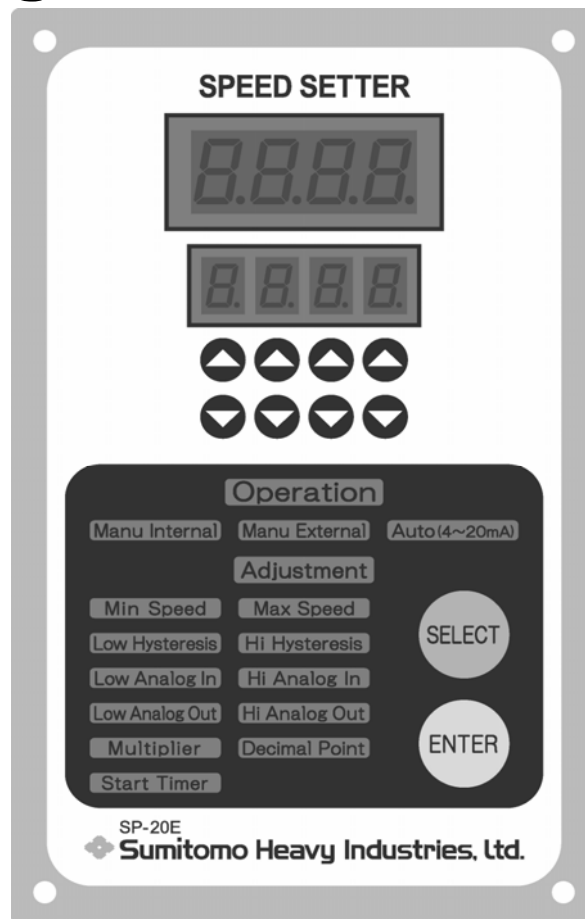


Speed Setter SP—20E

Operating and Maintenance Manual



Note

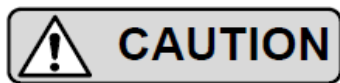
- Read manual carefully before starting installation, operation, and maintenance
- Provide the manual to end user so that they can refer
- Keep Operation and Maintenance manual

Safety and Other Precautions

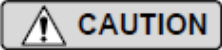
- Carefully read this operation and maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection and so on). Thoroughly understand the machine, information about safety, and all precautions for correct operation. Retain this manual for future reference.
- Pay close attention to the “Danger” and “Caution” warning regarding safety and proper use.



Improper handling may result in physical damage, serious personal injury and/or death.



Improper handling may result in physical damage and/or personal injury

Matters described in  may lead to serious danger depending on the situation. Be sure to observe important matters described herein.



Danger

- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be performed by qualified and trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- When the unit is to be used in a system for human transportation, secondary safety device should be installed to minimize risk of accidents resulting in personal injury, death, or damage to the equipment.
- When the unit is to be used for an elevator, install a safety device on the elevator side to prevent it from falling; otherwise, personal injury, death, or damage to the equipment may result.

Contents

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1. Inspection upon Delivery



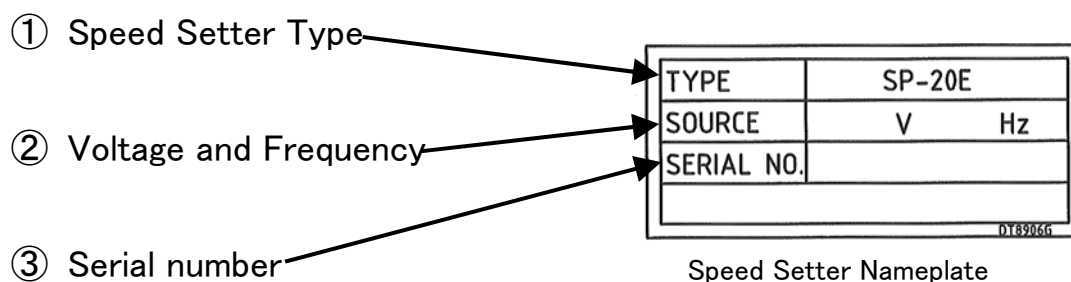
Cautions

- Unpack the unit after verifying that box is positioned right side up; otherwise, injury
- Verify that the unit received is in fact the one you ordered. Installing the wrong unit may result in personal injury or equipment damage.
- Do not remove nameplate.

Verify the items listed below upon receiving the "Speed Setter". When a nonconformity or problem is found, contact nearest agent, distributor, or sales office.

- (1) Does the information on the nameplate to what you ordered ?
- (2) Was there any part broken during transport ?

1 – 1) Nameplate



Note When making an inquiry, provide all information on nameplate: (1)Type, (2) Voltage and Frequency, and (3) Serial number.

2. Storage

In case this unit is temporarily stored other than in the place for installation upon arrival, keep it indoor, dry, and clean room, and avoid excess temperature change, humidity, dust, and/or corrosive gas.

3. Transportation



Caution

- Use both hands to handle and transport "Speed Setter" (approx. 1.85 kg)
Pay attentions to edge of panel to avoid injury.

4. Installation



Danger

- Do not install "Speed Setter" in explosive and flammable gas, or it may cause explosion, fire, electric shock, injury and damage to the application.



Cautions

- Operate "Speed Setter" in the place where specified by O&M manual, manufacturing specification, or it may cause electric shock, injury and damage to the application.
- Do not foot, or it may cause damage to "Speed Setter" and/or injury.

4—1: Installation environment

Install "Speed Setter" in the proper operating environment described below.

Ambient Temperature 0 to 40°C

Ambient Humidity 90%RH or less

Altitude 1000m above sea level, or less

Place Free from dust, iron particles, corrosive/explosive/flammable gas/objects, and steam
Indoor, no rain, no waterdrop, no direct sun light, less vibration, less magnetic field nor noise.

- Consider the space around Speed Setter for easy inspection and maintenance
- Install "Speed Setter" on panel where it is rigid and strong enough to hold.

4—2: Installation position

There is no restrict for mounting position.

5. Wiring



Danger

- Turn power off during wiring, or it may cause electric shock..
- Leads should be wired by qualified technician and it should meet regulation and/or laws, or it may cause burning, electric shock, injury and/or fire.
- Do not damage leads during wiring, or it may cause electric shock and/or fire.
- For ground terminal use wires as large and short as possible, or it may cause electric shock.



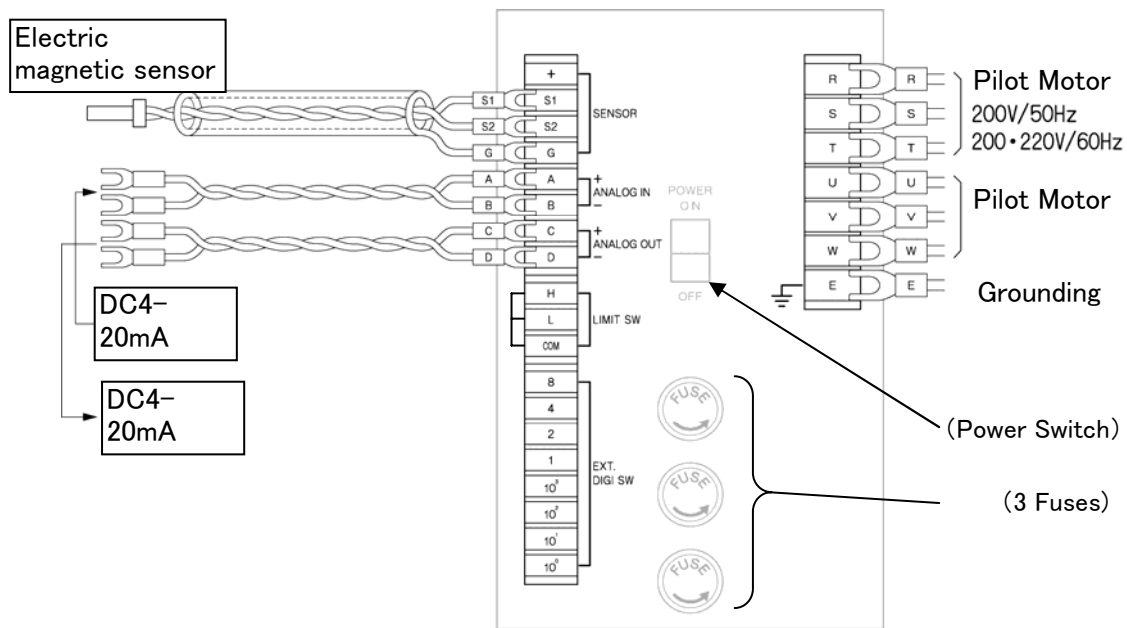
Caution

- Leads should be wired by qualified technician and it should meet regulation and/or laws, or it may cause burning, electric shock, injury and/or fire.

