CDLWin 4 Help
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<td>4</td>
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1 CDLWin Operating Instructions
2 INTRODUCTION

The COSMOS-DATA-LOGGER system measures, logs and analyses water supply data. The system consists of:
- the COSMOS-DATA-LOGGER (CD-Logger)
- the COSMOS-DATA-LOGGER-Evaluation Software (CDLWin)
and accessories for external connection to measuring device facilities (e.g. pulsers) and to a computer (e.g. CDL/PC connecting cable).

2.1 COSMOS-DATA-LOGGER

The COSMOS-DATA-LOGGER is installed on site. It records:
- pulses (e.g. pulses representing volume from a water meter)
- analogue values (e.g. pressure values from a pressure sensor)
together with date and time.

2.2 COSMOS-DATA-Evaluation Software

With the COSMOS-DATA-Evaluation Software, the COSMOS-DATA-LOGGER can be programmed before use
or downloaded during or after use.
The downloaded data is then processed and can be evaluated in tabular and graphical forms.
Please note that all units are freely selectable, e.g. m³/h or usgpm etc.

2.3 Requirements

A pulse output (reed switch) must be available from the water meter to be utilised by the CD-Logger.
The pressure sensor has to be furnished with a female 1/4" WW connection plug for logging of pipeline pressure.
A PC, is required for the COSMOS-DATA-LOGGER-Evaluation Software.

This guide will describe how to use the COSMOS-DATA-LOGGER system including application, function, start up and operation. In addition to this, notes on accessories and expansion features are also provided.
We will be happy to answer any questions you may have. Please note the comment at the end of this manual.

3 APPLICATION

Standard applications
- Leakage control
- Pipe system dimensioning
- Supply control
- Statistics, Queries
- Consumption control, consumption billing

Extended Applications
- Extended leakage control
- Pipe system calculations
- Pipe system analysis

Other Applications
- Reservoir level recording
- Determining the pipe friction factor
- Measurement of temperature, pH values etc.
- Tests for pressure surges
3.1 Standard applications

3.1.1 Leakage control

The condition of drinking water and sewage networks can be established with the use of COSMOS-DATA-LOGGER and the evaluation software (CDLWin). The flow rate is logged. If the flow rate does not fall below certain values during times of minimal consumption (e.g. during night and early morning hours) over an observation period of several days, there is a likelihood of leaks in the system. If the supply zones are isolated, the leaks can be located by further measurements.

![Graph showing flow rate over time](image.png)

Figure 1 Leakage control

To make the display the flow rate, use the logarithmic scale (-> Evaluation -> click on the vertical scale -> Change scale).

3.1.2 Pipe system dimensioning

The basis upon which pipe system specialists calculate pipe system sizing is on data related to consumption, peak, minimum, maximum and mean values. Tables, bar graphs and line graphs can be used to assist these calculations.
In order to show the average flow rate you can blend in the line under Evaluation. The statistical values for maximum, minimum and mean values can be seen directly by clicking the Statistics button.

### 3.1.3 Supply control

The capacities of supply networks should be optimised. COSMOS-DATA-LOGGER’s are used in order to obtain a consumption profile. This data provides information needed to control the consumption of industrial customers with large demands, for example; the tailored filling of reservoirs.
A resolution of few days shows the typical profile for some days. It may be necessary to look at the weekend values separately.

### 3.1.4 Statistics, Queries

The logger can be installed for extended logging periods in order to obtain an overview of water consumption. The recorded data is downloaded for statistical evaluation and can be saved as a file.

**Figure 4 Statistics, Queries**

Bar graphs are useful for displaying these statistics. The mean interval chosen should be large enough to obtain an informative graph.
3.1.5 Consumption control, consumption billing

In some supply areas, industrial consumers are billed or penalised for excessively high peak consumption. COSMOS-DATA-LOGGER’s are used to determine these consumption values.

Figure 5 Consumption control, consumption billing

3.2 Extended Applications

3.2.1 Extended leakage control

Flow rate and pressure are measured and recorded simultaneously. The pressure and flow rate relationship gives a detailed picture of the situation in the pipeline. If, for example, the water pressure drops without the water meter registering any flow, there is probably a leak upstream of the meter.
3.2.2 Pipe system calculations

The flow rate and pressure values recorded serve as basic data for system planning. Will the existing pipe system be able to maintain the required mains pressure with increased water consumption, or will the pressure drop be unacceptable? With the aid of the logger, tests and checks can be done to answer these questions.

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Pressure (bar)</th>
<th>Flow rate (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.06.1990 04:15</td>
<td>4.5184</td>
<td>0.00550</td>
</tr>
<tr>
<td>14.06.1990 04:30</td>
<td>4.5184</td>
<td>0.00586</td>
</tr>
<tr>
<td>14.06.1990 04:45</td>
<td>4.5184</td>
<td>0.00585</td>
</tr>
<tr>
<td>14.06.1990 05:00</td>
<td>4.5184</td>
<td>0.00581</td>
</tr>
<tr>
<td>14.06.1990 05:15</td>
<td>4.5206</td>
<td>0.00619</td>
</tr>
<tr>
<td>14.06.1990 05:30</td>
<td>4.4664</td>
<td>0.00685</td>
</tr>
<tr>
<td>14.06.1990 05:45</td>
<td>4.4816</td>
<td>0.00947</td>
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<tr>
<td>14.06.1990 06:00</td>
<td>4.4508</td>
<td>0.04324</td>
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<tr>
<td>14.06.1990 06:15</td>
<td>4.4107</td>
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<td>14.06.1990 06:30</td>
<td>4.4022</td>
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<tr>
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<td>0.1953</td>
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<td>14.06.1990 08:00</td>
<td>4.2889</td>
<td>0.21294</td>
</tr>
<tr>
<td>14.06.1990 08:15</td>
<td>4.4265</td>
<td>0.07376</td>
</tr>
<tr>
<td>14.06.1990 08:30</td>
<td>4.379</td>
<td>0.13325</td>
</tr>
</tbody>
</table>

3.2.3 Pipe system analysis

In order to see the condition of the pipe system it is necessary to measure the values at the relevant measuring sites simultaneously and to combine them in the later evaluation.

Example:

Two different pipes supply water to an area. But a farm is also connected to this system. The farms water is measured with a separate meter. That means the flowrate of the area is calculated as follows: Meter1+Meter2-Meter3.
3.3 Other Applications

3.3.1 Reservoir level recording

The water level of wells and reservoirs may be monitored by special pressure sensors and recorded for control purposes and for statistical analysis.

Figure 9 Ground water level recording
In order to measure the reservoir level you should choose a large measuring interval of about 1 hour, as level fluctuations take a long time. The measuring threshold should be kept low, so that small changes in the reservoir level are recorded.

### 3.3.2 Determining the pipe friction factor

The pressure is measured at the beginning and at the end of a defined length of pipe. The pressure drop determined is used, along with other data, to calculate the pipe friction factor.

![Graph](image)

Figure 10 Determining the pipe friction factor

In order to avoid mistakes by measuring with more than one logger, it is recommended:
- to synchronise the internal clocks of the loggers with the PC clock of the programming PC (set date and time during programming).
- to check and equalise the sensors used if necessary.

### 3.3.3 Measurement of temperature, pH values etc.

Sensors, which produce a 0...20 or 4...20 mA output, can be connected via the current interface to the CD-Logger. This enables measurement of temperature, pH values and the like.
If you want to record physical values, we recommend the use of sensors with standard current output of 0...20mA and to connect these over a CDL-current interface with the data logger. The interface and data logger can record positive and negative values. Measurement of temperatures below 0°C or flow rates in both directions are possible.

### 3.3.4 Tests for pressure surges

Pressure surges are the main cause of leaks in water networks. Short water hammers are not always indicated by line recorders because of the inertness of the system. A logger connected to a pressure sensor with 10 samples per second picks up the water hammer.
3.3.5 Meter sizing

When determine the meter type and the meter sizing there are some theoretical estimate models. To get more accurate and individual flow profile CDLWin enables a calculation showing the main consumption volume per flowrate. This gives basic input to make sure in For instance, CDLoggers are used to determine optimal areas for wind power stations by recording the wind conditions over a long period of time, and the customer flow in malls can be determined using light barriers...

![Example: Meter Sizing flowrate vs Volume rate diagramm](image)

The software provides individual evaluations which enables Volume rate vs flowrate which can be used for checking meter dimensioning and meter type to be used.

3.3.6 More possibilities

Because of the many different connection possibilities, the system offers various other applications. For instance, CDLoggers are used to determine optimal areas for wind power stations by recording the wind conditions over a long period of time, and the customer flow in malls can be determined using light barriers...

4 FUNCTION DESCRIPTION

4.1 Pulse input

4.1.1 Input

A pulser (for example a reed sensor) is connected to the water meter. The flowrate through the water meter triggers a switching contact in the reed sensor.
4.1.2 Recording

The microprocessor (CPU), controlled by a command from the program memory, reads the time from the Logger’s internal clock with every contact closure of the HRI pulser or any other pulser and records this together with the date in the memory.

Every pulse is recorded. A high flow rate produces many entries per unit of time, lower flow rates mean less entries per unit of time. One pulse requires about 1 byte of memory. Up to 512,000 bytes of memory is available.

