PENTRONIC GROUP Europe's leading manufacturer of temperature sensors

NO. 2019-3

PENTRONIC NEWS

It's about temperature!

PART OF SWEDEN'S CLIMATE TARGET IS RIGHT HERE

CONTINUED ON PAGES 2-3

Our exciting journey continues!

All companies and businesses must constantly develop and improve. The speed at which this is being done is increasing all the time. While some people must certainly feel this is tiresome, it also creates opportunities for organisations and individuals to explore new fields.

For some time now we have noticed an increased need for on-the-spot service and calibration out at our customers' premises. In response, we have increased our team with Emma in Karlstad and Adrian in Västervik so that we can serve you better.

On the product side, we have not been sitting back with our arms folded. We will soon launch a signal converter for thermocouples with a IO-link interface plus a complete temperature sensor system based on our own PLB bus standard. The entire system is certified for extreme environments and safety-critical applications in accordance with IEC-61508, SIL 2.

You can read more about one form of available technology in this issue of Pentronic News.

With the greater focus on sustainability, society needs a better and more efficient use of energy and other natural resources. By tracking the temperature of various processes, we can help to take more steps towards a sustainable world. Let us help each other!

Finally, I would like to thank you all for the year gone by and wish you a really good Christmas holiday and a 2020 that is at least as exciting!

Until then, happy reading!

Rikard Larsson
Managing Director

PART OF SWEDEN'S CLIMATE TARGET IS RIGHT HERE

The forest is an important component of Sweden's shift to fossil-free energy.

One supplier of this energy is Derome's pellets factory in Kinnared, western Sweden.

Here, green energy is produced with the help of the right recipe, right moisture content and right temperature.

DEROME is Sweden's biggest family-owned wood products industry, with 2,500 employees working all the way from the forest to finished houses. Its subsidiary Derome Timber operates five combined sawmills and planing mills. The sawdust and shavings are sent to the pellets factory in Kinnared.

"By using only our own raw material with properties that we know, we have better control over the properties of the end product," explains factory manager Ola Blohm. The pellets are made to a recipe, whose ingredients are various types of sawdust and shavings. Combined with the right temperature and moisture content at the various stages of the process, the result is pellets with very high and consistent quality. Derome claims the result is two percent more heat per kilo of pellets compared with those of other suppliers.

"We measure the moisture content of the sawdust and cuttings at the beginning of the process, after both dryers, and before the pressing stage," Ola says.

Those readings then determine the temperature in, and feeding speed through, the dryers and press. For that purpose, Derome uses three measurement heads by NDC, supplied by Pentronic.

"We've chosen Pentronic to supply our temperature sensors due to its operationally reliable products and excellent service," Ola says.

The three measurement heads measure the moisture content without contact directly in the flow with the help of light in the near-infrared (NIR) spectrum. The readings are shown on displays at each measuring location and are also transmitted to the control and monitoring system.

The measuring device is an industrial one whose current version is called the NDC CM710e and is designed for online measuring. The optical component is automatically kept clean with pressurised air and only needs to be cleaned about once a week, despite the dusty and hot environment.

Derome Pellets factory manager Ola Blohm with colleagues in the control room.

This type of moisture content measurement is important both to control product quality and to help prevent fires.

"In our case the fire risk is not very great because we mainly use spruce from our own sawmills. The risk is greater when you make pellets from pine," Ola says.

In contrast, a fire risk does exist with damp sawdust or shavings or with large piles of pellets, due to the heat produced by moisture migration. The corresponding risk also exists with composting. So it's important to monitor the temperatures.

The temperature is also significant for the end product's quality and purity. During the manufacturing process, the wood's own binder, lignin, is used to bind the pellets so they do not crumble. To achieve this requires either the correct temperature or the addition of starch.

"Many of our customers want a pure wood fuel without starch, and we deliver that," Ola says.

Finally, to clarify this article's title: Sweden has committed to reducing its emissions of carbon dioxide from fossil fuels. One of the cornerstones is the transition to renewable fuels from the forest. The sawdust piles lying outside Derome's pellets factory in Kinnared thus form part of Sweden's climate target.

