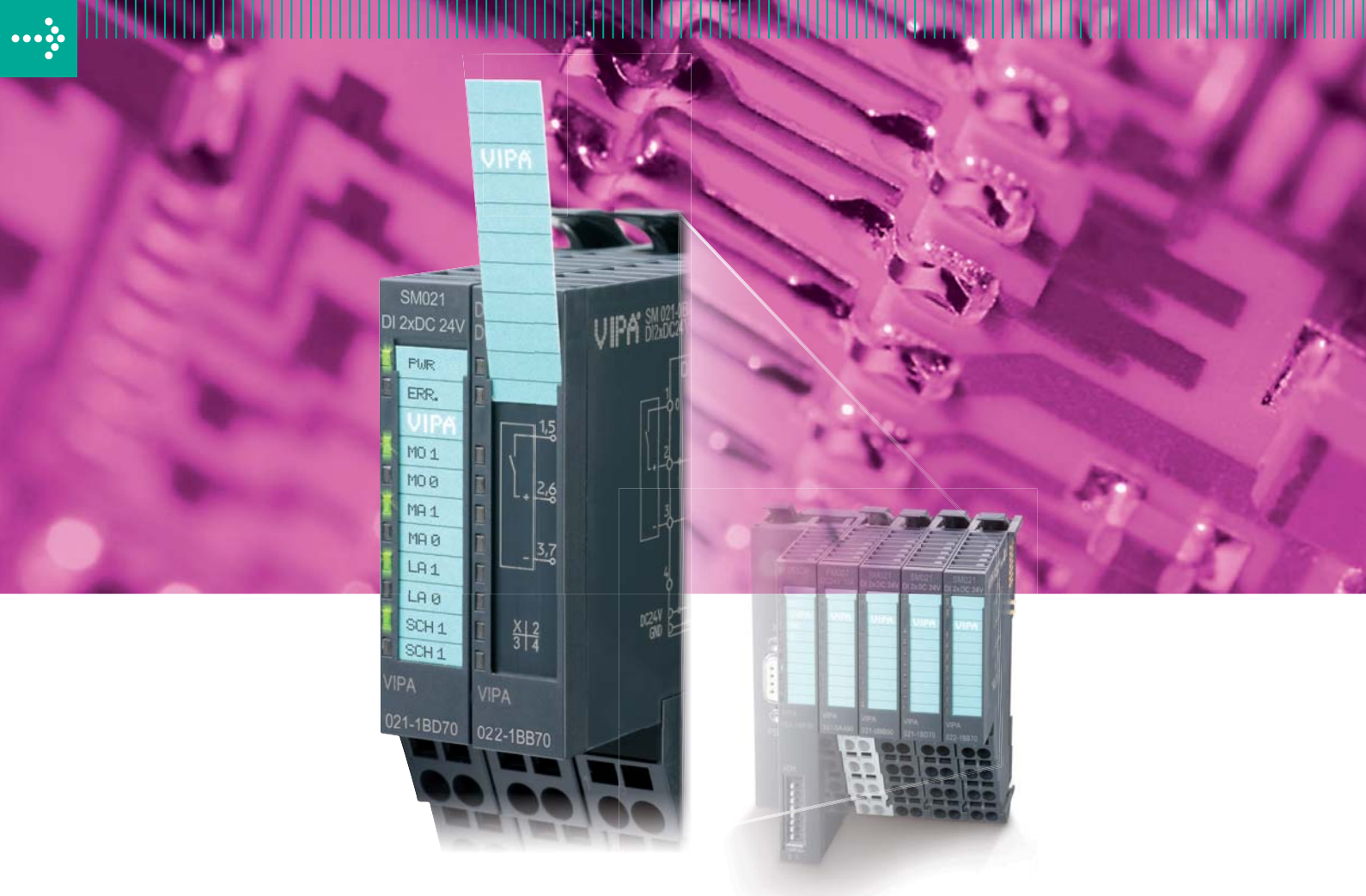
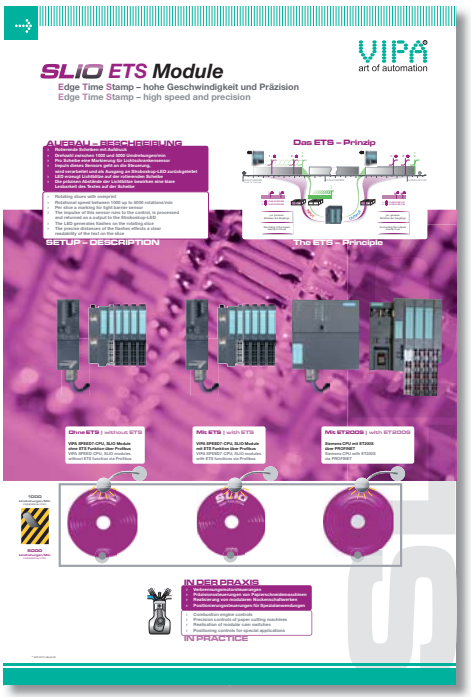


SLIO ETS Modules

Edge Time Stamp

„Measuring and controlling in µs area“



The definition of task:

On a rotating slice an overprint is to be made clearly and distinctly readable.

