

## SYSMAC Programmable Controller

## CQM1

**Six CPUs Available, Four of Which Have a Special I/O Function such as Absolute Encoder Feedback, 50 KHz Pulse I/O or Analogue Timers**

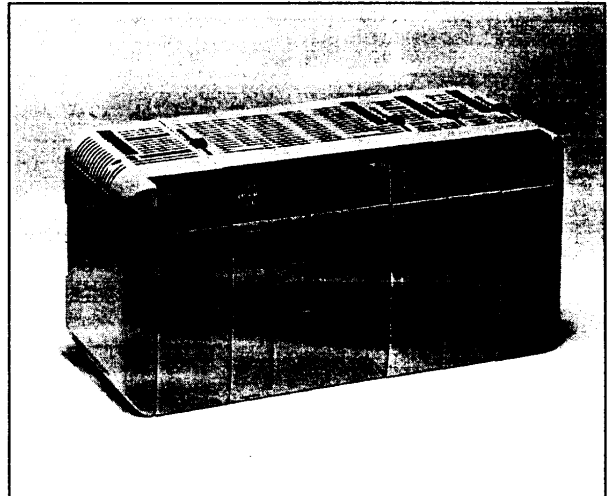
3.2K word to 7.2K word user memory and 1K word to 6K word data memory with a maximum I/O of 192.

Instruction execution from 0.5  $\mu$ s.

Built-in hard-wire interrupts will operate associated sub-routines in a guaranteed 1.0 ms from an input being made.

Up to three high-speed programs with execution times of only 0.5 ms can be placed within the normal program.

Maximum of 137 instructions including Keypad Input (Hex and BCD), Scale, Sum calculate, FCS calculate,



double-length maths with mark, PWM output, positioning and PID control.

## CQM1 PLC Overview

### Position Control

- All CPUs have a resident instruction enabling a 1 KHz pulse output to be directed to one standard output. Also, a Special CPU has the ability to control a further 2 stepper or servo motors (via a suitable driver) at a rate of up to 50 KHz. Speed, direction, acceleration and position can all be set.
- A CPU is available with all standard features, plus the ability to accept two Absolute Encoder inputs (gray scale), thus facilitating advanced position detection.
- All CPUs have 4 hard-wire interrupts with a guaranteed reaction time of 1.0 ms, these interrupts can be prioritised by the user. Alternatively, any number of these inputs can be designated as 1 KHz high-speed counters.
- Every CPU has at least one dedicated high-speed counter (in addition to those configurable as interrupts) which has a response of 2.5 KHz in bi-directional mode and 5 KHz in incremental mode.
- Advanced counting is further enhanced by a CPU with two 50 KHz pulsed inputs in addition to its standard features.

### Networking

- In-built, bi-directional RS232 ports both for programming and communication to devices such as printers, bar-code readers, temperature controllers and Man-machine Interfaces.
- CQM1 can be a master or slave via these RS232 ports, with the user being able to easily change the ports' configuration from 'ASCII' to 'Host' Mode.

- ASCII text to be stored by the CQM1 CPU can be loaded by Omron Ladder Support Software (LSS) avoiding the need for time-consuming conversions.
- CQM1 can be easily incorporated into a Sysmac Bus network on RS485 using a unique I/O Link Map structure, C200H/S being the master.
- PLC to PLC link can be performed between CQM1 CPUs through their in-built ports.
- Up to 16 input points and 16 output points can be distributed to a maximum distance of 500 metres via a B7A interface module.
- Resident Frame Check Sum instruction simplifies communications when CQM1 is a master to another RS232 device.

### Process Control

- PID loop instruction with option for Autotuning.
- Four channel analogue input module, -10 to +10V, 1 to 5 V, 0 to 10 V, 4 - 20 mA. Includes mean data calculation function. Data is convertible to engineering terms with 'Scale' command. Two channel analogue output module available.
- Up to two, bi-directional RS232 ports enable CQM1 to communicate to devices such as Temperature controllers, Process controllers and Instrumentation.
- Can be incorporated in an RS485, 187.5 K baud Omron Sysmac Bus network with Temperature and Process controllers, Load Cells and PID modules.
- Two channel Temperature Control module with PID algorithm.

