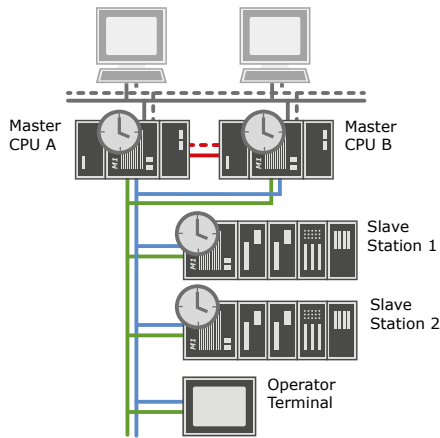


# Redundancy



## Hot-Standby Redundancy

Mission-critical systems, applications in harsh environments and facilities where even short outages, e.g. owing to cost restraints, are not tolerated are hot-standby redundancy's main fields of activity. In addition, control engineering applications with their requirement of smooth switchover, i.e. no deviation between values when switching the master CPU, are executable in this redundancy version too.

With redundancy on all system levels (i.e. hardware, system software, application programming and maintenance, monitoring interfaces) hot-standby redundancy provides maximum reliability with outstanding convenience at the same time.

The full integration of configuration, programming and monitoring in Bachmann tools shortens application creation and minimizes deviations with respect to everyday standard operating sequences. At the same time, risks in the course of maintenance operations, error corrections and application updates decrease during the process in operation.

Hot-standby redundancy combines the highest redundancy technology and the best performance possible with the customary ruggedness of every Bachmann module.

Hot-standby redundancy enhances network redundancy by the following attributes, among others:

- Fully automatic matching of process variables
- Automatic failover upon detecting internal errors
- Integrated self-tests for checking system status
- Automatic system matching (system software, configuration, applications)
- Automatic application synchronization (variance < 200 µs)
- Millisecond-precise synchronization of all stations

Item	Item no.	Description
M-HS-REDU RT	00019829-63	License to operate a hot-standby redundancy on two controller CPUs as redundant main controllers (includes 2 licenses). Allows any number of IO stations (slaves) to connect redundantly to both main controllers (includes network redundancy).

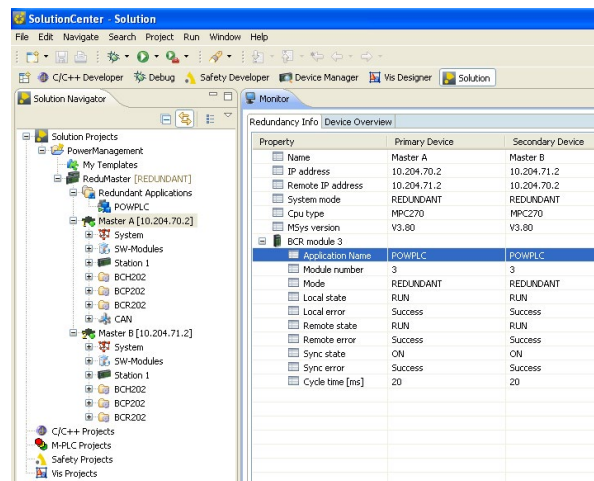


# Redundancy

- Network switching time freely configurable (0 to 10 PLC cycles)
- Blumpless switchover
- Redundancy programming support in M-PLC (IEC 61131-3)
- Debugging and forcing of variables in redundant applications (M-PLC)
- Resistant to single-fault events, additionally many multi-fault scenarios are overridden on a continuous basis

## Integration in the SolutionCenter

- Applying, monitoring and deleting redundancy devices
- Extra support in Solution Navigator and Device Manager for configuring, monitoring and logging redundant applications
- Textual and graphical redundancy status displays
- Virtual redundancy devices with the option of applying and manipulating redundancy configurations and applications
- Redundancy master status information
- Device designation
- Current redundancy status of the entire system
- CPU information
- System software information
- Network information
- Redundancy application status information
- Current redundancy status (REDUNDANT/SINGLE/ERROR)
- Runtime state (RUN/STOP/ERROR)
- Error status codes
- Synchronization status
- Cycle time
- Maintenance interface for redundancy systems integrated (execution of commands on both master CPUs at the same time)
- All commands and monitoring mechanisms are available to the operator as open user interfaces and/or as system variables.



