

# Cluey TM LR

LoRaWan® IoT Monitor with Temperaturesensor- analog- und digital Inputs



## Highlights:

- 4 Temperature sensor inputs
- 6 Signal terminals configurable as:
  - digital status input, pulse- or operating time counters
  - analog 20mA/10V input
- Threshold- and delta event-monitoring for temperature- and analog values
- Application-supporting signal processing
- Event triggered and/or time synchronized cyclic transmission
- Events with time tag
- External 24VDC- or from internal batterie powered operation
- Autonomy in low power battery operation mode up to 10 Jahre
- Clever housing with hinged cover / IP65 /Wall and DIN rail mounting
- Life sign message containing device and battery status
- Internal antenna, external antenna connectable

## Brief Functional Description

Cluey TM is ideally suited for Monitoring of temperatures and digital- and analog signals, in utility networks, industry and building automation. Cluey TM provides 4 ports to connect upto 4 2-wire or upto 2 4-wire PT100 or PT1000 temperature sensors.

furthermore 6 signal ports are available which can be configured as digital inputs, puls- or operating time counters or as analog 20mA/10V inputs.

Clever signal processing functions, e.g. threshold monitoring, are available directly in the device to support event driven and efficient radio transmission.

The Cluey TM can be powered from an external 24VDC supply or from the internal battery. With external power supply, the battery can also be used to bridge power failures.

It has an internal antenna, an external antenna can be connected.

### Temperature Sensor Inputs

Cluey TM provides 8 terminals for connecting temperature sensors. Either up to 4 2-wire-sensors or up to 2 4-wire sensors can be connected. Sensor type 2/4-wire and PT100/PT1000 can be selected by configuration.

The measured temperature values can be monitored for exceeding two limit values each.

Temperature values can be transmitted cyclically, dependent on changes (delta event) and/or in case of limit violation. For each temperature value an additional status flag is provided which indicates not or faulty connected sensor.

### Configurable Signal Inputs

The Cluey has further 6 pairs of input terminals that can be used to acquire analog or digital signals. The function of this inputs can be configured.

### Analog-Inputs

For standard analog signal 0...10V/0...20mA acquisition 4 of the signal inputs can be configured as voltage 0...10V or current 0...20mA inputs.

The analog values are acquired cyclically in configurable measuring intervals. Status bits are generated for each acquired analog value, indicating whether the measured value is

- <4mA/2V (open circuit detection)
- >22mA/11V (overrange or fault)
- has exceeded limit value 1 or limit value 2
- has changed by more than a configurable amount (delta event) compared to the last transmitted value.

The transmission of the analog values takes place in a cyclic interval independent of the measuring cycle or/and event-controlled, triggered by a change of the status bits (e.g. wire break, overflow) limit violation or delta event.

The status bits for the measured values are processed by the Cluey in the same way as digital inputs (inversion, delay,..)

### Digital Inputs

All 8 signal inputs of Cluey AM can be configured as digital inputs for the acquisition of digital states, pulses or operating times.

Each digital input can be individually inverted, i.e. adapted for NO (normally open) or NC (normally closed) contacts.

The state of the digital inputs can be transmitted cyclically or/and on change. On input changes, an adjustable message send delay first is waited for before a transmission is triggered, in order to be able to suppress short uninteresting signal changes to avoid unnecessary transmissions.

Digital inputs can be configured in pairs for double point info processing. In this case on/open, off/closed and intermediate states are detected. This function is best suited to monitor gates, doors, valves, circuit breakers, etc.

If intermediate state position lasts too long (e.g. if the running time of a valve is too long due to blocking), a fault status will be indicated.

By means of the integrated access control function where of digital inputs for door contact, motion detector and acknowledgement switch can be assigned to, it is possible to differentiate between permitted access or intrusion and this can be reported accordingly.

A defluttering function mutes an input as long as more than a certain configurable amount of signal changes during a time interval is detected, to avoid unwanted huge amount of transmissions caused by loose contact or e.g. motion detector.

## **Counter Inputs**

All digital inputs can also be used as pulse or operating time counters. With pulse counting, the transmitted counter value contains the total number of pulses detected at the input. When configured as an operating time counter (e.g. for runtime monitoring of fans), the counter value is regularly incremented as long as the corresponding input is active and thus contains the total time of activity, scaled in seconds, minutes or hour depending on configuration.

Reset and overflow of the counters is indicated by additional status bits transmitted with each counter value.

The counter readings are transmitted time-synchronized cyclically at configurable times (e.g. 0h05) and intervals (e.g. 1 time per day). A counter value transmission can additionally requested at any time via downlink command (counter general interrogation).

Counters can also be reset via downlink command.

## **Power supply**

Cluey can be powered by the integrated replaceable battery or by external 24V power supply. In battery operation, depending on the configuration, a battery life of 10 years can be achieved. In 24V operation, the battery can be used to bridge supply voltage failures.

Battery status is included in each transmission, so that it can be monitored by the superior system.

## **Data transmission**

The transmission of the input states is event-controlled, input states are transmitted with time stamp of the event. In addition, a periodic transmission can be configured.

