DLX

Datalogger

User Manual

Bär Industrie-Elektronik GmbH
Lange Straße 87
D-90762 Fürth
Deutschland / Germany

Phone +49 911 970590
Fax +49 911 9705950
Internet: www.baer-gmbh.com

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Bär Industrie-Elektronik GmbH / Lange Straße 87 / D-90762 Fürth / Phone +49 911 970590·Fax +49 911 9705950

1 Scope of application

1.1 Graphical representation of the application environment

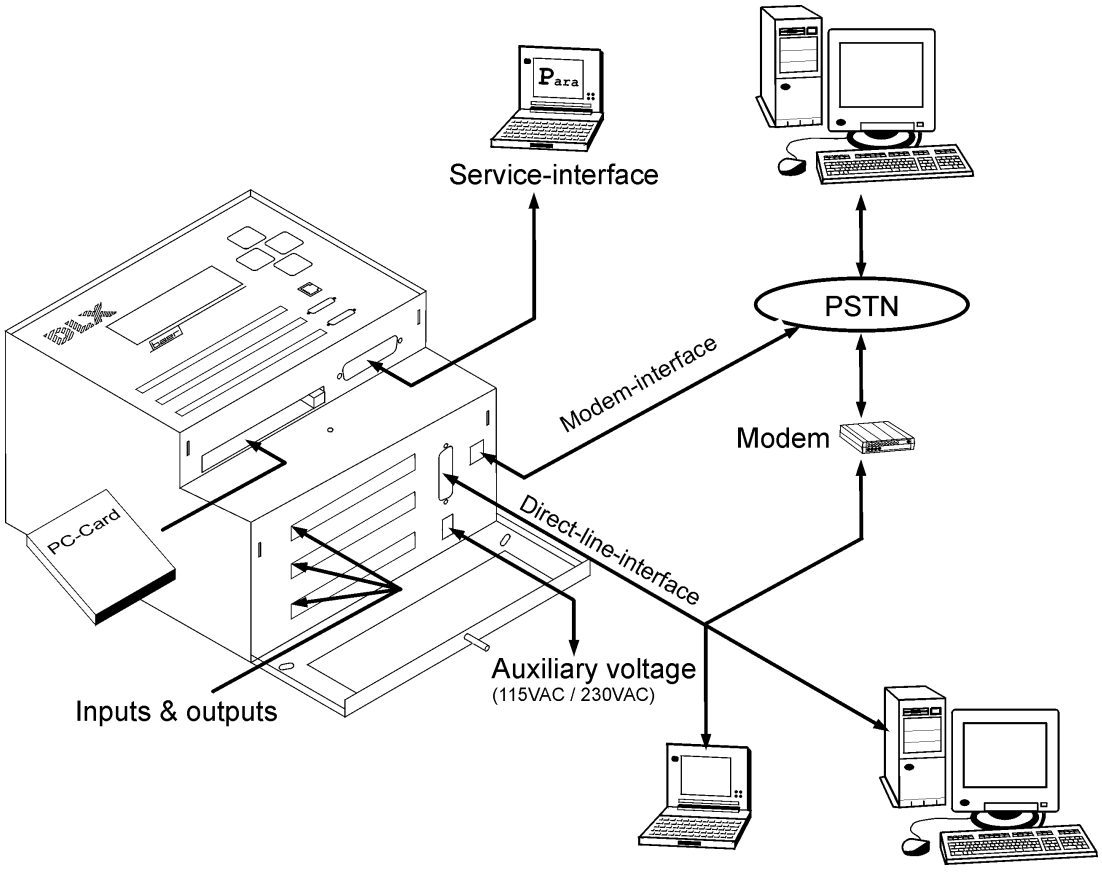

Figure 1, Application environment

1.1.1 Short description

The DLX was designed as a powerful device for the registration and processing of electrical impulses from energy meters, flow meters, heat flow processors and similar devices. It is meant for installation in bulk energy supply points, power station injection points, at special contract customers and industrial premises. Load profiles, calculated values and spontaneous events are processed and stored on the site. This data can be interrogated by hierarchically higher processing devices via a number of interfaces.

- The direct serial service interface (RS232) can be used to read and program the DLX via the programming software DLXPARA. Compatible data retrieval software (e.g. SIGLON) can be used to read data on site.
- The data interface (RS232, M-Bus or RS485) can be used to retrieve data on site via data retrieval software. Alternatively an external modem can be connected (via RS232).
- The modem interface can be used to connect via the internal modem (optional) to the public switched telephone network (PSTN) and data can be uploaded to a PC.

An optional PC-Card (backup memory) can be used to store the content of the periodical buffers and the spontaneous event buffer as well as part of the device parameters. This PC-Card can be read by compatible data retrieval software via standard card readers and a PC.

Load management (switching off and on of loads) can be realized on site via external load management software, using the control outputs of the DLX.

2 Device description

2.1 Features

Display	LCD (illuminated supertwist), 4 lines of 20 characters, controlled by keypad or control input ANZ
Light emitting diodes (Number / Usage)	16 / pulse inputs, 7 / control inputs, 6 / outputs, 2 / alarms, 1 / PC-Card (memory card), 3 / interfaces
Keypad	4 keys (Enter, Exit, Cursor-Up, Cursor-Down)
Interfaces	Service interface (programming/data retrieval): RS232 Data interface (optional): RS232, Fiber-optic, RS485 or M-Bus Internal modem (optional)
Data memory	Internal memory: 1MByte (Flash-Memory) Backup memory: PC-Card (memory card) acc. to JEIDA-Standard, max. 4MByte (SRAM or Flash)
Clock	Real time clock, buffered by GoldCap, max. deviation 30 sec/month at 25°C (10ppm) reserve: min. 7 days without auxiliary voltage
Synchronization	Via SYN input or external DCF77 receiver (optional)
Pulse inputs	6 (standard), optional up to16
Input types	S0 (IES), wipe (IEW), bi-current / bi-polar (IED), analogue (signal current): 0..20mA or 4..20mA
Control inputs	1 (standard: SYN), optional up to 7 (SYN, TR1÷4, RSTX, ANZ, LOG1÷4)
Control input types	S0 (standard), wipe
Outputs	2 mech. relays (change-over for Alarm1÷2/MPA1÷2/RSTA tariff rates1÷4/LOG1÷4), max.: 250V/2A 4 wipe (IAW/pulse), max.: 250V/100mA (optional)
Digits of energy registers	4, 6, 8 (programmable)
Digits of demand registers	4, 6, 8 (programmable)
Registration periods	2
Period lengths MP1: MP2:	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 minutes (programmable) in addition 2, 3, 6, 12, 24 hours
Load profile types	Register reading, register increment or demand
Totals	1 (standard), optional up to 4
Cos(φ) registers (alternatively apparent energy)	1 (standard), optional 2
Internal tariff calendar	Yes
Max. number of energy and demand rates	4 / 4
Demand registration	Yes, with storage of date and time
Number of stored previous demand values	Min. 20
Switching between summer and winter time.	automatic
Radio clock	optional: external DCF77-Receiver
Event buffer	min. 780 events

Transmission protocols	SCTM, IEC 60870-5-102, automatic protocol recognition
Internal modem	Housing for panel mounting: LGO 834 (9600 Baud), optional 19” rack: UniMod (9600 Baud), optional
Transmission speed. Service: Data: Modem:	9600 Baud 300, 600, 1200, 2400, 4800, 9600 Baud (programmable) 300, 1200, 2400 Baud, 9600 Baud
Transmission mode	Full duplex
Program protection	Via password and protection switch
Remote programming	Not permitted
Auxiliary voltage	100/115VAC or 200/230VAC, internal selection switch
Power consumption	< 20W
Enclosure	Housing for panel mounting or 19” rack
Connectors	Pluggable terminals with screws
Number of terminals	60 (inputs and outputs) + 3 (auxiliary voltage)
Dimensions	Housing for panel mounting: ca. 175mm × 300mm × 150mm 19” rack: ca. 215mm × 130mm × 265mm (W × H × D)
Ancillary equipment	Programming software, programming cable, PC-Card (memory card)

2.2 Block circuit diagram of modules

The block circuit diagram below gives an overview of the individual modules of the DLX.

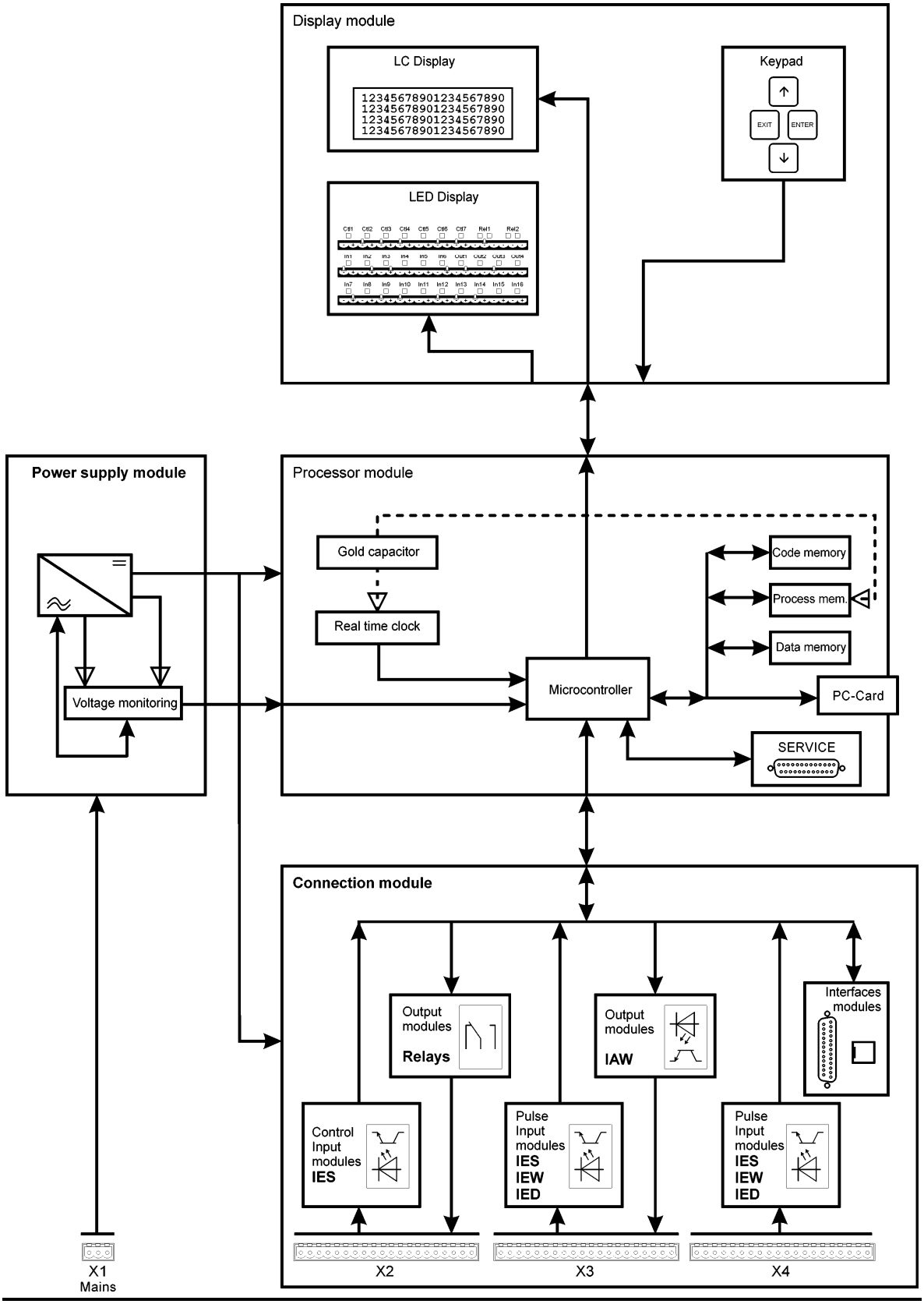

Figure 2, Block circuit diagram of modules

2.2.1 Description of the block circuit diagram of modules

The DLX has a modular design. It consists of the following modules:

- **Power supply module**
  Converts the external auxiliary voltage (110VAC or 230VAC) into the internal device voltages (5VDC and 12VDC).
- **Connection module**
  Input pulse signals and control signals are galvanically isolated from the process via input modules and connected to the processor module. Pulse output signals and control output signals are serviced via the relay module and an output module.
- **Processor module**
  The processor module controls all functions of the DLX. Apart from the micro controller it contains the internal program and data memory, a real time clock and capacitors to bridge power failures. The displays and the keypad are also connected to the processor module.
- **Display module**
  Stored data can be displayed via the LC-Display. The LED display shows the status of individual process signals. Commands to the micro controller are entered via the keypad. The program protection switch, which is used to protect the parameters of the DLX from alterations, is located on the inside of the display module.

3 Functional description

3.1 Functional circuit diagram

The functional circuit diagram below shows and overview of the individual functions of a DLX device.

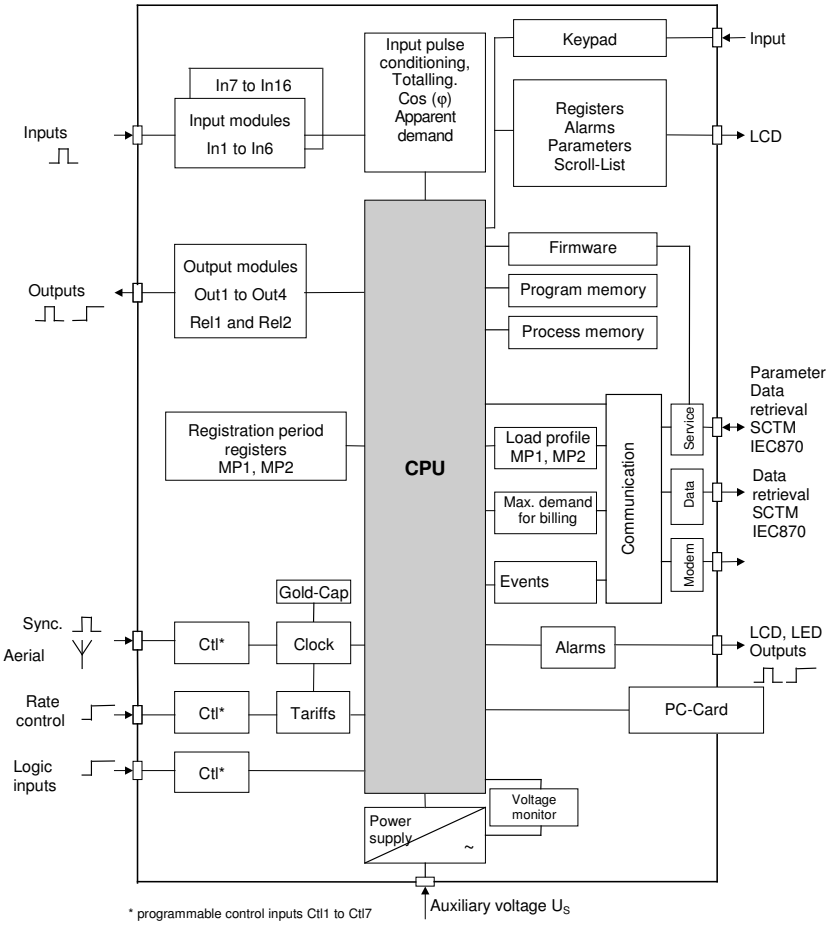

Figure 3, Functional circuit diagram

3.2 Data protection and safety

All individual storage cells of the DLX are checked continually:

- **RAM memory:** All storage cells are tested at least once in every 24 hours. The memory contents are first written to a safe place, then a number of different bit patterns (A5, 5A, 00, FF) are written and read back into each memory cell. Finally the original memory content is written back. If a defective memory cell is detected (bit patterns from read and write operations are not identical), an error message is shown at the display and the error notification relay is activated. The error message is available for remote data retrieval.
- **Firmware memory:** The content of the firmware memory is tested on an ongoing basis: a checksum is calculated over the whole memory content. If a difference is detected between the calculated checksum and the stored checksum, an error message is shown on the display and the error notification relay is activated. The error message is available for remote data retrieval.
- **Data memory:** Data for parameters, spontaneous events, reset events and for each registration period are stored in physically separate areas (sectors). When data is written, the correctness of the write cycle is confirmed for each individual byte of data by an additional read cycle. Additionally a checksum is calculated for each data set. When data sets are read, another checksum is calculated and compared with the stored checksum. The data set will only be processed if both checksums are identical.

3.3 Program code

The program code (firmware) is stored in the firmware memory (Flash memory). Program code can be loaded with a special software application via the service interface. Therefore no change of EPROM is required for firmware updates. Loading of a new firmware is only permitted in non-secured certification mode (in this mode the unit is not certified and the program protection switch is set to “Disable”). All internal memory will be cleared and the factory settings (see page 66) will be activated.

3.4 Setting of parameters (programming the DLX)

Parameter settings in the DLX can be altered via the programming software DLXPARA or via the keypad (only certain registers), however only after entering a valid password. All modifiable values are differentiated into two groups: programmable and settable (the list of all registers is contained in Appendix B). On each change of a parameter of the device, the state of the program protection switch on the backside of the display will be checked. If programming is protected (e.g. after certification), then only settable values can be altered. Modification of programmable values is only possible after removing the certification seal. If relevant regulations exist, the device must then be re-certified afterwards. Once the program protection switch is deactivated, all variable values can be modified.

For programming of the DLX a PC needs to be connected to the V.24 service interface of the DLX. Programming of the DLX is only possible with the programming software DLXPARA. For details of the programming software please read the user manual shipped with the software.

! Before setting (or changing) any parameters of the DLX a reset (to factory settings) should be executed. Modification of some parameters (see menu item „Internal memory“, page 23) will cause the unit to automatically erase the registration period buffers.
During the setting of parameters of a DLX the data retrieval is disabled due to reasons of data security.

3.4.1 Program protection switch

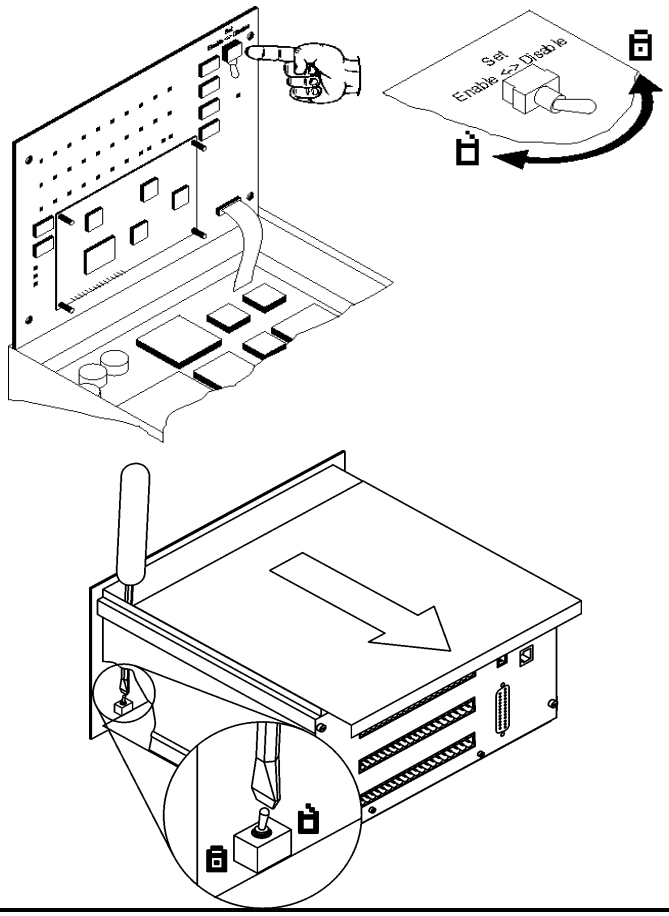

Figure 4, Program protection switch

Before transferring any parameters to the DLX unit, the program protection switch must be set to “Enable”. The program protection switch is located on the underside of the display board of the DLX.

! Disconnect the supply voltage to the DLX before opening the enclosure. Otherwise an accidental pull on the flat band cable can destroy the memory content of the unit.
Always touch first the grounded (earthed) metal frame of the unit with one hand to force equalization of voltage potentials. Avoid any contact with other possibly charged parts of the data logger unit when changing the setting of the program protection switch.

Housing for panel mounting: to achieve access to this switch, the front panel of the unit must be unscrewed and flipped upwards. Please note that the front panel is connected to the CPU board with a flat band cable. The program protection switch is located in the lower right hand corner of the DLX and can be operated by hand.

19” rack: see Figure 4

The meaning of the inscriptions are:

Set Enable: Setting of parameters is permitted, the symbol "🔓" blinks in the display.
Set Disable: Setting of parameters is disabled, the symbol "🔒" is shown in the display.

To refuse access to parameter settings to unauthorized persons, the front panel should be sealed.

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3.5 Pulse processing

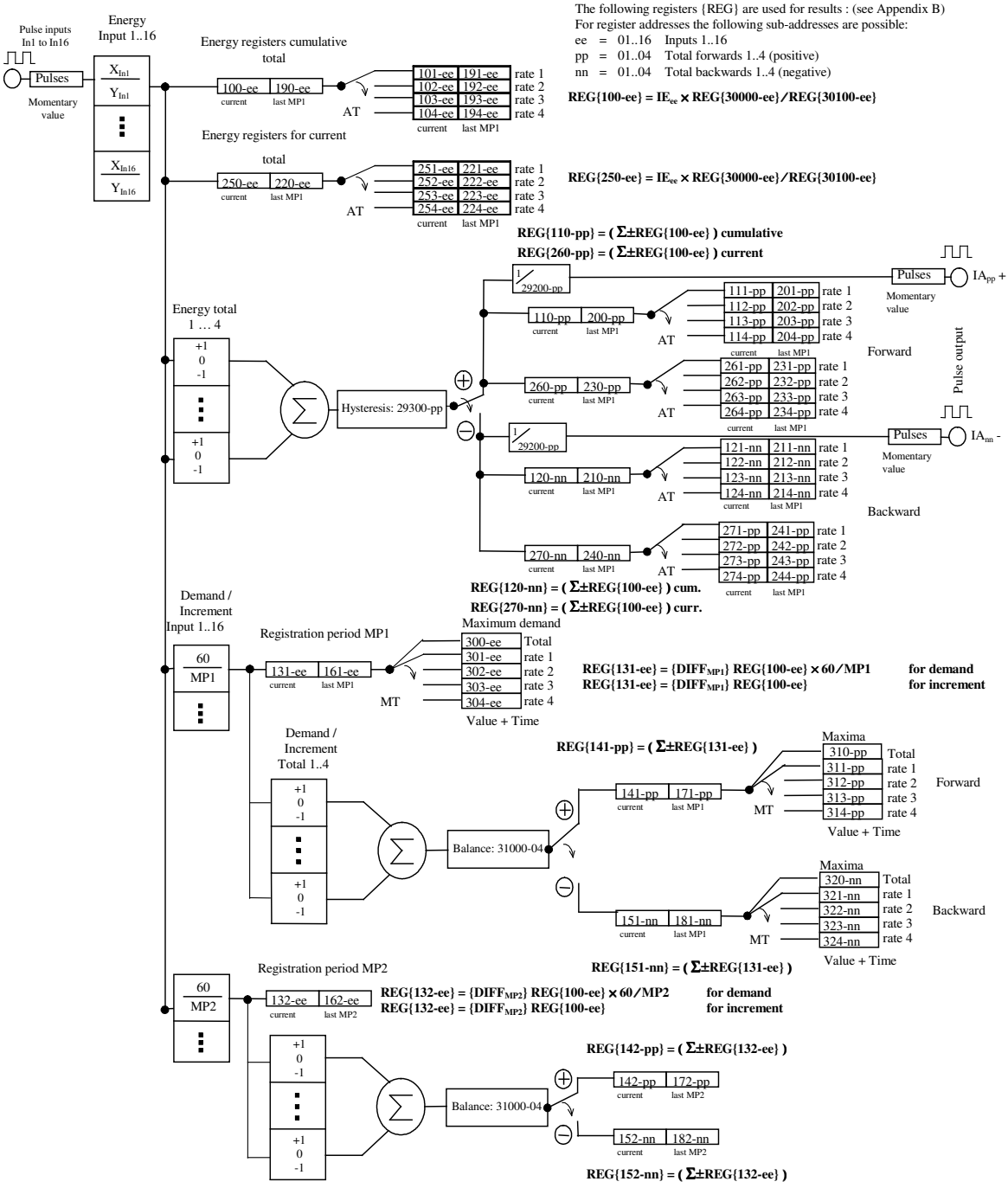


Figure 5, Block circuit diagram of impulse processing

! A calculation of values for registration period 2 only takes place if the parameter is set under the menu item „Registration period“ in DLXPARA.

3.5.1 Pulse inputs

Pulse inputs and control inputs are subject to signal verification implemented in the software, i.e. pulses that fall short of a minimum period of time are not processed. This period can be programmed separately for pulse length and pulse interval length in the range from 10ms to 2000ms in steps of 10 ms for all pulse inputs.

Incoming pulses are counted, multiplied with a programmable value between 1/1 and 99999999/99999999 (only positive values possible) and added to the energy registers separated by rate (see figure 5, block circuit diagram of pulse processing). Weighting to the correct physical measurement values is done with pulse multiplication factors (these express the meter and transformer constants). The formula used is as follows:

Energy value weighting : $\frac{X}{Y} = \frac{W}{R \times K}$

X, Y : Numerator and Divisor – no decimal places, 8 digits
W : Transformer ratio
R : Meter constant (e.g. Impulses/kWh)
K : Reading constant (for optimized reading)

The transformer ratio is calculated as the ratio between primary and secondary voltages and currents.

Transformer ratio : $W = U_{prim}/U_{sec} \times I_{prim}/I_{sec}$

The reading constant usually has a value of 1 (reading in kWh or kvarh).

Example:

Voltage transformer:	U_{prim}/U_{sec}	=	110kV/100V = 1100
Current transformer:	I_{prim}/I_{sec}	=	300A/5A = 60
Meter constant:	R	=	96000 Impulses/kWh
Reading constant:	K	=	1
→ Transformer ratio:	W	=	1100×60 = 66000

→ Energy value weighting : $\frac{X}{Y} = \frac{66000}{96000} = \frac{66}{96} = \frac{11}{16}$

The number of digits for energy register is set to 9 (Version 1.04.00 and higher). This includes digits to the left and to the right of the decimal point (e.g. with one decimal place : 12345678.9). If an energy register exceeds the value 999999999, it continues at the value 000000000 and a flag will be set in the device status register (of that registration period).

All pulse inputs arrive in two separate energy registers and one pulse register:

- Cumulative register (settable), in which the meter reading of the supplying meter can be adjusted for control and check purposes.
- Current (cannot be modified externally), which registers the flow of energy since the last reset.
- Pulse register (control register, cannot be modified externally), counts all incoming pulses from the related input without weighting.

Furthermore the energy increment since the end of the last registration period is calculated for both registration periods (MP1 and MP2). By multiplication with the time factor, these values are converted into demand values.

Demand value weighting : $ZF = \frac{60}{Tm}$

ZF : Time factor
Tm : Registration period (in minutes)

The energy increment registers (and therefore also the demand registers) are reset to 0 at the beginning of each new registration period.

Example:

Registration period:	MP1 =	15 min.	
Time factor:	ZF	=	60/15 = 4
Energy increment:	ΔE	=	25 kWh
→ Demand:	P	=	$\Delta E \times ZF$ = 100 kW

3.5.2 Signal current input

A continuous signal current flow is applied to the signal current inputs (e.g. 0 .. 20mA, or 4 .. 20mA). This current is proportional to the actual demand. By integration of the current over time (i.e. the measuring period) it is possible to calculate the energy consumed, from which the average demand is then calculated. The signal current input (analogue input) measures power in order to establish energy consumption. The power is measured over short intervals, multiplied by the time and the result is summated. This sum is equivalent to the energy consumed. If the sum exceeds a fixed limit value "W", a 25msec internal output pulse is triggered and "W" is subtracted from the sum. "W" is designated the pulse weighting and is set such that at maximum demand a pulse frequency of 20Hz (pulse length: 25msec) is reached. The demand is measured via an external transducer that converts the measured demand to an injected current (selectable ranges: 0 to 20mA or 4 to 20mA).

Maximum current (:=20mA) → 72000 pulses per hour (:=3600sec × 20)

Energy value weighting : $\frac{X}{Y} = \frac{DIF}{72000 \times K}$

X, Y : Numerator and Divisor – no decimal places, 8 digits
K : Reading constant (for optimized reading)
DIF : Transducer range (max. $value_{encoder}$ - min. $value_{encoder}$) := 20Hz

The reading constant usually has a value of 1 (reading in kWh or kvarh).

Example:

min. value:	0kW (corresponds to 0mA → 0Hz)
max. value:	3500kW (corresponds to 20mA → 20Hz)
→ Transducer range	DIF = 3500 – 0 = 3500kWh
Reading constant:	K = 1

→ Energy value weighting : $\frac{X}{Y} = \frac{3500}{72000} = \frac{35}{720} = \frac{7}{144}$

3.5.3 Summation registers

The weighted pulses of all inputs can be totaled in up to 4 total registers (with positive or negative sign):

$Total_i = \Sigma\, k_n \times E_n$

k_n : sign for input n, where: k = 1 or k = 0 or k = -1
E_n : Energy value at input n, where n = 1 … 16

Depending on the sign, the incoming pulses are totaled in a positive or a negative register. In the case of a simple sum (only positive inputs) the positive register contains the sum and the negative register contains the value 0.

In the case of frequent changes of the direction of energy flow (e.g. between forward and backward), the hysteresis (slack) can be used to activate the function “Differential total calculation” (for energy registers only). Here pulses will only be added to the positive or negative energy registers once they have exceeded a minimum amount of energy after a change of energy flow direction. The function of the hysteresis is one of an intermediate storage register. Each pulse in positive direction will increase the value of that register, whereas each pulse in negative direction will decrease its value. Pulses only appear at the output of the hysteresis register once its programmable maximum content is exceeded in either direction. An integrated energy direction pointer ensures correct output to either “positive” or “negative” target registers. The purpose of the hysteresis register is to prevent unnecessary totaling of pulses in the “positive” and “negative” registers, when the flow of energy in both directions is almost in balance. A meaningful guideline for the content of the hysteresis is double the sum of the absolute value of all weighted inputs of the related total register.

Example:

	Total Energy	Result with	
		Hysteresis = 0 kWh	Hysteresis = 4 kWh
Forward (+)	100 kWh	100 kWh	98 kWh
Backward (-)	2 kWh	2 kWh	0 kWh

In addition, the energy increment since the end of the last registration period is calculated for both the positive and negative registers of each sum and for each registration period (MP1 and MP2). If the function "balance calculation" is activated (possible only for demand or energy increment), then the difference between the positive and negative total registers is calculated at the end of the registration period and only the result is stored in the relevant register. This value is then multiplied with the time factor (ZF = 60/registration period length), which results in the demand value. At the beginning of each new registration period, the energy increment register (and therefore also the demand register) will be set to 0.

Example:

	Demand	Result	
		Without balance calculation	With balance calculation
Forward (+)	100 kW	100 kW	98 kW
Backward (-)	2 kW	2 kW	0 kW

3.5.4 Pulse outputs

The individual energy totals can be weighted with a separate divisor (defined in kWh/impulse) and forwarded to pulse outputs. Similar to the pulse inputs, the duration of pulse length and pulse interval can be programmed in the range from 10ms to 1000ms in steps of 10ms. A pulse output can buffer up to 255 pulses. As soon as this value is exceeded, the unit sets the correlated error bit in the unit status. This error bit can only be reset manually by the user. It is possible to link an output (Out1 to Out 4) on a software level to a particular totaling unit. When this link for a pulse output is modified, the pulse buffer of that output is cleared.

Please note that when the function „Differential Total calculation" is activated (Hysteresis > 0), the relation between current demand and correlated pulses at the output can temporarily run out of synchronization because of buffered pulses.

3.5.5 Apparent demand and cos(φ)

The DLX can calculate the apparent demand and the demand factor cos(φ) of any input and total registers. One register each can be defined to hold the active or reactive demand, respectively:

$$\text{Apparent demand} = \sqrt{(\text{reactive demand})^2 + (\text{active demand})^2}$$

$$\cos(\varphi) = \frac{\text{Active demand}}{\text{Apparent demand}}$$

Up to two calculations of apparent demand and cos(φ) are possible. The results are available on the display and can be stored in the periodic buffer (load profile memory). For the cos(φ) the display (and the stored value) will always contain the first three decimals.