5—1: General

- (1) Power source to "Speed Setter" should be 200V /50Hz, 200V /60Hz, or 220V/60Hz.
- (2) Provide interlocking so that power to "Speed Setter" will not turn ON, when main motor is not running, or it may cause serious damage to "Beier Variator" that is not designed to operate pilot motor while "Beier Variator" stops running.
Provide interlocking so that power to "Speed Setter" will not turn ON until main motor speed reaches to constant speed at acceleration. Also see section 7-10: "Start Timer"
- (3) 5A fuse on "Speed Setter" is intended for short-circuit protection.
Use "2E thermal relay" suited for pilot motor to protect from burning due to overcurrent or missing phase.
- (4) Use twisted wire or shielded wire of 0.5mm square or more, for control such as leads to electric magnetic speed sensor and DC4-20mA input/output signal. Also it should be separated from power lines.
Distance between "Speed Setter" and "Beier variator" should be 100 meters or less.
- (5) Do not check insulation by megger test, or it may cause damage to "Speed Setter"

5—2: Wiring



Terminals

(1) Power Source

Connect power source: 200V /50Hz, 200V /60Hz, or 220V/60Hz. To terminals: R, S, T. Consider interlocking so that "Speed Setter" can't be turned on while main motor is not running.

(2) Pilot Motor

Connect leads from Pilot motor to terminal U,V, and W. See section 6-1: "Test run" to make sure Pilot motor rotation direction. Swap wiring to U and V to change the direction.

(3) Electric magnetic sensor

Connect leads from "Electric magnetic sensor" to terminals: S1, S2 and G(Ground). Use twisted wire or shielded wire of 0.5mm square or more. Also it should be separated from power lines.

(4) DC4~20mA Input

In order to control "Speed Setter" by using DC 4-20mA input, connect leads to terminals: A(+) and B(-).

Use twisted wire or shielded wire of 0.5mm square or more. Also it should be separated from power lines.

Input impedance between A and B is 100 (Ohm)

(5) DC4~20mA Output

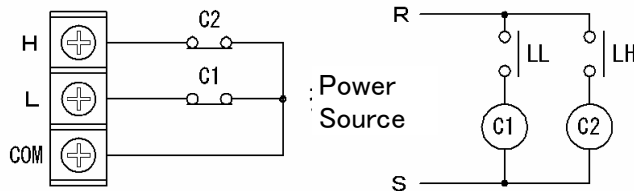
In order to gain DC4-20mA that is proportion to Beier output speed, connect leads to terminals: C(+) and D(-).

Note: Load resistance should be 500 (Ohm) or less.

(6) Limit Switches (Option)

There is a plate to short-circuit terminals: H, L, and COM as factory default

When 2 limit switches are installed on "Beier variator", then follow instruction below.



LL: Limit switch on low speed side mounted on "Beier variator"

LH: Limit switch on high speed side mounted on "Beier variator"

C1、C2: Control Relay

Install control relay as close to "Speed Setter" as possible. Use relays with twin contacts or rated for low voltage circuit.

- Section 5-2-(1) through (6) are for Sumitomo standard recommendation
See other wiring diagrams that may be provided for special control method.
Also see other wiring examples in catalog for special control.

6. Operation



Danger

- Turn off power switch to avoid electric shock, injury, or damage to the application in case power is recovered after electric power failure.



Caution

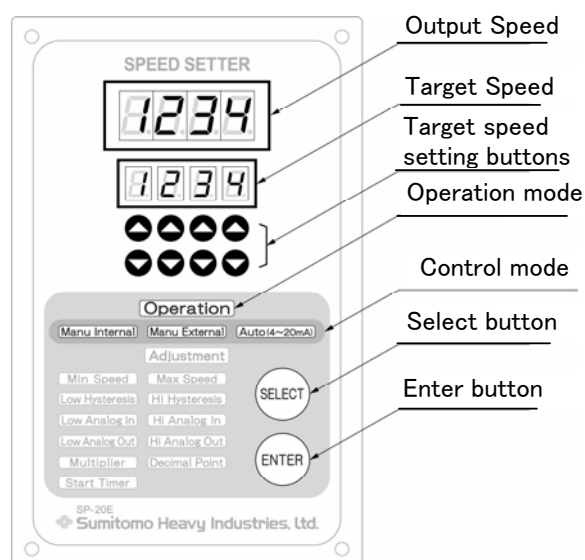
- Stop operation immediately when system behave different from what is expected, or it may cause electric shock, injury, fire or damage to Beier and/or application.

6—1: Test run

When wiring has been completed, check to make sure that there is no incorrect wiring, faulty wiring, short-circuiting due to wiring wastes and so on. It is strongly recommended to do "Test run" with no load.

- (1) Start main motor and wait till it runs at constant speed.
- (2) Turn on power switch of "Speed Setter"
 - "8888" will be displayed on Target speed display several seconds. Then number will start count
 - Output speed will be displayed after count down end.

- (3) Press Target speed setting buttons to specify Target speed. It is recommended to set the speed far from actual output speed in order to check pilot motor behavior.

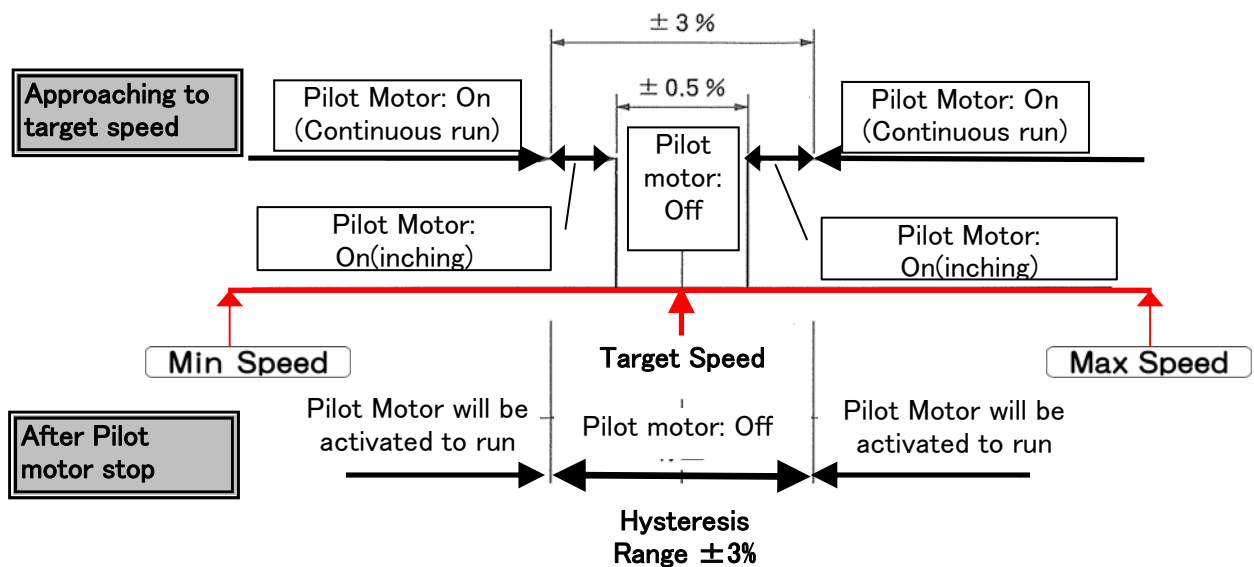


Pilot motor start running, inching, and stop at target speed, when leads are wired correctly and all parameters in Speed Setter are correctly set.

- **Turn off power switch immediately, when output speed doesn't approach the target speed. Change the leads to terminals:U and V in order for pilot motor to change rotation direction.**
- (4) Repeat (2) and (3), when changing wiring connection to U and V. Also it is recommended to change "Target speed" couple times for making shure entire system works.
 - (5) When using DC4~20mA input signal to change "Target speed", switch operation mode to "Auto(4~20mA)" and check again.
 - (6) Activate interlocking so that power is provided to both "Speed setter" and Beier main motor. Adjust "Start Timer" if necessary. (See section 7-10:"Start Timer"). It may be recommended to adjust the timing with load, since acceleration time may vary depending upon the load.

6—2: How Pilot motor approach target speed

- (1) Pilot motor runs continuously to approach the target speed, and starts inching, when actual output speed reaches $\pm 3\%$ of target speed.
- (2) Pilot motor stops, when actual output speed reaches $\pm 0.5\%$ of the target speed.
- (3) Pilot motor keep stop while actual output speed is within hysteresis range $\pm 3\%$ of target speed. It will start same process(1) and (2), when actual output speed is out of the hysteresis range.
- (4) The Hysteresis range $\pm 3\%$ is factory default, and can be adjusted. See section 7-5 to adjust the range.