# Specifications

## ■ Characteristics

| Item                         | CQM1-CPU11-E/CPU21-E                                                                                                                                                                                                                                                                                   | CQM1-CPU41-E/CPU42-E/CPU43-E/CPU44-E                     |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| I/O points                   | 128 points max.                                                                                                                                                                                                                                                                                        | 192 points max.                                          |
| Control method               | Stored program method                                                                                                                                                                                                                                                                                  |                                                          |
| I/O control method           | Cyclic scan method with direct output; immediate interrupt processing                                                                                                                                                                                                                                  |                                                          |
| Programming language         | Ladder diagram                                                                                                                                                                                                                                                                                         |                                                          |
| Instruction length           | 1 step per instruction, 1 to 4 words per instruction                                                                                                                                                                                                                                                   |                                                          |
| Types of instructions        | 117 instructions (14 basic and 103 special instructions)                                                                                                                                                                                                                                               | 137 instructions (14 basic and 123 special instructions) |
| Instruction execution time   | Basic instructions: 0.5 $\mu$ s to 1.5 $\mu$ s (eg. LD=0.5 $\mu$ s, TIM=1.5 $\mu$ s)<br>Special instructions (eg. MOV(21)=24 $\mu$ s)                                                                                                                                                                  |                                                          |
| Program capacity             | Program Memory: 3.2K words<br>Data Memory: 1K words                                                                                                                                                                                                                                                    | Program Memory: 7.2K words<br>Data Memory: 6K words      |
| Interrupt inputs             | 4 points (IN00000 to IN00003)                                                                                                                                                                                                                                                                          |                                                          |
| Backup function              | The contents of HR, AR, CNT, DM and RTC areas are maintained during power interruptions                                                                                                                                                                                                                |                                                          |
| Battery life (memory backup) | The life of the battery is 5 years whether or not the RTC function is used.<br>The possible memory backup time of the Unit varies with the ambient temperature.<br>Replace the battery within a week after the battery error indicator lights. Do not spend more than 5 minutes replacing the battery. |                                                          |
| Self-diagnostic function     | CPU error (WDT), memory check, I/O bus check, battery error, host link error and CPU bus error                                                                                                                                                                                                         |                                                          |

