**Autonics**

# DeviceNet ANALOG REMOTE I/O
# ARD SERIES

**M A N U A L**

Thank you very much for selecting Autonics products.
**For your safety, please read the following before using.**

## ▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;

**⚠Warning** Serious injury may result if instructions are not followed.

**⚠Caution** Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.
⚠Caution:Injury or danger may occur under special conditions.

### ⚠Warning

1. **In case of using this unit with machinery (Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may cause a fire, human injury or damage to property.
2. **Do not connect, inspect and repair when power is ON.**
   It may cause electric shock or a fire.
3. **Do not disassemble or modify this unit. Please contact us if it is required.**
   It may cause electric shock or a fire.
4. **Do not insert metallic substance into the unit.**
   It may cause electric shock or a fire, malfunction.

### ⚠Caution

1. **This unit shall not be used outdoors.**
   It may shorten the life cycle of the product or cause electric shock.
2. **Do not use this unit in place with flammable or explosive gas.**
   It may cause a fire or explosion.
3. **Do not use this unit in place with vibration or impact.**
   It may cause a breakdown of the product.
4. **Please connect power terminal and communication wire exactly after checking the connection diagram.**
   It may cause a fire and malfunction.
5. **Tighten communication cable connector as tight as possible for stable cable connection.**
   In case of unstable cable connections, it may cause serious communication or network malfunction.
6. **In cleaning the unit, do not use water or an oil-based detergent and use dried cloth.**
   It may cause electric shock and breakdown of the product.
7. **Please observe the rated specification.**
   It may cause electric shock, human injury and breakdown of the product.
8. **Please separate as industrial waste when disusing this unit.**

## ▣ Model

| Model | Network | Digital/Analog | Input/Output | Input/Output point |
|---|---|---|---|---|
| ARD-AI04 | DeviceNet | Analog | Input | 4-point |
| ARD-AO04 | | | Output | |

## ▣ DeviceNet communication

| Item | Specification |
|---|---|
| Communication | I/O Slave messaging(Group 2 Only slave)<br>·Poll command: Yes ·Bit_strobe command: Yes<br>·Cyclic command: Yes ·COS command: Yes |
| Communication distance | Max. 500 m(125 kbps), Max. 250 m(250kbps), Max.100 m(500 kbps) |
| Node address | Max. 64 nodes |
| Communication speed | ·125 kbps ·250 kbps ·500 kbps(automatically set when connecting with master) |
| Insulation | I/O and inner circuit: Non-insulated,<br>DeviceNet and inner circuit: insulation, Power of DeviceNet: insulation |
| Approval | ODVA Conformance test |

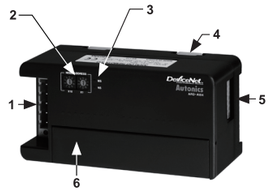
**※The above specifications are subject to change and some models may be discontinued without notice.**

## ▣ Specifications

| Model | | ARD-AI04 | ARD-AO04 |
|---|---|---|---|
| Power supply | | Rated voltage: 24VDC, Voltage range: 12-28VDC | |
| Power consumtion | | Max. 3W | |
| Insulation type | | Photocoupler isolated | |
| I/O points | | 4 points of input<br>(Switchable voltage/current) | 4 points of output<br>(Voltage: 2CH, Current: 2CH) |
| Control I/O | Voltage | 0-10VDC, -10-10VDC, 0-5VDC, 1-5VDC, -5-5VDC (Input impedance: Min. 1MΩ) | 0-10VDC, -10-10VDC, 0-5VDC, 1-5VDC, -5-5VDC (Load resistance: Min. 1KΩ) |
| | Current | DC 4-20mA, DC0-20mA<br>(Input impedance: 250 Ω) | DC4-20mA, DC0-20mA<br>(Load resistance: Max. 600 Ω) |
| Max. allowable I/O | | ±5% for rated I/O range | |
| Sampling cycle | | 1 ms/point | |
| Accuracy | 25±5℃ | ±0.3% F.S. | |
| | -10~20℃, 30 to 50℃ | ±0.6% F.S. | |
| Resolution | | 1/16,000 | |
| Insulation resistance | | Min. 200 MΩ(at 500 VDC megger) | |
| Noise resistance | | ±240 V the squre wave noise(pulse width: 1 ㎲) by the nosie simulator | |
| Dielectric strength | | 500VAC 50/60 Hz for 1 minute<br>(Between external terminals and case, Between I/O terminals and power terminals) | |
| Vibration | | 1.5 mm amplitude or 300m/s² at frequency of 10 to 55 Hz in each of X, Y, Z directions for 2 hours | |
| Shock | | 500 m/s² (approx. 50 G) in X, Y, Z directions for 3 times | |
| Environ -Ment | Ambient temperature | 10 to 50 ℃, Storage: -25 to 75 ℃ | |
| | Ambient humidity | 35 to 85%RH, Storage: 35 to 85%RH | |
| Protection | | IP20(IEC standards) | |
| Protection circuit | | Surge,static electricity, reverse power polarity protection circuit | |
| Indicator | | Network status LED(NS): Green, Red, Module Status LED(MS): Green, Red | |
| Material | | Front Case, Body Case: PC | |
| Mounting | | DIN rail or screw lock type | |
| Approval | | CE, DeviceNet | |
| Weight※1 | | Approx. 210g(Approx. 145g) | |

