PRODUCT INFORMATION

MDL

Data logger

Functions and advantages

- Up to 8 x analogue inputs, 3 x wind speeds and directions, 1 x precipitation, 3 x outputs. Extension options for max. 40 analogue inputs
- 3 types of data storage: interval oriented, conditional and event-oriented storage
- Actual value, minimum, maximum, average value, standard deviation, total, day total, intensity
- Comprehensive reporting function via SMS, modem retrieval or switch contact
- Rapid retrieval of current measured values via SMS
- Minimum energy requirement due to “sleep mode”
- Simple connection to all types of sensors, regardless of their pin configuration and voltage supply
- Rapid and assistant-supported parameterisation
- Storage without a backup battery for 600,000 measurement data items

Introducing the MDL product range

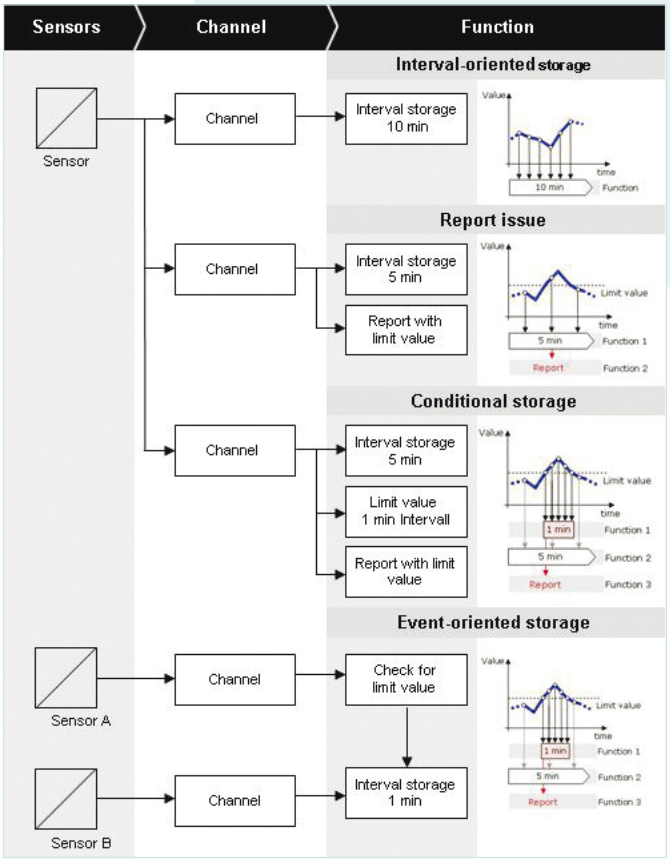
The data loggers in the MDL range prove their worth whenever precise recording, storage, evaluation and documentation of measurement data is required under extreme environmental conditions. Through the use of highly robust, reliable and energy-saving technology, the logger environmental measuring technology range has been optimised to cope at a distance from any infrastructure. In order to meet the specific measuring requirements, the loggers in the MDL range have comprehensive functions for recording, storing, warning about/reporting, controlling and transferring the measurement data. Up to 600,000 measurement values are stored in the permanent 2MB memory, and guarantee long, autonomous data recording. Data is not lost as a result of power or battery failure, since the memory is based on EEPROM technology and requires no backup battery for storage purposes. With a data memory of 2MB, 3 measurement values can be stored over 2 years, for example, in a 5-minute interval, without interim data reading.

MDL 4/1	MDL 8/3
For small measuring technology solutions	**For complex and comprehensive systems**
4 analogue inputs	8 analogue inputs
1 input, wind speed and direction	3 inputs, wind speed and direction
1 counter (precipitation)	1 counter (precipitation)
1 serial interface (RS232) for communication (e.g. GSM or radio modem)	2 serial interface (RS232) for communication (e.g. GSM or Radio modem)
1 switch output for reporting	1 switch output for reporting
	Can be extended to up to 40 analogue inputs

Data logger operating principle

The diagram on the right shows a schematic view of the operating principle for the data logger.

For each sensor (measurement source), e.g. the temperature, one or more measuring channels can be defined, whereby each measuring channel is capable of implementing up to 3 functions. In order to achieve more complex recording of measurement data and/or reporting scenarios, up to 40 channels can be defined on one sensor. Each measuring channel is stored in a separate time sequence. A function can be an interval-oriented, conditional or event oriented storage, as well as reporting.



