ISKRAEMECO

MT855 - Tipo3

ISKRAEMECO

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1. General features of MT855

MT855 is an electronic four-quadrant electricity meter, for measurement and registration of active and reactive energy as well as active and reactive demand. The meter is mainly intended for large and medium size commercial and industrial customers.

MT855 characteristics:

- Wide spectrum of multifunction meter versions assembled and programmed according to customer specification
- Measuring of active energy (import, export), reactive energy (four quadrants) as well as corresponding demands
- Time-of-use registration of energy and demand in up to 9 tariff rates for 3 contractual parties (all together up to 27 tariff registers)
- Two simultaneous load-profiles (registration period RP1 = 60 minutes, RP2 = 15 minutes)
- Registration of excess demand in each tariff – demand limits programmable for each tariff separately
- 4 lines 20 characters LCD displaying a variety of data, alarms and meter status
- High metering accuracy and long-term metering stability
- Support for communication protocol IEC 60870-5-102 with additional requirements defined by REE
- Digital signature
- Additional special requirements supported (for Spanish market)

Connection: The meter is mainly intended for CT or CT/VT connection in three- or four-wire networks. On request is also available direct connection type.

Standards: Measuring, functional and physical characteristics of MT855 comply with following IEC standards:

- IEC 61036 (new IEC 62053-21, 62052-11) Static meters for active energy (classes 1 and 2)
- IEC 60687 (new IEC 62053-22) - Static meters for active energy (classes 0,2S and 0,5S)
- IEC 61268 (new IEC 62053-23) - Static meters for reactive energy (classes 2 and 3)
- IEC 61107 (new IEC 62056-21) - Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange
- IEC 870-5-102: Telecontrol Systems and Equipment. Part 5: Transmission protocols. Section 102: Companion standard for integrated totals transmission in power electric systems. IEC, 1996–06.
- NIST FIPS PUB 186, Digital Signature Standard, National Institute of Standard and Technology, US Department of Commerce, 19/5/94.

Additional reference documents:

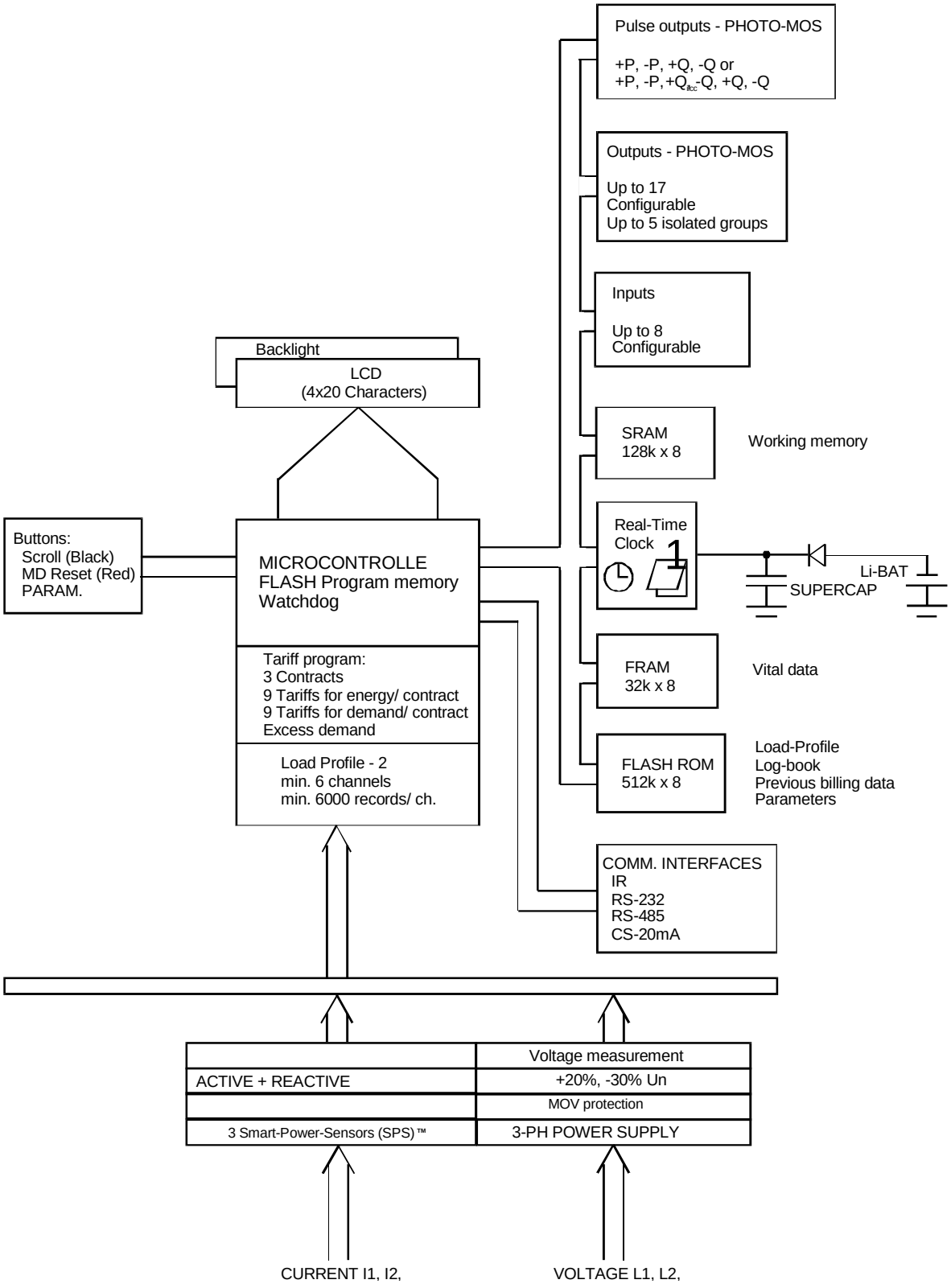
- Real Decreto (Royal Decree) 2018/1997 that approves the Regulation of Metering Points, 26/12/97. Proposal for the RD of CNSE 22/12/99 modification.
- Orden Ministerial (Ministerial Order) dated 12/04/1999 that dictates Technical Instructions Complementary to the Regulation of Metering Points.
- Real Decreto 2820/1998 that approves the Access Tariffs to the Electrical Distribution Network, 23/12/1998.
- Annex: Ampliacion del protocolo de comunicaciones entre concentradores de medida / terminales de servicio y registradores de medida, Versión 3.0 (23 de Octubre de 2001)

