

# S12 Single and S34 Three Phase Meters

S12



S34



# Autometers

is a specialist company engaged in the design, manufacture and supply of electricity metering and energy measurement systems. It has the experience, technical capability and manufacturing resources to provide practical and cost effective solutions to consulting electrical engineers and electricity supply authorities throughout the world.

As a United Kingdom based company with global manufacturing capabilities Autometers produces a selection of metering and measuring devices and systems ranging from single and polyphase electro-mechanical kWh meters, to an array of sophisticated, fully programmable Information Centres built to comply with the most demanding operating standards for accuracy and reliability. Autometers has established its reputation on the highest levels of innovation, quality and service and has been a leading supplier to switchboard manufacturers, wholesalers and electricity supply companies for more than 40 years,

## Tropicalisation

All components in the S12 Single phase and S34 Three phase meters have been specially selected and treated to protect against corrosion. Steel laminates around the voltage coil have been electro painted.

S12 Single and  
S34 Three Phase Meters

The **S12** is the latest Single Phase Ferraris induction type meter from Autometers Limited.

The meter's modular design and construction means that common parts can be fitted into single and three phase meters resulting in a more efficient manufacturing process and an effective reduction in the price of the meters.

The modular construction also means that servicing costs are been kept to a minimum and the wide measuring range ensures accurate measurement at both low and high loadings.

The 20-100 amp meter has been designed and manufactured with the modern house in mind, where the ever increasing use of new electrical appliances can increase the day time load quite dramatically.

The S12 (20-100 amp) meter enables electricity authorities to install the meter with total confidence, realising these expected high demands, and at the same time recording accurately the very low demands during the night.

A long and trouble-free service life is guaranteed by a state of type art design concept, specialised finishing of components and the stability of the break magnets. Outstanding advantages are the lower magnetic suspension bearings, the none lubricating registering mechanism, the robust measuring assembly and the high dielectric strength at continuous and over surge voltage.

The S12 has been designed to satisfy BSEN 60521 and IEC 521 for class 2 accuracy.



Figure 1. S12 Single Phase Meter

**S12**  
single phase Meters

# Construction

## Case and Cover

The meters are supplied as shown in figure 1 on page, 3 with a case and cover of moulded insulating black material (bakelite) which is highly resistant to creep currents. They are adapted for tropical conditions as non-hygroscopic and comply with the flame test given in BS 5685 appendix b (clause 5.6). There is a rubber gasket, which acts as a seal between the case and the cover.

A clear polycarbonate cover is also available.

## Window

The cover is provided with a glass window through which the meter register may be read and the rotor observed. The window is fixed in the cover by four fixing washers and is sealed by strong sealing material.

## The Terminal Compartment

This is an integral part of the meter case and is dust proof. The nickel-plated brass terminals are inserted into the aperture from inside of the meter base. Maximum diameter of the terminal hole 8.2mm.

The voltage circuit can be disconnected from the current circuit in two ways:

- Under the main cover by removing the voltage coil connection from the current to the voltage terminal or,
- Under the terminal cover by removing the terminal link.

There are two terminal covers available

- short, which covers only the terminal compartment, and extended, which extends below the meter. Both covers are sealed independently from the meter case.

## Driving System

The tangential drive is fixed to an aluminium alloy frame, and consists of separate voltage and current coils.

The voltage coil is wound onto a plastic frame, and then completely encapsulated in plastic, to give high breakdown resistance which helps to prevent humidity penetrating into the coil. The current electromagnet is synthetic resin insulated wire, again formed around a plastic frame. Both these plastic frames and the voltage coil encapsulation are made from high temperature and electrically resistant thermoplastic, adding additional insulation from the aluminium frame.

Voltage and current coils can easily be replaced on the frame whilst maintaining the original air gaps.

## Magnetic Suspension

The magnetic bearing has two magnetic parts with equally polarised adjacent surfaces. Due to the mutually repelling forces between the two magnetic surfaces and the rotor weight, the rotor magnet floats at a distance from the stator magnet. The rotor is guided by a highly polished spindle which projects from the lower part of the bearing into the upper part, its upper pin acts as an armature guide for the rotor.

The stainless steel spindle runs in a graphite sleeve, making lubrication unnecessary.

