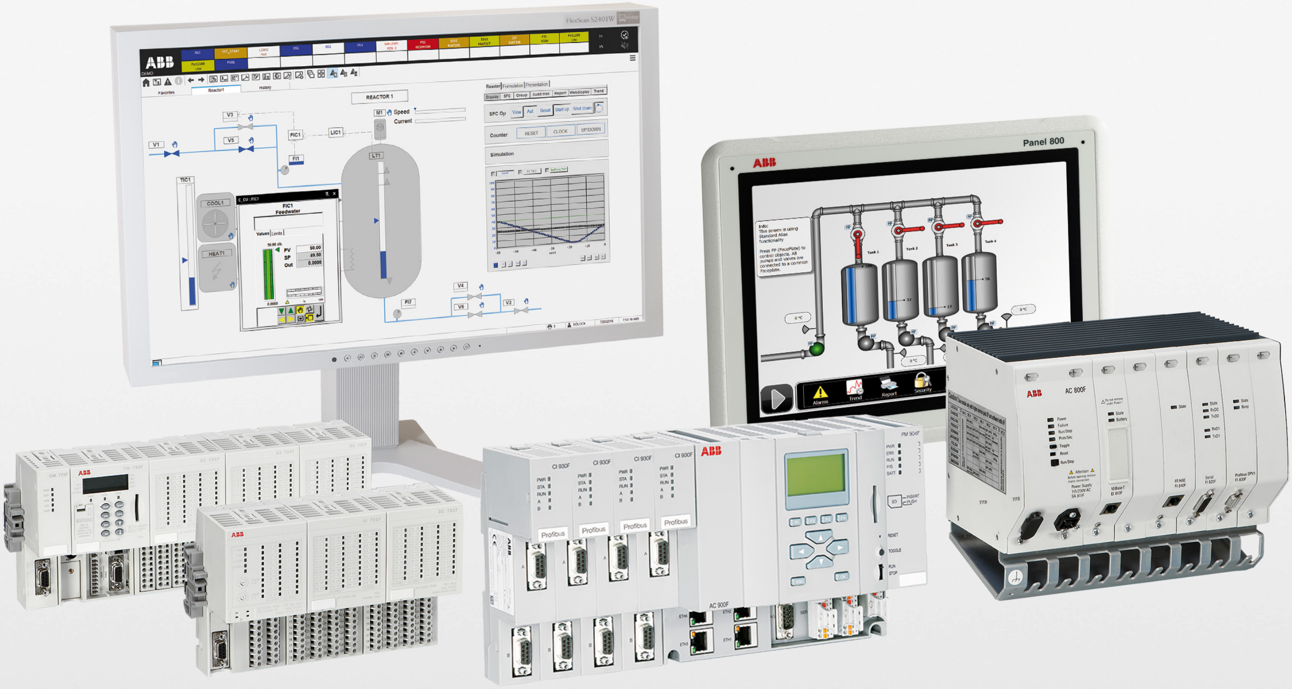
FREELANCE 2019

Freelance DCS
Product Catalog

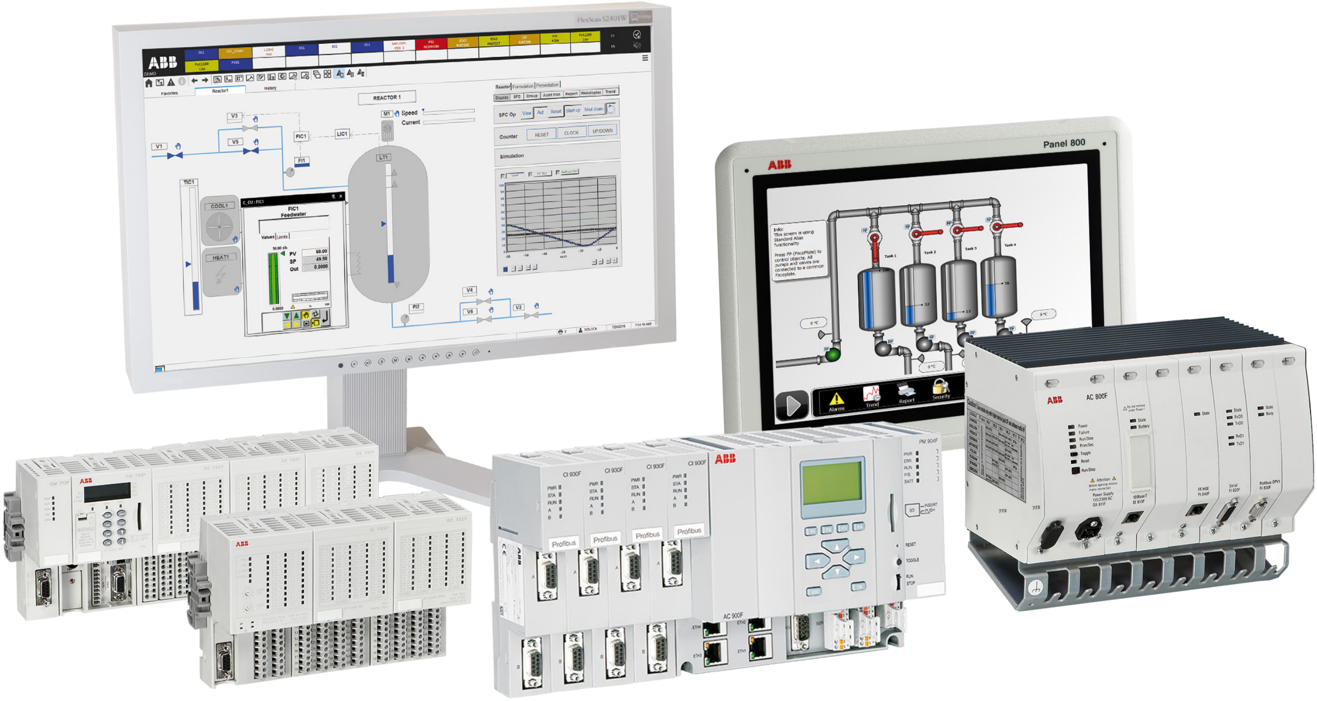


Freelance takes the next step into the future. The Freelance 2019 version provides significant improvements in all areas: scalability, usability, connectivity, compatibility and security.

Table of contents

004 – 005	Introduction	01
006 – 009	System architecture	02
010 – 062	The AC 900F, AC 800F, AC 700F controllers	03
063	Power Supplies for AC 900F, AC 700F and S700 I/O	04
064 – 122	I/Os: S700, S800, S900	05
123 – 126	Fieldbus network components and PROFIBUS configuration for S700	06
127 – 136	Freelance Operations	07
137 – 151	Freelance Engineering	08
152 – 153	Freelance 2019 Media and documentation	09
154 – 157	Add-ons, extensions, and service	10
158 – 159	References	11
160 – 163	Index	12

Chapter 1 – Introduction



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 very easy to install, learn, engineer, commission, back-up, maintain and expand.
- **Scalable:** Projects can start as small as a few I/Os for skids, package units or single plant equipment 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.
- **Compatibility:** Freelance 2019 runs on Windows 10 and Windows 7.

Freelance version 2019

Thousands of installations and still more benefits? Sure. With the latest AC 900F controller, the Freelance DCS provides significant improvements in all areas: availability, scalability, usability, connectivity.

Benefits at a glance:

- Enhanced scalability: The 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.

Easy to use

Freelance can be installed on any standard computer and in just a few minutes. A Quickstart Tutorial is available, which allows users to learn at their own pace with detailed instructional videos. It takes less than a week to learn since there is just one engineering tool. Pre-engineered, ready-to-use displays make engineering much easier compared to other control systems or PLC/SCADA combinations. Additionally, a system-wide project database makes archiving or backup very easy to perform. There is also multiple language support.

The Freelance control system combines user-friendly engineering with an open, modern system architecture. This means:

- Only one tool for engineering, commissioning and diagnostics
- Fieldbus management completely integrated into control system engineering
- Time and cost savings in engineering, commissioning, testing, service and maintenance
- Assembly close to the field: reduction of field wiring and space requirements
- Freelance has a convenient cross-reference feature allowing variables and tags to be found easily in any editor right up to the graphic display. This makes troubleshooting and debugging easier, resulting in faster project execution.

Pre-configured components for the operator level. The engineering of the Freelance operator level is straightforward. The pre-configured visualization components include:

- Faceplates
- Module diagnostics
- Extended troubleshooting capabilities
- Automatically generated SFC displays
- Automatically generated system communication
- Event list, alarm line and message log files
- Trend displays with long-term archiving
- These components can be used straight out of the box, eliminating time-consuming manual configuration.

Reliable

Freelance is a well-proven technology that has been around for more than 20 years and is installed in thousands of installations globally since its origination in Germany.

High availability

The technology has proven its worth in industrial use over several years and meets the toughest requirements regarding availability. The hardware can be structured redundantly at all levels. This includes the redundant fieldbus modules, redundant fieldbus lines as well as network and controller redundancy.

Regulatory compliance

With a view to meeting the requirements of regulatory authorities such as the American FDA (Food and Drug Administration) or the EFSA (European Food Safety Authority), Freelance provides a series of features that facilitate the validation procedure. Examples include:

- Encrypted log and trend data
- Audit trail functions
- Access rights and user administration

Scalable

Freelance can be easily scaled up from a small system of a few I/Os to a large system of up to thousands of I/Os. Expansion can be done with minimal engineering effort. All controller types can be used in combination in a single system. They are suitable both for installation in the control room and for use in junction boxes directly in the field.

- The AC 700F controller has a small footprint that supports PROFIBUS. It can support up to eight direct I/O modules.
- The AC 800F controller can be equipped with up to four fieldbus modules of type serial, PROFIBUS, FF HSE or Freelance CAN bus. Optionally, AC 800F supports redundancy.

The new PM904F controller consists of:

- 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, line redundancy
  - CAN bus modules for Freelance Rack I/O
- Direct connection to S700 I/O modules. 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 small footprint.

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.

Value for your money

The easy-to-use features and use of only one tool for configuration of graphics, controllers and field devices allows engineering and commissioning time to be reduced, resulting in faster start-ups.

Freelance has a small footprint (comparable to a PLC), which means less space requirement for cabinets. Since the system uses intelligent peer-to-peer architecture, there is no need for expensive server PCs. Can be installed in few minutes.

Chapter 2 – System architecture

007 **2.1 Operator level**

007 **2.2 Engineering tool**

007 **2.3 Process level**

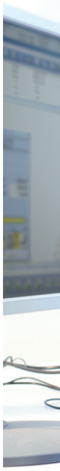
008 – 009 **2.4 System communication**

008 2.4.1 Control network

009 2.4.2 OPC

009 2.4.3 Advanced application programming DMS-API

009 2.4.4 Technical details of the control network



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.

2.1 Operator level

The Freelance Operations station is a software that runs on a simple PC-environment under Microsoft Windows. It installs in five minutes. Freelance Operations supports dual-monitor operation, which offers the benefit to stay continuously tuned with essential information like the alarm list, while inspecting at the same time for example the progress of a sequential function chart, trend archives, or the system display with extended diagnostics. In a plant, several Freelance Operator Workplaces can work seamlessly together.

The extended automation functionality of ABB’s System 800xA can be utilized for Freelance as well by utilizing the “800xA for Freelance” connectivity package. This way you can concentrate several Freelance systems under one common operator console in parallel to the existing operator stations.

2.2 Engineering tool

The Freelance engineering station is used to configure and commission the whole system including the controllers, field devices and Freelance Operations. Usually, portable equipment such as laptops, which allow configuration both in the office and on site, is used. The operator level PCs can also be used for system engineering. A permanent connection to the engineering station is not necessary.

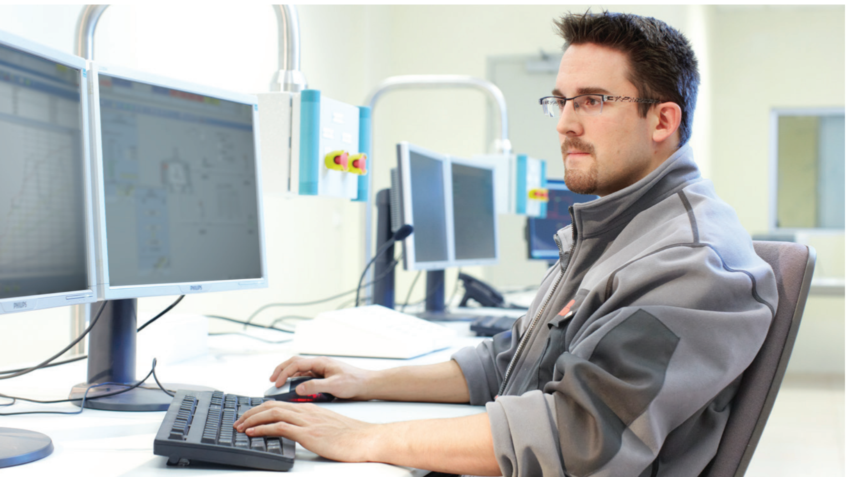
2.3 Process level

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 (see "Freelance System Architecture" on page 8), 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 Plus 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.

Integration of 3rd party PLCs like Safety PLCs or package units can easily be achieved by using the 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.



2.4 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.

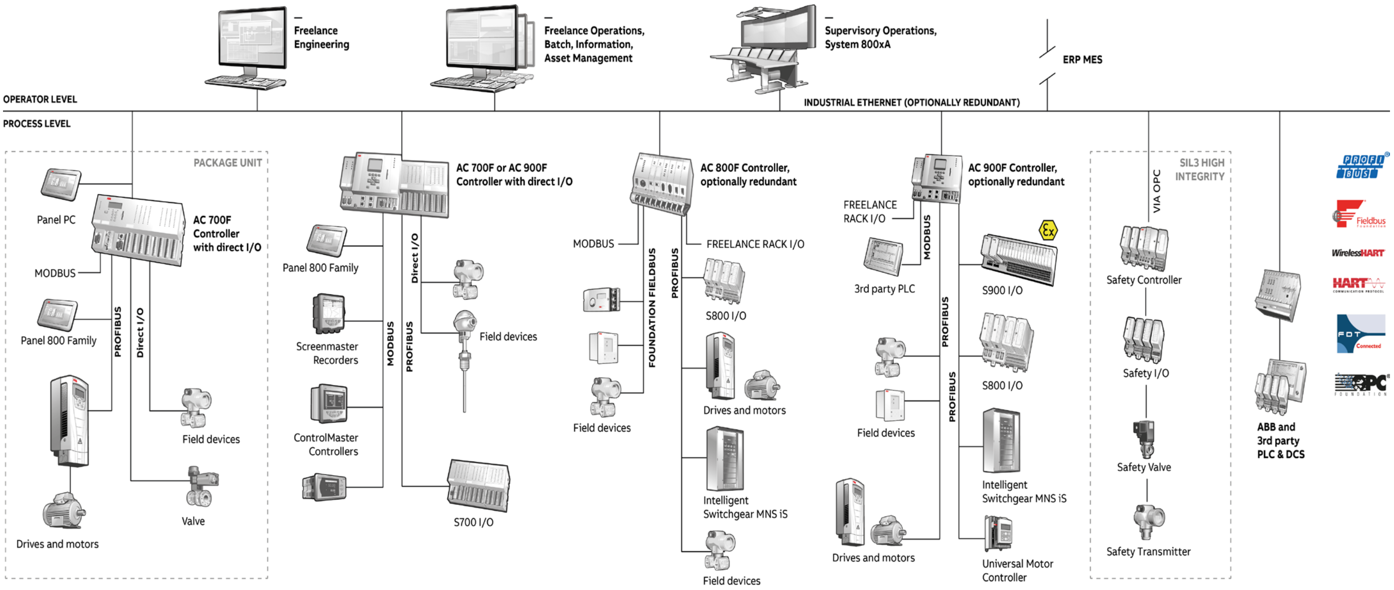
Note: a Freelance operator station or the Freelance OPC-server can “talk” to more than 10 controllers. So, if the number of controllers exceed 10, there is no further action required.

