

E89...

Single-Phase
Meter



SINGLE-PHASE METERS TYPE E89

APPLICATION

The standard single-phase meter is intended for measuring active electrical energy in two-wire, single-phase networks, where relatively high changes occur in measuring power, and deviations from referential condition are present. Connection is direct or over instrument transformers. Meters are surface mounting types.

RATINGS

The measuring-technical characteristics comply to EN publ. 60521, BS 5685, BS EN 60521 and AS 1284 Part 1. The accuracy class is 2.

DESIGN

The following versions of meters are manufactured:

- Type **E89B** for 300 % current loading
- Type **E89C** for 400 % current loading
- Type **E89E** for 500 % current loading
- Type **E89F** for 600 % current loading
- Type **E89G** for 666 % current loading

The symbols added to the type designation indicate the following:

- D**: double tariff type meter (E89CD)
- T**: meter for connection via measuring transformers (E89CT)
- 2**: meter with magnetic bearing (E89F2)
- 5**: meter with inductive pulse transmitter (E89C2-5)
 - Semiconductor output (S0 – DIN 43864/86)
- 9**: meter with optoelectronic pulse transmitter (E89C-9)
 - OPTO-MOS relay output (voltage free) or
 - semiconductor output (S0 – DIN 43864/86)

VOLTAGE RANGE

Direct operating meters: 120 V, 240 V (50 or 60 Hz)

Transformer operated meters: 100 V, 240 V

(other voltages between 100 and 500 V are also possible)

CURRENT RANGE

Direct operating meters: 5–20, 10–40, 20–80, 20–100, 10–60, 15–100 A
(other current ranges to maximum 100 A are also possible)

Transformer operated meters: 2.5–10, 3–6 A

CONSTRUCTION

METER CASE

The meter case is adapted for tropical conditions as non-hygroscopic and complies with the flame test given in BS5685, Appendix B (clause 5.6)

Meter base

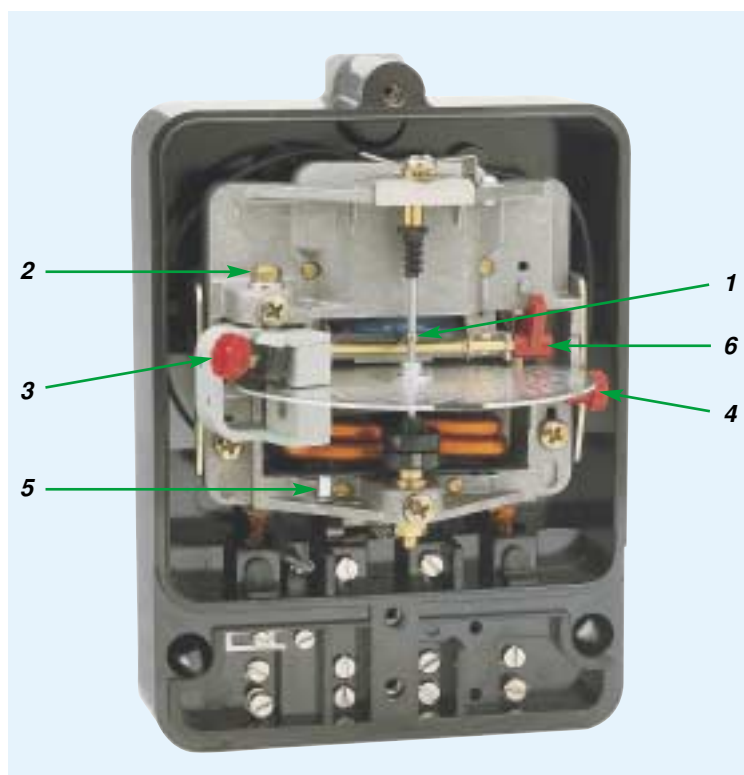
is made of moulded insulating black material (bakelite), highly resistant to creep currents. It makes an integral part with the meter terminal block.

Connection terminals are inserted into the terminal aperture from the inside of meter base, and are made of nickel plated brass. The diameter of a terminal hole is up to 9.5 mm, suitable for connection of external conductors. Each terminal is provided with two M6 clamping screws. The hook is fixed to the base rear side. A carrying handle can be provided on special request.

Terminal cover

is insulation-type made of bakelite as the meter base, or it can be transparent made of modified polymethyl-methacrylate as a standard version, or polycarbonate on request.

