



OPERATION MANUAL

E/P REGULATOR

MODEL NAME

ITV1000, ITV2000, ITV3000 series

Series

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Safety instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of “CAUTION” “WARNING”, or “DANGER”. To ensure safety, be sure to observe ISO 4414, JIS B 8370 and other safety practices.

■ Explanation of label

Label	Meaning of label
 WARNING	Operator error could result in serious injury or loss of life.
 CAUTION	Operator error could result in injury or equipment damage.

WARNING

① **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analyses and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

② **Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

③ **Do not service machinery / equipment or attempt to remove components until safety is confirmed.**

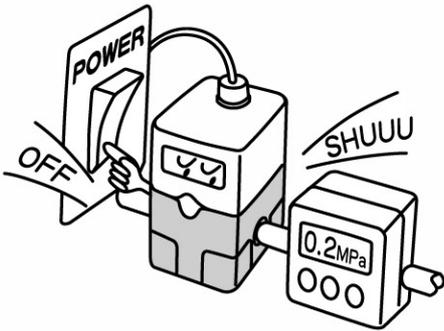
- A. Inspection and maintenance of machinery / equipment should only be performed once safety of personnel and equipment is confirmed.
- B. When equipment is to be removed. Stop supplied air, exhaust the residual pressure, verify the release of air, turn the power off and confirm safety before performing maintenance.
- C. Before machinery / equipment is restarted, ensure safety before applying power.

④ **Contact SMC if the product is to be used in any of the following conditions.**

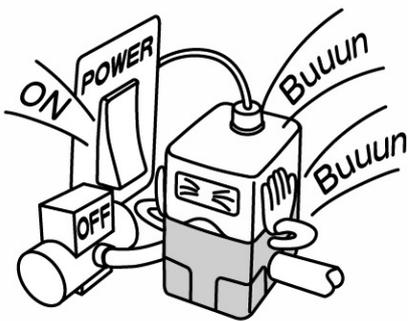
- A. Conditions and environments beyond the given specifications, or if product is used outdoors.
- B. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuit in press applications, or safety equipment.
- C. An application which has the possibility of having negative effects on people, property, or animals requiring special safety analysis.

Handling precautions

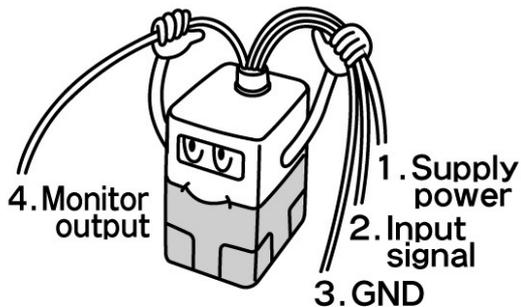
CAUTION



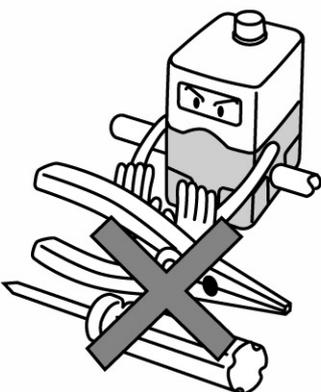
If power to this product is cut off due to a power failure, etc. when it is in a controlled state, residual pressure will be retained temporarily. Handle carefully when operating with output pressure released to the atmosphere, as air will continue to flow out.



If supply pressure to this product is interrupted or shut off, while the power is still on, the internal solenoid valve will continue to operate and a humming noise may be generated. Since the life of the product may be shortened, shut off the power supply also when supply pressure is interrupted or shut off.

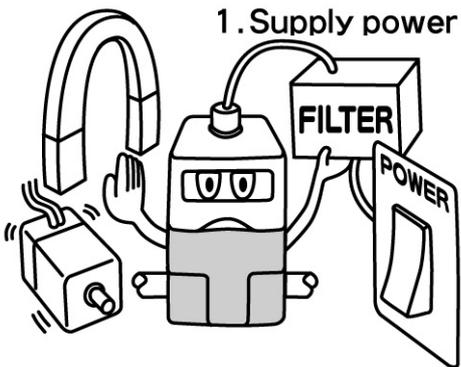


The optional cable connector is a 4 wire type. When the monitor output (analogue output or switch output) is not being used, prevent it from touching the other wires as a malfunction could occur.