2.4.1 Control network

The control network connects 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
- Control Network redundancy


Freelance Engineering
Freelance Operations, Batch, Information, Asset Management
Supervisory Operations, System 800xA
ERP MES
OPERATOR LEVEL
PROCESS LEVEL
INDUSTRIAL ETHERNET (OPTIONALLY REDUNDANT)
PACKAGE UNIT
Panel PC
AC 700F Controller with direct I/O
MODBUS
Panel 800 Family
PROFIBUS
Direct I/O
Field devices
Valve
Drives and motors
AC 700F or AC 900F Controller with direct I/O
Panel 800 Family
Screenmaster Recorders
ControlMaster Controllers
MODBUS
PROFIBUS
Direct I/O
Field devices
S700 I/O
AC 800F Controller, optionally redundant
MODBUS
FOUNDATION FIELDBUS
PROFIBUS
FREELANCE RACK I/O
S800 I/O
Field devices
Drives and motors
Intelligent Switchgear MNS iS
Field devices
AC 900F Controller, optionally redundant
FREELANCE RACK I/O
MODBUS
3rd party PLC
PROFIBUS
PROFIBUS
Field devices
Drives and motors
S900 I/O
S800 I/O
Intelligent Switchgear MNS iS
Universal Motor Controller
SIL3 HIGH INTEGRITY
VIA OPC
Safety Controller
Safety I/O
Safety Valve
Safety Transmitter
ABB and 3rd party PLC & DCS
PROFIBUS
Fieldbus Foundation
WirelessHART
HART
FDT Connected
OPC Foundation

—
Freelance system Architecture

2.4.2 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. Since Version 9.2, when using Freelance Operations 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. The Freelance Engineering software supports this with the redundant OPC gateway configuration.

The trend server option provides a special OPC gateway that is used by the 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.

2.4.3 Advanced application programming 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.

2.4.4 Technical details of the control network

Details of the control network		
Bus type:	Twisted Pair (TP)	Fiber optic (FL)
Max. length:	5 x 100 m 5 x 400 m for shielded TP	4500 m
Application:	Control network connection of Freelance operator stations (for operation and observation), engineering station and controllers	
Standard:	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE-FL	DIN/ISO 8802 Part 3 10BASE-FL (IEEE 802.3)
Transmission rate:	10/100 MBit/s	10/100 MBit/s

Chapter 3 – Controllers

012 **3.1 Overview**

013 **3.2 Functions**

014–028 **3.3 The controller AC 900F**

014 3.3.1 Hardware and certificates

017 3.3.2 AC 900F redundancy concept

019 3.3.3 Central processing unit PM 904F and PM 902F

022 3.3.4 Central processing unit PM 901F, lite

024 3.3.5 PROFIBUS Communication Interfaces

026 3.3.6 CAN Communication Interface

029 3.3.7 Accessories

031–055 **3.4 The controller AC 800F**

032 3.4.1 Hardware and certificates

036 3.4.2 AC 800F redundancy concept

038 3.4.3 AC 800F, pre-assembled stations

038 3.4.4 AC 800F, base unit PM 803F

040 3.4.5 Power supply

044 3.4.6 Ethernet interface

046 3.4.7 Fieldbus interface modules

052 3.4.8 Coated and G3 compliant hardware

053 3.4.9 Accessories

056 – 062 3.5 The controller AC 700F

056 3.5.1 Hardware and certificates

058 3.5.2 Central processing unit PM 783F

060 3.5.3 PROFIBUS module CI 773F

060 3.5.4 CPU terminal base TB 711F

062 3.5.5 Accessories for CPU module

3.1 Overview

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.

AC 900F

AC 800F

AC 700F

AC 900F

- Typically around 1,500 I/Os supported with CPU PM 902F / PM 904F
- Up to 400 I/Os supported with CPU PM 901F (Lite)
- G3 compliant as standard
- Redundancy option for high availability
- AC 900F Plus (PM 904F) / AC 900F Standard (PM 902F): Four (4) built-in Ethernet ports supporting Modbus TCP or 60870-5-104 Telecontrol protocol
- AC 900F Lite (PM 901F): Three (3) built-in Ethernet ports supporting Modbus TCP or 60870-5-104 Telecontrol protocol
- Two (2) serial ports supporting Modbus RTU or IEC 60870-5-101 Telecontrol protocol
- Optional PROFIBUS master modules (PM901/ PM902 up to two, PM904F up to four) providing integrated line redundancy
- Optional one CAN Bus communication interface for connection of Freelance Rack I/O
- Direct connection of I/O modules, including modules combining inputs and outputs in just one module can reduce footprint and costs.
- I/O modules can also be connected remotely via PROFIBUS
- SD card support

AC 800F

- The outstanding feature is it can be equipped with a set of fieldbus modules, covering all major fieldbuses used in process automation.
- Option to run controllers either redundantly (CPU redundancy, fieldbus module redundancy) or non-redundantly.
- Fieldbus-compliant components such as remote I/O, field devices, and network components can be used.
- Optional G3-compliant
- A single controller can typically support around 1,000 I/Os

AC 700F

- Typically supports around 300 I/O signals per AC 700F controller.
- This PLC-like controller comes with a very small footprint. As many as eight (8) S700 direct I/O modules can be plugged to the right of the controller module.
- The connection to the Freelance control network is via Ethernet as for all other controllers. As an alternative to remote I/Os, AC 700F can be placed directly in the field, offering a very flexible and cost-effective solution for an “intelligent” I/O station.
- I/O modules can also be connected remotely via PROFIBUS. This allows for high flexibility in installation.
- SD card support

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. All function blocks and pre-engineered functions are available for all controllers in the same way.

3.2 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. Furthermore user-specific function blocks can be added for dedicated tasks. During configuration, the processing capacity and speed of the controllers can be easily dapted to the demands of the automation task. Program execution in the controller is based on real-time multitasking operating system, leading to flexible strategies for processing programs.

The operating system of the controllers has two different types of tasks, system tasks and user tasks. System tasks supervise the system for example at cold start or in case of an error. User tasks execute the application 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); one task only

System tasks are automatically available. These tasks are executed once in case of the following events:
- RUN
- STOP
- COLD START
- WARM START (voltage restored)
- REDUNDANCY TOGGLE
- ERROR

Functions and function blocks	
Analog value processing	• Input and output conversion • Linearization • Delay and dead-time filter • Average / extreme value determination in time • Setpoint adjustment • Counter with analog input • Time scheduler
Binary value processing	• Binary output, monostable • Input and output delay • Pulse / Time Counter, pushbutton
Closed-loop control	• Continuous controllers (PID), Step controllers • On / Off controller, three-position controller • Ratio controller • Basic functions • Auto-tuning
Open-loop control	• Individual drive functions • Sequence control, dosing circuits
Logic functions	• 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	• Analog and binary monitoring • Event monitoring • Audible alarm control • Connection monitoring
Acquisition functions	• Disturbance course acquisition, trend acquisition
Arithmetic functions	• Basic arithmetic functions, numerical functions • Logarithmic functions • Trigonometric functions • Analog value and time limitation
Modbus functions	• Master and slave functions
PROFIBUS	• DPV1 master functions
Telecontrol functions	• Master and slave functions
Phase logic processing	• Interface module for batch applications

3.3 The AC 900F controller

3.3.1 Hardware and certificates

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 CPU (PM 904F) and Standard CPU (PM 902F) or up to 400 I/Os when using the Lite CPU (PM 901F).

A key feature of the AC 900F is the support of SD cards. Especially the new optional display for AC 900F allows to load applications or firmware into the controller, without PC or FTP software.

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
- PM 904F is NAMUR conform

Mechanical design

Thanks to its four holes in the rear, the CPU modules PM 904F, PM 902F and PM 901F 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.

CI 930F
CI 930F
CI 930F
CI 930F
ABB
AC 900F
PM 904F

The AC 900F consists of:
- CPU module PM904F, PM 902F or PM 901F with
  - four Ethernet interfaces for PM904F, 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 four fieldbus interface modules for PM 904F
- A maximum of two fieldbus interface modules for PM 902F and PM 901F

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 and Telecontrol TCP
- 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. PM 902F/PM 901F can be equipped with a maximum of two PROFIBUS modules. PM 904F can be equipped with maximum of four PROFIBUS modules. The controllers are optionally redundant.

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.

Certificates

The AC 900F controller has the following certificates:

- PM 904F: CE, cULus, ISA-S71.04 G3, UL Class I Div. 2, NAMUR
- PM 902F: CE, cULus, ISA-S71.04 G3, UL Class I Div. 2
- PM 901F: CE, cULus, ISA-S71.04 G3, UL Class I Div. 2

Environmental conditions

The ambient temperature range of AC 900F ranges from -20 to +70°C (operation), no forced cooling required.

Temperature ranges and other environmental conditions		
Ambient temperature AC 900F	Operating	-20 … +70°C (-4°F … 158°F)*
	Storage:	- 40 °C … +85°C (-40°F … 185°F)
	Storage (TD 951F inserted):	- 25 °C … +70 °C (13°F … 158°F)
Ambient temperature of battery	Operating:	- 40 °C … +85 °C (-40°F … 185°F)
	Storage:	- 40 °C … +85 °C (-40°F … 185°F)
Humidity		Maximum 93%, without condensation
Air pressure	Operating:	< 2000 m (2187 yd.)
	Storage:	< 3500 m (3827 yd.)
Climatic category		3K3 according to EN 60721-3-3
Degree of protection		IP 20
G3 severity level		ISA-S71.04 G3

* This temperature range applies to the new versions of PM 902F 3BDH001000R0005, HW Revision ≥ 06.00 and 3BDH001000R0001, HW Revision ≥ 03.00 and to the new PM 901F 3BDH001001R0005

Product compliance

Electromagnetic compatibility and other directives	
2014/30/EU	EMC Directive
EN 61000-6-2	Electromagnetic compatibility (EMC) – Generic standards, Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) – Generic standards, Emission standard for industrial environments
2014/35/EU	Low Voltage Directive
NAMUR NE21	Electromagnetic Compatibility of industrial process and laboratory control equipment
2011/65/EU	RoHS Directive

Mechanical stress / mounting

Mechanical stress and mounting	
Mounting	Horizontal
Mounting of the modules	Wall mounting or DIN rail according to DIN EN 50022, 35 mm, depth 7,5 mm or 15 mm, mounting with screws of type M4, fastening torque 1.2 Nm
Flammability	According to UL 94 V0
Vibration resistance according to IEC/EN 60068-2-6	2 g, 2 Hz … 150 Hz
Shock test according to IEC/EN 60068-2-27	15 g, 11 ms, half-sinusoidal

Electric data / Electrical protection

Voltages according to EN 61131-2	
Process- and Supply-voltage	24 VDC
Absolute limits	+19.2 V ... +32.5 V incl. ripple (see below)
Ripple	< 5 %
Protection against reverse polarity	Yes
Permissible interruptions of power supply as per EN 61131-2	
DC supply	Interruptions < 7.5 ms, time between 2 interruptions > 1 s, PS2
Creepage distances and clearances	
The creepage distances and clearances meet the overvoltage category II, pollution degree 2.	
Power supply units	
Power supply units meeting the PELV specification should be used for powering the modules.	

Power dissipation for the calculation of cooling systems

The following table lists the anticipated power dissipation (heat dissipation) of individual AC 900F modules.

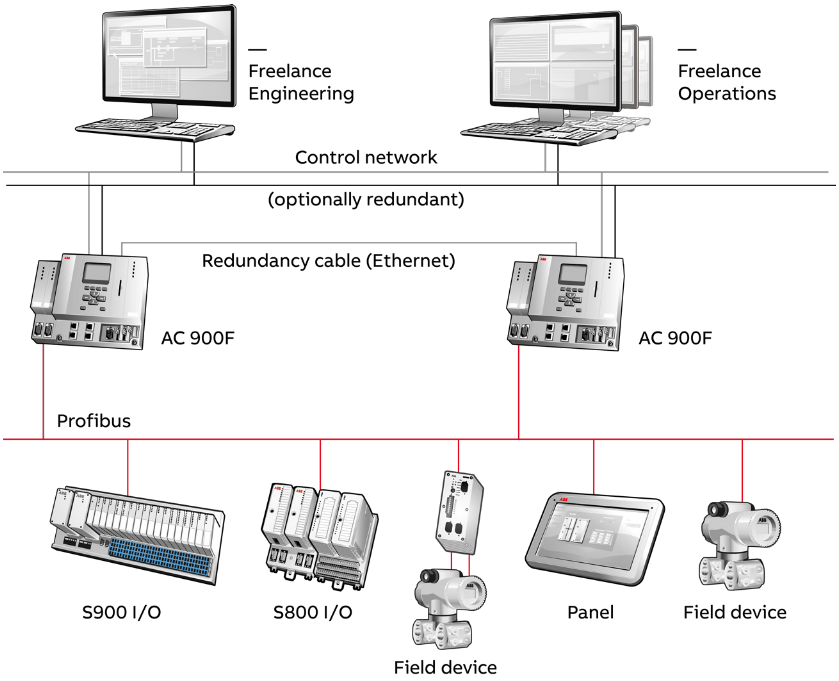
The data for the modules contain the combined power consumption from internal and external supply sources. For detailed information see the Mounting and Installation Instructions, AC 900F manual.

Module	Max. power dissipation
Central processing unit PM 904F, PM 902F and PM 901F	18 W
Communication interface CI 930F	1.8 W
Communication module CI 773F	1.8 W
Communication interface CI 910F	1.9 W
Display unit TD 951F	0.35 W

3.3.2 AC 900F redundancy concept

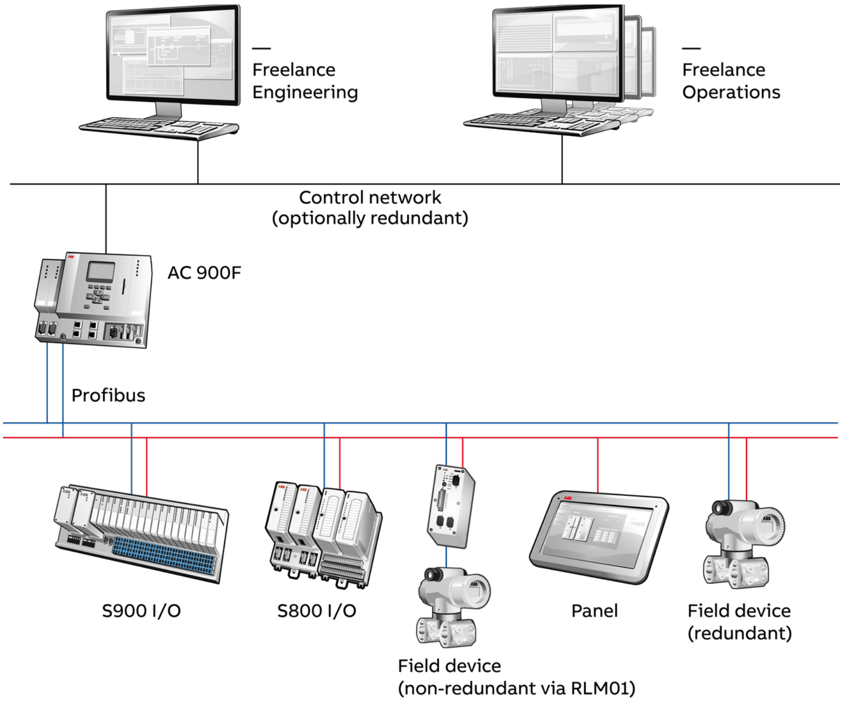
Controller redundancy

Controller redundancy can be achieved by installing two AC 900F. To ensure quick and smooth takeover by the secondary AC 900F in case the primary AC 900F fails, a dedicated redundancy communications link through the second Ethernet module makes sure that both AC 900F are always synchronized. All inputs and outputs are designed to support redundant operation.