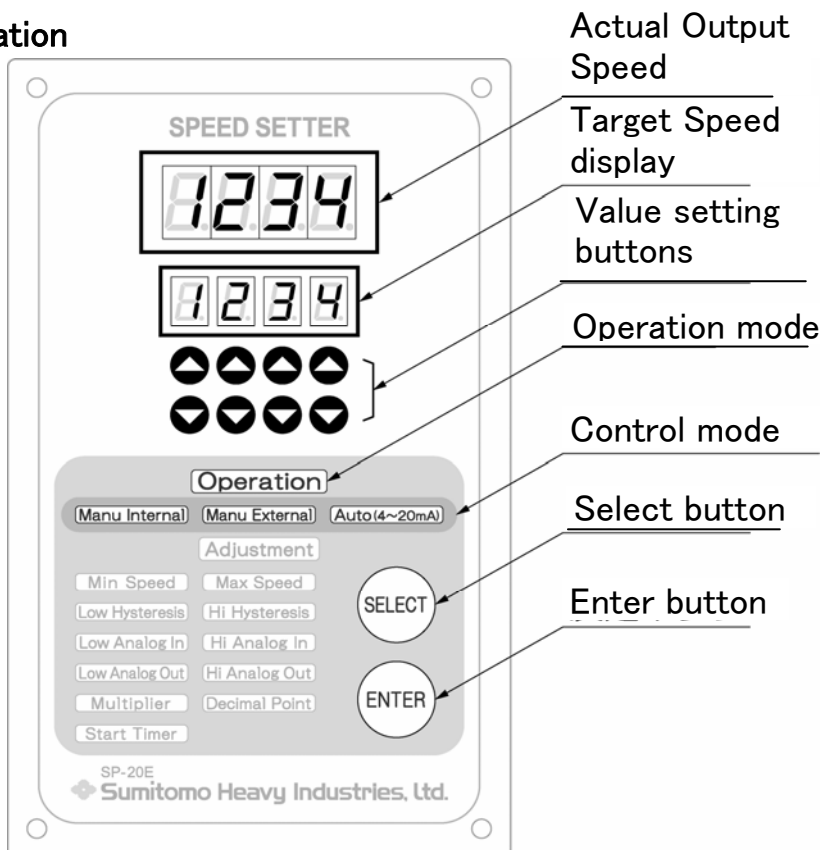


7. Adjustment

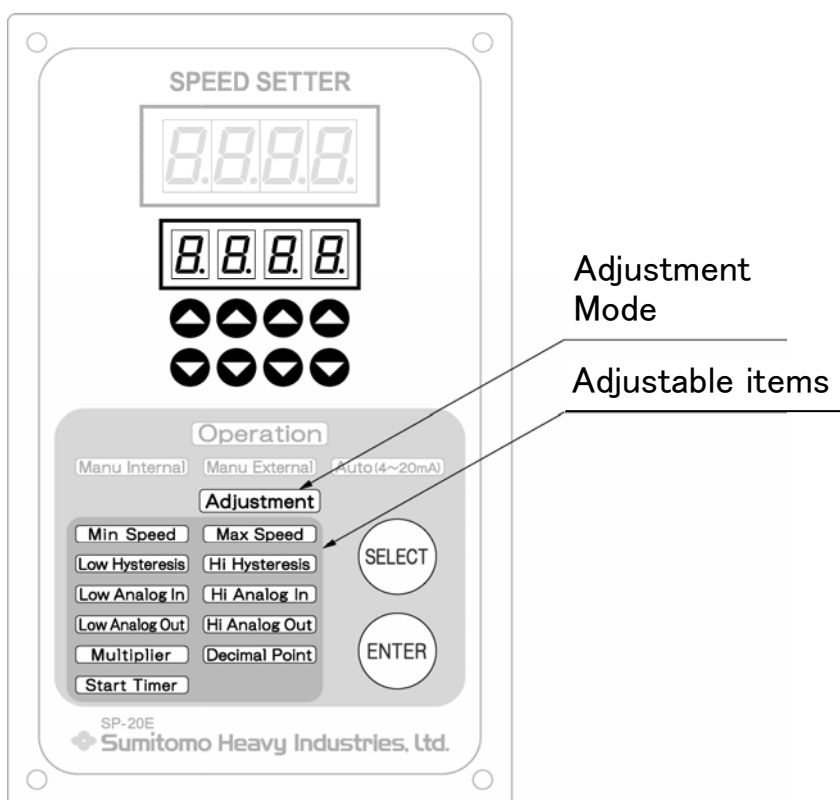
Default value is set to each item at Sumitomo factory shipment. Follow instruction below to change the parameter setting if necessary.

7 – 1: Operation Panel

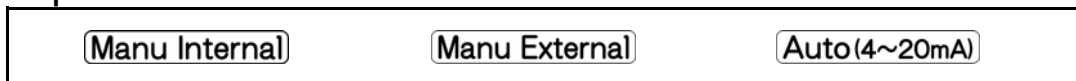
(1) For operation



(2) For parameters adjustment



7-2: Operation mode

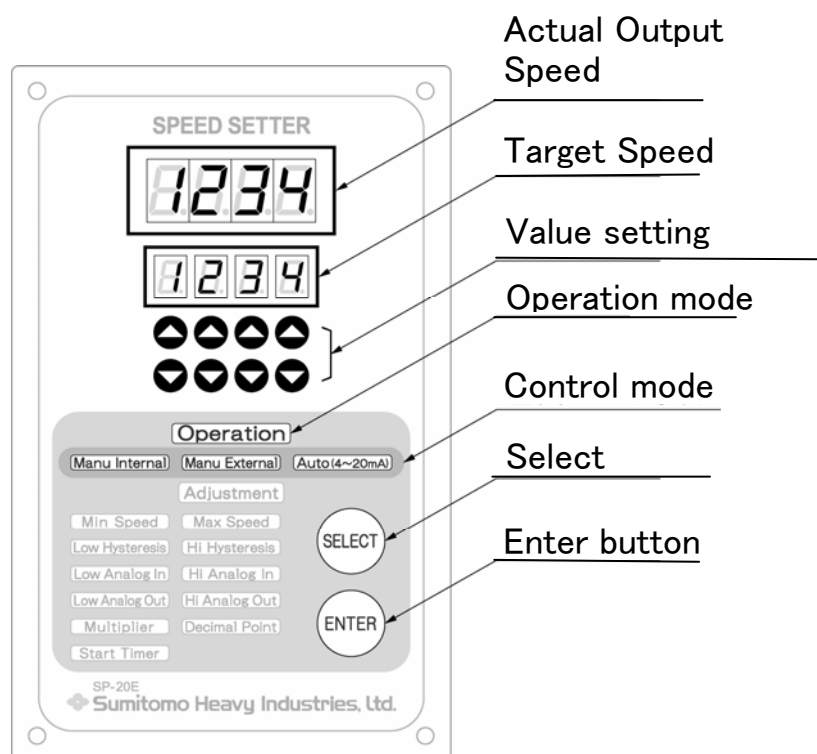


(1) **Operation** There are 3 modes of operation:

- ① **Manu Internal** Manual control for "Target speed" by operation panel.
- ② **Manu External** Manual control for "Target speed" by external speed device.
- ③ **Auto(4~20mA)** Automatic control by DC4~20mA analog input.
LED for "Target speed" will be off during automatic mode.


Note "Speed setter" control pilot motor while actual speed is between "Min. Speed" and "Max. Speed" for all control modes.

See section 7-4 to change the parameters for both Minimum and Maximum speed

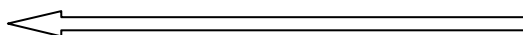


(2) How to change "Control mode"

- ① Press "Select button"  to change control mode during "Operation mode" **Operation** is on.

"Control mode" change as following order, when pressing "Select button" 

Manu Internal ⇒ **Manu External** ⇒ **Auto(4~20mA)**



Press "Enter button"  to finalize the control mode.


7 – 3: Adjustment

Default value is set to each item at Sumitomo factory shipment. Follow instruction belows to change the parameter setting if necessary.


General procedure

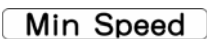


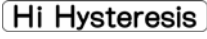
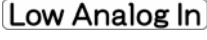
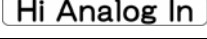

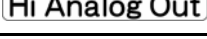
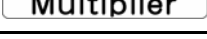
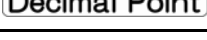

1) Press "Enter"  button 2 seconds, then "Adjustment" will light.

Adjustment

2) Press "Select"  button to choose item for changing the parameter setting. Keep pressing "Select" button till the item will light.

3) Press "arrows"  to change the numbers

4) Go to 2) to change the setting for another item, or press "Enter"  to finalize the parameter and exit.

Item	Contents	Section
 Min Speed	Minimum speed	7-4
 Max Speed	Maximum speed	
 Low Hysteresis	Hysteresis range at minimum speed	7-5
 Hi Hysteresis	Hysteresis range at maximum speed	
 Low Analog In	DC mA Input (automatic control) at minimum speed	7-6
 Hi Analog In	DC mA Input (automatic control) at maximum speed	
 Low Analog Out	DC mA Output at minimum speed	7-7
 Hi Analog Out	DC mA Output at maximum speed	
 Multiplier	Conversion multiplier to display different number	7-8
 Decimal Point	Location of decimal point	7-9
 Start Timer	Timer to delay control system after power on	7-10

7-4) "Minimum Speed" and "Maximum Speed"

Min Speed

Max Speed

(1) General

Minimum Speed and Maximum Speed are speed range that "Speed Setter" can control speed of "Beier variator" for.

