KBR Energy Management

Operating instructions
Technical Parameters

Electronical energy meter

multicount

3D6-0-LCD-EP-US1
3D6-1-LCD-ES-US1

Your Partner for Network Analyzing

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Dear Customer

We would like to thank you for choosing a **KBR** quality product.

In order to familiarize yourself with the operation and programming of the device and always be able to use the whole functionality of this high-quality product, we recommend that you read this manual thoroughly.
The individual chapters serve to explain the technical details of the device and show how to avoid damage by means of proper installation and commissioning.

The manual is included in the scope of delivery of the device and must be accessible for the user at all times (e.g. in the switchgear cabinet). Even when the device is resold to third parties, the manual remains part of the device.

Although we used the utmost care in assembling this manual, we would like to thank you in advance for notifying us about any errors or ambiguous descriptions that might be in it. You will find a form for corrections in the appendix.

Sincerely,

KBR GmbH Schwabach

General Safety Precautions

In order to prevent operating errors, handling of the device is kept as simple as possible. This way, you will be able to use the device very soon.
In your own interest, however, you should read the following safety precautions carefully.

Warning

During installation, the applicable DIN / VDE regulations must be observed.
Mains connection, setup and operation of the device must only be performed by **qualified personne**l. Qualified personnel as understood in the safety precautions of this manual are persons authorized to setup, ground and mark equipment, systems and wiring systems in accordance with applicable standards.

To avoid the hazard of fire and electrical shock, the device must not be subjected to rain or other humidity!

Before the device is connected to the mains, you will have to check whether the local mains conditions comply with the specifications on the manufacturer's label. A wrong connection may destroy the device!

When connecting the device, the connection chart must be observed (see chapter "Connection chart") and the connection lines must be powerless. Only use proper line material and watch the correct polarity when wiring!

In order to ensure proper and safe operation of the product, it must be transported, stored, installed and mounted in accordance with the specifications and operated and maintained carefully.

A device showing visible damage must by all means be considered as unfit for operation and must be disconnected from the mains!

Error detection, repairs and maintenance work may only be carried out in our facilities or after contacting our service team. Every warranty obligation of the manufacturer expires if the device is opened without written consent from our service team. Proper operation can no longer be guaranteed!

Opening the device may expose parts under voltage. Capacitors in the device may still be loaded even if the device was disconnected from all voltage sources. It is generally not allowed to operate the open device!

In facilities subject to hazard of lightning, lightning protection must be provided for all input and output lines (recommendations see chapter "Protective measures")!

Disclaimer

The contents of this manual has been checked with the described hardware and software components. Certain deviations, however, cannot be excluded, so the manufacturer is not liable for complete conformity. The specifications made in this manual are checked on a regular basis, necessary corrections are included in the next revision.
We appreciate your corrections and comments.

KBR GmbH 2002
Subject to change

Product Liability

With these product, you have acquired a quality product.

In its manufacture, only components of the highest reliability and quality were used. Each device is subject to long-term testing before it is delivered.

For information on product liability, please refer to our General Terms and Conditions for electronic devices.

The warranted properties of the device apply only if it is operated in accordance with its intended use!

Disposal

Please dispose of defective, outdated or no longer used devices properly.
At your request, we will be pleased to dispose of the devices for you

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1 Device memory, battery-buffered

The device is equipped with an internal data memory, which is battery buffered to preserve long-term data. To prevent it from being discharged, this backup battery (e.g. Varta CR 2032) is not built in when the device is delivered, but included separately in the delivery.

Caution

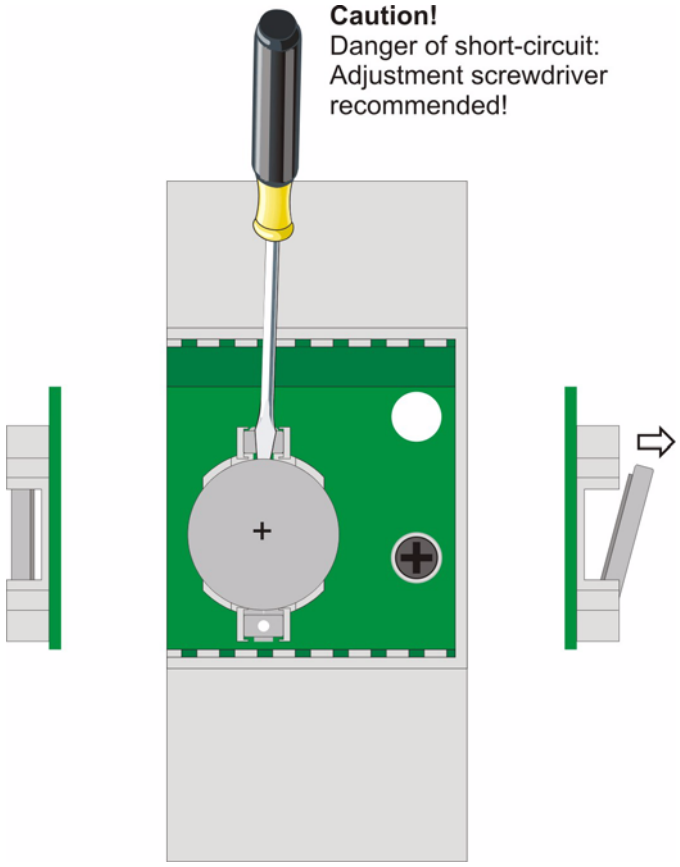
Before the initial commissioning of the device, please insert the backup battery first (as described in the following), as otherwise all storage data would be lost in case of a power failure.

Inserting or replacing backup battery:

1. Disconnect the device from the supply voltage.
2. Lift the upper casing cover with a suitable tool (e.g. a small screwdriver).
3. When replacing a battery, remove the empty battery from the clamp with the tool.
4. Push the new battery into the clamp and make sure that it is inserted correctly and has the right polarity.
5. Put the upper casing cover back on and click it into place by pushing.
6. Reconnect the device to the supply voltage.

Caution

As, when the battery is empty or removed and there is no supply voltage, not only the storage data are lost but the time is not correct anymore either, the time has to be reset in Visual Energy with the corresponding command!



2 Definition of Terms

Below you will find brief explanations of the terminology used in this manual.

Root-mean-square value:	By definition the square of the mean value of a periodic or pulsating quantity is referred to as the root-mean-square value. **multicount 3D6-0-LCD-EP-.../ 3D6-1-LCD-ES-...** exclusively uses the effective values of pure periodic quantities (RMS).
Instantaneous root-mean-square value:	Is the value determined by the **multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-...** within its measuring interval.
Measuring interval:	Within a measuring interval, the electrical quantity ”voltage” or ”current” of one phase is scanned. The resulting scanning spots are available for further calculations. This interval is mainly determined by the A/D conversion.
Measuring cycle:	The measuring cycle is the time the device needs for measuring all possible quantities for all three phases.
Firmware:	Operating system software implemented in the **multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-...**'s microcontroller
Load profile memory:	Saves the actual values of the measuring periods with timestamp.
Measuring period max:	The measuring period containing the highest (maximum) value that occurred.
Aktive- / reaktive power periods	Actual active or reactive power within a measuring period.
Measuring period:	The period of time used to determine the average power demand. Typical intervals: e.g. 15, 30, 60 minutes.
DIN rail:	Top hat rail / mounting rail acc. to DIN EN 50022

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3 Field of application / Function range

multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-... is a compact, easy-to-use energy meter counting active as well as reactive energy (for consumption and recovery).
This energy meter was designed in accordance with the standards DIN EN 61036 (IEC 1036), DIN EN 61268 (IEC 1268) and the requirement specification 2.0 revision 12/97 by the German Electricity Association (VDEW)

Dual-tariff meter function (HT/LT) (multicount 3D6-1-LCD-ES-... only**)**
Consumption during high tariff and low tariff times is saved separately. Switching from high to low tariff times and vice versa is either carried out by means of a digital signal to be applied externally, e.g. from the energy supplier, or via an internal clock. A display flashing on the front of the device indicates which tariff is active at the moment. When operated with the KBR Energy Bus, switching over can also be carried out centrally via the Multimaster or PC.

Convenient operation and display
The LCD serves to either display the measured values directly or enter the respective parameters and configuration data. In addition, six LEDs serve to show the status and monitor the functions. Four buttons facilitate clearly structured navigation through the menus.

