
Freelance Distributed Control System

System description



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Freelance takes the next step into the future. Freelance 2019 provides significant improvements in all areas: scalability, usability, connectivity, compatibility and security.

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Freelance

The distributed control system



Freelance is a full-fledged distributed control system that combines the advantages of both worlds – DCS and PLC. It offers the small footprint of a PLC, together with the full functionality of a DCS. The integrated environment simplifies engineering, commissioning, maintenance and fieldbus management. The intuitive operator interface enables easy operation and diagnosis of the entire system.



After thousands of installations spanning more than 100 countries, ABB continues to introduce innovations in its Freelance distributed control system (DCS). With the latest AC 900F controller, Freelance provides more power, speed and functionality than ever before. Key features are increased performance, on-board interfaces and the support of SD cards for AC 700F and AC 900F controllers. This allows one to load applications or firmware into the controller without the need of a computer.

Freelance is ABB's user-friendly, cost-effective and robust solution ideal for nearly all process industries, with the following benefits:

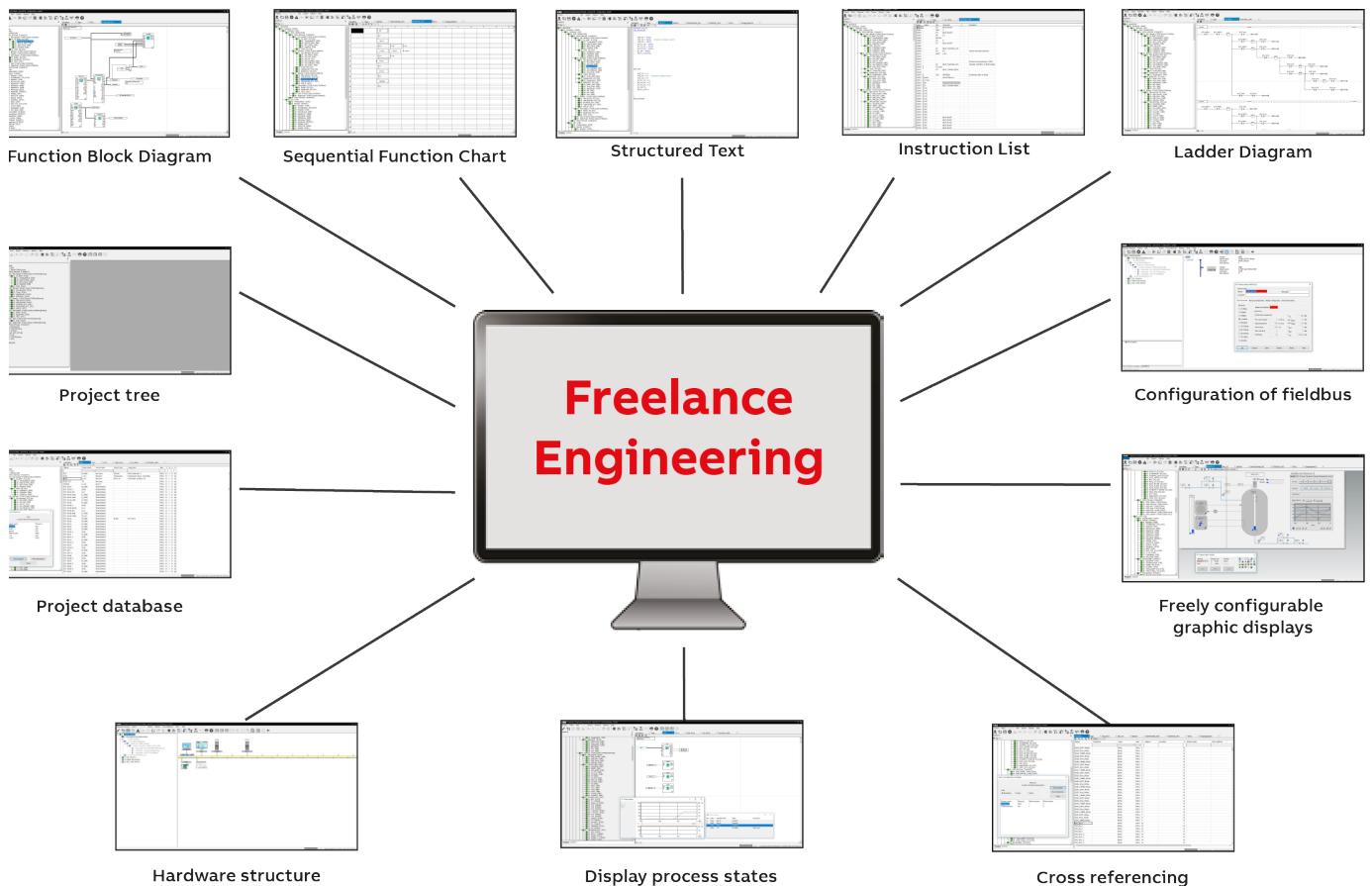
- **Easy to use:** It is easy to install, learn, engineer, commission, back-up, maintain and expand.
- **Scalable:** Projects can start as small as a few I/Os and grow to thousands of I/Os controlling the whole plant.

- **Reliable:** It is a proven system with high reliability and availability providing redundancy options supporting solutions without any single point of failure.
- **Value for your money:** Investment goes a long way because of its small footprint and ability to run on any standard computer. Together with its ease of use, this results in savings in installation, engineering, commissioning and life cycle costs.

The Freelance distributed process control system is a safe investment for the future, based on the concept, Process automation made easy!

System architecture

Engineering and operation



Freelance provides both, operator level and process level. The operator level contains the functions for operation, process monitoring, archives and logs, trends and alarms. Open- and closed-loop control functions are processed in the controllers which communicate with actuators and sensors in the field.

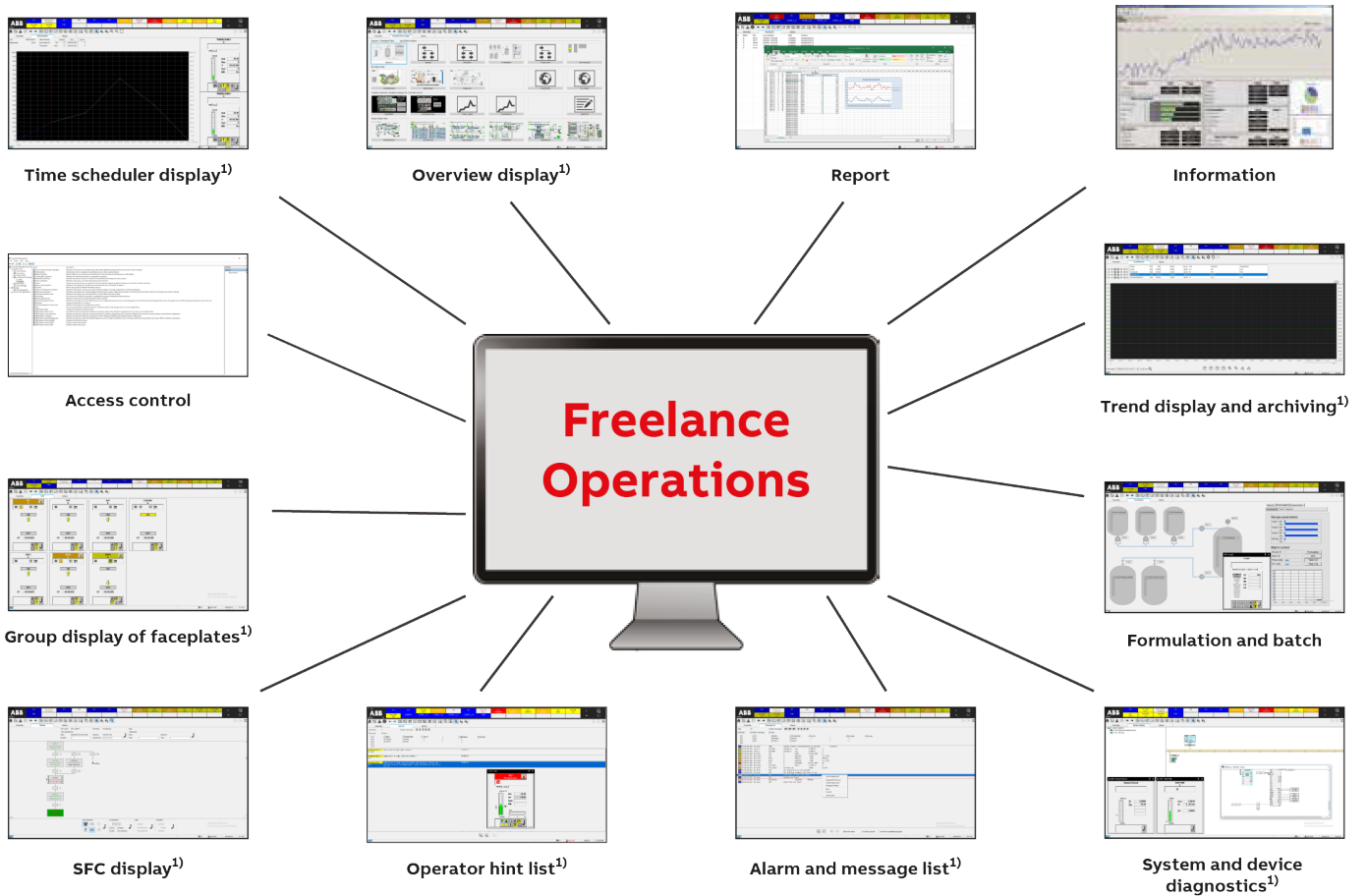
Freelance Engineering

With Freelance, all engineering work is performed with one single tool, Freelance Engineering, which works hand in hand with the visualization and operation tool Freelance Operations. Usually, portable equipment such as laptops, which allow configuration both in the office and on site, is used.

Benefits at a glance:

- Compatible with former versions
- Intuitive auto router in Function Block Diagram (FBD) editor
- Both project tree and editors can be viewed simultaneously for easier navigation
- Direct copy paste between several editors
- Optimized for efficient engineering, fewer clicks with auto-accept
- Direct import/export to Microsoft® Excel®
- Excel-like filter and sort functions in variable/tag list
- Graphical project preview for easier distinction of project
- Direct access to user documentation

More details about Freelance Engineering see page 34.



¹⁾ Pre-engineered and ready-to-use displays

Freelance Operations

Freelance Operations configuration is fully integrated in Freelance Engineering. Optional batch and information packages are also easy to integrate. Freelance Operations meets all standard process control requirements with regard to operation and observation at an attractive price. Amongst other things, Freelance Operations offers the following visualization features:

- Clearly structured faceplates for operator interventions which can also be combined as required in group displays
- Trend displays including historical data and long-term archiving
- Alarm pages for specific plant areas, sequence control
- Displays, shift logs, event logs and data archiving

- Standardized system display for system hardware diagnostics
- Free graphic displays that besides standard graphic elements are also supported by bitmaps and a 3D macro library
- Multi monitor operation
- Control aspect for interlocking displays
- A Freelance Operations Lite License is available at an attractive price, useful for smaller applications

More details about Freelance Operation see page 28.

System architecture

Overview

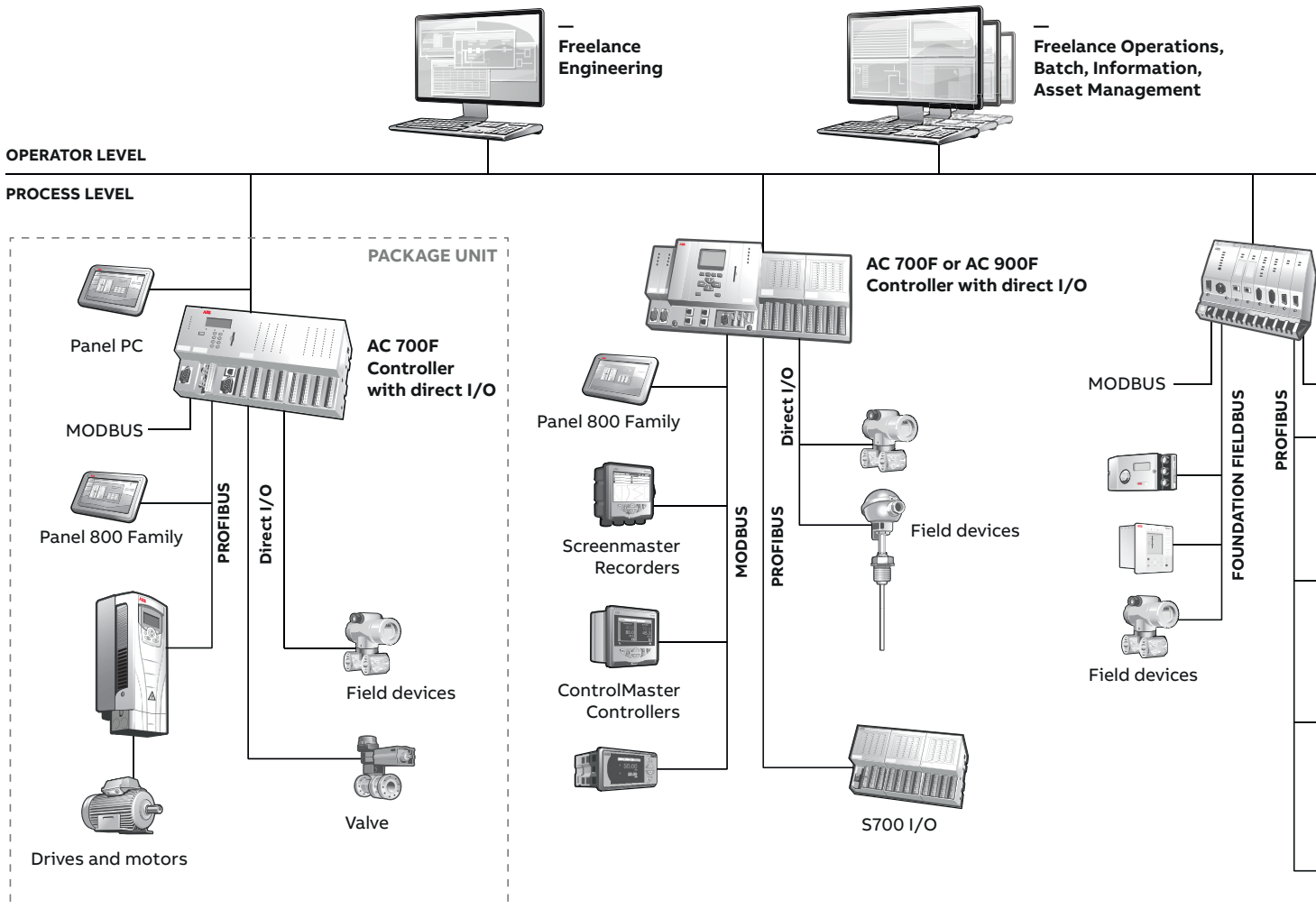
A Freelance system can consist of one or combination of several AC 700F, AC 800F and/or AC 900F controllers. It can be connected to field devices through fieldbuses, direct and remote I/Os.

With the AC 800F and AC 900F controllers, you have the option of configuring your entire system in redundancy.

As shown in the architecture drawing below, Freelance can go from a typical OEM offering with an AC 700F controller, a Panel 800 and around 50-100 I/Os. The AC 700F can have up to eight

direct I/O modules connected to it or have remote I/Os connected via PROFIBUS. Modbus RTU and TCP are also supported.

The Freelance Lite offering can typically have an AC 700F or AC 900F controller and will be in the 250 to 400 I/O range with possibly a combination license and a few operator stations. This can ramp up to the Freelance Standard and Premium offerings with the AC 800F and/or AC 900F, with or without redundancy.

