DC-CONTROLLER
MU1000C Language

USER MANUAL

(Firmware version: V2.08)

Notes to this manual

ATTENTION! Read this manual carefully before installing and commissioning the specified unit. This manual is a part of the delivered unit. Familiarity with the contents of this manual is required for installing and operating the specified unit. The rules for prevention of accidents for the specific country and the general safety rules in accordance with IEC 364 must be observed.

The function description in this manual corresponds to the date of publishing. Technical changes and changes in form and content can be made at any time by the manufacturer without notice. There are no obligations to update the manual continually.

The unit is manufactured in accordance with applicable DIN and VDE standards such as VDE 0106 (part 100) and VDE 0100 (part 410). The CE marking on the unit confirms compliance with EU standards 2006-95-EG (low voltage) and 2004-108-EG (electromagnetic compatibility) if the installation and operation instructions are followed.

Supplier:

✉	ELTEK DEUTSCHLAND GmbH BU Industrial Schillerstraße 16 D-32052 Herford
☎	+ 49 (0) 5221 1708-210
FAX	+ 49 (0) 5221 1708-222
Email	Info.industrial@eltek.com
Internet	http://www.eltek.com

Changes and errors excepted.

Revision history

Revision: 3.1

Date: 2013-09-06

Revision	Description	Author	Date
00	Preliminary version (translation of the German version …R02)	PS	2008-08-04
1.0	Section 4.6 "Temperature Compensation" completed; translation reworked; pinning of connector X2:5 corrected; new revision numbering (X.X) introduced.	RTH	2011-01-31
2.0	Pinning of the relay contacts corrected.	RTH	2011-04-06
3.0	Section “Optional: Relayboard MU1000C-I/O” omitted	RTH	2013-06-10
3.1	Section 2.1 “Options” reworked	RTH	2013-09-06

Contents

1. Applications & functioning 5

2. Type list 6

2.1 Options and additional available articles 6

3. Features 7

4. Description of the individual functions 8

4.1 Measuring inputs V_{dc1}, V_{dc2}, V_{dc3} 8
4.2 Measuring inputs I_{dc1}, I_{dc2}, I_{dc3} 8
4.3 Insulation error monitoring 9
4.4 Signalling of "DC voltage low" 9
4.5 Signalling of "DC voltage high" 9
4.6 Temperature control and temperature compensation of the charge voltage 10
4.7 Monitoring of mains voltage 10
4.8 Digital inputs 10
4.9 Signalling relays K1 & K2 (K11-K16) 11
4.10 Monitoring: Battery voltage imbalance 11
4.11 Boost charge/hand operation charge/system test 12
4.12 Bootloader 12

5. Operation 13

6. Menu- and display structure 14

6.1 General structure 14
6.2.1. Customer menu 15
6.2.2. Service menu 1 31
6.2.3. Service menu 2/calibration menu 31

7. Electrical connectors 31

7.1 CAN bus connector 33

8. Optional: Relay board DCC-RB 34

9. Optional: Digital input board DCC-DI8 34

10. Technical Data MU1000C 35

10.1 Dimensional drawing of the MU1000C 36

1. Applications & functioning

The Signalling and Monitoring unit MU 1000C (named MU 1000C in the following) is used as a central monitoring- and signalling unit in DC power supply systems. These plants can be battery-powered or operate as direct supply for DC-bus bars.

They are used in all the places, where plant information is collected (such as voltages and current at different intersections of the system), where parameters have to be monitored and errors signalled or if boost charge function or discharge test is required in a battery system.
The monitoring unit can be mounted in different ways. Thus it is possible to mount it in 19” full insertion units with a minimum height of 3 HU, and 19” partial insertion units (1/3-19” width), or door mounted as well.

The individual signal parameters such as voltages and current are connected using secured lines directly to the MU 1000 by plug (DIN41612, R48).
The MU1000 receives these values, indicates them on the display, compares the values with adjusted monitoring thresholds, gives disturbance signals (LED + relay) and operates in the boost charge operation as well as discharge test operation as a controlling device of the connected rectifiers.
Additionally the output values of rectifier REC and inverter INV can be read out if a CAN bus is connected.

The user language can be selected by menu. All the necessary monitoring parameters can be read by the end-user directly at the site of application and can be adjusted by code-protected service menu. Special software adaptations are not necessary for this.

The MU 1000C can be obtained for two different voltage ranges and can be directly connected to the corresponding DC potential without any further measures.
The software as well as the default values for the plant parameters for the MU 1000C is programmed in an EPROM. The current values (adaptations on site etc) as well as the error data are stored in an EEPROM.

If there is cancellation in the EEPROM (e.g. due to a defect of the MU 1000C), a reprogramming starts using the default values of the plant which are stored in the EEPROM. During reprogramming all the functions which include a control function for external devices (boost charge option, discharge test) are deactivated in order to prevent damage due to false values in the plant. These functions must be manually enabled again in the service menu.

2. Type list

MU1000C versions as listed in the table below are available.

Type designation	Article code	Supply voltage (V DC)
MU1000C-I Language	300-110-660.00	24 to 80 (Low Voltage Version)
MU1000C-II Language	300-110-770.00	80 to 300 (High Voltage Version)

2.1 Options and additional available articles

- 3-phase mains monitoring board: DCC-MM
- Battery monitoring board: DCC-BM (old: MU1000C-BM)
- 8 digital inputs: signalling board DCC-DI8
- 6 relay outputs: relay board DCC-RB
- Profibus-accessibility by unigate gateway CL
- Modbus-accessibility by unigate gateway CL-RS
- Front plate 1/3-19“ x 6 HU for mounting one MU1000; printed
- Front plate 19“ x 3 HU for mounting one MU1000; printed

3. Features

The MU1000C has the following standard features:

- Real time clock (RTC) with date and Event History
- Measurement, indication and monitoring of three DC voltages in the system
- Measurement, indication and monitoring of three DC currents in the system
- Isolation fault monitoring
- Boost charge automatic (dependent on current, voltage and time)
  boost charge switchable by digital input
- Battery test (dependent on time) and switchable by digital input
- Drop diode control
- Monitoring of battery voltage imbalance
- Control of LVD
- RS232 interface for parameterization using PC configuration software
- 4 potential free relay outputs (K1-K4)
- 8 digital measuring inputs
- CAN bus interface to control connected power supply modules
- Multilingual facility, seven languages (three at the same time): English and German as well (always), French, Italian, Russian (Cyrillic), Swedish, Czech
- LED signals to indicate errors
- Free programming of indication and error texts as well
- Free allocation of individual errors to urgent and not urgent alarms as well as to the signalling relays
- BootLoader, i.e. firmware-update via CAN or RS232 alternatively

The following options and upgrades as well are available:

- Temperature compensation of the charge voltage
  (using a temperature sensor LM335)
- Measurement, indication, and control of current and voltage of
  3-phase mains (using a mains monitoring board DCC-MMB)
- 8 additional digital inputs (using a signalling board DCC-DI8)
- 6 additional potential free relay contacts (using a relay board DCC-RB)
- Remote data retrieval via modem
- Programming software for the parameterization of the unit via RS232
- Connection to Profibus (using an external gateway Unigate CL)
- Connection to Modbus (using an external gateway Unigate CL-RS)

4. Description of the individual functions

4.1 Measuring inputs V_{dc1}, V_{dc2}, V_{dc3}

- Voltage version 1 (LV): Measurement and indication voltage range 0 V to 100 VDC
- Voltage version 2 (HV): Measurement and indication voltage range 0 V to 300 VDC

The supply lines have to be externally fused. If V_{dc3} is used for monitoring the battery symmetry, pay attention to use the same reference connection point of the minus connections for V_{dc1} and V_{dc3}!

