DIGITAL SIGNAL PRE-PROCESSING

Simple? Simply safer! - LOGIC MODULES

Inductive

Magnetic

Capacitive

Optical

AI

PLC

I 4.0

IoT

IO-Link

Big Data

CE IPF 281216

1 Logic gate
10-30VDC
100mA
Push-Pull active
2 Logic gate
10-30VDC
100mA
Push-Pull active

1 L+ Imax=1A
2 Output 2
4 Output 1
3 L-

IO-Link

VL610308

Output 1   Output 2
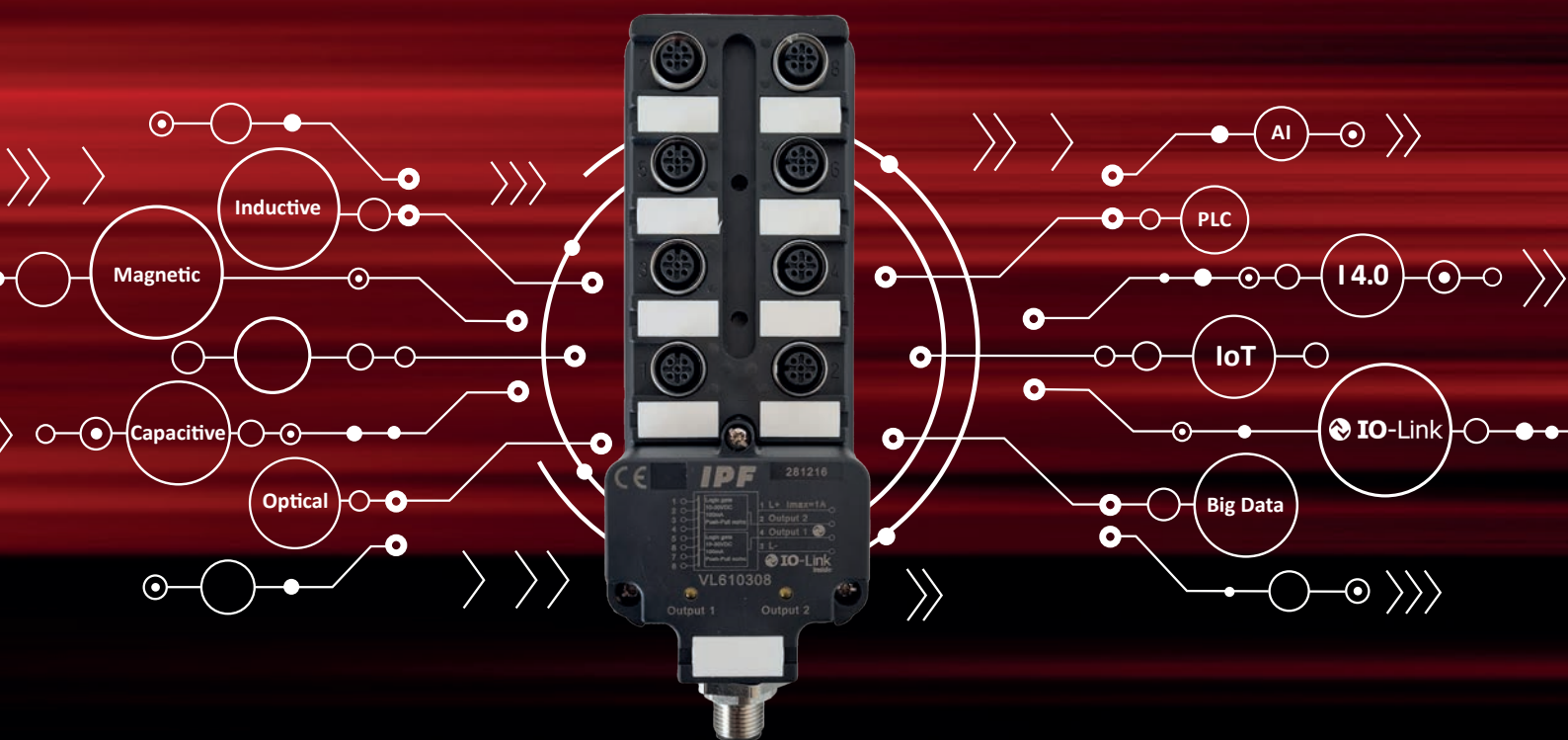
IPF ELECTRONIC

High-End in High-Tech.