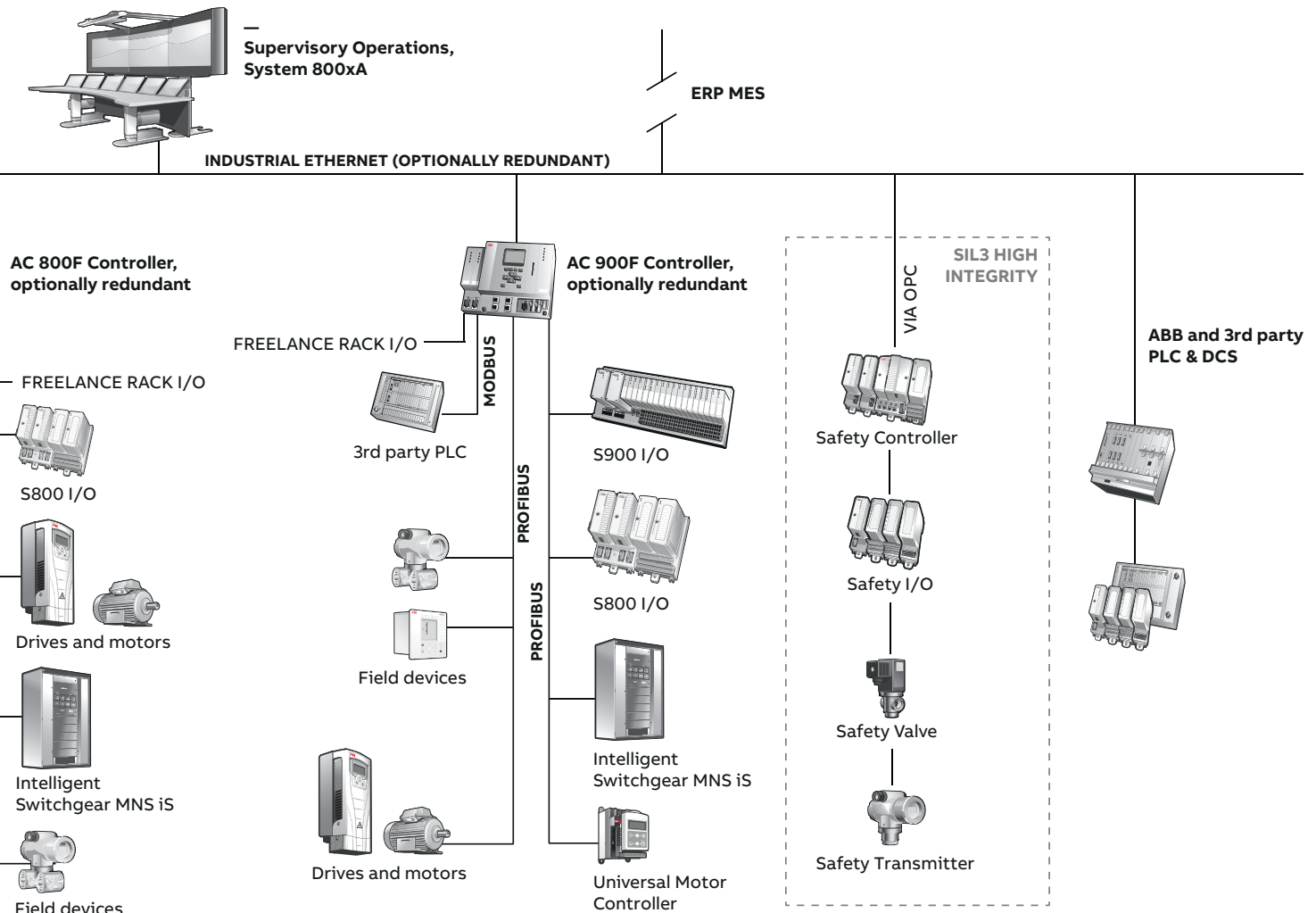


Freelance can go up to thousands of I/Os. Connections include FOUNDATION Fieldbus, PROFIBUS and HART as well. There is also the possibility to connect to supervisory control stations running on ABB's 800xA system.

Freelance comes with three different types of controllers, AC 700F, AC 800F and its latest Freelance controller – the AC 900F. This controller truly extends the hardware portfolio of Freelance distributed control system. All three controller types can be used side by side within a project

and can easily communicate with each other via the Ethernet based control network.

With all controllers, fieldbus-compliant components such as remote I/O, field devices and network components can be used. ABB also offers equipment for standard and hazardous area applications and Safety.



System architecture



System communication

The operator and the process level communicate via the control network, which is based on Standard Ethernet. You can choose between various transmission media such as twisted pair or fiber optic cable. The system components use a specific protocol called DMS, which is an enhanced MMS (Machine Message Specification) protocol. This protocol can be utilized by 3rd party network subscribers using the application interface DMS-API. This is a “C” programming interface for MS Windows to enable programmers to create tailored solutions. A more standardized and generic approach to connect to the system is provided by the Freelance OPC server to access real-time process values (DA) and alarms/ events (AE) from the Freelance System.

A Freelance system in theory can have up to 100 controllers and 100 operator stations. However - the majority of the systems are in the range of 1 to 5 controllers/ operator stations. Each controller can communicate to a total of 10 Freelance operator stations, OPC- or trend servers. If the number of those exceeds 10, the system allows to segment the data communication accordingly per simply setting some check marks.

Note: a Freelance operator station or the Freelance OPC-server can “talk” to more than 10 controllers. So, if the number of controllers exceed 10, there is no further action required.

Integration of 3rd party PLCs

Integration of 3rd party PLCs like Safety PLCs or package units can easily be achieved by using the new OPC based “PLC Integration” functionality of Freelance. This not only provides the ability read or write data, but also to create faceplates based on existing Freelance ones to interact with those units and to integrate the alarms into the Freelance alarm management.

Other enhancements

In addition to the standard Freelance operator station, 800xA Operations may also be used. Of course other options such as batch management, enhanced information management and asset management are also available.

Asset Management

If you want to keep your production plant up and running in the long term, you need information about the availability and degree of wear and tear of your equipment. All of the information necessary for this is available; integrated and included in the basic software package of the Freelance control system. As a result, several customers have been able to avoid making investments that appeared essential but were in fact unnecessary. Freelance allows the use of modern asset management methods for more efficient maintenance and optimization – helping for instance to make optimum use of plant capacity.

The controllers

AC 900F, AC 800F and AC 700F

The process level is the domain of controllers. Together with the engineering tool, their functions and modularity define the ease of use, scalability and performance of a DCS. Freelance comes with three different types of controllers: AC 900F, AC 800F and AC 700F.

A Freelance system can consist of one or combination of several AC 900F, AC 800F and/or AC 700F controllers. It can be extended with fieldbuses, field devices and remote I/Os. With AC 900F and AC 800F you have the option of configuring your system optionally redundant (controller and line redundancy).

AC 900F

AC 900F comes with four built-in Ethernet ports supporting Modbus TCP or 60870-5-104 telecontrol protocol. Up to two pluggable PROFIBUS master modules support optional redundancy available on the PM 901F/PM902F. Up to four pluggable PROFIBUS master modules support optional redundancy in PM 904F. S700 I/O modules (as many as 10) can be connected directly to the controller. Apart from its highly sophisticated automation functions, the AC 900F modular controller offers expanded flexibility via a pluggable SD card. It is available in a plus, standard and lite version. The plus and standard version supports around 1,500 I/Os per controller. The lite version is optimized for smaller applications supporting up to 400 I/Os.

AC 800F

A single controller is able to feed several fieldbus lines running the main fieldbuses of process industries, Modbus, PROFIBUS and FOUNDATION Fieldbus. And for sure, via intelligent remote I/Os the HART protocol is supported as well.

AC 700F

AC 700F comes along with a very small footprint and is particularly suitable for small applications consisting of very few to several hundred I/O signals. Applications can easily be distributed to several controllers. AC 700F can also be extended with PROFIBUS Remote I/O units. In addition, field devices can be connected to AC 700F. Thanks to the flexibility of Ethernet and its small footprint, AC 700F can also be placed in junction boxes in non-hazardous areas out in the field as competitive, intelligent Ethernet I/O.

All three controller types can be used side by side within a project and can easily communicate with each other via the Ethernet based control network. The Engineering is performed with one engineering tool, Freelance Engineering. All function blocks and pre-engineered functions are available for all three controllers in the same way.

AC 900F



AC 800F



AC 700F



The controllers

AC 900F



The AC 900F controller truly extends the hardware portfolio of Freelance distributed control system. Apart from its highly sophisticated automation functions, the AC 900F modular controller offers expanded flexibility via a pluggable SD card, more Ethernet ports, redundancy options for high availability and powers for around 1,500 I/Os when using the Plus and Standard CPU (PM 904F and PM 902F) or up to 400 I/Os when using the Lite CPU (PM 901F).

Key features of the AC 900F are increased performance, on-board interfaces and the support of SD cards. Especially the new optional display for AC 900F allows to load applications or firmware into the controller without the need of a terminal program on a computer.

Benefits at a glance:

- More power than any previous generation Freelance controller
- More connectivity with serial ports and Ethernet ports
- Built-in SD card support
- New Ethernet based protocols – Modbus TCP and IEC 60870-5-104
- G3 compliant as standard
- Built-in power supply
- Optional LCD providing enhanced security through controller lock
- Small footprint
- Optional redundancy

Mechanical design

Thanks to its four holes in the rear, the CPU modules PM 904F (Plus), PM 902F (Standard) and PM 901F (Lite) allow easy wall-mounting. DIN rail mounting is even faster and easier by just placing the component on top of the DIN rail and pushing it down to lock it in place.

Technical data

The AC 900F controller consists of a CPU module which is the main component. According to the application and requirements, further modules can be added to the controller. These modules are fieldbus interface modules and I/O modules. The AC 900F consists of:

- CPU module PM 904F, PM 902F or PM 901F with
 - four Ethernet interfaces for PM 904F and PM 902F or three Ethernet interfaces for PM 901F
 - one diagnostic interface
 - two serial interfaces
 - display unit (optional)
- Up to ten S700 I/O modules directly attached on terminal units
- A maximum of two fieldbus interface modules for PM 902F and PM 901F
- Up to four (4) fieldbus interfaces for PM 904F

The AC 900F controller can be arranged in a single or redundant manner. The controller supports remote I/Os, transmitters, actuators, drives and other devices, for example through PROFIBUS and other fieldbus protocols. At present, the following field busses are available for the AC 900F controller:

- PROFIBUS DP V0/V1
- Modbus RTU and Modbus TCP
- Telecontrol IEC 60870-5-101 and Telecontrol IEC 60870-5-104
- CAN Bus for connection of Freelance Rack I/O

Input/output modules are used as direct I/O and remote I/O in accordance with the type and quantity of process signals.

The hardware configuration of AC 900F is based on a hardware function block concept similar to the configuration like AC 700F and AC 800F. AC 900F can be equipped with a maximum of two

PROFIBUS modules for PM 902F and PM 901F. The PM904F can handle up to four PROFIBUS modules. You have the option to run these controllers in redundancy. Modular plug-in I/O modules are used in accordance with the type and quantity of process signals. With AC 900F controllers, fieldbus compliant components such as remote I/O, field devices, and network components can be used. ABB offers equipment for applications covering standard and hazardous areas.

What's new? Additional CPU variant for the AC 900F controller

The new version of the CPU, the Processor Module PM 904F, expands the capabilities of the Standard version, PM 902F. PM 904F supports up to four (4) Communication Interfaces for PROFIBUS or CAN as well as more application memory. In addition there is a specific memory reserved for the permanent storage of variables (cold retain values), that can be used for e.g. for life time counters or metering data...

Overview of new AC 900F Interface - PM 904F

It has four (4) built-in and free configurable Ethernet ports supporting System bus redundancy, Modbus TCP/IP, Send & Receive UDP or TCP and IEC 60870-5-104 Telecontrol protocol.

- Two (2) serial ports supporting Modbus RTU/ ASCII or IEC 60870-5-101 Telecontrol protocol.
- Four (4) slots for Communication Interfaces: PROFIBUS master modules providing integrated line redundancy.
- CAN bus modules for connection to Freelance Rack I/O.

Direct connection to S700 I/O modules (up to 10). The S700 I/O series provides high density configurable modules that support a mix of inputs and outputs and even analog and digital I/Os in one module for a small footprint.

Freelance Engineering

With focus on Engineering Efficiency we improved all filtering and sorting functionality. Also the auto routing capabilities in the Function Block Diagram editor has been improved. With this new version it is possible to backup / restore the whole project application file including all operator graphic displays, logic programs, and even field device parameters directly via SD card within the controller (AC 700F and AC 900F).

Multi Monitor support

Freelance Operations expands its multi monitor support. With Freelance 2019 up to four (4) monitors can be connected to a single operator workplace. The available display types per monitor, as well as the arrangements of the monitors, are easily configured and fulfill the typical requirements on occupational safety and operator effectiveness.

Freelance Operations

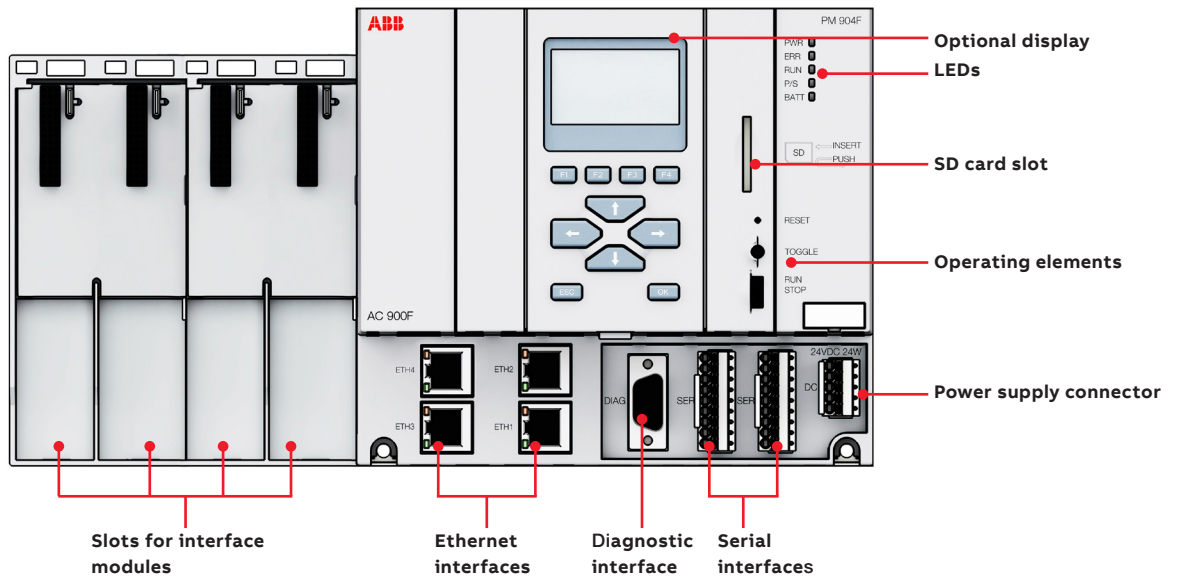
Freelance Operations received various improvements in terms of the User Interface and User Experience. The new Freelance Operations leans on the High Performance HMI style while making sure that experienced users from former Freelance versions still feel confident.

Benefits of the new version at a glance

- Enhanced scalability: New PM 904F expands the AC 900F controller family in the upper range.
- Improved usability: Freelance 2019 provides significant increase of efficiency for Operations and Engineering.
- More connectivity: Four (4) communication Interfaces in new AC 900F with PM 904F.
- Enhanced Security: New Extended User Management based on Windows User accounts.
- As a matter of course, Freelance Version 2019 still supports Freelance hardware from its first version.
- Multi monitor support from 2019 version, up to 4 monitors on one PC.
- Compatibility: Freelance 2019 runs on Windows 10 and Windows 7.