Example:

Active demand:	900 kW
Reactive demand:	120 kvar
→ Apparent demand:	907,965... kVA
→ Display of app. demand:	908 kVA
→ cos(φ):	0,99123...
→ Display of cos(φ):	991

3.5.6 Maximum demand calculation

At the end of each registration period, the unit compares the current demand value with the highest value registered so far. If the new value is higher, then it will be stored together with date and time, separate for each rate. This calculation only takes place for registration period MP1. Current maximum demand values and register contents can be retrieved via remote data retrieval (currently only possible with SCTM protocol). Starting from version 1.04.00, a maximum demand is also calculated without regard to rates (in addition to the rate related values, and considering all days from 00:00 to 24:00).

3.5.7 Maximum demand reset

With a maximum demand reset the values for maximum demand of registration period MP1 and the current energy register values are transferred into the periodical buffer and then set to zero, to enable a new maximum demand calculation. In addition, the values of the cumulative energy registers will be stored.

The reset can be activated in three ways:

1) Via control input RSTX. The unit will execute the reset approx. 200ms after the change of the voltage level at RSTX.
2) Via internal clock automatically once per day, week, month or year. The time can be selected without limitation.
3) Manually via the keypad (password protected).

All three methods can be enabled or disabled separately by means of setting the relevant parameters. Only one reset is allowed for each registration period MP1. After a reset the next reset can be suppressed for a maximum of 99 registration periods MP1 (so called reset blockage).

3.5.8 Periodical buffer (billing data)

Upon each reset, the DLX unit stores the maximum demand values, the energy increment since the last reset (from the current energy registers) and the value of the cumulative energy registers at the time of the last completed registration period MP1. These values are available on the display of the unit. The DLX will store at least the values of the last 20 resets. Using remote data retrieval (currently only available for SCTM protocol), maximum demand values and register readings for the last 9 reset actions can be retrieved.

3.6 Time basis

The registration and calculation of demand values has to happen in a defined time frame. In order to calculate the correct tariff-related values, the internal real time clock must be programmed to the valid official time (e.g. CET = Central European Time or CEST = Central European Summer Time).

3.6.1 Setting the real time clock

The integrated real time clock is buffered by a "GoldCap" capacitor, which provides power for a minimum of 7 days in the event of a power failure. Should the power failure last longer than the capacity of the GoldCap, then the clock (the system time) will be set 59 minutes and 10 seconds after the date and time of the last stored value of the main registration period MP1 once the power supply returns.

The time can be set via the keypad, via the service interface or by means of the SCTM message in the case of remote data retrieval (if this feature was enabled during the setting of parameters). Please note that if summertime switching is activated, the clock cannot be set or synchronized during the time period of the "double" hour, due to the ambiguity of that period. During this period the unit will ignore the command. In order to not affect time management, the clock should not be set via more than one interface at the same time.

3.6.2 Automatic summertime switching

The DLX unit can perform automatic summertime switching if so desired. The switching times (month weekday, hour) can be programmed (set) in advance into a table.

Example:

Start of summertime:	last Sunday in March, switch from 2:00 to 3:00
Start of wintertime:	last Sunday in October, switch from 3:00 to 2:00

Please note that when using the table, both times must be programmed as standard time (CET = wintertime), i.e. if the reverse switching from summer to winter shall take place at 03:00 summertime, the value must be set as 02:00 in DLXPARA. After a unit reset, summertime switching is activated (factory setting).

3.6.3 Synchronization

The internal real time clock can be synchronized to the closest full minute via a freely programmable SYN control input (any of Ctl1 to Ctl7). Currently two methods of synchronization are available:

- Via external contact (e.g. external radio clock)
- Via DCF77 receiver module (type AWS0) from the company Meinberg (Germany)

In both cases the unit is synchronized to a full minute (seconds = 0). The permitted synchronization window depends on a setting in DLXPARA:

- SYN window = 0: Synchronization in a window of +/- 30 seconds around each full minute; synchronization is always possible
- SYN window > 0: Synchronization in a window of +/- x seconds (max. 29 seconds) around the end of registration period MP1, any attempt to synchronize outside of the permitted time window results in the generation (and storage) of an error event.

Example:

SYN window:	10 seconds
Registration period:	MP1 = 15 minutes

→ Synchronization only permitted in a window of +/- 10 seconds around each full 15 minutes (where minutes = 0 or 15 or 30 or 45).

3.6.4 Registration period

The registration period is the period of time used to calculate demand values (and energy increment values). At the end of a registration period, the current value of the maximum demand registers will be stored. Subsequently the maximum demand registers will be set to zero. Two independent registration periods can be defined:

- Registration period MP1: "Billing registration period" programmable in steps of 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 minutes.
- Registration period MP2: programmable in steps of 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 minutes as well as 2, 3, 6, 12 and 24 hours; if not required, this registration period can be disabled; registration period MP2 can be programmed to the same value as MP1.

Calculation of maximum demand values and billing data (see page 17) only takes place for registration period MP1.

3.7 Rate dependent processing

The DLX can process up to 4 energy and maximum demand rates. Please note that there is a differentiation between „number of rates“ (programmable) and “rate control” (settable).

With “rate control” one can select the method of switching between different rates. There are two alternatives:

1) The rate is determined by control inputs TR1, TR2, TR3 and TR4 (external rate control).
2) The rate is determined by the internal rate calendar.

The "number of rates" determines how many different rates the unit will differentiate and use. If the unit is programmed to use less than 4 rates, then the limit used is the highest programmed rate. If, for example the number of energy rates is programmed to 2, then the energy registration will only allow rates 1 and 2, even if the rate calendar stipulates rate 4. In this case rate 2 would be used instead of rate 4.

Example:

Number of rates: 2

- AT1 (theoretical) → AT1 (in the unit)
- AT2 (theoretical) → AT2 (in the unit)
- AT3 (theoretical) → AT2 (in the unit) : Limited to the highest programmed rate
- AT4 (theoretical) → AT2 (in the unit) : Limited to the highest programmed rate

3.7.1 Rate control

The currently active rate can be determined either via the rate control inputs (e.g. radio clock, or ripple control receiver) or via the internal rate calendar. Both are queried all the time:

- AT: Changes have an immediate effect on the energy rate.
- MT: The current maximum demand rate is always determined 5 seconds before the end of the current registration period and is then valid for this registration period (only one demand rate is possible per registration period.

3.7.2 Rate calendar

The device has a rate calendar with a table for up to 100 public holidays. The internal rates can be transmitted to external devices using the control outputs (Out1 to Out4 or Rel1 and Rel2), e.g. to control other devices.

The rate program (settable) is stored in the form of an internal rate calendar, which is hierarchically structured in three levels. The highest level defines the seasons, the second level defines the weekly programs and the lowest level defines the daily rate tables with the switching times for rates.

The definition of seasons allows up to six periods within one year (e.g. summertime or wintertime) that can have different rate structures.

Example:

Season 1: from 01.03 00:00 to 01.10 00:00

Season 2: from 01.10 00:00 to 01.03 00:00 (default value in DLXPARA: 1 ---)

Each active season requires the definition of a weekly program, which assigns the relevant daily rate switching tables (1..15) to weekdays. This can be shown in a table as follows:

Season	Weekdays							
	Mo	Tu-Th	Fr	Sa	Su	PH1	PH2	PH3
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3								
4								
5								
6								

In the table, weekdays are abbreviated as follows:
Mo = Monday Tu-Th = Tuesday/Wednesday/Thursday Fr = Friday
Sa = Saturday So = Sunday
PH1, 2, 3 = Public Holiday Type 1, 2, 3

The three types of public holidays (PH1, 2 or 3) allow you to define single weekdays to have special rates that are set in a separate definition table. These public holidays have higher priority than normal weekdays and allow one to consider holidays such as Easter, Christmas or other country specific holidays.

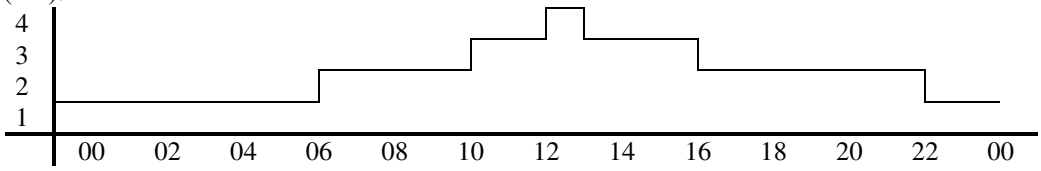
The sample entries in the above shown weekly program mean that in season 1 the daily rate table 1 shall be used all the time and in season 2 the daily rate table 2 is valid. Of course, different daily rate tables can be used for each weekday within a season, however only a maximum of 15 daily rate tables are available.

These daily rate tables define which energy rate and maximum demand rate shall be active at what time and also which control outputs must be used to signal the rates to subsequent external devices. Each daily rate table can have up to 16 rate switching times.

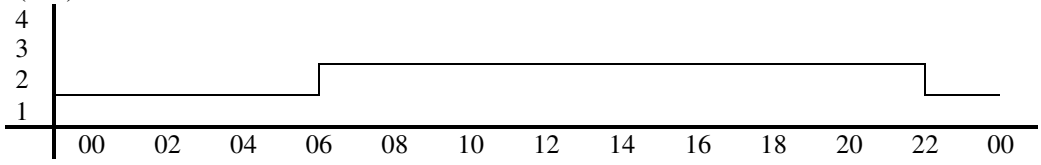
Example: rate control for 4 energy rates and 2 maximum demand rates:

Switching times		Rates	
from	To	Energy (AT)	Demand (MT)
06:00	10:00	AT2	MT2
10:00	12:00	AT3	MT2
12:00	13:00	AT4	MT2
13:00	16:00	AT3	MT2
16:00	22:00	AT2	MT2
22:00	06:00	AT1	MT1

This rate table relates to the following energy and demand rate curves:
Energy rate (AT):



Demand rate (MT):



The daily rate tables determine the rate curves that are used for different days within a year. These tables are linked to seasons by means of the weekly programs.

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3.7.3 Rate control inputs

The rate control inputs TR1 to TR4 determine (if desired and if present in the customer specific hardware configuration) the currently active energy rate and maximum demand rate. The usage of inputs and the correlation of input states to rates can be programmed freely (settable).

The factory default settings use TR1 to switch between two energy and demand rates.

	TR1	TR2	TR3	TR4
Energy rate mask	☑	☐	☐	☐
Demand rate mask	☑	☐	☐	☐

TR1	TR2	TR3	TR4	Energy	Demand
0	-	-	-	AT1	MT1
1	-	-	-	AT2	MT2

Note: The state of deactivated control inputs (in our example: TR2, TR3 and TR4) has no influence on the rate control (no matter whether the state is 0 = open or 1 = closed).

If other combinations are desired, they can be programmed (see user manual of DLXPARA).

Example: rate control for 4 energy rates and 2 demand rates, controlled by TR1, TR2 and TR3.

	TR1	TR2	TR3	TR4
Energy rate mask	☑	☑	☑	☐
Demand rate mask	☑	☑	☑	☐

TR1	TR2	TR3	TR4	Energy	Demand
0	0	0	-	AT1	MT1
1	0	0	-	AT1	MT2
0	1	0	-	AT2	MT1
1	1	0	-	AT2	MT2
0	0	1	-	AT3	MT1
1	0	1	-	AT3	MT2
0	1	1	-	AT4	MT1
1	1	1	-	AT4	MT2

3.8 Storage of measurements

3.8.1 Internal memory

All data that needs to be retained during a power failure, is stored in internal memory (Flash technology, non volatile without backup battery, size of internal memory : 1MByte). These are all device parameters, registration period data (load profile data), spontaneous events and resets (billing data).

Each type of data uses a separate area of memory, which is administered separately. Memory is organized as a circular buffer, i.e. once a particular storage area is full, the “oldest” information will be overwritten.

The registration period memory area can alternatively contain demand values, energy increments or cumulative counter values, positive and negative totals, apparent energy and cos(φ).

3.8.1.1 Unit restart (loading of factory default settings)

After a unit restart (message in the display (“Parameter Reset”) the complete internal memory (device parameters, spontaneous events, resets and registration period data) is erased and the standard parameters will be loaded (see menu item “Factory settings”, page 66). A unit restart can be executed in the following ways:

- Via the keypad: menu item „SET PARAMETERS – Factory settings”. This is password protected.
- Via the programming software DLXPARA (using the service interface. This is password protected.
- Via hardware reset: switch off the unit and place a jumper onto the pins labeled “Test” (located on the CPU board under the display), then power up the unit and wait until the display shows “Parameter Reset”, then remove the jumper. This is protected by seals.

! If parameters defining the buffer usage (number of counters, totals, digits, measurement types or storage allocation) are altered, the registration period buffer and the reset memory are erased automatically.

3.8.1.2 Unit warm start

The DLX unit performs a warm start (message in the display: “System warm start”) under the following conditions:

- On return of power supply after a power failure
- When placing the “Reset” jumper on the CPU board.

Data device parameters and data remain intact. No data will be stored for registration periods during which the power supply was absent. An event will be stored in the spontaneous event buffer for a unit warm start.

3.8.1.3 Unit cold start

The DLX unit performs a cold start (message in the display: “System cold start” under the same conditions as above, if the internal RAM memory could not be buffered by the GoldCap (minimum of 7 days without power supply voltage). In this case all device parameters and the device internal system time need to be reconfigured. All data in the registration period buffer is retained, and the system time is set to 59 minutes and 10 seconds after the timestamp of the last stored entry in the main registration period buffer. An event will be stored in the spontaneous event buffer.

3.8.1.4 Erase memory

All internal memory (spontaneous events, resets and registration period data) can be erased using the menu item „SET PARAMETERS – Erase memory“). The device parameters are retained.

An event is stored in the spontaneous event buffer.

3.8.2 Security mechanisms for data storage

All data is secured in a number of ways: when data is stored, each byte written is checked by an additional read cycle; for each block of data a checksum is stored which is checked for correctness when the block is read. Data is only used and forwarded when the checksums match.

3.8.3 Block diagram of internal memory

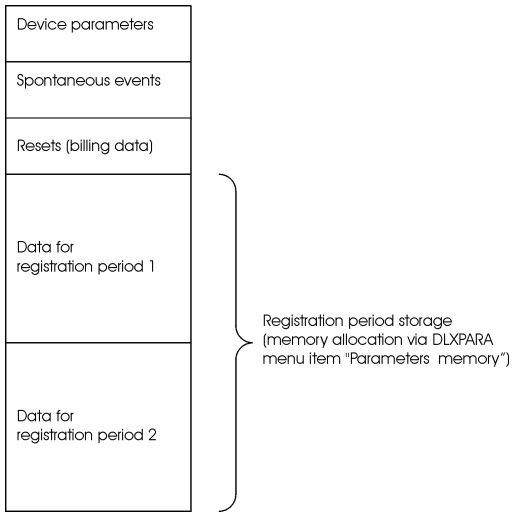


Figure 6, Block diagram of internal memory

The internal registration period memory can be divided into two areas for registration periods MP1 and MP2 (if active), using DLXPARA. Each area can contain counter readings, energy increments or demand values with 4, 6 or 8 digits.

Data stored in internal memory can additionally be stored on a PC-Card (backup memory, see page 63).

3.8.4 Capacity of internal memory

Depending on parameter settings (DLXPARA) the individual areas of internal memory have the following capacity:

Device parameters:	1 set of parameters
Spontaneous events:	Min. 780
Resets (billing data):	Min. 20 (depends on the number of defined input channels and totals)
Registration period MP1:	Min. $\frac{\text{No. of sectors in MP1} \times 65522}{12 + (\text{No. of bytes in MP1} \times \text{No. of entries in MP1})}$
Registration period MP2:	Min. $\frac{\text{No. of sectors in MP2} \times 65522}{12 + (\text{No. of bytes in MP2} \times \text{No. of entries in MP2})}$

where:

No. of bytes in MPx:	4: for values with 4 stored digits 6: for values with 6 or 8 stored digits
No. of sectors in MPx:	Round (memory share for MPx x 9) (depends on the parameters for internal memory shares in DLXPARA) e.g. memory share for MP1 = 56% → No. of sectors in MP1 = 5.
No. of entries in MPx:	1..32 (depends on the parameters for storage allocation: number of inputs, totals, apparent demand and cos(φ) in registration period MP1 or MP2)

Note:

Due to the composition of FLASH memory devices a minimum of sectors of 65536 Bytes each is allocated to each area (the exception being the device parameters with 1 sector).

3.8.5 Capacity of backup memory (PC-Card)

Due to technological and administrational reasons the whole memory of a PC-Card is divided into sectors. Data is always written or erased by complete sectors.

Depending on the card type the following sector sizes are available:

- SRAM cards: 256Byte
- FLASH cards: 128kByte (:=131072Byte)

The memory is divided into the following areas:

Memory area		SRAM	FLASH
Administration information:	Number of Bytes (Sectors)	768 (3)	131072 (1)
Spontaneous events:	Number of Bytes (Sectors)	1536 (6)	262144 (2)
	Number bytes per event	11	11
	Number of events	114 to 139	11914 to 23831
Reset buffer:	Number of Bytes (Sectors)	9472 (37)	262144 (2)
(cumulative counters,		1538	1538
without rates)		4 to 6	83 to 170
Registration period MP1:	Number of days	Programmed via DLXPARA	
Registration period MP2:	Number of days	Programmed via DLXPARA	
Intermediate buffer:	Number of Bytes (Sectors)	0	131072 (1)

The number of stored entries per memory area varies depending on the level of usage in individual sectors.

DLXPARA can determine the required memory capacity of a PC-Card and this information can retrieved from the unit via SCTM protocol (see appendix A: table addresses 700-80 and 700-81).

Checksums are created for each block of data to protect against corruption. The checksum is the arithmetic sum total of a block of data and it uses one byte of memory. The amounts carried over from the summation are discarded.

Each block of data can vary in length. For buffers one block of data is equivalent to one buffer entry. Administration information is also divided into blocks of data.

3.9 Control inputs

The DLX unit can have up to 7 control inputs (Ctl1..Ctl7). These inputs are by default of the S0 type (also called IES), but optionally they are available in wipe technology (IEW). Control inputs are programmed and activated by the software application DLXPARA. The following functions are available:

- SYN input: Synchronization of the internal real time clock via external transmitters or external DCF77 receiver (see page 62)
- RSTX input: External maximum demand reset
- ANZ input: External control for scrolling of the display
- TR1 to TR4: Rate control via external transmitters (e.g. ripple control receivers)
- Log1 to Log4: Logic inputs that allow connection of the DLX with signal outputs of external devices. With these inputs the user can create and log events that are relevant to the processing of meter readings (e.g. defective transformers or external fault messages). The logic inputs are scanned every 10 seconds (second 5, 15, 25, 35, 45, 55). Incoming signals are stored in the spontaneous events buffer together with date and time. They can additionally be stored (this needs to be enabled by DLXPARA) in the device status data of the registration period area (L-bit, see appendix A).

Control inputs are subject to a signal detection in software similar to the one used for pulse inputs, i.e. pulses that fall short of a minimum length are not considered. For control inputs the minimum pulse length and the minimum pulse interval is set to 30ms.

3.10 Outputs

The DLX data logger (remote metering device) can have up to 6 freely programmable outputs, which are available in wipe technology (Out1 to Out4, type IAW) and as mechanical relays (Rel1 and Rel2). Corresponding light emitting diodes (LED) in the display show the state of each output (output closed or active: LED is lit). The following functions are possible:

- Total 1 to 4: pulse output for total registers (only with Out1 to Out4)
- MPA1 and 2: output indicating the end of registration period MP1 or MP2
- RSTA: reset output
- Alarm1 and 2: output for warning messages (Alarm1) and device faults (Alarm2)
- TRA1 to 4: Rate control outputs. After a unit restart the following factory settings are active:

Energy rate	TRA1	TRA2
AT1	0	0
AT2	1	0
AT3	0	1
AT4	1	1

Demand rate	TRA3	TRA4
MT1	0	0
MT2	1	0
MT3	0	1
MT4	1	1

where: state "1": output is active (closed), output LED is lit.

- Log1 to 4: logic outputs, used to forward signals to externally connected devices. Control of the logic outputs is performed via remote data retrieval.
- In1 to 16: pulse inputs can be redirected (1 to 1) to outputs (Version 1.04.00 and higher). No conditioning of pulse lengths or signal type is performed.

These functions can allocated to more than one output at the same time (pulse multiplication).

3.11 Communication

The Data logger can communicate (for programming and for data retrieval) via three serial interfaces:

- Service interface
- Data interface
- Modem

The DLX currently supports two different protocols: SCTM and IEC60870 (see appendix A). An exact description of all interfaces is contained in section 8 Interfaces and section 9 Modem (Optional).

4 Design

4.1 Sealing arrangements

4.1.1 Housing for panel mounting

The keypad can be sealed by two sealing screws in the upper left and lower right corner of the keypad. The sealing wire needs to be fed through the whole in the enclosure and through the sealing screw and a seal needs to be attached to the wire.

Sealing of the PC-Card cover or the terminal cover is done by means of a sealing screw and the splicing plate of the PC-Card cover or the terminal cover. After placing and fixing the cover the sealing screw is fixed through the whole in the splicing plate and then sealing wire needs to be fed through the holes in both the splicing plate and the sealing screw and finally a seal is attached to the wire. Alternatively the PC-Card cover can also be secured with a padlock (according to the VDEW requirement definition for electronic watt-hour meters, Version 2.0).

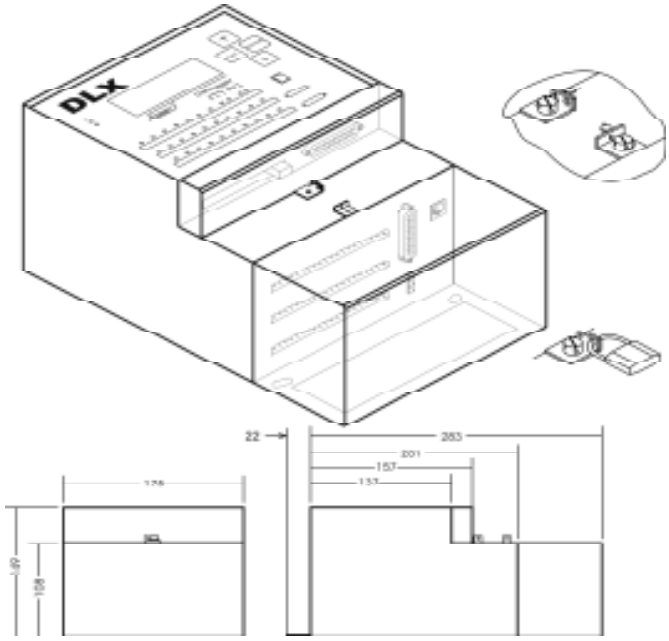


Figure 7, Dimensions and sealing arrangements for covers

4.1.2 19” rack

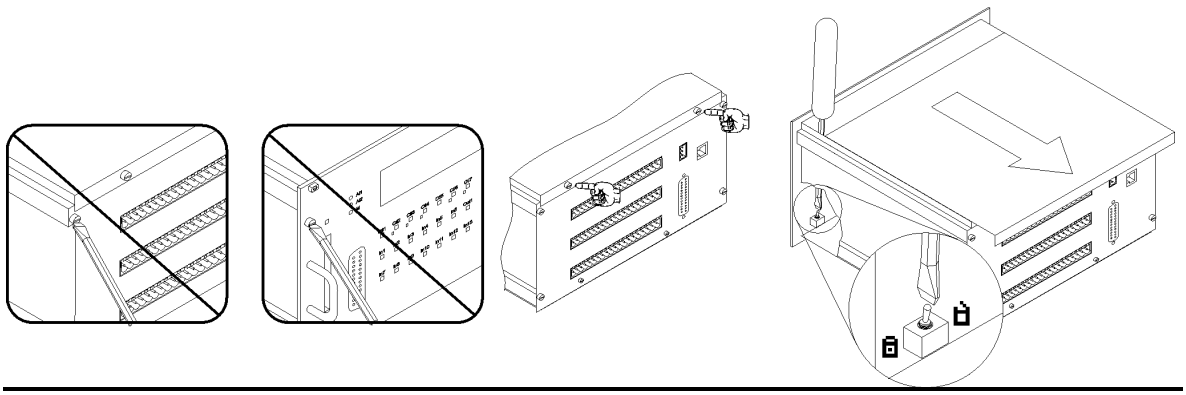


Figure 8, Sealing arrangements for 19” rack

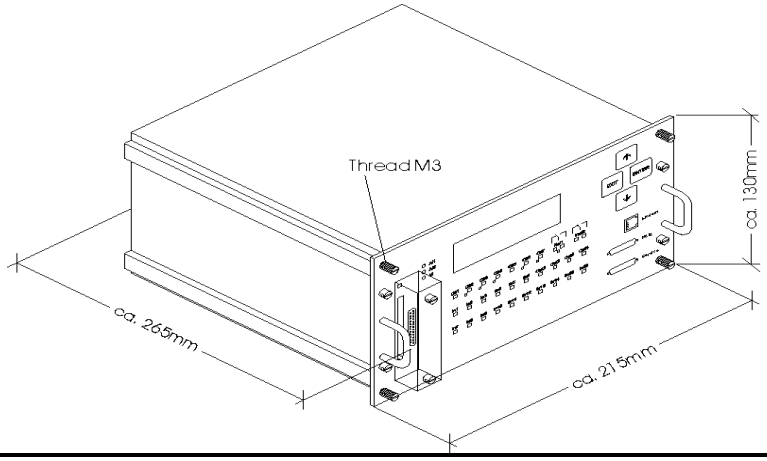


Figure 9, Dimensions of 19" rack

4.2 Installation diagram

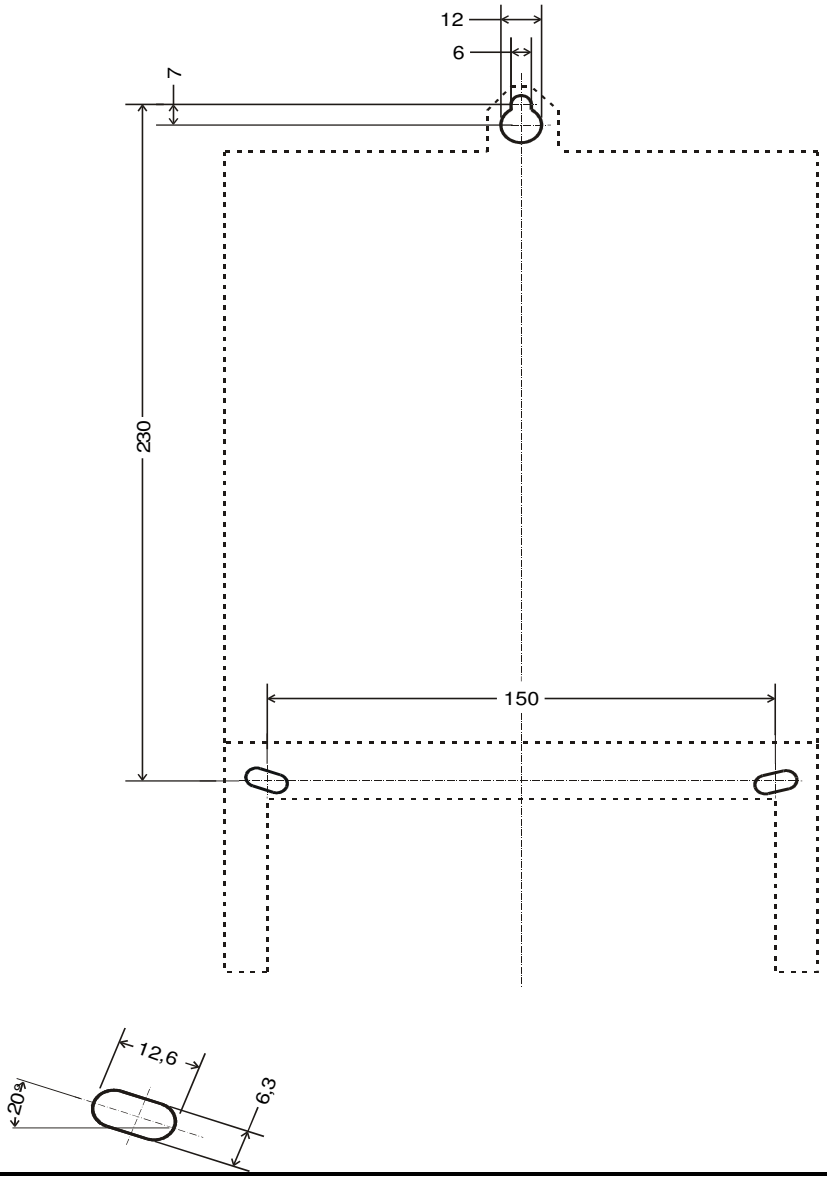


Figure 10, Dimensions of mounting points

5 Commissioning

5.1 Delivery state

PC Card slot: no PC-Card inserted
Program protection switch: Programming enabled (switch position: "Set Enable")
Supply voltage: as per order

5.2 Preparation for commissioning

1) Check the DLX unit for transport damages.
   Should there be any damages caused by transport, please contact us.
2) Check that your DLX unit was delivered as per your order.
3) Read this user manual carefully before starting the commissioning.
4) Prepare all electrical connections according to the section “Terminals” (starting from page 30) or according to the accompanying special terminal connection plan. If a special terminal connection plan is present, the section “Terminals” is invalid!
5) Install the DLX at the designated measurement location.
6) Connect the DLX to the mains supply voltage.
   The DLX will start immediately with its operation, based on the factory settings as per section “Factory settings” (see page 66).
7) Modify the measurement parameters and device parameters with the software application DLXPARA, if required.

5.3 Supply voltage selection

The supply voltage of the DLX can be changed from 110/115VAC to 200/230VAC inside the device by means of a sliding switch.

! The supply voltage must only be changed when the DLX is without power!

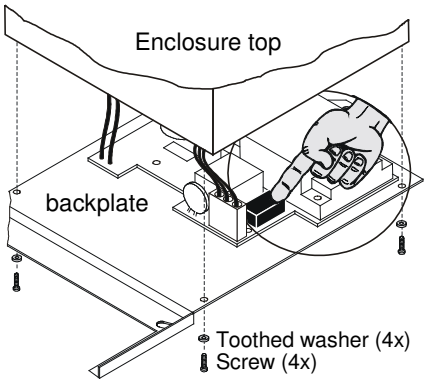


Figure 11, Location of the switch

Proceed as follows:

Remove the four screws at the backside of the DLX and lift the back plate off.

The switch for changing the supply voltage is located on the PC-board mounted to the back plate (see diagram to the left).

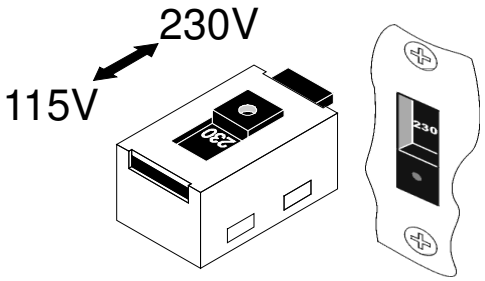


Figure 12, Voltage selection switch

Move the selector switch to the desired position

The selected voltage will be displayed on the switch.

