Three Phase ME Series
Surface mounting type

Three Phase MP Series
Surface mounting type

Three Phase MPE Series
Flush mounting type
Or Panel mount type

Flush Mount MPE Series

All meters are produced strictly to comply with, where applicable, international standard such IEC 60521 and Germany standard, VDE 0418 which are synonymous to British standard, BS 5685. This energy meters are used for the measurements of active power and reactive power in electrical networks and installations.

This Ferraris-type kWh & kVarh meters in electrical three phase system with optional features of pulse outputs; max demand; Class 2.0 accuracy or Class 1.0; magnetic or double-jewel bearings or panel mounting type etc.

Three-phase energy meters of the ME, MP series types are used for measuring electric energy in three-phase systems of low voltage or hi voltage system of 50 Hz or 60 Hz. The three-phase energy meters available for direct connection or transformers connection.

This ME, series types with identical measuring systems are available according to wiring of circuits on the terminal block and according to attachment dimensions of the case: It has asymmetric connection of the terminal block with double neutral terminal on the right-hand side with current rating up to max. 100 A. In case of indirect connection, both the voltage and current terminals are the same. This design can also be delivered with an integrated base with terminal block of dimensions prescribed by DIN standards. It has attachment dimensions of case and terminal block corresponding to British Standard IEC, BS 60521, symmetric or asymmetric connection or with the sectional current coil for single-phase systems with current rating max. up to 100 A.

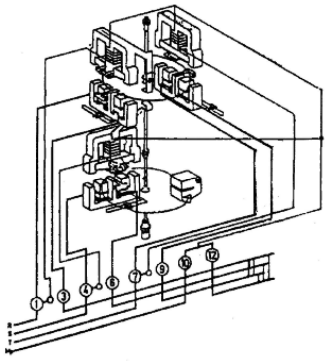
According to the number of driving elements are available:

ME SURFACE MOUNTING TYPE
Driving elements for application in three-phase three-wire systems or four-wire systems (star connection) with current ratings up to 100 A, designed for direct connection and CT 5A or 1A connection with PT rated 100, 110, 115,120V all available. Besides the single-rate version special meters with tariff accessories are available, i.e. two-rate meters, three-rate meters, for energy supply and consumption. Another group is represented by transmitting meters for remote metering and two-rate excess-energy meters.

MP SURFACE MOUNTING TYPE
Driving elements for application in three-phase three-wire systems or four-wire systems (star connection) with current ratings up to 100 A, designed for direct connection and CT 5A or 1A connection with PT rated 100, 110, 115,120V all available. Besides the single-rate version special meters with tariff accessories are available, i.e. two-rate meters, three-rate meters, for energy supply and consumption. Another group is represented by transmitting meters for remote metering and two-rate excess-energy meters.

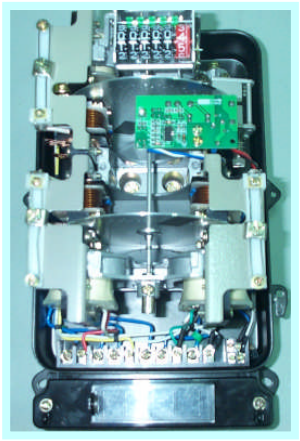
MPE FLUSH MOUNTING TYPE
This type of meter designed for mounting to panel directly with convenient and easy to install. Driving elements for application in three-phase three-wire systems or four-wire systems (star connection) with current ratings up to 100 A, designed for direct connection and CT 5A or 1A connection with PT rated 100, 110, 115,120V all available.

Feature of the Meters.
- Large range of versions for various types of installations and systems.
- All-insulated as well as cases.
- Service reliability proved by the longtime fabrication.
- Selected spare parts for a service stock as a part of each delivery (according to the customer's requirements).
- Components important for the maintenance as upper and lower bearings, registers, terminals, voltage coils are the same as for single-phase meters.
- Calibration adjusters easily accessible and easily adjustable.
- Reliable and comfortable connection to mains.
- Dial trains with enlarged number wheels, quick change transfer mechanism, easily resetting to zero.
- Various precautions against tampering with the meters.



