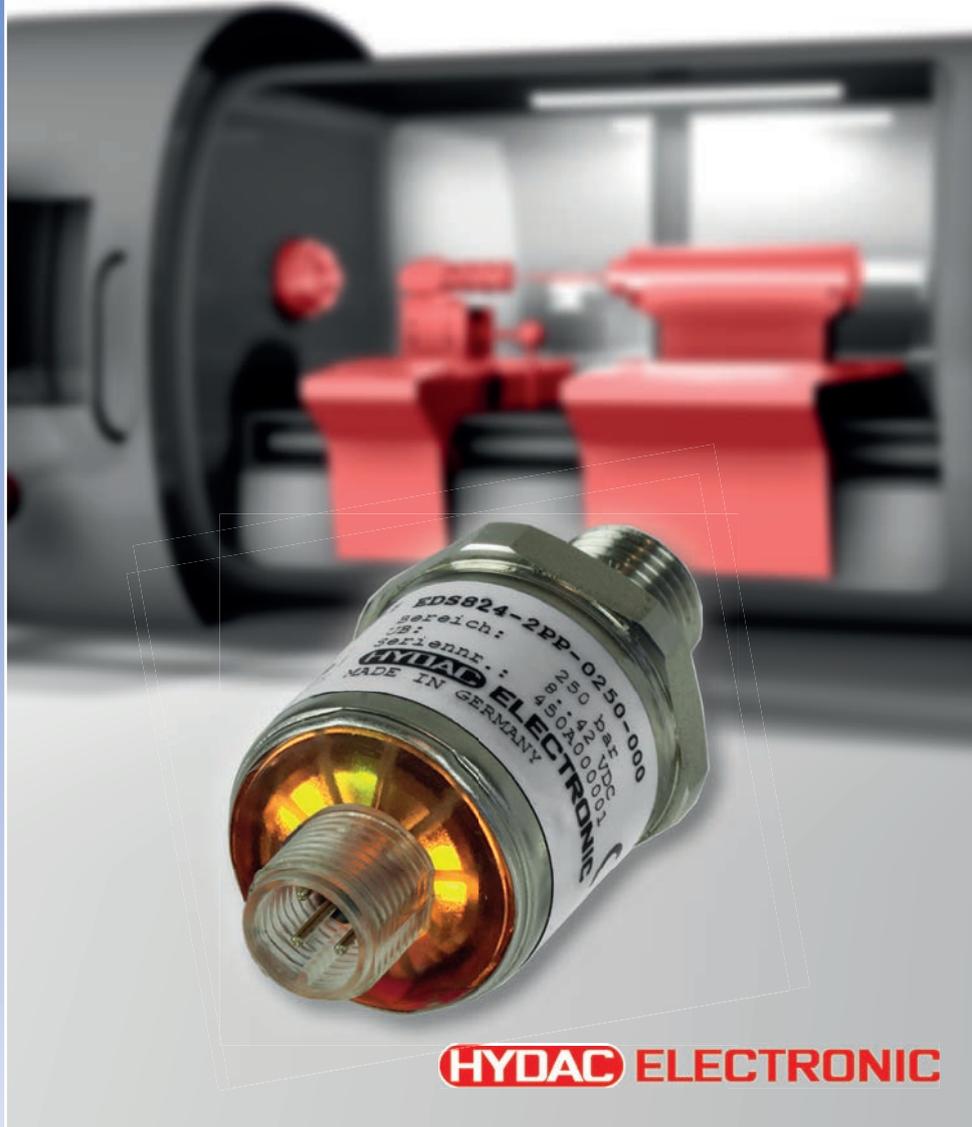


**m**essen  
**p**rüfen  
**a**utomatisieren

**Special Issue**

**Technology Report**

Added Value Thanks to  
 Smart Products and Solutions



**HYDAC ELECTRONIC**

# Added Value Thanks to Smart Products and Solutions

In the future, production systems will be linked to state of the art communication and information systems. Intelligent and digitally networked technologies form the technical foundation for this. In the machinery and production equipment sector, products and solutions will all play a crucial role in the context of Industry 4.0 and IO-Link.

Originally, hydraulic machines were primarily regulated and controlled manually. The 1970's saw the first programmable logic controllers (PLCs) launched onto the market, based on what was still a relatively new semiconductor technology. The introduction of this computer-based automation in industry, is referred to as "Industry 3.0", following on from "Industry 1.0" – which was the beginning of the age of steam engines – and "Industry 2.0" – which signalled the start of mass production based on assembly line work.

