Air Catch Sensor

Series ISA

For Workpiece Placement Confirmation



No-contact sensor for confirming workpiece placement, with a configuration that is less affected by supply pressure change.

ZSE ISE
ZSP
PS
ISA
PSE
IS
ISG
ZSM

Easy-to-set-up LED level meter

Proper set position is steadily and easily set due to the LED level meter and setting dial.



Stably detects 10 μm clearance

The configuration is unlikely to be affected by supply pressure change due to the air pressure bridge circuit and semi-conductor pressure sensor.

Compliant with manifolds of up to 6 stations

Compliant with centralized wiring and piping

Free mounting position

Stable detection is available at any mounting position due to the pressure sensor.

Wide adjustment range

Compliant between 10 and 300 μm

IP66-compliant

Dustproof and dripproof type

Air Catch Sensor Series ISA

How to Order



Accessory

- · Bracket: ISA-1-A
- · Gauge: G33-3-01
- · DIN rail: ISA-2-1 to 7

· Gauge: G33-3-01



Description

No.	Description	Material
1	Cover glass	glass
2	Outer frame	Stainless steel
3	Inner frame	Stainless steel
4	Round head Phillips screw	Stainless steel
5	Socket	Brass

· Bracket: ISA-1-A



* Each part order comes with two M3 x 8 tapping screws.

· DIN rail: ISA-2-1 to 7

Material: Aluminum



Part no.	L	Applicable model
ISA-2-1	105	ISA -1
ISA-2-2	140	ISA□-2 · ISA□-1 ^L _B
ISA-2-3	175	ISA□-3 · ISA□-2 ^L _R
ISA-2-4	210	ISA□-4 · ISA□-3 ^L _B
ISA-2-5	245	ISA□-5 · ISA□-4 ^L _B
ISA-2-6	280	ISA□-6 · ISA□-5 ^L _R
ISA-2-7	315	ISA -6 ^L _R

Series **ISA**

Specifications

Fluid			Dry air (filtered to 5 µm)			
Operating pressure range		ge	0.05 to 0.2 MPa			
Recommended pr	essui	e range	0.1 to 0.2 MPa			
Detection distance	e rang	ge	10 to 300 µm			
Repeatability inclu characteristics	uding	temperature	$\pm 10~\mu m$ (0 to 60°C (standard 25°C))			
Hysteresis			10 μ m or less (Detection distance: 10 to 150 μ m)			
Detection nozzle ().D .		ø1.0 standard (Refer to page 820 for data when the nozzle diameter is modified.)			
Display function			Operating indicator light (Lights ON), Deviation level indicator light			
Power supply volt	tage		12 to 24 VDC \pm 10%, Ripple (p-p) 10% or less (With power supply polarity protection)			
Current consumption	tion		30 mA or less (Output ON, All LEDs ON)			
Switch output	IS	A11	NPN open collector: 30 V, 80 mA or less			
ISA15		A15	PNP open collector: 80 mA or less			
Operating temperature range		range	0 to 60°C (No condensation)			
Operating humidity range		ge	35 to 85 % RH (No condensation)			
Noise resistance			1000 Vp-p, Pulse width 1 μs, Rise time 1 ns			
Withstand voltage)		1000 VAC in 50/60 Hz for 1 minute between live parts and case			
Insulation resistar	nce		2 M Ω or more between live parts and case (at 500 VDC by megameter)			
Vibration resistan	се		1.5 mm amplitude in 10 to 500Hz or acceleration of 98 m/s ² , whichever is smaller for 2 hours in X, Y, Z direction each (De-energized)			
Impact resistance	1		980 m/s ² in X, Y and Z direction, 3 times each (De-energized)			
Lead wire			Oil-resistant vinyl cabtire code (3 cores, ø3.4, 5 m), Cross section: 0.2 mm ² , Insulator O.D.: 1.1 mm			
Mass			250 g (including gauge and 5-m lead wire)			
Port size			Rc ¹ /8			
Enclosure			IP66 (Dustproof and dripproof type)			
	y ure	0.10 MPa	16 t /min or less			
Air consumption	ldd	0.15 MPa	21 t /min or less			
	Su pr∈	0.20 MPa	25 t /min or less			

*₿*SMC

Working Principle



In a bridge circuit as in the figure above, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1 = P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2 \ge P1). Then the switch output turns on to notify that the pressure is below the detection gap.

How to Set Pressure

Air catch sensor is adjusted by using the LED level meter and the setting dial.



(1) For accurate setting, create the proper setting conditions by applying a clearance gauge to the detection nozzle beforehand.

- (2) Confirm that pressure is being applied. At this time, if the setting dial is fully closed, all LEDs should be off.
- (3) Turning the setting dial in a plus direction (counterclockwise) will cause the LEDs to turn on in order: Red 1, Red 2, Green 1, Green 2.
- (4) When the Green 1 LED level meter comes on, output will be switched on, so please end the setting process at the point when Green 1 comes on.
- (5) Apply a clearance gauge to the detection nozzle once more, and confirm that Green 1 has switched on.
- (6) Hold the setting dial with a finger, and tighten the lock nut with a wrench. Tighten so that the setting dial will not turn.