# Redundancy

Hot-standby redundancy	
Rationale/Characteristic	
High availability system type	Hot-standby redundancy with local I/O stations (1oo2 voting integrated)
CPU redundancy	Yes (synchronization and self-monitoring automatic)
Network redundancy	Included
I/O redundancy	Possible
Sensor redundancy	Possible
Switchover	Bumpless
Continuous dual-channel ability	Yes
Communication redundancy	Yes
Processing units (recommendation)	Master: M1 standard CPUs of the MPC, MC, MH families or better Slave: M1 standard CPUs of the MX, MPC, MC, MH families or better
I/O peripheral	Via MX CPU all from M1 standard module portfolio
Use of special hardware	No (straight software solution and standard Ethernet)
Topology/Networking	
Protocol basis	Ethernet IEEE 802.3q, Ethertype 0x892D
Communication protocol	bluecom with redundancy enhancement (100% IEEE 802.3q compatible)
Media redundancy	Yes (2-channel, galvanically separated Ethernet networks)
Switches	Industrial standard managed switch (or unmanaged switch with appropriate configuration)
Topologies	Star, bus, ring, mesh
Ring redundancy	Possible via parallel application of MRP, STP and RSTP
Dimension	In compliance with IEEE 802.3 - $\geq 2000$ m per network section with fiber optic connection
CPUs spatially separable	Yes (see Dimension)
Time synchronization	Integrated in network protocol
Number of I/O stations	More than 100
Smart substations	Yes, for example, I/O stations can execute local applications for: emergency operation, load separation or local logging
Parallel data traffic	Yes, possible (Ethernet-based protocols and services, e.g. HTTP, FTP, video stream, Modbus, OPC, MMS)
Interfaces	
I/O peripheral	M1 standard module portfolio
Redundancy network	bluecom network variables
Field buses	Gateway function for CAN, Profibus DP, Profinet, Modbus, EtherCAT via application possible
SCADA / control station & PDA	Standard protocols: IEC61850, IEC61400-25, IEC60870-5-104, OPC DA, Modbus TCP/UDP Application development: communication library M1Com and M1Com.NET
IT protocols	See M1 software (FTP, HTTP, SNMP, SMTP etc. and security versions)
Configuration/Programming	
Configuration	SolutionCenter (support via wizards)
Remote configuration	Yes (Ethernet LAN, Internet)
Network configuration	SolutionCenter (support via wizards)
Programming	M-PLC: IEC 61131-3 (IL, LD, FBD, ST, AS, SFC)

# Redundancy

Hot-standby redundancy	
Configuration/Programming	
Editor	CoDeSys
Redundancy download	Automatic
Redundancy debugging	Yes
Redundancy synchronization	Automatic (process variables, system software)
Manual switchover	Yes Switchover: triggering by user Failover: automatic via software
Multitasking	Yes (one redundant task permissible per PLC application, total up to three independent redundancy tasks)
Mixed operation	Yes (non-redundant, non-synchronized applications can run parallel to redundancy applications)
Diagnostics/Monitoring	
I/O live display	SolutionCenter
Redundancy status	Yes
Error status	Yes
Diagnostic user interface (API)	Yes, integrated
Statistic user interface (API)	Yes, integrated
Network monitor	SolutionCenter
Network analysis	Yes (by Wireshark plug-in, Wireshark data are generated automatically on the controller)
Distributed logging	Yes (synchronized, granularity 1 ms)
Performance data	
Master cycle time	1 to 1000 ms*
I/O cycle time	Minimum 200 µs for non-redundant applications 1 ms to 1000 ms for redundant applications*
I/O frame works	More than 100 stations* Number of channels unrestricted (*, **) - typically 400 to 600 channels per station (1/3 analog, 2/3 digital)
Synchronization volume	Max. 120*1400 byte
Switching time	Adjustable from 0 to 10 cycles
Time precision	< 1 ms *
Installation	
Installation medium	CD ROM or network
Installation tool	SolutionCenter
Upgrading existing systems	Possible via software / new CF card required
License protection	Data CF of the master CPUs is integrated dongle
System prerequisites	
Controller equipment	M1 CPUs of the MX200 family or better (minimum 2 Ethernet interfaces onboard)
Network	2x Ethernet 100 MBit/s or Gbit/s, managed switch
Software	MSys / MxCCore / M-BASE V3.80 or higher

\* Limit value subject to CPU type, memory available, application size, number of exchangeable variables, network bandwidth available and network and CPU load via non-redundant applications

\*\* No program-technical restriction.