

KHLSM

AEL.KC.800

AEL.KC.801

AEL.KC.810

AEL.KC.811

**INTRODUCTORY AND OPERATING MANUAL
THREE-PHASE ACTIVE, REACTIVE AND
CAPACITIVE
ELECTRONIC ELECTRICITY METERS**



ISO 9001

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0. INTRODUCTION

This manual describes the technical specifications of electronic electricity gauges measuring active/reactive electric energy and maximum energy absorbed, showing these data on LCD screen, keeping desired information and programs in its memory, accessing these information when desired, which have been manufactured with advanced technology, and which comply with the specifications issued by Turkish Electricity Distribution Company (TEDAŞ) in order to promote electricity saving and to regulate multi-tariff electricity selling, and which comply with Regulation 2014/32/EC on Measurement Devices covered under the new approach statutes issued by EC.

KÖHLER A.Ş.

WARNING!

BEFORE ASSEMBLY OF THE ELECTRICITY METER READ THIS MANUAL CAREFULLY.

- The electricity meter should be mounted only by **licensed qualified personnel**.
- During mounting, avoid contact with the **parts with voltage**.
- During mounting and dismounting the electricity meter, **the power should be cut off**.
- KHLSM Electronic electricity meters are high-tech products. Any and all technical data and documents are under intellectual property of the Company; they may neither be reproduced nor used by third parties.
- This booklet provides summarized information about the electricity meter.
- Prior to assembly, qualified personnel should check whether the electricity meter type to be mounted is or is not in compliance with the electric supply system and electrical installation. Otherwise, the mounted electricity meter may be damaged because of faulty selection and connection of electricity meter. **Such electricity meters shall not be assessed under the guarantee.**
- The data displayed on the LCD monitor of the electricity meter are determined by TEDAŞ.
- Meter parameter settings and maintenance can not be done by user. Meter setting and maintenance process are done by only TEDAS personnel.

1. TECHNICAL SPECIFICATIONS OF THE ELECTRICITY METER

Name	Three Phase Four Wire, Four Tariff, Demand Measuring, Outdoor, Active , Reactive and Capacitive Electronic Electric Meter			
Type	AEL.KC.800 (Import)	AEL.KC.801 (Import&Export)	AEL.KC.810 (Import)	AEL.KC.811 (Import&Export)
Class	Active : B, Reactive: 2	Active: C, Reactive: 2	Active: B, Reactive: 2	Active: C, Reactive: 2
Connection	Direct		Current circuit with transformer, Voltage circuit with transformer or direct	
Reference Voltage (Un)	3x230/400 V		3x230/400V - 3x57,7/100V	
Operating Voltage Range	3x35V / 60V (Minimum) - 3x420V / 727V (Maximum)			
Reference Frequency (Fn)	50 Hz ±%5			
Starting Current (Ist)	0,02A (0,04.Itr)		0,001A (0,02.Itr)	
Minimum Current (Imin)	0,25A	0,15A	0,01A	
Transition Current (Itr)	0,5A		0,05A	
Reference Current (In/Ib)	5A		5A	
Maximum Current (Imax)	100A		10A	
IP Class	IP54 (Outdoor)			
Protection Class	Two (2)			
Relative Humidity Ratio	%95			
Operating Temperature	-40 °C, +70 °C (3K7)			
Mechanical Environment	M1 (2014/32/EC Directive)			
Electromagnetic Environment	E2 (2014/32/EC Directive)			
User Environment	For Non-Condensing Humidity Environment			
Power Consumption in Voltage Circuit	≤ 1W			
Power Consumption in Current Circuit	≤ 1VA			
ESD Voltage Resistance	Contact Discharge : 8 kV Air Discharge : 15 kV			
Pulse Voltage	6 kV			
Meter Constant	1.000 imp.		10.000 imp.	
LCD Display	6+3 Dijit			
Interface Unit	Optical Port (IEC 62056-21), RS485			
Communication Speed	300 - 19.200 Baud			
Battery Life of the System	≥ 10 year			
Real Time Clock Battery Life	≥ 10 year			
Shelf Life of the Electricity Meter	≥ 4 year			
Time Clock Accuracy	0,5 s/day (at room temperature) (IEC-EN 61038)			
Data Storage Capacity	2 year			
Related Standards	TS EN 50470-1, TS EN 50470-3, TS EN 62053-23			

