# SattCon 200

## Control System Versions 2.4 and 2.5



The SattCon 200 is a control system intended for various size applications and includes a powerful PLC with numerous advanced functions.

SattCon 200 programs can be prepared in the form of sequence diagrams, function blocks, structured text, instruction lists and/or ladder diagrams using the ABB Automation PC-based programming tool DOX 10.

SattCon 200 has the following features:

- Compact and modular design - easy to expand.[a]
- Optimization of applications through a choice of several CPU units giving a range of performance.
- Text handling for alarms, reports, protocols and operator communications.
- Central and/or Remote I/O.
- Connection to Central or Remote rack-based I/O.
- Connection to Alert I/O.

- Comprehensive PID Controllers.
- Autotuning for optimising PID Controller parameters.
- Floating-point calculation.
- Time event control functions.
- Communication with other systems via Ethernet (TCP/IP), SattBus, serial channels (COMLI) or PROFIBUS-DP Gateway.
- Dial-up functions (Hayes modem).
- DOX 10 programming via network.
- Application program backup[b].
- Fast loop interrupt program (to 1 ms in CPU50).

[a] The SattCon 200 hardware is fully described in separate data sheets.
[b] Available from SattCon 200 Control System, version 2.5.

**ABB**

## Central System

The central system consists of a number of different units including CPU, communication interfaces, backup and power supply. They are mounted on the modular backplane (200-BPN) units, each of which can accommodate two system units. The maximum number of backplanes in the Central System is eight.

It is possible to have more than one Series 200 Power Supply to cater for power redundancy situations. If more than one power supply is required to supply the central units, it is simply a matter of inserting another one into a vacant backplane slot.

## I/O System

The Series 200 I/O system is modular and flexible, incorporating adapters, terminal bases and I/O interface units.

Two I/O systems can be supported, namely, Central and Remote.

The Central I/O system has the I/O located together with the Central System in one cabinet. The distributed I/O System has the I/O located outside the cabinet.

The I/O interface units are common to both Central and Remote I/O systems.

## Central I/O

The Central I/O is connected via the adapter 200-ANN. Each adapter can accomodate up to eight I/O interface units. Further adapters to a maximum of six in total can be connected in series. These 200-ANN adapters form the Central I/O System in conjunction with the terminal bases and I/O interface units. Each adaptor can accommodate up to eight I/O interface units.



Ethernet

SattBus    PROFIBUS-DP

Serial communication

Central I/O[c]

Remote I/O

ControlNet

Central rack-based I/O[c]

Remote rack-based I/O

Alert I/O[c]

## Central Rack-based I/O

Rack-based I/O systems can be connected to the Central System via the adaptor board 200-RANN situated in the I/O rack. Each Central I/O rack may connect up to two further expansion racks.