FIRST THING:

WE ARE THE "HIDDEN CHAMPIONS" IN THE FIELD OF LOGIC MODULES...

... because ipf electronic probably has one of the most comprehensive portfolios on this technology and developed the first logic module as early as 1998. Thus, we are certainly one of the pioneers in this field in the industry. Logic modules or logic distributors are often the best choice for logical AND or OR linking of digital sensor signals directly on site. This is always useful when a large number of sensors are used to monitor, for example, tools, handling systems, clamping devices, etc.

The potential fields of application for our logic modules are therefore extremely diverse, for example when:

/ there are not enough inputs available for the sensors on the control side (PLC)

/ access to the PLC program code is only possible to a limited extent or is not possible at all

/ a simple and always reversible solution is needed without having to access a PLC program code directly

/ the qualified personnel for the appropriate programming of a PLC is missing

/ Solutions with hard wiring always cause problems in practice

/ or, or, or

On the following pages, we will show you why you always have the right partner when it comes to logic modules with ipf electronic. And since you can expect more from a "hidden champion", you will see not least from our innovations where the decisive differences are in our solutions.

FUNCTION, FEATURES, ADVANTAGES

Logic modules from ipf electronic have the task of logically linking the digital output signals of the connected sensors cost-efficiently and with little wiring effort. For this purpose, logic gates from the semiconductor industry are used instead of connecting the sensors in series or parallel.

The special feature: The outputs of the sensors connected to the logic modules are not linked via internal wiring, but via integrated electronics. The sensors therefore do not influence each other, regardless of the choice of the respective logic. Unsafe switching behavior, which can sometimes occur with conventional solutions, is ruled out. The result: With our logic modules, the signals present at a controller are invariably as "clean" as if only one sensor were connected.

You benefit from the following advantages, among others:

AND link: All outputs of the connected devices must supply a "High" signal so that the output of the logic module switches.

/ each sensor is connected to voltage- no voltage loss as with series connections

/ no readiness delay for the sensors

/ each output signal is evaluated individually

/ no limitation on the number of linked sensor signals

/ no unsafe switching behavior (for example caused by voltage drop or start-up current of a sensor with AND connections)

/ high functional reliability of the logic modules during operation

OR link: At least one of the output signals of the connected sensors must provide a "High" signal so that the output of the logic module switches.

/ each sensor is connected to voltage- no voltage loss

/ no readiness delay for the sensors

/ no interaction between the sensors

/ high functional reliability of the logic modules during operation

An exception among our logic modules are the solutions of the **VL61** series, with which you can use many more functions due to the IO-Link interface and thus benefit from additional advantages.
Details on this from page 9.

PRODUCT PREMIERE:
FULLY ELECTRONIC DUAL LOGIC MODULES

With the **VL15**, **VL16** and **VL17** series, ipf electronic developed the first fully electronic dual logic modules on the market. Conventional solutions on the market, on the other hand, are always based on hard wiring.

THE MOST IMPORTANT DETAILS AT A GLANCE*:*

/ **AND link**: The switching output of a module only becomes active, when the switching outputs of both sensors are switched on simultaneously.

/ **OR link**: The switching output of a module is always active when at least one of the two sensors connected to the module is switched on, regardless of which device is currently switching.

/ all connection variants are covered
(3-pin M8 and M12-connectors)

/ simple, safe linking of two sensor signals

/ doubling the number of sensor inputs by combining with a distributor

VL15, VL16 and VL17

PIONEERING:
VL25 LOGIC MODULES FOR THE SWITCHING CABINET

The logic modules of the **VL25** series are among the first developments in this field. The compact housings with screw terminal connection are designed for DIN rail mounting and each have four sensor inputs. By stringing the logic modules together, it is possible to logically link more than four sensors on site.