Construction

The whole electromechanical movement of the energy meter is fixed on a robust one-piece aluminium alloy die-cast frame using reamed bolt at strategic points. The driving rotor disk is suspended by the bottom magnetic bearings with easy removal via the pivoted top.
The plastic worm & gear assembly of the cyclometric register is precisely guided into its position without needs of further adjustment. On this register assembly, two spring-action-fastening points hold the name-plate in place preventing any disturbance to the moving parts.
The meter's base & cover are made of solid Bakelite Duroplastic, FS 31-14 DIN 7708 with the viewing window of clear PTE acrylic material. Double terminal screws of nickel-plated brass are provided for wiring connection to the meters. For models with built-in maximum demand kW indication and built-in multiple-tariffs, the basic electromechanical movement is retained or with serial communication RS485 with SMT circuitry module is adapted on to it.
With this unique design, the movement of the Ferraris meter is sensed by an inductive pulse device mounted directly on the driving rotor and this signal is processed by the



The measuring assembly

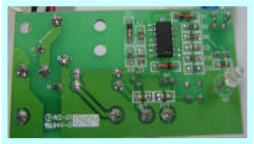
Comprises two or three driving elements, a braking element, a two-disc rotor with bearings, a register and a mounting frame where all components are fixed.The driving element of the first phase and the braking element always carry the upper disc, the lower disc is from the front carried by the second driving element (three wire) or from both sides by the second and the third driving elements (four wire). The symmetrical location of the driving elements part and polarity of their coils eliminates the influence of reversed phase sequence on meter errors. Each driving element is provided with inductive load adjuster (phase regulation), torque balance adjuster (torque regulation) and low-load coarse adjuster (so called 10 %-regulation). The upper driving element is provided moreover with a low-load fine adjuster and both lower driving elements of the four wire meters type with devices for balancing the creeping at reversed phase sequence. The full-load adjustment carried out by turning the brake magnet. The die-cast aluminium alloy frame is fixed to the meter's base with two screws and one strong flexible clip, so that distortions that might be caused when tightening the meter to the meter board are not transferred to the measuring assembly. The driving elements consist of current and voltage parts fixed directly onto the frame. The voltage part is equipped with a bridge with an opposite pole representing a part of the magnetic circuit. The voltage and current coils have their frames very resistant to electricity, and in addition to it the voltage coil is protected by a plastic shrink wrap. The precautions improve the resistance to voltage surges. The wide measuring range is achieved by efficient disposition of magnetic flows in the air gap, and by using of the magnetic shunts on the current frames.

The braking element

Composed of two magnetic segments made of AlNiCo anisotropic alloy with a high energy product that together make up a two-pole magnet sat onto the holder of aluminium alloy allowing its turning. The magnet is designed to suppress the vibrations of the rotor what favorably influences the life of the meters. A plate made of temperature dependent alloy is fixed between the magnet segments in order to compensate the effect of ambient temperature upon the meters' accuracy. The magnetic stability is ensured by means of stabilisation after magnetizating. The set position of the magnets is fixed with a strong spring and a centric fastener.

The meter rotor

May be withdrawn and replaced without any additional adjustment or calibration. Two discs are fitted on a strong duralumin shaft by die-casting of metal alloy. For testing and calibration purposes the upper disc is provided, besides the black mark on the circumference edge, with a rectangular mark on the upper surface, and the lower disc with a similar mark on the lower surface. Both discs are further provided with stroboscopic marks along the upper surface, each second and tenth being prolonged, and each twentieth of the upper disc. A steel flag is also mounted on the rotor shaft to prevent the rotor from running with no-load. The opposite part of this magnetic stop is located under the voltage coil of the upper rotor. When requested, the meter rotor may be provided with a reverse running stop or reverse running break device consisting of a ratchet and a pawl.