For 100 to 500 V networks
The multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-… can be applied in three-wire as well as four-wire networks. The unit can be implemented in 100 V as well as in 500 V networks for direct measurement. Using a transducer adaptor, up to 700 V can be connected to the meter. Higher voltages can only be connected via external voltage transformers; primary and secondary voltage can be freely programmed. The measuring voltage inputs of the device measure directly, i.e. they are not metallically separated by a voltage transformer! For energy supply networks with outer conductor connected to the earth potential, suitable suitable control gear with electrical isolation (e.g. voltage transformer) must be used.

x/5A or x/1A freely programmable
The measuring inputs for current must always be fed via current transformers, while the transformer ratio is programmable. The primary current value as well as the secondary current value can be selected.

Programmable pulse output
Active energy or reactive energy proportional pulses can be output via a programmable output laid out as S_0 interface. The pulse output type (in proportion to active or reactive energy for consumption or recovery) as well as the pulse values (number of pulses per kWh or per kVArh) and the pulse length can be configured. These pulses can be processed fo example by a master system for data acquisition or optimization, a maximum-demand monitor or a central process control.
Each pulse is visualized by a flashing LED.

Serial port for connection to the KBR Energy Bus (multicount 3D6-1-LCD-ES-… **only**)
The multicount 3D6-0-LCD-EP-….has a serial port (RS485) is designed for conveniently configuring the instrument via computer and optional software.

The interface offers the possibility to equip the multicount 3D6-0-LCD-EP-… with the funtionality of the multicount 3D6-1-LCD-ES-… with an optionally available upgrade.

The multicount 3D6-1-LCD-ES-… has a serial port (RS485) for operation with the KBR Energy Bus.

A large amount of information that cannot be shown on the display can be read from the device via the Energy Bus.

This allows both the online measured values for phase voltages, phase currents, individual power factors and individual performance, as well as an entire series of data to be read out from the long-term memory.

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Extensive memory functions
In addition to its counter functions, the multicount 3D6-1-LCD-ES-… offers extensive storage functions.

- **4-quadrant load profile memory** to record the cumulated active and reactive power
- Memory to record the **daily energy values** for 365 days
- Memory for the **measuring period maximum** of the previous month
- **Event memory** (4096 entries), for logging actions of the meter such as mains failures, tariff switching actions, delete functions, and many more.

These memory functions are exclusively available via the KBR Energy Bus..

Synchronization
For synchronization of the load profile memory, a digital input is integrated into the multicount 3D6-1-LCD-ES-… to connect the the synchronization signal of the energy supplier, for example. Synchronization as well as high / low tariff switching can be controlled centrally via the KBR Energy Bus as well as via the internal clock.

Software (optional)
A number of software products that can be run on most Microsoft® Windows® operating systems is available for the convenient programming and storage of long-term data.

Separate power supply
The device requires a separate auxiliary voltage for operation (see nameplate).

For questions about this device or about our software products please don't hesitate to contact us. We will be glad to assist you. ,
Please see the cover of this manual for your contact.

4 Connecting the multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-...

4.1 Installation and Assembly

The housing of the multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-… has been designed for wall mounting on 35 mm DIN rail. The module is snapped on the mounted DIN rail.

Caution

The control voltage as well as the applied measuring voltage of the device must be protected by means of a back-up fuse.

When connecting the current transformers, the direction of the energy flow and the correct assignment to the voltage paths must be observed!

For the wiring of the pulse output, we recommend to use twisted pair and shielded material exclusively to avoid disturbance (e.g. installation line I-Y(ST) Y 2x2x0.8mm, while the shielding may only be connected on one side).

During installation, please also observe our notes on safety measures against overvoltage and lightning in chapter "Protective Measures" of this manual.

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Note

You should take the following points into consideration when connecting the device to the three-phase network to be measured:

- Energy flow direction
Assigning measuring voltage input / current transformer input

Rotary field:

As soon as the multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-…*c* is connected to the mains, it will automatically detect the rotary direction.

Current transformation connection:

Energy flow direction:

When mounting the transformers, observe the current flow or energy flow direction. If the current transformers are inserted the wrong way, the current will have a negative sign for active power input. In this case, interchange the pins of the terminals k and I of the affected transformers.

Assigning measuring voltage input / current transformer input:

The current transformer on terminal 20/21 (k1/l1) must be arranged in the phase where the measuring voltage for the terminal 10 (L1) is measured. The same applies to the other transformer and measuring voltage connections.

Caution

Before any interchanging the transformers must be shorted out!

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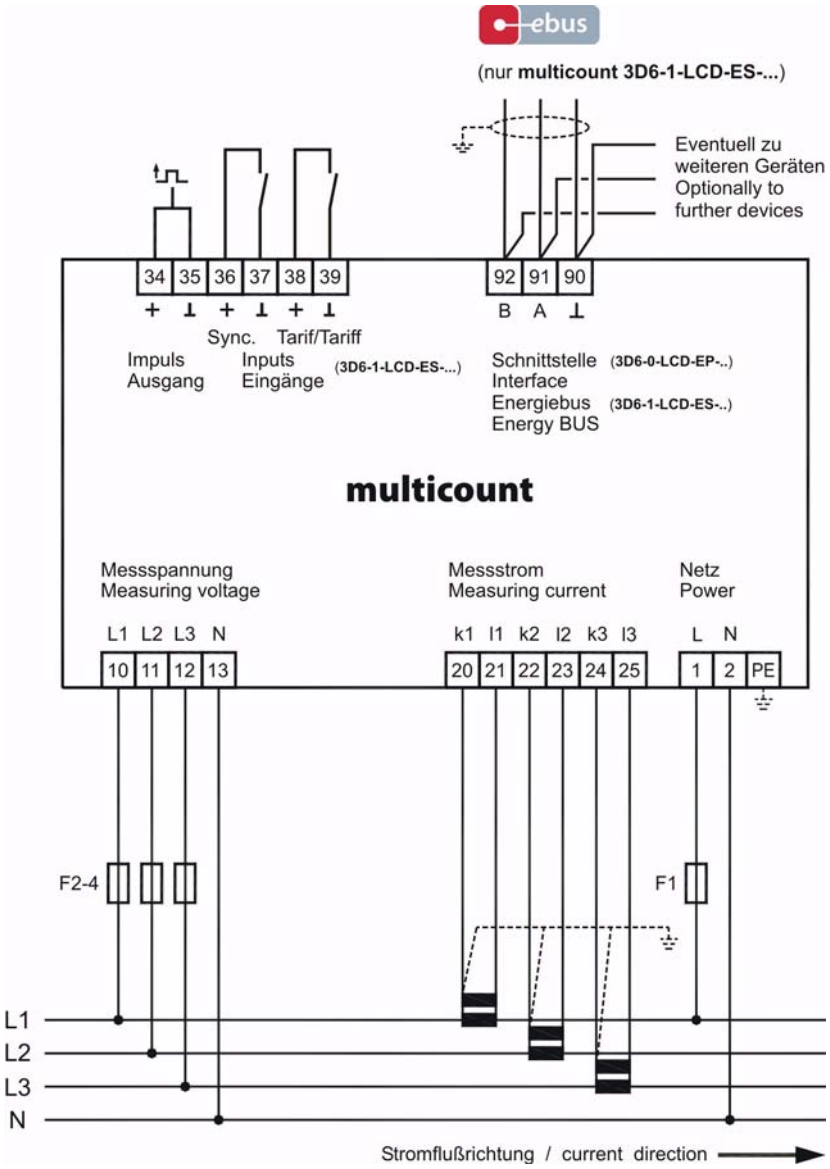
4.2 Connection diagram



4.3 Terminal assignment

Terminal 1 (L) / 2 (N) and PE: Connection power supply

A control voltage is required to supply the device with power. The device can be operated with a voltage from 85V to 265V.

Terminal 20 (k1) and 21 (I1):
22 (k2) and 23 (I2)
24 (k3) and 25 (I3)

Measuring inputs for current

The measuring inputs for current must be connected via current transformers x/1A AC or x/5A AC.
When connecting transformers, pay attention to the energy flow direction and to the correct assignment of measuring voltage inputs to current transformers.

