User' s Manual
of AIJE D7 Multi -functional Power Instrument

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CONTENTS

1.Summary

AIJE D7 multifunctional power instrument is a new generation of measurement and control instrument carefully designed and manufactured with advanced microelectronics technology, which can accurately measure voltage, current, active power, reactive power, apparent power, frequency, power factor, etc; Mature energy meter technology is used for this instrument, which not only accurately measures active energy, reactive energy, and four quadrant energy, but also realizes time-sharing billing, multiple rate calculation, maximum demand recording, and 12-month energy statistics functions. It can also help customers achieve comprehensive energy metering and assessment management; In addition, it can serve as a front-end acquisition component for automation systems, a continuous measurement and monitoring unit for distribution systems, and can also be applied to industrial distribution automation systems, substation automation systems, high and low voltage switchgear, intelligent building electrical engineering, and enterprise energy efficiency management systems; At the same time, it is also a fully functional and compact smart three-phase electricity meter.

Its main features of the instrument are as follows:

● With a wide voltage range of 100-240VAC (or 24VDC), and automatically recognize frequencies from 50Hz to 60Hz, which makes it can be used worldwide.

● Built-in rechargeable battery facilitates timely storage of power outage information in case of sudden power outage; The internal clock can accurately record monthly electricity consumption and maximum demand data.

● With a four quadrant energy metering.

● Multiple rate electricity calculation: Multiple rate electricity can be divided into up to 10 time periods per day, with 4 different rates (sharp, peak, plane and valley) to complete the time-sharing calculation.

● Maximum demand record: The maximum demand refers to the average power consumption of customers during a certain period of time (currently 15 minutes in China) within a certain settlement period (usually one month), and the maximum indicated value is retained as the maximum demand for this settlement period. It can calculate the maximum values of total active power, total reactive power, total apparent power, A-phase current, B-phase current, and C-phase current during a certain settlement period.

● Optional harmonic analysis function, capable of measuring harmonic components from 2 to 41.

● The built-in 4~20mA current transmission output can freely select common power values for transmission output.

● One freely configurable relay output is used for alarm or event output, which can be programmed to set multiple alarm modes and also has event recording for voltage loss, total voltage loss, current loss, and phase failure

● Can be connected to the upper computer through RS485 MODBUS-RTU communication.

2.Code Definition

Advanced modules are used in the hardware of the AIJE D7 multifunctional power instrument, allowing for flexible selection of functions such as transmission, communication, and alarm.

. AIJE - 743 - D71 - 30A/15mA - N - 24VDC
① ② ③ ④ ⑤ ⑥

This represents: ① Instrument serial number AIJE; ② Host model 743; ③ Dimension D71;

④ Externally connected to a small current transformers of 30A/15mA or 50A/10mA.

⑤ Optional modules X7, CF3, L2 , N indicates not needed.

⑥ 24VDC means using a 24VDC power supply.

① Basic functions:

② Host model

743: Multi functional power instrument with a fixed S2A RS485 serial communication module. Externally connected to a small current transformers of 30A/15mA or 50A/10mA. Can be used to measure three-phase current, voltage, power, active energy, reactive energy, and four quadrant energy.

763: Curing rechargeable batteries based on 743, with functions such as time-sharing billing, multiple rate calculation, maximum demand recording, and 12-month electricity statistics.

783: Add harmonic analysis function on the basis of 763.

③ Dimension

D71 rail installation with display panel and welding module.

The AIJE D7 instrument does not have an internal transformer, and is externally connected to a small current transformer of 30A/15mA or 50A/10mA.

(1) Power equipment with a rated current (full range) of 5A~49A can be directly connected to a 30A/15mA current transformer. And set the parameters LI=rated current=5.00~49.00, CT=1.

(2) Power equipment with a rated current (full range) of 50A~99A can be directly connected to a 50A/10mA current transformer. And set the parameters LI=rated current=50.00~99.00, CT=1.

(3) Equipment with a rated current higher than 100A can be directly connected to a 30A/15mA current transformer, and a high current transformer with CT=20 or CT>20 can be connected in series. The secondary measured rated current is 5 amperes, and the parameter LI=5.00 is set.

④ Module (choose one from three)

HX5A Current transmission module, 4~20mA

CF3 Pulse output module, used for measurement

L21 One-way alarm relay output alarm module

N Indicating no module installation

⑤ **power**

Blank indicates the use of a 100-240VAC power supply, while 24VDC indicates the use of a 24VDC power supply.

3.Technical Specification

● **Accuracy:**

Voltage measurement (kV): level 0.2%
Current measurement (kA): level 0.2%;
Active power (kW): level 0.5%
Reactive power (kVAR): level 1.0%;
Active energy (kWh): level 0.5%
Reactive energy (kVARh): level 1.0%.

● **Electrical:**

working power supply: AC100~240V
Insulation voltage: ≥ 2300VAC
Voltage measurement range: AC 10~400V

● **Climate conditions:**

Normal operating temperature: -10 ℃~+60 ℃
Annual average humidity: ≤ 70%

● **electromagnetic compatibility(EMC)**

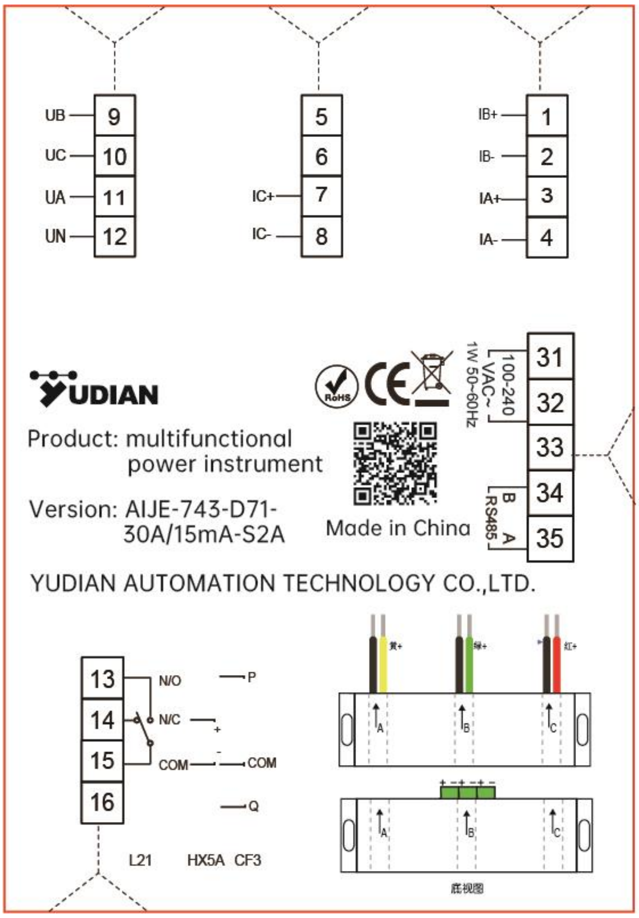
GB/T 17626.2-2006 (Electrostatic Discharge Immunity), 4KV;
GB/T 17626.3-2016 (Immunity to Radio Frequency Electromagnetic Field Radiation), 10V/m;
GB/T 17626.4-2008 (Electrical Fast Transient Pulse Group Immunity), ± 4KV/5KHz;
GB/T 17626.5-2008 (Surge/Impulse Immunity), 4KV;
GB/T 17626.6-2017 (Immunity to Conducted Disturbances Induced by Radio Frequency Fields) 10V;
GB/T 17626.8-2006 (Power frequency magnetic field immunity), 10A/m;
GB/T 17626.11-2008 (Immunity to voltage dips, short interruptions, and voltage changes);

4.Wiring Diagram

The wiring diagram is shown in the following left figure:

① 4, 1, and 7 for current inputs, while 3, 2, and 8 for current outputs. 9-UB, 10-UC, 11-UA, 12-UN.

The instrument should be installed in a dry, dust-free place and avoid being placed around heat, radiation, and strong interference. There should be sufficient space around the installation location. On one hand, the loading and unloading require operational space, and terminal wiring and routing also require space; On the other hand, it also avoids danger or damage caused by being too close to other objects around it.



