ISKRAEMECO

Energy Measurement and Management

TE*851...*
DE*851...*

High-Accuracy
Four Quadrant
Multifunction meters
with Load profile

The **TE851** and **DE851** high precision multifunction static transformer operated electricity meters are designed for metering of active energy in two directions, reactive energy in four quadrants, active and reactive demand as well as registration of load profile at industrial consumers and electric utilities. The meters can be connected either via a current transformer or via current and voltage transformers in 3-wire or 4- wire networks. They comply with the IEC 60687 standard for active energy (class 0.2S or 0.5S) and IEC 61268 standard for reactive energy (class 2 or 3) as well as VDEW requirements. Meters are manufactured in compliance with ISO 9001 standard.

Design

Each meter is a unique design and is made according to a customer's specification. This is performed by a powerful microcomputer, internal real-time clock, LCD, LED, communication interfaces as well as inputs and outputs according to a customer's specification.

Metering system

The metering system is 2-element at DE851 meters or 3-element at TE851 meters. The meters are based on Time Division Multiplication (TDM) technique. The kvarh-meter employes either artificial or natural connection.

Metering technique, meter design as well as built-in electronic components assure excellent and long-term stable metering feature, negligible effect of influence quantities and high meter reliability.

The metering elements are shielded against external magnetic fields and are protected against over-voltages and high frequency disturbances.

Time-of-use registration

The meters have 24 registers for TOU registration of energy and 24 registers for TOU registration of demand. Depending on a number of quantities up to 8 tariffs can be programmed. Times of changing-over tariffs are set with hour and minute with resolution 1 minute. It is possible to set up to 32 periods over a day in which one or more tariffs are valid. Up to 64 different daily tariff change-over schedules can be programmed. Up to 8 different day types (7 days + a holiday) and up to 64 weekly tariff changing-over schedule can be programmed. Up to 64 seasons a year defined by weekly tariff changing-over schedule that is valid in a particular season can be programmed. Besides the current tariff program up to three so called sleeping tariff programs can be programmed and are activated automatical on programmed dates. It is possible to define up to 330 holidays a year, including holidays based on a lunar calendar (e.g. Eastern) or some other cyclic algorithm. The calendar is valid by the year 2090.

Load-profile

The meters are equipped with a load-profile recorder having up to 32 channels. It enables poly-phase load profile registration of active energy or demand in two energy flow directions and reactive energy or demand in four quadrants or combination of them (i.e. Q1+Q2 and Q3+Q4). The load-profile period can be set in a range from 1 minute to 60 minutes with 1 minute resolution. The load-profile recorder can also register events that have occurred (power shortages, manual meter resets, etc.) and the meter status (energy flow direction, disabled demand registration, tripping of a load limiter, status of inputs and outputs, etc.).

Load limiter

The meters can be equipped with auxiliary terminals for a load limiter. It can be either an ON-OFF switch or a three-point controller. In the first case the microcomputer switches off the load when calculates that the contractual demand has been already achieved in a current demand period. The microcomputer switches on the load again at the end of the demand period. In the second case, the microcomputer calculates the demand trend over the whole demand period and off/on switches parts of the load so that at the end of demand periods the contractual demand is not exceeded.

Maximum demand indicator

Maximum demand can be based either on fixed or rolling demand period. The demand period can be set in a range from 1 to 60 minutes with 1 minute resolution. It is possible to register maximum demand of active energy for two energy flow directions as well as of reactive energy in each of four quadrants. Maximum demands are registered in tariffs (up to 8) and cumulative. It is possible to disable maximum demand registration for a certain period that follows a period of power shortage.