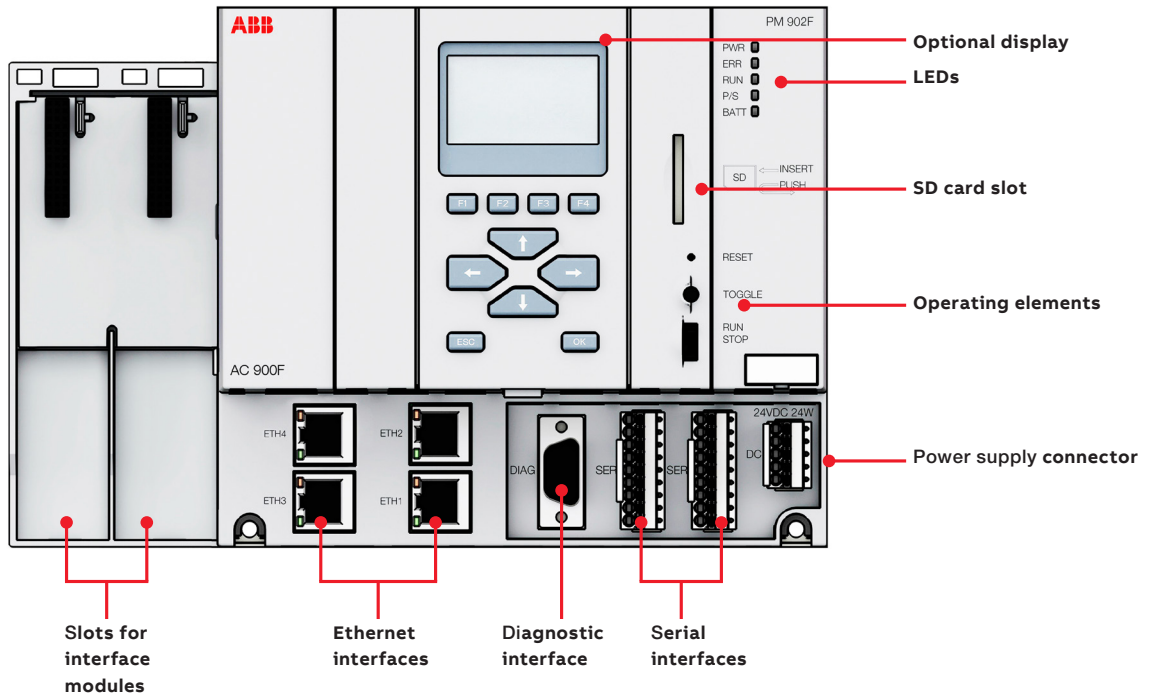
CPU module PM 904F



PM 904F Technical data

Technical Data PM 904F	
RAM (Total)	48 MB
RAM battery buffered	16 MB
CPU clock rate	800 MHz
Number of direct I/O modules	Up to 10
Power consumption	24 W (full station assembly)
Power supply	Terminal for 24 VDC power supply DC-IN +24 VDC
Max. power dissipation within the module	18 W
Current consumption from 24 VDC	1 A
Inrush current at 24 VDC	1.5 A
Data backup source	Lithium battery for SRAM contents and real time clock
Buffering time at +40 °C	> 2 years After battery low warning: 14 days
Battery low indication	Warning indication issued about 2 weeks before the battery charge becomes critical
Real-time clock, with battery backup	Yes
Multitasking program execution: <ul style="list-style-type: none"> Cyclic (equidistant) Cyclic (as fast as possible) Event driven 	<ul style="list-style-type: none"> Configurable cycle times from 5 ms PLC mode Predefined events
Serial interfaces (SER1 and SER2) <ul style="list-style-type: none"> Physical link: Connection: Usage: 	<ul style="list-style-type: none"> Configurable for RS-232 or RS-485 (from 600 bps to 38400 bps), Pluggable terminal block with spring connection Modbus RTU Telecontrol IEC 60870-5-101
Onboard network interface 4 Ethernet interfaces (RJ45) <ul style="list-style-type: none"> Ethernet 1: Ethernet 2: Ethernet 3 & 4: 	<ul style="list-style-type: none"> for ControlNet (optional Modbus TCP and Telecontrol IEC 60870-5-104) for redundancy link for Modbus TCP and Telecontrol IEC 60870-5-104 or for ControlNet redundancy
Weight	1.1 kg (2.43 lbs)
Dimensions	Width 285 mm (11.22 inch) Height 152 mm (5.98 inch) Depth 95 mm (3.74 inch)

CPU module PM 902F



Central processing unit

The PM 902F or PM 901F CPU modules are the central part of the AC 900F controller. The CPU provides a high performance processor for multi-tasking and executing fast loop cycle times. PM 902F comes with four on-board 100 Mbit/s Ethernet network connections and two serial interfaces. PM 901F comes with three on-board 100 Mbit/s Ethernet network connections and two serial interfaces. A third serial interface is reserved for diagnosis purpose and radio clock connection. Coupler bus slots and an I/O bus interface enables for adding further modules left and right to the CPU modules.

The front panel display shows status and diagnostic information directly at the module. Operating modes can be modified by switches on the front panel.

CI 930F PROFIBUS Master	
Protocol	DP-V0/V1 protocol
Baud rate	9.6 kBit/s to 12 MBit/s
Connector	2 x D-SUB, 9-pole, female
Slaves	max. 126
Redundancy	Support of PROFIBUS line redundancy
Hot plug, hot configuration in run	The CI 930F PROFIBUS Master can be exchanged during operation of AC 900F
CI 773F PROFIBUS Master	
Protocol	DP-V0/V1 protocol
Baud rate	9.6 kBit/s to 12 MBit/s
Connector	D-SUB, 9-pole, female
Slaves	max. 126

Technical data PM 902F and PM 901F	
PM 902F	RAM (Total) = 24MB RAM battery buffered = 8MB
PM 901F	RAM (total) = 11MB RAM battery buffered = 3MB
Battery low indication	Warning indication issued about 2 weeks before the battery charge becomes critical
Real-time clock, with battery backup	Yes
Multitasking program execution Cyclic (equidistant) Cyclic (as fast as possible) Event driven	Configurable cycle times from 5 ms PLC mode Predefined events
Serial interfaces (SER1 and SER2) Physical link:	Configurable for RS-232 or RS-485 (from 600 bps to 38400 bps),
Connection:	Pluggable terminal block with spring connection
Usage:	Modbus RTU (Master / Slave) Telecontrol IEC 60870-5-101
Onboard network interfaces / Ethernet (RJ45)	PM 902F: 4 PM 901F: 3
PM 902F / PM 901F	Ethernet 1: for Control Net (optional Modbus TCP and Telecontrol IEC 60870-5-104)
PM 902F / PM 901F	Ethernet 2: for redundancy link
PM 902F / PM 901F	Ethernet 3: for Modbus TCP and Telecontrol IEC 60870-5-104
PM 902F	Ethernet 4: for Modbus TCP and Telecontrol IEC 60870-5-104

The controllers

AC 800F



The AC 800F controller has a modular structure. The CPU is designed as a backplane to which various modules – power supply units, Ethernet and fieldbus modules – can be attached in line with the application. On the fieldbus side, modules for PROFIBUS-DPV1, FOUNDATION Fieldbus HSE, MODBUS (master / slave, RTU or ASCII), IEC 60870-5-101, IEC 60870-5-104 and CAN for Freelance Rack I/O are available.

The fieldbus line and the connected field devices are entirely configured and parameterized using the engineering tool Freelance. No further external tools are needed for configuration. Fieldbus and device configuration can be performed offline without connection to the field devices. In case of PROFIBUS, field devices or slaves can be integrated into the system using device specific GSD¹ files or DTMs². If for a certain device no DTM is available, generic GSD files of PROFIBUS slaves can be used instead. Together with S900 remote I/O, HART variables are cyclically available as process data.

In the case of FOUNDATION Fieldbus, configuration takes place using specific CFF³ or DD⁴ files. Field devices are connected to H1 links, which in turn are connected via LD 800HSE linking devices to the high-speed HSE subnet.

Even a single AC 800F controller can be connected to both buses, PROFIBUS and FOUNDATION Fieldbus at the same time. This makes it very convenient to run loops of an FF application using „control in the field“ technology, while at the same time gathering fast binary data via high-speed PROFIBUS using remote I/Os.

Furthermore Freelance Rack I/O can be connected to the AC 800F. In this case, the CAN module is used. This allows you to operate five I/O racks, typically up to 1000 I/Os, for each AC 800F. Each I/O rack is equipped with a link module and up to nine I/O modules and can be mounted separately at a distance of up to 400 m from the AC 800F.

The basic unit with CPU

The core element of the AC 800F controller is a high-performance processor with rapid bit processing properties making it ideal for use in process applications.

Fieldbus modules	
CPU	32-bit super scalar RISC processor with rapid bit processing
RAM	16 MB (SD-RAM) for application with battery backup
Task execution	Cyclic (configurable cycle times from 5 ms) Event-driven (predefined events) As fast as possible (PLC mode)
Interfaces	Ethernet PROFIBUS FOUNDATION Fieldbus MODBUS TCP Station bus (CAN bus)
	Serial: RS485/422/232 Modbus RTU IEC 60870-5-101 Telecontrol protocol
Usage:	0...60°C (32...140°F), no forced cooling required
Certificates	CE NAMUR UL ISA-S71.04 (G3 severity level)

¹ GSD = Device Master Data, abbreviation for the German term “Gerätstammdaten”.
A GSD is the device database file (also called “device datasheet”)
² DTM = a device driver based on FDT technology
³ CFF= Capabilities File
⁴ DD = Device Description

AC 800F uses the fieldbus modules to collect and process real-time and diagnostic data. Up to four fieldbus modules can be mounted into one AC 800F. The fieldbus modules have the following tasks and characteristics:

- Electrical isolation between the process and the Controller
- Status LEDs for each module
- Independent fault detection and fault signaling
- Connection of the fieldbus segments and sub-nets

Details of the fieldbus modules

Type	Channels	Function	Modules per controller
CAN module	3	Connection of up to 5 Freelance I/O racks	1
Serial module	2	RS232/RS422/RS485 configurable for MODBUS, IEC 60870-5-101 telecontrol protocol	4
PROFIBUS module	1	Full-value PROFIBUS DPV1 Master	4
FF-HSE module	1	For the connection of up to 10 LD 800HSE Linking Devices with 10/100 MBaud autosense twisted pair connection	4

Ethernet module for the system bus

Type	Channels	Function
Ethernet module EI 813F	1	twisted pair connection 10 base T for connection to hubs or switches

Mechanical design of AC 800F

The AC 800F front panel connection technique makes it exceptionally easy to assemble and to service.

Mounting on the wall can be achieved very easily. All AC 800F modules are inserted into slots from the front and secured in position with screws. The modules are activated using a lock switch, which conceals the upper screw opening. The lock switch must be opened to reach the upper screw opening.

All modules are surrounded by a metal housing, which gives them optimum mechanical and electrical protection.

All housing materials used are simply screwed together, allowing them to be separated for future recycling. Last but not least, Freelance has taken environmental protection into account by using a minimal amount of paint.

The controllers

AC 700F

The AC 700F controller, as a member of Freelance, has numerous advantages over a PLC based solution: The distributed process control system simplifies engineering, commissioning and maintenance of the automation system.

Visualization is directly incorporated into the engineering, making configuration particularly straightforward. Small or distributed plant components can be implemented cost effectively by using AC 700F. The competitive advantage is clear: the same engineering, operation and maintenance method for all plant components hand in hand with the well-known ease of use of Freelance.

The AC 700F hardware

AC 700F comes with a modular design. The base elements are different types of terminal units, for the CPU module and for S700 I/O modules. Both, screw type and spring type terminal units are available.

The CPU and the local S700 I/O modules communicate very fast. I/O scan times of 2 ms are possible. Short circuit and line break detection is realized for each channel. Certificates according to CE, UL and GL enables AC 700F to be used in a wide variety of applications. S700 I/O can be connected directly to the controller, or remote via PROFIBUS. See "S700 I/O Modules" on page 20 for details.

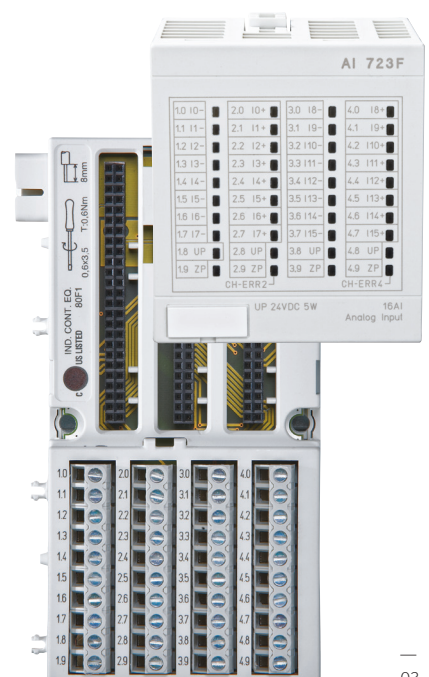
01 AC 700 CPU plugged on terminal unit

02 S700 I/O module plugged on terminal unit

The modules can be easily plugged to the terminal units and then terminal units can be plugged one to the other. The entire controller and the I/O modules are then mounted on a DIN rail.



01



02

AC 700F CPU PM 783F



Small front panel display

The CPU module

The CPU module is equipped with a high-performance processor allowing for fast cycle times. It comes with on-board 10/100 MBit/s Ethernet network connection used for communication between controllers, operator stations and engineering tool. Two serial line interfaces complement the connectivity. One interface can be used for Modbus communication while the other is used for diagnostics.

For demanding applications, eight cyclic and priority driven tasks with adjustable cycle time can be configured, as well as a PLC type task, which runs as fast as possible. This multi-tasking scenario enables engineers to design applications that reflect all demands of process control, while at the same time balancing the CPU load. This keeps the resources needed in a project at the minimum.

The small front panel display shows diagnostics information directly at the module.

AC 700F CPU PM 783F	
Processor Motorola Power PC (MPC8247) Max	
Number of I/O Modules	8
Serial interface "SER" (COM1)	Physical link: configurable for RS-232 or RS-485 (from 1200 bps to 38400 bps) Connection: pluggable terminal block, spring connection Usage: as Modbus RTU
Serial interface "DIAG" (COM2)	Physical link: RS-232 Connection: SUB-D Female connector Usage: for diagnostics
Onboard network interface	1 x Ethernet (RJ45)
Certificates	CE, GL, UL

CI 773F PROFIBUS Master	
Protocol	DP-V0/V1 protocol
Baud rate	9.6 kBit/s to 12 MBit/s
Connector	D-SUB, 9-pole, female

The controllers

Functions and function blocks

Functions and function blocks	
Analog value	<ul style="list-style-type: none"> • Input and output conversion processing • Linearization • Deld dead-time filter • Average/extreme value determination in time • Setpoint adjustment • Counter with analog input • Time scheduler
Binary value processing	<ul style="list-style-type: none"> • Binary output, monostable • Input and output delay • Pulse/time counter, pushbutton
PID loops	<ul style="list-style-type: none"> • Continuous controllers • Step controllers • On/off controller, three-position controller • Ratio controller • Basic functions • Auto-tuning
Open-loop control	<ul style="list-style-type: none"> • Individual drive functions • Sequence control, dosing circuits
Logic functions	<ul style="list-style-type: none"> • Logic processing • Average/extreme value determination • Comparator, binary switch • Multiplexer • Converter (data type & code) • Flip-flop, edge detection • String blocks • Radio controlled adjustment of daylight-saving time
Monitoring	<ul style="list-style-type: none"> • Analog and binary monitoring • Event monitoring • Audible alarm control • Connection monitoring
Acquisition functions	<ul style="list-style-type: none"> • Disturbance course acquisition, trend acquisition
Arithmetic functions	<ul style="list-style-type: none"> • Basic arithmetic functions, numerical functions • Logarithmic functions • Trigonometric functions • Analog value and time limitation
Modbus functions	<ul style="list-style-type: none"> • Master and slave functions
PROFIBUS	<ul style="list-style-type: none"> • DPV1 master functions
Telecontrol functions	<ul style="list-style-type: none"> • Master and slave functions
Phase logic	<ul style="list-style-type: none"> • Interface module for batch applications processing

Functions

The scope of functions provided by the Freelance system corresponds to the basic supply defined in IEC 61131-3, in addition to numerous other high performance, industry-proven functions and function blocks. They are accommodated in a function block library and can be expanded by user-specific function blocks.