816

OUT

Internal Circuit and Wiring

NPN-type open collector DC (+) Brown UUT Black Max.80 mA DC (-) Blue PNP-type open collector



Centralized wiring type

Refer to the below figure for the relation between terminal block wiring in terminal box and switch.



OUT OUT OUT OUT

Specific Product Precautions

Read before handling.

Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

······

Mounting

≜Caution

 If the detection nozzle is exposed to splashes of water or cutting oil, do not allow backflow from the detection nozzle to the switch body. Install the switch body at a position higher than the detection nozzle wherever possible.

Piping

≜Caution

1. Piping equipment

In the piping between the switch body and the detection nozzle, do not use equipment or fittings that can possibly cause leakage or serve as resistance.

Do not use One-touch fittings in an environment where the air catch sensor is exposed to water or other liquid.

Pressure Source

Caution

1. Supply air

Since the orifice of the air catch sensor is small, prevent foreign matter from entering the equipment. For this purpose, use supply air that is dry and filtered 5 μ m or better.

2. Operating pressure

Since the product adopts a semiconductor pressure sensor, keep the operating pressure not larger than 0.2 MPa.

Operating Environment

≜Caution

- When an air catch sensor is contained in a box, provide an air outlet to constantly keep the atmospheric pressure inside the box. Internal pressure rises will hinder normal air discharge and may lead to possible malfunction.
- rises will hinder normal air discharge and may lead to possible malfunction. 2. The air catch sensor is IP66-compliant, but when there is a possibility of water, oil, etc. from the exhaust port entering the case interior, use an M5 fitting to connect a tube, and discharge air in a place where water and oil will not enter the interior. When attached with a gauge, there is a danger of materials entering the gauge interior and causing malfunction, so please remove the gauge and use a plug instead.

When mounting a gauge to the exterior, please use piping of as short a length as possible. Failure to do so may result in slower response speed.

Maintenance

≜Caution

1. How to change

- After loosening the four mounting screws (M4 x 8), pull straight back on the switch body. Pulling back diagonally can result in bending of the connector pin, etc., so take precautions.When mounting the switch body to the base, push the pin (main body
- When mounting the switch body to the base, push the pin (main body side) straight into the connector (base side), and evenly mount with four mounting screws (M4 x 8). Be sure not to forget to include seals, etc. (Tightening torque 0.45 N·m)





ZSE

ISE

ZSP

PS

ISA

PSE

IS

ISG

ZSM

Dimensions: Centralized Wiring Type (Terminal Block Box Type)



When the bracket has two stations and the terminal block box is on the right side, it attaches to the second switch, while when it is on the left side, it attaches to the first switch. With n stations, it attaches to the first switch and the *n*th switch.

Body	With DIN rail	Manifol	d
Body	With DIN rail	Manifol Deviation level indicator light dial Station 1 Station 1	d 40 Terminal block box 10 10 10 10 10 10 10 10 10 10
	GND OUT6 VCC		Detection port Rc 1/8

Dimensions: With DIN rail								
Station	2	3	4	5	6			
L1	110	145	180	215	250			
L2	140	175	210	245	280			
L3	175	210	245	280	315			

L1 110

L2 —

145

36

180 215 250

71

106 141

Terminal block box wiring diagram

SMC

Dimensions: Individual Wiring Type (Lead Wire Type)



Series **ISA**

Operation guideline: Design data

When you design the pneumatic circuit using the air catch sensor, please refer to the data below. The detection distance of the air catch sensor is between 10 and 300 μ m. However, please note that stable detection cannot be done when supply pressure or nozzle size are different.

Relation between Nozzle Diameter and Detection Distance

The data in the following charts are characteristics of hysteresis at the detection distance.

In case accuracy is required by the settings, the design should be made so that the hysteresis will stay within the optimum adjustment range not larger than 10 µm.

The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 10 μ m, the air catch sensor should be used to check the presence of the work piece.



Ex. 1) To detect 300 $\mu m,$ select a ø1.0 detection nozzle and supply pressure of 0.2 MPa. Ex. 2) To detect 10 $\mu m,$ select a ø1.5 detection nozzle.

Nozzle Shape

Please keep the nozzle shape as illustrated below. Take every caution against chamfer on the detection surface and/or nozzle hole,

which could affect the characteristics as illustrated in Figure (1).





Response Time

Response time changes with detection distance and piping length. It is hardly influenced by the supply pressure and nozzle diameter (\emptyset 1.0 to \emptyset 2.0). While both graphs assume a fixed set distance with changes in the detection distance, Fig. 2 shows responses at various set values and Fig. 3 shows responses at various piping lengths. If the detection distance is equal to the set value, the response becomes quicker as the set value becomes smaller or the piping length becomes shorter.



Fig. 2 Detection distance – Response time characteristics



Detection nozzle: ø1.0

Fig. 3 Response time - Piping tubing length

Supply Pressure Dependence

The charts illustrate changes in the detection distance with fluctuations in the supply pressure.