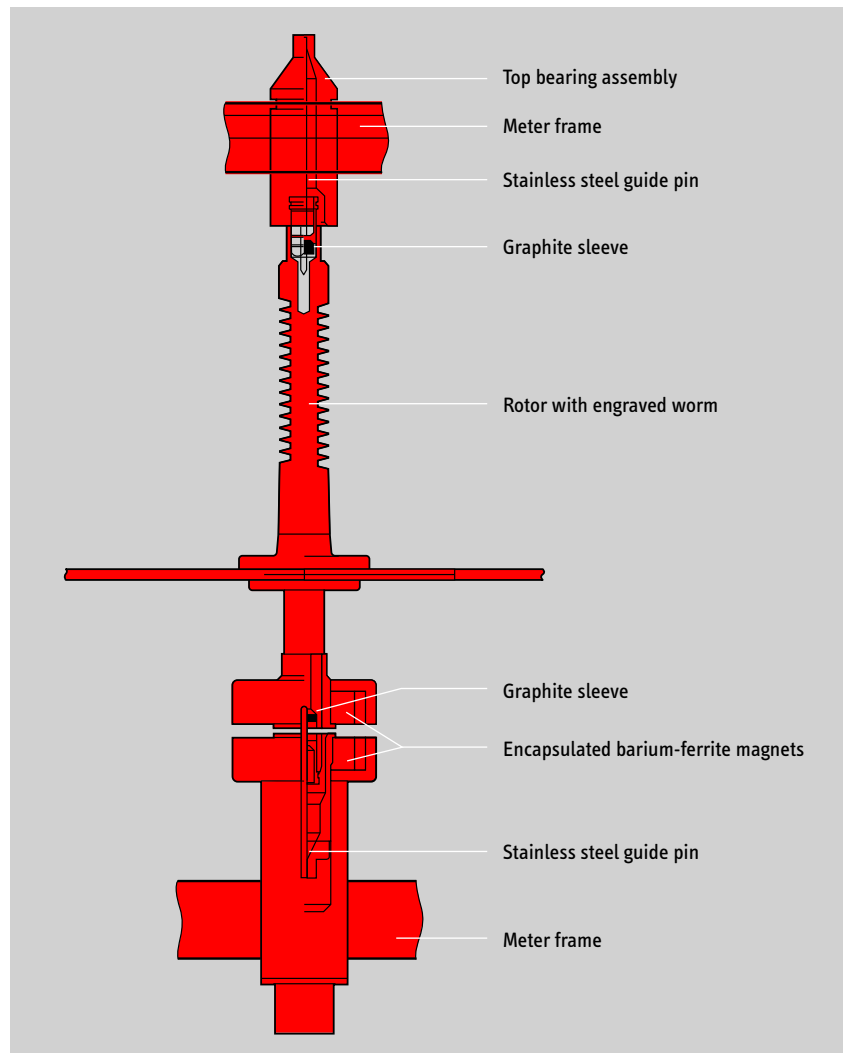


Figure 2. Magnetic Bearing Suspension

**Braking Magnet**

The two directional magnet has U-shaped cubes of high coercivity alnico alloy, which reduces the influence of short circuit thrusts on the measuring accuracy of the meters. The magnet is fixed on the aluminium frame by means of two screws with spring washers to prevent any positional movement while being handled. Such a rigid design ensures that the meter maintains a very stable accuracy. Adjustment of the magnet is by means of sliding the shunt plate. This allows for adjustment of approximately  $\pm 4\%$  range of the rotor speed setting.

**Energy Register**

There are two types of register available for the S12 meter; the continuous drive or the jumping figure type. Both registers can accommodate six figures or seven figures. The numbers are 6.9mm high and 4mm wide. The white figures on black plastic drums represent kWh and decimal numbers are represented by red figures on a white plastic drum. The lowest figure is divided into one hundred sections. The register mechanism is housed in an aluminium grid and incorporates a location plate enabling the register to be placed on the meter without alteration in depth of the meshing of the worm wheel. The worm wheel and the remaining gears are nickel plated brass which are then positioned on highly polished steel spindles.



Figure 3. Six Figure Register

**Rotor System**

The rotor system is a light circular rigid stamping of electrolytic aluminium, 84mm in diameter and 1mm thick, die cast by aluminium alloy to the spindle.

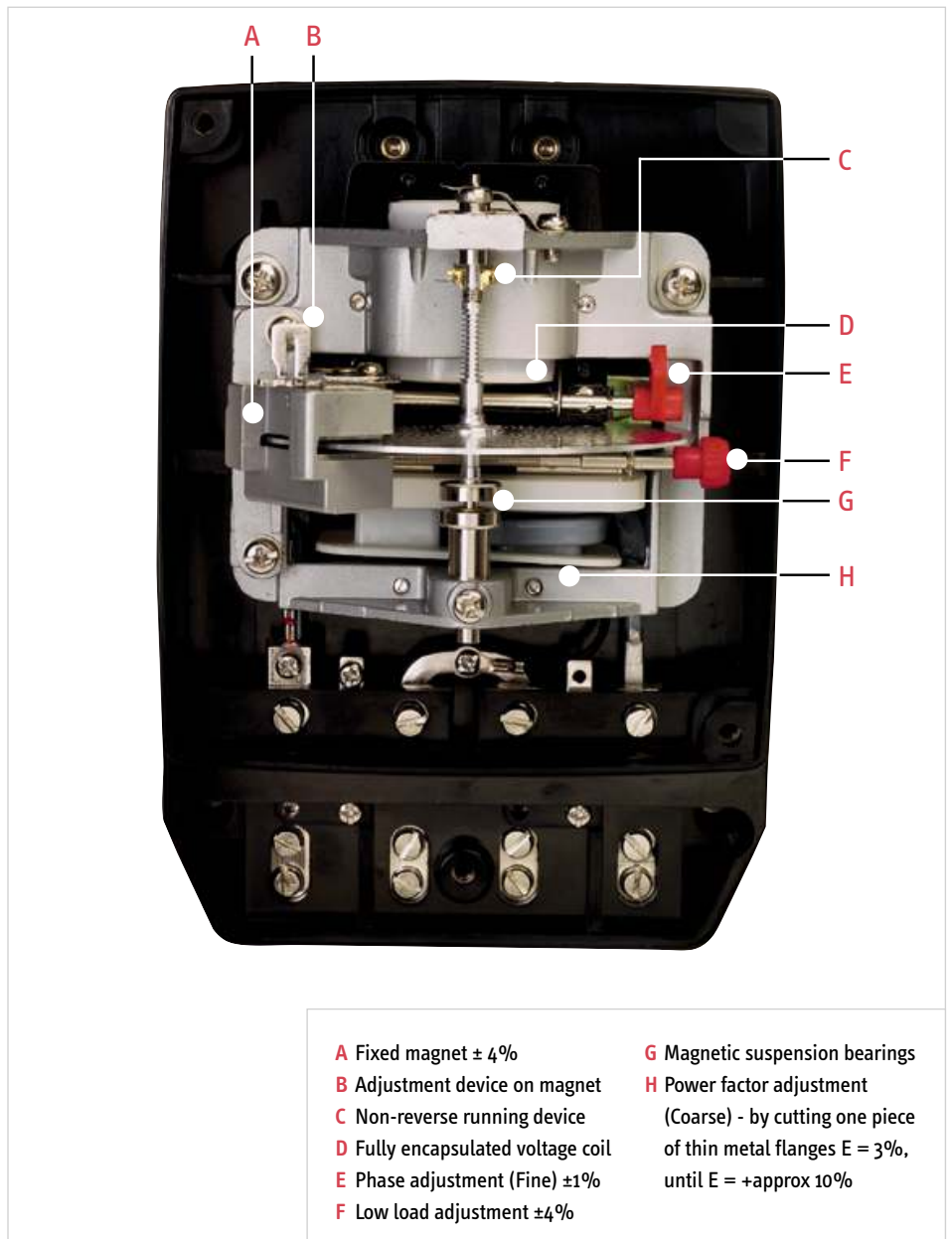
The worm gear is engraved onto the aluminium spindle.

On request 100 radially equal black divisions can be printed around the circumference to allow stroboscopic calibration. The standard meter has one black mark on the edge of the rotor.

An optional extra non-reverse device can be fitted to the meter to prevent registration under conditions of reverse power flow.

**Measuring Assembly**

The meter-driving element of the Ferraris induction type meter is rigidly mounted on a robust aluminium alloy die-cast frame, which is secured to the meter base by means of two screws. The aluminium frame also carries the voltage coil, current coil permanent magnet, the rotor, and the register.