The plain text of display indication of the measuring inputs V_{dc1} to V_{dc3} can be freely programmed (max. five signs) via software (not included in this version) in the user menu.

The indication accuracy of the values corresponds to class 1 measuring device.

Clear text terms:

- V_{dc1}: free programmable; designation in this version: Vbatt
- V_{dc2}: not connected
- V_{dc3}: not connected

4.2 Measuring inputs I_{dc1}, I_{dc2}, I_{dc3}

The assignment of the nominal shunt values is done in the Service menu. The shunt magnitudes can be assigned to the individual measuring inputs as follows:

- I_{dc1}(±)0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"
- I_{dc2}: 0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"
- I_{dc3}: 0 A to 50 A (1 A steps), 50 A to 1000 A (5 A steps); 0 A means "no shunt installed"

The assigned maximum current of the shunt corresponds to a potential drop of 60 mV.
Because exclusively measuring input I_{dc1} is able to measure negative current values it should be used to meter the battery charging and discharging current as well.

The indication accuracy of the values corresponds to class 1 measuring device.

ATTENTION!
All shunts have to be referenced to the same DC-bar. Potential differences in the current path of the shunts may destroy the measuring inputs.
For the correct indication of the measured current value it is necessary to connect digital GND to the positive measurement line connection point at the shunt (in the direction of current flow). If more than one shunt is used in the system, the connection to one shunt is sufficient.

4.3 Insulation error monitoring

The connection of the measuring and supply voltage Vdc1 as well as of the protective conductor is the minimum necessity for monitoring insulation errors of the DC-system for. While measuring the insulation error, it can be seen whether there is an insulation error between plus pole and earth, or minus pole and earth.

Insulation errors are only recognised if they appear between plus potential /minus potential and earth, not between the potentials. The threshold value of the insulation resistance can be adjusted using the user menu. The prefix indicates whether there is an earth-leakage against plus or minus.

Earth fault R = +(-)xxx kOhm

Factory setting: The error signal does not enter collective failure relay.

4.4 Signalling of "DC voltage low"

A monitoring threshold V<Vmin can be set for each measuring voltage (V_{dc1} to V_{dc3}). The LED indication at the front side $V>V_{min}$ and the relay K4 are fixedly connected to the monitoring of V_{dc1}. The green LED $V>V_{min}$ is OFF, and the signalling relay K4 switches over in the case of error.

External signalling of monitoring V_{dc2} and V_{dc3} is possible by an assignment of the signal to the reserve relay K1 or LED-signal S1 or S2.

A time delay can be adjusted in the user-menu for these signals.

Indication: $V_{dc1}<V_{min}$
$V_{dc2}<V_{min}$
$V_{dc3}<V_{min}$

4.5 Signalling of "DC voltage high"

A monitoring threshold V>Vmax can be set for each measuring voltage (V_{dc1} to V_{dc3}). The LED indication at the front side $V>V_{max}$ and the relay K3 are fixedly connected to the monitoring of V_{dc2}. The red LED $V>V_{max}$ is ON and the signalling relay K3 pulls up in the case of error.

External signalling of monitoring V_{dc2} and V_{dc3} is possible by an assignment of the signal to the reserve relay K1 or LED-signals S1 or S2.

A time-delay can be adjusted in the user-menu for these signals.

Indication: $V_{dc1}>V_{max}$
$V_{dc2}>V_{max}$
$V_{dc3}>V_{max}$

4.6 Temperature control and temperature compensation of the charge voltage

If an active temperature sensor (LM335) is connected to the monitoring unit, the temperature of the devices (cabinet), or the battery can be monitored. The signal can be set as collective failure (selectable by the user) or signalled by the reserve relay K1 (programmable).

Indication: Temperature high "T>"

Thus the relay contact can be used e.g. for fan control. Temperature monitoring can be enabled in the service menu. The temperature threshold and hysteresis can be adjusted in the service menu as well.

If the option "temperature compensation" is enabled, the output voltage of the CAN bus connected rectifiers is controlled dependent on temperature.
The temperature coefficient as well as the start temperature and final temperature of the charge voltage control are settable.
The reference temperature value is 20 °C. The relevant parameters of the regulator (U_{batt}) are related to this value. If the temperature deviates from the reference value, the charge voltage is controlled accordingly.

4.7 Monitoring of mains voltage

Using a Mains Monitoring Board (DCC-MMB) the unit monitors and displays mains voltages. The monitoring threshold is settable in the service menu.

Indication:

VR	VS	VT	f
xxxV	xxxV	xxxV	50.0

and

IR	IS	IT
xxxA	xxxA	xxxA

Fault Indication: MM1 fault, mains fault V< or mains fault V>

If the set threshold values are deviated, an error signal is generated by the MU1000. The error signal is stored in the event memory and can be assigned to a signalling LED (S1 or S2) and a signalling relay as well.

The indicated frequency is measured at phase L1.

4.8 Digital inputs

In total eight digital inputs are available for different monitoring functions. External relay contacts such as fuse monitoring are connectable to monitor and signal error signals via MU1000C.

4.9 Signalling relays K1 & K2 (K11-K16)

By configuration at the service menu signals can be assigned to the internal signalling relay K1 and K2 (using an optional relay board DCC-RB in addition to the relays K11 to K16). The signals are linked if more than one signal is assigned to one relay. If one or more signals occur, the relay is deactivated. A time delay of 0 sec. up to 300 sec. can be set to each relay. Deactivation of the relay is delayed if an error occurs but if the error disappears, the relay operates without delay.
If "boost charge" is assigned to one relay, it is deactivated without delay if boost charge is enabled. The relay keeps deactivated for a settable follow-up time of 0 min. up to 300 min. This feature can be used e.g. for a period of continued ventilation (battery room).

4.10 Monitoring: Battery voltage imbalance

By setting the threshold dV_{batt} and battery center tap voltage $V_{batt}/2$ as well in the service menu, defective battery cells can be detected at deviation of the battery center tap voltage. Simply the voltage imbalance is detected not the position of the defective battery cell(s). To be able to use this monitoring feature the connection of the measurement voltage U_{dc3} between minus potential and battery center tap is essential.