5.4 Terminals

5.4.1 Location of the terminals

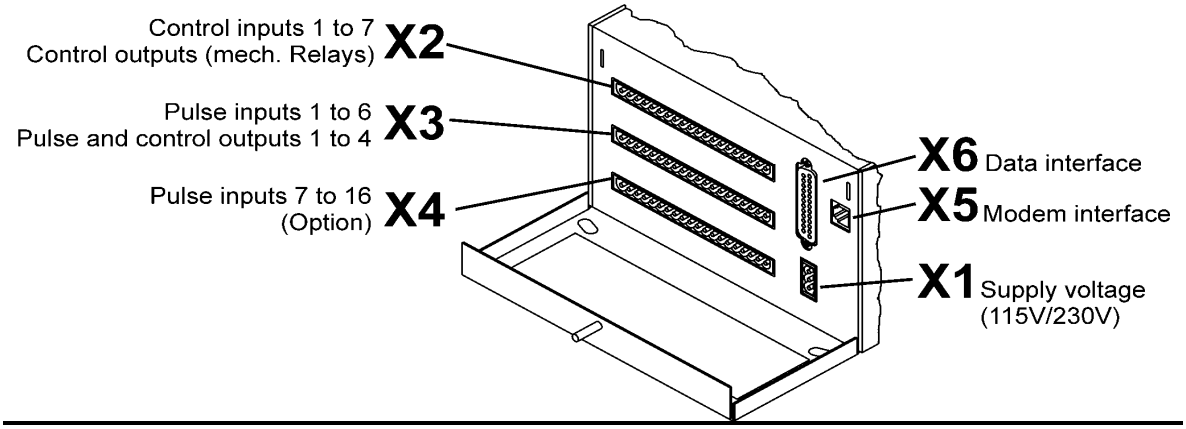


Figure 13, Location of the terminals (Housing for panel mounting)

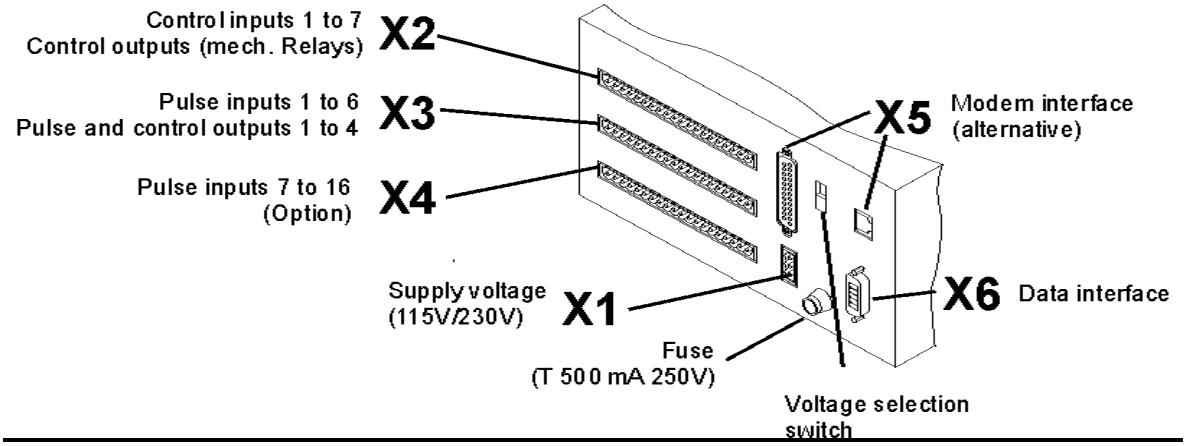
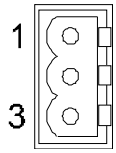


Figure 14, Location of the terminals (19" rack)

5.4.2 Connector X1 (Supply voltage)

Type of connector: Combicon MSTB2,5/3-ST-5,08 (Phoenix)
Function: DLX mains power supply connector
Supply voltage: 100/115VAC or 200/230VAC; ca. 20VA
(Supply voltage selection see page 29)



Terminal	Description	
1	Live (100/115VAC or 200/230VAC)	L1
2	Neutral	N
3	Protective Earth	PE

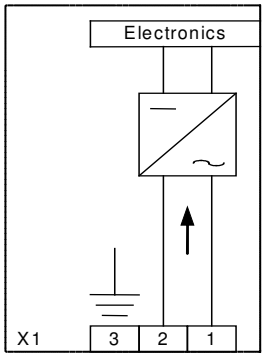


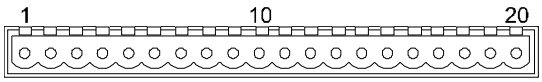
Figure 15, Connector X1 (Supply voltage)

5.4.3 Connector X2 (control inputs, relay outputs)

Terminal type: Combicon MSTB2,5/10-ST-5,08 (Phoenix),
2 per In-/Output card

Function: Control inputs (Ctl1 to Ctl7, terminal 1 to 14)
Relay outputs (Rel1 and Rel2, terminal 15 to 20)

Input/output types: 7 input modules (IES or IEW)
2 mech. relays (IAW me., max. 250V/2A)



Terminal	Description		Function (default)
1	Control input Ctl1 -	SYN	External Synchronization input
2	Control input Ctl1 +		
3	Control input Ctl2-	RSTX	External Reset
4	Control input Ctl2+		
5	Control input Ctl3-	ANZ	Scroll key
6	Control input Ctl3+		
7	Control input Ctl4-	TR1	External rate control input 1
8	Control input Ctl4+		
9	Control input Ctl5-	TR2	External rate control input 2
10	Control input Ctl5+		
11	Control input Ctl6-	TR3	External rate control input 3
12	Control input Ctl6+		
13	Control input Ctl7-	TR4	External rate control input 4
14	Control input Ctl7+		
15	Relay output Rel1	idle contact (off, rk)	Alarm 2
16	Relay output Rel1	feeder (uk)	
17	Relay output Rel1	active contact (on, ak)	
18	Relay output Rel2	idle contact (off, rk)	Registration period output MPA1
19	Relay output Rel2	feeder (uk)	
20	Relay output Rel2	active contact (on, ak)	

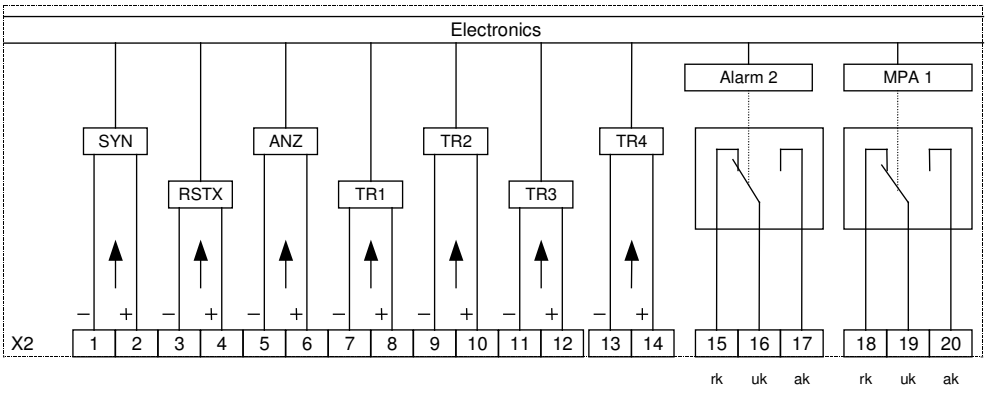


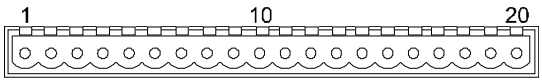
Figure 16, Connector X2

5.4.4 Connector X3 (pulse inputs 1-6, outputs 1-4)

Terminal type: Combicon MSTB2,5/10-ST-5,08 (Phoenix),
2 per input / output card

Function: Pulse inputs (In1 to In6, terminal 1 to 12)
Electronic outputs (Out1 to Out4, terminal 13 to 20)

Types of inputs / outputs: 6 Input modules (IES, IEW, IED)
4 Output modules (solid state IAW el., max. 265V/100mA)



Terminal	Description		
1	Pulse input	In1-	IN1
2	Pulse input	In1+	
3	Pulse input	In2-	IN2
4	Pulse input	In2+	
5	Pulse input	In3-	IN3
6	Pulse input	In3+	
7	Pulse input	In4-	IN4
8	Pulse input	In4+	
9	Pulse input	In5-	IN5
10	Pulse input	In5+	
11	Pulse input	In6-	IN6
12	Pulse input	In6+	
Freely programmable outputs			
13	Electronic output	Out1-	OUT1
14	Electronic output	Out1+	
15	Electronic output	Out2-	OUT2
16	Electronic output	Out2+	
17	Electronic output	Out3-	OUT3
18	Electronic output	Out3+	
19	Electronic output	Out4-	OUT4
20	Electronic output	Out4+	

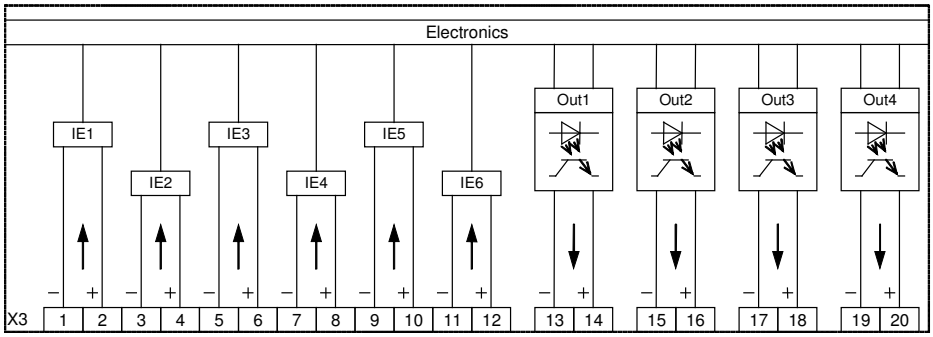


Figure 17, Connector X3

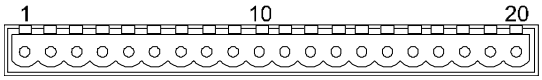
! When IED (bi-current / bi-polar) Modules are used, then the signal conditioning must be adjusted by means of the programming software DLXPARA.
When using mixed types of pulse inputs, the IES type modules are located at the **left hand side**.

5.4.5 Connector X4 (pulse inputs 7-16)

Terminal type: Combicon MSTB2,5/10-ST-5,08 (Phoenix), 2 per input/output card

Function: Pulse inputs (In7 to In16, terminal 1 to 20)

Input types: 10 input modules (IEW, IES, IED)



Terminal	Description		
1	Pulse input	In7-	IN7
2	Pulse input	In7+	
3	Pulse input	In8-	IN8
4	Pulse input	In8+	
5	Pulse input	In9-	IN9
6	Pulse input	In9+	
7	Pulse input	In10-	IN10
8	Pulse input	In10+	
9	Pulse input	In11-	IN11
10	Pulse input	In11+	
11	Pulse input	In12-	IN12
12	Pulse input	In12+	
13	Pulse input	In13-	IN13
14	Pulse input	In13+	
15	Pulse input	In14-	IN14
16	Pulse input	In14+	
17	Pulse input	In15-	IN15
18	Pulse input	In15+	
19	Pulse input	In16-	IN16
20	Pulse input	In16+	

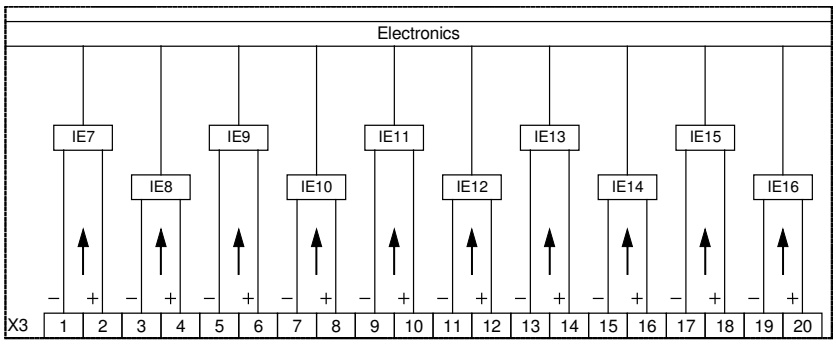


Figure 18, Connector X4

! When IED (bi-current / bi-polar) modules are used, then the signal conditioning must be adjusted by means of the programming software DLXPARA.
When using mixed types of pulse inputs, the IES type modules are located at the **left hand side**.

5.4.6 Connectors X5 and X6

X5 (modem interface): from page 61

X6 (data interface): from page 58

5.4.7 Input and output modules

Input and output modules convert the pulse types and voltage levels of commonly used signals in metering technology into TTL signals used by the micro controller (and vice versa). At the same time these signals are galvanically isolated from the process.

These types of input modules are available:

IES **Pulse input S0**

S0 inputs are active inputs, i.e. they not only supply the transmitter with a signal voltage, but also with an auxiliary voltage. S0 transmitters can contain their own electronic circuitry without the need to have their own power supply. The relevant current and voltage limits are defined in DIN 43864. S0 inputs are capable to deliver 10mA to an 800Ω transmitter (to supply the transmitter) and they still recognize a maximum current flow of 2.2mA as an "Off" signal. They are limited to supplying a maximum voltage of 27V. Therefore S0 inputs are well suited for simple potential free contacts and passive transmitters using optical couplers or transistors and they are frequently used for control signals (synchronization, rate control, resets etc.)

IEW **Pulse inputs of type „wipe"**

These inputs are passive inputs, i.e. they are supplied by the transmitter. A metering pulse is transmitted directly as a voltage signal. In practice many different voltages and currents are used.
The input modules used can be operated with DC or AC signals from 24 to 265V. The maximum pulse frequency is at 10Hz, current consumption is less than 10mA. Indefinite pulses (permanent contact) are permitted. This makes IEW modules basically suitable for control signals.

IED **Pulse inputs of type „bi-current / bi-polar"**

"Bi-current" inputs are passive inputs, i.e. they are supplied by the pulse transmitter. As such they are not linked to any voltage. „Bi-current" pulses are DC voltage pulses of alternating polarity. A pulse is recognized by the transgression of the 0V level. Instead of DC voltage pulses a permanent DC voltage that changes its polarity for each pulse, can also be used. The standard voltage is 24V, but it can vary from 19V to 60V. Our bi-current pulse inputs have an input current of less than 2mA at 24V. As each input pulse is represented by a change of polarity of the input voltage, our IED modules internally produce a complete pulse of typically 20msec duration for each change of polarity. This needs to be taken into consideration for the maximum pulse frequency (max. 20Hz). If desired, IED modules with 90msec are available, which can be used up to 6Hz pulse frequency. Bi-current transmission lines are highly immune to disturbances and should be used for long distance transmissions. Depending on the environment (neighboring lines, transmission distance) a shielded cable of sufficient diameter should be used.

Note: As each pulse is represented by a change of polarity, the signal condition must be deactivated in DLXPARA.

Analogue Signal current input (analogue input)

A continuous signal current flow is applied to the signal current inputs (e.g. 0 .. 20mA, or 4 .. 20mA). This current is proportional to the actual demand. By integration of the current over time (i.e. the measuring period) it is possible to calculate the energy consumed, from which the average demand is then calculated. The signal current input (analogue input) measures power in order to establish energy consumption. The power is measured over short intervals, multiplied by the time and the result is summated. This sum is equivalent to the energy consumed. If the sum exceeds a fixed limit value "W", a 25msec output pulse is triggered and "W" is subtracted from the sum. "W" is designated the pulse weighting and is set such that at maximum demand a pulse frequency of 20Hz (pulse length: 25msec) is reached. The demand is measured via an external transducer that converts the measured demand to an injected current (selectable ranges: 0 to 20mA or 4 to 20mA).

Note: The signal condition must be deactivated in DLXPARA (minimal high phase,0: 10msec).

The following types are used as output modules:

IAW el. Pulse output type „wipe“ (solid state, Out1 to Out4)
Electronic outputs of type wipe behave the same as relay contacts, i.e. they can carry a burden of up to 265V and 100mA for AC or DC. They combine wear free switching with high switching frequency and are therefore ideal for high pulse frequencies. They can drive S0 inputs directly.

IAW me. Pulse output type „wipe“ (relay contacts, Rel1 and Rel2)
Mechanical relays are currently the only practical solution for the implementation of transmission lines without auxiliary voltage. Similarly, only mechanical components are available for outputs with change-over contacts (idle contact and active contact). Due to a life span of approx. 5×10^5 they are not suitable for the transmission of pulses.
Electronic outputs (IAW el.) are generally less problematic.

6 Operation

6.1 Display

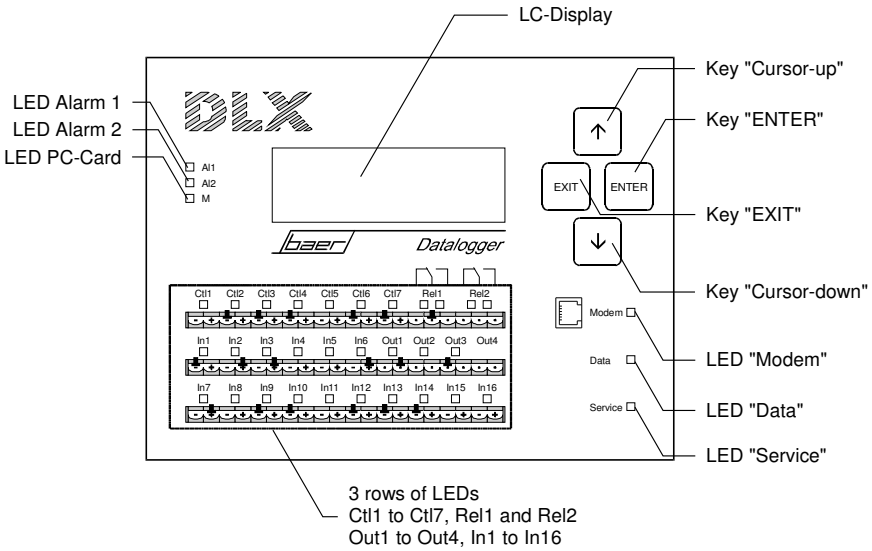


Figure 19, Layout of operation controls and indicators

6.1.1 Keys

- ENTER — Moves the scroll list to the next value (in the standard display mode);
  Activates the selected menu item (in menu mode);
  Stores the previously set parameter values (in individual menus);
  Moves the cursor one position to the right (in individual menus).
- EXIT — Exits from the current menu item without storing any parameter values.
- Up (↑) — Changes from the standard display mode into the menu item „Select language“;
  Moves one menu item up or increases a value by one (+1).
- Down (↓) — Activates the main menu (in standard display mode);
  Moves one menu item down or decreases a value by one (-1).

After pressing any key the background illumination of the LC displays is activated for approx. 15 minutes.

6.1.2 Light emitting diodes (LED)

The LED’s show whether the DLX is receiving or transmitting pulses, whether faults have occurred and whether the unit is currently using the PC-Card:

The light emitting diode(s)

- "In1" to „In16" represent the state of the corresponding pulse input.
- "Al1" blinks when an alarm of class1 (warning) has occurred (see „Fault displays“, page 67).
- "Al2" blinks when an alarm of class 2 (device fault) has occurred (see „Fault displays”, page 67).
- "M" is active during access to the PC-Card (memory card).
- "Out1" to "Out4" are lit when the corresponding output is closed (active).
- "Rel1" and "Rel2" show the current status of the corresponding relay..
- "Ctl1" to "Ctl7" show the current status of the corresponding control input.
- "Modem", "Data" and "Service" are lit during communication on these interfaces.

6.1.3 Standard display mode

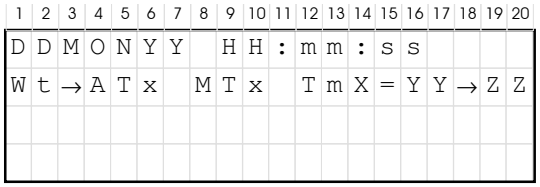


Figure 20, Standard display mode

Interpretation of the standard display mode

Line	Digit	Information	Format	Explanation
1	1 and 2	Day	01 to 31	Date display: Day
	3 to 5	Month	JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC	Date display: Month
	6 and 7	Year	00 to 99	Date display: Year
	8	Summertime Switching	(no symbol)	No switching between summertime and wintertime
			S	Summertime
			W	Wintertime
	9 to 11	Hour	00: to 23:	Hour display
	12 to 14	Minute	00: to 59:	Minute display
	15 and 16	Second	00 to 59	Second display
	17	Reset block	(blinking)	Reset not permitted
	18	PC-Card	(no symbol)	No PC-Card inserted or activated
			PC	PC-Card inserted and activated
			PC (blinking)	PC-Card registered but not activated
	19	Synchronization	(no symbol)	Synchronization not programmed
			M	Manual Synchronization (via terminal)
			F	Synchronization via DCF77 receiver, DCF77 signal valid
			F (blinking)	No synchronization, DCF77 signal disturbed
	20	Program prot. Switch		Programming not permitted ("Set Disable")
			(blinking)	Programming permitted ("Set Enable")
2	1 to 3	Weekday	Mo to Su, F1 to F3	Weekday or public holiday (F1 to F3 from the rate calendar)
	4 to 6	Energy rate	AT1 to AT4	Name of the active energy rate
	8 to 10	Demand rate	MT1 to MT4	Name of the active demand rate
	12 to 15	Registr. Period	MP1= or MP2=	Registration period identifier
	16 to 17	Registr. Period length	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60, 2*, 3*, 6*, 12*, 24*	Length of registration period MP1 or MP2 in minutes or in hours* (if a lowercase „h“ is shown in position 18)
	18	Unit of registr. period	→ or h	Length of registration period MP1 or MP2 in minutes (→) or . in hours* (h).
	19 to 20	Time remaining in registr. period	ZZ	Time remaining to the end of the registration period in minutes or in hours (is a lowercase „h“ is shown in position 18)
3	1 to 20	Scroll list : text display (if programmed via programming software DLXPARA)		
4	1 to 20	Scroll list : text display (if programmed via programming software DLXPARA) During programming line 4 shows the text “Password is active!”		

* only for registration period MP2

7 Menus

7.1 Flow diagram

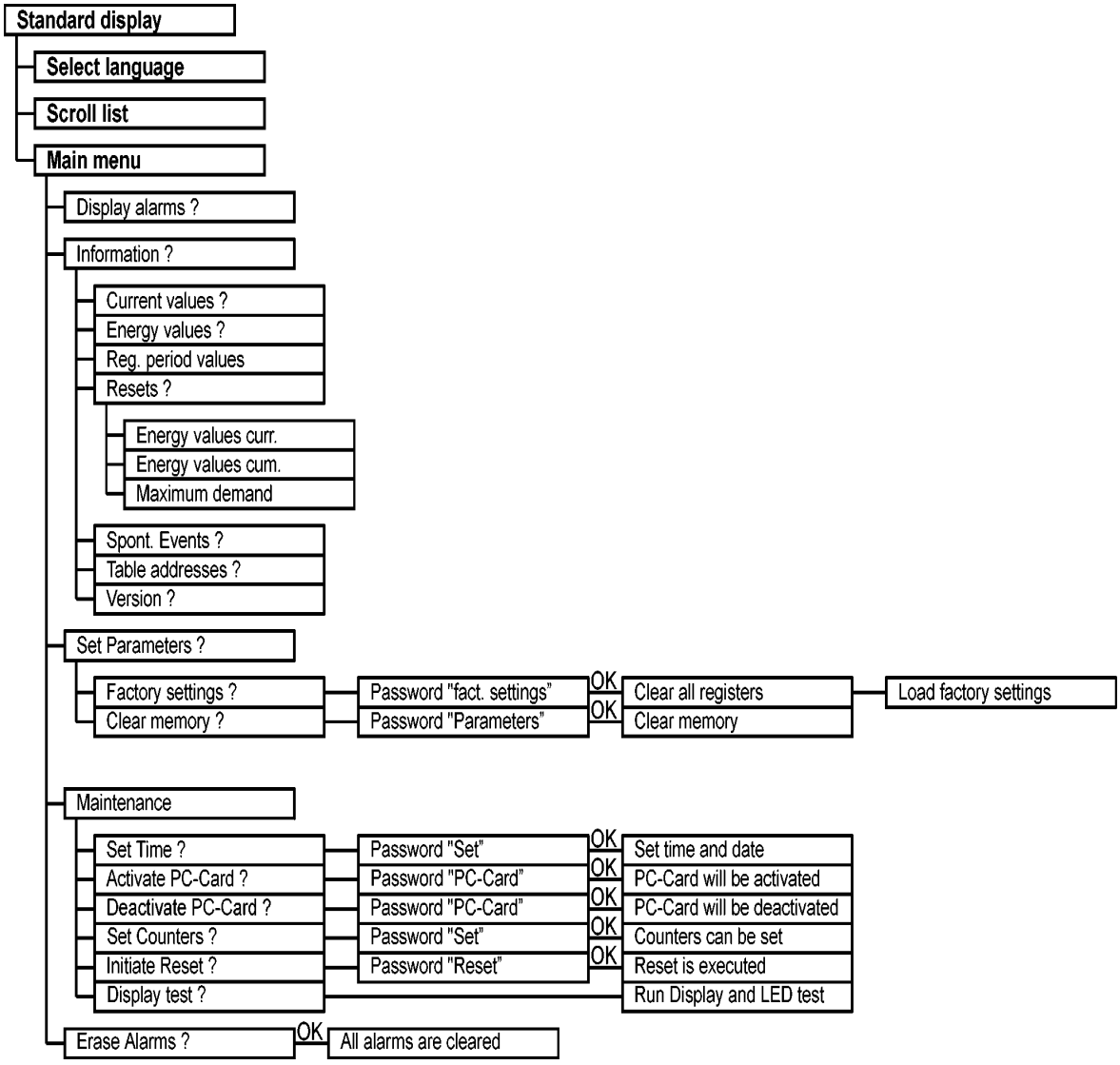


Figure 21, Flow diagram of menus

The menus

After powering up, the DLX shows the standard display (see page 37). Press ↑ to go to the menu item „Select language“ (see page 41). Press ↓ to go to the main menu (from page 43).

Press ENTER to start the scroll list (if a scroll list has been programmed via DLXPARA) (see page 42).

7.2 Legend of flow diagrams

The following symbols will be used in the next section:

Symbol	Explanation	Key on DLX
EXIT	**EXIT key** Exit current menu item, displayed settings are not stored in the DLX	EXIT
ENTER	**ENTER key** Enter the selected menu item or store the displayed value in the DLX	ENTER
↑	**ARROW UPWARDS key** Move up by one menu item or increase the selected value bye 1 (+1)	↑
↓	**ARROW DOWNWARDS key** Move down by one menu item or decrease the selected value bye 1 (-1)	↓
◄▲▼►	**Arrow keys** Indicate the selected menu item and the direction to more menu items	

Figure 22, Legend of flow diagrams

7.3 Password input

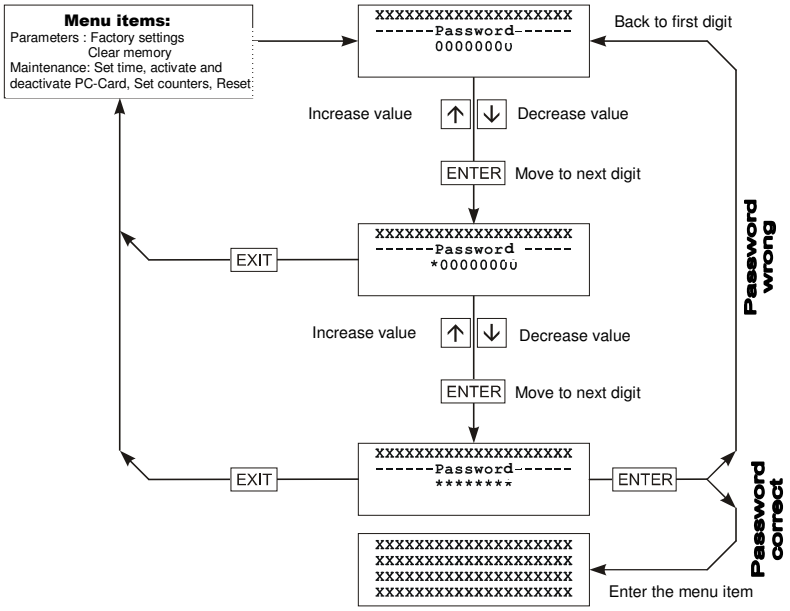


Figure 23, Flow diagram for password input

Several menu items („Set Parameters“: Factory Settings (unit restart) and Clear Memory, as well as “Maintenance”: Set Time, Activate PC-Card, Deactivate PC-Card, Set Counters, Initiate Reset) require a password for their activation. The following passwords are supported:

- PARAMETERS: for the protection of parameters (when programming via DLXPARA) and for activation of other menu items in the menus „Maintenance“ and „Set Parameters“ except for a unit restart. The default password is **00000001**
- SET (Menu "Maintenance"): to protect the unit against unauthorized alterations of time and counter settings, the default password is **00000002**
- PC-CARD (Menu "Maintenance"): in order to activate and deactivate a PC-Card, the default password is **00000003**
- FACT. SETTINGS (unit restart, Menu "Set Parameters"): to clear the entire memory and load the factory default settings, the default password is **00000004**
- RESET (Menu "Maintenance"): to initiate a maximum demand reset via the keypad, the default password is **00000005**

Leading zeros can be ignored when using DLXPARA. The default passwords can only be modified using DLXPARA.

How to enter a password

Proceed as follows to enter a password:

1) Use the keys [↑] or [↓] until the display shows the correct first digit (a number between 0 and 9) of the password.
2) Press the [ENTER] key to confirm the digit. It will be replaced by an asterisk (*) and the next digit will be selected.
3) For the remaining digits proceed as described under 1) and 2).
4) Once the last digit has been selected and the [ENTER] key has been pressed, the DLX checks the entered password.
5) If the password was entered correctly, the DLX will activate the relevant menu item..
6) If the password was incorrect, input returns to the first digit of the password.
7) Press the [EXIT] key to cancel password input.

Example: Password: 00000001 (you can enter 1 only, if using DLXPARA)
Input: 7 × [ENTER], 1 × [↑], [ENTER]

Input/ Key	Display
Starting point	00000000
[ENTER]	*0000000
[ENTER]	**000000
[ENTER]	***00000
[ENTER]	****0000
[ENTER]	*****000
[ENTER]	******00
[ENTER]	*******0
[↑]	*******1
[ENTER]	Relevant menu

Figure 24, Entering a password

7.4 Select language

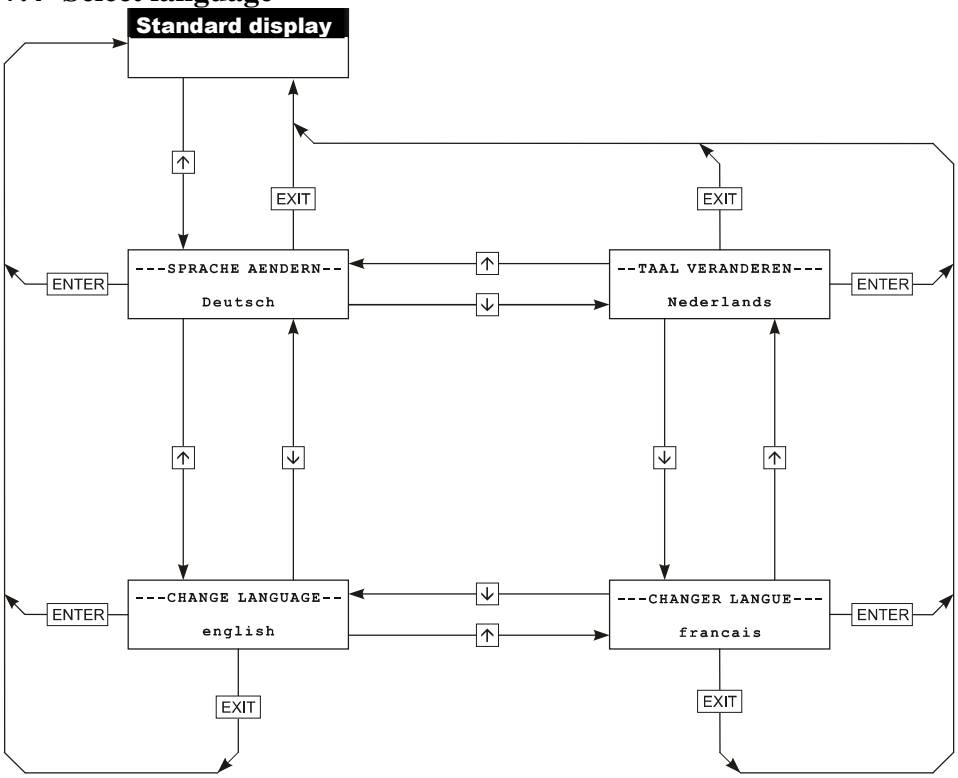


Figure 25, Flow diagram for menu item „Select Language“

How to get there
Press the ↑ key once when in the standard display.

„Scrolling“ the languages
Each press of the ↑ key or the ↓ key scrolls to the next language.

Which languages are available ?
The DLX currently supports the languages German, English, French and Dutch.

Selecting a language
Press the ENTER key to select the language. Afterwards the standard display is shown in the selected language.

Exit the menu without changing the language (back to standard display)
Press the EXIT key to exit the menu. No new language will be selected. The standard display will be shown in the original language.

