

Memosens

A practical guide to memosens, covering the reader intent, the relationship to memosens, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



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In the landscape of industrial process automation, the transition from analog to digital signal transmission has redefined how engineers approach sensor reliability and maintenance. Memosens technology represents a fundamental shift in liquid analysis, moving away from traditional high-impedance analog connections toward a robust, inductive, and digital communication protocol. While primarily associated with parameters such as pH, ORP, dissolved oxygen, and conductivity, the integration of Memosens-enabled systems often runs parallel to level measurement technologies in complex process environments.

For engineers managing water treatment, chemical processing, or oil and gas facilities, understanding the underlying principles of Memosens is essential for optimizing system uptime and data accuracy. This guide explores the technical architecture of Memosens, its practical application alongside industrial level measurement instruments, and the criteria for successful field implementation.

| The Measurement Principle of Memosens Technology

Traditional analytical sensors rely on a direct electrical contact between the sensor and the transmitter. In high-impedance circuits, such as those used for pH measurement, even minute amounts of moisture, corrosion, or salt bridges at the connection point can lead to significant signal drift or total failure. Memosens eliminates these vulnerabilities through a non-contact, inductive coupling system.

| Inductive Signal Transmission

The core of Memosens technology is the galvanic isolation of the sensor from the transmitter. The sensor head and the cable connector each contain an inductive coil. When connected, these coils form a transformer-like coupling. Power is transferred inductively from the transmitter to the sensor, and data is transmitted bi-directionally via the same electromagnetic field. Because there are no exposed metal contacts, the system is entirely immune to moisture, humidity, and the corrosive atmospheres common in industrial tanks.

| Digital Data Processing

Unlike analog sensors that send a raw millivolt signal through a cable, Memosens sensors convert the analog measurement value into a digital signal directly within the sensor head. This digital signal is then transmitted to the transmitter. This architecture ensures that the signal remains stable regardless of cable length or external electromagnetic interference (EMI). Furthermore, the sensor head stores critical data, including:

Calibration constants and slope.

Operating hours and peak temperature exposures.

Serial numbers and manufacturing data.

This "intelligence at the sensor" allows for offline calibration in a controlled laboratory environment, which is then recognized immediately by the transmitter upon connection in the field.

| Integration with Level Measurement Systems

In many industrial applications, liquid analysis and level measurement are interdependent. For instance, in a chemical neutralization tank, a radar level meter monitors the volume of the medium while a Memosens pH sensor monitors the reaction state.

Manufacturers like Welk provide a range of Main Page solutions, including ultrasonic and hydrostatic level transmitters, that often work in tandem with digital analytical protocols. When designing a control loop, the reliability of the level data must be matched by the reliability of the analytical data. The use of Memosens ensures that the analytical component of the process control does not become the "weak link" due to cable degradation or moisture ingress in the junction boxes.

Technical Selection Criteria

Choosing the correct Memosens-ready system requires an evaluation of the process conditions and the existing infrastructure. The following table provides a comparison between traditional analog systems and Memosens digital systems to assist in the selection process.

Table 1: Comparison of Sensor Technologies

Feature	Traditional Analog (High Impedance)	Memosens Digital Technology
Connection Type	Metallic contact (pins/sockets)	Inductive coupling (non-contact)
Moisture Sensitivity	Extremely high; requires dry environment	Zero; can operate submerged
Signal Integrity	Subject to EMI and cable resistance	Digital; immune to external noise
Calibration	Must be performed at the transmitter	Can be performed offline in a lab
Cable Length	Limited (typically < 15m without booster)	Up to 100 meters (328 ft)
Data Storage	None in the sensor	Stores calibration and history data
Maintenance	High; frequent cleaning of contacts	Low; plug-and-play replacement

Installation and Engineering Considerations

Successful deployment of Memosens technology requires adherence to specific engineering standards to ensure the longevity of the instrumentation.

