

Discontinued



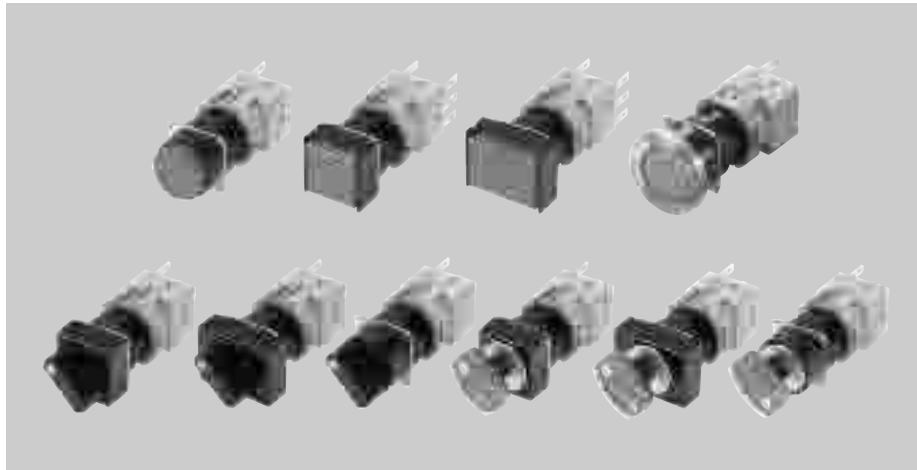
Panasonic
ideas for life

Illuminated pushbutton,
non-illuminated pushbutton,
selector,
key selector switches

ND Series
(mounting hole 16 dia. type)

Bright, clear illumination (ultra-high intensity LED used)
Separate mounting model features removable lock lever

Tight, space-saving mounting



2. Emergency pushbutton switches equipped with safety lock mechanism. Contacts have forced contact separation mechanism. Two button diameters available, 25 and 40.

1) Safety lock mechanism
A safety lock mechanism is used in which the contact does not move until the pushbutton has completely locked. Because the contact does not operate unless the button has been pressed all the way down, there is no danger of the machine suddenly stopping because of a malfunction caused by something coming in contact with the button, and no loss from such situations.

FEATURES

1. Bright, clear LED illumination

1) Uses brilliantly illuminating LEDs that are much brighter than incandescent bulbs.

2) Brightness greatly increased for vastly improved recognition and safety. Yellow and green are particularly easy to distinguish.

Makers who are especially concerned about product liability laws and worker safety and sanitation are calling for machines that are designed and manufactured based on the ISO12100 series of international safety standards (general regulations governing basic conceptual design for machine safety). With the ISO12100 series, the man-machine interface must be designed so that the status of the machine can be recognized clearly and correctly by anyone running the machine, without special training or expertise. For that reason, display lamp colors are standardized under IEC60073, IEC60204-1 and other standards cited in the ISO12100 series, and are covered by JIS standards as well. The LED illumination of the ND type meets safety needs such as these, and beyond.

Note) IEC60073:
JIS C 0448 Colors for Display Units and Operation Devices
IEC60204-1:
JIS B 9960-1 Safety of Machines and Electrical Units of Machines

Display lamp colors and meanings indicating machine status (taken from International Electrical Standards Conference IEC-60073 and 60204-1)

Color	Meaning	Explanation	Operator action
Red	Emergency	Hazardous situation	Action appropriate to hazardous situation
Yellow	Caution	Problem status/urgent or critical situation	Visual monitoring and (or) intervention
Green	Normal	Normal status	As appropriate
Blue	Obligatory	Displays status of action required by operator	Obligatory action
White	Neutral	Any other status; Can be used when using red, yellow, green, or blue might be interpreted erroneously.	Visual monitoring

3) Power consumption greatly reduced (12 V type).

The power consumption has been reduced by 60% in the 12 V type (mounting hole 16 dia. type).

4) Continuous illumination with no need for replacement for 5 years (50,000 hours).

5) Products available in 6 illuminated colors: red, orange, yellow, green, blue, and white.

	Rated current	
	Mounting hole 16 dia. type	Mounting hole 22 dia. type
12 V AC/DC type	8 mA (20 mA in previous model)	10 mA (20 mA in previous model)

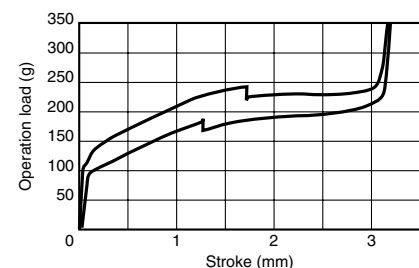


2) Forced contact separation mechanism
The mechanism is designed so that the button operation force is used, as is, as the contact separation force. Therefore, the circuit will shut off perfectly even if a problem happens to occur such as the contact welding shut. (Conforms to EN60947-5-1 Annex K.)

3) Two button diameters available, 25 and 40.

3. Nice, light switching feel. Light operation load due to snap action mechanism. Short stroke type.

Relationship between operation load and stroke (Mounting hole 16 dia. type: 1 Form C contact momentary action)



1) Stroke: 3 mm

2) Mechanical life (mounting hole 16 dia. type)
Momentary type: Min. 2×10^6
(4 times better than previous)
Alternate type: Min. 2.5×10^5
(2.5 times better than previous)

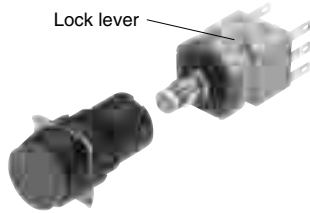
ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

4. Removal/installation type with lock lever system.

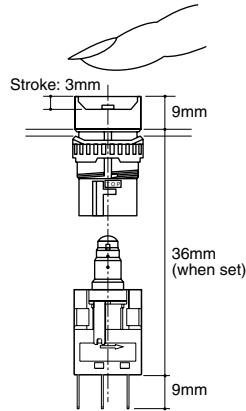
Smooth installation now possible.