7.5 Scroll list

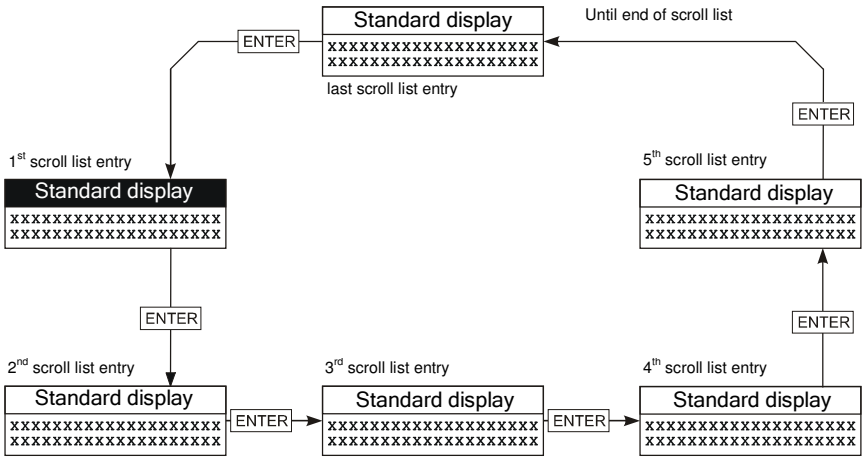


Figure 26, Flow diagram for the scroll list

Selecting the scroll list (if programmed)
The first entry of the scroll list is always shown in line 3 and 4 of the standard display.
Press the ENTER key to show the second entry of the scroll list in the display.

Scrolling the list
There are three ways to scroll through the list:

1) Manual scrolling by pressing the ENTER key:
   Each press on the ENTER key shows the next entry of the scroll list in the display. When there are no further entries in the list, the display returns to the first entry.
2) Automatic scrolling of the list based on a time delay:
   In order to activate automatic scrolling of the scroll list, the delay (in seconds) determining the time period for which each entry is displayed, must be stipulated in the programming software. Once this time is set, the display will scroll automatically (from the time the parameters are programmed into the unit).
   Each press of the ENTER key interrupts (and resets) the time delay and moves the display to the next entry. After the delay time has elapsed, automatic scrolling will be resumed.
3) Scrolling by means of the ANZ control input:
   Each activation of the ANZ control input activates the next entry of the scroll list in the display. Once the list is exhausted, the display returns to the first entry.

Other key functions:

ENTER key: if no scroll list was programmed, pressing the ENTER key has no function (other than activating the display illumination).

↑- and ↓ keys: these keys have their usual function during the display of the scroll list (i.e. the ↑ key displays the Select Language menu and the ↓ key enters the main menu).

Content of the scroll list
Programming of the scroll list can only be done with the programming software DLXPARA. An entry into the scroll list consists of the scroll list entry text, the related value and a physical unit:

- Line 3 shows the freely programmable text (max. 20 characters)
- Line 4 shows the related value (selected by address) and the programmable unit (5 characters)

Example:

Standard display																			
E	n	e	r	g	y	-	T	r	a	n	s	1	1	-	H	T			
			0	0	1	7	3	1	1	5					k	W	h		

Input in DLXPARA:
Text: "Energy-Trans11-HT"
Unit: "kWh"

Bär Industrie-Elektronik GmbH · Lange Straße 87 · D-90762 Fürth · Telefon 0911/97059-0 · Telefax +49 911 9705950

7.6 Main menu item „Display alarms”

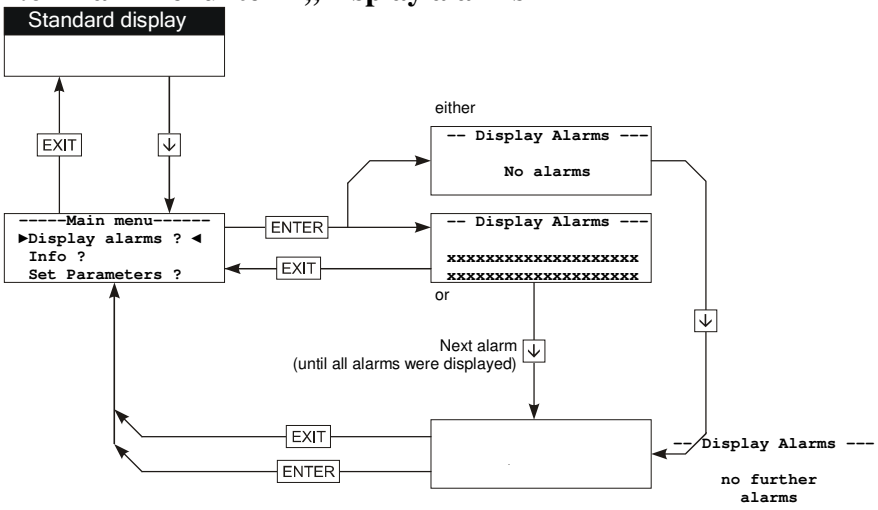


Figure 27, Flow diagram for alarm display

How to get there
Press the ↓ key once and then press the ENTER key.

Display of alarms
All occurred and undeleted alarms will be displayed.
The displays and their meaning are described in further detail in the section "Fault displays" (see page 67).

Exit the menu item
Press the EXIT key to return to the main menu.

7.7 Main menu item „Info“

How to get there

Press the ↓ key twice when in the standard display and then press the ENTER key.

What does the display show ?

The display will show the current values (cumulative and current energy, demand and pulses), the measurement values from the registration period (MP1 or MP2: energy values, increments or demand values) as well as resets (billing data), spontaneous events, table addresses and information about the current firmware version. It is possible to show all values stored in internal memory (load profiles and billing data) in the display. All values are displayed with 4, 6 or 8 digits and their correct physical units (depending on the parameters set with DLXPARA). Starting from Version 1.04.00 one or two decimal places are possible.

Item selection

Use the keys on the front panel to select the required value from the internal memory via its parameters:

ENTER key : moves to the next parameter, after the last parameter moves to the first parameters (this corresponds to a → key).

EXIT key : returns to the original menu.

↑ key : increases the selected parameter to the next higher possible value.

↓ key : decreases the selected parameter to the next lower possible value.

One digit of the selected parameter blinks in the display. On each change of the parameters the measurement display will be updated.

If no value is available for the selected parameters, then automatically the next valid entry from the registration period buffer will be displayed. This is an easy method to request the oldest or newest load profile entry: modify the input field for the year with the ↑ or the ↓ key until there are no further changes of the display: the display now shows the oldest load profile entry (after using the ↓ key) or the newest load profile entry (after using the ↑ key).
Invalid values or values incompatible with memory entries cannot be requested.

When displaying energy or demand values from the load profile memory, the unit always shows the total value (not rate related) together with the active energy and demand rate valid at the end of the registration period (you cannot edit the rate).

When displaying billing data, the values are shown depending on the rate, which can be selected. Each entry can only be selected by the secondary reset index (0..99), the primary reset index (1..12, settable) will be displayed automatically.

The unit differentiates between counters (Z01 to Z06), totals (S01+ to S04-), apparent demand (X01 and X02) and cos(φ) (P01+ to P02-): only the values programmed for the corresponding registration period will be displayed.
The physical unit displayed must be programmed with DLXPARA.

Display on entry

When entering the menu item the display first shows the newest complete registration period or the last set of billing data. The cursor (blinking) points to the first character of the first parameter. If the memory is empty, the display will show “No data available”.

7.7.1 Current values

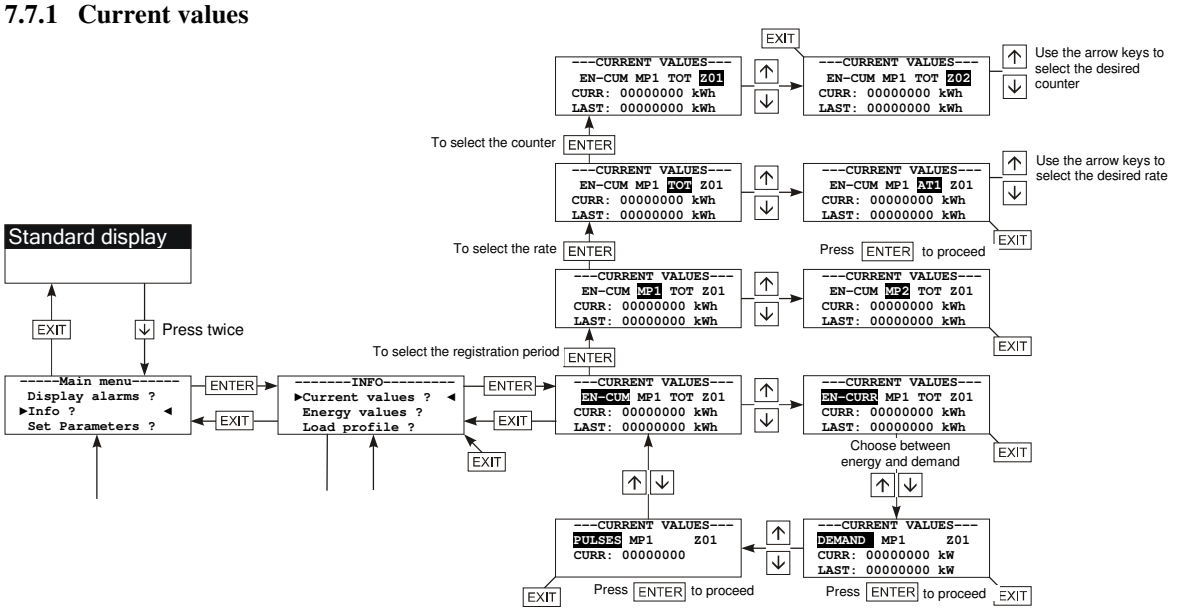


Figure 28, Flow diagram for menu item “Info” (current values)

How to get there
Press the ENTER-key while in menu “Info”. The DLX enters the menu item selected (displays and arrow on each side).

Changing the parameters
The ↑ or ↓ keys can be used to select energy, demand or pulse values, to select the registration period, the rate, the counter or to select a total value.

What will be shown ?
The display will show the cumulative (settable) and the current (not settable) energy values as well as the demand values of the DLX for the current and the previous (last) registration period MP1 or MP2 (if present) for all counters (Z) and totals (S) stored in that registration period.

For the pulse values all pulses recorded since the start of measurement (unweighted) will be shown for all counters (Z01 to Z16), as well as all pulses forwarded to outputs from totals (S01 to S04).

7.7.2 Energy values

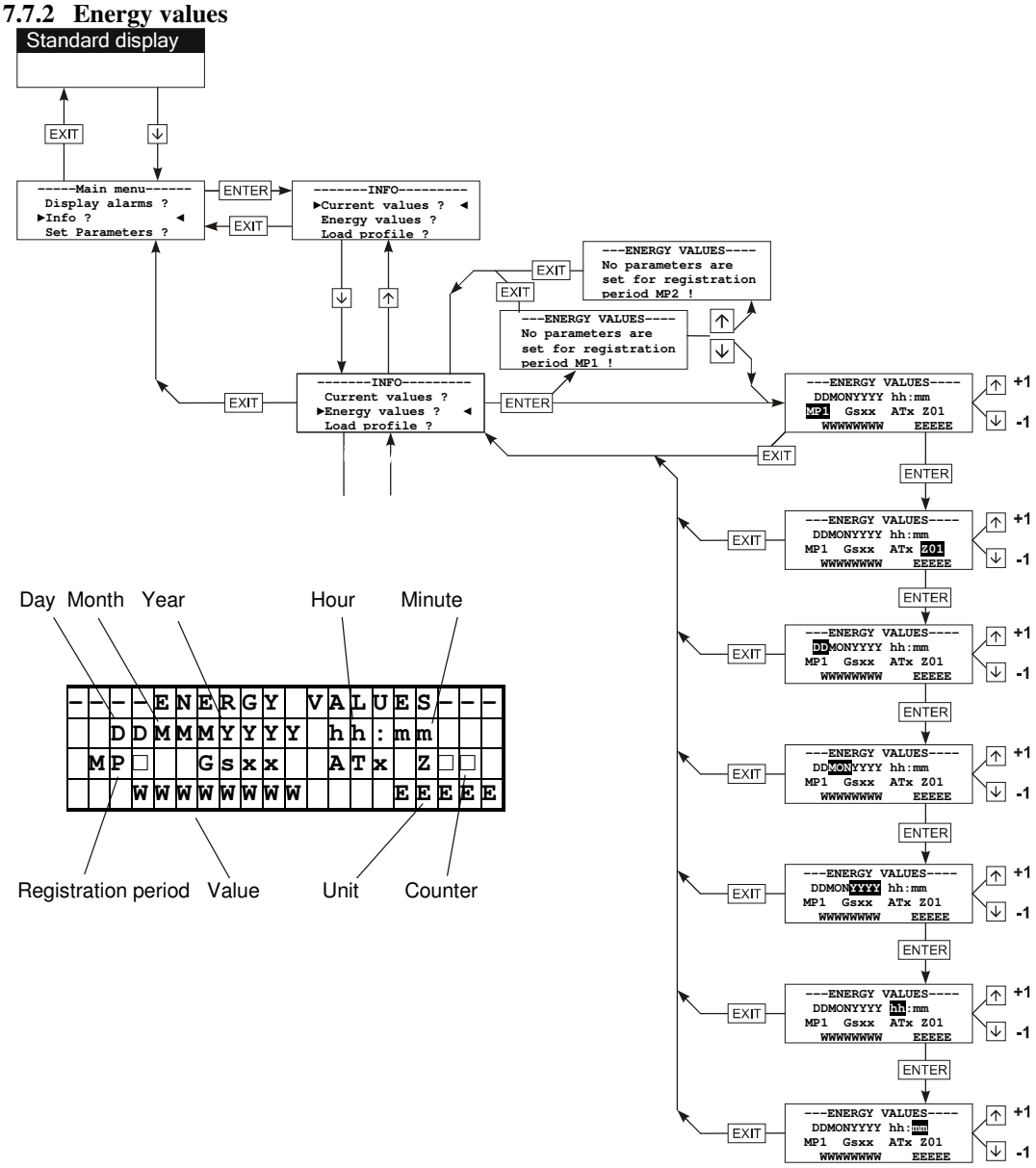


Figure 29, Flow diagram for menu item „Info“ (energy values)

How to get there

Press the ↓ key once when in menu “Info” and then press the ENTER key. The DLX enters the menu item selected.

Changing the parameters

The ↑ or ↓ keys can be used to select the registration period (MP1 or MP2), the counter, the date and time and to select apparent energy or cos(φ).

What will be shown ?

After entering the menu item the DLX will display the energy values of the last registration period MP1 or MP2 (if present) for all counters (Z01 to Z16), totals (S01 to S04), apparent demand (X01 or X02) and cos(φ) that have been stored. It will also show the device status (Gs, see appendix A, SCTM Addresses).
Use the ↑-key or the ↓-key to switch between registration periods.
Use the ENTER-key to move the cursor to the next parameter, then use the ↑ or the ↓ key to change the parameter value.

7.7.3 Load profiles

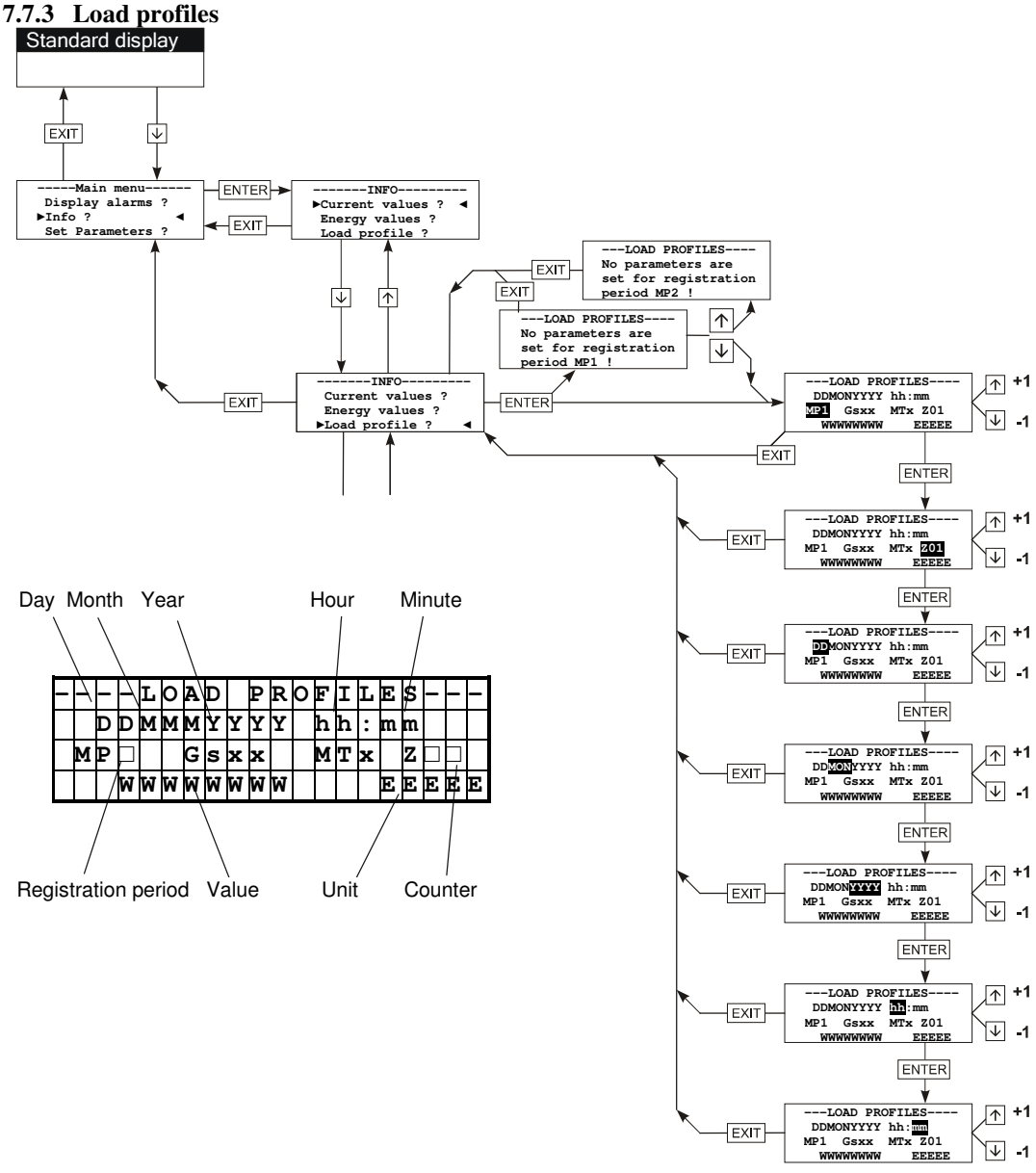


Figure 30, Flow diagram for menu item „Info“ (load profile values)

How to get there

Press the ↓ key twice when in menu “Info” and then press the ENTER key. The DLX enters the menu item selected.

Changing the parameters

The ↑ or ↓ keys can be used to select the registration period (MP1 or MP2), the counter, the date and time and to select apparent energy or cos(φ).

What will be shown ?

After entering the menu item the DLX will display the load profile values (demand values or increments) of the last registration period MP1 or MP2 (if present) for all counters (Z01 to Z16), totals (S01 to S04), apparent demand (X01 or X02) and cos(φ) (P01 or P02) that have been stored. Load profile values that have rolled over (exceeded the maximum value of the register) are indicated by a leading FF, e.g. a value of 18000 is shown as FFFF8000 (if 4 digits have been programmed for this value) (see buffer options in DLXPARA manual). Values for periods of a power failure are shown as “--------“.

Use the ↑-key or the ↓-key to switch between registration periods. Use the ENTER-key to move the cursor to the next parameter, then use the ↑ or the ↓ key to change the parameter value.

7.7.4 Billing data

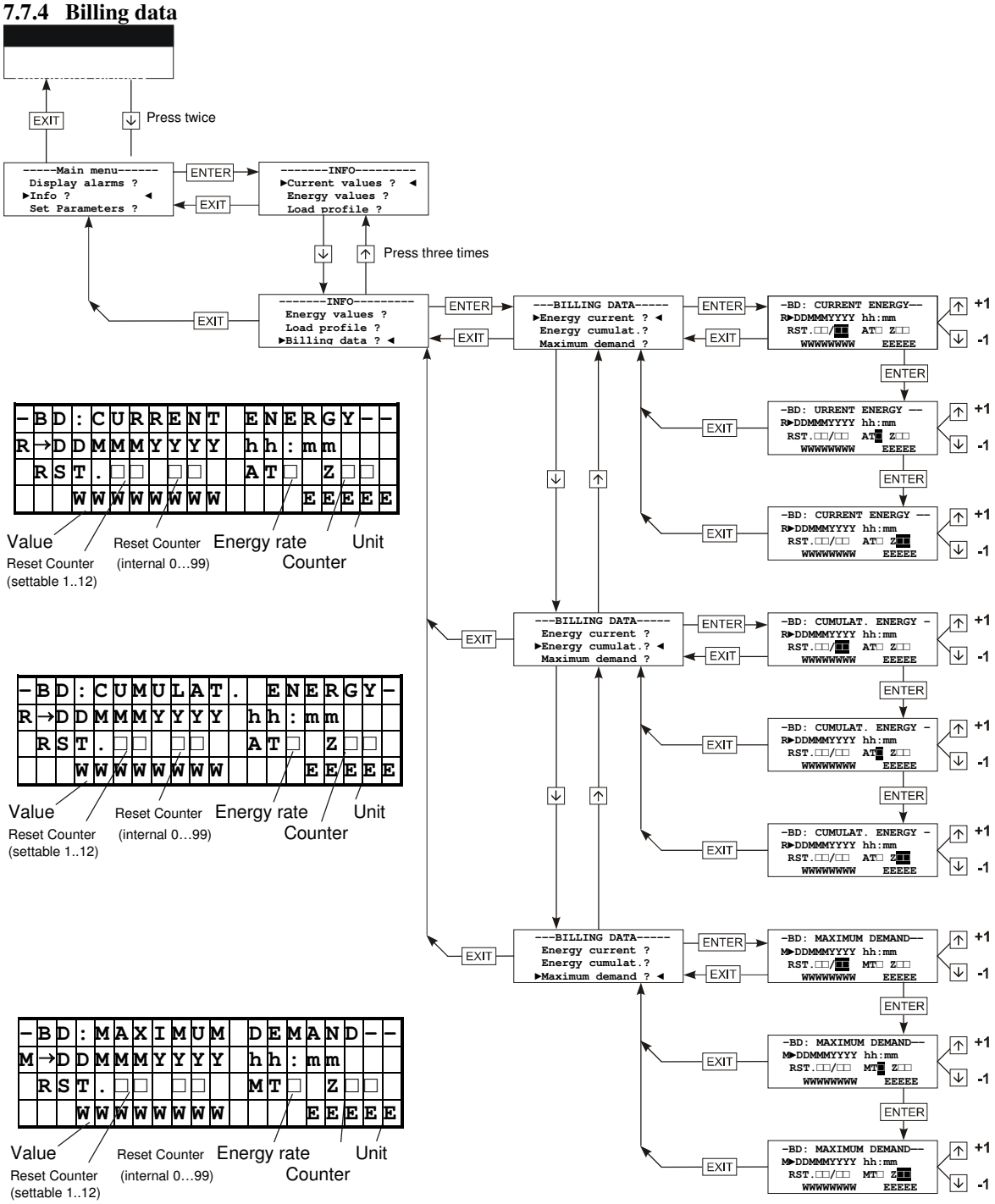


Figure 31, Flow diagram for menu item „Info" (billing data)

How to get there

Press the ↓ key three times when in menu "Info" and then press the ENTER key. The DLX enters the menu item selected (the one surrounded by two arrows). There will be three submenu items:

- current energy
- cumulative energy
- Maximum demand

7.7.4.1 Energy current

How to select „energy current"

Press the ENTER-key when in menu item „Info: Billing data". The submenu item will be activated.

Changing the Parameters

The ↑ or ↓ keys can be used to select values for the internal reset counter, the energy rate, the counter or the total register. The date shown (the date and time of the reset) will be adjusted automatically.

What will be shown ?

The display will show the current energy values for all counters and totals as of the date and time of the maximum demand reset. You can use the ↑ or the ↓ key to select the desired reset index.

7.7.4.2 Energy Cumulative

How to get there

Press the ↓ key once when in menu item „Info: Billing data“ and then the ENTER key. The submenu item will be activated.

Changing the parameters

The ↑ or ↓ keys can be used to select values for the internal reset counter, the energy rate, the counter or the total register. The date shown (the date and time of the reset) will be adjusted automatically.

What will be shown ?

The display will show the cumulative energy values (also called meter readings) for all counters and totals as of the date and time of the maximum demand reset. You can use the ↑ or the ↓ key to select the desired reset index.

7.7.4.3 Maximum demand

How to get there

Press the ↓ key twice when in menu item „Info: Billing data“ and then the ENTER key. The submenu item will be activated.

Changing the parameters

The ↑ or ↓ keys can be used to select values for the internal reset counter, the energy rate, the counter or the total register. The date shown (the date and time of the maximum) will be adjusted automatically.

What will be shown ?

The display will show the maximum demand values for all counters and totals as of the date and time of the maximum demand reset. You can use the ↑ or the ↓ key to select the desired reset index.

7.7.5 Spontaneous events

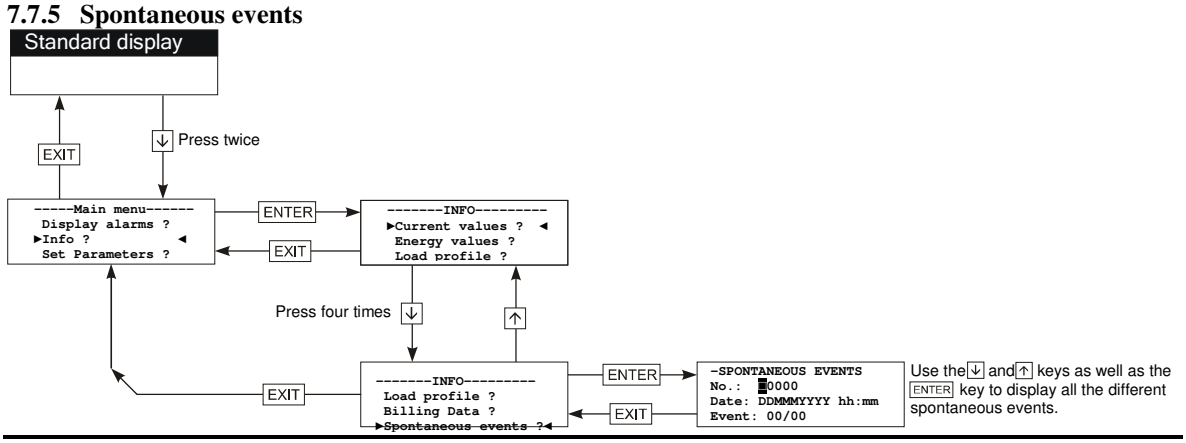


Figure 32, Flow diagram for the menu item „Info“ (spontaneous events)

How to get there

Press the ↓ key four times when in menu “Info” and then press the ENTER key. The DLX enters the menu item selected.

What will be shown ?

The DLX will show the spontaneous events on the display. For more information see "Fault displays" on page 67.

Example:

-	S	P	O	N	T	A	N	E	O	U	S	-	E	V	E	N	T	S	-
N	o	.	:			0	0	0	0	1									
D	a	t	e	:		0	1	A	P	R	9	9		1	1	:	5	0	
M	e	s	s	a	g	e	:		0	3	/	0	1		+				

Explanation:

No: sequential number
Date: date and time of occurrence
Message: see page 67
e.g.: 03/01: power failure

The sign behind the event identifier shows whether the fault or error has occurred (“+”: = event occurred/activated) or was erased (“-“: = event was erased or fault was removed).

7.7.6 Table address

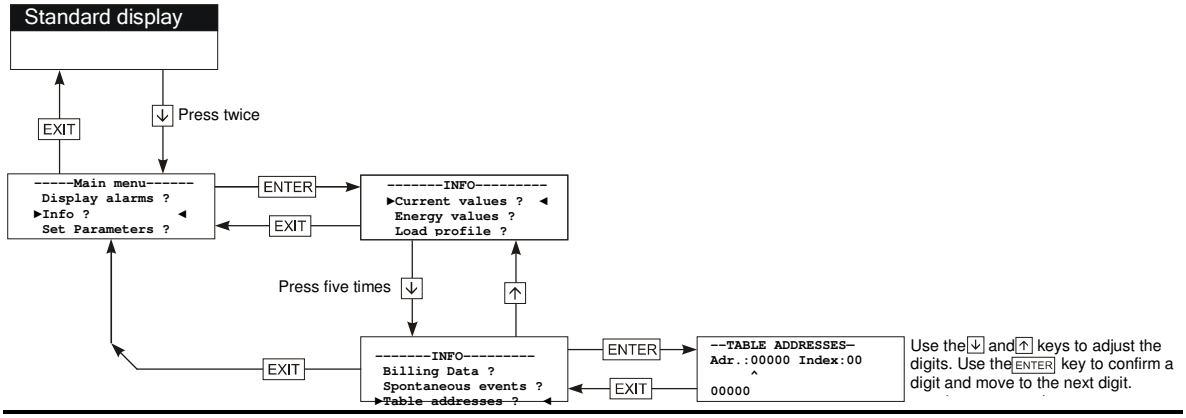


Figure 33, Flow diagram for menu item „Info“ (table addresses)

How to get there

Press the ↓ key five times when in menu “Info” and then press the ENTER key. The DLX enters the menu item selected.

Changing the parameters

The ↑ or ↓ keys can be used to select values for address and the index.

What will be shown ?

DLX will show the selected table addresses on the display. For more information see appendix B.

Example:

-	-	-	T	A	B	L	E	-	-	A	D	D	R	E	S	S	-	-	-
A	d	r	.	:	1	0	0	0	0		I	n	d	e	x	:	0	1	
1	4	3	2																

Explanation:

Adr.: desired table address; see appendix B
1432: value in DLX memory

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7.7.7 Version

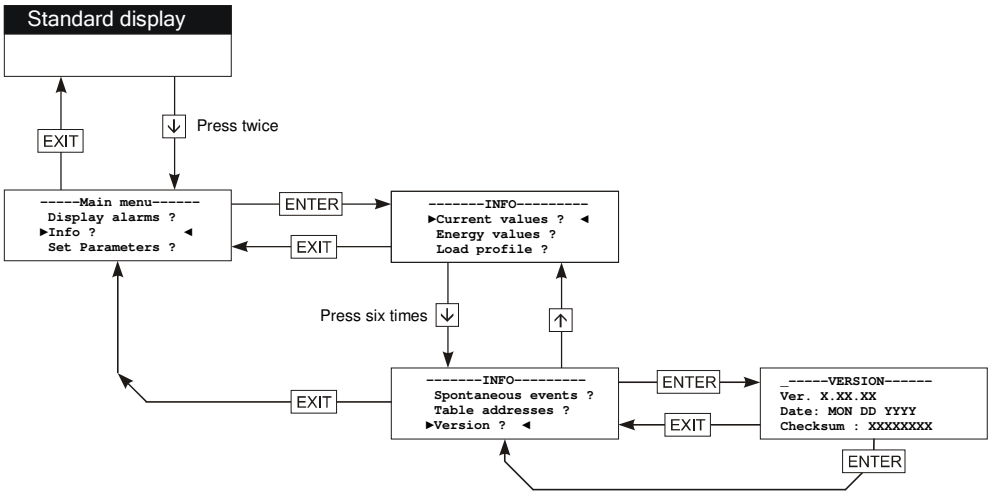

Figure 34, Flow diagram for menu item „Info“ (version)

How to get there
Press the ↓ key six times when in menu “Info” and then press the ENTER key. The DLX enters the menu item selected.

What will be shown ?
The DLX will show the firmware version, the release date and the checksum of the firmware.

7.8 Main menu item „Set Parameters“

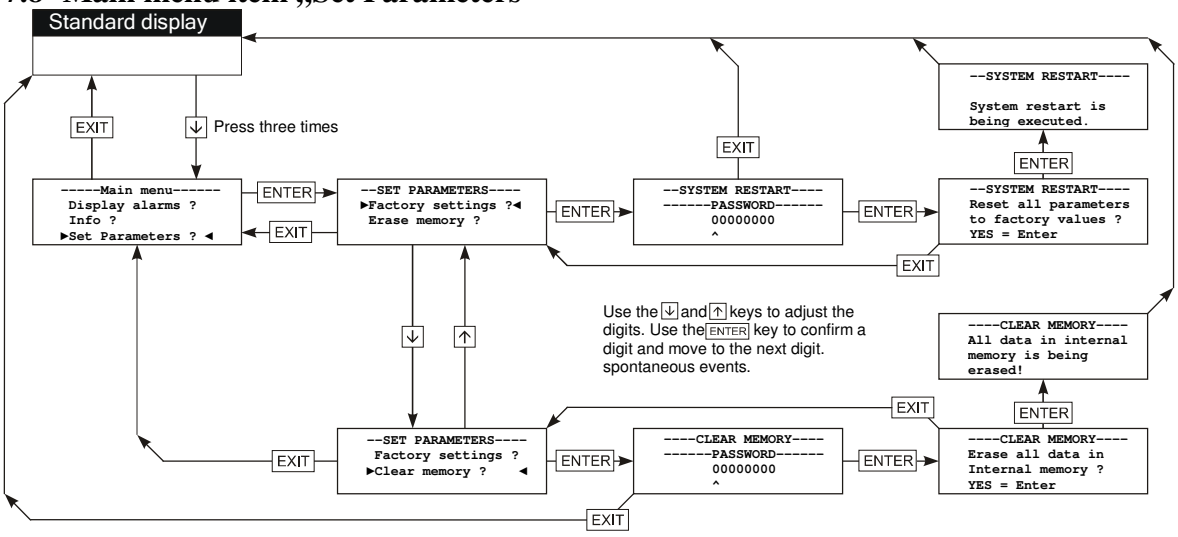

Figure 35, Flow diagram for menu „Set Parameters“

How to get there
Press the ↓ key three times when in standard display and then press the ENTER key.