- A Fixed magnet  $\pm 4\%$
- B Adjustment device on magnet
- C Non-reverse running device
- D Fully encapsulated voltage coil
- E Phase adjustment (Fine)  $\pm 1\%$
- F Low load adjustment  $\pm 4\%$
- G Magnetic suspension bearings
- H Power factor adjustment (Coarse) - by cutting one piece of thin metal flanges E = 3%, until E = +approx 10%

Figure 4. S12 Adjustment Devices

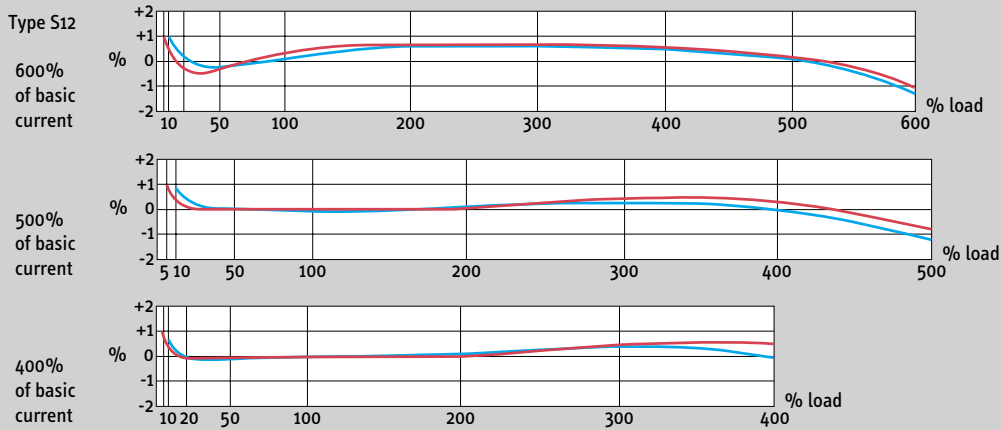
# Technical Data

## Performance data valid for all current ratings

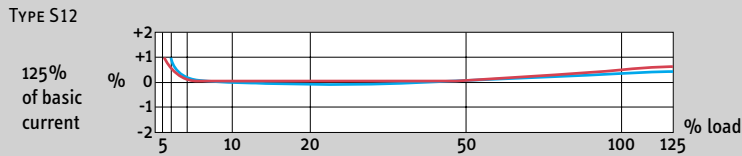
Meter type	S12		S12								
Type of connection	CT		Whole current								
Current loading (%basic current)	120		400			500			600		
Basic to maximum current load (A)	1-1.2	5-6	5-20	10-40	15-60	20-80	5-25	10-50	20-10	5-30	10-60
Standard reference volt Uref(V)	240										
Optional reference voltage (V)	Any value between 110-300										
Standard frequency (Hz)	50										
Optional frequency (Hz)	Any value between 40-60										
Torque at Uref, load, f (10-5Nm)	47		46			40					
Rated rotor speed (rev/min)	21.6	30	10.8	10.8	10.8	12	12	12	12	12	12
Current circuit at load (VA)	0.31	0.29	0.25	0.26	0.25	0.28	0.25	0.24	0.26	0.25	0.24
Meter constant at Uref=240V (ref/kWh)	6000	1500	540	270	180	150	540	270	135	500	250
Self consumption in voltage circuit at Uref	0.9W, 0.31VA										
Starting current (%load)	0.5										
Temperature coefficient (%/°C) In temperature range from -5 to+60°C	At Upf=0.05, at Pfo.5lag=0.07										
Weight of rotor (g)	21										
Accuracy class	2.0										
Net weight (kg)	1.5										
Diameter of terminal holes	>5mm		>8mm								

# Performance Characteristics At 50Hz

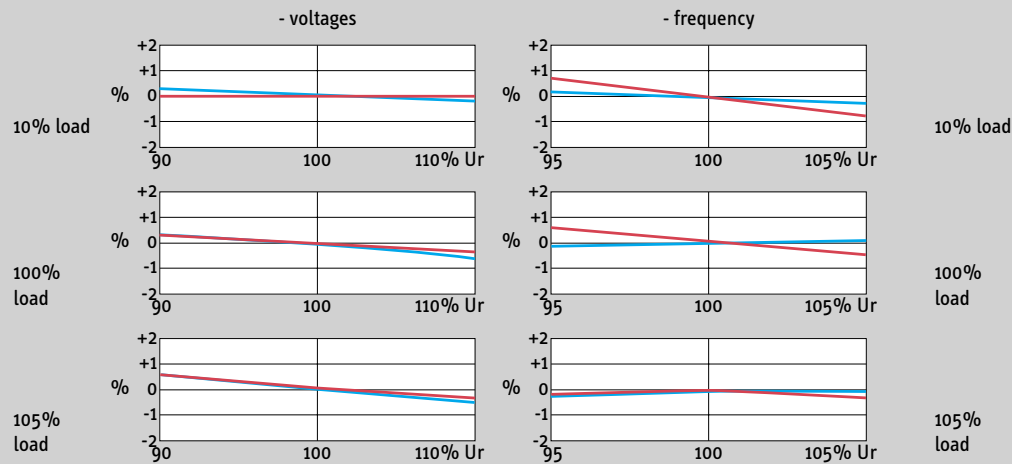
## Load curves of whole current meters



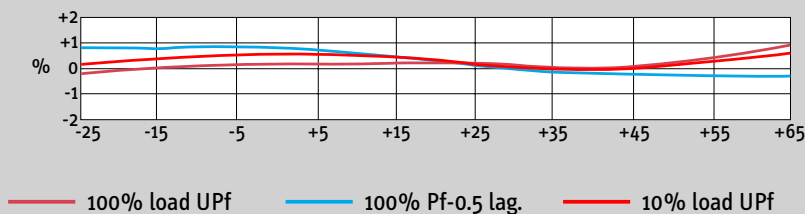
## Load curve of transformer operated meters