## ■ Data Areas

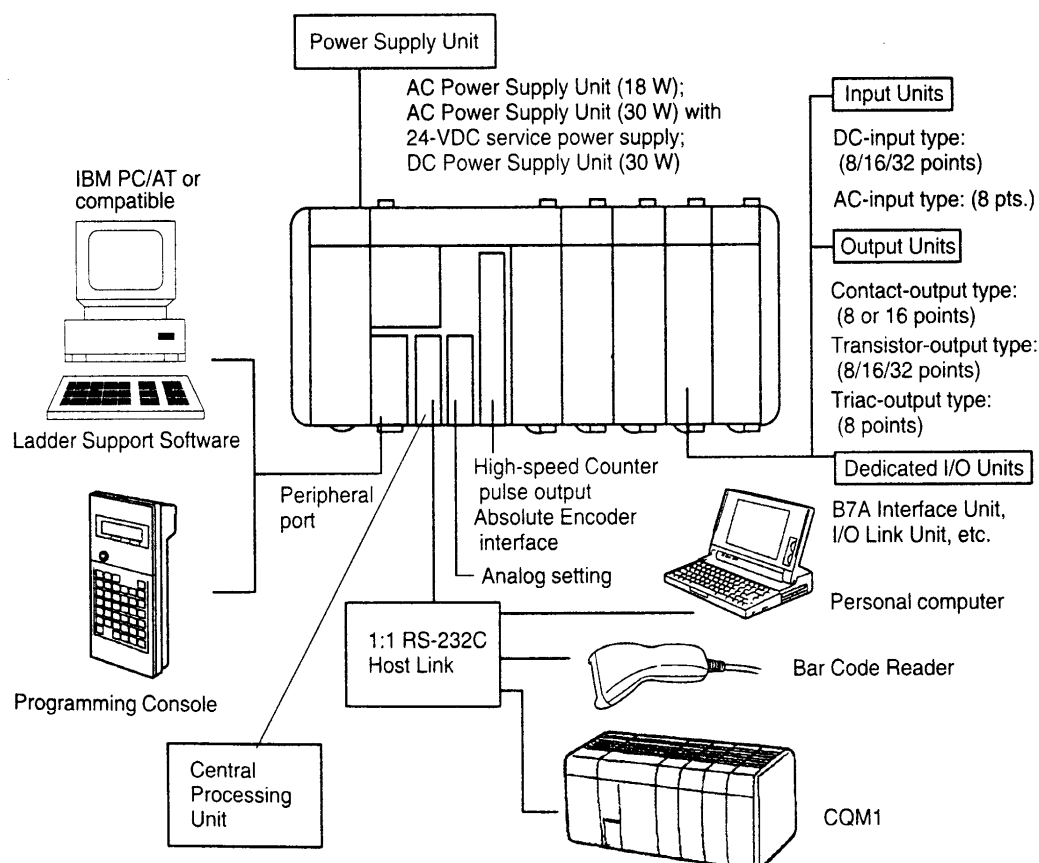
| Name                                |             | CPU                                                            | I/O points        | Words                                                                                              | Bits                    | Comments                                                                                                                                                         |
|-------------------------------------|-------------|----------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O words                           | Input Area  | CPU11-E<br>CPU21-E                                             | 128 points max.   | IR 000 to<br>IR 007                                                                                | IR 00000 to<br>IR 00715 | Input Areas: Input words are assigned to Units that bring inputs into the PC.<br>Output Areas: Output words are assigned to Units that send outputs from the PC. |
|                                     | Output Area |                                                                |                   | IR 100 to<br>IR 107                                                                                | IR 10000 to<br>IR 10715 |                                                                                                                                                                  |
|                                     | Input Area  | CPU41-E<br>CPU42-E<br>CPU43-E<br>CPU44-E                       | 192 points max.   | IR 000 to<br>IR 011                                                                                | IR 00000 to<br>IR 01115 |                                                                                                                                                                  |
|                                     | Output Area |                                                                |                   | IR 100 to<br>IR 111                                                                                | IR 10000 to<br>IR 11115 |                                                                                                                                                                  |
| Work Area                           |             | CPU11-E<br>CPU21-E<br>CPU41-E<br>CPU42-E<br>CPU43-E<br>CPU44-E | 2,720 points max. | Any words from IR 001 to IR 229 that are not being used as I/O words or for the MACRO instruction. |                         | These words and bits can be used as work words and bits in the program.                                                                                          |
| MACRO instruction words             | Input       |                                                                | 64 points         | IR 096 to<br>IR 099                                                                                | IR 09600 to<br>IR 09915 | These words are used by the MACRO instruction to receive data from I/O bits.                                                                                     |
|                                     | Output      |                                                                |                   | IR 196 to<br>IR 199                                                                                | IR 19600 to<br>IR 19915 |                                                                                                                                                                  |
| Internal high-speed counter PV Area |             |                                                                | 2 words           | IR 230 to<br>IR 231                                                                                | IR 23000 to<br>IR 23115 | These words are used to store the counter's PV.                                                                                                                  |
| SR Area                             |             |                                                                | 192 points        | SR244 to<br>SR255                                                                                  | SR 24400 to<br>SR 25515 | The SR Area bits are used for special functions, such as flags and control bits.                                                                                 |
| Temporary Memory Area               |             |                                                                | 8 points          | —                                                                                                  | TR0 to TR7              | The 8 bits of the TR Area are used for branching in complex ladder diagram programs.                                                                             |
| Holding Area                        |             |                                                                | 1,600 points      | HR00 to HR99                                                                                       | HR0000 to<br>HR9915     | Data in the HR Area retains its status when PC power is interrupted.                                                                                             |
| Auxiliary Area                      |             |                                                                | 448 points        | AR00 to AR27                                                                                       | AR0000 to<br>AR2715     | The AR Area bits are used for special functions, such as flags and control bits.                                                                                 |