- 1) New tight mounting type added. Space saving realized with small installation area.
- 2) It is easy to install in tight spaces and maintenance is easy.
- 3) Operation efficiency is greatly increased since surface installation and wiring operations can be carried out separately.

Mounting hole 16 dia. type



Mounting hole 16 dia. type exterior configuration diagram



5. Mushroom button type for easier operation.

6. Splashproof type protective construction (IP65).

Conforms to IEC 60529.

7. Safety standard

- 1) UL and CSA certified (excluding buzzer).
- 2) Conforms to EN standard (excluding buzzer), has received CE marking.

8. Durability

Thermoplastic materials are used for durability in the outer casing and installation points.

9. Contacts made of cadmium-free material.

RoHS Directive compatibility information
<http://www.nais-e.com/>

ORDERING INFORMATION

1. Illuminated pushbutton switches (LED illumination) and indicators (display lamps)

Illumination type
 EL: LED type

Mounting holes and flange shapes
 (With transparent button type)

Mounting hole	Flange shape
2: 16 dia.	18 dia. projecting type
3: 16 dia.	18 square flat type
4: 16 dia.	18 × 24 flat type

(With mushroom button type)

Mounting hole	Flange shape
0: 16 dia.	24 dia.
5: 16 dia.	30 dia.

Protective construction

2: Splashproof type (IP65)

No. of poles and operating characteristics

0: Indicator (indicator lamp)	3: Single-pole (1 Form C) alternate
1: Single-pole (1 Form C) momentary	4: Double-pole (2 Form C) alternate
2: Double-pole (2 Form C) momentary	

Contact material

0: Indicator (indicator lamp) (No contact)	2: Low-level circuit type (Gold-clad contact)
1: Standard type (Silver contact)	

LED voltages and pushbutton colors

Pushbutton color		Color					
		Red	Orange	Yellow	Green	Blue	White (LED: opaque)
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

Terminal shape and mounting dimensions

Nil: solderable tab terminal, tight mounting
 3: Terminal for PC board and tight mounting (only gold contact)

Color cap types

Nil: Regular K: Mushroom button type * There is no mushroom button type in the indicator (indicator lamp).

ACEL 2

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

2. Pushbutton switches (non-illuminated types and transparent buttons)

ACBL 2

Mounting holes and flange shapes
(With transparent button type)

Mounting hole	Flange shape
2: 16 dia.	18 dia. projecting type
3: 16 dia.	18 square flat type
4: 16 dia.	18 × 24 flat type

(With mushroom button type)

Mounting hole	Flange shape
0: 16 dia.	24 dia.
5: 16 dia.	30 dia.

Protective construction

2: Splashproof type (IP65)

No. of poles and operating characteristics

5: Single-pole (1 Form C) momentary	7: Single-pole (1 Form C) Alternate
6: Double-pole (2 Form C) momentary	8: Double-pole (2 Form C) Alternate

Contact material

1: Standard type (Silver alloy contact)	2: Low-level circuit type (Gold-clad contact)
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Types of color caps

0: Transparent button K: Mushroom button

Pushbutton colors

Transparent button (Mushroom button: not clear)	R	J	Y	G	L	X	B
	Red	Orange	Yellow	Green	Blue	White	Black

Note: Mushroom button type is not available in orange.

Terminal shape and mounting dimensions

Nil: solderable tab terminal, tight mounting

3: Terminal for PC board and tight mounting (only gold contact)

3. Selector switches

ACSL 2

Mounting holes and flange shapes

<Mounting hole	Flange shape>
3: 16 dia.	18 square flat type
4: 16 dia.	18 × 24 flat type
5: 16 dia.	18 dia. flat type

Protective construction

2: Splashproof type (IP65)

Operation methods

1: 2-notch manual reset	Note) Manual reset: Switch is rotated to turn it on and remains on when released. Automatic reset: Switch is rotated to turn it on and goes off when released.
3: 3-notch manual reset (Double poles only)	

No. of poles

5: Single pole (2-notch only)	6: Double poles
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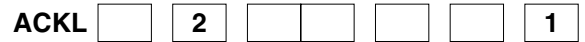
Contact material

3: Standard type (Silver contact)	4: Low-level circuit type (Gold-clad contact)
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Note: Terminals for PC board are also possible.

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

4. Key selector switches



Mounting holes and flange shapes

<Mounting hole	Flange shape>
3: 16 dia.	18 square flat type
4: 16 dia.	18 × 24 flat type
5: 16 dia.	18 dia. flat type

Protective construction
2: Splashproof type (IP65)

Operation methods and key removal positions

- 11: 2-notch manual reset: OFF position
- 12: 2-notch manual reset: ON position
- 13: 2-notch manual reset: Both ON and OFF positions
- 21: 2-notch automatic reset: OFF position (mounting hole 16 dia. type only)
- 37: 3-notch manual reset (no single pole; double poles only) (Key can be removed at all 3 positions)

No. of poles

- 1: Single pole
- 2: Double poles

Contact material

- 3: Standard type (Silver contact)
- 4: Low-level circuit type (Gold-clad contact)

Key type

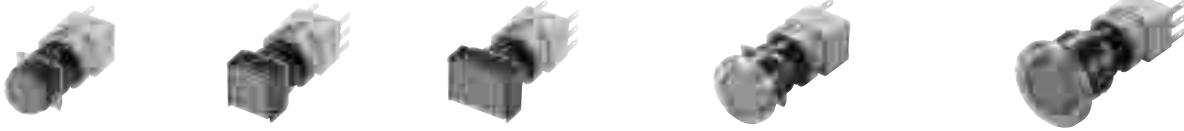
- 1: Standard key

Note: Terminals for PC board are also possible.