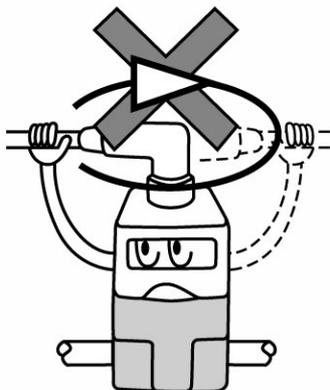
This product is adjusted for each specification at the time of shipment from the factory. Avoid careless disassembly or removal of parts, as this can lead to malfunction.

 CAUTION



Take the following steps to avoid malfunction due to noise.

- 1) Install a line filter etc. to the AC power line to reduce / eliminate power supply noise.
- 2) Avoid malfunction due to noise by installing this product and its wiring away from strong electric fields, such as those of motors and power line, etc.
- 3) Be sure to implement protective measures against load surge for induction loads (solenoid valves, relays etc.).
- 4) Turn off the power supply before installing or removing the connector.

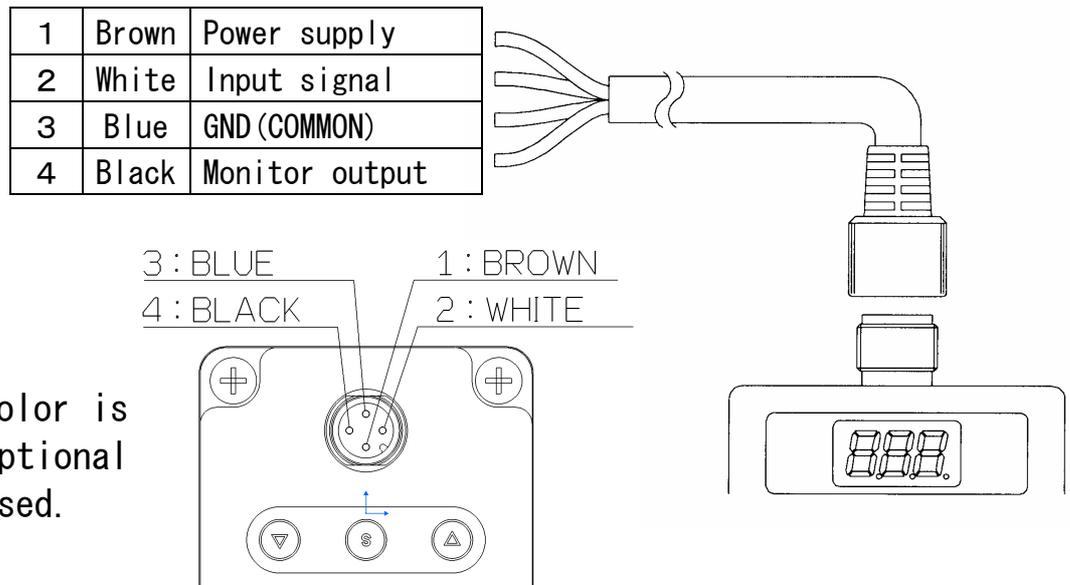


Please note that the right angled cable connector does not rotate and is limited to only one entry direction.

Wiring method

⚠ CAUTION

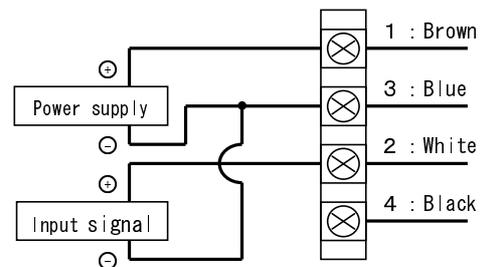
- ① Proceed carefully, as incorrect wiring can cause damage.
- ② Use DC power supply with sufficient capacity and a low ripple.
- ③ Turn off the power supply to remove and insert the connector.
- ④ Never turn the right angled type connector as it is not designed to turn.