For a water meter with a nominal diameter DN 150 with pulses representing 1m³, around 500,500m³ can be registered before the memory is full. Once the memory is full, the logger can be programmed to overwrite the oldest values in the memory with new data so that the latest data is always available.

4.1.3 Downloading

Downloading transfers the recorded data from the memory to a computer via the serial port. The data can be saved on hard drive for later evaluation.

4.1.4 Resolution

The resolution that is attainable during later evaluation, is dependent upon the selected pulse value of the pulser used.

Example:

With a Sensus water meter DN 100, 1 pulse/1 m³ (low resolution) or 10 pulses/1 m³ (high resolution) can be selected. With low flow rates (for example, when searching for leaks) it is better to use a high resolution (low pulse value), and with high flow rates (peak flow test), and with long-term measurements (statistics), a lower resolution generally suffices.

4.1.5 Other pulsers

The COSMOS-DATA-LOGGER was specifically developed for data recording in conjunction with water meters. The pulse input can however also process signals from other measuring devices which are equipped with a pulse output facility.

Therefore, magmeters, gas and electricity meters can also be connected. Magnetic switches (Reed switch), open-collector transmitters or pulsers with external power supplies are also compatible.

4.2 Analogue input

4.2.1 Input

Analogue values (i.e. pressure) are converted into proportional electrical values by sensors.

CDL pressure sensors are specially adapted and require no external power supply so they can be connected directly to the analogue input of the CD-Logger.

Other sensors with standard current output, (0/4...20mA) are connected to the analogue input by special connecting cables (CDL current interface). These sensors are not powered by the logger and need an external power supply.

4.2.2 Conversion

The sensors current is periodically sampled in the analogue to digital converter and converted into a numerical value from 0 to 1024.

The measuring interval between these samples can be selected. Longer measuring intervals produce less data and consequently takes longer for the memory to fill.
4.2.3 Recording

The deviation from the last-recorded measured value, which causes the new value to be recorded, can be programmed. It can range from 0.2/1024 to 1024/1024 of the set measuring range. Larger deviation settings mean that less is put into memory. This extends the recording capacity.

Note:
Extremely short measuring interval settings and small deviation settings can, depending on the input signal, fill the memory very quickly (min. 3 hours!). The memory suffices for 1 to 3 months or longer with normal settings. Optimum memory usage is obtained by the selection of suitable parameters:
- short measuring intervals and large deviation settings for short-term events, e.g. tests for pressure surges
- long measuring intervals and small deviation settings for statistical recordings, e.g. level measurement

4.2.4 Downloading

Downloading transfers the recorded data from the memory to a computer via the serial port like RS232 or USB. The data can be saved on hard disk for later evaluation.

5 COMPONENTS

5.1 CD-Logger

!!! Please refer to ML1260e !!!

5.2 Evaluation Software CDLWin
For programming, downloading and evaluating all CD-Loggers
CD software incl. manual in English

5.3  CDL/PC-Connection Cable

To connect the CD-logger with the serial interface of a personal computer:
- CDL-PC CABLE

5.4  CDL-Installation / Introduction

Installation of the software, introduction for the operation staff
½ day, location as agreed.

5.5  Pulsers

Different pulsers fitted with the CDL-pulse plug for Sensus water meters are available:
- HRI-A3-CDL  HRI pulser incl. pulse plug for domestic water meter
- HRI-Mei-CDL  for MeiStream bulk water meter incl. pulse plug
- Pulser RD022 Reed RD incl.pulse plug (old generation of C&I meters)

5.6  CDL-Pressure Sensors

CDL-pressure sensors are available in different pressure ranges:
- CDL-pressure sensor
  - CDL-DS  0...10 bar  1/4"
  - CDL-DS  0...20 bar  1/4"

5.7  CDL- Current Interface

All standardised sensors (pH value, magmeter etc.) can be connected to CDL-loggers using the CDL current interface. The power supply of the sensor circuit does not come from the logger.
- CDL-current interface  CDL-IF  0...20mA
- CDL-current interface  CDL-IF  4...20mA

Other accessories are found in the leaflet LS6400

5.8  Basic equipment

5.8.1  Flow measurement with Sensus Domestic water meters:

<table>
<thead>
<tr>
<th>HRI-A3 CDL</th>
<th>CDL-1U</th>
<th>CDL/PC</th>
<th>CDLWin</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRI pulser incl. pulse plug</td>
<td>Data logger with 1 input</td>
<td>Connection cable</td>
<td>Evaluation software</td>
</tr>
</tbody>
</table>

In addition, an IBM-compatible PC with a printer is required (see 5.2.1).
5.8.2 Flowrate and pressure meas. w/ COSMOS bulkwater meters:

- HRI-Mei-CDL: HRI-Mei pulser incl. pulse plug
- CDL-2U: Data logger with 2 inputs
- CDL-DS: Pressure sensor range 0...10 bar
- CDL/PC: Connection cable
- CDLWin: Evaluation software

6 Getting started

6.1 Evaluation software

6.1.1 CDLWin Software

CDLWin is the communication and analysis software for the COSMOS-DATA-LOGGERs.
CDLWin includes the following functionalities:

- Programming of the new loggers
- Downloading of the measured data files of the new loggers
- Evaluation in graphical and tabular analysis of the data files, combining of logger channels
- Online-Monitor
- Export of measuring files for further use with spreadsheet programs etc.
- Remote Communication

6.1.2 System requirements

To use the CDLWin software you need at least:

Minimum hardware requirements:
- System RAM: minimum as required by the operating system used.
- Serial Port or USB Port for connecting the CDL device
- Screen resolution 800x600 or higher

Minimum software requirements:
- Windows™ 2000/XP/Vista/Win7
- Administrative privileges on the system (only during the installation).
- .NET Framework
- Available serial port (if a computer has only USB ports an additional USB-serial adapter is needed!)

---

CDLWin 4 requires .NET Framework to be installed on the target computer:
- .NET Framework 3.5 SP1 (Service Pack 1) is required for .NET Framework 3.5 or
- .NET Framework 4
CDLWin requires full .NET Framework, the distribution "Client Profile" of the .NET Framework is not sufficient. If you are using the "Client Profile" distribution of the .NET Framework CDLWin will not support printing and exporting. Please replace the "Client Profile" distribution with full .NET framework.

It is assumed that you have a fundamental understanding of Windows. If not, it is suggested that you work through some of the demonstration programs provided with Windows. You may also consult the Windows manual.
6.1.3 Installation

The installation of the SensusREAD on the PC is fully automated and controlled by the setup program. This step is simple and no problems should occur.

6.1.4 CDLWIN at Windows XP:

- Install CDLWinxxxx.exe from your installation media
- click OK

Select your language

- Enter the password: This is the version no!
  - E.g. if it is CDLWin4050 it is 4050
If you accept CDLWin will also install Sample data. This is required as this allows to do some trial evaluations without having first data files from your CDL-Logger. This is required to have an easy start.

### 6.1.5 Getting started

It is assumed that you have a fundamental understanding of Windows®. If not, it is suggested that you work through some of the demonstration programs provided with Windows. You may also consult the Windows manual.

Under WINDOWS, the program can be started:

```
START>>>PROGRAMS>>>CDLWIN
```

A click on the „CDLWin“- symbol in this program-group starts the program:
6.1.6  Software License

Unregistered Version
Unregistered version can only be used for 60 days. After expiring the unregistered version period, you have to uninstall the software or register it. Unregistered version is fully functional, please see also

Registration
Every time you start unregistered version of the software, About dialog is shown and you can register the software using the page Licenses. At any time or if you want to change your existing license, please display the About dialog using the File Button | About command and select the page License.

The license is linked to the unique PC hardware ID, please run the registration process exactly on the PC where you want to use the software.

If you need license for more computers, repeat the following procedure on every PC:
- Install the unregistered version
- Request the license file
- Load the license file

To request a license file, click on the button "Send License Request" button. Fill in your registration request data and send the request through email on the suggested email address.
License Owner: It is recommended to use your company name. If you plan to purchase more licenses please use always the same license owner.
Serial Number: Please fill in the CDLWin product serial number delivered from Sensus. The number has format A00AA000000A and can be found on the installation CD cover. Leave empty if you don't have this number.
PC Hardware ID: Generated by the software, it is a unique PC identification number.

After receiving the license file please start the software again and click the button "Load License file". At the first time the software will ask for registration.

6.1.7  On-line Help

Please pay attention to the ? symbol in the upper right of the menu line of the main menu. During processing this extensive on-line help is at your disposal at any time. The help information is context sensitive. We recommend using this on-line help, as you have quicker access than by consulting the manual.

Update installation
If an existing CDLWin installation has to be updated, the procedure is the same as for first time installation. The settings
in the existing configuration are automatically used. If the configuration is changed, the new values have to be set in the configuration menu. The existing data files will remain on the fixed disk and can be used with the new version.

6.1.8 First Evaluations

To do the first evaluations it would be necessary to install the data logger to capture some data. To enable a first try run in evaluations CDLWin has some sample files which are offered to be copied during the installation process.

