21.Aug.2000

Technical Operation Manual

Serial Interface Unit

ISO Plug-in Manifold Valve

Rev 1.004 21.Aug.2000

SI Unit Model No. : EX230-SDN1

Contents

1. Summary

EX230-SDN1 is SI (Serial Interface) unit for ISO plug-in manifold valve, that can connect to Device Net. Followings are the specification and the operation manual.

2. Structure

●2－1 System structure

SI unit connect to Device Net of system in the parts manufacturing line with ISO plug-in manifold, and the unit is used as component inside system.
Fig 2.1 is connection example of SI unit.
Connect SI unit at the node on the fig.

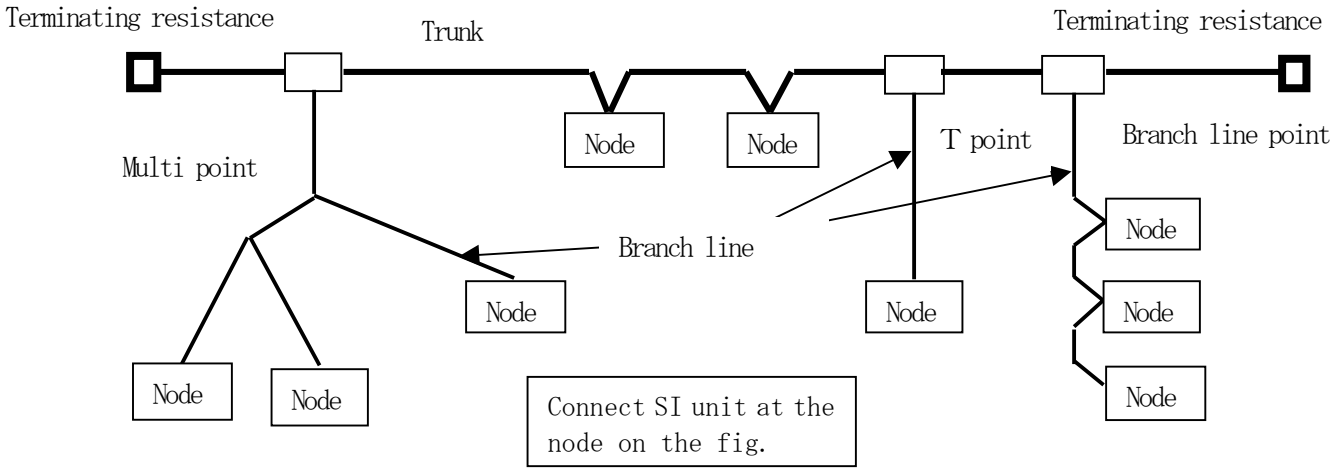


Fig 2. 1 System structure

●2－2 ＳＩ unit structure

SI unit consists of micro computer, CAN transceiver, Sensor input control gate ally, output driver circuit, LED, SW and DC-DC converter.

Fig 2.2 shows Si unit internal block.