## Average values of additional errors

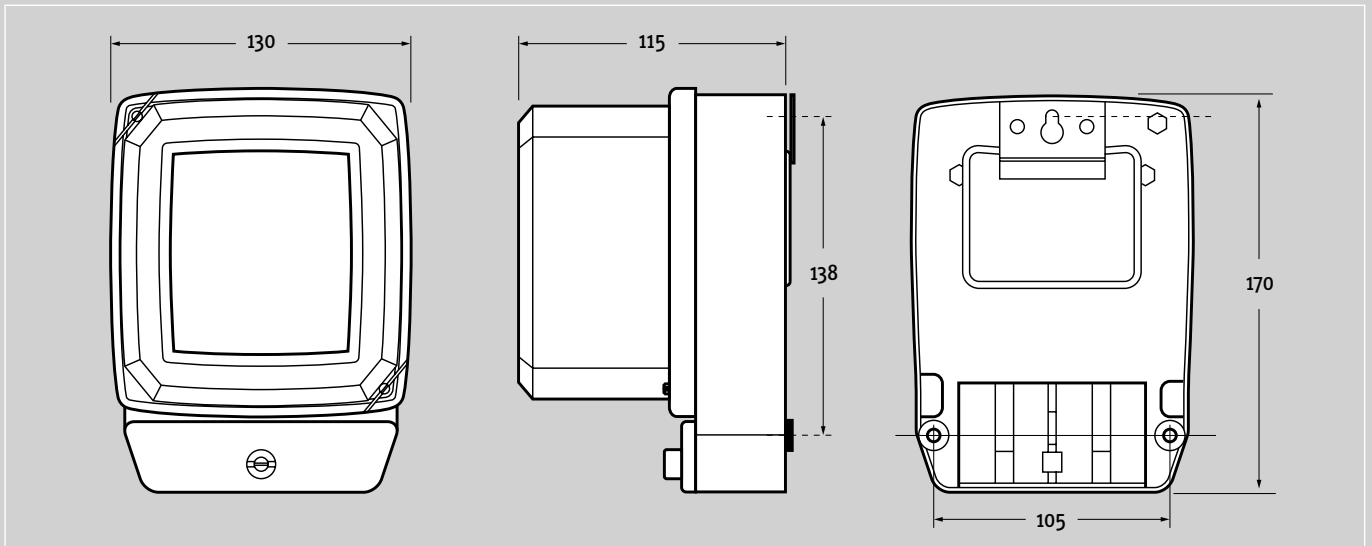


## Error due to temperature variation

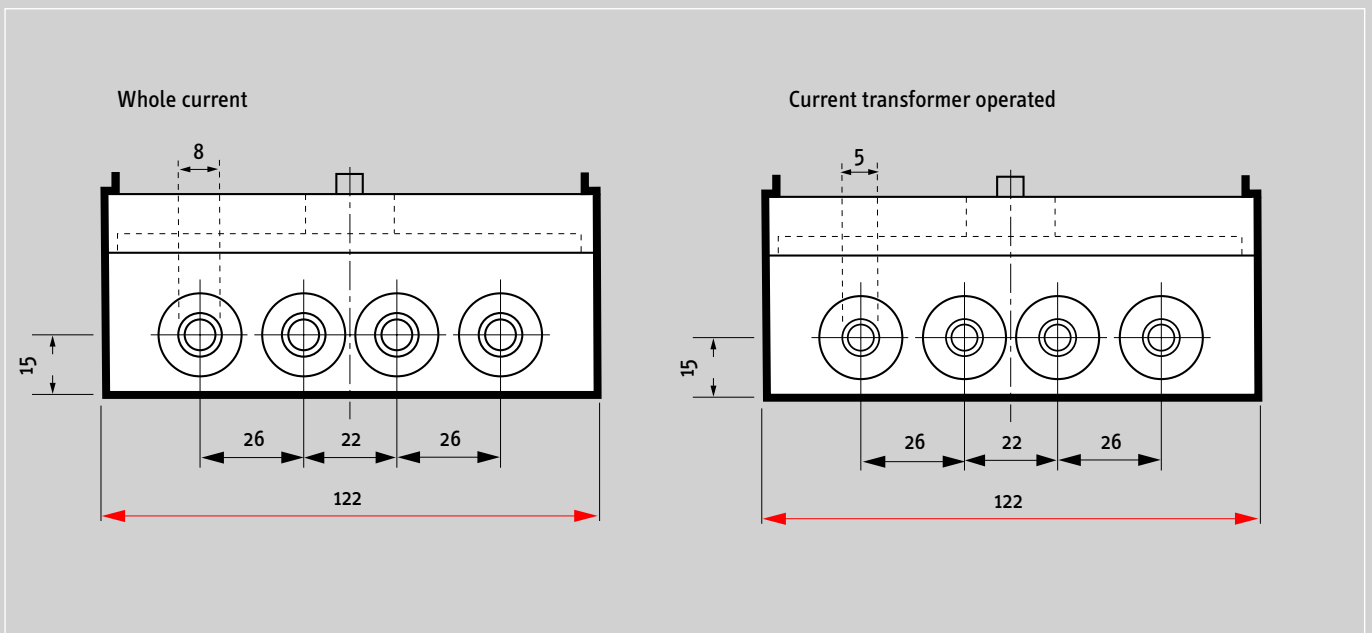


# Installation and Mounting

## S12 Single Phase Meters



## Installation



## Packing specification.

All meters are individually packed in poly foam boxes.

Packed Sizes. 195 x 145 x 140mm





Autometers' new **S34** range of three phase meters is designed to cope with the fluctuating demands produced when peak load requirements, created by the start up of high power appliances, contrasts with very low off-peak requirements.

The flexibility of the S34 means that meters do not have to be changed to deal with the increasing demand.

The new S34 range of three phase meters have been specifically designed and manufactured to record these new demands with consistent accuracy.

The 5-30 Amp meter can record small loads from 15 watts up to 20kW and the 10-60 Amp meter can record from 60 Watts up to 40 KW. For loads above 100 amps it is necessary to use a current transformer operated meter. This too has an extended range to give high sensitivity at low loads.

The S34 (20-100) meter is the latest in the extended range of three phase meters. Like the successful 20-100 Amp single phase version, the three phase meter has now proved to be equally successful. The extended load ranges means that meters do not need to be changed to deal with increasing demand, thereby ensuring a longer service life. Additional features supporting long service life without any need of recalibration include

- magnetic suspension lower bearing
- low rotor speed, low weight of the rotor and light dial train
- high stability of mechanical and magnetic components
- permanence of calibration and enforced insulation.

Overall the S34 extended long range meters results in more accurate measurements and lower maintenance costs.

