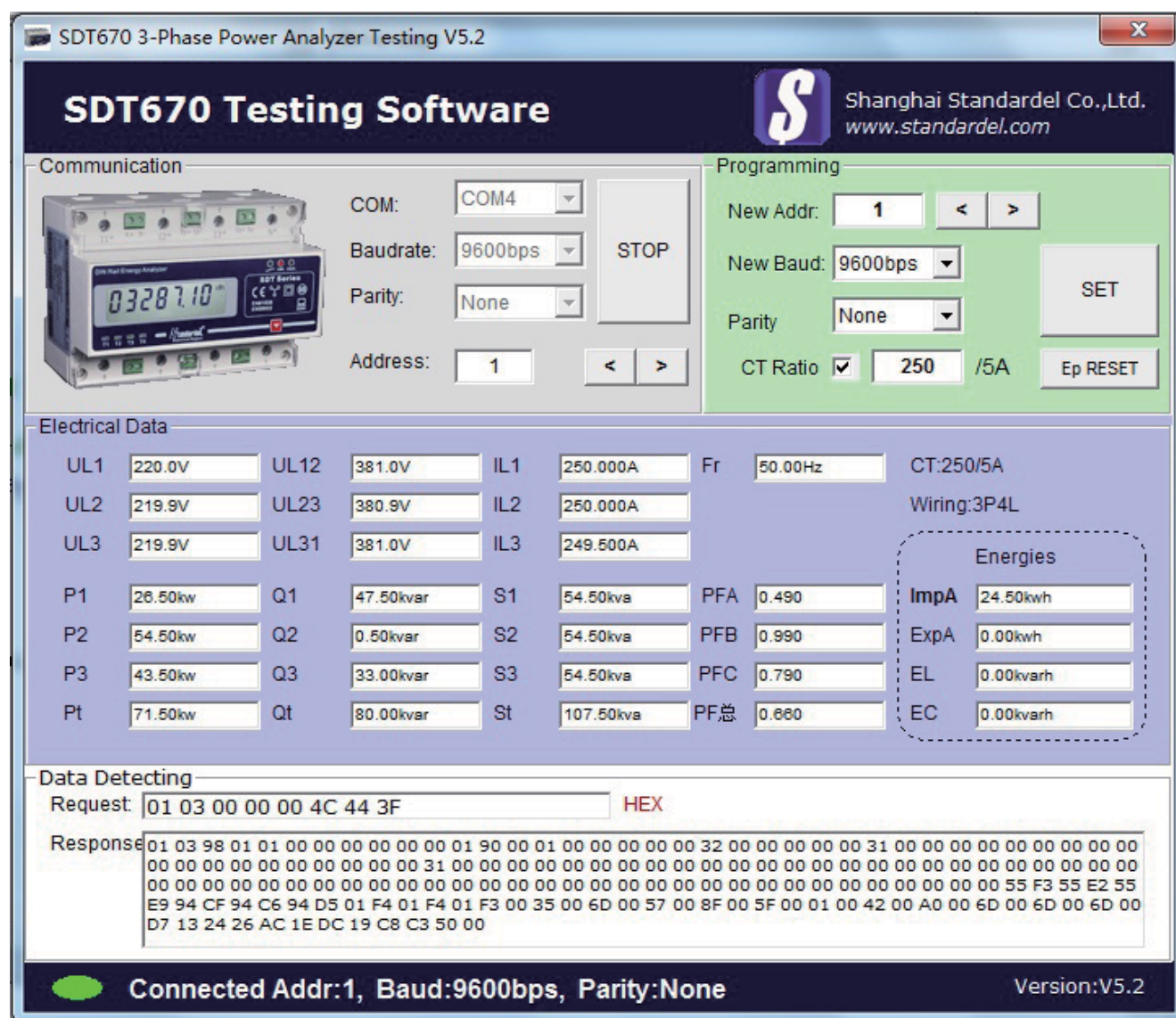
5.5 RS485 interface wiring



Note:

1. On the same RS485 line, there aren't more than 32 devices;
2. At the end of RS485 line, please connect a 120Ω resistor to the last device.;
3. Every SDT670 has own different slave address (You may set SDT670 address by our software).

6. Setting Software



SdT670 Testing Software can check all the state of SdT670 by RS485 communication:

- 1) it can get all data measured by SDT670;
- 2) it can make mass setting of SDT670's Modbus slave address and baudrate.;
- 3) it can easily clear SDT670's energies data.

7. Display



Alarm of break line

Pulse of kWh

Pulse of kVarh

Attention:

1. When SDT670 communicates normally, will glitter at the bottom of screen;
2. If there isn't current or voltage on the any of phases L1,L2,L3, the light [Alarm of break line] will be turn on;
If there isn't load on lines, the light [Alarm of break line] will be turn on;
If L1,L2,L3 error wiring, [Alarm of break line] will be turn on;
3. The three currents has direction, if current is inverse, will display at the bottom of current value.