If a training is needed we suggest to jump to Chapter "Evaluate" and try to get results. We recommend to use the sample files and create evaluation curves like in shown in the introduction Chapter at the beginning of this manual.

6.2 Connection of the CD-Logger to the computer

The COSMOS-DATA-LOGGER is connected to the computer with the CDL/PC connection cable for programming and downloading. The concentric plug and socket of the cable is plugged into the CDL jack „Readout device“. The flat 9-pin plug is connected to the serial port of the computer. Depending on the make of computer, it is designated „COM1, COM2, serial interface, V24/RS232“ or something similar. Further details can be found in your computer instructions.

If your computer has only USB ports you need a USB-to-serial converter cable which is available at your computer shop. Or you use alternatively a direct USB cable.

Please check which serial port is supported. Usually you need to select COM5…COM8 at this case.

7 Programming
7.1 Programming

If older CDL-1D, CDL-2D, or CDL-DA loggers are used, CDLWin activates the previous CDL-AS software. Please refer to the CDL-AS manual for detailed information.

For programming, click [Programming] in the main menu.

If the installed loggers are installed on a modem connection or another Remote link you have to go for this. In this case, a direct cable-linked logger is selected with Logger direct.
After successful selection, the **Logger Programming** window appears:

The screen is divided into standard logger data (left side) and the channel programming (right side).
### 7.2 Standard data

First the standard logger data are entered:

<table>
<thead>
<tr>
<th>Logger</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td>Michael</td>
</tr>
<tr>
<td><strong>Site</strong></td>
<td>Andre</td>
</tr>
<tr>
<td><strong>Logger ID</strong></td>
<td>Loetzen</td>
</tr>
<tr>
<td><strong>Comment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ROM ID</strong></td>
<td>08/01/97</td>
</tr>
<tr>
<td><strong>Logger status</strong></td>
<td>No error</td>
</tr>
<tr>
<td><strong>Memory used</strong></td>
<td>100 %</td>
</tr>
<tr>
<td><strong>Memory type</strong></td>
<td>Scrolling</td>
</tr>
<tr>
<td><strong>Daily period</strong></td>
<td>0 - 24</td>
</tr>
<tr>
<td><strong>First value saved</strong></td>
<td>13.11.2011 12:51:36</td>
</tr>
<tr>
<td><strong>Last value saved</strong></td>
<td>12.03.2012 00:00:01</td>
</tr>
<tr>
<td><strong>Date and time</strong></td>
<td>12.03.2012 14:18:51</td>
</tr>
<tr>
<td><strong>Communication interface</strong></td>
<td>COM1.2</td>
</tr>
</tbody>
</table>

The following is valid:

- **Area**: alphanumeric, 8 digits - Used to name the data files
- **Site**: alphanumeric, 8 digits - in order to make it easier
- **Logger ID**: alphanumeric, 8 digits - to identify them
- **Comment**: alphanumeric, 2 lines each with 16 digits as additional information
- **ROM ID**: indicates the Firmware version
- **Logger status**:
  - active - the data logger has been, or is activated for measurement.
  - inactive - the data logger will not record any values. A way of lowering the power consumption when the logger is not in use.
- **Memory used**: Shows the already used memory
- **Memory type**: Scrolling - if the memory is 100% full, the oldest data is overwritten with the new values.
  - Block - if the memory is 100% full, the new values are not recorded any longer.
- **Measuring period**: Start and end dates of planned measuring. The earliest date allowed is the current day
- **Daily period**: Beginning and end adjustable between 0 and 24 hours in full hours. Daily measurement only takes place during the selected measuring period.
- **First saved value**: The first measurement value which has been stored
- **Last saved value**: The last measurement value which has been stored
- **Date and time**: The logger uses the system time of the computer. The internal time of the logger is shown and updated in 15 second intervals.

**Note:** If Error is shown at the logger status, details can be found under Info. The cause of the error has to be removed before further programming, otherwise error free processing cannot be guaranteed.
# 7.3 Channel programming - Pulse

First the standard data are to be entered:

<table>
<thead>
<tr>
<th>Channel mode:</th>
<th>Selection depends on whether the channel is installed for impulses (pulse) or analogue values (analog).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel name:</td>
<td>alphanumeric, 8 digits</td>
</tr>
<tr>
<td>Channel note:</td>
<td>alphanumeric, 16 digits serves as identification and additional information</td>
</tr>
<tr>
<td>User comments:</td>
<td>alphanumeric, 250 digits</td>
</tr>
</tbody>
</table>

### Pulse:

<table>
<thead>
<tr>
<th>Operation:</th>
<th>The incoming pulses are received and recorded</th>
<th>disabled</th>
<th>This channel is barred. The incoming pulses are not recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter reading:</td>
<td>The counter reading can be set, for example, to synchronise measurement between an installed water meter and the data logger.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse unit:</td>
<td>The required unit can be chosen from the list of the possible units, (complete list with ( \beta ))</td>
<td>Units</td>
<td>Clicking switches to unit management, e.g. to add new units</td>
</tr>
<tr>
<td>Predivider:</td>
<td>In order to save on memory usage, a predivider can be used. For incoming pulses with frequencies ( &gt;10 \text{Hz} ), a predivisor should also be used. The value can be ( 1 \ldots 9999 ). If, for example, a predivisor of 50 is chosen, only every 50th pulse will be stored. The period of time available for recording will increase 50-fold. The pulse priority (see below) can be changed to fit the configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse value:</td>
<td>Here the pulse value of the installed pulser is fixed. 8 digits are valid, including decimal symbols. The pulse value will be changed accordingly, if the predivider does not equal ( .1 ).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate unit:</td>
<td>The flow rate unit can be chosen from the list of all possibilities. Additional engineering units can be entered here, which you may wish to work with.</td>
<td>Units</td>
<td></td>
</tr>
</tbody>
</table>
7.4 Channel programming - Analogue

First the standard data is entered:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel mode</td>
<td>Selection depends on whether the channel is installed for impulses (pulse) or analogue values (analog). Depending on your choice, the following points change:</td>
</tr>
<tr>
<td>Channel name</td>
<td>alphanumeric, 8 digits</td>
</tr>
<tr>
<td>Channel note</td>
<td>alphanumeric, 16 digits serves as identification and additional information</td>
</tr>
<tr>
<td>User comments</td>
<td>alphanumeric, 250 digits</td>
</tr>
<tr>
<td>Analogue</td>
<td>The required unit can be chosen from the list of the possible units. (Complete list with ß)</td>
</tr>
<tr>
<td>Operation</td>
<td>enabled The incoming values are received and recorded</td>
</tr>
<tr>
<td>disabled The channel is disabled. Incoming values are not recorded</td>
<td></td>
</tr>
<tr>
<td>Lower value</td>
<td>The lowest value of the installed sensor is entered. Example: for a pressure sensor with 0...10bar =&gt; 0bar.</td>
</tr>
<tr>
<td>Upper value</td>
<td>The upper value of the installed sensor is entered. Example: for a pressure sensor with 0...10bar =&gt; 10bar. Note: for sensors which measure in both directions, e.g. temperature sensors -50...0...+50°C, the lowest value is 0 and the highest +50°C. Because of the polarity of the input voltage, the data logger recognises a negatively measured value (e.g. negative temperature). During the analysis the reversed direction is indicated with the appropriate negative sign.</td>
</tr>
<tr>
<td>Analogue unit</td>
<td>The incoming values are received and recorded</td>
</tr>
<tr>
<td>Measuring interval</td>
<td>The measurement frequency is selected. Possible values are 0.1 sec...min...24hours. The time period available for recording reduces with increased measuring frequency. A short measuring interval is recommended for recording fast changes like pressure shock waves. Slow changes such as temperature, should be recorded with a larger interval.</td>
</tr>
<tr>
<td>Memory threshold</td>
<td>The data logger measures the incoming signal in unison with the measuring interval, but recording of the new values only takes place if the new value differs</td>
</tr>
</tbody>
</table>
from the last recorded value by at least the memory threshold value. In order to save memory, the memory threshold can be changed. With a small memory threshold, every change will be recorded and saved. With a larger memory threshold, every change will be recorded, but will only be saved if it is higher than the memory threshold.

A value can be chosen between the lowest and highest value. If „0“ is chosen, every change will be recorded.

A value will be pre-defined by the program itself after fixing both the lowest and highest value. This pre-setting is suitable for most applications.

The screen is divided into standard logger data (left side) and the channel programming (right side).

7.5 Further Programming Possibilities

7.5.1 Programming and downloading-Password

During programming and downloading, passwords can be assigned to the CD-Loggers. Programming and downloading is only possible after entering the password. This prevents unauthorised persons from re-programming or interrogating the logger. This protection is especially recommended, if several people can have access to the logger, for example over a telephone modem or network.

In the window for altering the logger passwords, there are three text fields both for download and programming passwords. In the top one you enter the old password, in the field below the new password is entered and then entered again in the lower field as confirmation. If you do not want to alter the password, do not enter anything in the three fields.

You can delete a password by leaving the two fields for the new password empty.