ZSP PS ISA PSE IS ISG ZSM

ZSE ISE

Air Catch Sensor

Series ISA2

Non-Contact Sensor for Workpiece Placement Verification



Minimum operating pressure **30** kPa (ISA2-G)

Energy consumption can be reduced compared with the conventional models (Conventional models: 50 kPa)

Position of supply port: Either right side or left side is available.

Air Catch Sensor Series ISA2

(6

How to Order



How to Order

RoHS

For single and double notation type and additional stations



With control unit Centralized wiring/Supply port left





Individual wiring/Supply port right



Series ISA2

Specifications

For details about the Pressure Switch Precautions, refer to pages 763 and 764. For details about the Specific Product Precautions, refer to the Operation Manual at SMC website.

		Mode	1	ISA2-GODOIO		ISA2-HODD50			
Detection distance			•	0.01 to 0.25 mm			0.03 to 0.50 mm		
Eluid				0.01101	Dru air (filtered to 5 um)				
Opera	atina r	ressure	range	30 to 2					
Beco	mmon	ded dete	range	30102	5 5	30102	00 KFa		
neco	innen		50 kPo	5.01	.0	10 a			
Cons	umptic w rate	n [d b	100 kPa	5 01 9 or	1000	15 01	1000		
L/mir	n (ANF	n la se	200 kPa	12 01	1000	10 01	1000		
Dowo	reun		200 KFa	12 to 24 VDC +	10% Ripple (n-n) 10% or l	ess (With nower supply pol-	arity protection)		
Curre	nt cou	ny voltac	je vn	12 10 24 VDC 1	15 mA	or loco			
Swite	sh out	isumptic	/11	NDN		NDN	DND		
Swite	nouq	Jui		open collector: 1 output	open collector: 1 output	open collector: 1 output	open collector: 1 output		
	ſ	Maximu	m load current		80	mA			
	ŀ	Maximu	m load voltage		30 VDC (at				
		Residua	l voltage	1 5 V or less (at 80 mÅ)					
	ŀ	Output r	protection	Yes					
Repe (Inclue	atabili ding te	ty mperature	characteristics)	0.01 mm or less (Detection distance range 0.01 to 0.15 mm, supply pressure 100 to 200 kPa) 0.01 mm or less (Detection distance range 0.03 to supply pressure 100 to 200 kPa)					
Hyste	eresis	Note 1)		0.01 mm or less (Detection dis	tance range 0.01 to 0.15 mm)	0.01 mm or less (Detection dis	stance range 0.03 to 0.15 mm)		
Indica	ator lig	ght		LED level meter Note 2) with 1 red, 2 green Set value < detection distance: red, Set value = detection distance: green 1, Set value > detection distance: green 1 + green 2					
Ħ	Encle	osure		IP66: without pressure gauge IP40: with pressure gauge					
ner	Oper	ating tem	perature range	Operatin	g: 0 to 60°C, Stored: -20 to	70°C (No condensation or	freezing)		
- u	Oper	ating hu	midity range		Operating/stored: 35 to 8	5%RH (No condensation)			
<u>vi</u>	With	stand vo	Itage	1000 VAC (in 50/60 Hz) for 1 minute between terminals and housing					
ш	Insul	ation res	istance	2 MΩ or more (5	600 VDC measured via meg	johmmeter) between termir	als and housing		
Port s	ort size Nil: Rc 1/8, N type: NPT 1/8, F type: G 1/8								
Lead wi	ire with c	onnector (In	dividual wiring type)	4 cores, oil-resistant cable (ø6	5, 5m) with M12 4-pin pre-wired	connector, Conductor O.D.: 0.9	0 mm, Insulator O.D.: 1.72 mm		
Termin	al block	box (Cent	ralized wiring type)		Front wiring (Ele	ctrical entry ø21)			
Weig	ht			Individual wir Terminal block box: 205	Individual wiring type (body only): 253 g, common wiring type (body only): 250 g, Terminal block box: 205 g, lead wire: 278 g, connecting bracket with sealing for additional station: 4 g				
Stand	dards				CE, F	RoHS			

Note 1) Refer to "Relation between Nozzle Diameter and Detection Distance" (page 870) for hysteresis. Note 2) Refer to "Setting Procedure" (page 872) for LED level meter.

Working Principle



In a bridge circuit as in the left figure, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1 = P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2 \geq P1). Then the switch output turns on to notify that the pressure is below the detection gap.

Wiring

Individual wiring



- Insert the connector of the lead wire with its key groove at the proper position.
- Hold the knurl with 2 fingers and rotate it clockwise. Do not use tools.



 Connect the colored wires coming from the cable terminal. Refer to the circuit diagram and table above to avoid mistakes.

Centralized wiring

Terminal block

X											
	[0L 1	JT	01	JT	OL	JT 3	OL	JT L	OL	JT 5
	E	3	D (-	C -)	D (-	C ⊦)	N	5	01	JT S	(

- Mount the seal conduit on the terminal block box. For mounting procedure, refer to the catalog and operation manual provided by the manufacturer of the seal conduit.
- Thread the cable through the seal conduit and arrange wiring according to the polarity of the terminal block illustrated above.
- 3. Fasten the seal conduit with a tightening torque not greater than 5 N·m. Do not hold the terminal block box or the switch.