Log-book

Events that have occurred as well as date and time of their occurrence are registered in a ring buffer by the microcomputer. The log-book has 255 registers. Data stored in the log-book can be downloaded with other data in the data download sequence. The following events can be stored in the log-book: power up, power down, setting RTC, setting parameters via pushbuttons, parameterisation of the meter via communication, reset at the end of billing periods, initialisation of registers containing values of previous billing periods, initialisation of the log-book, initialisation of the load-profile recorder, watchdog reset, master reset, CPU error.
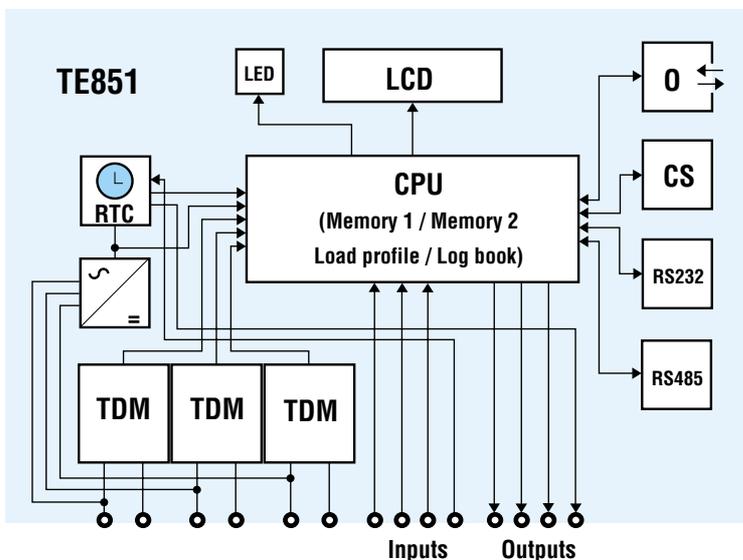
BLOCK DIAGRAM

Microcomputer

The microcomputer enables all functions specified by a customer, processes metering pulses from the TDM stage, stores metering data and parameters in a non-volatile memory, stores metering data of previous billing periods (up to 50 last billing periods), enables load profile and time-of-use registration, definition of calendar and holidays, compensates errors of instrument transformers, logs events that have occurred, drives the LCD, enables monitoring and control functions.

The microcomputer is supervised by a Watchdog circuitry.

Real-time clock

The internal real-time clock is either synchronised with 50 Hz network frequency or is controlled with a 32 kHz quartz crystal oscillator. The RTC that is controlled with a quartz crystal oscillator complies with the IEC 61038 standard. It is backed up with a super capacitor or a Li-battery and a super capacitor. The super capacitor permits 250-hour operation reserve; the Li-battery permits 2-year operation reserve. The microcomputer logs elapsed time of the RTC operated on the Li-battery and set a flagg on the LCD when the Li-battery should be replaced.

The RTC enables metering periods for demand and load profile, definition of tariff change-over schedules, seasons registration, automatic change-over from standard time to day-light saving period and vice versa, registration of day, date, hour and minute (a time stamp) when events have occurred.

Indicators

LED indicators are used for testing and indication of kWh- and kvarh-meter operation. Meter constants depend on maximum current and voltage.

Communication interfaces

The meters are equipped with an infrared optical port (IEC 61107) for local meter programming and data downloading. Data transmission rate is 9600 baud.

A CS interface (20-mA current loop by DIN 66348), RS 232 and RS 485 interfaces are built into the meters on request. The meters can be equipped with a CS interface and either RS232 or RS 485 interface. The RS232 interface can be used for an external standard PSTN, ISDN or GSM modem. At meter programming and data downloading the IEC 61107, Mode C protocol with a password is used.

Pushbuttons

The meters are equipped with 3 pushbuttons. The Data Scroll pushbutton (S1) is always accessible and is used for the manual scroll data display mode. The Reset pushbutton (S2) can be sealed and is used for manual billing reset of the meter or together with the Data Scroll pushbutton for programming the meter in a field as well as setting meter parameters. The Param pushbutton is placed under the meter cover and is used for setting the most proteceted parameters.

LCD

The meters are equipped with a LCD specified by VDEW recommendation. The LCD operates in two data display modes: auto scroll and manual scroll. The user programs which meter data will be displayed in each of data display modes, data format and resolution as well as time of data being displayed. User can program the metering data to be displayed as primary, semiprimary or secondary value. Displayed data is identified by EDIS identification codes (DIN 43863-3). Besides metering data the LCD displays events that have occurred, the meter status and alarms as well.

Inputs and outputs

The meters can be equipped with up to 17 auxiliary terminals. Up to 3 inputs and 8 outputs can be realised. At order, a customer defines which inputs and outputs should be built-in.

The following control inputs are available: tariff change-over for energy and demand, the RTC synchronisation, timing demand period for billing reset and demand registration disabling. The control inputs are controlled with line-to-neutral voltage.

On request one input can be used for external power supply of the meters or for redundant power supply at meters with ineternal power supply.

The meters are equipped with photo-MOS relay outputs. The following outputs are available: pulse outputs for kWh- and kvarh-meter, output for changing-over tariff for energy and/or demand of an external meter, starting demand period, energy flow direction indication, indication of disabled demand measurement, 3-level load limiter, indication of billing reset, different alarms and the meter status (e.g. line failure, energy registered in a particular quadrant, load profile registration, etc.).