The S34 has been designed to satisfy BSEN 60521 and IEC521 for class 2 accuracy.



Figure 5. S34 Three Phase Meter

**S34**  
three phase Meters

# Construction

## Case and Cover

The Three phase meter is made up of four insulated parts, the case, the cover, terminal chamber and the terminal cover. The four parts are of moulded insulating black material (bakelite) which is highly resistant to creep currents. They are adapted for tropical conditions as non-hygroscopic and comply with the flame test given in BS 5685 appendix b (clause 5.6). There is a rubber gasket, which acts as a seal between the case and the cover.

A clear polycarbonate cover is also available.

## Window

The cover is provided with a glass window through which the meter register may be read and the rotor observed. The window is fixed in the cover by four fixing washers and is sealed by strong sealing material.

## The Terminal Compartments

The Terminal chamber is a moulded compartment made of Bakelite, into which nickel plated brass terminals are fitted for main service cables.

The compartment has two protruding rails which locate into recesses in the meter base forming a dust seal.

A preformed metal bracket clips onto the back of the meter base and is secured by two screws.

The voltage circuit can be disconnected from the current circuit in two ways:

- Under the main meter cover by removing the voltage coil connection from the current terminal or,
- Under the terminal cover by removing the terminal links. A separate terminal cover is provided.

There are two terminal covers available

- Short, which covers only the terminal compartment, and extended, which extends below the meter. Both covers are sealed independently from the meter case.

## Driving System

The tangential drive is fixed to an aluminium alloy frame, and consists of separate voltage and current coils. The voltage coil is wound onto a plastic frame, and then completely encapsulated in plastic, to give high breakdown resistance which helps to prevent humidity penetrating into the coil. The current electro magnet is synthetic resin insulated wire, again formed around a plastic frame. Both these plastic frames and the voltage coil encapsulation are made from high temperature and electrically resistant thermoplastic, adding additional insulation from the aluminium frame. Voltage and current coils can easily be replaced on the frame whilst maintaining the original air gaps.

## Energy Register

There are two types of register available for the S34 meter; the continuous drive or the jumping figure type. Both registers can accommodate six figures or seven figures. The numbers are 6.9mm high and 4mm wide. The white figures on black plastic drums represent kWh and decimal numbers are represented by red figures on a white plastic drum. The lowest figure is divided into one hundred sections. The register mechanism is housed in an aluminium grid and incorporates a location plate enabling the register to be placed on the meter without alteration in depth of the meshing of the worm wheel. The worm wheel and the remaining gears are nickel plated brass which are then positioned on highly polished steel spindles.

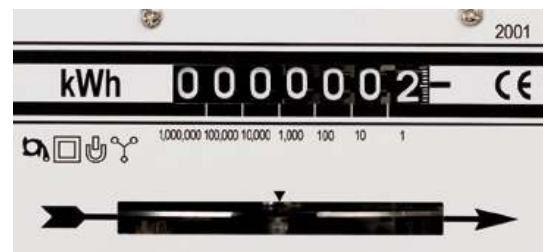


Figure 6. Seven Digit Register

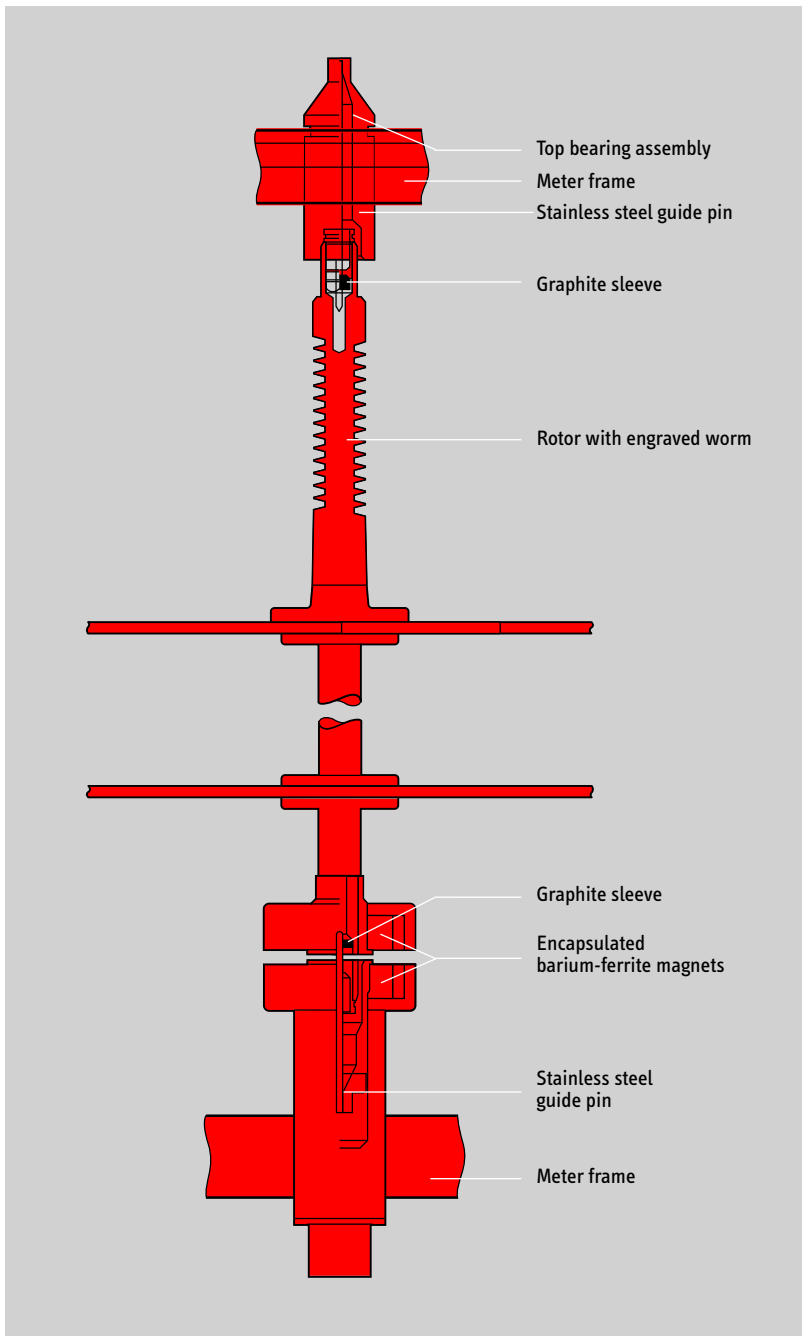


Figure 7. Magnetic Bearing Suspension

### Magnetic Suspension

The magnetic bearing has two magnetic parts with equally polarised adjacent surfaces. Due to the mutually repelling forces between the two magnetic surfaces and the rotor weight, the rotor magnet floats at a distance from the stator magnet.