## Remote I/O – ControlNet[d]

Remote I/O can be connected to the Central System through one or two ControlNet communications interface units (200-CICN). The Remote I/O system adaptor used is a 200-ACN unit. Up to 31 of these adaptors may be connected to a single 200-CICN.
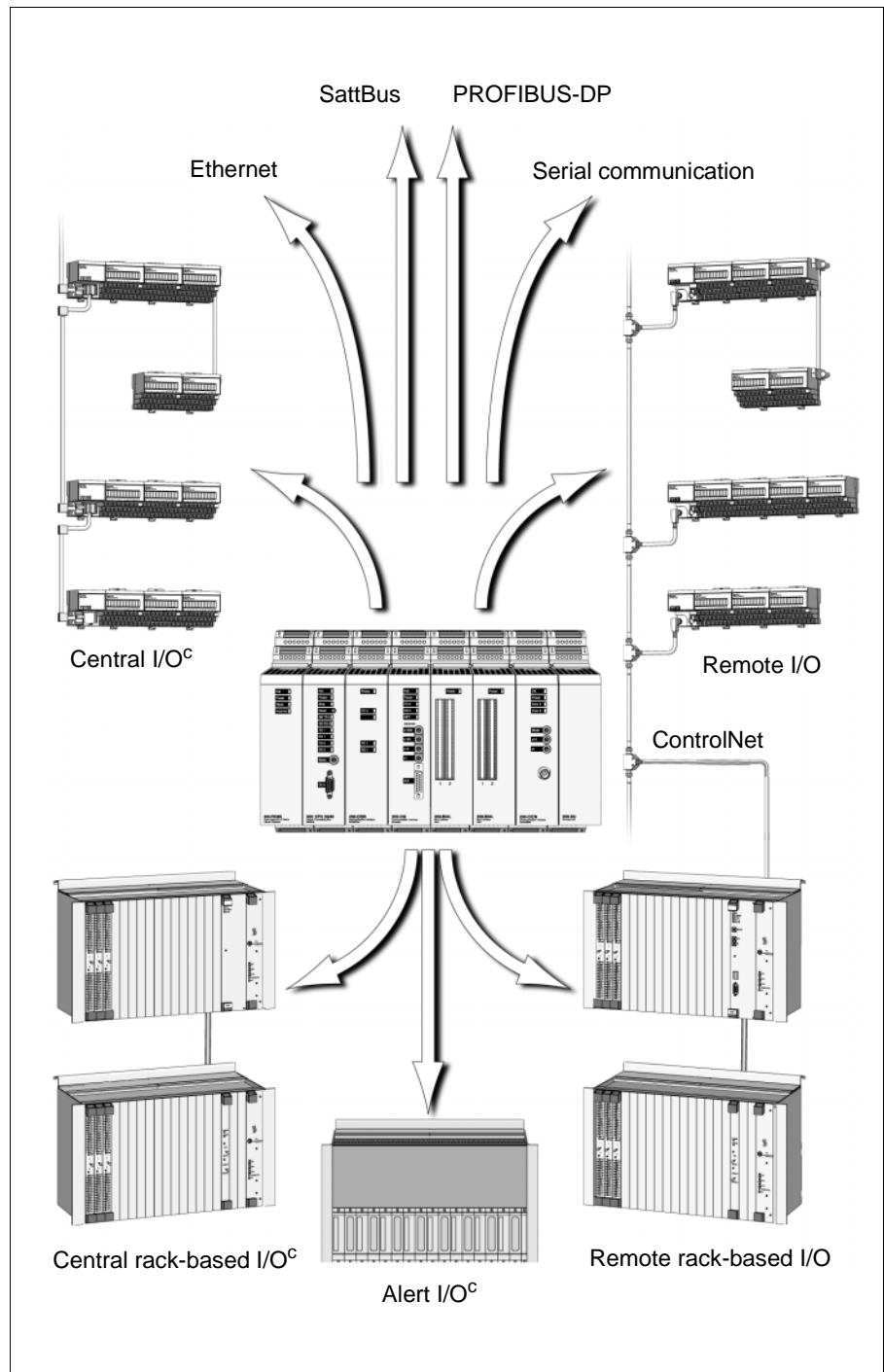
## Remote I/O – PROFIBUS-DP

Remote I/O can be connected to the Central System through a PROFIBUS-DP network using a 200-CIPB/DP communication interface unit. The Remote I/O system adaptor used is a 200-APB unit. Up to 99 of these adaptors may be connected to a 200-CIPB/DP.

Communication is established using a PROFIBUS-DP Gateway. Other PROFIBUS-DP Slave products on the market can also be connected.

## Remote Rack-based I/O

Remote rack-based I/O can be connected to the ControlNet network through the 200-RACN adaptor board situated in the rack. Each Remote rack may connect to one further expansion rack.

## Alert I/O

The Alert I/O system can be connected to the SattCon 200 Control system using an Alert upgrade kit.

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[c] Only one of the three Central I/O systems can be connected simultaneously – the Central I/O, the Central Rack-based I/O or the Alert I/O.
[d] ControlNet™ is a trademark of Allen-Bradley Company, Inc., a Rockwell International Company.

## System Monitoring

The SattCon 200 system has an error diagnostic handling facility which monitors the system program and hardware for errors. These are indicated by predefined variables' status and stored in an error log.

During start-up the SattCon 200 system performs tests to ensure fault free CPU operation.

The CPU load, as a percentage, can be viewed on screen and is stored in a system variable.

All I/O interface units have status information which may be used for I/O unit supervision within the application program.

## Programming

Configuration and programming of the SattCon 200 system is performed using the PC-based programming package DOX 10. This can either be run in DOS or as a DOS product under Windows™.

Calculation programs are performed in a Structured Text format (ST) using a Windows-based editor.

DOX 10 provides both off-line and on-line programming facilities.