It protects the terminal block against unauthorised access. The terminal block is sealed with one sealing screw independently of the meter cover and can be short or extended. Extended cover type meters are normally supplied unless short terminal cover is requested. A connection diagram is impressed into the terminal cover from the inside.



SETTING ELEMENTS

are easily accessible and are manually adjusted without special tools. Interactive setting influences are at a minimum.

- 1 – **starting adjustment**
- 2 – **coarse braking element adjustment**
- 3 – **fine braking element adjustment**
- 4 – **low load adjustment**
- 5 – **coarse adjustment of inductive load**
- 6 – **fine adjustment of inductive load**

Meter cover

is insulation-type made of bakelite as the meter base, or it can be transparent made of modified polymethyl-methacrylate as a standard version, or of polycarbonate on request. The bakelite cover is provided with a glass window through which the meter register can be read and the rotor observed. The window is fixed into the cover by means of four fixing washers and sealed with silicon compound. A sealing gasket in the cover prevents the penetration of dust, humidity or other particles into the meter. Both covers are provided with two sealing screws.

DRIVING SYSTEM

A tangential driving system is attached to a supporting frame. The voltage electro-magnet is wound onto a coil of thermoplastic material, sealed with duroplon and covered with a shrinkable plastic tube allowing for a high break-down strength. The

winding of the current electro-magnet is located on the divided coil of plastic material and is thereby insulated against the core. The beginning and the end of the winding can be attached to the terminal directly or over a filament wire soldered to the terminal. Both the current and voltage electro-magnets are positioned on the frame with a plug.

METER ROTOR

The rotor is a light, circular, rigid stamping of electrolytic aluminium, 90 mm in diameter and 1 mm thick, die-cast with aluminium alloy to a stainless steel spindle.

On request 100 radial, equal black divisions can be printed around the circumference to allow stroboscopic calibration and testing. The black mark for observation of meter rotation is printed out on the top surface of the disc. The register is driven by a moulded worm, made of polyamide, which is fitted to the spindle. A

graphite sleeve is impressed into the worm on the upper part of the shaft. An optional extra reverse running stop can be fitted to the meter to prevent registration under conditions of reverse power flow.

BRAKING MAGNET

The braking magnet is a two-directional version. The U-shaped magnetic cubes are of AlNiCo alloy with high coercivity which reduces the influence of short-circuit thrusts on the measuring accuracy of the meter. A wide range of rotor speed settings is possible by moving the whole magnet, and fine speed setting is guaranteed with a micro-meter control. Large temperature compensation is provided with the compensation plates made of a special alloy.

TECHNICAL DATA

DIRECT OPERATING METERS

Type	E89C		E89E	E89F	E89G	
Reference voltage U_r	240 V					
Reference frequency f_r	50 Hz					
Basic – Maximum current I_b–I_m	5–20 A	10–40 A	20–80 A	20–100 A	10–60 A	15–100 A
Thermal current	24 A	48 A	120 A		72 A	120 A
Self-consumption:	0.9 W 3.7 VA		0.9 W 4.25 VA	1 W 3.9 VA	0.9 W 4.25 VA	
– voltage electro-magnet	0.26 W 0.40 VA		0.26 W 0.38 VA	0.12 W 0.23 VA	0.14 W 0.21 VA	
– current electro-magnet at I_b	0.18 W 0.35 VA					
Torque at U_r, I_b, f_r	4.2×10 ⁻⁴ Nm		4.1×10 ⁻⁴ Nm		3.8×10 ⁻⁴ Nm	3.5×10 ⁻⁴ Nm
Rated number of revolutions at U_r, I_b, f_r	24 r.p.m.		19.2 r.p.m.		15 r.p.m.	14.4 r.p.m.
Starting current	0.5 % I _b					
No-load operation	without no-load operation between 80 % and 120 % U _r					
Test voltage	4 kV, 1 min.					
Voltage thrust (1.2/50 μs)	>7 kV (on special request >10 kV)					
Adjustment range:	44 %		28 %		33 %	37 %
5 %, Unity power factor approx.	rough 30 %, fine 5 %					
I _m /2, Unity power factor approx.	4.2 %					
I _m /2, 0.5 power factor approx.	1.57 kg					
Meter weight						