Percentage Error Limits at Reference Conditions (Active)

Current Range	Power Factor	Percentage Error Limit (%)	
		Class B	Class C
$I_{min} \leq I < I_{tr}$	1	$\pm 1,5$	$\pm 1,0$
$I_{tr} \leq I \leq I_{max}$	0,5 ind....1.....cap 0,8	± 1	$\pm 0,5$

Percentage Error Limits at Reference Conditions (Reactive)

Current Range		Sin ϕ (inductive or capacitive)	Percentage Error Limit (%)
For Direct Coupled Electricity Meters	For Meters Operating with Transformers		Class 2
$0,05 I_b \leq I < 0,1 I_b$	$0,02 I_n \leq I < 0,05 I_n$	1	$\pm 2,5$
$0,1 I_b \leq I \leq I_{max}$	$0,05 I_n \leq I < I_{max}$	1	$\pm 2,0$
$0,1 I_b \leq I < 0,2 I_b$	$0,05 I_n \leq I < 0,1 I_n$	0,5	$\pm 2,5$
$0,2 I_b \leq I \leq I_{max}$	$0,1 I_n \leq I \leq I_{max}$	0,5	$\pm 2,0$
$0,2 I_b \leq I \leq I_{max}$	$0,1 I_n \leq I \leq I_{max}$	0,25	$\pm 2,5$

2. MAIN FUNCTIONS

2.1. Gauging: The electricity meter gauge the total active and reactive power and demand.

2.2. Programming the Electricity Meter: Time slices and tariffs are programmable. For a whole day, 8 different time slices may be determined and each time slice may be selected and paired with one tariff out of four. Furthermore, the electricity meter has a feature capable to tariff individually the weekdays, Saturdays and Sundays. On the electricity meter, the date and time, tariff data and demand receiving period may be adjusted by the authorized TEDAŞ personnel by opening the lid of electric terminal box.

2.3. Reading the Electricity Meter: Invoicing data for 24 months, consumed total power amount, data about lid openings of electric terminal box, demand data for 12 months and initial opening date of upper lid can be read on optic port or RS485 outlet of the electricity meter.

2.4. Auto Trouble-Shooting Feature: The electricity meter continuously controls its internal circuits and displays in the menu of its monitor the trouble types shown hereunder. For trouble displays and details, please refer LCD MONITOR INDICATORS.

2.5. Electric Terminal Box Lid and Upper Lid Opening, Closing, Recording Features: When the upper lid is opened, the first opening date is stored. When the lid of electric terminal box is opened, the first opening date of each month and total of openings throughout the relevant month is stored. Lid opening dates and numbers of the most recent 24 months are stored in the memory.

2.6. Signal Output: On the electricity meter, there is two LEDs so as to indicate the consumed active and reactive energy. Numbers of blinks of these LEDs shows Imp/kWh and Imp/kVarh values of the electricity meter.

1000 Imp/kWh : 1000 Blink = 1kWh, 1000 Imp/kVarh: 1000 Blink = 1kVarh
 10.000 Imp/kWh: 10.000 Blinks = 1kWh, 10.000 Imp/kVarh : 10.000 Blinks = 1kVarh

2.7. Displaying during Power Failure: When the power is cut, the data requested can be brought to the LCD monitor via the call-button on the electricity meter and reading can be taken from optic port. This operation is limited with 5 minutes for the sake of battery life. When the power is cut, taking reading from RS485 outlet is not possible.