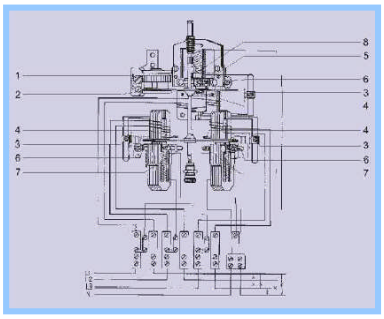
The pulse transmitter

Can be built in the electromechanical electricity meters, which have two free auxiliary terminals on the terminal block. The transmitter with electronic module senses revolutions of the rotor using the reflection principle and 2-wire line, from which the transmitter is supplied, as well. Pulses are transmitted to the end device through 2-wire line. The electronic module resolves the direction of rotor revolution. It has an option for pulse width adjustment during production using SMD junctions, and allows selection of the number of revolutions of the rotor per one transmitted pulse using the switch.

Measuring Assembly with Adjusters

Three phase four wire meter and three phase three wire meters are equipped with the following adjusters:

1 - Coarse brake-magnet adjuster,
2 - Fine brake-magnet adjuster,
3 - Inductive load adjuster,
4 - Coarse low-load adjuster,
5 - Fine low-load adjuster,
6 - Torque balance adjuster,
7 - Reversed phase-sequence adjuster,
8 - Starting adjuster.

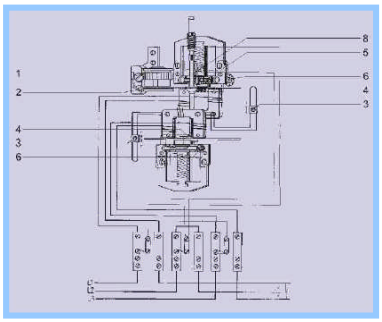


Three phase four wire type

All adjusters are easily accessible and can be manipulated easily with a screw driver without any need of special tools. The adjustment ranges of all adjusters are much more wider than prescribed by specifications and their mutual dependence is negligible. They are self-locking and possess considerable mechanical-shock and transport-impact resistance what is for all adjusters arranged by elastic seating effecting enough friction to keep the position during transport or operation.

The full load adjustment

Carried out by turning the brake magnet using the control screw which acts as a worm gear. The overall range of adjustment is more than 50 %.



Three phase three wire type

The inductive load adjustment

Provided by varying the position of the pointer located on the resistance loop. The pointer is fixed on the loop with a screw, the manipulation is facilitated by a bakelite guide. Each driving element is equipped with one resistance loop. The overall range of adjustment is about 12 % at power factor φ 0.5.

The low-load adjustment

There are two type of low load adjustments.

1) The coarse adjustment is performed by turning of a swing arm mounted on the counter pole of each driving element. The adjustment, the overall range of which is more than 80 % at the load 5 % I_b serves for balancing each driving element separately with current circuits disconnected.

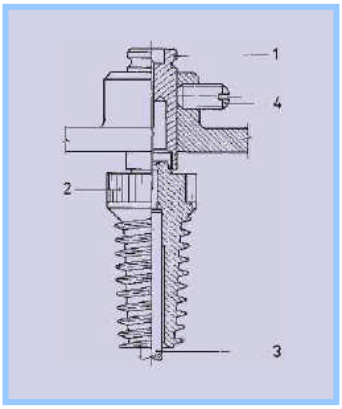
2) The fine adjustment obtained by the adjusting screw has a restricted range of about 8 % and serves for selective adjusting at low load calibration. One adjusting screw common for the whole meter is always located on the driving element.

The torque balance adjustment

Carried out by rotating of an axis with a slot for a screwdriver what results in setting of the magnetic shunt on the voltage core of each driving system. The manipulation is easy and effective. The total range of adjustment is 10 %.

The reversed phase sequence adjustment

Made if needed by simultaneous shifting of a couple of the adjusting screws located on the second and third driving elements.



The starting adjuster

A magnetic stop is always located on the upper driving system. Adjustment is carried out by bending or shifting of the steel flag mounted on the rotor shaft.

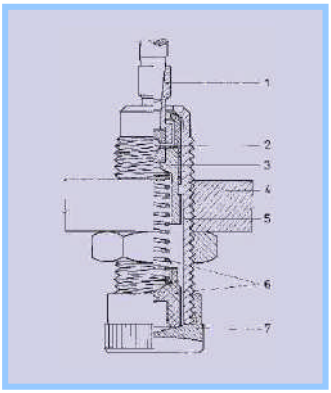
The top bearing

Is a needle one and its cap with a pin is fixed to the meter frame allowing to set the axial position so that during transport a stop end is created. The bearing bush moulded of high-quality plastics and mounted on the top of the rotor shaft is combined with a worm for driving the register.