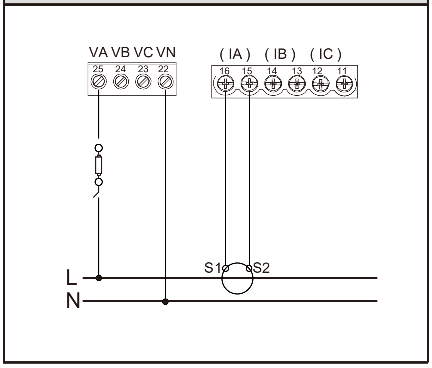
symbol	Description
	Potential or voltage transformer
	current transformer
	fuse
	Voltage isolation switch

When using an external 50:10mA transformer, please correspond the same pin numbers in the diagram with the AIJE instrument one by one.

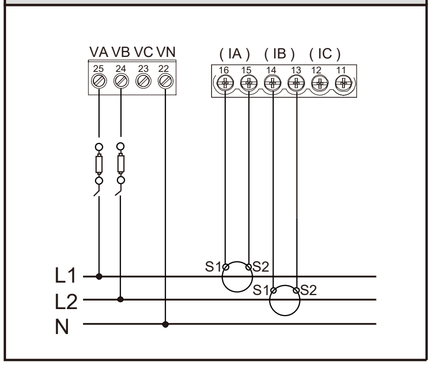
1 IB+	2 IB-	3 IA-	4 IA+
5	6	7 IC+	8 IC-
9 UB	10 UC	11 UA	12 UN

13	14+	15-	X5
P	CF3	Q	COM
NO	NO	COM	L2

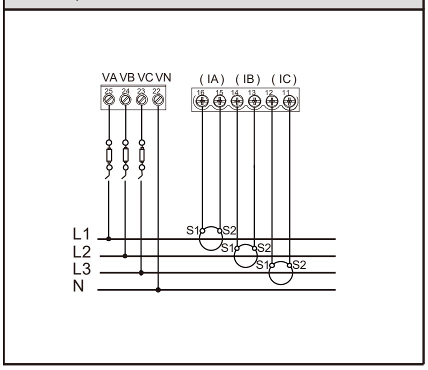
Single phase L-N two-wire;1CT



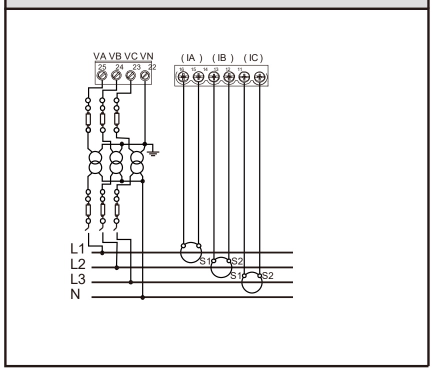
Two phase voltage direct connection; 2CT



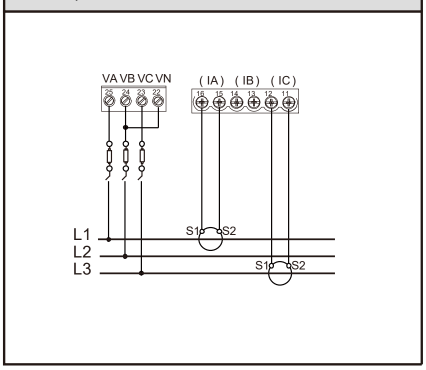
Three-phase four-wire; 3CT



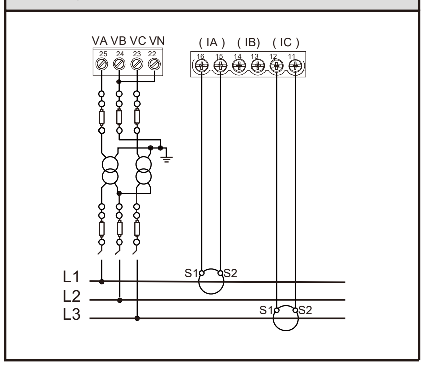
Three-phase four-wire; 3CT, 3PT



Three phase three wire; 2CT



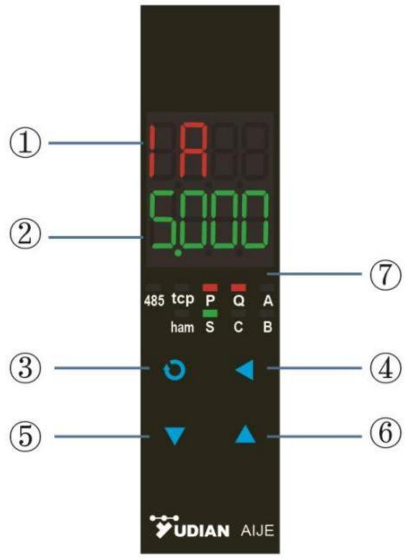
Three phase three wire; 2PT, 2CT



Three phase three wire delta connection (2PT, 2CT two-phase method): When connecting, the common terminal of the two power instruments is connected to phase B, and phase B is grounded. The application premise of the two-phase method is: IA+IB+IC=0; UAB=UAN-UBN; UBC=UBN-UCN; P=P1+P2=UAB * IA+UCB * IC. That is to say, due to these constraints, only two

5.Panels and Operations

5.1 Panel Description



① Upper display window, showing parameter names
② Lower Display window, showing parameter values
③ Settings - Circle Key
④ Data Shift - Left Click
⑤ Data reduction - down key
⑥ Data increase - up key
⑦ 9 LED indicator lights, 485 (communication), TCP (communication), P (active power pulse output, lights up when no output, flashes when output), Q (reactive power pulse output, lights up when no output, flashes when output), A (alarm), B (alarm), C (alarm), S (L2 alarm), ham (lights up when srun=7 and there is voltage and current signal for harmonic analysis).

Parameter setting: When the parameter lock is not locked, press ⟲ for 2 seconds, and after setting the LOC password (default 9008), users can enter the parameter setting status. Press ⟲ again, and the instrument panel will display each parameter in sequence. Parameter values can be modified through ▽, △, ◁. Press ◁ first and then ⟲ to exit the parameter setting status, and hold ◁ to return to check the previous parameter.

5.2 Operation Description

The upper display window shows the parameter name. The lower display window shows the parameter values. Type (0~629), different type values have different display contents.

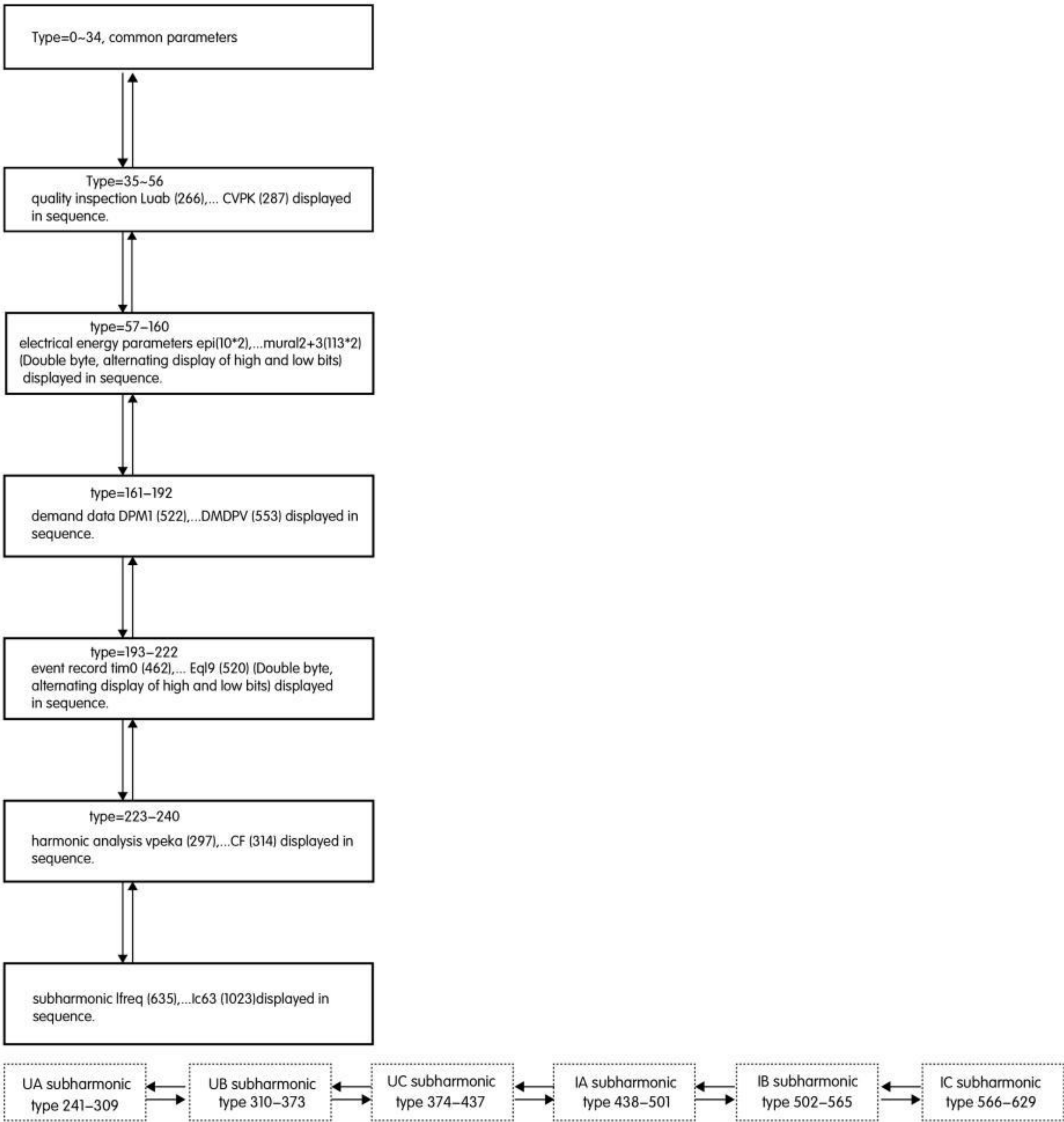
There are a total of 7 sets of parameters, and since the 7th set is divided into 6 groups, therefore, there are a total of 12 sets of parameters. Short press the up key type++, short press the down key type --, long press the up key group++, long press the down key group - -. There are two ways to express current and power parameters: measured values and standard values (refers to the description of LI parameters for details). When displaying current and power parameters, the normal display is the measured value. Short press the left button to get the standard value. Press the circle key again to return to the measurement value.