7.5.2 Set alarm parameters

For CDLWin software that has been delivered from the middle of 1996 onwards, alarm parameters can be set. Lower and upper alarm thresholds are pre-programmed. If these thresholds are transgressed, a contact (open-collector) is activated. With this contact it is possible to activate a remote alarm system that automatically calls the installed telephone central.
The channels of the logger work separately. For each channel you can enter:
Operation: active or inactive
upper and lower threshold

The time interval determines how long the thresholds have to be broken until the alarm is activated. For example 60 sec means that the pressure has to drop below the lower threshold for at least 1 minute before the alarm is activated. In this way you avoid false alarms caused by short spikes.

### 7.6 Installing the CD-Logger

Once the logger been programmed successfully, it can be disconnected from the CDL/PC connection cable. It can now be taken to the site and connected to the pulsers and sensors. The measurement starts at the pre-programmed time.

After installation the current value of the single channels can be displayed on the LCD display of the logger. In this way you can check immediately if the connected sensors and pulsers as well as the logger are functioning correctly.

Always keep unused connection ports protected with the protection caps!!!
8 Downloading

The measured data of the loggers can be downloaded during or after measurement. Usually the logger is connected directly to the PC with the CDL/PC-connection cable.

The Connection window appears, allowing a logger to be selected for communication. After selection, the procedure is the same as if the network option was not activated.

If no modem connection has been set up (status line on the bottom right displays: ‘Modem Offline’), CDLWin tries to set up a direct connection to a CDL logger by using the interface which was selected.
Selecting DOWNLOAD DATA opens the following window:

### Statistical values.

Only the logger parameters (daily and hourly values) are downloaded!

### Detailed values

The recorded measured data and the logger parameters are downloaded and saved on the harddisk.

#### 8.1 Download Data

If a CDL-4U is detected, the Download Window appears, showing the currently set logger parameters. The measured values of the logger can now be downloaded. You may choose if you only want to download the statistical data (daily and hourly values) or in addition, the extensive detailed data.

It is generally recommended to download all detailed and statistical values.

If you are downloading over a modem or radio connection, the cost factor might give reason for only transmitting daily or hourly values. With this method the average value of each hour is transmitted, as
well as the absolute maximum and minimum values. The time needed to transmit is considerably reduced, but in the subsequent analysis, the accuracy is limited to a minimum mean interval of 1 hour.

8.2 Correcting

If the programmed values of the connected sensors, like pulse value etc. were incorrectly programmed, these values can be corrected during downloading.

Click the ENABLE CHANGE-button and the values are changed. After correction click on . Now the corrected values are saved.

8.3 Evaluation

After downloading a note is displayed. You can change to the evaluation directly. All channels of the last logger to be downloaded are shown.
9 Evaluation

The graphical evaluation can be reached:

- EVALUATION.

If the graphical evaluation has been selected directly after downloading or from the management, the last downloaded or the marked file will be shown with all channels.

Evaluate

Graphics

Measured value table

9.1 Evaluate

Select files to be evaluated
Select graphical presentation
Period of time to be evaluated

9.1.1 Select files to be evaluated

On entering the graphical evaluation from the main menu, you select the channels to be shown in the CHANNEL SELECTION.
The upper screen shows the list of the files to be evaluated. By selecting with the mouse you mark the channels for the graphical presentation. Up to 6 channels can be marked. These 6 channels can be selected from different measurements.

9.1.2 Select graphical presentation

For each channel you can choose, whether you want to see the consumption (Con), the mean value (Avg.), the maximum (Max), the minimum (Min) or all values (All). The option All shows all recorded measured values, but might need enormous calculation times. This option should be used for detailed evaluations for short periods of time.

- For overview and most applications the Avg-option should be sufficient.
- For leakage control the Min-option can show the absolute minimum values.
- For determining pressure surges the Max-option can be helpful.
- For consumption calculations the Con-option is the best.

9.1.3 Period of time to be evaluated

The Period of time to be evaluated can be determined. „ALL“ has been preset, i.e. the entire time period of measurement.
9.2 Graphics

On selecting GRAPHICS a line graph is shown:

- menu bar
- icon bar
- graphical display
- selection buttons
- message line

9.2.1 Mouse control

With the mouse you can select every point of the graph. If a value on the graph been reached, the cursor changes from δ to á. By clicking the right mouse button the actual value of the selected point will be shown.

In addition to the zoom function the time axis (X-axis) can be clicked with the left mouse button in order to select the period of time to be presented more accurately. A window will be opened where you can enter the exact period of time to be evaluated.
Clicking with the left mouse button on the values axis (Y-axis) opens a window for changing the value scale:

The LABELS can be selected. When the label to be moved is reached, the cursor changes from ₀ to ₐ. Now the label can be moved as long as you keep the button pressed. In this way you can move and change all labels on the screen and change the size.

9.2.2 Legend

In the right upper corner of the screen the LEGEND is shown. If this legend gets in the way, it can be clicked off (and on) with the symbol or the button. If the legend is on, you can move it and change its size with the mouse.
### 9.2.3 Graph type

The standard pre-set graph type for all graphs is the line graph. One can select line, bar graphs or a pie chart. The pie chart can only be selected if one graph is displayed. **Note: Your choice will generally be accepted but a check to see if the choice is valid, especially in cases of multiple lines, will not be done!**

During evaluation you have various opportunities in the layout menu:

Clicking OK will transfer the settings directly to the current graph. 'Abort' will leave the settings unchanged.

### 9.2.4 Graphs

At first the selected graphical presentation appears. You can chose between consumption, mean value, maximum, minimum and all values.

For consumption graphs you select Consumption.

Most applications are done with the Mean Value.

To see only the peaks you chose Maximum.

Minimum is useful for leakage control.

The option All values shows every value. This displays very detailed information, but requires a long processing time and the graph can get quite confusing.

### 9.2.5 Grid lines

Horizontal and vertical grid lines can be shown or hidden with this function. The pre-set standard is to have both deactivated. Any change to the settings will remain until the next modification.

The horizontal lines are arranged according to the Y-axis scale and the vertical lines according to the time axis scale. Clicking OK will transfer the settings to the current graph. 'Abort' will leave the settings unchanged.
9.2.6  Colour setting

9.2.6.1  Background colours

The background colours of the graph can be changed with this function. Choose the desired colours and confirm your choice with OK. You will return to the graph with the new background colours. These settings will remain until the next modification.

Note: If the graph lines have the same colour as the background, they will not be visible.

Aborting from the colour change will leave the current colours unchanged.

9.2.6.2  Graph colours

The colour of each individual graph line, line thickness and style can be set with this function. Choose the desired colours and confirm your choice with OK. You will return to the graph with the new background colours. These settings will remain until the next modification.

Note: If the graph lines have the same colour as the background, they will not be visible.

Choose the graph colour you wish to change with the black frame. Click the ‘Change colour’ field and the colour selection window will appear. Choose a new colour and confirm by clicking OK. CDLWin will then return to the graph colour window in which the new colour will be set. Confirm all colour changes to the graph lines with OK. You will return to the current graph with the new colour settings.

Note: If the graph lines have the same colour as the background, they will not be visible.

Clicking the ‘Standard settings’ will reset the original values depending on what graph is displayed:

- The colour selection begins with black.
- Consumption graphs are set to line thickness 2.
- The analysis type 'all values' is set as line.
- Average value graphs are set to line thickness 4, minimum- and maximum graphs are set as line and all 3 graphs are the same colour.

If standard settings are active and channels are combined, the line thickness automatically changes for the graphs. The user can then determine what analysis type is displayed by looking at the line thickness and colour.

9.2.7  Labels

The graph title, Y-axis label and the time axis label can be entered with this option. The standard setting is the logger comment as the title. If there is more than one logger, the titles can be stacked. No title will appear if there is no comment. The sub-title will be in the form of Area/Site/Logger-ID.

The X-axis label is split into the left and right part. On the left is the displayed time period and on the right is the mean interval. The labels for the left and right Y-axes are blank.

All labels can be over-written. Confirming with OK will transfer the changes directly to the graph. Clicking 'Abort' will leave all settings unchanged.

All changes will be lost after leaving the graph.

9.2.8  Changing the scale

CDLWin sets the range of the Y-axis values according to the graphical data and the channel unit. These automatic settings take place when 'Standard' is set.. The value range and the scale unit can be custom set by selecting 'User defined':

- The Y-value range can be re-defined. A valid range must be entered, -the lower scale end must be
smaller than the upper scale end. All graphs related to the Y-axis will be adapted when confirming with OK.

- The given channel unit can be changed so long as the new unit is described in the unit manager. All graphs related to the Y-axis will be adapted when confirming with OK. Clicking 'Abort' will leave all Y-axis settings unchanged. The settings for the Y-axis are not saved and must be newly set for each graph, if changes to the standard settings are desired.

### 9.2.9 Marker

Vertical markers indicating the time value can be inserted into the graph with this function. The markers can be moved with the mouse to the desired measured values indicating the corresponding time value for the mean interval. Selecting 'Marker/Show' will display a coloured marker. The marker can be de-activated, in the order they were shown, using the 'Marker/Hide' function.

The marker can be shifted horizontally anywhere along the time axis. Click hold the left mouse button on the marker to be shifted and move the marker to its new position. Releasing the button will fix the marker position and the time value will be displayed.