The clear and easy to interpret DOX 10 presentation of the program is converted to machine code and sent in this compact form to the SattCon 200 system.

DOX 10 offers a choice of four programming methods: Sequential Function Chart (SFC), Function Block Diagram (FBD), Instruction List (IL) and Ladder Diagram (LD). The user can change between the four methods at will to select the programming method most appropriate to an application or program section, or according to personal preference.

DOX 10 provides facilities for generating and modifying programs, documentation and testing. It can also, through in-built diagnostic features (including a terminal emulator), adjust operating parameters and perform fault-finding and maintenance operations.

## Programming Functions

The SattCon 200 system includes 16 separate PLC program modules which use a common PLC memory area. Each program module can have an individual scan time.

In addition to the common logic operations, the instruction repertoire also includes SR flip-flops, edge detection, conditional jumps, subroutines, 16 and 32 bit integer arithmetic, floating point arithmetic, equivalence testing, indirect addressing, multiplexing, shift registers, BCD to binary conversion....

### Registers

The SattCon 200 system has an impressive number of registers for data storage, recipe handling, process parameters, communication, operator interface dialogue....

### Timers

There are some 1,000 Timers in the SattCon 200 system. There are 50 at a 10ms time base, 100 at a 100ms time base and 850 at a 1s time base.
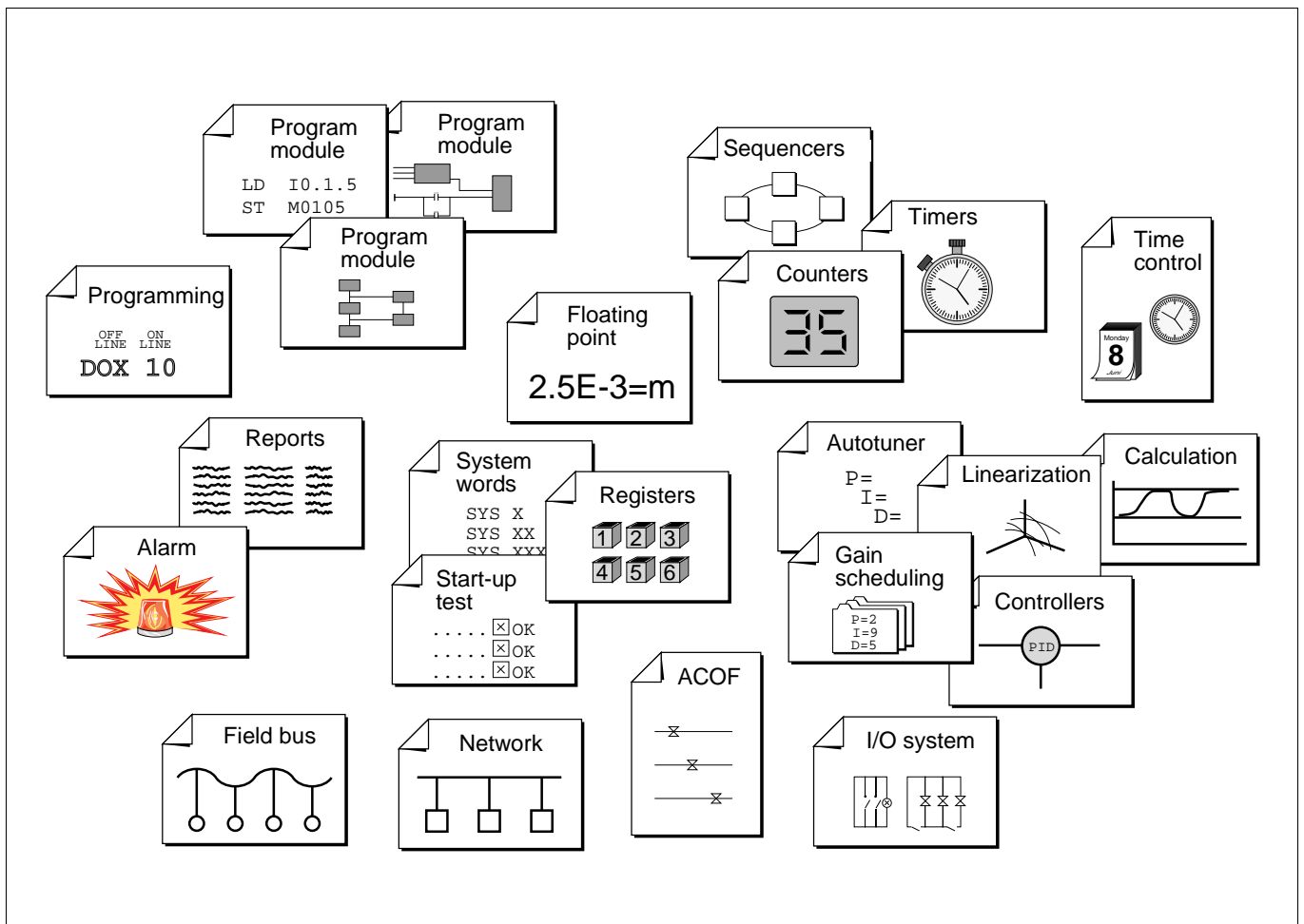
## Counters