The rotor is guided by a highly polished spindle which projects from the lower part of the bearing into the upper part, its upper pin acts as an armature guide for the rotor.

The stainless steel spindle runs in a graphite sleeve, making lubrication unnecessary.

### Braking Magnet

The two directional magnet has U-shaped cubes of high coercivity alnico alloy, which reduces the influence of short circuit thrusts on the measuring accuracy of the meters. The magnet is fixed on the aluminium frame by means to two screws with spring washers to prevent any positional movement while being handled. Such a rigid design ensures that the meter maintains a very stable accuracy. Adjustment of the magnet is by means of sliding the shunt plate. This allows for adjustment of approximately  $\pm 4\%$  range of the rotor speed setting.

### Rotor System

The rotor system consists of two light circular rigid stamping of electrolytic aluminium, 84mm in diameter and 1mm thick, dia cast by aluminium alloy to the spindle.

On request 100 radially equal black divisions can be printed around the circumference to allow stroboscopic calibration. The standard meter has one black mark on the edge of the rotor.

An optional extra non-reverse device can be fitted to the meter to prevent registration under conditions of reverse power flow.

# Construction

## Measuring Assembly

The three meter-driving elements of the Ferraris induction type meter are rigidly mounted on a robust aluminium alloy die-case frame, which is secured to the meter base by means of two screws. The aluminium frame also carries the voltage coil, current coil permanent magnet, the rotor, and the register.

## Reactive Energy (VARhour) Meters

These meters are used for the integration of the reactive power in three phase systems. VARhour meters are derived from watthour meters by means of artificial connection with 90 degrees phase displacement. These differ from active energy meters of corresponding types in internal connections of voltage coils while dimensions, characteristic load curves and auxiliary devices are identical. These meters are accurate under all conditions of loading provided the system voltages are equal and symmetrical and the prescribed rotation has been kept.

All reactive energy meters are provided with anti reverse running stops.

### 3 phase 3 wire.

Two - element meters with an auxiliary voltage element to obtain an artificial neutral, for installation in three - wire systems.

### 3 phase 4 wire.

Three - element meters for installation in three and four wire systems.

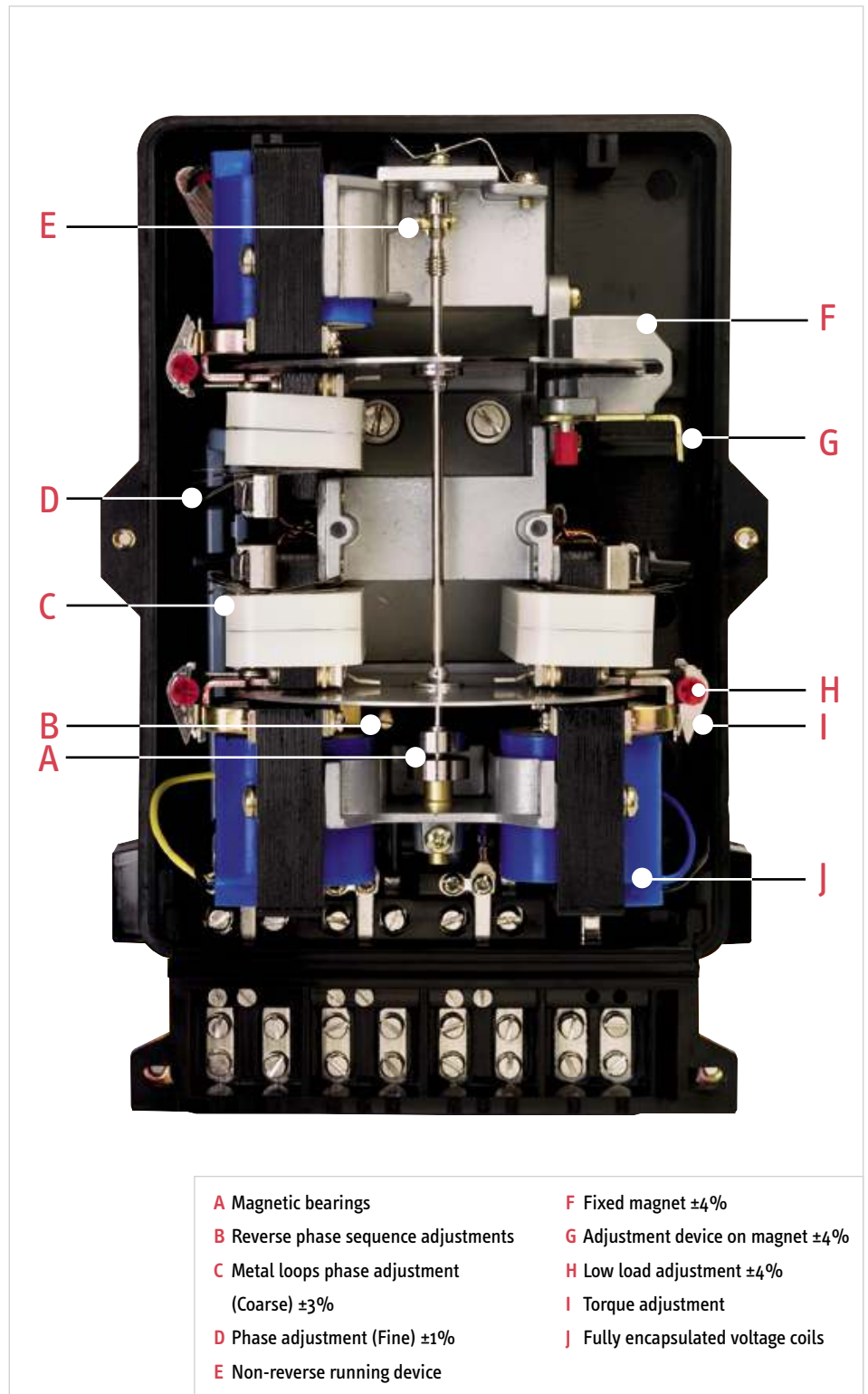
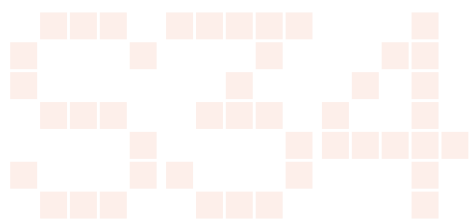