Types of data storage

With extreme events, high time resolutions of the data sequences are necessary for evaluations and analyses. Beyond the extreme event, a lower level of data quantity is generally required. The MDL makes anything possible, from simple interval storage through to complex, conditional storage for extreme events.

Interval-oriented storage or scheduled value storage

For each connected measuring input, the measuring data can be recorded in an interval of between 1s and 24h (Fig. 1). Equally, the measurement value storage operations can be conducted at one or more specific points in time, e.g. recurrently at 7am (Fig. 2). By defining start and end time points, measurement values for a specific time range can be stored, e.g. the data can be stored in a 5-minute interval only between 8am and 12pm.

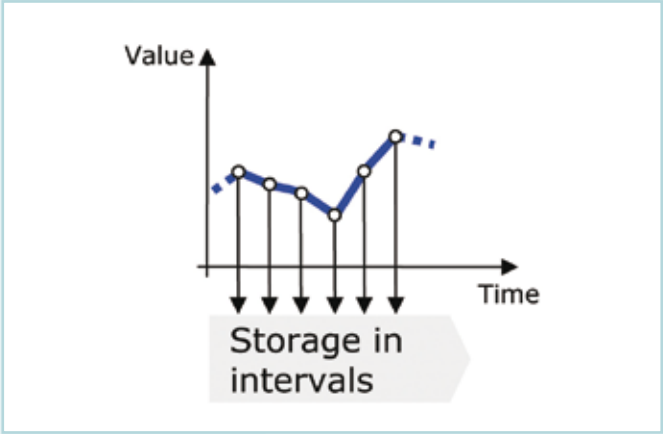


Fig. 1: Synchronous storage of a measurement value

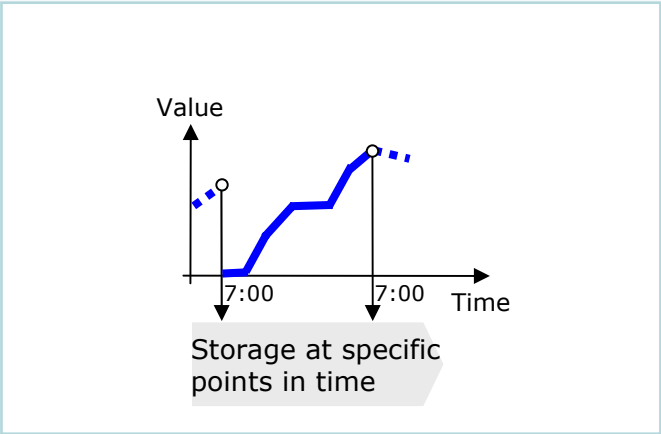


Fig. 2: Scheduled value storage: e.g. a total of the day's precipitation. The day's total is always stored at 7am

Conditional storage

In addition to the functions of the interval-oriented storage, conditions such as a limit value or limit value range can be defined, which trigger a storage. In order to realise complex measuring requirements, the following types of test can be set for the conditional storage.

Test type	Explanation
Absolute limit value excess	The measurement value is directly checked to determine wither a limit value/limit range has not been reached/has been exceeded (Fig. 3)
Relative limit value excess	An check of the relative change in measurement value. Measurement value change not related to time (Fig. 4)
Time-related limit value excess	A check of the relative change in measurement value within a defined time period (Fig. 5), e.g. speeds of changes, intensities etc.

Conditional storage with limit value

The storage is triggered as a result of definitions of limit values which are either not reached or are exceeded. At the same time as the synchronous storage, e.g. at 10-minute intervals, a conditional, asynchronous storage can be conducted when the limit value is exceeded, e.g. in 1-minute intervals.

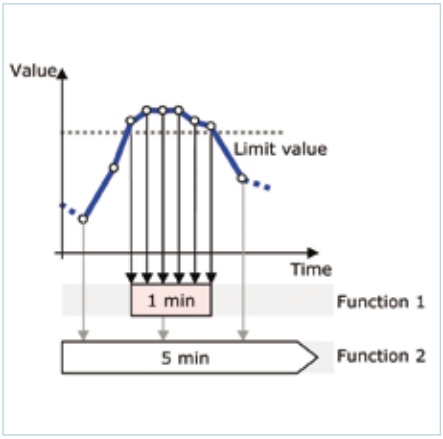


Fig. 3: Absolute limit value excess: additional 1-minute asynchronous storage when limit value is exceeded – event is recorded at high resolution

