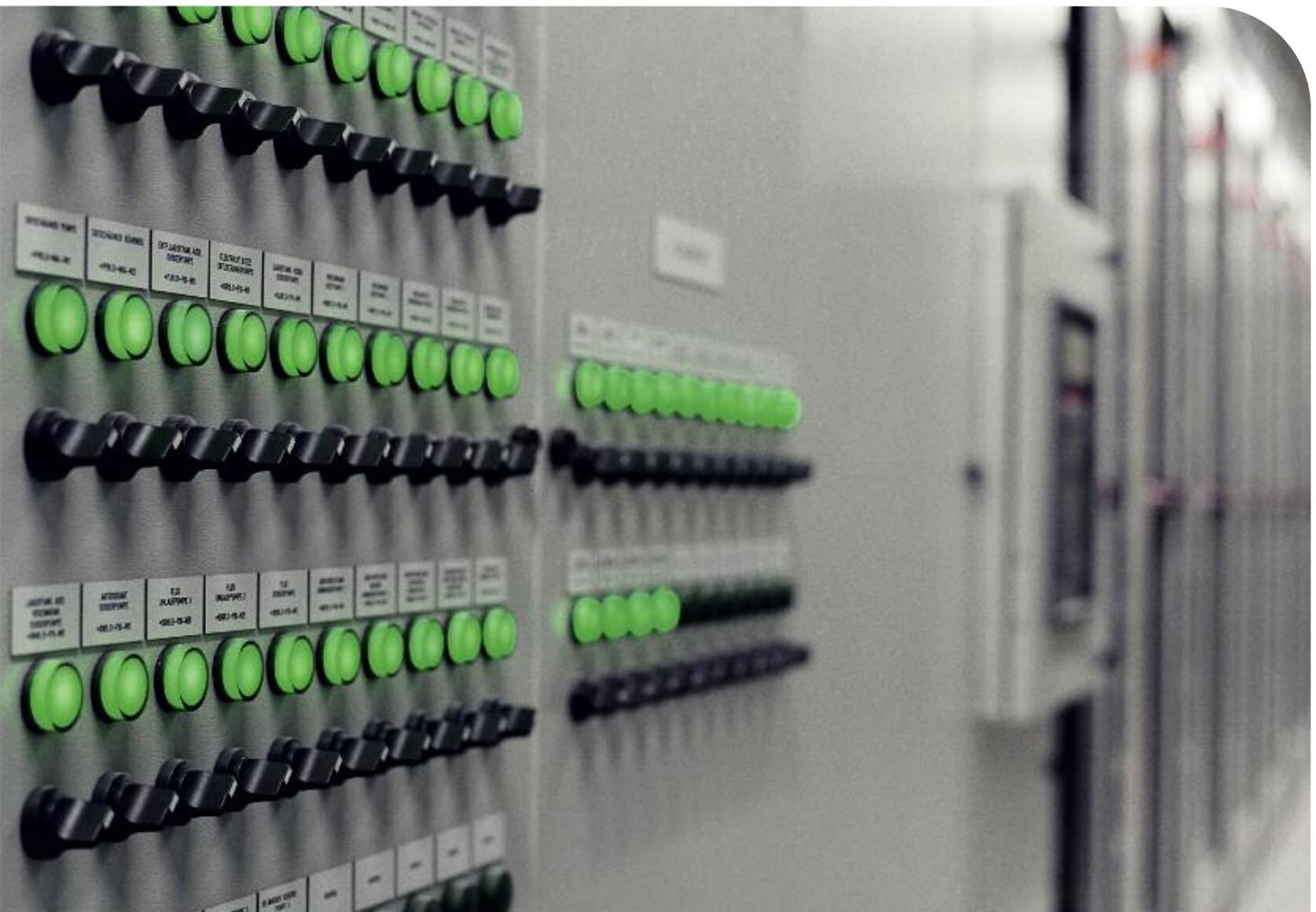


AluControl[®] - Level 1 Electrical and Automation Systems



AluControl® – Level 1

Process automation and control systems

ALUCONTROL® LEVEL 1

Maximum stability, easy maintenance, uncomplicated adaptation and high technological performance are often-stated requirements when it comes to modern automation systems. AluControl® is a part of the X-Pact® automation package from SMS group and is designed to suit the special requirements of aluminum hot and cold rolling processes.