Error indication: "Battery unsymmetrical"

The setting effects in "%" of the nominal battery voltage value (=number of cells x 2.0 V).

4.11 Boost charge / hand operation charge / system test

The **boost charge mode** can be switched ON in different ways.

-Manual switch ON. If "boost charge" is enabled in the main menu, you are able to switch ON (and OFF as well) the boost charge mode in the main menu by clicking "ENTER".

-Automatic switch ON. E.g if the battery voltage drops below a set threshold value,

or

if I_{batt} (I_{lade}) > 200 A.

-Boost charge can also be released via digital input (MU1000 or I/O or DI8).

-Boost charge can be automatically started after a battery test.

A running boost charge is indicated in the main menu of the MU.

A timer can be set (one hour up to 24 hours) in order to switch OFF the boost charge after the set period is lapsed.

By digital input boost charge can be disabled, or blocked in order to prevent starting.

Furthermore **hand operation charge** can be enabled. In this case the charge voltage value (rectifier output voltage) can manually be set.

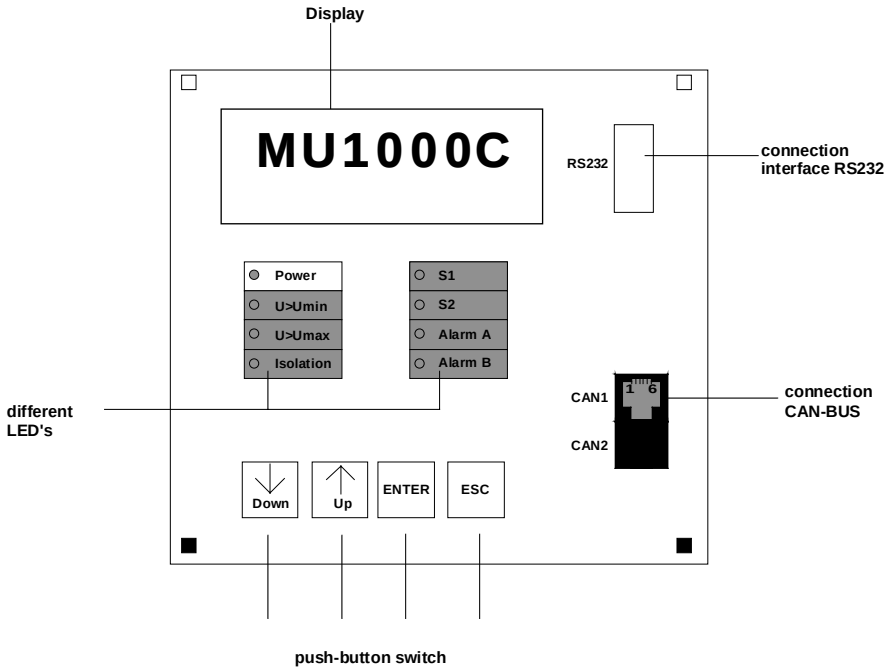
Also **system test** is possible. In this case the charge voltage value (rectifier output voltage) also can manually be set e.g. to test the threshold values of the system.

4.12 Bootloader

From the firmware version MU 2.0 a "Bootloader" is integrated. This enables you to carry out a firmware update via CAN bus (using an USB-CAN-Dongle), or via RS232 interface as well.

5. Operation

The MU 1000 is operated over the 4 keys at the front side (↑, ↓ , ENTER,ESC). The function of the individual key depends on the indication of the display and on the respective menu level.



Picture 5.1: Front view MU1000C

Change indication (leafing through)
By pressing the keys ↑, ↓ you are able to leaf through the different indications, whereby the previous indication appears when ↑ is pressed and the next indication occurs by pressing ↓. The order of the indications is described in section 6. "Menu and display structure".

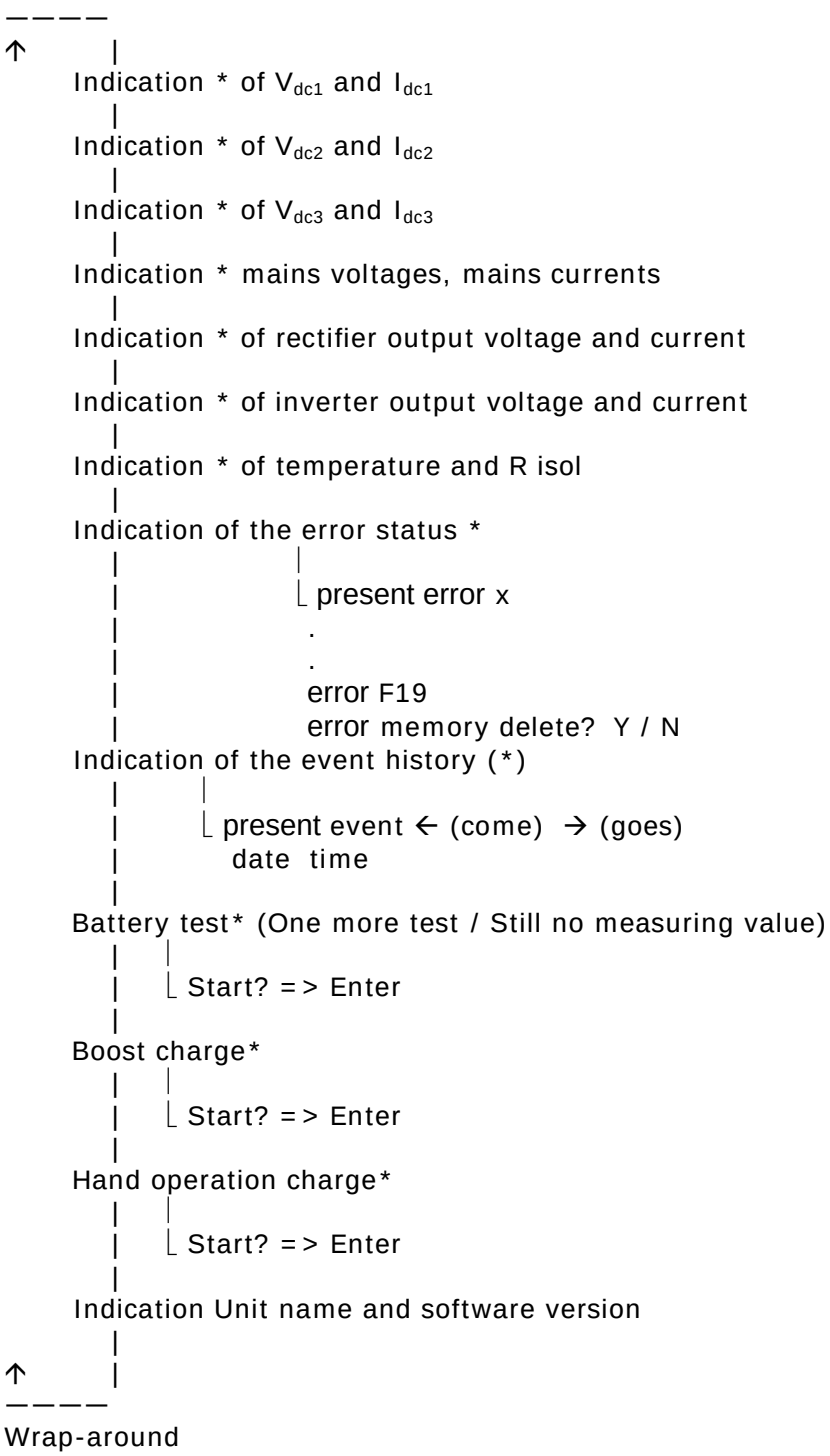
Menu change
Indications, which contain a selectable sub-menu, are labelled with a star "*". By pressing the key "ENTER" for a short time one reaches the respective sub-menu. The return to the above menu is done by simultaneously pressing the "ESC" key.

