

# Wireless measurement solutions enhance safety

By Ron Auvil

## Application Note

Two examples: Boiler room temperature sensor checkout and variable speed drive checkout

Are you working safely every day? I sure hope so! If not, get off the job right now! If you are like me, we have mandatory safety training every month, or more often as needed. We cover safety topics ranging from fall protection and ladder safety to arc-flash protection. Because I've had friends injured or killed, I pay close attention and take in every word.

Having said that, following all of the proper safety precautions in every situation is a burden. Safety equipment is bulky, heavy, and hot. In my position as a senior HVAC technician in the southern United States, I routinely work in boiler rooms that are over 120 °F (48.8 °C). While I would never compromise any safety procedures, I'm the first one to gripe about my arc-flash clothing and gloves. Also, it is routine for me to use a laptop to turn mechanical devices on or off. Bulky safety gear and gloves can make it difficult for me to use the laptop effectively. Not only is this the case with arc flash dress-out, but also when devices are in difficult-to-access areas—in many cases high off the floor. This means that ladder safety and fall protection requirements also come into play. Being a little older, I am more careful than ever about putting myself into situations where I am required to work from a ladder for extended periods of time.

### Customers and safety

Interestingly, another issue is financial. When I get to a job site on a service call, the meter is running. The customer's bill is going up every minute I am there. Believe me, they are very aware of this fact.

Keep in mind that many customers are not aware of changes or updates to safety regulations and procedures. More than once customers have told me they are paying for me to get all of my arc flash gear on or to make sure that other safety standards are being met. For example, if a technician is billed at \$150 per hour, and it takes half an hour to set up with safety gear, then the customer is paying \$75 just to get dressed-out before any work gets done. In some cases this amount can be even more. While this may seem like financial nitpicking, I have had customers bring this up more than once.



So, is there at least a partial solution to these issues? Is the solution to somehow ignore or circumvent the rigid adherence to the safety rules and procedures we have been taught? Obviously the answer is a resounding no.

Wireless solutions from Fluke, such as the 233 Remote Display Multimeter and the CNX™ wireless test tools, can help at least reduce some of these issues. If used properly, and with all safety rules in mind, these meters and accessories can reduce the need to wear arc flash clothing. In addition, they can be connected in a difficult-to-reach area and then read remotely at a safe and comfortable distance. Here are two real-world examples.



### Example #1: Boiler room temperature sensor checkout

A customer called and complained about a boiler hot-water temperature sensor. When I arrived the customer said the sensor seemed to be very inaccurate, and giving strange readings. The control sequence was being affected by the sensor problem. The customer and I decided the best course of action would be to use a digital multimeter (DMM) and measure the signal from the sensor while cycling the boiler on and off through the facility BAS. This would be done through my laptop. The temperature sensor was a simple resistive nickel sensor with a resistance of 1 K $\Omega$  at 70 °F (21.1 °C) and a positive temperature coefficient of 3  $\Omega$  per °F.

#### A major complication

While this is a very straightforward problem, there was a major complication. The temperature sensor was located in the hot-water discharge line directly on top of a boiler in operation. While a ladder could be used to reach the sensor, it would be very difficult to hold the DMM leads in place and read the value continuously in operation. I was unwilling to break any ladder safety rules by doing this. In addition, the temperature in the boiler room was about 120 °F (49 °C). To make it even more difficult, I would have to cycle the boilers on and off while somehow measuring the resistance value at the same time. This would be almost impossible.

#### Safer, comparatively comfortable, and easier

My solution was to safely climb the ladder and find the sensor wiring. Then I connected my Fluke 233 to the sensor leads. I removed the wireless readout

and climbed down the ladder. Placing the readout next to my laptop, I was able to cycle the boilers while reading the sensor resistance values at the same time. This task was done both safely (without trying to reach from the ladder) and comparatively comfortably (from the floor of the boiler room, which was ventilated).

I discovered that the sensor was intermittently opening and then reading correctly, so I replaced it. I also found that the sensor had been connected using two wire nuts at a junction box. The wires did not seem to be making good contact, so during the replacement I tightened those connections as well. In my opinion, the 233 made my job a lot safer from ladder issues, comfortable from a temperature standpoint, and easier because I could see my laptop and the meter at the same time.

### Example #2: Variable speed drive checkout

A customer called me and we scheduled a service visit to work on a problem with the hot water distribution system. The customer thought the cause of the problem was either the control system or the variable speed drive on the hot water pumps.

#### Operating erratically

This system had an older variable speed drive that was operating erratically. He wondered if it was failing and needed to be replaced. After I checked the control system and found it was operating properly, we turned our attention to the drive. Similar models of the drive had failed in this facility over the past two years.

We wanted the ability to monitor all three phases of the drive simultaneously and remotely with the enclosure door closed and from a safe distance. This would be faster than checking each phase one at a time with a standard clamp meter and having to dress out during the entire process with the enclosure door open.

While we knew we would still have to dress out for arc flash to check for power during the lockout/tagouts, we wanted to avoid it during the checkout of the drive with the enclosure door closed.

#### Applying the wireless system

We did a proper lockout/tagout of the drive and waited for the drive components to de-energize per manufacturer recommendations. We then attached the CNX 3000 Wireless Multimeter and the amperage meters to each phase. We buttoned up the drive, turned the power on, and placed the system back into service. We used the customer cell phone interface to override the drive to various commands, such as 0 %, 25 %, 50 %, 75 %, and 100 %. We checked amperage and hertz at each point.

After multiple checks, we found that the drive parameters did not match the motor. The customer remembered that the motor had been changed but the drive parameters had not. We placed the

drive into bypass and changed the parameters. We started up the drive and repeated the same checks. After the drive checked out properly, we again performed a lockout/tagout of the drive power and removed the CNX, then placed the system back into normal operation. The control system worked perfectly to bring the hot water system into control.

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