

Professional article

For practical applications from practical applications

The new GHM-ONE automation device in the world of INDUSTRY 4.0
For full-fledged automation without PLC

Introduction

Reliability, reproducibility, precision, quick reaction and transparency in the process are essential for the user in industrial automation. GHM Messtechnik of Erolzheim, Germany, presents a new device type for these core tasks of measurement control and regulating technology with the GHM-ONE. This device enables practice-oriented approaches to implementation in Industry 4.0 concepts with some special characteristics.

Compact device solution

A single compact housing in DIN format 96x96 combines the full range of measurement, control and regulating technology and has direct connections for sensors, actuators, analogue and digital signals, as well as several communication interfaces for field buses and superordinate networks. This independently operating automation device is equipped with a touch control panel and full graphic colour display, making it a convenient local human-machine interface (HMI). Unlike well-known compact regulators in this housing class, which only permit connection of one or two sensors, all current value signals required in the respective process, including all types of sensors and measuring transducers for temperatures, pressures, flow rates, humidity, pH, conductivity, oxygen sensors, etc., can be incorporated. Contactors, solid state relays, frequency converters and actuators for flaps and valves can be connected to the integrated outputs, which are potential-free relay contacts and standard voltage and current signals. Digital inputs and outputs required for PLC functions are also wired directly to the device.

Adaptable to a variety of tasks

“The device should function the way process specialists and plant operators want! The regulating structure, in particular, must be adapted specifically to the task,” said Industrial Electronics Division Manager Stefan Langer. “Whether it applies to a switching controller with 2 or 3-point behaviour, a three-point continuous single-circuit controller or intermeshed multiple-variable and cascade regulation, the most important factor is how the process technician can implement their ideas.”

Torsten Obermann, Industrial Electronics Key Account Manager, explained, “We have developed a suitable tool for precisely this purpose. As a result, the practitioner can create their individual solution themselves without any special skills in advanced programming languages!” All that is needed is a laptop and the GHM-CAT application, an intuitively operated graphic toolbox. It includes ready-to-use, tested modules for measurement, control and regulating technology. For example, a block representing a complete temperature regulator can be duplicated to create four

units on the laptop screen at the click of a mouse in order to create a multiple-circuit regulator. The desired inputs are “wired” graphically to the “thermocouple sensor” blocks, any arbitrary number of other sensors or transducers. The process is the same with the outputs. With an additional click on the toolbox, the user can select a regulator type from an extensive range for each regulating circuit or carry out further intermeshing. In addition, alarm monitors are defined, trend archiving is selected or modified calculations of process variables can also be added - possibly with customized mathematical formulae - and arranged in the “right” place in the process sequence. This takes place in a simple and easy-to-understand way without major explanations or misunderstandings, because a clear, graphic representation with functional blocks and connecting lines is used. Online help for prompt assistance with more complex questions about control strategies also provides explanations with information text and detailed graphics.

Gain an overview

In order to maintain an overview after the detail work, the nearly unlimited number of functional blocks is combined into a superordinate application block that represents a set of tasks in the system, such as “boiler regulation”, “furnace regulation” or “clean room air climate control”. A clearly arranged representation of the overall system is created as a result. This also includes the additional purely control-related tasks - such as locking conditions for material supply valves or furnace doors, or the activation of signal and alarm lamps, etc. - which are activated via digital inputs and outputs and can be linked with graphic logic modules.

Of course, a combination of measurement, control and regulation modules that have already been tested extensively in practice must still be tested prior to commissioning.

Simulation shortens commissioning times and reduces the associated costs

The first test step takes place with comprehensive simulation on the PC: The entire operation is tested with a reproduced device front, which enables testing of the individual texts and arrangements for transparent understandability. With the assistance of integrated model control paths and temporary signal forcing (fixed specification of current values and variables), testing takes place to determine, for instance, whether the direction of action of outputs and the individual signal links work together as previously expected and whether various limit behaviours are correctly managed! After successful completion, the entire constellation is transferred to the GHM-ONE device via Ethernet network or direct USB connection.

After the device is wired with the real process periphery connections, the commissioning technician can better recognise the causes of faulty behaviour with these preliminary tests, because they can be certain that the functionalities are fault-free – as a result, errors such as concealed twisted cables and loose connections in the field wiring can be found more quickly!

External expansion breaks down barriers

Several types of field bus connections are integrated into the GHM-ONE so that signal connections beyond the actual scope of the device, as well as intelligent sensor and actuator assemblies, are connected and integrated with the necessary external input and output modules.

Torsten Obermann explained which buses this pertains to: “In addition to the bus developed in-house for direct expansion of the local inputs/outputs, the GHM-ONE offers the field buses established in the process world, such as integration into existing PROFIBUS-DP networks or even the function as a master with Modbus RTU. The device is also equipped for Ethernet-based buses and for connection as a PROFINET device!”