The upper bearing of the needle type consists of the following parts:

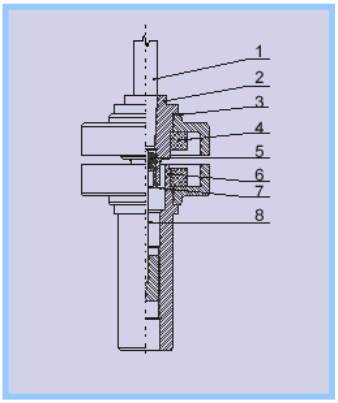
1 - cap with needle,
2 - adapter made of plastic combined with worm,
3 - axis of the electricity meter,
4 - adjustment screw.

The cap with needle is kept in the position by an adjustment screw. The adapter is fit on the end of the axis, and is kept in the correct position by its own elasticity. Handling the bearing and replacement of parts does not require any special tools.



The two-jewel bottom bearing

Consists of two sapphires with spherical highly polished grinding, and a free steel ball made of hard highly polished steel and sat between the jewels. The bearing is bolted to the meter frame and locked in position by a nut. When replacing the jewels or the ball the inside parts are replaced as a whole. When new parts are put in, the rotor returns to its initial position. Neither the top bearing nor the bottom one are lubricated so that during the performance the friction will not increase due to oil pollution.
The bottom two-stone bearing consists of the following two parts:
1 - pivot journal with stone,
2 - loose ball,
3 - sleeve with stone,
4 - connecting bush made of plastic,
5 - clamping bearing bush,
6 - spring of the bottom bearing,
7 - closing cap.
The bottom bearing is screwed into the frame and secured with a nut. In case of replacement of stones or a ball only a cap is unscrewed, and inner parts are removed as one unit. The stones are protected against damage during impacts by resilient mounting of the bottom sleeve.



The magnetic bottom bearing

With two ring magnets made of the materials on the basis of rare earths. It is placed in steel pans, which are magnetised in such a way that they are mutually repulsed. The magnetic material is stable, which ensure long-lasting service life. The guiding bearing needle made of hard highly polished steel is attached in the bottom sleeve clamped in the frame by an adjustment screw. The sapphire toroid bearing is attached in the upper hub fitted on the axis of the rotor system.
The bottom magnetic bearing consists of the following parts:
1 - axis of the rotor system,
2 - hub of the bearing,
3 - pan of the bearing,
4 - bearing magnet,
5 - sapphire bearing,
6 - clamping sleeve,
7 - case,
8 - guide pin.

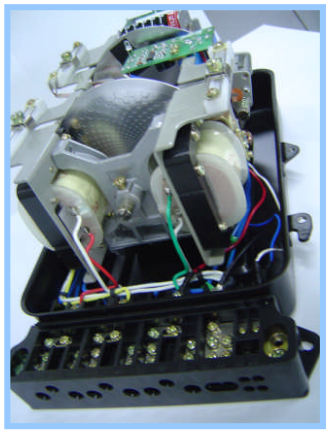
Possible additional measures against tampering (according of the customer`s wish):
- one-way screws for cover attachment
- holographic seal

The register of single rate

6-digit or 7-digit cyclometric type and can be fitted in two versions differing by dimensions of the number wheels and its numerals. The smaller wheels are made either of aluminium (numerals 4.5 mm x 2.2 mm), or moulded of plastics (numerals 5 mm x 2.8 mm). The 6-digit register with enlarged number wheels (numerals 7.5 mm x 4.5 mm) operating with a quick charge transfer mechanism has a possibility of resetting to zero. The data are conspicuous, so the reading of dial can be done precisely even if the meter is installed at the top of a wall or in case of other unfavourable circumstances. With the quick change transfer the reading changes in one jump what prevents the register from appearing of the part of true numerals, the reading is always unambiguous. The register position on the frame is secured by adjustable stop end so that with removing and replacing the register the mesh between the worm on the rotor shaft and the worm wheel will not change its original setting.