TRANSFORMER OPERATED METERS

Type	E89CT	E89AT
Reference voltage U_r	240 V	240 V
Reference frequency f_r	50 Hz	50 Hz
Basic – Maximum current I_b–I_m	2.5–10 A	3–6 A
Thermal current	12 A	7.2 A
Self-consumption:	1 W 3.9 VA	
– voltage electro-magnet	0.11 W 0.23 VA	
– current electro-magnet at I_b	0.22 W 0.29 VA	
Torque at U_r, I_b, f_r	4.3×10 ⁻⁴ Nm	3.7×10 ⁻⁴ Nm
Rated number of revolutions at U_r, I_b, f_r	15 r.p.m.	23 r.p.m.
Adjustment range:	44 %	
5 %, Unity power factor approx.	rough 30 %, fine 5 %	
I _m /2, Unity power factor approx.	4.2 %	
I _m /2, 0.5 power factor approx.		

Other technical data same as for direct operating meters.

BEARINGS

Upper bearing

is a spindle version and serves as an axial rotor guide. A pin made of stainless steel smoothly slides in the sintered graphite bearing. The pin is pressed in to the brass sleeve. The pin is rounded in order to prevent damages of the bearing surfaces. A sleeve with the pin is fastened to the meter frame.

Worm

A graphite insert is pressed in to a plastic guide and forms an integral part with the worm. The bearing has very low and time-constant friction. No lubrication is required.

Lower bearing

is designed as a carrying bearing. The repulsive magnetic field of both bearing parts completely compensates the rotor weight. The upper part of the magnetic bearing is pressed on to the rotor shaft together with the graphite guide. The lower

part of the magnetic bearing is fixed to the meter frame together with a guiding pin and brass internal and external sleeves. A plate for temperature compensation is a part of the lower magnet assembly, as well. A guiding pin is made of quality stainless steel. It is rounded on the lower part in order to prevent damages of the bearing surfaces.

The bearing has small and time constant friction what assures long life of the meter. No lubrication of the bearing is required. The bearing height can be set and there is no need to reset the height in case of rotor replacement.

REGISTERS

Single- Rate Register

consist of six or seven graduated drums. The periphery of the last drum is divided in 100 sections. Thin polished axles are rotating in plastic bearings causing minimum friction and high error stability at small loads. No lubrication of bearings is necessary. The register framework can be fastened to the meter framework with one screw without an adjustment plate, so that the worm and the worm wheel fit each other completely.

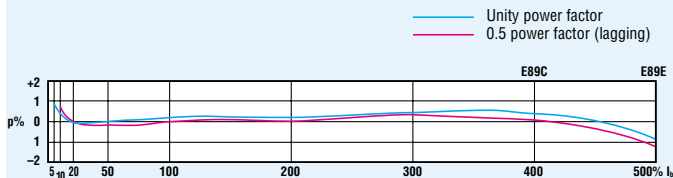
Two versions of single-tariff register are produced: a register with standard digit drum with the size of numbers 4,7x2,3 mm and a register with larger digit drum with size of numbers 6,9 x 3,65 mm.

The continuous- resetable type and the jumping- resetable type of large register are also available.