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

TYPES

1. Illuminated pushbutton switches (LED illumination)



18 dia. projecting type 18 square flat type 18 × 24 flat type 24 dia. mushroom button type 30 dia. mushroom button type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			Momentary	Alternate
			Part No.	Part No.
18 dia. projecting type	Single pole	Standard type (Silver contact)	ACEL2211□*	ACEL2231□*
		Low-level circuit type (Gold-clad contact)	ACEL2212□*	ACEL2232□*
	Double poles	Standard type (Silver contact)	ACEL2221□*	ACEL2241□*
		Low-level circuit type (Gold-clad contact)	ACEL2222□*	ACEL2242□*
18 square flat type	Single pole	Standard type (Silver contact)	ACEL3211□*	ACEL3231□*
		Low-level circuit type (Gold-clad contact)	ACEL3212□*	ACEL3232□*
	Double poles	Standard type (Silver contact)	ACEL3221□*	ACEL3241□*
		Low-level circuit type (Gold-clad contact)	ACEL3222□*	ACEL3242□*
18 × 24 flat type	Single pole	Standard type (Silver contact)	ACEL4211□*	ACEL4231□*
		Low-level circuit type (Gold-clad contact)	ACEL4212□*	ACEL4232□*
	Double poles	Standard type (Silver contact)	ACEL4221□*	ACEL4241□*
		Low-level circuit type (Gold-clad contact)	ACEL4222□*	ACEL4242□*
24 dia. mushroom button type	Single pole	Standard type (Silver contact)	ACEL0211□* K	ACEL0231□* K
		Low-level circuit type (Gold-clad contact)	ACEL0212□* △K	ACEL0232□* △K
	Double poles	Standard type (Silver contact)	ACEL0221□* K	ACEL0241□* K
		Low-level circuit type (Gold-clad contact)	ACEL0222□* △K	ACEL0242□* △K
30 dia. mushroom button type	Single pole	Standard type (Silver contact)	ACEL5211□* K	ACEL5231□* K
		Low-level circuit type (Gold-clad contact)	ACEL5212□* △K	ACEL5232□* △K
	Double poles	Standard type (Silver contact)	ACEL5221□* K	ACEL5241□* K
		Low-level circuit type (Gold-clad contact)	ACEL5222□* △K	ACEL5242□* △K

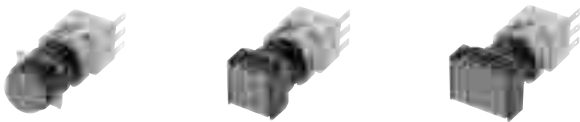
Notes) 1. The following combinations of numbers and letters are entered in the square and in the * symbol to indicate the LED voltage and pushbutton color.

Pushbutton color		Red	Orange	Yellow	Green	Blue	White
							Opaque LED
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

2. The white type has a colorless transparent cap.

3. If you would like PC board terminals, please add a "3" to the end of the part number when ordering. However, this only applies to gold contacts. Please inquire for details. Also, if you would like mushroom button type PC board terminals, please add a "3" in the position marked by a triangle.

2. Indicators (indicator lamps)



18 dia. projecting type 18 square flat type 18 × 24 flat type

Form	Splashproof type (IP65)
	Part No.
18 dia. projecting type	ACEL2200□*
18 square flat type	ACEL3200□*
18 × 24 flat type	ACEL4200□*

Notes) 1. The following combinations of numbers and letters are entered in the square and in the * symbol to indicate the LED voltage and pushbutton color.

Pushbutton color		Red	Orange	Yellow	Green	Blue	White
							Opaque LED
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

2. The white type has a colorless transparent cap.

3. There is no mushroom button type in the indicator (indicator lamp).

4. If you would like PC board terminals, please add a "3" to the end of the part number when ordering.

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

3. Ordering block items

Please refer to the configuration diagram below.

16 dia. mounting hole type illuminated pushbutton switch configuration diagram



- Notes: 1. For LEDs, please see the page on accessories and maintenance parts.
 2. Indicators are also combined as shown above. Please use a dedicated indicator for the switch block.
 3. For the pushbutton switch (non-illuminating), please combine the color cap, operation block and switch block from the blocks above.
 4. Please use a dedicated 30 dia. mushroom button type for a 30 dia. mushroom button operation block.

4. Pushbutton switches (non-illuminated types and transparent buttons However, the mushroom button type is not clear.)



18 dia. projecting type 18 square flat type 18 x 24 flat type 24 dia. mushroom button type 30 dia. mushroom button type

Color cap	Form	No. of poles	Contact material	Splashproof type (IP65)		
				Momentary	Alternate	
				Part No.	Part No.	
Transparent button	18 dia. projecting type	Single pole	Standard type (Silver contact)	ACBL22510*	ACBL22710*	
			Low-level circuit type (Gold-clad contact)	ACBL22520*	ACBL22720*	
		Double poles	Standard type (Silver contact)	ACBL22610*	ACBL22810*	
			Low-level circuit type (Gold-clad contact)	ACBL22620*	ACBL22820*	
		18 square flat type	Single pole	Standard type (Silver contact)	ACBL32510*	ACBL32710*
				Low-level circuit type (Gold-clad contact)	ACBL32520*	ACBL32720*
	Double poles		Standard type (Silver contact)	ACBL32610*	ACBL32810*	
			Low-level circuit type (Gold-clad contact)	ACBL32620*	ACBL32820*	
	18 x 24 flat type		Single pole	Standard type (Silver contact)	ACBL42510*	ACBL42710*
				Low-level circuit type (Gold-clad contact)	ACBL42520*	ACBL42720*
		Double poles	Standard type (Silver contact)	ACBL42610*	ACBL42810*	
			Low-level circuit type (Gold-clad contact)	ACBL42620*	ACBL42820*	
Mushroom button		24 dia.	Single pole	Standard type (Silver contact)	ACBL0251K*	ACBL0271K*
				Low-level circuit type (Gold-clad contact)	ACBL0252K*	ACBL0272K*
	Double poles		Standard type (Silver contact)	ACBL0261K*	ACBL0281K*	
			Low-level circuit type (Gold-clad contact)	ACBL0262K*	ACBL0282K*	
	30 dia.		Single pole	Standard type (Silver contact)	ACBL5251K*	ACBL5271K*
				Low-level circuit type (Gold-clad contact)	ACBL5252K*	ACBL5272K*
		Double poles	Standard type (Silver contact)	ACBL5261K*	ACBL5281K*	
			Low-level circuit type (Gold-clad contact)	ACBL5262K*	ACBL5282K*	

Notes) 1. The following letter indicating the pushbutton color is entered in place of the * symbol.