Default value at Sumitomo factory shipment:

Min speed: minimum speed (Hz) that is same as Sumitomo catalog

Max speed: maximum speed (Hz) that is considering motor slip and little lower than catalog max. speed

When changing the parameter, understand the concept below and both speeds should be located within Beier Variator can provide, or it may cause that Pilot motor never stop and damage Pilot motor and/or Beier variator

i.e.

"Beier variator min. speed" \leq "Speed Settet min. speed" and

"Speed setter max. speed" \leq "Beier variator max. speed"

It is required to set frequency (Hz) for both minimum and maximum speed those are compared with feedback from electric magnetic sensor.

The feedback from Electric magnetic sensor is the number of gear teeth pass per second (Hz) and the gear is mounted at Beier output shaft.

The feedback P is calculated by formula:

$$P_{\min} = N_{\min} \times Z / 60 \quad P_{\max} = N_{\max} \times Z / 60$$

where

Pmin: Minimum shaft speed (Hz), Pmax: Maximum shaft speed (Hz)

Z: Sensor Gear teeth number Z1: Cyclo Reduction Ratio: 6,8,11,13,15,17,21...

Nmin: Minimum output shaft speed (r/min)

Nmax: Maximum output shaft speed (r/min)

When sensor is located at intermediate shaft, then the shaft speed is given by formula:

intermediate shaft speed = Output shaft speed x Cyclo reduction Ratio

The feedback P is calculated by formula:

$$P_{\min} = N_{\min} \times Z \times Z1 / 60 \quad P_{\max} = N_{\max} \times Z \times Z1 / 60$$

Summary

1st letter of Beier model#	Description	Electric magnetic Sensor and gear location	Beier Size	Z: Sensor Gear Teeth#	Pmin	Pmax
B	Beier stand alone	Output Shaft	All	60	$= N_{min} \times 60/60$ $= N_{min}$	$= N_{max} \times 60/60$ $= N_{max}$
G	G-type Beier	Output Shaft	50A, 75A, 100A, 50B, 75B	120	$= N_{min} \times 120/60$ $= 2 \times N_{min}$	$= N_{max} \times 120/60$ $= 2 \times N_{max}$
			Others	60	$= N_{min} \times 60/60$ $= N_{min}$	$= N_{max} \times 60/60$ $= N_{max}$
C	Beier Cyclo	Intermediate shaft between Cyclo and Beier	All	60	$= N_{min} \times 60/60$ $\times Z1/60 = N_{min} \times Z1$ $*1$	$= N_{max} \times 60 \times Z1/60$ $= N_{max} \times Z1$ $*1$

*1: Consider Z1: Cyclo reduction ratio to calculate the intermediate shaft speed:

Intermediate shaft speed = Output Shaft speed x Cyclo reduction Ratio

Value of Min. Speed and Max. Speed are used for Hysteresis setting and Analog DC4–20mA Input/Output also.

(2) How to adjust "Minimum Speed" and "Maximum Speed"

① Minimum Speed

Press "Enter" 2 seconds to light
"adjustment"

Adjustment

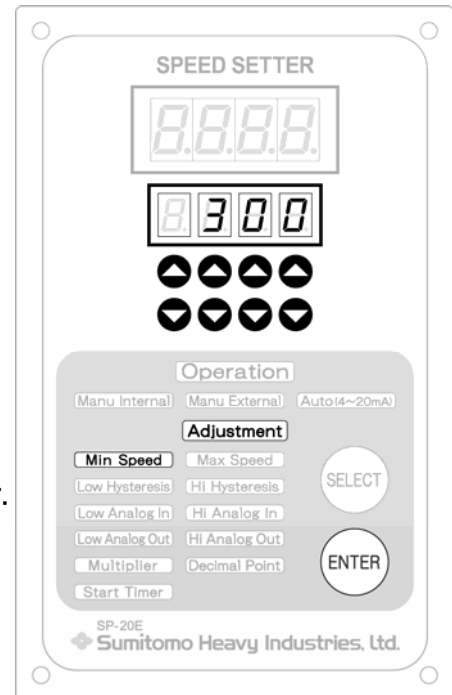
Press "Select" to light "Min Speed"

Min Speed

Press "Arrows" key to specify minimum
speed: (r/min)



Press "Enter"  to finalize the number.



Example to set 300

② Maximum Speed

Press "Enter" 2 seconds to light
"adjustment"


Adjustment

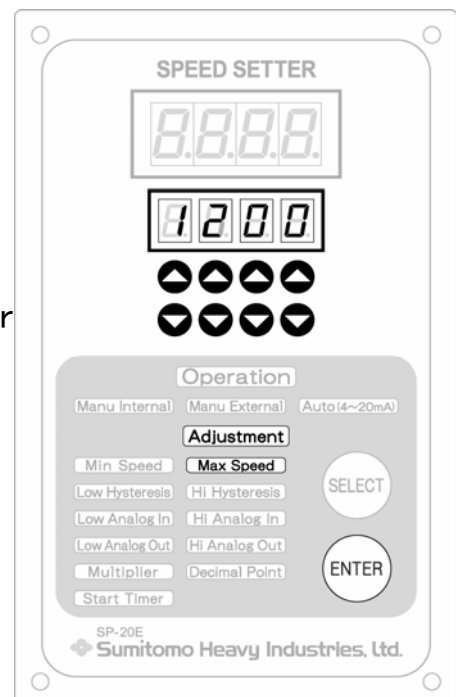
Press "Select" to light "Max Speed"

Max Speed

Press "Arrows" key to specify maximum
speed: (r/minute)



Press "Enter"  to finalize the number



Example to set 1200

7—5: Hysteresis Low Hysteresis Hi Hysteresis

(1) General

Hysteresis is dead zone where "Speed Setter" doesn't activate Pilot motor against "Target speed". See section 6-2 for the definition.

Hysteresis is set by giving 2 parameters: "Low Hysteresis" and "High Hysteresis"

Low Hysteresis (%) should be set at Min Speed Factory default: 3.0 = (3%)

Hi Hysteresis (%) should be set at Max Speed Factory default: 2.0 = (2%)

a) Hysteresis zone (r/min) at Minimum speed and Maximum speed

Example

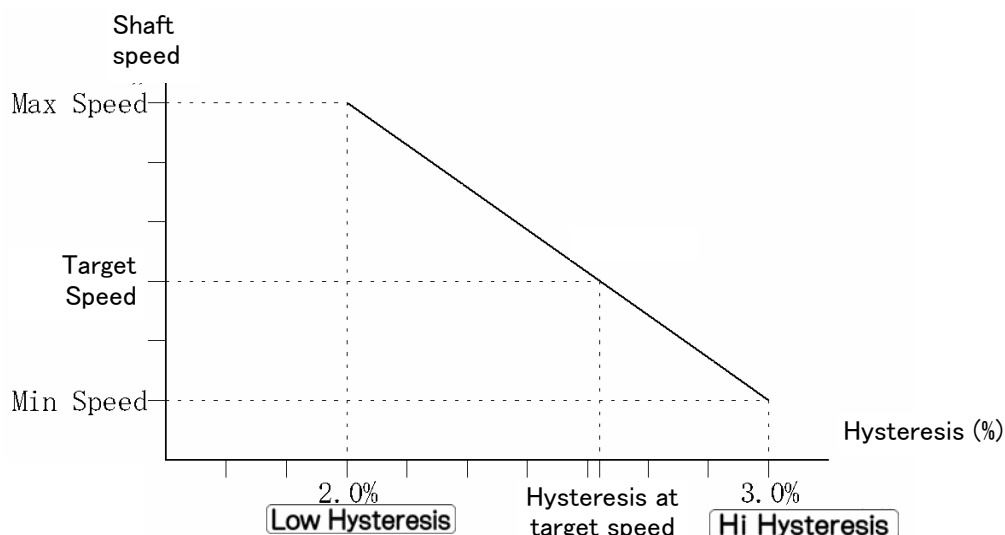
Min Speed : 360 r/min Max Speed : 1400 r/min

Low Hysteresis : 3.0 Hi Hysteresis : 2.0
(Default: 3.0%) (Default 2.0%)

Low (r/min) = $360 \times (\pm 0.030) = \pm 10.8 \text{ (r/min)}$

Hi (r/min) = $1400 \times (\pm 0.020) = \pm 28.0 \text{ (r/min)}$

b) Hysteresis zone at target speed



Hysteresis is proportional to shaft speed, and given by formula:

"Hysteresis at Target Speed" =

$$\frac{("Hi \text{ Hysteresis(r/min)}" - "Low \text{ Hysteresis(r/min)}") \times (\text{Target Speed} - \text{Min Speed})}{(\text{Max Speed} - \text{Min Speed})}$$

+ "Low Hysteresis (r/min)"

Example: Hysteresis at 1000 r/min =

$$= \frac{(28.0 - 10.8) \times (1000 - 360)}{(1400 - 360)} + 10.8$$


$$= \pm 21.4 \text{ r/min}$$

In this case Pilot motor doesn't move, when actual speed is between 978.6 (=1000-21.4) r/min and 1021.4 (=1000+21.4) r/min.