— Freelance Engineering
— Freelance Operations
Control network
(optionally redundant)
Redundancy cable (Ethernet)
AC 900F
AC 900F
Profibus
S900 I/O
S800 I/O
Panel
Field device
Field device

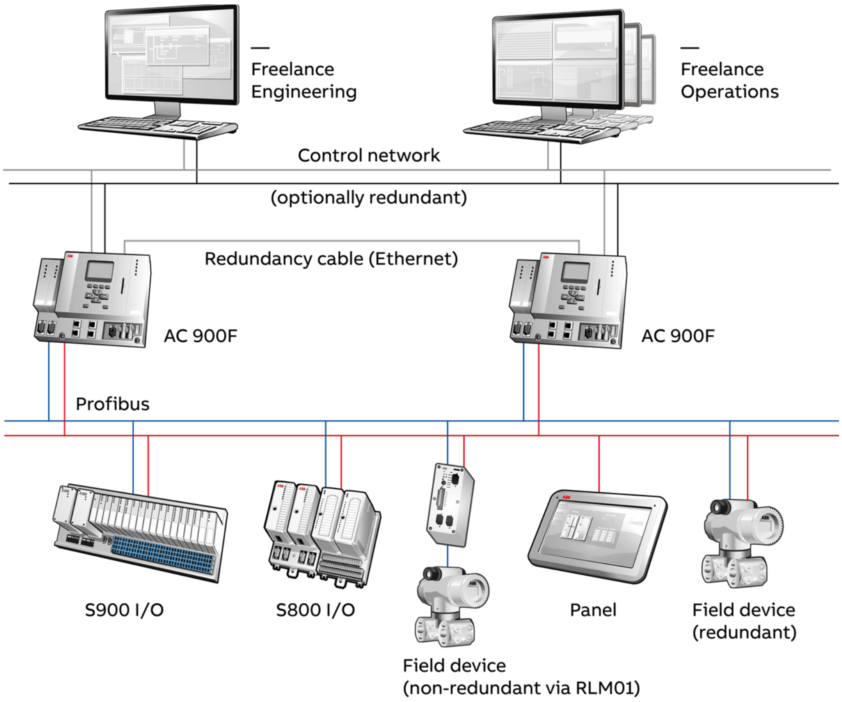
PROFIBUS line redundancy

The CI 930F communication interface provides integrated PROFIBUS line redundancy. An alternative solution to the PROFIBUS line redundancy is to use a Fiber Optic Ring.


— Freelance Engineering
— Freelance Operations
Control network
(optionally redundant)
AC 900F
Profibus
S900 I/O
S800 I/O
Panel
Field device
(redundant)
Field device
(non-redundant via RLM01)

Controller redundancy together with PROFIBUS line redundancy

You can achieve the highest availability when doing both, controller redundancy and PROFIBUS line redundancy by using two AC 900F with a CI 930F communication interface each. This topology combines the advantages of controller redundancy with the one of line redundancy as described in the preceding paragraphs.


Freelance Engineering
Freelance Operations
Control network
(optionally redundant)
Redundancy cable (Ethernet)
AC 900F
AC 900F
Profibus
S900 I/O
S800 I/O
Panel
Field device (redundant)
Field device (non-redundant via RLM01)

3.3.3 Central processing unit PM 904F and PM 902F

Name	Short description	Article no.
PM 904F CPU Module	4 Ethernet interfaces, 800 MHz CPU clock, 48 MB Controller Memory, 16 MB battery buffered SRAM, 32 MB DRAM. 4 slots for assembling Communication Interface Modules. Without operating system. The operating system has to be loaded during software installation. Needs external 24 VDC power supply. Software version 2019 or higher is mandatory. White housing. Display Unit TD 951F and Battery TA 951F are not included.	3BDH001002R0001
PM 902F CPU Module	4 Ethernet interfaces, 800 MHz CPU clock, 24 MB Controller Memory, 8 MB battery buffered SRAM, 16 MB DRAM. 2 slots for assembling Communication Interface Modules. Without operating system. The operating system has to be loaded during software installation. Needs external 24 VDC power supply. Software version 2013 or higher is mandatory. White housing. Display Unit TD 951F and Battery TA 951F are not included.	3BDH001000R0001

The Central Processing Unit (CPU) module is equipped with a high-performance processor for multitasking and executing fast loop cycle times. It offers expanded flexibility via a pluggable SD card, redundancy options for high availability and powers for around 1500 I/Os. It comes with four onboard 100 Mbit/s Ethernet network connection used for communication between controllers, operator stations and engineering tool. Two serial line interfaces can be used for Modbus communication and/or Telecontrol. A third serial interface is reserved for diagnosis purpose and radio clock connection.

The PM 904F has 48 MB of memory of which 16 MB are battery backed up. For demanding applications, eight cyclic and priority driven tasks with adjustable cycle time can be configured, as well as a cyclic PLC type task which runs as fast as possible. The additional available display unit TD 951F shows status and diagnostic information directly at the module.

Operating modes can be modified by switches on the front panel. The controller can be blocked for downloads of application and firmware to enhance security. The status, if the controller is locked or unlocked, is shown on the display.

S700 I/O modules can be directly plugged to the I/O bus interface on the right side of the CPU module. A maximum of 10 direct I/O modules can be connected to one controller.

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. Four coupler bus slots on the left side can be assigned with fieldbus interface modules.

The PM 904F can be equipped with a maximum of four PROFIBUS modules. 3rd party I/O‘s can be connected via a MODBUS ASCII / RTU, IEC 60870-5-101 Telecontrol protocol or via PROFIBUS.

The PM 902F CPU module is the central part of the AC 900F controller. It provides a high performance processor for multitasking and executing fast loop cycle times. PM 902F also has 24 MB of memory of which 8 MB is battery backed up.

The PM 902F can be equipped with a maximum of two PROFIBUS modules. PM 902F comes with four 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.

A lite version PM 901F is also available, see section “3.3.4 Central processing unit PM 901F, lite” on page 22.

CPU module PM 904F

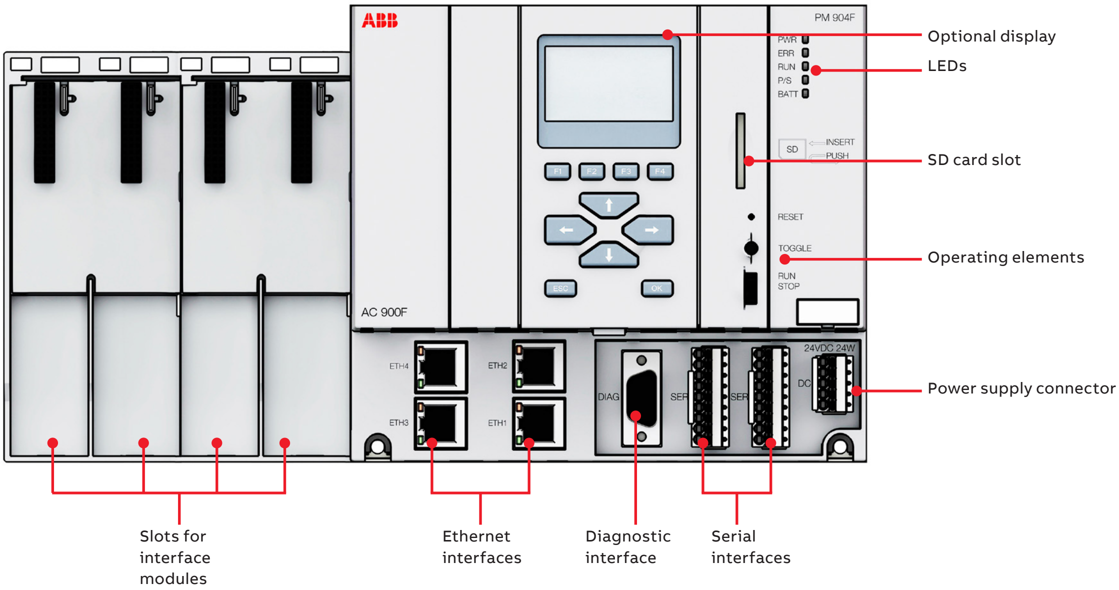


ABB
AC 900F
PM 904F
PWR
ERR
RUN
P/S
BATT
SD
INSERT
PUSH
RESET
TOGGLE
RUN
STOP
F1
F2
F3
F4
ESC
OK
ETH4
ETH3
ETH2
ETH1
DIAG
SER
SER
24VDC 24W
DC
Optional display
LEDs
SD card slot
Operating elements
Power supply connector
Slots for interface modules
Ethernet interfaces
Diagnostic interface
Serial interfaces

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: • 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: • Connection: • Usage:	• 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) • Ethernet 1: • Ethernet 2: • Ethernet 3 & 4:	• 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

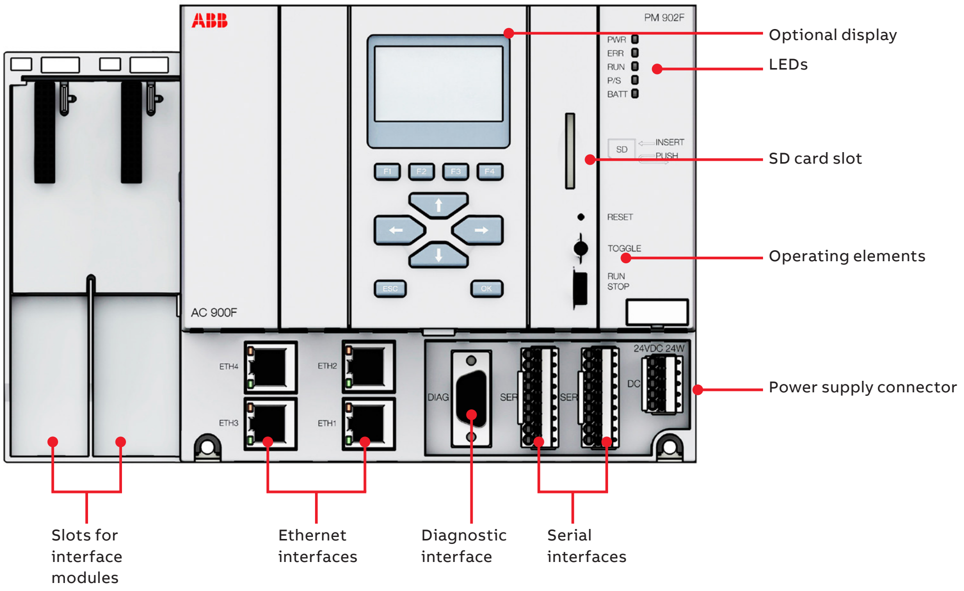


ABB
AC 900F
PM 902F
PWR
ERR
RUN
P/S
BATT
SD
INSERT
PUSH
RESET
TOGGLE
RUN
STOP
F1
F2
F3
F4
ESC
OK
ETH4
ETH2
ETH3
ETH1
DIAG
SER
SER
DC
24VDC 24W
Optional display
LEDs
SD card slot
Operating elements
Power supply connector
Slots for interface modules
Ethernet interfaces
Diagnostic interface
Serial interfaces

Technical data

Technical Data PM 902F	
RAM (Total)	24 MB
RAM battery buffered	8 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: • 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: • Connection: • Usage:	 • 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) • Ethernet 1: • Ethernet 2: • Ethernet 3 & 4:	 • 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	1.07 kg (2.36 lbs)
Dimensions	Width 227 mm (8.94 inch) Height 152 mm (5.98 inch) Depth 95 mm (3.74 inch)

3.3.4 Central processing unit PM 901F, lite

Name	Short description	Article no.
PM 901F CPU Module	3 Ethernet interfaces, 400 MHz CPU clock, 11 MB Controller Memory, 3 MB battery buffered SRAM, 8 MB DRAM. Processing of max. 400 IO's. 2 slots for assembling Communication Interface Module. Without operating system. The operating system has to be loaded during software installation. Needs external 24 VDC power supply. Software version 2016 or higher is mandatory. White housing. Display Unit TD 951F and Battery TA 951F are not included.	3BDH001001R0001

A CPU module is the central part of the AC 900F controller. It provides a high performance processor for multitasking and executing fast loop cycle times.

It 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.

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

—
CPU module PM 901F

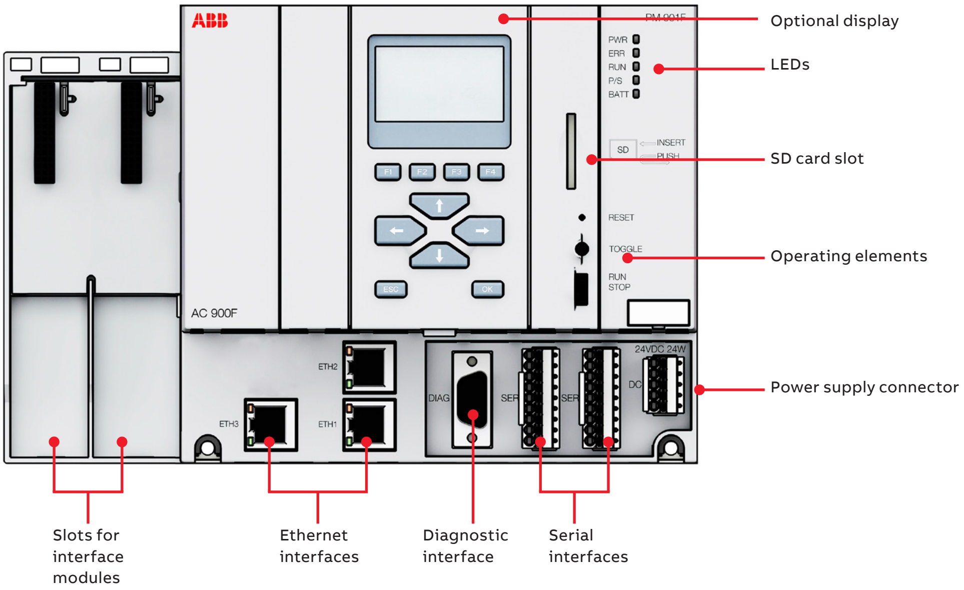


ABB
AC 900F
PM 901F
PWR
ERR
RUN
P/S
BATT
SD
INSERT
PUSH
RESET
TOGGLE
RUN
STOP
F1
F2
F3
F4
ESC
OK
ETH2
ETH3
ETH1
DIAG
SER
SER
DC
24VDC 24W
Optional display
LEDs
SD card slot
Operating elements
Power supply connector
Slots for interface modules
Ethernet interfaces
Diagnostic interface
Serial interfaces

Technical data

Technical Data PM 901F	
RAM (Total)	11 MB
RAM battery buffered	3 MB
CPU clock rate	400 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: • 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: • Connection: • Usage:	 • 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 3 Ethernet interfaces (RJ45) • Ethernet 1: • Ethernet 2: • Ethernet 3:	 • 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	1.07 kg (2.36 lbs)
Dimensions	Width 227 mm (8.94 inch) Height 152 mm (5.98 inch) Depth 95 mm (3.74 inch)

3.3.5 PROFIBUS Communication Interfaces

Two types of PROFIBUS Master interface modules can be used with AC 900F: CI 930F and CI 773F.

