General Specifications

Model YS170
Single-Loop Programmable Controller

YS100 SERIES

GS 01B07C02-01E

GENERAL

The YS170 Single Loop Programmable Controller is an intelligent controller with user-selectable (preset) single-loop, cascade, autoselector and user-programmable modes. It comes in a compact IEC-size case.

STANDARD SPECIFICATIONS

Control Functions

There are four modes available :

User-programmable mode

User-selectable multifunction mode

- single loop mode
- cascade mode
- auto-selector mode

Refer to Block Diagrams of each mode on page 9.

Controller Mode

User-programmable mode

This mode combines control modules and computational modules by programming. In this mode, the user can choose either a Single Control module, Cascade Control module, or Selector module.

Single Loop Mode

A single controller with advanced control functions' external cascade setpoint, ratio control, feedforward and tracking.

Cascade Mode

Two control modules connected in cascade. A single YS170 controller can implement a cascade loop. External cascade setpoint, ratio control and feedforward are provided.

Selector Mode

Two control modules connected in parallel. A single YS170 controller can implement an autoselector loop. External cascade setpoint and ratio control for each loop are provided.

Control Type and Parameter Specification

Each control type is incorporated in a control module.

Standard PID Control

Proportional band : 2.0 to 999. 9%
Integral time : 1 to 9999sec
Derivative time : 0 to 9999sec (Note)

Including PID with reset bias

Reset bias : 0. 0 to 106. 3%

Including non-linear control

non-linear gap : 0.0 to 100. 0%
non-linear gain : 0.000 to 1. 000

Proportional (PD) Control

Proportional band : 2. 0 to 999.9%
Derivative time : 0 to 9999sec (Note)
Balance-rate time : 1 to 9999sec
Manual reset : –6.3 to 106.3%

These act on basic control module .

Including non-linear control

Sample PI

Selectable for programmable mode

PI parameters are the same as standard PID .

Sample period: 0 to 9999sec
Control time width : 0 to 9999sec

Including non-linear control

Batch PID

Act on basic control module for the programmable mode .

PID parameters are the same as standard PID .

Velocity : 0.0 to 100. 0%
Bias : 0.0 to 100. 0%
Lock up width : 0.0 to 100. 0%

Note:Active range is 2 to 9999 sec (0 & 1:OFF)

12th Edition:Aug. 2000(YG)

Advanced Control Functions

In the user-selectable mode, these functions are pre configured.

In the programmable mode, these functions are available through programming.

Feedforward Control (For single loop / cascade mode)

Feedforward computation is added to control output while in CAS or AUT mode.

Output Tracking (TRK) (For single loop mode)

Output is tracked depending on an external contact signal when the controller is in CAS or AUT mode.

Preset MV (PMV) output (For all the user-selectable mode)

Output is set to predetermined value when in CAS or AUT mode depending on external contact signal . PMV provided for Single-loop , Cascade and Selector modes.

Preset PID (For the user-programmable mode)

Preset PID parameter sets (8 items) can be switched by the user program.

Adjustable Setpoint Filter (SVF)

Used for improved response to setpoint changes.

Self Tuning Functions (STC)

This function automatically adjusts PID parameters according to changes in process characteristics. STC may be started/stopped using the PF key on the front panel or an external contact signal, or user-program ; tuning limits are also set from the front display panel.

STC selection in combination with control modules

Basic control module : STC acts on the first loop.

Cascade control module :

Based on internal cascade switch (OPEN/CLOSED). Acts on primary when CLOSED, on secondary when OPEN.

Selector control module :

STC acts on selected loop.

STC selection in combination with control types

standard PID, nonlinear PID, PID with reset bias.

Alarm Functions

Alarm Action : High limit , Low limit , Deviation alarms

Input High Limit Alarm Setting:

−6.3 to 106.3% (or Engineering Units)

Input Low Limit Alarm Setting :

−6.3 to 106.3% (or Engineering Units)

Deviation Limit Alarm Setting :

0.0 to 106.3% (or Engineering Units)

Alarm hysteresis : 2% of span

Velocity Alarm

Velocity setpoint : 0.0 to 106.3% (PVor Engineering Units)

Velocity time setpoint : 1 to 9999 sec

Alarm Indication : Yellow lamp (ALM) on front panel is lit, displayed on loop panel and alarm panel in detail .

Alarming contacts output , open or close : Selectable

for a power failure , contact outputs open .

Output Contact : In Single Loop mode , one each for high limit, low limit , deviation .

In cascade mode and selector mode, output alarm for high limit , low limit or deviation for each of two internal controllers.

In the programmable mode, output is provided by a program.

Signal Conditioning Computations

(For the user-selectable (preset) mode)

Input Signal Conditioning Computations

Square Root with Low Signal Cutoff

Computes square root for process variable (PV) and cascade setpoint input. For signals below the "cutoff" point (selectable between 0.0 and 100.0%), output=input.

Ten segment characterizer function

Line-segment characterizer for each PV input . Set range of inputs and outputs between 0.0 and 100.0%. (10% intervals)

First order lag filter

Computes input filter for PV, cascade, feedforward and tracking inputs. Range of time constant is 0.0 to 800.0 sec.

External Cascade Setpoint Scaling Computation

CSV=CGN(CIN+CBI)+CBO

CSV : cascade setpoint computation output

CIN : cascade input

CGN : gain (set in range : −8.000 to 8.000)

CBI : input bias (set in range : −106.3 to 106.3%)

CBO : output bias (set in range : −800.0 to 800.0%)

Feedforward Signal Computation

Applies only for CAS or AUT mode operation, single loop or cascade mode .