Change of numerical values/Assignments
To change an indicated value, the key ↑ should be pressed for increasing the value and ↓ should be pressed for decreasing the value. By touching the individual keys separately the value is changed by the smallest possible amount (usually one digit). If one key is pressed for a longer time, then the values change continuously. The speed of change thereby increases with the duration for which it is pressed.

Saving the changed values
After changing the adjustments the user is able to save the values by pressing the key "ENTER".

6. Menu- and display structure

6.1 General structure



6.2 Service menu

The service menu is used for changing parameters in the MU 1000. It is protected against unauthorized access by a 3-digit access code. For the calibration of the voltage and current measuring inputs, a calibration menu can be selected by a second access code (see Pt. *6.2.3.*)

Only authorised technical personnel should do changes in the service menu because wrong adjustments could damage the system as well as the connected battery and the load device. Eltek Valere Industries does not warrant damages caused by incorrect operation of the MU 1000C or by changes in the service menu. Menu items which include subitems are indicated by star "*".

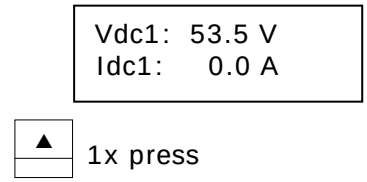
The indication values and possible parameters/adjustment fields are programmable only by service personnel.

6.2.1. Customer menu

The customer menu is quasi a mirroring of the service menu, i.e. all valid values of the system are indicated. However these values cannot be changed in contrast to the service menu. The menu point should serve to give a topical overview of the system parameters to the customer as well as to allow a detailed remote control in case of errors.
Menu items which include subitems are indicated by star "*".

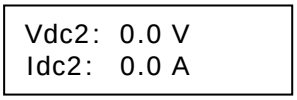
Menu description MU1000C

1. Display at switching on



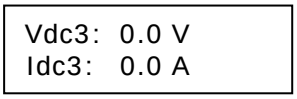
▲ 1x press

2. Display



▲ 1x press

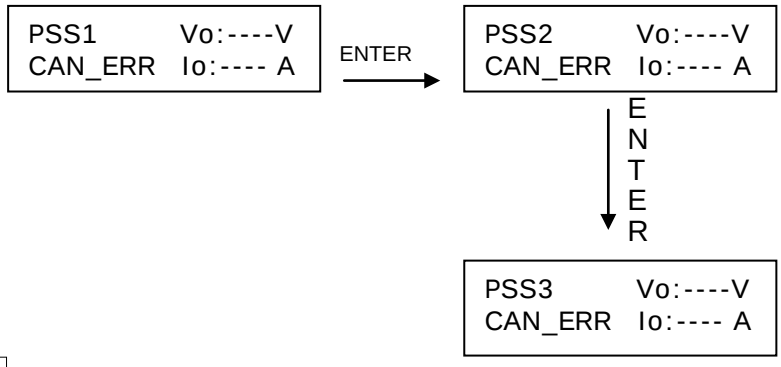
3. Display



▲ 1x press

4. Display

4a)



▲ 1x press

5. Display

UNV1 Vo:----V CAN_ERR Io:---- A

▲ 1x press

6. Display

Temp.: 23.1 °C Risol: >500kΩ

▲ 1x press

7. Display

No Errors 20.04.2006

▲ 1x press

8. Display

No Event 20.04.2006

▲ 1x press

9. Display

Battery Test* *a)* No test at all *b)* No test value

a) & b) alternating visible on Display

▲ 1x press on ENTER

10. Display

Boost charge*

Abort Boost cha* Boost ch. runs

▲ 1x press

11. Display

Manual charge *

or System charge*

▲ 1x press

12. Display

Eltek-Valere MU1000_C V2.08

Text free configurable

▲ 1x press

Display 1. appears

Calling the Customer Menu

By pressing the ENTER-button for approx. four sec. the following menu will appear:

Customers menu	ENTER
Exit	ESC

By pressing the ENTER-button the custumer menu appears.
By pressing ▲ (UP-button) you are able to leaf throw the menu step by step.

The display shows the following menu items:

The star "✶" indicates that subitems are available

a), b)	Denotations ✶	Thresholds ✶
c), d)	Monitor.-delays ✶	Signal config ✶
e), f)	Signal delays ✶	Dig.inp.delays ✶
g), h)	IO-inp.delays ✶	Nominal values ✶
i), j)	System values ✶	Contact alloca ✶
k), l)	IO- Contact alloca ✶	Mains monitor ✶
m), n)	RS232 PC/Modem✶	Battery param. ✶
o), p)	Boost charge ✶	Manual charge ✶
q), r)	System test ✶	Countercells ✶
s), t)	Language English (GB)	Date/Time 27.04.2008 08:27

u), v), w)	Weekday Thursday	LCD-Contrast 75 %	LCD- illumination Ein

x), y)	LCD/LED - test	Thyristor loader St:0x0000 0x0000
z), aa)	Reset (boot)	Version: 2.08 JJ000000-000.000

Subsequently display a) appears again

Subitems of the items a) - z)

Press the ENTER-button to get into the menu.
Using the ▲ UP-button you are able to leaf throw the menu.

to a)

Denotations ✶		(press ENTER)

a1), a2) from MU1000	Vdc1= Vdc1 :	Vdc2= Vdc2 :
a3), a4)	Vdc3= Vdc3 :	Idc1= Idc1 :
a5), a6)	Idc2= Idc2 :	Idc3= Idc3 :
a7), a8) from BM-card	2Vdc1= BM1Vdc1:	2Vdc3= BM1Vdc3:
a9), a10)	2Idc1= BM1Idc1:	3Vdc1= BM2Vdc1:
a11), a12)	3Vdc3= BM2Vdc3:	3Idc1= BMIdc1:
a13), a14) from MU1000	input 1 input 1	input 2 input 2
a15), a16)	input 3 input 3	input 4 input 4
a17), a18)	input 5 input 5	input 6 input 6
a19), a20)	input 7 input 7	input 8 input 8
a21)-a28) from IO-card	I/O- input 1 I/O- input 1	to I/O - input 8 I/O - input 8