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Internal Circuits and Wiring Examples

NPN (1 output)



PNP (1 output)



Series ISA2

Relation between Detection Distance and Hysteresis (Typical example)

The data in the following charts are characteristics of hysteresis at the detection distance.

The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 0.01 mm, the air catch sensor should be used to check the presence of the workpiece.

ISA2-G

Detection nozzle: Ø1.5 Detection side piping: Ø6 x Ø4 tubing 5 m



ISA2-H





Supply Pressure Dependence (Typical example)

The charts illustrate changes in the detection distance with fluctuations in the supply pressure.

ISA2-GOODOO



Standard pressure: 100 kPa Detection nozzle: Ø1.5 Detection side piping: Ø6 x Ø4 tubing 5 m



Standard pressure: 100 kPa Detection nozzle: Ø2.0 Detection side piping: Ø6 x Ø4 tubing 5 m



Response Time (Typical example)

Response time changes with detection distance and piping length.

While all graphs assume a fixed set distance with changes in the detection distance, the upper charts show responses at various set values and the lower charts show responses at various piping lengths. The response time becomes quicker as the set value becomes larger. Additionally, the response time becomes quicker as the piping length becomes shorter.

ISA2-H

ISA2-GODDDD





Detection distance-Response time characteristics







Nozzle Shape

Please keep the nozzle shape as illustrated below.

Take every caution against chamfer on the detection surface and/or nozzle hole. which could affect the characteristics as illustrated in Figure (1).







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Detection distance-Response time characteristics

Supply pressure: 100 kPa Detection nozzle: Ø2.0 Detection side piping: ø6×ø4 Set distance: 0.3 mm



Piping tubing length-Response time



ZSE30 ISE30 ZSE40 ISE40 ZSE10 ISE10 ISE70 ZSE80 **ISE80** ZSE ISE ZSP PS ISA2 PSE IS ISG ZSM1

Series ISA2

Setting Procedure

The detection distance is set with the LED level meter and setting dial.

Keep the setting dial pulled out while in use. If released, it will return to its original position and become unable to rotate.



Pulled out

Handling and setting of 2 port solenoid valve

Throttle setting for blowing to prevent water and cutting oil from entering the nozzle.

(Clockwise: Close throttle; Counterclockwise: Open throttle)

- * The setting is not applicable to valves without throttle.
- 1. Power off the valve.
- 2. Rotate the throttle clockwise for adjustment so that the detection nozzle will not suck up water or cutting oil.



 Power on the valve, then off again. Confirm that the detection nozzle does not suck up water or cutting oil.

Note) Do not rotate the throttle more than 5 turns or it will fall out.

- For accuracy in setting, apply a clearance gauge to the detection nozzle to replicate the set condition in advance.
- Confirm that the set pressure is applied. If the setting dial is fully open, the LED level meter appears as ULU (Light OFF).
- Pull the setting dial and rotate it in the positive direction. The lights will turn on in the order shown below.



- The sensor output comes on when the lights on the LED level meter turn on as [____] Complete the setting when this condition is observed.

Handling and setting of limit gauge indicator

1. Removal of cover

Hook the finger on the front cover ridge and rotate it in the direction of the OPEN arrow until it stops (15°). Then pull out and remove the cover.



2. Setting the installation needle

The installation needle should be moved by the fingertip. Set the 2 green installation needles at the maximum and minimum limits of pressure.



3. Installation of cover

After setting the installation needles, locate the OPEN arrow at the top right position and insert the claws on the cover into the grooves on the case (indicated by \P in the expanded view of A part). Rotate the cover clockwise until it stops. Confirm that the cover is firmly secured.



Relation between Dial Scale and Detection Distance (Typical example)

Test procedure and conditions

Dial scales when the detection nozzle is under the following conditions;

Supplied pressure: 100 kPa Piping: ø6 x ø4 tubing, 5 m in length. Detection nozzle: ISA2-G□...ø1.5 ISA2-H□...ø2.0

Results of measurement Note 1)

● Relation between the detection distance and set dial scales Note 2) (Scale numbers) ISA2-G□ ISA2-H□

Detection distance	Set dial scales
0.05 mm	1.2 to 1.6
0.10 mm	2.6 to 3.0
0.15 mm	3.9 to 4.5
0.20 mm	5.0 to 6.0
0.25 mm	6.1 to 7.7

SA2-H□	
Detection distance	Set dial scales
0.1 mm	2.9 to 3.7
0.2 mm	5.9 to 6.9
0.3 mm	7.8 to 9.0
0.4 mm	9.0 to 10.6
0.5 mm	9.3 to 11.3

• Average variation per scale (Detection distance [mm])

ISA2-G (Detection nozzle: Ø1.5)







Note 1) This data provides reference values as a guide only, this should not be viewed as a guarantee of our products performance. Note 2) Set dial scales are as follows;



Between each major scales, it is sub divided into ten smaller settings (for example, between 2.0 to 3.0—2.1, 2.2, 2.3, etc.), settings are possible at 0.1 scale.