The all-insulated case

Comprises a black phenolic moulded base of uniform dimensions up to maximal current of 120 A. The cover may be moulded of black phenolic resin with a glass window or whole made of transparent polycarbonate. Bakelite meter cover is possible; it covers the meter base in combination with the glass exchangeable window. The window is set into the mechanical rim, what increases protection of the cover against a strange objects penetration into the meter case. The terminal block cover is available of black shock-proof polystyrene or of transparent or black polycarbonate. The meter cover is fitted by three captive screws and the terminal-case cover is fixed by two ones. The all-insulated version meets all safety requirements of the double insulation level. The contact surface between the base and the cover is protected against dust and extraneous objects penetration by an elastic gasket of porous rubber or of plastics. The glass window of the cover is blinded by cementing paste.



The terminal-block covers

Composed of a phenolic body of high quality insulating and heat-resistant material, and bush type current terminals inserted into the body and they suit to the reliable connection of both copper and aluminium cables. The version with prolonged case up to 100 A has its current terminals pressed and equipped with detachable cable sockets for easier manipulation with rough conductors. Deep cone-shaped cable entries into the insulating material of the terminal-block body are provided to facilitate the connection of both stranded and solid cables and to cover their insulation parts. Ample anti creepage partitions are provided between terminal groups of different phases. The terminal block is rigidly fitted with the meter base.

The terminal block

Depending on the current rating. As it is clear out of the dimensional drawings the terminal-block covers for higher ampere ranges are larger to provide more space for the cables. The extended terminal-block covers are also available with openings for the cables at the bottom for installation onto the wall or onto the switchboard. The wiring diagram is located on the internal side of the terminal cover or printed on the name plate.

Execution of current terminals

Connection	Current rating	Diameter of terminal hole	Conductor section	AWG
Direct	up to 60 A up to 80 A up to 100 A	6 mm 8 mm 9 mm	25 mm^2 50 mm^2 50 mm^2	3 1 1/0
Transformer connection	up to 10 A	5 mm	16 mm^2	5
Tariff		3 mm	6 mm^2	9

The neutral terminal is doubled, each current or voltage lead is fixed by two clamping screws. The potential link may be also located internally under the meter cover.

Reactive - Energy (Varhour) Meters

These meters are designed for the measuring of reactive energy in three-phase supply systems with both balanced and unbalanced conditions. They are derived from the basic types of MEand ME watthour meters using artificial connection with 90° phase shift. They differ from active energy meters of corresponding types in the way of internal connection of voltage coils while immersions, characteristic load curves, special versions and accessories are identical. However, the metering accuracy depends on symmetry of the supply voltage delta and the prescribed phase sequence must be kept. All reactive-energy meters are provided with reverse-running stops.

The maximum demand indicators of MPE

This type are built in the supporting meters as additional devices of accuracy class 1 complying with the IEC 60 211. The indicator shows on the large and clear scale the highest value of mean power during successive integrating period, between one zero setting and the ext. The maximum demand pointer is driven by the supporting meter driving system, and the driving
pointer is provided with a small scale for coarse reading of the current rate of the mean power. At the end o each integrating period the propelling element is released and returns to its initial position, while the indicating pointer is retained at its highest reading. The pointers are at the end of the measuring period annually reset to zero using the sealable resetting device located in the middle of the window. The „K“ constant of the maximum demand indicator is expressed as 1, 2 or 5 multiplied by 1, 10, 100,..., etc., and it represents a multiplier factor to multiply the reading. The time period in minutes, mean value of the detent time in seconds and rated torque of the disconnecting electromagnet are also given on the dial. The electromagnet is controlled by separately located time switch. The maximum demand indicators as well as the two-rate registers are furnished with separate tariff terminals for connection of their electromagnets placed on the right-hand side of the terminal block. The only exception is exceeded case for current up to 120 V where the tariff terminals are inserted between phase terminal groups. The correct phase and the correct sequence for the tariff terminals according to the wiring diagram placed in the terminal cover must be secured.