Wiring diagram (Power supply and input signal)

Current/Voltage type (ITV※0※※-0、ITV※0※※-1、ITV※0※※-2、ITV※0※※-3)

Power supply	24VDC	(ITV※0※0-※)
	12~15VDC	(ITV※0※1-※)
Input signal	4~20mADC	(ITV※0※※-0)
	0~20mADC	(ITV※0※※-1)
	0~ 5VDC	(ITV※0※※-2)
	0~10VDC	(ITV※0※※-3)

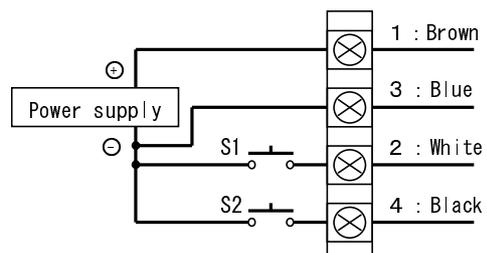


Preset input type (ITV※0※※-4)

Power supply	24VDC	(ITV※0※0-4)
	12~15VDC	(ITV※0※1-4)

Fig. 1 Relation between preset pressure and switch

Preset pressure	P_1	P_2	P_3	P_4
S1	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON



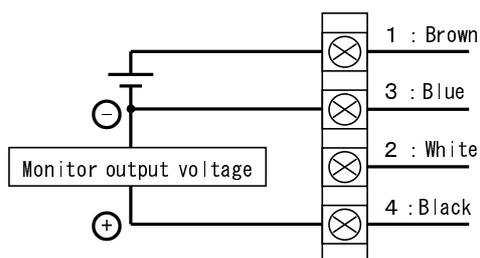
Wiring diagram (Monitor output)



CAUTION

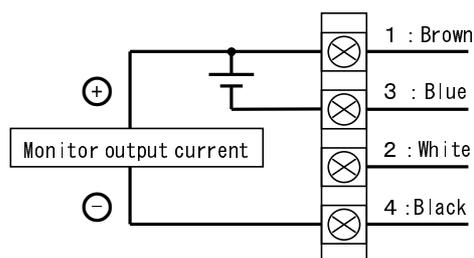
When the monitor output is not being used, prevent it from touching the other wires as this can cause a malfunction.

Analogue output • Voltage type (ITV※0※※-※1)



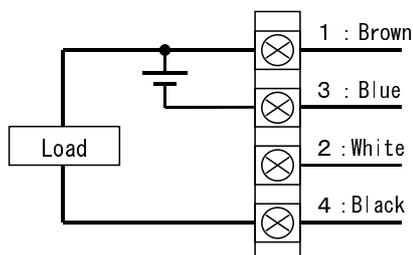
Only use a equipment with a minimum load impedance of $1k\Omega$.

Analogue output • Current (sink) type (ITV※0※※-※4)



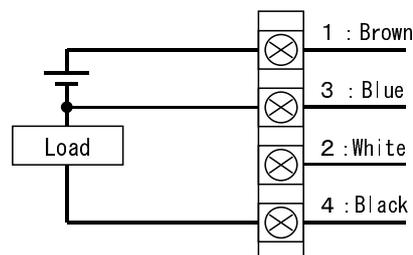
Only use equipment with a maximum load impedance of 250Ω .

Switch output • NPN type (ITV※0※※-※2)



When a current of approx. 150mADC or more is applied, the over current circuit is archived, “Er.5” is displayed and the operation stops. Please use with installing the load that the output current becomes to 80mADC or less.