2.8. Communication: The data is transmitted to a portable computer (indexor) through an optical reader from optic port of the electricity meter. Moreover, through the RS485 communication outlet that is standard on all combined electricity meters, remote access to the electricity meter data is achieved. When the power is cut, taking reading from RS485 outlet is not possible.

3. STRUCTURE AND OPERATION PRINCIPLE OF THE ELECTRICITY METER

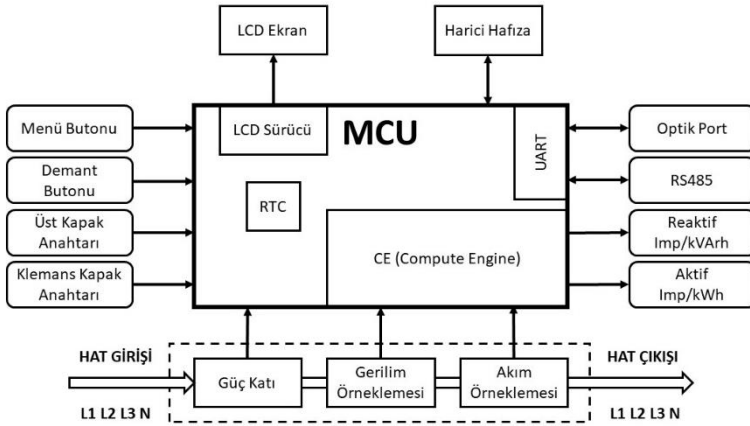
3.1. Structure of the Electricity Meter:

Casing and lids of the electricity meter are compliance with IP54 Outdoor Standard and fully sealed. The electricity meter is made of high-grade non-flammable engineering plastics.

All electronic components are laid on a special PCB card; and these cards are mounted to the casing of the electricity meter. Following calibration of the electricity meter, the upper lid is screwed in the factory and sealed.

The lid of electric terminal box is sealed by authorized TEDAŞ personnel following assembly of the electricity meter.

3.2. Block Diagram of Operation



4. STARTING-UP THE ELECTRICITY METER

Normally the electricity meter as well as the LCD monitor operates, when the meter is mounted and powered on.

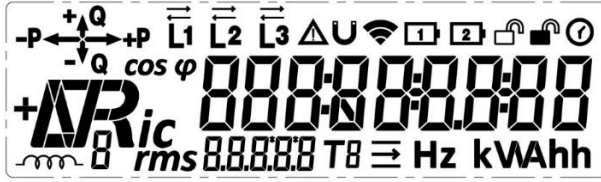
4.1. Controlling the Functions

Once the electricity meter is mounted, its electrical connections should be checked whether they are proper or not. After the electricity meter mounted properly to its place, the screw on the lid of the electric terminal box should be tightened. 2nd lock indicator blinking on the LCD monitor will disappear after the first reading. If not, then it means either the lid of the electric terminal box is not attached properly or its screw is not tightened well.

4.2. Operation of the LCD Monitor

Following initial operation of the electricity meter, the automatic menu mod will activate within 90 minutes. Each menu of the relevant mod will be displayed for 5 seconds and then automatically proceed to the next informative menu. When the call button on the electricity meter is pushed down, the button menu mod will activate. If no button would be pushed down for the following 90 seconds, the electricity meter will return to the automatic menu mod. When the call button of the electricity meter is pushed down for 3 minutes, the sub menus will be activated. This menu generally contains the data pertaining to the previous months. To return to the button menu, the call button should be re-pushed for 3 minutes.

5. LCD MONITOR INDICATORS



Definitions of the symbols and indicators on the LCD Monitor are as follows:



The Upper Lid is Open (The Lock numbered 1):

This symbol indicates that the upper lid is opened. If the indicator is blinking while the lid is close, then it is indicating that the lid is opened earlier. If the indicator is being displayed on the monitor solidly, then the upper lid is on open position.