Another special version is represented by ***„IM“*** type where the maximum demand meter is controlled with internal electronic time device energizing the electromagnet of the meter. The internal time device is energised by the line voltage, and together with the electronic circuit determines the integrating period so no separate external time device is needed. The integrating period can be 15, 30 or 60 minutes, mean value of the detent time is 1% of the integrating period.
to the evaluation device The electronic module can distinguish the direction of the disc rotation, the width of pulses can be set during the production using SMD links, and using the switch also allows choosing of the disc rotation number per 1 sent pulse. type have their registers equipped with passive transmitters providing for each revolution of the decimal roller one pulse (in case of the direct connection 1 pulse per 1 kWh). The version determined by additional code character „G“ is used in connection with the remote combined register for the group reading.

Three Phase ME Series
Surface mount type

Three Phase MP Series
Surface mount type

Three Phase MPE Series
Flush mount type
Or Panel mounts type

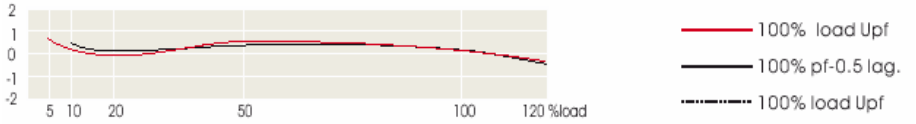
Flush Mount MPE Series

Data table for Energy Meters - Comply to IEC521 & VDE0418

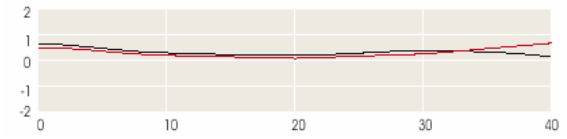
		3Phase 3Wire		3Phase 4Wire	
Surface Mount Type Kwh kVarh Max demand Kwh or kVarh		ME3, MP3 ME3, MP3 MP3	ME3, MP3 ME3, MP3	ME3, MP3 ME3, MP3 MP3	ME3, MP3 ME3, MP3
Flush Mount Type(Panel Mounting) Kwh kVarh		MPE3 MPE3	MPE3 MPE3	MPE3 MPE3	MPE3 MPE3
class: active (reactive) energy		2(3)	1(2)	2(3)	1(2)
rated voltage ranges	V A	3x380 3x100	3x380 3x100	3x220/380 3x63.5/100	3x220/380 3x63.5/100
basic (max.) current		5(20)*:10(40)* 15(60)*:20(80)* 30(100)* 1(2):3(6)	1(2):3(6) 1.5(6)	5(20)*:10(40)* 15(60)*:20(80)* 30(100)* 1(2):3(6)	5(20)*:10(40)* 15(60)*:20(80)* 30(100)* 1(2):3(6)
	%In	1.5(6)		1.5(6)	1.5(6)
maximum load	Nm	200/400	200	400/200	400/200
rated torque	Hz	>4,0 . 10^{-4}	>4,0 . 10^{-4}	>4,0 . 10^{-4}	>4,0 . 10^{-4}
rated frequency	%In	50 or 60	50 or 60	50 or 60	50 or 60
starting load		0,5	0,5	0,5	0,5
power loss/phase in voltage circuit at Un	VA W	≤ 4,2	4,2	≤ 4,2	4,2
power loss/phase in current circuit at In	VA	≤ 0,7	≤ 0,7	0,3	0,3
weight of rotor	kg	27 . 10^{-2}	27 . 10^{-2}	27 . 10^{-2}	27 . 10^{-2}
weight of meter	kg	3,6	3,6	3,9	3,9