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Terminal	**10 (L1):**	**Measuring input for voltage**
	11 (L2)	Three phase voltage measurement in 4-wire rotary current networks. Direct measurement is possible in the following networks: 3 x 100V/57,7V AC;3 x 400V/230V AC; For higher voltages, the unit needs to be connected via a voltage transformer.
	12 (L3)	
	13 (N)	

Terminal	**92 (B)**	**Bus connection**
	91 (A)	For communication at the Energy Bus **multicount 3D6-0-LCD-EP-...:** to device parameters **multicount 3D6-1-LCD-ES-...:** to connection for power bus
	90 (Masse):	

Terminal 34 (+) and 35 (-): Pulse output

Output of energy-proportional pulses via a digital contact (S_0 interface in accordance with DIN 43864). Correct polarity is important for this output. The output signals can be processed by a maximum demand monitor or a master central process control, for example.

Terminal 36 (+) and 37 (-): Synchronization input (multicount 3D6-1-LCD-ES-... **only)**

A floating contact, e.g. from the energy supplier for synchronizing the measuring period, can be connected to this input

Terminal 38 (+) and 39 (-): Tariff input (multicount 3D6-1-LCD-ES-... **only)**

A floating contact, e.g. from the energy supplier for switching from high to low tariff, can be connected to this input.n.

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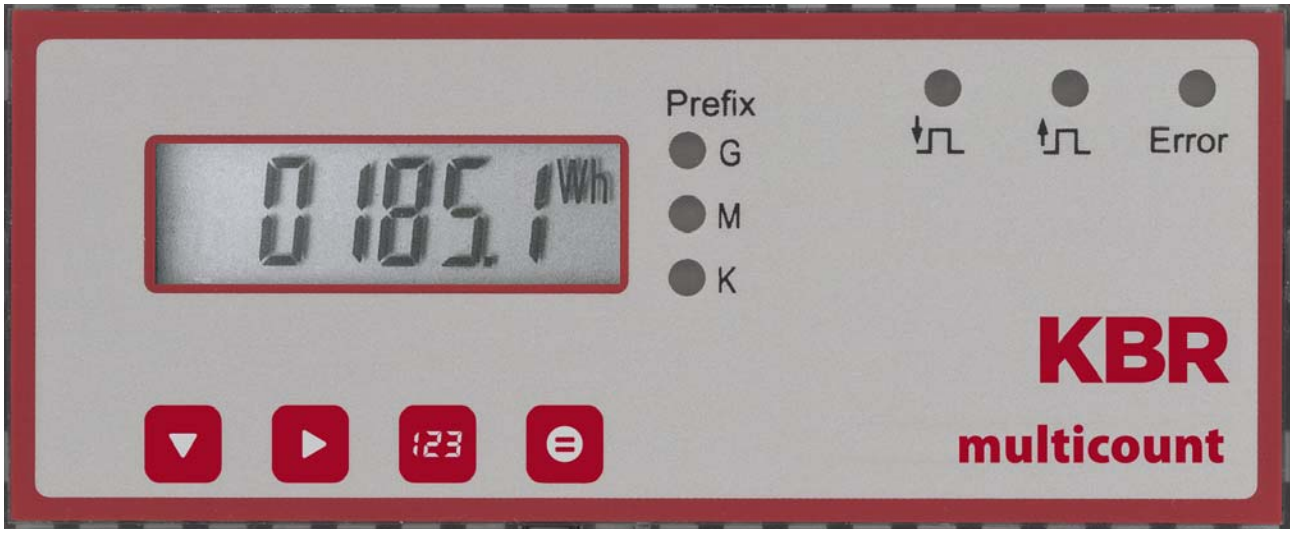
5 Start-up

5.1 Control and display panel

The meter multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-… features four key buttons, ▼ , ▶ , 123 and ⊖ to reach the individual menus and submenus for programming the device. The 6-digit LCD serves to display the currently selected measuring values. Six green LEDs indicate the significance of the measured data as well as different messages



5.2 LEDs

LED „K“
LED „M“
LED „G“

While the LCD shows the type of measurement and the measured numerical value, the three prefix LEDs “K”, M” and “G” show the significance of the unscaled unit. It is decisive which LED is active:

- "**K**" means that the value is shown in "**Kilo**..." (e.g. [kW]),
- "**M**" stands for "**Mega**..." (e.g. [MVArh]) and
- "**G**" corresponds to "**Giga**..." (e.g. [GVA])
- If **no LED** is active, the value is represented as unscaled unit.

LED „Error“

This LED **flashes** if an **error message** is waiting or an **error** has occurred.

LED „ ⏐↓⎍ “

The LED **lights up** when the input **external measuring period synchronization** is activated and a synchronous pulse is applied (e.g. from energy supplier).

LED „ ⏐↑⎍ “

This LED always **flashes** when the **pulse output** is active.

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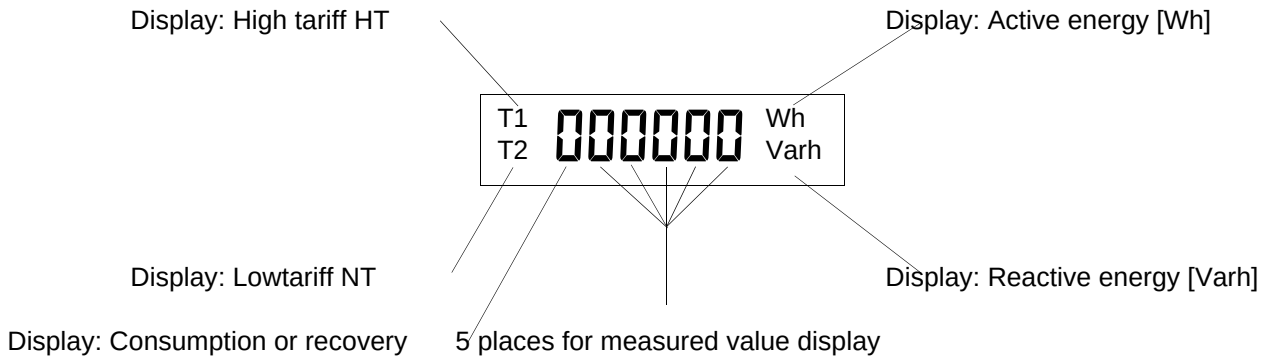
6 Measuring values of the multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-... and their representation

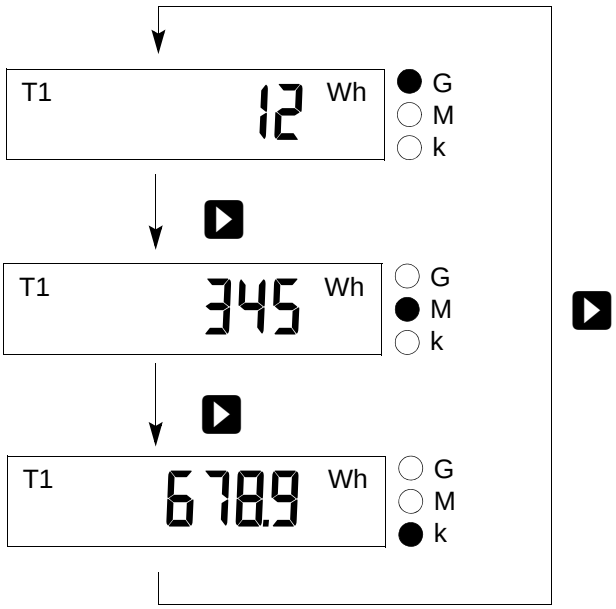
The following section provides an overview of the measuring values of the multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-... and their representation on the device. The respective measuring range switches automatically in the display.

6.1 Display of active or reactive energy measurement



It can be seen in the LC display through **T1** or **T2** whether the period is **high or low tariff**. The currently active tariff is indicated by flashing of **T1** or **T2.** (Two-tariff counter function only fori multicount 3D6-1-LCD-ES-...)
The five **digit places** and the **Prefix LEDs** serve to show the **instantaneous meter count**.
As long as the meter count does not exceed 9999kWh, the entire meter count is displayed in one menu. From 10 MWh the display is divided into several menus so that more than five places can be read. These menus can be called up using the A key. The overall value results from simply writing out the individual values one after another.

Exampel:
Display:



Display of the **Active energy W $_{Act}$** in kWh, MWh or GWh and the **reactive energy W$_{React}$** in kVArh, MVArh or GVArh. The output measuring value must be multiplied with the respective significance "Kilo", "Mega" or "Giga", depending on the active LED.