FF=FGN(FIN+FBI)+FBO

FF : feedforward signal computation output

FIN : feedforward input

FGN : FF gain (set in range : −8.000 to 8.000)

FBI : FF input bias
(set in range : –106.3 to 106.3%)
FBO : FF output bias
(set in range : –800.0 to 800.0%)

Output Signal Conditioning Computations

Output limiters act on MV for each control module .

Control Computational Period

50msec, 100msec, or 200msec
(For multifunction mode, only 100msec.)

Operation Mode status output

C / (A·M) status output : 1 point
(C·A) /M status output : 1 point
C : Cascade mode
A : Auto mode , M : Manual mode

In cascade mode ,
Cascade OPEN / CLOSED status : 1 point

In selector mode ,
SV of secondary loop , LOCAL / REMOTE : 1 point

Mode Switching by Contact Status Input

(For the user-selectable (preset) mode)

One of the following operation mode switchings can be selected.

Open / close of status input signal : selectable

Action mode \ Controller mode	single	cascade	selector
CAS↔AUTO or CAS,AUTO↔MAN External switching	○	–	–
Internal Cascade Connection OPEN/CLOSE	–	○	–
SV of secondary loop REMOTE/LOCAL	–	–	○
Preset MV output ON / OFF	○	○	○
Output tracking ON / OFF	○	–	–
Self-Tuning Function ON/OFF external switching	○	○	○

(note) In this table , [—] is not applicable.

Trend Recorder Specification

The recorder gathers PV data for both loops and displays this on the trend recording panels .

Trend recording span (scan rate in parenthesis)
: 1.5min (1sec), 7.5min (5sec),
15min (10sec), 45min (30sec),
1.5hr (1min), 7.5hr (5min),
15hr (10min), 45hr (30min)

Trend data points : 90

Operation / Monitoring Specification

The data displayed on YS170 display panels are changed by use of keys on the front display panel.

C , A , M switching key : one each
Inc , Dec key : one each (increase / decrease)
Change panel key : 1
PF key : 1

For the multifunction mode, this key can be used to set STC function ON/OFF. For the programmable mode, it is fully programmable.

MV setting key : 2
MV full speed key : 1
(Also used as SHIFT Key to change panel group)
Display lamp : 2
FAIL lamp red
ALM lamp yellow

Panel Specification

Bar Graph

Scale graduations : Maximum 10 (1, 2, 4, 5, 10 available)

0% and 100% value of scale (in engineering units):
4 digits plus decimal point and sign

PV bar graph resolution : 0.5% (200 elements / 100%)
SV resolution : 0.5%
MV bar graph resolution : 1.25% (80 elements / 100%)

Tag No. and Other Values Displayed

Tag No. Display : Alphanumetic
Maximum 8 digit .
Digital PV, SV display : 4 digit in engineering unit
plus decimal point and sign
Digital MV display : 4 digit %
plus decimal point and sign

Display Panel Specification

Front display panels are classified in three groups : Operation, Tuning, and Engineering panels. Switch groups by pressing SHIFT and Page keys together.

Operation Panels

Five panels are provided : LOOP 1, LOOP 2, TREND 1, TREND 2, ALARM, DUAL 1 and DUAL 2. Display is selected by pressing the Page key.

Tuning Panels

Seven tuning panels are provided : TUNING MENU, PID 1, PID 2, STC 1, STC 2, and I/O DATA.

When the programmable mode, P & T REG provided.

When the multifunction mode , PARAMETER provided.

Engineering Panels 1

Seven engineering panels are provided : ENG. MENU 1, CONFIG 1, CONFIG 2, SC MAINT, PASSWORD and FX TABLE.

When the programmable mode, SMPL & BATCH provided .

When the multifunction mode, CONFIG 3 provided.

Engineering Panels 2

(For the programmable mode)

Six engineering panels are provided :

ENG.MENU2, GX1 TABLE, GX2 TABLE, PGM SET, PID TABLE, K CONSTANT

Panel Operational Specification

Panels are operated by front keys .

SV operation key rate : 40sec / full scale

MV operation key rate : Slow 40sec/ full scale
Fast 4sec/ full scale

Programming Functions

Computational functions

(For the Programmable mode)

Computational functions and Number available

Functions	Function name	Number of using
General functions	Addition , Subtraction	– * –
	Multiplication , Division , Square root	– * –
	Magnitude (absolute value)	– * –
	High selector , Low selector	– * –
	High limiter , Low limiter	– * –
Functions with unit addresses	10-segment characterizer function	2
	Arbitrary characterizer function	2
	High limit, low limit alarms	each 4
	First order lag	8
	First order lead	2
	Dead time	3
	Velocity computations	3
	Moving average	3
	Velocity limiter	6
	Timer	4
	Program set unit	1
	Detection of status change	8
	Pulse input counter	4
	Pulse rate output	2
Logical Functions	AND , OR , XOR , NOT	– * –
	CMP	– * –
	Signal switching	– * –
	Branching , Conditional branching	– * –
	Subroutine calls	– * –
Others	Changing Computational registers	– * –
	Rotation Computational registers	– * –

(note1) Where limits are indicated by a dash "– * –" above, this means that there is no preset limit .

Computational Registers

Coefficients : 30 points

Constants : 30 points

Temporary Registers

Numerical : 30

Status flag : 16

User-programming specification

Program size : Max. 400 steps (Include main and sub programs. Subprograms may be repeated .)

Programming : A separate programming package is available for creating user programs on a personal computer . Programs are loaded to YS170 by communication.

Personal computer : IBM AT or Compatible
MS-DOS version 4.0 or later

Test run functions

This function is for test running for made up user programs .

A simple check program is described in the simulation program area to allow the user program operation to be checked.

Number of steps for simulation programs : 20 steps

Communication Function

YS-net communication

YS-net can be used for peer-to-peer communication and personal computer communication.