Figure 8. S34 Adjustment Devices

# Technical Data

Performance data valid for all current ratings

Meter type	S34									
Type of connection	CT		Direct connected							
Current loading (%basic current)	120		400			500		600		
Basic to maximum current (A)	1-1.2	5-6	5-20	10-40	15-60	20-100	10-50	5-30	10-60	
Standard reference volt Uref(V)	240									
Optional reference voltage(V)	110-300									
Standard frequency (Hz)	50									
Optional frequency (Hz)	40 - 60									
Torque at Uref, load, f (10-5Nm)	9.5									
Rated rotor speed (rev/min)	17.28	21.60	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64
Current circuit at load (VA)	0.41	0.41	0.41	0.41	0.41	0.36	0.4	0.45	0.45	
Meter constant at Uref=240Vrev/KWh	1440	360	72	48	36	72	36	144	72	
Self consumption in voltage circuits at Uref	1.1W									
Starting current (% load)	0.5%lb									
Temperature coefficient (%/°C) in temperature range from -5 to +60 °C	0.02									
Weight of rotor (g)	55									
Accuracy class	2									
Net weight (kg)	3.665									
Power loss of two rate register	-									
Diameter of terminal holes	>5 mm					>8 mm				

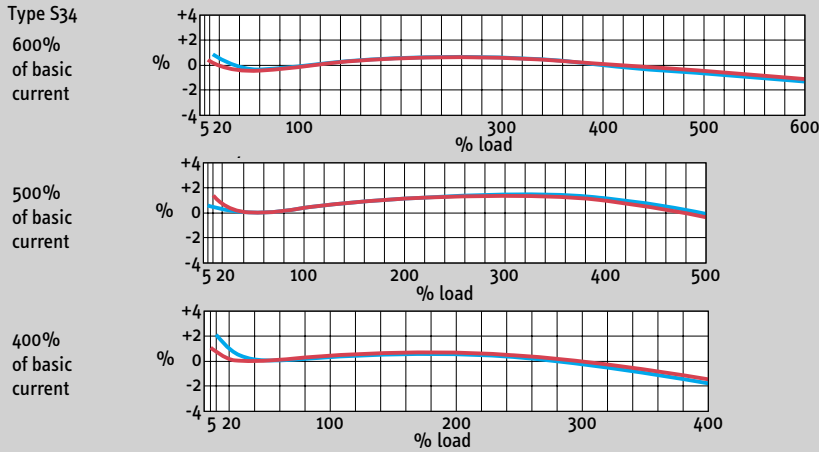


three phase Meters

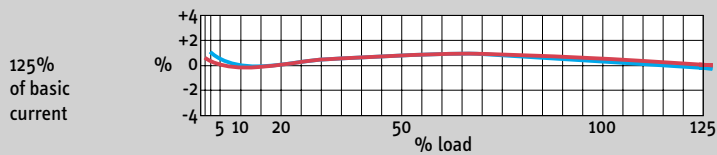
# Typical Performance Characteristics at 50Hz

The characteristics below are for basic meters. The differences in these characteristics for various current ratings are negligible, no additional errors occur in case of the two rate version.

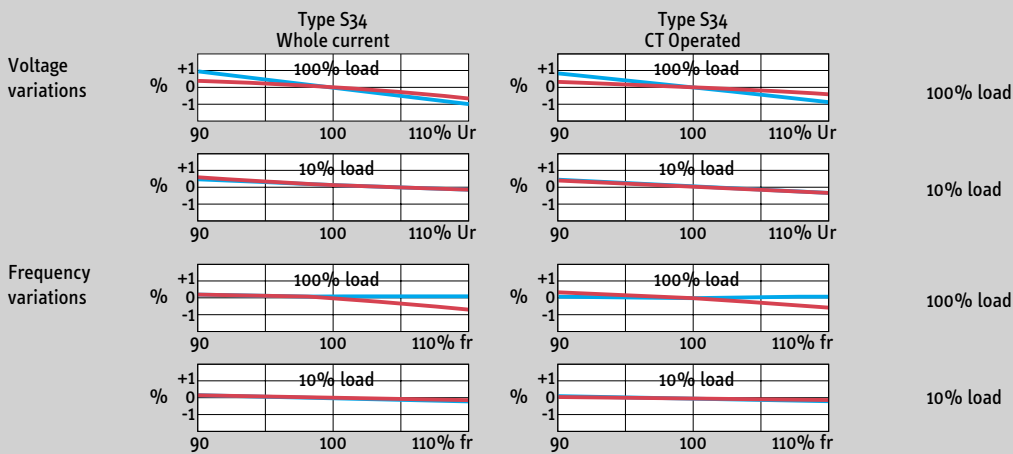
## Load curves of whole current meters balanced loads



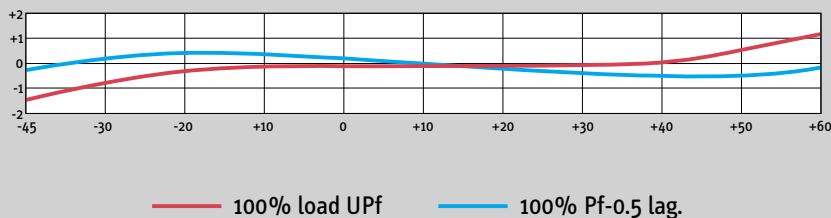
## Load curve of transformer operated meters