The Lid of Electric Terminal Box is Open (The Lock numbered 2):

This symbol indicates that the lid of the electric terminal box is opened. If the indicator is blinking while the lid is close, then it is indicating that the lid is opened earlier. If the indicator is being displayed on the monitor solidly, then the lid is on open position. Symbol will disappear after the electricity meter is read.



Clock Error: If the clock does not operate normal, this symbol will be displayed.



Battery of the System: If the voltage of the battery of the system is low, this symbol will be displayed.



Battery of the Clock: If the voltage of the battery of the clock is low, this symbol will be displayed.



L1, L2 and L3 symbols indicate existence of, respectively, **R, S and T** phases. For instance, if the R phase has no voltage, only **L2** and **L3** symbols will be displayed on the monitor. If **L1, L2** and **L3** symbols are blinking together, it means there is an error on phase sequences. If the energy current of one or more phases are in reverse direction, there will be '-' mark in front of the relevant symbol. For instance, if the energy current of L1 phase is in reverse direction, **-L1, L2** and **L3** symbols will be displayed on the monitor.



Magnetic field warning icon.



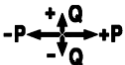
These symbols indicate currently active tariff. For instance, if the present date/time is corresponding to **T2** tariff, **T2** will be displayed on the monitor. In the event of any failure on the clock of the electricity meter, **T1** will be active continuously.



Reverse current direction warning icon on one-way meters.



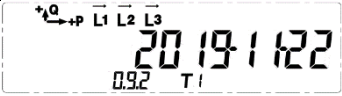
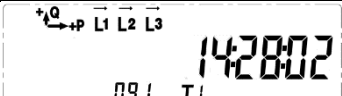
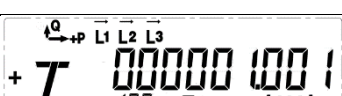
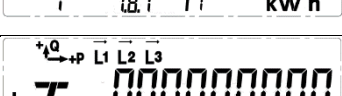
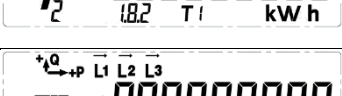
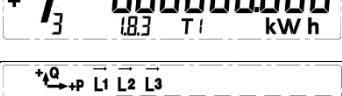
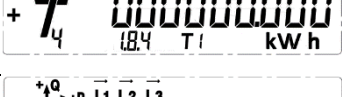
It lights up to indicate data transfer when data is being read from the meter via optical or RS485. When the reading is finished, the mark will disappear from the screen.

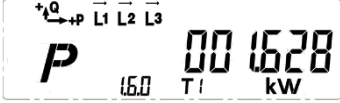
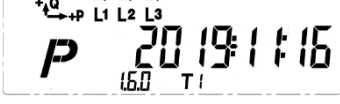
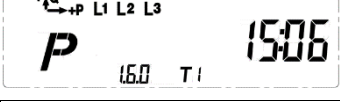
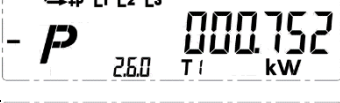
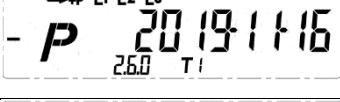
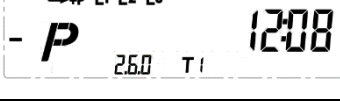