Subsequently display a1) appears again by ESC one level back

to b)	Thresholds ✶	(press ENTER)
b1), b2)	Vmin [Vdc1] 43.2V = 1.80V/Z	Vmax [Vdc1] 57.6V = 2.40V/Z
b3), b4)	Vwarn [Vdc1] 45.6V = 1.90V/Z	Vmin [Vdc2] 43.2V = 1.80V/Z
b5), b6)	Vmax [Vdc2] 57.6V = 2.40V/Z	Vmin [Vdc3] 43.2V = 1.80V/Z
b7), b8)	Vmax [Udc3] 57.6V = 2.40V/Z	Imax [Idc1] 30.0 A
b9), b10)	Imax [Idc2] 30.0 A	Imax [Idc3] 30.0 A
b11), b12)	Hysteresis Umin1 5 %	Hysteresis Umin2 5 %
b13), b14)	Hysteresis Umin3 5 %	Hysteresis Umax 1 %
b15), b16)	Hysteresis Imax 1 %	Temperature high 60.0 °C
b17), b18)	Hysteresis Tmax 5 %	Batt. Operation -IB> 20.0 A
b19), b20)	Hyst. Batt.oper 5 %	Battery unsymmet. 2.5 V
b21), b22)	Hyst. Batt.-unsy 5 %	Insulation fault 60 kΩ
b23)	Hyst. Insul. fault 5 %	

Subsequently display b1) appears again

to c)	Monitor.- delays✶	(press ENTER)
c1), c2)	Delay Vdc1 < Vmin1 10s	Delay Vdc2 < Vmin2 10s
c3), c4)	Delay Vdc3 < Vmin3 10s	Delay Vdcx > Vmax 3s
c5), c6)	Delay Idcx > Imax 1s	Delay T > Tmax 20s
c7), c8)	Delay batt.-oper. 20s	Delay insu.fault 10s
c9), c10)	Delay batt.unsym 10s	Delay Uglr - 0 s
c11)	Delay Uglr + 0 s	

to d)	Signal config. ✶	(press ENTER)
d1), d2)	Error state ✶	Event history ✶
d3), d4)	Signal LED S1 ✶	Signal LED S2 ✶
d5), d6)	Alarm A ✶	Alarm B ✶
d7), d8)	Relay K1 ✶	Relay K2 ✶
d9) to d16) using an IO	Relay K11 ✶	Relay K18 ✶
d17)	Modem ✶	


to d1)
Error State ✶
(press ENTER)
d1.1)
Vdc1* < Vmin1
No
d1.2)
2Vdc1* < Vmin1
No
* texts
configurable
3Vdc1* < Vmin1
No
Vdc1 > Vmax1
No
d1.3)
d1.4)
d1.5)
2Vdc1 > Vmax1
No
d1.6)
3Vdc1 > Vmax1
No
d1.7)
Vdc1 < Vwarn1
No
d1.8)
2Vdc1 < Vwarn1
No
d1.9)
3Vdc1 < Vwarn1
No
d1.10)
Vdc2 < Vmin2
No
d1.11)
Vdc2 > Vmax2
No
d1.12)
Vdc3 < Vmin3
No
d1.13)
2Vdc3 < Vmin3
No
d.1.14)
3Vdc3 < Vmin3
No
d1.15)
Vdc1 > Vmax3
No
d1.16)
2Vdc3 > Vmax3
No
d1.17)
3Vdc3 > Vmax3
No
d1.18)
Battery 1 unsym
No
d1.19)
Battery 2 unsym
No
d1.20)
Battery 3 unsym
No
d1.21)
Overtemperat. 1
No
d1.22)
Overtemperat. 2
No
d1.23)
Overtemperat. 3
No
d1.24)
MM1 fault V<
No
d1.25)
MM1 fault V>
No
d1.26)
Insulation fault
No
d1.27)
Rec. fault
No
d1.28)
Rec.redundancy
No
d1.29)
Rec.load limit
No
d1.30)
load distribut.
No
d1.31)
Inv. fault
No
d1.32)
Inv. redundancy
No

d1.33)	UNB fault No	d1.34)	I/O fault No	
d1.35)	MM1- fault No	d1.36)	BM1- fault No	
d1.37)	fan tray fault No	d1.38)	input 1 No	input texts free
d1.39)	input 2 No	d1.40)	input 3 No	configurable
d1.41)	input 4 No	d1.42)	input 5 No	
d1.43)	input 6 No	d1.44)	input 7 No	
d1.45)	input 8 No	d.1.46)	I/O - input 1 No	
d1.47)	I/O - input 2 No	d1.48)	I/O - input 3 No	
d1.49)	I/O - input 4 No	d1.50)	I/O - input 5 No	
d1.51)	I/O - input 6 No	d1.52)	I/O - input 7 No	
d1.53)	I/O - input 8 No	d1.54)	Battery fault No	
d1.55)	Battery test No	d1.56)	Batt.operation	
d1.57)	Boost charge No	d1.58)	Fan operating No	
d1.59)	Countercell 1 No	d1.60)	Countercell 2 No	
d1.61)	Idc1 > Imax1 No	d1.62)	Idc2 > Imax2 No	
d1.63)	Idc3 > Imax3 No	d1.64)	Reserve	

to d2) | Event history ✶ | (press ENTER)

The workflow of d2.1) to d2.64) is the same like d1.1) to d1.64)

to d3) | Signal LED S1 ✶ | (press ENTER)

The workflow of d3.1) to d3.64) is the same like d1.1) to d1.64)

to d4) | Signal LED S2 ✶ | (press ENTER)

The workflow of d4.1) to d4.64) is the same like d1.1) to d1.64)

to d5) | Alarm A ✶ | (press ENTER)

The workflow of d5.1) to d5.64) is the same like d1.1) to d1.64)

to d6) | Alarm B ✶ | (press ENTER)

The workflow of d6.1) to d6.64) is the same like d1.1) to d1.64)

to d7/8) | Relais K1/2 ✶ | (press ENTER)

The workflow of d7/8.1) to d7/8.64) is the same like d1.1) to d1.64)

to d9-16) | Relais K11/K18 ✶ | (press ENTER)