For AC 900F, these PROFIBUS interface modules enable communication over the PROFIBUS DP fieldbus. The interfaces can be mounted to the slots on the left side of the CPU module. (see "Figure 1: CPU Module PM 904F" on page 20 and "Figure 2: CPU Module PM 902F" on page 21 and "Figure 3: CPU Module PM 901F" on page 22) The internal coupler bus makes the connection to the CPU.

PROFIBUS modules are configured in the Freelance Engineering hardware structure. Information on configuring the PROFIBUS module in hardware structure, see Engineering Manual System Configuration, Hardware Structure.

The parameter data directly influence the functionality of the module. Further information on configuration and parameterization of the module, refer to the Engineering Manual AC 900F.

Communication Interface CI 930F

Name	Short description	Article no.
CI 930F	Communication Interface, PROFIBUS DP Master DP-V0/V1, 12 MBit/s Supports PROFIBUS line redundancy Two D-Sub terminals (9-pole), one each for line A/B Software version 2013 or higher is mandatory Requires one coupler bus slot on the CPU module. White housing.	3BDH001010R0002

CI 930F
PWR
STA
RUN
A
B

CI 930F is module is a PROFIBUS DP master, but with additional features compared to CI 773F. CI 930F supports built-in line redundancy.

Each PROFIBUS module allows the connection of a PROFIBUS line of maximum of 126 slaves. Each of these slaves can be modular.

LED Status Displays

The PROFIBUS module CI 930F runs a self test during the power ON process. During the initialization procedure if the module is newly configured or if the operating mode is changed then all the LEDs may light up for a short period of time before reaching a definite condition.

Technical data CI 930F	
Transmission protocol	PROFIBUS DP master, DP-V0/V1
Transmission rate	9.6 kBit/s to 12 MBit/s
Transmission standard	EIA RS-485 acc. to EN 50170, potential free
Fieldbus connectors	2 x D-SUB, 9-pole, female
Number of slaves	up to 126
Useable CPU	PM 904F, PM 902F or PM 901F
Data interchange	64 kB module, dual-port memory
PROFIBUS line redundancy	yes
Support controller redundancy	yes, with AC 900F
Hotplug, hot configuration in run	yes, with AC 900F
Current consumption	80 mA, via 24 V terminal of CPU module
Power dissipation	1.8 W

Technical data CI 930F	
Status display	PWR, STA, RUN, Line A, Line B
Protection	IP20
Weight	115 g (0.25 lbs)
Dimensions	Width: 28 mm (1.1 inch)
	Height: 152 mm (5.98 inch)
	Depth: 85 mm (3.35 inch)
Ambient temperature	Operation: -20 .. +70 °C (-4 °F .. 158 °F)
	Storage: -40 °C .. +85°C (-40 °F .. 185 °F)
Certificates / Approvals	CE, ANSI/ISA 71.04-1985 G3 cULus, UL Class I Div 2 (Group A,B,C,D), EAC

Communication Interface CI 773F

Name	Short description	Article no.
CI 773F	Communication Interface, PROFIBUS DP Master DP-V0/V1, 12 MBit/s D-Sub terminal, 9-pole Software version 2013 SP1 or higher is mandatory Requires one coupler bus slot on the CPU module on PM904F, PM 902F, PM 901F or Terminal Base TB 711F. White housing.	3BDH000395R0001

CI 773F
PWR
STA
RUN
L

CI 773F is the sucessor of CM 772F. It offers additional features and enough memory (I/O bytes) for maximum number of PROFIBUS Slaves.
CI 773F supports controller redundancy.

LED Status Displays
After having switched on, the CI 773F module performs a self-test during power-up. During the initialization procedure, with newly configured modules or after a change of the operating mode, then all the LEDs may light up briefly before reaching the defined status.

Technical data CI 773F	
Transmission protocol	PROFIBUS DP master, DP-V0/V1
Transmission rate	9.6 kBit/s to 12 MBit/s
Transmission standard	EIA RS-485 acc. to EN 50170, potential free
Fieldbus connectors	1 x D-SUB, 9-pole, female
Number of slaves	up to 126
Useable CPU	PM 904F, PM 902F, PM 901F or PM 783F
Data interchange	16/64 kB, dual-port memory
Current consumption	80 mA, via 24 V terminal of CPU module
Power dissipation	1.6 W
Status display	PWR, STA, RUN, L
Protection	IP20
Weight	96 g (0.21 lbs)
Dimensions	Width: 28 mm (1.1 inch)
	Height: 135 mm (5.31 inch)
	Depth: 75 mm (2.95 inch)
Ambient temperature	Operation: -20 .. +70 °C (-4 °F .. 158 °F)
	Storage: -40 °C .. +70°C (-40 °F .. 158 °F)
Certificates / Approvals	CE, ANSI/ISA 71.04-1985 G3 cULus, UL Class I Div 2 (Group A,B,C,D), EAC

3.3.6 CAN Communication Interface

CI 910F
PWR
STA
L0
L1
L2

An AC 900F controller with CI 910F CAN Bus module allows for connecting Freelance Rack I/O. The CI 910F CAN Bus interface comprises three CAN Bus lines, CAN 1 to CAN 3. The lines are electrically isolated from the system and designed for redundant operation with a second AC 900F controller.

The internal coupler bus connects the CI 910F to the CPU module. This is valid for both data transmission and power supply. A dual port RAM is used for data exchange.

CAN modules are configured in the Freelance Engineering hardware structure. Information on configuring the CAN module in hardware structure, see Engineering Manual System Configuration, Hardware Structure. The parameter data directly influence the functionality of the module. Further information on configuration and parameterization of the module, refer to the Engineering Manual AC 900F.

Communication Interface CI 910F

Name	Short description	Article no.
CI 910F	Three CAN Bus channels. ABB CAN Bus protocol. D-Sub terminals (9-pole). Software version 2016 or higher is mandatory. White housing. Requires one coupler bus slot on the CPU module.	3BDH001005R0001

Technical data CI 910F	
Transmission protocol	ABB CAN Bus protocol
Transmission rate	max. 1 MBit/s
Settings for rack-based I/O modules	100 kBit/s or 500 kBit/s depending on bus length
Fieldbus connector	D-SUB, 9-pole, female
CAN interface	Acc. to ISO/DIN 11898, CAN 2.0
Electrical isolation	CAN channels to system
Number of I/O racks	max. 5
Dual-port memory	256 kB
Channels / Lines	CAN 1, CAN 2, CAN 3
Power supply	Via coupler bus
Current consumption	90 mA, via DC-IN of the CPU module
Power dissipation	1.9 W
Number of CI 910F modules per controller	max. 1, optionally in slot C1 or C2
Useable CPU	PM 904F, PM 902F or PM 901F
LEDs	Five LEDs for the status display

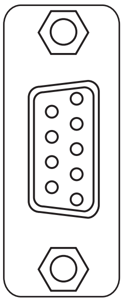
Technical data CI 910F	
Support controller redundancy	yes, with AC 900F
Hotplug, hot configuration in run	yes, with AC 900F
Status display	PWR, STA, L0, L1, L2
Protection	IP20
Weight	178 g (0.39 lbs)
Dimensions	Width: 28 mm (1.1 inch)
	Height: 152 mm (5.98 inch)
	Depth: 75 mm (2.95 inch)
Ambient temperature	Operation: -20 .. +70 °C (-4 °F .. 158 °F)
	Storage: -40 °C .. +85°C (-40 °F .. 185 °F)
Certificates / Approvals	CE ANSI/ISA 71.04-1985 G3, cULus, UL Class 1 Div 2 (Group A,B,C,D), EAC

LED Status Displays

After having been switched on, the CI 910F CAN Bus module performs a self-test during power-up. During initialization, with newly configured modules or after a change of the operating mode, all LEDs may light up briefly before reaching the defined status.

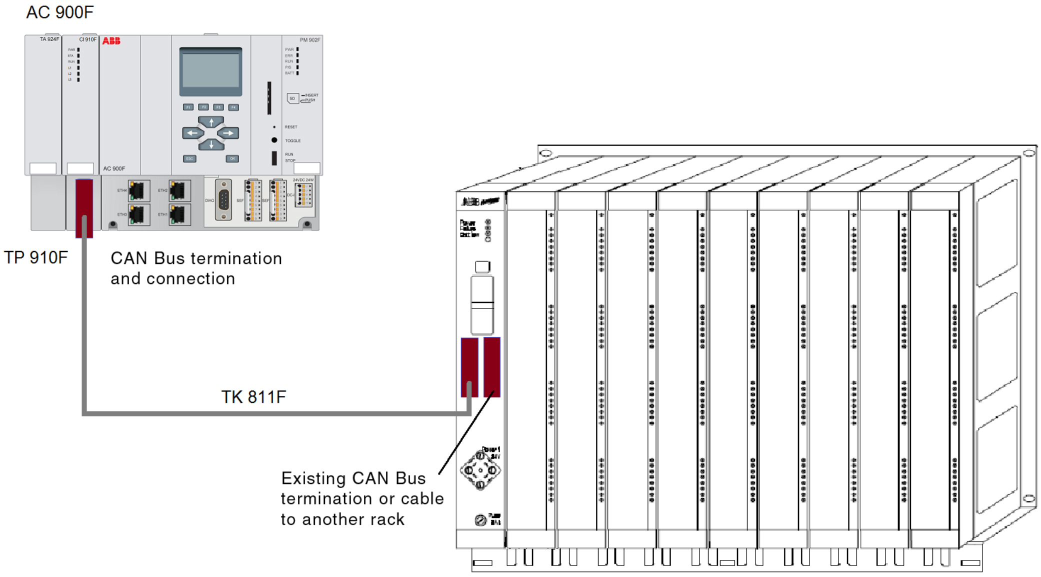
CAN Bus connector

The CAN Bus connector of CI 910F features the following pin assignment:



1	Shield
2	CAN 1 H
3	CAN 1 L
4	CAN 3 L
5	unused
6	CAN 2 H
7	CAN 2 L
8	CAN 3 H
9	unused

CAN Bus
9-pole, Female


AC 900F
TP 910F
CAN Bus termination and connection
TK 811F
Existing CAN Bus termination or cable to another rack

Connection of Freelance Rack I/O

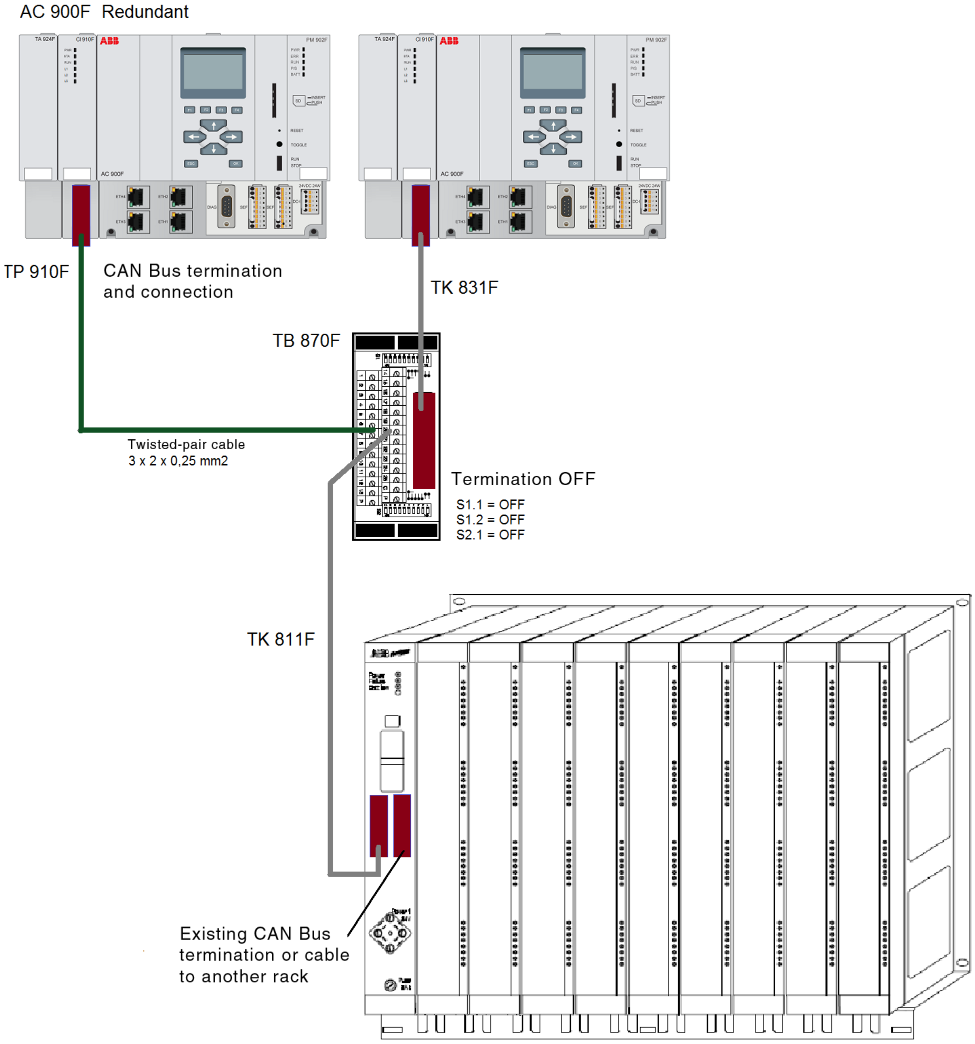
When connecting the AC 900F controller to a Freelance rack, you will have to remove the DCP 02/10 CPU modules.

AC 900F controller at the beginning (end) of the CAN Bus

The TP 910F CAN Bus termination plug is used for terminating the three CAN buses directly at the controller at the beginning (end) of the bus lines. The open end of the TK 811F CAN cable is connected to the screw terminals of the TP 910F plug.

Redundant AC 900F controller at the beginning (end) of the CAN Bus
The terminating resistors integrated into the TP 910F termination plug ensure that the termination and, thus, the function of the three CAN Bus lines is preserved even if a CAN bus module or controller is replaced. TB 870F is used for connecting the CAN bus between controllers and to the I/O rack.

The TK 831F cable contains feed and return lines. When replacing a CI 910F module or controller, only disconnect the 9-pole connector. Disconnecting the 25-pole connector will interrupt the CAN Bus.


AC 900F Redundant
TP 910F
CAN Bus termination and connection
TK 831F
TB 870F
Twisted-pair cable
3 x 2 x 0,25 mm2
Termination OFF
S1.1 = OFF
S1.2 = OFF
S2.1 = OFF
TK 811F
Existing CAN Bus termination or cable to another rack

3.3.7 Accessories

TD 951F Display Unit

This is an optional accessory. It provides a dot matrix LCD with 128 x 64 pixel resolution, keypad with six predefined and four function keys. The display unit allows the following functions:

- Network settings
- Backup/Restore application
- Status display
- Display of process variables
- Module exchange
- Firmware update
- Lock/unlock the controller against firmware and application downloads

F1
F2
F3
F4
ESC
OK

Name	Short description	Article no.
TD 951F	64 x 128 Dot Matrix LCD. White housing.	3BDH001020R0001

TA 951F Battery for RAM buffering

TA 951F contains a 2/3A size Lithium battery with cable connection. The battery is sealed within a plastic pack. It is possible to exchange this battery without stopping the CPU module. In the event of power failure, the TA 951F Lithium battery supplies power to store the SRAM contents (e.g. process and configuration data) and to back-up the real time clock. The CPU module is supplied without a Lithium battery. New battery TA 951F is inserted before starting the CPU module.

Although the CPU module can work without a battery, its use is still recommended in order to avoid losing process data. The CPU module monitors the discharge status of the battery.

An pre-warning indication is displayed before (at least two weeks in advance) the battery status becomes critical. The battery should be replaced in fixed intervals or as soon as possible after this error indication is displayed. The TA 951F Lithium battery is the only battery that can be used with CPU module PM 901F, PM 902F or PM 904F. It is a primary cell and cannot be recharged.