| Name                 |                | CPU                                                            | I/O points   | Words                                                                     | Bits             | Comments                                                                                                                                                                                                                                                 |
|----------------------|----------------|----------------------------------------------------------------|--------------|---------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link Area            |                | CPU11-E<br>CPU21-E<br>CPU41-E<br>CPU42-E<br>CPU43-E<br>CPU44-E | 1,024 points | LR00 to LR63                                                              | LR0000 to LR6315 | The LR Area is used as a common data area to transfer information automatically between two CQM1 PCs. Data links can involve 8, 16 or 32 LR words. LR words that are not used in a data link can be used as work words in programming.                   |
| Timer/Counter Area   |                |                                                                | 512 points   | TIM/CNT000 to TIM/CNT511                                                  |                  | TC numbers are used to define timers and counters.                                                                                                                                                                                                       |
| High-precision timer |                |                                                                | 3 points     | —                                                                         |                  | Adjustable in increments of 0.1 ms and set in increments of 0.5 ms.                                                                                                                                                                                      |
| Data Memory          | READ/<br>WRITE | CPU11-E<br>CPU21-E                                             | 1,024 words  | DM0000 to DM1023                                                          |                  | Data in the DM Area is accessible only by word and retains its status when PC power is interrupted. Read-only DM cannot be overwritten from the program. DM6600 to DM6655 contain the PC Setup data. Make the PC Setup settings before operating the PC. |
|                      | READ only      |                                                                | 512 words    | DM6144 to DM6655 (DM6600 to DM6655 contain the PC Setup data)             |                  |                                                                                                                                                                                                                                                          |
|                      | READ/<br>WRITE | CPU41-E<br>CPU42-E<br>CPU43-E<br>CPU44-E                       | 6,144 words  | DM0000 to DM6143                                                          |                  |                                                                                                                                                                                                                                                          |
|                      | READ only      |                                                                | 512 words    | DM6144 to DM6655 (DM6600 to DM6655 is the system setting area of the CPU) |                  |                                                                                                                                                                                                                                                          |

### ■ Memory Cassette

| Item             | CQM1-ME04K         | CQM1-ME04R | CQM1-ME08K    | CQM1-ME08R | CQM1-MP08K                              | CQM1-MP08R |
|------------------|--------------------|------------|---------------|------------|-----------------------------------------|------------|
| Program capacity | 4K words max.      |            | 8K words max. |            | 8K words max. (EPROM chip not included) |            |
| DM capacity      | DM 6144 to DM 6655 |            |               |            |                                         |            |
| Memory type      | EEPROM             |            |               |            | EPROM (purchase separately)             |            |
| Clock function   | No                 | Yes        | No            | Yes        | No                                      | Yes        |

## Selecting a CQM1 System



# Ordering Information

## ■ CPUs

### Standard CPUs

| Name                         | Description                                     | Model Number |
|------------------------------|-------------------------------------------------|--------------|
| CPU,<br>with 16, 24 VDC I/Ps | 3.2K words Program Memory. 1K words Data Memory | CQM1-CPU11E  |
|                              | 3.2K words with RS232C port                     | CQM1-CPU21E  |

### Advanced CPUs

| Name                         | Description                                     | Model Number |
|------------------------------|-------------------------------------------------|--------------|
| CPU,<br>with 16, 24 VDC I/Ps | 7.2K words Program Memory. 6K words Data Memory | CQM1-CPU41E  |
|                              | 7.2K with Analogue setting                      | CQM1-CPU42E  |
|                              | 7.2K with pulse I/O                             | CQM1-CPU43E  |
|                              | 7.2K with ABS I/F                               | CQM1-CPU44E  |

## ■ Power Supplies

| Name                 | Description     | Model Number |
|----------------------|-----------------|--------------|
| AC Power Supply Unit | 18W consumption | CQM1-PA203   |
|                      | 30W consumption | CQM1-PA206   |
| DC Power Supply Unit | 30W consumption | CQM1-PD026   |

## ■ Memory Units (optional)

| Name   | Description                         | Model Number |
|--------|-------------------------------------|--------------|
| EEPROM | 4K words                            | CQM1-ME04K   |
|        | 4K words with clock function        | CQM1-ME04R   |
|        | 8K words                            | CQM1-ME08K   |
|        | 8K words with clock function        | CQM1-ME08R   |
| EPROM  | Memory cassette only                | CQM1-MP08K   |
|        | Memory cassette with clock function | CQM1-MP08R   |

## ■ Input Units

| Name          | Description              | Model Number |
|---------------|--------------------------|--------------|
| DC Input Unit | 8 points, 12 to 24 VDC   | CQM1-ID211   |
|               | 16 points, 24 VDC        | CQM1-ID212   |
|               | 32 points, 24 VDC        | CQM1-ID213   |
| AC Input Unit | 8 points, 100 to 120 VAC | CQM1-IA121   |
|               | 8 points, 200 to 240 VAC | CQM1-IA221   |