THE MOST IMPORTANT DETAILS AT A GLANCE*:*

I compact 4-fold logic modules for AND or OR links

I space-saving mounting on a DIN rail

*I* easy cascading due to additional input
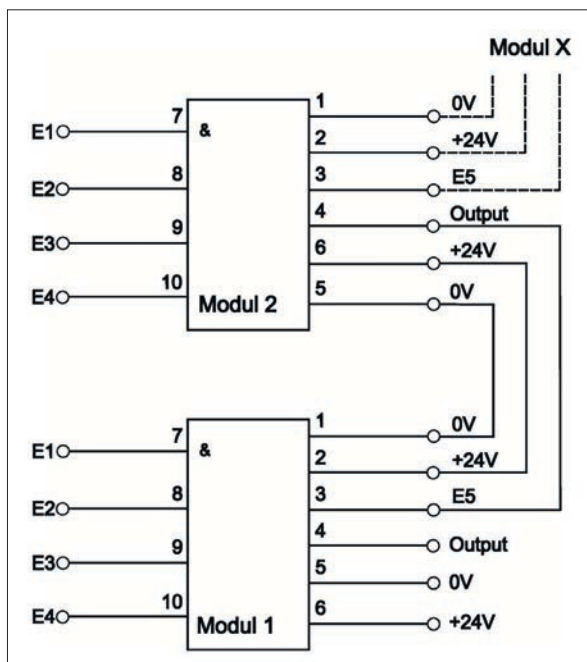
INDUSTRY PROVEN:
COMPACT LOGIC MODULES VL31 WITH M8-CONNECTOR

The 4-, 8-, and 10-fold logic modules of the **VL31** series have M8-connections on the sensor side and are particularly impressive due to their compact design. The entire electronics are integrated on the underside of the device. Another special feature: The logic modules can be used flexibly for both AND and OR links.

THE MOST IMPORTANT DETAILS AT A GLANCE

/ 3-pin M8-connectors (sensor side),
   5-pin M12-connector (control side)

/ compact solutions for space-saving assembly

/ simple realization of AND or OR links with a solution

/ vibration-proof connection of the sensor cables

/ wide operating temperature range from -30°C to +85°C

/ robust solution in IP67 for industrial applications

/ clear visualization of input and output signals via LEDs
   (immediately recognizable status, quick identification of error sources in case of service)

**/** clear labeling of all sensor inputs

/ no wiring effort
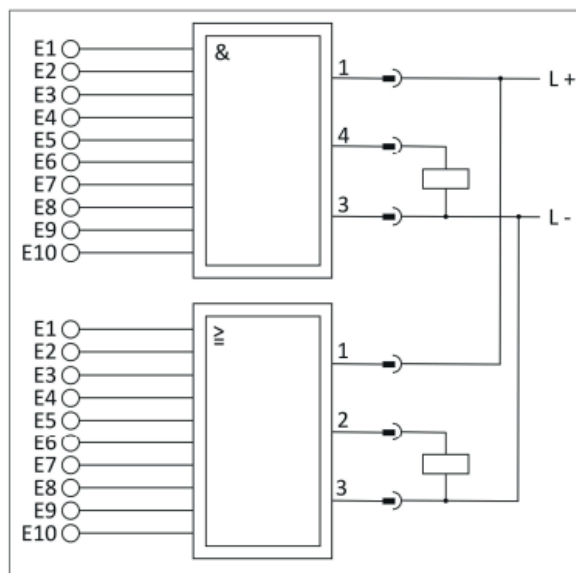
INDUSTRY PROVEN:
VL60 LOGIC MODULES WITH M12-CONNECTOR

The logic modules of the **VL60** series integrate M12-connectors on both the sensor side and the control side and have proven themselves many times over as robust solutions in all conceivable industrial applications. **Special feature**: The logic modules have two outputs, which means that the sensor signals can be applied internally to two separate logic gates. For each sensor input row, a separate AND or OR operation is available, which leads to one of the two outputs as separate logics.

DIE WICHTIGSTEN DETAILS IM ÜBERBLICK

/ M12-connector (sensor and control side)

/ versatile range of solutions
  (4- and 8-fold, as well as 2x2-fold and 2x4-fold modules)

/ simple realization of AND- or OR-connections with a solution

/ easy implementation of separate logics for each of the two outputs

/ vibration-proof connection of sensor cables

/ robust industrial design in IP67

/ clear visualization of input and output signals as well as power supply via LEDs
  (immediately recognizable status, quick identification of error sources in case of service)