ZSE30

ISE30

ZSE40 ISE40

ZSE10 ISE10

Series ISA2

Dimensions: Centralized Wiring Type







Dimensions: Individual Wiring Type

With bracket



SMC

Dimensions: With Control Unit

SUP port on the left



With regulator + 2 port solenoid valve

With 2 port solenoid valve



With regulator + 2 port solenoid valve





SUP port on the right

ISA-8-A

ISA-8-B

ZSE30 ISE30 ZSE40 ISE40 ZSE10 ISE10 ISE70

ZSE80 ISE80 ZSE ISE

ZSP PS

ISA2 PSE

IS

ISG

ZSM1

Bracket Mounting Position

With 2 stations, the bracket is mounted on the second sensor from the left.



With n stations, the bracket is mounted on the first and "n" th sensor from the left.



Addition of Manifold Stations

1. Disassembly





3. Assembly



- 1. Loosen the screws and remove the 2 mounting brackets on the front and back side.
- 2. Disassemble the switch carefully so that the O-ring on the SUP port will not be detached.

End plate removal



- 1. Fit seal for additional station $(\mbox{ISA-7-B})$ to the recess of the SUP port of the additional switch.
- 2. Fit the protrusion of the additional switch into the existing switch.
- 3. Mount joint brackets (ISA-3-A) at 2 positions.
- Note) Perform temporary tightening of screws.
- Confirm that the recess of the SUP port of the existing switch has seal for additional station attached.
- 5. Fit the protrusion of the existing switch into the recess of the additional switch.
- Mount the existing joint bracket. Note) Perform temporary tightening of screws.

∕⊘SMC

- 1. Tighten the joint brackets with the prescribed tightening torque of 1.2 $\ensuremath{\text{N-m}}$.
- 2. Arrange pneumatic piping and confirm that there is no air leakage from new joints.

Series ISA2

Parts List



SMC

DIN Rail ISA-5-Applicable models 1.3 8 7.5 Part no. 4.5 L Individual wiring type Centralized wiring type ISA-5-1 IISA2DPD-1 73.0 ZSE30 ISA-5-2 IISA2DPD-2 IISA2DSD-1 135.5 IISA2 S -2 ISE30 ISA-5-3 IISA2DPD-3 173.0 ISA-5-4 210.5 IISA2DPD-4 IISA2DSD-3 ♠-෯-෯-෯ ZSE40 ഗ്ല ISA-5-5 IISA2DPD-5 IISA2DSD-4 248.0 ISE40 ISA-5-6 285.5 IISA2□P□-6 IISA2DSD-5 ZSE10 IISA2□S□-6 ISA-5-7 323.0 ISE10 Pressure Gauge for Air Catch Sensor ISE70 Square embedded pressure gauge Round pressure gauge Connection ZSE80 101 thread ISE80 GC3-4AS G36 - 4 Nil R 1/8 Maximum Notation ZSE Maximum Ρ NPT 1/8 pressure **ISE** specifications Notation pressure indication specifications NII MPa single notation indication ZSP 2 0.2 MPa MPa-psi Nil MPa single notation 2 0.2 MPa DN 4 0.4 MPa double notation P psi single notation 4 0.4 MPa PS Note) For double notation of MPa and psi, add "-X30" at the end of part number. Example) G36-P4-01-X30 ISA2 2 Port Solenoid Valve Regulator PSE VCA27A-5 S -4-02 DL Q AR 20 -02 B IS Port size Voltage CE 02 Rc 1/4 Thread type compliant ISG 1 100 VAC 02N NPT 1/4 Nil Ro 2 200 VAC 02F G 1/4 N NPT ZSM1 3 110 VAC Throttle E G 4 220 VAC Nil Without throttle and manual lock 24 VDC 5 With throttle S 6 12 VDC Semi-standard specification With manual lock в 36 230 VAC Nil к With manual lock and throttle None R Flow direction: Right to left Electrical entry D DIN connector Max. display pressure of the pressure gauge DIN connector (With light) DL Nil 0.4 MPa D0 DIN connector (Without connector) -X2105 0.2 MPa т Conduit terminal Conduit terminal (With light) TL Option (The shape of pressure gauge) Standard Specifications Nil Without pressure gauge Valve type Direct operation poppet E Square embedded pressure gauge (With limit indicator, MPa single notation) Fluid Air, Inert gas GNote) Round pressure gauge (With limit indicator, MPa single notation) Withstand pressure MPa 2.0 PNote) Round pressure gauge (With limit indicator, MPa-psi double notation) Body material ΔΙ Note) The pressure gauge port is 1/8. The pressure gauge is included in the package icati HNBR (not assembled). Seal material * When a regulator with square embedded pressure gauge (psi single notation) is specifi -20 to 60 Ambient temperature °C required, change the part number suffix to "-X2175" -10 to 60 (No freezing) Fluid temperature °C Example) AR20-02E-1-B-X2175 Enclosure Dustproof and jetproof (Equivalent to IP65) Valve * Under the New Measurement Law, this type is only sold outside Japan. (The SI unit Atmosphere Environment with no corrosive or explosive gas is used inside Japan.)