Switch • PNP type (ITV※0※※-※3)



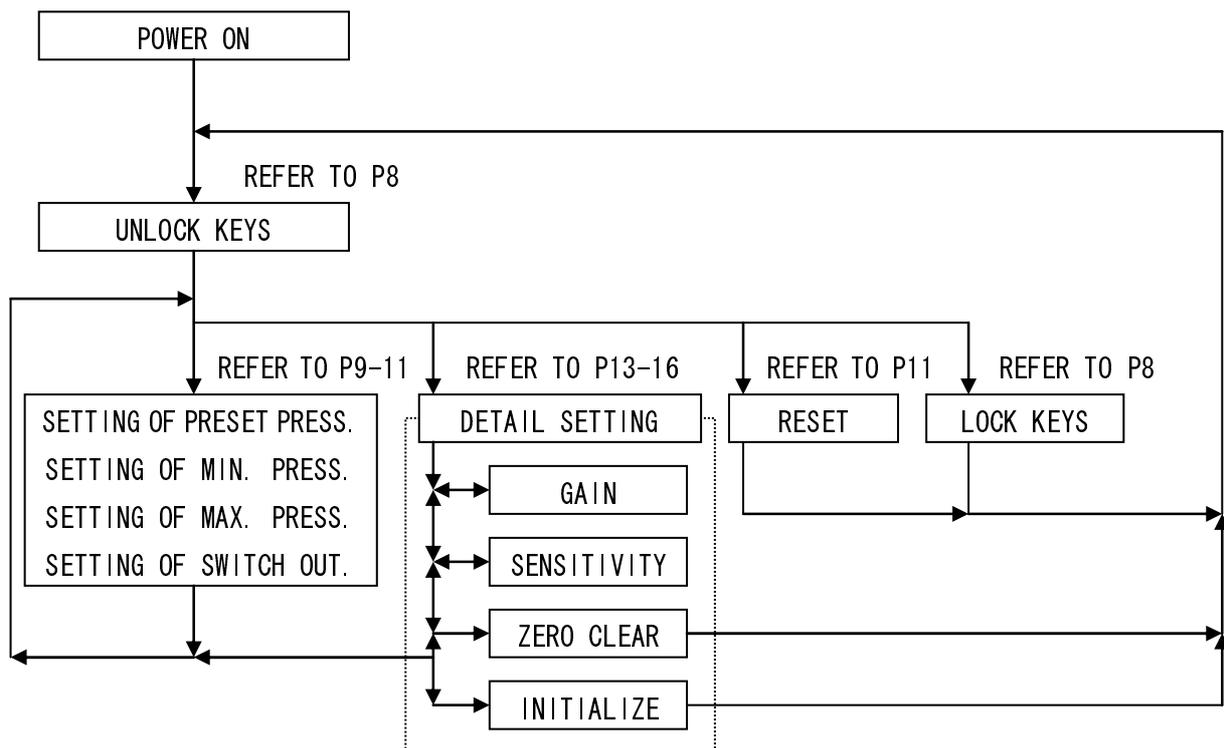
When a current of approx. 150mADC or more is applied, the over current circuit is archived, “Er.5” is displayed and the operation stops. Please use with installing the load that the output current becomes to 80mADC or less.



CAUTION

- ① If the incorrect key is pressed or incorrect information is displayed during setting, power must be shut off and the procedure started again.
- ② It is recommended that the settings are changed without supply pressure. The product operates immediately maximum and minimum pressures are set and the S-key is pressed.
- ③ It is recommended that the minimum pressure is output when air is supplied to the inlet, even if the input signal has not been entered.
- ④ Output pressure from this product and state of operation are changed by changing of each setting and function. Each setting and function should be operated by trained and experienced operator.

Flow of the setting



(Note 1) : Please refer to each contents about operation method.

(Note 2) : The function of the setting of preset pressure is preset input type only.

(Note 3) : The function of the setting of switch output is switch output type only.

Key locking function



CAUTION

The keys are locked after turning the power on and can not be operated.

Unlocking the keys

No	Key operation	LED Display
①		(current) pressure is displayed
②	Press ▽ key for 2 seconds or more.	<i>LOC</i> is displayed
③		<i>LOC</i> flashes on the display
④	Press S-key	
⑤		<i>UNL</i> is displayed for approx. 1 second
⑥	Key lock is released	(current) pressure is displayed

※④ Press △ key to cancel.

Locking the keys

No	Key operation	LED Display
①		(current) pressure is displayed
②	Press △ key for 2 seconds or more.	<i>UNL</i> is displayed
③		<i>UNL</i> flashes on the display
④	Press S-key	
⑤		<i>LOC</i> is displayed for approx. 1 second
⑥	Keys are locked	(current) pressure is displayed

※④ Press ▽ key to cancel.