## ■ Output Units

| Name               | Description                                                 | Model Number |
|--------------------|-------------------------------------------------------------|--------------|
| Contact Outputs    | 8 points, 250 VAC/24 VDC 2A                                 | CQM1-OC221   |
|                    | 16 points, 250 VAC/24 VDC 2A                                | CQM1-OC222   |
| Transistor Outputs | 8 points, 24 VDC, 2A                                        | CQM1-OD211   |
|                    | 16 points, 4.5 VDC, 50 mA at 26.4 V 300 mA                  | CQM1-OD212   |
|                    | 32 points, 4.5 VDC, 16 mA at 26.4 V 100 mA                  | CQM1-OD213   |
|                    | 16 points, 24 VDC, 300 mA, PNP outputs                      | CQM1-OD214   |
|                    | 8 points, 24 VDC, 1A, PNP outputs, built-in circuit breaker | CQM1-OD215   |
| Triac Outputs      | 8 points, 0.4A at 100 to 240 VAC                            | CQM1-OA221   |

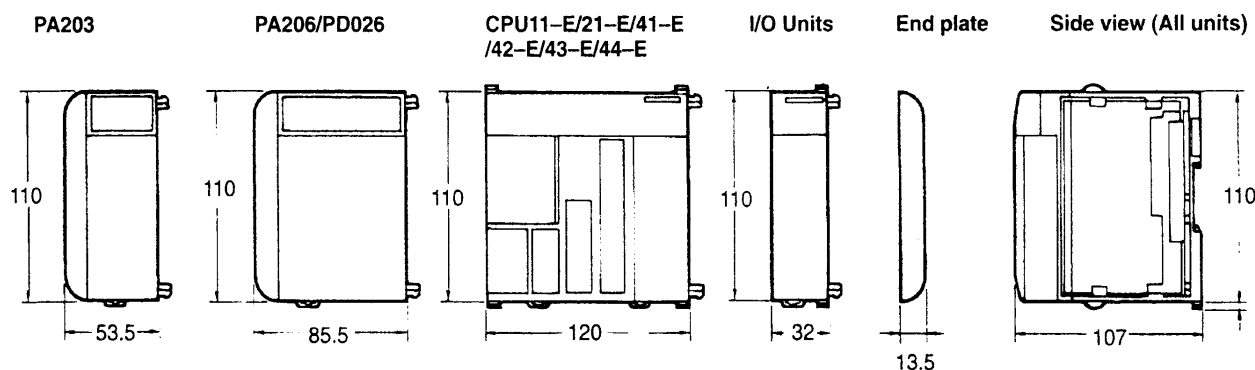
## ■ Special I/O Units

| Name                                                                                    | Model Number |
|-----------------------------------------------------------------------------------------|--------------|
| Analogue Input Unit                                                                     | CQM1-AD041   |
| Power Supply unit for 1 Analogue Input Unit or 1 Analogue Output Unit                   | CQM1-IPS01   |
| Power Supply unit for 2 Analogue Input Units or 1 analogue Input/1 Analogue Output Unit | CQM1-IPS02   |
| B7A Interface Unit , 16 inputs, 16 outputs                                              | CQM1-B7A01   |
| I/O Link Unit – use as slave unit                                                       | CQM1-LK501   |
| Sensor Unit – no. of sensor input points: 4 max.                                        | CQM1-SEN01   |
| Temperature control unit; 2 J/K thermocouple inputs, NPN outputs                        | CQM1-TC001   |
| Temperature control unit; 2 J/K thermocouple inputs, PNP outputs                        | CQM1-TC002   |
| Temperature control unit; 2 Pt100/JPt 100 RTD inputs, NPN outputs                       | CQM1-TC101   |
| Temperature control unit; 2 Pt100/JPt100 RTD inputs, PNP outputs                        | CQM1-TC102   |
| 2 Channel analogue output module                                                        | CQM1-DA021   |

| Name                                                                                                                                                                          | Model Number |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Programming console with 2m cable attached (compatible with all C-series PLCs except C20; CK requires adaptor C500-AP003)                                                     | CQM1-PRO01E  |
| Programming software to run on a computer, for all OMRON C-series PLCs                                                                                                        | LSS 3        |
| Connecting cable and converter for CQM1 Peripheral port to a PC or OMRON NT (Note: All CQM1 CPUs except CPU11E have a standard RS232 port in addition to the peripheral port) | CQM1-CIF02   |
| Connecting cable for CQM1 to a computer                                                                                                                                       | RS232 cable  |
| Battery                                                                                                                                                                       | C500-BAT08   |

## Dimensions



**Note:** Please refer to Technical Brochure Number P031-E1 for further details on the CQM1 range.