According to the settings of SRUN, parameters of different types and ranges can be measured and displayed.

Srun=2; type (0~60) can measure and display three-phase current, voltage, power, active energy, reactive energy, and four quadrant energy. Srun of version 743=2

Srun=5; type (0~222) can measure and display three-phase current, voltage, power, active energy, reactive energy, and four quadrant energy. It also has the functions of measuring and displaying time-sharing billing, multiple rate calculation, maximum demand recording, and 12-month electricity statistics. Srun of version 763=5

Srun=6; type (0~629) can measure and display three-phase current, voltage, power, active energy, reactive energy, and four quadrant energy. Not only does it have the functions of measuring and


Type=0~34, common parameters
Type=35~56
quality inspection Luab (266),... CVPK (287) displayed in sequence.
type=57–160
electrical energy parameters epi(10*2),...mural2+3(113*2) (Double byte, alternating display of high and low bits) displayed in sequence.
type=161–192
demand data DPM1 (522),...DMDPV (553) displayed in sequence.
type=193–222
event record tim0 (462),... Eql9 (520) (Double byte, alternating display of high and low bits) displayed in sequence.
type=223–240
harmonic analysis vpeka (297),...CF (314) displayed in sequence.
subharmonic Ifreq (635),...Ic63 (1023)displayed in sequence.
UA subharmonic type 241–309
UB subharmonic type 310–373
UC subharmonic type 374–437
IA subharmonic type 438–501
IB subharmonic type 502–565
IC subharmonic type 566–629

5.3 Main Interface(Common parameters)

Type=0; Ia, Ib, Ic, izer will be displayed repeatedly. Long press ◁ for 2 seconds to enter the time editing status, press ▽ or △ to edit values, and short press ⟲ to confirm, switch, and display year, month, day, hour, etc. in sequence. After completing all edits, exit the time editing status.

Type=1, Ua, Ub, Uc, f displayed repeatedly.

Type 2, Pa, Pb, Pc, Ps, Qa, Qb, Qc, Qs displayed repeatedly.

Type=3, Sa, Sb, Sc, Ss, PFa, PFb, PFc, PFs displayed repeatedly.

type=4, epi,eql,epe,eqc displayed repeatedly.

type=5~34, ia (228), ua, ib, ub, ic, uc, Izer, f, Pa, Pb, Pc, Ps, Qa, Qb, Qc,... mv (257) displayed in sequence

type=34, mv (257) displayed. Long press ◁ for 2 seconds to enter the status of editing transmission parameter, press ▽ or △ to edit the values, short press ⟲ to confirm, switch and display ctrl (pop, sop, dev), inp (ua, ub, uc, Ia, Ib, ic, f, Izer, pa, pb, pc, ps, qa, qb, qc, qs, PFa, PFb, PFc, PFs, Sa, Sb, Sc, Ss), pv, sv, step, etc. in sequence. After completing all edits, exit the status of editing transmission parameter.

5.4 Quality Testing

type=35~56, Iuab(266),Iubc..Iuac,aangvi,bangvi,cangvi,vuf,uuu0,iuf,...cvpk(287) displayed in sequence.

5.5 Electric Energy Parameters

type=57-160, PI(10*2),QL,PE,QC,E0,E1,E2,E3,1PI,1QL,1PE,...mura12+3(113*2) (Double byte, alternating display of high and low bits)displayed in sequence.

The setting method of electricity in different time periods:

Measure the electricity consumption(up to a maximum of four rates) for each period of the day (which can be divided into ten periods) based on multiple rates (only counting one of epi, epe, eqc, eql).

Taking Time0 in the parameter table as an example:

Time0=20700 means that billing will be based on the 2nd level from 0:00 to 7:00, and the next time period will start from 7:00. (The default starting time for Time0 is 0:00)

Time1=10830 means that billing will be based on the 1st level from 7:00 to 8:30, and the next time period will start from 8:30.

Time2=01130 means that billing will be based on zero level from 8:30 to 11:30, and the next time period will start from 11:30.

Time3=11430 means that billing will be based on the 1st level from 11:30 am to 2:30 pm, and the next time period will start from 2:30 pm.

Time4=01730 means that billing will be based on zero level from 2:30 pm to 5:30 pm, and the next time period will start from 5:30 pm.

Time5=11900 means that billing will be based on the 1st level from 17:30 to 19:00, and the next time period will start from 19:00.

Time6=02100 means that billing will be based on zero level from 19:00 to 21:00, and the next time period will start from 21:00.

Time7=12300 means that billing will be based on the 1st level from 21:00 to 23:00, and the next time period will start from 23:00.

Time8=22400 means that billing will be based on the 2nd level from 23:00 to 24:00, 24:00 being the end time. If there are still time periods after that, the same value will be set.

Time9=22400

The above is the algorithm for time-based billing by the local power bureau in Fujian. 0-peak, 1-plane, 2-valley.

5.6 Demand Data

type=161~192, PM1(522),TM1,PM2,TM2,..DMDPV(553) displayed in sequence.

5.7 Event Recording

type=193~222, tim0(462),epi0,epl0, tim1,epi1,epl11,...eql9(520) (Double byte, alternating display of high and low bits) displayed in sequence.

Tim0, tim1.: At the time of the event, the letters ABCPIV will appear to display the corresponding status. ABC will respectively determine whether the three phases are working properly. If the letters are not displayed, it is normal, otherwise it is abnormal. P represents phase failure, I represents current loss, and V represents total voltage loss.

Epi0, Epl0... respectively represent the active and reactive energy at that moment.

5.8 Quality of Harmonic Wave

type=223~240, vpeka(297),vpekb,vpekc,aipk,bipk,cipk,tfffa,tfffb,....CF(314) displayed in sequence.

5.9 Sub-harmonic Contents

type=241~629, lfreq(635),..ic63(1023) displayed in sequence.

ua 241~310 Lfreq(635),findzero,ncycle,haranlength,Uash,hUa1,hUa2~63(703)

ub 310~373 Ubsh(704),hUb1,hUb2~63(767)

uc 374~437 Ucsh(768),hUc1,hUc2~63(831)

ia 438~501 Iash(832),hIa1,hIa2~63(895)

ib 502~565 Ibsh(896),hIb1,hIb2~63(959)

ic 566~629 Icsh(960),hIc1,hIc2~63(1023)

6.Parameters

(RS485 communication: standard Modbus protocol, commands 03H, 06H, 10H are available.)