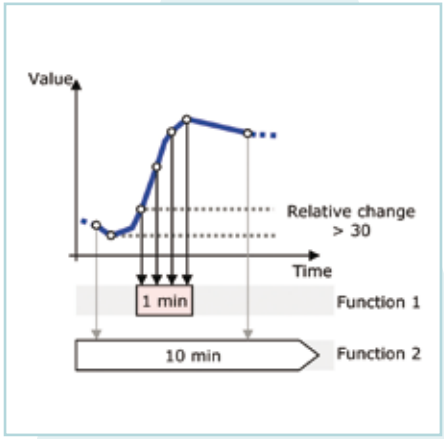


Fig. 4: Relative limit value excess: storage is triggered when a relative measure value is changed

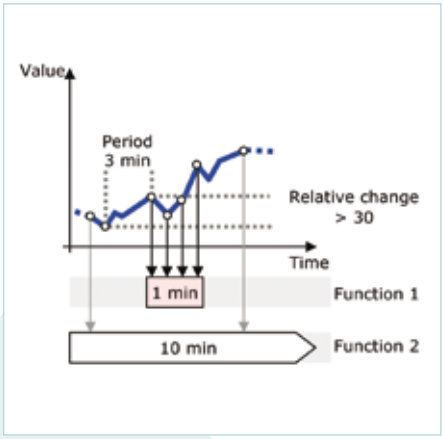


Fig. 5: Time-related limit value excess: storage in 1-minute intervals when the measurement value changes by the value 30 in 3 minutes – events are recorded at high resolution

Conditional storage with limit value range

If a limit value range is defined, the data is stored when the measurement value lies within or outside the range. At the same time as the synchronous storage in 10-minute intervals on channel 1, an asynchronous recording of the measurement values on channel 2 is conducted in a 5-minute resolution (Fig. 6).

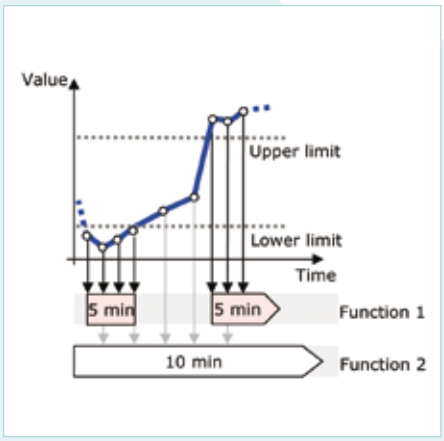


Fig. 6: Limit value range: when the limits are not reached or are exceeded, additional asynchronous storage is conducted in a 5-mi-

Event-controlled storage

The data storage of a measurement value is conducted depending on the entrance of one or more events for other measurement values, i.e. a combined switching of measurement data (e.g. limit value excess – Fig. 7).

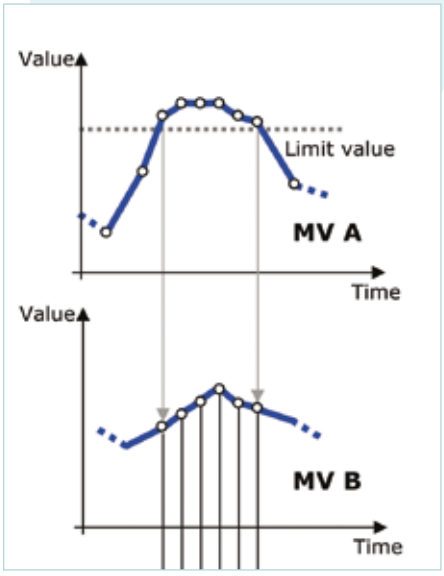


Fig. 7: Event-controlled storage: when a limit value is exceeded of measurement value A (MV A), the storage for measurement value B (MV B) is conducted in 1-minute intervals

Types of measurement

Frequently, it is not only the recording of the current measurement value which is necessary in order to assess an environmental event, but also a statistical recording of the measurement values for evaluation purposes.

With this in mind, the MDL range offers actual value, maximum, minimum, average value, standard deviation, total (e.g. day total) and intensity types of measurement. In order to measure the strength and direction of the wind and wind gusts, the vectorial or the scalar calculation methods are used.