Standard Specifications

Model	AR20-B (-X2105)
Port size	1/4
Gauge port sizeNote)	1/8
Fluid	Air
Ambient and fluid temperature	–5 to 60°C (No freezing)
Proof pressure	1.5 MPa
Maximum operating pressure	1.0 MPa
Set pressure range	0.02 to 0.2 MPa
Construction	Relieving type
Weight (kg)	0.16

Note) The type with square embedded pressure gauge does not have connection.

300 Hz range in the axial and right angle directions of the main valve and armature, for both energized and de-energized states. Shock resistance: No malfunction resulted in an impact test using a drop impact tester. The test was performed in the axial and right angle directions of the main valve and armature. of both energized and de-energized states.

Note 1) Since the AC specifications include a rectifying device, there is no difference between the apparent power required for starting and holding. Note 2V libration resistance: Nor maffunction resulted in a one-sween test in a 10 to

0.2 or less Free

30/150 or less 24/12 VDC, 100/110/200/220 VAC (50/60 Hz)

±10% rated voltage

B type

VCA2: 6.5 W

VCA2: 7.5 VA

Valve leakage cm3/min (ANR)

Allowable voltage fluctuation Type of coil insulation

AC 60 Hz

Mounting orientation Vibration resistance/Impact resistance m/s

Power consumption DC

Rated voltage

Apparent

fications

specif

S power



CAT.ES100-105C

3 Step Setting (Switch Point Change Mode)



Features of the 2-Screen, 3-Color Digital Display

The seating condition can be checked at a glance. The sub screen display can be selected from 6 display options.



Improved Environmental Resistance

Easier maintenance





Noise reduction

Measures against clogging

Exhaust noise

Noise reduction

Energy

saving

The current model (ISA2) needs to exhaust air from the exhaust port due to the bridge circuit. The ISA3 does not exhaust air from the product body.

This reduces noise considerably compared with the current model.

Energy Air consumption B saving 0 0% reduction*1

The new detection principle eliminates air being exhausted from the product. This makes the flow consumption 0 L/min. when the workpiece is seated.

A much lower air consumption is required than the current model.

*1: Conditions: Unseated for 5 seconds and seated for 20 seconds (For G type)







Space-saving & Reduction of Work-Hours (Centralized Lead Wire)



Keylock Function

A key LED turns ON when the product is locked and the button operation is disabled to prevent unintentional changes to set values.



Piping Variations

Piping specification: C type



Detection side



G1/8 *1 Detection side *1: Conforming to ISO1179-1

Mounting



Manifold



*: The electrical entry of centralized lead wire for M12 connector is on the right side.

If the supply port on the right side is used, arrange the centralized lead wire so that it does not interfere with the control unit.



Application Examples



Confirmation of close contact with the reference plane for machining



Confirmation of close contact with the workpiece for machining



Main Functions

Display OFF mode

Display OFF mode can be selected. The display can be turned OFF to reduce power consumption.

Display color

The color of the main display can be set to change depending upon the output activity. The display color change makes visual identification of the output ON/OFF easier.

Unit selection

The pressure unit displayed on the sub screen can be changed.

		_	-
Display unit	kPa	bar	psi
Smallest settable increment	1	0.01	0.1

When ON: Orange When OFF: Green

When ON: Green

Normally: Orange

Normally: Green

The numerical

value disappears

and only the

When OFF: Orange

SMC

decimal point

Security code

By activating the security code, the key lock cannot be released without entering a security code.



Security code: Input an arbitrary 3-digit value.

Displayed value compensation

The displayed value can be corrected within $\pm 20\%$ R.D. of the displayed value at the time of shipment.

Forced output

The output can be fixed to an ON/OFF state when starting the system or during maintenance. This enables confirmation of the wiring and prevents system errors due to unexpected output.

Zero-clear of pressure display

The pressure value displayed on the sub screen can be cleared to zero.

lav color

CONTENTS

ISA3 Series



3-Color Display Digital Gap Checker ISA3 Series

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3-Color Display Digital Gap Checker Without Control Unit ISA3 Series (€ Понз





*7: The bracket for control unit is shipped mounted on the product.

ISA3 Series

Specifications

For the Common Precautions for the Gap Checker, refer to Handling Precautions for SMC Products. For the Specific Product Precautions, refer to the Operation Manual on the SMC website.