Setting of min. pressure, max. pressure and switch output [current/voltage input type only]

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key	
③	Set the minimum pressure by using the Δ and ∇ keys.	$F_1 \leftrightarrow .0000$ (displayed alternately) *Adjusting range: Refer to note 1 to 6
④	Press S-key	
⑤	Set the maximum pressure by using the Δ and ∇ keys.	$F_2 \leftrightarrow .9000$ (displayed alternately) *Adjusting range: Refer to note 1 to 6
⑥	Go to no. ⑪ for monitor output: analogue output (voltage and current) type.	
⑦	Press S-key	
⑧	Set the P_1 by using the Δ and ∇ keys.	$P_1 \leftrightarrow .0000$ (displayed alternately)
⑨	Press S-key	
⑩	Set the P_2 by using the Δ and ∇ keys.	$P_2 \leftrightarrow .9000$ (displayed alternately)
⑪	Press S-key	Return to (current) pressure display.
⑫	Lock keys (refer to P8)	

Minimum pressure (F_1) adjusting range	Maximum pressure (F_2) adjusting range
<p>100% 90% 0% -20%</p> <p>4 12 20mA 0 10 20mA 0 2.5 5V 0 5 10V</p>	<p>120% 100% 10% 0%</p> <p>4 12 20mA 0 10 20mA 0 2.5 5V 0 5 10V</p>

(Note 1): F_1 is adjustable in a range from -20% to 90% of the rated value.
(DEFAULT VALUE: 0%)

(Note 2): The pressure of less than 0% is not output, even if F_1 is adjusted to less than 0%.

(Note 3): F_2 is adjustable in a range from 10 to 120% of the rated value.
(DEFAULT VALUE: 100%)

(Note 4): Do not input the signal as like output the pressure of more than 100%.
Please use in a range of rating.

(Note 5): The difference between F_1 and F_2 is adjustable in a range of 10% of the rated value.

(Note 6): The adjustment like making the relation of $F_1 > F_2$ is not available.

Mode of switch output

The following operation types are available by setting P_1 and P_2.

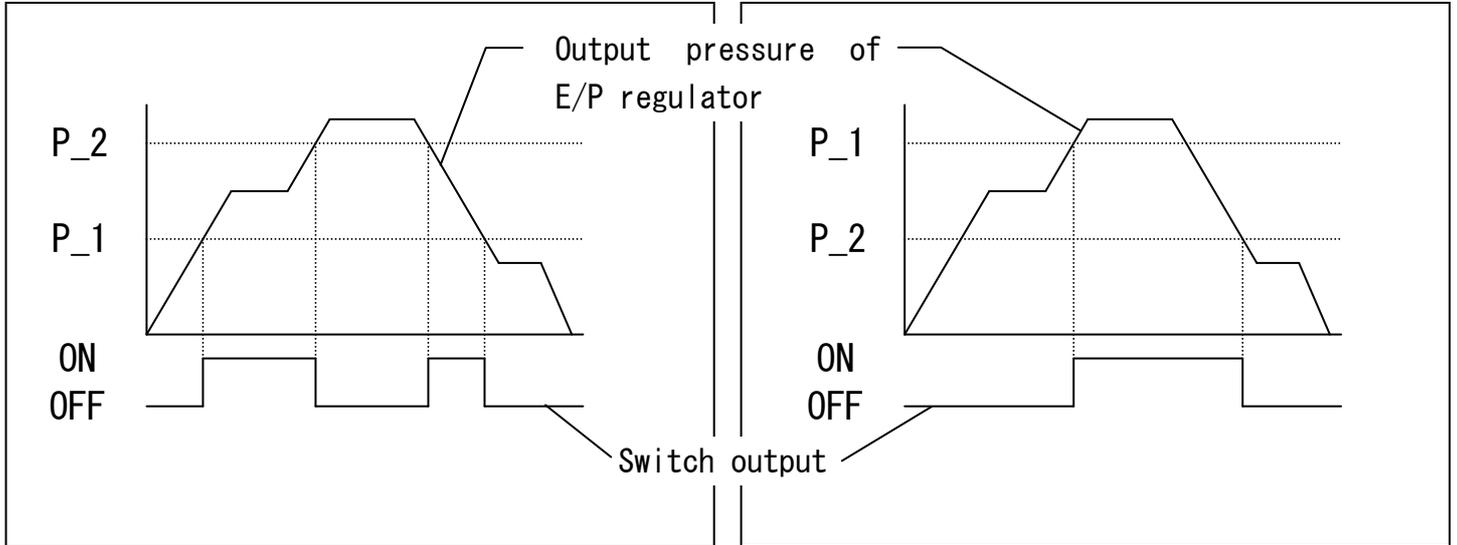
Note). This function is available for monitor output: switch output type (ITV※0※※-※2 and ITV※0※※-※3).