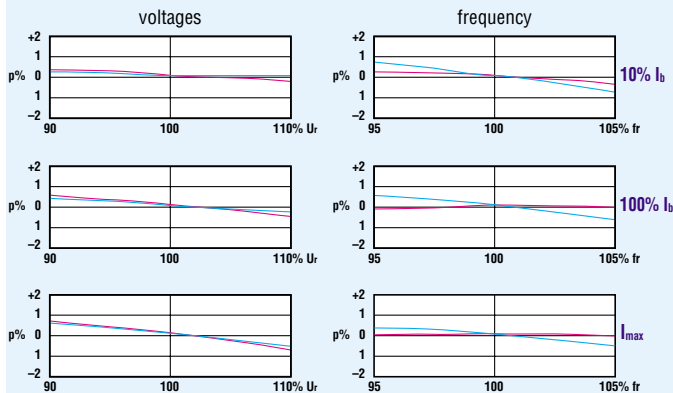
TYPICAL PERFORMANCE CHARACTERISTIC

– type E89C, E89E

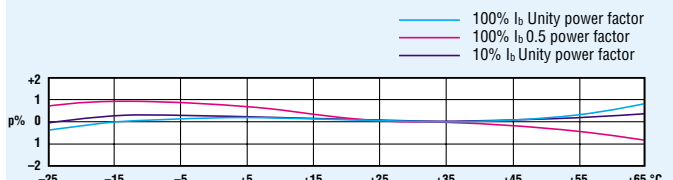
Load dependence



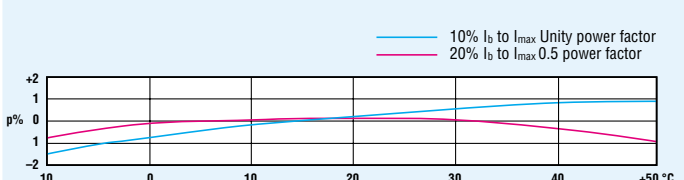
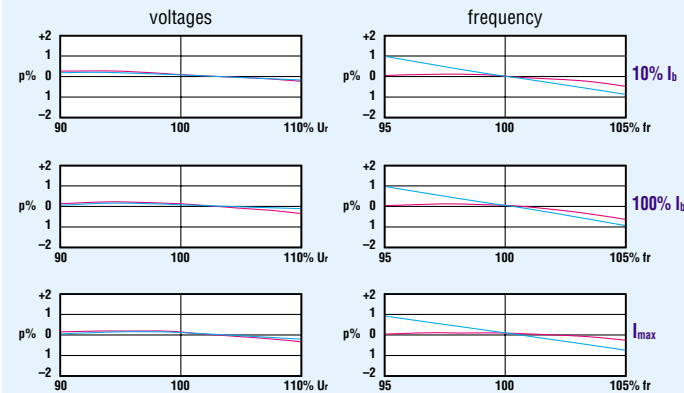
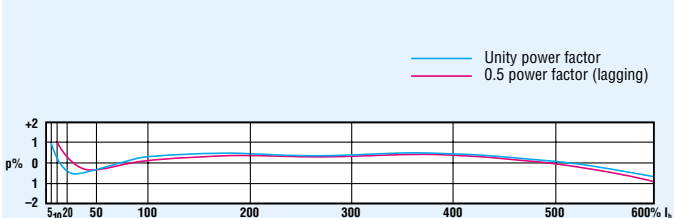
Influence of change in:



Dependance on external temperature



– type E89F



Two-tariff register

has six or seven digits for each tariff. The rear register circumference is divided in 100 sections. The tariff switchover is enabled by a change-over relay functioning via differential gear. Thus the register display error at switchover from the first to the second tariff and vice-versa is eliminated.

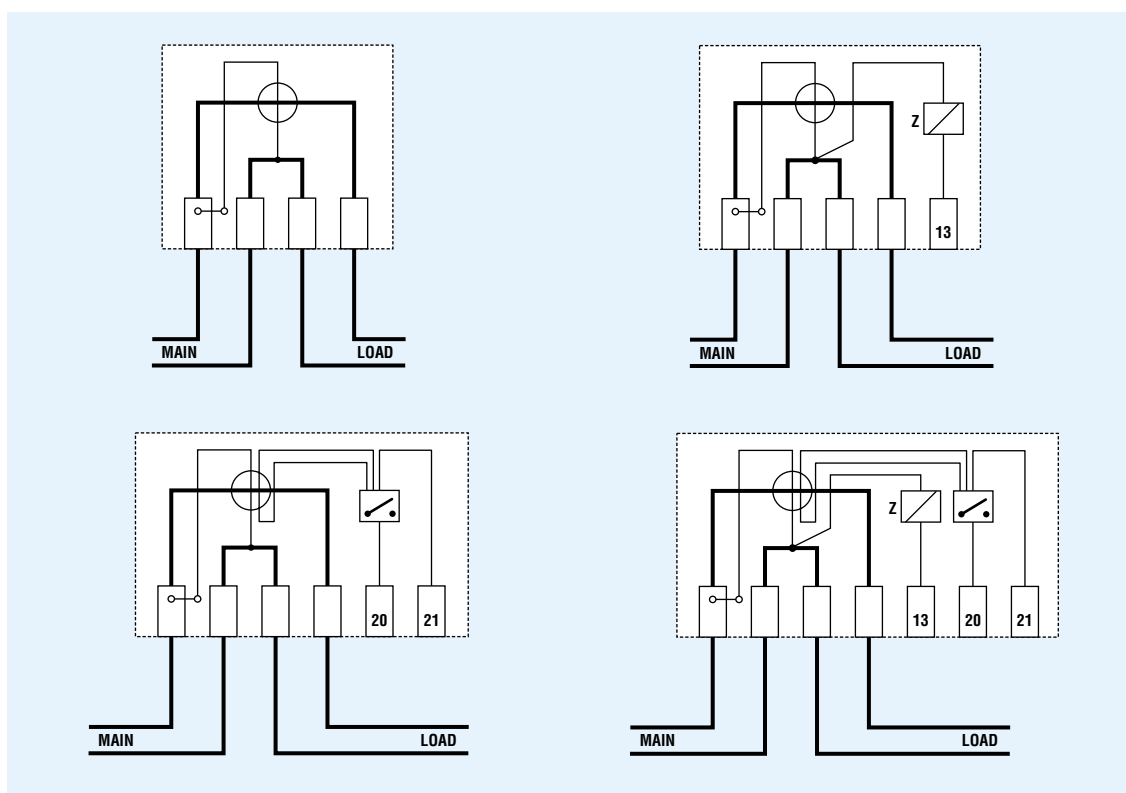
The two-tariff register registers with one tariff when the relay is not under voltage and with the other when it is under voltage.

