Measuring system transmits data via e-mail, ftp or SMS and collects the measuring data centrally on a PC/MySQL database

Autonomous measuring systems with remote data transmission (GSM-2)

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There has been a need for autonomously operating measuring systems for quite some time, but until now they have only been implemented using locally read-out data loggers. However, this meant that the data that was acquired was never up to date, and merely provided a historical picture. The measuring devices did not have a continuous function monitoring facility.

The use of mobile radio networks and the Internet has now made it possible to create a virtual combination of widely distributed measuring systems in one location, and make use of the acquired data on the spot.

Modern measuring systems are cheaper

Professional measuring technology has reaped considerable benefits from the use of components and technology that were originally developed for the large quantities that were needed for consumable products. A current example is the use of mobile radio networks for data transmission. The GSM reception coverage is so far advanced and the price of telephone modules and data transmission are so low that this is the cheapest and simplest measurement acquisition method, not just for decentralised or extremely remote measuring points, but also easily accessed locations.

The cost of data transmission is a fraction of the cost of personnel for measurement acquisition. Furthermore, this entire measuring system with GSM transmission is only slightly more expensive than a data logger without GSM transmission. The cost of transmitting measuring data via e-mail or ftp (file transfer protocol) is extremely cheap at the moment. If a prepaid card is used, there are not even any monthly charges.

Data transmission via e-mail, ftp or SMS is the easiest solution to implement in practice, because not much needs to be done at the receive end. A normal mobile phone is sufficient for reading out the measuring data (SMS) using PC, or a PC with an Internet connection via which the data can be received by e-mail or ftp.

Illustration of the GSM-2 measuring system
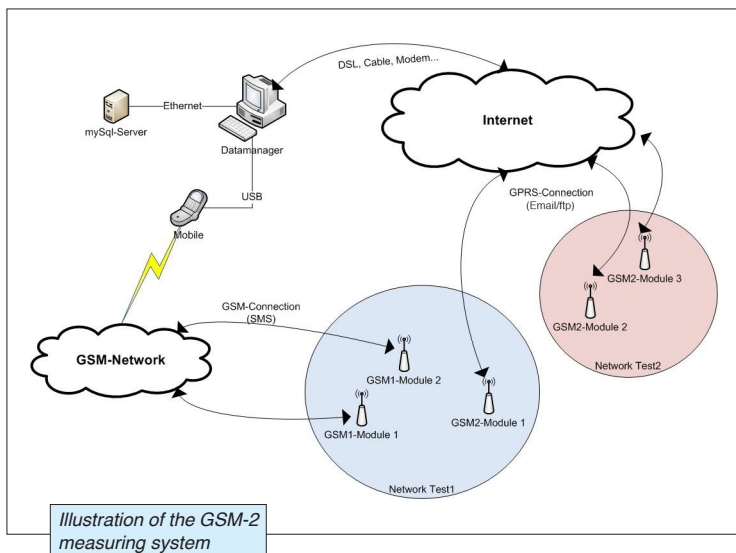
Data processing: The PC as a data logger

The heart of the measuring system is the user-friendly and free GSM-2 DataManager software. It collects the measuring data, monitors and controls the different measuring stations (GSM-2) and is used to display or automatically process the measuring data, which is stored in a MySQL database.

The data that is transmitted by the GSM-2 (e-mail/ftp/SMS) is continuously read in by the DataManager and stored in the database.

It is evident at a glance whether all measuring stations are operating correctly. In the event of an error, e.g. missing measuring data, this is shown on the PC screen or the responsible person is notified by SMS or e-mail. Measuring data is converted into the physical quantity that is used at the measuring location, and can be displayed in graphical format. The measuring station locations are displayed on a map.

Configuration changes for the individual measuring stations (GSM-2) are made on the PC. The new configuration is transmitted by e-mail or ftp file and received by the relevant GSM-2 module.

Applications

The GSM-2 is suitable for use in locations where no power supply is available or cables cannot be used. Typical applications are: groundwater level measurements, waste water level measurements, tank capacity measurement on vehicles or building sites.

GSM-2 for groundwater level measurement

The monitoring of groundwater levels or the surface levels of lakes and rivers is a widespread task. It is carried out by different state-run institutions and also private water and energy providers.

Keller AG für Druckmesstechnik has therefore developed the GSM-2 module for its water level measuring sensors. The usage locations are almost limitless. Measurements like this used to be carried out manually using an electric contact gauge. A 2-inch diameter pipe embedded in the ground was completely sufficient. However, the measuring frequency was extremely dependent on the accessibility of the measuring points and the prevailing weather conditions. In order to equip the existing measuring stations with a measuring system, the GSM-2 module has been designed with a diameter that allows it to be inserted into the so-called sounding pipes.