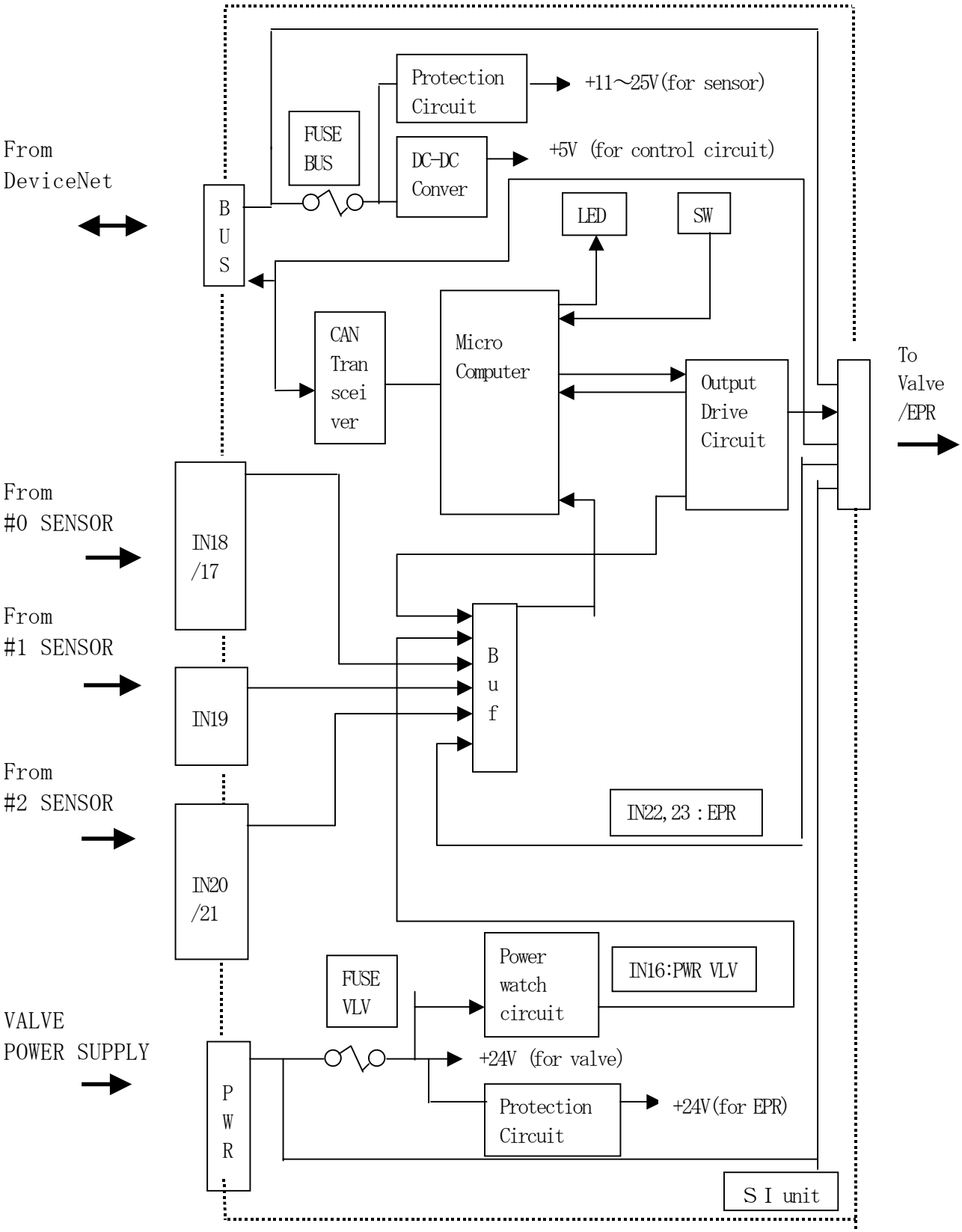


Fig２．２　ＳＩ unit internal block

3. Specification

●３－１　General specification

item	Specification
Protection class	ＩＰ６５（ＮＥＭＡ４）
Operating ambient temperature	+5 ～ +45℃
Operating ambient moisture	35～85%RH (no dewing)
Vibration resistance	5G (10～55Hz all amplitude 0.50mm)
Shock resistance	Peak acceleration 10G
Noise resistance	1000Vp-p Pulse width 100ns～1μS leading edge 1ns pulse
Voltage resistance	Between external terminal package and case, AC1000V,50/60Hz 1 minute
isolation resistance	Between external terminal package and case, 10MΩ
Environment	No corrosive gas. No dust.

●３－２　Communication specification

Item	specification				
Applicable system	ＤｅｖｉｃｅＮｅｔ				
Node address	０～６３				
Communication speed	１２５ｋ，２５０ｋ，５００ｋｂｉｔ／ｓｅｃ				
Max cable length	communication speed	Network max length		Branch line length	All branch line length
		thick cable	Thin cable		
	500kbps	100m or less	100m or less	6m or less	39m or less
	250kbps	250m or less			78m or less
	125kbps	500m or less			156m or less

●3－3　ＳＩ unit specification

Item	Specification
Output points	16 points
Output type	PNP transistor, open collector type (with the function of excessive current protection)
Connection load	Solenoid valve with DC24V、2.8W or less lamp･serge voltage protection circuit
Input points	32 points
Input contents	０～１５： Excessive current detecting status １６　　： PWR VLV status １７～２１： Sensor input ２２，２３： EPR input ２４～３１： NOT USE
Power supply voltage, consumption current	DC11～25V (For DeviceNet) , 0.5A (Max) ：When sensor not use.
	DC20～25V (For DeviceNet) , 0.5A (Max) ：When sensor use.
	DC20～26.4V (For solenoid valve) , 2.0A (Max)
Weight	６００ｇ or less
external dimensions (D×W×H)	（７１）×（１６７）×（５７）

4. Parts description and function

Fig4.1 shows SI unit appearance.