Communication specifications

Communication interface : Specification unique to YS-net (2 terminals)

Communication speed : 78.125 kbps

Connection method : Daisy-chain connection

Communication distance : Maximum 1000 m

Communication cable : Twisted-pair cable

Function of peer-to-peer communication

YS170s can send and receive data to and from one another via the YS-net. Four YS170s can output data to the YS-net and other YS170s can receive the data on the YS-net.

Maximum number of instruments to be connected :
16 (YS170 programmable mode only)

Number of data-send instruments : 4

Number of data-receive instruments :
16 (including data-send instruments)

Number of data items to be sent : 4 numeric data and 16 status data for each instrument

Data type to be sent :
Numeric value / status data which can be dealt with in the programmable mode.

Peer-to-peer communication period :
200 msec on an average (asynchronous with control cycle)

Function of personal computer communication

This function is used to communicate with a personal computer. Data can be exchanged with application software on Windows with the DDE server function without a program.

Maximum number of instruments to be connected :
16 (combination of YS131, YS135, YS136, YS150 and YS170 is possible.)

Simultaneous use with peer-to-peer communication :
available

YS-net communication specifications on the computer side :
Personal computer : compatible with IBM PC / AT
YS-net communication board (for ISA slot)
YSS50 YS-net parameter definition file
Communication softwares (DDE server)
OS of Microsoft Windows version 3.1 or later.
Also, application software with a DDE server function is necessary.
(For example, Microsoft Excel or other SCADA software)
* Windows is a trademark of Microsoft Corporation. Microsoft is a registered trademark of Microsoft Corporation.

Communication items :
Various kinds of parameters such as the measured value, set value, manipulated output, PID set value, and operation mode can be sent or received. Selectable data setting permission by communication.

DDC, SPC mode : DDC / SPC mode is selectable.
In the DDC mode, manipulated output can be directly operated from a computer.
In the SPC mode, set value can be set from a computer.

Back-up for communication failure :
The operation mode (AUT / MAN) at supervisory computer failure can be set.

Communication cycle: 1 sec

RS-485 Communication

Communication Specifications

Communication interface : RS–485 (5 terminals)
Transmission Control : Start - stop synchronization, no protocol, half-duplex
Communication speed : 1200, 2400, 4800, 9600 bps
Connection Type : Multi Drop Type

Maximum number of instruments to be connected:
16 (combination of YS131, YS135, YS136, YS150, YS170 is possible.)
Communication distance : Max. length is 1200m
Max. flame length : 220 Byte
Time to wait between characters : 0.1 sec

Communication Items

Selectable to send/receive PV, SV, MV and other parameters. Data setting can be enabled / disabled by communication .

DDC, SPC mode

DDC mode : MV operated directly by supervisory computer.
SPC mode : SV set by supervisory computer.

Back-up for Communication Failure

Backup mode if supervisory computer fails is selectable (AUT or MAN mode) .

Communications with DCS "Host" system

CENTUM- XL , CENTUM : LCS card in control station
μXL , YEWPACK mark II : LCS card in control unit
Distance of communication : Maximum length is 100m
Use SCCD communication cable .

Communication Items

Data Communication period : 480msec

DDC or SPC mode

DDC or SPC mode is selsctable from DCS .

Back-up for Communication Failure

Backup mode if supervisory computer fails is selectable (AUT or MAN mode) .

Power-Fail /Restart Functions

Select from following three recovery modes ;

TIM1 mode : Up to approx. 2sec. , HOT start .
Longer than approx. 2sec. , COLD start .
TIM2 mode : Up to approx. 2sec. , HOT start .
Longer than approx. 2sec. , Initial start
AUT mode : Always HOT start .

For long power failure, always initial start .

Life of parameter backup : over 48hours , average is 7days (Backed up by charge on super capacitor)

If a power failure continues longer than the life of parameter backup, restarted by a Intial start.

ction for each start mode

	HOT start	COLD start	Initial start
Operation mode	same as before power fail	MAN	MAN
Manipulated Value (MV)	sameas before power fail	−6.3%	−6.3%
Set point (SV)	same as before power fail	same as before power fail	Data stored in nonvolatile memory
PID Parameter	same as before power fail	same as before power fail	
Dynamic computation as first order lag	Continue	Initialize	Initialize

Self-Diagnostic Features

Failure of computation · control circuit :
FAIL lamp lit.
Fail contact output is open.
(open for power fail)

Failure of input signals , open outputs (MV) :
ALM lamp Lit on
Display the origin for alarm

Back up for failure of YS170

Upon failure, the display changes to the loop1 panel. The controller can be operated in hard manual mode. Before switching to hard manual, user can balance the output .

I /O Signals Specifications

Analog Input Specification

Analog input : 1 to 5VDC, 5 points
4 points are used in the multifunction mode.
Option for single direct input
(mV, TC, RTD, 2-wire transmitter, potentiometer or frequency input).

Input resistance: More than 1MΩ

Analog Outputs

Analog output : 4 to 20mA, 1 point, Load resistance is 0 to 750Ω.
1 to 5VDC, 2 points, Load resistance is greater than 2kΩ(One of the two outputs can be changed to 4 to 20 mA output).

Status Input /Output

Status input : 1 -6 points selectable for the programmable mode
1 point for the multifunction mode

Input	ON	OFF
Non-voltage contact *1*2	CLOSED less than 200Ω	OPEN more than 100kΩ
Voltage contact *1*2	LOW input voltage −0.5~1VDC	HIGH input voltage +4.5~30VDC

*1 Supply rating : more than 5VDC, 20mA
*2 Minimum pulse width : 120msec

Status output signals : 1 -6 points selectable for the programmable mode
(For the programmable mode total of inputs and outputs is 6)
5 points for the multifunction mode
Transistor contact rating 30V DC 200mA
(resistance load)

Fail output signal : 1 point
Transistor contact rating 30V DC 200mA
(resistance load)

Signal Isolation

Analog input / output signals are not isolated from the computation circuit, and use a negative common ground.
For direct input, except for a 2-wire transmitter (input not isolated), the input signals are isolated from the computation circuit.
Status input / output signals are isolated from computation circuit , and isolated from each other. Isolation is also provided between the computation circuit and power supply circuit.