2. MT855 basics

MT855 is a successor of a family of Iskraemeco meters MT851. There were done some major improvements and enhancements:

- powerful microcontroller (16-bit with internal 32-bit structure) with internal FLASH memory for firmware storage
- increased memory capacity – 4 Mb (512k x 8) of Flash (for Load-profile, Log-Book, parameters, billing data), 1Mb (128k x 8) of SRAM for working registers, 256 kb (32k x 8) of FRAM (ferro-electric RAM – non-volatile memory with > 10 billions of erase/write cycles) for “sudden death” storage of data
- three independent communication interfaces – separately programmable format and speed
- dot-matrix 4 lines 20 characters LCD with backlight
- reduced number of components => increased reliability

2.1. Block diagram



2.2. Load Profile (LP)

There are two recorders running in MT855 simultaneously. There are 6 channels for each LP. The measuring quantities in channels are:

- A+ - active energy imported
- A- - active energy exported
- R1 - reactive energy imported (inductive)
- R2 - reactive energy imported (capacitive)
- R3 - reactive energy exported (inductive)
- R4 - reactive energy imported (capacitive)

Data in LP records are stored as actual number of pulses for a specific measuring quantity. All status informations are stored together with data. Registration periods RP1 and RP2 are defined with ASDUs. RP1 is defined to 60 minutes and RP2 to 15 minutes.

Memory capacity:

- Ex.1 (default setting)

Up to 6000 records for recorder 1, 6 channels at RP1 = 60 minutes
and 6000 records for recorder 2, 6 ch at RP2 = 15 min.

- Ex.2

Up to 4000 records for recorder 1, 6 channels at RP1 = 60 minutes
and 8000 records for recorder 2, 6 ch at RP2 = 15 min.

2.3. MD Reset

MD Reset can be performed either:

- via communication – for each contract separately
- via MD Reset (red) button - for all contracts simultaneously (default)
- periodic monthly - on a specific day at 0:00

For each contract we have following registers:

- Counter of MD resets
- Table of automatic MD reset for active calendar
- Table of automatic MD reset for dormant (=latent or sleeping) calendar – MD reset which will happen on a specific date and time in future.

2.4. Intrusiveness

Every opening of the meter cover is detected as intrusiveness. Even in case of opening the meter cover without power present intrusiveness will be detected.
Intrusiveness status is present on the LCD till next MD reset or power-down. It is stored together with PVs, in Load-Profile (INT status) and also as an event in Log-Book.

2.5. RTC and battery

Real-Time-Clock (RTC) is backed-up via SuperCap and optionally also via Li-battery. RTC is digitally trimmed in factory to 1 ppm at 23 deg. C (approximately 31 sec. per year).
There are two registers for battery use:

- 14 – time since battery was installed
- 15 – time of battery use (total time of power-down)

Reset of these two registers is possible with manufacturer specific ASDU (= ASDU 200). Default RTC base is quartz frequency. Synchronisation on MP input (terminal 16) is as default enabled (can be disabled on request). The synchronisation tolerance is defined to 9 seconds (different values available on request). This means if synchronisation signal appears the change of time for up to ± 9 seconds will be performed at next half a minute (hh:mm:30).

2.6. Tariff program

RTC controls all the functions of the tariff program. There are up to 9 tariff rates available for each of the 3 contractual parties. Each contract can have:

- up to 12 seasons
- up to 10 daily programs
- up to 48 daily switchovers
- up to 4 types of day - Working, Saturday, Sunday and Holidays.

Each tariff program can be either active or dormant. Dormant means that tariff program will start on a predefined date and time in future.