(2) How to set "Low Hysteresis"


Press "Enter" 2 seconds to light
"Adjustment"

Adjustment

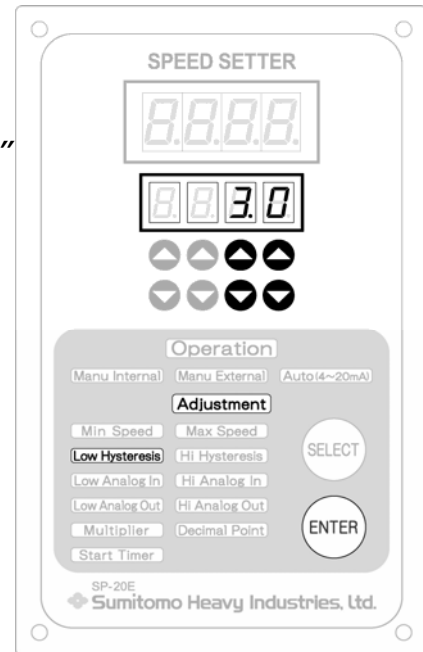
Press "Select"  to light "Low Hysteresis"

Low Hysteresis

Press "Arrows"  to specify Low Hysteresis: (%) with 1 digit after decimal point)

Press "Enter"  to finalize the number.

Note: Low Hysteresis can be set between 0.5 through 9.9 (%). It shouldn't be too small more than necessary, or it may cause hunting on pilot motor.
Factory default: 3.0 = (3%)



Example to set 3.0 (%)


(3) How to set "Hi Hysteresis"


Press "Enter" 2 seconds to light
"Adjustment"

Adjustment

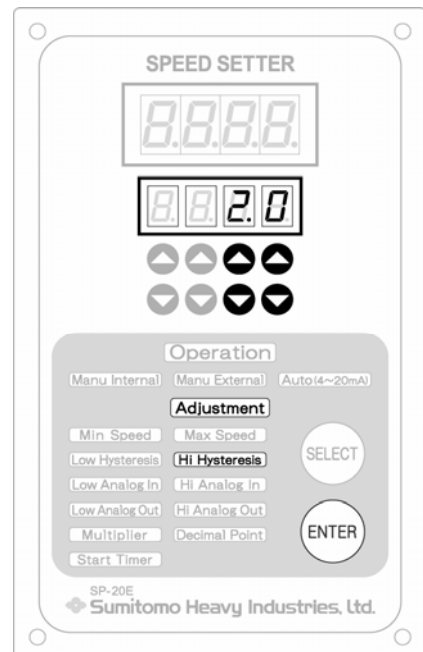
Press "Select"  to light "Hi Hysteresis"

Hi Hysteresis

Press "Arrows" key  to specify Hi Hysteresis: (%) with 1 digit after decimal point)

Press "Enter"  to finalize the number.

Note: Hi Hysteresis can be set between 0.5 through 9.9 (%). It shouldn't be too small more than necessary, or it may cause hunting on pilot motor.
Factory default: 2.0 = (2%)



Example for 2.0 (%)

7—6: Analog DC4–20mA input

Low Analog In

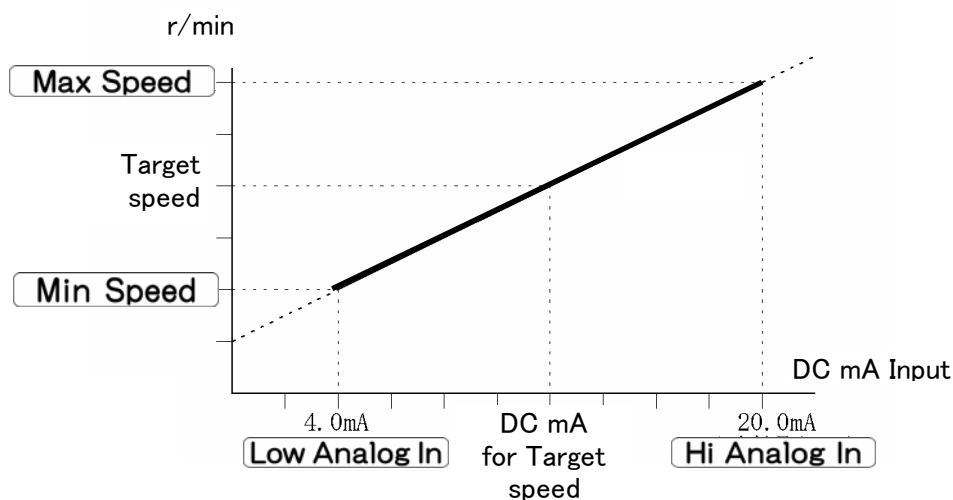
Hi Analog In

(1) General

When **Operation** and **Auto(4~20mA)** light are on,
DC4–20mA input signal control “Speed Setter” for target speed..

(2) How to set

Define relationship between Min Speed、Max Speed (set at section 7-4)
and “Low Analog in”, “Hi Analog in” by value: DC4~20mA with 1 decimal
point.



DC mA is proportional to the speed


Low Analog In should be DC mA at **Min Speed**

Default: 4.0 (=DC 4mA)

Hi Analog In should be DC mA at **Max Speed**

Default: 20.0 (=DC 20mA)

① Low Analog In


Press “Enter”  2 seconds to light
“adjustment”

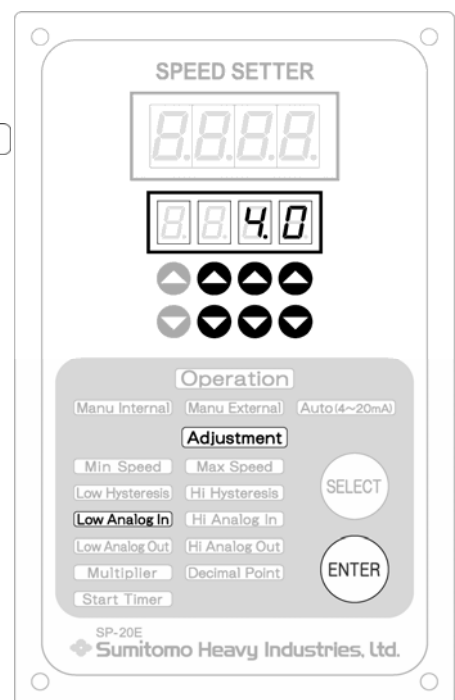
Adjustment

Press “Select” to light “Low Analog In”

Low Analog In

Press “arrows”  to specify
value (DC mA) with 1 digit after decimal
point

Press “Enter”  to finalize the number.

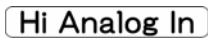



Example for 4.0 (mA)


② Hi Analog In

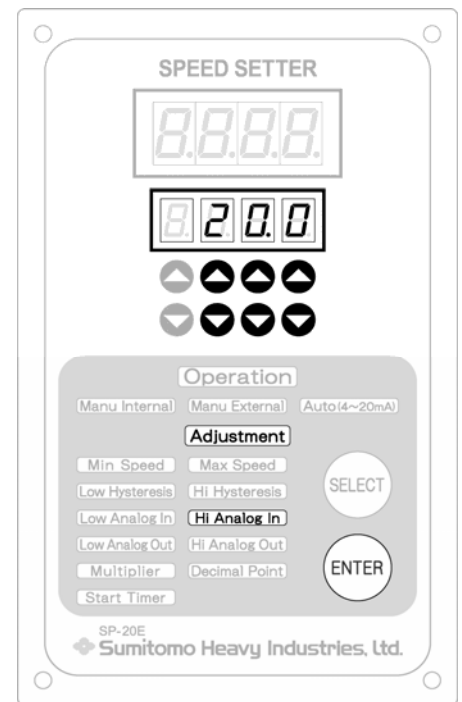
Press "Enter"  2 seconds to light
"adjustment" 

Press "Select" to light "Hi Analog In"



Press "arrows"  to specify
value (DC mA) with 1 digit after decimal
point

Press "Enter"  to finalize the number.