Model				ISA3-F	ISA3-G	ISA3-H	
Applicable fluid				Dry air (Filtered through a 5 um filter)			
Rated distance range				0.01 to 0.03 mm	0.02 to 0.15 mm	0.05 to 0.30 mm	
Displayable/Se	ttable	, range (Distan	ce reference) *1	0 to 60 *4	10 to 300 *4	30 to 500 *4	
Minimum disp	lay u	nit (Distance	reference) *1		1		
Rated pressur	e ran	ge		100 to 200 kPa			
Displayable ra	inge (Pressure val	ue) *2		–20 to 220 kPa		
Withstand pre	ssure	1		600 kPa			
Detection noz	zle			ø1.5 *3			
Consumption	flow i	ate		5 L/min or less	12 L/min or less	22 L/min or less	
Power supply	volta	ge		24 VDC ±10%, Ripple	(p-p) 10% or less (With power sup	ply polarity protection)	
Current consu	Imptio	on			25 mA or less		
Switch output				1 output (NPN or PNP)			
	[Maximum lo	oad current	10 mA			
Maximum applied voltage Residual voltage Short circuit protection		Maximum a	pplied voltage	26.4 V			
		1 V or less (at 10 mA)					
		Provided					
Repeatability				0.005 mm	0.010 mm	0.020 mm	
Temperature characteristics (Reference: 25°C)			eference: 25°C)	0.010 mm	0.015 mm	0.030 mm	
Hysteresis				0 to variable (Default: 3)	0 to variable (Default: 20)		
Display				2-screen display, LCD Main screen: 3-digit, 7-segment 2-color (Orange/Green) Sub screen: 6-digit, 7-segment 1-color (White)			
		Enclosure		IP67 equivalent			
	[Operating temperature range		Operating: 0 to 50°C, Stored: -20 to 70°C (No condensation or freezing)			
Environment	[Operating humidity range		Operating/stored: 35 to 85% RH (No condensation)			
		Withstand voltage		1000 VAC or more (in 50/60 Hz) for 1 minute between terminals and housing			
		Insulation resistance		2 $M\Omega$ or more (500 VDC measured via megohmmeter) between terminals and housing			
	For	For C type Supply port		Rc1/8			
Piping	T OF C Type		Detection port	ø4 One-touch fitting	ø6 One-touch fitting		
specifications	For	Supply port		G1/8 (Conforming to ISO1179-1)			
	Detection port		Detection port	G1/8 (Conforming to ISO1179-1)			
	Lead wire with connector		onnector	M12 lead wire with 4 pin connector, 4 cores, ø4, 5 m Conductor O.D.: 0.72 mm, Insulator O.D.: 1.14 mm			
Cable		Centralized lead wire		M12 lead wire with 4 pin connector part, 4 cores, ø4, Insulator O.D.: 1.14 mm Centralized lead wire part, 2 to 3 stations: 5 cores, ø4, 5 m, 4 to 6 stations: 8 cores, ø6, 5 m Conductor O.D.: 0.50 mm, Insulator O.D.: 1.00 mm (2 to 6 stations common)			
Weight				113 g (Cable not included, One-touch fitting)			
Standards				CE, RoHS compliant			

*1: For details, refer to Relationship between Displayed Value and Distance on page 12.

*2: The pressure value will be indicated on the sub screen.

*3: For details of the detection nozzle, refer to the figures on page 12.

*4: If hysteresis is set to 3 (Default setting), "Displayable/Settable range" of F type is limited to 57. If hysteresis is set to 20 (Default setting), G type is limited to 280 and H type is limited to 480.

Rated Distance Range and Displayable/Settable Range

A Caution

The displayed value is a reference value obtained by converting the distance between the workpiece and the detection surface into a digital numerical value, it is not displayed in units.

For details, refer to Relationship between Displayed Value and Distance on page 12.

Rated distance range: Distance within which the product meets the specifications.

Displayable/Settable range: It is possible to display or set values, but it is not guaranteed to meet the specifications.

Madal	Distance				
Widder	0 mm 0.02 mm	0.05 mm	0.15 mm	0.30 mm	0.50 mm
ISA3-F type					
ISA3-G type					
ISA3-H type					

Rated distance range Displayable/Settable range



Supply Pressure Dependence Characteristics

The distance for the product to turn ON varies depending on the supply pressure.

The graphs below show the variation of the distance for the product to turn ON, for 3 types of gap, by changing the supply pressure (±50 kPa) when the product is set to turn ON at 150 kPa supply pressure.



*: Use within the rated pressure range (100 kPa to 200 kPa).

It will be impossible to measure the gap when the operating pressure is less than or equal to 80 kPa or more than 220 kPa. And the output will be OFF. (Refer to Relationship between Supply Pressure and Display on page 21.)



ISA3 Series

Response Time

Response time is the elapsed time between the pressure supply and the turning ON of the switch output.

The response time varies depending on the piping length from the OUT port to the detection nozzle, and the seating condition of the workpiece. The graphs below show the response time when the workpiece is approached at 90% distance and 0% distance (close contact). (*: The switch point is 100% distance.)

(Example: When the switch point is set to 0.1 mm, the response time when the workpiece is at 0.09 mm and 0 mm are measured.)





Relationship between Displayed Value and Distance

The graphs below show the relationship between the displayed value and distance. *: The data shown below are for reference. They change depending on the individual product differences, machining dimensions of the nozzle, etc.

Test conditions Detection nozzle: Ø1.5 Detection nozzle piping: F type Ø4 x Ø2.5 tube 1 m, 3 m, 5 m/G, H type Ø6 x Ø4 tube 1 m, 3 m, 5 m Supply pressure: 200 kPa

ISA3-F





ISA3-H



Nozzle Shape

The nozzle shape must be similar to Fig. 1. Do not chamfer the nozzle as shown in Fig. 2, as the characteristics will be affected.