There has to be exactly one tariff program active at a time. Each contract can be configured either for import or export or it can be disabled.
Control outputs (on terminals 61, 63 and 65) are correlated with tariff program for energy for contract 1. The designation of outputs is configurable (=defined by producer) and must be defined with order.

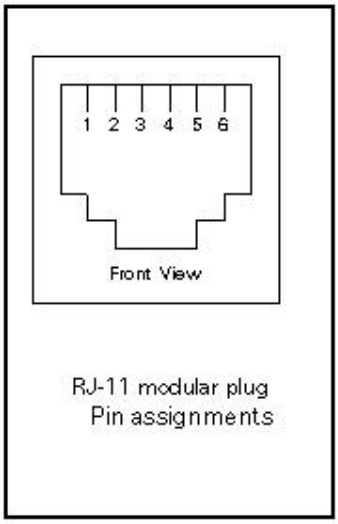
2.7. Communication

There are up to 3 communication interfaces available. These are:

- IR - optical interface - speed up to 38,4 kb/s, protocol IEC 61107 or IEC 60870-5-102
- RS-232 - speed up to 38,4 kb/s, protocol IEC 61107 or IEC 60870-5-102
- RS-485 - speed up to 38,4 kb/s, protocol IEC 61107 or IEC 60870-5-102.

They can operate simultaneously in case that different data are transferred on different interface.

RS-232/RS-485 Pins description:



Pin Nr.	RS-232	RS-485
1	NC	NC
2	GND	NC
3	Tx	A
4	Rx	B
5	NC	NC
6	NC	NC

GND = Ground
Rx = Receive Data
Tx = Transmit Data
NC = No connection

2.8. Inputs and outputs

Special feature of MT855 is big number of available inputs and outputs.
MT855 can have:

- up to 8 inputs - for time synchronisation
- up to 17 outputs - grouped in 5 galvanically isolated groups

The number of I/O and their functionality must be defined with order.

Inputs can be used for:

- Inputs for external tariff change-over for energy registration
- Inputs for external tariff change-over for demand registration
- Inputs MRa and MRb for remote billing reset of the meter
- Input MPE for external time synchronization and/or external triggering of demand period
- Input MZE for external disabling of demand measurement

They have one common terminal (number 15).

Outputs can be used for:

- Impulse outputs for indicating energy consumption in a particular quadrant - up to 6
- Output for end of interval or end of MP
- Outputs for remote indication of valid tariff for energy - derived from a specific contract
- Outputs for remote indication of valid tariff for demand
- Two outputs for indicating energy flow direction
- Two outputs for signaling billing reset
- Output for indication of disabled demand measurement - MZE
- Outputs for load control - up to 3
- Special outputs - derived from status information

Outputs can be also generated from several combinations of statuses for e.g. in case of power failure on a specific power line,...

Outputs can have up to 5 common terminals:
- number 40 for impulse outputs
- number 35 for MP and direction outputs
- number 65 for tariff, billing reset and MZE outputs
- number 75 for load control outputs
- number 20 for special outputs

2.9. Digital Signature

Electric Energy Meter MT 855 provides an important security feature – it can digitally sign its important data.

Digital Signature generated by MT 855 conforms to the following standards issued by National Institute of Standards and Technology (NIST):
- FIPS PUB 186-2 Digital Signature Standard (DSS)
- FIPS PUB 180-1 Secure Hash Standard (SHS)

Digital signature serves more or less the same purpose as a handwritten signature. However, digital signature is virtually impossible to counterfeit, plus it provides us the following features:
- Authentication – The recipient of information can verify the authenticity of the information's origin.
- Data Integrity – The recipient can verify that the information he received is intact.
- Non-Repudiation – The sender of information can not claim that he did not actually send that information.

With the digital signature we are not trying to hide the contents of the message. We actually append the digital signature to the data we are signing, so that the receiver of the message can verify the identity of the signatory and integrity of the data.

Digital Signature is composed of two strings of binary digits which are computed using a set of rules and a set of parameters. The total length of a Digital Signature is 320 bits (two strings, each 160 bits long).

An important parameter in generation of the signature is a **private key**. This is a randomly or pseudorandomly generated integer up to 160 bits long. Private key is kept secret and is known only to the signer of the message (this is in our case MT 855).

Signature verification, on the other hand, uses a **public key**. This is also a very long integer (512 bits) and is computed from the private key. Public key is known to anyone, who wants to verify the signature.

Private and public key pairs are mathematically related in such way, that it is easy to compute a public key from a private key, but the other way round is virtually impossible.

So, anyone can verify the signature of a user with user's public key, but the signature can be generated only by the possessor of the private key.

An important part of the signature generation and verification process is generation of a **message digest**.
This is a condensed representation of the data that we are signing. A message digest is computed with the help of a hash function – Secure Hash Algorithm. (SHA-1). When a message of any length is input, the SHA-1 produces 160-bit message digest.
Message digest is important because signing the message itself would take a lot of time and computing power. We rather sign the message digest , which is allways 160 bits long, no matter how long the message is. This saves us a lot of time and computer resources.