While designing the station and during configuration, the processing capacity and speed of the controller can be easily adapted to the demands of the automation task. Program execution in the controller is based on a task oriented, real-time multitasking operating system, leading to a flexible strategy for processing programs.

Different modes are available for user task execution:

- Up to eight tasks with individual cycle times between 5 ms and 24 hours
- Processing as fast as possible (PLC mode)

Along with the user tasks, system tasks are automatically made available. These tasks are executed once in case of the following events:

- RUN
- STOP
- COLD START
- WARM START (voltage restored)
- REDUNDANCY TOGGLE
- ERROR

Remote I/O

S700, S800 and S900

The PROFIBUS Master module enables connection of remote I/O units such as S700, S800, or S900 Remote I/O. S700 I/O is meant for basic applications where traditionally PLC I/Os have been used. S800 is generally used in process automation. S900 is preferred, due to its extended channel diagnostics and intrinsic safety, in the chemicals segment and in areas where explosion protection is required.

One of the benefits using remote I/O is that it can be placed in junction boxes in the field and not in the control room.

S700

S700 I/O can be used as direct I/O for AC 700F and AC 900F. S700 can be used as PROFIBUS remote I/O at AC 700F, AC 800F, AC 900F or other PROFIBUS Masters.

One of the S700 I/O benefits is the small footprint – the modules are featured with a high packing density, several modules are available with inputs and outputs mixed in one module. Currently, 14 different module types are available covering a wide variety of applications.

For further details, see:

Freelance DCS Product Catalog 3BDD015188

S800

S800 I/O is a comprehensive, distributed and modular process I/O system that communicates with controllers via PROFIBUS. Installation in the field, close to sensors and actuators, S800 I/O greatly reduces the installation cost by reducing

the cost of cabling. It is possible to exchange modules and reconfigure the system during operation. Redundancy options in all areas allow a high degree of availability. For harsh environments, the I/O modules are compliant to G3 severity level of ISA-S71.04, Environmental Conditions for Process Measurement and Control Systems. A pass-through feature makes it possible to configure and examine all HART-compliant field devices directly from the control systems engineering tool.

For further details, see:

System 800xA 6.1 Product Catalog 3BSE091397

S900

The remote S900 I/O system can be installed directly in zone 1 and zone 2 hazardous areas.

It communicates with the control system level using the PROFIBUS standard, therefore reducing marshalling and wiring costs. The system is sturdy, error-tolerant and easy to service. Moreover, the S900 I/O system is characterized by a compact design, cyclical transmission of secondary HART variables, parameterization and diagnosis of all HART field devices via the fieldbus. Its redundancy ensures maximum availability.

Integrated disconnection mechanisms allow replacement during operation, meaning that there is no need to interrupt the primary voltage in order to exchange the power supply units.

For further details, see:

S900 I/O Datasheet Catalog 3BDD010420

S700 I/O



S800 I/O



S900 I/O



Remote I/O

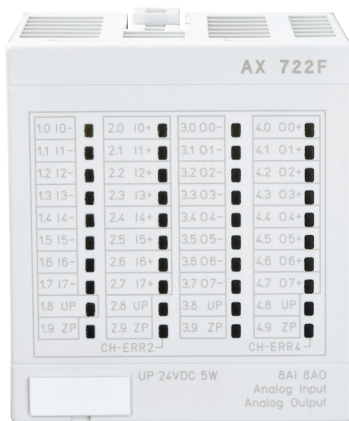
S700

S700 I/O Modules

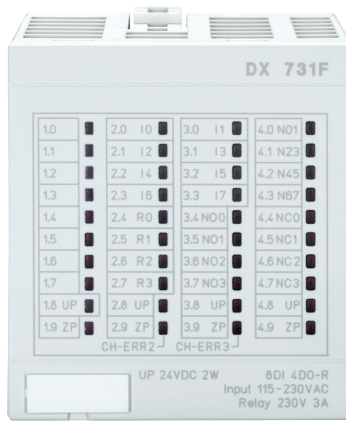
Module Name	Channels	Description	Direct I/O	Remote I/O (PROFIBUS)	Required Terminal Unit
DC 732F	16 DI, 16 DC	16 channels are assigned as digital inputs, while the remaining. 16 channels can be configured as input or as output.	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
AI 723F	16 AI	16 AI: +-10 V, 0/4-20 mA 24 VDC, Pt100 12 bit + sign, 2-wire, 24 VDC 5 W For 3-wired connections two channels are required	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
AX 722F	8 AI, 8 AO	Eight of these channels can be individually configured as inputs, which can again sense voltage, current, or temperatures. Four channels can be configured as analog voltage outputs (-10 V to +10 V) or analog current outputs (0 ... 20 mA or 4 ... 20 mA), four channels can provide voltage signals in the range from -10 V to +10 V. 8 AI: +-10 V 0/4-20 mA 24 VDC, Pt100 8 AO: +-10 V 0/4-20 mA 24 VDC. 12 bit + sign, 2-wire, 24 VDC 5 W	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
AO 723F	16 AO	16 configurable analog outputs in two groups. 16 AO: +-10 V, 0/4-20 mA max. 8 AO usable as current outputs 12 Bit + sign, 2-wire, 24 VDC 8 W	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
DX 722F	8 DI, 8 DO Relay	8 digital inputs 8 relay outputs with one switch-over contact each 8 DI: 24 VDC 8 DO: relay contacts, 24 VDC, 230 VAC 1/3-wire, 24 VDC 2 W	Yes	Yes	TU 731F (screw type) or TU 732F (spring type)
DX 731F	8 DI, 4 DO Relay	8 digital inputs 230 V DC in two groups. 4 relay outputs (2.4...2.7), with one switch-over contact each 8 DI: 230 VAC 4 DO: relay contacts, 24 VDC, 230 VAC 2-wire, 24 VDC 2 W	Yes	Yes	TU 731F (screw type) or TU 732F (spring type)
AI 731F	8 AI	8 configurable analog inputs in two groups. Thermocouple, RTD, mV/V, mA, kOhm and 24 VDC 15 Bit + sign, 2-, 3- and 4-wire, 24 VDC 5 W	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)

S700 I/O Modules

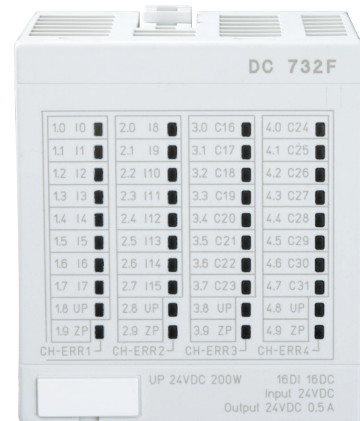
Module Name	Channels	Description	Direct I/O	Remote I/O (PROFIBUS)	Required Terminal Unit
DI 724F	32 DI	32 digital inputs 24V DC in four groups. 32 DI: 24 VDC 1-wire, 24 VDC 1 W	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
DC 723F	24 DI/DC	One 24 V DC 0.5 A sensor power supply with short-circuit and overload protection – 24 digital Inputs/Outputs 24 V DC in one group, each of which can be used – As an input, – As a transistor output with short-circuit and overload protection with 0.5 A rated current or – As a re-readable output (combined input/ output) and can be addressed accordingly	No	Yes	TU 715F (screw type) or TU 716F (spring type)
DA 701F	16 DI, 4 AI, 2 AO, 8 DC	30 channels – 16 digital inputs, 24 V DC – 4 analog inputs, voltage, current and RTD, resolution 12 bits plus sign – 2 analog outputs, voltage and current, resolution 12 bits plus sign – 8 configurable digital inputs/outputs 24 V DC, 0.5 A max.	Yes	Yes	TU 715F (screw type) or TU 716F (spring type)
CI 741F	PROFIBUS Interface 8 DI, 8 DO, 4 AI, 2 AO	The CI741F is used as communication interface for PROFIBUS communication. In addition the PROFIBUS Interface Module CI 741F provides: 8 DI: 24 V DC; 8 DO: 24 V DC/0.5 A 4 AI: +-10 V, 0/4-20 mA, RTD, 24 V DC 2 AO: +-10 V, 0/4-20 mA; 1- wire, 24 V DC, 100 W	No	Yes	TU 709F (screw type) or TU 710F (spring type)



AX 722 F



DX 731



DC 732F

Remote I/O

S800

S800 I/O modules

Digital input modules	
DI810	16 ch., 2 groups of 8 ch., 24 V d.c., current sink.
DI811	16 ch., 2 groups of 8 ch., 48 V d.c., current sink.
DI814	16 ch., 2 groups of 8 ch., 24 V d.c., current source.
DI818	32 ch., 2 groups of 16 ch., 24 V d.c., current sink.
DI820	8 ch., separate returns, 110 V d.c., 120 V a.c.
DI821	8 ch., separate returns, 220 V d.c., 230 V a.c.
DI828	16 ch., separate returns, 110 V d.c., 120 V a.c. / d.c.
DI840	16 ch., 1 group of 16 ch., 24 V d.c., current sink, extended diagnostics, transmitter power supply.
DI890	8 ch., separate returns, 24 V d.c., current sink.
Digital output modules	
DO810	16 ch., 2 groups of 8 ch., 24 V d.c., max 0.5 A, transistor, current source, short-circuit-proof.
DO814	16 ch., 2 groups of 8 ch., 24 V d.c., max 0.5 A, transistor, current sink, short-circuit-proof.
DO815	8 ch., 2 groups of 4 ch., 24 V d.c., max 2 A, transistor, current source, short-circuit-proof.
DO818	32 ch., 2 groups of 16 ch., 24 V d.c., max 0.5 A, transistor, current source, short-circuit-proof.
DO820	8 ch., separate returns, 5-250 V, max 3 A a.c./d.c., relay (N.O.).
DO821	8 ch., separate returns, 5-250 V, max 3 A a.c./d.c., relay (N.C.).
DO828	16 ch., separate returns, 5-250V a.c. / 5-125V d.c. max 2A a.c./d.c., relay (N.C.).
DO840	16 ch., 1 group of 16 ch., 24 V d.c., max. 0,5 A, current source, short-circuit-proof, extended diagnostics.
DO890	4 ch., separate returns, 11 V @ 40 mA, load 150-5000 Ohms, current source, short circuit-proof.
Analog input modules	
AI810	8 ch., 1 group of 8 ch., single ended with common return, 0(4)-20 mA, 0(2)-10 V, 12 bits.
AI815	8 ch., 1 group of 8 ch., single ended with common return, 0(4)-20 mA 0(1)-5 V, 12 bits, HART interface, transmitter power supply.
AI820	4 ch., 1 group of 4 ch., bipolar differential, $\pm 0(1)$ -5 V, $\pm 0(2)$ -10 V, $\pm 0(4)$ -20 mA, 14 bits + sign.
AI825	4 ch., separate returns, isolated bipolar, $\pm 0(2)$ -10 V, $\pm 0(4)$ -20 mA, 14 bits + sign.
AI830A	8 ch., 1 group of 8 ch., Pt100, Ni100, Ni120, Cu10, resistor 0-400 Ohms, 14 bits, 3-wire.
AI835A	8 ch., (7+ ref. junction), 1 group of 8 ch., TC types B, C, D, E, J, K, L, N, R, S, T, U, -30...75 mV, 15 bits.
AI843	8 ch. + ref. junction, 1 group of 8 ch., TC types: B, C, E, J, K, L, N, R, S, T, U, -30...75 mV, 16 bits, extended diagnostics.
AI845	8 ch., 1 group of 8 ch., single ended with common return, 0(4)-20 mA 0(1)-5 V, 12 bits, extended diagnostics, HART interface, transmitter power supply.
AI890	8 ch., 1 group of 8 ch., single ended with common return, 0(4)-20 mA, 12 bits, transmitter power supply
AI893	8 ch. (7 + ref. junction), 1 group of 8 ch., TC types B, C, E, J, K, L, N, R, S, T, U, -10...80 mV. RTD: Pt50-1000, Ni100-500, Cu10-100, resistor 0-4000 Ohms, 3-wire. 15 bits + sign.
AI895	8 ch., 1 group of 8 ch., single ended with common return, 4-20 mA, 12 bits, HART interface, transmitter power supply
Analog output modules	
AO810V2	8 ch., 1 group of 8 ch., 0(4)-20 mA, 14 bits, load: max 850 Ohms (short-circuit-proof).
AO815	8 ch., 1 group of 8 ch., 4...20 mA, 12 bit, load: max 750 Ohms (short-circuit-proof), HART interface.
AO820	4 ch., separate returns, isolated bipolar, $+0(2)$ -10 V, $+0(4)$ -20 mA, 12 bits + sign, load: max 550 Ohms (current) / ≥ 2 kOhms (voltage), short-circuit-proof.
AO845A	8 ch., 1 group of 8 ch., 4-20 mA, 12 bit, load: max 750 Ω (short-circuit-proof) extended diagnostics, HART interface.
AO890	8 ch., 1 group of 8 ch., 0(4)-20 mA, 12 bits, load: max 725 Ohms (short-circuit-proof).
AO895	8 ch., 1 group of 8 ch., 4-20 mA, 12 bits, HART interface, load: max 725 Ohms (short-circuit-proof).

Remote I/O

S800L I/O and S900

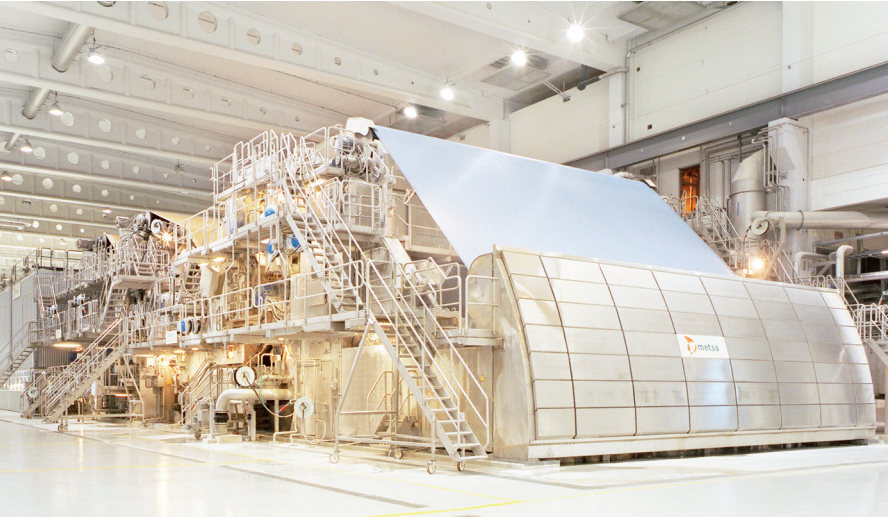
S800L I/O modules

Digital input modules	
DI801	Digital Input, 24 VDC, 1x16 channels
DI802	Digital Input, 120 VAC / DC, 8x1 channel
DI803	Digital Input, 230 VAC / DC, 8x1 channel
Digital output modules	
DO801	Digital Output, 24 VDC, 16 channels
DO802	Digital Output, Relay, normal open, 8x1 channel
Analog input modules	
AI801	Analog Input, 1x8 channels
Analog output modules	
AO801	Analog Output, 1x8 channels

S900 I/O modules

Digital I/O modules	
DX910S/B/N	Digital input or output Input for dry contact or NAMUR initiator. Output for low power intrinsic safe valves. 8 I/O channels
DP910S/B/N	Frequency input Input for dry contact or NAMUR initiator.
DX910S/B/N	Digital input or output Input for dry contact or NAMUR initiator. Output for low power intrinsic safe valves. 8 I/O channels
DO910S/B/N	Output for valves 4 channels
DO930N	With 4 normally-open contacts and 2 changeover contacts
Analog input modules	
AI910S/B/N	Analog input. 4 channels. Transmitter power supply, 4..20 mA.
AI930S/B/N	Analog input, HART. 4 channels. Transmitter power supply, 4..20 mA.
AI931S/B/N	Analog Input, HART. 4 channels. Passive input, 0/4..20 mA.
AI950S/B/N	Temperature. 4 channels. Pt100, Pt1000, Ni100 in 2-/3-/4-wire technique thermocouples type B, E, J, K, L, N, R, S, T isolated inputs channel by channel.
Analog output modules	
AO910S/B/N	4 channels. Output 0/4..20 mA.
AO920S/B/N	4 channels. Output 0/4..20 mA. Isolated outputs channel by channel.
AO930S/B/N	4 channels. HART. Output 0/4..20 mA.

