

NAVIGATING CORROSIVE MEDIA

Choosing the Right CONDUCTIVITY "SC42" Sensor Body for Acids and Oxidizers

Why This Guide Matters

Measuring conductivity in corrosive chemical environments is not only about accuracy, it is about long-term reliability and safety. Acids, oxidizers, and aggressive chemical media can quickly attack unsuitable sensor materials, leading to leakage, drift, or unexpected failures.



In many applications, the conductivity measurement itself is technically straightforward, but selecting the wrong sensor body material results in increased maintenance, shortened sensor lifetime, or even process downtime.

This guide explains how to select the correct SC42 sensor body material, focusing on PVDF and PTFE versions, and helps you balance chemical resistance, mechanical strength, pressure limits, and temperature constraints with confidence.

Corrosive Media: The Hidden Challenge

Corrosive process media attack sensors in more ways than one. While chemical compatibility is often the first concern, real-world applications frequently involve pressure, temperature changes, and mechanical stress at the same time.

Strong oxidizers such as fuming nitric acid or chlorine compounds can degrade many plastics that otherwise perform well in common acids. At the same time, high pressure or temperature accelerates material creep, deformation, and seal failure.



The Risk: Ignoring these combined effects can result in leaks, unstable readings, or sudden sensor body failure even when the sensor works perfectly during initial start-up.

The SC42 Sensor Family Overview

Yokogawa’s SC42 large-bore conductivity sensors are designed for demanding industrial applications involving high conductivity liquids and aggressive chemistry. The SC42 series is available with sensor bodies made of:

- Epoxy & Stainless Steel (Standard/Mechanical applications)
- PVDF & PTFE (Aggressive/Corrosive chemical profiles)

This guide explains how to select the correct SC42 sensor body material, focusing on PVDF and PTFE versions, and helps you balance chemical resistance, mechanical strength, pressure limits, and temperature constraints with confidence.



PVDF vs PTFE: Quick Comparison

Both PVDF and PTFE SC42 sensors offer excellent corrosion resistance, but they are optimized for entirely different process priorities:

PVDF Body (-FP/FV)	PTFE Body (-TP/TV)
High Mechanical Strength	Near-Universal Inertness
Superior Pressure Integrity	Defends Against Aggressive Oxidizers
Excellent for Abrasive Lines	Optimized for Low-Pressure Lines

PVDF provides higher mechanical strength and pressure capability, making it suitable for pressurized lines and abrasive services. PTFE offers near-universal chemical resistance, allowing safe use in extremely aggressive oxidizing media.

Understanding this difference is the key to reliable material selection especially when pressure and chemical severity are both critical factors.

Pressure and Temperature Limits Explained

Specification	PVDF Version (-FP/FV)	PTFE Version (-TP/TV)
Max Temperature	Up to 110°C (230°F)	Up to 110°C (230°F)
Max Pressure @ 20°C	10 bar (142 PSIG)	2 bar (28.5 PSIG)
Max Pressure @ 110°C	3 bar (43.5 PSIG)	2 bar (28.5 PSIG)
Vacuum Rating	0.5 bar absolute	Not recommended for high vacuum

If pressure capability is required, PVDF is the safer choice provided that strong oxidizers are absent. PTFE should only be used in low-pressure or atmospheric conditions.

Exceeding pressure-temperature limits may result in sensor body deformation, seal failure, or loss of measurement integrity, even when chemical compatibility appears sufficient.



While both PVDF and PTFE models handle temperatures up to 110°C, the PVDF version offers better pressure resistance at ambient temperatures, whereas PTFE provides unmatched resistance to fuming acids.

Deep Dive: PVDF Version: Strength and Versatility

The PVDF (Polyvinylidene Fluoride) version of the SC42 sensor is designed for applications where chemical resistance must be combined with mechanical durability. PVDF offers higher tensile strength, improved abrasion resistance, and better pressure tolerance compared to PTFE. This makes it particularly suitable for industrial processes with suspended solids, flowing media, or moderate mechanical stress.

PVDF is ideal for most non-oxidizing acids and aggressive industrial wastewater, where pressure capability is required but extreme oxidizers are not present.

Common PVDF Applications:

- *Chemical manufacturing involving dilute hydrochloric or phosphoric acid*
- *Acidic wastewater and industrial effluents*
- *Mining and metal finishing processes with abrasive solutions*
- *Pickling baths where mechanical robustness is critical*

Outcome: The PVDF body maintains dimensional stability and resists wear while delivering accurate conductivity measurement over long periods.