The change-over relay is a D.C. version supplied via the incorporated rectifier and protective resistor.

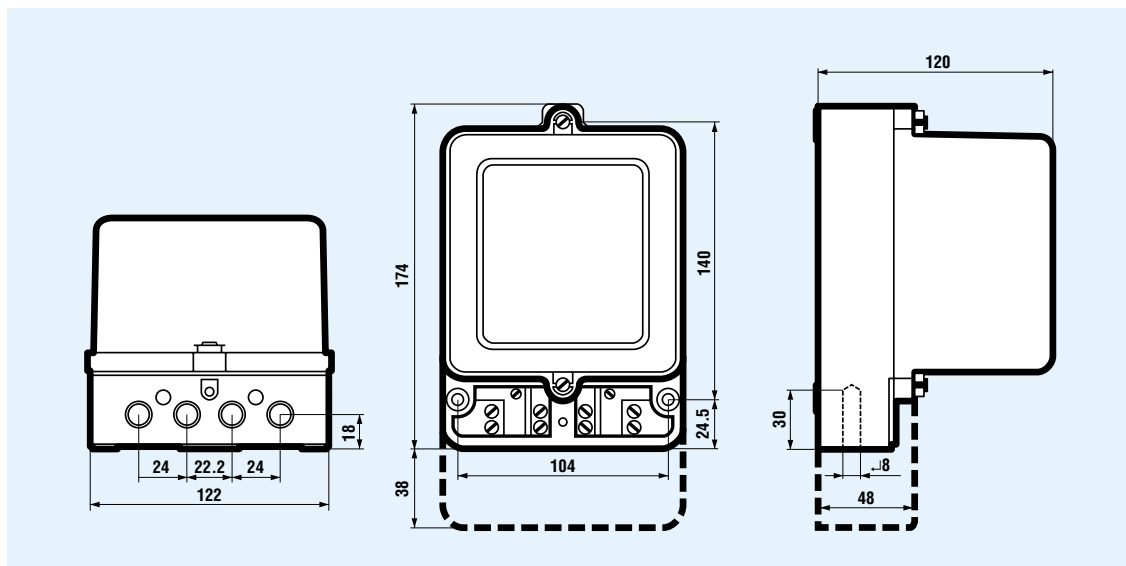
REVERSE RUNNING STOP

The reverse running stop can be incorporated on special request. It is built-in at the upper bearing and acts on the toothed part of the upper bearing sleeve with worm. A hardly discernible friction has no effect on meter accuracy.

CONNECTION DIAGRAMS



ASSEMBLING DATA



Order specifications

Example

- 1. Meter type:E89C2
- 2. Reference voltage:240 V
- 3. Reference frequency:50 Hz
- 4. Basic and maximum current:20–80 A
- 5. Meter terminal cover:extended cover
- 6. Register:cyclometer type
- 7. Lower bearing version:magnetic bearing
- 8. Additional information (where necessary):
ownership on name plate, carrying handle, reverse running stop, connections, ...

If no requirement is given under points 6, 7 and 8 then a meter version with short terminal cover, register with large drums and magnetic bearing, is supplied.

Packaging

The meters are supplied individually or in groups in boxes.
Data on dimensions and gross weight depend on packaging:

Packaging for	No. of packed meters	External dimensions of packages (mm)	Gross weight approx. kg
individual	1	193×129×127	1.7
truck	160	1200×800×1005	290
container (22 feet)	192 (4992)	1200×760×1050	345
wooden box	200	1276×872×1038	325

Packaging depends on destination, type of transport and specific requirements of individual buyers.

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