Field devices



Freelance enables you to connect and configure PROFIBUS DP and PROFIBUS PA devices. For connection of PROFIBUS PA devices the PROFIBUS Power Hub must be used in between the controller and the field devices.

For FF, the LD 800HSE Linking Device allows you to connect and configure FOUNDATION Fieldbus H1 devices. The configuration of “control in the field” with FOUNDATION Fieldbus is supported by Freelance.

HART devices can be connected using HART compliant modules of S800 or S900 remote I/O. If the HART devices are connected to S900, certain S900 modules can be used to transfer additional HART values to the cyclical I/O mapping. This makes it possible to use the second or third measured values of a HART device in the AC 800F controller as an input for applications.

An example is the use of ABB’s 2600T series multivariable transmitters. Such a transmitter sends its pressure process value as 4...20 mA signal and in addition the temperature and the differential pressure as secondary measurement values via HART communication. With these three values the flow can be calculated. Having three measured values on a single transmitter allows for smarter design and cost savings.

PROFIBUS DP/PA Linking Device

The PROFIBUS Power Hub is an interface between the PROFIBUS DP and the PROFIBUS PA. Combining a PROFIBUS Power Hub with a field barriers and segment protectors makes it possible to connect field devices to a control system, which are located in intrinsic safe areas.

The field barriers and segment protectors can be connected to the non-intrinsically safe outputs (trunks) of PROFIBUS Power Hub. The recommended PROFIBUS Power Hub is a device from Pepperl+Fuchs (<http://www.pepperl-fuchs.com>).

FOUNDATION Fieldbus Linking Device LD 800HSE

LD 800HSE serves as a gateway between High Speed Ethernet (HSE Subnet) and the FOUNDATION Fieldbus field devices on H1 links. The scheduling and provision of data from one H1 link to another is established by the communication between field devices. LD 800HSE establishes this communication. The communication works independently on how the devices are connected: on the same H1 link, on different H1 links connected to one LD 800HSE or on H1 links connected to different LD 800HSEs at the same HSE subnet.

LD 810HSE EX linking device

The new LD 810HSE EX module used for DIN rail mounting with 4 H1 links and one HSE connector. The module itself needs external 24 VDC power supply. H1 links must be powered separately.

Restrictions: Linking Device LD 810HSE Ex is not suitable for replacing one of the LD 800HSE Linking Devices in a redundant pair. To clarify, both devices in the redundant pair must be replaced with LD 810HSE Ex. Redundancy cable for LD 810HSE Ex can be made by the end customer directly and need not be ordered through ABB.

Fieldbus infrastructure

To protect fieldbus segments and links, appropriate fieldbus barriers can be used. For H1 links, power conditioners have to provide sufficient current. Furthermore proper network switches should be used to connect AC 800F FF modules and several LD 800HSEs.

System communication

Control network

The control network interconnects the Controllers, operator stations and engineering station in the Freelance system.

The control network complies with the Ethernet Standard according to DIN/ISO 8802, Part 3 (IEEE 802.3) and can be used with twisted pair or coaxial cable. It is also possible to use a combination of these standards or to implement 1-GBit/s components within a network as high-speed backbone.

Freelance uses confirmed and unconfirmed services. The unconfirmed UDP service is used for screen updating and lateral communication between controllers. The confirmed TCP/IP service is used for alarming and trend archiving.

The control network has the following features:

- The ability to cover long distances
- A high data throughput
- A flexible network layout
- Easy connection to a higher plant management level through the OPC standard
- Pre-programmed routines in the event of errors
- Excellent EMC properties
- Ability to switch bus members on and off during operation
- Highest availability through redundancy

OPC

Freelance provides an OPC gateway (server), which allows OPC clients to access data and alarms from the Freelance controllers. The OPC server also allows access to the DPV1 parameters and user parameters of PROFIBUS and HART devices. In the case of HART devices, this is only possible if they are connected to an S900 remote I/O unit.

For Freelance version 8.2 and higher, the parameters of FOUNDATION Fieldbus devices can also be accessed. It is possible to limit access to this data at the OPC gateway such that an OPC client cannot see certain tags and variables at all, can only read other tags and variables, or has both read and write access to certain tags and variables.

Freelance Operations has a built-in OPC client, which permits you to access data from external OPC servers. Using this, for example, data from third-party controllers with OPC support can be integrated into a custom graphic in Freelance Operations. From Version 9.2, when using PLC Integration, also Faceplate creation and Alarm & Events are supported.

As several OPC gateways can be used in the Freelance system, server redundancy can be established using OPC clients that support this function. Freelance Engineering supports this with the redundant OPC gateway configuration.

The trend server option provides a special OPC gateway that is used by the Freelance operator stations for user-defined trend displays. Access to the trend server is fixed to "read only", and all trend variables are automatically available. There is one trend server per Freelance system.

DMS-API

The DMS Application Programming Interface provides C programmers with a Windows interface through which they can access internal Freelance communications services. This enables them to create their own Windows applications that can read online data from the Freelance system and create values.

Freelance Operations

Scalable, intuitive operator interface

Freelance Operations, based on Microsoft Windows as a graphical user interface, enhances the ease of use and the performance of process operation. In addition, you can also use any PC peripherals such as monitors, printers, mouses and keyboards that are available on the market for Windows compliant PCs.

The operation and engineering functions can also be performed together on one PC. For operation, Freelance Operations offers the following features:

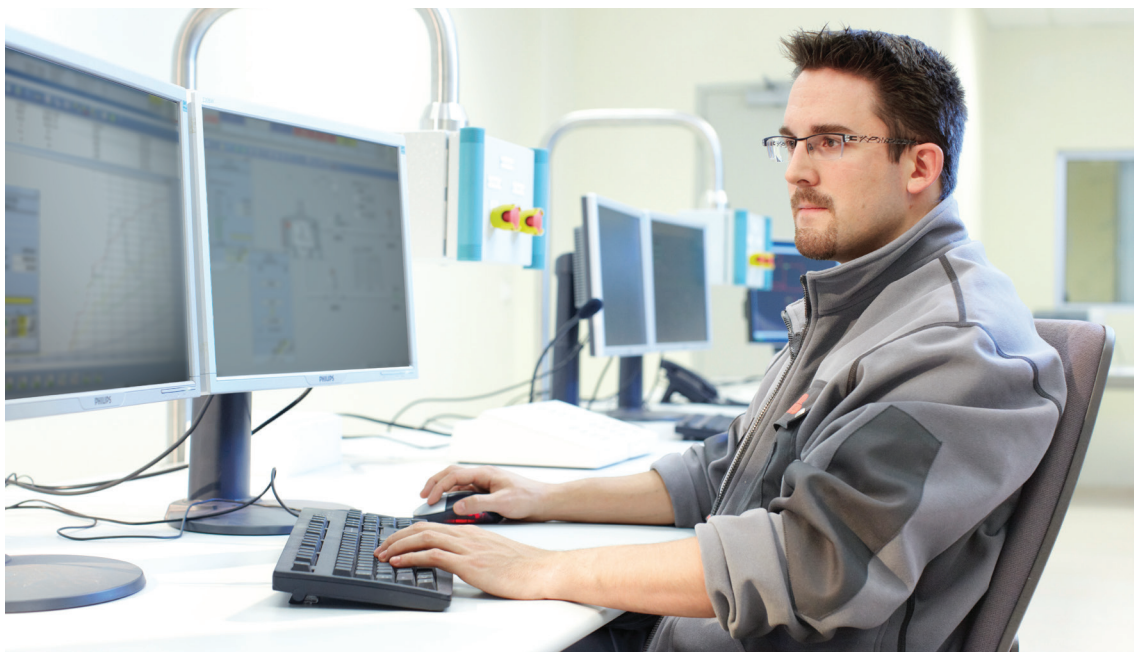
- Transparent and rapid operation due to a clearly structured information hierarchy
- User-specific function key assignment for fast display selection
- A large number of pre-engineered displays
- Rapid and secure action in case of process alarms
- Trend displays with archiving
- Logging of all operator actions, including name and timestamp
- System diagnostics, even down to the field device, allowing extended field device diagnostics
- Uniform process alarm and message concept and clearly arranged display of messages and operator hints
- Up to 16 user groups / access profiles, with up to 1000 users, specific password for each user (with optional Security Lock software). Freelance extends its User Management capabilities known from “Security Lock” by an alternative

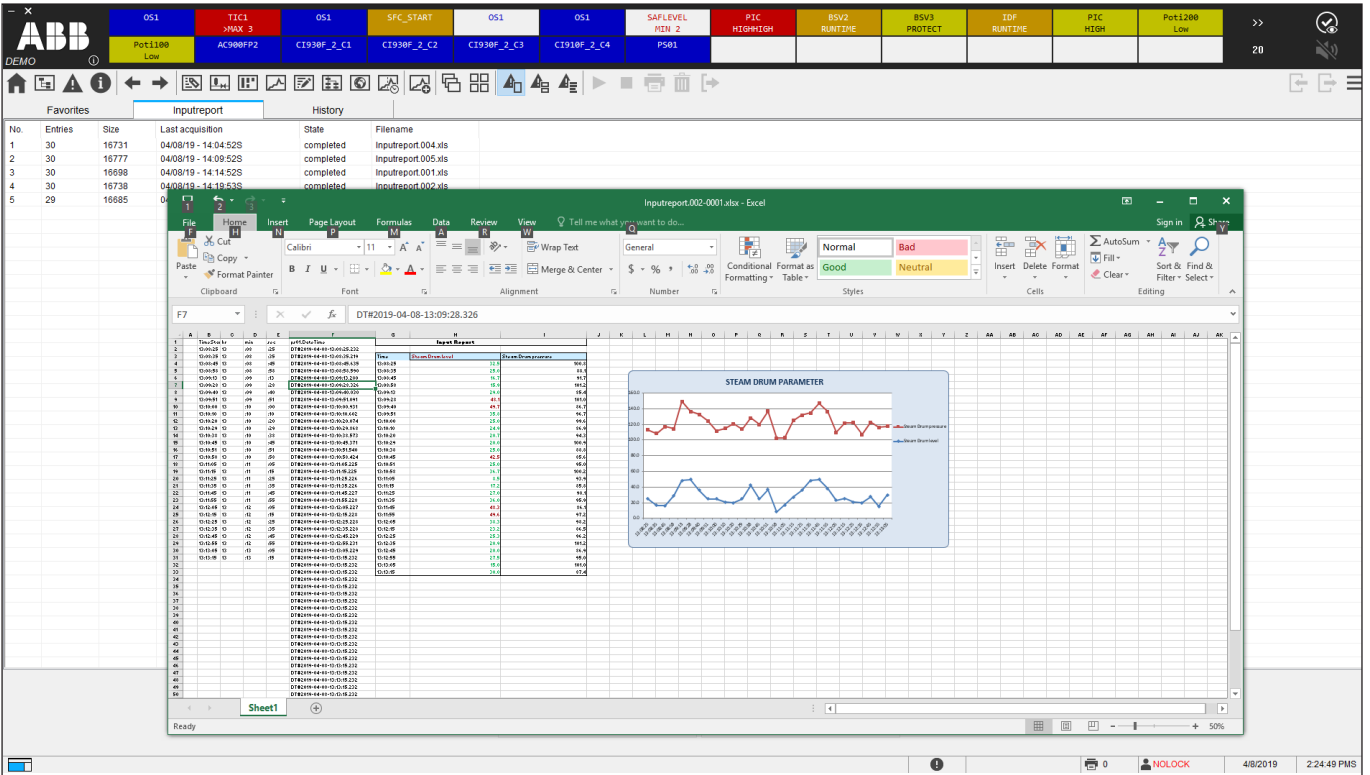
solution, the so called “Extended User Management”. This new options make use of Windows User accounts, local as well as domain accounts are supported. With this new option typical requests like a central password management, rules for password complexity or password aging can be fulfilled.

- Various language versions like for example: English, Chinese, German, Spanish, Brazilian Portuguese, Swedish, Russian, Polish, French, and Japanese
- A control aspect, providing access to automatically generated dynamic interlocking displays for the selected tag (in connection with OPC or trend server)
- External aspects, providing access to additional information such as PDF documentation, live videos from the plant, standard operational procedures (SOPs), etc.
- Configurable voice output on the PC for process alarms
- Multi monitor operation on a single PC, with one mouse and one keyboard (Freelance 2019)

The process visualization is supported by plant-specific custom graphic displays, faceplates for tags and up to 15 plant areas with plain text labeling.

The new lite version of Freelance Operations also provides forenhanced scalability of the system on the operator level. Freelance Operations Lite has full functionality and is only limited in number of free graphic displays.





Excel Report

Plant-specific displays

Plant-specific displays geared to the specific demands of the plant operator can be configured to depict process activities. Static sections of the graphic displays can be created using the graphics editor. In addition, you also have the option of inserting such static sections in the form of bitmaps, created by any other graphic editor, scanner, or digital photograph. Current process data or process states can be animated at every suitable position using features such as bar graphs, level indicators and trend windows.

Depending on process states, graphic symbols can, flash, change color and position or be replaced in the graphic display. Tags can be viewed either via faceplates in the graphic displays or via the standard group displays.

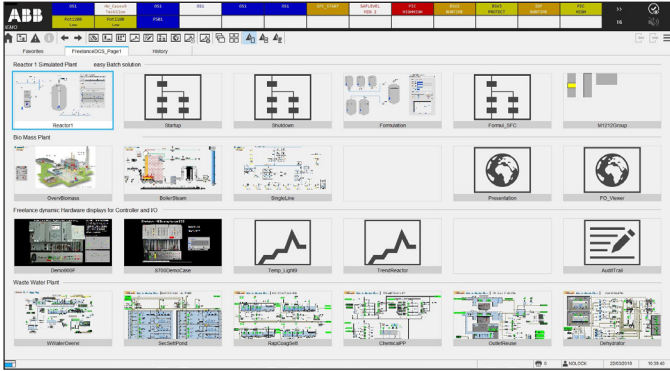
Display selector fields or buttons can be used to set up a specific selection hierarchy within custom graphics for operation. The number of custom graphics available in Freelance Operations is limited only by the hard disk capacity.

Excel Reporting

Excel Reporting functionality offers high flexibility for reporting functions in Freelance Operations, e.g. for shift logs. Due to the Excel functionality, also calculations like min, max, average, or sum are available.

Freelance Operations

Scalable, intuitive operator interface



01

01 Overview display

02 Faceplates

Pre-engineered, ready-to-use displays

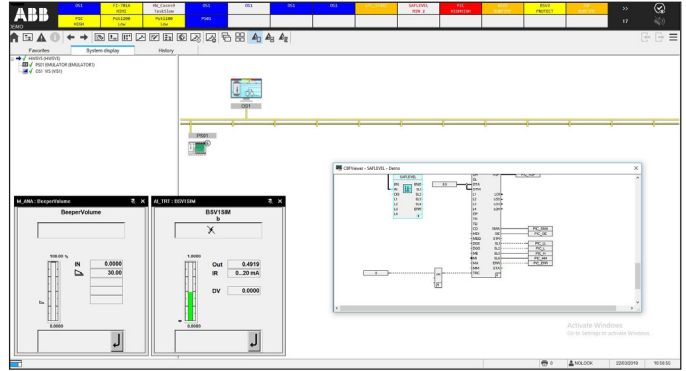
Pre-engineered displays are adapted to the needs of process control engineering with regard to structure and information content. The following displays are available:

- Overview display
- Group display
- Faceplate
- SFC display
- Time scheduler display
- Trend display
- Web display
- Message list and operator hint list
- Logs
- System display for hardware diagnostics

Therefore, most functions already have fully prepared displays for operation and observation and can be used without any further programming.