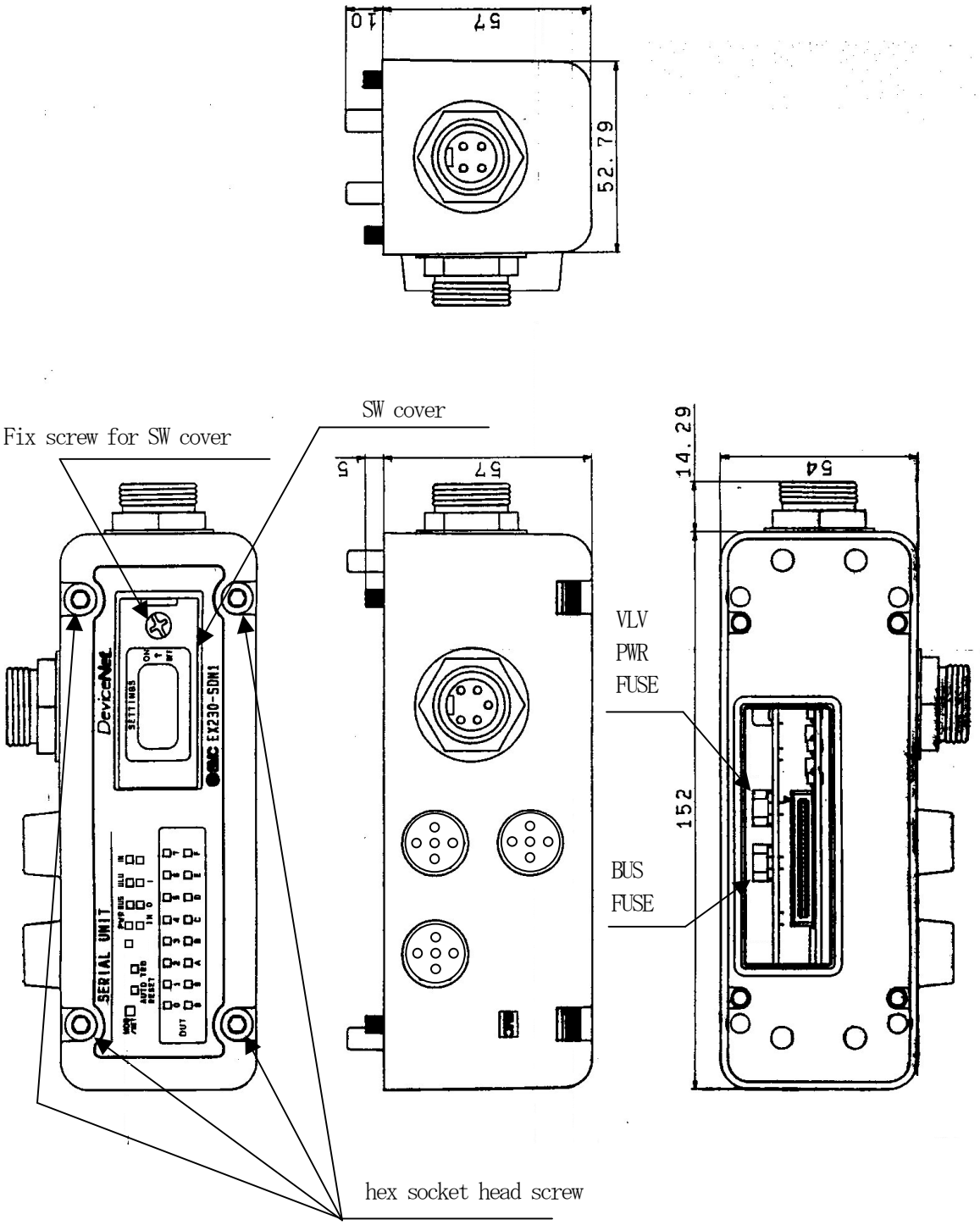


Fig4.1 SI unit appearance

●4－1 LED display

Name	Function
MOD / NET	Display the status of communication to Device Net
AUTORESET	When shorted at the output toward solenoid valve, turn the output OFF. When set as the recovery is done automatically, this LED become steady.
PWR BUS	Display source status. The source is inputted from DeviceNet.
PWR IN	Display status of the source for sensor, which is outputted.
PWR EPR	Display status of the source for EPR, which is outputted.
PWR VLV	Display status of the source for solenoid valve, which is inputted.
IN 17～21	Display the status of sensor input.
IN 22,23	Display the status of EPR input.
OUT 0 ～ F	Display the status of output .

(Refer to item 7 for the details)

●4－2 SW function

Fig 4.2.1 shows SW1 function. Fig 4.2.2 shows SW2 function.