LCD displayer

Button for change display Page

Display Menu

12345.67 kWh	Import active energy (Unit: kWh)	
00005.67 kWh	Export active energy (Unit: kWh)	
76543.21 kVarh	Inductive reactive energy (Unit: kVarh)	
00043.21 kVarh	Capacitive reactive energy (Unit: kVarh)	
UA 220.1 V	Voltage of Phase A (Unit: V)	
Ub 219.9 V	Voltage of Phase B (Unit: V)	
Uc 219.9 V	Voltage of Phase C (Unit: V)	
IA 05.01 A	Current of Phase A (Unit: A)	
Ib 05.00 A	Current of Phase B (Unit: A)	
Ic 04.99 A	Current of Phase C (Unit: A)	
Pt00 1.64 kW	Total Active Power (Unit: kW)	
9t002.85 kVar	Total Reactive Power (Unit: kVar)	
PF 0.50	Total Power Factor	
50.0 Hz	Frequency (Unit: Hz)	
005 Addr	Modbus Slave Address (Default 001 Set by SDMT software)	
9600	Modbus Baud rate (Default 9600bps Set by SDMT software)	
Ct 050	CT Ratio (Default 001, 250/5A, CT= 050)	

Note:

SDT670 can display main 16 parameters, the user may change display page by button . For the other 3-phase parameters (line voltages, phase active powers, phase reactive powers, phase power factors), the user may read them by Modbus Map (See Page6); or the user may read them by our software. The 3 currents have the sense, if current is inverse, it will display .

**8. Modbus Protocol****8.1 Register Map**

Register Dec	Code Hex	Items	Format	Read Write	Explanation
0 - high	00 - high	Slave Address	Char	R/W	Range: 001~247 (Default 00 1)
- low	- low	Baud rate	Char	R/W	1:9600bps 2:4800bps 3:2400bps 4:1200bps (Default: 1)
1 - high	01 - high	Data Frame format	Char	R/W	0: 8,n,1 (Default: 0) 1: 8,e,1 2: 8,o,1 3: 8,n,2
- low	- low	Line Mode	Char	R	0:3P4L; 1:3P3L (Default: 0)
2~5	02~05	Empty			
6 - high	06 - high	Error Alarm Message	Char	R	0000 0 0 0 0 (0-No; 1-Alarm) Er Phases UL3 UL2 UL1
- low	- low	Current sense	Char	R	00000 0 0 0 (0 positive; 1 negative) IL3 IL2 IL1
7	07	Empty			
8	08	CT ratio (Option)	Word	R/W	1~120 (External CT 200/5A, ratio = 40)
9	09	Empty			
10,11	0A,0B	Import active energy	DWord	R/W	RealValue = (65536*Register_H+Register_L)/100 (Unite: kWh)
12,13	0C,0D	Export active energy	DWord	R/W	
14,15	0E,0F	Inductive reactive energy	DWord	R/W	RealValue = (65536*Register_H+Register_L)/100 (Unite: kVarh)
16,17	10,11	Capacitive reactive energy	DWord	R/W	
18~49	12~31	Empty			
50	32	Voltage between L1 & Neutral	Word	R	RealValue = RegisterValue/100 (Unit: V)
51	33	Voltage between L2 & Neutral	Word	R	
52	34	Voltage between L3 & Neutral	Word	R	
53	35	Voltage between L1 & L2	Word	R	
54	36	Voltage between L2 & L3	Word	R	
55	37	Voltage between L3 & L1	Word	R	RealValue = RegisterValue/100 (Unite: A)
56	38	Current on phase L1	Word	R	
57	39	Current on phase L2	Word	R	
58	3A	Current on phase L3	Word	R	RealValue = RegisterValue/100 (Unite: kW)
59	3B	Active power on phase L1	Word	R	
60	3C	Active power on phase L2	Word	R	
61	3D	Active power on phase L3	Word	R	RealValue = RegisterValue/100 (Unite: kVar)
62	3E	Total Active power	Word	R	
63	3F	Reactive power on phase L1	Word	R	
64	40	Reactive power on phase L2	Word	R	RealValue = RegisterValue/100 (Unite: kVA)
65	41	Reactive power on phase L3	Word	R	
66	42	Total Reactive power	Word	R	
67	43	Apparent power on phase L1	Word	R	RealValue = RegisterValue/100 (Unite: kVA)
68	44	Apparent power on phase L2	Word	R	
69	45	Apparent power on phase L3	Word	R	
70	46	Total Apparent power	Word	R	RealValue = RegisterValue/10000
71	47	Power factor on phase L1	Word	R	
72	48	Power factor on phase L2	Word	R	
73	49	Power factor on phase L3	Word	R	
74	4A	Total Power factor	Word	R	RealValue = RegisterValue/1000 (Unite: Hz)
75	4B	Frequency	Word	R	

* All the registers of SDT670 are 16 bits unsigned integer.