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6.2 Display of power measurement

The entire active power measurement is marked with a "P" in the first position, "S" tands for total apparent power measurement and "q" for total reactive power measurement.

Active power during **energy consumption** is displayed **without polarity sign**, during **energy recovery** (multicount 3D6-1-LCD-ES-... only) **with a negative polarity sign**.
For **inductive reactive power**, the measured value is preceded by an "i" **capacitive reactive power** is identified by a "c".

For the display of the measured values themselves the same principles apply as for the display of active and reactive energy. The output measuring value must be multiplied with the respective display significance ”Kilo”, ”Mega” or ”Giga”, depending on the active LED.

Display of **active power** in W, kW, MW, GW, the **apparent power S** in VA, kVA, MVA, GVA and the **reactive power Q** in Var, kvar, Mvar, Gvar.

6.2.1 Display for energy consumption or recovery (multicount 3D6-1-LCD-ES-... only)

Whether energy is recovered can be determined by means of the polarity sign for the active power and the continuous meter.

6.2.2 Display of the power factor

If the power factor λ is measured, this is indicated by “PF” (power factor) in the first of the two places in the display.

by definition the power factor is the relationship of the active power to apparent power $\left(\lambda p = PF = \frac{|P|}{S}\right)$

In contrast to the cos φ. for the power factor λ the proportion of distorted reactive power is included in the calculation.

Display of the **power factor** λ in the range 0.00 to 1.00.

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7 Programming

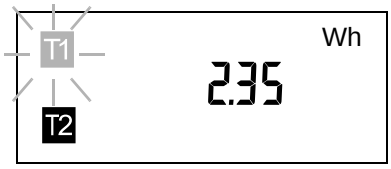
Programming of the energy meter multicount 3D6-0-LCD-EP-.../3D6-1-LCD-ES-... is done using the 4 keys ▼, ▶, 123 and ⊖.

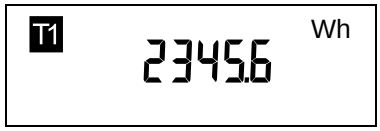
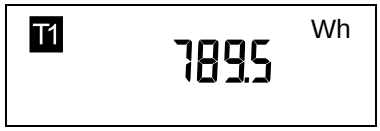
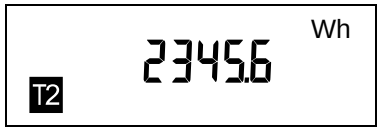
7.1 Working with the display menu

Pressing the navigation key ▼ jumps to the respective following menu item. If the key ▼ is kept depressed, the menus will be switched through with a new menu being activated every 0.5 seconds.

Note

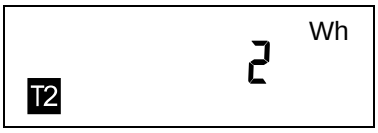
The active tariff is displayed by permanent flashing of the respective tariff display T1 or T2 in each display menu.

Active energy for low tariff		Display of the accumulated active energy in low tariff The tariff display T2 (low tariff) lights up permanently The tariff display T1 flashes, i.e. the current counting tariff is T1 (high tariff).

Menu	LC-Display	Unscaled unit
Active energy W_{Act} for high tariff		kWh if the prefix LED "k" lights up. (if the prefix LED "G" or "M" lights up, other menus are available)
Continue in basic menu ▼ or ▶		For meter count detailed view
		Detailed view giga-watt hours GWh if the prefix LED “G” is active
Continue with ▶ or ▼ to jump back to basic menu		
		Detailed view mega-watt hours MWh if the prefix LED “M” is activet
Continue with ▶ or ▼ to jump back to basic menu		
		Detailed view kilo-watt hours kWh if the prefix LED "K" lights up
Back to main menu ▶ or ▼		
Active energy W_{Act} for Low tariff (multicount 3D6-1-LCD-ES-... only)		kWh if the prefix LED "k" lights up. (if the prefix LED "G" or "M" lights up, other menus are available)

Continue in basic menu ▼
or ▶

For meter count detailed view

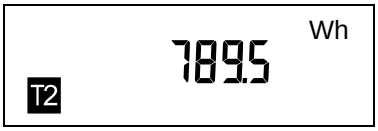


Detailed view giga-watt hours
GWh if the prefix LED “G” is active

Continue with ▶ or ▼ to jump back to basic menu

Detailed view mega-watt hours
MWh if the prefix LED “M” is active.

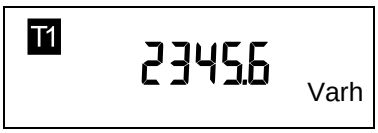
Continue with ▶ or ▼ to jump back to basic menu



Detailed view kilo-watt hours
kWh if the prefix LED "K" lights up.

Continue with ▶ or ▼ to jump back to basic menu

Reactive energy R_{eact} for high tariff



kvarh if the prefix LED "k" lights up.
(if the prefix LED "G" or "M" lights up, other menus are available)

Continue in basic menu ▼
or ▶

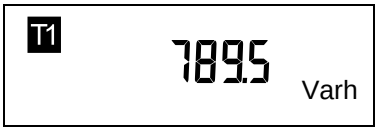
For meter count detailed view

Detailed view giga-var hours
Gvarh if the prefix LED “G” is active

Continue with ▶ or ▼ to jump back to basic menu

Detailed view mega-var hours
Mvarh if the prefix LED “M” is active

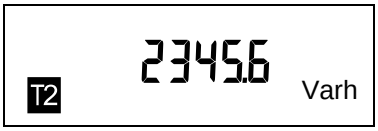
Continue with ▶ or ▼ to jump back to basic menu



Detailed view kilo-var hours
kvarh if the prefix LED "K" lights up.

Continue in basic menu ▼
or ▶

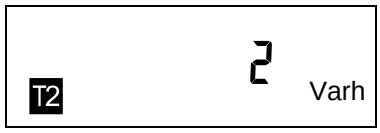
Reactive energy R_{eact} for low tariff
(multicount 3D6-1-LCD-ES-...only)



kvarh if the prefix LED "k" lights up. (if the prefix LED "G" or "M" lights up, other menus are available)

Continue in basic menu ▼
or ▶

For meter count detailed view



Detailed view giga-var hours
Gvarh if the prefix LED “G” is active

Continue with ▶ or ▼ to jump back to basic menu

Detailed view mega-var hours
Mvarh if the prefix LED “M” is active

Continue with ▶ or ▼ to jump back to basic menu

Detailed view kilo-var hours
kvarh if the prefix LED "K" lights up.

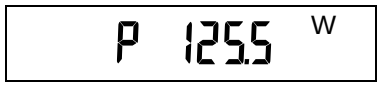
Continue in basic menu ▼
or ▶

Apparent power S_{total}

VA if no prefix LED is active

▼

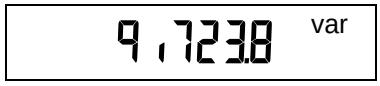
Active power P_{total}



W if no prefix LED is active

▼

Reactive power Q_{total}



var if no prefix LED is active

▼

Power factor λ

Display of the power factor (basic harmonic and overharmonics)

▼

Device time
(3D6-1-LCD-ES-... only)

Output format
Hours:Minutes:seconds

▼

Device - date
(3D6-1-LCD-ES-... only)

Output format
Day:Month:Year

▼

Firmware version

Version number V2.00 Release 01

▼

Mains frequency

measured mains frequency

▼ etc.

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7.2 Programming scheme

	Pressing both keys simultaneously will jump to the configuration menu - from any other display menu.
	Confirms inputs or changes.Changes can only be carried out after a valid password is entered or after the device has been released (password 9999).
	Cancels input from any position in the configuration menu without applying values. Jumps back to point where input started. If input is not active, continue to next item.
	Changes to the input mode, i.e. the first place of the value to be modified flashes. Pressing the key again will jump to the second place of the value to be modified asf.
	Pressing the key steps through the flashing value from 0 to 9.
	Confirms the inputs made. (values are only saved to the device after the configuration menu is closed, i.e. after the last Config - menu item has been passed)

7.3 Working with the configuration menu

Menu	Key combination	Device display	Description
Configuration menu	Press both keys simultaneously		Changes to programming mode; Display flashes
	or		Execute configuration menu **or** Cancel, i.e. back to display of measuring values

Note

The display will automatically jump back from the configuration menu to the display menu after 60 seconds of inactivity, without saving changes!
If you want to change displayed settings, you will have to enter the appropriate password to get access.

