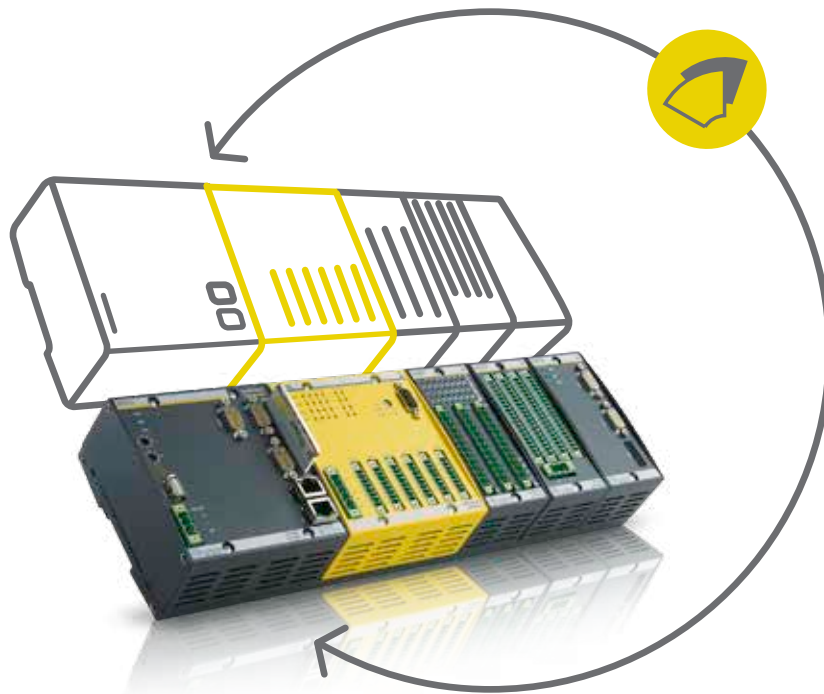



Redundancy

For maximum plant availability.





Integrated and scalable

- **Easy retrofitting and upgrading**

- **Three expansion levels**

Network redundancy

secures communication in harsh environments with redundant transmission paths

Warm standby redundancy

Alarm and monitoring systems benefit from genuine CPU redundancy

Hot standby redundancy

The bumpless switchover enables use in process control and in closed-loop control applications

- **Seamless integration**
in the SolutionCenter engineering environment (commissioning, configuration, programming, monitoring)
- **Robust and reliable**
coldclimate modules for use also in extreme conditions



Safety net in case of an incident

— *Redundant systems maximize availability and secure productivity*

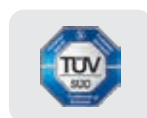
Malfunctions and failures in important operating components reduce the uptimes for machines and plants. In addition to this, they often lead to consequential damage and lengthy repairs.

This involves considerable costs, and the production downtime leads to financial losses.

Bachmann's redundancy solutions enable you to increase the availability of your plant effectively and sustainably: With implementation variants that are tailored to meet your particular requirements, you can reduce downtimes and optimize productivity. The seamless embedding in hardware, engineering and programming concept, together with the robustness of proven Bachmann components, guarantee the highest level of operational reliability, thus maximizing yield.

Bachmann redundancy concept

Automation solutions based on the M1 controller can be created as redundant systems with little effort – even as a retrofit. Together with its optimized design for cost-sensitive requirements, the Bachmann redundancy concept is enabling implementations in new application fields. Starting from simple communication and media redundancy, the concept can be implemented in levels up to meeting the requirements of the most demanding systems, such as those of a distributed hot standby redundancy system. For this only standard Bachmann devices are used.



▼ **Certified worldwide:** Internationally accredited test institutes verify conformity with the most important standards and thus provide approval for the most demanding applications.

Flexible redundancy concept

— *Seamless embedded in the automation system*

Automation solutions from Bachmann stand out on account of their outstanding robustness and availability. Nevertheless, no single system can guarantee failsafe operation on its own. Using the redundancy system enables the risk of unplanned machine and plant downtimes to be considerably further reduced.

Minimum switchover times

The switchover time is a quality feature of a network redundant system. Typical systems often operate using a ring topology, in which the network devices reroute the data packets in the event of a failure. However, the detection of a fault and the subsequent rerouting takes time. The redundancy solutions from Bachmann directly integrate the detection and switchover operation into the communication end points. In this way, switchover times can be considerably improved. Due to the comprehensive Ethernet conformity, any topology can be selected.