Since the Hannover Messe in 2011, "Industry 4.0" (I 4.0) has been a hot topic of discussion, as the next industrial revolution. This term is used to describe the merger of state-of-the-art information and communication systems within the manufacturing industry, and includes the organisation and control of the entire value development chain throughout the entire product lifecycle. While Europe is primarily leading this discussion under the heading "I4.0", there are similar activities ongoing in other regions of the world under terms such as "Industrial Internet of Things" (IIoT) or Smart Factory. The motivation behind this new "revolutionary step" lies in the fact that it will provide significant advantages

for both manufacturers and operators of production systems and machines, ultimately providing benefits for the end customers. Machine manufacturers for instance, can create a digital image of all of the components included in their planned system, (a digital twin), to perform simulations at an early stage of the development process, optimising their development costs. Due to the increased availability of system data, manufacturers can for example analyse the available data to optimise decisions on predictive maintenance, increasing the availability of the machine. Optimised time and logistical synchronisation of both parallel and serial working processes in a production environment will have a positive impact on

productivity for example. The possibility of more dynamic use of production systems, where for example large quantities are produced, but also the possibility of producing in single quantities, opens up the possibilities for the end customer who is purchasing the manufactured goods.

Some key basics in the context of I4.0 are "data digitalisation", "connectivity and communication" and "real-time availability of relevant information". With regard to the lowest field level in automation, where sensors and actuators communicate with the machine controller, using often analogue interfaces, IO-Link can bridge the gap of the digital age. IO-Link is based on a point-to-point communication be-



EDS 824 IO-Link pressure switch. Source: Hydac Electronic



IO-Link device product range. Source: Hydac Electronic

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tween the sensor or actuator and the controller, enabling bidirectional communication. Other advantages result in respect to cabling for example, whereby standard unshielded cables can be used, utilising established connection technologies (4-pin or 5-pin M12 plugs). Compared to sensors or actuators that are connected to the machine controller analogously or with a simple switching output, additional information beyond the process

ler, in digital form. To this end, the manufacturer of the IO-Link device provides in XML format, what is known as an IO-DD, (IO Device Description). This IO-DD is similar to a passport. While a passport contains all of the key data and characteristics about a person, the IO-DD serves the same function for the IO-Link product, providing the likes of the name of the manufacturer, the precise type designation or part number etc. Information relating to the use or operation of supported functions, parameters and process data is also provided. To increase flexibility when handling prob-

sors are available to monitor pressure, temperature, level, distance, oil characteristics and particle contamination, also available in most cases with displays. Devices with displays are often installed in control cabinets or enclosed environments, because they enable manual in-situ access to data settings for example. In hydraulic or pneumatic systems, appropriate piping would need to be installed between the system and the sensors.

With the EDS 824, Hydac offers an IO-Link pressure switch in the form of a small compact pressure transducer that indicates the switching position status using differently coloured LEDs which are visible on the top of the sensor. The sensor can be positioned anywhere in the system and can therefore provide beneficial savings with regards to the connection to the measured medium.

Hydac provides an IO-DD for all devices, which the machine manufacturer can simply access via the Internet. Using the IO-DD Finder, found under <https://ioddfinder.io-link.com/#/>, manufacturers can locate the IO-DD's for all Hydac IO-Link products. Download of the appropriate IO-DD is possible via the "Hydac Electronic" selection criterion.

All HYDAC IO-Link devices can be read or programmed outside of an IO-Link network. There are several Hydac tools available for this purpose, which can be used to access the device information, or read the settings of an IO-Link device that is already in the machine, via a PC for example, enabling the transfer of settings to other IO-Link devices. This functionality is also available with the new Hydac HMG 4000 portable data recorder. The HMG4000 can be used to read and save the parameters of HYDAC IO-Link devices or copy them to other HYDAC IO-Link devices. While IO-Link, in an Industry 4.0 or Industrial Internet of Things environment

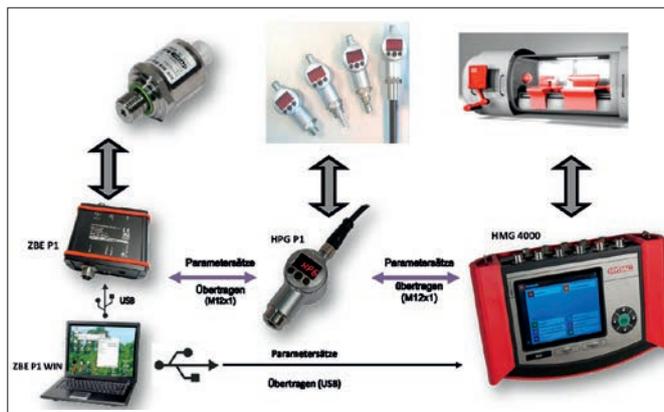
Artikelnummer	Produkt-Typ	Hersteller	IO-Link Rev.	Version	Hinzugefügt	Bild
M924439R1	EDS 3446-F31-0250-000	HYDAC ELECTRONIC GmbH	1.1	V1.1	05.01.17	
M924790R1	EDS 824-F31-0100-000	HYDAC ELECTRONIC GmbH	1.1	V1.1	05.01.17	
M924887R1	HNS 3126-F31-0250-000	HYDAC ELECTRONIC GmbH	1.1	V1.1	05.01.17	