There are some 1,000 Counters in the SattCon 200 system, each of which can count up to 65,535 events. The individual counters are clocked at a rate equivalent to the cycle time of the PLC program in which they are used.

## Sequencers

There are 256 sequence registers, each with 100 steps in the SattCon 200 system.

## Text Handling

A comprehensive array of powerful text handling functions are included in the SattCon 200 system. They are used to create user-friendly operator command menus, operational reports and input formulas. Also, ASCII communication protocols may be programmed and the system can be tailored to the application.

## Alarm Handling

Process alarms can be printed to one or more alarm printers and/or VT300 series compatible terminals from the SattCon 200 system. The terminal display alarm list shows the alarm status including indication of whether or not an alarm has been acknowledged. The alarm conditions can also be interrogated by a supervisory system via Ethernet, SattBus or COMLI.

## Dial-up (Hayes Modem)

The SattCon 200 has a built-in dial function to facilitate communication with other systems via a modem and COMLI. The telephone number and the modem commands are held in SattCon 200 text strings. The modem must be of a Hayes type.

## Measurement Units (PHYS)

All analogue values can be displayed in physical engineering units from the SattCon 200 system. This is used for presentation of process data in alarm texts and process mimics.

## Feedback Monitoring (ACOF)

Automatic Check Of Feedback is possible in the SattCon 200 system. This monitors process devices that have feedback facilities such as valves and motors.

An alarm event occurs if the expected signals from the process devices are not received within a predetermined time period.

## Time Clock Control

TCC (Time Clock Control) allows operations to be activated on particular days or for predetermined periods. Process start-time optimization can also be implemented using TCC.

## COMLI

The SattCon 200 system includes COMLI which is a basic master/slave communication protocol permitting data to be transferred to and from other systems.

## SattBus

The SattCon 200 system includes SattBus, an integrated token-passing field bus.

The SattBus network permits rapid transfer of data to and from other systems.

The SattCon 200 system is capable of SattBus supervision functionality.

## Ethernet and TCP/IP

The SattCon 200 system includes SattBus communication on TCP/IP which is used to interconnect several systems on Ethernet IEEE 802.3.

## DOX 10 Programming over a Network

Programming and maintenance of the SattCon 200 system can be achieved by SattBus or Ethernet, in addition to the standard serial channels.

## PID Controllers

Included in the SattCon 200 system are powerful, comprehensive PID Controllers providing functions such as cascade control, parameter control and feed-forward.

## Autotuner

Within the SattCon 200 system an Autotuner determines the dynamics of a process and automatically calculates the correct parameter values for the PID Controller used. A parameter table divided into four operating zones improves the Controller's ability to control a process with precision.

The gain scheduling facility allows a non-linear process to be tuned so that it will operate in a stable manner within the entire operating range.

## Linearization

The linear module is used to create a function with one or two input variables and one output variable. The function is defined in discrete points and represents a surface in a three dimensional co-ordinate system.

## Floating Point Calculation

Mathematical functions written in a high level language (Structured Text) can be integrated with PID controller functions or be separately used in program modules. Floating point calculations for controllers, mean value calculations, array handling, statistical analyses in process... can easily be made.

## Arithmetic and Instrumentation Functions

A number of ready-to-use mathematical functions for use with arithmetic, data handling and analogue signals are included in the SattCon 200 system. Addition, subtraction, maximum selection, integration and limitation of analogue signals are some examples of the available functions.