The password is queried when you press the key

No password is required to check the settings made, without modifying them. You can scroll through the complete configuration menu while it cannot be changed, using the key .

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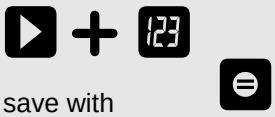
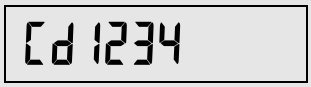
Menu	Key combination	Device display	Description
Reset			Reset should only be carried out during setup and when the device is completely reprogrammed. Caution! Reset will reset all programmed values to their default settings!!!
	 or 		Jump to the next menu **without** performing a reset Key combination to carry out reset

Note

Press the key and hold it down while pressing the key as well (for key combinations, see below!)
The "reset" display flashes for approx. 5 sec. (keep key depressed). The "Reset" is only carried out delayed by these 5 seconds, i.e. the reset procedure can be cancelled by releasing the keys while the display “rESEt” is still flashing!
The display "rEb00t" appears.
After this key combination has been pressed >5 sec., the device is back in its default state; data and parameter memory are deleted.

Menu	Key combination	Device display	Description
Carry out reset	simultaneously and hold down > for 5 sec		The display flashes for approx.5 sec., the reset function is carried out delayed by these 5 sec.
			Display appears briefly after reset has been performed Resetting the device to the factory defaults
Enter password			Requesting password input (only if password 9999 is not used) Password 9999 on delivery, and after reset => all entries are released!
The password function is only supported for **multicount 3D6-1-LCD-ES-...**	 save with		Enter password

Note

If the password is entered correctly, changes can now be carried out within the configuration menu. When leaving the configuration menu, the password will become active again.
In case a wrong password is entered, the password is queried again if changes should be applied.
len (multicount 3D6-1-LCD-ES-... **only)**

Note

All continuous energy counters are deleted when the measuring parameters are changed!

Menu	Key combination	Device display	Description
Measuring voltage primary		UP:0400 V	e.g.: Operation in a network with 400V rated voltage (U_{PH-PH})
	save with	UP:0500 V	Change measuring voltage to 500V, for example
Measuring voltage secondary		US: 400 V	e.g.: Operation in a network with 400V rated voltage (U_{PH-PH})
	save with	US: 100 V	Change measuring voltage to 100V, for example
Transformer – Primary current		IP:0005 A	Display of the configured primary current, e.g.: 5A
	save with	IP:1500 A	Programming transformer primary current, e.g.: 1500A
Transformer - secondary current		IS: 5 A	Display of secondary current, here 5A; 5A or 1A switchable
	save with	IS: 1 A	Switching from 5A to 1A
Delete active energy memory		T1 CLEAr Wh T2 VArh	Menu to delete all energy memory

Note

Delete functions can only be carried out after the appropriate password has been entered!

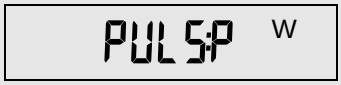
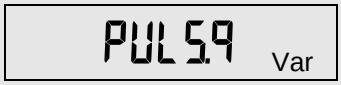
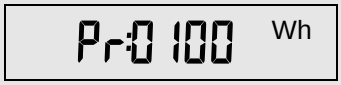
Procedure for delete functions:

Press both keys simultaneously and keep depressed (key combination see next page!).

The display flashes for 5 sec. The ”CLEAr” function is only carried out after this 5 second time delay, i.e. the delete procedure can be cancelled by releasing the keys while the display “CLEAr” is still flashing!

If this key combination is held down > 5 sec., the active energy memory for HT as well as for LT is deleted irrevocably!

After deleting, the "donE" display remains lit for a few seconds

Menu	Key combination	Device display	Description
Delete function Performing	Press simultaneously and hold down > for 5 sec		The display flashes for 5 sec., the delete function is only carried out delayed by these 5 sec
			Display appears after deleting the active energy memory
Pulse output: active or reactive energy proportional to consumption or recovery			Pulse output type KWh: in prop. to active or reactive energy W = in prop. to active energy VAr = in prop. to reactive
	save with		Programming the pulse output type for reactive energy: Display switches from W to Var
Pulse significance of the output			Pulse significance Pulse per kWh or kvarh 0000 = pulse output deactivated
	save with		Programming the pulse significance for the pulse output e.g. 100 P./kWh

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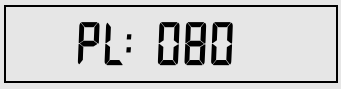
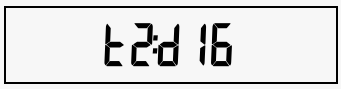
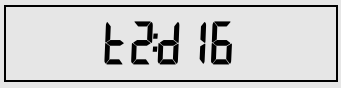
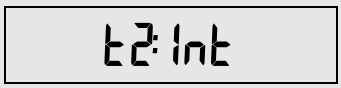
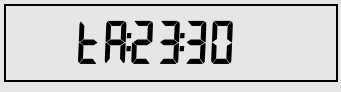
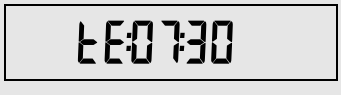
Pulse length of the output			Length of the energy pulse in ms, adjustable from 30 – 990 ms Default 100 ms
	save with		Set length of the energy pulse e.g. to 80 ms
Tariff switching method (**3D6-1-LCD-ES-...** ony)			Switching T1/T2 by floating contact
	save with		Change switching method: The following switching possibilities: diG = signal at the digital input or buS = via Energy Bus command or Int = internal programming period
			
Begin low tariff time (**3D6-1-LCD-ES-...**only)			Start of LT period: Default: 10:00 PM
	save with		Change start of LT time Enter time in Hours : Minutes
End Low teriff time (**3D6-1-LCD-ES-...**only)			End of LT period: Default 06:00 AM
	save with		Change end of LT time Enter time in Hours : Minutes

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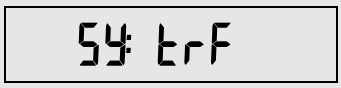
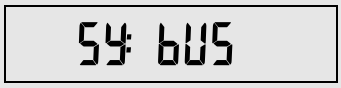
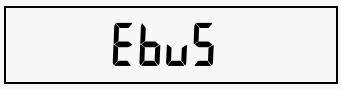
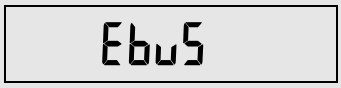
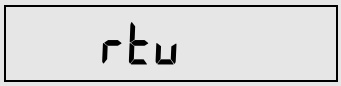
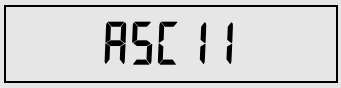
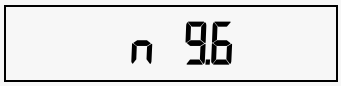
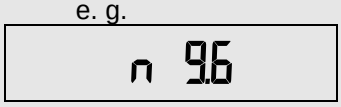
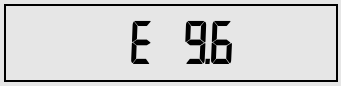
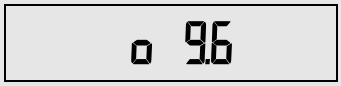
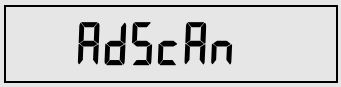
Measuring period synchronization (**3D6-1-LCD-ES-...**only)			Measuring period synchronization default SY = Int Synchronization implemented
	save with		Change synchronization type: SY-int; internal synchronization or
			SY-trF; synchronization with HT/NT switching (tariff switching) or
			SY-diG; synchronization through signal on digital input or
			SY-buS; sychronization through energy bus command and internal clock See Chap.6.4.4 Measuring period synchronization

Bus mode (**3D6-1-LCD-ES-...**only)			KBR-energy bus active Change switching method: Following switching options available:
	save with		Ebus: KBR energy bus or
			rtu: Modbus commands or:
			ASCII: Modbus ASCII