Overview display

The process information for the entire plant is presented in a condensed manner in a single overview display. It offers options for selecting the group, graphic, SFC, Web, time scheduler and trend displays. Logs can also be called up directly from the overview display. Up to 96 displays (16 lines, each with 6 displays per line) can be shown



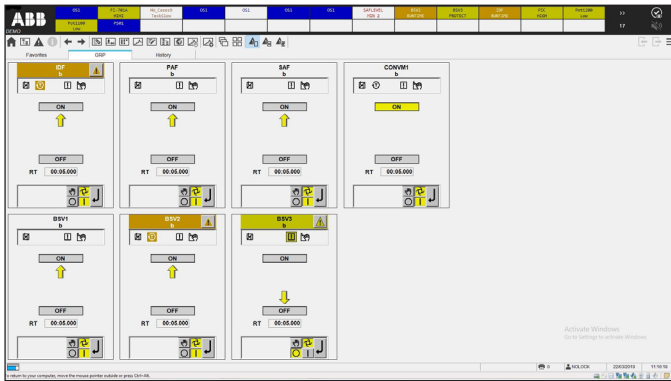
02

in the overview display. The group display symbols within the overview display also feature dynamic updating of tags, allowing disturbance states to be detected rapidly through appropriate symbols and colors. If required, you can also set a graphic display of your choice as overview display. It then replaces the standardized overview display.

Faceplates

Faceplates allow both overview and detailed information to be obtained simultaneously. Since faceplates are predefined, they are available immediately in the system following the definition of a tag, without any additional programming.

This is also the case for user-defined faceplates. Therefore, faceplates can be displayed together with standardized and freely designed displays. A selected tag can always be displayed via its faceplate.



01

01 Group display

02 SFC display

Group display

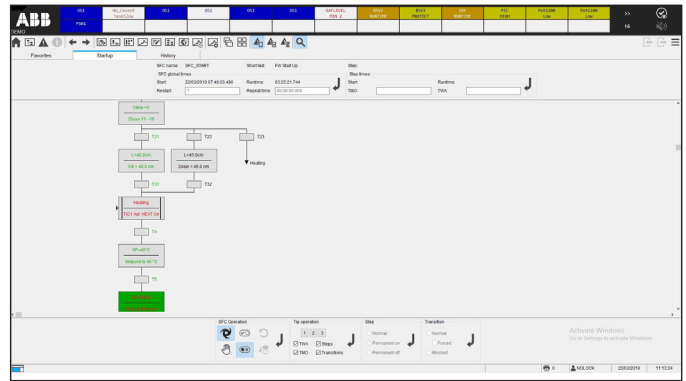
The group display is a combination of several faceplates and contains detailed information about associated tags. All functions, including PID-loops, time and monitoring functions as well as open-loop control functions, can be displayed and operated.

To provide a quick source of information, analog values are displayed as colored bars. To allow more precise reading, they are also shown as alphanumeric values. Pending disturbance states in the respective variables can be detected immediately through a change in color and flashing and can be acknowledged directly in the faceplate or message list. Configured limits can be additionally displayed as symbols. You can create your own faceplates for user-defined function blocks.

SFC display

The sequential function chart (SFC) based on the IEC 61131-3 standard is viewed in a standardized SFC display showing the current program state of the sequential function chart.

In the SFC display, you see the actual processing status, where already finished and coming steps are marked with different colors. Disturbance states, such as non-fulfilled process criteria or time outs can be easily detected by a color change within a criteria window for steps and transitions. Furthermore, a display selection can be configured for each step and transition. The variables shown in the criteria window can be operated.



02

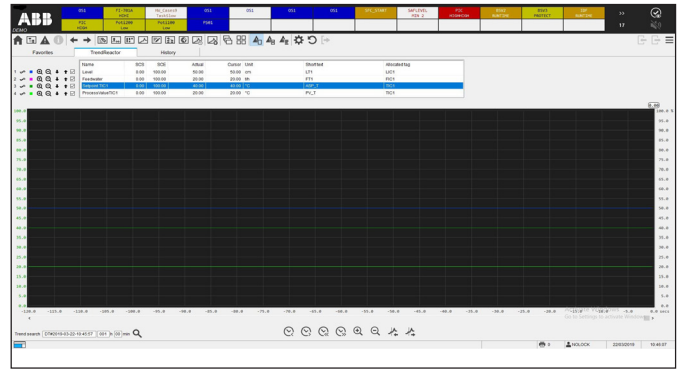
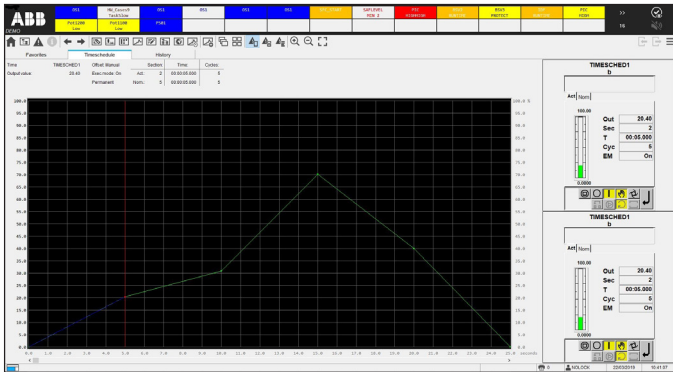
An SFC overview display allows direct access to a step or transition and the desired information can be selected immediately. This is particularly beneficial in the case of complex open-loop control structures, when rapid intervention by the operator is essential. The Control Aspect allows the animated display of the transition program, similar to the commissioning display in Freelance Engineering.

The display is generated automatically and is an alternative to the criteria window, which allows you to configure a standardized, reduced display of the criteria.

Time scheduler display

The time scheduler module makes it possible to define analog variables during a pre-defined time by default, e.g. as a set point value for a connected controller. The current set point is determined from a series of up to 32 configured values describing a set point curve. The time scheduler display is easy to operate. Apart from enabling the switching of operation modes, it also permits the modification of the current set point. Manual alterations to the set point are displayed in a separate curve.

A manual set point can be defined by offsetting the configured set point. A return (time-delayed) to the original value is possible at any time. A program can be executed cyclically or by stating a certain number of runs.



01

02

01 Time scheduler display

02 Trend display

³ CSV=comma separated value, a format in which data can easily be imported into Microsoft Excel and evaluated

Web display

The Web display provides a simple way to display web pages on the operator station, without covering the message line. For example, this allows you to observe the picture of a camera using a built-in Web server, making it easy to monitor flames or observe chimneys. However, in addition to showing Web pages, it is also possible to start other applications and display documents using this display type.

Trend display and archiving

The chronological sequence of analog and binary process variables can be displayed as a trend display.

The following can be shown in one trend display:

- Up to six signals in different colors
- The associated measuring point name with short text
- The current measured value with scale and unit used

The trend display can be altered by:

- Moving the time axis to show previous values
- Hiding trends
- Increasing and decreasing the signal range
- Selecting specific settings for each trend progression (e. g. color or interpolation)
- Highlighting individual trend curves
- Using a variable time range (seconds through to weeks)

If a trend display is configured with archiving, the measured values are recorded as a cyclical function of the operator station. The archived values can be backed up on any data medium or sent via file transfer protocol (FTP) to any subscriber on the Ethernet.

They are then available for further evaluations and can be exported in CSV³ format using the separate Archive Browser software. The original data is binary coded and therefore protected against manipulation.

User-defined trend displays

Operators can compile any process values in a trend display themselves by selecting the required process values from a list of all variable names. No additional engineering effort is necessary. The task of archiving this trend data on the hard disk of the operator station PC can also be carried out easily in the same way.

A prerequisite for user-defined trends is that the system contains a trend server.

Messages and operator hints

Process disturbances are detected by the controllers and forwarded to the operator stations with a timestamp.

The Freelance system allows the following message types: system alarm (S1-S3), process alarm (P1-P4) fault message and operator hint message (P5). Process alarm are divided into fault messages (P1-P3) and switching messages (P4). When parameterizing the function blocks, it is possible to assign up to 4 messages to its limit monitoring units integrated into the block.

Whereas the internal controller time is generally used for the timestamp for messages, you also have the option of using a special function block to assign external timestamps to alarms. In this way, for example, you can generate an alarm from a device connected to the Modbus in the correct chronological order with the device's timestamp.

Different methods of acknowledgement can be selected for each priority level. Incoming messages are displayed in different colors, along with the name and disturbed status of the tag in accordance with their priority.

Message line

The upper area of the display is always reserved as a message line for the higher-level display of all message types from the entire process.

The message line optionally displays either the newest or oldest messages, as well as buttons for acknowledging messages and viewing operator hints. There is also a field for indicating overflow, a field for acknowledging alarms and a field showing the number of unacknowledged messages in the message list. For quick operation, the faceplate of the disturbed tag can be accessed directly from the message line.

Operators can choose between three different message line views:

- Standard view
- Area view: shows in which areas alarms are present
- List view: like a short message list

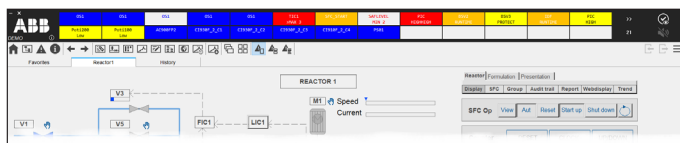
Message list

The message list offers an overview of all pending messages. It features a chronological list of fault, switch and system alarm messages. The latest message is placed at the beginning or end of the list, as configured. This message sequence can be altered by configuration.

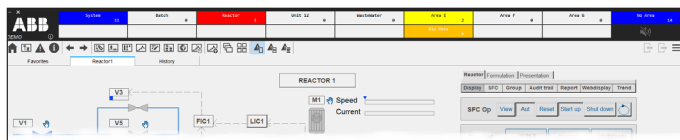
Just as in the message line, different priorities are color-coded. Messages can be acknowledged both by block and by page. To provide a better overview, the user can filter certain priorities or plant areas on the screen display.

Other displays belonging to the tag, such as faceplates, graphic or trend displays, can be selected via tag specific aspect navigation from the message list simply by a right-click.

- 01 Standard view
- 02 Area view
- 03 List view
- 04 Message list



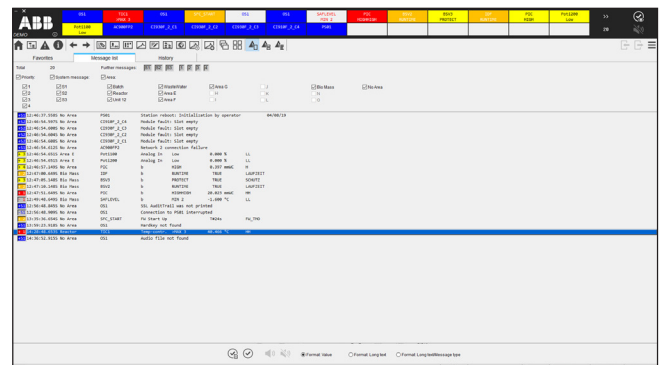
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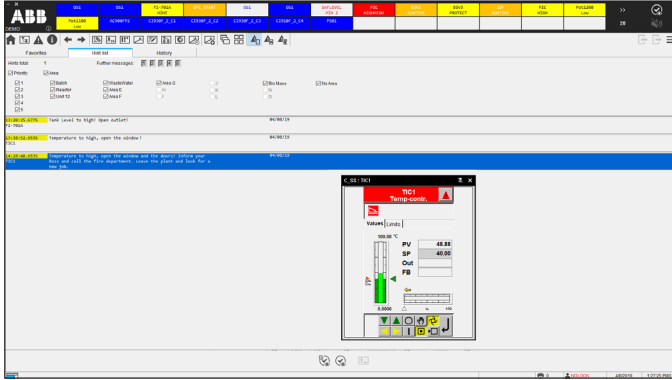
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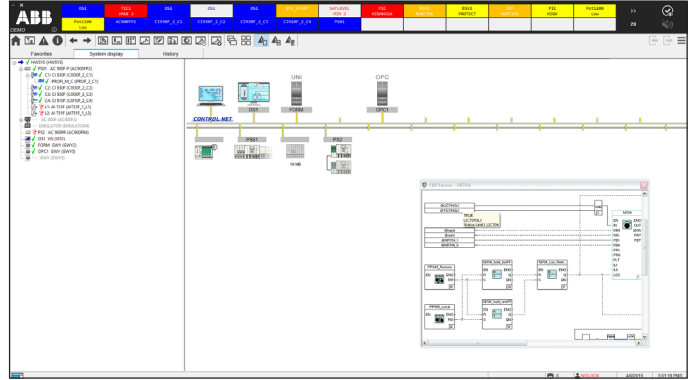
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04



01



02

- 01 Operator hint list
- 02 Easy system diagnostics with the system display

Operator hint list

A hint for the operator can be configured for each process alarm or event. Hints are intended to inform the operator about the cause of the message or about the procedure to be adopted for eliminating a process alarm. If necessary, hints can also provide further user help.

All configured hints are displayed in the hint list. Faceplates or other displays can also be called up directly from the hint list to operate a tag or analyze critical process situations.

Logging

Logs are used to document events, states and sequences from the process. Log files can be displayed on the screen, printed and saved on a CD, DVD, or memory stick for further evaluation. In addition, the archived files can be automatically sent to any subscriber on the Ethernet via the file transfer protocol. The Archive Browser software makes it possible to view the data and to convert it into ASCII (CSV file) for further evaluation, for instance using Excel.

The Freelance system features the following log types:

Signal sequence log

The signal sequence log is used for logging events such as process and system messages, switching messages and hints. Even operator intervention can be logged in detail together with the user name and timestamp. The user can determine which message priorities are to be logged.

Process messages and alarms are logged with time stamps of 1 ms resolution. "Signal sequence log 1" allows the operation of a line printer in order to immediately print every alarm when it is received.

Operation log

At certain intervals or in certain situations, the plant log records the current values or states of process variables. It can run cyclically, or can be started and stopped manually or by an event. The output format is freely configurable as table or fill-in-the-blanks text.

Disturbance course log

The disturbance course log is used to examine the course of disturbances. The process values before and after a disturbance are recorded with a high time resolution and archived in an operator station. Four logs of each type can be configured in one operator station.

System diagnostics

The current state of the hardware and software of a Freelance system is shown in the automatically generated system display. Here, information can be obtained in various degrees of detail about the status of an individual controller to a specific field device.

The simple system display is available to all operators of a Freelance operator station. Additional information is also available for field devices on PROFIBUS or FOUNDATION Fieldbus.

Add-ons

800xA Operations (operation and observation)

Freelance Operations makes it possible to operate and observe all controllers in one Freelance system. In the case of 800xA Operations, in contrast, ABB offers a very convenient means of connecting several Freelance systems to a common operator level in very large plants.

Here, the relevant faceplates are generated automatically for all tags in the connected Freelance systems. Freelance Operations and 800xA Operations are compatible, meaning that both operator levels can be used together, for instance Freelance Operations in the local control room and 800xA Operations in the head office.

Batch processing in Freelance

Freelance is also ideally suited for batch automation in accordance with ISA S88. In this case, **800xA Batch Management** software is used, which has been optimized for Freelance. Again,

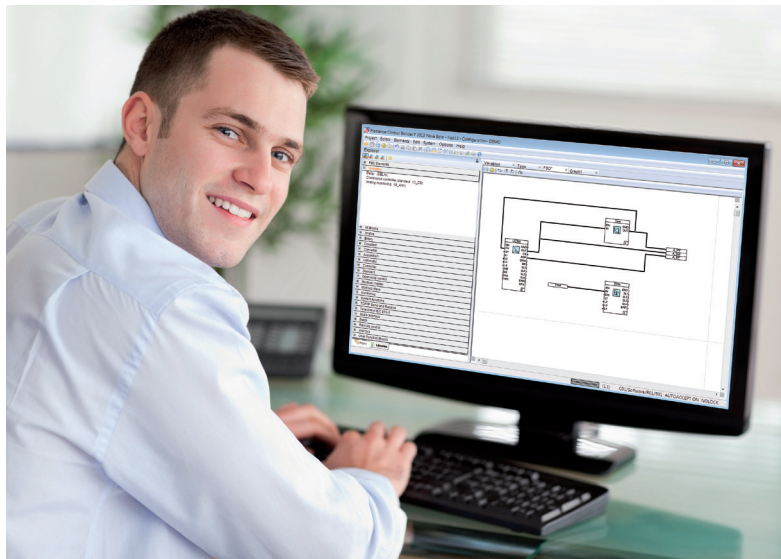
the system structure can be designed very flexibly. Standard operation can either remain on Freelance Operations, with parallel batch management workstations and appropriate servers, or operation, observation and batch management can be carried out entirely using 800xA.