Distributor Power Supply for Transmitter

Power Supply for Transmitter : 24VDC 30mA
(No short circuit protection)
It is not isolated from the computational circuits .
When it is shorted the computation will stop.
Provide external resistance (250Ω) for 1 to 5V.

Safety Requirements Conformity Standards

The YS170 conforms to the safety requirements as shown below except when with the option / D□□.

IEC1010-1 : 1990
EN61010-1 : 1992

EMC Conformity Standards

The instruments with the option /CE have the EMC conformity as shown below.
For EMI (Emission) - EN55011 : Class A Group 1
For EMS (Immunity) - EN50082 - 2 : 1995

Note that this instrument continues to operate with its measurement accuracy with ±20% of range during the test.

Hazardous Area Classification

The YS170 with the option / CSA is CSA approved as shown below.

CSA standard : CSA C22.2 No. 213
(Non-incendive Electrical Equipment for use in Hazardous Locations)
Location : Class I, Division 2, Groups A, B, C & D
Teperature Code : T4

Design Performance

Accuracy rating for
1 to 5V input : ±0.2% of span
Accuracy rating for
4 to 20mA output : Output current ±1.0% of span
Accuracy rating
for 1 to 5V output : Voltage output ±0.3% of span
Effect of ambient temperature change
on accuracy rating : |Accuracy| / 2 (per 10°C between 0°C to 50°C)
Effect of power supply voltage variation
on accuracy rating : |Accuracy| / 2 (within rated power supply voltage)
Maximum current flow : 600mA (DC drive of 100V version)
100mA (DC drive of 220V version)
Maximum power consumption : 26VA (AC drive of 100V version)
29VA (AC drive of 220V version)
Current flow and power
consumption for rated voltage : 430mA Typ. at 24VDC
19VA Typ. at 100VAC
23VA Typ. at 220VAC
Isolation Resistance :
Between I/O Terminals and Ground: 100MΩ/500VDC
Between Power supply and Ground : 100MΩ/500VDC
Withstanding Voltage
Between I/O Terminals and Ground: 500V AC for 1minute
Between Power supply and Ground : 100V AC version
1000V AC for 1 minute
220V AC version
1500V AC for 1 minute
Common mode noise rejection : 83dB(50Hz)
Series mode noise rejection : 46dB(50Hz)

Normal Operating Conditions

Ambient Temperature: 0 to 50℃ (32 to 122°F)
Ambient Humidity : 5 to 90%RH (non-condensing)
Rated Power Supply Voltage : For both DC and AC
100V version ;
DC drive ; 24 - 120VDC ⎓ (±10%), no polarity
AC drive ;100 - 120VAC ~ (±10%), 50/60Hz (±3Hz)
220V version ;
DC drive ;135 - 190VDC ⎓ (±10%), no polarity
AC drive ;220 - 240VAC ~ (±10%), 50/60Hz (±3Hz)

Under this rated voltage the instruments conform to the safety requirements in IEC1010-1 and EN61010-1. Under this condition the safety barrier BARD is allowed to be connected to the inputs.

On the other hand, the instruments themselves have the ability to operate under the condition as shown below which is the same as the former description of the power supply voltage.

Usable Power Supply Voltage : For both DC and AC
100V version ;
DC drive ; 20 - 130VDC, no polarity
AC drive ; 80 - 138VAC, 47 - 63Hz
220V version ;
DC drive ;120 - 340VDC, no polarity
AC drive ;138 - 264VAC, 47 - 63Hz

Dimensions, Mounting , Wiring

Mounting type : Direct panel mount
Panel mounting : Direct panel mounting kit(side by side)
Panel cut out : $137^{+2}\times68^{+0.7}$ (mm) [5.4×2.7 (inch)]
Connecting type :
External connections : Use ISO M4 screws
Power supply , ground connections : Use ISO M4 screws
Housing dimensions : 144×72×320mm
[5.7×2.8×12.6 (inch)]
(H×W×Depth behind panel)
Weight : 2.6kg

MODEL & SUFFIX CODES

Model	Suffix code	Option	Description
YS170			Single Loop Programmable Controller
	-0		Standard
	1		Always 1
Power Supply	1		100V version
	2		220V version
Options		/ □	Option (Refer to the following table)