Pulse or operating time counters are transmitted periodically (interval is configurable) at a configurable time, e.g. always on Wednesdays at 8 pm.

Analog values and temperature values are transmitted on a cyclic or delta event basis.

In addition, a transmission of the recent input states, measured analog, temperature and the actual counter values can be requested via downlink command (general interrogation).

## **Time**

Cluey has an internal real-time clock for time stamping of the events and time-synchronous transmission of the counter values. The Cluey TM requests a time synchronization telegram from the LoRA network server at configurable intervals, which then contains the current time and is used to synchronize the internal clock.

## **Radio**

The Cluey can be operated as a Class A in batterie powered low power mode or as Class C device with external power supply in the LoRaWAN® network.

For optimal radio links, the Cluey has a powerful internal antenna, which can be replaced by a suitable external antenna (not included, option) in case of difficult radio conditions.

## **Configuration**

The Cluey is configured by means a configuration file, which can be accessed via the integrated USB interface. For editing the configuration file, change setting of the parameters common text editors can be used, no special configuration tool is needed.

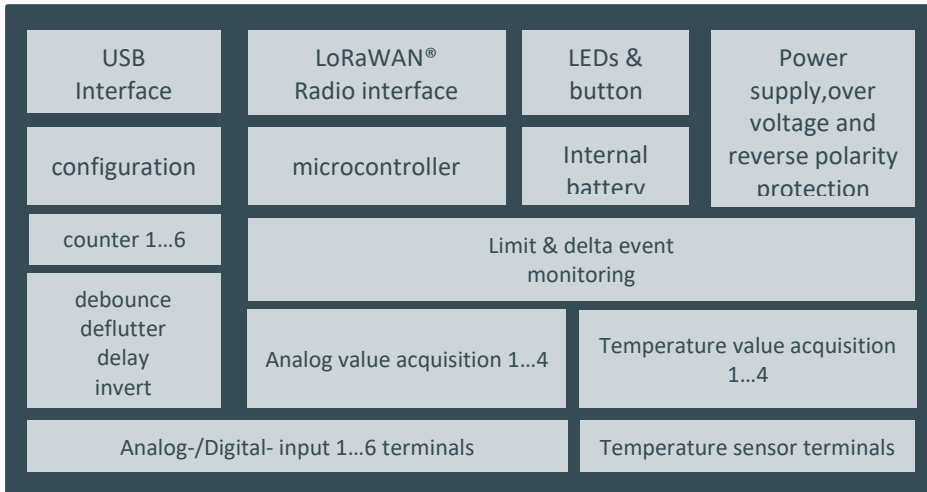
Parameters can also be changed via a downlink (OverTheAir) as well.

Commissioning and fault diagnosis are supported by a button, which e.g. triggers a join-procedure or forces a data transmission, and status LEDs, indication the current operating and communication status.

## **Terminals and Mounting**

Pluggable terminals and removable PG glands simplify installation and commissioning, as does the mounting tray supplied, which is suitable for wall and DIN rail mounting and into which the housing is simply inserted.