/ clear identification of the sensor inputs by numbering

/ no wiring effort
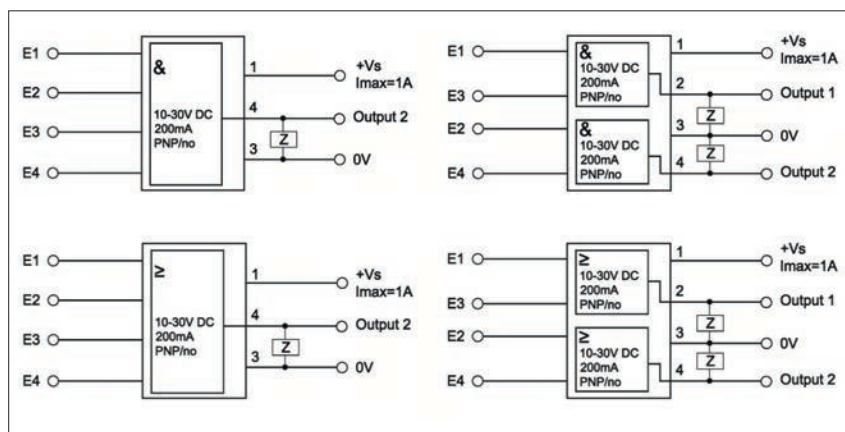
THE MOST IMPORTANT DETAILS
TO THE LOGIC MODULES VL31 AND VL60 AT A GLANCE:

SUMMARY:

/ M8-connections (sensor side), M12 connection (control side) (**VL31**)

/ M12-onnection (sensor and control side) (**VL60**)

/ compact solutions for space-saving assembly

/ easy implementation of separate logics for each of the two outputs

/ doubling of sensor inputs by combination with fully electronic dual logic modules

/ simple realization of AND- or OR-connections with a solution

/ vibration-proof connection of the sensor lines

/ wide operating temperature range from-30°C to +85°C

/ robust industrial design in IP67

/ clear visualization of input and output signals as well as power supply (**VL60**) via LEDs (immediately recognizable status, quick identification of sources of error in case of service)

/ clear labeling of all sensor inputs

/ no wiring effort

VL31-series

VL60-series

GENUINE INNOVATION:

VL61 LOGIC MODULES WITH IO-LINK

We have recognized the potential of IO-Link and, with the **VL61** series, we have developed the first logic modules with an IO-Link interface for highly flexible parameterization. Our solutions show how the functionality of logic modules can be designed to be even more versatile with regard to a very wide range of applications, without requiring a separate device for each application. Even to changing requirements, our IO-Link logic modules can be easily and flexibly adapted at any time.

A SINGLE SOLUTION FOR DIVERSITY AND FLEXIBILITY:

Material and cost savings: If only four sensor inputs are occupied in an AND link with a conventional 8-fold logic module, for example, simulation connectors are required for the free inputs to ensure that the module functions properly (right). With the **VL61** (left), each free sensor input can be independently deactivated via the IO-Link interface. Simulation connectors are not required.

INCREASED FLEXIBILITY OF USE:

The inputs of the IO-Link logic modules can be linked completely independently of each other, with a completely free choice of the logics required for this. This means: only one IO-Link logic module solves a great many different tasks.


(Figure 1 with color coding: 8-fold logic module with AND link at output 1 for inputs 1 to 4. OR link for inputs 5 to 8.)

(Figure 2 with color coding: 8-fold logic module with AND link at output 2 for inputs 5 to 8. OR link for inputs 1 to 4.)

ONE SOLUTION REPLACES UP TO 3 MODULES:

By setting up virtual groups, a single IO-Link logic module replaces several conventional logic modules. For example, sensor inputs 1 to 4 can be combined in a virtual group with an AND link, and the remaining slots (input 5 to 8) can be given an OR link in a second virtual group. The outputs of the groups lead to another common and also freely selectable logic. You always remain flexible in the choice of inputs and desired logics. All combinations are conceivable, independent of the number of linked sensors.
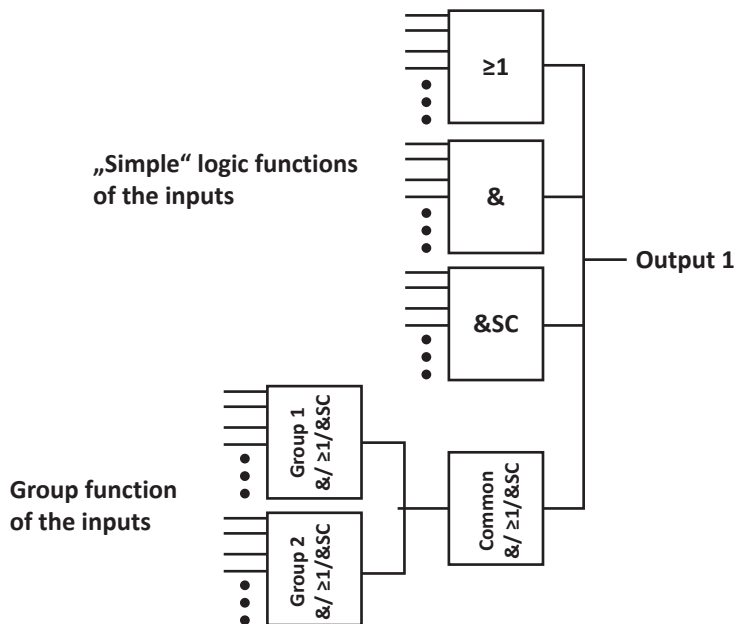