■ P_1 < P_2 :

Window comparator mode

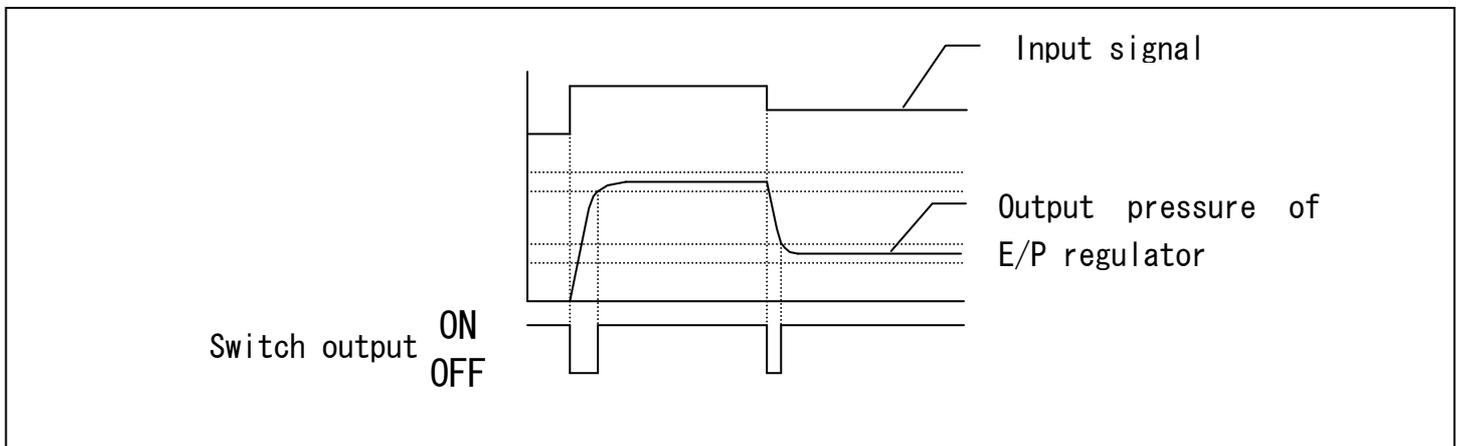
■ P_1 ≥ P_2 :

Hysteresis mode



■ P_1 = P_2 = 0 : Out of range mode

(The switch output turns on when set pressure is achieved.)



Setting of preset pressure [Preset input type only]

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key	
③	Set P_1 by using the Δ and ∇ keys.	$P_1 \leftrightarrow .0000$ (displayed alternately)
④	Press S-key	
⑤	Set P_2 by using the Δ and ∇ keys.	$P_2 \leftrightarrow .0000$ (displayed alternately)
⑥	Press S-key	
⑦	Set P_3 by using the Δ and ∇ keys.	$P_3 \leftrightarrow .0000$ (displayed alternately)
⑧	Press S-key	
⑨	Set P_4 by using the Δ and ∇ keys.	$P_4 \leftrightarrow .0000$ (displayed alternately)
⑩	Press S-key	Return to (current) pressure display.
⑪	Lock keys (refer to P11)	

(Note) : P_1 to P_4 are adjustable in a range from 0% to 100% of the rated value.
(DEFAULT VALUE: 0%)