MODBUS register numbers 40398-40462 are parameters that can be viewed or set in the parameter table.

The description of each parameter and the communication address of Modbus are explained as follows:

Parameter	Hexadecimal code	Decimal code	modbus	Description	Range	Readability and Writing
aije	8	8	40009	Model, Hundred digit, 6, (instrument A), 7 (instrument D7) Ten digit 4, able to measure three-phase current, voltage, power, active energy, reactive energy, four quadrant energy, RS485 serial communication Ten digit 6, solidified rechargeable battery based on 4, with functions such as time-sharing billing, multiple rate calculation, maximum demand recording, and 12-month energy statistics Ten digit 8, adding harmonic analysis function on the basis of 6 Single digit 0, instrument A has built-in 5A/2.5mA current transformers, instrument D7 can directly be connected to 30A/15mA current transformers; After connected to a high current transformer with CT=>20 in series, the rated current on its secondary side is 5 amperes, and the parameter LI=5.00 is set Single digit 1, power equipment with a rated current (full range) of 6~49A can be directly connected to a current transformer with a current of 30A/15mA. Set parameter LI=rated current of the instrument=6.00~49.00, CT=1. Single digit 2, power equipment with a rated current (full range) of 50A~99A can be directly connected to a current transformer with a rated current of 50A/10mA. Set parameter LI=rated current of the instrument=50.00~99.00, CT=1.		R16
LI	9	9	40010	Refer to the following description about Li		
timm2	A	10	40011	Real time, needs to be converted (Year*0x100000+Month*0x10000+	0~9999999	R 32
	B	11	40012	Day*0x800+Hour*0x40+Minute)		
UD	C	12	40013	Usage time, used to define the start time of billing, which only affects the automatic billing for the corresponding month and the previous month, and does not affect the recorded total electricity,	0~9999999	R 32
	D	13	40014	After setting LOC=9006, press briefly to reset the start time of use. When pno<2, this parameter can be		

				edited on the host, but communication cannot set this parameter.		
MD	E	14	40015	Factory time.	0~9999999	R 32
	F	15	40016			
dema2	10	16	40017	Instrument-reading time	0~9999999	R 32
	11	17	40018			
Line	12	18	40019	Refer to the following description about Line		
CT	13	19	40020	Refer to the following description about CT		
PI	14	20	40021	Absorb active electrical energy, corresponding to the PI value below the current monthly total value	0~9999999	R 32
	15	21	40022			
QL	16	22	40023	Inductive reactive power, corresponding to the QL value below the current monthly total value	0~9999999	R 32
	17	23	40024			
PE	18	24	40025	Release active electrical energy, corresponding to the PE value below the current monthly total value	0~9999999	R 32
	19	25	40026			
QC	1A	26	40027	Capacitive reactive power, corresponding to the QC value below the current monthly total value	0~9999999	R 32
	1B	27	40028			
E0	1C	28	40029	Real time compound rate for 0-level electricity, corresponding to E0 value below the current monthly total value	0~9999999	R 32
	1D	29	40030			
E1	1E	30	40031	Real time compound rate 1-level electricity, corresponding to E1 value below the current monthly total value	0~9999999	R 32
	1F	31	40032			
E2	20	32	40033	Real time compound rate 2-level electricity, corresponding to E2 value below the current monthly total value	0~9999999	R 32
	21	33	40034			
E3	22	34	40035	Real time compound rate 3-level electricity, corresponding to E3 value below the current monthly total value	0~9999999	R 32
	23	35	40036			
1PI	24	36	40037	In January, active energy is absorbed and the four quadrant energy values are read from the start-up to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the four quadrant energy interface.	0~9999999	R 32
	25	37	40038			
1QL	26	38	40039	Inductive reactive power in January, and the four quadrants energy values are read from startup to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the four quadrant energy interface.	0~9999999	R 32
	27	39	40040			
1PE	28	40	40041	In January, active energy is released and the four quadrant energy values are read from the start-up to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the four quadrant energy interface.	0~9999999	R 32
	29	41	40042			
1QC	2A	42	40043	Capacitive reactive power in January, and the four quadrants energy values are read from startup to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the four quadrant energy interface.	0~9999999	R 32
	2B	43	40044			
2PI - 12QC	2C-83	44-131	40045-40132	Four quadrant electricity from February to December.	0~9999999	R 32
1 E0	84	132	40133	0-level electricity in January; the segmented energy values are read from startup to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the energy interface.	0~9999999	R 32
	85	133	40134			
1 E1	86	134	40135	1-level electricity in January; the segmented energy values are read from startup to the corresponding monthly settlement date. Except for the current month,	0~9999999	R 32
	87	135	40136			

				other months correspond to the Total column on the energy interface.		
1 E2	88	136	40137	2-level electricity in January; the segmented energy values are read from startup to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the energy interface.	0~9999999	R 32
	89	137	40138			
1 E3	8A	138	40139	3-level electricity in January; the segmented energy values are read from startup to the corresponding monthly settlement date. Except for the current month, other months correspond to the Total column on the energy interface.	0~9999999	R 32
	8B	139	40140			
2E0 - 12E3	8C-E3	140-227	40141-40228	Multi rate electricity from February to December.	0~9999999	R 32
Ia	E4	228	40229	A-phase current		R 16
Ua	E5	229	40230	A-phase voltage		R 16
Ib	E6	230	40231	B-phase current		R 16
Ub	E7	231	40232	B-phase voltage		R 16
Ic	E8	232	40233	C-phase current		R 16
Uc	E9	233	40234	C-phase voltage		R 16
Izer	EA	234	40235	Zero line current		R 16
f	EB	235	40236	Power frequency		R 16
Pa	EC	236	40237	A-phase active power		R 16
Pb	ED	237	40238	B-phase active power		R 16
Pc	EE	238	40239	C-phase active power		R 16
Ps	EF	239	40240	Total active power		R 16
Qa	F0	240	40241	A-phase reactive power		R 16
Qb	F1	241	40242	B-phase reactive power		R 16
Qc	F2	242	40243	C-phase reactive power		R 16
Qs	F3	243	40244	Total reactive power		R 16
Sa	F4	244	40245	A-phase apparent power		R 16
Sb	F5	245	40246	B-phase apparent power		R 16
Sc	F6	246	40247	C-phase apparent power		R 16
Ss	F7	247	40248	Total apparent power		R 16
aangl	F8	248	40249	AB voltage phase angle ANGL_VA_VB		R 16
bangl	F9	249	40250	BC voltage phase angle ANGL_VB_VC		R 16
cangl	FA	250	40251	AC voltage phase angle ANGL_VA_VC		R 16
PFa	FB	251	40252	A-phase power factor		R 16
PFb	FC	252	40253	B-phase power factor		R 16
PFc	FD	253	40254	C-phase power factor		R 16
PFs	FE	254	40255	Total power factor		R 16
nouse	FF	255	40256	Maximum demand time		R 16
pvx	100	256	40257	Transmitting data		R 16
mv	101	257	40258	Percentage of transmission output		R 16
opcl	103	259	49260	Switch variable BIT1 (0, three-phase four wire; 1. Three phase three wire) BIT3 (RUN, running) BIT12 (sum, total alarm) BIT13 (C-phase alarm) BIT14 (B-phase alarm) BIT15 (A-phase alarm)		R 16
U32SE Cz	106	262	40263	Clock calibration		W 32