The generation and verification of a Digital Signature is illustrated with the following figure:

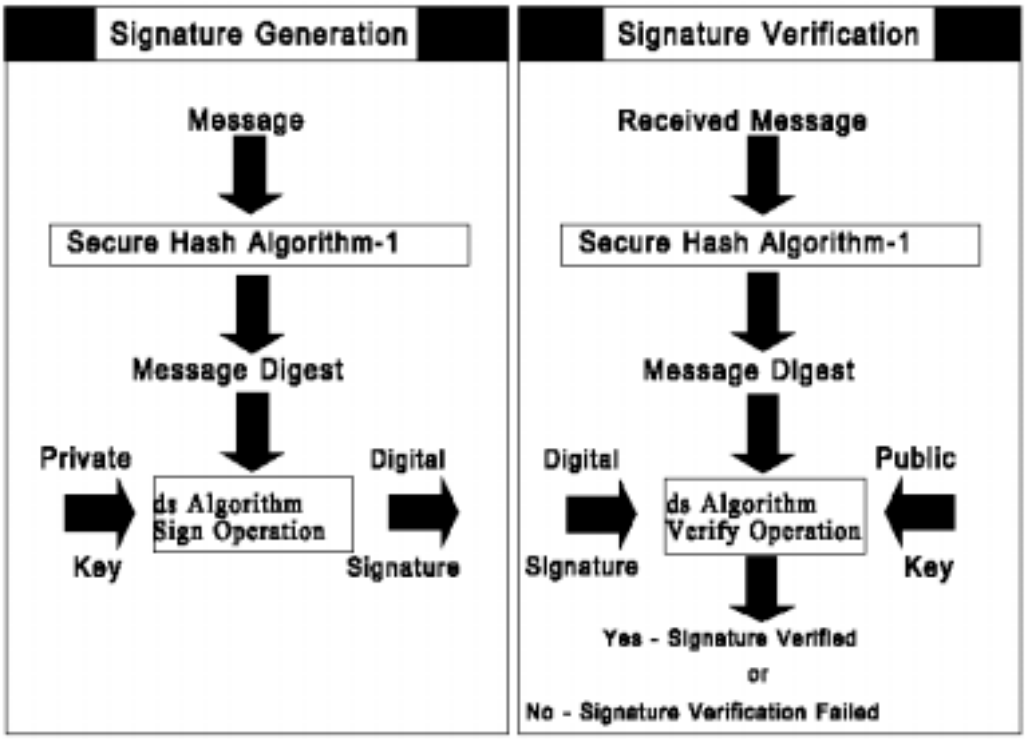


Figure 1

In a signature generation process we first compute a message digest from the original message. Message digest is then input in a digital signature algorithm to generate the digital signature with help of a private key.
The digital signature is sent to the intended verifier along with the signed data.

In a signature verification process the verifier of the signature also computes message digest of the received message. With help of this message digest and public key he verifies the signature.

2.10. Excess demand

Special function of the MT855 is calculation of excess demand. This is done for each tariff according to following formula:

$$X = \sqrt{\sum (P - Pc)^2}$$

if $P > Pc$

where: X = excess demand
P = actual demand in previous measuring period (=MP)
Pc = contracted demand

At the end of the MP the value of excess demand is updated in case that actual demand was greater than contracted demand.