UNIQUE - SECURE AND LINKING:

The special option ''AND_SW'', a safe AND link, additionally queries a signal change on the sensor input parameterized in this way. Each of the inputs defined in this way must therefore have switched off once (''Low'') before the corresponding output of the logic module becomes active again. This is helpful to avoid false signals of the sensors, e.g. caused by jammed components.

REQUIREMENTS FOR THIS IN THE PAST:

A logic module with two logic gates (AND as well as OR link). Each sensor output also had to be simultaneously connected to two separate inputs of a logic module (high workload due to double connection and assignment of two inputs for one sensor connection).
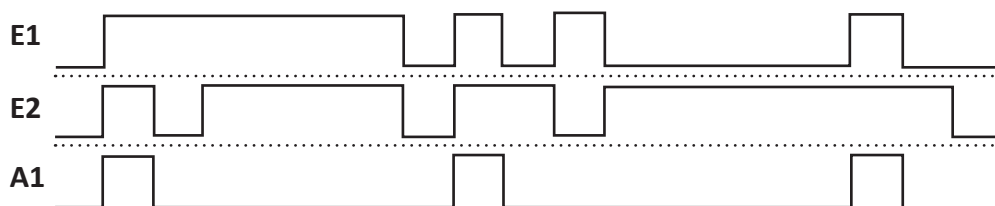
Fictitious example for the function ''AND_SW'': Behavior of the switching output (A1) when the first inputs (E1, E2) monitor the negative edge change.

OR	▼
not used	
OR	
AND	
AND_SW	
Group1	
Group2	

Section of the parameterization interface (IO-Link master **VY000005**).
Wide range of options for setting the connected sensors.

LOGIC MODULE AS IO-LINK HUB:

In an IO-Link topology, only one IO-Link device per input can be connected to an IO-Link master. Logic modules of the VL61 series can be used as an IO-Link hub and combine the switching signals of the sensors connected to it with or without an IO-Link interface. The logic modules thus function as a distribution island that occupies only one input of the IO-Link master.