PHNOLOAD	108	264	40265	Phase no-load register, indicating whether each phase's electrical energy is in no-load status		R 32
luab	10A	266	40267	line voltage Uab		R16
lubc	10B	267	40268	line voltage Ubc		R16
luac	10C	268	40269	line voltage Uac		R16
aangvi	10D	269	40270	Phase angle between VA and IA		R16
bangvi	10E	270	40271	Phase angle between VB and IB		R16
cangvi	10F	271	40272	Phase angle between VC and IC		R16
vuf	110	272	40273	Voltage imbalance (vnc/vpc)		R16
uuu0	111	273	40274	(v3u0/vpc)		R16
iuf	112	274	40275	Current imbalance (cnc/cpc)		R16
iii0	113	275	40276	(c3i0/cpc)		R16
vpc	114	276	40277	Positive sequence voltage		R16
vnc	115	277	40278	Negative sequence voltage		R16
v3u0	116	278	40279	Zero sequence voltage		R16
cpc	117	279	40280	Positive sequence current		R16
cnc	118	280	40281	Negative sequence current		R16
c3i0	119	281	40282	Zero sequence current		R16
afvr	11A	282	40283	A-phase fundamental reactive power		R16
bfvr	11B	283	40284	B-phase fundamental reactive power		R16
cfvr	11C	284	40285	C-phase fundamental reactive power		R16
avpk	11D	285	40286	Total A-phase voltage peak factor		R16
bvpk	11E	286	40287	Total B-phase voltage peak factor		R16
cvpk	11F	287	40288	Total C-phase voltage peak factor		R16
abciv	123	291	40292	Testing position IA		R16
abciv1	124	292	40293	Testing position UA		R16
abciv2	125	293	40294	Testing position IB		R16
abciv3	126	294	40295	Testing position UB		R16
abciv4	127	295	40296	Testing position IC		R16
abciv5	128	296	40297	Testing position UC		R16
vpeka	129	297	40298	A-phase voltage peak factor VCFA		R16
vpekb	12A	298	40299	B-phase voltage peak factor VCFB		R16
vpekc	12B	299	40300	C-phase voltage peak factor VCFC		R16
aipk	12C	300	40301	A-phase current peak factor ICFA		R16
bipk	12D	301	40302	B-phase current peak factor ICFB		R16
cipk	12E	302	40303	C-phase current peak factoR ICFC		R16
tfffa	12F	303	40304	Telephone waveform factor A THF(%) TFA		R16
tfffb	130	304	40305	Telephone waveform factor B THF(%) TFB		R16
tfffc	131	305	40306	Telephone waveform factor C THF(%) TFC		R16
kfactora	132	306	40307	K factor of A-phase current KICA		R16
kfactorb	133	307	40308	K factor of B-phase current KICB		R16
kfactorc	134	308	40309	K factor of C-phase current KICC		R16
thda	135	309	40310	UA Total harmonic content UHDA		R16
thdb	136	310	40311	UB Total harmonic content UHDB		R16
thdc	137	311	40312	UC Total harmonic content UHDC		R16
ithda	138	312	40313	IA Total harmonic content IHDA		R16

ithdb	139	313	40314	IB Total harmonic content IHDB		R16
ithdc	13A	314	40315	IC Total harmonic content IHDC		R16
paf	17C	394	40395	Mark the electricity statistics in 12 months, and the values can be automatically generated BIT0~BIT11 correspond to the electricity statistics from January to December		R 16
step	18C	396	40397	Fine tuning of transmission gain		
loc	18D	397	40398	Parameter lock, set Loc=passd and press to enter the display and edit the full parameter table. Before writing other values for communication, Loc=passd needs to be written first. The default password is 9008.		R/W 16
aop	17C	398	40399	The hundred digit AOP3 of AOP represents the alarm status, and the ten digit AOP2 represents the hysteresis: 0~10%, 1~2%, 2~4%, 3~6%, 4~8%, 5~10%, 6~12%, 7~14%, 8~16%, 9~18%. The single digit aop1 represents the integer delay of 0~5s, 1~1s, and 9~9s Alarm status aop3 (0~3) aop3=0: No alarm aop3=1: If the A-phase current exceeds 10% of the nominal current, ALM-A will act. If the B-phase current exceeds 10% of the nominal current, ALM-B will act. If the C-phase current exceeds 10% of the nominal current, ALM-C will act. Each phase of the three-phase voltage is below 80V, and ALM-S acts. aop3=2: Capa (ALM-A) corresponds to the upper limit alarm of Ia, capb (ALM-B) corresponds to the upper limit alarm of Ib, and capc (ALM-C) corresponds to the upper limit alarm of Ic; When the full voltage is lower than caps, ALM-S outputs. (Comparing the value of capx [x=a, b, c, s] * 10 with the value of the register, Capa=400, Ia>4000=4.000A Ia upper limit alarm). aop3=3: various complex alarms turn on based on the values of capa,capb,capc,caps. When aop3=3, Capx=X*1000+Y*10000+Z X=0, Event alarm; 1, PV; 2, Maximum three-phase voltage; 3, I; 4, Ib; 5, Ic; 6, Ps; 7, Qs; 8, Ss; (PV alarm can only be set at Caps output) Y=0, Upper limit alarm; 1, Lower limit alarm When X=0, Z represents the event that needs to be output Z=A&1+B&2+C&4+V&8+I&16+P&32 ABC=1 corresponds to the output when the three phases are abnormal, V=1 represents the output when the voltage is completely lost, I=1 represents the output when the current is lost, and P=1 represents the output when the phase is disconnected, When X>0, Z * 10 represents the output value of the corresponding alarm. If Capa=3550 is set, it indicates the output of ALM-A when Ia>5.5A. Regardless of the value of AOP, Capx>=30000 (x=a, b, c, s) indicates that ALM-A, ALM-B, ALM-C, and ALM-S are forcibly output.	0~399	R/W 16
Capa	17C	399	40400			R/W 16
Capb	190	400	40401			R/W 16
Capc	191	401	40402			R/W 16
Caps	192	402	40403			R/W 16
ctrl	17C	403	40404	Transmission method; 0 deviation, dev=PV-SV, Deviation value is used as the transmission output; 1, PoP, PV=transmission output, which can make the instrument a transmitter; 2, SOP, SV=transmit output, which can be used as a program generator.		R/W 16

srun	194	404	40405	According to the settings of SRUN, parameters of different types and ranges can be measured and displayed. Srun=2; type(0~60) Srun=5; type(0~222) Srun=6; type(0~629)	2~7	R/W 16
day	195	405	40406	Monthly billing date		R/W 16
PT	196	406	40407	Voltage conversion ratio; The input voltage should not exceed 120% of the rated input voltage (400V), otherwise a voltage transformer should be considered.	1~9999	R/W 16
SETT	197	407	40408	0: Default status, Pi displays electrical energy; 1: The current gain is 8 to facilitate the display of small currents; 2: Pi displays the number of pulses. When PNO>0, it can only be in the default status.		R/W 16
SV	198	408	40409	SV		R W 16
LI	199	409	40410	Full range current (* 100). Full scale 5A=5.00, 50A=50.00, 80A=80.00; There are three working modes: 1. For power equipment with a rated current (full range) of 5A~49A, a small current transformer of 30A/15mA needs to be connected externally to the instrument, LI=5.00~49.00。CT=1 2. For power equipment with a rated current (full range) of 50A~100A, a small current transformer of 50A/10mA should be connected externally to the instrument, LI=50.00~100.00。CT=1 3. For power equipment with a rated current (full range) higher than 100A, a small current transformer of 30A/15mA with LI=5.00 should be connected externally to the instrument. A high current transformer with CT=20 or CT>20 should also be connected in series. Assuming that the current power and electrical energy measured by the chip inside the instrument are K (current, power, electrical energy), users can obtain two types of data: the measured value and the standard value with 5A as the full range current. The standard value is used for alarm, transmission, and maximum demand calculation. Measurement value K=K (current, power, energy) * CT; Standard value K=K (current, power) * 5.00/LI; Measurement value (current, power) K=(CT * LI/5.00) * K standard value (current, power) Measurement value (electric energy) K=K Measurement (electric energy) * CT; The registers for current and power are standard values, multiplied by CT * LI/5.00 to obtain the measurement value. The energy register is a measurement value, multiplied CT to obtain the measurement value.	500~9500	R W 16
type	19A	410	40411	Main interface (0~34); Quality inspection (35-56); Electric energy parameters (57-160); Demand data (161~192); Event records (211~240); Harmonic analysis (223~240); Sub harmonic (241~629)	0~629	R/W 16
inp	19B	411	40412	Specification of Single Measurement (PV) 0-UA 1-UB 2-UC 50~500V 3-IA 4-IB 5-IC 6-F frequency 7-Iz Zero line current 8-PA 9-PB 10-PC 11-PS total 12-QA 13-QB 14-QC 15-QS 16-FA 17-FB 18-FC 19-FS Power factor		R/W 16