Housing

The meter housing is made of self-extinguishing polycarbonate and can be recycled at the end of the meter life. It assures double insulation and IP 51 protection level against dust and water penetration. Overall and fixing dimensions comply with the DIN 43857 standard.

The screw type terminal block made of bakelite accommodates terminals made of solid brass that are Ni-plated at tropical meter versions. The terminal bore diameter is 5 mm.

Anti-fraud protection

The meters are protected against fraud in the following ways: meter and terminal covers are sealed separately, also the Reset pushbutton (S2) can be sealed, the Param pushbutton is under the meter cover, execution of some commands and access to some registers is protected with passwords and code algorithms. All parameter modifications that affect the metered values are recorded in the log-book. All metering data are stored in a non-volatile memory at two locations as an original and its copy.

Power supply

Meters with internal or external power supply are available. Voltage of the internal power supply source is equal to the metered voltage. As an option at the meters with internal power supply a redundant power supply is available too. It assures communication with the meter via its interfaces and data displaying during power shortages. Voltage of the redundant power supply source can be either AC or DC in a range from 50 to 230 V.

Voltage of an external auxiliary power supply source can be 60 V, 120 V or 230 V.

Upgrading

The meters can be upgraded by an Iskraemeco P2C communicator, which can be mounted on the meter terminal block. The P2C is connected to the meter communication interface and is equipped with a standard PSTN, ISDN or GSM-modem. In such a case a Call-back function is possible.

Accessory

An optical probe with 9-pin RS232 connector as well as meter managing software MeterView for Microsoft Windows or MeterRead for palmtops with Windows CE operating system are available on request.

TECHNICAL DATA

Current range	Rated current	Maximum current	Thermal current
1(1.2) A	1 A	1.2 A	2 A
1(2) A	1 A	2 A	3 A
1//5 A	1 A	6 A	8 A
5(10) A	5 A	10 A	15 A
5(6) A	5 A	6 A	8 A

Accuracy class . . . .(kWh-meter) 0.2S or 0.5S (IEC 60687)
(kvarh-meter) calibrated 0.2%, 0.5%,1%, class 2 or 3 (IEC 61268)
Voltage . . . . .3x58/100 V, 3x64/110 V, 3x115/200 V, 3x127/220 V, 3x220/380V, 3x230/400 V, 3x240/415 V
3x100 V, 3x110 V, 3x220 V, 3x230 V, 3x240 V
Voltage range . . . . .0.8 ... 1.15 U_n
Short-circuit current . . . . .30 I_n
Starting current . . . .< 2 mA (0.05% P_n)
Rated frequency .50 Hz or 60 Hz
Temperature range
              Operation . . . .–10°C ... +45°C
      Operation (limit) . . . .–20°C ... +55°C
             Storage . . . .–20°C ... +55°C
Burden
        Voltage circuit . . . . .8.8 VA (at 58V)
        Current circuit . . . . .0.06 VA (at 5A)
        Control input . . . . .1.6 VA (at 230V)
Pulse width (relay) . . . . .80 ms (values in range 20 ms to 2.5 s on request)
Type of outputs .photo-MOS relay, potential-free
Relay ratings . . . . .25 VA (100 mA, 250 V AC)
Burst test . . . . .4 kV (IEC 1000-4-4)
Dielectric strength . . . . .4 kVrms, 50 Hz, 1 min
Impulse voltage .6 kV, 1.2/50 µs
Relative humidity . . . . .In compliance with IEC 60687 Tab. 5
LED for optical reading
      Impulse frequency . . . .≤ 40 Hz
      Impulse length . . . . approx. 8 ms
RTC accuracy . . . . .Crystal: 6 ppm = ≤±3 min./year (at +25°C)
Housing . . . . .Designed according to DIN 43857
           Material . . . . .Polycarbonate, grey coloured
      Fire retardant . . . . .Self-extinguish rate: IEC60695-5-11(960 C), UL94 (94V0)
      Overall Dimensions . . . . .327 x 178 x 150 mm
Protection against dust and water . . . . . . .IP51 (IEC 529)
Mass . . . . .approx. 2.5 kgC
Capacity of load-profile recorder . . . . .84 days at 4 channels and 15-minute demand period
Number of auxiliary terminals . . . . .up to 17
Number of inputs . . . . .up to 3
Number of outputs . . . . .up to 8

Metered and calculated quantities

The meters measure polyphase quantities. The following electric quantities are metered or calculated:

– active energy in two energy flow directions

– reactive energy in four quadrants as well as in combined quadrants (i.e. Q1+Q2 and Q3+Q4)

– demand of active energy in two energy flow directions

– demand of reactive energy in four quadrants as well as in combined quadrants (i.e. Q1+Q2 and Q3+Q4)
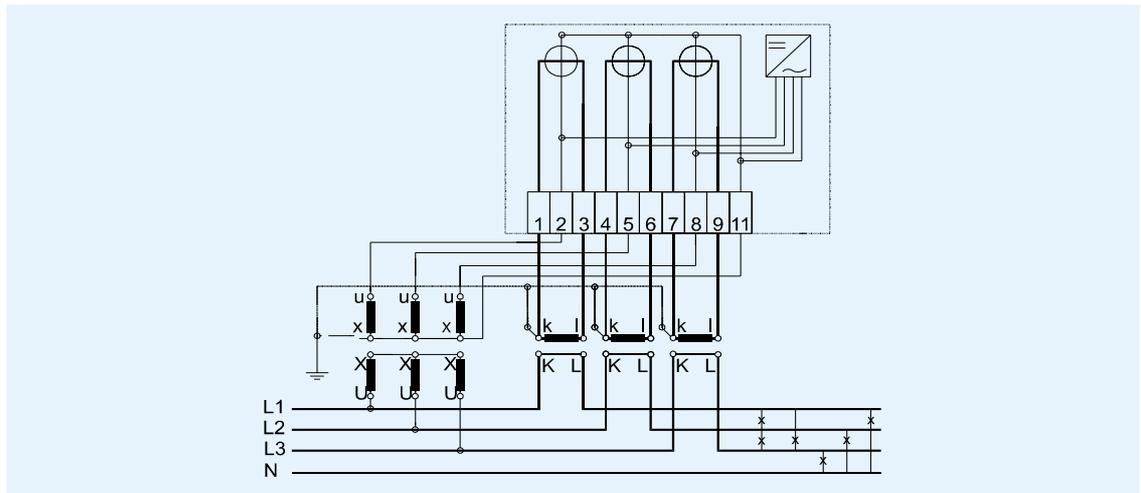
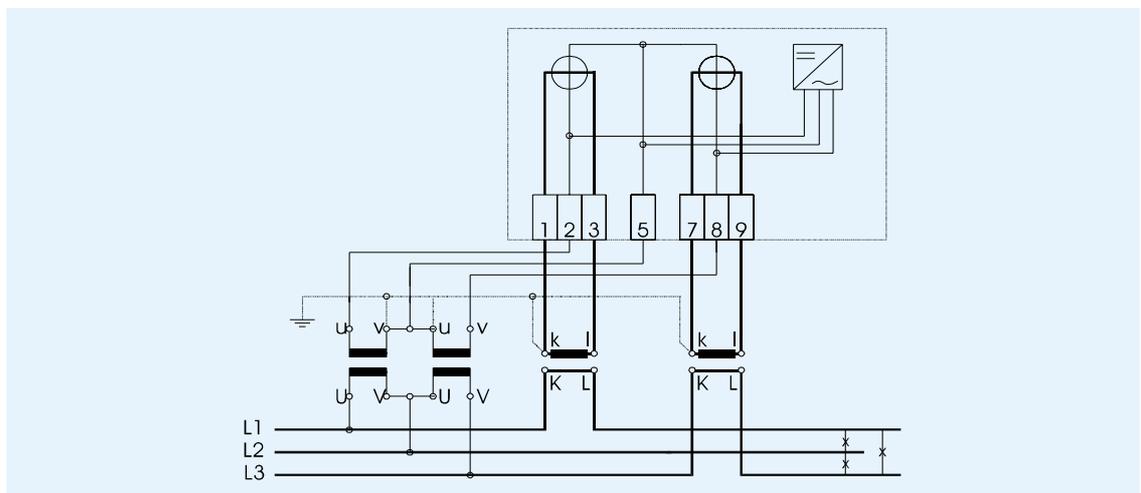– cumulative maximum demands
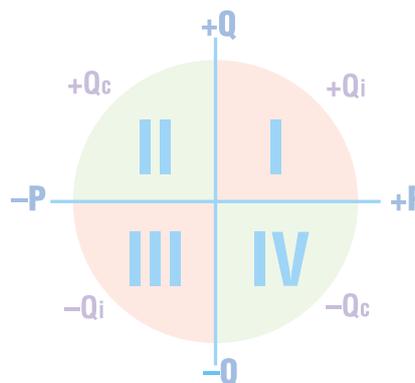
OVERALL AND FIXING DIMENSIONS
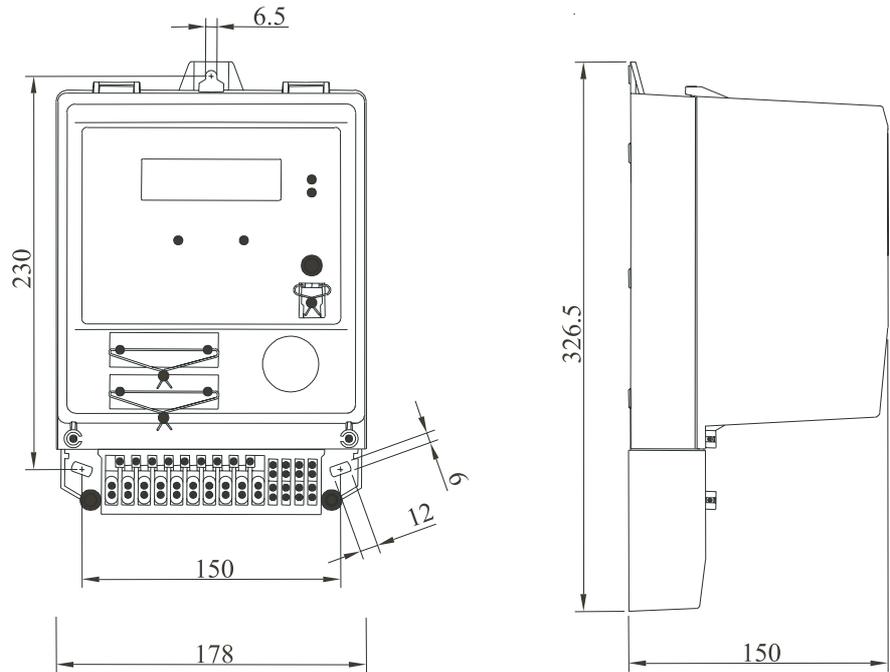
TYPICAL CONNECTION DIAGRAMS