You can now select between submenu items:

- Factory settings
- Clear memory

7.8.1 Factory settings (unit restart or system restart)

How to get there
Press the ENTER-key when in menu item “Set Parameters”. The function “Factory settings” is protected by a password and can only be selected when programming is enabled (program protection switch is in position “Set Enable”, see page 13).

Password protection
The function „System Restart“ can be activated with the password for FACT. SETTINGS . After entering the correct password (see „Password input“ on page 39) the function will be executed.

What is going to happen?
The function „Unit restart/System restart“ will set all parameters to the factory settings (see page 66), clear the internal memory and erase the internal clock.

Execution of a system restart
After entering the password the display will show the safety question „Reset all parameters to factory settings ?”. Press the ENTER key to confirm. The DLX unit will now check the state of the program protection switch (see page 13). Only if the switch is in position “Set Enable” will a system restart be executed. If you press the EXIT key, no system restart will be executed.
If the program protection switch is in position "Set Disable" (programming blocked, secured certification mode), the message “programming disabled” will be displayed. The DLX will exit the menu item without executing a system restart.
Once a system restart has been activated correctly, the display will show the message “System restart is being executed”. When the system restart is complete, the LCD will show the standard display.

! Once a system restart has been activated, it cannot be cancelled.

7.8.2 Erase memory

How to get there
Press the ↓ key when in menu item “Set Parameters” and then the ENTER key. The function “Erase memory” is protected by a password and can only be selected when programming is enabled (program protection switch is in position “Set Enable”, see page 13).

Password protection
The function „Erase memory“ can be activated with the password for PARAMETERS . After entering the correct password (see „Password input“ on page 39) the function will be executed.

What is going to happen ?
The function „Erase memory“ clears all of the internal memory:

- Registration period memory for MP1 and MP2 (load profiles)
- Spontaneous event buffer
- Resets and billing data

If the values stored so far in memory need to be processed further elsewhere, then they need to be retrieved by adequate means from the data logger.

Execution of the function „Clear memory“
After entering the password the display will show the safety question „Clear all data in internal memory ?”. Press the ENTER key to confirm. The DLX unit will now check the state of the program protection switch (see page 13). Only if the switch is in position “Set Enable” will the memory be erased. If you press the EXIT key, the memory will not be erased..
If the program protection switch is in position "Set Disable" (programming blocked, secured certification mode), the message “programming disabled” will be displayed. The DLX will exit the menu item without erasing the memory.
Once the function has been activated correctly, the display will show the message “All data in internal memory is being erased”. When all data has been erased, the LCD will show the standard display.

! Once the function “Clear memory” has been activated, it cannot be cancelled.

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7.9 Main menu item „Maintenance“

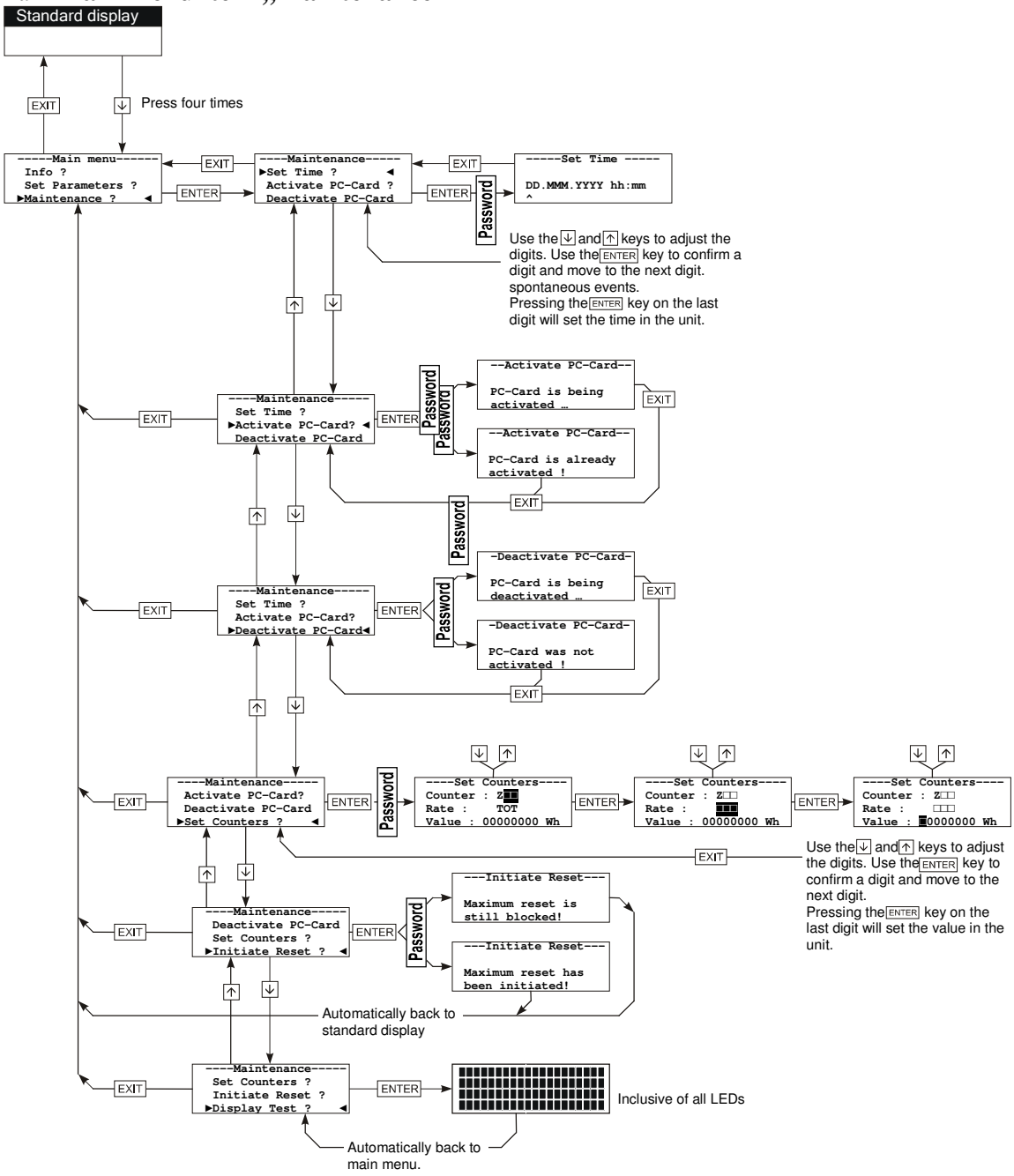


Figure 36, Flow diagram for menu item „Maintenance“

How to get there

Press the ↓ key four times when in standard display then press the ENTER key. Now you can choose one of six additional sub menu items:

- Set Time
- Activate PC-Card
- Deactivate PC-Card
- Enter counter values
- Initiate maximum reset
- Display test

7.9.1 Set time

How to get there
Press the ENTER-key when in menu item “Maintenance”. The function „Set time“ is password protected.

Password protection
The function „Set time“ can be activated with either the password for PARAMETERS or the password for SET. After entering the correct password (see „Password input“ on page 39) the function will be executed.

What can be done ?
You can set the date and time of the internal real time clock of the DLX unit.

Setting the time
You can set the day (DD), the month (MMM), the year (YYYY), the hour (hh) and the minute (mm), one after the other. Use the ↑ and ↓ keys to change the selected value (increase or decrease). Use the ENTER key to confirm your input and to move to the next value.

Press ENTER key after setting the minute value to set the time into the DLC unit. The value for the seconds will be set to zero.

Press the EXIT key to exit the function and to return to the menu item „Maintenance“ without altering the date and time of the unit.

7.9.2 Register PC-Card

How to get there
Press the ↓-key once when in menu item “Maintenance” and then press the ENTER key. The function "Register PC-Card " is password protected.

Password protection
The function „Register PC-Card“ can be activated with either the password for PARAMETERS or the password for PC-CARD. After entering the correct password (see „Password input“ on page 39) the function will be executed.

Why do you have to activate a PC-Card ?
If you do not activate the PC-Card, the DLX unit cannot write to the PC-Card. By activating the PC-Card the virtual interface between the DLX unit and the PC-Card will be activated and the PC-Card will be prepared for data storage.

During the activation of a PC-Card..
The display will first show the message „Card will be erased on first activation. Continue = ENTER”. Press the ENTER key to confirm the formatting of the PC-Card. The LED labeled “M” will be lit and the display will show the message “PC-Card is being activated… DO NOT REMOVE !!“. Once the formatting is complete, the display will show the message „Card is ready for recording DO NOT REMOVE !!“ and the LED labeled „M“ will go out.
If the PC-Card cannot be activated, a corresponding message will be show, such as:

- Card is not present Please insert again AT ONCE!!
- Card is write protected Please UNLOCK!!
- Wrong card type Try ANOTHER card!!

In this state the LC display will blink with a one second frequency.

7.9.3 Deactivate PC-Card

How to get there
Press the ↓-key twice when in menu item “Maintenance” and then press the ENTER key. The function "Deactivate PC-Card " is password protected.

Password protection
The function „Deactivate PC-Card“ can be activated with either the password for PARAMETERS or the password for PC-CARD. After entering the correct password (see „Password input“ on page 39) the function will be executed.

Why do you have to deactivate a PC-Card ?
When deactivating a PC-Card, the recording of information on the card will be terminated, the administration information will be updated and the virtual interface between the DLX unit and the PC-Card will be deactivated. If the PC-Card is removed from the DLX unit without deactivating it, then the administration information is incomplete and the PC-Card cannot be read by other software.

During the deactivation of a PC-Card..
The LED labeled „M“ will be lit and the display will show the message „Updating admin. Information DO NOT REMOVE!!“. Once this action is complete, the LED labeled „M“ will go out and the display will show the message „Card has been deactivated. Please remove NOW!!“.

7.9.4 Enter counter values

How to get there
Press the ↓-key three times when in menu item “Maintenance” and then press the ENTER key. The function "Enter counter values" is password protected.

Password protection
The function „Enter counter values“ can be activated with either the password for PARAMETERS or the password for SET. After entering the correct password (see „Password input“ on page 39) the function will be executed.

What can be done?
You can modify the cumulative initial counter value for all counters (Z) and for all total registers (S).

How to do it
Use the ↑ and ↓ keys to select the counter (Z01 to Z16) or the summation unit (S01 + to S04-). Then press the ENTER key to move the cursor to the rate selection. Use the ↑ and ↓ keys to select the desired rate (rate 1 to 4 or the rateless register). Now press the ENTER key to move the cursor to the register value. Use the ↑ and ↓ keys to modify the individual digits (9 digits for version 1.04.00 and higher) and the ENTER key to confirm your input and to move to the next digit. Use the EXIT key to abort the function at any stage.

7.9.5 Initiate maximum reset

How to get there
Press the ↓-key four times when in menu item “Maintenance” and then press the ENTER key. The function "Initiate maximum reset" is password protected.

Password protection
The function „Initiate maximum reset“ can be activated with either the password for PARAMETERS or the password for RESET. After entering the correct password (see „Password input“ on page 39) the function will be executed.

Executing a reset
The function will store the maximum demand values (together with the date and time of occurrence) as well as the cumulative and the current counter values. The display will show the message „Reset is being executed.” for a couple of seconds. Afterwards the display returns to showing the standard display. The first line will now show the symbol "⧖" for the duration of the reset blocking time.

7.9.6 Display test

How to get there
Press the ↓-key five times when in menu item “Maintenance” and then press the ENTER key.

What will be tested ?
The test includes all segments of the LC display, the background illumination and all light emitting diodes of the DLX. First the illumination of the display will be switched off and all LEDs will be lit. Then the display illumination is switched back on and all segments are switched to black. Finally all light emitting diodes are lit for a short time, one after another.

The display test will take approximately 10 seconds. Once it is complete, the DLX returns to the menu item “Maintenance”
The display test has no effect on the measurement or the state of the outputs.

7.10 Main menu item „Erase Alarms“

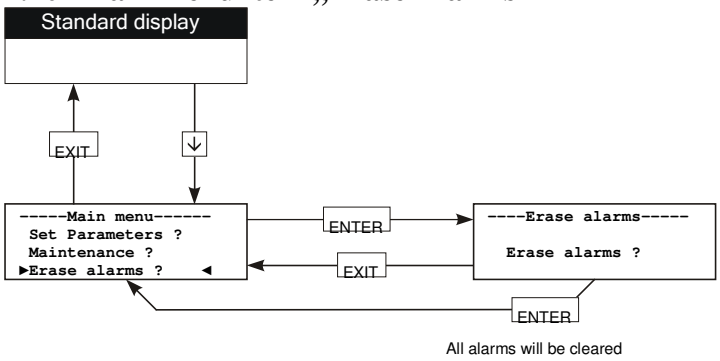


Figure 37, Flow diagram for menu item „Erase alarms“

How to get there
Press the ↓ key five times when in standard display and the press the ENTER key.

Erasing alarms
The user can erase all alarms that have occurred. Possibly active alarm indication relays will be reset and the light emitting diodes for alarm indication will stop blinking.

8 Interfaces

8.1 General

Three interfaces are available in the DLX unit:

- Service interface for programming purposes and data retrieval
- Data interface for data retrieval on site (optional)
- Modem interface for remote data retrieval (optional)

8.1.1 Automatic protocol recognition:

The DLX unit automatically recognizes the retrieval protocol (currently SCTM, IEC60870 or the programming software DLXPARA). On both direct interfaces (service interface and data interface) the first query telegram will be lost in the case of a protocol change (the modem interface can change the protocol without losing a telegram). Therefore DLXPARA can be used to define the default protocol for the data interface (the default protocol for the service interface is always the IE60870 protocol). The DLX unit will switch to the default protocol after each programming activity and after 5 minutes with no communication on the relevant interface.

! Due to safety reasons the programming software can only communicate with the service interface.

8.2 Service interface

The service interface is used to program the DLX unit and to retrieve data with a fixed baud rate (9600 baud). It is implemented as a 25 pin SUB-D connector (female) according to ISO2110, the pin allocation is according to V.24/RS232C/DIN 66020.

Programming of the DLX is done using the programming software DLXPARA.
Please read the user manual of the programming software DLXPARA for instructions on programming.

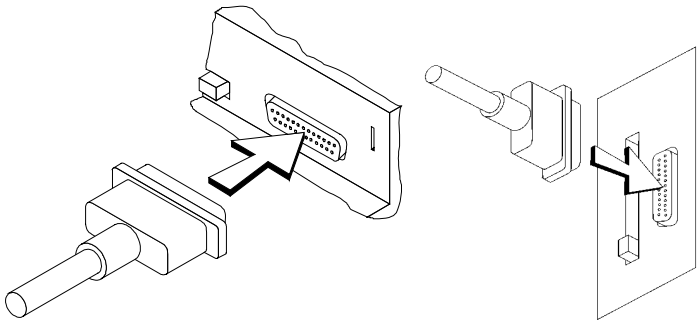


Figure 38, Service interface

8.2.1 Pin allocation of the SUB-D (female) service interface RS232

DLX (25 pins, female)		cable	PC (25 pins, male)		
Input/Output	Pin No.		Pin No.	Input/Output	Standard usage
Input	**2**		**2**	Output	TxD (transmit data)
Output	**3**		**3**	Input	RxD (receive data)
Input	**4**		**4**	Output	RTS (request to send)
Output	**5**		**5**	Input	CTS (clear to send)
Output	**6**		**6**	Input	DSR (data set ready)
	7		**7**		GND (protective earth)
Input	**20**		**20**	Output	DTR (data terminal ready)

8.2.2 Connection PC/Laptop ↔ Service interface

For the connection between a DLX and a PC, a programming cable or modem cable (#6998) is required.
Plug the programming cable into a free COM port of the PC/Laptop and into the service interface of the DLX.
Now you can start the required software (programming or data retrieval).

8.3 Data interface (optional, X6)

The optional data interface can be used for data retrieval on site with data retrieval software (e.g. SIGLON) or to connect to an external modem. The baud rate can be set with DLXPARA to a value between 300 and 9600 baud. It is implemented as a 25 pin SUB-D connector (female) according to ISO2110, the pin allocation is according to V.24/RS232C/DIN 66020. Alternatively a 25 pin SUB-D male connector, a bus interface (M-Bus or RS485) or a LWL connector (fiber optic transmission connection) can be used.

8.3.1 Pin allocation of the data interface RS232 SUB-D (female)

The standard pin allocation of the data interface is identical with the service interface. For the connection between the DLX and a PC, a modem cable is required. For the connection between a DLX and an external modem a so-called null modem cable (crossed wires) is required.

8.3.2 Pin allocation of the data interface RS232 SUB-D (male)

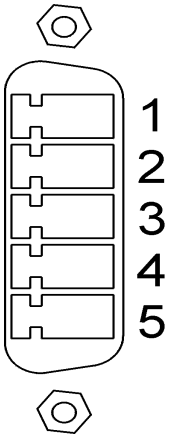
For the connection between the DLX and a PC, a null modem cable (crossed wires) is required. For the connection between a DLX and an external modem a modem cable is required.

DLX (25 pins, male)		cable	PC (25 pins, male)		
Input/Output	Pin No.		Pin No.	Input/Output	Standard usage
Output	**2**		**2**	Output	TxD (transmit data)
Input	**3**		**3**	Input	RxD (receive data)
Output	**4**		**4**	Output	RTS (request to send)
Input	**5**		**5**	Input	CTS (clear to send)
	7		**7**		GND (protective earth)
Input	**6**		**6**	Input	DSR (data set ready)
Output	**20**		**20**	Output	DTR (data terminal ready)

8.3.3 Pin allocation of the data interface RS232 (X6 at 19" rack)

For the connection between the DLX and a PC, a special cable (5 wires) is required.

Identification: Phoenix 5 pins PSC 1,5/5-M.



DLX (5 pins, male)		cable	PC (25 pins, male)		
Input/Output	Pin No.		Pin No.	Input/Output	Standard usage
Input	**1**		**4**	Output	RTS
Input	**2**		**2**	Output	TxD
Output	**3**		**3**	Input	RxD
Output	**4**		**5**	Input	CTS
	5		**7**		GND

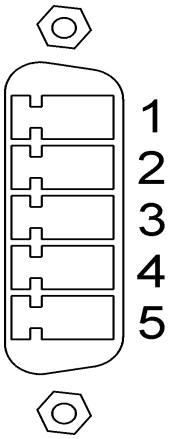
Baud rate: 300 to 9600 Baud

8.3.4 Pin allocation of the M-Bus data interface

With a passive M-Bus interface module the unit can be used in a M-Bus system, as described in the standard TC 176/N17 Part 3:

- Typ. M-Bus voltage: 24V to 42V
- Max. M-Bus voltage: 50V
- Idle current: < 2mA
- Working current: 10 to 20mA
- Baud rate: 300 to 2400 Baud (with good lines up to 4800 Bud)
  Note: up to 9600 Baud at 19" rack (connector X6)
- Communication protocol: SCTM or IEC60870
- Connection: via terminals

The distance between the DLX and the next M-Bus repeater unit can exceed 5 km. The maximum distance depends on the line conditions and the current burden on the M-Bus. With sufficient line diameter, twisted lines and limitations on the baud rate, up to double the value of the above mentioned distance can be achieved.

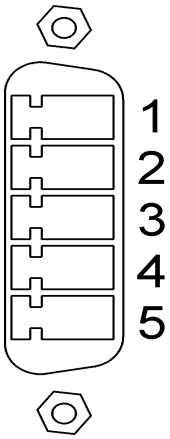


Pin allocation at housing for panel mounting:

DLX (5 pins, male)	
Function	Pin No.
M-Bus	**1**
M-Bus	**2**
—	**3**
Bridge to 1	**4**
Bridge to 2	**5**

Baud rate: 300 to 2400 Baud (with good lines up to 4800 Bud)

Note: the two M-Bus terminals 1 and 2 present twice and bridged internally (with 4 and 5)



Pin allocation at 19" rack (X6):

DLX (5 pins, male)	
Function	Pin No.
—	**1**
M-Bus	**2**
M-Bus	**3**
—	**4**
—	**5**

Baud rate: 300 to 9600 Baud

8.3.5 Pin allocation of the fiber optic connector

Using the fiber optic connector (for fiber optic transmission), the unit can be read via 820nm optical fiber.

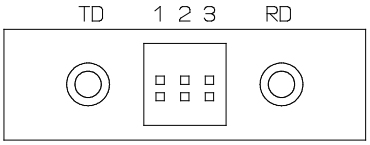


Figure 39, Fiber optic connector

- Wave length: 820nm (fiber optic interface from Hewlett Packard)
- Transmitter (TD): transmits light
- Receiver (RD): receives light
- Cable code: A – 100/140µm
- Connection code: W – SMA connector
- Baud rate: 300 to 9600 Baud
- Communication protocol: SCTM or IEC60870
-

Note: The idle condition of the fiber optic transmission line has to be configured with the jumpers between the two connector elements:

- Idle condition „Light off“: the jumper must be placed on pins 1/2 (delivery condition)
- Idle condition „Light on“: the jumper must be placed on pins 2/3

The upper row of pins determines the condition of the receiver, the lower row of pins sets the condition for the transmitter. Jumpers must be placed in both rows!

9 Modem (Optional)

The DLX can be optionally equipped with an internal modem:

- Type: L834 (PSTN modem LGO 834) at housing for panel mounting
  MOD (PSTN modem UniMod) at 19" rack

The modem works according to CCITT recommendations and supports the following modes:

- V.21 – Full duplex, 300 Baud
- V.22 – Full duplex, 1200 Baud
- V.22bis – Full duplex, 1200 and 2400 Baud
- V32 – Full duplex: 4800, 7200 and 9600 Baud
- V32bis – Full duplex: 4800, 7200, 9600 and 14400 Baud

9.1 Default settings for the integrated modem

On delivery of the DLX the following settings are active for the modem LGM832:

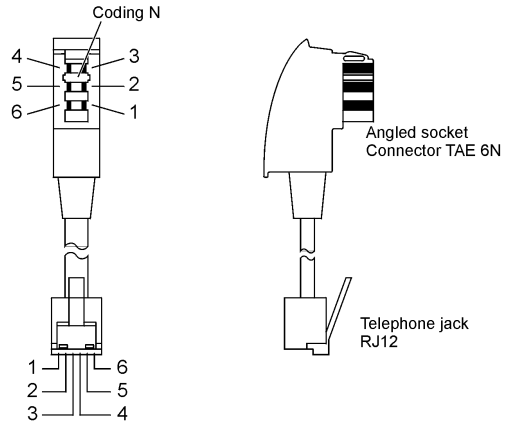
- &F0 Load factory setting 0
- S0=1 Respond after one ring
- &D0 Ignore DTR
- \N3 Auto-Reliable-Mode with error correction according to V.42/MNP4 and data compression according to V.42bis/MNP5.
  Note: If you use an older modem without error correction at your PC, then it is recommended to use the setting \N0 (normal mode, no error correction), as this will shorten the time required to establish a connection.
- Q1 No feedback messages
- &W0&W1 Save user settings in non-volatile memory

The modem will respond after the first detected ring (S0=1). The transmission speed between the modems will be adjusted automatically (\N3 or \N0). These settings are stipulated in DLXPARA as the modem initialization string and can be adjusted at any time.
For more detailed information please consult the manual shipped with the modem.

9.2 Modem interface (X5)

9.2.1 Pin allocation of the modem interface

The connection between the modem interface and a telephone line uses a telephone cable of type RJ12 with a connector of type TAE6N.



TAE	Code	RJ11/12 Housing for panel mounting	RJ11/12 19"-rack
1	La	5	4
2	Lb	2	3
3	G	4	-
4	E	3	-
5	b2	1	2
6	a2	6	5
Shield		S	

Figure 40, Pin allocation of the telephone cable

In areas with high probability of lightning additional protection needs to be installed. For more information please consult the manual shipped with the modem.

10 DCF77 receiver (Option)

The DLX can be optionally equipped with a receiver for the signals transmitted by the long wave transmitter DCF77 (time codes). The type used must the DCF77 aerial/receiver unit AWS0 from the company Meinberg Funkuhren (Germany). The receiver module requires a +12VDC auxiliary voltage and it can be connected to a S0 control input of the DLX.

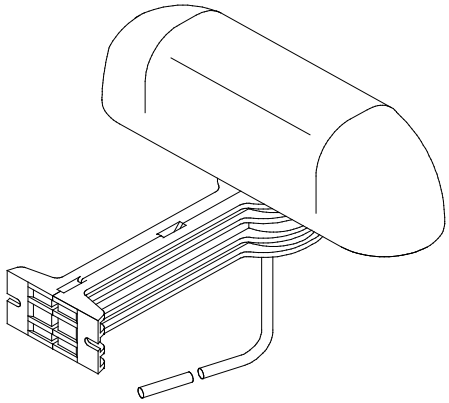


Figure 41, DCF77 receiver module AWS0

10.1 Function

Synchronization of the time to full minutes (seconds = 0), no setting of the time! Prior to using the unit, the time must have been set to within 30 seconds via the main menu item „Maintenance – Set time“ or by means of the programming software DLXPARA.

10.2 Setting the parameters for the receiver module

Activate the item “Synchronization via external radio clock” in the menu item “Parameters – Time” in DLXPARA and allocate the used control input in the menu item “Control Inputs” to the “SYN” function.

! You must not allocate more than one control input to the SYN function!

The display of the data logger will show the corresponding symbol when the receiver module is active: "".

10.3 Commissioning

10.3.1 Connection

Co-ax. cable:	Shield to	SYN-	(Ctl-)	terminal,
	Wire to	SYN+	(Ctl+)	terminal.

10.3.2 Alignment of the receiver module

The receiver module must be aligned to show its long side to the transmitter, which is located in Frankfurt/Main in central Germany.

Minimum distances
min. 1m to computers and monitors
min. 30cm to steel girders, metal plates and other metallic devices.

Checking the alignment
The modulation LED in the aerial enclosure of the AWS0 needs to blink once per second. The corresponding LED on the DLX (for the control input SYN) needs to blink in the same rhythm. Rotate the receiver module slowly and select an alignment roughly at the center of the area with good signal reception. If you have good reception , the DLX display will show a static symbol "" latest after 3 minutes. A blinking symbol "" indicates disrupted radio clock signal reception.

11 PC-Card

11.1 Permitted PC-Card's

- Standard: JEIDA/PCMCIA
- Type: SRAM battery backed
  Flash Memory-Card (AMD, D Series)
- Capacity: up to 4MByte

11.2 Treatment advice for PC-Cards

Noncompliance with the following advice can lead to destruction of the PC-Card.

- Do not bend or fold the PC-Card or subject it to similar conditions.
- Do not drop the PC-Card.
- Always keep the PC-Card dry and free of dust.
- Do not expose the PC-Card to high temperature or high humidity.
- To avoid static charges, always store the PC-Card in its original packing when it is not in use.
- Do not touch the connections of the PC-Card.
- Never use force when inserting a PC-Card. Only insert the card into slots designed for them.
- Do not remove the PC-Card from the unit until it has been deactivated.

11.3 Inserting a PC-Card

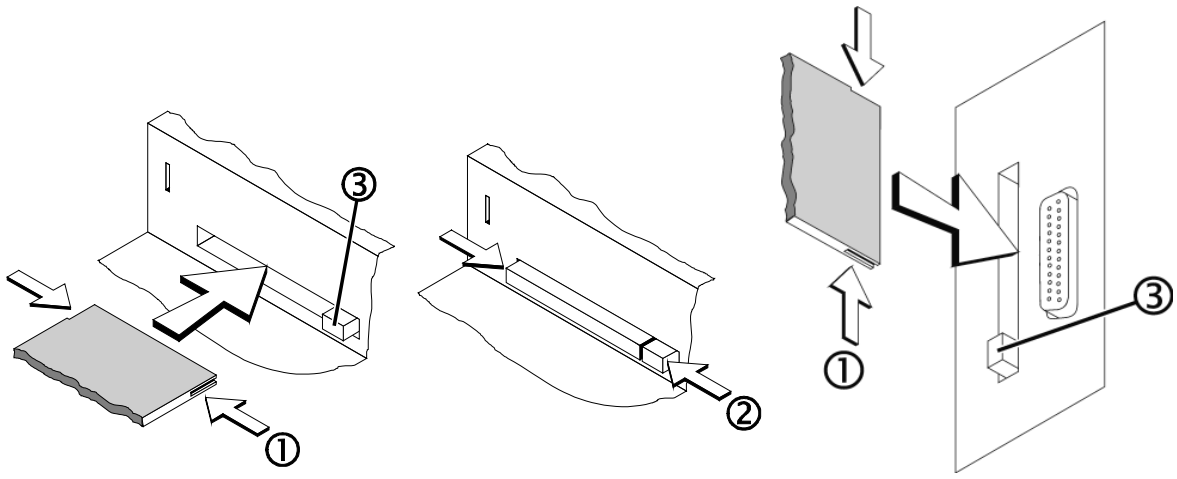


Figure 42, Inserting a PC-Card

Please ensure that you always insert the side of the PC-Card with the connector into the PC-Card slot. Also ensure that the guiding grooves on the card match those of the slot, as shown in the above picture. The PC-Card is guided in the slot by two guide rails that prevent the card from twisting. Slide the card into the slot and press carefully until the PC-Card reaches the final position (PC-Card and ejection button are aligned, see arrow ②).

After inserting the PC-Card it needs to be activated by the DLX in order to use it for storage purposes.

The display will show the symbol "PC" in position 18 of line 1 after the card has been inserted and successfully activated by the DLX unit.
If the card is not activated by the unit, the symbol will blink and the display will show the message “PC Card is not activated!”.

11.4 Activating a PC-Card

Use the menu item „Activate PC-Card“ (see page 54) to activate a PC-Card. After activation the symbol "PE" will appear in the first line of the LC display.

Activation includes the following actions:

1) The DLX determines type and capacity of the PC-Card.
2) The DLX checks whether the capacity of the card is sufficient for the programmed number of counters and days for the registration period buffer.
3) Once the PC-Card has been found to be suitable, it will be formatted to ensure that recording always takes place on an empty PC-Card.
4) Afterwards the administration information will be stored on the PC-Card.

11.5 Deactivating a PC-Card

A PC-Card needs to be deactivated before it may be removed from the DLX. The deactivation updates the administration information on the PC-Card. Use the menu item “Deactivate PC-Card” (see page 54) to deactivate a PC-Card. Once this is done, the symbol "PE" disappears from the first line of the LC display.

11.6 Removing a PC-Card

Press the eject button ③ (see Figure 42, Inserting a PC-Card) on the right hand side of the PC-Card to remove the card.

! Only after deactivation via the keypad (see menu item "Deactivate PC-Card" page 54) the PC-Card may be removed from the PC-Card slot.
If the PC-Card is removed from the DLX without prior deactivation, it cannot be read by other processing software! The "PE" symbol starts to blink and a corresponding alarm message will be created.

11.7 Data storage on a PC-Card

The following information will always automatically be stored on a PC-Card (independent from the program parameters of the unit):

Spontaneous events:	the PC-Card will always contain at least the last 100 events.
Billing data:	the PC-Card will always contain at least cumulative rateless counter values of the last 4 reset instances.

By default (if nothing else was programmed with DLXPARA) the demand values of counters 1 through to 16 for registration period MP1 will be stored for the last 35 days. The PC-Card will be used as a circular buffer, i.e. once the buffer is full, the newest incoming value overwrites the oldest value.

You can use the programming software to activate storage of data for registration period MP2. In addition, you can select which values shall be stored and what the storage depth in days will be. For more information see page 25.

