



Virtual Fluid Lab (VFL) Next Generation

Smart Determination of the Filter Element's Remaining Service Life

Smart

IO-Link

Differential pressure

Element service life for service planning

1. DESCRIPTION

The new generation of smart sensors provides additional relevant information in addition to the regular process data. This enables dynamic and self-organising processes that are optimised in real time, thus optimising availability and resource consumption and reducing costs.

The Virtual Fluid Lab VD ... VFL with IO bus interface has been developed specifically for the purpose of enabling demand-orientated and predictive maintenance of filter elements based on the measurement of differential pressure.

To do this, the pressure drop of the filter and the temperature of the medium (read in via IO-Link) measured by the sensor are analysed in real time using a smart algorithm and the current filter load is then calculated.

Based on a prediction model, the algorithm works out the remaining service life of the filter element and calculates exactly when the filter element actually needs to be replaced. This provides information that helps to optimise the planning of maintenance work and minimise downtimes.

This is supplemented by internal logging of the filter's operating conditions so that the usage profile and the number of filter replacements carried out can be recorded and retrieved when needed.

Media compatibility includes hydraulic oils, lubricating oils and HFD as well as all other environmentally compatible fluids¹⁾.

The Virtual Fluid Lab is used in systems requiring continuous and smart monitoring of the remaining service life in order to facilitate well-organised servicing and make the most of the service life of the filter elements. The Virtual Fluid Lab is typically fitted to a dedicated connection on the filter housing.

2. TECHNICAL DATA

Input data

Measurement ranges	Differential pressure 2; 5 bar
Permitted operating pressure	420 bar
Mechanical connection	G ½ HN 28-22.1
Tightening torque, recommended	100 Nm (steel), 33 Nm (aluminium)
Parts in contact with fluid	- Mech. connector: Stainless steel - O-ring: FKM - Profile seal ring: PTFE

Environmental conditions

Compensated temperature range	+20 °C to +70 °C
Operating temperature range	-30 °C to +85 °C
Storage temperature range	-40 °C to +100 °C
CE mark	EN 61000-1 / 2 / 3 / 4

CE mark

Vibration resistance acc. to DIN EN 60068-2-6 at 10 to 500 Hz	≤ 20 g
Shock resistance acc. to DIN EN 60068-2-29 (1 ms)	50 g
Protection type acc. to IEC 60529 ²⁾	IP 67

IO-Link specific data

IO-Link revision	V1.1
Transmission rate, Baud rate	38.4 kBaud (COM2)
Minimum Cycle Time	10 ms
SIO mode supported	Yes
Sensor profile	0x4000 Common Application profile
M-Sequence capability	PREOPERATE = TYPE_1_V with 8 octets on-request data OPERATE = TYPE_2_2 with 8 octets on-request data ISDU supported

Process data	- Remaining filter service life - Operating hours - Differential pressure - Filter load - Status information - Operating state messages
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Smart functions

Operating data recording (over entire service life, last 10 replacement intervals)	- Histogram of differential pressure and fluid temperature - Temperature peak monitoring including logging - Filter replacement log including maintenance history
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Other data

Electrical connection	M12x1, 4-pin
Supply voltage ³⁾	18 to 30 V DC for IO-Link communication mode
Residual ripple of supply voltage	≤ 5 %
Current consumption, 3-wire	~ 25 mA
Service life	at least 1 million cycles (max. permissible operating pressure)
Weight	~ 180 g

Note:

Reverse polarity protection of the supply voltage, excess voltage, override and short circuit protection are provided.

¹⁾ HFC media compatibility available upon request

²⁾ with mounted mating connector in corresponding protection type

³⁾ 9 to 35 V DC outside IO-Link communication mode (e.g. SIO mode without master)

3. MODEL CODE

VD 5 VFL.x /-V-I4M040

Type

VD Differential pressure measurement

Measuring ranges in bar

2; 5

Type

VFL Virtual Fluid Lab

Modification code

X the latest version of the specific type is always supplied

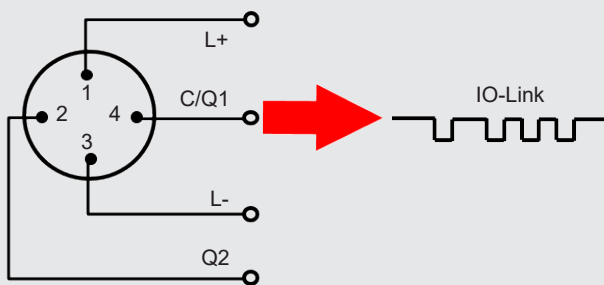
Supplementary details

V FKM seal

I4M040 IO-Link, 4-pin, M12x1

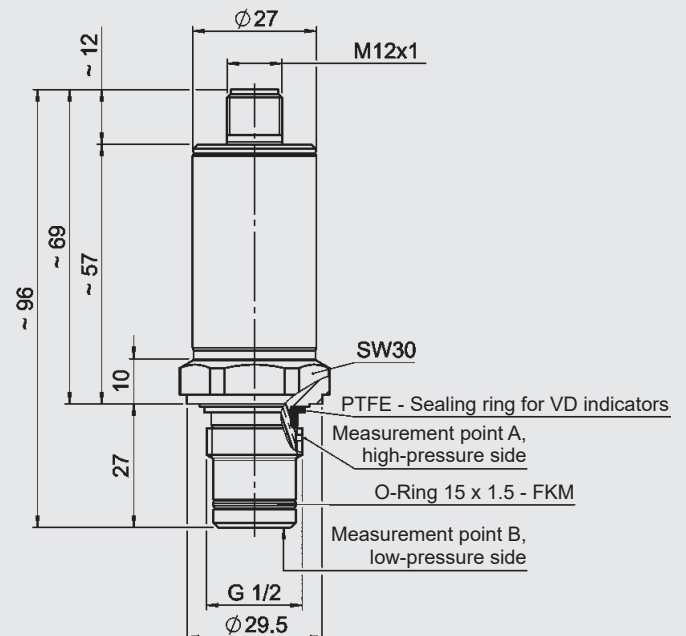
4. PIN CONNECTIONS

M12x1, 4-pin



Pin	Signal	Description
1	L+	+ UB
2	Q2	Switching output 2
3	L-	0 V
4	Q1/C	IO-Link communication / switching output 1

5. EQUIPMENT DIMENSIONS



NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and/or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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