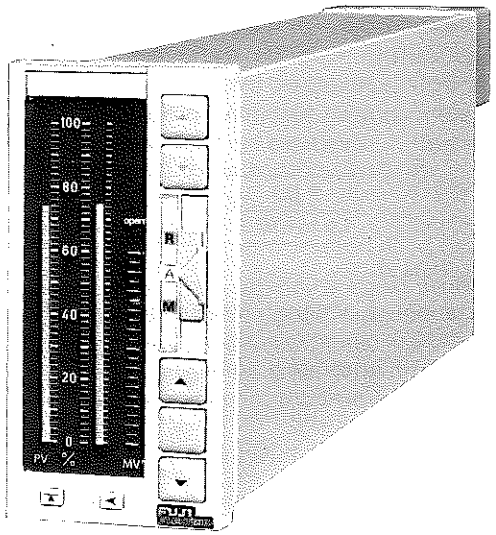
FUJI ELECTRIC

FC SERIES COMPACT CONTROLLER F (STEP OUTPUT TYPE)

DATA SHEET PML

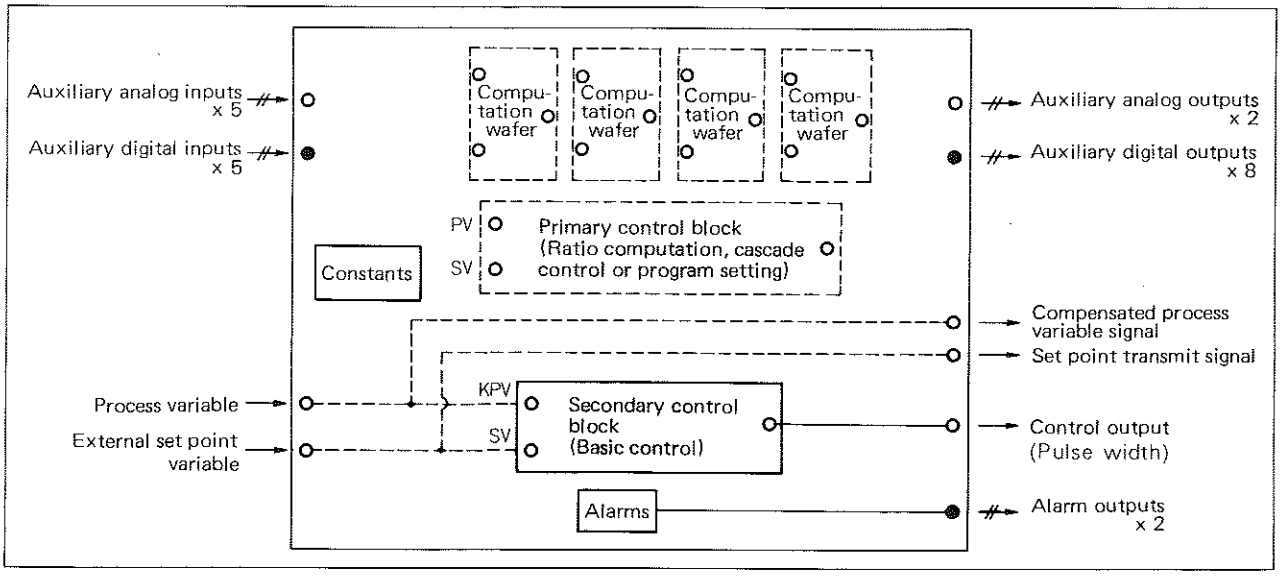
The FC SERIES Compact Controller F is a single loop controller equipped with a microprocessor, and designed to be operated in the same manner as analog controllers. It features a full variety of functions for control, computation and data transmission. This high cost-performance, flexible controller enables realizing an optimum digital instrumentation system.



