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 9999.9%
- Integral time: 1 to 99999 sec
- Derivative time: 0 to 9999 sec (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 9999.9%
- Derivative time: 0 to 99999 sec (Note)
- Balance-rate time: 1 to 99999 sec
- 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 99999 sec
- Control time width: 0 to 99999 sec
- 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)
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% (PV or 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

\[ CSV = \text{CGN(CIN + CBI)} + CBO \]
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 = \( FGN(FIN + FBU) + FBO \)
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

<table>
<thead>
<tr>
<th>Action mode</th>
<th>Controller mode</th>
<th>single</th>
<th>cascade</th>
<th>selector</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS&lt;AUTO or CAS&lt;AUTO&lt;MAN</td>
<td></td>
<td>O</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>External switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Cascade Connection</td>
<td></td>
<td>-</td>
<td>O</td>
<td>-</td>
</tr>
<tr>
<td>OPEN/CLOSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SV of secondary loop</td>
<td></td>
<td>-</td>
<td>-</td>
<td>O</td>
</tr>
<tr>
<td>REMOTE/LOCAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preset MV output ON / OFF</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Output tracking ON / OFF</td>
<td></td>
<td>O</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self-Tuning Function ON/OFF</td>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>external switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(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 (5sec), 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 : Alphanumeric
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

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

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

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. frame 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 selectable from DCS.

Back-up for Communication Failure
  Backup mode if supervisory computer fails is selectable
  (AUT or MAN mode).

Power-Fail/Rearst 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 48 hours, average is 7 days
  (Backed up by charge on super capacitor)
If a power failure continues longer than the life of parameter
backup, restarted by a Initial start.
Operation for each start mode

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>HOT start</th>
<th>COLD start</th>
<th>Initial start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as before power fail</td>
<td>MAN</td>
<td>MAN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manipulated Value (MV)</th>
<th>Same as before power fail</th>
<th>Same as before power fail</th>
<th>-6.3%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Set point (SV)</th>
<th>Same as before power fail</th>
<th>Same as before power fail</th>
<th>Data stored in nonvolatile memory</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PID Parameter</th>
<th>Same as before power fail</th>
<th>Same as before power fail</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dynamic computation as first order lag</th>
<th>Continue</th>
<th>Initialize</th>
<th>Initialize</th>
</tr>
</thead>
</table>

### 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 | CLOSED less than 200Ω | OPEN more than 100kΩ
Voltage contact | LOW input voltage -0.5-1VDC | HIGH input voltage +4.6-30VDC

*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) - EN55082-2: 1995

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

GS 01B07C02-01E
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
Temperature 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 : \[ \frac{\text{Accuracy}}{2} \] (per 10°C between 0°C to 50°C)

Effect of power supply voltage variation on accuracy rating : \[ \frac{\text{Accuracy}}{2} \] (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 1 minute
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°C (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\(\times\)25\(\times\)12.8 (inch)
Connecting type : External connections : Use ISO M4 screws
Power supply, ground connections : Use ISO M4 screws
Housing dimensions : 144\(\times\)72\(\times\)320mm
  \[ 5.7\times2.8\times12.6 \text{ (inch)} \]
Weight : 2.6kg
## MODEL & SUFFIX CODES

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YS170</td>
<td>--0</td>
<td>Standard</td>
<td>Single Loop Programmable Controller</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Always 1</td>
<td></td>
</tr>
</tbody>
</table>

### Power Supply Options
- 1: 100V version
- 2: 220V version

### Options
- /☐: Option (Refer to the following table)

## OPTION CODES

<table>
<thead>
<tr>
<th>Option Codes</th>
<th>Combination with /CE</th>
<th>Combination with /CSA</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ CE / CSA</td>
<td>No</td>
<td>No</td>
<td>CB Mark Approved, CSA Non-invasive Approved</td>
</tr>
</tbody>
</table>
| / A01        | No                   | Yes                   | It is possible to select one from the followings:
| / A02        | No                   | Yes                   |
| / A03        | No                   | Yes                   |
| / A04        | Yes                  | No                    | It is possible to select one from the followings:
| / A05        | Yes                  | No                    |
| / A06        | Yes                  | No                    |
| / A07        | Yes                  | No                    |
| / A08        | Yes                  | No                    |