Pushbutton color	Red	Orange	Yellow	Green	Blue	White	Black
Product no.	R	J	Y	G	L	X	B

2. The white type has a colorless transparent cap.
 3. The mushroom button type is not available in orange.
 4. If you would like PC board terminals, please add a "3" to the end of the part number when ordering. However, this only applies to gold contacts. Please inquire for details.

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

5. Selector switches



18 square flat type



18 x 24 flat type



18 dia. flat type



2-notch manual reset



3-notch manual reset

1) 2-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			Part No.	
18 square flat type	Single pole	Standard type (Silver contact)	ACSL32153	
		Low-level circuit type (Gold-clad contact)	ACSL32154	
	Double poles	Standard type (Silver contact)	ACSL32163	
		Low-level circuit type (Gold-clad contact)	ACSL32164	
18 x 24 flat type	Single pole	Standard type (Silver contact)	ACSL42153	
		Low-level circuit type (Gold-clad contact)	ACSL42154	
	Double poles	Standard type (Silver contact)	ACSL42163	
		Low-level circuit type (Gold-clad contact)	ACSL42164	
18 dia. flat type	Single pole	Standard type (Silver contact)	ACSL52153	
		Low-level circuit type (Gold-clad contact)	ACSL52154	
	Double poles	Standard type (Silver contact)	ACSL52163	
		Low-level circuit type (Gold-clad contact)	ACSL52164	

2) 3-notch manual reset type

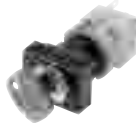
Form	No. of poles	Contact material	Splashproof type (IP65)	
			Part No.	
18 square flat type	Double poles	Standard type (Silver contact)	ACSL32363	
		Low-level circuit type (Gold-clad contact)	ACSL32364	
18 x 24 flat type	Double poles	Standard type (Silver contact)	ACSL42363	
		Low-level circuit type (Gold-clad contact)	ACSL42364	
18 dia. flat type	Double poles	Standard type (Silver contact)	ACSL52363	
		Low-level circuit type (Gold-clad contact)	ACSL52364	

Note: If you would like PC board terminals, please add a "3" to the end of the part number when ordering. However, this only applies to gold contacts.

6. Key selector switches



18 square flat type



18 x 24 flat type




18 dia. flat type

1) 2-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)		
			Key removed in OFF position	Key removed in ON position	Key removed in both OFF and ON positions
			Part No.	Part No.	Part No.
18 square flat type	Single pole	Standard type (Silver contact)	ACKL3211131	ACKL3212131	ACKL3213131
		Low-level circuit type (Gold-clad contact)	ACKL3211141	ACKL3212141	ACKL3213141
	Double poles	Standard type (Silver contact)	ACKL3211231	ACKL3212231	ACKL3213231
		Low-level circuit type (Gold-clad contact)	ACKL3211241	ACKL3212241	ACKL3213241
18 x 24 flat type	Single pole	Standard type (Silver contact)	ACKL4211131	ACKL4212131	ACKL4213131
		Low-level circuit type (Gold-clad contact)	ACKL4211141	ACKL4212141	ACKL4213141
	Double poles	Standard type (Silver contact)	ACKL4211231	ACKL4212231	ACKL4213231
		Low-level circuit type (Gold-clad contact)	ACKL4211241	ACKL4212241	ACKL4213241
18 dia. flat type	Single pole	Standard type (Silver contact)	ACKL5211131	ACKL5212131	ACKL5213131
		Low-level circuit type (Gold-clad contact)	ACKL5211141	ACKL5212141	ACKL5213141
	Double poles	Standard type (Silver contact)	ACKL5211231	ACKL5212231	ACKL5213231
		Low-level circuit type (Gold-clad contact)	ACKL5211241	ACKL5212241	ACKL5213241

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

2) 2-notch automatic reset type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			 Key removed in OFF position Part No.	Part No.
18 square flat type	Single pole	Standard type (Silver contact)		ACKL3221131
		Low-level circuit type (Gold-clad contact)		ACKL3221141
	Double poles	Standard type (Silver contact)		ACKL3221231
		Low-level circuit type (Gold-clad contact)		ACKL3221241
18 x 24 flat type	Single pole	Standard type (Silver contact)		ACKL4221131
		Low-level circuit type (Gold-clad contact)		ACKL4221141
	Double poles	Standard type (Silver contact)		ACKL4221231
		Low-level circuit type (Gold-clad contact)		ACKL4221241
18 dia. flat type	Single pole	Standard type (Silver contact)		ACKL5221131
		Low-level circuit type (Gold-clad contact)		ACKL5221141
	Double poles	Standard type (Silver contact)		ACKL5221231
		Low-level circuit type (Gold-clad contact)		ACKL5221241

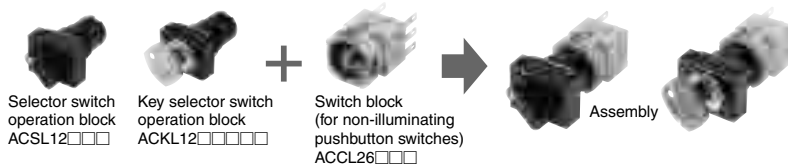
3) 3-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			 Key removed in all 3 positions Part No.	Part No.
18 square flat type	Double poles	Standard type (Silver contact)		ACKL3237231
		Low-level circuit type (Gold-clad contact)		ACKL3237241
18 x 24 flat type	Double poles	Standard type (Silver contact)		ACKL4237231
		Low-level circuit type (Gold-clad contact)		ACKL4237241
18 dia. flat type	Double poles	Standard type (Silver contact)		ACKL5237231
		Low-level circuit type (Gold-clad contact)		ACKL5237241

Note: If you would like PC board terminals, please add a "3" to the end of the part number when ordering. However, this only applies to gold contacts.