The slice rotates at a speed of up to 5,000 revs. per minute, which corresponds approx. to 12 milliseconds per revolution and so reaches a circumferential speed of 31 meters per second or 31 mm per millisecond respectively.

To ensure that the overprint is clearly readable, the slice always has to be illuminated at each revolution at exactly the same position of the rotation, to create the impression of a standing picture.

The solution:

Each slice is characterized by means of an indentation, which is scanned by a light barrier sensor. The impulse of this sensor is sent to the controller, processed and passed on to an output. This output now controls a Stroboscope, which acts as an LED emitting impulses of light to the rotating slice.

Only when the controller including the decentral I/O systems succeeds in capturing the impulse caused by the indentation exactly on the slice and so controlling the LED at exactly the right time, a stationary and clear picture will be created which can be distinguished by our eyes.

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The applications

Application with a Siemens CPU and **ET200S** decentral via PROFINET:

The setup right of the board demonstrates a solution with only Siemens components. On this version it is clear to see that the writing on the rotating slice is not readable.

Why is that?

A counter is used for the determination of the time on which the impulse occurs. This counter is read permanently in a free-running OB1 of the controller. Uncertainty results from the 250µs PROFINET IRT cycle and the OB1 cycle. Due to this there is no time more exact than 1ms available in this controller. A time base of its own is created internally by the performance of a loop. The setting of the output is created by a direct access to the periphery. So uncertainty occurs anew in the 250µs PROFINET cycle.

Application with SLIO **without** the **ETS function** via Profibus:

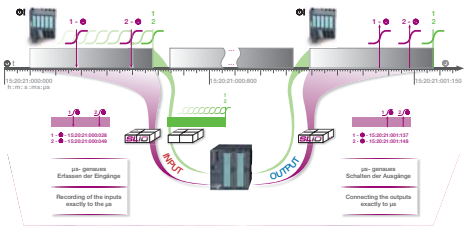
The setup is the same as right of the board, described above. But the cycle time of the Profibus at this compact setup is worse, which makes it nearly impossible to read the overprint on the slice clearly.

Application with SLIO **and ETS function** via Profibus:

The setup in the middle of the board demonstrates our SLIO solution with ETS function. By means of the FIFO memory which is integrated in the SLIO ETS modules, the ETS modules are able to store the time of the impulse in µs. This value is assigned to the PLC via the Profibus, the PLC computes out of this the speed and the time when the writing is at the preferred position and sends this information via the Profibus to the SLIO ETS output clamp.

The output clamp now turns the LED on and off, so that the LED sends out a light signal (10µs) at the required time and at exactly the right place.

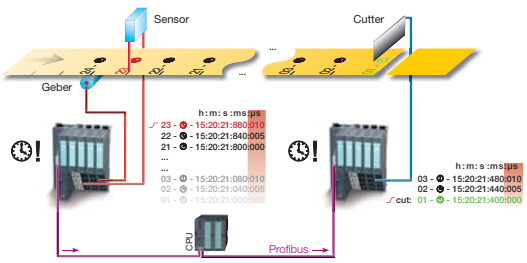
It should be especially pointed out here that this fast processing is also possible via Profibus / PROFINET / EtherCAT and CANopen and does not necessarily depend on the applied CPU. In the ETS modules up to 15 different time stamps can be buffered.



What does this mean for you and your application?

You can still use the existing hardware including the existing bus system in combination with the SLIO ETS modules. For this cost saving application neither a system change nor a expensive special solution is required.

Even the most difficult applications, like the control and supervision of stationary combustion engines, the precise controlling of paper cutting machines, the implementation of cam controls or the positioning for special applications can now be solved with the SLIO ETS modules in a very easy way.

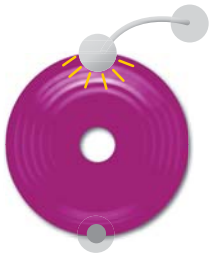


Summary:

It was expected that the PROFINET communication in the application would bring a significant advantage in speed against the Profibus communication. But the result was different:

The cycle time of e.g. 2ms for the OB1 still exists. Even after great time and effort trying to create new cycle calculations and taking all tricks into consideration it was not possible to control a periodically flashing LED with this approach. The necessary high precision realised with the SLIO ETS modules was not reached in order to allow the text on the rotating slice to be clearly readable.

The result of a communication via PROFINET is better than a solution via Profibus, but clearly more inaccurate than a result with SLIO ETS modules. In our case the accuracy of Profibus on PROFINET IRT increased by a factor of 4 times. A change of the standard Profibus I/O to SLIO ETS via Profibus results in a astonishing increase in accuracy by a factor of >100.



With ET200S
Siemens PLC with ET200S via PROFINET

Without ETS
VIPA SPEED7 PLC, SLIO modules with ETS function via PROFIBUS

With ETS
VIPA SPEED7 PLC, SLIO modules with ETS function via PROFIBUS

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