FEATURES

1. **Compact single loop controller with microprocessor**
   The Compact Controller F is an epoch-making single loop controller equipped with a microprocessor. The instrument dimensions comply with the international standards.
2. **Same handling procedure as analog controller**
   The Compact Controller F is easy to operate, for you can handle it the same way as analog controllers. Installation of additional controllers and alteration of the system are very easy.
3. **Full variety of control and computation functions**
   Besides being used as a PID controller, the Compact Controller F has various kinds of control and computation functions and also has a transmission function (to a higher-level system), giving full scope to its excellent cost-performance instrumentation.
4. **Adoption of solid-state indicator**
   The Compact Controller F uses solid-state indicators with plasma display and LED (Light Emitting Diode) for easy and accurate readout. These indicators have no mechanical parts, thus assuring high reliability.
5. **Instantaneous change of control and computation data**
   By using the keys on the Data Entry Unit, the way of control can be changed instantaneously. The use of a non-volatile memory circuit protects the way of control and computation against power failure.
6. **Creation of functions according to instrumentation plan**
   An instrumentation plan can be very easily built up by utilizing functions (wafers) which accurately correspond to the contents of instrumentation.

FUNCTIONAL DIAGRAM



SPECIFICATIONS

1. Control and computation functions

Control functions (executed by control block Wafers)

1) Basic control function (one PID control) Note 1)
   ..... executed by 4 wafers
2) Cascade control function (PID control + PID control)
   ..... executed by 3 + 4 wafers
3) Ratio control function (ratio computation + PID control) ..... executed by 2 + 4 wafers
4) Program control function (program setting + PID control) ..... executed by 1 + 4 wafers

P (%)	I (sec)	D (sec)
1.0 to 655.3	0.2 to 3276.6	0.0 to 900.0

5) Other Note 2)

Computation functions (executed by computation wafers)

Pulse width integrating wafer
Temperature/pressure compensating wafer
Selector wafer,
Absolute value/sign inverting wafer
Linearize wafer 1
Linearize wafer 2* Note 3)
Square root extraction wafer
Addition wafer
Subtraction/multiplication wafer
Multiplication/addition wafer
Addition/division wafer
Logical operation wafer
Changeover wafer
Dead time wafer 1*
Dead time wafer 2*
Dead time wafer 3*
Dead time wafer 4*
Dead time wafer 5*
Dead time wafer 6*
Lead element wafer
Lag element wafer
ON-OFF wafer
Limiter wafer
Pulse generating wafer
Timer wafer
Ramp function (min) wafer
Analog averaging wafer
Analog integrating wafer
Gap wafer
Flip-flop wafer
Decoder wafer
Ramp function (hr) wafer
Addition/four arithmetic rules wafer
Subtraction/four arithmetic rules wafer
Multiplication/four arithmetic rules wafer
Division/four arithmetic rules wafer
Pulse counter wafer
Alarm wafer
Pulse no. output wafer
Lead/lag element wafer
Moving average wafer 1*
Moving average wafer 2*
Position/pulse width converting wafer
Sample hold wafer
Logical operation wafer 2
Logical operation wafer 3
Logical operation wafer 4
Logical operation wafer 5
Logical operation wafer 6

Output functions (executed by output wafers)

Indication output wafer (indication and KPV, SV)
Analog output wafer (aux. AO 1, 2)
Digital output wafer 1 (aux. DO 1 to 3)
Digital output wafer 2 (aux. DO 4 to 6)
Digital output wafer 3 (aux. DO 7, 8)

Alarm functions

Upper/lower alarm
Change rate alarm
Deviation alarm
Abnormal input check

Note 1) PID includes dead band.
Note 2) Various control functions such as adaptive gain control, PID control with error squared, dead time compensating control etc. are available through combination with the computation functions.
Note 3) There are some limitations on using the asterisked wafers.
Note 4)

Kind of wafer	No. of usable wafers	No. of executable wafers
Control block wafer	15 kinds	Total of 16 or 24
Computation wafer	49 kinds	
Output wafer	5 kinds	

Linearize	No. of executable wafers	Computation cycle
2 patterns	16	0.2 sec
1 pattern	24	0.2 sec