Deep Dive: PTFE Version: Max. Chemical Resistance

The PTFE (Polytetrafluoroethylene) version of the SC42 sensor is reserved strictly for the most chemically aggressive environments. PTFE is highly inert and resistant to virtually all chemicals, including strong oxidizers that can degrade PVDF.



To improve mechanical stability, the sensor body uses glass-filled PTFE, but pressure limits remain intentionally conservative. PTFE should be selected whenever chemical compatibility cannot be compromised even if process pressure is low.

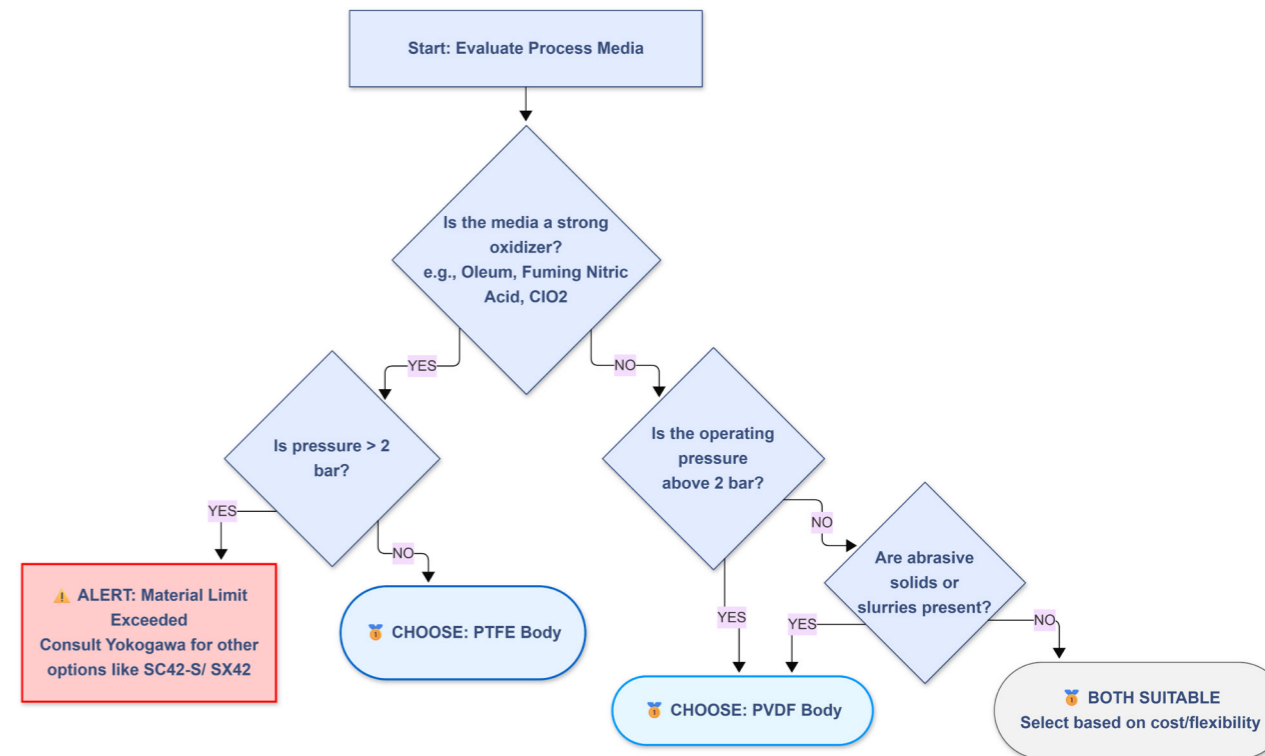
Common PTFE Applications:

- *Oleum (fuming sulfuric acid)*
- *Concentrated or fuming nitric acid*
- *Strong oxidizing agents such as chlorine dioxide*
- *High-strength peroxide processes*

Outcome: These environments rapidly damage most polymers. PTFE ensures long-term chemical integrity and prevents body degradation in extreme oxidizing chemistry.



Material Selection Decision Tree



Sealing and Electrode Design

Both PVDF and PTFE SC42 sensors use a shielded glass-platinum, 4-electrode design, ensuring stable measurement in high-conductivity liquids and minimizing polarization effects.