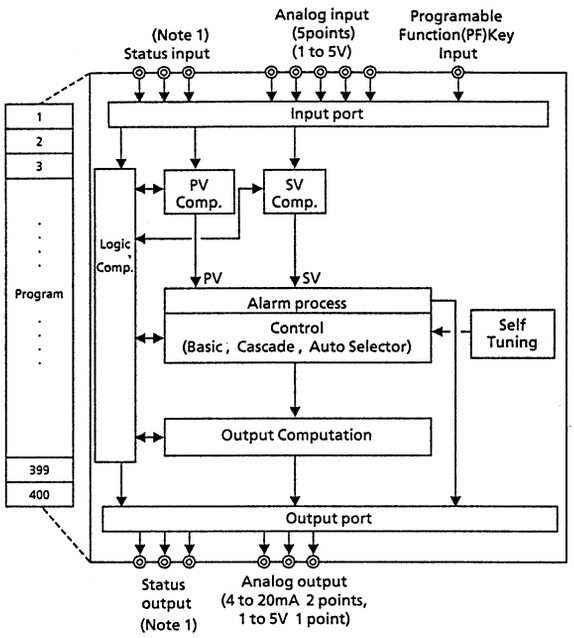
OPTION CODES

	Option Codes	Combi-nation with /CE	Combi-nation with /CSA	Description
	/ CE	-	No	CE Mark Approved
	/ CSA	No	-	CSA Non-incendive Approved
Input Options				It is possible to select one from the followings;
	/ A01	No	Yes	mV Input (EM1)
	/ A02	No	Yes	Thermocouple Input (ET5 / YS) (Type K, T, J, E, B, R, S)
	/ A03	No	Yes	Resistance Temperature Detector Input (ER5) (Pt100, JPt100)
	/ A04	No	Yes	Potentiometer (ES1)
	/ A05	No	Yes	Input Isolator (EH1)
	/ A06	No	Yes	2 - wire Transmitter Input (EA1)
	/ A07	No	Yes	2 - wire Transmitter Input (EA9) (no isolation from the field)
	/ A08	No	Yes	Frequency Input (EP3)
Input Options for /CE				It is possible to select one from the followings;
	/ A12	Yes	No	Thermocouple Input (ET5 / YS) (Type K, T, J, E, B, R, S)
	/ A13	Yes	No	Resistance Temperature Detector Input (ER5) (Pt100, JPt100)
	/ A16	Yes	No	2 - wire Transmitter Input (EA1)
	/ A17	Yes	No	2 - wire Transmitter Input (EA9) (no isolation from the field)
Commu-nication				It is possible to select one from the followings;
	/ A31	Yes	Yes	RS - 485
	/ A32	Yes	Yes	DCS-LCS
	/ A33	Yes	Yes	YS-net
Con-struction				It is possible to select one from the followings;
	/ D11	No	No	Replace for YEWSERIES 80 Internal Unit (Separate ordered for housing or use SHUP that already mounted)
	/ D12	No	No	Closely Mounting for YEWSERIES 80 Housing
	/ D13	No	No	Replace for 100 Line Internal Unit (Order YS006, YS100 Housing for 100 Line, separately.)

ORDERING INSTRUCTIONS

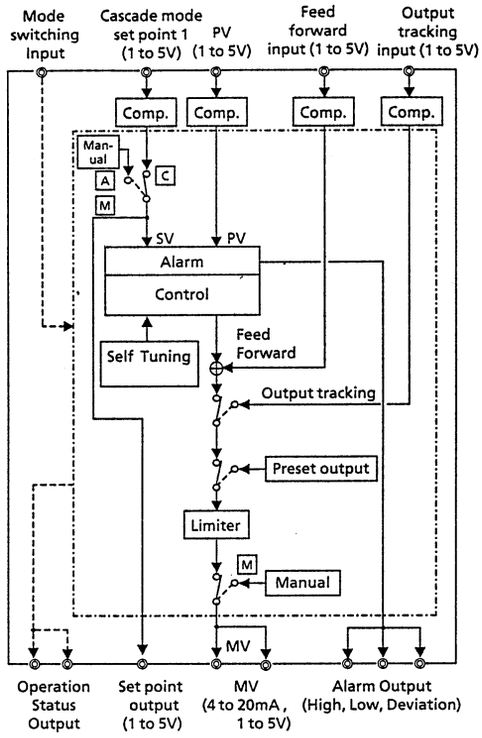
When ordering, specify the model & suffix code and option code if necessary.

BLOCK DIAGRAM

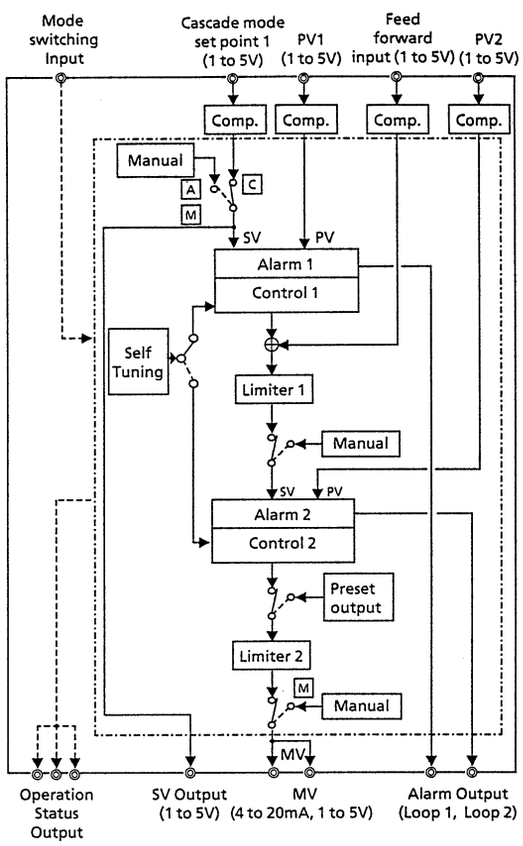


(Note 1) : Selectable as Input / Outputs ; total 6 points.