Example for 20.0 (mA)

- Control signal should be DC 4mA through 20mA
- When "Speed Setter" miss to catch control signal, it may display target speed based on 0mA input
- When "Speed Setter" miss to catch the control signal, it will activate Pilot motor to run at lowest speed.
- During normal operation, there is no display on "target speed"

7 — 7: Analog DC4–20mA Output

Low Analog Out

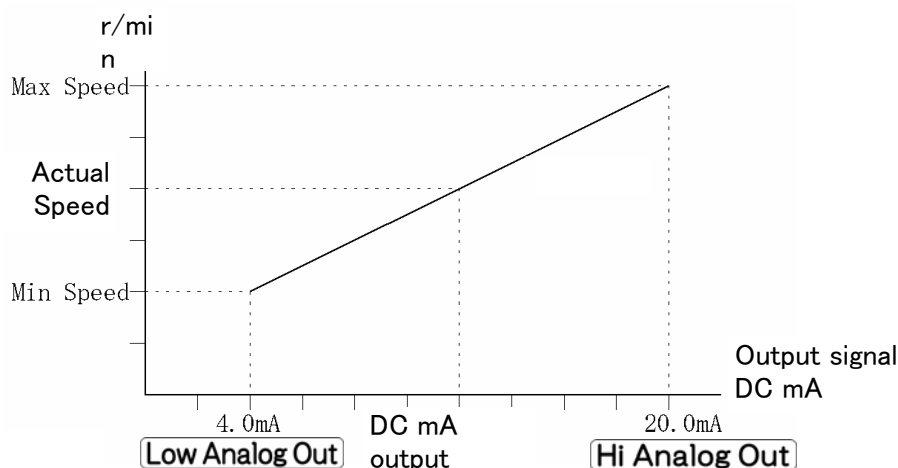
Hi Analog Out

(1) General

When using external device to display speed, "Low Analog Out" and "Hi Analog Out" are used to define DC mA output at both "Min. Speed" and "Max. Speed"

(2) How to set

Define relationship between Min Speed, Max Speed (set at section 7-4) and "Low Analog Out", "Hi Analog Out" by value: DC4~20mA with 1 digit after decimal point.



Low Analog Out should be DC mA at **Min Speed**

Default: 4.0 (=DC 4mA)

Hi Analog Out should be DC mA at **Max Speed**

Default: 20.0 (=DC 20mA)

① Low Analog Out


Press "Enter"  2 seconds to light "adjustment"

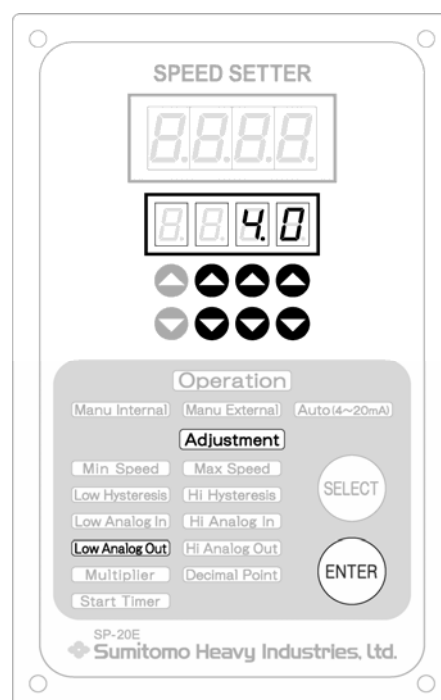
Adjustment

Press "Select" to light "Low Analog Out"

Low Analog Out

Press "arrows"  to specify value (DC mA) with 1 digit after decimal point

Press "Enter"  to finalize the number.





Example for 4.0 (mA)

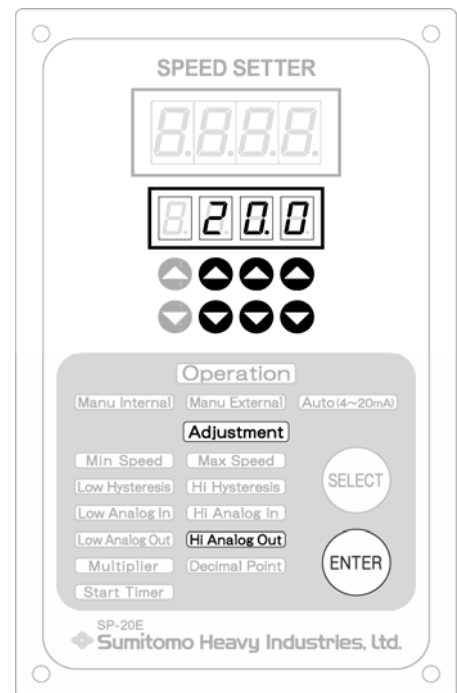
② Hi Analog Out

Press "Enter"  2 seconds to light "adjustment"

Press "Select" to light "Hi Analog Out"

Press "arrows"  to specify value (DC mA) with 1 digit after decimal point

Press "Enter"  to finalize the number.



Example for 20.0 (mA)

- Maximum load resistance for DC4–20mA output should be 500 Ohm or less. Output signal should be 20mA or less

7—8: Multiplier Multiplier

(1) General

Multiplier is used to convert output from electric magnetic sensor to number on "Speed Setter" display.

Default value at Sumitomo factory shipment is to display output shaft speed r/min. Change multiplier value to display different number on "Speed Setter" if necessary.

Multiplier is calculated by formula:

$$T = \frac{D}{P} = \frac{60 \times D}{Z \times N}$$

T: Multiplier

D: Value on display

Note: Remove decimal point for D to calculate T: multiplier

Example 100.5 → 1005

P: Output from Sensor (Hz)

Z: Number of Gear teeth (60 or 120)

N: Output Shaft speed (r/min)

Z1: Cyclo reduction ratio: 6, 8, 11, 13,.....

1st letter of Beier model#	Description	Electric magnetic Sensor and gear location	Beier Size	Z: Gear Teeth# for sensor	P output from sensor	Note
B	Beier stand alone	Output Shaft	All	60	$= N \times 60/60$ $= N$	
G	G-type Beier	Output Shaft	50A, 75A, 100A, 50B, 75B	120	$= N \times 120/60$ $= 2 \times N$	
			Others	60	$= N \times 60/60$ $= N$	
C	Beier Cyclo	Intermediate shaft between Cyclo and Beier	All	60	$= N \times 60 \times Z1/60$ $= N \times Z1$	Z1: Cyclo reduction ratio

Example-1: Beier Cyclo model#: CHHBMN5D—6165—13

(Z1: Cyclo reduction ratio = 13)

Z: 60 tooth

N: 72 r/min output speed (for example)

D: 720 (to display 72.0 (r/min) on Speed Setter)

$$T = \frac{D}{P} = \frac{720}{N \times Z1} = \frac{720}{72 \times 13} = \underline{0.769} \text{ (should be 3 digits after decimal point)}$$

Example-2: Beier GVFBM100A—G80—4

Z: 120

N: 280 r/min (for example)

D: 280 (to display 280 on Speed Setter)

$$T = \frac{60 \cdot D}{Z \cdot N} = \frac{60 \times 280}{120 \times 280} = \underline{\underline{0.500}}$$

(2) How to set

Multiplier

Multiplier should be set with value with 3 digits after decimal poi

Press "Enter"  2 seconds to light
"adjustment"

Adjustment


Press "Select" to light "Multiplier" **Multiplier**

Press "arrows"  to specify
value with 3 digits after decimal point.

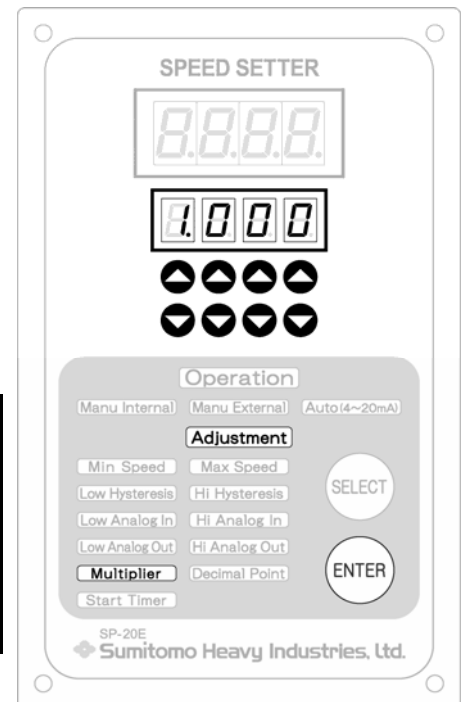
Press "Enter"  to finalize the number.

Note:

Available multiplier: 0.001 through 10.00

In order to specify 10.00 press "arrow", when
value on display is more than 9.000 

Default value at Sumitomo factory shipment is
to display output shaft speed r/min.



Example for 1.000

7—9: Decimal point Decimal Point

(1) General

It is used to display "Decimal point" on Speed Setter.

(2) How to set

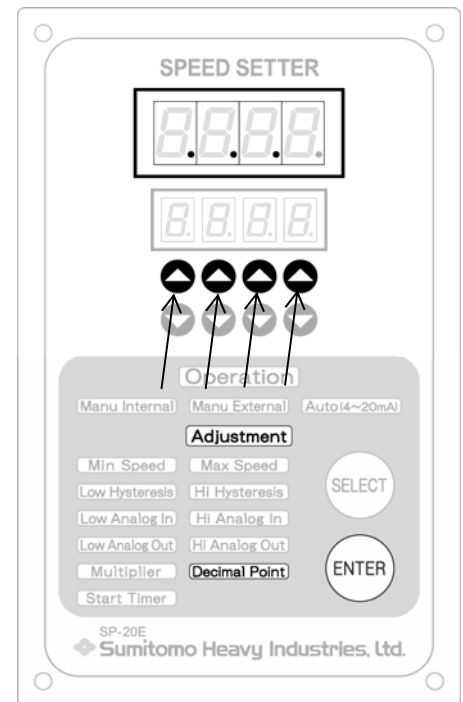
Press "Enter" ENTER 2 seconds to light
"adjustment" Adjustment

Press "Select" to light "Decimal Point"
Decimal Point

Press "arrows"  to specify
place of decimal point.