7. Ordering block items

Selector switches with 16 dia. mounting holes and key selector switches consist of the two blocks below. Block items are given on a separate page.



ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

SPECIFICATIONS

1. Contact rating

1) Gold-clad contact

Load	Rating
Resistive load	0.1 A 125 V AC
	0.1 A 30 V DC
Minute load	1 mA 5 V AC/DC*

Note) The usable range for the minute load indicated by the asterisk may fluctuate depending on the usage conditions and the type of load.

2) Silver contact

Load	AC rating	DC rating
Resistive load	3 A 250 V AC	0.4 A 125 V DC
	3 A 125 V AC	2 A 30 V DC
Induction load*	1.5 A 250 V AC	0.2 A 125 V DC
	2 A 125 V AC	1 A 30 V DC

Note) The values for the induction load indicated by the asterisk are as follows: The alternating current induction load is PF = 0.6 to 0.7, and the direct current induction load is L/R = 7 ms and less.

2. LED rating

Rated operating voltage	Operating voltage range	Rated current	LED life (reference value)	Equivalence circuit	Lighted colors
5 V DC	5 V DC±5%	8 mA	Approx. 50,000 hours (with full direct current lighting at 50% of initial intensity)		Red, orange, yellow, green, blue, opaque
12 V AC/DC	12 V AC/DC±10%	8 mA			
24 V AC/DC	24 V AC/DC±10%	8 mA			

Note) The current limiting resistor and protective diode are built into the LED bulb.

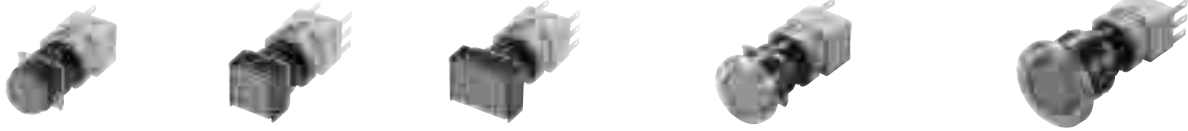
3. Characteristics

Item	Specifications
Standard usage condition	Ambient temperature: -25 to +55°C (Not freezing) (Storage temperature: -30 to +80°C) Relative humidity: 45 to 85%
Contact resistance	Max. 50 mΩ (initial)
Insulation resistance	Min. 100 MΩ (500 V DC megger)
Dielectric strength	Switch section Between charging part and ground: 2,500 V AC for 1 min. Between terminals with unlike poles: 2,500 V AC for 1 min. Between terminals with like poles: 1,000 V AC for 1 min.
	Illuminating section Between charging part and ground: 2,500 V AC for 1 min.
Vibration resistance	Malfunctioning 10 to 55 Hz at double amplitude of 1.5 mm
Shock resistance	Durability 1,000 m/s ²
	Malfunctioning 196 m/s ²
Expected life	Mechanical Momentary: Min. 2 x 10 ⁶ times, switching frequency 1,200 times/hr. Alternate: Min. 2.5 x 10 ⁵ times, switching frequency 1,200 times/hr. Selector switch (incl. those with keys): Min. 2.5 x 10 ⁵ times, switching frequency 1,200 times/hr.
	Electrical Momentary: Min. 10 ⁵ times, switching frequency 1,200 times/hr. Alternate: Min. 10 ⁵ times, switching frequency 1,200 times/hr. Selector switch (incl. those with keys): Min. 10 ⁵ times, switching frequency 1,200 times/hr.
Protective construction	Splashproof type IP65 (IEC60529)
Terminal shape	110 terminal with tab that doubles for soldering use

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

DIMENSIONS (unit: mm)

1. Illuminated pushbutton switches, indicators, and pushbutton switches



18 dia. projecting type

18 square flat type

18 x 24 flat type

24 dia. mushroom button type

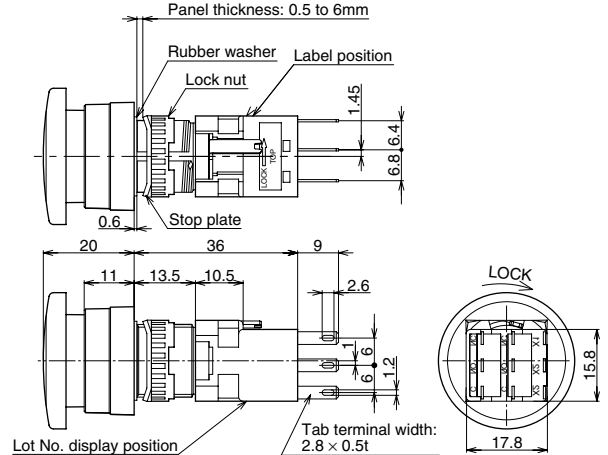
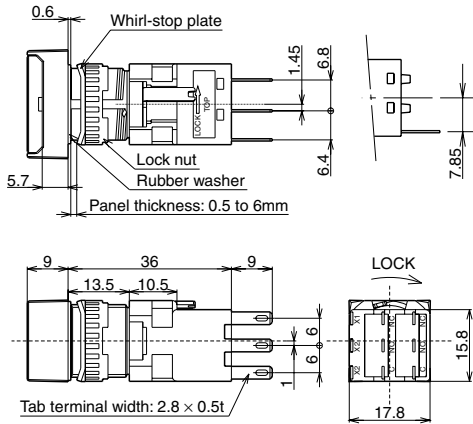
30 dia. mushroom button type