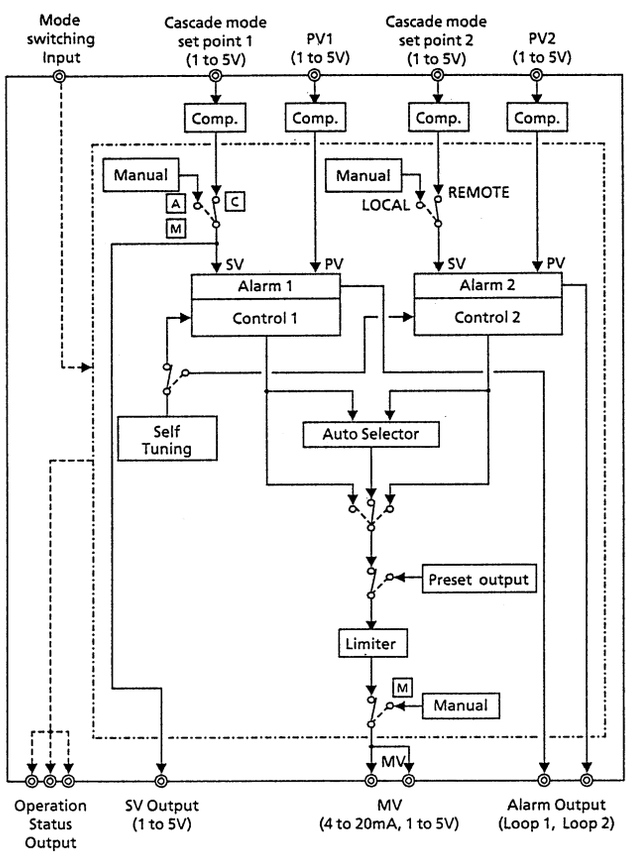
Programmable mode



Single-Loop mode



Cascade mode



Auto-selector mode

INPUT OPTIONS

Name		mV input	Thermocouple input	Resistance temperature detector input	Potentiometer
Option Code		/A01	/A02, /A12	/A03, /A13	/A04
Input Signal		DC voltage – 50 to +150mV	JIS, ANSI Thermocouple Type B, R, S, K, E, J, T IEC,ANSI Type N	RTS JIS' 89Pt100 (DIN Pt100) or JIS' 89 JPt100 3-wire Current : 1mA	potentiometer 3-wire
Measuring Limit	Span	10 to 100mV DC	10 to 63mV (Thermoelectric conversion)	10 to 650℃ 10 to 500℃ (JPt100)	Total resistance 100 to 2000Ω Span 80 to 2000Ω
	Zero Elevation	The smaller one of 3 times of span or ±50mV	The smaller one of 3 times of span or ±25mV	Max. 5 times of span	Within 50% of total resistance
Measuring Range		Set on Engineering panel			
Input Resistance		1MΩ (3kΩ when power off)		–	–
Input External Register		Less than 500Ω		Less than 10Ω / wire (note 1)	Less than 10Ω / wire
Allowable Input Current, Voltage		– 0. 5 to 4V DC		–	–
Input Linearization		None	provided	provided	None
1 to 5V Output Accuracy Rating		Within±0. 2% of span	Within larger of ±0. 2%of span or ±20μVof input conversion	Within larger of ±0. 2% of span or ±0. 2℃	Within±0. 2% of span
Reference Junction Compensation Error		–	Within±1℃ (note 2)	–	–

(note 1) The smaller one of 10Ω or measuring temperature span×0.4Ω per wire.

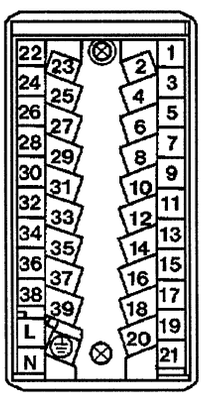
(note 2) For Type B , there is no reference junction compensation .
For other types, when the measured temperature is less than 0°C, multiply above error by K .

$$\text{where } K = \frac{\text{TC output per °C at 0°C}}{\text{TC output per °C at measured temperature}}$$

Name	Input isolator (1 to 5V input)	2-wire transmitter input	2-wire transmitter input (Input : not isolated)
Option Code	/A05	/A06, /A16	/A07, /A17
Input Signal	1 to 5VDC	4 to 20mADC signal from 2-wire transmitter (Transmitter power supplies)	4 to 20mADC signal from 2-wire transmitter (Transmitter power supplies)
Input Resistance	1MΩ (100kΩ when power off)	250Ω	250Ω
Input External Register	–	Less than RL= (20 – minimum transmitter operating voltage) / 0. 02 A (Ω)	Less than RL= (20 – minimum transmitter operating voltage) / 0. 02 A (Ω)
Allowable Input Current, Voltage	±30VDC	40mADC	40mADC
Input Linearization	None	None	None
1 to 5V Output Accuracy Rating	Within±0. 2% of span	Within±0. 2% of span	Within±0. 2% of span

Name	Frequency input
Option code	/A08
Input Signal	2-wire type : ON/OFF contact , voltage pulse , current pulse (Internal distributor may be used to supply power to transmitter) 3-wire type : Voltage pulse , internal distributor may be used to supply power to transmitter
Input Frequency	0 to 10 kHz
100%Frequency	0. 1 to 10 kHz
Zero elevation	May be varied between 0 to 50% of input frequency.
Measuring range	Can be changed on engineering panel
Low level input cut off point	Set in range : 0. 01 Hz (and more than 1% of max. frequency) to 100%
Minimum input pulse width	ON time : 60 µsec OFF time : 60 µsec (for input frequency 0 to 6 kHz) ON time : 30 µsec OFF time : 30 µsec (for input frequency 6 to 10 kHz)
Input signal level	Contact input : Relay contact , transistor contact Detection level Open : more than 100 kΩ Close : less than 200 Ω Contact rating : at least 15 VDC , 15 mA Voltage / Current input : Low level : −1 to +8 V, High level : +3 to +24 V Voltage swing : at least 3 Vpp (for input frequency 0 to 6 kHz) at least 5 Vpp (for input frequency 6 to 10 kHz)
Internal load resistance	Selected from 200 Ω, 500 Ω, 1 kΩ (for current pulse input)
Input filter	10 msec filter enable/disable (contact or voltage)
Internal distributor	12VDC 30 mA or 24 VDC 30 mA can be selected .
1 to 5V output Accuracy rating	Within ±0. 2% of span

TERMINAL DESIGNATION



(Reffer to Terminal Designation Table on the next page)