The workflow of d9-16.1) to d9-16.64) is the same like d1.1) to d1.64)

to e) | Signal delays ✶ | (press ENTER)

e1) | Delay signal S1 5s | e2) | Delay signal S2 5s

e3) | Delay alarm A 5s | e4) | Delay alarm B 5s

e5/6) | Delay K1/2 5s | e7-14) | Delay K11/18 5s

to f) | Dig.inp.delays ✶

like Point e1) to e14)

to g) | IO-inp.delays ✶

like Point e1) to e14)

h) | Nominal values ✶ | (press ENTER)

h1), h2) | Nom.Vrect_norm 54.5V = 2.27V/Z | Nom.Vrect_fast 57.5V = 2.40V/Z

h3), h4) | Nom.Vrect_bat 42.5V = 1.77V/Z | Nominal Iract 50.0A

h5) | Nominal Vmains 230V

to i)	System values ✶	(press ENTER)
i1), i2)	Rec. count 3	Rec.count rdancy 0
i3), i4)	Rec. Load limit 100 % 0.0 %	Rec. Loadl delay 1 s
i5), i6)	Rec. Load alloca. 10 %	Rec.Loada. delay 5 s
i7), i8)	Rec.-blink addr0 No	Rec. reset 0
i9), i10)	Inv. count 1	Inv.count rdancy 0
i11), 12)	UNB present? No	I/O-Board? No
i13), i14)	RB6 - Board? No	DIGI8 - Board? No
i15), i16)	Ext. mains monit? No	Thyr.count ? 0
i17), i18)	BM1 present ? No	Fan tray count 0
i19), i20)	Num. of batteries 1	Batt1 capacity 50Ah
i21), i22)	Batt2 capacity 50Ah	Batt3 capacity 50Ah
i23), i24)	Max.charge cur1 30 30.0 A	Max.charge cur2 30 30.0 A
i25), i26)	Max.charge cur3 30 30.0 A	Batt. cellcount 24
i27)	Batt. tap. point 12	

i28/29)	Temperat.Sensor 1 Yes	Temperat.Sensor 2 No
i30/31)	Temperat.Sensor 3 No	Measurement Riso? No
i32/33)	Refer to Vload? No	TempComp -2 mV/K
i34/35)	Tmin K 0.0° C	Tmax K 60.0° C
i36/37)	Batt1 Shunt Idc1 60mV = 50A	Batt1 Shunt Idc2 60mV = 50A
i38/39)	Batt1 Shunt Idc3 60mV = 50A	Batt2 Shunt Idc1 60mV = 50A
i40), i41)	Batt3 Shunt Idc1 60mV = 50A	IP-address 192.168.1.1

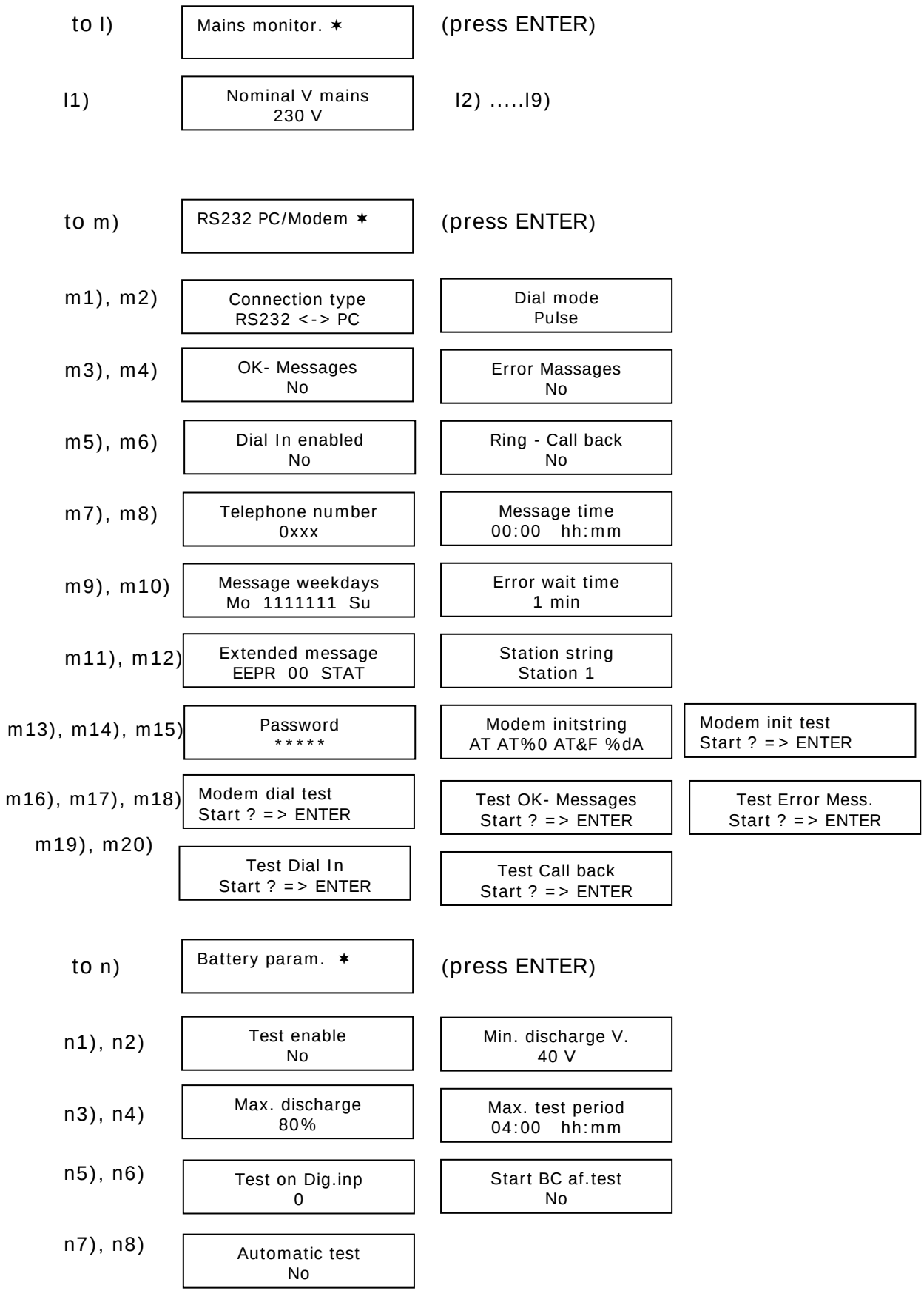
again to i1)

to j) Contact alloca ✶ (press ENTER)

j1)	Alarm A Close contact	j2)	Alarm B Close contact
j3-4)	Relay K1/2 Close contact	j5-12)	Relay K11-18 Close contact
j13-20)	Input 1-8 Close contact		

to k) IO-contact al. ✶ (press ENTER)