2. Input signals

Types

Process variable input signal:
1 to 5V DC

External set point signal:
1 to 5V DC
Pulse width input;
24V DC/signal "OFF", 0V/signal "ON" x 1 pair (increase/decrease)

Auxiliary analog input signal:
1 to 5V DC, 5 points

Digital input signal:
24V DC/signal "OFF", 0V/signal "ON", 4 points

Auxiliary digital input signal:
24V DC/signal "OFF", 0V/signal "ON", 5 points

Ratings

Voltage input signal (1 to 5V DC):
Input resistance more than 1MΩ
(15kΩ outside of range)

Digital input signal, pulse width input signal:
Input current approx. 13mA/24V DC

Allowance

Voltage input signal (1 to 5V DC):
±0.1% (12 bits)

3. Output signals

Types

Control output signal:
Pulse width (open collector output)

Analog output signal:
1 to 5V DC, 4 points
(aux. analog output 2 points plus compensated process variable signal and set point transmit signal)

Digital output signal:
Open collector output, 8 points

Auxiliary digital output signal:
Open collector output, 8 points

Ratings

Actuator speed: 10, 30 or 60 sec full stroke

Voltage output signal (1 to 5V DC):
Output resistance less than 0.5Ω

Digital output signal:
30V DC x 0.1A

Allowance

Voltage output signal (1 to 5V DC):
±0.2% (10 bits)

4. Indication

Process variable, set point variable indicators

Indicating method:
Plasma display (orange)

No. of indicating segments:
201

Indicating range: 0 to 100% linear

Indicating resolution:
0.5% of full scale

Scale length: 100 mm

Opening indicator

Input signal: Potentiometer 10–100–10Ω
or 1 to 5V DC

Indicating method:
Light emitting diode (red)

No. of indicating segments:
23

Indicating range: 0 to 100% linear

Indicating resolution:
2.5% of full scale

Scale length: 60 mm

Note) Pressing the Change button indicates opening on plasma display (set point indicator)

Alarm and status indication

Alarm indication: Indicates the upper/lower alarm of any one of process variable, change rate of process variable, and deviation. Also, outputs open collector signal.
▲(upper alarm), ▼(lower alarm)···(red)

Fault indication: Provides simultaneous indication of the above upper/lower alarm and also outputs open collector signal, when some fault occurs.

Status indication: A, R ····· (green)
M, SCC ····· (red)

5. Setting

5.1 Basic control

Setting types

Local setting type

Remote setting type:
Operation mode changeover lever, (R–A–M)

Transmission setting type

(1) Local setting type

Setting: Manual setting (front panel pushbutton ▲▼, traveling time about 40 sec full scale), or the Data Entry Unit (digital setting)

Transmit digital signal (open collector output):
"LS" signal

(2) Remote setting type

Remote (R) setting:
External set point signal (voltage or pulse width signal) is used

Setting limiter: Upper and lower limits;
setting range 0 to 100%

Local (A)–Remote (R) changeover:
Changed over by lever of the front panel. R→A changeover is balanceless bumpless. With pulse width setting, changeover is balanceless bumpless in both directions.

Transmit digital signal (open collector output):
Lever in "R" position ("R–REQ" signal);
$\overline{R}$ status ("LS" signal)

(3) Transmission setting type

Transmission (SCC) setting:
Set point depends on setting signal from a higher-level system. When Switch Unit's SCC is at "SCC" and external signal "C·ENBL" is ON, the SCC ENABLE (transmission possible) mode is assumed.