				20-SA 21-SB 22-SC 23-Ss apparent power		
filt	19C	412	40413	Input digital filtering, the larger FILt is set, the stronger the filtering, but the slower the response speed of the measured data.		R/W 16
mrate	19D	413	40414	Types of multi rate energy calculation: 0-EPI 1-EPE 2-EQL 3-EQC		R/W 16
dema	19E	414	40415	Maximum demand; Demad=0 represents the time period without maximum demand, Demad=n (n=1~12) represents the time period with maximum demand (n * 5=5~60min), usually set n=3. The time period is 15 minutes		R/W 16
addr	19F	415	40416	485 communication address; Instruments on the same communication line should be set with different Addr values to distinguish them from each other.	0~99	R/W 16
baud	1A0	416	40417	Baud, 0~38400, 1~19200, 2~9600；		R/W 16
scren	1A1	417	40418	Screen sleep control; Scren=A * 1000+B, A is the power-off holding time for 5s; B is the automatic sleep time for 20 seconds. Setting 0 means this function is not enabled. Instrument D71 does not have this function.	0~30999	R/W 16
passd	1A2	418	40419	The password passd can be set (256~9004), with a default value of 9008.		R/W 16
pno	1A3	419	40420	PNO=0 allows modification of real-time time and usage time, PNO<2 allows modification of usage time, PNO>=2 does not allow modification of any time.		R/W 16
time0	1A4	420	40421	Multiple rate electricity can be divided into up to ten time periods per day, with four different rates used to complete the time-sharing calculation of electricity.		R/W 16
time1	1A5	421	40422	Among them, the tens of thousands represents the rate (3-svalley, 2-plane, 1-peak, 0-sharp), the thousands and hundreds represent the hour (0~24), and the tens and units represent the minute (0~59). The first to eighth paragraphs below a thousand digits must be increasing. Time0=0 means no multiple rate.		R/W 16
time2	1A6	422	40423			R/W 16
time3	1A7	423	40424			R/W 16
time4	1A8	424	40425			R/W 16
time5	1A9	425	40426			R/W 16
time6	1AA	426	40427			R/W 16
time7	1AB	427	40428			R/W 16
time8	1AC	428	40429			R/W 16
time9	1AD	429	40430			R/W 16
ysr	1AE	430	40431	Communication mode; 0~485 communication, 1~485 to WiFi, 2~485 to 4G		R/W 16
line	1AF	431	40432	3P4L three-phase four wire; 3P3L three-phase three wire; 3P4Lm three-phase four-wire milliampere-level current; 3P3Lm three-phase three-wire milliampere-level current; The decimal code 18 is a read-only parameter for line		R/W 16
CT	1B0	432	40433	Transformation ratio, decimal code 19 is a read-only parameter for CT	1~1800	R/W 16
dmd	1B1	433	40434	Maximum demand Ia		R 16
timh	1B2	434	40435	Months and days corresponding to the maximum demand of Ia		R 16
timl	1B3	435	40436	Hours and minutes corresponding to the maximum demand of Ia		R 16
dmd1	1B4	436	40437	Maximum demand Ib		R 16

timh1	1B5	437	40438	Months and days corresponding to the maximum demand of Ib		R 16
timl1	1B6	438	40439	Hours and minutes corresponding to the maximum demand of Ib		R 16
dmd2	1B7	439	40440	Maximum demand Ic		R 16
timh2	1B8	440	40441	Months and days corresponding to the maximum demand of Ib		R 16
timl2	1B9	441	40442	Hours and minutes corresponding to the maximum demand of Iv		R 16
dmd3	1BA	442	40443	Maximum demand for total active power of P		R 16
timh3	1BB	443	40444	Months and days corresponding to the maximum demand for total active power of P		R 16
timl3	1BC	444	40445	Hours and minutes corresponding to the maximum demand for total active power of P		R 16
dmd4	1BD	445	40446	The maximum demand for total reactive power of q		R 16
timh4	1BE	446	40447	Months and days corresponding to the maximum demand for total reactive power of q		R 16
timl4	1BF	447	40448	Hours and minutes corresponding to the maximum demand for total reactive power of q		R 16
dmd5	1C0	448	40449	Maximum demand for total apparent power of s		R 16
timh5	1C1	449	40450	Months and days corresponding to the maximum demand for total apparent power of s		R 16
timl5	1C2	450	40451	Hours and minutes corresponding to the maximum demand for total apparent power of s		R 16
dmd6	1C3	451	40452	Maximum demand of PV		R 16
timh6	1C4	452	40453	Months and days corresponding to the maximum demand of PV		R 16
timl6	1C5	453	40454	Hours and minutes corresponding to the maximum demand of PV		R 16
nowt	1C6	454	40455	The cunrrent month		R 16
scl	1C7	455	40456	Lower limit of transmission range; Parameters can only be modified when pno<2	-3000~9999	R/W 16
sch	1C8	456	40457	Upper limit of transmission range; Parameters can only be modified when pno<2	-3000~9999	R/W 16
lli	1C9	457	40458	Basic current; The default is 5% of the rated current, while the starting current is 10% of the basic current. The parameters can only be modified when pno<2	5~100	R/W 16
hhv	1CA	458	40459	Voltage triggering upper limit for voltage loss event, default is 78% Un; Parameters can only be modified when pno<2	800~1800	R/W 16
llv	1CB	459	40460	Voltage recovery lower limit for voltage loss events; Default is 85% Un; Parameters can only be modified when pno<2	900~2000	R/W 16
lhv	1CC	460	40461	Voltage triggering upper limit for phase failure event, default is 60% Un; Parameters can only be modified when pno<2	700~1500	R/W 16
lhno	1CD	461	40462	The event flag represents the sequence of recorded events.		R 16
tim0	1CE	462	40463	At the time of the event, there will be letters ABCPIV indicating the corresponding status, ABC correspond to determine whether the three phases are working properly, with green (empty letters) indicating normal and red (with letters) indicating abnormal. P is red for phase failure, I is red for current loss, and V is red for total voltage loss.		R 32
epi0	1D0	464	40465	Active electrical energy at the corresponding time		R 32
eql0	1D2	466	40467	Reactive energy at the corresponding time		R 32
tim1	1D4	468	40469	event time		R 32

epi1	1D6	470	40471	Active electrical energy at the corresponding time		R 32
eql1	1D8	472	40473	Reactive energy at the corresponding time		R 32
tim2	1DA	474	40475	event time		R 32
epi2	1DC	476	40477	Active electrical energy at the corresponding time		R 32
eql2	1DE	478	40479	Reactive energy at the corresponding time		R 32
tim3	1E0	480	40481	event time		R 32
epi3	1E2	482	40483	Active electrical energy at the corresponding time		R 32
eql3	1E4	484	40485	Reactive energy at the corresponding time		R 32
tim4	1E6	486	40487	event time		R 32
epi4	1E8	488	40489	Active electrical energy at the corresponding time		R 32
eql4	1EA	490	40491	Reactive energy at the corresponding time		R 32
tim5	1EC	492	40493	event time		R 32
epi5	1EE	494	40495	Active electrical energy at the corresponding time		R 32
eql5	1F0	496	40497	Reactive energy at the corresponding time		R 32
tim6	1F2	498	40499	event time		R 32
epi6	1F4	500	40501	Active electrical energy at the corresponding time		R 32
eql6	1F6	502	40503	Reactive energy at the corresponding time		R 32
tim7	1F8	504	40505	event time		R 32
epi7	1FA	506	40507	Active electrical energy at the corresponding time		R 32
eql7	1FC	508	40509	Reactive energy at the corresponding time		R 32
tim8	1FE	510	40511	event time		R 32
epi8	200	512	40513	Active electrical energy at the corresponding time		R 32
eql8	202	514	40515	Reactive energy at the corresponding time		R 32
tim9	204	516	40517	event time		R 32
epi9	206	518	40519	Active electrical energy at the corresponding time		R 32
eql9	208	520	40521	Reactive energy at the corresponding time		R 32
PM1	20A	522	40523	Maximum demand in January (maximum demand recorded in the month before the settlement date)		R 16
TM1	20B	523	40524	The moment when the maximum demand is generated		R 16
PM2	20C	524	40525	Maximum demand in February(maximum demand recorded in the month before the settlement date)		R 16
TM2	20D	525	40526	The moment when the maximum demand is generated		R 16
PM3	20E	526	40527	Maximum demand in March(maximum demand recorded in the month before the settlement date)		R 16
TM3	20F	527	40528	The moment when the maximum demand is generated		R 16
PM4	210	528	40529	Maximum demand in April(maximum demand recorded in the month before the settlement date)		R 16
TM4	211	529	40530	The moment when the maximum demand is generated		R 16
PM5	212	530	40531	Maximum demand in May(maximum demand recorded in the month before the settlement date)		R 16
TM5	213	531	40532	The moment when the maximum demand is generated		R 16
PM6	214	532	40533	Maximum demand in June(maximum demand recorded in the month before the settlement date)		R 16
TM6	215	533	40534	The moment when the maximum demand is generated		R 16
PM7	216	534	40535	Maximum demand in July(maximum demand recorded in the month before the settlement date)		R 16
TM7	217	535	40536	The moment when the maximum demand is generated		R 16
PM8	218	536	40537	Maximum demand in August(maximum demand recorded in the month before the settlement date)		R 16
TM8	219	537	40538	The moment when the maximum demand is generated		R 16