Communication with all levels

The person working on the system has a transparent overview of the current process events with the colour screen of the GHM-ONE with full graphic system overview screens. A tap of the finger can switch directly to alarm monitoring screens, setpoint/actual value trend curves, setting screens, etc. Integration into superordinate communication networks is also possible for additional data exchange. Stefan Langer explained, "The requirement is that a correspondence table known in both the 'application layer' of the control computer and in the independently operating GHM-ONE automation device exists explicitly for the desired process variables and production data. We provide connection via Ethernet as a transport medium, as explained earlier. In particular, the PROFINET Ethernet protocol and, in the future, OPC UA offer a way to immediately access all released processed parameters and values calculated in the GHM-ONE." The other way, transmission of the setpoint recipes stored in the superordinate control computer of the MES system for the new order, is possible with the same interfaces. "We have already solved these purely communications-related issues with the GHM-ONE: predefined communication blocks also support the user. The user only has to select the data and connect it graphically," said Stefan Langer.

The topic of "preventive maintenance"

Torsten Obermann explained the approach to preventive maintenance: "Of course, the user can easily install meter blocks in a clear arrangement in order to monitor maximum operating cycle counts based on periphery device manufacturer specifications, operating hours, service life, etc. and in order to evaluate these variables on customised screens with automatic evaluation with corresponding alarms. The information is communicated in good time for preventive maintenance for material planning and service personnel. Practitioners know from experience how an imminent premature failure often manifests itself..."

Now this experience can be utilised and integrated anywhere in the functional diagram with corresponding blocks with individual formulae and links. "We know where the output signals and process signals are accessible and can easily monitor the output values with the real variables for plausibility, e.g. with tolerance ranges and thus recognise jammed flaps and slow ageing of heating elements based on impermissible flow and heating current changes," said Torsten Obermann. Changes in the time behaviour of process variables offer an additional inspection source that the user can evaluate with their experience. "For practical applications from practical applications!" summarised Torsten Obermann.

Alternative to a PLC solution

The GHM-ONE is a compact automation unit that operates fully independently. The natural question is why a PLC was not selected as a basis.

"There are two main reasons," explained Stefan Langer. We want to implement all functions for typical applications in a single device and also integrate the operation and visualisation locally. Secondly, this measurement, control and regulating unit also remains manageable for the personnel of a typical system operator down to in-depth elements without the need for expertise and experience with software programming languages. We solved this for practitioners with GHM-CAT!" The nearly unlimited expandability with various communication connections to field buses and the company network with the tasks of the control computer, such as order and machine

assignment planning, quality data and recipe administration, order processing, etc. offers numerous approaches to automation.

“That is also the practice-oriented key for integration into current Industry 4.0 concepts,” explained Johannes Overhues, Managing Director of GHM GROUP. “This way, we offer integration into the transparency of the process and production data required by various company levels with the current status of order processing. And we simultaneously give the system operator reassurance that the system can still run and be regulated under control without repeated extensive start-up processes if the superordinate should fail or functionality is limited for an extended time.” Since the regulating process is not interrupted, the thermal process system equilibrium is also maintained, and, because the quality data also remains activated in GHM-ONE, the current batch does not have to be discarded. “The individual employees are thus capable of calling up data which is archived based on their area of responsibility in a central cloud, etc. via apps on their smartphones and tablets. That contributes to the desired company-internal transparency. That is no longer our direct area of activity, but we remain at our customers’ disposal for assistance in these areas with our qualified staff from the regional offices and the applications areas as local competent contact partners for these current tasks. In general, we provide the necessary information on our newly designed home page www.ghm-one.com, and especially after seminars and training,” said Johannes Overhues on the topic of customer support.

Summary

Saving resources and optimising the value creation chain are the top agenda for production facilities. There are also current the tasks for fulfilling requirements of the Internet of Things in the scope of Industry 4.0 implementation. The independently operating automation device “GHM-ONE” and the corresponding application tool GHM-CAT offer the user an especially compact solution that always protects transparency in the process.

Additional information about GHM-ONE is available on the home page www.ghm-one.com, where a fully functional demo version of GHM-CAT is available for download. Current news on trade fair dates, etc. is provided on the page www.ghm-messtechnik.de.

GHM Messtechnik GmbH is a leading specialist and full-range supplier for innovative measurement and control technology. With a global focus and passionate employees, the company develops and produces a wide range of more than 2,000 high-quality device types for all essential areas of industrial sensors and electronics.

The versatile portfolio comprises industrial electronics, industrial sensors, environmental measuring technology, water analysis, process measuring technology (hygienic design), state-of-the-art laboratory and handheld measuring devices and measurement data recording.

From the fusion of the Greisinger, Honsberg, Martens, Imtron, Delta OHM and VAL.CO companies, the GHM GROUP still considers itself a tradition-oriented company. With an eye on the vision of the founders, the company continues in its consistent efforts to permanently advance measuring and regulation technology with innovative developments and application-specific solutions.

The central focus is the bundling of technological expertise for development of customer-oriented solutions that are appropriate for the market and tailored to the high demands of industry and producing industry. In addition to long-term expertise and state-of-the-art production methods, the GHM GROUP offers competent application consultation and comprehensive customer service, high flexibility even for small part quantities, quick device adaptations and short delivery times. This is all offered at an outstanding price-performance ratio.

Publication free of charge.

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