GaugeKeeper - Optical Water Level Measurement

Key Features:
- Patented image processing system for water level measurement
- Remote data transmission
- Intelligent alarm management
- Visual verification of data
- Connections for further sensors
- TCP/IP connectivity
**Product description and function**

The Gaugekeeper is a completely new method for detecting and storage of water levels data using an intelligent image processing technology. In addition to the digitised measured values it is possible to store current images and transmit them via GPRS to any FTP server. In this way, individual measured values of the available image information can be immediately verified. Advantage: no more expensive trips to remote measuring sites.

The intelligent camera system consists of a high-definition camera, an illumination, a data collector and data transmission. This measuring system can easily be mounted on a water gauge station or on a mast. The GaugeKeeper can, due to the low power consumption in contrast to conventional webcams, easily be operated with a battery or a solar panel. An alarm management system can be applied to inform the operator via SMS / email immediately in case of floods or critical situations (e.g. if the freely programmable thresholds would be exceeded). The GaugeKeeper does not provide you only the measured value but also the associated photographic evidence.

**System components**

![System components diagram](image)

The surveillance camera is ruggedised, equipped with special illumination for nighttime measurement and uses an integrated powerful processor to automatically convert data to measurement values. The frequency is configurable and the images are saved to a local SD-card for preservation of evidence. Images and time-lapse movies may also be downloaded. The water level is measured and converted inside the processor unit then sent to the logger. All data are stored inside the UnilogCom data logger. Those data can be downloaded via remote access. There are several ways to transfer the files to your server or the SEBA Hydrocenter (e.g. GSM/GPRS, satellite, landline, radio transmission, DSL, ethernet). Files (values and images) can alternatively be pushed to an FTP-Server.

The data logger allows connection of additional sensors (e.g. water level by radar, pressure transducer etc.) for redundant water level data. With the efficient data management software DEMASdb, the system can be called several times per day in individually programmable time slots. Independently, alarm limits can be defined (i.e. water level, battery capacity). SMS alarms can be sent to up to 8 different mobile phone numbers as well as to a facsimile.

**Calibration**

Prior to using the system for the first time, the GaugeKeeper needs to be calibrated to the site’s specific conditions.

That is done via graphical user interface (GUI) by holding a calibration template facing towards the camera. An initial value is entered into the system.

The software then calibrates the system and defines an individual measuring scale. As a final step, the Region of Interest (ROI) is defined.
Special features and benefits

- Unlike many other types of sensors, the GaugeKeeper provides in addition to the water level measurement also the possibility to assess the situation on site according to the current image information. Therefore, the measured water levels of the sensors in operation can be, when required, evaluated and verified.
- Time-consuming verification visits are not necessary.
- Due to the optical image processing method, the GaugeKeeper requires no contact with the measured medium. Therefore, silting or flotsam have no influence on the operation of the GaugeKeeper.
- Since this measuring system is installed and operated without water contact, it can work even in extreme events such as floods.
- The special lighting of the GaugeKeeper system enables its operation under many different weather and light conditions.
- The GaugeKeeper informs you immediately by SMS and/or e-mail when critical system states (e.g. in case of low battery voltage or sensor drift) are reached or when definable thresholds are exceeded/fallen below.
- The low energy consumption allows a permanent autonomous battery or solar operation.
- The system has analogue or Modbus or SDI12 outputs.
- The GaugeKeeper can be applied both as a central system or decentralised as a part of an existing measuring/monitoring system.
- Distance is up to 70 m between the camera 1 and ROI (Region of Interest).
- Connections for additional sensors and webcams are possible.
- A second camera can be installed for the monitoring of the surroundings and for protection against vandalism using a motion detector.
- The activation of the measuring system can alternatively be controlled by trigger pulses. This can be very useful in cases where the water doesn't flow permanently, like in wadis, or if the water level exceeds a predefined value. The application of a water detection sensor will GaugeKeeper automatically switched from a sleep mode (e.g. every 24 hours) to a dynamic measurement mode with higher data recording frequency (e.g. every 2 minutes). This feature provides a detailed visual representation of the observed events and saves a lot of energy!

Further application sectors

The Gaugekeeper is an applicable sensor system for the optical level detection in many sectors like industry, agriculture, sewage treatment plants, water treatment plants and monitoring of stowage heights at dams and dikes.

The GaugeKeeper can adequately measure both liquids and solids by imaging and technical measuring with its camera-based data acquisition and horizontal edge detection.
Validation
The GaugeKeeper was tested under different weather and light conditions. The comparison between the values measured by the GaugeKeeper with the ones measured by other conventional sensors such as radar on the same site and under the same conditions shows a very good agreement.

Technical Data

GaugeKeeper General:
- measuring range: water-level variations of up to 10 m
- power consumption: 60 µA (power down mode)
  ~75 mA (modem transmitting/peak current)

Camera
Recording: Day & Night
Max. Image Size: 4096 x 1536 (6.2 MEGA) with 2 modules
Image Sensor: 5MP sensor technology: more than 2.5-times detailed than Full-HD
In/Outdoor: Weatherproof (IP66)
Sensor Modules: L12 - L160, horizontal picture angle 180° to 13° (35 mm)
Max. Frame Rate: 30 B/s (MEGA)
Interface: Ethernet 10/100 Mbit
Zoom: Stepless to 8x zoom
Min. Intensity of Light: Colour: 0.25 lux (t=1/60s) • 0.013 lux (t=1/1s)
B/W: 0.05 lux (t=1/60s) • 0.0025 lux (t=1/1s)
Operating Temperature: -30...+60 °C
Dimensions: 165x170x80 mm (LxWxD)

Special Illumination
Illumination: Infrared, sensor-controlled
Angle: 15°
Energy consumption: 6 mA/h per measurement
Dimensions: 190x125x100 mm (LxWxD)

Data Logger type GaugeKeeper
Power Supply: External 4.5...20 V
Flash Controller: M32C 32 bit with integrated watchdog
Memory: Serial Flash with 16 MB (approx. 1.120,000 measured values)
A/D Converter: 32 bit
Inputs: RS485 sensor interfaces (SHWP)
SDI12 sensor interface input (option) up/down counter input phase counter, impulse (rain)
2 contact inputs (control, protocol)
2 analogue bi-/unipolar for standard signals, extendable up to max. 32 analogue inputs (optional with external module)
Keyboard: with 3 function keys
Display: 3 lines each 16 characters, 3.65 mm
Interfaces: RS232
RS485 micro SD (up to 32 GB)
USB highspeed (up to 2)
eternet TCP/IP functionality
Operating Temperature: -30...70 °C
Dimensions: 157x126x60 mm (LxWxH)
Modem (integrated) Frequency: 850/900/1800/1900MHz (EGSM, Quadband)
SIM-card: 1.8V/3V