TE851...

DE851...

METER TYPE DESIGNATION

TE851 - A22 R36 - E V11 L41 - M3 K 0 1 2 Z2

T – polyphase 3-element precision meter

D – polyphase 2-element precision meter

E – static meter

851 – high precision multifunction four quadrant meter in surface mounting housing (DIN 43857)

A – Active energy,

> **2** – kWh-meter class 0.2S (IEC 60687)
> **3** – kWh-meter class 0.5S (IEC 60687)
> > **1** – one energy-flow direction
> > **2** – two energy-flow directions

R – Reactive energy

> **2** – kvarh-calibrated 0.2 %
> **3** – kvarh-calibrated 0.5 %
> **4** – kvarh-calibrated 1 %
> **5** – kvarh-meter class 2 (IEC 61268)
> **6** – kvarh-meter class 3 (IEC 61268)
> > **1** – one energy-flow direction (Q+=Q1+Q2)
> > **2** – two energy-flow directions (Q+=Q1+Q2 ; Q-=Q3+Q4)
> > **3** – inductive import, capacitive export (Q1, Q4)
> > **4** – inductive import, inductive export (Q1, Q3)
> > **5** – four quadrant (Q1, Q2, Q3, Q4)
> > **6** – four quadrant, import, export (Q+, Q-, Q1, Q2, Q3, Q4)

E – External power supply

I – Internal power supply

V – Control inputs

> ***n*** – number of control inputs (n = 1, 2, 3)
> > **1** – inputs - capacitor type

L – Photo-MOS relay outputs

> ***m*** – number of outputs (m = 1, 2, …, 8)
> > **1** – make contact

C – Energy-flow direction relay

> **1** – one energy-flow direction relay
> **2** – two energy-flow directions relay
> > **2** – photo–MOS relay

M – Additional device

> **2** – RTC with a super-cap
> **3** – RTC with a Li-battery and a super-cap

K – Communication interface

> **0** – 1st interface: IR optical port
> > **1** – 2nd interface: CS-20 mA
> > **2** – 2nd interface: RS-232
> > **3** – 2nd interface: RS-485
> > > **2** – 3rd interface: RS-232
> > > **3** – 3rd interface: RS-485

Z – Data profile recorder

> **2** – 128k SRAM

Owing to periodical improvements of our products the supplied products can differ in some details from the data stated in the prospectus material.