Fig 4.2.1 SW1 function

SW No.	function
1～6	Select node address from 0～63, and set.
7, 8	Select communication speed from 125k,250k, and 500k, and set.
9	When communication error occur, select CLEAR or HOLD at the output of solenoid valve, and set.
10	Select HW mode (actuation by SW1-1 to 8 setting) or SW mode (actuation by network setting) at the setting of communication speed and node address, and set

Fig 4.2.2 SW2 function

SW No.	Function
1	When shorted at the status of solenoid valve output, select HOLD with output OFF or output automatic recovery when short status was removed and output OFF, and then set.
2	―――――
3	―――――
4	―――――

●4－3 Connector function

No.	Name	function
1	BUS IN	connect to Device Net cable
2	VLV PWR IN	connect to source cable
3	IN 18／17	connect to sensor cable
4	IN 19	connect to sensor cable
5	IN 20／21	connect to sensor cable

5. How to set up SW

2 of DIP SW (SW1:10bit, SW2:4bit) are mounted on the display of SI unit.
To set SW, loosen fix screw for SW cover, open cover and set the each bit.

fig5.1 How to set SW1

SW1 No.		1	2	3	4	5	6	7	8	9	10
Node address		1	2	4	8	16	32				
	0	0	0	0	0	0	0				
	1	1	0	0	0	0	0				
	2	0	1	0	0	0	0				
	62	0	1	1	1	1	1				
	63	1	1	1	1	1	1				
Communication speed (BAUD RATE)	125k							0	0		
	250k							1	0		
	500k							0	1		
	—							1	1		
Output specification when communication error is detected.	CLEAR									0	
	HOLD									1	
Setting mode	HW										0
	SW										1

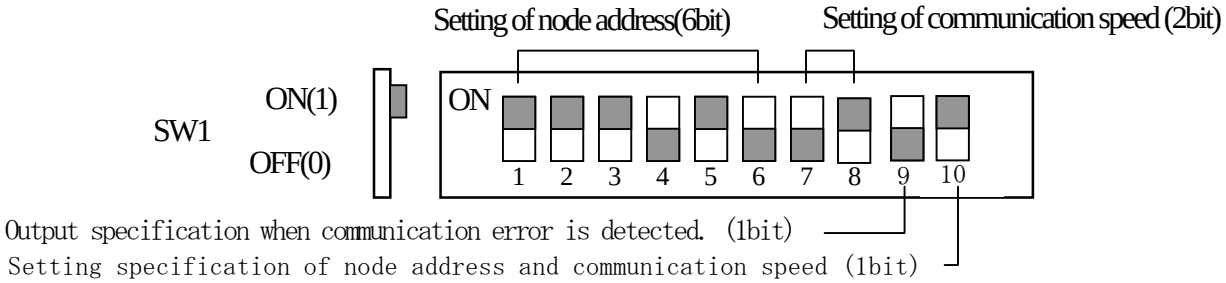
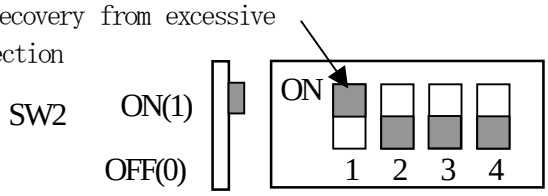


Fig. 5.2 How to set SW2

SW2 No.		1	2	3	4
AUTORESET	OFF	0			
	ON	1			
RESERVE	OFF		0		
RESERVE	OFF			0	
RESERVE	OFF				0

Setting of recovery from excessive current protection



6. Connection method

●6－1　Connection of communication cable

・Device Net can connect as T point, branch line point and multi drop.
・Truck and Branch line max length change depending on communication speed and communication cable material. So please refer to table.6.1.1.
・　SI unit can connect at node position of fig.6.1.1.
・　Connect Device net cable to BUS connector of SI unit.