All AluControl® Level 1 systems use the uniform hardware platform with its modular structure of X-Pact® Embedded Controllers. In this way, they can be adapted easily to the various degrees of plant complexity in the field of aluminum hot and cold rolling. Our technological control systems are designed for an optimum utilization of the hydraulic and electric adjustment systems in order to ensure consistently high product quality. A high degree of automation for all process sequences in combination with high-performance service functions are further important characteristics of our systems. In close cooperation with the design department, the matching software modules are developed for every item of mechanical equipment, permanently tested in operation and continuously optimized.

LEVEL 1 CONFIGURATION

The Level 1 systems are often reduced to the technological control systems, e.g. for thickness, profile and flatness control. The actual tasks of the Level 1 systems, however, are much more complex, as they also comprise the operational and sequence controls in the plant, the drive control systems as well as the entire data exchange and the communication to the systems connected.

The SMS group Level 1 systems are divided into different automation functions that work on a stand-alone basis and are electrically connected directly to the assigned sensors and actuators.

The Level 1 systems have the following main functions:

- Master controller
- Operation and sequence controls
- Drive control systems
- Technological control systems



Master controller

The master controller coordinates the rolling process and the exchange of information with the Level 2 system, the safety system and the Level 1 control functions.

Operation and sequence controls

These functions ensure a smooth process sequence in the various sections of the rolling mill. This for example includes the material flow control in the entry and exit area of the plant or the control systems of the various utility systems, such as hydraulic systems, rolling oil and emulsion systems.

Drive control systems

The field of drive control systems comprises all drives involved in transportation, rolling or coiling and uncoiling of the strip. This chiefly includes the main drives, the drives of the tension and pay-off reels as well as the flatness measuring and deflector rollers and also the roller table drives in hot rolling mills. The coordination of all drives involved is effected by the so-called "Speed master".

Technological control systems

The technological control systems mainly comprise the high-speed control circuits for the actuators and the higher-level process control circuits. These process control circuits for example include the systems for thickness control as well as for profile and flatness control. The technological control systems ensure perfect product quality in terms of tolerance parameters, a stable rolling process and high plant availability.

PROBAS LEVEL 1

The ProBAS automation platform comprises the hardware, operating system, system level and application software for the Level 1 systems. It is an integral part of the X-Pact® package, which covers the entire range of electrical and automation systems for metallurgical plants and rolling mills – from Level 0 to Level 3.

For our Level 1 real-time control systems, we make use of the latest computer technologies. A typical configuration comprises:

- one or more engineering stations (MS Windows)
- one X-Pact® ProBAS development server (MS Windows)
- several X-Pact® Embedded Controllers (VxWorks)

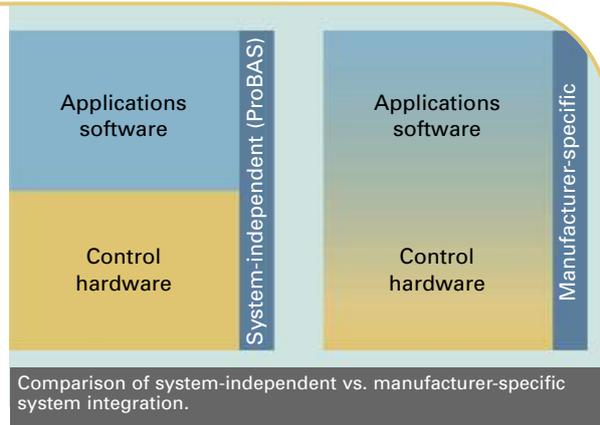
X-PACT® EMBEDDED

X-Pact® Embedded is the SMS group hardware platform for modern controllers and technological control systems for our aluminum hot and cold rolling mills. The X-Pact® Embedded Controller is based on Intel® multi-core processors and provides the required computer performance for all applications.