8.2 Interface

- SDT670 is equipped with 2-cables half-duplex RS485 interface and it is built-in standard Modbus-RTU protocol; the cables should be Shielded Twisted Pair and its diameter should above 0.5 mm².
- On one RS485 line, there are able to connect maximan 32 devices; every SDT670 must have own different slave address.
- The wiring of RS485 cables should be far away HV cables or HV environment; we suggest wiring of Mode T, not Mode Star
- Programmable Baudrate 9600, 4800, 2400, 1200bps,
default is 9600bps
- Data Transmit Format: 1 start bit, 8 data bit, 1 stop bit, no parity

8.3 Protocol

Modbus-RTU: it is the communication mode between master device and slave device on one RS485 line. At first, the master device requests one sole slave device; then this slave device reponses master device

Modbus-RTU allow to commnunicate only between master device and slave device and don't allow to communiante among slave devices. Therefore the slave devices don't occupy the communication line when it initialize.

Master request: request frame includes slave address, function code, data and CRC check.

Slave Address	Function Code	Data	CRC16 Check
1 byte	1 byte	N bytes	2 bytes

Slave Address: every analyzer has one address different from others on one RS485 line; range from 1~247; only requested analyzer will response master.

Function Code:

Hex order	Function
03H	Read data from one or several registor(s)
10H	Write data into one or several registor(s)

Data: including read or write data

CRC16 check: $x^{16} + x^{15} + x^2 + 1$

8.4 Examples

- Read registers: want to read the currents of 3 phases of analyzer's slave address 01.

Master request:

Slave Address	Function	Start Register	Register Number	CRC
01H	03H	00H,38H	00H,03H	84H,06H

SDT670 response:

Slave Address	Function	Byte Number	Data	CRC
01H	03H	06H	27H,27H,27H,11H,27H,0AH	D2H,E3H

AL1 = (27Hx100H+27H)/100 = 100.23A

AL2 = (27Hx100H+11H)/100 = 100.01A

AL3 = (27Hx100H+0AH)/100 = 99.94A

- Read registers: want to read the import reactive energy of analyzer's slave address 10.

Master request:

Slave Address	Function	Start Register	Register Number	CRC
0AH	03H	00H,50H	00H,02H	C5H,61H

SDT670 response:

Slave Address	Function	Byte Number	Data	CRC
0AH	03H	04H	01H,02H,03H,04H	E1H,FCH

Import kVarh = (10000Hx(100Hx01H+02H) + (100Hx03H+04H))/100 = 169090.00 kVarh



8. Feedback

9.1 RS485 Communication Error

- SDT670 doesn't response

Please make sure the correct RS485 communication setting of SDT670, they (slave address, baudrate, data frame format) must be well corresponding to master devices (PC, PLC); If there are several SDT670, don't response, on a same RS485 line, please check whether this RS485 line is available, or whether the RS485 converter / TCP server work well. If only one SDT670 doesn't response, please check the RS485 cable.

- SDT670 responses error data

Please read SDT670 register map again, make check the good position, data format of the register. We suggest using our SDT670 testing software to test and set SDT670 after installation.

9.2 Electrical value error

1. Please make sure of correct wiring of input current and of input voltage to SDT670, after wiring, you may use multimeter to check whether the input values are correct.

2. Please make sure of phase sequence is correct, that's to say that L1 current input must be matched to L1 voltage input.

3. The measured values by SDT670 are RMS, they are a little different from the measured values by multimeter. It is normal.

9.3 Energy value error

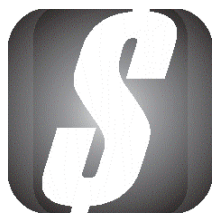
SDT670's accumulated energy values are based on active power values, if energy values aren't correct, please check whether active power values and PF values are corresponding to real values. SDT670 counts bidirectional active energies, if the current wiring or CT secondary wiring is inverse, the active energy will be counted on export active energy. So you have to make current wiring again.

9.4 SDT670 doesn't work

SDT670 must be wired voltage line(s) (the 3 pairs of green connectors), otherwise it can't work; if the input voltage is below the 80% rating voltage, SDT670 can't work too; if the input voltage is above the 120% rating voltage, it will damage SDT670. If input voltage is OK, but SDT670 can't work, please contact our service after sale.

9.5 SDT670 Err Alarms LED

1. There is no current or no voltage on any one of 3 phase;
2. Any current input doesn't match its voltage input;
3. On 3P3L wiring, Err Alarm LED will turn on;
4. To measure Unbalance 3 phases load, Err Alarm LED will turn on.



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