



## SIL: Safety first

# World's first TÜV-approved SIL2 analytical measuring chain

SIL means risk reduction to a tolerable level by fault avoidance and fault monitoring. It plays a growing role as a quality feature, not only in safety related systems. SIL chains ensure maximum safety for personnel, environment and equipment.

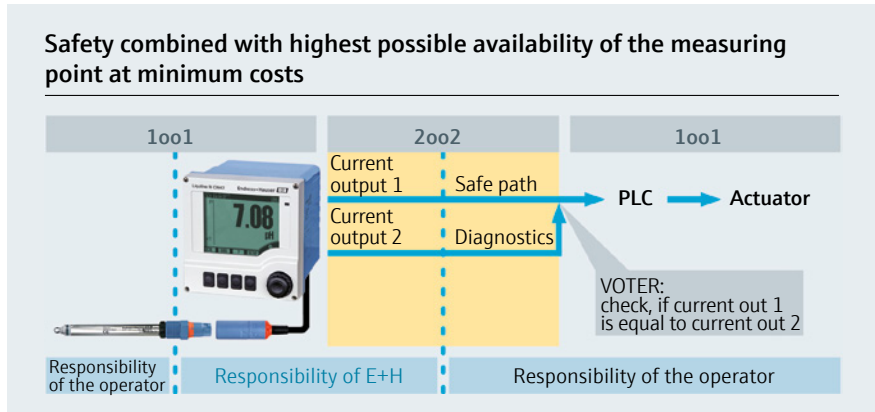
The world's first TÜV-approved SIL2 liquid analysis measuring chain guarantees this safety in a unique way. It is a classified and evaluated instrumentation – from sensor to current outputs, from calibration to proof tests. The measured value is delivered safely.

- SIL2 chain consists of Liquiline CM42 Ex, Memosens cable CYK10 and digital pH glass sensor (separate approvals)
- Developed acc. to IEC 61508
- TÜV-approved
- Two safety functions: limit value monitoring and safe measurement
- Defined life cycle management involved in design, development and service



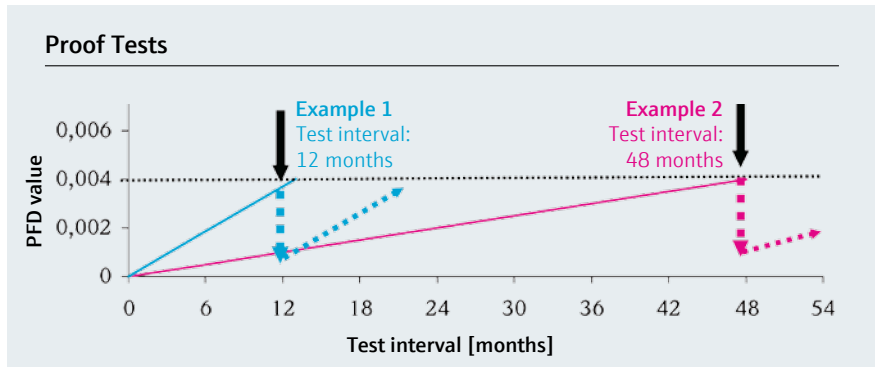
**Safety combined with highest possible availability of the measuring point at minimum costs**

- Measured value is delivered separately to both current outputs and then compared by the voter
- The CM42 SIL measuring chain is classified “**1oo1D**” = **1 out of 1** with **D**iagnostics in total
- HFT=0 means: no failure is tolerable



**Proof tests**

The PFD value of each component is growing continuously. To update it, for the sensor, the cable and the transmitter a proof test can be done after the proof test interval has expired.



**SIL characteristics of the complete measuring chain**

Parameters according to IEC 61508	E+H Memosens pH SIL measuring chain	Parameters according to IEC 61508	E+H Memosens pH SIL measuring chain
Safety Function	1: pH limit monitoring 2: pH value measurement 3+4: Safe calibration and adjustment	$\lambda_{SD}$	688 FIT
SIL	Hardware: 2 Software: 3 in homogenous redundancy: 3	$\lambda_{SU}$	1623 FIT
HFT	0	$\lambda_{DO}$	4473 FIT
Device Type	B	$\lambda_{DU}$	447 FIT
Mode of Operation	Low demand mode	$\lambda_{Total}$	7238 FIT
SFF	93,8%	<b>PFD<sub>avg</sub> (for T<sub>1</sub> = 1 year)</b>	<b>19.6 × 10<sup>-4</sup></b>
MTTR (used for PFD calculation)	8 h	MTBF/MTBF <sub>DU</sub>	15 years / 287 years
		Diagnostic-Test-Interval	< 60 min
		Error Reaction Time	< 10 seconds
		DCD (Diagnostic Coverage Dangerous)	91 %

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