Fault detection integrated in the end points

Another benefit of the integration is the voting mechanism used by all Bachmann terminal devices. After being configured once in the application program, redundant process variables here can be used and processed as a single variable without

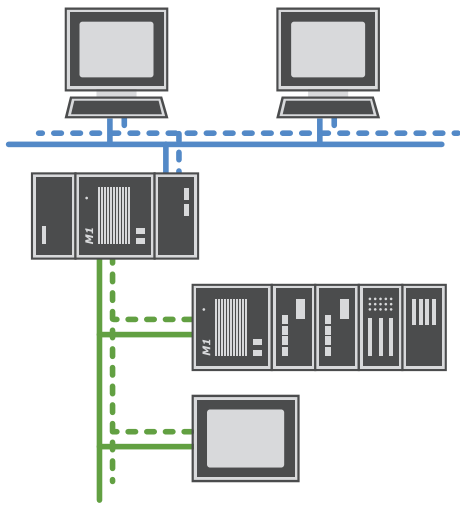
having to manually read or write the values twice. Management and fault detection are fully handled by the system, thus reducing the workload for the user.

Scalable and cost efficient

With Bachmann systems, redundancy can be tailored to meet the requirements at hand. The use of standard components offers a wide choice of CPUs with different processing speeds, which can communicate with the substations either via copper or fiber optic connections.

Combined with the product variants, this results in the most economical solutions – from simple network redundancy for protection from communication failures, right through to the virtually fully available system.

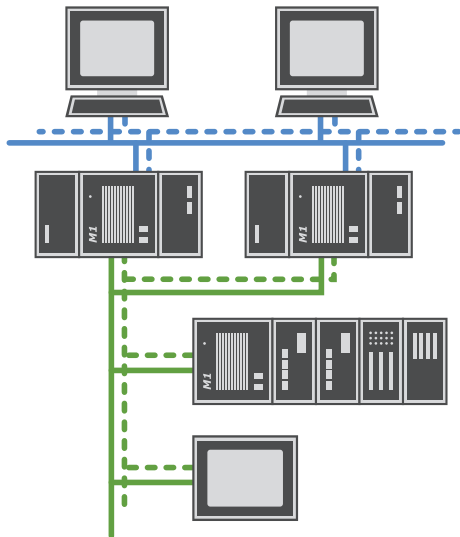




Network redundancy

To create network redundancy (media and communication redundancy) the data transfer between master CPU and connected substations is implemented via a second transmission medium. Different cabling routes provide additional protection from total failure by a single event.

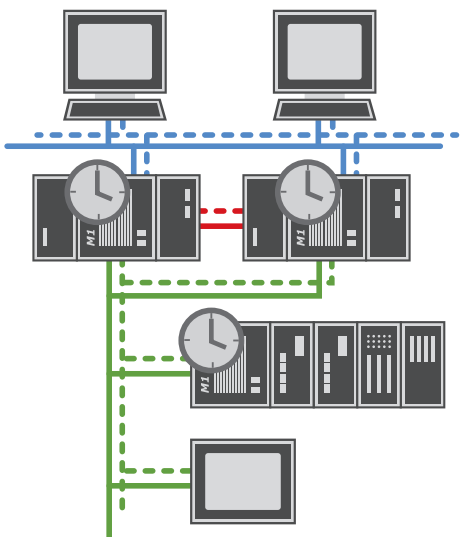
The configuration is simple: Diagnostic tools, programming interfaces and libraries integrated in the development environment ensure the efficient creation of applications. The switchover to the redundant path takes place within the same PLC cycle.



Warm standby redundancy

By adding a second master CPU, this topology also protects from any possible failure of the primary CPU, as well as from failures in the transmission path. A selection algorithm (voter) decides autonomously which of the redundantly calculated and transferred data packets are used. This therefore eliminates the need to manually manage redundant signals when the program is created.

This simplifies programming and shortens the time required for the implementation, whilst reducing susceptibility to errors at the same time. The switchover time can be configured as required (0, 1, 2, ... PLC cycles).



Hot standby redundancy

Hot standby operation is an extension of warm standby redundancy. The two redundant master CPUs are synchronized in real-time. If the primary device fails, the secondary device is activated seamlessly.

Configuration and monitoring in the SolutionCenter are also provided with specific support for creating and monitoring redundant applications in the IEC61131-3 compliant programming environment. Switching between the two devices is bumpless and is thus also suitable for critical monitoring and closed-loop control tasks.