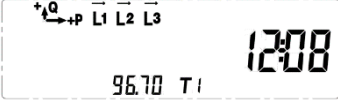
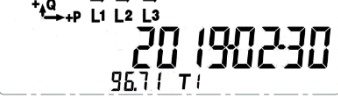
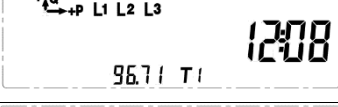
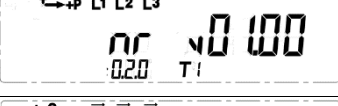
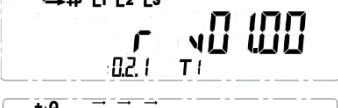
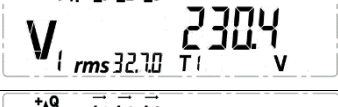
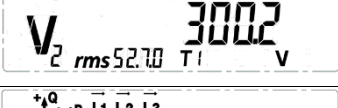
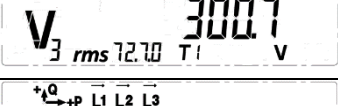
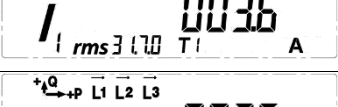
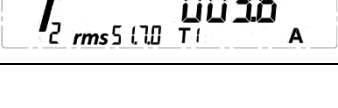
This symbol indicates characteristics of the energy current in the system. For instance, if the current from R phase is in the direction to +P and +Q, and from S phase in the direction to +P, and from T phase in the direction to +P and -Q, then arrows will be displayed in the monitor as seen on the right hand side.

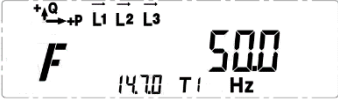
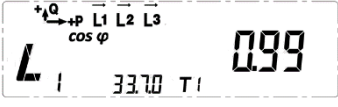
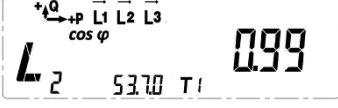
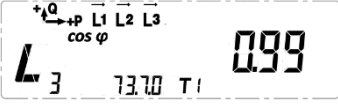


5.1 Samples from Display List

Date Menu (YYYY-AA-GG)	
Hour Menu (SS:DD:ss)	
Total active energy, taken (+T)	
Active energy taken, Tariff 1 (+T1)	
Active energy taken, Tariff 2 (+T2)	
Active energy taken, Tariff 3 (+T3)	
Active energy taken, Tariff 4 (+T4)	
Total active energy given (-T)	
Active energy given, Tariff 1 (-T1)	
Active energy given, Tariff 2 (-T2)	
Active energy given, Tariff 3 (-T3)	

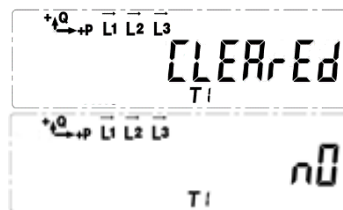
Active energy given, Tariff 4 (-T4)	
Inductive Reactive energy taken (+Ri)	
Capacitive Reactive energy taken (+Rc)	
Inductive Reactive energy given (-Ri)	
Capacitive Reactive energy given (-Rc)	
Alınan Aktif Maksimum Demand (+P)	
Active Maximum Demand Received (+P) Date (YYYY-AA-GG)	
Active Maximum Demand Received (+P) Hour (SS:DD)	
Active Maximum Demand Given (-P)	
Active Maximum Demand Given (-P) Date (YYYY-AA-GG)	
Active Maximum Demand Given (-P) Hour (SS:DD).	

Serial Number	
Top cover opening date	
Top cover opening hour	
Terminal cover opening date	
Terminal cover opening hour	
Software number	
Measurement Software number	
Instantaneous Voltage in Phase L1	
Instantaneous Voltage in Phase L2	
Instantaneous Voltage in Phase L3	
Instantaneous Current in Phase L1	
Instantaneous Current in Phase L2	

Instantaneous Current in Phase L3	
Network frequency	
L1 Phase Cos α	
L2 Phase Cos α	
L3 Phase Cos α	

Manual Demand Reset Process:

To Reset the Demand, the Red Demand Reset Button on the electricity meter should be kept pushed-down for 3 seconds. This can be done only once in a month. If the Demand reset is achieved, “CLEARED” will be displayed on the monitor. If the Demand is reset earlier in the month, “NO” will be displayed on the monitor. If the Demand is not reset earlier in the month, the electricity meter will reset the Demand automatically at the end of month.