Technical data:

- Lithium cylindrical cell
- 3 V, 1200 mAh
- Primary cell, non rechargeable
- Protection against reverse polarity is by mechanical coding of the plug

Name	Short description	Article no.
TA 951F Battery for RAM buffering	2/3A Size, Lithium metal. Do not order more than three batteries for each module which requires a battery, due to air freight regulations. Please pay attention to the instruction in section 'General' of the price list.	3BDH001030R0001

Dummy coupler Modules

Name	Short description	Article no.
TA 724F	Empty housing for covering unused coupler bus slots.	3BDH000367R0001
TA 924F	Empty housing for covering unused coupler bus slots. For use with the AC 900F CPU module. White housing.	3BDH001031R0001

TA 924F

White Plastic Markers

Name	Short description	Article no.
TA525	Set(10) of white Plastic Markers. For labeling the modules, waterproof felt pins can be used.	1SAP180700R0001

Accessories for AC 900F CAN Bus installation

Name	Short description	Article no.
TP 910F	CAN Bus Termination Plug Integrated termination resistors. Screw type clamps. Connection of the Freelance rack based I/O.	3BDH001033R0001
TB 870F	Terminal Block, for serial interface. Identical with DFA 070.	3BDM000160R1
TK 811F	CAN Cable, open end, 3 m 3 x 2 x 0.25 mm². Identical with DFA 011. Connection FI 8x0F to Terminal Block TB 870F.	3BDM000103R1
TK 831F	CAN Cable (3 channel), connectors, 0.5 m 3 x 2 x 0.25 mm². Identical with DFA 031. Connection FI 810F to Terminal Block TB 870F (3 channel).	3BDM000100R1

3.4 The AC 800F controller

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, Telecontrol IEC 60870-5-101, Telecontrol 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 GSD[1] files or DTMs[2]. 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 CFF[3] or DD[4] 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.

Features:
- Controller with built-in fieldbus capability
- 4 high-speed fieldbus lines
- Supports different fieldbus types, even simultaneously:
  - PROFIBUS-DP, up to 12 MBd
  - FOUNDATION Fieldbus H1 (with LD 800HSE)
  - HART
  - Modbus RTU and Modbus TCP
  - Telecontrol IEC 60870-5-101 and Telecontrol IEC 60870-5-104
  - CAN (for Freelance Rack I/O)
- Easy engineering: fully integrated in Freelance
- One system-wide database for field devices shared by the control level and the Human System Interface
- Module recognition with factory and operational parameters
- Comprehensive diagnostics for predictive maintenance
- Compact, rugged design
- Front panel connectors
- DIN Rail (C-rail) or wall mounting for easy installation
- Ambient temperature 0-60 °C / 32-140 °F with temperature monitoring
- EMC certification according to EN50082

[1]. GSD = Device Master Data, abbreviation for the German term “Gerätestammdaten”. A GSD is the device database file (also called device data sheet)
[2]. DTM = Device Driver based on FDT technolog
[3]. CFF= Capabilities File
[4]. DD= Device Description

3.4.1 Hardware and certificates

Mechanical design

The front panel connection technique of the AC 800F controller 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.

By moving the screw-cover, the wish to remove the module from the CPU is signalized, and the fieldbus is automatically shut down. As a result, the remote I/Os and field device outputs have time enough to go to configured safety values, avoiding undefined states when the module is removed.

All modules are surrounded by metal housing when installed, 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.

Technical data

AC 800F opens up the flexibility of fieldbus technology to the user. It collects and processes diagnostic and process data from four fieldbus lines, which may be of different types. AC 800F is available with 16 MB for typically up to 1000 I/Os.

Up to four fieldbus modules can be plugged into the AC 800F controller. The communication with other controllers runs via Ethernet.

AC 800F optionally provides several levels of redundancy:
- Controller redundancy with two identically equipped AC 800F controllers, which means full redundancy versus just a CPU-board redundancy. Possibility to mount the redundant unit far away from each other, e.g. in a fire proof room
- Line redundancy for PROFIBUS DP, by using external equipment (Redundancy Link Module RLM01)

The availability of the control network can be increased by using ring topologies. The data protection is made via battery backup.

Certificates

The AC 800F controller has the following certificates:
- CE, NAMUR, UL, EN61000-6-2, G3 ISA71.04, ISO 9001

Environmental conditions

Temperature ranges and other environmental conditions	
Max. ambient temperature	0 °C - 60 °C / 32 °F - 140 °F (no fan required)
Max. module internal temperature	0 °C - 70 °C / 32 °F - 158 °F (temperature monitoring on the CPU board)
Temperature gradient	In operation: 1 °C (33.8 °F) / min, according to DIN IEC 68, Part 14 / EN 60068-2-14(11.99)
Transport and storage temperature	-25 °C - +85 °C / -13 °F / 185 °F
Permissible relative humidity	Non-condensing, ≤ 80 % annual average ≤ 95 % for 30 days per year maximum
Degree of humidity	RH-1, according to EN 61131-2: 1994 (IEC 1131-2)
Climatic category	KWF according to DIN 40040 (replaced by EN 60721-3-3 and EN 61709) 3K3 according to DIN IEC 721 / EN 60721-3-3
Degree of protection	For basic unit with module complement: IP20
G3 severity level	ISA71.04 G3 compliant (-Z variant)

Product compliance

Electromagnetic compatibility and other directives	
2014/30/EU	EMC Directive
EN 61000-6-2	Electromagnetic compatibility (EMC) – Generic standards, Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) – Generic standards, Emission standard for industrial environments
2014/35/EU	Low Voltage Directive
NAMUR NE21	Electromagnetic Compatibility of industrial process and laboratory control equipment
2011/65/EU	RoHS Directive (6.2011)

Electrical protection

Electrical protection	
Safety class	II
Overvoltage category	II for all connectors, pollution degree 2
Designed according to	IEC 1010-1 (1990 - 09); EN 61010-1 / 3.94 or DIN/EN 61010-Part 1 / 3.94 (VDE 0411-Part 1), CSAC 22.2, No. 1010-1 and No. 213 (Class I, Div 2), SIQ (CB Scheme 97NK2421), CSA / NTRL.
Module supply power	Extra low voltage with protective separation from other circuits which may be grounded according to DIN VDE 0100, Part 410-1.97/IEC 60364-4-41/10.92
Power supply SA 811F	Safety isolating transformer according to DIN VDE 0551, Part 1 (9.95); EN 60742 Optocoupler for protective separation against electrical shock (German standard VDE 0884 / 8.87)
Power supply SD 812F	No electrical separation!

03

Shock and vibration data

Shock and vibration data	
Tested according to DIN IEC 68, Part 2-6, 2-27 / EN 60068-2-6, 2-27 (11.99)	
Transport: Shock	30 g / 11 ms / 3 times to each axis Max. values for the individual modules. The values are valid for correct mounted modules.
In operation: Vibration, 3x5 cycles	2 g / 0.15 mm / 5 - 150 Hz

Power dissipation for the calculation of cooling system

The following table lists the anticipated power dissipation (heat dissipation) of individual AC 800F modules.

The data for the modules contain the combined power consumption from internal and external supply sources. For detailed information see the “Mounting and Installation Instructions, AC 800F” manual.

Module	**Max. power dissipation**
Basic unit PM 803F • power supply SA 811F • power supply SD 812F	 • 26.8 W • 13.8 W
Ethernet module EI 813F	1.2 W
CAN-module FI 810F	2.6 W
Serial module FI 820F	2.6 W
PROFIBUS module FI 830F	2.8 W
FF / HSE module FI 840F	2.1 W
Battery module AM 811F	0.28 W

System Communication

Bus type	**Max. length**	**Application**	**Standard**	**Transmission rate**
Twisted Pair (TP)	5 x 100 m 5 x 400 m for shielded TP	Control network connection of Freelance operator stations (for operation and observation), engineering station and controllers	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE-FL	10 MBit/s
Fiber optic (FL)	4500 m		DIN/ISO 8802 Part 3 10BASE-FL (IEEE 802.3)	10 MBit/s
Thin-Ethernet (Cheapernet)	5 x 185 m		DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE2	10 MBit/s
Control network Full-Ethernet (Yellow Cable)	5 x 500 m for Coax, 50 m for AUI		DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE5	10 MBit/s
Station bus (CAN-Bus)	80 m, 400 m	Station bus and as connection to I/O units	ISO/DIN 11898	500 KBit/s for 80 m 100 KBit/s for 400 m

Fieldbus modules

The 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 subnets

Details of the fieldbus modules			
Type	Channels	Function	Max. number of 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 modules

Controllers, operator stations, and engineering stations communicate with each other via the Ethernet based control network.

Ethernet modules for the control network

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

Linking devices

As the AC 800F is equipped with high-speed connections to both PROFIBUS (PROFIBUS DP) and FOUNDATION Fieldbus (FF-HSE), the slower buses of the two fieldbus technologies (PROFIBUS PA and FF-H1) can be connected using intelligent linking devices. These devices allow to connect several slow buses to one fast bus, with the advantage that a lot more field devices can be connected to an AC 800F station than when the slow fieldbuses are connected directly.

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. PROFIBUS Power Hub is a device from Pepperl+Fuchs.

FOUNDATION Fieldbus linking device
LD 800HSE EX
FOUNDATION Fieldbus (FF) is a fieldbus protocol based on international standards and designed for applications in the manufacturing industry, process automation and buildings automation. FF defines two communication profiles, H1 and HSE. The H1 profile, with a transmission rate of 31.25 kbit/s, is preferably used for direct communication between field devices in one link (H1 link).

The HSE profile, which is based on standard Ethernet and typically features a transmission rate of 100 Mbit/s, serves a backbone for the connection between H1 links. The LD 800HSE EX connects the HSE Ethernet with the field devices on the H1 link side. They serve as a gateway between the field devices on the H1 link and the HSE subnet. The LD 800HSE EX is also designed for redundancy.

FOUNDATION Fieldbus linking device
LD 810HSE EX
The new LD 810 HSE EX module 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. The Linking Device LD 810HSE Ex is not suitable for replacing just one of the LD 800 Linking Devices in a redundant pair.

In new installations use only LD 810 HSE EX modules together. Redundancy cable for LD 810HSE Ex can be made by the end customer directly and need not be ordered through ABB.

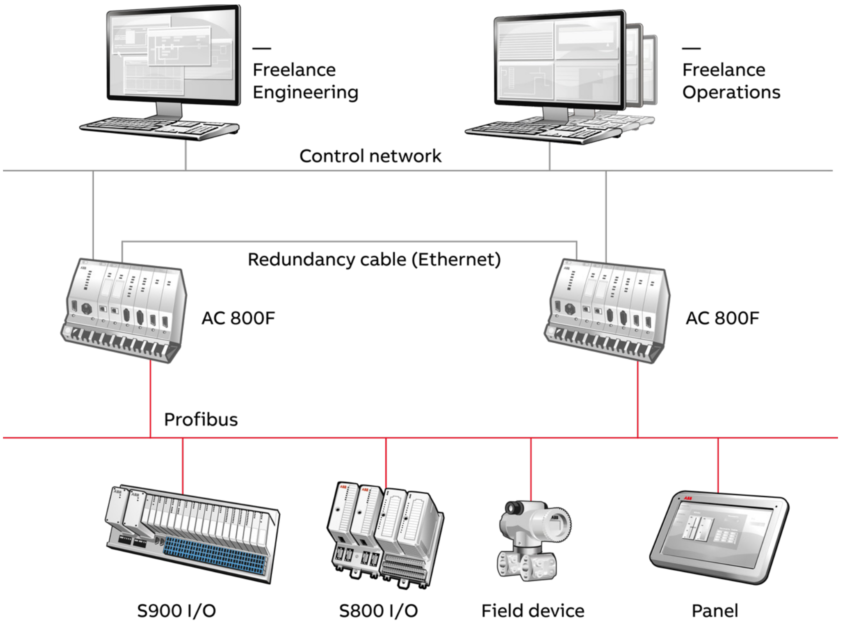
Fieldbus infrastructure

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 800HSE EX.

3.4.2 AC 800F redundancy concept

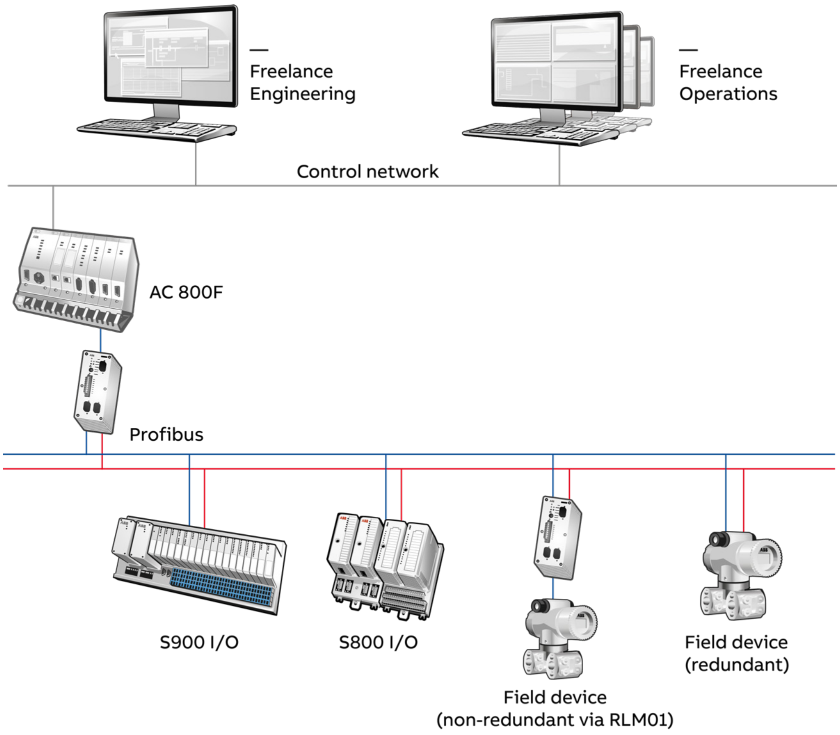
Controller redundancy

Controller redundancy can be achieved by installing two AC 800F. To ensure quick and smooth takeover by the secondary AC 800F in case the primary AC 800F fails, a dedicated redundancy communications link through the second Ethernet module makes sure that both AC 800F are always synchronized. All inputs and outputs are designed to support redundant operation.