(Tight mounting type illuminated pushbutton switches)

(Indicators)

(Pushbutton switches)

30 dia. mushroom button type



External dimensions

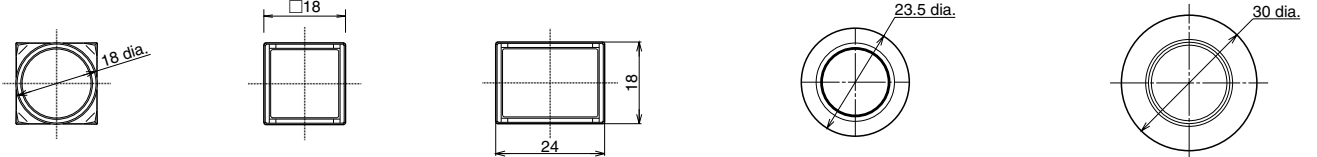
18 dia. projecting type

18 square flat type

18 x 24 flat type

24 dia. mushroom button type

30 dia. mushroom button type



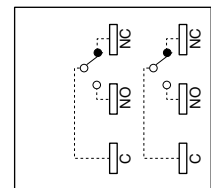
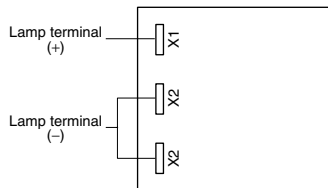
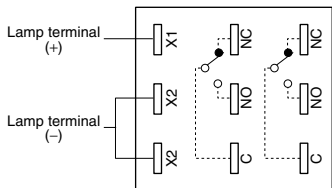
- Notes) 1. Pushbutton switches have only contact terminals, and do not have lamp terminals.
 2. Indicators have only lamp terminals, and do not have contact terminals.
 3. There is no mushroom button type in the indicator.
 4. Please inquire regarding external dimensions of the PC board terminal type.

WIRING DIAGRAM (BOTTOM VIEW)

(Illuminated pushbutton switches)

(Indicators)

(Pushbutton switches)



(Single pole types have only the right terminal.)

(Single pole types have only the right terminal.)

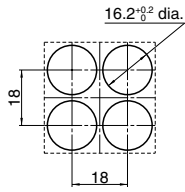
- Notes: 1. "X2" terminals have two terminals in order to make cross wiring easy.
 2. Two "X2" terminals are connected internally.

ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

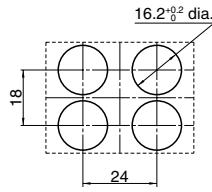
Tight mounting type, mounting hole diagram, and recommended minimum mounting pitch

Change to tight mounting type was from production lot of March, 2002.

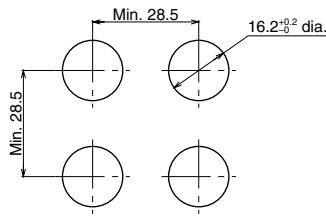
18 dia. projecting and 18 square flat types



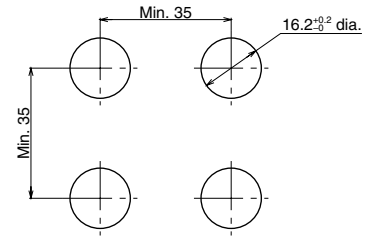
18 × 24 flat type



24 dia. mushroom button type



30 dia. mushroom button type



Note) Operability should be taken into consideration when deciding the mounting pitch.

2. Selector switches/Key selector switches

1) Selector switches



18 square flat type

18 × 24 flat type

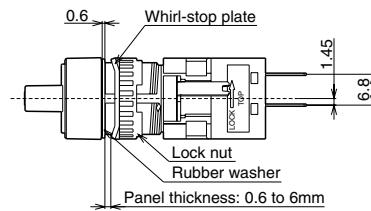
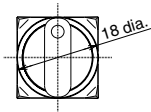
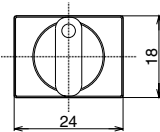
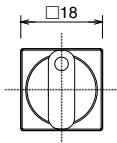
18 dia. flat type

18 square flat type

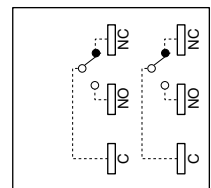
External dimensions

18 × 24 flat type

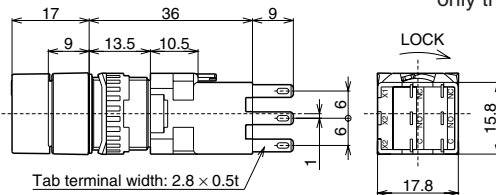
18 dia. flat type



Wiring diagram (BOTTOM VIEW)



(Single pole types have only the right terminal.)



2) Key selector switches



18 square flat type

18 × 24 flat type

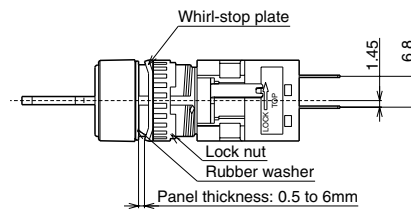
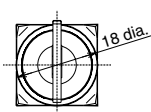
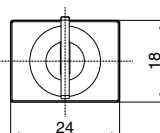
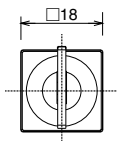
18 dia. flat type

18 square flat type

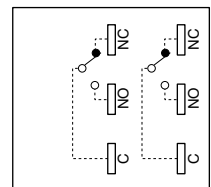
External dimensions

18 × 24 flat type

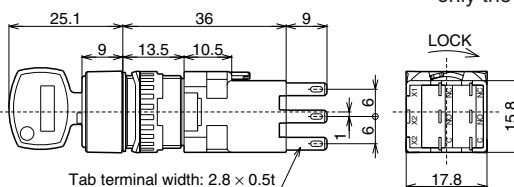
18 dia. flat type



Wiring diagram (BOTTOM VIEW)



(Single pole types have only the right terminal.)