6. Load Profile

The device is able to store load profiles every fifteen minutes for one year. It can store informations as;

Year-Month-Day-Hour-Minute

Event Registrations

Positive Active Energy, Negative Active Energy, Pozitif Inductive Energy, Negative Inductive Energy,

Positive Capacitive Energy, Negative Capacitive Energy (For Each Tariff)

Maximum RMS Voltage, Minimum RMS Voltage, Closing RMS Voltage(For Each Phase)

Maximum RMS Current, Minimum RMS Current, Closing RMS Current

Cos ϕ (For Each Phase)

Total Voltage Harmonic Distortion (For Each Phase)

Total Current Harmonic Distortion (For Each Phase)

Total Power Harmonic Distortion (For Each Phase)

Frequency (For Each Phase)

Status Informations(The Lid of Electric Terminal Box, The Upper Lid, L1, L2, L3, -L1, -L2, -L3,Phase

Order Err, RTC, System Battery, RTC Battery, Reactive Alarm, R Phase Positive Active Energy, R Phase Negative Active Energy, , R Phase Positive Reactive Energy, , R Phase Negative Reactive Energy, S Phase Positive Active Energy, , S Phase Negative Active Energy, S Phase Positive Reactive Energy, S Phase Negative Reactive Energy, T Phase Positive Active Energy, T Phase Negative Active Energy, T Phase Positive Reactive Energy, T Phase Negative Reactive Energy, T1, T2, T3, T4

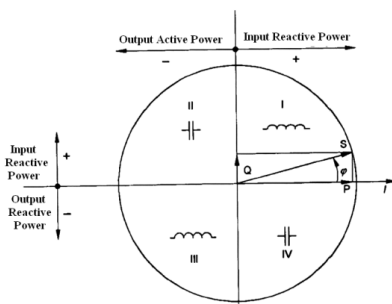
System Battery Level

RTC Battery Level

Active Traiff Sections

Temperature

Geometrical Diagram of Active and Reactive Power:



Note 1 - The diagram is compliance with Article 12 and Article 14 of IEC 60375.

Note 2 - Reference to the above diagram is current vector (indicated as the line on the right hand side).

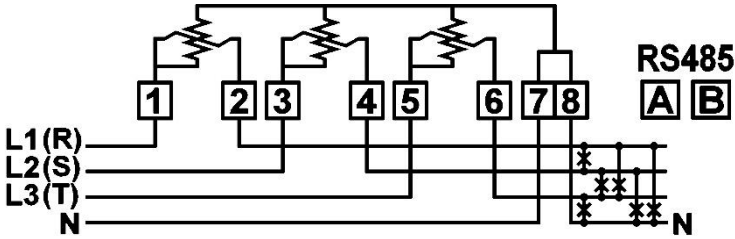
Note 3 - The voltage vector changes on its own direction as to V phase angle ϕ .

Note 4 - Mathematically, the phase angle " ϕ " in between voltage vector " V " and current " I " is evaluated positively (anticlockwise).

As to the Diagram, Energy Record Registers of the Electricity Meter	Import	Import&Export
Import Active Energy (+T)	1.8.0	1.8.0
Export Active Energy (-T)	1.8.0	2.8.0
1 st Zone Import Inductive (+Ri)	5.8.0	5.8.0
2 nd Zone Import Capacitive (+Rc)	8.8.0	6.8.0
3 rd Zone Export Inductive (-Ri)	5.8.0	7.8.0
4 th Zone Export Capacitive (-Rc)	8.8.0	8.8.0