In order to erase decimal point, press either
same arrow or most right arrow

Press "Enter" ENTER to finalize the number.



7 — 10: Start Timer Start Timer

(1) General

"Start timer" is to delay activating control system after power on so that main motor can run at constant speed at start up.

Default at Sumitomo factory shipment: 5 seconds

(2) How to set

Press "Enter" ENTER 2 seconds to light "adjustment" Adjustment

Press "Select" to light "Start Timer" Start Timer

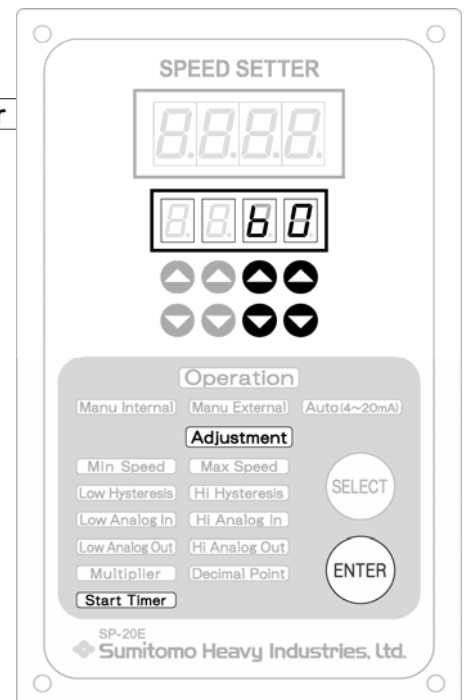
Press "arrows" ⬆️⬇️⬇️⬆️ to specify delay time in second.

Press "Enter" ENTER to finalize the number.

Note

Available time delay: 0 to 60 seconds

New setting will be available after power off.



Example for 60 seconds

8. Daily inspection and maintenance



Danger

- Turn off power to check wires, or it may cause electric shock.



Caution

- See trouble shooting to check in case trouble occurs, and do not operate again until fixing the problem
- Do not disassemble or modify "Speed Setter" It is out of warranty.

Daily and periodical inspection is strongly recommended to keep good condition long time.

8—1) Daily inspection

Check Speed setter daily to make sure

- Speed Setter works correctly
- Ambient environment is under specification
- Vibration and noise are normal
- No excessive heat nor temper color

8—2) Periodical inspection

Frequency	Contents of inspection
Every 6 months	<ul style="list-style-type: none">① Fasten bolts or nut, when loosening.② Check wiring connections③ no corrosion on terminals nor break of wires④ Check contact points on External Relay
Once a year	<ul style="list-style-type: none">① Remove dust by air blow② Replace parts if necessary

- Do not use megger or buzzer to check resistance.

9. Troubleshooting

Q: Power failure (no display)

- A:
- Check power source
It should be 3phase 200V/50Hz or 200、220V/60Hz
 - Check fuse
Rating: 250V—5A
Conforming fuse tube: $\phi 6$. 4 × 30mm (MF—60NR(B) fit for fusion)

Q: Pilot motor doesn't move

- A:
- Is connection correct between limit switches, terminal-H、L、COM ?
terminals H、L、COM are normally connected with short circuit plate
When there are external limit switches, then see section 5-2
 - Is target speed set correctly ? Is actual speed far from target speed ?
Is operation mode correct ?
 - Manu Internal** check manual setting on panel
 - Manu External** check external speed setting device
 - Auto(4~20mA)** check DC 4-20mA input
- see section 7—2 for operation mode
- **Min Speed** **Max Speed** Are both numbers set correctly ?
- Pilot motor change the speed between "Min.Speed" and "Max.Speed"
See section 7—4 for min. speed and max. speed

Q: Pilot motor continue to run at lower speed range

- A:
- Is actual speed approaching target speed ?
Check wiring to terminals U and V for correct rotation direction
 - **Min Speed** is too low
Adjust **Min Speed**
see section 7—4

Q: Pilot motor continue to run at higher speed

- A:
- Is pilot motor changing speed to approach target speed?
Check wiring to terminals U and V for correct rotation direction
 - **Max Speed** is too high
Adjust **Max Speed**
See section 7—4

Q: Incorrect number display

- A:
- **Multiplier** Is multiplier correct ?
See section 7—8
 - Is wiring to terminal S1—S2 correct?
 - Break or short-circuit on wires
see section 5—2

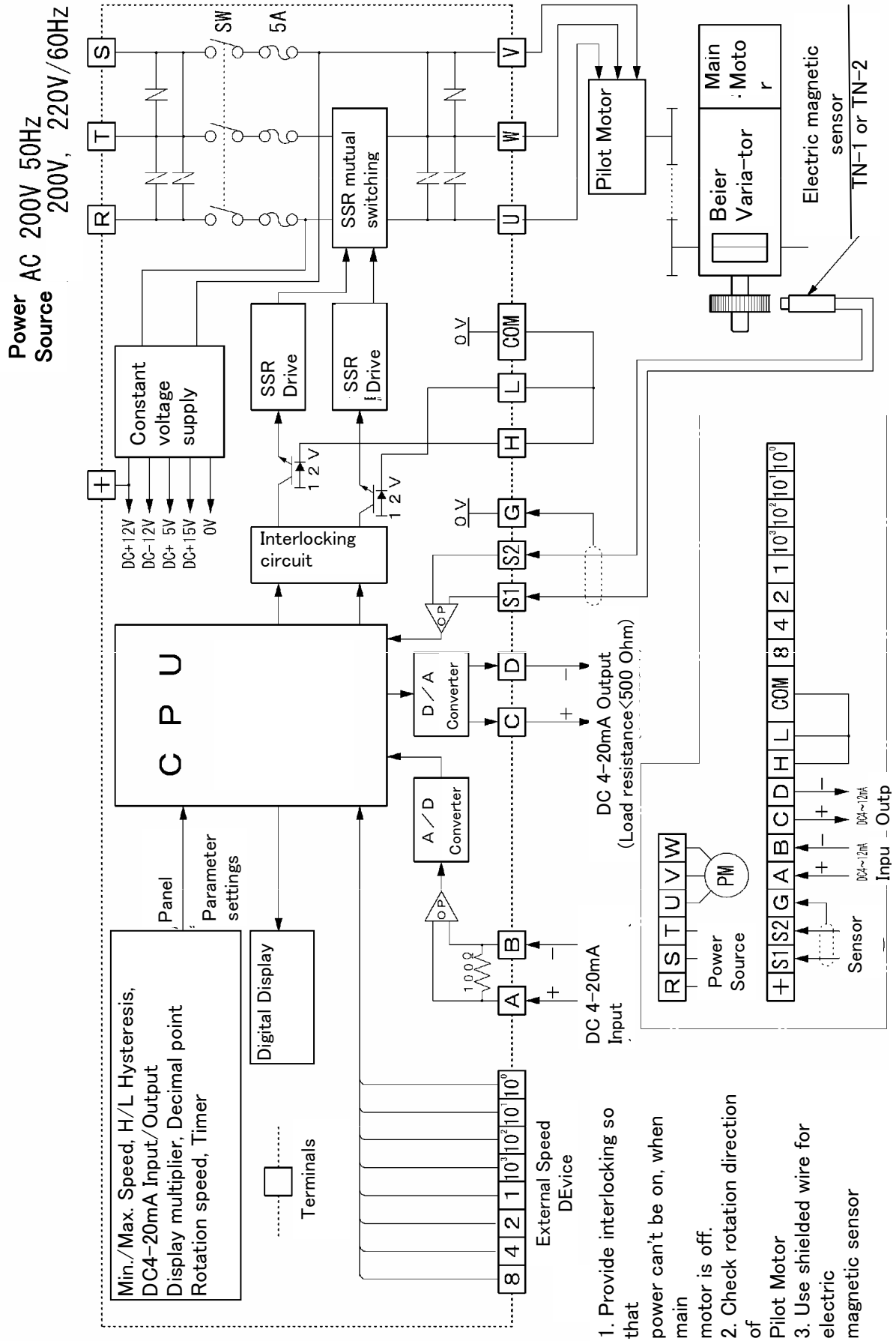
Q: No control by DC4–20mA input signal

- A:
- Is wiring to terminal A—B correct ?
See section 5—2
Pay attention to polarity + and –
 - Is DC4–20mA input correctly set ?
See section 7–6 for **Low Analog In** **Hi Analog In**
Pilot motor will not run, when Input signal is out of the range.
"Low Analog In" \leq Input signal \leq "Hi Analog In"

Q: No DC4–20mA output

- A:
- Is wiring to terminal C–D correct ?
See section 5–2
Pay attention to polarity + and –
 - Is DC4–20mA output correctly set ?
See section 7—7
 - Is load impedance 500 Ohm or less ?
Output current may drop at higher speed, when load impedance is high.
Output current rating is approx. 21mA, when 500 Ohm device is connected.