Modbus mode (only if rtu or ASCII was selected in Bus mode)			9600 Baud, no Parity
	save with	e. g.   	Change switching method: Options:: n 4.8, e 4.8, o 4.8, n 9.6, e 9.6, o 9.6, n 19.2, e 19.2, o 19.2,
Bus address (**3D6-1-LCD-ES-...** only)			Display of device address
		only Ebus 	Starting the automat. Bus scan (display flashes for approx. 60 sec.)! As soon as the device is recognized at the Bus, an address is assigned automatically by the PC software and the address is entered in the device memory.
			With the key ▶ the automated process can be stopped and an address can be entered manually Jump to the next menu **without** changing the device address
	save with		Manual setting of device address (Ebus 1 - 9999, Modbus 1-247)

Time (**3D6-1-LCD-ES-...** only)		10:24:56	Time of the device internal clock
	Save and jump to input menu Date with	10:24:57	Set device clock time Enter clock time in Hours : Minutes : Seconds

Note

Setting the device internal clock may have influence on the load profile memory.
If the time of the multicount 3D6-1-LCD-ES-... **is adjusted by less than the duration of one period, the measurement for the instantaneous period is finished at the next synchronization event and saved.**
If the time of the multicount 3D6-1-LCD-ES-... **is moved back by more than the duration of one period, the load profile memory is deleted and restarted.**
In both cases, a clock adjustment event is created and saved in the event memory.
The date can only be changed via the Bus.

Menu	**Key combination**	**Device display**	**Description**
Password (**3D6-1-LCD-ES-...** only)		Cd:1234	The current password is displayed if it has previously been entered at another point
		Cd:____	Otherwise: enter password
	save with	Cd:4321	Change password e. g. 4321
			Exit configuration menu, save values and apply. The display for the kWh meter count **T1** (HT) is shown

7.4 Storage

7.4.1 Device settings

All device settings and parameter data for storage utilization are stored in the device.

Note

The parameters cannot be changed by means of the software via the bus as long as a user is in the configuration menu of the device on location.

7.4.2 Devices - basic parameters

Parameters	Stored by user
Measurement voltage, primary	programmable by user from 1 to 9999V
Measurement voltage, secondary	programmable by user from 1 to 500V
Measuring current; transformer primary	programmable by user from 0001A … to 9999A
Measuring current (at device input, i.e. transformer secondary!)	can be selected by user from 1A or 5A
Pulse output type /pulse significance Pulse length	according to user settings / 0 to 9999 P/kWh 30 to 990 ms
Tariff switching (3D6-1-LCD-ES-… only)	user can select from digital input, switching via energy bus or times programmed in the device
Synchronization settings (3D6-1-LCD-ES-… only)	setting options: dig. input, bus, tariff switching and internal clock
Bus mode (3D6-1-LCD-ES-… only)	choice of Ebus, Modbus rtu or Modbus Ascii
Bus address (3D6-1-LCD-ES-… only)	according to user settings between 0001 and 9999 for Ebus and 1 to 247 for Modbus
Time (3D6-1-LCD-ES-… only)	acc. to user settings in hh:mm:ss
Password (3D6-1-LCD-ES-… only)	acc. to user settings Password is a 4-digit number (leading zeros) 9999 means: Device is not password-protected
Device name (3D6-1-LCD-ES-… only)	any name chosen by the user 1*)
Event name (3D6-1-LCD-ES-… only)	an individual designation is assigned to every event
Measuring period (3D6-1-LCD-ES-… only)	1 / 15 / 30 / 60 min. 1*)

1*) This function can only be set by means of the PC with optionally available software (e.g. Visual Energy).

7.4.3 Long-term memory (multicount 3D6-1-LCD-ES-… only)

The multicount 3D6-1-LCD-ES-… offers the user the long-term memory described in the following section.

7.4.3.1 Load profile memory

The meter has a load profile memory which can record up to a maximum of 4x3840 entries depending on the number of parameters to be saved (active power periods for HT and LT, consumption and recovery, reactive power periods for HT and LT, capacitive and inductive) and a measuring period that can be selected by the user (possible period values 60 / 30 / 15 / 1 minutes).
This means that a period of 60 min. results in a storage duration of 160 days max.
The measuring period can be programmed via the PC using the optionally available software.

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Note

Setting the internal time of the device
If the clock time of the multicount 3D6-1-LCD-ES-... is adjusted by less than the duration of one period, the measurement for the instantaneous period is finished at the next synchronization event and saved.
If the time of the multicount 3D6-1-LCD-ES-... is moved back by more than the duration of one period, the load profile memory is deleted and restarted.
In both cases, a clock adjustment event is created and saved in the event memory.

Adjusting the period duration
If the period duration is adjusted, the load profile memory is deleted and restarted.
An adjustment event (adjustment of the period duration) is created and entered in the event memory.

7.4.3.2 Annual energy memory

The daily energy values of the past 365 days for W_{Act} consumption, W_{Act} recovery, W_{React} inductive and W_{React} capacitive are stored in an annual energy memory separated for high and low tariff.

7.4.3.3 Pmax and Qmax annual memory

The multicount 3D6-1-LCD-ES-... can, apart from the daily energy values and the cumulated values for power, also save the maximum values of the last 12 months of cumulated active and reactive power Pkum and Qkum.

7.4.3.4 Event memory

The event memory saves 4096 events with date, time and status in a ring buffer.

Fhe following events are acquired:

Event	**Acquisition**
Tariff input	Switchover signal HT => LT with date and time Switchover signal LT => HT with date and time
Sync input	Signal pulse with date and time
Mains failures	with date, time and duration of the mains failure
Error	Error type with date and time
Changed settings / deletions	e.g. reset via EBUS / set clock / deletions / general parameter changes

Note

The described memories can only be read or parameterized via the Energy Bus by means of optionally available software (e.g. Visual Energy).

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7.4.4 Measuring period synchronization (multicount 3D6-1-LCD-ES-… only)

Measuring period synchronization of the multicount 3D6-1-LCD-ES-… can be carried out in four ways, while the measuring period duration can be adjusted as described in chapter 7.5 Device memory. The measuring period duration and the synchronization always affect all period values.

The following 4 types of synchronization are possible:

7.4.4.1 Synchronization only by internal clock.

The synchronization by internal clock is started with the manufacturer's reset. From this time onwards, the clock synchronizes the measuring period every 15 minutes

7.4.4.2 Synchronization by the energy supplier's synchronous pulse.

If the synchronous pulse is available as floating contact from the energy supplier, it can be connected to the synchronization input. If the contact closes for at least 250 ms, it will be recognized as synchronous pulse and the measuring period is restarted.
Under certain operating conditions, the energy supplier may carry out an intermediate synchronization while a measuring period is still running. The multicount 3D6-1-LCD-ES-… terminates the instantaneous period measurement and saves the period value together with a timestamp. The time pattern is shifted to the new start time and a new measurement is started immediately.
Example:
Period duration is set to 15 min
i.e. 20 kW input power results in a period value of 20 kW (15 min period)
if there is an intermediate synchronization 3 min after period start and this 3 min period is saved,
the period value to be recorded will be 4 kW.
If the energy supplier's synchronous pulse does not take place, the error message E-SYnc will be displayed and the internal clock will continue with the time pattern.

7.4.4.3 Synchronization by KBR ENERGY BUS

Synchronization is carried out via a telegram created either by the PC or by the MULTIMASTER and sent via the KBR ENERGY BUS to the selected recipients.
Under certain operating conditions, an intermediate synchronization may be carried out while a measuring period is still running. multicount 3D6-1-LCD-ES-… terminates the instantaneous period measurement and saves the period value together with a timestamp. The time pattern is shifted to the new start time and a new measurement is started immediately.
Example:
Period duration is set to 15 min
i.e. 20 kW input power results in a period value of 20 kW (15 min period)
if there is an intermediate synchronization 3 min after period start and this 3 min period is saved,
the period value to be recorded will be 4 kW.
If the BUS synchronous pulse does not take place, the error message E-SYnc will be displayed and the internal clock will continue with the time pattern.

7.4.4.4 Synchronization when tariffs are changed

This type of synchronization makes it possible for the counter to change tariffs immediately after the tariff HT/LT has been switched instead of waiting until the end of the measuring period.