Freelance Formulation is an essential recipe management component for single product or multi-grade product applications by Freelance process stations. Freelance Formulation provides recipe management the easy way.

Freelance Formulation is also a preferred solution for common sequencing applications like continuous process startup/shutdown, equipment sequencing, or cleaning skid control, where flexible definitions for repeatable execution of activity is required.



Configuration and commissioning Freelance Engineering



Freelance Engineering is the engineering tool of Freelance. It is used for configuration and commissioning of all automation functions.

Furthermore, the Freelance Operations will not only be configured with Freelance Engineering, also process graphics, which can dynamically indicate for example the status of a process, can be created.

The entire Freelance system can be configured either online, while Freelance Engineering is connected to a controller, or offline. For offline configuration, no controller is needed. The application program, which was created during offline configuration, can later on be downloaded to a controller.

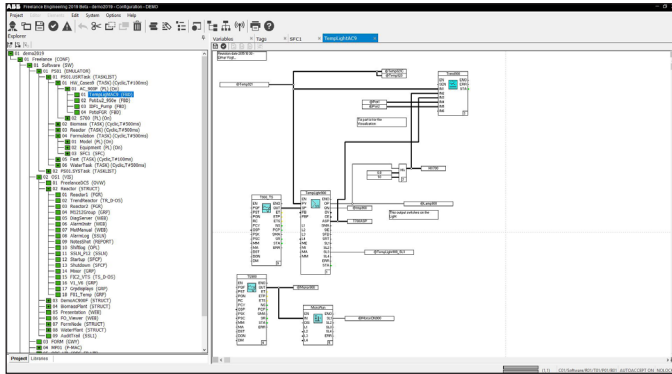
In particular, this is also true for FOUNDATION Fieldbus configurations. Freelance Engineering can be used to generate the control-in-the-field application even without any devices being available.

Freelance Engineering offers the following features for configuration, parameterization and commissioning:

- A single software tool for configuration of the automation functions, the operator interface

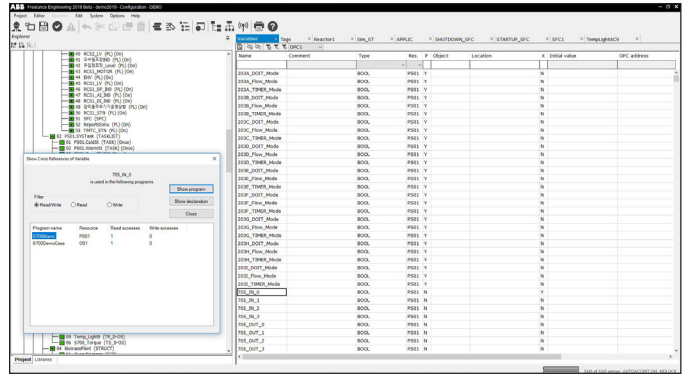
with displays and logs and fieldbus parameters: Graphical configuration with powerful editors according to IEC 61131-3 in any of the following programming languages:

- Function block diagram (FBD)
- Instruction List (IL)
- Ladder diagram (LD)
- Sequential function chart (SFC)
- Structured text (ST)
- A function block library with more than 220 tried and tested functions, greatly exceeding the basic ones outlined in IEC 61131-3
- An extensive macro library containing more than 200 graphic symbols, which can be extended by the user
- A project tree for flexible program generation and transparent program structuring
- Verification of automation functions, with the chance to find and remove errors quickly and easily
- Convenient cross-reference function allowing variables and tags to be found easily in any editor right up to the graphic display
- Importing and exporting of programs, displays, variables, tags and parts of the project tree
- Password protection to prevent unauthorized project modification
- Password protection for user-defined function blocks
- Uniform and auto-generated system-wide graphical documentation of the entire user program, system communication and all field device parameters
- Integrated online help
- Project file (application) backup on any data medium (hard disk, CD, memory stick, SD card of AC 900F and AC 700F). The project file includes the complete project with all programs, graphics, controllers and field device parameters.
- Testing and simulation of user programs (e.g. interlocks) even without connected hardware using the controller emulator
- Bulk data manager allows to import signal lists from planning tools via Excel and fast duplicating of typical solutions



01

01 Project tree with Function Block Diagram



02

02 Tag list with cross references

Project tree

The project tree is the central instrument for managing the entire user program and commissioning. All project configuration data is displayed as a tree structure. Within the project tree:

- The configuration data in a project is structured
- Task levels and cycle times are defined
- Programs are assigned to the task levels
- Programs, displays and logs can be opened for editing, copied and moved
- Programs are checked for plausibility and their processing status displayed
- Project configuration data is exported and imported
- User programs are loaded into the process and operator stations

Project data base

All configured signals, variables and tags are managed in the Freelance system as lists in a common project database:

- List of variables (inputs, outputs, internal variables)
- Tag list (function blocks)
- Graphics
- Programs

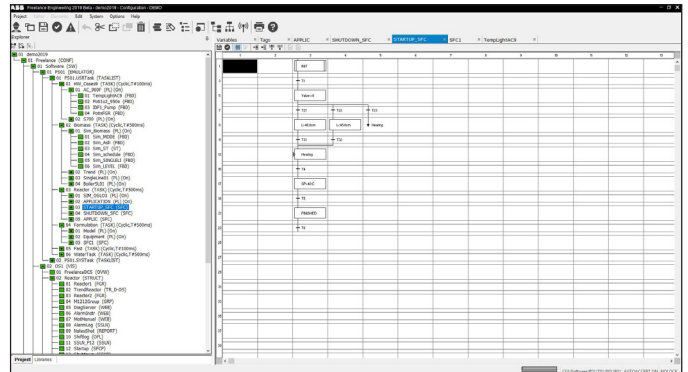
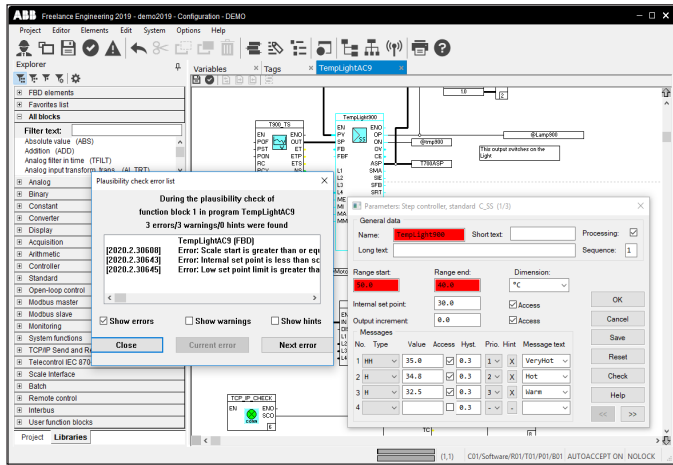
Because the database is system-wide, data only needs to be entered once, avoiding further potential errors during configuration. The single project database file makes archiving or backup ease of use.

The list of variables and tags is created automatically when a user program is generated.

Other list functions include:

- Project-wide modification of name, comments, data or module type
- Search and display based on specified search criteria
- Cross-reference function permitting rapid, system wide location of all programs and displays in which a selected variable or tag is used. This makes debugging very easy to do.

Configuration of automation functions



01

01 Program with parameterization screen and plausibility check

02 SFC program

Configuration of function block diagrams

The function block diagram (FBD) is a graphical programming language. It keeps one or several function blocks. The inputs and outputs of the function blocks can be connected to create the signal flow. Freelance Engineering checks if the terminals of two function blocks can be connected.

Inputs are always displayed on the left and outputs always on the right of a function block. With variables, values can be referred from one diagram to another one. Two different access types to variables are available: read and write access. While write variables are written by a single function block, read variables can be used by several blocks.

The layout of the terminals and the color of signal flow lines provide information about the data type. All parameters of the function blocks are defined in the function block diagram. Clearly structured and easy to understand parameter dialogs, in which all block-specific entries can be made, are available. Once completed, the function block diagram can be verified using a plausibility check for errors or syntactic accuracy.

Any errors or warnings are displayed in a list and it is possible to navigate directly to the source of the error by simply clicking on the relevant line in that list. The cross references in a program can be displayed for the whole system. The corresponding displays or programs can be called up directly in order to gain easy access to the variables referred to.

A function block diagram (FBD program) is configured as follows:

- Define name for FBD program
- Open editor for FBD program
- Select function blocks – Position in the graphic area
- Connect functions with the signal flow lines
 - Enter input and output variables
- Define parameters for the functions
- Check FBD program for plausibility
- Correct any syntax errors

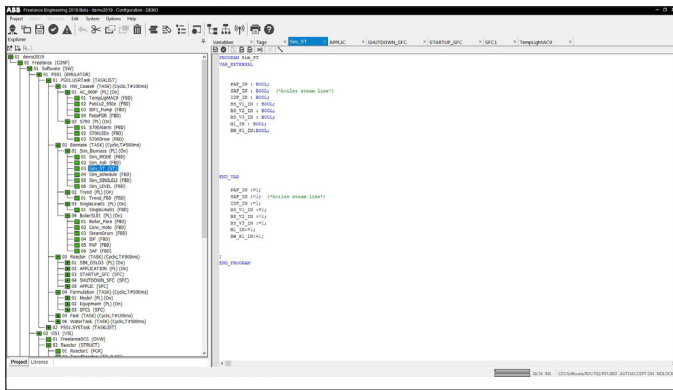
Workflow with Bulk data manager

Tag lists or I/O lists from customers can easily be imported into the system using the Bulk Data Manager in Freelance. Typical combinations of function blocks can easily be instantiated or parameters can be adapted in an Excel-sheet. This feature is useful in the planning phase or basic engineering especially for bigger projects.

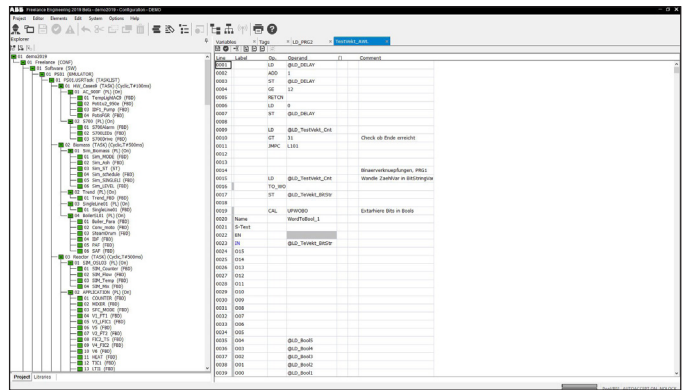
Configuration of sequential function charts

The sequential function chart (SFC) readily allows transparent, graphical creation of sequential control programs. To create an SFC program, steps are configured with assigned actions (commands) and transitions with step-enabling conditions. Programs (function block diagram, ladder diagram, structured text, or instruction list) can be assigned to the steps and transitions.

A further feature of the sequential function chart is the facility for creating alternative and parallel branches as well as the synchronization of these sequential structures. At the same time as the sequential function chart is configured, the SFC display for operation and observation on the operator station is generated automatically.



01



02

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- 01 Structured text
-
- 02 IL program

Configuration of structured text

Structured text is one of the text-oriented programming languages of IEC 61131-3, in which program processing is determined by instructions. All functions and function blocks can also be used in ST programs. The scope of the functions is partly covered by the ST operands. Function blocks can be used in the ST program following declaration.

Parameter definition of the function blocks also takes place in the same way as in the ladder diagram or function block diagram. In contrast to that of the function block diagram (FBD), the scope of functions of the structured text also includes conditional commands and loop commands, which are called using appropriate key words.

The processing sequence is determined from the order of the commands in the ST editor. The only way to specifically change the order is to insert loop commands.

Configuration of instruction lists

All Freelance processing functions can be defined by the instruction list (IL). The scope of the instruction list exceeds that of the function block diagram and sequential flow chart, as jump commands and program loops can also be programmed.

The operands can be displayed and entered with a selection list according to IEC 61131-3. Parameter definition of the function blocks also uses the same parameter definition screens as those used in the function block diagram.

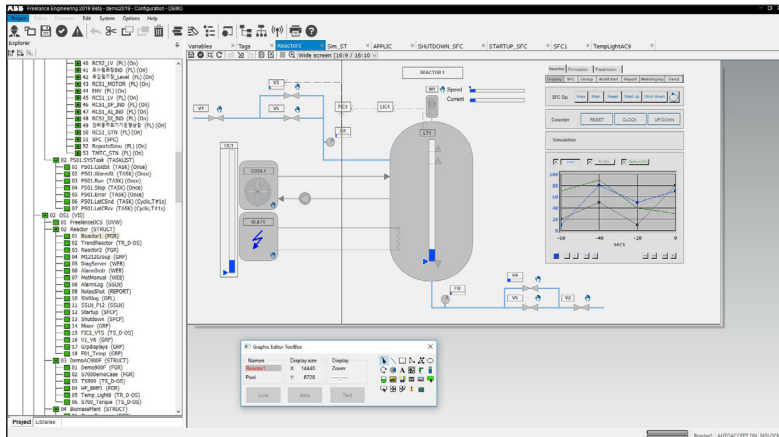
Configuration of ladder diagrams

Along with the function block diagram (FBD) and sequential function chart (SFC), the ladder diagram (LD) is also one of the graphical languages of the IEC 61131-3.

The ladder diagram language originates from the area of electromagnetic relay systems and describes the flow of current through individual rungs. The boundaries of a rung are defined on the right and left side by devices known as power rails, which have the logical state 1 (current is flowing). A rung is created with the elements of the ladder diagram (links, contacts and coils).

Functions and function blocks in the ladder diagram can be called up and used in the same way as in the function block diagram. Parameters are also defined for function blocks using the same parameter screens.

Configuration of operation and observation functions



Graphics editor

The following functions can be configured for operation and display:

- Custom graphic displays
- Web displays
- Standard display types: overview display, group display, trend display, time scheduler display
- SFC display
- Signal sequence, disturbance course and plant log
- Message list and message line
- Operator hint list

Since the common system database is automatically accessed while configuring these functions, there is no need to re-enter the data.

Standardized displays (pre-engineered)

Standard displays can be configured very easily using Freelance Engineering. To configure a group display, for example, it is only necessary to select the tags via the selection list. The entry is made automatically. In this manner, up to 10 large analog faceplate tags can be entered per group display.

The configuration procedure for the overview display is equally simple, as the containing displays are entered from a selection list.

Freely configurable graphic displays

Plant-specific graphic displays can be constructed for displaying the process. The graphic displays contain static and dynamic display elements.

The static part of the plant display – the background display – is composed of separate graphic elements which can be modified in color, line type and filling pattern and can, for example, display the schematic plant layout.

The following constructional aids in the system make it easier to create displays:

- Static elements such as lines, polylines, rectangles, polygons, ellipses, arcs and texts are created, for example, by specifying the start and end points.
- Display sections already created can be duplicated, moved, rotated in 90° steps, transposed or superimposed.
- The combination of several graphic elements can be saved as a macro and stored in libraries to be used when desired.
- The zoom function facilitates precise construction of the individual graphic display elements.
- Import of bitmap files facilitates the generation of static background displays.