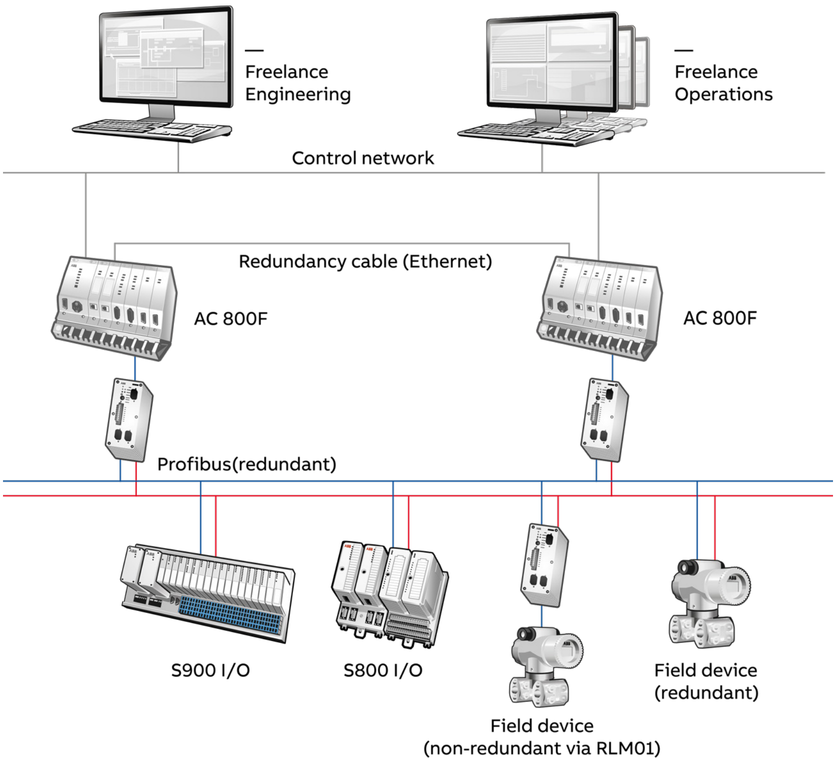

— Freelance Engineering
— Freelance Operations
Control network
Redundancy cable (Ethernet)
AC 800F
AC 800F
Profibus
S900 I/O
S800 I/O
Field device
Panel

PROFIBUS line redundancy

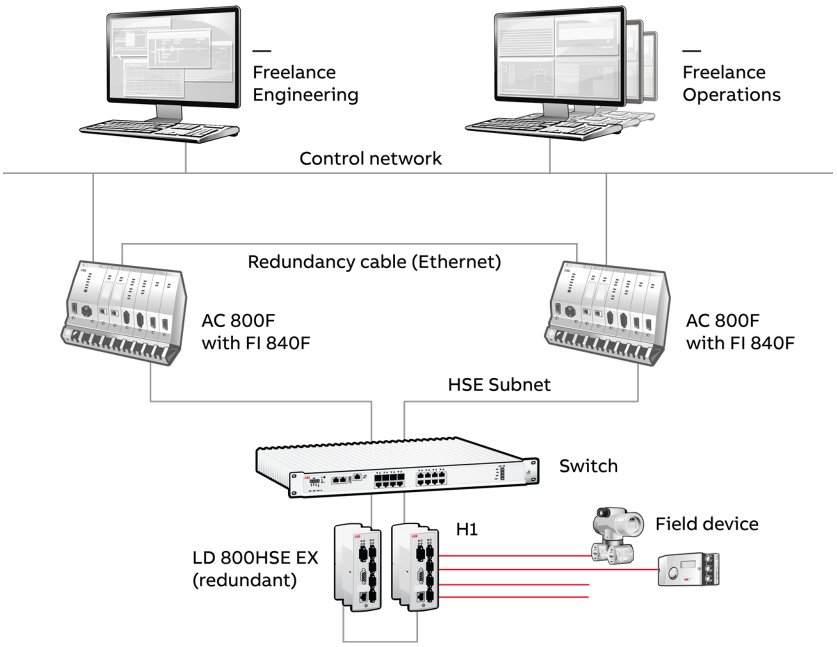
Using the Redundancy Link Module RLM 01 will do the conversion of one simple, non-redundant PROFIBUS line into two reciprocally redundant lines. You can position the Redundancy Link Module RLM 01 directly after a PROFIBUS module (master), before a bus segment with several slaves or before an individual slave. PROFIBUS stations with redundant couplers can be directly connected to the PROFIBUS set redundant by RLM 01. Stations with only one interface can be optionally assigned to the one or other line. An alternative solution to the PROFIBUS line redundancy is to use a Fiber Optic Ring.


— Freelance Engineering
— Freelance Operations
Control network
AC 800F
Profibus
S900 I/O
S800 I/O
Field device (non-redundant via RLM01)
Field device (redundant)

Controller redundancy together with PROFIBUS line redundancy
You can achieve the highest availability when doing both, controller redundancy and PROFIBUS line redundancy by using two AC 800F with one RLM01 each. This topology combines the advantages of controller redundancy with the one of line redundancy as described in the above paragraphs.

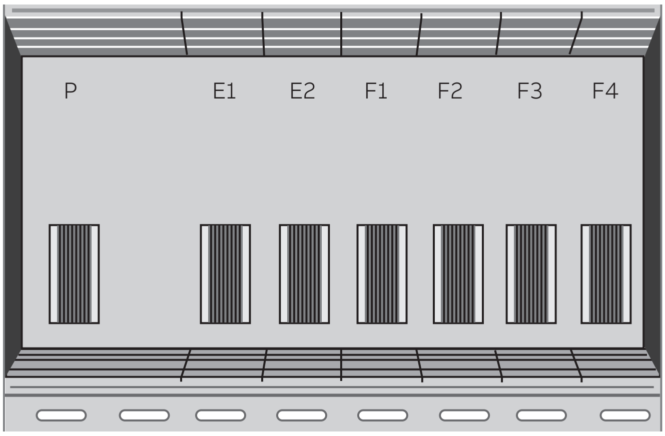

Freelance Engineering
Freelance Operations
Control network
Redundancy cable (Ethernet)
AC 800F
AC 800F
Profibus(redundant)
S900 I/O
S800 I/O
Field device (non-redundant via RLM01)
Field device (redundant)

Controller redundancy together with FOUNDATION Fieldbus redundancy
FOUNDATION Fieldbus redundancy can be achieved by installing two LD 800HSE EX. To ensure quick and smooth takeover by the secondary LD 800HSE EX in case the primary LD 800HSE EX fails, both devices are linked via a redundancy cable (COM). In new installations use only the new LD 810 HSE EX modules together. Redundancy cable for LD 810HSE Ex can be customer made.


Freelance Engineering
Freelance Operations
Control network
Redundancy cable (Ethernet)
AC 800F with FI 840F
AC 800F with FI 840F
HSE Subnet
Switch
H1
Field device
LD 800HSE EX (redundant)

3.4.3 AC 800F redundancy concept

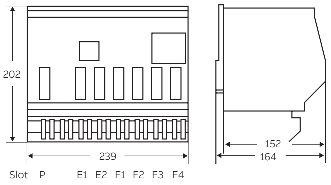
Name	Short description	Article no.
AC 800F – 16 MB, 115 / 230 VAC	With Ethernet 10BaseT, PROFIBUS module and Base Unit PM 803F Incl. standard system test, battery SB 808F, mains cable TK 807F (open end). Slot assignment: P = SA 811F, E1 = EI 813F, F3 = FI 830F, E2, F1, F2, F4 = Front panel. Compliant to cULus by using mains cable TK 809F (3BDM000212R1). Freelance V7.1SP2a or higher is mandatory.	3BDH000103R1
AC 800F – 16 MB, prepared for redundancy, 24 VDC	With Ethernet 10BaseT, PROFIBUS module and Base Unit PM 803F Incl. standard system test, 2 batteries SB 808F, 2 mains cable TK 802F (open end). Slot assignment: P = SD 812F, E1, E2 = EI 813F, F3 = FI 830F, F1, F2, F4 = Front panel. Freelance V7.1SP2a or higher is mandatory.	3BDH000133R1



AC 800F Housing with slot assignment

3.4.4 AC 800F, base unit PM 803F

Name	Short description	Article no.
PM 803F	Base Unit 16 MB, battery-buffered RAM Without operating system. The operating system has to be loaded during software installation. With special Contact Ledge RW 855F. Software V7.1SP2a or higher is mandatory. Restrictions: The performance of PM 803F is 5 - 10% below the performance of PM 802F (Classic).	3BDH000530R1



The basic unit PM 803F, cyclically scans signals from the fieldbus lines via the corresponding fieldbus modules, processes these signals according the application programs installed by the user and sends appropriate signals to the fieldbus actuators via the fieldbus modules.

Controller redundancy can be achieved by using two AC 800F, see also “3.4.2 AC 800F redundancy concept” on page 36. To ensure quick and smooth takeover in milliseconds by the secondary AC 800F in case the primary AC 800F fails, a dedicated redundancy communications link through the second Ethernet module makes sure that both AC 800F are always synchronized. All inputs and outputs are designed to support redundant operation.

Data communication between AC 800F, the engineering and operator stations runs via the control network. Engineering station communications can involve new or updated configuration files being downloaded to the controller, or information about the connected modules being reported back. When fieldbus modules are installed or exchanged, the required configuration information is automatically updated.

Configuration and real-time process data is stored in the controllers. To safeguard this data in case of power loss, the RAM power is backed up with batteries located either on the Ethernet modules or on battery modules.

Features:

- Super Scalar RISC microprocessor (up to 150 MIPS)
- 16 K internal CPU cache RAM
- RAM memory with error detection and correction
  - 16 MB synchronous dynamic
- Flash-EPROM
  - 8 MB, 32-bit words
- EEPROM, serial, 16 kbit
- Monitoring of the temperature inside the device
- Watchdog
- 4 slots for fieldbus modules
- 2 slots for Ethernet communications modules, 32-bit data bus, 10 Mbits/s
- Battery backup incl. battery watchdog
- G3 compliant Z variant available

Technical data

Technical data PM 803F	
CPU	CPU Intel® 32-bit RISC Super Scalar processor up to 150 MIPS
RAM	16 MB synchronous dynamic read / write memory, battery back up
I/O scan cycle time	Selectable by configuration. Depends on the capabilities of the fieldbus module
Processing time for 1000 instructions	0.78 ms for binary instructions 0.78 ms for word instructions 1.09 ms for floating point instructions
Power consumption	Basic unit only: max. 7.8 W depending on CPU usage and cycle time
Power supply	SA 811F: 115 - 230 VAC SD 812F: 24 VDC
Max. power output	See power supply modules
Weight	1.6 kg / 3.3 lbs max. 5 kg / 11 lbs (fully assembled)
Dimensions	Width: 239 mm (9.4 inch) Height: 202 mm (8 inch) Depth: 164 mm (6.5 inch)

3.4.5 Power supply

Ethernet modules

Name	Short description	Article no.
SA 811F	Power Supply 115 / 230 VAC To use together with PM 802F or PM 803F. Freelance V7.1SP2a or higher is mandatory.	3BDH000013R1

The AC 800F modules are supplied with 5 VDC / 5.5 A and 3.3 VDC / 6.5 A by SA 811F. The power supply has open-circuit, overload and sustained short-circuit protection. The electronically controlled output voltage provides high stability and low residual ripple.

In case of power loss ≥ 5 ms, the power supply module generates a power-fail signal. This signal is used by the CPU module to shut down operations and enter to a safe state of connected outputs of Remote I/Os. This is required for a controlled restart of the system and the user application when power is restored. The output voltage remains within its tolerance limits for at least another 15 ms. Altogether a mains voltage drop of 20 ms will be managed.

Features:
- Input voltage 115 - 230 VAC (self adjusting), output is electrically isolated
- Power supply outputs provide: 5 VDC / 5.5 A and 3.3 VDC / 6.5 A
- Enhanced power-fail prediction and shutdown procedures
- LED indication for power supply status and operating status of the AC 800F
- Short circuit proof, current limited
- 20 ms backup energy for use in the event of primary power failure, according to NAMUR
- G3 compliant Z variant available.

Technical data

Technical data SA 811F	
Input voltage	Alternating current 115 - 230 VAC Permissible range 90 - 260 VAC Frequency: 50 - 60 Hz (47 - 63 Hz)
Input current at nominal load	230 VAC: 275 mA 115 VAC: 541 mA
Rated input power	63 VA
Backup energy for the event of power failure	> 20 ms
Fuse	Subminiature fuse 2.5 AT, soldered
Output voltage	3.3 VDC (± 3%) typical 5 VDC (± 3%) typical
Output current	0.5 - 6.5 A to 3.3 V 0.5 - 5.5 A to 5.0 V
Current limit	Approx. 7.5 A Automatic return to normal operation after short circuit
Total output power	Max. 35 W
Weight	0.460 kg, 1.014 lbs

LED displays

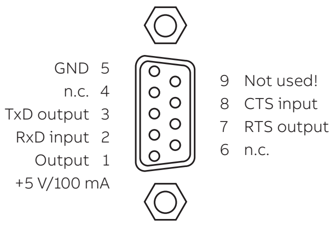
LED	Status	Description
Power		Internal supply voltage is available
Failure	Off	Normal status
	Orange	Self test
	Flashing orange	Overtemperature occurred during operation
	Red	Hardware failure of the basic unit
	Flashing red	Software failure of the system
Run/Stop	Green	Processing active
	Flashing green	Process was stopped and is now started again
	Red	Processing inactive
	Flashing red	Process was active and is stopped now
	Orange	Self test
	Off	Software initialization
Prim/Sec	In case of redundancy please see the LEDs description in the manual “Mounting and Installation Instruction AC 800F”. For non-redundancy the states are:	
	Orange	Self test
	Off	Normal status

Operator controls

Control	Description
Run/Stop switch	Internal supply voltage is available
Toggle Prim/Sec	For redundancy. Toggles between primary and secondary AC 800F (operational on primary AC 800F only, and only if a secondary AC 800F is available)
Reset	Reset button press and hold > 4 s for coldstart

Front panel connections

Control	Description
Power supply	One connector for 115 - 230 VAC input
Diag	For diagnostics and optional radio-controlled clock 9-pin male connector



SD 812F

Name	Short description	Article no.
SD 812F	Power Supply 24 VDC To use together with PM 802F or PM 803F. Freelance V7.1SP2a or higher is mandatory.	3BDH000014R1

ABB
AC 800F
Power
Failure
Run/Stop
Prim/Sec
Toggle
Reset
Run/Stop
Power Supply
Ind. 24V DC
SD 812F

The AC 800F modules are supplied with 5 VDC / 5.5 A and 3.3 VDC / 6.5 A by SD 812F. The power supply has open-circuit, overload and sustained short-circuit protection. The electronically controlled output voltage provides high stability and low residual ripple.

In case of power loss ≥ 5 ms, the power supply module generates a power-fail signal. This signal is used by the CPU module to shut down operations and enter to a safe state. This is required for a controlled restart of the system and the user application when power is restored. The output voltage remains within its tolerance limits for at least another 15 ms. Altogether an input voltage drop of 20 ms will be managed..

Features:
- Redundant input voltage 24 VDC, provides operation in accordance with NAMUR
- Power supply outputs provide: 5 VDC / 5.5 A and 3.3 VDC / 6.5 A
- Enhanced power-fail prediction and shutdown procedures
- LED indication for power supply status and operating status of the AC 800F
- Short circuit proof, current limited
- 20 ms backup energy for use in the event of primary power failure, according to NAMUR
- G3 compliant Z variant available

Technical data

Technical data SD 812F	
Input voltage	24 VDC, 2 redundant inputs permissible range 19.2 - 32.5 VDC
Input current at nominal load	1.7 A at 24 VDC
Rated input power	41 W
Backup energy for the event of power failure	> 20 ms
Fuse	For each supply: subminiature fuse 3.15 AT, soldered
Output voltage	3.3 VDC (± 3%) typical 5 VDC (± 3%) typical
Output current	0.5 - 6.5 A to 3.3 V 0.5 - 5.5 A to 5.0 V
Current limit	Approx. 7.5 A Automatic return to normal operation after short circuit
Total output power	Max. 35 W
Weight	0.460 kg, 1.014 lbs

LED displays

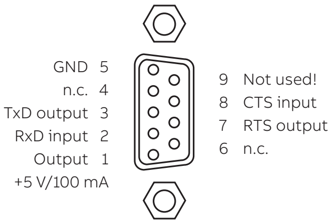
LED	Status	Description
Power		Internal supply voltage is available
Failure	Off	Normal status
	Orange	Self test
	Flashing orange	Overtemperature occurred during operation
	Red	Hardware failure of the basic unit
	Flashing red	Software failure of the system
Run/Stop	Green	Processing active
	Flashing green	Process was stopped and is now started again
	Red	Processing inactive
	Flashing red	Process was active and is stopped now
	Orange	Self test
	Off	Software initialization
Prim/Sec	In case of redundancy please see the LEDs description in the manual “Mounting and Installation Instruction AC 800F”. For non-redundancy the states are:	
	Orange	Self test
	Off	Normal status

Operator controls

Control	Description
Run/Stop switch	Connected to LED
Toggle Prim/Sec	For redundancy. Toggles between primary and secondary AC 800F (operational on primary AC 800F only, and only if a secondary AC 800F is available)
Reset	Reset button press and hold > 4 s for coldstart

Front panel connections

Control	Description
Power supply	Two connectors for 24 VDC, automatic input selection when used with single power supply
Diag	For diagnostics and optional radio-controlled clock 9-pin male connector



3.4.6 Ethernet interface

EI 813F, 10BaseT

Name	Short description	Article no.
EI 813F	Ethernet Module 10BaseT (Twisted pair) To use together with PM 802F or PM 803F. Battery not included. Freelance V7.1SP2a or higher is mandatory.	3BDH000022R1

These communication modules provide Ethernet communications to the control network compliant with IEEE802.3 standard.