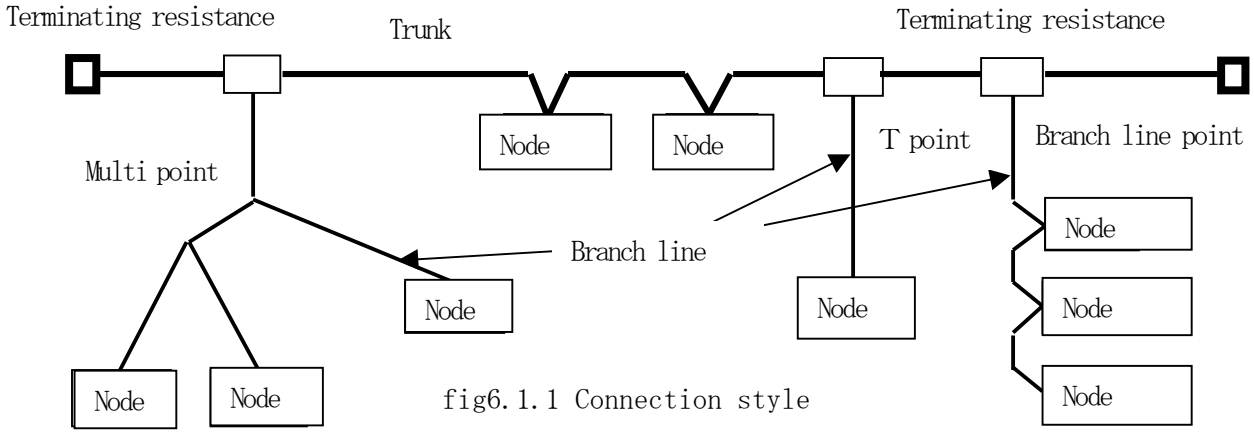


fig6.1.1 Connection style

Table 6.1.1　Wire length

		Communication speed（ｋｂｐｓ）		
		１２５	２５０	５００
Trunk	Thick line	５００ｍ	２５０ｍ	１００ｍ
	Thin line	１００ｍ		
Branch line (note)		１５６ｍ	７８ｍ	３９ｍ
Terminating resistance		１２１Ω±１０％（１／４Ｗ, Ｍｅｔａｌ Ｆｉｌｍ）		

note. One branch line max length is up to 6m.

Table 6.1.2 Cable specification

Item	Thick line	Thin line
Conductor cross section	0.82㎟	0.20㎟
Impedance	120Ω±10%	120Ω±10%
propagation delay	1.36ns/ft	1.36ns/ft
damping ratio	500KHz:0.25dB/ft 125KHz:0.13dB/ft 1.00MHz:0.40dB/ft	500KHz:0.50dB/ft 125KHz:0.29dB/ft 1.00MHz:0.70dB/ft
Conductor resistance	6.9Ω/1000ft	28Ω/1000ft

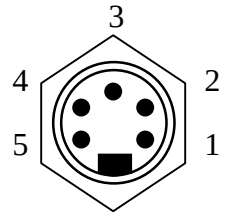
Caution on wiring

1) User need to provide plug connector for T type point in order to do multidrop connection. (Example : TMSTBP 2.5...-STF-5.08 made by Fenix contact Co.)

2) Please use the special cable for DeviceNet as communication cable.

3) Please connect surely the special terminating resistance at the trunk line both ends.

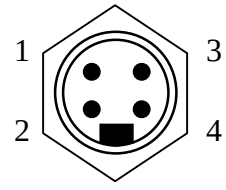
Table 6.1.3 BUS connector specification

Name	Function
 BUS IN	Connect to Device Net cable Connector description : 5-pin connector (Mini style) Male Connector type : equivalent to 84854-9101(MOLEX) Signal description : 1. Drain / Shield 2. V+ 3. V— 4. CAN_H 5. CAN_L

●6－2 connection of power supply cable

・Connect power supply cable to PWR connector of SI unit.

Table 6.2.1 VLV PWR IN connector specification

Name	Function
 VLV PWR IN	Connect to power supply cable Connector description : 4-pin connector (Mini style) Male Connector type : equivalent to 84854-9104(MOLEX) Signal description : 1. 24V 2. NC 3. NC 4. 0V

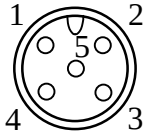
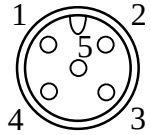
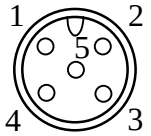
●６－３ Connection of sensor

（１） Connection of sensor

SI unit can directly connect to sensor for 5 points.

Connect to sensor cable to IN18/17, IN19 and IN20/21 connector of SI unit.

Table 6.3.1 input connector specification

Name	Function
 ＩＮ １８／１７	Connect to sensor cable Connector description：5-pin connector (M12) Female Signal description：1. 24V DC (for sensor) 2. IN 17 3. 0V (for sensor) 4. IN 18 5. PE (Protective Earth)
 ＩＮ １９	Connect to sensor cable (1 point sensor) Connector description：5-pin connector (M12) Female Signal description：1. 24V DC (for sensor) 2. NC 3. 0V (for sensor) 4. IN 19 5. PE (Protective Earth)
 ＩＮ ２０／２１	Connect to sensor cable Connector description：5-pin connector (M12) Female Signal description：1. 24V DC (for sensor) 2. IN 21 3. 0V (for sensor) 4. IN 20 5. PE (Protective Earth)

7. Actuation and LED display

●7－1 Actuation of SI unit

SI unit actuate as follows normally.
Table 7.1 shows LED display specification.

（1）When DeviceNet is turned ON, SI unit PWR BUS and PWR IN LED become steady.
(If AUTO RESET mode is set, AUTO RESET LED become steady)

（2）When Device Net start to actuate, and Communication to master is established, MOD/NET LED become steadily green.

（3）When power for solenoid valve is turned ON, PWR EPR and PWR VLV LED of SI unit become steady.

＊With above, SI unit become ready.

（4）Hereafter, turn ON/OFF according to command from Device Net master.
Moreover, respond the status to master if there is input from sensor.
Also, respond the status to master if output short is detected.