Comprehensive reporting function

The signals are processed directly by the logger, and are used for decision processes. Depending on the definition of the limit value and the type of test, different reporting scenarios can be realised. The report is issued when a limit value is exceeded/is not reached, or when an event occurs, and the report is triggered by a combination with another measurement value/limit value. The report is issued by means of a relay contact for switching connected systems, by a modem call in order to forward the report in warning systems, or by SMS in order to inform individuals.

The limit value is always defined in combination with a hysteresis value in order to prevent multiple messages due to the fluctuating measurement values. Only when a certain limit (hysteresis value) is not reached is a new report triggered. When the condition of the type of test is met, a specifically definable report is issued.

Type of test	Explanation
Absolute value	The measurement value is checked directly as to whether a limit value/limit range has been exceeded (Fig. 8)
Relative change	The report is triggered when a relative measurement change is exceeded or not reached, not related to time (Fig. 9)
Time-related change	The report is triggered when a relative change to the measurement value is exceeded or not reached within a defined time period (Fig. 10), e.g. change speeds, intensities etc.

Fig. 8: Triggering when pre-defined limit values are absolutely exceeded

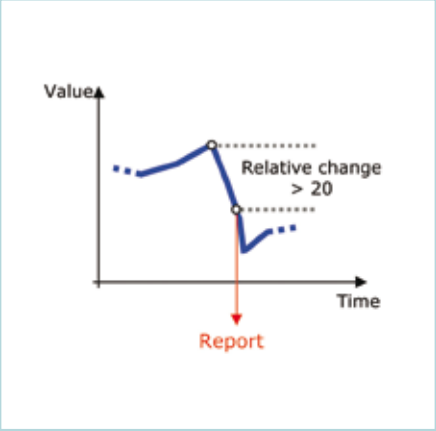


Fig. 9: Triggering when a relative value change is exceeded

Fig. 10: Triggering when within a time period, the measurement value exceeds a relative value change

Minimum energy requirement due to “sleep mode”

In order to construct measurement systems which can operate at a distance from any infrastructure, components are needed with energy management in order to keep energy requirements at a low level. The MDL range requires low levels of energy due to a special sleep mode between the recording intervals. Communication (e.g. data retrieval with a GSM modem) requires the largest amount of energy. Due to configurable time management for the modem, the energy requirement is significantly reduced. Taking into account the rate time of the sensor (which guarantees a stable measurement result), each individual sensor is only switched on for the measurement, and thus plays an important role in saving energy. Due to these energy saving measures, long-term operation with an autonomous energy source can be guaranteed with a solar panel and rechargeable battery for a standard measuring station. Even under difficult environmental conditions such as high Alpine stations, continuous operation is secured despite the solar panel icing up or low levels of solar power due to a shady location during the winter.

Simple connection and assistant-supported parameterisation of the sensors

Any measuring transmitter, regardless of the power supply required for the sensor, can be connected to the inputs A1 to A8, W1 to W2 and Z on the data logger without external circuitry (for 3 of 40 possible connection options, see Figs. 11 to 13). The parameterisation is achieved by the assistant-supported selection of the measuring transmitter from the sensor database with pre-defined transmitter and parameterisation settings.

Each sensor is supplied with power via the data logger. By integrating a voltage converter in the data logger, the sensors are supplied with 5V or 15V, regardless of the supply voltage of the logger. In this way, it is possible to also connect sensors with a voltage supply of 15V with a supply voltage of the data logger of just 5V, as a result of which, independence is achieved from the available voltage supply with installations which are located at a distance from any infrastructure.

Due to the measures described above, a more rapid commissioning is achieved without parameterisation errors. The maintenance can also be completed by staff without any technical training.