Communications module, compliant with 10 BaseT shielded Twisted Pair (STP, cable category 3, 4 or 5 advanced)

Features:
- IEEE802.3 Ethernet standard
- Provides 10BaseT compliant communication (10Mbit)
- 32-bit data bus
- Transmission rate 10 Mbit/s
- Direct memory access to main memory, < 4% CPU overhead for operation
- Optional battery for redundant battery backup of main memory
- G3 compliant Z variant available

Technical data

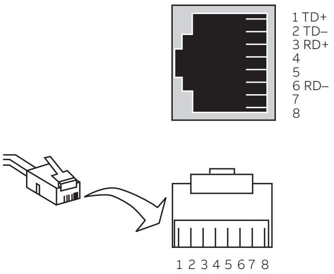
Technical data EI 813F	
Rated voltage	3.3 V / 5 V, ±3%, from CPU board
Power consumption	Max. 1.2 W
STP	10BaseT cable category 3, 4 or 5 advanced
RAM and real-time-clock buffering time New battery inserted After “Low” warning	PM 803F: ≥ 10 days ≥ 5 hours
Battery	3.6 V lithium battery, 950 mAh (has to be ordered separately
Weight	Approx. 0.150 kg, 0.33 lbs (without battery)

LED displays

LED	Status	Description
Status	Off	No supply voltage, module is isolated
	Green	Power supply on, module identified and ready to operate as configured
	Orange	Power supply on, module identified and either: • Normal transitory state after module startup • Configuration mode of Boot Loader
	Orange flashing	Power supply on, module identified; module not connected to proper bus structure
	Red	Power supply on and either: • Module not yet identified (normal for short time during module startup) • Error occurred during module test
Battery (PM 803F)	Off	AC 800F is active, EI 812F not active => buffering from power supply module
		AC 800F is off (no watchdog of the batteries voltage) => buffering from battery
	Orange	During battery recovery or start-up phase
	Red	Warning: battery low, no battery inserted, insufficient electrical contact etc.
	Green	Battery inserted and data protection provided

Front panel connections

Control	Description	
RJ-45 female connector (shielded) There are two integrated LED's indicating the current communication status. The LEDs are not labeled but can be identified by their color. The upper yellow LED indicates the link state; the lower green LED indicates active communication.		
LED 10BaseT link	Off	No active link. No communication possible.
	Static yellow	Active link. communication possible.
LED 10BaseT active	Off	No communication.
	Flashing green	Communication



3.4.7 Fieldbus interface modules

CAN-3 module FI 810

Name	Short description	Article no.
FI 810F	Fieldbus Module, 3 channel CAN modules. To use together with PM 802F or PM 803F for rack I/O.	3BDH000030R1

The FI 810F module provides connectivity to the Freelance rack I/O - up to 5 racks can be connected. It provides functionality according CAN 2.0 specification and supports baud rates up 1 MBd. All interfaces are electrically isolated and support redundant operation in conjunction with a second AC 800F.

Only one FI 810F module may be plugged per AC 800F. The slot of the FI 810F module has to be F1

Features:
- 3-channel CAN modules
- Transmission rate: up to 1 MBd
- Module can be removed or inserted during operation
- Redundant operation, with redundant AC 800F
- G3 compliant Z variant available

Technical data

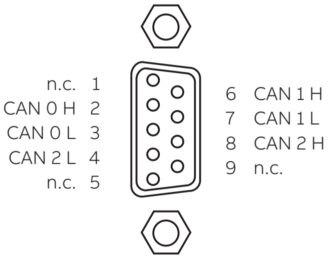
Technical data FI 810F	
Rated voltage	5 V, ± 3% from basic unit
Power consumption	1.6 W - 2.6 W, appending from communication
Channel supply: • Raged voltage • Power consump. • per channel	• 5 V, ± 10% • 0.15 W, when idling • 0.30 W, during communication
Weight	Approx. 0.145 kg, 0.32 lbs

LED displays

LED	Status	Description
Status	Off	No supply power, module is isolated
	Green	Module is active and working properly
	Orange	Module has been identified by AC 800F, but has not yet been activated
	Red	Module powered up, but not yet identified, or an error has occurred
RxD0	Green	Receive data on channel 0
TxD0	Green	Transmit data on channel 0
RxD1	Green	Receive data on channel 1
TxD1	Green	Transmit data on channel 1
RxD2	Green	Receive data on channel 2
TxD2	Green	Transmit data on channel 2

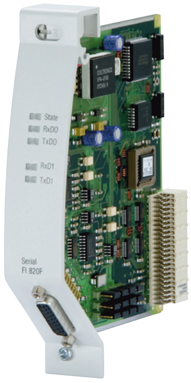
Front panel connections

Front panel connections
CAN 3 9-pin female connector



Serial module FI 820F

Name	Short description	Article no.
FI 820F	Fieldbus Module, Serial (2 channel) To use together with PM 802F or PM 803F.	3BDH000031R1



The FI 820F module provides connectivity to a variety of serial fieldbuses and serial protocols. Standard protocol is MODBUS

By using different connection cables the physical interface can easily be selected: RS485 (half duplex), RS422 (full duplex) or RS232. All interfaces are electrically isolated and support redundant operation in conjunction with a second AC 800F.

Features:

- Provides 2 serial interfaces
- Transmission rates up to 38.4 kBd configurable
- Physical interfaces RS485, RS422, RS232 selectable
- Electrical isolation
- Module can be removed or inserted during operation
- Redundant operation, with redundant AC 800F
- G3 compliant Z variant available

Technical data

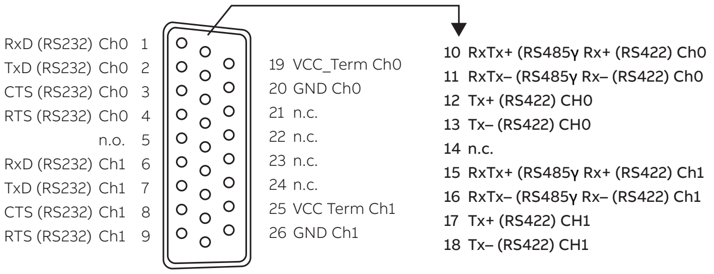
Technical data FI 820F	
Rated voltage	5 V, ± 3% from basic unit
Power consumption	1.6 W - 2.6 W, appending from communication
Channel supply: • Raged voltage • Power consump. • per channel	• 5 V, ± 10% • 0.15 W, when idling • 0.30 W, during communication
Output voltage for termination (Vcc_Term) • Rated voltage • Max. output current	• 5 V, ± 10% • 20 mA
Weight	Approx. 0.145 kg, 0.32 lbs

LED displays

LED	Status	Description
Status	Off	No supply power, module is isolated
	Green	Module is active and working properly
	Orange	Module has been identified by AC 800F, but has not yet been activated
	Red	Module powered up, but not yet identified, or an error has occurred
RxD0	Green	Receive data on channel 0
TxD0	Green	Transmit data on channel 0
RxD1	Green	Receive data on channel 1
TxD1	Green	Transmit data on channel 1

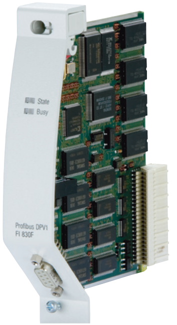
Front panel connections

Front panel connections
Serial - 26-pin female connector


RxD (RS232) Ch0 1
TxD (RS232) Ch0 2
CTS (RS232) Ch0 3
RTS (RS232) Ch0 4
n.o. 5
RxD (RS232) Ch1 6
TxD (RS232) Ch1 7
CTS (RS232) Ch1 8
RTS (RS232) Ch1 9
19 VCC_Term Ch0
20 GND Ch0
21 n.c.
22 n.c.
23 n.c.
24 n.c.
25 VCC Term Ch1
26 GND Ch1
10 RxTx+ (RS485γ Rx+ (RS422) Ch0
11 RxTx– (RS485γ Rx– (RS422) Ch0
12 Tx+ (RS422) CH0
13 Tx– (RS422) CH0
14 n.c.
15 RxTx+ (RS485γ Rx+ (RS422) Ch1
16 RxTx– (RS485γ Rx– (RS422) Ch1
17 Tx+ (RS422) CH1
18 Tx– (RS422) CH1

PROFIBUS module FI 830F

Name	Short description	Article no.
FI 830F	Fieldbus Module, PROFIBUS-DP To use together with PM 802F or PM 803F.	3BDH000032R1



The FI 830F module interfaces to the PROFIBUS fieldbus. It provides functionality according to the PROFIBUS-DP V1 standard (DIN 19245 amendment 1) and supports baud rates up 12 MBd. The module is the master on the PROFIBUS line and allows connecting up to 126 PROFIBUS slaves. Configuration and parameterization is carried out completely with Freelance — no additional external configuration tools are required.

Line redundancy can be achieved using an external device (RLM 01) which drives two PROFIBUS lines in parallel. In conjunction with a second AC 800F the module can also operate in a redundant-master mode without limiting any other feature. See also chapter “3.4.2 AC 800F redundancy concept” on page 36.

Features:
- PROFIBUS-DP Module (DIN 19245)
- Transmission rate up 12 MBd
- Supports up to 126 slaves
- Physical interface: RS485
- Electrical isolation
- Shared memory (256 KB) onboard, to minimize the use of basic unit memory
- Module can be removed or inserted during operation
- Redundant operation, with redundant AC 800F
- G3 compliant Z variant available

Technical data

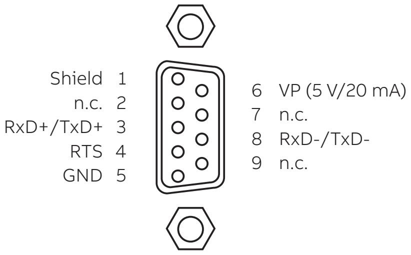
Technical data FI 830F	
Power consumption	In the active state, depends on the communication cycle time: 2.8 W
Max. output current	20 mA for bus termination / repeater supply
Output voltage	5 V, ± 5%
Overvoltage protection	+7.5 V / -5 V either transmission line to GND
Weight	Approx. 0.150 kg, 0.33 lbs

LED displays

LED	Status	Description
Status	Off	No supply power, module is isolated
	Green	Module is active and working properly
	Orange	Module has been identified by AC 800F, but has not yet been activated
	Red	Module powered up, but not yet identified, or an error has occurred
Busy	Off	Module is in passive state on the PROFIBUS
	Green	Module has token and, thus, is acting as the master

Front panel connections

Front panel connections
PROFIBUS 9-pin female connector (DIN 41652)



FF / HSE module FI 840F

Name	Short description	Article no.
FI 840F	Fieldbus Module, FF HSE. Freelance V7.1SP2a or higher is mandatory.	3BDH000033R1

The FI 840F is a high speed ethernet fieldbus module designed for fast data exchange in production engineering with decentralized peripherals.

The FF / HSE module FI 840F is a Fieldbus Foundation-(FF)-Master. Using the Freelance it is possible to configure diverse Fieldbus Foundation devices.

The FF / HSE module FI 840F is designed to connect the AC 800F to a FF / HSE network. It can be mounted on slots F1...F4. It is used if high transmission rates are required or shall be made available for future use. FF / HSE wiring is always a point-to-point connection. Therefore a networks with more than two nodes always requires network switches or hubs.

Features:
- ARM-CPU with integrated Ethernet controller, 32-bit data bus, 32-bit address bus
- Flash EPROM for module CPU and protocol software
- Software / firmware update without EPROM exchange
- Separate memory for module CPU
- Shared memory for data exchange between main processor and module CPU. Data protection by parity check
- Automatic detection if 10BaseT or 100BaseTX is connected
- Electrical isolation for TP interface
- ESD protector on RJ45 socket
- Serial interface / Manchester encoder for generating a serial bit stream
- EEPROM for configuration data and diagnostic data memory independent from battery buffering
- Isolator for electrical isolation of the bus signals
- RJ45 connector with two link LEDs
- G3 compliant Z variant available

Technical data

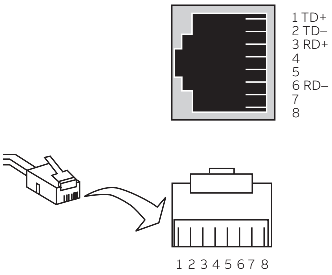
Technical data FI 840F	
Rated voltage	5 V ± 3 % 3.3 V ± 3 % and 2.5 V ± 5 %
Power consumption	In the active state, 1.4 W - 2.1 W depending on communications load
Module memory	8 MBytes synchronous dynamic RAM
Shared memory	1 MByte synchronous static RAM used for data exchange between CPU board and module
Firmware memory	2 MByte Flash EPROM, 32-bit word length, capable of programming in the system and direct programming from AC 800F CPU board
EEPROM	Serial 16 kbit EEPROM, write cycles ≥ 107 buffering time ≥ 10 years
Weight	Approx. 0.150 kg, 0.33 lbs
Static characteristics	
Power consumption	Max. 2.1 W
Medium	100BaseTx cable, category 5
Max. segment length	100 m
Static characteristics	
Max. number of nodes per segment	2
Dynamic characteristics	
Transmission rate 10 Mbit/s or 100 Mbit/s	

LED displays

LED	Status	Description
State	Off	No voltage applied, module is separated
	Green	Power on, module is identified and ready for operation according to the configuration
	Orange	Power on
		Module has been identified by AC 800F
		Intermediate state during start-up
		Configuration mode of the boot loader
	Flashing orange	Power on, module has been identified by AC 800F. Module is not connected to corrected bus physics
	Red	Power on
		Module not yet identified (on a short-term basis during startup)
		An error has occurred during module test

Front panel connections

Front panel connections		
RJ-45 female connector (shielded) There are two integrated LEDs indicating the current communication status. The LEDs are not labeled but can be identified by their color. The upper yellow LED indicates the transmission rate, the lower green LED indicates the communication state.		
LED FF / HSE Speed	Off	Module has detected 10 Mbit/s data connection.
	Static yellow	Module has detected 100 Mbit/s data connection
LED FF / HSE Link	Off	No active link, neither 10Mbit nor 100 Mbit. No communication possible.
	Static green	Active link. Communication possible. No data transfer.
	Flashing green	Active link. Communication possible.



3.4.8 Coated and G3 compliant hardware

G3 compliant components are protected with a special coating against corrosive gases.

The following Freelance ISA71.04 G3 compliant components can be ordered under the same conditions as any ordinary Freelance component. G3 compliance for AC 800F requires exclusively use of –Z components. AM 810F-Z serves for closing unused slots and the behind system plug.

G3 compliant components are identified by “Z“ added to the module name, for example AC 800F-Z-4 MB.