Pentronic's sales engineer Per Bäckström checks the moisture meter.

"WE'VE CHOSEN PENTRONIC TO SUPPLY OUR TEMPERATURE SENSORS DUE TO ITS OPERATIONALLY RELIABLE PRODUCTS AND EXCELLENT SERVICE"

Ola Blohm reads off the measured value.

PENTRONIC STRENGTHENS ITS ACCREDITED LAB IN KARLSTAD

Swedish industry's demands for accuracy and efficiency continue to grow. As a result, Pentronic is now expanding its operations to improve access to our temperature calibration services.

Emma Johansson and Morgan Norring. In response to our customers' increased need for temperature calibration, Morgan Norring at our branch in Karlstad has now been joined by a new colleague.

Pentronic has been accredited in accordance with ISO/IEC 17025 since 1988, and was the first entity to receive such accreditation outside Sweden's national testing institute. Since then, we have continually been developing methods for better accuracy within an ever-broader temperature range. Since 1999 we have been approved to perform accredited measurements out in the field at our customers' premises.

We now welcome Emma Johansson as a new colleague at our branch in Karlstad, where she joins our area sales manager Morgan Norring. Emma is now being trained to perform commissions both out in the field and at our local temperature laboratory.

"The need for expertise in temperature and calibration has increased a lot in the past few years," Morgan explains. "For some companies this is due to a generational shift; for others to an increased demand for their products. It's also about being careful with resources. Recalibrating instead of buying a new sensor is often a good way to save both money and the environment. Here at Pentronic, we know about temperature, and now that Emma has joined us, more customers can get the help they need."

We offer Emma a warm welcome to Pentronic!

If you have questions about temperature calibration in your process, don't hesitate to contact us!

The whole accredited lab (AKL) team gathered at a meeting in Västervik. From left: Lars Grönlund, Emma Johansson, Andreas Holm, Karoline Haneck and Morgan Norring.

PRODUCT INFORMATION

CT13 CHEMISTRY FOR USE IN EXTREMELY AGGRESSIVE ENVIRONMENTS

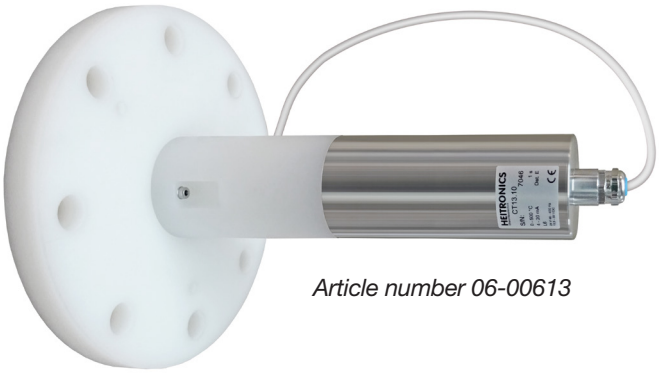
Pentronic presents a new product version of Heitronics' type CT13: CT13 Chemistry.

This IR pyrometer is designed for extremely aggressive environments such as sterilisation using aggressive cleaning agents with concentrated acids and alkalis.

To perform in the demanding environment, the CT13 Chemistry is equipped with a diamond window and a flange made of PVDF polymer (polyvinylidene difluoride) and has an IP67 ingress protection rating.

The normal measurement range is -50 to 500 °C. The signal output can be 4-20mA current output, voltage output or data communication, and these alternatives can be configured by the user.

In conclusion, the CT13 Chemistry is suitable for applications in the following industries:



Article number 06-00613

- Chemical
- Petrochemical
- Pharmaceutical

The picture shows a CT13 with a DN150 flange. Other mounting options are available on request.

