OmniaLog case study; thermal dispersion monitoring of buried cables

A system to monitor thermal dispersion of medium voltage buried cables has been configured with OMNIAlog. This system has been configured to register temperatures, soil and current at 1.5 meters depth moisture evolutions.

Requests;

Parameters to be measured

- Temperature (4 points, from -10°C to +100°C)
- Soil moisture (1 point)
- Current of the buried, medium voltage, not-sectioned cable (0 to 500A)

Recording time
6 months
Sampling time
1 data collection every 15 minutes
Detection depth
1.5 meters
Possibility to power the datalogger
No
Data Transmission
Internal memory or GSM network

Proposal:

Data recording

OmniaLog Universal Datalogger by Next Industries (fully made in Italy). This datalogger allows entry up to 8 sensors of any type with an analog output (voltage or current), thermistors, RTDs (=termoresistenze?), thermocouples and RS485 signals.

No other software is needed as it is supplied with internal webserver; it is so fully configurable by simply connecting any PC via ethernet cable and using a browser.

It is also a high accuracy datalogger and it can last months being powered with lead batteries; in fact, sensors are activated and powered only for necessay time to perform measurements (or sensors are preloaded with a “warm up” setted up from interface).

Temperature sensor

Thermocouple type T (type T - costantana copper - are slightly more accurate than K one), mineral insulated and metal sheated, is designed just for this application, being highly resistant to earth corrosion. It is supplied with a 3 meters cable junction. This sensor is read without any particular configuration by the universal datalogger OMNIAlog. The wiring scheme to OMNIAlog terminals is directly supplied from the GUI (Graphical Interface).

Current sensor

The maximum cross-section of cables conductors is 240mm^2. Customer specifies that cables are medium voltage and that a single phase reading is enough. For this reason, installation of an toroidal openable TA with at least 10 cm diameter is needed. The chosen TA is made by IME and has to be combined with a self-powered transmitter with 4-20 mA output. Signal 4-20 mA has to be configured as type of sensor on OMNIAlog datalogger, so providing the conversion constant between the signal and the engineering unit, which is Ampere in this case. So, 4mA received by the trasducer are equivalent to 0A current passing through the cable, 20mA received by the transducer are equivalent to 500A current passing through the cable if the conversion is considered linear (also non-linear transformation curves can be setted up on OMNIAlog). Then, the engineering units has to be setted as Ampere. The wiring scheme to OMNIAlog terminals is directly supplied from the GUI (Graphical Interface).

Humidity sensor

The customer needs a guideline, not a very accurate measure, for humidity measurements; in other words, what is needed is the possibility to make a comparison like " today the land is more humid than yesterday" or to identify a rainy day. In order to do so, a sensor with 2 electrodes at a fixed distance would be enough, measuring the change of resistance between electrodes in the different soil conditions. However a sensor widely used in agricolture is proposed, with low costs, which uses the principle of electrical resistance. In this case the output signal is a voltage one (0V for very wet to 2,4V for dry). As the tranformation cuve is not linear, another device that "straightens" the signal - making it linear from 0 to 2,8V - is needed. 0-5V signal (voltage) will be setted up as type of sensor on OMNIAlog and the sensor has to be powered at 5V. Centibar (or kPa) will be setted up as engineering unit, which is used in this field to understand the soil moisture degree. 0V is equivalent to 0 centibar, 2,8V are equivalent to 240 centibar. The wiring scheme to OMNIAlog terminals - including sensor power supply - is directly supplied from the GUI (Graphical Interface). In this case it is also better to set up a time to warm up (heat of the sensor) of at least 1 minute before data acquisition.

Summary;

With a sigle datalogger it is possible to collect

- 4 temperature measurement
- 1 current measurement on a medium voltage cable
- 1 soil moisture measurement

Data are collected by OMNIAlog every 15 minutes for 180 days. Data will be downloaded by simply connecting a laptop pc via ethernet cable and querying the datalogger. In the future, the datalogger will be configured to send data to an online server, remotely accessible, via a GSM secure data transmission module.