The markers can also be shifted by the keyboard although somewhat more tediously. The options 'Marker/Shift right' and 'Marker /Shift left' move the last shown marker to the left or right by one time axis division.

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9.2.10 Statistical graphs

Statistical graphs allow the presentation of mean value and interpolated lines. The interpolated line shows a trend that can be used for planning.

9.2.11 Move

The displayed portion of the graph can be moved. This can be done in small steps or even by moving by a whole screen.

9.2.12 Zoom

There are different options available to display small parts of the graph:
- Zoom symbol
- Menu Edit-Zoom
- Clicking the time axis

9.2.12.1 Zoom symbol

By selecting the zoom symbol:

After clicking the (+)-symbol, the mouse marker changes into a + sign. With the left mouse button pressed down the part of the graph to be zoomed in on can be marked (→time axis!).

Clicking the (-)-symbol undoes the zoom in. In this way you can undo the four last zooms.
9.2.12.2 Menu Edit-Zoom

On selecting ENTRY in the menu you can enter the desired period of time manually. ZOOM (+) changes to the mouse selection (→Zoom symbol).

9.2.12.3 Clicking the time axis

Moving on to the time axis with the mouse, the pointer changes from ↓ to ↑. Now the time period can be selected manually by clicking the left mouse button.
9.2.13 Save graph

In the menu Edit-Save graph the presented graph can be saved. There are two possible file formats:

Windows Meta Files (WMF) normally have the better print quality.

If only WINDOWS (3.1 or 3.11) with Paintbrush or Windows 95 with Paint are available, you have to use the Bitmap (BMP) format.
9.2.14 Copy graph

In the menu Edit-Save graph the presented graph can be saved.

9.2.15 Activate a second time axis.

Enter the start time for the second time axis in this window. The first time it is called up, the start time for the previous first graph is displayed. After entering the start time and confirming with OK, the second graph will be displayed and the legend and table will be up-dated.

9.2.16 Resolution

With the icon bar or by menu selection Layout-Resolution you can determine the resolution.
9.3 Measured value table

The measured value table contains all the values displayed on the graph.

If all the values on the table do not fit onto the screen you can scroll or page to see the rest of the values. If there are more than four graphs you can also scroll horizontally to view the values of the rest of the graphs.

For the analysis type 'All values', the exact pulse time or the change in the analogue value is displayed. If many graphs are displayed and one of them is an 'all values' analysis type, then the time points will be sorted. Gaps will exist for those graphs which have no value for the indicated time.

The consumption column of a consumption table is always followed by a column with the counter readings. If it is an analogue channel then the counter start is usually 0.

If the mean interval is changed, the graph zoomed or the time period shifted, the table will automatically be adapted.
9.3.1 Mark

With the mouse you can select a line of the table. The marked area can be increased by keeping the mouse button pressed.

9.3.2 Copy

The marked area (see above) can be saved to the clipboard with Edit/Copy. In this way it will be available for other Windows applications.

9.3.3 Print

You can specify what you want to have printed:

- Graph
- Legend
- Statistical values
- Measured value table
- The further functions equal the functions of graphical evaluation.

9.4 Windows

The parallel presentation of the graph and measured value table is possible by selecting the WINDOWS function: The graphical presentation and the table can be shown on the screen together, above one another or side by side. Select the desired option in the Windows menu. The parallel presentation will be undone, when you click on the top right button in the window title line.
The statistical evaluation of each graph can calculate and display:
- the minimum value and the time that it occurs,
- the maximum value and the time that it occurs,
- the average value, and
- total consumption, when dealing with a consumption graph.

If a minimum or maximum occurs more than once, the time of the first occurrence will be displayed. The other time points can be called up on an information window which is opened with the window button to the right of the ‘Time’ field.

The statistics relate to the displayed time period!

When the time period or mean interval is changed, the resulting changed graph values will be automatically up-dated in the statistics.
9.6 Channel combination

A maximum of 6 graphs can be defined in the channel selection which can be displayed as 6 lines on one graph. Each of these graphs/lines is based on one channel. Channels can be combined and calculated together with constant values. You can combine a maximum of 4 channels with the addition and subtraction functions and one constant with the addition, subtraction, multiplication or division functions.

Example: Two water meters have been placed in ONE pipe. The graphs of both are pretty similar. Which meter is better and has counted more?

To answer this question the meters have to be shown subtracted. Therefore you change to the Channel combination.
The consumption graphs are subtracted and the following appears:

Every 3 hours the meter 1416 has counted about 0.2 m³ per day more than meter 1177!
With this function extensive pipe system calculations can be evaluated. Besides the flowrate, pressure measurements and the pipe friction factor can be calculated.
9.7 Export Data

The measured values of the channels displayed in the current graph can be saved as ASCII files for exporting to programs such as EXCEL for further editing. One ASCII file will be created for all displayed channels.

To use the exported ASCII files in Excel, the following must be done:

- Load Excel
- Select 'File/Open'.
- Select the drive to which the ASCII file was exported.
- Select the file type 'All files (*.*)'.
- Select the ASCII file and confirm with 'OK'.

Settings in the Text assistant (Step 1 of 3):
- Select 'Separate' for the original file.
- Begin Import in the first line.
- Select 'Windows (ANSI)' as the file source.
- Click 'Continue'.

Settings for the Text assistant (Step 2 of 3):
- Set 'Tab' for the separator symbol.
- Select '{None}' for the Tester symbol.
- Following should not be recognised as a separator symbol.

Settings for the Text assistant (Step 3 of 3):
- Select 'Standard' for the column settings.
- The text is displayed on the screen.

The row and column width as well as the justification (left, right, etc.) can now be set for the cells.

To set the correct date and time format for the fields with date and time, select 'Format/Cells'. In the 'Digits' folder select 'User defined'. Enter the date and time as follows: DD:MM:YY hh:mm:ss,00
DD:MM:YY stands for the date and hh:mm:ss for the time. If the time needs to measured in milliseconds then >> ,00 << must be added.

Should the values need to be corrected, the user must select the cells to correct or use the currently selected cells. Clicking 'Continue' executes the Graphic assistant. There the type of graph can be selected. If the graph is to be displayed in CDLWin, a 'line' graph must be selected and 'Continue' must be clicked. A format must then be selected for the graph. To achieve a graph layout similar to CDLWin, the line graph 2 or 10 should be selected.

After entering the individual settings for the graph (step 4 and 5), the graph is displayed.

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10 Measured data file management

10.1 Structure of file management

The data files are stored in a tree structure which offers an overview as well as easy management. It is also necessary to make an automatic update of the measurements possible. During downloading or copying of files from another disc, CDLWin checks if there is another file with the same identification. If it finds such a file with the same settings, the new data will be attached to the first file. In this way a long-time calculation with one single file is possible.

All CDL-measured data files are shown, that have been saved in the DATA-directory structure of CDLWin in the order: Area-Measuring site-Logger:

\[
\begin{align*}
\text{Data} & \rightarrow \text{Area} \\
& \rightarrow \text{Site} \\
& \rightarrow \text{Logger-ID} \\
& \rightarrow \text{Detailed data files} \\
& \quad \rightarrow \text{Daily values (DYS)} \\
& \quad \rightarrow \text{Hourly values (HRS)}
\end{align*}
\]

This structure will automatically be created during downloading. If you are importing CDL-AS files, you have to specify the area and the measuring site. The structure will be automatically transferred whenever you copy the files to another drive. Missing daily or hourly values can be created by using the detailed data files.

On selecting the measured data file management, all loggers for which data files had been created under CDLWin are displayed with channels and the latest date of detailed data files in a window.

10.2 Selection window

The screen of the selection window can be moved or rearranged by using:
- the scroll option on the right and lower edge of the window
- the PgUp, PgDn, Cursor Up and Cursor Down keys
- the sort option
- the search option.

10.3 Sort

The alphabetical organiser and the search engine ignore capitalised and other letters. A numerical sort is not possible. If numbers are used, a special order only is possible by using pre-zeros. The last sort selected will be recalled as preset for the next time logger-overview is entered.

10.4 Search

Above the selection window there are three different search fields, where you can specify area, measuring site or logger-ID.

10.5 Edit
### 10.5.1 Equalise DYS/HRS

All measured data files in the \DATA-directories are checked for consistency and completeness and equalised if necessary. Missing DYS- or HRS-values are rebuilt in order to keep the logger channel in a condition to be evaluated.

The Equaliser checks all \DATA-subdirectories. This can take quite a long time. A corresponding note will appear on selecting the equaliser function.

### 10.6 Logger files

#### 10.6.1 Delete...

All data files of the marked logger will be deleted after the safety check. The logger directory will be deleted. It is also possible to delete the relevant measuring site and area, if they are empty.

#### 10.6.2 Copy...

You have to specify the source drive. The target is preset to the program directory. In this overview the logger files of a selected drive are displayed. One or more loggers can be selected. Clicking 'Retrieve' copies the complete data of all the selected loggers from the source drive onto the harddisk under the data directory. Double clicking on a logger will also copy all the logger data. Clicking 'Abort' closes the overview window. If the file already exists on the harddisk, you will be asked if it can be overwritten. Confirmation with 'Yes' will overwrite the file. If 'No' is selected, the file will be skipped and the next file will be copied.