### Input Options
- / A12: Yes
- / A13: Yes
- / A16: Yes
- / A17: Yes

### Input Options for /CE
- / A21: Yes
- / A22: Yes
- / A23: Yes

### Communication
- / A31: Yes
- / A32: Yes
- / A33: Yes

### Construction
- / D11: No
- / D12: No
- / D13: No

## ORDERING INSTRUCTIONS

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

Programmable mode

Single-Loop mode

Cascade mode

Auto-selector mode

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

<table>
<thead>
<tr>
<th>Name</th>
<th>mV input</th>
<th>Thermocouple input</th>
<th>Resistance temperature detector input</th>
<th>Potentiometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option Code</td>
<td>/A01</td>
<td>/A02, /A12</td>
<td>/A03, /A13</td>
<td>/A04</td>
</tr>
<tr>
<td>Input Signal</td>
<td>DC voltage 50 to +150mV</td>
<td>JIS, ANSI Thermocouple Type B, R, S, K, E, J, T IEC, ANSI Type N</td>
<td>RTS JIS'89Pt100 (DIN Pt100) or JIS'89 JPt100 3-wire Current : 1mA</td>
<td>potentiometer 3-wire</td>
</tr>
<tr>
<td>Measuring Limit</td>
<td>Span 10 to 100mV DC (Thermoelectric conversion)</td>
<td>10 to 63mV</td>
<td>10 to 500°C (JPt100)</td>
<td>Total resistance 100 to 2000Ω Span 80 to 2000Ω</td>
</tr>
<tr>
<td></td>
<td>Zero Elevation The smaller one of 3 times of span or ±50mV</td>
<td>The smaller one of 3 times of span or ±25mV</td>
<td>Max. 8 times of span</td>
<td>Within 50% of total resistance</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>Set on Engineering panel</td>
<td>1MΩ (3kΩ when power off)</td>
<td>Less than 100Ω / wire (note 1)</td>
<td>Less than 10Ω / wire</td>
</tr>
<tr>
<td>Input External Register</td>
<td>Less than 5000Ω</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Allowable Input Current, Voltage</td>
<td>– 0.5 to 4V DC</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Input Linearization</td>
<td>None</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1 to 5V Output Accuracy Rating</td>
<td>Within ±0.2% of span</td>
<td>Within larger of ±0.2% of span or ±20µV of input conversion</td>
<td>Within larger of ±0.2% of span or ±0.2°C</td>
<td>Within ±0.2% of span</td>
</tr>
<tr>
<td>Reference Junction Compensation Error</td>
<td>–</td>
<td>Within ±1°C (note 2)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

(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.

\[
\text{K} = \frac{\text{TC output per } ^\circ\text{C at } 0^\circ\text{C}}{\text{TC output per } ^\circ\text{C at measured temperature}}
\]

### 2-wire transmitter input

<table>
<thead>
<tr>
<th>Name</th>
<th>Input isolator (1 to 5V input)</th>
<th>2-wire transmitter input (Transmitter power supplies)</th>
<th>2-wire transmitter input (Input: not isolated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option Code</td>
<td>/A05</td>
<td>/A06, /A18</td>
<td>/A07, /A17</td>
</tr>
<tr>
<td>Input Signal</td>
<td>1 to 5VDC</td>
<td>4 to 20mADC signal from 2-wire transmitter</td>
<td>4 to 20mADC signal from 2-wire transmitter</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>1MΩ (100kΩ when power off)</td>
<td>250Ω</td>
<td>250Ω</td>
</tr>
<tr>
<td>Input External Register</td>
<td>–</td>
<td>Less than RL = (20 – minimum transmitter operating voltage) / 0.02 A (Ω)</td>
<td>Less than RL = (20 – minimum transmitter operating voltage) / 0.02 A (Ω)</td>
</tr>
<tr>
<td>Allowable Input Current, Voltage</td>
<td>±30VDC</td>
<td>40mADC</td>
<td>40mADC</td>
</tr>
<tr>
<td>Input Linearization</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>1 to 5V Output Accuracy Rating</td>
<td>Within ±0.2% of span</td>
<td>Within ±0.2% of span</td>
<td>Within ±0.2% of span</td>
</tr>
</tbody>
</table>
### TERMINAL DESIGNATION

(Refer to Terminal Designation Table on the next page)
## Terminal Designation Table

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

(note 1) When connecting a direct input to direct input terminals (19, 20, 21), these terminals are the output terminals for the 1 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.

GS 01B07C02-01E
Wiring For Direct Input

<table>
<thead>
<tr>
<th></th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV, Thermocouple input</td>
<td>+</td>
</tr>
<tr>
<td>Resistance temperature detector RTD (note 1)</td>
<td>A B B</td>
</tr>
<tr>
<td>Potentiometer input (note 2)</td>
<td>100% 0%</td>
</tr>
<tr>
<td>Frequency input</td>
<td>-</td>
</tr>
<tr>
<td>2-wire (volt contact)</td>
<td>+</td>
</tr>
<tr>
<td>2-wire type</td>
<td>Signal</td>
</tr>
<tr>
<td>3-wire type</td>
<td>+</td>
</tr>
<tr>
<td>2-wire transmitter input (note 3)</td>
<td>-</td>
</tr>
</tbody>
</table>

(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

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 backlighting, 130mm clearance above the swinged up faceplate is required.
Note 3: For good ventilation, keep space of more than 100mm in the upper and lower parts of the panel.

Panel cutout for mounting closely multi-unit

<table>
<thead>
<tr>
<th>Size</th>
<th>Unit</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>72</td>
<td>144</td>
<td>216</td>
<td>288</td>
<td>360</td>
<td>432</td>
<td>504</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>68+0.7</td>
<td>140+1.0</td>
<td>212+1.0</td>
<td>284+1.0</td>
<td>356+1.0</td>
<td>428+1.0</td>
<td>500+1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>576</td>
<td>648</td>
<td>720</td>
<td>792</td>
<td>864</td>
<td>936</td>
<td>1008</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>572+1.0</td>
<td>644+1.0</td>
<td>716+1.0</td>
<td>788+1.0</td>
<td>860+1.0</td>
<td>932+1.0</td>
<td>1004+1.0</td>
<td></td>
</tr>
</tbody>
</table>

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