Sensor hub in IO-Link topology

IO-LINK MASTER

SENSOR HUB
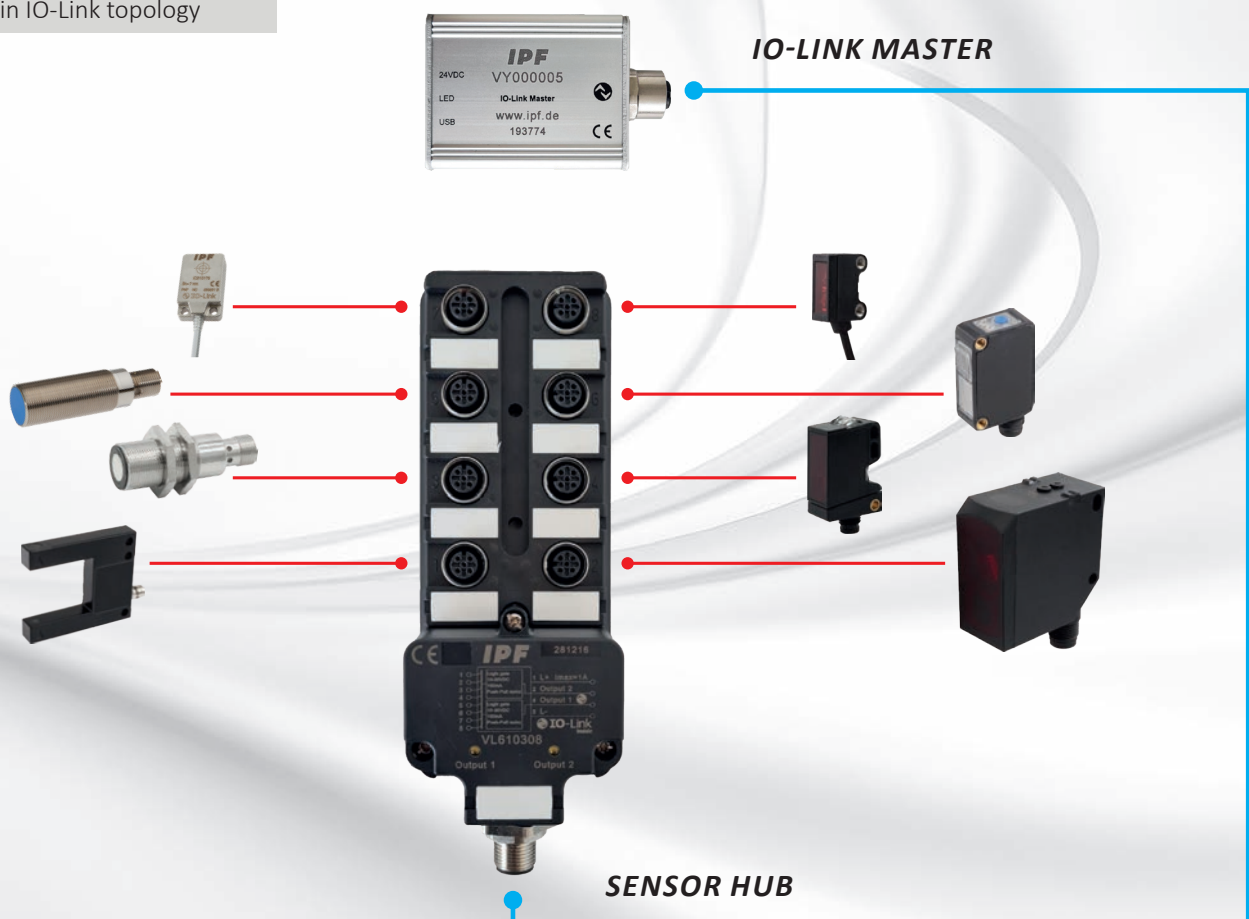
### THE MOST IMPORTANT DETAILS AT A GLANCE:

I simple, highly flexible parameterization via the IO-Link interface

I diverse applications: a single module offers numerous options

I targeted material and cost savings

I completely free choice of inputs and logics

I enormous space savings (one **VL61** replaces up to three modules)

I unique function of safe AND linking

I flexible use also as IO-Link hub

I automatic transfer of parameters in case of exchange

FUNCTION OVERVIEW IN COMPARISON
(CONVENTIONAL LOGIC DISTRIBUTOR / IO-LINK LOGIC DISTRIBUTOR)

Function	VL60-AND	VL60-OR	VL60-AND/OR	VL61
AND logic	✓	✘	✘	✓
OR logic	✘	✓	✘	✓
AND & OR logic	✘	✘	✓	✓
Secure AND logic	✘	✘	✘	✓
Logic groups	✘	✘	✘	✓
NAND logic	✘	✘	✘	✓
NOR logic	✘	✘	✘	✓
NAND & NOR logic	✘	✘	✘	✓
PNP	✓	✓	✓	✓
NPN / PNP	✘	✘	✘	✓
Closer	✓	✓	✓	✓
Opener	✘	✘	✘	✓