* Not available for Varh meters or please consult before ordering

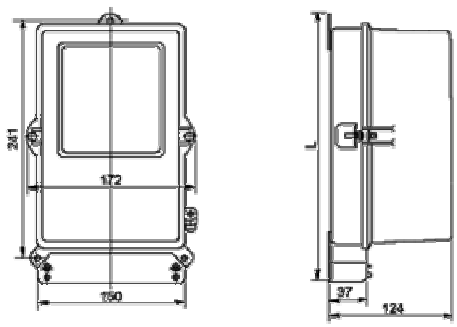
Accuracy curve



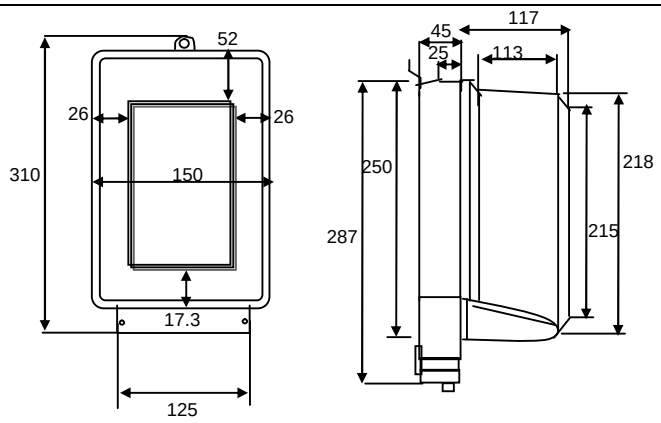
Accuracy curve with temperature variation