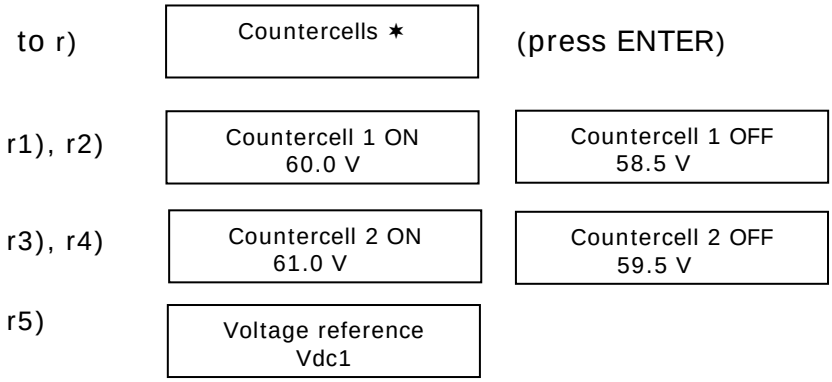
k1-8) I/O- Input 1-8
Close contact


to l)
Mains monitor. ✶
(press ENTER)
l1)
Nominal V mains
230 V
l2) .....l9)
to m)
RS232 PC/Modem ✶
(press ENTER)
m1), m2)
Connection type
RS232 <-> PC
Dial mode
Pulse
m3), m4)
OK- Messages
No
Error Massages
No
m5), m6)
Dial In enabled
No
Ring - Call back
No
m7), m8)
Telephone number
0xxx
Message time
00:00 hh:mm
m9), m10)
Message weekdays
Mo 1111111 Su
Error wait time
1 min
m11), m12)
Extended message
EEPR 00 STAT
Station string
Station 1
m13), m14), m15)
Password
*****
Modem initstring
AT AT%0 AT&F %dA
Modem init test
Start ? => ENTER
m16), m17), m18)
Modem dial test
Start ? => ENTER
Test OK- Messages
Start ? => ENTER
Test Error Mess.
Start ? => ENTER
m19), m20)
Test Dial In
Start ? => ENTER
Test Call back
Start ? => ENTER
to n)
Battery param. ✶
(press ENTER)
n1), n2)
Test enable
No
Min. discharge V.
40 V
n3), n4)
Max. discharge
80%
Max. test period
04:00 hh:mm
n5), n6)
Test on Dig.inp
0
Start BC af.test
No
n7), n8)
Automatic test
No

to o)	Boost charge ✶	(press ENTER)
o1), o2)	Man.boost chrge No	Auto boost chrge No
o3), o4)	Boost charge at: 43.2V = 1.80V/Z	Boost charge ON I Lade >: 250.0A
o5), o6)	Delayed trigger 2 s	Level post run 56.0V = 2.33V/Z
o7), o8)	Boost charge OFF I Lade <: 30.0A	Delay post run 20 s
o9), o10)	Charge down time 1 min	BattOper/Mainoff 15 min
o11), o12)	Fan off delay 5 min	Charge OFF Dinp 0
o13), o14)	Charge off D.Inp 0	Max.BC. duration 1 hh

to p)	Manual charge ✶	(press ENTER)
p1), p2)	Manual charge No	Overvoltage alarm No
p3), p4)	Switch off inmed. 3.5 V	Alarm delay 600 s
p5), p6)	Max.charge volt 65.0V = 2.71V/Z	Irectifier nomin 40.0 A

to q)	System test ✶	(press ENTER)
q1), q2)	System test No	Overvoltage alarm No
q3), q4)	Alarm delay 600 s	Vmin Vmax 20.0 V 80.0 V
q5)	Irectifier nomin 50.0 A	


to r)
Countercells ✶
(press ENTER)
r1), r2)
Countercell 1 ON
60.0 V
Countercell 1 OFF
58.5 V
r3), r4)
Countercell 2 ON
61.0 V
Countercell 2 OFF
59.5 V
r5)
Voltage reference
Vdc1

6.2.2. Service menu 1

In the service menu all parameters of the system are programmed. This menu is protected by code and is accessible only to the service staff.

6.2.3. Service menu 2 / calibration menu

In this menu deviation of the voltage value indicated by display compared to the real measured value can be calibrated in order to indicate the real values. The adjustment is done separately for all 3 voltages and currents. The indicated value has to be changed by pressing the arrow-keys until it coincides with an externally measured value. After this, the value can be saved.

An offset of the battery current indication can be compensated in a separate menu. This has to be done while no current flows through the shunt!

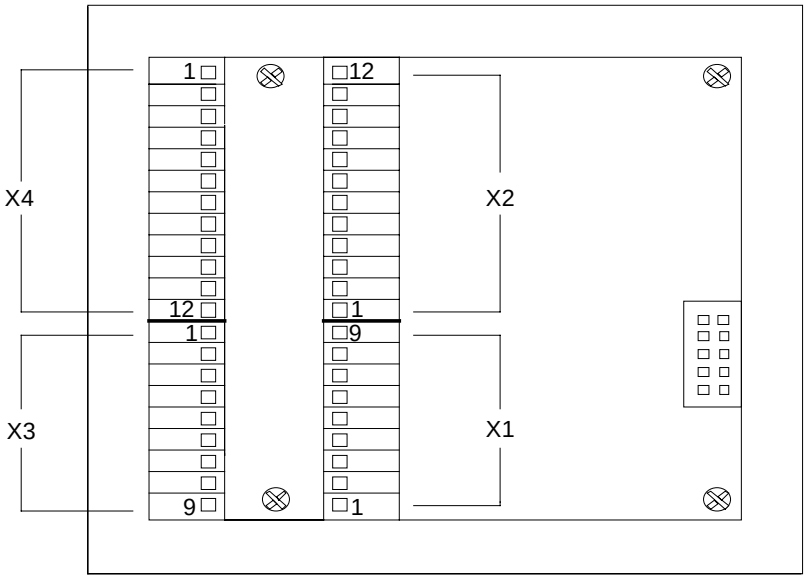
After pressing both keys the calibrated "zero point" of the display is stored.

This menu is protected by code and is accessible only to the service staff.

7. Electrical connectors

The connections to the MU 1000C are made using a 42-pole plug. The matching plug is included in delivery of the unit. The delivery of the MSTB plug (screw connection) is optional.