Reset function

Reset method

No	Key operation	LED Display
①	Unlock keys (refer to P11)	
②	Press the Δ and ∇ keys simultaneously for 3 seconds or more.	(Current) pressure is displayed
③		$r\text{-}E\text{-}S$ is displayed for approx. 1 second
④	The setting is reset	

Reset content

Item	Reset content	Application model
F_1	0%F. S.	Current · Voltage input type
F_2	100%F. S.	Current · Voltage input type
P_1、P_2	100%F. S.	Switch output type
P_1~P_4	0%F. S.	Preset input type

(Note) : Gain (GL) and sensitivity (SL) are not reset.

Error indicating function

Error name	LED display	Contents of error	Countermeasure
Over range of input signal	Er.1	Input signal exceeds the rated value range.	Reduce input signal to within the rated range and restart the power supply.
System error	Er.2	Reading or writing errors occurred in EEPROM.	Please execute "initialize (refer to P16)" when ITV do not operate normally after restarting the power supply. Please contact us, when ITV do not operate normally after initialize.
	Er.3	Reading and writing errors occurred in memory.	Please contact us when ITV do not operate normally after restarting the power supply.
Solenoid valve error	Er.4	Solenoid valve failure.	Replace the solenoid valve. For the replacement procedure contact SMC.
Over current error	Er.5	Over current errors in switch output	Please use with installing the load that the output current becomes to 80mADC or less.
Residual pressure error	Er.6	Out of range error of zero clear	Please operate "zero clear" within the range of 5%F.S.. Please operate "zero clear" after the secondary pressure of ITV is became to atmosphere.

Detail setting mode

No	Key operation and LED display
①	Unlock keys (refer to P8)
②	Press S-key for 2 seconds or more.
③	<pre> graph TD S1["F01 ↔ 0L.9 Δkey ↑ ∇key ↓"] -- Δkey ↑ --> S2["F02 ↔ 5L.0 Δkey ↑ ∇key ↓"] S2 -- Δkey ↑ --> S3["F03 ↔ 0cL Δkey ↑ ∇key ↓"] S3 -- Δkey ↑ --> S4["F99 ↔ in.1 Δkey ↑ ∇key ↓"] S4 -- ∇key ↓ --> S1 </pre> <p>(displayed alternately) Press S-key To "GAIN" (refer to P13)</p> <p>(displayed alternately) Press S-key To "SENSITIVITY" (refer to P14)</p> <p>(displayed alternately) Press S-key To "ZERO CLEAR" (refer to P15)</p> <p>(displayed alternately) Press S-key To "INITIALIZE" (refer to P16)</p>
④	In state of ③, press S-key for 2seconds or more.
⑤	Return to (current) pressure display.
⑥	Lock keys (refer to P8)

Gain setting

Normal operation does not require the adjustment of gain.

This product can change the response with this gain setting.

When the gain is changed to more larger, the response become quickly, but there is a possibility that stability is lost.

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key for 2 seconds or more, then go to detail setting mode.	
③	To "F01" by using the Δ and ∇ keys.	F01 ↔ 0L.9 (displayed alternately)
④	Press S-key.	
⑤	Set the GAIN by using the Δ and ∇ keys.	0L.9 (blink and change the most right digit)

⑥	Press S-key.	<i>F01</i> ↔ <i>GL9</i> (displayed alternately)
⑦	Press S-key for 2 seconds or more, then go out from detail setting mode. (Select the menu with Δ or ∇ keys, then jump to another item.)	
⑧	Lock keys (refer to P8)	

Relation between setting of gain and response time

Response	←—————→												Quick
Setting of GAIN	<i>GL0</i>	<i>GL1</i>	<i>GL2</i>	~	<i>GL7</i>	<i>GL8</i>	<i>GL9</i>	<i>GLA</i>	<i>GLb</i>	<i>GLc</i>	<i>GLd</i>	<i>GLE</i>	<i>GLF</i>

※Default: *GL9*

Sensitivity setting

Normal operation does not require the adjustment of sensitivity.