STRAIGHT FROM THE LAB

NEW DEFINITION OF THE KELVIN

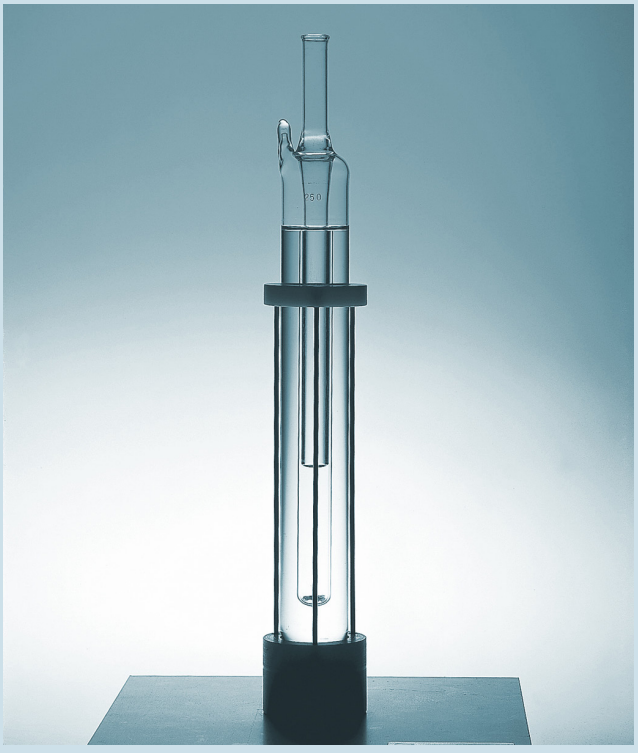
SWEDAC ACKREDITERING
Accred. no. 0076
Calibration
ISO/IEC 17025

On 20 May 2019, all BIPM member states held a vote which means that all units in the SI system now have a natural constant as their definition.

This means there will be a new definition of the kelvin, which will now be defined in terms of energy instead of as a relationship to another temperature. For temperature, the Boltzmann constant is used. By determining the value of the Boltzmann constant, the kelvin can be redefined as the amount of molecular energy that relates to one kelvin.

The new definition does not lead to any difference in the use of fixed points, which in its turn means that there will be no difference when doing "normal" calibrations, and therefore no differences in our calibration certificates. The researchers have done such a good job that we do not notice the difference.

If you want to find out more about the definition of the kelvin, we can recommend this link to the BIPM website: *https://www.bipm.org/utils/en/pdf/si-mep/SI-App2-kelvin.pdf*



MEASUREMENT ERROR DUE TO COATING BUILD-UP

QUESTION ? ANSWER

Questions should be of general interest and be about temperature measurement techniques and/or heat transfer.

QUESTION: We measure the water temperature inside an insulated pipe with the help of a sheathed thermocouple. The installation is of the same kind as that shown in the Q&A article in *Pentronic News 2019 #2*. The water temperature is approximately 120 °C and the pipe is located in an industrial building, where the temperature is approximately 15 °C. Unfortunately, sometimes a coating builds up on the thermocouple and pipe wall. How will this coating influence the measurement result?

Martin D

ANSWER: Normally, the coating build-up would affect both the measurement error and the response time. In some cases, however, the measurement error only increases by an insignificant amount or not at all. What determines the resulting measurement error depends on what is occurring with the heat flow in the thermocouple itself to/from its attachment to the pipe wall. Usually, a heat flow exists between the liquid and the pipe's surroundings, which causes a difference between the temperature of the liquid and that of the pipe wall. This also means that we get an axial heat flow in the thermocouple and we measure a temperature that is slightly lower than that of the liquid. The measurement error depends on such factors as the thermocouple's diameter and insertion length, the axial thermal conductivity in the thermocouple, the heat transfer coefficient between the liquid and the thermocouple, and the temperature difference between the liquid and the pipe wall. For the thermocouple with no coating build-up, the measurement error, ΔT, can be estimated with the help of the equation

$$\Delta T = T_{liquid} - T_{meas.} = 2(T_{liquid} - T_{wall})/(e^{a} + e^{-a})$$

where, T_{meas} is the measured temperature in °C, T_{liquid} the liquid temperature in °C, T_{wall} the pipe wall's temperature in °C at the thermocouple's attachment to the wall, and a is a parameter