This function can also be selected from the icon bar.

#### 10.6.3 Save as...

Daily and hourly values and detailed data files of the selected logger are copied at the same time. You can choose the drive. If the \DATA directory does not exist, it will be created as well as the logger path. If there is not enough free memory on the disk, a new one is requested. Overwriting of an existing file has to be confirmed.

### 10.7 Logger and channel information

In the left half of the window all logger information is displayed, and the logger channel information is displayed in the right half. Depending on the type of channel (Pulse or Analogue), the relevant pulse or analogue information will be displayed. The information for one channel produces an independent, moveable window. The window can be moved where desired using the mouse.
10.7.1 User memo

The top half of the user memo window has up to five lines of text which is downloaded from the logger. Only the lower memo containing additional messages, which is not saved in the logger, can be edited. Each of these 5 editable lines can be a maximum of 50 characters long.

10.7.2 Parameter correction

The correction of some logger and channel parameters in the data file information, is the same as in the Download window.

The correctable fields can be edited using the menu option ‘Edit/Correction’. The button on the toolbar can also be used for this purpose.

The following fields can be corrected:

Area Location of the logger, max. 8 character.
Site Logger site, max. 8 character.
Logger-ID Logger identification, max. 8 character.
Comment Two lines of logger commentary, max. 16 char. each.
Channel name Name of each channel, max. 8 character.
Channel commentary Comment for each channel, max. 16 characters

If the area, site and logger-ID parameters are changed, you may not alter the existing directory.

The following analogue fields can be corrected:

Lower value Smallest value of the measured value range.
Upper value Largest value of the measured value range. The resolution of the sensor is taken from this measured value interval.
Analogue unit The unit in which the values will be displayed. The Unit manager can switched to by clicking ‘Units’.

Changing the upper and lower values causes an automatic re-calculation of the memory threshold in the new resolution range.

The following pulse fields can be corrected:

Pulse unit Unit with which the channel values are displayed. The Unit manager can switched to by clicking ‘Units’
Pulse value The pulse value of a channel indicates which pulse unit value is recorded as measured pulse.
Flow rate unit Unit used by the channel. The entered unit must appear the unit management list ‘pulses/flowrate unit’. Clicking ‘units’ switches to unit management.

Changing the pulse value causes a re-calculation of the counter reading.

The corrected parameters can be saved using the menu option ‘Edit/Save correction’ Alternatively, the toolbar switch can be used.

The menu option ‘Edit/Discard correction’ discards the changes and restores the original parameters of the fields.

After saving the corrections, the logger is re-programmed with the new parameters. All existing data files will then be adapted to the corrected settings. If the area, site or logger-ID parameters have changed, you will be asked to confirm if the old files should be deleted. If they are not deleted, they will remain at your disposal.
10.7.3 Alarm parameters

The alarm parameters saved in the data file are displayed.

10.8 Evaluation

You can mark a file of the displayed loggers which then will be shown with another background colour. After clicking on Evaluation this data file will be evaluated. All channels of this file will be shown as line graphs.

11 Configuration

After selecting Configuration, the Configuration menu appears:
Now the different sub-functions can be executed:

### 11.1 Units

CDLWin has a central unit table which contains all possible logger units (measuring units) for pulse and analogue channels, the associated display units for evaluation and display quotients. If a conversion is possible, the consumption unit will refer to the consumption quotient.
The quotients are calculated using the following formulas:

**Pulse channel**

\[
\text{Counter quotient} = \frac{\text{Counter unit}}{\text{Measuring unit} / \text{s}}
\]

\[
\text{Consump. quotient} = \frac{\text{Counter unit}}{\text{Measuring unit}}
\]

**Analogue channel**

\[
\text{Counter quotient} = \frac{\text{Counter unit}}{\text{Measuring unit}}
\]

\[
\text{Consump. quotient} = \frac{\text{Consump. unit} / \text{s}}{\text{Measuring unit}}
\]

The unit table (compiled by HM) should be comprehensive for most cases and if not, additions can be made to the table by the user with the CDLWin configuration option.

The following entries may not be modified or deleted:

<table>
<thead>
<tr>
<th>Chnl</th>
<th>Meas. unit</th>
<th>Counter unit</th>
<th>Counter quotient</th>
<th>Consump. unit</th>
<th>Consump. quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>D/A</td>
<td>m³</td>
<td>m³/h</td>
<td>3600</td>
<td>m³</td>
<td>1.0</td>
</tr>
<tr>
<td>A</td>
<td>bar</td>
<td>bar</td>
<td>1.0</td>
<td>m³</td>
<td>3600</td>
</tr>
</tbody>
</table>

The following is also restricted:
Channel + Measuring unit + Counter unit form a characteristic ‘key’. This key may not be subsequently modified. When saving a unit, the program will check if the grouping Measuring unit and Counter unit or Measuring unit and Consumption unit already exists. If it does, the respective quotient will be compared. If the quotients do not correspond a warning message will appear where you may choose to cancel or continue with saving.

Reference is made to the unit table for all units used in CDLWin.

This concerns the programming and downloading of loggers as well as evaluation.
Only unit values defined in the unit table can be entered in the programming window. If the desired unit cannot be found, click the ‘Units’ button to open the Unit manager and enter the new unit. If this is not done, programming will be refused. When downloading a logger with at least one undefined unit, a warning will appear indicating the missing units. The downloaded procedure will not be affected. The evaluation of a channel is only possible if the values are defined. Should a unit be missing, it must be defined before evaluation continues.

11.1.1 Alter units

Under the menu point Configuration/Units/Edit single entries of the unit table can be created, altered or deleted. „NEW“ or „ALTER“ edits the currently marked table entry. Afterwards the following points are listed:
- Channel D/A
- Measuring unit
- Counter unit
- Counter quotient
- Consumption unit
- Consumption quotient

To edit an entry, a measuring unit is set according to the type of channel (D=pulse or A=analog), as well as the necessary counter unit and counter quotient. If consumption evaluations are to be done, consumption unit and consumption quotient also have to be defined.

Analogue channels often do not need consumption evaluations, e.g. with the measuring unit °C or bar. In this case the consumption quotient field simply remains undefined/empty.

If there are already quotients stored for the same combination of measuring unit and counter unit or measuring unit and consumption unit, CDLWin first checks for differences before saving. You are warned in case of different quotients. You can now decide if you want to abort the saving procedure or if you want to continue and save the changes.

11.2 Interface

This function configures the serial interfaces for direct communication with a CDL-1U/-2U/-4U/-B logger. The serial interfaces, port parameters, baud rate, parity, data bits and stop bits can all be configured. The correct settings for baud rate, parity data and stop bits for your hardware are already displayed.

If your computer has only USB ports you need a USB-to-serial converter cable which is available at your computer shop. Please check which serial port is supported. Usually you need to select COM5…COM8 at this case.

Note about the baud rate:
The pre-set baud rate is the starting point for the automatic baud rate selection. If no connection can be made to the connected logger, CDLWin try the next connection with a lower baud rate.
11.3 Drive

All the drives of your system will be listed in a selection window. Select the correct drive. The drive selection will be accepted if the DLOGGER directory is found on the drive. If not, an error message will appear. Cancelling from the drive selection will maintain the old settings.

11.4 Modem

CDLWin supports up to four different modem configurations. Either modem or interface initialisation configurations can be specified for the respective modems 1-4. The reason for configuring modem 1 and 2 is that they for example might be of different types or that the modems may be connected to different serial interfaces.
Information about the individual modems can be called up and modified by clicking the modem number. The header identifies the current modem and displays any desired notes about the configuration.

In the 'Initialisation' folder the command sequences for initialising each modem connection and disconnection sequence can be edited. The initialisation and connections for up to four individual sequences and the disconnection of two individual sequences can be set.

Single sequences can also usually be combined (Example: for a Hayes modem AT Q0 and AT E0 are combined to form AT Q0E0). The combined sequence will then be recognised as a single sequence. Generally, critical commands such as re-setting the modem or connection using the 'Connect' command should be entered as single sequences.

In the command sequence there are certain symbols with a special meaning; a place marker for a 'phone number, a 0.7s transmission pause and a line ending. Clicking the 'Substitution table' will display all the symbols with instructions for their use and their meanings. The symbols used can be changed. The substitution table is valid for all modems (Nr. 1-4). The 'meaning' field is purely informative.

The answer sequences, which are expected as verification are very important. If the modem has to quit a command sequence, the answer sequence has to be entered. If the modem answers with the incorrect answer while connected, CDLWin will indicate an error and end the connection.

The complete answer does not have to be entered, part of it is sufficient. Example; if a modem answers with 'CONNECT 9600' and you enter 'CONNECT' as the answer, CDLWin will accept the answer.

In the 'Port parameters' folder, all settings for the serial ports can be defined for the modem.

The maximum baud rate will be used for the first test connection. If there is a bad connection it is possible that the modems will automatically communicate with a lower baud rate. Remember that the baud rate is not determined by the maximum baud of the modem but rather that of the logger!

Clicking the ‘Save’ button will save all changes to the four modem configurations.