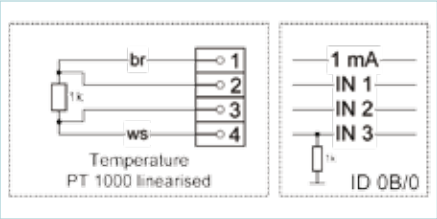


Fig. 11: Connection diagram, temperature sensor

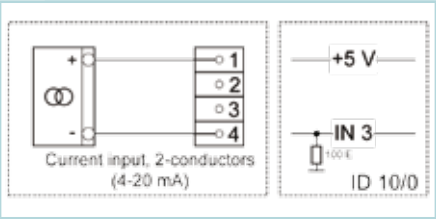


Fig. 12: Connection diagram, 2-conductor current measurement

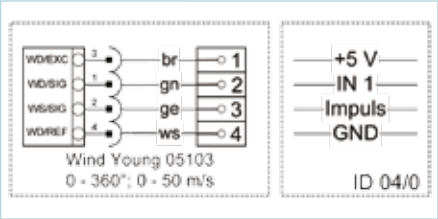


Fig. 13: Connection diagram, wind sensor

Retrieval of the measurement values via SMS

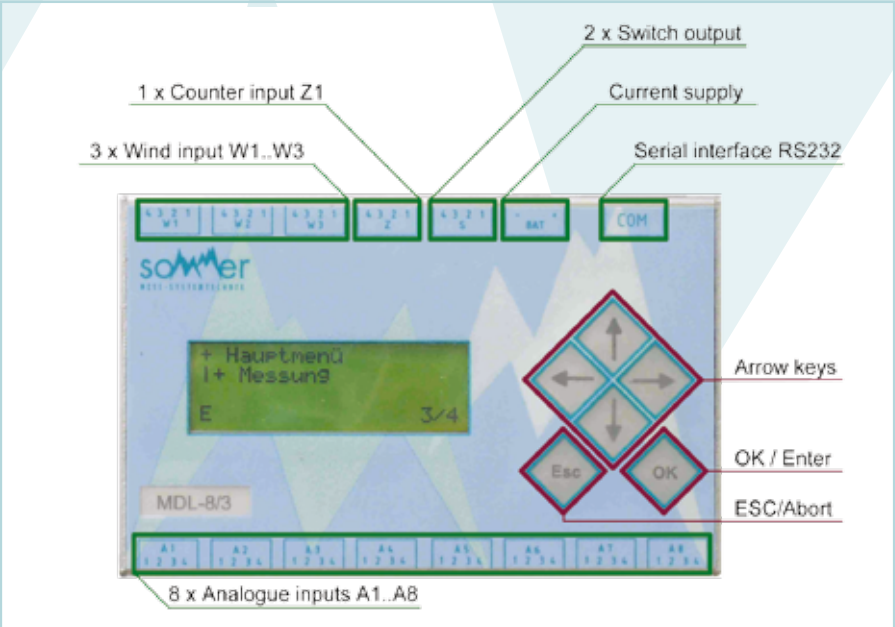
If a GSM modem is connected to the data logger, the current measurement values of the sensors can be retrieved at any time with the aid of SMS dispatch, and shown on any mobile telephone. The data logger responds to a request SMS with a response SMS showing the current measurement values.