Setting limiter: Upper and lower limits;
setting range 0 to 100%

Local (A)–Transmission (SCC) changeover:
The A⇄SCC changeover is balanceless bumpless

Remote (R)–Transmission (SCC) changeover:
The R→SCC changeover is balanceless bumpless

Transmit digital signal (open collector output):
Lever in "R" position ("R–REQ" signal); $\overline{R}$ status ("LS" signal)

5.2 Cascade or ratio control

Operation mode changeover lever (R—A—M)

5.2.1 Setting of primary block

Setting types

Local setting type

Remote setting type

Transmission setting type

(1) Local setting type

Setting: Manual setting (front panel pushbutton ▲▼, traveling time about 40 sec full scale), or the Data Entry Unit (digital setting)

(2) Remote setting type

Remote (EXT) setting:
External set point signal (voltage or pulse width signal) is used

Setting limiter: Upper and lower limits; setting range 0 to 100%

Local (INT)—Remote (EXT) changeover:
Changed over by the switch "INT—EXT" on the Switch Unit. EXT→INT changeover is balanceless bumpless.

Transmit digital signal (open collector output):
Local (INT) setting status ("INT" signal)

(3) Transmission setting type

Transmission (SCC) setting:
Set point depends on setting signal from a higher-level system. With Switch Unit's SCC "SCC" and external signal "C·ENBL" on the SCC ENABLE (transmission possible) mode is assumed

Setting limiter: Upper and lower limits; setting range 0 to 100%

Local (INT)—Transmission (SCC) changeover:
The INT ⇄ SCC changeover is balanceless bumpless

Remote (EXT)—Transmission (SCC) changeover:
The EXT→SCC changeover is balanceless bumpless

Transmit digital signal (open collector output):
Local (INT) setting status ("INT" signal)

5.2.2 Setting of secondary block

Same as the items (1), (2) and (3) in section 5.1

5.3 Program control

Operation mode changeover lever (R—A—M)

Local setting type

Program setting type

Transmission setting type

(1) Local setting type

Same as item (1) of section 5.1

(2) Program setting type

Program (R) setting:
According to set point which follows a predetermined program pattern
Program setting pattern;
7 segmented lines max.
1 section; approx. 9 hours or approx. 22 days max.

Setting limiter: Upper and lower limits; setting range 0 to 100%

Local (A)—Program (R) changeover:
Changed over by lever on front panel

Transmit digital signal (open collector output):
Lever in "R" position ("R—REQ" signal)

(3) Transmission setting type

Same as item (3) in section 5.1

6. Control output

Output mode: Auto (A), (R) and manual (M)

Manual (M) operation:
By front panel pushbuttons ▲▼

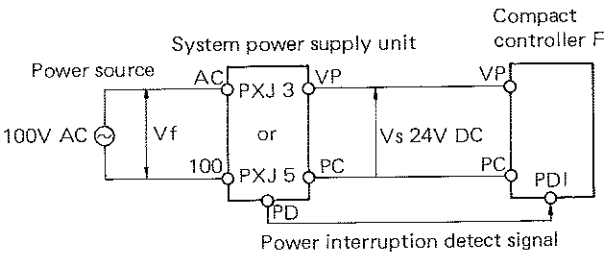
Auto (A), (R)—Manual (M) changeover:
Changed over by front panel lever or by external sequence signal for manual (M) changeover. Balanceless bumpless changeover in both directions

External sequence signal for Auto (A)—Manual (M) changeover: "SMV" signal

Transmit digital signal (open collector output):
Manual mode ("M" signal),
Non-auto mode ("NOT-A" signal)

7. Protection from power interruptions

For the protection from power interruptions, system power supply unit (Type PXJ 3 or 5) has to be used. The connection between the system power supply unit and the controller is as follows.



If Vf is interrupted for intervals less than 30 ms, the operation of the controller is not affected.
When Vs is interrupted manipulated variable is affected.

8. Additional functions (option)

Data Entry Unit (OPC)

Used for indicating and entering data, constants and parameters, and for connecting control and computation wafers.