Base units

Name	Short description	Article no.
PM 803F-Z	Base Unit 16 MB, battery-buffered RAM Coated and G3 compliant version. Without operating system. The operating system has to be loaded during software installation. With special Contact Ledge RW 855F. Software V7.1SP2a or higher is mandatory. Restriction: The performance of PM 803F-Z is 5 to 10% below the performance of PM 802F-Z (Classic).	3BDH000530Z1

Power supplies

Name	Short description	Article no.
SA 811F-Z	Power Supply 115/230 VAC Coated and G3 compliant version. To use together with PM 802F-Z or PM 803F-Z. Software V7.1SP2a or higher is mandatory.	3BDH000013Z1
SD 812F-Z	Power Supply 24 VDC Coated and G3 compliant version. To use together with PM 802F-Z or PM 803F-Z. Software V7.1SP2a or higher is mandatory	3BDH000014Z1

Ethernet interface module

Name	Short description	Article no.
EI 813F-Z	Ethernet Module 10BaseT (Twisted pair) Coated and G3 compliant version. To use together with PM 802F-Z or PM 803F-Z. Battery not included. Software V7.1SP2a or higher is mandatory.	3BDH000022Z1

Fieldbus interface modules

Name	Short description	Article no.
FI 810F-Z	Fieldbus Module, 3 channel CAN module. Coated and G3 compliant version. To use together with PM 802F-Z or PM 803F-Z for rack I/O.	3BDH000030Z1
FI 820F-Z	Fieldbus Module, Serial (2 channel) Coated and G3 compliant version. To use together with PM 802F-Z or PM 803F-Z.	3BDH000031Z1
FI 830F-Z	Fieldbus Module, PROFIBUS-DP Coated and G3 compliant version. To use together with PM 803F-Z.	3BDH000032Z1
FI 840F-Z	Fieldbus Module, FF HSE Coated and G3 compliant version. To use together with PM 803F-Z. Software V7.1SP2a or higher is mandatory.	3BDH000033Z1

Auxiliary modules

Name	Short description	Article no.
AM 810F-Z	Cover Module G3 compliant station assembly requires AM 810F-Z for covering unused slots.	3BDH000030Z1
AM 811F-Z	Battery Module Coated and G3 compliant version. To use together with PM 803F-Z Without battery SB 808. Software V7.1SP2a or higher is mandatory.	3BDH000050Z1

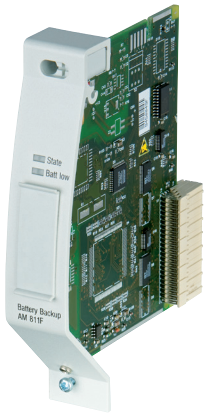
3.4.9 Accessories

3.4.9.1 Battery modules and holder

Name	Short description	Article no.
SY 809F	Battery Holder Without battery SB 808F.	3BDH000042R1
SB 808F	Battery for RAM buffering, 2 pcs.	3BDM000199R1

AC 800F battery module

Name	Short description	Article no.
AM 811F	Battery Module To use together with PM 803F Without battery SB 808. Freelance V7.1SP2a or higher is mandatory.	3BDH000050R1



The battery module can be used in non-redundant controllers with only one Ethernet module to increases the buffering time.

Features:
- Provides battery backup
- Enables redundant battery energy backup on the AC 800F
- G3 compliant Z variant available

Technical data

Technical data AM 811F	
Rated voltage	3.3 V / 5 V ±3%, from CPU board
Power consumption	Approx. 0.28 W
Battery	3.6 V lithium battery, 950 mAh (included in delivery)
Low battery signaling	≤ 3.2 V
RAM and real-time-clock buffering time New battery inserted After “Low“ warning	PM 803F: ≥ 10 days ≥ 5 hours
Weight	Approx. 0.150 kg, 0.33 lbs without buffer battery Approx. 0.170 kg, 0.375 lbs with buffer battery

LED displays

LED	Status	Description
Status	Off	No supply voltage, module is isolated
	Green	Power supply on, module identified and ready to operate as configured
	Orange	Power supply on, module identified and either: • Normal transitory state after module startup • Configuration mode of Boot Loader
	Red	Module power supply on and either: • Module not yet identified (normal for short time during module startup) • Error occurred during module test
Battery (PM 803F)	Off	AC 800F is active, AM 811F not active => buffering from power supply module
		AC 800F is off (no watchdog of the batteries voltage): => buffering from Battery.
	Orange	During battery recovery or start-up phase
	Red	Warning: battery low, no battery inserted, insufficient electrical contact etc.
	Green	Battery inserted and data protection provided.

3.4.9.2 Battery modules and holder

Name	Short description	Article no.
AM 895F	Front Panel, 4 pcs Covering unused slots of AC 800F.	3BDH000044R1

3.4.9.3 Power supply accessories

Name	Short description	Article no.
TK 807F	Supply Cable 115 / 230 VAC, ferrules, 2 m For SA 811F.	3BDM000210R1
TK 808F	Supply Cable 115 / 230 VAC, Euro plug, 2 m For SA 811F.	3BDM000211R1
TK 809F	Supply Cable 115 / 230 VAC, US plug, 2 m For SA 811F.	3BDM000212R1
TK 802F	Supply Cable 24 VDC, ferrules, 2 m For SD 812F.	3BDM000213R1

3.4.9.4 Cables

Name	Short description	Article no.
TK 831F	CAN Cable (3 channel), integral connectors, 0.5 m 3 x 2 x 0.25 mm², Identical with DFA 031. Connection FI 810F to Terminal Block TB 870F.	3BDM000100R1
TK 811F	CAN Cable, open end, ferrules, 3 m 3 x 2 x 0.25 mm², Identical with DFA 011. Connection FI 8x0F to Terminal Block TB 870F.	3BDM000103R1
TK 821F	Serial Cable (2 channel), integral connectors, 0.5 m Identical with DFA 021. Connection FI 820F to Terminal Block TB 870F.	3BDM000150R1
TK 891F	Diagnostics Cable, 5 m Identical with DSU 141.	3BDM000201R1
TK 890F	Diagnostics Cable, 10 m Identical with DSU 141.	3BDM000202R1

3.4.9.5 Clips, Clamps and Miscellaneous

Name	Short description	Article no.
TB 870F	Terminal Block, for serial interface	3BDM000160R1
RW 856F	Mounting Accessory, for enforced wall mounting	3BDM000190R1
RY 885F	Grounding Strap, 2 pcs.	3BDM000169R1
TV 821F	Clip for shielding, 6 mm, 5 pcs.	3BDM000171R1
TV 822F	Clip for shielding, 16 mm, 5 pcs.	3BDM000172R1
TV 823F	Clip for shielding, 16..25 mm, 5 pcs.	3BDM000173R1
TV 824F	Clip for shielding, 23..35 mm, 5 pcs.	3BDM000174R1
TV 825F	Clip for shielding, 25..40 mm, 5 pcs.	3BDM000175R1
TV 831F	Clamp-type terminal, 3..10 mm, 5 pcs.	3BDM000180R1
TV 832F	Clamp-type Terminal, 16…20 mm, 5 pcs.	3BDM000181R1

3.5 The AC 700F controller

The AC 700F controller comes in a really small footprint and high signal density of S700 I/O. The S700 I/O modules are directly plugged to the CPU module or can be used as remote I/O via PROFIBUS. A maximum of eight modules can be connected to one controller. 3rd party I/O‘s can be connected via a MODBUS ASCII / RTU serial bus or via PROFIBUS. AC 700F now also offers expanded flexibility via a pluggable SD card for controller backup and firmware update.

AC 700F is based on hardware that is successfully used as PLC in practice for years in factory automation. The AC 700F controller, as a member of Freelance, has numerous advantages over a PLC based solution: The compact 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.

3.5.1 Hardware and certificates

AC 700F comes with a modular design. The base elements are different types of terminal units, for the CPU module, for the FBP interface module, and for S700 I/O modules. Both, screw type and spring type terminal units are available. The modules can be easily plugged to the terminal units and then the terminal units can be plugged one to the other. The entire controller is then mounted on a DIN rail.

Certificates

The AC 700F controller has the following certificates:
- CE, GL, UL, ISO 9001.

Technical data

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.

The AC 700F controller is designed according to the EN 61131-2 / IEC 61131-2 standards. Data that differ from the IEC 61131 standards are caused due to the high requirements of Maritime Services.

Environmental conditions

The temperature range of AC 700F and S700 I/O extends from 0 °C to 60 °C / 32-140 °F.

Temperature ranges and other environmental conditions		
Ambient temperature	Operating:	Temperature range: 0 °C (32 °F) ..+60 °C (140 °F) With FieldbusPlug: 0 °C (32 °F) ..+55 °C (131 °F) Highly recommended mounting: horizontally **Vertical mounting**: is possible, however, derating considerations should be made to avoid problems with poor air circulation and the potential for excessive temperatures. Temperature range: 0 °C (32 °F) ..+40 °C / 104 °F 50% output load derating
	Storage:	-25 °C (-13 °F)...+75 °C (167 °F)
	Transport:	-25 °C (-13 °F)...+75 °C (167 °F)
Ambient temperature for the battery	Operating	0 °C (32 °F)...+60 °C (140 °F)
	Storage:	-20 °C (-4 °F)...+60 °C (140 °F)
	Storage:	-20 °C (-4 °F)...+60 °C (140 °F)
Humidity		Maximum 95%, without condensation
Air pressure	Operating:	> 800 hPa / < 2000 m
	Storage:	> 660 hPa / < 3500 m

Mechanical stress

Mechanical stress and mounting	
Mounting	Horizontal
Degree of protection	IP 20
Housing	According to UL 94
Vibration resistance according to EN 61131-2	All three axes 2 Hz...15 Hz, continuous 3.5 mm (0.1379 inch) 15 Hz...150 Hz, continuous 1 g (0.04 oz) (4 g (0.14 oz) in preparation)
Shock test	All three axes 15 g (0.53 oz), 11 ms, half-sinusoidal
Mounting of the modules	DIN-rail according to DIN EN 50022, 35 mm (1.38 inch), depth 7.5 mm (0.2955 inch) or 15 mm (0.591 inch), mounting with screws of type M4, fastening torque 1.2 Nm

Product compliance

Electromagnetic compatibility and other directives	
2014/30/EU	EMC Directive
EN 61131-2:2007	Functional, electrical, mechanical, environmental and construction characteristics, service conditions, safety, EMC, user programming and tests applicable to PLCs and the associated peripherals.
2011/65/EU	RoHS Directive (6.2011)

Electric data

Electric data	
Voltages according to EN 61131-2	
Process- and Supply-voltage	24 VDC (-15 %, +20 % without ripple)
Absolute limits	19.2 V...30 V incl. Ripple (see below)
Ripple	< 5 %
Protection against reverse polarity	10 s
Permissible interruptions of power supply as per EN 61131-2	
DC supply	Interruption < 10 ms, time between 2 interruptions > 1 s, PS2
Creepage distances and clearances	
The creepage distances and clearances meet the overvoltage category II, pollution degree 2.	
Power supply units	
Power supply units meeting the PELV specification should be used for powering the modules.	

Insulation test voltages

Routine Test, according to EN 61131-2			
Circuits against other circuitry	230 V	2500 V	High voltage pulse 1.2/50 µs
	120 V	1500 V	
	120-240 V	2500 V	
24 V circuits (supply, 24 V inputs / outputs), if they are electrically isolated against other circuitry.		500 V	
COM interfaces, electrically isolated		500 V	
Ethernet		500 V	
24 V circuits (supply, 24 inputs / outputs), if they are electrically isolated against other circuitry		350 V	AC voltage during 2 seconds
COM interfaces, electrically isolated		350 V	
Ethernet		350 V	

3.5.2 Central processing unit PM 783F

Name	Short description	Article no.
PM 783F	Central Processing Unit (2 MB) Without operating system. The operating system has to be loaded during software installation. Needs external 24 VDC power supply. Software version 2013 SP1 RU04, 2016 SP1 RU03 or higher is mandatory. For details, refer to the Freelance AC 700F Compatibility Matrix (2PAA106303D0002 C). Terminal Base TB 711F and Battery TA521 are not included	3BDH000364R0005

ABB
PM 783F
RUN
DIAG
VAL
CFG
ESC
OK
WARNING
PWR
RUN
ERR
ETH
FBP
SER
DIAG
CPU
UP 24VDC 10W

The Central Processing Unit (CPU) module is equipped with a high-performance processor for fast loop cycle times. It comes with on-board 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 cyclic 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 status and diagnostic information directly at the module. Furthermore, you can lock the controller via the keys. This means, the controller can be blocked for downloads of application and firmware to enhance security. The status, if the controller is locked or unlocked is shown on the display.

Technical data

Technical data PM 783F		
CPU		Freescale PowerPCTM
RAM		Program memory (battery backed up) 2 MB SRAM Internal memory 8 MB SDRAM, 4 MB FLASH ROM
Processing time for 1000 instructions		0.71 ms for binary instructions
		0.84 ms for word instructions
		1.36 ms for floating point instructions
Max. number of I/O modules on I/O bus (direct I/O)		8
Power supply		24 V DC
Max. power dissipation within the module		10 W
Current consumption from 24 VDC		80 mA (max)
Inrush current at 24 VDC		1 A^2s
Data backup source		Lithium battery
Data buffering time at 25 °C / 77 °F		Approximately 1.5 years
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	8 tasks
	Cyclic (as fast as possible)	1 PLC type task
	Event driven	Upon any of these events: “Run, Stop, Warm start, Cold start, Error“
Serial interface “SER“ (COM1) (See "Terminal Base TB 711F" on page 59)	Physical link:	Configurable for RS-232 or RS-485 (from 1200 bps to 38400 bps)
	Connection:	Pluggable terminal block, spring connection
	Usage:	Modbus • ASCII (Master / Slave) • RTU (Master / Slave) • IEC 60870-5-101 Telecontrol protocol
Serial interface “DIAG“ (COM2) (See "Terminal Base TB 711F" on page 59)	Physical link:	RS-232
	Connection:	SUB-D female connector
	Usage:	For diagnostics
Onboard network interface	Connection:	1 x Ethernet (RJ45) 100 Mbit/s
	Usage:	• Modbus TCP • Telecontrol IEC 60870-5-104
LEDs, LCD display, 8 function keys		For RUN / STOP switch-over, status displays and diagnostics
Weight (CPU without Terminal Base)		150 g / 5.29 oz.
Dimensions (CPU without Terminal Base)	Width	67.5 mm, 2.66 inches
	Height	76 mm, 2.99 inches
	Depth	54 mm, 2.13 inches

3.5.3 PROFIBUS module CI 773F

Name	Short description	Article no.
CI 773F	Communication Interface, PROFIBUS DP Master DP-V0/V1, 12 MBit/s D-Sub terminal, 9-pole Software version 2013SP1 or higher is mandatory White housing Requires one coupler bus slot on the CPU module on PM 904F, PM 902F, PM 901F or Terminal Base TB 711F.	3BDH000395R0001

CI 773F
PWR
STA
RUN
L

For more details please see "Communication Interface CI 773F" on page 25.

3.5.4 CPU terminal base TB 711F

Name	Short description	Article no.
TB 711F	CPU Terminal Base 24 VDC, 1x Coupler slots, Ethernet RJ45.	3BDH000365R0001

Technical data TB 711F	
Connection of the 24 VDC process voltage	With a 5-pole removable terminal block
Slots	1 CPU, 1 Communication module (not used currently)
Interfaces	Field I/O: 1 for I/O-Bus Serial ports: 2 (“SER“ (COM1), “DIAG“ (COM2)) Networking: 1 Ethernet (RJ45) PROFIBUS Master port
Weight	175 g / 6.17 oz.
Dimensions (with CPU inserted)	Width 95.5 mm, 3.75 inches Height 135 mm, 5.31 inches Depth 75 mm, 2.95 inches