✘ not applicable ✓ applicable
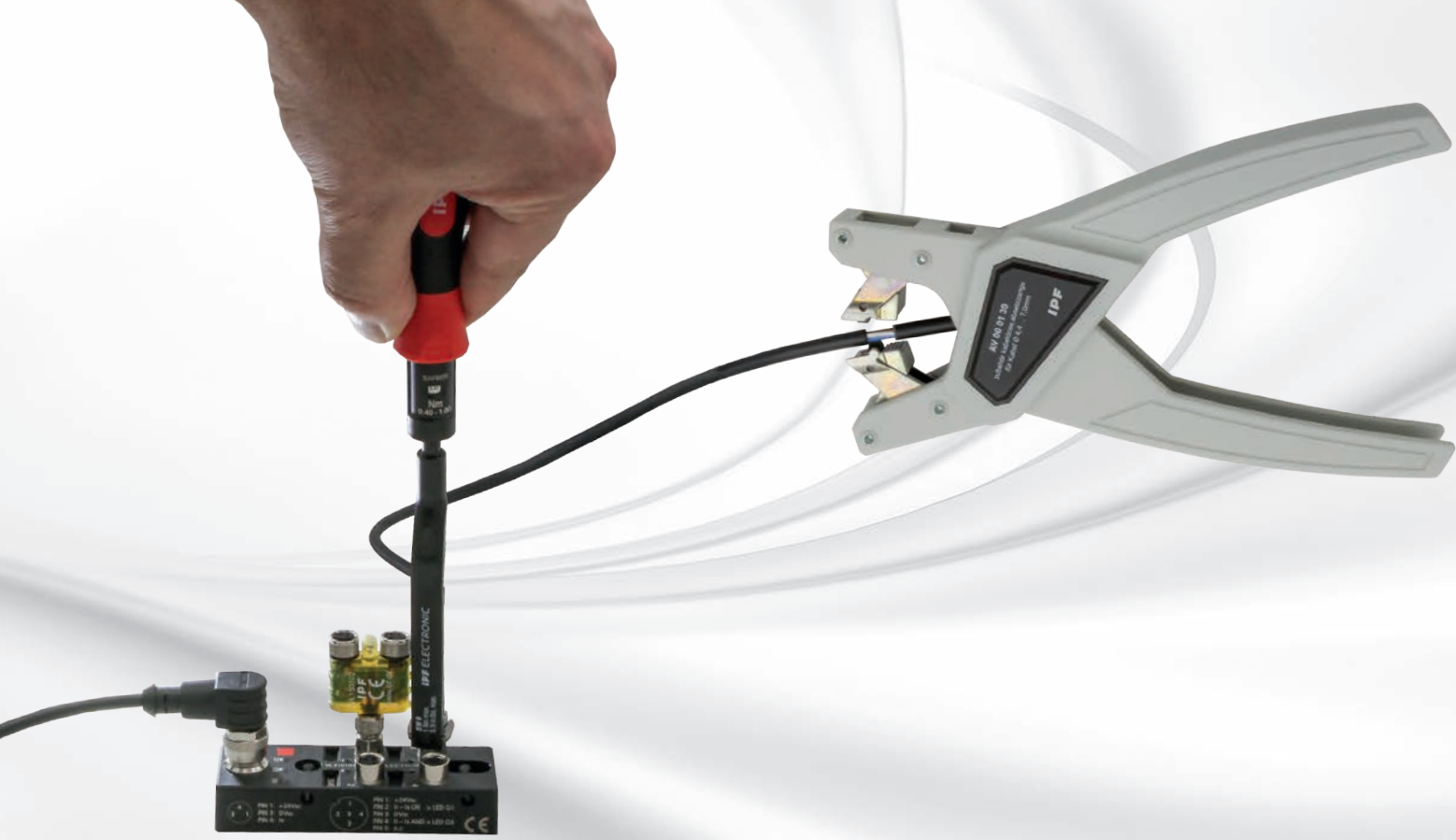
Suitable accessories for logic modules

BEFORE THE USE
COMES THE CONNECTION

Of course, you can also get the right accessories for the logic modules from us. So you don't have to think, search or try out for a long time, but have everything at hand immediately. This saves a lot of time and quickly leads to the desired result.

We have thought of everything: from the cable box for connection, to the tools for assembly, mounting and fastening, to the matching simulation plug.

# AUTOMATION SOLUTION WITH MORE THAN 50 SENSORS

One company specializes in, among other things, the development and construction of injection molds and the automation of injection molding machines.

For the automation of injection molding machines, the company develops, among other things, robot-assisted handling heads for removing injection molded parts from a machine. The number of gripper stations integrated in the handling heads and interrogated with sensors for damage-free handling of such parts varies depending on their complexity and size. Therefore, solutions with a very large number of sensors for a wide variety of queries are also required here.

In a specific case, the gripper stations with more than 50 sensors, among others, were to be queried in a handling device. Since there were not enough inputs available for this on the control side, the company decided to use logic modules from ipf electronic to decentrally logically link the sensors at different positions of the very complex, yet compact automation solution.