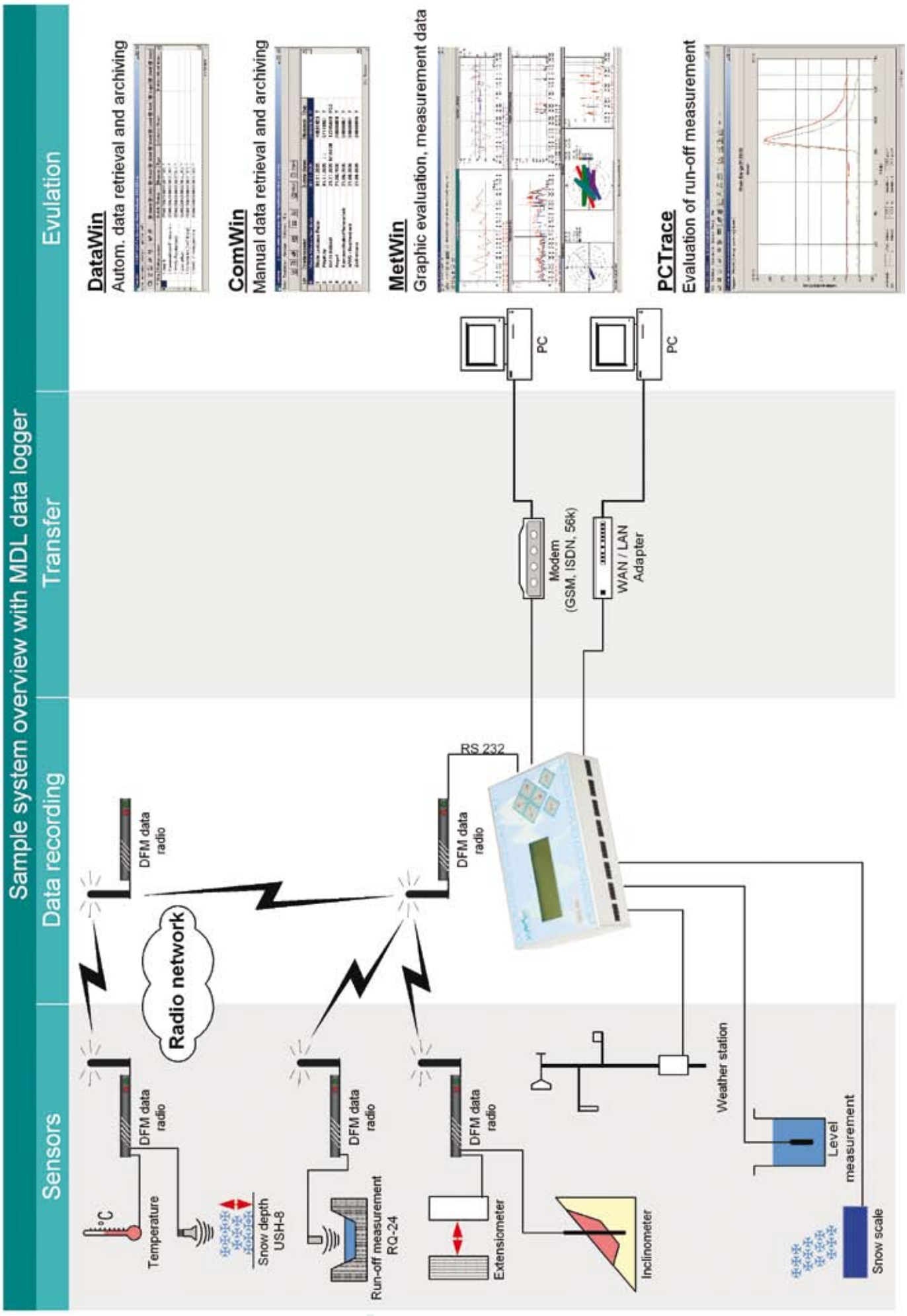
Convenient parameterisation – retrieving the measurement values

The serial interface enables data retrieval and parameterisation of the data logger directly on site with a PC and a PDA, or via remote data transfer using a modem (analogue, ISDN, GSM).

Device utilisation

Intuitive and easy to use menus, similar in style to the menus in mobile telephones, via arrow keys, ESC and OK operating elements.




Sample system overview with MDL data logger
Sensors
Data recording
Transfer
Evulation
DataWin
Autom. data retrieval and archiving
ComWin
Manual data retrieval and archiving
MetWin
Graphic evaluation, measurement data
PCTrace
Evaluation of run-off measurement
PC
PC
Modem
(GSM, ISDN, 56k)
WAN / LAN
Adapter
RS 232
DFM data
radio
Radio network
Temperature
Snow depth
USH-8
Run-off measurement
RQ-24
Extensiometer
Inclinometer
Weather station
Level
measurement
Snow scale

Technical specifications

Inputs – analogue	Voltage	0 - 2,5 V (22 Bit, corresponds 1 µV)
	Current	0 - 20 mA or 4 - 20 mA (22 Bit, corresponds 0,1 µA)
	Resistance	0 - 10 kOhm
Inputs – frequency (wind)		2 - 1500 Hz with a resolution of 0,1 Hz
Input – impulse (precipitation)		0 - 10 Hz
Outputs		Semiconductor relay, max. 1.8 A / 24 VDC
Interface – digital		RS 232; 9,6 - 115 kBd
Memory		Fail-safe ring memory (not backup battery required for storage), 2 MB internal (corresponds to approx. 600,000 measurement values)
Storage methods	Interval	Synchronous and asynchronous interval; 1s – 24h
	Conditional	When limit values are exceeded or not reached
	Event	Measurement data is stored depending on one or more other measurement values (combined switching)
Memory functions		Measurement values store as scheduled values, intensity, minimum, maximum, total, average values, standard deviation, vectors
Supply	Voltage	5,5 - 15 V
	Current	Max. 30mA (without sensors) (measuring time approx. 2 s)
	Standby	100 µA
Supply for sensors	Supply	5 or 15 VDC; 2,5 V reference voltage; 1mA or 0,4mA reference current
	Current	Max. 50mA for each sensor
See the datasheet for all technical specifications		

Scope of delivery

» Datalogger for mounting on an h-rail

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