**IO-DD Finder; source: <https://ioddfinder.io-link.com/#/> - all products available for download.**

data is made available with IO-Link. Such information might relate to the value status, (validity of process data), events, (status/error messages), or device data, (manufacturer information, device description and device settings). This communication method means that it is possible to eliminate the manual device setting process on machines. Automated programming of the sensors/actuators via the controller can both significantly shorten the start-up time and provide flexibility-related advantages during normal operation. For the machine controller to detect and operate an IO-Link device, a device description is stored within the control-

lems or dealing with spare parts for example, it can be useful to save the IO-DDs of several product manufacturers in the same machine controller.

Due to the significance of IO-Link, Hydac began participating in the IO-Link Consortium at an early stage, offering now not only the classic analogue and switching type of sensors, but also a wide range of IO-Link related products. With regard to measured variables, sen-



**Parameterisation and data transfer options using Hydac IO-Link sensors regardless of the IO-Link system; source: Hydac Electronic**



is only a standardised way of digitally integrating sensors and actuators in the world of controllers, additional significant added value can be achieved for machine and system manufacturers via the sensors and actuators. In so-called “smart products”, process information from sensors for example, is merged with system knowledge. Valuable additional functions can be applied to operate machines and systems more efficiently, created on the basis of smart algorithms. In the one hand, Hydac has detailed knowledge of the products it develops and manufactures in-house, such as sensors, valves, coolers, accumulators, filters, drives and so on and in the other, it has extensive application-based knowledge due to its in-house manufacturing operations for sub-systems, systems and installations from an extremely wide range of industries, such as the oil and gas industry, tooling machines, presses, plastic injection moulding machines, steel

## About the company

With almost 9,000 members of staff in 48 countries around the world and a network of more than 500 trade and service partners, Hydac is one of the largest international providers of hydraulic solutions. In addition to its components business, which has become more comprehensive over time, Hydac now offers systems and sub-systems to an extremely wide range of mechanical engineering companies. The range of products and services on offer, have long since gone beyond the limits of classic hydraulics. Today, Hydac's product portfolio includes solutions for the process industry, non-fluid-related sensors, electronic programmable controllers, displays, electronic drive axles, solutions for electronic cooling functions and an in-house developed software package, that can be used by manufacturers to develop control software for new machines.



**EDS 3000 pressure switch with IO-Link interface for bladder accumulator monitoring (figure: top left). Source: Hydac Accumulator Technology**



**Hydac HPT 500 high-pressure filter with IO-Link sensor. Source: Hydac Filtration Technology**

manufacture, etc. Hydac is already in the process of developing smart solutions and smart products. On this basis, HYDAC is the ideal development partner for I4.0 solutions for machine and system manufacturers.

Two examples with regard to smart products and solutions are:

Hydac has been developing and selling hydraulic accumulators since 1963, offering three key operating principles: bladder, diaphragm and piston accumulators. Bladder accumulators are pre-set with an application-independent pre-charge pressure. If the pre-charge pressure is lost, the accumulator function is restricted. There are several ways to monitor this pre-charge pressure. Hydac has developed smart accumulator monitoring in combination with an EDS3000 pressure switch, which is already used in many applications for accumulator charging purposes. In this case, the pressure switch monitors the pre-charge pressure in a cyclical manner. If an error occurs, the EDS3000 pressure switch sends an error message to the machine controller via IO-Link, which means that service measures can be taken immediately. Because the pressure switch is already being used for accumulator charging purposes, this addition creates an affordable accumulator pre-charge pressure monitoring solution.

The Hydac filtration technology offers a multitude of filter contamination displays for monitoring filter life. One of these solutions is based on the HPT500 differential pressure transducer from Hydac Electronic. The HPT500 provides a Delta P measured value from the filter to the controller via IO-Link, proportional to the filter contamination. This also makes it possible to identify whether a filter element has been installed in the first place – in other words, it makes it possible to identify whether the machine is being operated under the specified conditions. Using its product and system knowledge, Hydac has developed an algorithm that enables the prediction of a filter's remaining life, using additional machine data. This projection is implemented in the machine controller in the form of a software program. Both the availability and the overall lifetime of machines and systems can be increased with this smart solution.

## Conclusion

Nowadays, Hydac offers a multitude of products and solutions that can be integrated into new machines and systems in the context of I4.0. IO-Link is an interesting and standardised interface which creates a bridge between the sensor/actuator level and the machine controller. Using system and product knowledge as a basis, Hydac offers smart solutions that can be used to increase both the efficiency and availability of machines and installations. With regards to developments in the context of Industry 4.0 or the Industrial Internet of Things, Hydac is an ideal and experienced development partner.

## CONTACT

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