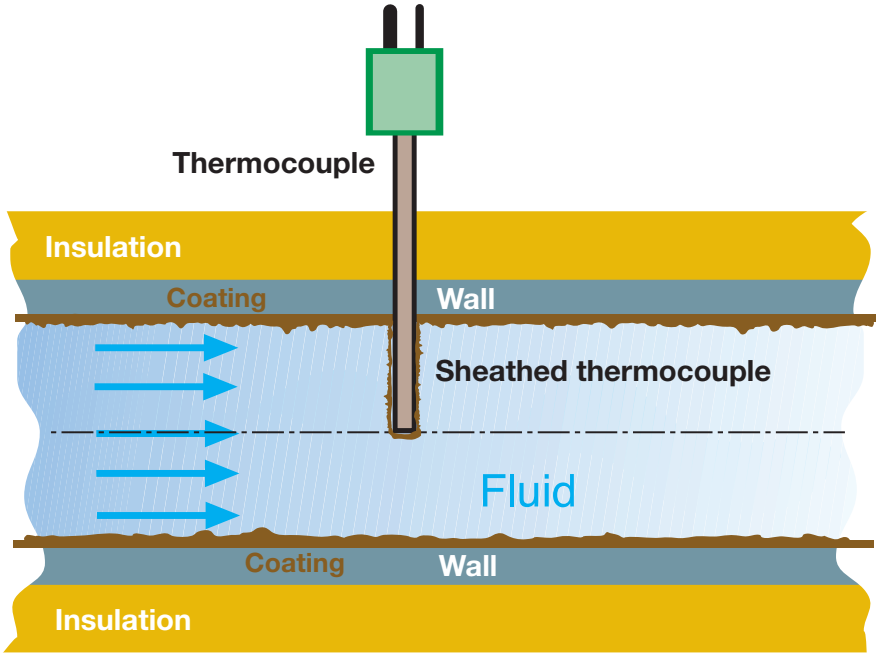
$$a = L(4h/(kD))^{0.5}$$

If a coating builds up on the thermocouple and the pipe wall, this affects the heat transfer to both the thermocouple and the pipe wall. The heat transfer in the thermocouple itself is affected and thereby the measurement error. We now assume that the thermocouple and the pipe wall both receive an even coating. We also assume that the coating's thermal conductivity is much lower than that of the pipe and the thermocouple. The coating build-up reduces the radial heat flow from the liquid to the thermocouple. When the thermocouple acquires such a coating, its diameter increases, which in normal cases leads to a slightly lower heat transfer coefficient. When doing rough estimates, the heat transfer coefficient can be replaced with an overall heat transfer coefficient, U, which includes both the heat transfer coefficient and the thermal conductivity of the coating. The overall heat transfer coefficient U becomes less than the heat transfer coefficient, h, which applies for the clean thermocouple, and the parameter a is lowered when h is replaced by U. Accordingly, in the case of a coating build-up, the expression $1/(e^{a} + e^{-a})$ increases, which in its turn means that the measurement error ΔT increases.

The heat flow through the coated pipe wall is reduced, causing a drop in the pipe temperature. The temperature difference ($T_{liquid} - T_{wall}$) increases and thereby so does the measurement error. Both the temperature reduction of the pipe wall and the reduced heat flow to the thermocouple also contribute to increasing the measurement error.

The case we have discussed here involves an even distribution of the coating build-up on the pipe wall and the thermocouple. Even if the coating's thickness varies, the same basic discussion applies.