10. Standard Block Diagram

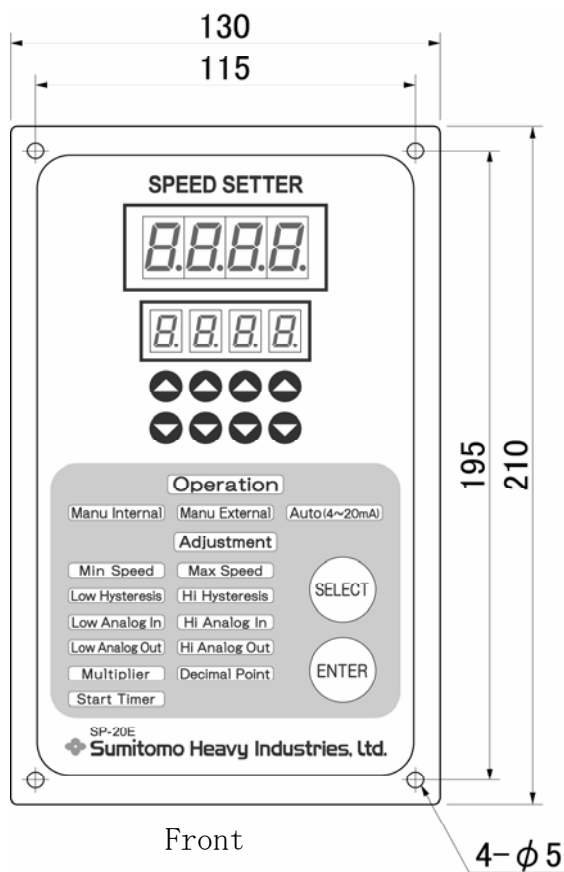


11. Specification

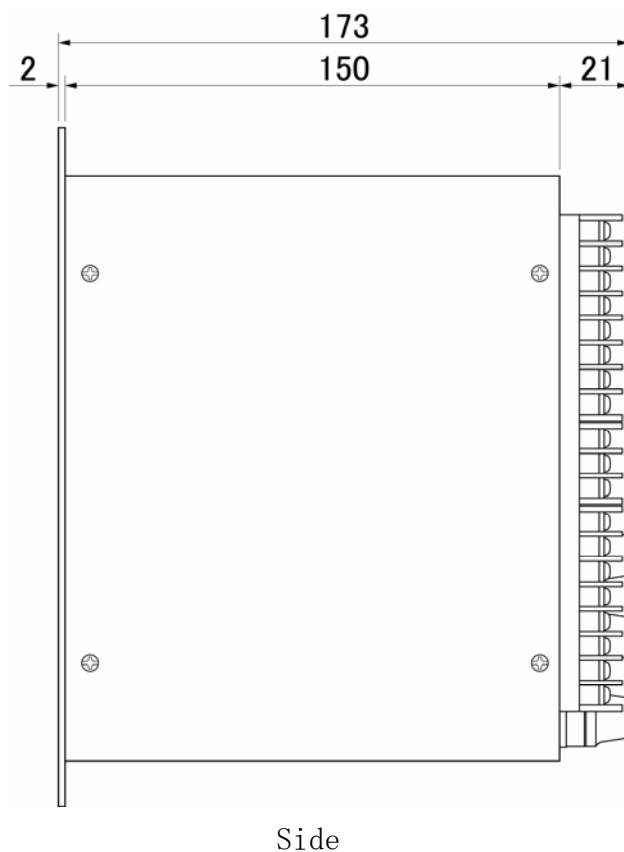
Item		Specification	
C o n t r o l	Control System	Feedback control system	
	Drive system	Mutual switching circuit with zero cross type SSR	
	Control command	Operation control command with CPU	
	Stop accuracy	$\pm 0.5\%$ of target speed ※1	
	Hysteresis	Can be set between 0.5 and 9.9%	
	Pilot motor	0.4kW x 4P (smaller motor may be used) Power Source 3Phase AC200V 50Hz, or 200, 200V/60Hz	
S e t t i n g	Manual	4digits, digital switch External speed setter	Operation mode Manu Internal
	Auto	DC4~20mA (Input impedance 100Ω)	Manu External Auto (4~20mA)
Speed Sensor	Model	TN-1 or TN-2 electric magnetic revolution sensor	
	input signal	frequency 10Hz~10kHz 0.15V~50Vp-p	
D i s p l a y	Display unit	Digital display with Red 7segments LED	
	Display range	0000 to 9999, 4 digit display, zero suppressing	
	Conversion display	Conversion multiplier (0.001to10.00) with decimal point change	
	Accuracy	± 1 digit	
analog output characteristic		DC4~20mA $\pm 0.5\%$ accuracy, Max. load resistance: 500Ω or less	
Ambient temperature		0~40°C	
Power consumption		approx 7W	
Weight		approx. 1.85kg	
Color		Munsell 5Y 7/1 semi-gloss	

※1: Once pilot motor stop within $\pm 0.5\%$ of target speed, it doesn't change the speed while actual speed is within hysteresis zone.

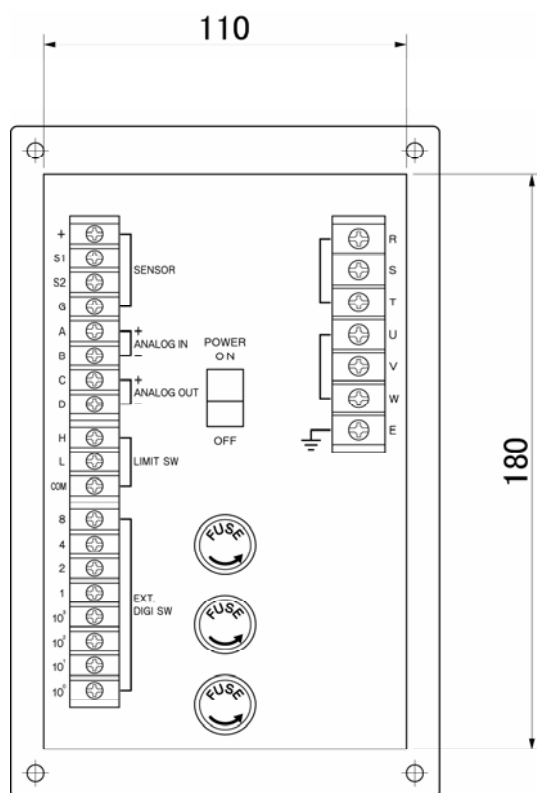
12. Dimension and Panel cut



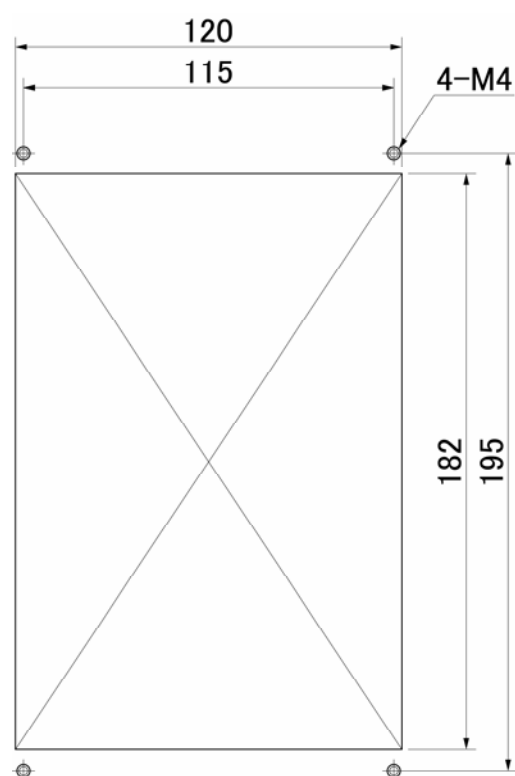
Front



Side



Back



Panel Cut

13. Warranty

Warranty Period	The Warranty period is 18 months from date of shipment or 12 months after initial operation, whichever comes first.
Warranty Condition	In the event that any problem or damage to the product arises during the "Warranty period" from defects in the product whenever the product is properly installed and combined with the Buyer's equipment or machines maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agreed upon in writing between the Seller and Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product without charge at a designated facility, except as stipulated in the "Warranty Exclusions" as described below. However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.
Warranty exclusion	<p>Notwithstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by:</p> <ol style="list-style-type: none"> 1. Installation, connection, combination or integration of the Product in or to the other equipment or machine that rendered by any person or entity other than the Seller. 2. Insufficient maintenance or improper operation by the Buyer or its customers such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller 3. Improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications. 4. Any problem or damage on any equipment or machine to which the Product is installed, connected or combined or any specifications particular to the Buyer or its customers. 5. Any changes, modifications, improvements or alternations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller. 6. Any parts in the Product that are supplied or designated by the Buyer or its customers. 7. Earthquake, fire, flood, salt air, gas, lightning, acts of God or any other reasons beyond the control of the Seller. 8. Normal wear and tear, or deterioration of the Product's parts. 9. Any other troubles, problems or damage to the Product that are not attributable to the Seller.