The internal clock synchronizes the measuring period. If the tariff is changed, depending on the configuration by contact at the HT/LT input or by bus signal, this event will additionally synchronize the measuring period.
Under certain operating conditions, the synchronization pulse and the internal measuring period synchronization may not be in accordance with the same time pattern. The multicount 3D6-1-LCD-ES-… terminates the instantaneous period measurement and saves the period value together with a timestamp. The time pattern is shifted to the new start time and a new measurement is started immediately.
Example:
Period duration is set to 15 min
i.e. 20 kW input power results in a period value of 20 kW (15 min period)
if synchronization is carried out 3 min after period start and if this 3 min period is saved,
the period value to be recorded will be 4 kW.

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8 Technical Data

8.1 Measuring and display values

Active energy	Calculation	W_P
	Units	kWh if the prefix LED “K” is active MWh if the prefix LED “M” is active GWh if the prefix LED “G” is active
	Display range	0.0000 kWh to 9999 GWh; autom. range switching
Reactive energy	Calculation	W_Q
	Units	kVArh if prefix LED “K” is active MVArh if the prefix LED “M” is active GVArh if the prefix LED “G” is active
	Display range	0.0000 kVArh to 9999 GVArh; autom. range switching
Active power	Calculation	P_Σ / P_{L1}, P_{L2}, P_{L3}; display of phase power only via Energy bus
	Units	W if no prefix LED is active kW if prefix LED “K” is active MW if the prefix LED “M” is active GW if the prefix LED “G” is active
	Display range	10.0 W to 9999 GVA; autom. range switching
Apparent power	Calculation	S_Σ / S_{L1}, S_{L2}, S_{L3}; display of phase power only via Energy bus
	Units	VA if no prefix LED is active kVA if prefix LED “K” is active MVA if the prefix LED “M” is active GVA if the prefix LED “G” is active
	Display range	10.0 VAr to 9999 GVA; autom. range switching
Reactive power	Calculation	Q_Σ / Q_{L1},QS_{L2}, Q_{L3}; display of phase reactive power only via Energy bus Distinction between ind. / cap. xx
	Units	VAr if no prefix LED is active kVAr if prefix LED “K” is active MVAr if the prefix LED “M” is active GVAr if the prefix LED “G” is active
	Display range	10.0VAr to 9999 GVAr ; autom. range switching
Power factor	Power factor	λ_Σ / λ_{L1}; λ_{L2}; λ_{L3} display of phase power factors only via Energy bus The power factor contains the first and overharmonics
	Display range	0,00 $\rightarrow$ 1.00
Voltage	Actual value of a measuring	Phase - N; U_{L1-N} / U_{L2-N} / U_{L3-N} / Phase - Phase; U_{L1-L2} / U_{L2-L3} / U_{L3-L1}
	Units	No display on the device! Data can only be read via PC und operating software
	Display range	No display on the device! Data can only be read via PC und operating software
Current	Actual value of a measuring	I_{L1Inst}; I_{L2Inst}; I_{L3Inst}; instantaneous value per phase
	Average value formation	I_{L1Mit}; I_{L2Mit}; I_{L3Mit}; floating average value from effective values over 15 minutes
	Units	No display on the device! Data can only be read via PC und operating software

8.2 Operating and display elements

Operation	4 softkeys
Measuring values	8-digit 7-segment LCD
Control display	6 green LEDs: 3 x display significance, 1 x error message, 1 x synchronization input, 1 x pulse output

8.3 Measuring accuracy

Voltage / Current with respect to the nominal value	± 0.5% ± 1 digit
Active power with respect to the nominal value	± 1% ± 1 digit
Reactive power with respect to the nominal value	± 2% ± 1 digit

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8.4 Measuring principle

Reading	128 points per period at 50Hz
Update time	~ 500ms
Frequency range	Automatic frequency adjustment between 40-70 Hz

8.5 Device memory

Main data and program memory	1MB RAM battery-buffered/ 256k EPROM
Memory type	Ring buffer
Long-term memory (1 year) (multicount 3D6-1-LCD-ES-… only)	Annual energy memory daily values for active and reactive energy, for high and low tariff, for consumption and recovery for one year
Long-term memory for max. 160 days, min. 64 hours depending on memory configuration (multicount 3D6-1-LCD-ES-… only)	Load profile memory: A maximum of 4*3840 entries; 60 / 30 / 15 / 1 – minute average values of PΣ and Q Σ for high and low tariff, for consumption and recovery; configurable via operating software!
Long-term memory (1 year) (multicount 3D6-1-LCD-ES-… only)	Measuring period maximum Pkum / Qkum per month for 1 year
Event memory (multicount 3D6-1-LCD-ES-… only)	A maximum of 4096 entries to record tariff switching commands, mains failures, error messages, and many more.
Parameter memory	non volatile
Password memory (multicount 3D6-1-LCD-ES-… only)	Code 4-digit

8.6 Power supply

Power supply	85 to 265V AC/DC; 50/60Hz
Power consumption	15 VA

8.7 Hardware inputs

Measuring input for voltage	U_{L1-L2}; U_{L2-L3}; U_{L3-L1}	3 * 5V ...**100V**...120V AC (measuring range 1) 3 * 20V...**500V**...600V AC (measuring range 2)
	Direct impedance	1.2 MOHM (Ph-Ph)
	Measuring range	programmable
Measuring inputs for current	I_{L1}; I_{L2}; I_{L3}	3 * 0,01A...**1A**...1,2A AC (measuring range 1) 3 * 0,05A...**5A**...6A AC (measuring range 2)
	Power consumption	≤ 0,3VA per input at 6A
	Measuring range	programmable
Digital inpputs (multicount 3D6-1-LCD-ES-… only)	Tariff input	digital input for floating contact Switching HT/LT, signal e.g. from energy supplier Contact open => Tariff HT Contact closed => Tariff LT
	Synchronous input	digital input for floating contact Synchronization of measuring period; pulse length ≥ 250ms
	Power supply	27V / 15mA DC

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8.8 Electrical connection

Connection elements		Screw-type terminal
Max. permissible cross-section of connecting cables		2.5 mm^2
Measurement voltage inputs	Fuse protection	F2-F4: Recommendation 0.1 A < Fuse < 4 A
Measuring current inputs	Fuse protection	**NONE!!!** Always short-circuit current transformer terminals k and l prior to opening the circuit!
Input Power supply	Fuse protection	F1: Recommendation 1 AT < Fuse < 4 AT
BUS - connection (multicount 3D6-1-LCD-ES-… only)	Connection material	For proper operation please only use shielded twisted-pair cables; e.g. I-Y(St)Y 2x2x0.8
Pulse input (multicount 3D6-1-LCD-ES-… only)	Connection & Cables	Ensure proper polarity! For proper operation please only use shielded twisted-pair cables; e.g. I-Y(St)Y 2x2x0.8
Tariff input / Synchronous input (multicount 3D6-1-LCD-ES-… only)	Connection & Cables	Ensure proper polarity! For proper operation please only use shielded twisted-pair cables; e.g. I-Y(St)Y 2x2x0.8
Transformer connection	Connections	Cf. Chapter 3.2 Connection chart
BUS connection	multicount 3D6-0-LCD-EP-… Pins for BUS connection via RS485 multicount 3D6-1-LCD-ES-… Pins for BUS connection via RS485	Device **MULTIMASTER** or interface adaptor terminal 90 (⊥) → Pin ⊥ → see Software-manual terminal 91 (A) → Pin A → see Software-manual terminal 92 (B) → Pin B → see Software-manual

8.9 Hardware outputs

Pulse output	Output type	In proportion to active or reactive energy ⇒ programmable on the device
	Opto coupler output	Digital S_0-compatible in accordance with DIN 43865
	Pulse significance	Linear: programmable from 0...9999 P/kWh or P/kVArh limited additionally by the max. possible pulse frequency of 16 Hz
	Pulse length interpulse period	100ms ⇒ 30-990 ms configurable on the device = Pulse length
	External voltage supply	max. 35V / 15 mA DC; ensure correct polarity
Serial interface multicount 3D6-0-LCD-EP-…	RS 485 interface baud rate addressing	For device configuration 38400 fixed Address 1 fixed
Serial interface multicount 3D6-1-LCD-ES-…	BUS Baud rate Addressing	RS 485 for connection to the Energy bus; a max. of 32 devices per bus segment, up to 1000 m without bus amplifier, for additional information see installation guide KBR Energy Bus 38400 Can be addressed up to address 9999; automatically via software or manually on the device