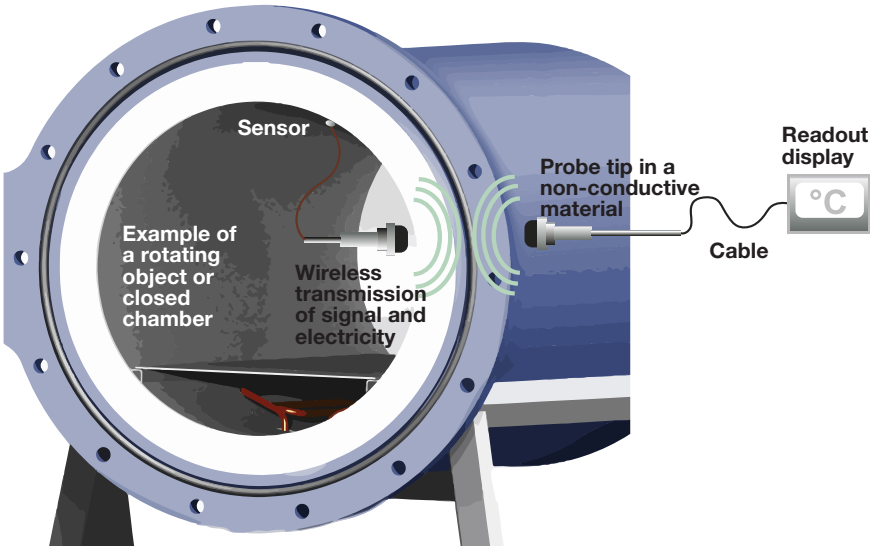
If the temperature of the pipe wall is the same as that of the liquid, then no axial heat flow occurs in the thermocouple. For this to be the case, one requirement is that the pipe is well insulated. If the water temperature is constant and the axial heat flow in the thermocouple can be disregarded, the measured value is not affected if the thermocouple acquires a coating build-up. If the liquid temperature varies, however, the coating will extend the response time, because the heat flow from the liquid to the thermocouple decreases as a result of the coating. To determine whether the measurement error and response time are acceptable, it is necessary to produce the numeric values for the case in question.

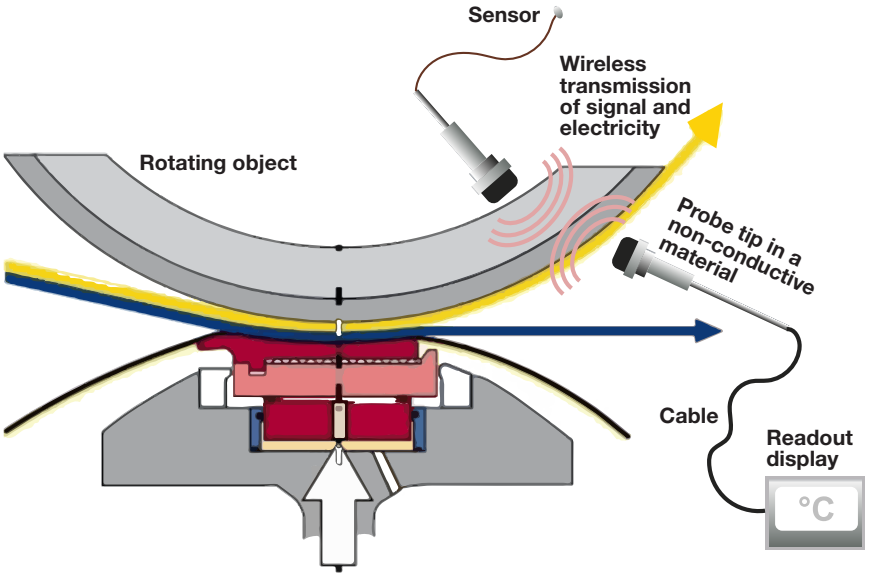


If you have questions or comments, contact Professor Emeritus Dan Loyd, LiU, dan.loyd@liu.se

PENTRONIC'S SENSORS GO WIRELESS

New technology is developing faster and faster, leading to new solutions to previously identified problems. Pentronic has been working for a number of years on developing "smart" sensors, which can use modern electronics to transform discrete signals from thermocouples and platinum resistors into standardised analogue and digital signals transmitted to measuring and control equipment. Signal transformation at the sensor has advantages such as diagnostics and signal output, so that the same model of sensor always produces the same signal regardless of the individual unit.