Fig. 1: Recommended nozzle shape







Internal Circuit and Wiring Example





*: Refer to the **WEB catalog** for wiring details of the VX2 series (2 port solenoid valve).



ISA3 Series

Construction Diagram



Construction Diagram



When the gap checker is used in a place where water and dust splashes may occur, insert a tube into the atmospheric vent port, and route the other end of the tube to a safe place away from water and dust.

*: SMC TU0425 (polyurethane, O.D. ø4, I.D. ø2.5) tubing suits to the gap checker.

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ISA3 Series

Parts List



*1: Spacers are included for 4 and 6 stations.





Parts List (Control Unit)



ISA-17



With 2 tapping screws (3 x 8)





E210-U01



Spacer

ISA-18

With O-ring *: When a 2 port

solenoid valve is connected to the riaht.

ISA3 Series

Dimensions

ISA3-DD (Bracket mounting)



ISA3-DD (DIN rail mounting)



2

Dimensions



*1: Conforming to ISO16030

*2: Conforming to ISO1179-1

н

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Piping type C (ø4 One-touch fitting) C (ø6 One-touch fitting) F (G thread)

13.6

13

ISA3 Series

Dimensions





Connector pin no.

ZS-31-C (Cable with connector)



Pin no.	Lead wire color	Description
1	Brown	DC (+)
2	White	N.C.
3	Blue	DC (–)
4	Black	OUT1





M12 connector no.	Pin no.	Description	Lead wire color	(Output wire color)	
	1	DC (+)	Brown *1		
1	2	N.C.	—	Block	
I	3	DC (–)	Blue *1	DIACK	
	4	OUT1			
	1	DC (+)	Brown *1		
0	2	N.C.	—	\A/I= '+ -	
2	3	DC (–)	Blue *1	vvriite	
	4	OUT1			
	1	DC (+)	Brown *1		
0	2	N.C.	_	Crew	
3	3	DC (–)	Blue *1	Gray	
	4	OUT1			
	1	DC (+)	Brown *1		
4	2	N.C.	_	0	
4	3	DC (–)	Blue *1	Orange	
	4	OUT1			
	1	DC (+)	Brown *1		
F	2	N.C.	_	Ded	
э	3	DC (–)	Blue *1	Rea	
	4	OUT1		-	
	1	DC (+)	Brown *1		
6	2	N.C.	_	Crean	
0	3	DC (–)	Blue *1	Green	
	4	OUT1			

6

ISA-19-6

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*1: Brown and blue are connected inside the product.



Dimensions

ISA-14 (Bracket when control unit not fitted)



ISA-17 (Bracket when control unit fitted)



Y200T-A (Spacer with bracket)



ISA-20 (Bracket for centralized lead wire)



ISA3 Series

Error Indication

Main screen	Name	Description	Measures	
	Supply pressure error	Displayed when supply pressure is outside the range of 80 kPa to 220 kPa. Measurement is not possible.	Supply rated pressure (100 kPa to 200 kPa). The product will return to measurement mode automatically.	
	Outside of the displayable range (Switch point change mode)	The workpiece is outside the displayable range.	Move the workpiece closer to the detec- tion nozzle.	
Er l	OUT1 over current error	The switch output (OUT1) load current has exceeded 80 mA.	Turn the power OFF and remove the cause of the over current. Then turn the power ON again.	
Er 3	Zero clear error	Zero clear was not performed at atmospheric pressure. (Pressure outside of ± 14 kPa was supplied present.)	Perform zero clear at atmospheric pres- sure.	
ErO			Turn the power OFF and turn it ON again.	
Er4 to Er9	System error	An internal data error has occurred.		
Sub screen	Name	Description	Measures	
ннн	Supply pressure error (When [SUP side pressure	Pressure exceeding 220 kPa is supplied.	Keep the supply pressure within the dis-	
LLL	value display] is set to the sub screen)	Vacuum pressure (less than or equal to -20 kPa) is supplied.	playable range of –20 kPa to 220 kPa.	

Relationship between Supply Pressure and Display





▲ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "**Caution**," "**Warning**" or "**Danger**." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)^{*1}, and other safety regulations.

- Caution: indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
- Warning: Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

AWarning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

- 3. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.
 - The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
 - 2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
 - 3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

- 1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
- 2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
- 3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
- 4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

- *1) ISO 4414: Pneumatic fluid power General rules relating to systems.
 - ISO 4413: Hydraulic fluid power General rules relating to systems. IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
 - ISO 10218-1: Manipulating industrial robots Safety. etc.

 The product is provided for use in manufacturing industries. The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand

and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

Limited warranty and Disclaimer

- The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2) Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
- 2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
- Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.
 - 2) Vacuum pads are excluded from this 1 year warranty. A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

- The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
- 2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

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Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

Revision history

ST

US

Edition B * Added F type (Rated distance range: 0.01 to 0.03 mm).

Edition C * Added centralized lead wire.

- * Added the AR-B series regulator (control unit).
- * Added AC type 2 port solenoid valve (control unit).
- * Number of pages increased from 16 to 24.

A Safety Instructions Be sure to read the "Handling Precautions for SMC Products" (M-E03-3) and "Operation Manual" before use.