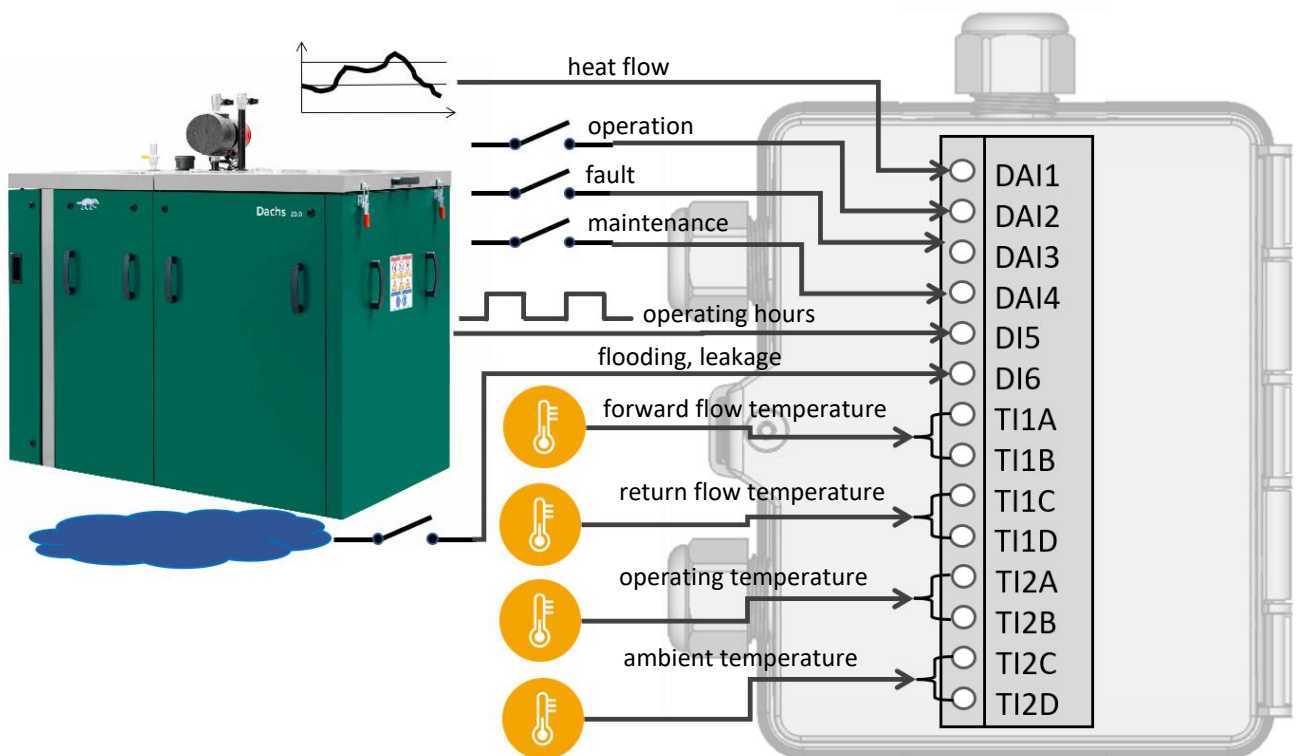
# Functional Block Diagram



## Application-/wiring example

### Monitoring and alarming for combined head and power units

- Heat circuit:
  - Flow
  - Temperature of forward and return flow
- Unit:
  - Operation
  - Fault
  - Maintenance request
  - Operating temperature
  - Operating hours counting
  - Operating temperature
  - Power fail
- Ambient:
  - Temperature
  - Flooding, leakage



## Technical Data

Power Supply	Werte	Hinweis
Operating Voltage Range	5 ... 32VDC	
Power consumption (ext 24V)	0.3W	Typical
Inrush current	< 2A	
Battery		
internal battery	3V LiMnO <sub>2</sub> primary Battery, C-Cell Type: CR26500 3.0V	Autonomie depends on configuration
Inputs DAI1...4; DI5,DI6 general		
Maximale Eingangsspannung	32V	
Supported operation modes	Digital input activ Digital input high level passiv Analog current input Analog voltage input	Selectable by configuration
Digitale Inputs DAI1...4; DI5,DI6		
Threshold active mode	1.5V	In active mode inputs are designed for contacts switching to ground
Input current active mode	max. -1mA, pulsing , per input	
Threshold high level passive mode	8V	In passive mode external voltage must be provided
High level mode input resistance	10 kOhm	
Counters DAI1...4; DI5,DI6		
Counter width	24 Bit	
Max. pulse rate	Battery operation: 2 Hz Ext. Power supply: 10Hz	Depends on configuration
Counter overflow	16'777'216	Overflow is indicated by flag
Operating time counter, resolution	1 s ,1min,1 h	configurable
Operating time counter overflow	After 0.5 years operating time	Overflow is indicated by flag
Analog Inputs AI1...4		
Current input range	0...24mA	
Current input load	500Ohm	
Voltage input range	0..12V	
Voltage Input impedanz	10kOhm	
Accuracy	0.5% of range	
Temperature sensor inputs TIx		
Supported sensor types	4* 2-wire or 2*4-wire, PT100, PT1000	according DIN EN 60751
Measuring range	PT1000: -200°C...+260°C PT100: -200°C...+650°C	
Measuring deviation	+0.05°K	
Sensor current	PT100: 1mA PT1000: 0.1mA	
resolution	10 mK°	
Button & Led-Indicators		

Button	1.) Device-activation from shipping mode 2.) In operation: press > 5s: (re-)join press < 5s: Telegramm senden press > 10s: Device Reboot	
LEDs	«USB», green: = USB-power connected «DC IN», green: ext. power supply (24V= «LED A», yellow: operation status «LED B(orange)»: communication	Leds are steady active only when device is operated from external or USB power supply In battery operation led indications by short flashing only
<b>connections</b>		
Antenna	50 Ohm, SMA	Internal antenna included
inputs & power supply	Pluggable screw terminals	
Configuration	Micro USB	
<b>Radio interface</b>		
Technology	LoRaWan®	
MAC Version	1.0.3	
Operating modes	Class C – with external power supply Class A – when battery operated	
Join procedure	OTAA APB	
Frequencyband /regional Parameters	EU868 A	
Max.transmit power	+14dbm	
Receiver sensitivity	-135dbm	
<b>Housing</b>		
Mounting	DIN rail & wall mounting	Bracked included
Material	Polycarbonat	
Inflamability Class	UL94V-0	
Resistivity	UV	
Degree of protection	IP65	EN60529
dimensions	B: 55 mm H: 111mm - incl. PG-glants H: 9.1 mm (mounting area) L: 135 mm - incl. PG-glants	
<b>Environmental conditions</b>		
Operating Temperature Range	-20°C .... +60°C	
Rel. Humidity	0% ... 95% (non condensing)	
Operating Altitude	0...2000m	

The product is subject to continuous further development and improvement. The description and technical data are informative and not to be understood as a guarantee of individual product properties.