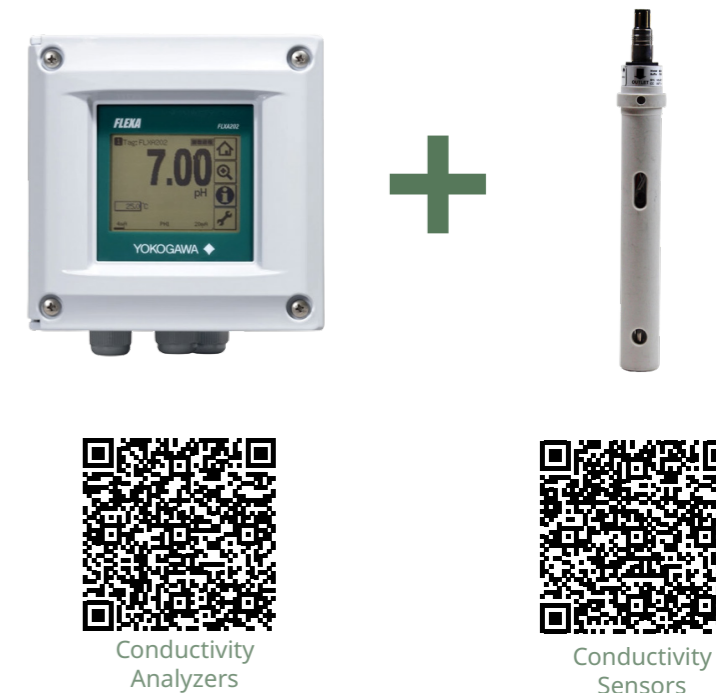


Critical Maintenance Insight: The O-ring seal is often the first point of failure in corrosive service. For aggressive applications, Yokogawa typically uses FFKM, Viton seals to match the extreme chemical resistance of the sensor body material. Selecting the correct seal material is just as critical as selecting the sensor body itself.

Complete Measurement Loop

The SC42 sensors are commonly paired with Yokogawa's FLXA21 or FLXA202 2-wire conductivity analyzers, forming a reliable, loop-powered measurement system.

This combination ensures stable signal transmission, HART communication, and compatibility with hazardous area requirements. Multiple installation options including inline, bypass, and immersion fittings allow flexible integration into existing industrial processes.



When to Consider Other Materials

In some applications, neither PVDF nor PTFE provides the required operating envelope. When both chemical resistance and mechanical strength must be sustained under extreme pressure or temperature, alternative sensor constructions should be evaluated.

For processes operating above 10 bar, or temperatures approaching or exceeding 110 °C, plastic sensor bodies may no longer provide sufficient structural stability. In these cases, sensors with metallic bodies or ceramic insulation offer a more robust solution.

Yokogawa's SC42-S (Stainless Steel) sensors are suitable for higher pressure environments where chemical compatibility allows the use of metallic materials. For more demanding conditions involving both high pressure and high temperature, the SX42 series is recommended. These sensors are engineered to withstand severe process conditions while maintaining measurement reliability.

Selecting an alternative material should always involve reviewing both chemical compatibility and mechanical design limits to ensure safe and stable operation over the full lifecycle of the installation.

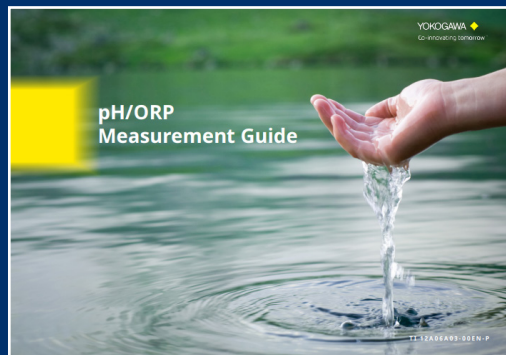
Summary & Key Takeaways

Selecting the correct conductivity sensor body is a critical step in ensuring long-term measurement reliability in corrosive chemical applications. While both PVDF and PTFE versions of the SC42 sensor are designed for harsh environments, their performance characteristics differ significantly.

When making a selection, it is important to evaluate the complete operating conditions, including pressure, temperature, chemical composition/concentration, and the presence of solids. In addition, sealing materials and installation conditions should not be overlooked, as they directly influence sensor lifetime and reliability.

A well-informed material choice minimizes maintenance, reduces risk of failure, and ensures consistent conductivity measurement performance in even the most demanding environments.

This guide is prepared in good faith to assist with initial material selection. Because real-world process conditions vary, we highly recommend contacting your local Yokogawa sales representative for a finalized, application-specific recommendation.



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