The following picture shows the layout of the connectors X1 to X4 (MSTB plugs):



Picture 7.1: Rear view of MU1000C

Connections:

Pin-No. MSTB-Plug	Name	Remark
- X2:12	PE	Earth connection for earth fault monitoring
- X2:11	$+V_{dc1}$	Measuring and supply volt. 1 (Plus potential)[1)]
- X2:10	$-V_{dc1}$	Measuring and supply volt. 1 (Minus potential)
- X2:9	$+V_{dc2}$	Measuring and supply volt. 2 (Plus potential) [1)]
- X2:8	$-V_{dc2}$	Measuring and supply volt. 2 (Minus potential)
- X2:7	$+V_{dc3}$	Measuring voltage 3 (Plus potential) [2)]
- X2:6	$-V_{dc3}$	Measuring voltage 3 (Minus potential)
- X4:1	$+I_{dc1}$	Current shunt 1 (Plus potential) [3)]
- X4:2	$+I_{dc2}$	Current shunt 2 (Plus potential) [3)]
- X4:3	$+I_{dc3}$	Current shunt 3 (Plus potential) [3)]
- X4:6	$-I_{dc1}$	Current shunt 1 (Minus potential)
- X4:5	$-I_{dc2}$	Current shunt 2 (Minus potential)
- X4:4	$-I_{dc3}$	Current shunt 3 (Minus potential)
- X4:7	---	Not used
- X4:8	---	Not used
- X4:10	-TS	Temperature sensor input for LM335 (Minus potential)
- X4:9	+TS	Temperature sensor input for LM335 (Plus potential)
- X2:5	---	Not used
- X2:4		Digital input 1
- X2:3		Digital input 2
- X2:2		Digital input 3
- X2:1	SIG - GND	Signal – GND
- X4:12		Digital input 4
- X4:11		Digital input 5
- X3:3	SIG - GND	Signal – GND
- X3:2		Digital input 6
- X3:1		Digital input 7
- X1:9	SIG - GND	Signal – GND
- X1:8		Digital input 8
- X1:7	---	Not used
- X3:6	K4 / NC	Relay contact K4 (Alarm A, urgent alarm)
- X3:5	K4 / COM	Relay contact K4
- X3:4	K4 / NO	Relay contact K4
- X1:6	K3 / NC	Relay contact K3 (Alarm B)
- X1:5	K3 / COM	Relay contact K3
- X1:4	K3 / NO	Relay contact K3
- X1:3	K2 / NC	Relay contact K2 (free programmable)
- X1:2	K2 / COM	Relay contact K2
- X1:1	K2 / NO	Relay contact K2
- X3:9	K1 / NC	Relay contact K1 (free programmable)
- X3:8	K1 / COM	Relay contact K1
- X3:7	K1 / NO	Relay contact K1

1)

Both of the supply voltages V_{dc1} and V_{dc2} should connected (redundancy) whereby the decoupling is done via diodes on the MU 1000 board. The measurement voltage is additionally required for the evaluation $V<V_{min}$ and insulation error and the measuring voltage V_{dc2} is used for V>. The connection of a protective conductor is necessary for detection of insulation error.

2)

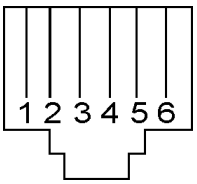
In case of monitoring the battery voltage imbalance make sure that this circuit is connected with the correct polarity between minus potential of the battery and $V_{batt}/2$. It should thereby be noted that the minus wire is connected at the same point as the minus wire of the measurement voltage Vdc1. If the voltage imbalance monitoring is not necessary, then another voltage metering point can be measured in the system.

3)

The potential drop (max. 60 mV) to be measured via shunt, measured with the correct potential, should be connected in the direction of the current, otherwise the MU 1000 don't indicate any current value. With the exception of Idc1, the unit only processes positive voltage values. The measuring voltage for Idc1 could be negative. It is intended for shunts, which are in the battery connection (charging and discharging current). Thus only I_{dc1} can be used as "I_{batt}". In order to correctly indicate all the currents, the SIG-GND should be connected to the shunt potential.

7.1 CAN bus connector

(Modular plug RJ45, 6-pole)



Pin-No. CAN-BUS	Allocation
1	+8 to 15V
2	+8 to 15V
3	CAN_High
4	CAN_LOW
5	GND
6	GND

8. Optional: Relay board DCC-RB

This extension board provides additional six potential free relay contacts. The allocation of individual signals and signal groups are freely programmable.
It can be installed at any place in the system and is simply connected to the CAN bus.

Further information is evident in the data sheet.

9. Optional: Digital input board DCC-DI8

The board provides eight digital inputs.

Enabling/disabling as well as the naming of each individual input is freely programmable.

It is also connected via CAN bus.

10. Technical Data MU1000C

Type	MU1000C-I Language	MU1000C-II Language
Article code	300-110-660.00	300-110-770.00
Supply voltage range	18 to 80 VDC	80 to 300 VDC
Voltage measuring range	0 to 100 VDC	0 to 300 VDC
Input power consumption	approx. 3 W	
Voltage measuring inputs	3, accuracy 1%; 3 x mains voltage and frequency (by using an optional mains monitoring board)	
Current measuring inputs	3 (1 x ± 60 mV for battery charge / discharge current measurement; (2 x + 60 mV) 3 x mains current (option: Battery monitoring board DCC-BM)	
Temperature measuring input	1 (for optional temperature sensor)	
PE–connector	1 (isolation fault)	
Digital measuring inputs	8 (free programmable)	
Alphanumeric display	LCD, 2 x 16 characters, with background lighting	
LED indications	Operating, V>Vmin, V>V max, isolation fault, S1/S2 (free programmable LED indications), alarm A (general fault, urgent alarm), alarm B (free programmable linkage of single faults, non-urgent alarm)	
Relay outputs	4 relay contacts (Alarm A, Alarm B, and 2 x reserve); free programmable; max. contact switching capacity= 1 A at 24 V to 125 VDC; 2 A at 250 VAC; extension to 10 free programmable relays (using an optional relay board)	
Configuration/interfaces	RS232 interface, CAN interface	
Communication	CAN-bus interface for communication with PSS/PSR-rectifier modules, UNV-inverter modules and UNB modules; RS232 interface for external modem control (optional) and programming of all functions and parameters via PC	
Fieldbus	Profibus or Modbus as option, via RS232 using a gateway	
Functions	Boost charge control (current-, voltage- and time dependent); battery test (voltage- and time dependent); controlling of voltage drop-down diodes; battery low protection; battery midpoint voltage monitoring; isolation fault monitoring	
Microprocessor controlling	Programmable monitoring functions with history function, real time clock, device parameters via front keys and alphanumeric display	
Languages	German, English, Swedish, Italian, Russian, Czech, French	
Ambient temperature	Operation: -20 °C to +55 °C, storage: -40 °C to +85 °C	
Climatic conditions	IEC 721-3-3 class 3K3/3Z1/3B1/3C2/3S2/3M2	
Max. installation altitude	1500 m	
Audible noise	≤ 30 dB (A) in 1m distance	
Construction	Built-in module for front panel mounting, rear side connectors	
Dimensions (W/H/D)	142/129/70 mm	
Weight	approx. 0,6 kg	
Type of enclosure / Protection class	IP20 (mech.); 1 acc. to EN 60950 (electr.)	
Colour (front panel)	RAL 7035	
CE conformity	yes	
Compliance to safety standards	EN 60950-1; VDE 0100 part 410; VDE 0110, EN 50178, EN 60146	
Compliance to EMC standards	EN 55022 class „B“, EN 61000-4 part 2-5	

10.1 Dimensional drawing of the MU1000C