Construction: Keyboard (40 keys) and digital indicator (5 digits with sign and decimal point for data display and 3 digits for channel)

Installation: Mounted on the main body or connected by a connector

Transmission Unit (XMT)

Used for connecting transmission lines (CC data lines) to form a distributed control system or hierarchy control system

9. Operating conditions

Power supply: 24V DC (20 to 30V DC)

Power consumption:
Approx. 11W

Dielectric strength:
500V AC, 1 minute

Insulation resistance:
More than 100MΩ at 500V DC

Ambient temperature:
0 to 45°C

Ambient humidity:
90% RH or less

Type of enclosure:
Steel case

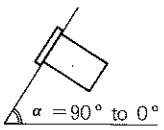
External dimensions (HxWxD):
144x72x400 mm, IEC (DIN) standards

Weight: Approx. 5 kg

Finish color: Munsell 7Y 7.3/1.4 (case and front panel)
RAL 7030 (operation mode changeover lever and pushbuttons)

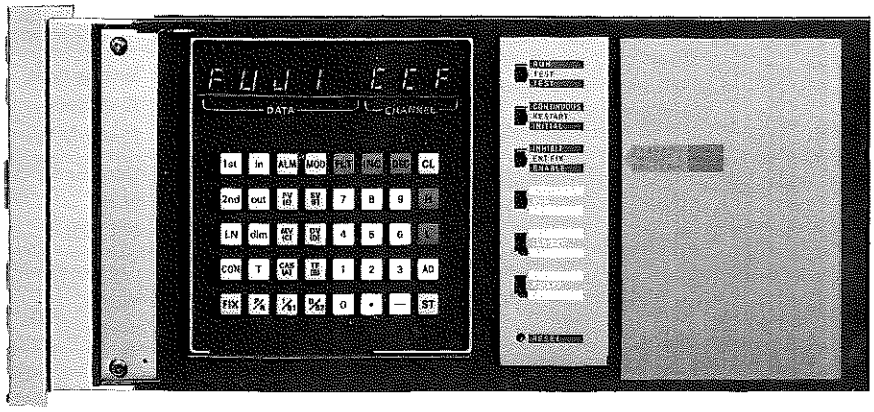
Range of delivery:
Controller and mounting bracket

Mounting method:
Panel flush mounting; vertical mounting is standard, tilted mounting is nonstandard (specify angle)