<table>
<thead>
<tr>
<th>Modem command</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT Z CR</td>
<td>Modem reset for declared conditions.</td>
</tr>
<tr>
<td>AT E0 CR</td>
<td>The modem should not send an „echo“ signal.</td>
</tr>
<tr>
<td>AT Q0 CR</td>
<td>The modem should use simple answers.</td>
</tr>
<tr>
<td>AT X0 CR</td>
<td>The modem should not wait for a dial tone when dialling. This parameter is necessary when using company networks.</td>
</tr>
</tbody>
</table>
An international modem will normally work with these settings without any problems. If you are using such a device, skip the following points and move on to saving parameters.
Transmission problems may arise if for example an ELSA modem (has some different commands) and an international modem are connected. This is not a modem error but is caused by the different standards in use.

Catchwork: transmission mode V.XXXX acc. CCITT
AT %L0 CR The modem should not use the CCITT-recommendation V.100 (possible fallback to 300 baud).
AT &G4 CR Guard-tone and dial-tone off.

Saving parameters (Important!! Absolutely necessary !!):
AT &W CR The modem must save the new parameters into the non removable memory. Without this command the modem will „forget“ the parameters when it is „reset“ (Power off or AT Z CR).

11.5 Logger address

All CD-Logger connections are managed in this menu. An overview of all the possible connections with additional information will be displayed.
This menu is in the configuration menu:

The addresses are displayed and may be modified or deleted:

In the configuration window you can select the communication settings (serial port, baudrate, initialisation) for each of the four possible modems and command codes for connection and disconnection.
All modifications will be saved when leaving with <SAVE>.
All pauses have to be inserted. These pauses have to be used after receiving a modem answer and before sending the next commands.

Overview of special characters:
The | character (Alt 92) closes a command code.
The ~ character causes a 0.7 sec pause before the next character is sent to the PC.
The * character is a space holder for the dial number. This character is replaced by the telephone number.
Configuration of special characters

For the modem commands there are special characters used as indicators for transmission tracing, representative of telephone numbers, and for executing commands. These special characters correspond to the Hayes command code. If the commands differ from the modem used, these characters can be modified. The special character settings are valid for each of the four modems. All settings may be modified.

Special characters: all ASCII characters 32-126 and 179-218 allowed
ASCII value: all characters 32-126, 179-218, 129, 132, 142, 148, 153, 154
<br /> <code>&lt;Abort&gt;</code>: will disable the new settings
<br /> <code>&lt;OK&gt;</code>: will save the settings in the memory

The status of these characters is only valid for command codes, not for the answers. Please differ between capital and small letters.

If the answer after sending a command code does not follow as expected, the next communication will be interrupted and an error message will be displayed.

Note: Name/Type of modem may entered with up to 40 alphanumeric letters.
Meaning is a description of max. 23 characters.
Answer commands according to Hayes command code.
Sequence may be up to 18 characters according to Hayes command code.

12 Printing

12.1 Printer setup

Depending on the selected data, you can print:
- everything,
- only the highlighted range or
- multiple consecutive pages.

Select the respective ranges or enter the page numbers to be printed.
If your printer supports different print styles and fonts, you can select a font from the Print quality field. Multiple copies can also be printed. Enter the number of prints in the Copies field. The pre-set value is one.
The print function is selected by clicking the printer icon. Now you can specify what is to be printed:
In order to get large graph print, all other prints should be unselected. Also the format should be defined as A4 (Landscape).

Printing will commence by clicking the OK button. Selecting CANCEL will return you to the previous window without printing.

12.2 Page layout

The margins and the position of the print on the paper can be adjusted as desired. Enter the values required for the margin and then click the 'OK' button to save the values permanently. If 'Cancel' is clicked the entered values will not be realised. The pre-set standard margins will be over-written by the custom setting when 'OK' is selected.

13 Optional applications
13.1 On-line monitor

From the main menu you can enter the on-line monitor by selecting options.

The current measured values of logger types CDL-1U/-2U/-4U/-B can be directly displayed on the screen with the on-line monitor, whereby a logger is simulated. A maximum of all 4 logger channels can be displayed. The displayed values will depend on the channel types and if they were programmed as pulse or analogue channels. Up to 4 values can be combined per graph.

13.1.1 Configuring the on-line monitor

After successful connection the following configuration menu appears:

The header contains brief information about the current logger (Area, Site, Logger ID and Commentary).

The download interval (in seconds) can be set to range between 1 to 10000s. The pre-set value is 5s. The scale of the time axis will determine the time spacing on the time axis. The time axis scale must always be 10 to 75 times greater than the download interval.

At least one channel must be assigned to a graph. Each graph is automatically assigned an active channel from the logger. Inactive channels are ignored. If less than four channels are available then the relevant graphs will remain empty. Graphs which have no assigned channel, will not be displayed.
All active logger channels are displayed in the channel selection list where they can also be selected. By entering an empty line or deleting a field, the channels can be deleted. Up to four channels can be combined on one graph (addition, subtraction) as well as a constants (addition, subtraction, multiplication and division).

The units can be selected from the list of units offered in the unit manager editor. Pulse channels will use the unit programmed into the logger. Values cannot be displayed without having been assigned a unit.

Upper and lower scale values can be defined for each graph. For analogue channels the value used is the programmed scale of the active logger and for pulse channels the minimum is 0 and the maximum is the upper limit of the display quotient.

A total of four different scales can be used (combination of unit and upper and lower scale values), where the different scales have their own Y-axes.

'Return' will return you to Options

'Graphics' changes to the graphical presentation of the configured graphs.

### 13.1.2 Graphical presentation of the on-line monitor

After calling up the graphic CDLWin starts to download and display immediately:

![Graphical presentation of on-line monitor](image)

Should the entered download interval not be valid, the download and presentation will not be possible. A message will be displayed in the lower left corner of the graph which displays the extent to which the time scale is exceeded. If the time is often exceeded then the download interval should be increased as the continuity of the presentation cannot be guaranteed in this case. Please note that a variety of windows functions ensure the continuity of the entire system and the download and presentation.

The graph can be edited in the following ways:

- **Printing**
  Print the current graph with the legend.

- **Save/Copy graph**
  Save the current graph and legend as a file. You have the opportunity to select the graphics format:
  - Windows metafile format, the graph can be enlarged while the resolution remains constant, or
  - bitmap format. If desired, the saved graph can also be edited by graphic editing programs.
  Copy graph will put the graph into the clipboard.

- **Stopping/starting the download**
The downloading can be stopped or started with this function. As it is possible that the time interval may not be adhered to if the download is stopped, a download stoppage is generally indicated on the graph as a vertical red line.

You need this function in order to edit the graph in any other way.

The layout of the graph can be modified as follows with the menu option 'Layout' :
- Grid line selection: Vertical and/or horizontal grid lines can be activated or de-activated.
- Absolute / relative time presentation: Change the labelling of the time axis scale between absolute and relative (Start point 0) time values.
- Background colours: Changes the background colours of the graph.
- Graph colours: Changes the colour of the graph lines.
- Labels: Specify titles and axis labels.

The simultaneous display of a graph and a value table is possible with the 'Window' function:
The graph and table can be displayed simultaneously either above and below each other, or side by side. Select either Window/Split horizontal or Window/Split vertical. The simultaneous display is cancelled by clicking the extreme upper right button on the window header.

The following branches are available:
- Table of values: Tabular display of the measured values for any graph.
- Return: Return to configuring the on-line monitor.

### 13.1.3 On-line monitor values

The measured value table contains all the values displayed on the graph.

If all the values on the table do not fit onto the screen you can scroll or page to see the rest of the values. If there are more than four graphs you can also scroll horizontally to view the values of the rest of the graphs.

The first column contains the measuring time points, either as absolute or relative times depending on the graph setting. The table will automatically adapt when changing from absolute to relative time setting or vice versa. The fixed values from the graph are displayed in the other columns.

---

**Table: On-line monitor values**

<table>
<thead>
<tr>
<th>Time (mm:ss)</th>
<th>Curve 1 Average (nM)</th>
<th>Curve 2 Average (nM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.56.1988 00:00:00</td>
<td>1.4000</td>
<td>4.3000</td>
</tr>
<tr>
<td>13.56.1988 01:00:00</td>
<td>1.5000</td>
<td>4.3100</td>
</tr>
<tr>
<td>13.56.1988 02:00:00</td>
<td>1.6000</td>
<td>4.3200</td>
</tr>
<tr>
<td>13.56.1988 03:00:00</td>
<td>1.7000</td>
<td>4.3300</td>
</tr>
<tr>
<td>13.56.1988 04:00:00</td>
<td>1.8000</td>
<td>4.3400</td>
</tr>
<tr>
<td>13.56.1988 05:00:00</td>
<td>1.9000</td>
<td>4.3500</td>
</tr>
<tr>
<td>13.56.1988 06:00:00</td>
<td>2.0000</td>
<td>4.3600</td>
</tr>
<tr>
<td>13.56.1988 07:00:00</td>
<td>2.1000</td>
<td>4.3700</td>
</tr>
<tr>
<td>13.56.1988 08:00:00</td>
<td>2.2000</td>
<td>4.3800</td>
</tr>
<tr>
<td>13.56.1988 09:00:00</td>
<td>2.3000</td>
<td>4.3900</td>
</tr>
<tr>
<td>13.56.1988 10:00:00</td>
<td>2.4000</td>
<td>4.4000</td>
</tr>
<tr>
<td>13.56.1988 11:00:00</td>
<td>2.5000</td>
<td>4.4100</td>
</tr>
<tr>
<td>13.56.1988 12:00:00</td>
<td>2.6000</td>
<td>4.4200</td>
</tr>
<tr>
<td>13.56.1988 13:00:00</td>
<td>2.7000</td>
<td>4.4300</td>
</tr>
<tr>
<td>13.56.1988 14:00:00</td>
<td>2.8000</td>
<td>4.4400</td>
</tr>
<tr>
<td>13.56.1988 15:00:00</td>
<td>2.9000</td>
<td>4.4500</td>
</tr>
<tr>
<td>13.56.1988 16:00:00</td>
<td>3.0000</td>
<td>4.4600</td>
</tr>
<tr>
<td>13.56.1988 17:00:00</td>
<td>3.1000</td>
<td>4.4700</td>
</tr>
<tr>
<td>13.56.1988 18:00:00</td>
<td>3.2000</td>
<td>4.4800</td>
</tr>
<tr>
<td>13.56.1988 19:00:00</td>
<td>3.3000</td>
<td>4.4900</td>
</tr>
</tbody>
</table>