## Application Program Backup[e]

The application program can be saved and loaded using the Backup Unit 200-BUP. A "SmartMedia" memory card is used for the application program storage.

[e] Available for SattCon 200 Control System, version 2.5.

# Technical Data for Supported Central System and I/O System Units

## Central System Units

| | |
|---|---|
| **200-CI232** | Communication interface for 2 RS232 serial channels |
| **200-CI485G** | Communication interface for 2 RS485 serial channels |
| **200-CISB** | Communication interface for 2 SattBus channels |
| **200-CICN** | Communication interface for 1 ControlNet channel |
| **200-CIE** | Communication interface for 1 Ethernet channel |
| **200-CIPB/DP** | Communication interface for 1 PROFIBUS-DP channel (used as COMLI-PROFIBUS-DP GATEWAY) |
| **200-BUP[f]** | Application program Backup unit |
| **200-PSMG** | Master power supply |
| **200-PSSG** | Slave power supply |
| **200-DU** | Dummy unit for vacant slot protection |
| **200-BIAL** | Alert I/O bus interface |

## I/O System Units

| | |
|---|---|
| **200-IB16** | 16 digital DC inputs, 24 V DC |
| **200-IA8** | 8 digital AC inputs, 120 V AC |
| **200-IE8** | 8 analogue inputs; 0–20 mA, 4–20 mA, 0–10 V, ±10 V |
| **200-IR8** | 8 three-wire RTD inputs |
| **200-IR8R** | 8 four-wire RTD inputs |
| **200-IT8** | 8 thermocouple inputs |
| **200-IP2** | 2 pulse counter interfaces, each with 4 inputs, 100 kHz |
| **200-IP4** | 4 frequency counter interfaces, each with 2 inputs, 100 kHz |
| **200-OB16** | 16 digital DC outputs, 24 V DC |
| **200-OB16P** | 16 digital short-circuit proof DC outputs, 24 V DC |
| **200-OB8EP** | 8 digital short-circuit proof DC outputs, 24 V DC |
| **200-OA8** | 8 digital AC outputs, 120 V AC |
| **200-OW8** | 8 relay outputs, 230 V AC |
| **200-OE4** | 4 analogue outputs; 0–20 mA, 4–20 mA, 0–10 V, ±10 V |
| **200-IB10xOB6** | 10 digital DC inputs and 6 digital outputs, 24 V DC |
| **200-IE4xOE2** | 4 analogue inputs and 2 analogue outputs; 0–20 mA, 4–20 mA, 0–10 V, ±10 V |
| **200-DUTB** | Dummy unit for vacant slot protection |
| **200C-IB16** | 16 digital DC inputs, 24 V DC, max. pulse frequency 1500 Hz |
| **200C-IE8** | 8 analogue inputs; 0–20 mA, 4–20 mA |
| **200C-OB16P** | 16 digital short-circuit proof DC outputs, 24 V DC |
| **200C-OE4** | 4 analogue outputs; 0–20 mA, 4–20 mA |
| **200C-IB10xOB6P** | 10 digital DC inputs and 6 digital outputs, 24 V DC |
| **200C-IE4xOE2** | 4 analogue inputs and 2 analogue outputs; 0–20 mA, 4–20 mA |

## I/O Adapters

| | |
|---|---|
| **200-ANN** | Adapter for central I/O system |
| **200-ACN** | Adapter for remote I/O system using ControlNet |
| **200-APB** | Adapter for remote I/O system using PROFIBUS-DP |
| **200-RANN** | Rack adapter board for central rack-based I/O |
| **200-RACN** | Rack adapter board for remote rack-based I/O |

## Rack-based I/O[g]

| | |
|---|---|
| **IDPG24** | 32 inputs DC |
| **IDPG48** | 32 inputs DC |
| **IAPG230** | 16 inputs AC |
| **ODPG.8** | 32 outputs DC |
| **ORG24** | 16 relay outputs |
| **ODSG** | 32 inputs DC (short-circuit proof) |
| **IPA4** | 4 8-bit counter inputs or 2 16-bit counter inputs |
| **IBA** | 8 analogue inputs |
| **OCAHG** | 4 analogue outputs |
| **OCVA** | 2 analogue outputs |