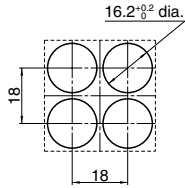


ND Series: 16 dia. types (ACEL, ACBL, ACSL, ACKL)

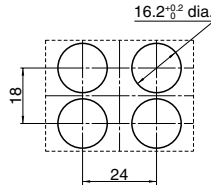
Tight mounting type, mounting hole diagram, and recommended minimum mounting pitch

Change to tight mounting type was from production lot of March, 2002.

18 dia. projecting and 18 square flat types



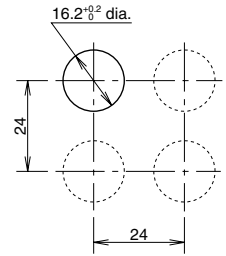
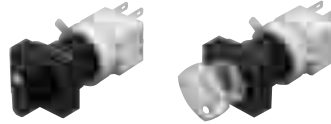
18 x 24 flat type



24 x 24 mounting pitch type, mounting hole diagram, and recommended minimum mounting pitch

The mounting hole diagram below applies to products up to the production lot of February 2002.

24 x 24 mounting pitch type



Note) Operability should be taken into consideration when deciding the mounting pitch.

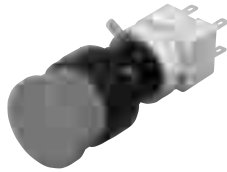
Note) Operability should be taken into consideration when deciding the mounting pitch.

Internal circuit diagram

Notch specifications		Contact arrangement	Notch positions (TOP VIEW)		
			1 (left)	0 (center)	2 (right)
90° -2-notch		1 Form C			
		2 Form C			
45° -3-notch		2 Form C			

Emergency pushbutton switches

ND Series (mounting hole 16 dia. type)



25 dia. button type



40 dia. button type

FEATURES

1. Equipped with a safety lock mechanism that prevents emergency stops caused by erroneous operation

1) Safety lock mechanism
A safety lock mechanism is used in which the contact does not move until the pushbutton has completely locked. Because the contact does not operate unless the button has been pressed all the way down, there is no danger of the machine suddenly stopping because of a malfunction caused by something coming in contact with the button, and no loss from such situations.

2. Forced contact separation mechanism used as the contact mechanism. Has received CE marking.

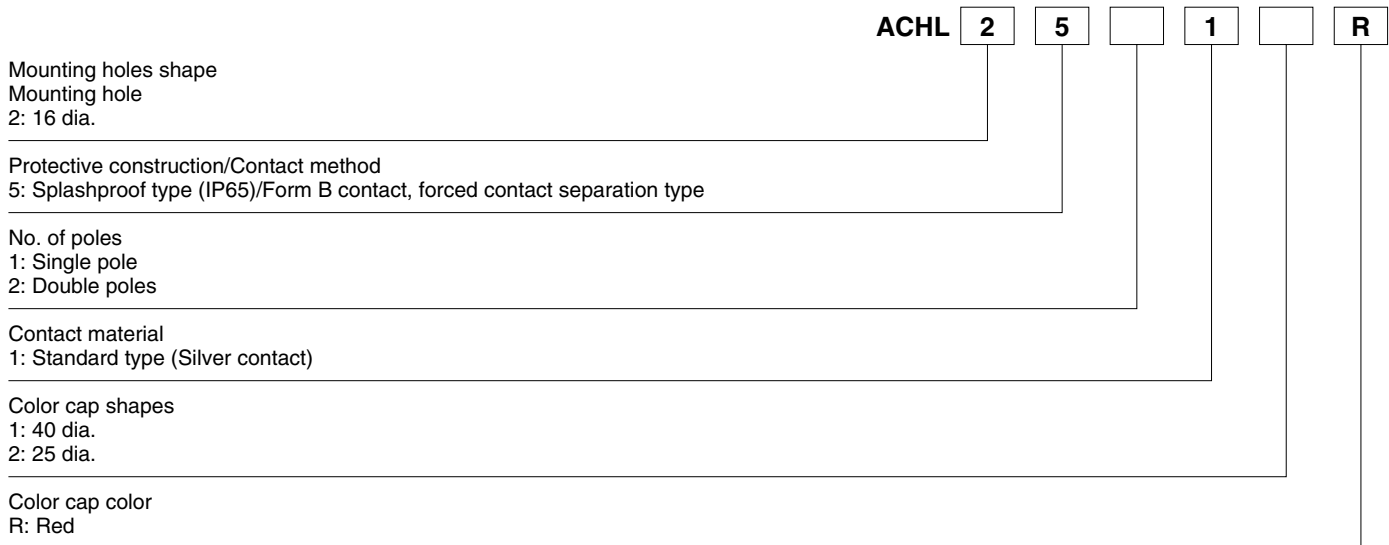
1) Forced contact separation mechanism
The mechanism is designed so that the button operation force is used, as is, as the contact separation force. Therefore, the circuit will shut off perfectly even if a problem happens to occur such as the contact welding shut. (Conforms to EN60947-5-1 Annex K.)
UL and CSA certified.
Conforms to EN (European) standards. (Meets EN60947-1, EN60947-5-1, and DEMKO standards.)