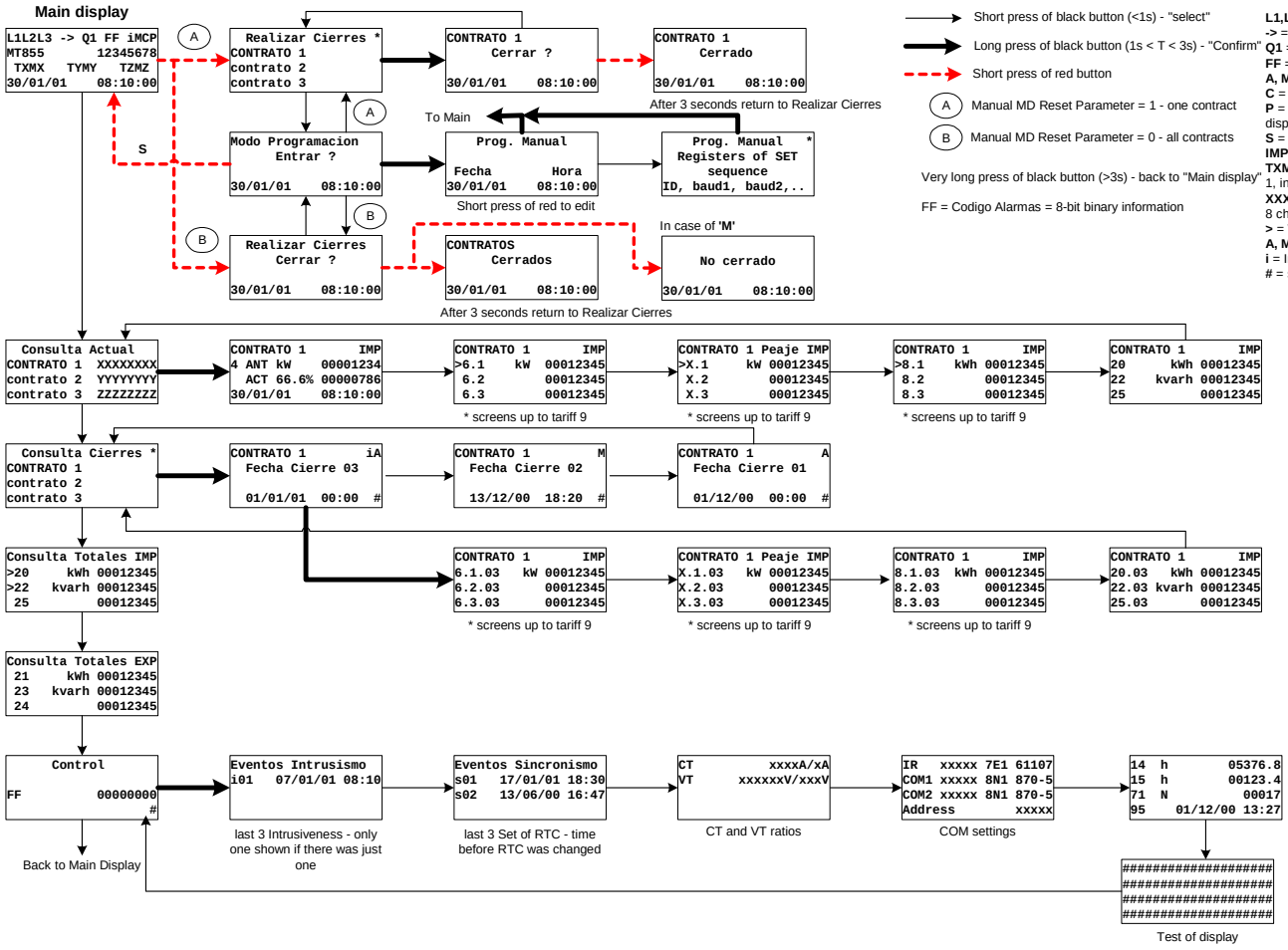
An example of calculation of excess demand

Period	P (kW)	Pc (kW)	P-Pc	(P-Pc)**2	∑	Peaje
1.	36	2	34	1156	1156	34
2.	36	2	34	1156	2312	48,08326
3.	36	2	34	1156	3468	58,88973
4.	36	2	34	1156	4624	68
5.	36	2	34	1156	5780	76,02631
6.	36	2	34	1156	6936	83,28265
7.	36	2	34	1156	8092	89,95554
8.	36	2	34	1156	9248	96,16652
9.	36	2	34	1156	10404	102
10.	36	2	34	1156	11560	107,5174

If contracted demand Pc is defined with value 0 it means that this function for a specific tariff is disabled.

3. Flowchart of operation

Flowchart demonstrates the correlation between button operations and different information on the LCD of MT855.



L1,L2,L3 = presence of voltages - blinking if wrong connection
-> = import = **IMP** (**<-** = export = **EXP**)
Q1 = reactive in quadrant 1 (Q2, Q3, Q4)
FF = Fatal error - FF register is not equal to "0" - Blinking character
A, M = Automatic/Manual MD reset blockade active
C = meter in communication
P = meter in PARAM mode - after press of PARAM button (only from "Main display")
S = meter in SET mode
IMP = contract for import (**EXP** = contract for export)
TXMX, TYMY, TZMZ = Working tariff for energy (TX) and demand (MX) in contract 1, in contract 2 & in contract 3
XXXXXX, YYYYYY, ZZZZZZ = Names for contract 1, contract 2 & contract 3 - max. 8 characters
> = Working register of energy
A, M = Reset done automatically (A) or manually (M)
i = Intrusiveness bit is set - reset by MD Reset or power-down
= screen with second level of information

Import registers:

4	**- actual counter of maximum demand (with % of MP)**
6.X	**- Maximum demand pro tariff**
6.X.XX	**- Maximum demand pro tariff - up to 15 PVs**
8.X	**- Active energy pro tariff**
8.X.XX	**- Active energy pro tariff - up to 15 PVs**
20	**- Active energy total**
20.XX	**- Active energy total - up to 15 PVs**
22	**- Reactive energy total in Q1**
22.XX	**- Reactive energy total in Q1 - up to 15 PVs**
25	**- Reactive energy total in Q4**
25.XX	**- Reactive energy total in Q4 - up to 15 PVs**

Export registers:

5	**- actual counter of maximum demand (with % of MP)**
7.X	**- Maximum demand pro tariff**
7.X.XX	**- Maximum demand pro tariff - up to 15 PVs**
39.X	**- Active energy pro tariff**
39.X.XX	**- Active energy pro tariff - up to 15 PVs**
21	**- Active energy total**
21.XX	**- Active energy total - up to 15 PVs**
23	**- Reactive energy total in Q2**
23.XX	**- Reactive energy total in Q2 - up to 15 PVs**
24	**- Reactive energy total in Q3**
24.XX	**- Reactive energy total in Q3 - up to 15 PVs**