Seamless engineering

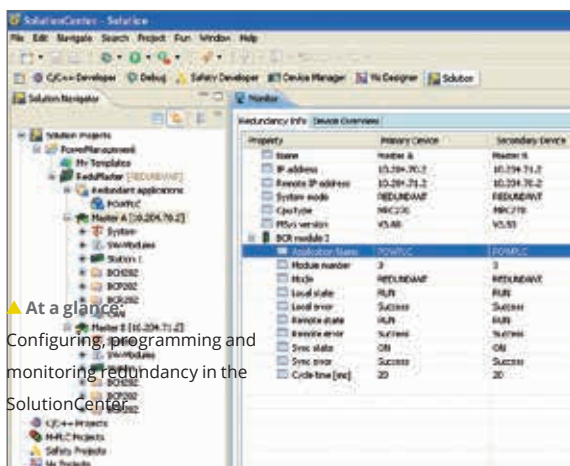
Configuration and monitoring the redundancy solution in the SolutionCenter

The Bachmann SolutionCenter covers all phases of the engineering process – from planning and configuration, to system installation and programming, mounting and commissioning, right through to regular operation and service. The redundancy solutions are fully embedded in the SolutionCenter environment. Tools for monitoring, diagnostics and programming, with additional free function libraries, simplify commissioning and troubleshooting, thus helping to save time and costs.

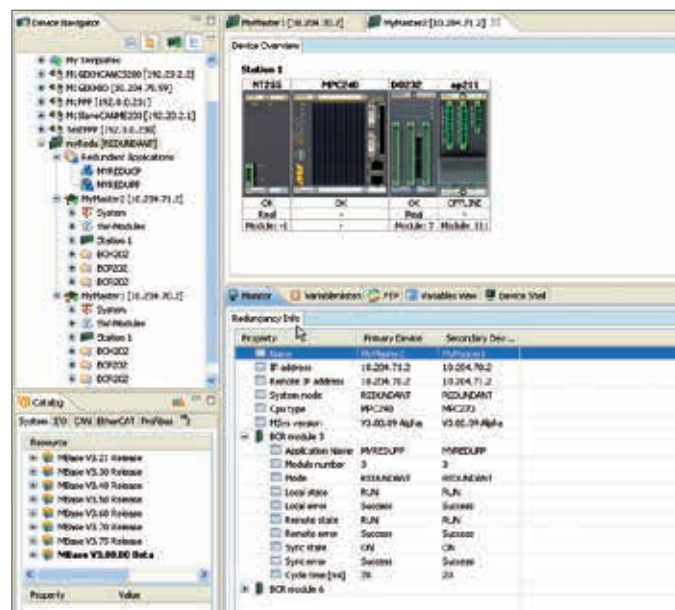
During ongoing operation, detailed error messages and diagnostic tools enable faults to be examined and repair measures to be completed, such as the replacement of a CPU. This information is used for the preventative and ongoing adaption of maintenance schedules, and thus to further reduce the probability of malfunctions. All this information is fully available both for the IEC61131 programming environment and for teleservice tasks.

The user configures and programs the redundant system in the SolutionCenter. All relevant status information for the entire system, details on the master CPUs and information about the redundancy, error, and synchronization status of the application is shown clearly.

At a glance: Configuring, programming and monitoring redundancy in the SolutionCenter



At a glance: Configuring, programming and monitoring redundancy in the SolutionCenter



Robust, efficient – and easy to retrofit

The new form of redundancy

Redundant systems have a reputation of being complex, expensive and extraordinarily labor-intensive for programming and operating. Not so with Bachmann redundant solutions: They offer full real-time capability, are easy to program and are fully integrated into the engineering environment.



The facts of the Bachmann redundancy solution are impressive

- **Seamless integration** of redundancy in hardware, software and engineering
- **Optimum performance** (switchover times, execution speed)
- **Use of standard components**
- **coldclimate components** enable use in **extreme environmental conditions** with transient extreme temperatures as low as -40°C and when condensation is present.
- **Full compatibility** to bus systems such as Profinet, Profibus, CANopen, NMEA or J1939.
- **Implementation of distributed solutions** via copper or fiber-optic connections.
- **Access to the complete network** from any station.
- **Maintenance or control terminals** can be connected directly to the I/O stations or the redundant network.
- **Maintenance terminals** (e.g. notebooks) for troubleshooting, process visualization or control of each node can be connected **during operation** at any network point.
- **Alarm and monitoring systems**, as well as the connection to stations for process control, operate with TCP/IP using standard protocols such as OPC, Modbus, Java and C/C++.

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