Table 7.1 LED display specification

Name	Contents	
MOD / NET	Green steadily	When communication to DeviceNet is doing normally.
	Green flashing	When communication to DeviceNet is waiting.
	Red steadily	When communication to DeviceNet become error.
	Red flashing	When communication to DeviceNet become connection timeout.
	OFF	When Off line
AUTO RESET	Green steadily	When set at excessive current protection AUTO RESET mode.
	OFF	Unless set at excessive current protection AUTO RESET mode.
PWR BUS	Green steadily	DeviceNet turn ON the power supply
	OFF	DeviceNet turn OFF the power supply
PWR IN	Green steadily	When power for sensor is turned ON
	OFF	When power for sensor is turned OFF or the sensor circuit is shorted
PWR EPR	Green steadily	When power for EPR is turned ON
	OFF	When power for EPR is turned OFF or the EPR circuit is shorted
PWR VLV	Green steadily	When power for solenoid valve is turned ON with 20V or over
	Red steadily	When power for solenoid valve is turned ON with 18V～20V
	OFF	When power for solenoid valve is turned OFF or less than 18V
IN 17～21	Orange steadily	When input from sensor is turned ON.
	OFF	When input from sensor is turned OFF
IN 22,23	Orange steadily	When input from EPR is turned ON.
	OFF	When input from EPR is turned OFF
OUT 0 ～ F	Orange steadily	Output toward solenoid valve is turned ON
	Orange flashing	Output toward solenoid valve is shorted
	OFF	Output toward solenoid valve is turned OFF

●7－2 Actuation of output excessive current protection

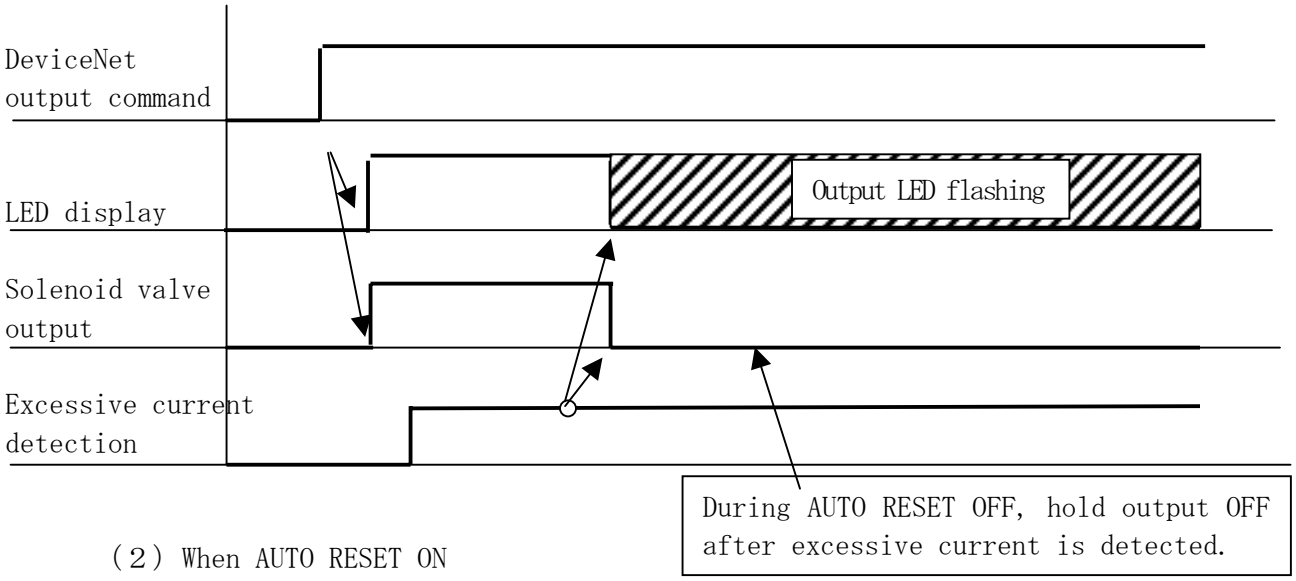
（1）When AUTO RESET OFF

SI unit is execute following procedure to output command from Device Net master.

① Turn ON solenoid valve according to command (output LED steady)

② Turn OFF solenoid valve when output excessive current occur. (Output LED flashing)

Output OFF status is hold until DeviceNet power supply is turned OFF.