PM9	21A	538	40539	Maximum demand in Septembery(maximum demand recorded in the month before the settlement date)		R 16
TM9	21B	539	40540	The moment when the maximum demand is generated		R 16
PM10	21C	540	40541	Maximum demand in October(maximum demand recorded in the month before the settlement date)		R 16
TM10	21D	541	40542	The moment when the maximum demand is generated		R 16
PM11	21E	542	40543	Maximum demand in November(maximum demand recorded in the month before the settlement date)		R 16
TM11	21F	543	40544	The moment when the maximum demand is generated		R 16
PM12	220	544	40545	Maximum demand in December(maximum demand recorded in the month before the settlement date)		R 16
TM12	221	545	40546	The moment when the maximum demand is generated		R 16
demand 1	222	546	40547	Seek the time for the maximum demand		R 16
DMDAI	223	547	40548	A-phase current demand		R 16
DMDBI	224	548	40549	B-phase current demand		R 16
DMDCI	225	549	40550	C-phase current demand		R 16
DMDP	226	550	40551	Average demand for three-phase active power		R 16
DMDQ	227	551	40552	Average demand for three-phase reactive power		R 16
DMDS	228	552	40553	Average demand for three-phase apprent power		R 16
DMDPV	229	553	40554	Average demand for PV		R 16
		560-609				R/W 16
hsrun	276	630	40631	Run harmonic analysis (set hsrun=7, after running harmonic measurement once, hsrun automatically returns to zero)		R/W 16
hfreq	277	631	40632	Fundamental frequency		R 16
htime3	278	632	40633	Harmonic analysis time		R 32
Lfreq	27B	635	40636	Manual synchronization, for 50 cycles of actual mains power, the process values 287 or 288 depend on the frequency.		R 16
findzero	27C	636	40637	The distance between the zero crossing point and the first crossing point of phase-A voltage		R 16
ncycle	27D	637	40638	Repeated collection interval, default interval is 200 times to collect harmonic data once		R 16
lastreg	27E	638	40639	The position of the last register for high-speed sampling storage is fixed at 8192		R 16
haranlength	27F	639	40640	The last register of the sampled data is fixed at 4095.		R 16
Uash	280	640	40641	Total harmonic content Ua		R 16
hUa1	281	641	40642	standby		R 16
hUa2-63	282-2BF	642-703	40643-40704	Sub-harmonic content Ua		R 16
Ubsh	2C0	704	40705	Total harmonic content Ub		R 16
hUb1	2C1	705	40706	standby		R 16
hUb2-63	2C2-2FF	706-767	40707-40768	Sub-harmonic content Ub		R 16
Ucsh	300	768	40769	Total harmonic content Uc		R 16
hUc1	301	769	40770	standby		R 16
hUc2-63	302-33F	770-703	40707-40832	Sub-harmonic content Uc		R 16
Iash	340	832	40833	Total harmonic content Ia		R 16
hIa1	341	833	40834	standby		R 16

hIa2-63	342-37F	834-895	40835-40896	Sub-harmonic content Ia		R 16
Ibsh	380	896	40897	Total harmonic content Ib		R 16
hIb1	381	897	40898	standby		R 16
hIb2-63	382-3BF	898-959	40899-40960	Sub-harmonic content Ib		R 16
Icsh	3C0	960	40961	Total harmonic content Ic		R 16
hIc1	3C1	961	40962	Fundamental wave content Ic		R 16
hIc2-63	3C2-3FF	962-1023	40963-41024	Sub-harmonic content Ic		R 16

Parameter	Actual value	**Modbus** LI=5.0	**Modbus** LI=10.00	Communication processing
Voltage(U)	220.0V	2200	2200	Register data/10
Current (I)	5.000A	5000	2500	Register data*CT*LI/500000
Active power (P)	1.100KW	1100	550	Register data*CT*LI/500000
Total active power (Ps)	3.300KW	3300	1650	Register data*CT*LI/500000
Power factor (PF)	1	1000	1000	Register data/1000
Active electrical energy (Pi)	9.50KWh	950	950	Register data*CT/100

For other power processing, refer to Pi, and for other power processing, refer to P.

The maximum demand data refers to the register data.

Epi0-9 and eql0-9 refers to register data.

The transmission value PV is displayed as the corresponding value when CT=1.

After the energy register value accumulates to 10000000, start counting again from 0.

Appendix: glossary

Phase voltage: The voltage between a three-phase transmission line (live wire) and a neutral wire is called phase voltage. For example, the voltage in the three-phase four-wire system of daily power consumption is 380/220V, which means the line voltage is 380V and the phase voltage is 220V.

Line Voltage: The voltage between the live wires of a three-phase transmission line is called line voltage, which is 1.73 times the phase voltage.

Potential transformer(PT)/Voltage transformer(VT): It is very similar to a transformer, both used to transform the voltage on the line. However, the reason why transformers convert voltage is to transmit electrical energy, so their capacity is large, usually measured in kilovolt amperes or megavolt amperes; The reason why voltage transformers convert voltage is to supply power to measuring instruments and relay protection devices, as well as to measure the voltage, power, and electrical energy of the line, or to protect valuable equipment, motors, and transformers in the line in case of faults. Therefore, the capacity of voltage transformers is very small, generally only a few volt amperes, tens of volt amperes, and the maximum does not exceed one thousand volt amperes. A voltage transformer is a transformer with an iron core. It is mainly composed of primary or secondary coils, iron cores, and insulation. When a voltage U1 is applied to a primary winding, a magnetic flux φ is generated in the iron core. According to the law of electromagnetic induction, a secondary voltage U2 is generated in the secondary winding. Changing the number of turns in the primary or secondary winding can generate different ratios of primary voltage to secondary voltage, which can form voltage transformers with different ratios (1~1000000). The voltage transformer proportionally converts high voltage into low voltage, i.e. 100V. The primary side of the voltage transformer is connected to the primary system, and the secondary side is connected to the measuring instrument.

Current transformer(CT): The function of a current transformer is to convert the large current passing through the transformer into a small current for instrument detection. The operation of current transformers is based on the principle of electromagnetic induction. It consists of a closed iron core and winding. Its primary winding has very few turns and is connected in series in the line where the current needs to be measured, so it often has all the current flowing through the line; The secondary winding has a relatively large number of turns and is connected in series between the measuring instrument and the protection circuit. During operation, the secondary circuit of the current transformer is always closed, so the impedance of the coil connected in series between the measuring instrument and the protection circuit is very small, which makes the working status of the current transformer close to a short circuit. A current transformer is used to convert the large current on the primary side into a small current on the secondary side, and the secondary side must not be open circuited. There are two main types of current transformers; One type is current transformers for power system detection instruments and control circuits, with a secondary side of 5 amperes or 1 ampere, etc. The other type is current transformers (5A/2.5mA) with small current used for electronic detection and control. The commonly used specifications of current transformers in power systems include: 10000/5, 5000/5, 3000/5, 2000/5, 1500/5, 1000/5, 800/5, 750/5, 600/5, 500/5, 400/5, 350/5, 300/5, 250/5, 200/5, 150/5, 100/5, 75/5, 50/5, 30/5, 20/5, etc. The above-mentioned transformers convert high current into low current, which we call

CT. There is now a new type of current transformer, where the secondary current is in the milliampere range (e.g. 50A/10mA). A standard resistor is connected in series at both ends of the secondary output side. When the primary side outputs at full range, the voltage at the two terminals of the secondary side is in the mv level. There are two benefits to doing this: Firstly, the secondary circuit is always closed, which greatly improves the safety of the current transformer; The second is to directly connect the voltage signal to the instrument, which eliminates the need for a current transformer (5A/2.5mA) inside the instrument to convert current into MV signal, thus simplifying the circuit and reducing costs.

