



# Temperature Monitoring of Multiple Borehole Heat Exchangers

## Hamburg, Germany

When the Hamburg Ministry of Urban Development and Environment moved into their new buildings they decided to make use of geothermal heat exchange pipes to heat the buildings in Winter and keep them cool in Summer. Over 1600 boreholes and borepiles were drilled and heat exchangers were installed in over 800 borepiles. In 27 boreholes fiber optic sensor cable was also installed to enable temperature monitoring with AP Sensing's DTS (Distributed Temperature Sensing) solution.



*Hamburg Ministry of Urban Development and Environment*

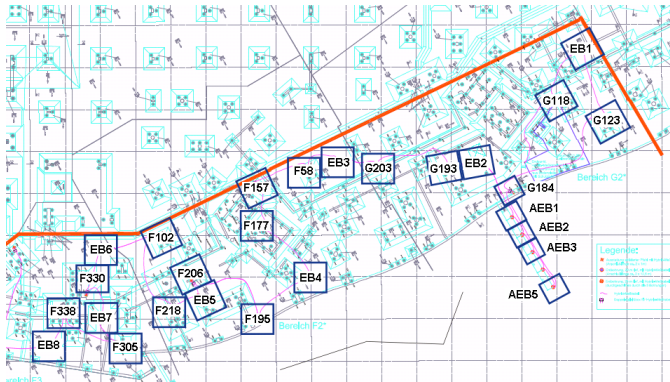
The well-insulated buildings are among the most energy-efficient offices in Germany, requiring only 70 kWh per square meter per year.



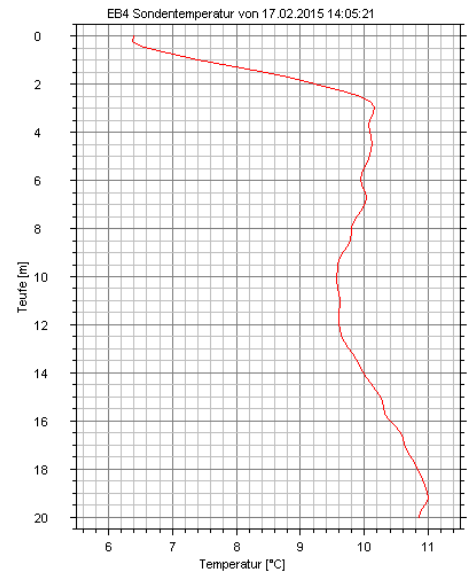
*Joint box used to connect cables  
during installation*



*19" AP Sensing DTS device mounted  
in a flat wall cabinet*



**Map of the 27 borehole locations**



**Temperature monitoring from one of the boreholes**

The AP Sensing solution consists of a Linear Pro Series DTS instrument with 2 channels and a 2 km measurement range. The device itself is installed in a wall cabinet in a control room.

The thermal monitoring of the boreholes is important, because there is a heat limit set by the Ministry that should not be exceeded (e.g., during the warmer Summer months, when the systems acts to keep the buildings cooler). In addition, the temperature data is used to measure and optimize the system's efficiency. The data is also used for a research project by the University of Harburg.

GTC Kappelmeyer was responsible for the planning, commissioning, and installation. They developed a project-specific program that provides real-time temperature profiles of the monitored boreholes, as well as the temperature histories for each since the system went live in September 2014. In the internal network of the Ministry live temperature data and graphs can be viewed online.



**The AP Sensing Linear Pro Series**