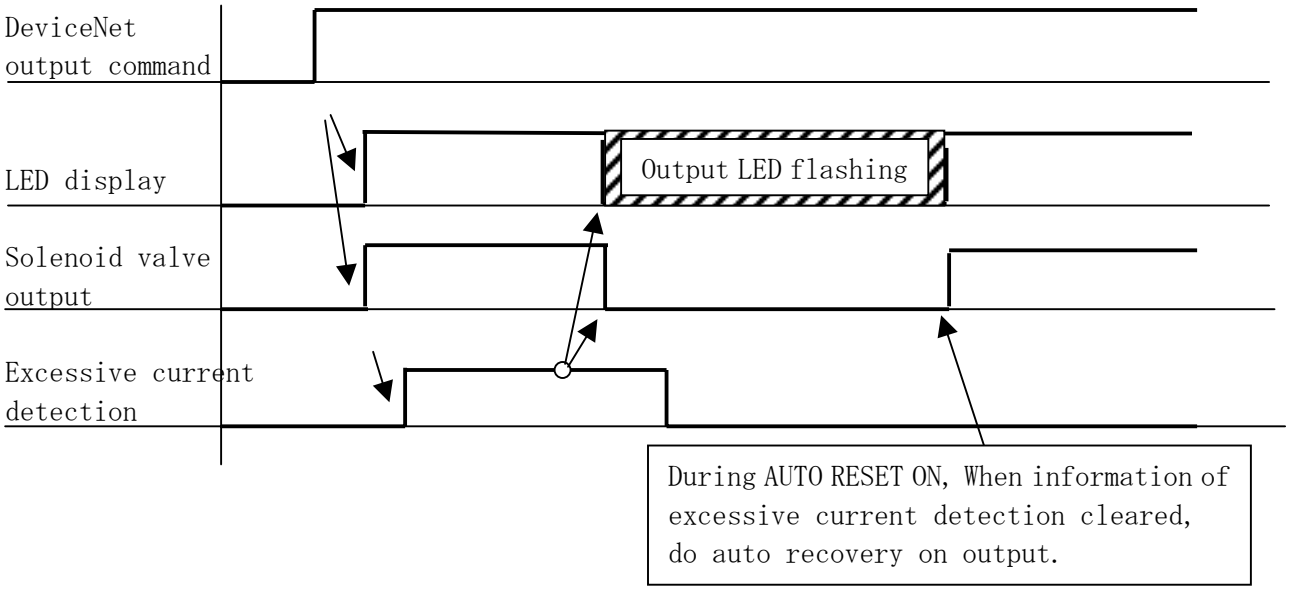


（2）When AUTO RESET ON

① Turn ON solenoid valve according to command (output LED steady)

② Turn OFF solenoid valve when output excessive current occur. (Output LED flashing)

③ When the cause of excessive current is removed, make solenoid valve recover its normal output.



8. Maintenance

●8－1 Procedure of SI unit exchange

SI unit and valve manifold is connected by internal connector.
SI unit is stationary with screw (4 pieces)
Please follow the procedure to exchange SI unit.

(1) Ensure SI unit is not supplied with power.
(2) Remove all cables connected to SI unit.
(Normally Device Net cable and source cable should be removed.
When sensor are used, remove the cable connected to IN18/17,IN19 and IN20/21 connector) .
(3) Remove hex socket head screw (4 pieces) with wrench.
Screws are seen at display surface side of SI unit.
(4) Draw SI unit upward (display surface side) from bottom, and remove it.
(5) Adjust SW setting of SI unit to exchange, and mount with the reverse procedure.

Refer to Fig4.1 for the position of connector and screw.

●8－2 Procedure of fuse exchange

See SI unit from bottom surface to find internal connector and 2 fuses.
Exchange the fuse.
Remove SI unit with the same procedure as SI unit exchange.
Pull out fuses toward bottom, which are seen from SI unit bottom surface side.
Remove and exchange.

Refer to Fig4.1 for the position of fuse.

(Note) Fuses are built-in to avoid fire when internal circuit is shorted.
Also it is necessary to protect SI unit from external serge voltage and current. So please use specified fuse.
FUSE BUS : 3961200044 made by WICKMANN (Rated2.0A)
FUSE VLV PWR : 3961315044 made by WICKMANN (Rated3.15A)

9. MAP for system control

●9－1 I/O assign

Item		Output	Input
Occupied byte		2byte (solenoid valve output)	4byte (short circuit / sensor input)
Send / receive data	Output Address+0byte	Output No. 0 ～ 7	
	+1byte	Output No. 8 ～ 15	
		-	
		-	
	Input Address +0byte		Output status No.0 ～ 7
	+1byte		Output status No.8 ～ 15
	+2byte		Input No.16 ～ 23
	+3byte		Input No.24 ～ 31

Assignment method of send/receive data is different by PLC. Refer to PLC master (scanner) manual for the detail.