※1: This weight is with packaging and the weight in parentheses is only unit weight.
※Environment resistance is rated at no freezing or condensation.

## ▣ Part description




**1. DeviceNet Connector**

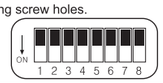
| No. | Color | For | Organization |
|---|---|---|---|
| 5 | Red | 24VDC(+) | V+ |
| 4 | White | CAN_H | CAN_H |
| 3 | None | SHIELD | SHIELD |
| 2 | Blue | CAN_L | CAN_L |
| 1 | Black | 24VDC(-) | V- |

**2. Rotary switch for node address**
Two rotary switches are used for setting node address.
X10 switch represents the 10's multiplier and X1 switch represents the 1's multiplier.

**3. Status LED**
It displays the status of unit(MS) and network(NS).

**4. Rail Lock**
It is used for holding DIN rail and fixing screw holes.

**5. DIP switch**
Set the range of I/O.
(Factory default: All switches are OFF)




(●: ON, -: OFF)

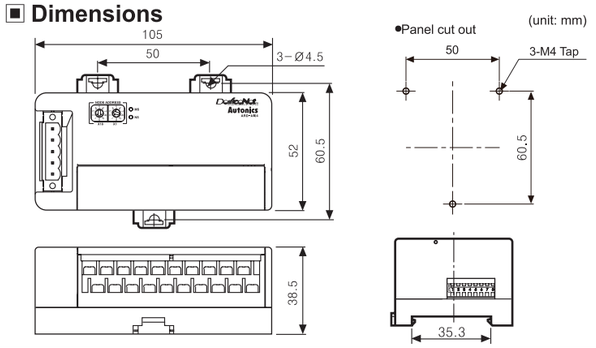
| | ARD-AI04(Input model) | | | | | | ARD-AO04(Output model) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CH0, CH1 | | | CH2, CH3 | | | CH0, CH1 | | | CH2, CH3 | | | | |
| I/O range | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8※1 |
| 0-5VDC | - | - | - | - | - | - | - | - | - | | | | | ON<br>Used DIP switch<br><br>OFF<br>Not used DIP switch |
| 1-5VDC | ● | - | - | ● | - | - | ● | - | - | | | | | |
| 0-10VDC | - | ● | - | - | ● | - | - | ● | - | Not supported | | | Not Used (Off Setting) | |
| -5-5VDC | ● | ● | - | ● | ● | - | ● | ● | - | | | | | |
| -10-10VDC | - | - | ● | - | - | ● | - | - | ● | | | | | |
| DC4-20mA | ● | - | ● | ● | - | ● | Not supported | | | - | - | - | | |
| DC0-20mA | - | ● | ● | - | ● | ● | | | | ● | - | - | | |

※1: Turn ON SW8 and I/O range can be set by DIP switch(SW1 to SW6). Turn OFF SW8 and I/O range can be set by communication.
By DIP switch, CH0 and CH1 (CH2 and CH3) cannot be set separately. By communication, each CH can be set.

**6. I/O terminal block**
It connects I/O with external devices.

## ▣ Dimensions

(unit: mm)




## ▣ I/O circuit diagram

| Item | DeviceNet Connector | Inner circuit | External connection |
|---|---|---|---|
| Analog Input | V+<br>CAN_H<br>SHIELD<br>CAN_L<br>V- | Inner circuit<br>Power circuit<br>Input circuit<br>Power circuit | V0+<br>I0+<br>V0-<br>V1+<br>I1+<br>V1-<br>AG<br>Analog GND<br>※: Short V□+ and I□+ and it is current input. |
| Analog Output | V+<br>CAN_H<br>SHIELD<br>CAN_L<br>V- | Inner circuit<br>Power circuit<br>Output circuit<br>Power circuit | V.OUT<br>COM<br>I.OUT<br>COM<br>LOAD Min. 1KΩ<br>LOAD Max. 600Ω<br>Analog GND |