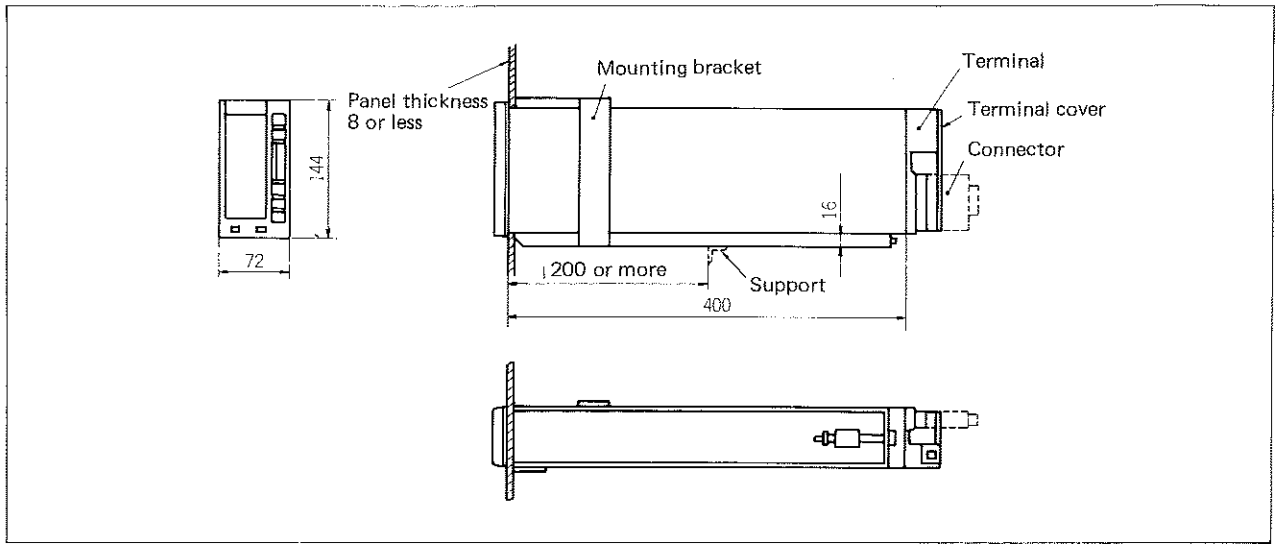


CODE SYMBOLS

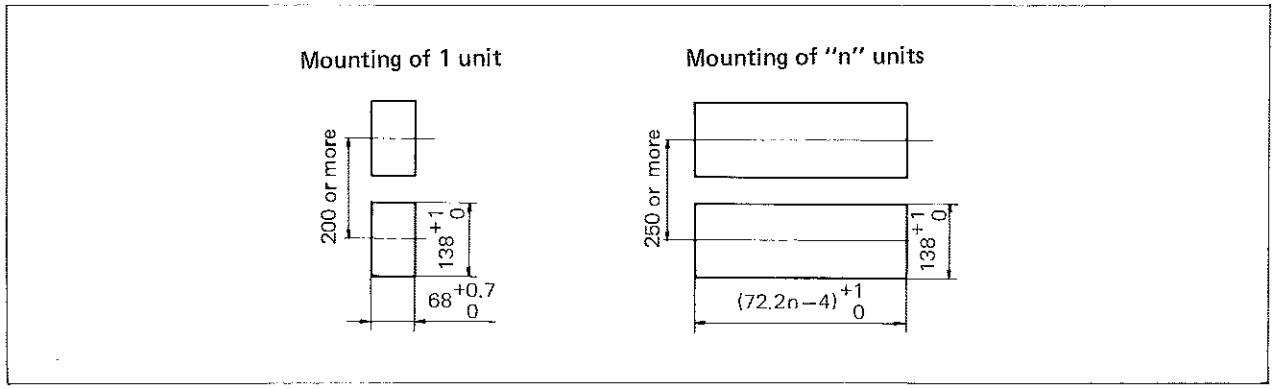
PML 3 –	Description
	Setting type
A	A–M type
B	R–A–M type
	Data Entry Unit (OPC)
A	With
B	Without
	Transmission Unit (XMT)
B	With
Y	Without
	Opening indicator signal
V	DC 1 – 5V
W	10–100–10Ω 3-wire potentiometer
	Wafer connection
0	Without
1	With
	Treatment for environment
0	Without
1	With (coating)



EXTERNAL DIMENSIONS (Unit: mm)



PANEL CUTOUT (Unit : mm)



TERMINAL ARRAGEMENT (as seen from rear of case)

Block terminal

M	PI+
INT	PI–
SMV	FLT

KVP	PV
SV	CAS
AO1	AI1
AO2	AI2
SC	AI3
SC	AI4
W+	AI5
Wo	PO+
W–	PO–
G	PDI
PC	VP
PCD	VPD

Multi-connector

M23	H		—	M 1	—
M24	L	M13	DI5	M 2	—
M25	R-REQ	M14	PV-TRK	M 3	PCD
M26	LS	M15	R-ACK	M 4	AO1
M27	NOT-A	M16	DI1	M 5	AO2
M28	DO1	M17	DI2	M 6	AI1
M29	DO2	M18	DI3	M 7	AI2
M30	DO3	M19	DI4	M 8	AI3
M31	DO4	M20	C·ENBL	M 9	AI4
M32	DO5	M21	DO8	M10	AI5
M33	DO6	M22	MV	M11	SC
M34	DO7		—	M12	VPD

Transmission connector

T 5		T 1	SHLD
T 6	INH	T 2	VST
T 7	RXD2	T 3	RXD1
T 8	TXD2	T 4	TXD1

ORDERING INFORMATION

1. Name of product
2. Type
3. Inputs
4. Control and computation functions
5. Outputs
6. Scale
7. Additional functions
8. Power source
9. Application
10. Others