The process variables are displayed in the dynamic section of the display – the foreground display. Specific process variables can be visualized simply by making the display elements dynamic. The following types of dynamic elements can be used:

- Bar graphs and dynamic filling set to operate in different directions
- Superimposed numerical values and text variables
- Trend window
- Color change or symbol change to depict states
- Continuous or discrete position modifications of the graphic symbol
- Keys (buttons) for the direct execution of actions (e.g. write value or similar)
- Animated objects, e.g. mixers that turn realistically
- Tool tips

Selection fields can be defined at any position so that the operator can access any other displays using the mouse or keyboard.

Hardware structure

The required hardware structure can be configured in a graphical system overview and the system communication can also be defined there. It is possible to assign particular Freelance operator stations to specific controllers.

Furthermore, detailed information can be obtained on the operator and controllers, together with their modules and the controllers with their connected fieldbus lines. In the station overview display, the operator and controllers can be equipped using selection lists. Specifications for processing, display and I/O channel assignment can be made for the individual modules of the controllers. And all this with just a few clicks.

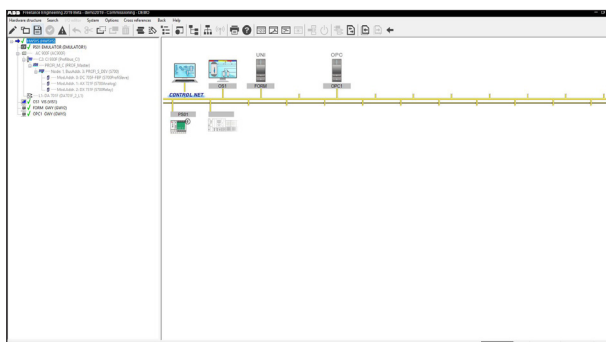
Fieldbus and field device configuration

The respective bus parameters, for instance the baud rate, number of subscribers and time constants, can be set for each fieldbus module. Freelance Engineering also suggests a setting for the bus parameters in line with how the fieldbus is equipped. This makes work easier for those new to the subject.

PROFIBUS

In the configuration view of the fieldbus line, new PROFIBUS slaves can be integrated into the fieldbus line using a GSD-file or FDT/DTM technology. Using the template concept, it is also possible to integrate completely pre-configurable PROFIBUS slaves by means of drag and drop. The intelligent DP/PA Linking Device is transparent with regard to configuration, allowing PA devices to be viewed as if they were connected to the PROFIBUS DP. Parameter definition screens are then available in the device display for defining parameters for both remote I/O and PA field devices.

- 01 Definition of the hardware structure
- 02 Configuration of the fieldbus line (PROFIBUS)
- 03 Configuration of the fieldbus line (FF)



01

HART

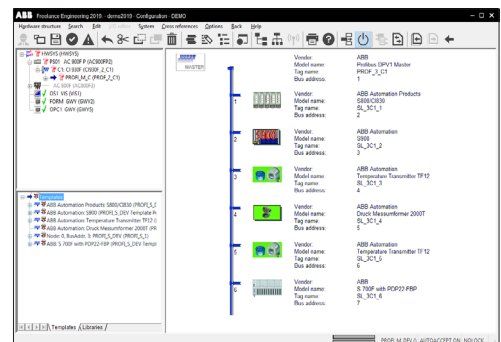
HART devices connected to the S800 or S900 Remote I/O can be configured with the aid of HART DTMs. For S900, also HART templates can be used. They consist of preconfigured DPV1 services which tunnel a HART command via the PROFIBUS to the HART device on the analog channel of a particular S900 I/O module. Users can also create HART templates themselves.

FOUNDATION Fieldbus

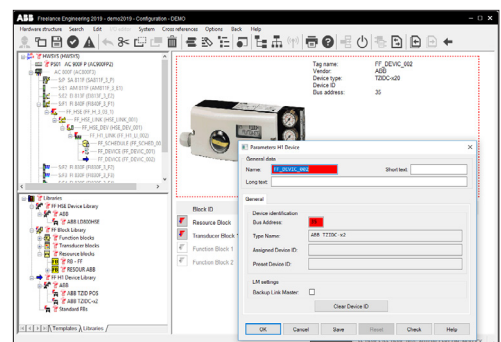
The devices are configured in the feedforward part by linking the Device Description (DD) files. This makes it possible to configure the FF without the field devices being physically connected to the controllers.

The devices are configured on the H1 links of the LD 800HSE Linking Device or LD 810HSE Linking Device. As Freelance Engineering supports control in the field for FF devices, it is possible to configure function charts that interconnect the function blocks in the individual FF devices.

In new installations use only the new LD 810HSE EX modules together. Redundancy cable for LD 810HSE Ex can be customer made.



02



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Freelance Engineering then automatically generates a process that is passed on to the Link Active Scheduler (LAS). Redundant Link Active Schedulers are also supported. However, it is also possible to use the FF devices “only” as I/O suppliers, and use the function blocks in the controllers.

Graphical documentation

The fully graphical forward documentation allows configured programs and displays to be printed. The documentation is always up-to-date, as the current configuration data is accessed. Various sorting criteria, such as drawing numbers, assure an orderly and transparent output of the data to be documented.

The scope of documentation can be specified as desired by the user, such as:

- Program and display contents, cross references, parameter definition data and comments
- System overview and hardware configuration

The documentation specification can be stored for future use. The FBD, IL, LD, SFC and ST programs, displays, etc. are documented in the form in which they appear on the screen. Using Freelance documentation management, complete or partial project documentation can be produced without effort. It is also possible to include bitmaps (such as customer logos) in the drawing footer.

Displaying process states

The editors for displaying the configured programs can also be accessed during commissioning. As opposed to during configuration, the process

states of the I/O variables are also displayed in the program. The status of the binary process signals is displayed in the FBD display by a change in the graphical representation of the signal flow lines.

Value and trend windows are available for displaying process values. They offer an optimal overview of the current process values for commissioning and test purposes. Here, the user is not restricted to the display of I/O variables for the program currently shown on the screen. Variables from other programs and/or controllers can also be displayed, as well as values from connections between various function blocks of the current program.

Modifying parameters

Parameters can also be modified during the commissioning phase, allowing optimal program settings for the process. These parameters can be altered from either the engineering station or the operator station. Whether the changes made are retained permanently or only temporarily is decided by the commissioner.

Through a parameter upload, it is possible to view all parameter modifications made in a particular period of time and to select those which are to be saved in order to be used at the next cold start.

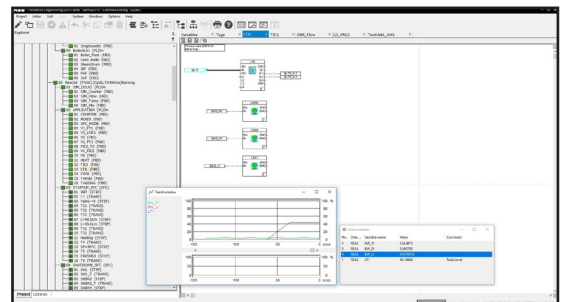
Other features allow you to force inputs and outputs and to specify new values for simulation purposes.

Commissioning

Trend and value window during commissioning

During commissioning, the user programs are loaded into the operator and controllers. It is also possible to:

- Load modifications
- Start and stop controllers
- Start, stop or reset tasks
- Define and activate parameters for function blocks
- Define and activate parameters for field devices
- Display, set and track process values
- Combine any process values at any time in a trend window
- Perform version and status checks
- Perform system diagnoses right up to the field device



Commissioning the fieldbus lines

PROFIBUS

The fieldbus line overview shows whether the configured PROFIBUS I/O and PA devices are available. In addition, the bus can be scanned using Freelance Engineering in order to detect new or incorrectly configured devices. Such devices can then be given the correct address from Freelance Engineering via the PROFIBUS.

During commissioning, Freelance allows you to compare configured parameters with the parameters that exist in the device. This makes it possible to detect device parameters that have been changed locally and transfer them to the configuration by means of uploading. When the PROFIBUS device transmits diagnoses, they can be displayed by Freelance Engineering.

When FDT/DTM technology is used, specific diagnostic options can be used, provided that the device manufacturer has incorporated such options in the DTM.

Individual PROFIBUS devices can be removed from cyclical data traffic in order to perform maintenance without it being necessary to stop the fieldbus.

FOUNDATION Fieldbus

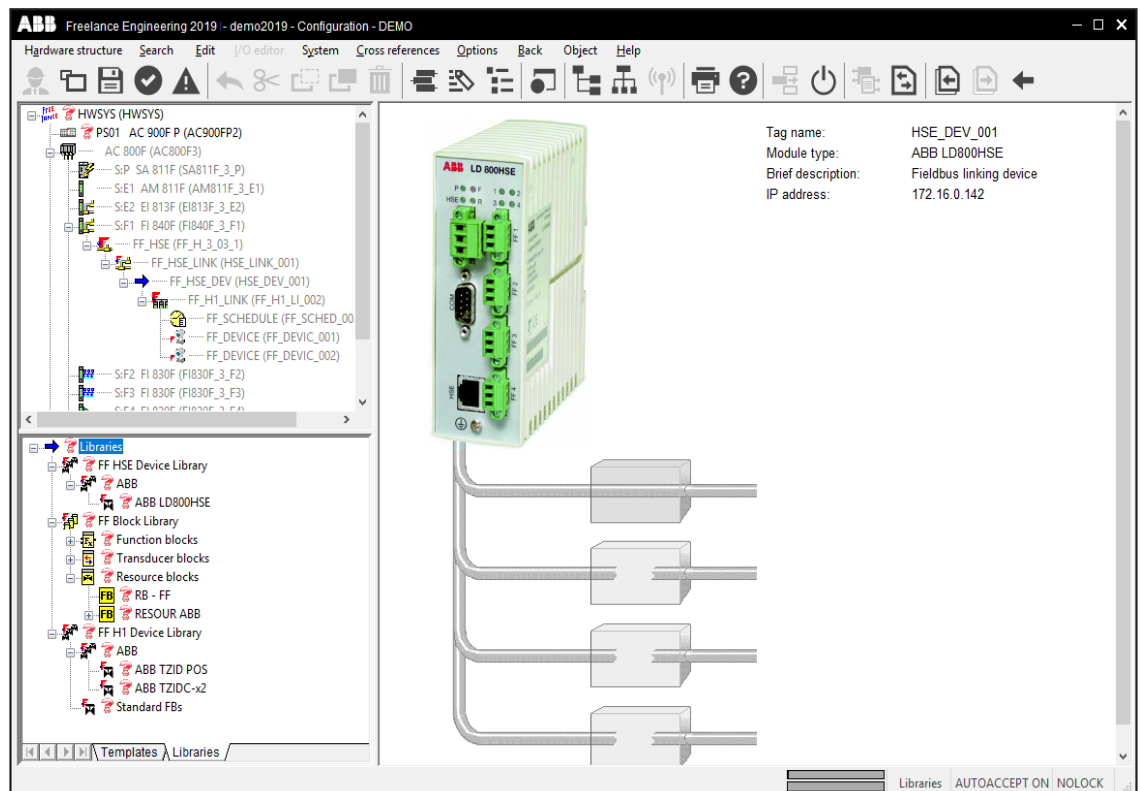
Live lists displaying which devices exist are available for HSE and H1.

During commissioning, Freelance allows you to compare configured parameters for the device modules with the parameters that exist in the device. This makes it possible to detect device parameters that have been changed locally and transfer them to the configuration by means of uploading.

The Link Active Scheduler (LAS) can be stopped in order to interrupt processing of the control loops in a control loops in an H1 link.

In new installations use only the new LD 810HSE EX modules together. Redundancy cable for LD 810HSE Ex can be customer made.

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Online diagnosis of fieldbus components



Engineering and services



ABB is one of the world's largest suppliers of equipment, systems and services for measurement and process automation.

A crucial factor in maintaining this market position is the quality of our products, from manufacture right through to services. The DQS Certificate based on DIN ISO 9001 awarded to ABB as far back as 1990 bears testimony to this fact. The same applies for the EQNet Certificate based on ISO 9000/EN 29000.

However, Freelance includes more than just outstanding technical features. We have also paid a great deal of attention to rational planning, installation and modification processes, allowing you to perform engineering and maintenance activities quickly and cost-effectively. Or, if you prefer, our highly-qualified specialists can perform these activities for you, including:

- Planning and engineering
- Installation planning and execution
- Plant documentation
- Commissioning
- Technical training
- After-sales service
- Upgrades and performance improvements

Our instrumentation and control specialists, or our certified partners in system integration, will be happy to assist you in planning and implementing your automation project. ABB Automation's staff

can also work with you to plan and implement the installation of a Freelance system in your plant.

Under this arrangement, the ABB Automation Engineering Department will compile the specific project documentation for you. This can include functional diagrams, circuit diagrams, configuration documentation, and operating documentation including system descriptions and instructions for operation, modes of operation and plant maintenance.

At many sites, ABB Automation has its own commissioning engineers who work together with planning engineers, process instructors and operators to commission your plant, optimize it, perform a test run and hand over the system to the operator.

To make sure your operators are fully knowledgeable in the operation of the Freelance compact control system, we offer a range of technical training courses.

In addition, we offer a computer-based training program for Freelance on a multimedia DVD. This will provide you with the basic knowledge you need for configuration, therefore allowing you to start using the system very quickly and efficiently.

A comprehensive customer service is worth its weight in gold

Service means a profitable investment in continually maximizing and optimizing the availability, performance, quality and security of a plant. ABB's support covers the following areas:

- Customer Support Services
- Training
- Spare Parts & Logistics, Repair Shops
- Process, Application & Consulting Services
- Service agreements
- Extensions, upgrades and retrofits
- Advanced Services
- Software maintenance and upgrades

Through the resulting specialization of our employees, we guarantee maximum competence for each task we perform. Whether it's more traditional service support such as commissioning and maintenance or individual consulting services – the result is measurable customer benefits.

Our comprehensive Life Cycle Services enable us to increase the value of your plant over its entire lifetime. The conventional, reactive service can reduce production downtimes, while the use of new technologies offers an increased number of capabilities for preventive service measures to identify and avoid cost-intensive faults at an early stage.

Proactive services such as asset management or ongoing modernization increase the value of our customers' plants and give them a distinct competitive edge.

Life cycle management

Control system life cycle management and investment protection have always been cornerstones of ABB's development programs. Over the last 30 years, ABB has built a large installed base across diverse industries. ABB looks after its installed base by crafting solutions that ensure the continued productivity, reliability and capability of all installed ABB assets.

With this 30 year track record, ABB has established a history of 'Evolution through enhancement' developing new products in a way that allows for incremental adoption, minimum risk to operations and maximum investment protection. In support of this mission is Automation Sentinel, ABB's control system life cycle management and support program.

With this program, customers can keep control software up-to-date and maintain a flexible path forward to new system software technology. Automation Sentinel provides the fundamental software support deliverables required to maintain operation and maximize the availability of the installed ABB control system.

Automation Sentinel assists system owners in actively managing their ABB control system software life cycle costs.

It provides:

- Optimal operation and availability of installed ABB assets through 24/7 support and maintenance services
- Better productivity through enhanced software functionality
- Lower support cost and more predictable soft-

ware management budgeting as a result of annual subscription fee

- Access to the most current system documentation
- Evolution to more advanced human system interface, control platform, information management and connectivity
- A way to stay current with the latest technology standards

The Automation Sentinel Program provides solutions for the main challenges system owner face to achieve maximum availability and reliability of the control system:

- Software maintenance and upgrades
- Cyber and IT security
- Online access to relevant information
- Control system software and performance checks

It also provides an evolution path to newer technology system enhancements to improve plant effectiveness and long-term support through annual maintenance subscription budgeting.

Benefits

- **Maintain operation and avoid loss of production:** Higher productivity through enhanced software functionality
- **Continuous optimization of your process operations:** Improves system availability, performance and reliability with predictable costs
- **Reduces overall maintenance costs:** Yearly subscription provides predictability for plant budgeting
- **Complete flexibility:** Improve your control system over time. Always the best, lowest risk path forward
- **Protection of intellectual property:** Your operator graphics and control programs are protected when new technology is implemented

For more information please refer to the Automation Sentinel brochure 3BDD015294.

abb.com/freelance
abb.com/controlsystems

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