! The PC-Card will only ever store values that have been registered or calculated after the time when the card was insert and activated.

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12 Registration of measurements

The device starts to register measurements immediately after the power supply is switched on. This data will be stored together with timestamps and device status in the registration period buffer according to the selected parameters (the factory settings will be used when the unit starts for the first time).

Setting the time during measurement
If the time is set backwards during measurement, all registration period buffer entries with a timestamp after the newly set time are marked as invalid and they are then no longer accessible via data retrieval.
If the time is set forwards, all registration periods in the skipped period are treated like entries during „power down“ condition and are displayed as „--------„.

Memory overflow:
Once the memory capacity of the registration period storage has been exhausted, the oldest entries will be automatically overwritten (due to the storage technology used this affects at least one sector = 64kByte in the buffer).

Power failures:
Should a power failure include the end of a registration period, then all registered measurements up that point in time will be stored at the end of the first incomplete registration period. This period will then be marked as incomplete.

Registration periods without power:
Should the device not have been supplied with power for one or more complete registration periods, then these are called „power down“. These registration periods do not use memory. If values are requested from these periods for display purposes, they are shown as “--------“.

Storage during programming:
The device continues to register measurements during the period of programming without interruption. Once programming is terminated, it checks which parameters have been modified. If the storage allocation or the registration period length was altered, all of the registration period storage area will be cleared.

12.1 Factory settings

List of the most important factory settings (basic settings and software settings) on delivery or after a unit restart:

Date:	Thursday, 1. January 1998
Time:	00:00:00
Device identifier:	0000000000000000
Number of input channels:	6 or 16 (according to order, all activated)
Number of totaling units:	0
Differential totals:	Off
Apparent demand reg./cos(φ):	0
Operation mode:	2 energy rates, 2 demand rates
Pulse ratios:	1:1 for all counters (energy and demand)
Counter values:	0
Totaling units:	Inactive
Usage of control inputs:	Ctl1: SYN Clt2: RSTX Clt3: ANZ Clt4: TR1 Clt5: TR2 Clt6: TR3 Clt7: TR4
Usage of control outputs:	Out1: unused Out2: unused Out3: unused Out4: unused
Usage of relays:	Rel1: Alarm 2 (device fault) Rel2: MPA1 (MP1)
Number of resets:	0
Registration periods:	Registration period MP1: 15 minutes Registration period MP2: inactive
Start of measurement:	Immediately after switching on
Baud rates for data retrieval:	9600 Baud (modem interface) 9600 Baud (data interface) 9600 Baud fixed (service interface)
Periodic buffers:	Registration period MP1: max. number of inputs activated demand values, 4 digits
Pulse conditioning:	30ms min. pulse duration 30ms min. pulse interval
Output pulses:	90 ms pulse duration 110 ms pulse interval
PC-Card:	Not registered
Summer time switching:	On (switching from 02:00 to 03:00 on the last Sunday in March and from 03:00 to 02:00 on the last Sunday in October)
Rate control:	External
Rate calendar:	Inactive
Radio clock:	Off
Language:	English
Passwords after restart:	PARAMETERS: **00000001** (in DLXPARA also possible: 1) SET: **00000002** (in DLXPARA also possible: 2) PC-Card: **00000003** RESTART: **00000004** (in DLXPARA also possible: 4) RESET: **00000005**

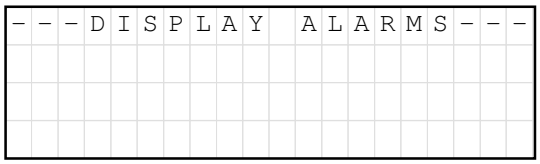
13 Fault displays

Should the DLX notice an internal fault, then these are stored as alarm messages and shown on the display. Two fault classes and one information class are differentiated:

- **Warnings** (operational faults) are non critical faults that can be removed on site and cleared using the main menu item „Main menu – Erase alarms“. Warnings are indicated by a blinking LED “AL1” on the front panel.
- **Device faults** (hardware faults) are critical faults that can only be removed by the manufacturer. This requires opening of the certification seal and afterwards the device needs to be re-certified, if relevant regulations exist. These error messages can only be cleared when programming of the unit is enabled. Device faults are indicated by a blinking LED „AL2” on the front panel.
- **Information messages** are used to indicate changes of conditions to the user that happen during normal operation. These are not alarms. The information message will be stored as a spontaneous event, but does not cause a fault display. The light emitting diodes „AL1“ and „AL2“ are not influenced.

13.1 LC display

Use the menu item „Main menu item „Display alarms“ (see page 43) to display all warnings and device faults that have occurred. The DLX uses line 3 and 4 to display relevant information.



The unit recognizes and displays the following alarms and information events (W = warning/AL1, F = device faults/AL2, I = information):

Alarm number (Hex)	Class	Message on the display	Description
01/01	W	System cold start	The capacitor used to buffer the contents of RAM memory was discharged due to a long power failure. The device time will be set to the time of the last complete registration period plus 59 minutes and 10 seconds. Parameters and measurement values are retained.
02/01	F	CPU-EPROM Checksum wrong	Program memory faulty Action: The DLX must be sent to the manufacturer for service
02/02	F	Parameter memory Checksum error	Data error in the parameter memory Action: The DLX must be sent to the manufacturer for service
02/03	F	Data memory Checksum error	Data error in the measurement memory (data memory) Action: The DLX must be sent to the manufacturer for service
02/93	W	PC-Card Checksum error	Data error on PC-Card Action: exchange PC-Card, only use authorized PC-Card’s
03/01	W	Power failure	Power supply had no voltage for at least 200ms
03/02	W	Voltage dip	Power supply had no voltage for max. 200ms
04/91	W	PC-Card: Battery low	Battery of the PC-Card is almost flat Action: Insert a new battery into the PC-Card
06/xx xx = 01/02: Buffer MP1/2, xx = 04: Billing data xx = 9A$_{hex}$: Spontan. events	W	Data memory: Data erased	During restart, after changes in memory allocation or after activation of menu item „Parameters – Erase memory“. The relevant memory areas are being erased.
07/02	W	Sync attempt out-side of prog. window	Attempt to synchronize the unit outside of the programmed window Action: Synchronize inside of the programmed window.
07/03	I	Switching from winter → summer	The internal clock is switching from wintertime to summertime.
07/04	I	Switching from winter → summer	The internal clock is switching from summertime to wintertime.
07/05	I	Setting the time	The device time was modified.
07/08	W	Radio clock not synchronizing	The radio clock is not synchronizing the internal clock (for at least 24 hours) Action: check the radio module and the internal time
08/12	W	PC-Card removed	PC-Card registered but not inserted Action: Insert PC-Card

Alarm number (Hex)	Class	Message on the display	Description
08/13	W	**PC-Card faulty**	PC-Card is faulty Action: Insert another PC-Card
08/14	W	**Wrong type of PC-Card inserted**	Cannot recognize the type of PC-Card Action: only use authorized PC-Card types
08/15	W	**PC-Card: insuff. capacity**	The programmed number of days and/or counter values does not fit onto the PC-Card Action: use PC-Card with higher capacity or reduce the number of days or counter values
09/xx xx = 01 to 10_{hex}(=16)	W	**Pulse error**	Input pulse was too long or too short (xx: pulse input1 .. 16) Action: adjust pulse conditioning, check pulse transmitter
0C/xx xx = 41..44 for pos. totals xx = 51..54 for neg. totals	W	**Pulse output overflow**	Overflow of an output buffer (xx indicates the corresponding totaling unit) Action: Adjust pulse output parameters for the totaling unit
0E/xx xx = 01 to 10_{hex}(=16) xx = 41..44 for pos. totals xx = 51..54 for neg. totals	W	**Energy register overflow**	Overflow of the input energy register xx (1 .. 16) or a totaling unit. The register continues to count from zero.
0F/00	I	**Program change**	Programming is active (via DLXPARA).
0F/01	I	**Table address changed**	The content of a table address has changed. This can happen during a SCTM remote communication session if a logic output is set via SCTM protocol.
11/00	I	**Counter value changed**	The value of a counter (Input/Total) was modified (set).
11/xx xx = 01..04 for Log1..Log4	I	**Logic input changed**	The state of a logic input has changed.
82/02	F	**CPU-RAM faulty**	Error in internal CPU-RAM Action: The DLX must be sent to the manufacturer for service
82/03	F	**CPU-Flash-Memory Faulty**	Error in CPU Flash memory Action: The DLX must be sent to the manufacturer for service
82/04	F	**CPU-EPROM Faulty**	Error in CPU EPROM memory (program memory) Action: The DLX must be sent to the manufacturer for service
82/05	F	**CPU real time clock Faulty**	Error in internal real time clock Action: The DLX must be sent to the manufacturer for service
88/01	W	**Card is write protected**	PC-Card is protected from write access Action: Remove write protection
88/02	W	**PC-Card changed Please insert Previous card**	PC-Card was changed during a power failure. Action: Insert previous PC-Card
88/12	I	**PC-Card (de)activated**	PC-Card was registered or deregistered.
8C/xx xx = 01..04 for Sum1.. Sum4	W	**Summation Overflow**	Internal overflow of a summation unit (totaling unit) xx (1..4) Action: adjust the pulse ratios for this totaling unit
8E/xx xx = 01 to 10_{hex}(=16) xx = 41..44 for pos. totals xx = 51..54 for neg. totals xx = 61,62 for apparent demand 1 or 2	W	**Demand register Overflow**	Demand register for an input xx (1 .. 16), a total or for apparent demand has over flown; the highest digits are not stored anymore → the measurement values are falsified and cannot be used for further processing Action: adjust parameters
8F/xx xx = 01..0A $_{hex}$(=10)	F	**Internal program Error**	Error in internal firmware Action: firmware update

Example:

-	-	-	D	I	S	P	L	A	Y		A	L	A	R	M	S	-	-	-
						#		0	3	/	0	1							
P	o	w	e	r		f	a	i	l	u	r	e							

Explanation

03/01: Alarm number
Description of the alarm

13.2 Light Emitting Diodes (LED's)

13.2.1 LED AL1 Warning

The LED „AL1" blinks after a fault of class „W" (warning) has occurred. Exceptions to this rule are the warnings „03/01 – power failure", „03/02 – power dip", „06/xx – Data memory: data erased" and "8E/xx – Energy register overflow", where the LED "AL1" will be automatically cleared after the end of a registration period (MP1).

13.2.2 LED AL2 Device fault

The LED „AL2" blinks after a fault of class „F" (device fault) has occurred.

13.3 Message buffers

All internal messages are stored in two different message buffers:

- Alarm buffer: in addition to the LED display all alarms (faults) that have occurred and that are not cleared are stored permanently in the internal alarm buffer. The contents of this buffer can be shown via the „Main menu - Display alarms". The buffer can be cleared via "Main menu – Erase alarms".
- Spontaneous event buffer: all alarms (faults) and information messages (at least the last 780) are stored permanently in the internal buffer for spontaneous events. The contents of this buffer can be displayed via „Main menu – Info – Spontaneous events".

13.4 Fault indication output

Apart from the optical display you have the possibility to forward error messages to the outside via the freely programmable outputs (mech. relays or solid state outputs). The assignment of faults to outputs is done in DLXPARA. Faults of class „W" (warnings) correspond to alarm 1 (AL1) and faults of class „F" (device faults) correspond to alarm 2 (AL2). The fault indications are active until the corresponding fault has been cleared. Exceptions to this rule are the warnings „03/01 – power failure", „03/02 – power dip", „06/xx – Data memory: data erased" and "8E/xx – Energy register overflow", where the LED "AL1" will be automatically cleared after the end of a registration period (MP1). These messages are stored in the alarm buffer and in the spontaneous event buffer. During power failures the solid state outputs are inactive and the relay outputs return to their default (idle) state.

14 Technical data

Connections

In-/Outputs	3 pluggable terminal groups of 20 poles each
Power supply	pluggable terminal group of 3 poles
Interfaces	service interface V.24: RS232 SUB-D 25 poles data interface V.24: RS232 SUB-D 25 poles or M-Bus or fiber optic terminal or RS485 (optional)
Modem	RJ11/12

Power supply

Nominal voltage U_N	115 or 230V~ (internally selectable)
Nominal frequency f_N	50/60Hz
Voltage range	90..132V~ or 180..264V~
Power consumption	max. 20VA
Fuse	T 500mA 250V (slow fuse)

Inputs

Pulse inputs	galvanically isolated
Type	S0, Wipe or bi-current (± 24V)
Number	max. 16
Control inputs, logic inputs	galvanically isolated
Type	S0 or Wipe
Number	7, programmable to be SYN, TR1, TR2, TR3, TR4, RSTX, LOG1, LOG2, LOG3, LOG4, ANZ
S0-input (IES)	acc. to DIN 43864
Pulse transmitter supply	min. 10mA to 800Ω, U=12V
Switching current (threshold)	2,2mA < I < 9mA
Contact impedance	≤ 800Ω
Cable length	max. 0,5m
Wipe pulse input (IEW)	24..264V≅
Pulse definition	1 pulse = pulse length plus pulse interval
Pulse frequency	max. 10 pulses/second
Pulse length	min. 40milisecond
Bi-current pulse input (IED)	
Pulse definition	1 pulse = 1 change of polarity
Pulse frequency	max. 25 pulses/second
Signal current input (0..20mA)	
Current	min.: 0mA (:= 0Hz) max.: 20mA (:=20Hz)
Frequency	max. 20 pulses/second
Signal current input (4..20mA)	
Current	min.: 4mA (:= 0Hz) max.: 20mA (:=20Hz)
Frequency	max. 20 pulses/second

Outputs

Wipe outputs (electronic contacts, solid state) Pulse outputs or control outputs
- Number.....4
- max. permitted voltage U_{max}.....265V≅
- max. permitted current I_{max}.....100mA

Relay outputs (mech. contacts).....Control outputs
- Number.....2 (with idle contact and active contact)
- max. switching voltage U_{max} .....250V≅
- max. permitted current I_{max}.....2A
- Switching cycles.....10^5

Central processing unit

CPU .....Motorola processor 68000
Clock rate.....14,7456MHz
Program memory .....Flash-EPROM, 1MByte
Internal CPU memory.....RAM, 256kByte
Data memory: .....Flash-EPROM 1MByte

Control elements

Keypad.....4 keys(Enter, Exit, Cursor-Up, Cursor-Down)
LC display .....4 lines of 20 characters,
character height 4.15mm
LED display.....2 LED's for alarms (red)
1 LED for PC-Card (green)
31 LED's for signal state indications (yellow)
3 LED's for interface state indications (yellow)

Backup memory (optional)

PC-Card .....max. 4MByte
- Standard .....JEIDA/PCMCIA
- Type .....SRAM battery backed
or Flash-Memory-Card (AMD, D Series)

Internal real time clock

Basic clock rate.....32,768kHz
Calendar features .....Leap years, summer-/wintertime
day, month, year, hour, minute, second
Accuracy/ deviation .....max. 30sec./month
Power failure reserve .....min. 7 days (GoldCap)

External radio clock(optional)

Type.....DCF77 receiver module AWS0
Manufacturer .....Fa. Meinberg, Bad Pyrmont, Germany
Display.....Modulation LED
Connection.....to SYN control input (S0)

Internal modem (optional)

Type.....LGO 834 or UniMod
Display.....LED on front panel
Connection to telephone network.....RJ11/12
max. transmission speed.....9600 baud

M-Bus interface (optional)

Standard.....TC 176/N17 Part 3
Typ. M-Bus voltage.....24 to 42V
Max. M-Bus voltage.....50V
Idle current .....< 2mA
Active current.....10 to 20mA
Baud rate .....300 to 9600 baud
Max. M-Bus distance.....5km
Connection.....via terminals

Optical fiber connection (optional)

Wavelength.....820nm
Cable Code .....A – 100/140µm (optical fiber)
Connection/Terminal Code.....W – SMA connector

Environmental conditions

Permissible environment temperature:
During operation.....0°C to +40°C
During transport and storage ....-10°C to +50°C
Humidity:
During operation.....max. 95% relative humidity
During transport and storage ....max. 95% relative humidity
Condensing.....not permitted

Protection against voltage and other disturbances

Protective measures according to VDE 0701:
- Protective earth impedance ..... ≤ 300mΩ
- Insulation measurements ..... protective class II, ≥ 2MΩ
- Earth leakage current ..... with protection capacitor ≤ 7mA

Insulation strength according to DIN 43863

Electro static discharge according to EN 61000-4-2:
- Discharge with contact 4kV
- Discharge through air 8kV

Electro magnetic HF protection according to EN 61000-4-3 and ENV 50204:
- Frequency range ..... 80MHz to 1000MHz
- Severity level 3
- Test field strength 10V/m

Fast transient protection according to EN 61000-4-4:
- Power supply 2kV
- Inputs & outputs 2kV
- Serial interfaces & modem 2kV

Voltage peaks according to EN 61000-4-5:
- Live to Neutral 2kV
- Live and Neutral to PE 4kV

Asymmetric high frequency, modulated amplitudes according to EN 61000-4-6:
- Severity level 3
- Inject currents ..... 0,15MHz to 80MHz; 80 % AM, 1kHz

Magnetic field with energy frequency according to EN 61000-4-8:
- Severity level 4
- Magnetic field strength 30A/m

Supply outages, dips and variations according to EN 61000-4-11

Modulation of supply current according to EN 61000-3-2:
- Threshold value ..... acc. to class A

Voltage range according to EN 61000-3-3

Mechanical properties

Enclosure type/ mounting ..... Housing for panel mounting
or 19” rack

Material ..... Steel sheet metal

Sealing options ..... Keypad (Protection against parameter changes)
Covers for PC-Card and service interface
Terminal cover

Protection level IP52

Dimensions (Height × Width × Depth) ..... Housing for panel mounting: 175mm × 300mm × 150mm
19” rack: 215mm × 130mm × 265mm

Colour ..... Housing for panel mounting: RAL 7035 (light grey)
19” rack: RAL 7330 (grey)

15 Glossary

Active demand	That part of the demand used to perform work at the load (see also reactive demand).
Alarm	Unusual event during operation of the device (e.g. power failure, register overflow etc.).
Alarm class	Differentiation of alarms by importance. The DLX knows the alarm classes “warning” for non critical or operational disturbances and “device fault” for grave errors.
Alarm group	Division of alarms into functional groups, e.g. the alarm group “energy register overflow” has alarms for each individual register.
Apparent demand	Is the hypotenuse of the right angled triangle constructed from active demand and reactive demand. The calculation of apparent demand in the data logger requires the definition of at least one input each for active demand and reactive demand.
Billing period	Period of time covered by an invoice from the energy supplier. Usually one month, corresponds to one reset.
Cold start	When the unit performs a cold start, parameters and register contents are retained. However, the device time will be set to time of the last stored registration period plus 59 minutes and 10 seconds (see also “unit restart” and “warm start”).
Configuration	Definition of basic properties of the data logger (e.g. number of inputs, totaling units, etc.). Configuration is done by the manufacturer and cannot be modified by the user. Configuration data is stored in a non volatile memory such as EEPROM or FLASH EPROM.
Cos(φ)	The cosine of the arc between the apparent demand pointer and the active demand pointer. A cos(φ) of 1.0 indicates flow of active energy only, a value of 0.0 indicates flow of reactive energy only.
Counter input	Receives energy and demand values from a meter in numerical form (e.g. via a serial interface of type RS485).
DCF77	Long wave transmitter for the official time of Germany. Carrier frequency: 77,5 kHz.
Demand register	Contains the average demand values per registration period in physical units (e.g. MW, kvar, etc.).
Digit	A number representing a value from 0..9 in a decimal numbering system. Energy values are often processed with 8 digits, i.e. resulting in a value range from 0 to 99999999.
Energy register	Contains measured energy values in physical units, e.g. kWh, varh, °C, etc.
Energy value, cumulative	The amount of energy registered (or measured) by an input since its activation.
Energy value, current	The amount of energy registered (or measured) by an input or register since the start of measurement (or the last reset).
Input	Receives signals from the outside into the data logger unit. These can be pulses from meters, control signals (e.g. for maximum demand reset or events). In the case of internal counter inputs, the values can also be numeric values.
Jumping registration period	In this operational mode each registration period starts at the end of the previous one. In difference to the rolling registration period, individual registration periods are strictly separated from each other.

Logic input, alarm input	Input that is monitored permanently. Changes of the input signal are stored in memory.
Logic output, alarm output	Output, the status of which can be altered by the remote metering center.
Main memory module	Used for storage of measured and registered values and for data transmission to the remote metering central. Optionally data can be stored on a PC-Card.
Maximum (demand)	The highest average demand value during a billing period. The data logger not only stores the value as such, but also the timestamp of its occurrence.
Meter	Electro-mechanic or electronic device for the measurement of energy in an electricity, gas or heat distribution network.
Output	Transmits signals of the data logger unit to the outside, e.g. pulses or rate signals.
Power dip, voltage dip	Event created after a very short failure of supply power (max. 200ms). Internal power supply is bridged (secured) by means of integrated buffer capacitors. All data stored in the unit is retained. Data processing and the internal real time clock are not affected.
Pulse weighting	Converts pulses into physical units, e.g. by using transformer ratios and meter constants.
Pulse input	Receives pulses transmitted by meters. Different pulse types are possible, e.g. S0, wipe or bi-current.
Radio clock	Component of the data logger unit that receives the current time via radio from an official transmitter and adjusts the device time accordingly.
Radio clock receiver/Receiver module	Contains only the receiver of the radio clock. The interpretation of the time telegrams is done by the central unit of the data logger. The current implementation can only synchronize the device, but cannot receive the full time telegram form the transmitter.
Reactive demand	That part of the demand that is transmitted from the generator to the load, but cannot be used. Reactive demand is caused by inductive or capacitive loads and is usually undesired.
Register, counter	Is connected to a pulse input or a counter input and measures (registers) the flow of energy. In addition the average demand over the registration period will be calculated.
Registration period	The time span used to calculate the average demand value. A data logger has several registration periods that can be active simultaneously.
Registration / Measurement	State of the data logger, where it measures and stores demand values and calculates maximum demand values. During registration a number of parameters of the unit must not be altered.
Registration period buffer	Storage area for the measured values of a registration period, which is used as a circular buffer, i.e. the newest entry overwrites the oldest entry once the storage area is full.
Reset, maximum demand reset	Maximum demand values and other energy values are stored together with timestamps. The maximum demand register is reset to the value zero and hence prepared for a new maximum demand measurement.

Restart, unit restart	Resets all parameters to factory settings. The storage area for measured values is cleared on restart. (see also „cold start“ and „Warm start“)
Rolling registration period	Operational mode in which the registration periods overlap each other. Example: the average maximum demand value of the last 15 minutes is calculated every 5 minutes. This is meaningful for more accurate maximum demand calculations.
RS232	Interface definition according to EIA (USA-Norm), corresponds to V.24.
Scroll display/scroll list	Operational mode of the display, where either automatically or triggered by the ANZ control input a predetermined list of parameters and measured values is scrolled over the display.
Spontaneous event buffer	Storage area for „unusual“ events. (e.g. alarms, parameter changes). This is organized as a circular buffer.
Standard display	This is shown on the LC display when no keys are pressed. It shows amongst other things date, time, active rate and registration period length.
Synchronization	Adjusts the device time synchronously to an external time standard. Synchronization only affects the seconds. If the second value is smaller than 30, it will be reset to zero, if not the minute value will be incremented in addition. Synchronization can be done using the SYN control input or via command from the remote metering central.
Synchronization window	Limits synchronization of the unit to a time window surrounding the end of a registration period. Any attempt to synchronize the unit outside of this window results in an alarm.
Totaling unit, summation unit	Adds up (totals) the energy amounts of a number of pulse or counter inputs, then calculates the average demand value over the registration period.
V.24	Interface definition according to CCITT (European standard).
Warm start	A warm start is performed after a short period of power failure (less than 7 days). All data stored in the unit will be retained. The internal real time clock is not affected.

Appendix A

Data Retrieval Protocols

Data stored in the unit (device parameters, counter values, alarms, parameter changes, etc.) can be retrieved using either the SCTM protocol or the IEC 60870-5-102 protocol. The communication uses a serial link (via RS232, modem, RS485, optic fiber or M-Bus) with adjustable baud rate (300, 600, 1200, 2400, 4800 or 9600 baud) and following transmission settings:

- 7, e, 1 for SCTM protocol
- 8, e, 1 for IEC 60870-5-102 protocol

The DLX unit automatically detects the retrieval protocol. When using the direct interfaces (service interface or data interface) the first telegram will be lost in the case of a protocol change (the modem interface can change the protocol without losing a telegram). For this reason you can use DLXPARA to define the default protocol for the data interface (the service interface always uses the IEC protocol as the default). After each parameter change or after 5 minutes with no communication the concerned interface returns to its default protocol.

! This appendix describes all the addresses available for the data retrieval protocols. Due to varying configurations of units it is possible that some of them are not supported in your unit.

SCTM protocol

The following sections describe the data format of telegrams during communication using the SCTM protocol (Serial Coded Telemetering). The following conditions have to be observed:

- transmission settings: 7 (bits), e (even parity), 1 (stop bit)
- the sub device number (US-Number) has 5 digits (can be programmed using DLXPARA)
- no point-to-point connection is possible without US-Number
- the length of the header is constant (14 bytes)
- broadcast commands and priority telegrams are not supported
- a maximum of two registration periods (MP1 and MP2) is supported

The following data can be retrieved:

- load profile data from registration period buffers (PP-01 for MP1 and PP-02 for MP2) with a maximum of 16 channels (demand, increments or energy values) per buffer and registration period
- spontaneous event data, including alarm messages, status messages and parameter changes
- table data (between 000-00 and 999-99)

Device status in the registration period data block

The DLX stores the device status for each completed registration period; this data contains general information about the unit for that period. It consists of 4 ASCII characters, representing 2 bytes (2 characters per byte). Each character is coded in the hexadecimal system and contains 4 bits. The following table describes the relations between the hexadecimal notation and the binary notation:

Hex	Binary	Hex	Binary	Hex	Binary	Hex	Binary
0	0000	4	0100	8	1000	C	1100
1	0001	5	0101	9	1001	D	1101
2	0010	6	0110	A	1010	E	1110
3	0011	7	0111	B	1011	F	1111

In the DLX unit the device status is contained in 2 bytes:

Byte 1								Byte 2							
Character 1				Character 2				Character 3				Character 4			
T-Bit	U-Bit	M-Bit	A-Bit	S-Bit	0	NP-Bit	L-Bit	0	1	0	0	0	0	0	0

Meaning of individual bits:

Byte-Nr.	Bit-Nr.	Content	Explanation
Byte 1	Bit 7	T-Bit	Summertime switching, setting the time
	Bit 6	U-Bit	Shortened registration period due to power failure or time change
	Bit 5	M-Bit	Parameter change
	Bit 4	A-Bit	Alarm or error message (collective message)
	Bit 3	S-Bit	Transmitted during summertime (MESZ)
	Bit 2	0	Unused
	Bit 1	NP-Bit	Power failure during the whole registration period
	Bit 0	L-Bit	Unused by default if enabled via DLXPARA: change of state of LOG control inputs
Byte 2	0100 0000 or aaaa mmmm		Default value $40 (hexadecimal notation); only if enabled via DLXPARA: rate status AT-MT, however only the energy rate (if energy values are transmitted) or the demand rate (if demand values or energy increments are transmitted) will be set.

Note: S-Bit not marked(:=0) → Wintertime (:=MEZ)

Examples for the device status in the registration period:

Device status	Bit pattern	Explanation
00 40	0000 0000 0100 0000	No events, wintertime
02 40	0000 0010 0100 0000	Power failure during whole period(NP-Bit=1), wintertime
08 40	0000 1000 0100 0000	No events, summertime (S-Bit=1)
0A 40	0000 1010 0100 0000	Summertime (S-Bit=1), power failure during whole period (NP=1)
10 40	0001 0000 0100 0000	Alarm (A-Bit=1), wintertime
20 40	0010 0000 0100 0000	Parameter was changed (M-Bit=1), wintertime
50 40	0101 0000 0100 0000	Shortened period (U-Bit=1), Alarm (A-Bit=1), wintertime
01 40	0000 0001 0100 0000	Logic input has changed, wintertime
00 00	0000 0000 0000 0000	No events, AT1 or MT1
00 10	0000 0000 0001 0000	No events, AT2
00 02	0000 0000 0000 0010	No events, MT3

Register status in the registration period data block

In each registration period the DLX stores a register status of 1 byte (2 characters) for each entry in the periodic buffer. This status is stored in the same format as the device status (hexadecimal notation):

Byte 1							
Character 1				Character 2			
Bit 7	Bit 6	0	Bit 4	0	0	0	0

Meaning of individual bits:

Byte-Nr.	Bit-Nr.	Description
Byte 1	Bit 7	The measurement value was set by the user
	Bit 6	Power failure
	Bit 4	Overflow of this register

Retrieval of events (spontaneous event buffer : 051-xx)

The messages have the following format:

PL	ETYPE	ETIME	EADR	OSTATE	NSTATE

PL: Packet length (24 or 43 bytes)

ETYPE: Type of event. The following event types are possible:
A1 – Alarm has occurred
A3 – Power outage

C1 – Parameter or value changed on site
C2 – Parameter or value changed via remote connection

D1 – Time was set on site
D2 – Time was set via remote connection
D3 – Change from wintertime to summertime
D4 – Change from summertime to wintertime

ETIME: Timestamp of the event: YY MM DD hh mm (Year Month Day Hour Minute)

EADR: Address of the information affected by the event (not applicable for messages such as “Time was set” or “Power failure”): 051xx, xx: number of the entry in the spontaneous event buffer modulo 100.

OSTATE: Old state of the information affected by the event (not applicable for messages such as “Time was set” or “Power failure”), see the table in section 13 „Fault displays“.

NSTATE: New state of the information affected by the event, see the table in section 13 „Fault displays“.

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List of addresses for SCTM

000 -00 Current date and time (resolution of minutes)

Table value:	Y	Y	M	M	D	D		W	h	h	m	m
Example:	9	8	0	2	0	1		7	0	3	0	2

YYMMDD: Year Month Day
W: Weekday (1:= Monday, 7:= Sunday)
hhmm: Hour Minute

Expl.: Date: 01. February 1998
Weekday: Sunday
Time: 03:02

000 -01 Settings for change from wintertime to summertime

Table value:				M	M		W		P		h	h
Example:				0	3		7		5		0	2

MM: Month
W: Weekday (1:=Monday, 7:= Sunday)
P: Position of the weekday in the month:
1- first
2- second
3- third
4- fourth
5- last
hh: hour

Expl.: The change from wintertime to summertime will take place on the last Sunday in March at 02:00 hours.

000 -02 Settings for change from summertime to wintertime

Table value:				M	M		W		P		h	h

see table value 000-01

Example:				1	0		7		5		0	2

Expl.: The change from wintertime to summertime will take place on the last Sunday in October at 02:00 hours.

000 -03 Wintertime/summertime flag

Table value:												S

S: Flag:
1- Summertime active
2- Wintertime active

Example:												1

Expl.: Summertime

000 -04 Summertime switching active

Table value:												A

A:
1- active
0- inactive (the device always works in wintertime)

Example:												1

Expl.: Summertime switching is active.

000 -05 Receive time from radio clock

Table value:												R

R: Radio clock flag
0- Do not receive time from radio clock
1- Receive time from radio clock

Example:												1

Expl.: Time will be received from radio clock

000 -06 **Reserved for future use**

Table value:

											U

U: Flag

Example:

											0

Expl.: Reserve

000 -07 **Synchronization mode**

Table value:

											S

S: Synchronization flag
- 0- Synchronization not possible
- 1- SYNC input active
- 2- Synchronization via radio clock receiver

Example:

											1

Expl.: Synchronization is done via SYNC input

000 -08 **Synchronization window surrounding the end of a registration period**

Table value:

										F	F

FF: Length of the synchronization window in seconds
Exception: if the value is 0, synchronization can happen at any time

Example:

										0	5

Expl.: Synchronization is possible in a window of +/- 5 seconds at the end of the registration period

000 -09 **Synchronization tolerance: if the synchronization changes the system time by more than this number of seconds, it will be marked in the device status**

Table value:

										T	T

TT: Synchronization tolerance
Note: If the value is 0, synchronization is never marked in the device status

Example:

										0	2

Expl.: If synchronization changes the system more than 2 seconds, the event will be marked in the device status.