●9－2 Bit mapping

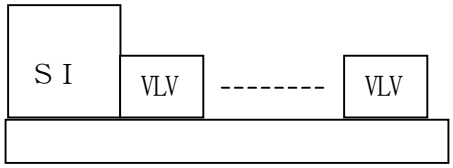
I / O	Item	Classification	SIGNAL NAME	BIT ADDRESS
Output	Word 1	Solenoid valve	OUT_0 ～ 15	Nxx:O00 ～ 15
Input	Word 1	Circuit protection status	STS_0 ～ 15	Nxx:I00 ～ 15
	Word 2	Valve power	IN_16	Nxx:I16
		Sensor	IN_17 ～ 21	Nxx:I17 ～ 21
		EPR 0,1	IN_22 ～ 23	Nxx:I22 ～ 23
		NOT USE	IN_24 ～ 31	Nxx:I24 ～ 31

*OUT_0 STS_0 and IN_16 is LSB , OUT_15, STS_15 and IN_23 is MSB.

*Next page shows detail of Bit mapping

Bit mapping (detail)

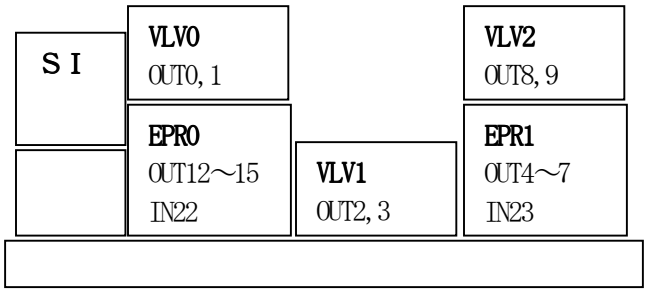
[I] Tooling TYPE



I / O	Item	Classification	SIGNAL NAME	BIT ADDRESS
Output	Word 1	Solenoid valve	OUT_0 ~ 15	Nxx:O00 ~ 15
Input	Word 1	Circuit protection status	STS_0 ~ 15	Nxx:I00 ~ 15
	Word 2	Valve Power	IN_16	Nxx:I16
		Sensor	IN_17 ~21	Nxx:I17 ~ 21
		NOT USE	IN_22,23	Nxx:I22,23
		NOT USE	IN_24 ~ 31	Nxx:I24 ~ 31

*OUT_0 STS_0 and IN_16 is LSB , OUT_15, STS_15 and IN_23 is MSB.

[II] Weld TYPE



I / O	Item	Classification	SIGNAL NAME	BIT ADDRESS
Output	Word 1	Solenoid valve	OUT_0 ~ 3	Nxx:O00 ~ 03
		EPR1	OUT_4 ~ 7	Nxx:O04 ~ 07
		Solenoid valve	OUT_ 8 ~ 11	Nxx:O08~11
		EPR0	OUT_12 ~ 15	Nxx:O12~15
Input	Word 1	Circuit protection status	STS_0 ~ 15	Nxx:I00 ~ 15
	Word 2	Valve Power	IN_16	Nxx:I16
		Sensor	IN_17 ~ 21	Nxx:I17 ~21
		EPR0	IN_22	Nxx:I22
		EPR1	IN_23	Nxx:I23
		NOT USE	IN_24 ~ 31	Nxx:I24 ~ 31

* OUT_0 STS_0 and IN_16 is LSB , OUT_15, STS_15 and IN_23 is MSB.

●9－3 EDS file

```
$   Electronic Data Sheet File for
$   SMC EX230-SDN1 Serial Interface Unit
$   BASIC Mode

[File]
        DescText = "SMC EX230-SDN1 EDS File";
        CreateDate = 07-14-2000;          $ created
        CreateTime = 12:00:00;
        Revision = 1.1;                           $ Revision of EDS

[Device]
        VendCode = 7;
        VendName = "SMC Corp.";
        ProdType = 27;
        ProdTypeStr = "Pneumatic Valve";
        ProdCode = 2301;
        MajRev = 1;                               $ Device Major Revision
        MinRev = 4;                               $ Device Minor Revision
        ProdName = "Valve Manifold SIU";
        Catalog = "EX230-SDN1";

[IO_Info]
        Default = 0x0001;                         $ Poll(Bit 0)
        PollInfo = 0x0001 , 1 , 1;        $ Prod. Cnxn=1
                                                  $ Cons. Cnxn=1
        Input1 = 4,                               $ 4 byte
                 0,                               $ All bits are significant
                 0x0001,                          $ Poll Only Connection
                 "Solenoid Status",               $ Name String
                 6,                               $ Path Size
                 "20 04 24 11 30 03",             $ Assy Obj Inst 11 Attr 3
                 "";                              $ Help String
        Output1 = 2,                              $ 2 byte
                  0,                              $ All bits are significant
                  0x0001,                         $ Poll Only Connection
                  "Solenoid Output",              $ Name String
                  6,                              $ Path Size
                  "20 04 24 23 30 03",            $ Assy Obj Inst 23 Attr 3
                  "";                             $ Help String
```