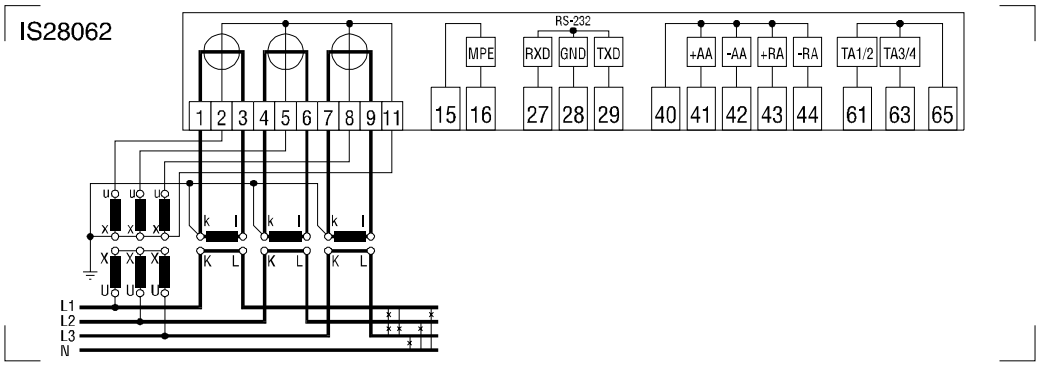
Other registers:

FF	**- Alarm register**
X	**- Excess demand**
0	**- Identification**
14	**- Battery installment counter**
15	**- Battery counter - total power outage**
71	**- Number of power-downs**
95	**- TST (timestamp) of the last parametrization**
TST	**- timestamp format for LCD = DD/MM/YY hh:mm**

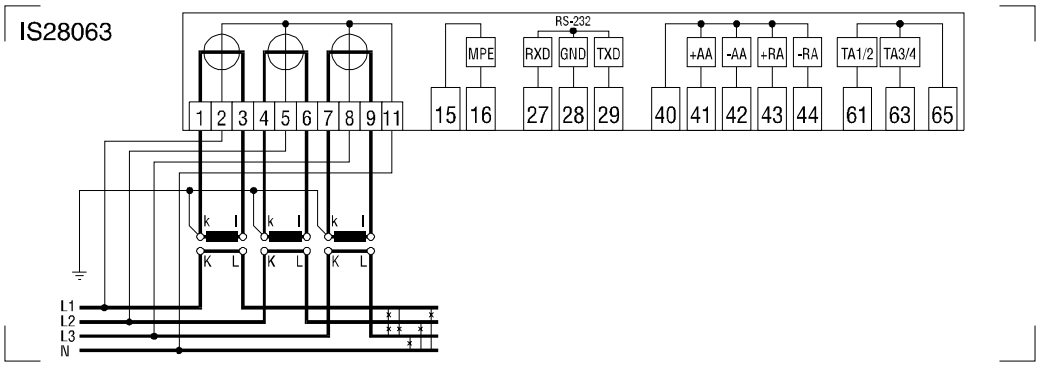
Delete of "P" - Session End - command or timeout or short PARAM
Delete of "S" - Session End - command or timeout

4. Connection diagram

Typical connection for 3x58/100 V or 3x63,5/110 V, 5A



Typical connection for 3x230/400 V, 5A



Note: Auxiliary terminals 27, 28 and 29 are implemented in RJ11 connector (see chapter 2.7).

5. Meter type designation

MT855 - T n A n m R n m - V n m L n m C n m - M n K n m p	
D	**Direct connected meter**
n = 2	Imax = 120 A
T	**Transformer rated meter**
n = 1	Terminal block made of thermoplastic material, three-phase transformer rated meter 5A by DIN
A	**Active energy**,
n = 3	class 0.5S (IEC 687)
n = 4	class 1 (IEC 1036)
n = 5	class 2 (IEC 10369
m = 1	one energy-flow direction
m = 2	two energy-flow directions
R	**Reactive energy**
n = 4	class 2 (IEC 1268) calibrated 1%
n = 5	class 2 (IEC 1268)
n = 6	class 3 (IEC 1268)
m = 1	one energy-flow direction (Q+ = Q1 + Q2)
m = 2	two e-f directions (Q+=Q1 + Q2 ; Q-=Q3 + Q4)
m = 5	4-quadrant (Q1, Q2, Q3, Q4)
m = 6	4-quadrant, imp., exp. (Q+, Q-, Q1, Q2, Q3, Q4)
-	dash
V	**Control inputs**
n = 1	1 control input
n = 2	2 control inputs
...	
n = 8	8 control inputs
m = 2	inputs with a resistor for rated voltage
L	**PHOTO-MOS relay outputs**
n = 1	1 output
...	
n = 10.	10 outputs
...	
n = 17	17 outputs
m = 1	make contact
C	**Energy-flow direction relay**
n = 1	1 energy-flow direction relay
n = 2	2 energy-flow directions relay
m = 2	PHOTO–MOS relay
-	dash
M	**Additional device**
n = 2	RTC with a super-cap
n = 3	RTC with a Li-battery and a super-cap
K	**Communication interface**
n	*Version of the 1st interface*
n = 0	IR optical port
n = 1	CS-20 mA
n = 2	RS-232
n = 3	RS-485
m	*Version of the 2nd interface*
m = 1	CS-20 mA
m = 2	RS-232
m = 3	RS-485
p	*Version of the 3rd interface*
p = 2	RS-232
p = 3	RS-485