000 -10 **Rate control mode**

Table value:

											T

T:
- 0- Rates are controlled by control inputs
- 1- Rates are controlled by the tariff calendar

Example:

											0

Expl.: Rates are controlled by control inputs

109 -rr **Reset index and corresponding timestamp**

rr: requested reset (rr:=00 to 99):
- 00 last reset
- 01 second last reset
- ... and so on

Table value:

		n	n		M	M	-	D	D		h	h	:	m	m

nn: internal reset index (nn:=01 to 12)
MM-DD: Month - Day
hh:mm: hour : minute

Example:

		0	1		0	3	-	1	5		1	0	:	0	0

Expl.: The reset with index 01 took place on 15. March at 10:00.

1mt -xx

Cumulative energy counter reading at the end of the last registration period (MP1 or MP2)

m: Registration period (m:=0, 1)
- 0 Registration period MP1
- 1 Registration period MP2

t: Energy rate (t:=0, 1, 2, 3, 4)
- 0 Total
- 1 Energy rate 1
- 2 Energy rate 2
- ... etc.

xx: desired value(Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

				d	d	d	D	d	d	d	d

ddddddddd: Counter reading

Example:

				0	0	0	0	0	0	2	0

Expl.: Counter reading at the end of the last registration period: 20

130 -xx

Pulse count for an input

xx: pulse input (xx:= 0 to 15)
- 00 In1
- 01 In2
- ... etc.

Table value:

	d	d	d	d	d	d	D	d	d	d	d

ddddddddddd: Pulse count

Example:

	0	0	0	0	0	0	0	0	0	0	4

Expl.: The input has counted 4 pulses.

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20m -xx
m:=0
to
m:=1

Demand values of the current registration period

m: Registration period (m:=0, 1)
- 0 Registration period MP1
- 1 Registration period MP2

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:					d	d	d	d	d	d	d	d

ddddddddd: demand

Example:					0	0	0	0	0	0	1	2

Expl.: Current demand is 12

20m -xx
m:=3
to
m:=4

Apparent demand of current registration period

m: Registration period (m:=3, 4)
- 3 Registration period MP1
- 4 Registration period MP2

xx: Apparent demand value (xx:=0,1)
- 00 Apparent demand 1
- 01 Apparent demand 2

Table value:					d	d	d	d	d	d	d	d

ddddddddd: Apparent demand

Example:					0	0	0	0	0	0	1	2

Expl.: The apparent demand is 12

20m -xx
m:=6
to
m:=7

cos(φ) of current registration period

m: Registration period (m:=6, 7)
- 6 Registration period MP1
- 7 Registration period MP2

xx: cos(φ) (xx:=0, 1)
- 00 cos(φ)1
- 01 cos(φ)2

Table value:	S				d	d	d	d	d	d	d	d

ddddddddd: cos(φ)
S = space for positive values, „-„ for negative values

Example:					0	0	0	0	1	0	0	0

Expl.: The cos(φ) is 1

21m -xx **Demand of the last registration period**

m: Registration period (m:=0, 1)
- 0 Registration period MP1
- 1 Registration period MP2

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:					d	d	d	d	d	d	d	d

ddddddddd: Demand

Example:					0	0	0	0	0	0	1	2

Expl.: The demand in the last registration period was 12

22m -xx
m:=0
to
m:=1

Current counter status(this table address exists for version 1.04.00 and higher)

m: Registration period (m:=0,1)
0 Registration period MP1
1 Registration period MP2

xx: desired value (Counter/Total)
00 Counter 1
01 Counter 2
... etc.
15 Counter 16
64 positive Total 1
65 positive Total 2
66 positive Total 3
67 positive Total 4
80 negative Total 1
81 negative Total 2
82 negative Total 3
83 negative Total 4

Table value:					b7	b6	b5	b4	b3	b2	b1	b0

b7b6b5b4b3b2b1b0: Status

b0 bis b7 usually have the value “0”. Exceptions:
b0 = ‘1‘ on over flow of the energy register
b1 = ‘1‘ on over flow of the demand register
b2 = ‘1‘ when the signal condition monitoring has been triggered
b3 = ‘1‘ on parameter change for the energy register
b4 = ‘1‘ if the register is currently in test mode

Example:					0	0	0	0	0	0	0	1

Expl.: Energy register has flown over.

22m -xx
m:=3
to
m:=4

Current status for apparent demand (this table address exists for version 1.04.00 and higher)

m: Registration period (m:=3,4)
3 Registration period MP1
4 Registration period MP2

xx: desired apparent demand value
00 Apparent demand 1
01 Apparent demand 2

Table value:					b7	b6	b5	b4	b3	b2	b1	b0

b7b6b5b4b3b2b1b0: Status

b0 to b7 usually have the value „0“. Exception:
b1 = ‘1‘ on over flow of the demand register

Example:					0	0	0	0	0	0	1	0

Expl.: Demand register has flown over

22m -xx
M:=6
to
m:=7

Current status for cos(φ) (this table address exists for version 1.04.00 and higher)

m: Registration period (m:=6,7)
- 6 Registration period MP1
- 7 Registration period MP2

xx: desired cos(φ)
- 00 cos(φ)1
- 01 cos(φ)2

Table value:

				b7	b6	b5	b4	b3	b2	b1	b0

b7b6b5b4b3b2b1b0: Status

b0 to b7 usually have the value „0“. Exception:
- b1 = ‘1‘ on over flow of the demand register

Example:

				b7	b6	b5	b4	b3	b2	b1	b0
				0	0	0	0	0	0	1	0

Expl.: Demand register has flown over.

23m -xx
m:=0
to
m:=1

Counter status for the previous registration period (this table address exists for version 1.04.00 and higher)

m: Registration period (m:=0,1)
- 0 Registration period MP1
- 1 Registration period MP2

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

				b7	b6	b5	b4	b3	b2	b1	b0

b7b6b5b4b3b2b1b0: Status

b0 to b7 usually have the value “0”. Exceptions:
- b0 = ‘1‘ on over flow of the energy register
- b1 = ‘1‘ on over flow of the demand register
- b2 = ‘1‘ when the signal condition monitoring has been triggered
- b3 = ‘1‘ on parameter change for the energy register
- b4 = ‘1‘ if the register is currently in test mode

Example:

				b7	b6	b5	b4	b3	b2	b1	b0
				0	0	0	0	0	0	0	1

Expl.: Energy register has flown over.

24m -xx
m:=0
to
m:=1

Total cumulated apparent demand for the current registration period

m: Registration period (m:=0, 1)
0 Registration period MP1
1 Registration period MP2

xx: Apparent demand (xx:=0, 1)
00 Apparent demand 1
01 Apparent demand 2

Table value:

				d	d	d	d	d	d	d	d

ddddddddd: Total cumulated apparent demand

Example:

				0	0	0	0	0	0	1	2

Expl.: The total cumulated apparent demand is 12

24m -xx
m:=3
to
m:=4

Cumulated cos(φ) (Forward)

m: Registration period (m:=3, 4)
3 Registration period MP1
4 Registration period MP2

xx: cos(φ) (xx:=0, 1)
00 cos(φ) 1
01 cos(φ) 2

Table value:

				d	d	d	d	d	d	d	d

ddddddddd: Cumulated cos(φ) (Forward)

Example:

				0	0	0	0	1	0	0	0

Expl.: The cumulated cos(φ) (Forward) is 1

24m -xx
m:=6
to
m:=7

Cumulated cos(φ) (Backward)

m: Registration period (m:=6, 7)
6 Registration period MP1
7 Registration period MP2

xx: cos(φ) (xx:=0, 1)
00 cos(φ) 1
01 cos(φ) 2

Table value:

				d	d	d	d	d	d	d	d

ddddddddd: Cumulated cos(φ) (Backward)

Example:

				0	0	0	0	1	0	0	0

Expl.: The cumulated cos(φ) (Backward) is 1

3rt -xx
t:=1
to
t:=4

Reset: Maximum of apparent demand, Minimum of cos(φ)

r: Reset index (r:=0 to r:=9)
- 0 current maximum / current minimum
- 1 last reset
- 2 second last reset
- ... etc.

t: Demand rate (t: =1 to t:=4)
- 1 Demand rate MP1
- 2 Demand rate MP 2
- ... etc.

xx: desired value(apparent demand / cos(φ))
- 00 Apparent demand 1
- 01 Apparent demand 2
- 08 cos(φ)1 (Forward)
- 09 cos(φ)2 (Forward)
- 16 cos(φ)1 (Backward)
- 17 cos(φ)2 (Backward)

Table value:

d	d	d	d	d	d	D	d		D	D		h	h	m	m

ddddddddd: value of the maximum/minimum
DD: Day
hh:mm: hour minute

Example:

0	0	0	0	0	0	1	2		2	5		1	0	1	5

Expl.: A maximum value of 12 was recorded for apparent demand on the 25th of the month at 10:15

3rt -xx
t:=6
to
t:=9

Reset : cumulated maximum for apparent demand, cumulated minimum for cos(φ)

r: Reset index (r:=0 to r:=9)
- 0 current maximum / current minimum
- 1 last reset
- 2 second last reset
- ... etc.

t: Demand rate (t: =6 to t:=9)
- 6 Demand rate MP1
- 7 Demand rate MP 2
- ... etc.

xx: desired value(apparent demand / cos(φ)
- 00 Apparent demand 1
- 01 Apparent demand 2
- 08 cos(φ)1 (Forward)
- 09 cos(φ)2 (Forward)
- 16 cos(φ)1 (Backward)
- 17 cos(φ)2 (Backward)

Table value:

d	d	d	d	d	d	d	d		D	D		h	h	m	m

ddddddddd: cumulated maximum value
DD: Day
hhmm: hour minute

Example:

0	0	0	0	0	0	1	2		2	5		1	0	1	5

Expl.: A cumulated maximum of 12 was recorded for apparent demand on the 25th day of the month at 10:15

4rt -xx
t:=0
to
t:=4

Reset: Maximum and timestamp for t:=0 to t:=4 (modified from Version 1.04.00 up)

r: desired reset index (r:=0 or r:=1 to 9):
- 0 current maximum
- 1 last reset
- 2 second last reset
- ... etc.

t: demand rate (t:=0 to 3 for rate 1 to 4) up to version 1.03.08
- 0 demand rate MP1
- 1 demand rate MP2
- ... etc.

t: demand rate (t:=1 to 4 for rate 1 to 4) from version 1.04.00 up
- 0 total maximum (without rate)
- 1 demand rate MP1
- 2 demand rate MP2
- ... etc.

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

d	d	d	d	d	d	d	d		D	D		h	h	m	m

ddddddddd: maximum demand value
DD: Day
hhmm: hour minute

Example:

0	0	0	0	0	1	2	3		1	2		1	0	1	5

Expl.: A maximum demand of 123 was recorded on the 12th day of the month

4rt -xx

t:=5
to
t:=9

Reset: counter value at the time of the reset for t:=5 to t:=9 (modified from version 1.04.00 up)

r: desired reset index (r:=0 or r:=1 to 9):
- 0 current counter values
- 1 last reset
- 2 second last reset
- ... etc.

t: energy rate (t:=4 for total and t:=5 to 8 for rate 1 to 4) up to version 1.03.08
- 4 Total (Sum of all rate values)
- 5 energy rate 1
- 6 energy rate 2
- ... etc.

t: energy rate (t:=5 for total and t:=6 to 9 for rate 1 to 4) from version 1.04.00
- 5 Total (sum of all rate values)
- 6 energy rate 1
- 7 energy rate 2
- ... etc.

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

								d	d	d	d	d	d	d	d

ddddddddd: The counter value at the time of the reset

Example:

								1	2	3	4	5	6	7	8

Expl.: At the time of the reset the counter value was 12345678.

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5rt -xx
t:=1
to
t:=4

Reset: cumulated maximum

r: desired reset index (r:=0 or r:=1 to 9):
- 0 current counter values
- 1 last reset
- 2 second last reset
- ... etc.

t: demand rate (t:=1 to 4)
- 1 demand rate 1
- 2 demand rate 2
- ... etc.

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

								d	d	d	d	d	d	d	d

ddddddddd: cumulated maximum demand

Example:

								0	0	0	1	2	3	4	5

Expl.: The cumulated maximum demand value is 12345

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5rt -xx (t:=5 to t:=9)

Reset: current register values

r: desired reset index (r:=0 or r:=1 to 9):
- 0 actual current register value
- 1 at last reset
- 2 at second last reset
- ... etc.

t: Demand rate (t:=5 to t:=9)
- 5 Total
- 6 Demand rate 1
- 7 Demand rate 2
- ... etc.

xx: desired value (Counter/Total)
- 00 Counter 1
- 01 Counter 2
- ... etc.
- 15 Counter 16
- 64 positive Total 1
- 65 positive Total 2
- 66 positive Total 3
- 67 positive Total 4
- 80 negative Total 1
- 81 negative Total 2
- 82 negative Total 3
- 83 negative Total 4

Table value:

								d	d	d	d	d	d	d	d

ddddddddd: current register value

Example:

								0	0	0	1	2	3	4	5

Expl.: The current register value is (was) 12345

600 -00

Number of counters (number of pulse inputs defined in the DLX)

Table value:

											n	n

nn: Number of counters

Example:

											1	6

Expl.: The DLX is currently programmed to use 16 pulse inputs.

600 -01

Number of totals (number of totaling units defined in the DLX)

Table value:

												s

s: Number of totals

Example:

												4

Expl.: The DLX is currently programmed to use 4 totaling units.

600 -02

Number of rates (energy and demand)

Table value:

						a						l

a: Number of energy rates

l: Number of demand rates

Example:

						2						2

Expl.: The DLX is currently programmed to use 2 energy rates and 2 demand rates.

600 -03

Number of apparent demand calculations

Table value:

												s

s: Number of apparent demand calculations

Example:

												2

Expl.: The DLX is currently programmed to calculate 2 apparent demand values.

600 -04 **Balance calculation (yes/no)**

Table value: | | | | | | | | | | | | S |

S: 0- without balance calculation
1- with balance calculation

Example: | | | | | | | | | | | | 1 |

Expl.: with balance calculation

602 -xx **Pulse weighting for energy (numerator)**

xx= 00 for pulse input 1
xx= 01 for pulse input 2
.
.
xx= 15 for pulse input 16

Table value:	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
Example:												1

603 -xx **Pulse weighting for energy (divisor)**

xx= 00 for pulse input 1
xx= 01 for pulse input 2
.
.
xx= 15 for pulse input 16

Table value:	N	N	N	N	N	N	N	N	N	N	N	N
Example:												3

606 -xx **Pulse weighting for totaling units: common divisor of the positive register**

xx= 00 for totaling unit 1
xx= 01 for totaling unit 2
:
xx= 03 for totaling unit 4

Table value:	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
Example:											1	0

607 -xx **Pulse weighting for totaling units: common divisor of the negative register**

xx= 00 for totaling unit 1
xx= 01 for totaling unit 2
:
xx= 03 for totaling unit 4

Table value:	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
Example:											1	0

608 -xx **Pulse weighting for totaling units: common divisor of the positive pulse output**

xx= 00 for totaling unit 1
xx= 01 for totaling unit 2
:
xx= 03 for totaling unit 4

Table value:	N	N	N	N	N	N	N	N	N	N	N	N
Example:												3

Note: value:=0 → the pulse output is disabled

609 -xx **Pulse weighting for totaling units: common divisor of the negative pulse output**

xx= 00 for totaling unit 1
xx= 01 for totaling unit 2
:
xx= 03 for totaling unit 4

Table value:	N	N	N	N	N	N	N	N	N	N	N	N
Example:												3

Note: value:=0 → the pulse output is disabled

61y -xx **Pulse weighting for totaling units: numerator for inputs**

y= Index of the totaling unit
y= 00 for totaling unit 1
y= 01 for totaling unit 2
:
y= 03 for totaling unit 4
xx= Index of the input
xx= 00 for input 1
xx= 01 for input 2
:
xx= 15 for input 16

Table value:	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

Note: The numerator can have a negative value

650 -xx **Terminal assignment (this table address exists only from Version 1.03.08 and up)**

xx= 00 Out1
xx= 01 Out 2
xx= 02 Out 3
xx= 03 Out 4
xx= 04 Rel 1
xx= 05 Rel 2

Table value:	N	N	N	N	N	N	N	N	N	N	N	N
Example:	R	E	L	2	:				M	P	A	1

Note: The following values are possible:
S1+, S2+, S3+, S4+ positive pulse output for totaling unit 1 to 4
S1-, S2-, S3-, S4- negative pulse output for totaling unit 1 to 4
MPA1, MPA2 outputs for registration periods MP1 and MP2
RSTA reset output
AL1, AL2 alarm output 1, 2
TRA1, TRA2, TRA3, TRA4 rate control output 1 to 4
Log1, Log2, Log3, Log4 logic outputs
In1, In2,... to In16 pulse input forwarded directly to output
....no function

660 - nn **State of logic inputs**

nn: logic input
00 logic input 1
01 logic input 2
... etc.

Table value:												b

b: state of the logic input (0 or 1)

Example:												0

Expl.: The state of the logic input is 0

661 -nn

State of logic outputs
Condition: the logic output is assigned to a terminal

nn: 00 for the 1. logic output
01 for the 2. logic output
02 for the 3. logic output
03 for the 4. logic output

Table value:

											Z

Z : State of the logic output (0:=off or 1:=on)

Example:

											0

Expl.: The state of the logic output is 0 (the output is inactive or switched off).

Note: **Use the command TABSET1 (S1) to set the state of a logic output during remote data retrieval or remote programming**

700 -00 **Protocol name of the DLX**

Table value:	S	C	T	M	-	D	L	X				

Expl.: The protocol name of the DLX is SCTM-DLX

700 -01 **Version of the DLX**

Table value:	V	e	r	.		x	.	y	y	.	z	z
Example:	V	e	r	.		1	.	0	0	.	0	0

Expl.: The version of the DLX is Ver. 1.00.00

700 -02 **Version date**

Table value:	M	M	M		D	D		Y	Y	Y	Y	

MMM: Month
DD: Day
YYYY: Year

Example:	J	a	n			9		1	9	9	8	

Expl.: The version date of the DLX is the 9th of January 1998

700 -03 **Manufacturer name**

Table value:				B	a	e	R		G	m	b	H

700 -2y **Device status of the registration period (from Version 1.03.08 and up)**

y: desired registration period
1 MP1
2 MP2

Table value:

S15	S14	S13	S12	S11	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1	S0

S0: Restart
S1: Parameter change
S2: Manual change of register (counter) values
S3: Power failure
S4: Warning
S5: Fault
S6: Manual Change of time or corrected by radio clock by more than 1 minute
S7: Test mode
S8: Change of state of a logic input
S9: Summer/Wintertime switching

Example:

0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1

Expl.: In this registration period a power failure of more than 200 ms has occurred. The bits S0 (Restart), S3 (Power failure) and S4 (Warning) are marked (set).

700 -80 **Required memory capacity for SRAM cards**

Table value:	S	S	S	S	S	S	S	S	S	S	S	S
Example:							2	5	4	2	0	8

Expl.: When a SRAM card is used, 254208 byte will be written to the card: → the card must have a minimum capacity of 256 kByte.

700 -81 **Required memory capacity for FLASH cards**

Table value:	S	S	S	S	S	S	S	S	S	S	S	S
Example:						1	1	7	9	6	4	8

Expl.: When a FLASH card is used, 1179648 byte will be written to the card: → the card must have a minimum capacity of 2 MByte.

700 -82 **Type and capacity of the successfully activated PC-Card**

Table value:	t	t	t	T	t		k	k	k		*	B

t t t t t: card type: SRAM or FLASH
k k k: Capacity
*: k for kilobyte; m for Megabyte

Example 1:	S	R	A	M			2	5	6		K	B

Expl.: The currently inserted and successfully activated card in the DLX is of type SRAM and has a capacity of 256 kByte.

Example 2:	S	R	A	M			0	0	4		M	B

Expl.: The last card that was successfully activated in the DLX was of type SRAM and had a capacity of 4 MByte.

If no card has been successfully activated the DLX will send:

-	-	-	-	-	-	-	-	-	-	-	-

700 -83 **State of the PC-Card in the DLX**

Table value:											n	n

nn:
70- No card activated
71- Card activated but not present
72- Card activated but write protected.
73- Card activated, unit busy determining type and capacity
74- Unit is busy calculating the number of sectors that need to be buffered during an update of the administration information.
75- Unit is busy writing administration information to the card.
76- Unit is busy determining the number of the last DEF file.
77- Unit is busy formatting the card.
78- Card is of the wrong type (neither SRAM nor FLASH from AMD)
79- Capacity of the card is not sufficient
7A- The currently inserted card was activated successfully. All is in order!
7B- Unit is busy updating the administration information
7C- Unit is busy deactivating the card
7D- The currently inserted card is not the one that was last activated.

700 -84 **Date and time of PC-Card activation (from Version 1.03.08 up)**

Table value:	Y	Y	M	M	D	D	Z	W	h	h	m	m

YYMMDD: Year Month Day
Z: „W“ for CET, „S“ for CEST (summertime)
W: Weekday(1-Monday, 7-Sunday)
hhmm: hour minute

Example:	0	0	1	2	0	6	W	3	1	5	3	8

Expl.: The PC-Card was activated on Wednesday, 6th of December 2000 at 15:38 hours (CET).

701 -00 **Registration period length (in minutes)**

Table value:	D^1	D^1		D^2	D^2	D^2	D^2		D^3	D^3	D^3	D^3

D^1 D^1 Registration period MP1
D^2 D^2 D^2 D^2 Registration period MP2
D^3 D^3 D^3 D^3 Registration period MP3 (not implemented in DLX)

Example:	1	5		0	0	3	0		0	0	0	0

Expl.: Registration period MP1: 15 minutes
Registration period MP2: 30 minutes

804 -01 **Number of stored and transmitted digits per value**

Table value:

d^1	d^1	d^1		d^2	d^2	d^2		d^3	d^3	d^3	

$d^1d^1d^1$: for load profile buffer MP1
$d^2d^2d^2$: for load profile buffer MP2
$d^3d^3d^3$: for load profile buffer MP2 (not implemented in DLX)

Example:

0	0	4		0	0	8		0	0	4	

Expl.: The following number of digits were programmed for the load profiles:
For MP1: 4 digits
For MP2: 8 digits
For MP3: 4 digits (not supported by DLX)

804 -02 **Type of load profile values(demand, energy, energy increment)**

Table value:

t^1	t^1			t^2	t^2			t^3	t^3		

t^1t^1: value type for load profile buffer MP1
t^2t^2: value type for load profile buffer MP2
t^3t^3: value type for load profile buffer MP3 (not supported by DLX)
The following types are possible: 10=demand, 20=energy, 30=increments

Example:

1	0			2	0			0	0		

Expl.: Load profile MP1 stores demand values, load profile MP2 stores energy values

805 -00 **Load profile storage depth on the PC-Card**

Table value:

n^1	n^1	n^1		n^2	n^2	n^2		n^3	n^3	n^3	

$n^1n^1n^1$: Number of programmed days on PC-Card for load profile MP1
$n^2n^2n^2$: Number of programmed days on PC-Card for load profile MP2
$n^3n^3n^3$: Number of programmed days on PC-Card for load profile MP3

Example:

0	3	5		0	0	0		0	0	0	

Expl.: The following number of days of storage on the PC-Card have been programmed:
For MP1: 35 days
For MP2: 0 days
For MP3: 0 days

805 -0y **Load profile storage depth in internal memory**
Note: this table address only exists from Version 1.03.08 up

y=2 for load profile MP1
y=3 for load profile MP2
y=4 for load profile MP3 (always 0, the DLX does not have a third load profile)

Table value:

t	t	t	t	t	t	t	t	t	T	t	t

Example:

										8	9

Expl.: The load profile storage depth in internal memory is at least 89 days.

805 -05 **Buffer capacity of internal memory in sectors (including clearing sector !)**
Note. : from Version 1.03.08 up

Table value:

n^1	n^1	n^1		n^2	n^2	n^2		n^3	n^3	n^3	

$n^1n^1n^1$: Number of sectors for MP1
$n^2n^2n^2$: Number of sectors for MP2
$n^3n^3n^3$: Number of sectors for MP3

82x -yy

Assignment of load profile storage areas

x: 1 Load profile MP1
2 Load profile MP2
3 Load profile MP3: not implemented in DLX

yy: 00 for the first three codes (0, 1, 2)
01 for the next three codes (3, 4, 5)
:
K/3 for codes K, K+1, K+2

Code	0 stands for		
	0	Counter 1	(yy=00 1--)
	1	Counter 2	(yy=00 -2-)
	2	Counter 3	(yy=00 --3)
	3	Counter 4	(yy=01 1--)
	:	:	
	15	Counter 16	(yy=05 1--)
	64	positive total 1	(yy=21 -2-)
	65	positive total 2	(yy=21 --3)
	66	positive total 3	(yy=22 1--)
	67	positive total 4	(yy=22 -2-)
	80	negative total 1	(yy=26 --3)
	81	negative total 2	(yy=27 1--)
	82	negative total 3	(yy=27 -2-)
	83	negative total 4	(yy=27 --3)
	96	apparent demand 1	(yy=32 1--)
	97	apparent demand 2	(yy=32 -2-)
	104	Cos φ 1+	(yy=34 --3)
	105	Cos φ 2+	(yy=35 1--)
	112	Cos φ 1-	(yy=37 -2-)
	113	Cos φ 2-	(yy=37 --3)

Table value:

	t	t	d		t	t	d		t	t	d

tt: 00 if no value is stored
10 for storage of the demand value
20 for storage of the total energy value
21 for storage of the energy value for rate 1
22 for storage of the energy value for rate 2
23 for storage of the energy value for rate 3
24 for storage of the energy value for rate 4

d: number of digits for storage and transmission for this value. If tt = 00 this position contains a blank (“ “).

Example: Query to table address 821-00 (the first three codes for load profile MP1):

	0	0			2	0	8		1	0	4

Expl.: 00: The value of code 0 will not be stored in load profile MP1,
208: The value of code 1 will be stored as a total energy value with 8 digits in load profile MP1
104: The value of code 2 will be stored as a demand value with 4 digits in load profile MP1

82x -yy **Assignment of load profile storage (fast access)**

x: 4 for load profile MP1
5 for load profile MP2
6 for load profile MP3

Table value: (for yy = 00 Counter)

Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	Z11	Z12	Z13	Z14	Z15	Z16

Table value: (for yy = 01 Totaling units)

S1+	S2+	S3+	S4+	S5+	S6+	S7+	S8+	S1-	S2-	S3-	S4-	S5-	S6-	S7-	S8-

Table value: (for yy = 02 Apparent demand)

SL1	SL2	SL3	SL4	SL5	SL6	SL7	SL8								

Table value: (for yy = 03 cosφ)

C1+	C2+	C3+	C4+	C5+	C6+	C7+	C8+	C1-	C2-	C3-	C4-	C5-	C6-	C7-	C8-

Example: Query to table address 824-00: Counters in load profile MP1

1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0

Expl.: The counters Z1, Z3, Z4 and Z10 will be stored in load profile MP1

830 -00 **Number of stored values per registration period (from version 1.03.08 up)**

Table value:

Z^1	Z^1	Z^1		Z^2	Z^2	Z^2		Z^3	Z^3	Z^3	

$Z^1Z^1Z^1$: for load profile MP1
$Z^2Z^2Z^2$: for load profile MP2
$Z^3Z^3Z^3$: for load profile MP3 (not supported by DLX)

Example:

0	1	8		0	0	8		0	0	0	

Expl.:
018: load profile MP1 stores 18 values,
008: load profile MP2 stores 8 values,
000: load profile MP3 stores no values.

830 -01 **Number of transmitted values per registration period**

Table value:

Z^1	Z^1	Z^1		Z^2	Z^2	Z^2		Z^3	Z^3	Z^3	

$Z^1Z^1Z^1$: for load profile MP1
$Z^2Z^2Z^2$: for load profile MP2
$Z^3Z^3Z^3$: for load profile MP3 (not supported by DLX)

Example:

0	1	6		0	0	8		0	0	0	

Expl.:
016: load profile MP1 transmits 16 values,
008: load profile MP2 transmits 8 values,
000: load profile MP3 transmits no values.

832 -00 **Device identifier**

Table value:

Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

Example:

0	0	0	0	0	0	0	0	0	0	0	1

Expl.: The device identifier is 0000000000000001.

832 -01 **Serial number**

Table value:

Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

Example:

0	0	0	0	0	0	0	0	0	1	2	3

Expl.: The serial number is 0000000000000123.

901 -01 **Enable time changes via SCTM**

Table value:

											Z

Z: Flag
0: time changes via SCTM are disabled
1: time changes via SCTM are enabled

Example:

											0

Expl.: time changes via SCTM are disabled

901 -02 **Reset blockage in number of registration periods MP1**

Table value:										R	R	R
	RR: Reset blockage in number of registration periods MP1											
Example:										0	0	3

Expl.: At least 3 registration periods MP1 need to pass between two resets

901 -03 **Automatic Reset (yes/no)**

Table value:												A

A: Flag
- 0- automatic resets are disabled
- 1- automatic resets are enabled

Example:												0

Expl.: Automatic reset is disabled. Resets are initiated via the keypad on the front panel or via the RST input.

901 -04 **Frequency of automatic resets**

Table value:												F

F: Frequency
- 0- daily
- 1- weekly
- 2- monthly
- 3- annually

Example:												2

Expl.: One reset per month will be initiated automatically.

901 -05 **Date and time of automatic resets**

Table value:		M	M		D	D		h	h		m	m

MM: Month (unused for daily, weekly and monthly resets)
DD: Day (unused for daily resets; for weekly resets: weekday; for monthly resets: day of the month)
hh mm: hour minute

Example:					0	1		0	0		0	0

Expl.: The reset will take place on the first day of each month at 00:00.

901 -08 **Use device status of a registration period to mark status changes of logic inputs**

Table value:												Z

Z: Flag
- 0: Bit0 in the device status of a registration period is always 0
- 1: Bit0 in the device status of a registration period is set to 1, if the state of a logic input has changed during that registration period..

Example:												0

Expl.: Bit0 in the device status of a registration period is always 0

901 -09 **Device identifier**

Table value:	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
	Device identifier															
Example:	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6

Expl.: The device identifier is 1234567890123456.

902 -00 **Currently active rate (demand, energy)**

Table value:

						er						dr

er: energy rate
dr: demand rate

Example:

						1						3

Expl.: Energy rate 1, demand rate 3

902 -01 **Current reset indices (Cnt12 and Cnt99)**

Table value:

				ct_{12}	ct_{12}					ct_{99}	ct_{99}	

$ct_{12}ct_{12}$: external reset index (1 to 12), can be set using DLXPARA
$ct_{99}ct_{99}$: internal reset index modulo 100 (0 to 99)

Example:

				0	1					1	2	

Expl.: 01: current month (e.g. January);
12 resets have occurred since the last unit restart.

902 -02 **Position of the program protection switch**

Table value:

												F

f-Flag:

0 Programming is disabled
1 Programming is enabled

Example:

												1

Expl.: Programming is enabled

902 -03 **Radio clock signal**

Table value:

												F

f- State of the radio clock signal interpretation

0 Radio clock is not active
1 No minute signal received yet
2 First minute signal received
3 Synchronization is active

Example:

												3

Expl.: Synchronization is active

910 -xx **Number of decimal places for energy registers**

xx: register (input or counter)

01 Register 1
02 Register 2
... etc.
15 Register 16

Table value:

												n

n: Number of decimal places

Example:

												3

Expl.: The register has 3 decimal places

911 -xx **Number of decimal places for totaling units for energy**

xx: totaling unit

00 totaling unit 1
01 totaling unit 2
02 totaling unit 3
03 totaling unit 4

Table value:

												n

n: Number of decimal places

Example:

												1

Expl.: The totaling units for energy have 1 decimal place.

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912 -xx **Number of decimal places for demand registers**

xx: Register

01	Register 1
02	Register 2
...	etc.
15	Register 16

Table value:

											n

n: Number of decimal places

Example:

											1

Expl.: Demand registers have 1 decimal place.

913 -xx **Number of decimal places for totaling units for demand**

xx: totaling unit

00	totaling unit 1
01	totaling unit 2
02	totaling unit 3
03	totaling unit 4

Table value:

											n

n: Number of decimal places

Example:

											1

Expl.: The totaling units for demand have 1 decimal place

914 -xx **Number of decimal places for apparent demand registers**

xx: Apparent demand register

00	Apparent demand register 1
01	Apparent demand register 2

Table value:

											n

n: Number of decimal places

Example:

											1

Expl.: The apparent demand registers have 1 decimal place.