X-Pact® Embedded Controllers save up space in the control cabinet. The plug-in drive modules (DVD, HDD) as well as two Compact Flash connections are protected by a cover on the front side of the device. All connections and interfaces are provided on the top surface of the housing. Depending on the requirements and complexity of the control systems, the



X-Pact® Embedded.



X-Pact® Embedded Controllers can be selected with 3 or 5 card slots and freely combined with each other.

With the X-Pact® Embedded Controller hardware, we can optimally adapt our system architecture to the various degrees of complexity of our plants. The programming of the control software takes place in logiCAD 32 according to an internationally uniform standard (IEC 61131-3) and allows the preparation of PLC programs (programmable logic controllers) which are not bound to a specific hardware and a specific provider.

Thanks to the consequent separation of system hardware and software, we accomplish the operability and performance of the technological functions independently from the currently used hardware. We make sure that our application software will continue to enable reliable plant operation even after many years and several hardware modernizations. The discontinuation of hardware components has thus lost its terrifying effect. It no longer affects the plant's functions and availability.

ETHERNET-BASED FIELD BUS SYSTEMS

In addition to common field bus systems, the X-Pact® automation system also supports real-time field bus systems such as EtherCAT.

SAFETY CONCEPT

Over the past years, the safety of machinery and plants has become an integral part of our plant control systems. Legislation and standards require the protection of humans and the environment. This applies worldwide and is implemented by us in all our plants in accordance with European standards, if necessary taking into account any additional country-specific requirements.

An essential requirement for the safe operation of our machines and plants is a coordinated approach for planning and design. The mechanical and electrical departments cooperate in preparing the most important components of the safety concept:

- Danger zone layout
- Risk assessment
- Electro-mechanical functional description "Safety"
- Emergency stop concept

In the **danger zone layout**, the plant is divided into danger zones. All plant-related safety equipment as well as the physical limits of the plant are defined.

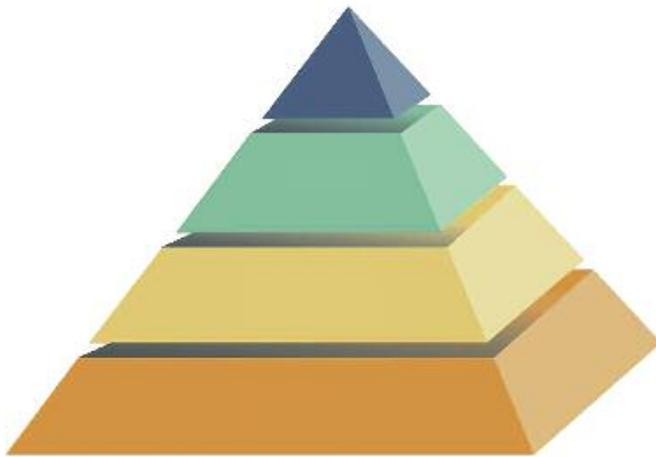
In the **risk assessment**, the possible dangers of a plant are recorded, assessed and the required protective measures are described.

In the **electro-mechanical functional description**, it is defined how the plant can be operated safely and in a perfectly functional condition in the various operating modes.

For every plant, a detailed **emergency stop concept** is specified which defines how – depending on the hazardous situation – the plant sections are brought to a standstill and can be disconnected from the power supply and the hydraulic energy source.

Together with the other automation systems, the plant safety concept is tested comprehensively and conclusively within the framework of the Plug & Work test in our test fields. The tests ensure that later on site a plant safety system can be commissioned without delay which is optimally tailored to suit the operating mode of the plant and the operating philosophy of our customer.





- Level 3** Production planning systems
- Level 2** Technological process models, process sequencing and reporting
- Level 1** Process automation and control systems
- Level 0** Power distribution and drive systems, sensors and measuring devices

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