**Editing:**

1. Printing using 'Edit/Print'
The table can be partially or completely printed. Partial printing is only possible if you highlight the columns and rows you wish to print as a print range using the ‘Print selection only’ function from the print window.

2. Simultaneous display of the graph and table using 'Window'
   The graph and table can be displayed simultaneously either above and below each other, or side by side. Select either Window/Split horizontal or Window/Split vertical. The simultaneous display is cancelled by clicking the extreme upper right button on the window header.

3. Clicking 'Graphics' will return to the graph.
4. Clicking 'Return' will return you to the configuration of the on-line monitor.

13.2 Programming and downloading by modem

13.2.1 Description

CDLWin programming and downloading by modem

Usually the CD-Loggers are directly connected to a PC by CDL-connection cable for downloading and programming. If there are long distances between the logger and the PC where the data is processed, it may save money and be more practical to program and download the logger by modem. There is one „calling” modem and one or more „called” or remote modem(s). These modems link the CD-loggers to the PC over the telephone network. They enable the connection and modulate and demodulate the data for transmission. Modem is the abbreviation for modulator and demodulator.

Possibilities

Two modes are supported:

Manual mode
This mode connects one CD-Logger to a PC by modem. Using „Modem connection” in the ‘Options’ menu will enable the connection of a PC to one modem with one (or more using CDL-network) CD-Logger. After connection the procedure is the same as for a directly connected CD-Logger connected by CDL/PC cable. After downloading or programming the logger it is necessary to „Disconnect” the modem in the communication menu or else the telephone line will stay busy. This mode is useful for one-time connection or for service purposes.

Automatic downloading of CD-Loggers
In this mode it is possible to automatically connect a number of modems with connected loggers. The CD Loggers to be downloaded can be selected.
The settings can be changed to clear the data memory of the CD-Logger after successfully downloading, or to keep the recorded data after downloading. The download time can be set e.g. for downloading during the night. The automatic downloading may be viewed on screen, printer or in a file. Various modems can be used. Four different modems can be configured at the same time. Modems with Hayes compatible commands are required.

### 13.2.2 Requirements for a modem used with CDLWin

Generally all completely Hayes-compatible devices can be used for remote downloading and interrogation of CD-loggers with CDLWin’s „Modem connection“ option. Most non-compatible modems can also be used because their parameters can be set to be compatible. In case of any problems, please call us. The requirements for usable modems are as follows:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>2400 Baud or more (recommended 19.2 kBaud) (see appendix: Firmware updates in the CD-Logger family)</td>
</tr>
<tr>
<td>Data format</td>
<td>8 Data bits, odd parity, 1 stop bit</td>
</tr>
<tr>
<td>Control mode</td>
<td>Hayes-AT-commands (otherwise see above) auto-answer</td>
</tr>
<tr>
<td>Serial port</td>
<td>25 pin. sub D, coded acc. RS232C</td>
</tr>
<tr>
<td>Dial mode</td>
<td>according the telephone network used (tone or pulse)</td>
</tr>
<tr>
<td>Power supply</td>
<td>external (mains supply)</td>
</tr>
<tr>
<td>Water protection</td>
<td>as determined by the environment. e.g. a water tight casing may be necessary</td>
</tr>
</tbody>
</table>

### 13.2.3 Configuration of the called (remote) modems

The called modem is the modem connected to the logger. The modem will be called from another modem (at the PC) for communication. The called modem should automatically answer the call. This is an „Auto answer“ modem. The modem has to be configured for this mode. This configuration will normally be saved and the configuration will not be lost when the power is switched off.

After the modem has been connected to the serial port of the PC, the commands need to be set using a terminal program that comes with the modem (Kermit, Vterm, Procomm etc.). If not, terminal software e.g. „TERMINAL“ or „HYPERTERMINAL“ from WINDOWS can be used. We recommend the use of 8 data bits, odd parity and one stop bit. The baud rate depends on the possible speed of the modem. The commands are:
### Optional applications

<table>
<thead>
<tr>
<th>Modem command</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT Z CR</td>
<td>Modem reset for declared conditions</td>
</tr>
<tr>
<td>AT E0 CR</td>
<td>The Modem should not send an “echo”</td>
</tr>
<tr>
<td>AT S0=1 CR</td>
<td>The Modem should answer after the first ring. Note: From now on a light may indicate „AA” (Auto Answer)</td>
</tr>
<tr>
<td>AT B0 CR</td>
<td>Modem should use the CCITT standard.</td>
</tr>
<tr>
<td>AT Y1 CR</td>
<td>„long distance disconnect“</td>
</tr>
<tr>
<td>AT S21=128 CR</td>
<td>The modem register No. 21 will be set to 128. (This command controls the RS232 serial port.)</td>
</tr>
<tr>
<td>AT Q1 CR</td>
<td>The Modem should not send return commands and should not confirm the commands. Note: From now on it seems that the modem does not react any more, which is correct as it does not give any answer as commanded!</td>
</tr>
<tr>
<td>AT &amp;W CR</td>
<td>Save the new parameters in its non-removable memory.</td>
</tr>
<tr>
<td>AT Z CR</td>
<td>Modern reset to check the newly set parameters.</td>
</tr>
<tr>
<td></td>
<td>Rem1: After resetting, the „AA“ (Auto Answer) light must illuminate again! If not it is possible that the modem used may use different basic settings („start profiles“). In this case all settings have to be done again and before sending AT Z CR the command: AT &amp;Y0 CR has to be sent.</td>
</tr>
<tr>
<td></td>
<td>Rem2: On some modems there is no „AA“ indication. It is still possible to test the auto answer function. Just call the connected modem by telephone (dial the telephone number where the modem is connected). If the modem answers and you can hear its characteristic whistle tone, everything is okay. The configured modems should be labelled as a remote modem.</td>
</tr>
</tbody>
</table>

### 13.2.4 Configuration of the called modem

In the main menu select the CONFIGURATION menu, then the MODEM menu. Please refer to the CONFIGURATION chapter.

The modem must be configured before downloading over telephone connection.

### 13.2.5 Logger address

In the main menu select the CONFIGURATION menu, then the LOGGER ADDRESS menu. Please refer to the CONFIGURATION chapter.

This entry must be done before downloading over telephone connection.

### 13.2.6 Manual Programming and Downloading

This „manual“ mode can be used for servicing, downloading of single loggers and for remote on-line monitoring etc.

**Modem Connection**

All configuration has to be done in modem configuration and addresses.

To run the individual connection return to MAIN MENU and open the OPTIONS menu. Then select MODEM CONNECTION:

Click „Set up connection“ to start the modem connection.

After the connection is set up, it will be indicated in the bottom status line in all windows.

It is now possible to program, download, or use the logger as an on-line monitor.

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The modem will remain connected until the DISCONNECT button is clicked. Always disconnect (hang up) the line. Otherwise - even if you switch off the PC - your line will stay busy and you will receive large ‘phone bills!

13.2.7 AUTO-DOWNLOAD of CD-Loggers

All addresses to be downloaded should be marked in the overview. The auto-download report will register any errors which may have occurred during downloading. The report may be viewed on screen, sent to a printer or saved as a data file. The download time has to be entered. After the download time has been set, no further modifications to the configuration or programming of the loggers can take place until the logger has been downloaded. All addresses will be dialled one after another. If an error occurs during the connection the error will be indicated in the report and the next address will be dialled. The address that was not downloaded successfully will not be tried again. If the connection was successful the data will be saved in a data file. The file gets an extension following the number Y of the L column.

If the addresses had been marked, the logger will be reset and the connection aborted after downloading. Once you delete data, it is only saved on your hard disc. You cannot get this data from your logger again.

The download time has to be entered:
Downloading starts at the entered time.
If a note is shown on the screen, every error causes a PAUSE till a key is pressed.
The note relating to transmission and destination files is displayed as pre-selected.
After successful transmission the data is saved on the fixed disk for further processing.
13.2.8 Communication via modem