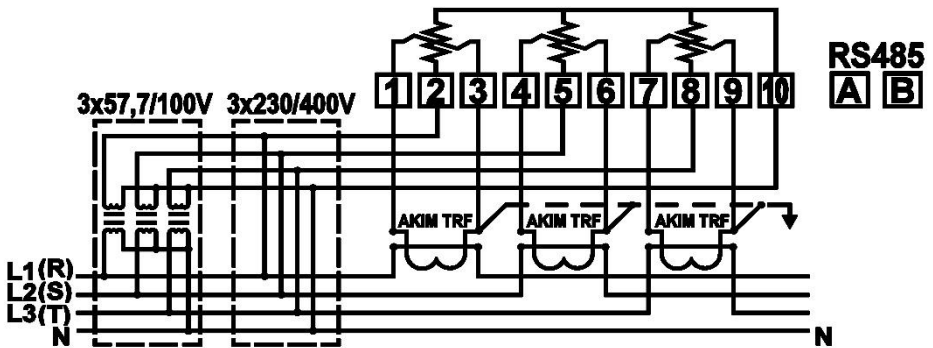
7. CONNECTION DIAGRAM

7.1 Connection Diagram for AEL.KC.800 / AEL.KC.801



WARNING: Terminal block to the right (A) and (B), generator outputs. Certainly the energy Do not!

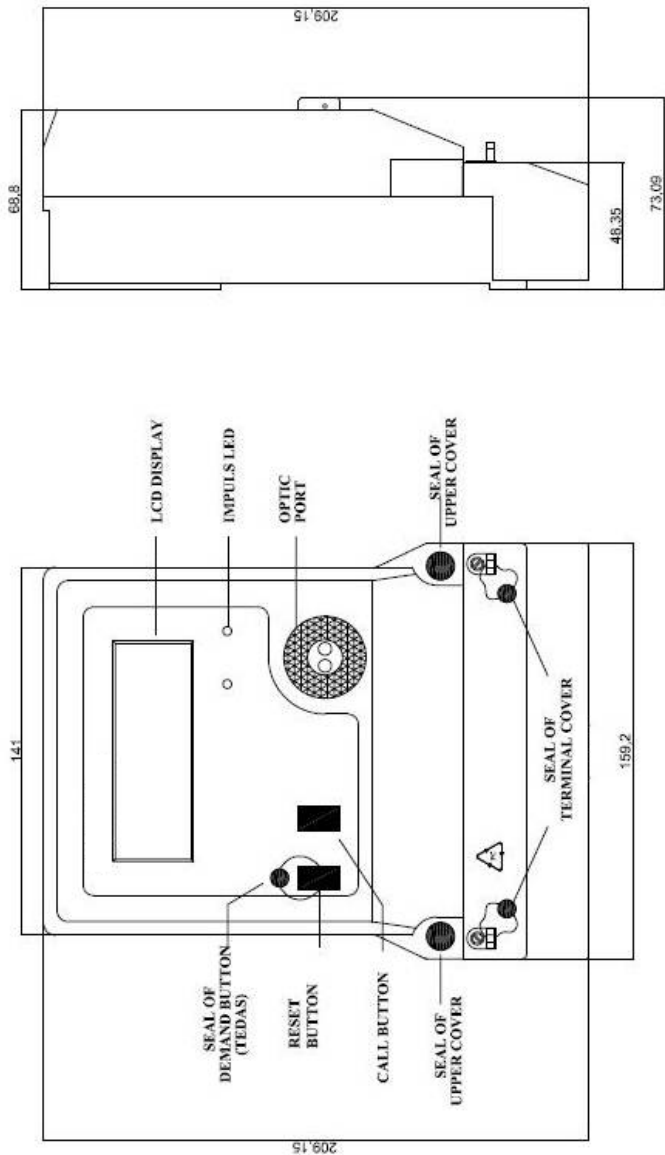
7.2 Connection Diagram for AEL.KC.810 / AEL.KC.811



WARNING: Terminal block to the right (A) and (B), RS485 outputs. Certainly the energy Do not!

Inner diameter of Current Sleeve of 3X5 (100)A Combined Electricity Meters is 7 mm. If these electricity meters will be connected to a line of 100 Ampere, the cross section of copper and conductive part of line cable should at least be 25mm².

8. DIAGRAM FOR ASSEMBLAGE MEASUREMENT AND SEAL POINTS



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