## Average values of additional errors

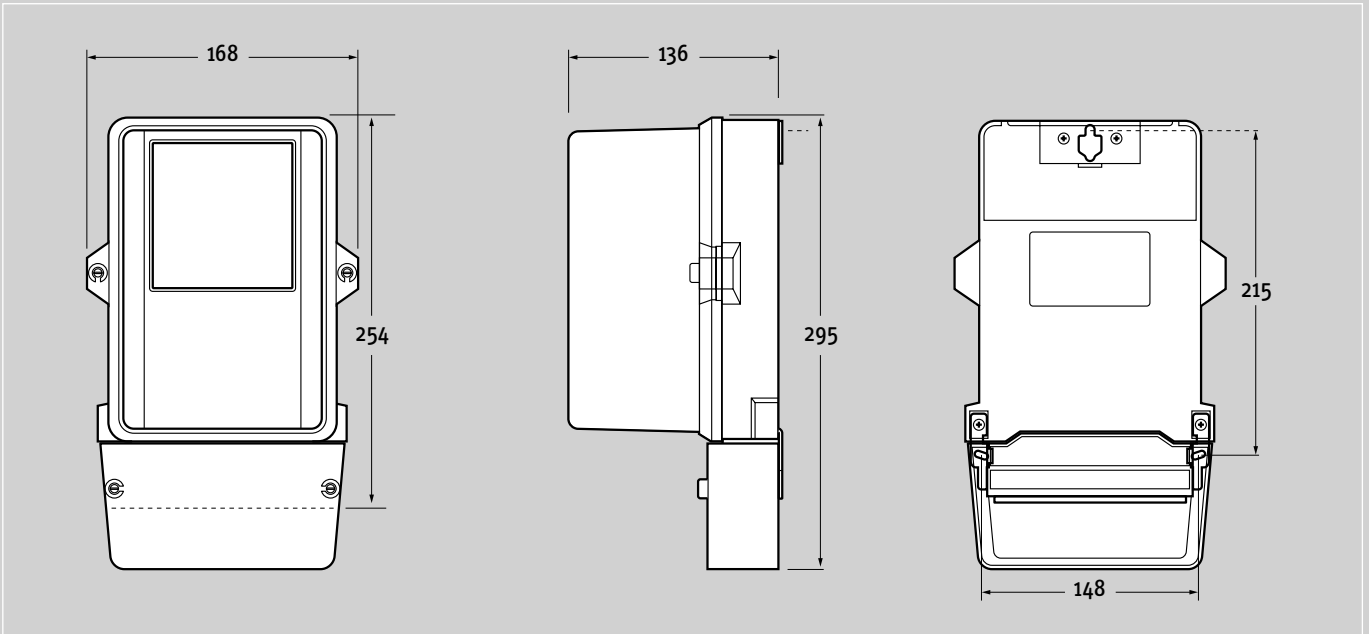


## Error due to temperature variation

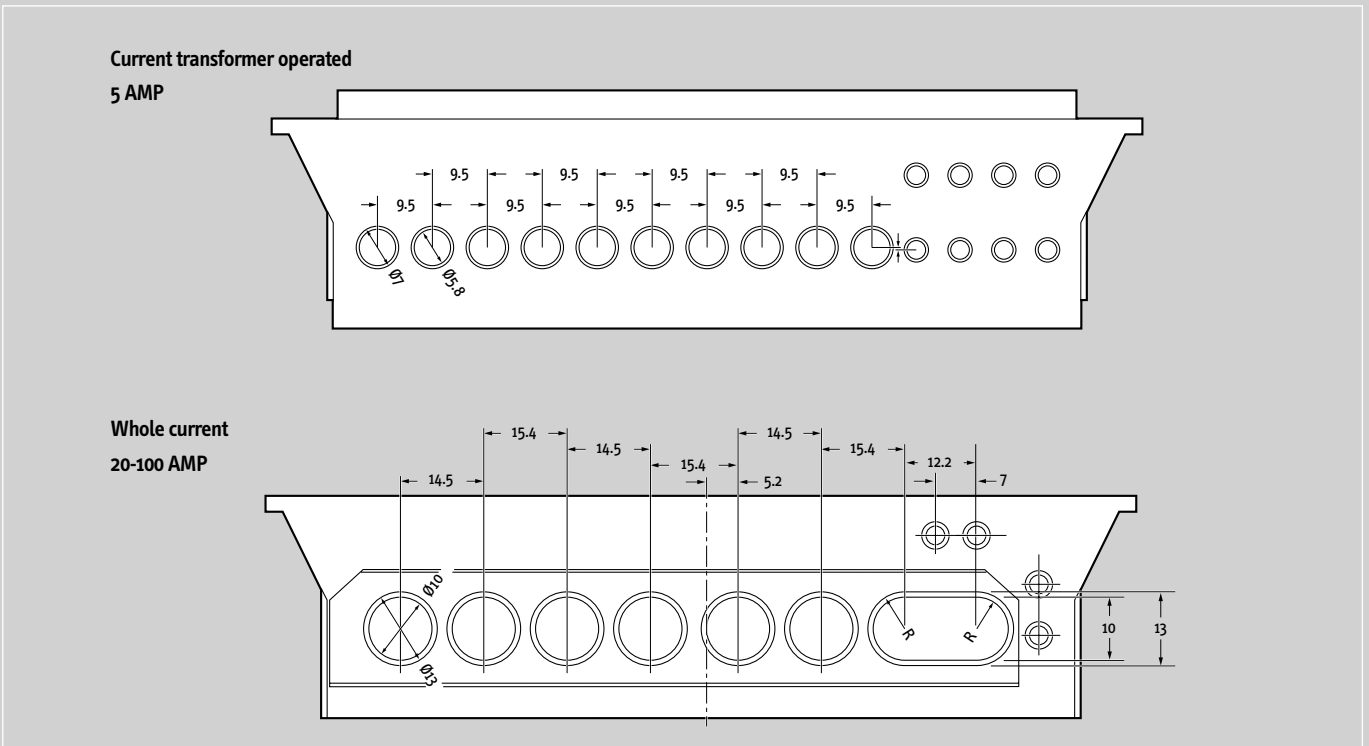


# Installation and Mounting

## S34 Three Phase Meters



## Installation



Packing specification.

All meters are individually packed in Polyfoam Boxes.

Dimensions 320 x 195 x 170mm



# AUTOMETERS

## THE METERING AND MONITORING SPECIALIST

Autometers Ltd

4B Albany Road, Chorlton-cum-Hardy, Manchester M21 0AW

Tel: +44 (0)161 861 9056

Fax: +44 (0)161 882 0499

email: [autometerslimited@btinternet.com](mailto:autometerslimited@btinternet.com)

[www.autometers.co.uk](http://www.autometers.co.uk)

Product development is continuous and the Autometers Group of Companies reserves the right to make alterations and manufacture without notice.  
Products as delivered may therefore differ from the description and illustration in this publication.