Using digital technology also makes it possible to connect the sensors to a bus system in order to reduce the need for laying cables in multi-sensor applications. Digital signal transmission eliminates measurement errors in the signal chain by digitally transmitting the sensor signal all the way from the sensor to the measuring or control system. A number of Pentronic's customer have chosen this type of technology for their applications.

The latest product development at Pentronic involves the ability to communicate with sensors wirelessly. A number of examples already exist of sensors with wireless signal transmission, but most of them require a battery or mains electricity supply in order to work.

"We can now offer a solution whereby both the signal and the electricity supply are transmitted wirelessly," explains Emil Ritzén, head of electronics development at Pentronic. "The technology is based on signal transmission with standardised communication plus energy that is transferred by induction."

Pentronic's Managing Director Rikard Larsson describes the applications where it can be appropriate to use this type of product. It might be when you want to place a sensor on a rotating object such as a drive shaft or roller. Another example is when the sensor has to be put inside a closed chamber, where it is difficult to create a seal because of cable lead-throughs or connectors. Or where it must be easy to install and remove sensors.

The first product to be available is built for resistance thermometers. It can transmit signals and power for a distance of up to 40 mm. The product is hermetic and can handle an ambient temperature of up to 85 degrees C. It is designed to meet the requirements for extreme environments. The signal output is 4-20 mA.

"We consider other sensor types such as thermocouples plus digital signal output to be a natural development of this product family," Emil says.

"If you're facing a problem where you think our wireless technology can be the solution, don't hesitate to contact Pentronic and we'll tell you more about how the technology works," Rikard Larsson concludes.

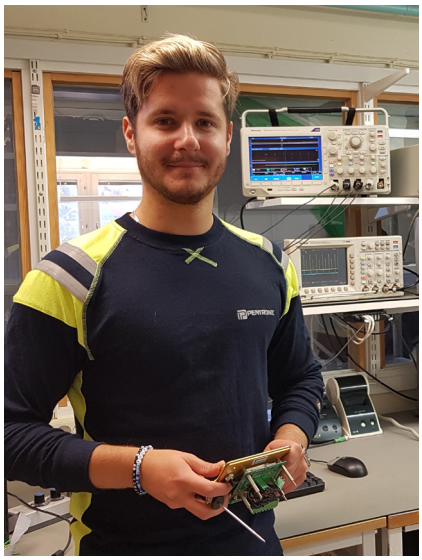
NEW SERVICE ENGINEER

In September, Adrian Södergren began working as a service engineer with us.

Adrian is already a well-known face at Pentronic because he worked for four years in the production department helping to make temperature sensors. This means he has good product expertise and experience from his previous position, which he brings with him now that he takes on an important role in the company as service engineer.

His tasks include the service and maintenance of temperature sensors and instruments plus installations and start-ups. All types of instruments we sell go through our service engineers for inspection before they are sent to customers. The work also means that as our customers, you will meet Adrian when he does field work at your premises. Pentronic also manufactures complete systems for measuring glass flow (GFMs), which require installation, start-up and service on site. Adrian is an active individual who is interested in technology and likes to travel, which suits his new duties.

"New challenges, inspirational and varied work, and tasks out in the field were what attracted me to this job. I look forward to meeting customers on site and helping them with various types of service tasks," Adrian says.



Adrian Södergren, new service engineer at Pentronic.

CERTIFICATION GUARANTEES EXPERTISE

Pentronic's sales engineer and technical expert Per Bäckström has received the certification Level 1-Electric ISM-ATEX. The certification guarantees expertise in the installation, service and maintenance of electrical and mechanical installations in ATEX environments. The certification was issued following training by the French institute INERIS.

We congratulate Pelle on his successful training and look forward to being able to help more customers with skilled support in this field!

Do read more about how we manufacture EX-classified sensors in Pentronic News 18-2, which you will find at our website.

Per Bäckström, sales engineer and technical support at Pentronic.

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