Active power: The instantaneous power of alternating current is not constant, and the average value of power within one cycle is called active power. It refers to the power consumed by the resistance part in the circuit, and for the electric motor, it refers to its output, represented by the letter P, in kilowatts (kW).

Reactive power: In a circuit with an inductor (or capacitor), the inductor (or capacitor) converts the energy of the power source into the energy of a magnetic field (or electric field) for storage during half a cycle, and returns the stored magnetic field (or electric field) energy to the power source during the other half of the cycle. They only exchange energy with the power source and do not actually consume energy. The amplitude value of energy exchanged with the power source is called reactive power, represented by the letter Q and measured in kilovar(kvar).

Apparent power: In a circuit with resistance and reactance, the product of voltage and current is called apparent power, represented by the letter S or symbol Ps, and measured in kilovolt amperes (kVA).

Note: The relationship between active power, reactive power, and apparent power can be represented by a power triangle S2=P2 + Q2, P=SCOSφ, Q= SSINφ

Maximum demand: refers to the average power, average current, etc. of electricity consumed by customers during a certain period of time (currently for 15 minutes in China) within a certain settlement period (usually one month). The maximum indication value is the maximum demand for this settlement period.

Loss of voltage: In a three-phase (or single-phase) power supply system, when the load current of a certain phase is greater than the starting current, but the voltage of the voltage line is lower than 78% of the reference voltage of the energy instrument, and the duration is greater than 60 seconds, this is called loss of voltage.

1. In practical use, the voltage loss function of the three-phase multifunctional electric energy meter can fully meet the requirements of DL/T 566. Using this function makes it easier to analyze voltage loss conditions, so there is no need to install independent equipment such as a voltage loss instrument in the electric energy metering device.

2. The default parameters are as follows:

Voltage triggering upper limit for voltage loss event, 78% Un;

Voltage recovery lower limit for voltage loss event, 85% Un;

Current triggering lower limit of the voltage loss event corresponds to the "starting current" here: 0.5% Ib;
Delay time for determining pressure loss event, 60 seconds.

No-voltage: If the three-phase voltage (single-phase voltage for single-phase instruments) is lower than the critical voltage of the energy instrument, and the load current is greater than 5% of the rated (basic) current, it is called total voltage loss.

1. This definition provides the range of determination for total depressurization and its difference from depressurization. The term 'load current greater than 5% of rated (basic) current' refers to the situation where at least one phase current is greater than 5% of rated (basic) current, which can be considered as a total voltage loss; The average value of three-phase current is recorded during a no-voltage event.
2. When the load current is greater than 5% of the rated (basic) current, if the three-phase voltage of the instrument is lower than the critical voltage, regardless of whether the instrument can work, it will be recorded as a total voltage loss; If the electricity instrument can still work at this time and the voltage continues to decrease until the instrument cannot work, it will not be recorded as the end of no voltage. It will be recorded as the end of no voltage when the voltage returns to normal operation of the electricity instrument.
3. After the electricity instrument stops working, check the current once by using the power-off reading battery. If the load current is detected to be greater than 5% of the rated (basic) current, it is recorded as no voltage; Afterwards, the battery will no longer be used to detect the current until the instrument can work with voltage applied, and then it will be judged as the end of no voltage. Considering the lifespan of the battery, detecting the current with the battery is only done once after the instrumentr stops working.

Loss of phase: this refers to the situation where in a three-phase power supply system, if the voltage of a certain phase is lower than the critical voltage of the energy meter, and the load current is less than the starting current.

1. This definition provides the range for determining losss of phase, which differs from loss of voltage where the load current is less than the starting current and is determined by the threshold of the critical voltage.
2. The default parameters are as follows:

Voltage triggering upper limit for phase loss event, 60% Un;
Current triggering upper limit of the phase loss event corresponds to the starting current here;
Delay time for phase loss event determination, 60 seconds.

Loss of current: This refers to the situation where in a three-phase power supply system, the three-phase voltage is greater than the critical voltage of the energy instrument, any phase or two phases of the three-phase current are less than the starting current, and the load current of the other phase lines is greater than 5% of the rated (basic) current.

1. This definition provides a range of criteria for determining current loss, which may be caused by abnormal electricity usage or normal electricity usage, but both are in an abnormal state.
2. A three-phase three-wire energy instrument only judges the loss of current in one phase. Both three-phase four-wire energy instruments and three-phase three-wire energy instruments do not have the

concept of total loss of current.
3. The default parameters are as follows:
Voltage triggering lower limit for current loss event, 60% Un;
Current triggering upper limit of the current loss event corresponds to the "starting current" here;
Current triggering lower limit for current loss event (corresponding to the load current limit of other phases during current loss determination), 5% Ib;
Delay time for determining loss of current event, 60 seconds.

Power fail: It refers to the working condition where the three-phase voltage (single-phase voltage for single-phase instruments) is lower than the critical voltage of the energy instrument, and the load current is not greater than 5% of the rated (basic) current.
1. This definition provides the range of judgment for power fail. If the voltage drops until the energy instrument stops working and the three-phase current is not greater than 5% of the rated (basic) current, it is judged as power fail. After the electricity instrument stops working, check the current once by using the power-off reading battery. Afterwards, the battery will no longer be used to detect the current until the instrument can work with voltage applied, and then it will be judged as the end of no voltage or power fail. Considering the lifespan of the battery, detecting the current with the battery is only done once after the instrumentr stops working.
2. When the power supply of the energy instrument meets the conditions for power fail, even if the auxiliary power supply of the energy instrument supplies power, the power fail status must be recorded in real time.

The difference between network power instruments and energy instruments: Both have the function of "energy metering". It is inappropriate to classify them as the same product or include them in the category of electromagnetic measuring instruments based on this. The reason is: firstly, there are numerous products with "energy metering" function, and the number is increasing every year; secondly, the two have different application objects.

The main distinctions are as follows:
1. Purpose: Power instruments are mainly used for measuring electrical parameters, energy metering, fault diagnosis, electrical control, alarm, protection, etc. in the power grid, especially for low voltage at the user end; Electric energy instruments are used for energy settlement in various links of the power grid and between users, as well as for measuring electrical parameters without diagnostic, control, and protection.
2. Standards: The standards for power instruments comply with GB/T22264-2008 "Installed Digital Electrical Measuring Instruments", JB/T10710-2007 "Low Voltage Electrical Monitoring Devices", etc; The standards for electric energy instruments comply with GB/T17215-2002 "Class 1 and Class 2 Static AC Energy Instruments", JJG596-1999 "Verification Regulations for Electronic Electric Energy Instruments", etc.
3. Product structure: The terminals of the power monitoring instrument are plug-in, without a "lead seal" structure and no anti-theft measures; The electric energy instrument has an anti-theft mechanism-"lead seal". The detachable parts of the electric energy instrument are sealed with "lead" to prevent manual opening, operation, and modification, as well as to prevent electricity theft.

4. Electric energy reset: The power instrument facilitates users to set PT and CT and change the electric energy reading; Energy can also be reset to zero according to management needs; After the "lead seal" of the electric energy instrument, the electric energy reading cannot be reset to zero.
5. System compatibility: Power instruments are specifically designed for intelligent distribution systems, with communication protocols compatible with distribution and internationally recognized; Electric energy instruments are mainly used for sales by power grid companies. The communication system of power grid companies is self-contained and follows the DL/T645 protocol.
6. Installation method: The power instruments are embedded, and various sizes of instruments can be conveniently installed in various links of the distribution system to "monitor" and manage the internal power operation status of the unit; The energy instrument is installed at the unit's incoming line, responsible for energy trade settlement. It is wall mounted and can be installed in large space switchgear or installed in a separate meter box.
7. Installation environment: Power instruments are installed indoors; Electric energy instruments can be installed both indoors and outdoors

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