Terminal Designation Table

Terminal No.	Programmable Mode	Single - Loop Mode	Cascade Mode	Selector Mode
1	+	+	+	+
2	– > Analog input 1	– > PV	– > PV 1	– > PV 1
3	+	+	+	+
4	– > Analog input 2	– > Cascade set point input	– > Cascade set point input	– > Cascade set point input 1
5	+	+	+	+
6	– > Analog input 3	– > Tracking input	– > PV 2	– > PV 2
7	+	+	+	+
8	– > Analog input 4	– > Feedforward input	– > Feedforward input	– > Cascade setpoint input 2
9	+	+	+	+
10	– > Analog input 5 (note1)	– > Direct input signal output (note 1)	– > Direct input signal output (note 1)	– > Direct input signal output (note 1)
11	+	+	+	+
12	– > Fail output	– > Fail output	– > Fail output	– > Fail output
13	Power supply for transmitter (note 2)	Power supply for transmitter (note 2)	Power supply for transmitter (note 2)	Power supply for transmitter (note 2)
14	Communication (SG)	Communication (SG)	Communication (SG)	Communication (SG)
15	Communication (SA)	Communication (SA)	Communication (SA)	Communication (SA)
16	Communication (SB)	Communication (SB)	Communication (SB)	Communication (SB)
17	Communication (RA)or LCS+ or YS-net DA	Communication (RA) or LCS+ or YS-net DA	Communication (RA) or LCS+ or YS-net DA	Communication (RA) or LCS+ or YS-net DA
18	Communication (RB) or LCS– or YS-net DB	Communication (RB) or LCS– or YS-net DB	Communication (RB) or LCS– or YS-net DB	Communication (RB) or LCS– or YS-net DB
19	+	+	+	+
20	– ⊣⊢ Direct input (note 3)	– ⊣⊢ Direct input (note 3)	– ⊣⊢ Direct input (note 3)	– ⊣⊢ Direct input (note 3)
21				
22	+	+	+	+
23	– > Analog output 1 (4 to 20mA)	– > MV1 (4 to 20mA)	– > MV1 (4 to 20mA)	– > MV1 (4 to 20mA)
24	+	+	+	+
25	– > Analog output 2 (1 to 5VDC) (note 4)	– > MV 2 (1 to 5 VDC)	– > MV 2 (1 to 5 VDC)	– > MV 2 (1 to 5 VDC)
26	+	+	+	+
27	– > Analog output 3 (4 to 20mA / 1 to 5VDC)	– > SV (1 to 5 VDC)	– > SV (1 to 5 VDC)	– > SV (1 to 5 VDC)
28	+	+	+	+
29	– > Status output 1 or Status input 6	– > High limit alarm output	– > First loop Alarm output	– > First loop Alarm output
30	+	+	+	+
31	– > Status output 2 or Status input 5	– > Low limit alarm output	– > Second loop Alarm output	– > Second loop Alarm output
32	+	+	+	+
33	– > Status output 3 or Status input 4	– > Deviation alarm output	– > OPEN/CLOSE status output	– > LOCAL/REMOTE status output
34	+	+	+	+
35	– > Status output 4 or Status input 3	– > C/AM status output	– > C/AM status output	– > C/AM status output
36	+	+	+	+
37	– > Status output 5 or Status input 2	– > CA/M status output	– > CA/M status output	– > CA/M status output
38	+	+	+	+
39	– > Status output 6 or Status input 1	– > Action mode switching input	– > Action mode switching input	– > Action mode switching input
L	+	+	+	+
N	– > Power supply	– > Power supply	– > Power supply	– > Power supply
⏚	Ground (GND)	Ground (GND)	Ground (GND)	Ground (GND)

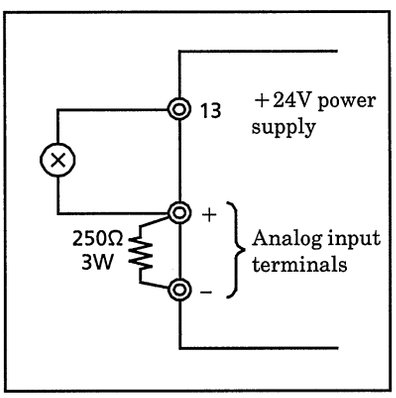
(note 1) When connecting a direct input to direct input terminals (19, 20, 21), these terminals are the output terminals for the1 to 5V output signal.
(note 2) For power supply for transmitter, refer to the connection diagram .
(note 3) For terminal connection, refer to other table "Wiring For Direct Input. ".
(note 4) Switching for 4 to 20mA / 1 to 5VDC is used with jumper.

Wiring For Direct Input

		Terminals		
		19	21	20
mV ,Thermocouple input		+		–
Resistance temperature detector RTD (note 1)		A B B		
Potentiometer input (note 2)		100 %		0 %
Fre - quency input	2 -wire (volt contact)	+		–
	2-wire type	Signal	Power supply	
	3-wire type	+	Power supply	–
2-wire transmitter input (note 3)		+		–

(note 1) Designations for A,B,B obey JIS Standard .
(note 2) Wiring resistance of A must be the same as B .
(note 3) For 4-20mA input that does not need the power supply transmitter , wire to 20 (+) and 21 (-) .