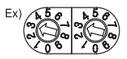
## ▣ Input/Output range

| No. | Input/Output range | Max. allowable input/output range |
|---|---|---|
| 0 | 0-5VDC | -0.25-5.25VDC |
| 1 | 1-5VDC | 0.8-5.2VDC |
| 2 | 0-10VDC | -0.5-10.5VDC |
| 3 | -5-5VDC | -5.5-5.5VDC |
| 4 | -10-10VDC | -11-11VDC |
| 5 | DC4-20mA | DC3.2-20.8mA |
| 6 | DC0-20mA | DC0-21mA |

## ▣ Setup and Installation

**1) Setting of node address**
①Two rotary switches are used for setting node address.
X10 switch represents the 10's multiplier and X1 switch represents the 1's multiplier. Node addresses are available from 0 to 63.
②The node address is changed when supplying the power to the unit.
Re-supply the power to the unit after changing the node address.

Ex)



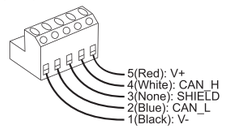

The X10 and X1 switches point at "3" so the node address is "33".

**2) Installation of Unit**
- Installation on panel
①Pull two rail locks on the rear part of unit, and there are fixing screw holes.
②Place this unit on a panel to be mounted.
③Make holes on the each fixing screw hole position.
④Place this unit on the two fixing screw holes and fix them tightly with 0.5 N·m tightening torque.
- Installaiton on DIN rail
①Pull two rail locks on the rear part of unit.
②Place this unit on a panel to be mounted.
③Press the rail locks and fix it firmly.

**3) I/O cable connection**
Refer to the I/O circuit diagram and connections.
Connect a sensor or the signal cable of external I/O device to the terminals.
(Tightening torque: 0.5 N·m )

**4) DeviceNet cable connection**
①For stable system, it is recommended to use the DeviceNet cable.
②Connect the DeviceNet cable to the DeviceNet connector and tighten the fixed screw of the connector by a driver. (Tightening torque: 0.5 N·m )
③Connect the DeviceNet connector to the ARD unit and supply the power to the network.

| Master unit | | | ARD unit | |
|---|---|---|---|---|
| PIN No. | Signal Name | | PIN No. | Signal Name |
| 5 | V+ | Red | 5 | V+ |
| 4 | CAN_H | White | 4 | CAN_H |
| 3 | SHIELD | None | 3 | SHIELD |
| 2 | CAN_L | Blue | 2 | CAN_L |
| 1 | V- | Black | 1 | V- |




**5) Setting of master unit**
①Check the LED status of ARD unit when power is ON. Normal operation is as below table.

| Item | Status LED | Status description |
|---|---|---|
| Unit status LED (MS) | Green LED is ON | When master unit status is communication standby, NS LED flashes When master unit setting is completed, NS LED is ON. |
| Network status LED (NS) | Green LED is ON / flashes | |

②Install the software from master unit manufacturing company.
③Setting communication speed and node address in the software.
・Baud rate: 125/250/500 kbps
・Node address of master unit: Usually it is set 00 address.
④Resister connected unit in the network.
・There are two methods to resister, automatically in on-line or manually in off-line.
(Refer to the manual of the master unit.)
・ARD Series I/O assignment: Usually it is automatically assigned by the software.
・Setting of operation mode: Select among Poll, COS, Cyclic, Bit Strobe(Usually set Poll mode)

**6) Check operating status**
When installation and setting are completed, MS LED and NS LED turn ON in green.(Refer to the '▣ Status LED'. )

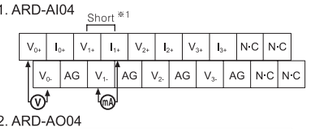
**☉Terminating resistance**
●120 Ω ●1 % of metallic film ●1/4 W
※Do not install terminating resistance on ARD unit, or it may cause network problem and malfunction.
(Impedance can be too high or low.)
※Connect terminating resistance on the both ends of the trunk line.

## ▣ Communication distance

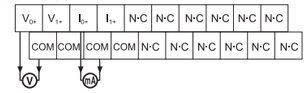
| Baud Rate | Max. network length | Max. length of branch line | Allowable expansion length of branch line |
|---|---|---|---|
| 125 kbps | 500m | 6m | 156m |
| 250 kbps | 250m | 6m | 78m |
| 500 kbps | 100m | 6m | 39m |

## ▣ Connections

1. ARD-AI04




2. ARD-AO04




| | |
|---|---|
| Voltage | 0~5VDC |
| | 1~5VDC |
| | -5~5VDC |
| | 0~10VDC |
| | -10~10VDC |
| Current | DC0~20mA |
| | DC4~20mA |

※1: For current input, short between V□+ and I□+.