When the sensitivity is changed, the correction operation of pressure changes. When the sensitivity is changed to sharp, the hunting of pressure might be occurred. And, when the sensitivity is changed to dull, there is a possibility that staggering of gradual pressure occur, because the pressure correction become lower.

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key for 2 seconds or more, then go to detail setting mode.	
③	To "F02" by using the Δ and ∇ keys.	<i>F02</i> ↔ <i>SL0</i> (displayed alternately)
④	Press S-key.	
⑤	Set the GAIN by using the Δ and ∇ keys.	<i>SL0</i> (blink and change the most right digit)
⑥	Press S-key.	<i>F02</i> ↔ <i>SL0</i> (displayed alternately)
⑦	Press S-key for 2 seconds or more, then go out from detail setting mode. (Select the menu with Δ or ∇ keys, then jump to another item.)	
⑧	Lock keys (refer to P8)	

Relation between setting and sensitivity

Sensitivity	←—————→								Dull
Setting of sensitivity	<i>SL-</i>	<i>SL-</i>	<i>SL0</i>	<i>SL1</i>	<i>SL2</i>	<i>SL3</i>	<i>SL4</i>	<i>SL5</i>	

※Default: *SL0*

Zero clear

The display can be set to zero again by executing "zero clear".

When "zero clear" is executed with residual pressure in the secondary piping, the pressure is assumed to be zero. Please execute the operation of "zero clear" with the supply pressure is intercepted, and the piping of the second side removed.

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key for 2 seconds or more, then go to detail setting mode.	
③	To "F03" by using the Δ and ∇ keys.	$F03 \leftrightarrow 0.0L$ (displayed alternately)
④	Press S-key.	$0.0L$ flashes on the display
⑤	Press Δ and ∇ keys for 3 seconds or more. (press S-key to ③)	$0.0L$ is displayed
⑥	"Zero clear" is executed, after 3 seconds. (Release keys till less than 3 seconds to ④)	$0.0L$ is displayed for approx. 1 second.
⑦	Returns to the state immediately after turning on of the power supply. (keys are locked)	

(note) : The adjustable range is within $\pm 5\%F.S$ from the state of the factory shipment. When more than this range, $Er.5$ is displayed and zero-clear is not executed.

Initialize

"Initialize" is a function to return all the settings that the internal control constant are included to an initial value. Please execute "initialize" only when the error is displayed and this product doesn't operate at all.

Please execute the "reset" function, when you want to return the pressure setting and the switch setting to an initial value.

No	Key operation	LED Display
①	Unlock keys (refer to P8)	
②	Press S-key for 2 seconds or more, then go to detail setting mode.	

③	To "F99" by using the Δ and ∇ keys.	F99 \leftrightarrow 111 (displayed alternately)
④	Press S-key.	111 flashes on the display)
⑤	Press Δ and S keys for 5 seconds or more. (press S-key to ③)	111 is displayed
⑥	"Initialize" is executed, after 5 seconds. (Release keys till less than 5 seconds to ④)	Turning off for 1 second
⑦	Returns to the state immediately after turning on of the power supply. (keys are locked)	

LED display

The range of the LED pressure display is different according to the pressure range and the unit of the display.

unit	ITV※01※	ITV※03※	ITV※05※	ITV209※
MPa	0.020~.120	0.100~.600	0.180~.A80	-
Kgf/cm ²	0.20~.120	1.00~6.00	1.80~A.80	-
bar	0.20~.120	1.00~6.00	1.80~A.80	-
PSI	3.0~18.0	14.0~84.0	-26~156	-
kPa	-20~120	-100~600	-180~A80	16~-96

(note1) : The mark "." is blinking the decimal point, and it is shown a minus.

(note2) : When the digit overflows, the following of "9" are substituted by "A".

(example: The following of 999(kPa) are displayed as A00(kPa), and it shows 1000 kPa.)

(note3) : When the display exceeds the lower bound value, "LLL" is displayed.

(note4) : When the display exceeds the upper bound value, "HHH" is displayed.

This operation manual refers to all standard types and is partially applicable to special models.

This operation manual is subject to change without prior notice or any obligation on the part of the manufacturer.