Connection diagram of power supply to transmitter

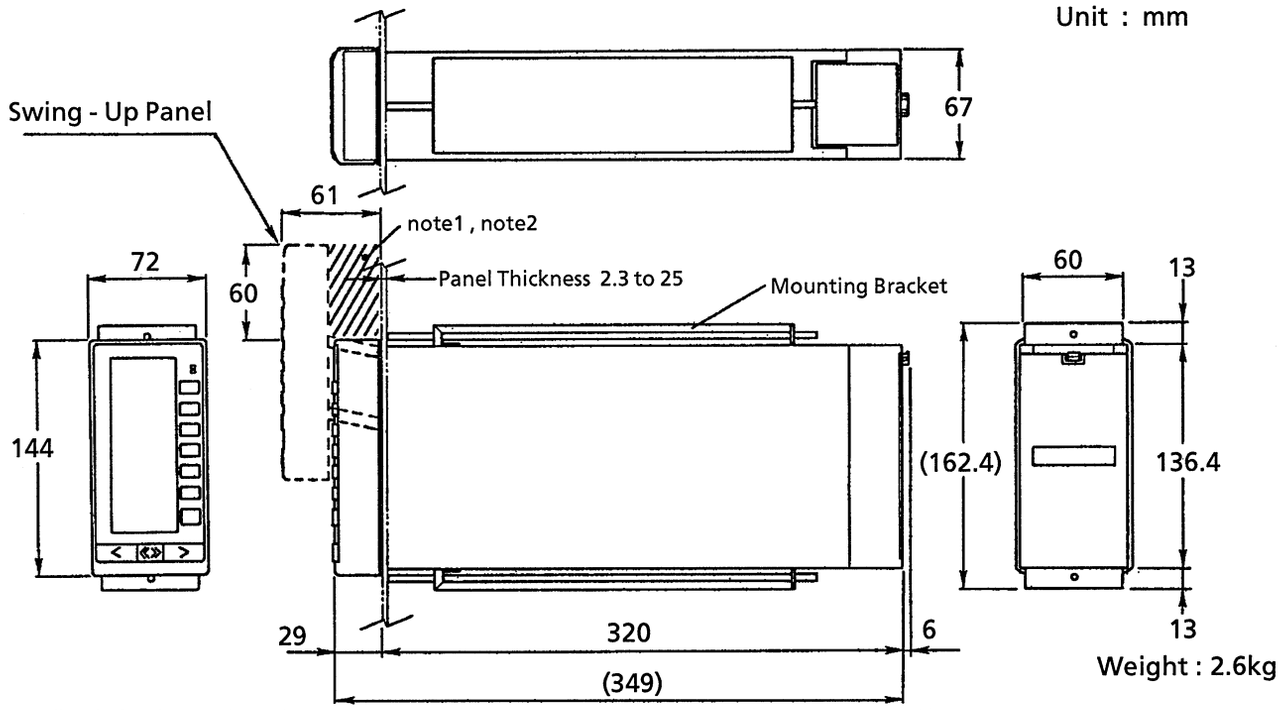


ACCESSORIES

Tag plate seals : 4 sheets
Range seals : 4 sheets

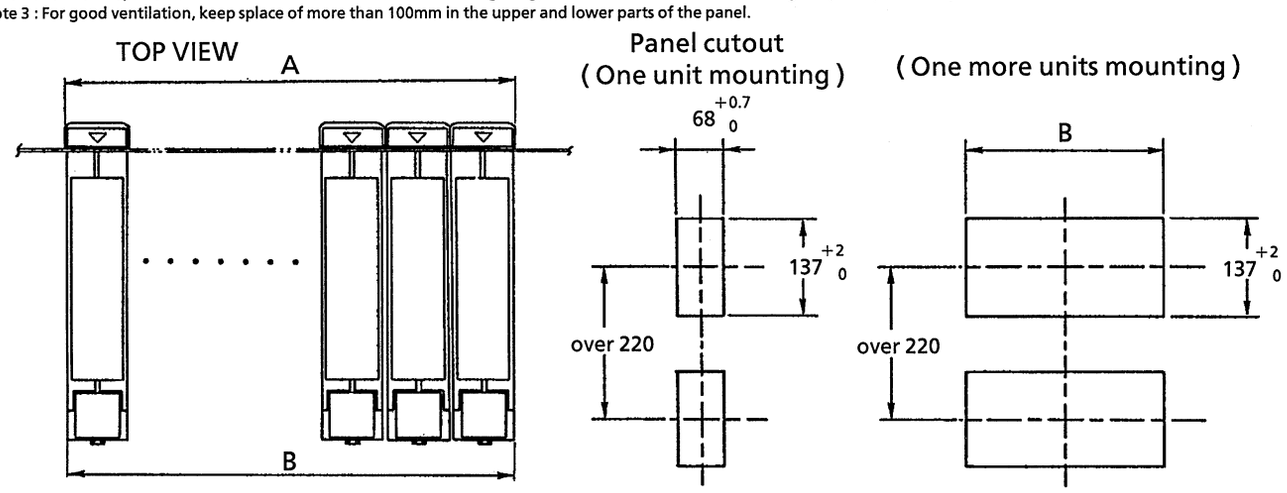
EXTERNAL DIMENSION

Unit : mm



Weight : 2.6kg

Note 1 : To allow the faceplate to swing up 60mm (see above), any obstruction at the top of the panel should project no more than 29mm.
Note 2 : To allow replacement of the fluorescent tube used for back-lighting, 130mm clearance above the swinged up faceplate is required.
Note 3 : For good ventilation, keep splace of more than 100mm in the upper and lower parts of the panel.



The Normal Allowable difference = ± (Value of IT18 for JIS B 0401 - 1986) / 2

Panel cutout for mounting closely multi - unit

Size \ Unit	1	2	3	4	5	6	7
A	72	144	216	288	360	432	504
B	$68^{+0.7}_{0}$	$140^{+1.0}_{0}$	$212^{+1.0}_{0}$	$284^{+1.0}_{0}$	$356^{+1.0}_{0}$	$428^{+1.0}_{0}$	$500^{+1.0}_{0}$

Size \ Unit	8	9	10	11	12	13	14
A	576	648	720	792	864	936	1008
B	$572^{+1.0}_{0}$	$644^{+1.0}_{0}$	$716^{+1.0}_{0}$	$788^{+1.0}_{0}$	$860^{+1.0}_{0}$	$932^{+1.0}_{0}$	$1004^{+1.0}_{0}$