## ▣ Functions

| Model | | ARD-AI04(Input) | ARD-AO04(Output) |
|---|---|---|---|
| Basic | Communication speed auto-detection | ● | |
| | Network power voltage | ● | |
| | Power on total time | ● | |
| | Unit comment | ● | |
| | Last maintenance date stored | ● | |
| Analog | Scaling | ● | |
| | I/O comment | ● | |
| | Adjustment gradient | ● | |
| | Adjustment offset | ● | |
| | Number of AD Conversion Points Setting | ● | - |
| | Moving Average Filter of Number | ● | - |
| | Peak/Bottom hold | ● | - |
| | Disconnected cable detection | ● | - |
| | Comparator | ● | - |
| | Hysteresis | ● | - |
| | Fault state | - | ● |

## ▣ Status LED

☼:LED ON ●:LED OFF ☼:LED Flash

| No | Item | LED Status | Color | Description | Solution |
|---|---|---|---|---|---|
| 1 | MS | ☼ | Green | **Normal operation**<br>I/O communication or message communication is working. | - |
| | NS | ☼ | Green | | |
| 2 | MS | ☼ | Green | **Standby of duplicated node address check**<br>The status of standby for receiving message of duplicated node address check from master unit. | - |
| | NS | ● | - | | |
| 3 | MS | ☼ | Green | **Standby of normal operation**<br>The status of standby for establish connection from master unit. | - |
| | NS | ☼ | Green | | |
| 4 | MS | ☼ | Red | **Switch setting error**<br>The status that DIP switch or another switch setting is invalid. | Change the switch with valid value and re-supply the power |
| | NS | ● | - | | |
| 5 | MS | ☼ | Red | **Changed node address during normal operation**<br>The status that node address is changed while it is operating normally. | Change the initial node address when suppling the power. |
| | NS | ☼ | Green | | |
| 6 | MS | ● | - | **Invalid node address**<br>The status of setting node address wrongly. | Change valid node address and re-supply the power |
| | NS | ☼ | Green | | |
| 7 | MS | ☼ | Red | **Duplicated node address**<br>There is duplicated node address in the network.<br>**Occuring Bus-Off error**<br>The communication is stopped with Bus-Off. | Change node address not duplicated.<br>Power on the slave unit again. Check master unit, communication, cable, terminating resistance and noise of network. |
| | NS | ☼ | Red | | |
| 8 | MS | ☼ | Green | **I/O Connection time out** | |
| | NS | ☼ | Red | | |

## ▣ User manual

Refer to the user manual for function descriptions, assembly ID assignment, Device Explict Message, etc. Visit our web site (www.autonics.com) to download it.

## ▣ Caution for using

1. Make sure that each network unit has its own node address to prevent node address duplication error. When changing the node address, unit status LED (MS) flashes in green and this communicates as the previous node address. Re-supply the power to the unit and the changed node address is applied.
2. Communication speed of master unit will be automatically set. If changing communication speed during operating, the network status LED (NS) turns ON in red and it cannot execute communication. Re-supply the power to the unit and it operates normally.
3. Make sure to use DeviceNet standards communication cables, and taps.
   It may cause communication error if non-standards products are used.
4. Make sure to examine disconnection or short-circuit before connecting cables.
5. Avoid installing the units where severe dust exists or where corrosion may occur.
6. Installation environment
   ① It shall be used indoor. ② Altitude max. 2,000 m
   ③ Pollution Degree 2 ④ Installation Category II

## ▣ Major products

■ Photoelectric sensors ■ Temperature controllers
■ Fiber optic sensors ■ Temperature/Humidity transducers
■ Door sensors ■ Tachometer/Pulse(Rate)meters
■ Door side sensors ■ SSR/Power controllers
■ Area sensors ■ Sensor controllers
■ Proximity sensors ■ Display units
■ Pressure sensors ■ Panel meters
■ Rotary encoders ■ Counters
■ Connectors/Sockets ■ Timers
■ Switching mode power supplies
■ Control switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper motors/drivers/motion controllers
■ Graphic/Logic panels
■ Field network devices
■ Laser marking system(Fiber, $CO_2$, Nd:YAG)
■ Laser welding/soldering system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