6. Technical data

Accuracy class	**Cl.**	(kWh) 1 (IEC 1036) or 0.5S (IEC 687)
		(kvarh) 2 (IEC 1268) or calibrated 1%
Nominal Voltage	**U_n**	3x230/400 V, 3x220/380 V, 3x240/415 V, 3x63/110 V, 3x58/100 V, 3x100 V, 3x110 V
Voltage range		0.8 ... 1.15 Un
Rated current	**I_n**	1 A (class 1/2 act/react)
		1 A or 5 A (class 0.5/1% act/react)
	Ib	5 A or 10 A
Maximum current	**I_{max}**	6 A (class 1/2 act/react)
		1.2 A or 6 A (class 0.5/1% act/react)
		120 A
Thermal current	**I_{th}**	1.2 I_{max}
Short-circuit current		30 I_n
Starting current		< 2 mA
Rated frequency	**f_n**	50 Hz ± 5%
Temperature range:		
Operation	**T_o**	-20°C ... +60°C
Storage	**T_s**	-30°C ... +70°C
Self-consumption:		
Voltage circuit		< 1 W / 2 VA
Current circuit		< 0.1 VA / phase
Meter constant: LED	**R_{LA}, R_{LR}**	
3x230/400 V, 120A		1.000 Imp/kWh (kvarh)
3x230/400 V		10.000 Imp/kWh (kvarh) for 1(5)A
3x110 V, 3x63,5/110 V		40.000 Imp/kWh (kvarh) for 1(5)A
3x110 V, 3x63,5/110 V		100.000 Imp/kWh (kvarh) for 1(2) A
Impulse output constant:	**R_{OA}, R_{OR}**	
3x230/400 V, 120A		500 Imp/kWh (kvarh)
3x230/400 V		5.000 Imp/kWh (kvarh) for 1(5)A
3x110 V, 3x63,5/110 V		20.000 Imp/kWh (kvarh) for 1(5)A
Pulse width (relay):	**T_i**	100 ms (other values on request)
Pulse width (test LED):	**T_i**	32ms
Type of outputs:		PHOTO-MOS relay, potential-free
Outputs (up to 17): **Voltage** **Current** **Power**		 max. 275 Vac max. 100 mA 25VA

Control inputs (up to 8): **Voltage threshold: ON** **OFF** **Current consumption**		U_n (230 V or 100 V) $U \geq 0.8$ Un $U < 0.2$ Un < 2 mA
Electrostatic discharge		15 kV (IEC 801-2)
HF Magnetic field		10 V/m (IEC 801-3)
Burst test		4 kV (IEC 801-4)
Dielectric strength		4 kV_{rms}, 50 Hz, 1 min
Impulse voltage		6 kV, 1.2/50 µs
Insulation between voltage circuits		Impulse voltage 6 kV, 1.2/50µs Dielectric strength 4 kV, 50 Hz, 1 min
RTC accuracy		Crystal: 6 ppm = ≤ ±3 Min./year (at T_{op}= +25°C)
RTC Power back-up:		
Super-Cap		250 h (other values on request)
Li-battery		Operation reserve: 2 years Life span: 10 years
LP recorder 1		
Registration Period		1,2,5,10,15,30,**60** min. Programmable
Channels		6 – A+, A-, R1, R2, R3, R4
Capacity		Min. 4000 records per channel at RP=60 min.
LP recorder 2		
Registration Period		1,2,5,10,**15**,30,60 min. Programmable
Channels		6 – A+, A-, R1, R2, R3, R4
Capacity		Min. 6000 records per channel at RP=15 min.
Communication protocols:		IEC 61107 – mode C IEC 870-5-102
Communication Speed:		Baudrate: max. 38.400 Bit/s
Dimensions		327x177x 90 mm
Mass		approx. 1.8 kg