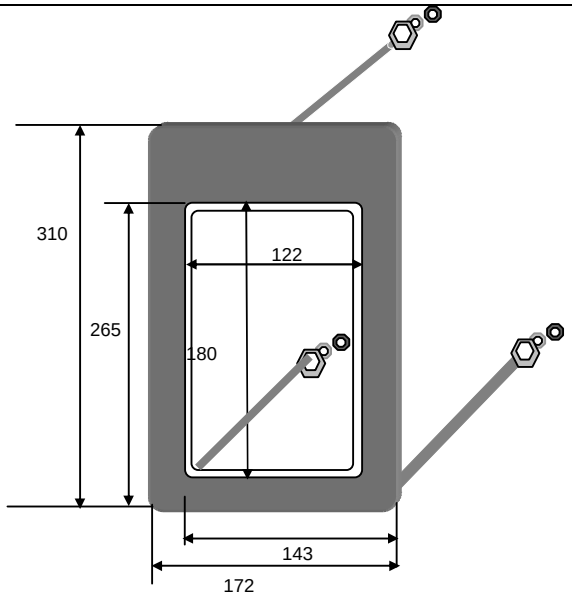
ME Series



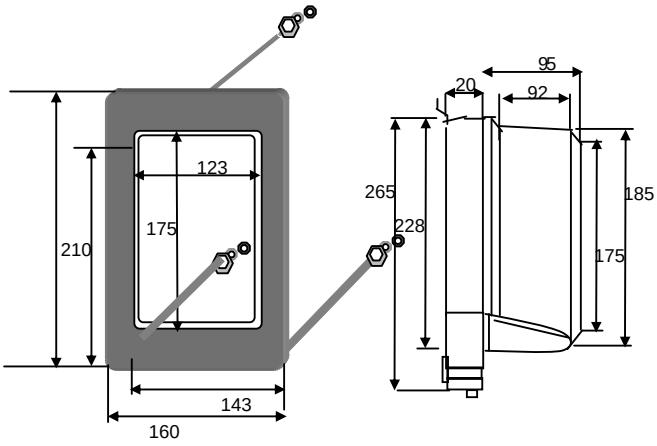
MPE Series



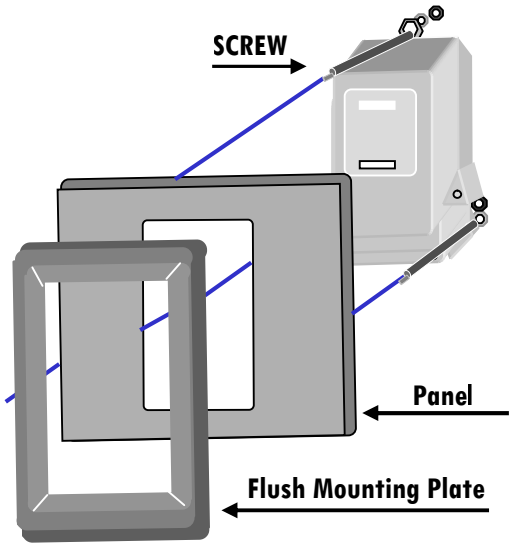
Flush Mount for MPE Series

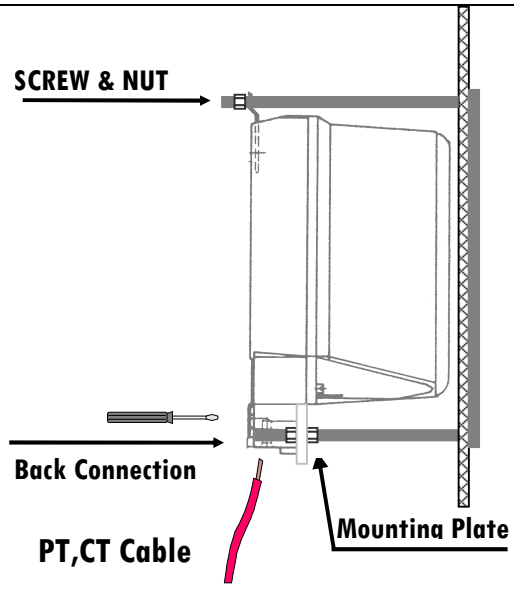


MP Series



Flush Mounting for MP Series

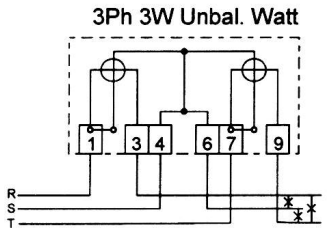




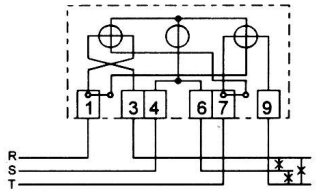
Wiring Connections

Direct – Connections

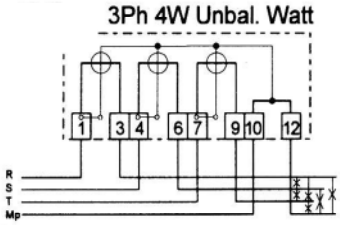
3Ph 3W Unbal. Watt



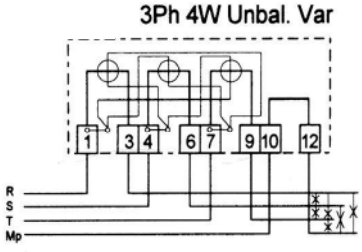
3Ph 3W Unbal Var



3Ph 4W Unbal. Watt

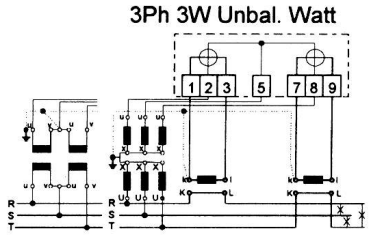


3Ph 4W Unbal. Var

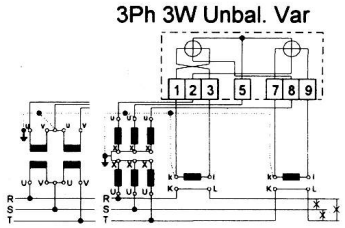


Transformers – Connections

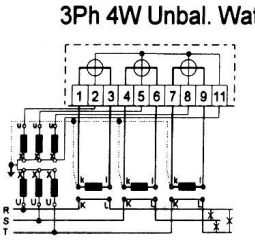
3Ph 3W Unbal. Watt



3Ph 3W Unbal. Var



3Ph 4W Unbal. Watt



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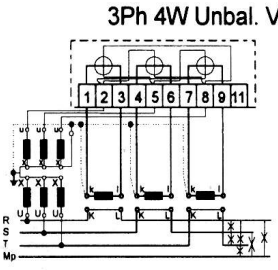

Ordering

Kwh meter class 2.0, 230/40v, 3ph4w, CT/5 + pulse output
Model ME3

Kwh with Max demand meter class 2.0, PT 24kV/120v, 3ph4w, CT100/5 Model MPE

Kwh meter class 2.0, PT 24kv/120V, 3ph4w, CT100/5A Flush mounting type with reverse break and pulse output Model MP3

Option

- Pulse output, Pulse rate upto model
- Pulse device are Open collector or Dry contact relay