| Cable Management and Distance

One of the primary advantages of Memosens is the ability to extend cable runs up to 100 meters without signal degradation. However, engineers should still ensure that cables are protected from mechanical stress. While the inductive coupling is immune to moisture, the outer jacket of the cable must be compatible with the chemical environment of the facility (e.g., PVC, PUR, or PTFE).

| Mounting and Submersion

Memosens sensors are often installed in flow-through assemblies or immersion pipes. When used in tanks where level fluctuations are frequent, the sensor must be positioned to remain submerged even at the minimum operating level. In these scenarios, integrating a hydrostatic level transmitter allows the control system to verify that the analytical sensor is covered by the medium before validating the pH or oxygen readings.

| Power Supply Requirements

Because the transmitter must provide power for the inductive coupling and the internal electronics of the sensor head, the power consumption of a Memosens-enabled transmitter is slightly higher than a standard 4-20mA loop-powered analog transmitter. Engineers must verify that the power supply (typically 24V DC) can handle the cumulative load of the analytical and level measurement instruments.

| Limitations and Operational Risks

While Memosens offers superior reliability, it is not without limitations. Understanding these boundaries is critical for process safety.

1. **Temperature Constraints:** The electronics within the Memosens sensor head are sensitive to extreme heat. Most standard Memosens sensors are rated for temperatures up to 135°C (275°F). In applications involving high-pressure steam or molten materials, alternative cooling assemblies or different measurement principles must be employed.
2. **Proprietary Protocols:** Although Memosens is an open standard supported by several major manufacturers, it is not compatible with standard analog transmitters. Upgrading a facility to Memosens typically requires replacing both the sensors and the corresponding transmitters.
3. **Electronic Failure:** While the inductive coupling eliminates mechanical wear, the internal microchips in the sensor head are still subject to electronic failure if exposed to radiation or extreme voltage surges (e.g., lightning strikes on ungrounded tanks).

| Practical Maintenance Guidance

The "Plug and Play" nature of Memosens significantly reduces the time spent in the field. Maintenance technicians can carry pre-calibrated sensors to the site, swap the existing sensor with the new one, and return the old sensor to the lab for cleaning and regeneration.

When a Memosens sensor is connected, the transmitter automatically uploads the calibration data. This eliminates the need for field calibration, which is often inaccurate due to environmental factors like wind, rain, or fluctuating temperatures. For facilities utilizing a wide array of Main Page level sensors and analytical probes, this standardized maintenance workflow reduces the risk of human error.

| Frequently Asked Questions (FAQ)

Q: Can Memosens cables be repaired if cut?

A: It is generally not recommended to splice Memosens cables. Because they carry high-frequency digital signals and power for the inductive coupling, a splice can introduce impedance changes that disrupt communication. It is better to replace the cable entirely or use a dedicated Memosens junction box.

Q: Does Memosens work with all types of level meters?

A: Memosens is a protocol for analytical sensors (pH, O₂, etc.). However, modern digital transmitters often feature multiple inputs, allowing them to accept a Memosens signal for analysis and a 4-20mA or HART signal from a level meter simultaneously to provide a comprehensive view of the tank status.

Q: How do I know if a Memosens sensor is reaching the end of its life?

A: Memosens sensors track their own operating history. The transmitter can display a "sensor health" percentage based on the number of hours in operation, the temperatures encountered, and the results of the last calibration. This allows for predictive maintenance before a failure occurs.

Q: Is the inductive coupling affected by magnetic fields?

A: Standard industrial magnetic fields (from motors or pumps) generally do not interfere with Memosens because the inductive coupling operates at a specific frequency and is shielded within the connector. However, extremely high-strength magnetic separators should be kept at a reasonable distance.

| Conclusion

Memosens technology provides a robust solution for the challenges of liquid analysis in harsh industrial environments. By replacing vulnerable metal contacts with inductive coupling and moving data processing to the sensor head, it ensures high data integrity and simplified maintenance. When integrated into a broader process control strategy—alongside reliable level measurement instruments and automation systems—Memosens contributes significantly to the safety and efficiency of modern industrial operations.