The measuring stations, most of which are located in remote areas for geographical or hydrographic reasons, do not have a power connection, of course. In other words a battery-operated system with as long a service life as possible is required. However, the list of requirements gets longer: the measuring equipment must be resistant to water and humidity, and also be able to withstand short periods of immersion. Finally, it must be protected against theft and vandalism.

Quick and easy installation

The entire GSM-2 measuring module is simply inserted into the 2-inch diameter sounding pipe and secured by the level sealing cap. No complicated and expensive installation of antenna with mast and solar panel required! Installed within seconds.
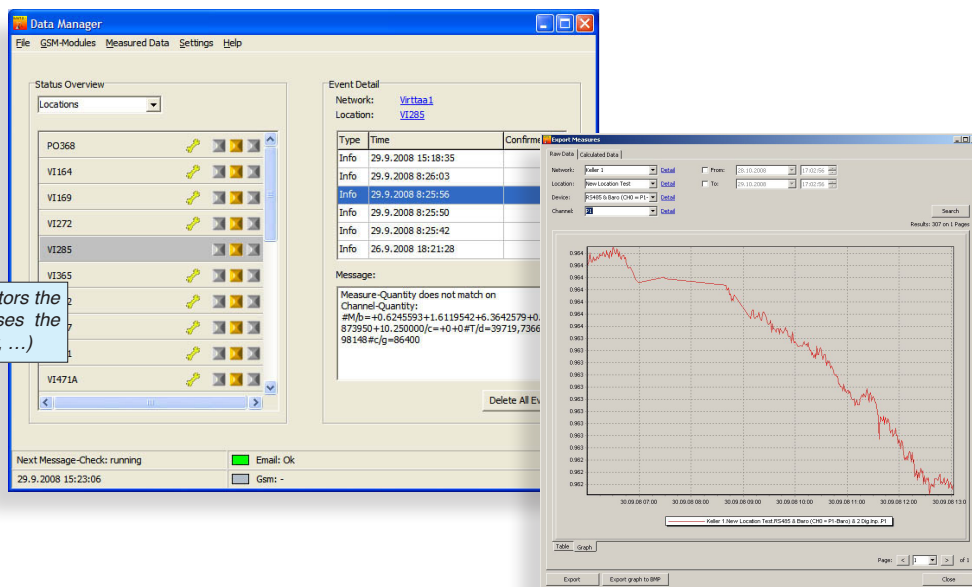

After installation, the GSM-2 transmits its configuration with measuring station name and position to the Data-Manager, which automatically starts to manage the new measuring station immediately.

Facts

➢ Battery operated (up to 10 years with one battery)

➢ Quick and easy installation

➢ Different interfaces for sensors

➢ Free software

➢ Low cost

Technical details

The electronics and the battery of the GSM-2 module are accommodated in a watertight stainless steel housing with an external diameter of 48 mm.

The upper part, which is designed to be secured in a lockable standpipe sealing cap with antenna for 2" pipes, contains the antenna and the interface for configuring the measuring system. The level measuring sensor is attached to the bottom end.
Depending on the ambient conditions and the configuration, the battery operated device can have a service life of more than 10 years! The GSM module is simply switched on when it is needed (i.e. in order to call up incoming configurations or send the measuring data or the system configuration).

Several level values that have been measured within a defined time period and stored (in the GSM-2) are sent in a single message (e-mail/ftp/SMS).

At the same time, critical events such as rapid level changes and levels that exceed maximum or minimum limits can be detected in another interval and additional messages transmitted in the form of e-mail, ftp or SMS alarms. The periodic transmission of system information containing current levels, battery capacity, antenna signal strength and other information can also take place.

The measurements are temporarly stored in the non-volatile data memory (logger) of the GSM-2, so that in case of failure of transmission (GSM network), the data can be read at any time directly from the GSM-2 logger (interface)

via a laptop. If the GSM connection can be restored, then the not yet transmitted measured values are transferred automatically.

Measuring inputs for various sensors and applications

In addition to the RS485 interface, via which the pressure or water level can be read out with extreme accuracy using KELLER water level sensors, an air pressure and temperature sensor is installed in the module itself. This makes it possible to make water level measurements using the so-called AA measuring method (absolute-absolute). The advantage of this measuring method is that no humidity-sensitive capillary tube needs to be installed in the cable of the level sensor. This makes the measuring station extremely robust and suitable for reliable use in damp and wet environments; not even short periods of immersion cause the measuring station to fail.

The two voltage inputs (0 – 2.5 V), the SDI12 interface or the two digital inputs allow customers to connect applications with all kinds of sensors to the device. From a simple switch contact (digital input) to an expensive and complex water analysis unit with up to 10 parameters (SDI12 interface).

The connected sensors are optionally supplied with a voltage of 12 volts, 5 volts or 3.7 volts by the GSM-2.

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