## Alert I/O

| | |
|---|---|
| **IACDC** | 8 inputs DC or AC |
| **I24AC** | 8 inputs 24 V AC |
| **OAC** | 8 outputs AC |
| **ODC** | 8 outputs DC |
| **OREL** | 8 relay outputs |
| **IBCD** | 4 BCD inputs |
| **OBCD** | 4 BCD outputs |
| **PROX** | 8 inputs for proximity switches |
| **LEV** | 4 inputs for level switches |
| **COUNT** | 4 counter inputs |
| **COUNT2** | 2 counter inputs |
| **IAN** | 8 analogue inputs |
| **OAN** | 2 analogue outputs |

[f] Available for SattCon 200 Control System, version 2.5.
[g] Old rack-based I/O boards can also be used if they belong to the categories described in the appendix "Rack-based I/O" of the SattCon 200 section of the DOX 10 User's Manual.

# Technical Data for SattCon 200 Versions 2.4 and 2.5, and DOX 10 Versions 3.3 and 3.4

| CPU-200 Functions | CPU20/10 | CPU30/10 | CPU30/20 | CPU30/30 | CPU30/40 | CPU40/40 | CPU50/40 | CPU50/80 |
|---|---|---|---|---|---|---|---|---|
| Clock frequency in MHz | 16.7 | | | | | 28.8 | 50 | |
| RAM in Mbyte | 1 | | 2 | 3 | | 4 | | 8 |
| Instruction time bit/word (typically) in $\mu$s | 0.6/1.0 | | | | | 0.4/0.6 | 0.07/0.07 | |
| Fast loop (min.) in ms | 5 | | | | | | 1 | |
| SattBus on CPU | No | Yes, one channel | | | | | No | |
| SattBus channels (max.) | 16 | | | | | | | |
| ControlNet channels (max.) | 2 | | | | | | | |
| Ethernet channel (max.) | 1 | | | | | | | |
| Number of I/O units[h] | 32 | | 64 | 96 | 128 | 512 | | |
| Number of boards (max.) | 16 | | 32 | 48 | 64 | 256 | | |
| Number of I/O & System unit types[i] | 20 | | | | | | | |
| Memory bits | 8,192 | 16,384 | | | | | | |
| Registers | 10,000 | 16,384 | | | | | | |
| Counters | 1,000 | | | | | | | |
| Jump Labels | 2,100 (2,000+100) | | | | | | | |
| Sequencers | 256 | | | | | | | |
| Timers | 1,000 (50+100+850) | | | | | | | |
| TCC modules | 0 | 256 | | | | | | |
| ACOF modules | 1,000 | | | | | | | |
| PHYS modules | 1,000 | | | | | | | |
| Communication areas | 30 | 50 | | 150 | | | | |
| Calculation modules | No | Yes | | | | | | |
| Loop members[j] | 0 | 8 | 16 | 24 | 32 | 64 | | |
| Text strings | 2,000 | 10,000 | | | | | | |
| Text scan modules | 100 | 2,000 | | | | | | |
| Text storage in kbytes | 0–256 | 0–512 | 0–768 | | 0–1024 | | | |
| Text/event queue | 10–1,000 positions. 0–16 kbytes/channel | | | | | | | |
| Alarm scan modules | 0 | 2,000 | | | | | | |
| Alarm list | 0 | 10–1,000 positions. 0–91 kbytes | | | | | | |
| Alarm queue | 0 | 10–1,000 positions. 0–19 kbytes/alarm channel | | | | | | |
| COMLI alarm queue | 0 | 10–1,000 positions. 0–83 kbytes | | | | | | |
| PLC program[k] in kbytes | 5–200 | 5–300 | 5–500 | 5–750 | 5–1,000 | | 5–1,500 | 5–3,000 |

[h] The maximum number of I/O units includes the total number of I/O units and Series 200 I/O rack boards used. One I/O rack board is equal to two Series 200 I/O units. For example, 200-CPU30/20 can be equipped with 44 remotely connected Series 200 I/O units and 10 rack I/O boards.

[i] I/O and System units (other than adaptors) which can be selected in the DOX 10 hardware configuration.

[j] Loop members consist of PID controllers, Autotuners, 3-P controllers, Linear modules and Loop calculation modules.

[k] Minimum size is 5 kbytes. There is no upper limit specified because it depends on the other functions used. The values in the table are estimated minimum upper limits.