7. Appendixes

7.1. Appendix A: Supported ASDUs

ASDU	Description	Access in MeterView
1	Event information with time tag	read log book
11	Periodicaly reset integrated totals	read load profile
71	Manufacturer and equipment identifier	read/write parameters, monitoring, commands, resets
72	Current date and time	monitoring
100	Read manufacturer and equipment identifier	read/write parameters, monitoring, commands, resets
102	Read event information record of a range of time	read log book
103	Read current date and time	monitoring
123	Read periodicaly reset integrated totals of a time range and a range of addres	read load profile
129	metering point parameters	read parameters
130	digital signature	read load profile
131	DST times	read parameters
132	Load private key	write parameters
133	Read current values of tariff information	monitoring
134	Read previous values of tariff information	monitoring
135	Current values of tariff information	monitoring
136	Previous values of tariff information	monitoring
137	Close billing period	commands
141	Read configuration *1	read parameters
142	Configuration *1	read parameters
143	Modify configuration *1	write parameters
144	Read contracted maximum *1	read parameters
145	Contracted maximums *1	read parameters
146	Modify contracted maximums *1	write parameters
147	Read holidays *1	read parameters
148	Holidays *1	read parameters
149	Modify parameters *1	write parameters
150	Contracts configuration *1	read parameters
151	Modify contracts configuration *1	write parameters
152	Read tariff seasons *1	read parameters
153	Tariff seasons *1	read parameters
154	Modify tariff seasons *1	write parameters

ASDU	Description	Access in MeterView
155	Read daily discrimination table *1	read parameters
156	Daily discrimination table *1	read parameters
157	Modify daily discrimination table *1	write parameters
158	Read passwords *1	read parameters
159	Passwords *1	read parameters
160	Modify passwords and addreses *1	write parameters
169	Read contracts configuration *1	read parameters
181	Change date and time	set time
183	Start session	any access
184	Read digital signature	read load profile
185	Read DST times	read parameters
186	Modify DST times	write parameters
187	End session	any access
200	*Manufacturer specific*	**2*

**1:* From Annex: Ampliacion del protocolo de comunicaciones entre concentradores de medida / terminales de servicio y registradores de medida, Versión 3.0 (23 de Octubre de 2001)
**2*: ASDU 200 covers several functions of the meter which are not covered in other ASDUs

7.2. Appendix B: Event Log-Book

7.2.1. Log-Book statuses (old events)

- SPA = 1 (initialization), SPQ = 1: system restart (data previous to initialization are lost). To use with record address 52.
- SPA = 1 (initialization), SPQ = 2: start after power failure (data, parameters and time are preserved). To use with record address 52.
- SPA = 3 (power failure - instant where voltage falls under limits -), SPQ = 0. To use with record address 52.
- SPA = 7 (time messages), SPQ = 9: time change, previous time. To use with record address 53.
- SPA = 7 (time messages), SPQ = 11: time change, new time: To use with record address 53.
- SPA = 7 (time messages), SPQ = 2: synchronization corrupted (meter in the associated metering point is not synchronized with its RM, the time difference being considerable). To use with record address 53.

- SPA = 15 (parameter change), SPQ = 0. To use with record address 54.
- SPA = 16 (private key change), SPQ = 0. Recorder's private key change. To use with record address 130.
- SPA = 18 (warning message), SPQ = 1 (intrusiveness event). To use with record address 128.
- SPA = 7 (time messages), SPQ = 21. Contract I billing period closed by command. To use with record address 131.
- SPA = 7 (time messages), SPQ = 22. Contract II billing period closed by command. To use with record address 132.
- SPA = 7 (time messages), SPQ = 23. Contract III billing period closed by command. To use with record address 133.

7.2.2. Log-Book statuses (new events)

Events to record any change in the communication ports configuration

When, with ASDU type 143, any characteristic of the communication ports is programmed in the recorder in a different way compared at how it was previously programmed, it will generate an event of communication port parameters changed, with SPA 15 and SPQ 1 (register address 54)

Events to record any change in the contract maximum demands

When, with ASDU type 146, any contract maximum demand is programmed in the recorder with a different value compared at how it was previously programmed, it will generate an event of contract maximum demand changed, with SPA 15 and SPQ 25, 25 or 26 depending on the modified contract 1, 2 or 3 either active or dormant (with register addresses 131, 132 and 133 respectively)

Events to record any change in the table of holidays

When, with ASDU type 149, any holiday date is programmed in the recorder, different from the ones it had previously programmed, it will generate an event of table of holidays changed, with SPA 15 and SPQ 27, 28 or 29 depending on the modified contract 1, 2 or 3 either active or dormant (with register addresses 131, 132 and 133 respectively).

Events for phase voltage failure

When the equipment will detect a failure in the measured voltage in any phase it will generate an event of phase voltage failure, with SPA 3 and SPQ 1, 2 or 3 depending on the phase 1, 2 or 3 (with register address 52). These events are independent from the already existing event of power supply failure (SPA 3, SPQ 0).

7.3. Appendix C: Code designation for Iberdrola and Endesa

Register names for A-, Q2 and Q4 are different for ENDESA and IBERDROLA:

	ENDESA	IBERDROLA
A-	9.t	39.t
Energy Q2 Total	25	23
Energy Q4 Total	23	25

7.4. Appendix D: Sample meter

Bottom view - with typical number of auxiliary terminals

Type of meter:

MT855-T1A42R56-V12-L61-M3K02

5A meter, class 1 active, class 2 reactive, bidirectional (= import and export), one control input (fpr time synchronisation), 6 outputs (4 pulse and two tariff control outputs), Li-battery, IR and RS-232 interface