8.10 Mechanical Data

Top hat rail device	Housing measures	90 x 106 x 61 mm (H x W x D)
	Mounting type	Wall mounting on DIN rail 7.5mm deep in accordance with DIN EN 50022 Suitable for distribution board mounting
	Weight	approx. 650g

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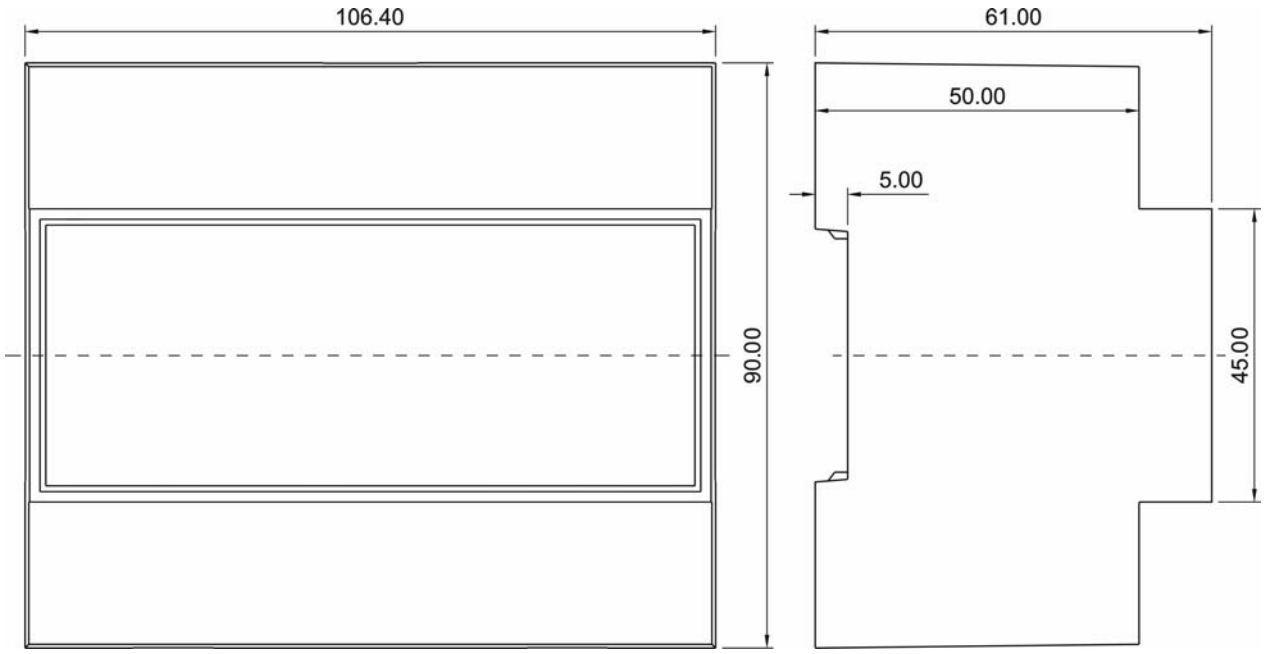
8.11 Dimensioned drawing



8.12 Environmental conditions / Electrical safety

Ambient conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C … +55°C
	Humidity	5% … 95%
	Storage temperature	-25°C … +70°C
Electrical safety	Standards and amendments	DIN EN 61010-1 / Edition 2002; (IEC1010-1/A2)
	Protection class	I in accordance with DIN EN 61010 / Edition 2002
	Overvoltage category	CAT III: U_{PH-PH} up to 400V
	Mode of protection	IP20 in accordance with DIN EN 40050 Part 9: 1993-05
	Electromagnetic Compatibility	DIN EN 61000-6-3: 2005-06; (IEC 61000-6-3) DIN EN 61000-6-2: 2000-03; (IEC 61000-6-2)

8.13 Default settings after reset

Measurement voltage, primary	400V
Measurement voltage, secondary	400V
Measuring current secondary	5A
Measuring current primary	5A
Summertime (multicount 3D6-1-LCD-ES-… only)	from March to October
Frequency correction	automatic
Current average value over	10 minutes
Tariff switching (multicount 3D6-1-LCD-ES-… only)	via digital input, active tariff T1 (HT)
Default setting for tariff switching over time by internal clock (multicount 3D6-1-LCD-ES-… only)	Start time: 12:00:00 AM for LT start End time: 12:00:00 AM for LT end
All measurements	Restart
Energy Memory	Deleting all energy memories
Measuring period (multicount 3D6-1-LCD-ES-… only)	15 min.

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Measuring period memory (multicount 3D6-1-LCD-ES-… only)	Deleting all entries
Damping coefficient for current / voltage	0
Synchronization type (multicount 3D6-1-LCD-ES-… only)	internal
Pulse output type Pulse significance Pulse length at pulse output	proportional to active energy (WAct) xx, consumption 1 pulse / kWh 100ms → Te/Ta = 50/50
Tarif (multicount 3D6-1-LCD-ES-… only)	HT
Password (multicount 3D6-1-LCD-ES-… only)	Basic setting 9999 device can be accessed

Unchanged by a RESET
Bus address and time (multicount 3D6-1-LCD-ES-… only)

8.14 Basic configuration when delivered

All settings are applied according to the defaults acc. to chapter 7.13.

Address	multicount 3D6-0-LCD-EP-…	0001
Bus address	multicount 3D6-1-LCD-ES-…	0000

9 Serial interface

9.1 Operating modes and interface configuration

9.1.1 RS 485 Bus operation

The RS485 port of the meter is designed for operation at the KBR Energy Bus. You can operate one or several multicount 3D6-1-LCD-ES-… devices together with the Energy Bus across great distances. The bus is connected to the PC via the interface converter RS 232/485 or the ***MULTIMASTER***. With the corresponding Windows® Software, all bus devices can be configured and visualized. On demand, we will be glad to provide information about which other devices you can connect to the Energy Bus and on the functions of our Windows® software.
Information on the structure and the technical parameters of the Energy Bus can be found in our installation guide for the KBR Energy Bus. Just send a request for this installation guide.

9.1.2 Protective measures

9.2 Overvoltage and lightning protection

It is recommended to install overvoltage protection measures to protect our high-quality electronic devices from damage. It is recommended to protect control voltage inputs and pulse lines.

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10 Error detection

No function.

Check power supply, back-up fuse and supply line.

The measured values for power differ, compared with the power supplier measurement.

Check k and l of the current measurement, the correctness of the phases of the transformers as well as the values entered for the transformer primary and secondary current and adjust, if required. See Chapter 6.3 Operating the Configuration menu, menu item "Transformers - Primary current and "Transformers - secondary current"

Note

Error call (LED Error flashes):
After pressing the key the error message is displayed.

The error message E-rnGE is displayed

Check the connected measurement voltage and the voltage transformer with respect to the programmed measuring range.
There is an overrange of at least 20%.

The errror message E-PULS is shown

Check the pulse significance with reference to the pulse duration.
Correct the pulse length or the pulse significance, if required.
The maximum active or reactive energy that can be processed can be estimated by means of the following calculation

$$\frac{3600s}{2 \bullet IL \bullet IP/kWh(kvarh)} = MaxValue$$

Explanation:

3600	Constant [s]
IL	Required pulse length [s]
IP/kWh(kvarh)	Required pulse count per kWh or pro kvarh [P/kWh or P/kvarh]
	Maximum value Maximum active or reactive energy that can be output [kWh or kvarh]]

After error correction, acknowledge error message with the key

The error message E-PArA is displayed

If this text appears in the display, a parameter error occurred. Reset the device.
Note! Take notes of all programmed parameters as they will have their default settings after the reset. After the reset the multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-… must be programmed again.

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The error message E-bAt is shown

The battery voltage of the integrated battery is too low.
Replace the battery.
Note! Read out the multicount 3D6-0-LCD-EP-…/3D6-1-LCD-ES-… and note all meter states, because through the
replacement of batteries, all saved data and measured values will be deleted.

The error message E-SYnC is shown

Depending on the user configuration, the synchronization via KBR Energy Bus or via synchronization contact could not be carried out (see Chapter 6.4.4 Measuring period synchronization)

Acknowledge error message with the ⊜ key.

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Vorschläge:
Korrekturen:
Betrifft Gerät:

Suggestions:
Corrections:
Device concerned

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