The DLX supports the following SCTM telegrams:

BUFENQ1 (E4)	Retrieval of individual buffer entries.
NEXTi (E5)	Retrieval of the following buffer entry.
BUFENQ2 (E6)	Retrieval of a continuous block of data from a load profile buffer.
NEXTBLOCK (HEADER)	Retrieval of the following data block.
TABENQ1 (E1)	Retrieval of listed table addresses.
TABENQ3 (E3)	Retrieval of date and time (resolution in seconds)
SETTIME (T1)	Sets the time to be programmed into the DLX. This command only works if it was previously enabled by using DLXPARA
SSYNC (T2)	Change the time in the DLX to the previously set time. Year, month, day, hour and minute will be changed to the values set with the SETTIME command, seconds will be set to 0. This command only works if it was previously enabled using DLXPARA.
MSYNC (T4)	Synchronize The seconds will be set to 0. If the second value was between 30 and 59, the minute value will be increased. This command only works if it was previously enabled using DLXPARA.
TABSET1 (S1)	Remote program change (set table addresses). Currently only the logic outputs can be set (address 661-nn).

Changing between summertime and wintertime

The following paragraphs illustrate the changes in system time and device status of a registration period when switching from wintertime to summertime (and vice versa) and subsequently retrieving data using the SCTM protocol.

- **Switching from wintertime to summertime**

  Example: Data registered on 28.03.99 is being retrieved, registration period length is 15 minutes.

CET Central European Time	CEST Central European Summertime	S-Bit	T-Bit*	Explanation
01:30	01:30	0	0	Wintertime
01:45	01:45	0	0	Wintertime
02:00	03:00	1	1	Summertime (→ **S-Bit is 1**, the change from wintertime to summertime has taken place→ **T-Bit is 1**
02:15	03:15	1	0	Summertime
02:30	03:30	1	0	Summertime

- **Switching from summertime to wintertime**

  Example: Data registered on 31.10.99 is being retrieved, registration period length is 15 minutes

CET Central European Time	CEST Central European Summertime	S-Bit	T-Bit*	Explanation
00:30	01:30	1	0	Summertime
00:45	01:45	1	0	Summertime
01:00	02:00	1	0	Summertime
01:15	02:15	1	0	Summertime
01:30	02:30	1	0	Summertime
01:45	02:45	1	0	Summertime
02:00	02:00	0	1	Wintertime (→ **S-Bit is 0**, the change from summertime to wintertime has taken place → **T-Bit is 1**
02:15	02:15	0	0	Wintertime
02:30	02:30	0	0	Wintertime

*: The T-Bit will be set in each registration period where the time was modified.

IEC 60870 protocol

Apart from the SCTM protocol, the protocol according to IEC 60870-5-102 can also be used for data retrieval.

Telegram processing

- Transmission settings: 8, E, 1 (1 start bit, 8 data bits, even parity, 1 stop bit)
- Only telegrams according to IEC 60870-5-1 format FT 1.2 are supported.
- Only asymmetrical transmission procedures according to section 5 of IEC 60870-5-2 are applied. The basic polling procedure uses the request/respond service with function code 11 for data retrieval of class 2. Data of class 1 is indicated by the ACD bit. Values of the most recent registration period are assigned to class 2, whereas values from previous registration periods and all information requested by the polling ASDU are assigned to class 1.
- The link address (address field of the link or connection layer) must have 2 bytes (fixed system parameter)
- The counter address (the common ASDU address) must have 2 bytes (and can be identical to the link address).
- The maximum telegram length is 256 byte.
- Telegrams with wrong link address, wrong checksum or wrong format are discarded.

Date retrieval (Periodic buffers MP1 & MP2)

You can retrieve current data (from the most recent registration period := class 2), data from the oldest registration period and any complete registration period, data from a selected time period as well as the manufacturer information.
The following selection was made from the user standard IEC 60870-5-3/4:

- All values are transferred per buffer either as „Billing data“ or as „operational data“ (You can program this using DLXPARA).
- A maximum of two registration periods (MP1 and MP2) are supported.
- The register addresses are entered in ascending numerical order (the sequence is defined by the device parameters set using DLXPARA: inputs are entered before totals).
- Under the heading „periodically reset readings“ either energy increments (e.g. kWh) or demand values (e.g. kW) will be transferred, depending on the parameters set with DLXPARA.

Retrieval of messages (spontaneous event buffer)

The section „Fault displays“ contains a table with all event types supported, including the corresponding explanations.
Events and alarms can only be cleared on site. It is not possible to acknowledge errors.

! After switching from one protocol to another the complete spontaneous event buffer will be transmitted from start.! (up to firmware version 1.03.08)

Compatibility list

The following section lists all parameter selections and functions supported by the DLX that are defined in the user standard DIN EN 60870-5-102 (international standard IEC 60870-5-102) from September 1997. The implementation in the DLX however does not include the full functionality but only a subset.
Empty fields (boxes) are for your choices, you need to make your own selections in these fields.

- **Network configuration**

☒ Point-to-point connection
☒ Point-to-point dial-up connection
☒ Multiple drop line configuration (DLX with RS485 module)

- **Physical layer**

Transmission speed (control and monitoring direction)

Asymmetric interface V.24/V.28 Standard		Asymmetric interface V.24/V.28 recommended for more than 1200 bit/s	
☐	300 bit/s	☐	2400 bit/s
☐	600 bit/s	☐	4800 bit/s
☐	1200 bit/s	☐	9600 bit/s

- **Link layer**

Only telegrams according to FT 1.2 (IEC 60870-5-1) are permitted:
- Telegram with variable length (68_{Hex} ... 16_{Hex})
- Telegram with fixed length (10_{Hex} ... 16_{Hex})
- Single characters ($E5_{Hex}$)

Link address (address field of the link layer)

☒ 2 Octets ☒ not structured ☐ Link address

☐ Maximum length L (number of octets)

Service functions of the link layer

☒ Query for data class 2 is present (meter readings or data of the most recent registration period)
☒ Query for data class 1 is present (data of previous registration periods and other data)
☒ Reset of the application process is not present
☒ Send / No Reply is not present
☒ Request status of link is present (FC9): Respond status of link (FC11)
☒ Reset of remote link is present (FC0): Confirm ACK (FC0), the next FCB-bit must be set

- **Application layer**

Transmission mode for application data

Mode 1 is used exclusively: least significant octet first according to IEC 60870-5-4, section 4.10.

ASDU address

☒ 2 Octets ☐ ASDU address

Signature

☐ with signature (default for billing data) ☐ without signature (for operational data)

List address (list number)

☒ <0> := basic data Single events (default if no other value was defined)
☐ <11> := Reg. Period 1 MP1: ___ (default: 15min.)
☐ <12> := Reg. Period 2 MP2: ___ (default: off)

Rate information (programmable)

☐ with rate information ☐ without rate information (default)

Selection of standardized ASDU

Process information in monitoring direction: reply(from the DLX to the central unit)

☒ <1> := Single event with timestamp
☐ <2> := Billing data, 4 octets each (default)
☐ <3> := Billing data, 3 octets each
☐ <4> := Billing data, 2 octets each
☐ <5> := Periodically reset billing data, 4 octets each
☐ <6> := Periodically reset billing data, 3 octets each
☐ <7> := Periodically reset billing data, 2 octets each
☐ <8> := Operational data, 4 octets each
☐ <9> := Operational data, 3 octets each
☐ <10> := Operational data, 2 octets each
☐ <11> := Periodically reset operational data, 4 octets each
☐ <12> := Periodically reset operational data, 3 octets each
☐ <13> := Periodically reset operational data, 2 octets each

System information in monitoring direction: reply(from the DLX to the central unit)

☒ <70> := End of initialization
☒ <71> := Manufacturer and product codes: 41_{Hex} 42_{Hex} 11_{Hex} 00_{Hex} 00_{Hex} 00_{Hex}

System information in control direction: Request (from the central unit to the DLX)

☒ <100> := Request of manufacturer and product codes
☐ <104> := Request for billing data of the oldest registration period (default)
☐ <106> := Request for billing data of a particular registration period in the past (default)
☐ <108> := Request for periodically reset billing data of the oldest registration period
☐ <110> := Request for periodically reset billing data of a particular registration period in the past
☐ <112> := Request for operational data of the oldest registration period
☐ <114> := Request for operational data of a particular registration period in the past
☐ <116> := Request for periodically reset operational data of the oldest registration period
☐ <118> := Request for periodically reset operational data of a particular registration period in the past
☐ <120> := Request for billing data of a selected time period and a selected address range (default), from version 1.03.08 and up
☐ <121> := Request for periodically reset billing data of a selected time period and a selected address range (default), from version 1.03.08 and up
☐ <122> := Request for operational data of a selected time period and a selected address range (default), from version 1.03.08 and up
☐ <123> := Request for periodically reset operational data of a selected time period and a selected address range (default), from version 1.03.08 and up

Basic application functions

Transmission of meter readings: programmable number, max. 30

No.	MP1	MP2	Signature	
	☐	☐	☒	Number of billing data values
	☐	☐	☒	Number of periodically reset billing data values
	☐	☐	–	Number of operational data values
	☐	☐	–	Number of periodically reset operational data values

Data addresses in ascending order (starting from input 1)

Registration period MP1

☐	1	01_{Hex}	Input 1
☐	2	02_{Hex}	Input 2
☐	3	03_{Hex}	Input 3
☐	4	04_{Hex}	Input 4
☐	5	05_{Hex}	Input 5
☐	6	06_{Hex}	Input 6
☐	7	07_{Hex}	Input 7
☐	8	08_{Hex}	Input 8
☐	9	09_{Hex}	Input 9
☐	10	$0A_{Hex}$	Input 10
☐	11	$0B_{Hex}$	Input 11
☐	12	$0C_{Hex}$	Input 12
☐	13	$0D_{Hex}$	Input 13
☐	14	$0E_{Hex}$	Input 14
☐	15	$0F_{Hex}$	Input 15
☐	16	10_{Hex}	Input 16
☐	65	41_{Hex}	Totaling unit 1+
☐	66	42_{Hex}	Totaling unit 2+
☐	67	43_{Hex}	Totaling unit 3+
☐	68	44_{Hex}	Totaling unit 4+
☐	81	51_{Hex}	Totaling unit 1–
☐	82	52_{Hex}	Totaling unit 2–
☐	83	53_{Hex}	Totaling unit 3–
☐	84	54_{Hex}	Totaling unit 4–
☐	97	61_{Hex}	Apparent demand 1
☐	99	62_{Hex}	Apparent demand 2
☐	105	69_{Hex}	Cos 1+
☐	106	$6A_{Hex}$	Cos 2+
☐	113	71_{Hex}	Cos 1–
☐	114	72_{Hex}	Cos 2–

Registration period MP2

☐	1	01_{Hex}	Input 1
☐	2	02_{Hex}	Input 2
☐	3	03_{Hex}	Input 3
☐	4	04_{Hex}	Input 4
☐	5	05_{Hex}	Input 5
☐	6	06_{Hex}	Input 6
☐	7	07_{Hex}	Input 7
☐	8	08_{Hex}	Input 8
☐	9	09_{Hex}	Input 9
☐	10	$0A_{Hex}$	Input 10
☐	11	$0B_{Hex}$	Input 11
☐	12	$0C_{Hex}$	Input 12
☐	13	$0D_{Hex}$	Input 13
☐	14	$0E_{Hex}$	Input 14
☐	15	$0F_{Hex}$	Input 15
☐	16	10_{Hex}	Input 16
☐	65	41_{Hex}	Totaling unit 1+
☐	66	42_{Hex}	Totaling unit 2+
☐	67	43_{Hex}	Totaling unit 3+
☐	68	44_{Hex}	Totaling unit 4+
☐	81	51_{Hex}	Totaling unit 1–
☐	82	52_{Hex}	Totaling unit 2–
☐	83	53_{Hex}	Totaling unit 3–
☐	84	54_{Hex}	Totaling unit 4–
☐	97	61_{Hex}	Apparent demand 1
☐	99	62_{Hex}	Apparent demand 2
☐	105	69_{Hex}	Cos 1+
☐	106	$6A_{Hex}$	Cos 2+
☐	113	71_{Hex}	Cos 1–
☐	114	72_{Hex}	Cos 2–

Appendix B

Table addresses

Service interface

The service interface underneath the keypad can be used to read or modify register contents via the programming software DLXPARA (after input of a password). This is a serial connection (8, e, 1) with fixed baud rate (9600 baud) using a standard serial cable (e.g. modem cable).
All register addresses have 5 digits plus a 2 digit index. The following table lists all of the registers. Use the keypad to query these values directly.

Meaning of special symbols in the table

The column „Stat." Shows whether this register can be set or programmed in a certified and sealed unit:

S Value can be set (i.e. it can be modified at any time after entering a password)

P Value can be programmed (i.e. it can only be modified if the program protection switch is set to „Set Enable"), these values cannot be modified in a certified and sealed unit!

Important! All locations marked with gray background indicate registers that cannot be modified from outside in a certified and sealed unit!

Table addresses for menu item "Info – Table addresses"

The table address consists of a 5 digit address and a 2 digit index.
When querying an invalid address, the value will be displayed as „???".

Stat.	Address	Index	Meaning	:=Value → Explanation/Note
S	00000	01	Summer time switching	0:=Off; 1:=On
S		02	Summertime start : month	0:=Jan; 1:=Feb; ... 11:=Dec
S		03	Summertime start : weekday	0:=Monday; ... 6:=Sunday
S		04	Summertime start : hour	0 to 23
S		05	Wintertime start : month	0:=Jan; 1:=Feb; ... 11:=Dec
S		06	Wintertime start : weekday	0:=Monday; ... 6:=Sunday
S		07	Wintertime start : hour	0 to 23
S		08	Day to switch to wintertime	0:=last; 1:=first; 2:=second; ...
S		09	Day to switch to summertime	0:=last; 1:=first; 2:=second; ...
S		10	Current date and time	Display:=YYYY-MM-DD.HH:MM:SS
S	00002	01	Synchronization	0:=no synchronization 1:=via SYN input 2:=via external radio clock
S	00004	01	Interpret radio clock telegram	0:=Off; 1:=On
S	00005	01	Set time via remote communication	0:=Off; 1:=On
S	10000 10001 10002 10003 10004	ee	Cumulative Energy Total (current) Cumulative Energy Rate 1 Cumulative Energy Rate 2 Cumulative Energy Rate 3 Cumulative Energy Rate 4	→ee from 01 to 6; →ee=01 for input1 →ee=02 for input 2 ...
S	10100 10101 10102 10103 10104	pp	Cumulative Energy Total (current) Cumulative Energy Rate 1 Cumulative Energy Rate 2 Cumulative Energy Rate 3 Cumulative Energy Rate 4	→pp from 01 to 04; →pp=01 for totaling unit 1 positive →pp=02 for totaling unit 2 positive ...
S	10200 10201 10202 10203 10204	nn	Cumulative Energy Total (current) Cumulative Energy Rate 1 Cumulative Energy Rate 2 Cumulative Energy Rate 3 Cumulative Energy Rate 4	→nn from 01 to 04; →nn=01 for totaling unit 1 negative →nn=02 for totaling unit 2 negative ...

	11000 11001 11002 11003 11004	Ee	Current Energy Total (current) Current Energy Rate 1 Current Energy Rate 2 Current Energy Rate 3 Current Energy Rate 4	→ee from 01 to 6; →ee=01 for input1 →ee=02 for input 2 ...
	11100 11101 11102 11103 11104	Pp	Current Energy Total (current) Current Energy Rate 1 Current Energy Rate 2 Current Energy Rate 3 Current Energy Rate 4	→pp from 01 to 04; →pp=01 for totaling unit 1 positive →pp=02 for totaling unit 2 positive ...
	11200 11201 11202 11203 11204	nn	Current Energy Total (current) Current Energy Rate 1 Current Energy Rate 2 Current Energy Rate 3 Current Energy Rate 4	→nn from 01 to 04; →nn=01 for totaling unit 1 negative →nn=02 for totaling unit 2 negative ...
P	20000	ee	Min. pulse length at input ee	Length:=Display*10 ms; →see also 10000
P	20100	Ee	Min. pulse interval at input ee	Length:=Display*10 ms; →see also 10000
P	20200	Ee	Max. pulse length at input ee, pulse length monitoring	Length:=Display*10 ms; 0: = pulse length monitor deactivated →see also 10000
P	20300	Ee	Input signal inversion	0:=not inverted; 1:=inverted; →see also10000
S	21000 21001 21002 21003	Ee	Assignment to: Total 1 Total 2 Total 3 Total 4	→ee=01 for input 1; →Value needs to contain the actual assignment ratio →see also 21100
S	21100	Pp	Assignment to totals : common divisor of the total	→pp from 01 to 04; →see also 10100 and 21000
P	28100	Pp	Output for positive part of the total	Hexadecimal bit mask: 0:= no output; 1:=Out1; 2:=Out2; 4:=Out3; 8:=Out4; 16:=Rel1; 32:=Rel2; →pp from 01 to 04; →see also 10100
P	28101	Nn	Output for negative part of the total	→nn from 01 to 04; →see 28100
P	28102	Mm	Output for registration period	→mm=01 for MP1 (MPA1); →mm=02 for MP2 (MPA2); →see also 28100
P	28103	01	Output for maximum demand reset	→see also 28100
P	28104	Aa	Output for alarms	→aa=01 for alarm1; →aa=02 for alarm2; →see also 28100
P	28105	Tt	Output for rates	→tt from 01 to 04 →tt=01 for rate output TRA1
P	28106	01	Length of the registration period output pulse	length:=display*200 ms; →value from 1 to 100
P	28107	01	Length of the reset output pulse	length:=display*200 ms; →value from 1 to 100
P	28108	01	Mode of RSTA (reset output)	0:=pulse; 1:=switch
P	28109	aa	Length of alarm output pulse	→aa=01 for alarm1; →aa=02 for alarm2; →Display in seconds from 1 to 254

P	28110	aa	Mode of alarm outputs	0:=pulse; 1:=switch →aa=01 for alarm1; →aa=02 for alarm2
P	28111	ll	Output assignment for logic outputs	→ll from 01 to 04 →ll=01 for logic output Log1 →see also 28100
P	28112	ee	Output assignment for pulse inputs	→ee from 01 to 16 →ee=01 for input 1 →ee=02 for input 2 ... →see also 28100
S	28700	cc	Active input for calculation of apparent demand and cos (φ)	Display:=Z1 to Z16: input 1 to 16 :=S1+ to S4+: pos. total 1 to 4 :=S1- to S4-: neg. total 1 to 4 →cc:=01 for $cos_1(\varphi)$ →cc:=02 for $cos_2(\varphi)$
S	28701	cc	Reactive input for calculation of apparent demand and cos (φ)	→see 28700
P	29000	pp	Output pulse for totaling unit: HIGH-time	Length:=display*10 ms; →pp from 01 to 04; →see also 10100
P	29100	pp	Output pulse for totaling unit: LOW-time	Length:=display*10 ms; →see 29000
P	29200	pp	Divisor for totaling unit pulse output	→pp from 01 to 04; →see also 10100
P	29300	pp	Hysteresis for outputs of totaling units	→see 29200
P	29400	pp	Totaling unit output inversion	→see 29200
S	30000	ee	Input pulse weighting: Numerator	→see 10000
S	30100	ee	Input pulse weighting: Divisor	→see 10000
P	30200	ee	Decimals for energy counters	Display: 0- no decimals 1- one decimal 2- two decimals →see also 10000
P	30201	pp	Decimals for energy totals	→see 30200 and 10100
P	30202	ee	Decimals for demand counters	→see 30200
P	30203	pp	Decimals for demand totals	→see 30201
P	30204	cc	Decimals for apparent demand	→cc:=01 for $Cos_1(\varphi)$ →cc:=02 for $Cos_2(\varphi)$ →see 30200
P	31000	01	Number of counters	Number:=1 to 16
P		02	Number of totaling units	Number:=0 to 4
P		03	Separate totals (differential totals)	1:=always active
P		04	Saldo calculation	0:=Off; 1:=On
P		05	Number of energy rates	Number:=1 to 4
P		06	Number of demand rates	Number:=1 to 4
P	31001	01	Number of apparent demand calcs.	Number:=0 to 2
S	64001	01	Reset blockage in registration periods	Number:=1 to 99
S	64002	01	Time for automatic scolling of the scroll list (in seconds)	Time:=seconds for automatic scrolling 0:=manual scrolling
S	64003	01	Time window for SYN input	Time:=seconds
S	64004	01	Polarity of SYN input signal	0:=positive (rising) edge 1:=negative (falling) edge
S	64005	01	Internal (settable) reset index	value:=1 to 12

S	64006	01	Mode of automatic time controlled reset	0:=Off; 1:=Daily; 2:=Weekly; 3:=Monthly; 4:=Yearly
S		02	Time controlled reset: month	Month:=1 to 12
S		03	Time controlled reset: day	Day:=1 to31
S		04	Time controlled reset: hour	Hour:=0 to 23
S		05	Time controlled reset: minute	Minute:=0 to 59
S		06	Time controlled reset: weekday	0:=Monday .... 5:=Saturday; 6:=Sunday
S	64100	01	Input assignment for SYN signal	Hexadecimal bit mask: 0:= function disabled; 1:=Ctl1; 2:=Ctl2; 4:=Ctl3; 8:=Ctl4; 16:=Ctl5; 32:=Ctl6; 64:=Ctl7
S	64101	tt	Input assignments for rate control inputs	→tt from 01 to 04 →tt=01 for rate input TR1 →see 64100
S	64102	01	Input assignment for RSTX input	→see 64100
S	64103	ll	Input assignments for logic inputs	→ll from 01 to 04 →ll=01 for logic input Log1 →see 64100
S	64104	01	Assignment for ANZ input	→see 64100
P	64202	rr	Scroll list: address	Display:=list of addresses 0:=end of scroll list →rr from 01 to 40 →rr=01: first entry
S	64300	tt	Rate control inputs: demand rate mask	Display: 0:=Input disabled 1:=Input enabled →tt from 01 to 04 →tt=01 for rate control input TR1
S	64301	tt	Rate control inputs: energy rate mask	→see 64300
S	64310	kk	Rate control combinations for demand	Display:=rate 1 to 4 →kk from 01 to 16; →kk=01: TR1-4 no rate active →kk=02: TR1 rate 1 active →kk=03: TR2 rate 2 active →kk=04: TR1+TR2 rate 1 & 2 active ... →kk=16: TR1-4 all rates active
S	64311	kk	Rate control combinations for energy	→see 64310
S	64400	01	Rate control via...	0:=external rate control inputs 1:=internal rate calendar
S	64401	tt	Text for demand rate	→tt from 01 to 04
S	64402	tt	Text for energy rate	→see 64310
P	70100	mm	Registration period length	Display: 0:=Off; 1:=1min; 2:=2min; 3:=3min; 4:=4min; 5:=5min; 6:=6min; 7:=10min; 8:=12min; 9:=15min; 10:=20min; 11:=30min; 12:=60min; 13:=2hrs; 14:=3 hrs; 15:=6 hrs; 16:=12 hrs; 17:=24 hrs; →mm=01 for MP1; mm=02 for MP2
P	70101	01	Starting hour for MP2, if MP2=24 hrs	Display:=hour 0 to 23
S	71000	xx	Rate calendar: start of season	Display:=DD.MON (Day.Month) →xx=01 for season 1 to xx=06

S	71001	xx	Rate calendar: Assignment of weekdays to daily rate tables for all seasons; Description of rate tables→see 71002 to 71016	Display:=aabbccddeeffgghh 8 values of two digits for the rate table used aa: rate table for Monday bb: rate table for Tuesday to Thursday cc: rate table for Friday dd: rate table for Saturday ee: rate table for Sunday ff: T-T for public holiday type 1 gg: T-T for public holiday type 2 hh: T-T for public holiday type 3 →xx=01 for season 1 to xx=06
S	71002 to 71016	xx	Rate calendar: daily rate tables 71002: 1st daily rate table 71003: 2nd daily rate table .... 71016: 15th daily rate tables	Display:=SS:MM A M (hour:minute energy rate demand rate) →xx=01 for the 1st entry to xx=16 for the 16th entry
S	72000	xx	Rate calendar : public holidays	Display:=YYYY-MM-DD Type T (Year-Month-Day Type 1 to 3) →xx=01 for the 1st public holiday xx=02 for the 2nd public holiday bis xx=00 for the 100th holiday
P	80400	mm	Buffer options: Function of stored values in a registration period buffer (load profile values)	0:=Demand; 1:=Energy; 2:=Energy increment; →mm=01 for MP1 (MPA1); →mm=02 for MP2 (MPA2);
S	80404	01	Store changes in logical inputs in device status	0:=don't store; 1:=store
P	82100	ee	Load profile MP1 for inputs	0:=not used; 1:= used; →ee from 01 to 16; →see also 10000
P	82101	pp	Load profile MP1 for positive totals	0:=not used; 1:= used; →ee from 01 to 16; →see also 10100
P	82102	nn	Load profile MP1 for negative totals	0:=not used; 1:= used; →ee from 01 to 16; →see also 10200
P	82103	cc	Load profile MP1 for apparent demand	0:=not used; 1:= used; →cc from 01 to 02
P	82104	cc	Load profile MP1 for posistive Cosine	0:=not used; 1:= used; →cc from 01 to 02
P	82105	cc	Load profile MP1 for negative cosine	0:=not used; 1:= used; →cc from 01 to 02
P	82200	ee	Load profile MP2 for inputs	→see 82100
P	82201	pp	Load profile MP2 for positive totals	→see 82101
P	82202	nn	Load profile MP2 for negative totals	→see 82102
P	82203	cc	Load profile MP2 for apparent demand	→see 82103
P	82204	cc	Load profile MP2 for positive cosine	→see 82104
P	82205	cc	Load profile MP2 for negative cosine	→see 82105

Appendix C

List of parameters and constants

Bär Industrie-Elektronik GmbH / Lange Straße 87 / D-90762 Fürth / Phone +49 911 970590·Fax +49 911 9705950

Installation location:	
Author:	Date:

Equipment identification: | | | | | | | | | | | | | | | | | |

Number of inputs:		Typ: IES0☐ IEW☐ IED☐	Energy rates: 1☐ 2☐ 3☐ 4☐
Number of sums:		Balance: Y☐ N☐	MD rates: 1☐ 2☐ 3☐ 4☐
Number of cosine phi:			

Outputs	Sum1+	Sum1-	Sum2+	Sum2-	Sum3+	Sum3-	Sum4+	Sum4-	MPA1	MPA2	RSTA	Alarm1	Alarm2	TRA1	TRA2	TRA3	TRA4	Log1	Log2	Log3	Log4	... (n.c.)
Out1 (IAW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Out2 (IAW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Out3 (IAW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Out4 (IAW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Rel1 (mech.)									☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Rel2 (mech.)									☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Controls	SYN	TR1	TR2	TR3	TR4	RSTX	Log1	Log2	Log3	Log4	ANZ	... (n.c.)
Ctl1 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl2 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl3 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl4 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl5 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl6 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ctl7 (IES0/IEW)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Measurig period	1 min.	2 min.	3 min.	4 min.	5 min.	6 min.	10 min.	12 min.	15 min.	20 min.	30 min.	60 min.	2 hours	3 hours	6 hours	12 hours	24 hours	off
MP1 (Tm1)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐						
MP2 (Tm2)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

MD reset	
Rst counter: | | |	☐auto → ☐daily
Rst disabl.: | | |	☐RSTX ☐weekly
	☐keyboard ☐monthly
	☐yearly

Communications parameter	Default protocol	SCTM	IEC	Baud rate	300	600	1200	2400	4800	9600	auto.
Service (RS232)			☒							☒	
Data (RS232)	☐	☐			☐	☐	☐	☐	☐		
Modem	☒	☒									☒
or directly (_____)	☒	☒			☐	☐	☐	☐	☐		

SCTM Protocol		**IEC Protocol**	
Unit identification:	| | | | | | |	Link address:	| | | | | (Hex decimal)
Identification for MP: ☐→	MP1: | | | | | |	Unit address:	| | | | | (Hex decimal)
	MP2: | | | | | |	Number of bytes:	2☐ 3☐ 4☐
Transmit tariff:	☐	Typ of meter value:	MP1: billing ☐ operating ☐
Mark change of LOG input:	☐		MP2: billing ☐ operating ☐

Periodic buffer	Inputs 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Sums 1+	2+	3+	4+	1-	2-	3-	4-	App. energy 1	2	Cosine phi 1+	2+	1-	2-
MP1 (Tm1)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MP2 (Tm2)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Buffer options	Meter value	power	energy	energy fd.	Decades	4	6	8
MP1 (Tm1)	☐	☐	☐	☐		☐	☐	☐
MP2 (Tm2)	☐	☐	☐	☐		☐	☐	☐

Bär Industrie-Elektronik GmbH / Lange Straße 87 / D-90762 Fürth / Phone +49 911 970590·Fax +49 911 9705950

Installation location:	
Author:	Date:

Pulse rates (quantization): $\frac{X_w}{Y_w} = \frac{W}{R \times K}$

X_w, Y_w: Numerator and divisor (no decimal), 8 digits
W: Transformer ratio ($U_{prim}/U_{sec} \times I_{prim}/I_{sec}$)
R: Meter constant [pulses/kWh]
K: Reading constant
w: Energy („work“)
P_{max}: Maximum of demand value

Pulse inputs		Reading constant		Meter & transformer ratio		Energy	
		P_{max}	K	R [puls./kWh]	W	X_w	Y_w
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Sums intergration

Maximum pulse frequecy for output:

$f_{max}[Hz] = P_{max}\ [kW] / IA_s\ [kWh/puls] \times 1 / 3600$

IA: Output [kWh/puls]
K: Reading constant
s: Sum
P_{max}: maximum of demand value
f_{max}: maximum puls frequency for output

Sum	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input 8	Input 9	Input 10	Input 11	Input 12	Input 13	Input 14	Input 15	Input 16	Output IA_s [kWh/puls]	Maximum value P_{max} [kW]	Readin constante K_s	Hysteresis Hs [kWh]	Max. frequency f_{max} [Hz]
Σ1:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐					
Σ2:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐					
Σ3:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐					
Σ4:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐					

Apparent demand and cosine phi	**1**	**2**
Active demand:	☐ Input ☐ Sum+ ☐ Sum-	☐ Input ☐ Sum+ ☐ Sum-
Reactive demand:	☐ Input ☐ Sum+ ☐ Sum-	☐ Input ☐ Sum+ ☐ Sum-

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Installation location:	
Author:	Date:

Scroll list

	Address	Text	Unit	Comment
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Tariff

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Public holydays	

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Installation location:	
Author:	Date:

Device up to 6 inputs

Pulse input 1x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 4x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 2x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 5x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 3x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 6x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Sum 1 Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /	**Sum 3** Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /
Sum 2 Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /	**Sum 4** Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /
Identification:			

Device up to 16 inputs

Pulse input 1x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 9x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 2x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 10x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 3x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 11x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 4x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 12x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 5x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 13x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 6x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 14x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 7x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 15x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Pulse input 8x____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /	**Pulse input 16x**____ S0/Bi-current/Wipe: _____V____Hz R= Pulse/ No: V A C=	Cl. /
Sum 1 Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /	**Sum 3** Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /
Sum 2 Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /	**Sum 4** Pulse-E C= **X**____ R= Pulse/ _____V____Hz	Cl. /
Identification:			

Physikalisch-Technische Bundesanstalt

PTB

Braunschweig und Berlin

Innerstaatliche Bauartzulassung

Type-approval certificate under German law

Zulassungsinhaber:
Issued to:
Bär Industrie-Elektronik GmbH
Lange Str. 87

90762 Fürth
Deutschland

Rechtsbezug:
In accordance with:
§ 13 des Gesetzes über das Mess- und Eichwesen (Eichgesetz) vom 23. März 1992 (BGBl. I S. 711)

Bauart:
In respect of:
Elektronische Zusatzeinrichtung
DLX
DATAREG 16

Zulassungszeichen:
Approval mark:
00.23
99.13

Gültig bis:
Valid until:
unbefristet

Anzahl der Seiten:
Number of pages:
13

Geschäftszeichen:
Reference No.:
2.33-99010898-3785-2

Im Auftrag
By order
Dr. Kahmann

Braunschweig, 23.03.2000

Siegel
Seal

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 10

Merkmale zur Bauart sowie ggf. inhaltliche Beschränkungen, Auflagen und Bedingungen sind in der Anlage festgelegt, die Bestandteil der innerstaatlichen Bauartzulassung ist. Hinweise und eine Rechtsbehelfsbelehrung befinden sich auf der letzten Seite der Anlage.

Characteristics of the instrument type approved, restrictions as to the contents, special conditions and approval conditions, if any, are set out in the Annex which forms an integral part of the type-approval certificate under German law. For notes and information on legal remedies, see last page of the Annex.

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