For this purpose, a total of eight logic modules of type **VL31** (AND/OR logic) with eight sensor inputs per module were installed and these were partially combined with the electronic dual logic modules **VL150102** in order to be able to link all sensors required for the query despite the limited installation space.
The outputs of the **VL31** logic modules were also combined with distribution islands from ipf electronic, which ultimately simplified the entire wiring. Thanks to these solutions from a single source, the company was able to realize a compact handling automation despite a large number of sensors.
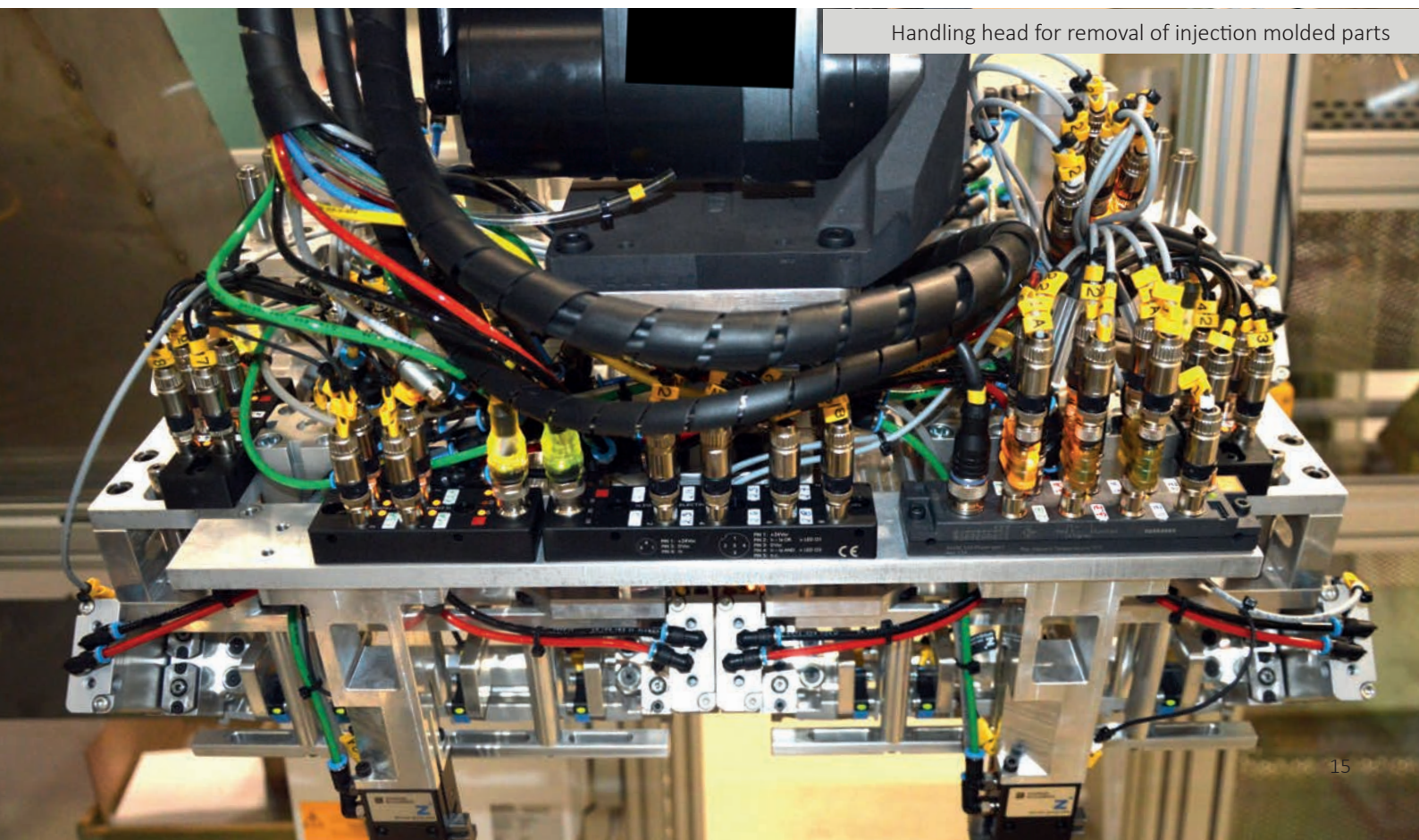
Handling head for removal of injection molded parts

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