3. Two button diameters available, 25 and 40

RoHS Directive compatibility information
<http://www.nais-e.com/>

ORDERING INFORMATION

Emergency pushbutton switches (push to lock, turn to reset)



TYPES

Mounting hole	Contact arrangement	Color cap	Splashproof type (IP65)/Form B contact, forced contact separation type	
			Part No.	
16 mm dia.	1 Form B	40 dia.	ACHL25111R	
		25 dia.	ACHL25112R	
	2 Form B	40 dia.	ACHL25211R	
		25 dia.	ACHL25212R	

Note: Emergency pushbutton switches are not sold as block items.

SPECIFICATIONS

1. Contact rating

Load	AC rating	DC rating
Resistive load	3 A 250 V AC	0.2 A 250 V DC
	5 A 125 V AC (AC-12)	0.4 A 125 V DC
Induction load*	1.5 A 250 V AC	0.1 A 250 V DC
	3 A 125 V AC (AC-15)	0.22 A 125 V DC
		1 A 30 V DC (DC-13)

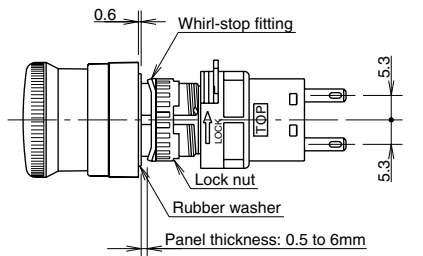
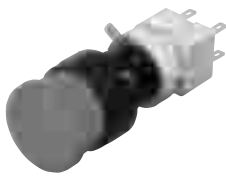
Note) The values for the induction load indicated by the asterisk are as follows: The alternating current induction load is PF = 0.6 to 0.7, and the direct current induction load is L/R = 7 ms and less.

2. Characteristics

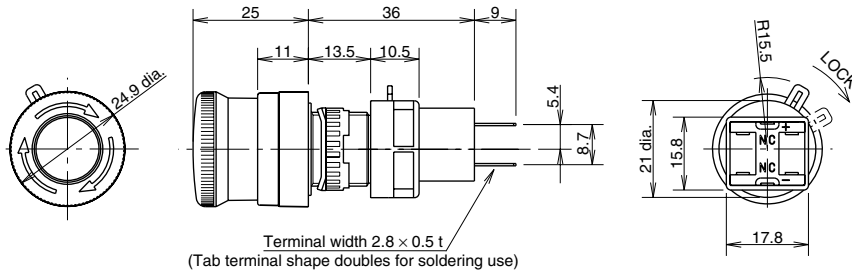
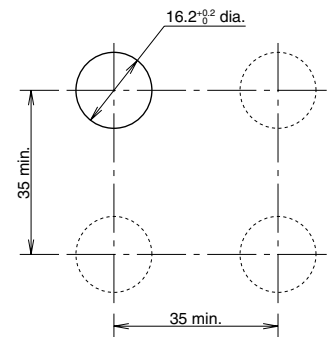
Item	Specifications
Standard usage condition	Ambient temperature: -25 to +55°C (Not freezing) (Storage temperature: -30 to +80°C) Relative humidity: 45 to 85%
Contact resistance	Max. 50 mΩ (initial)
Insulation resistance	Min. 100 MΩ (500 V DC megger)
Dielectric strength	Switch section Between charging part and ground: 2,500 V AC for 1 min. Between terminals with unlike poles: 2,500 V AC for 1 min. Between terminals with like poles: 1,000 V AC for 1 min.
Vibration resistance	Malfunctioning 10 to 55 Hz at double amplitude of 1.5 mm
Shock resistance	Durability 1,000 m/s ²
	Malfunctioning 196 m/s ²
Expected life	Mechanical Min. 2.5 × 10 ⁵
	Electrical Min. 10 ⁵ , switching frequency 1,200 times/hr.
Protective construction	Splashproof type IP65 (IEC 60529)
Terminal shape	110 terminal with tab that doubles for soldering use

DIMENSIONS (unit: mm)

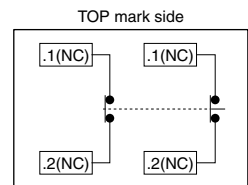
1) 25 dia. button type



Panel mounting dimension

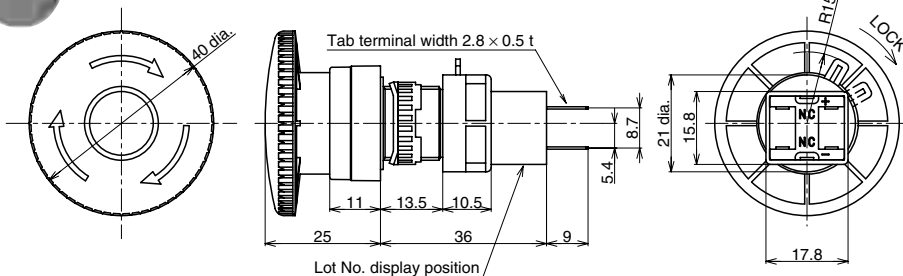


Wiring Diagram (BOTTOM VIEW)

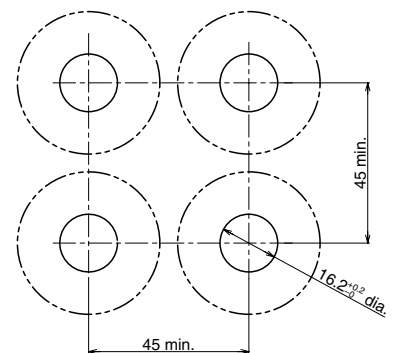


Note) The 1 Form B contact type has a contact only on the left side.

2) 40 dia. button type



Panel mounting dimension





FEATURES

The user can select a continuous buzzing sound, a long intermittent sound, or a short intermittent sound, using a slide switch inside the terminal part.

RoHS Directive compatibility information
<http://www.nais-e.com/>

TYPES

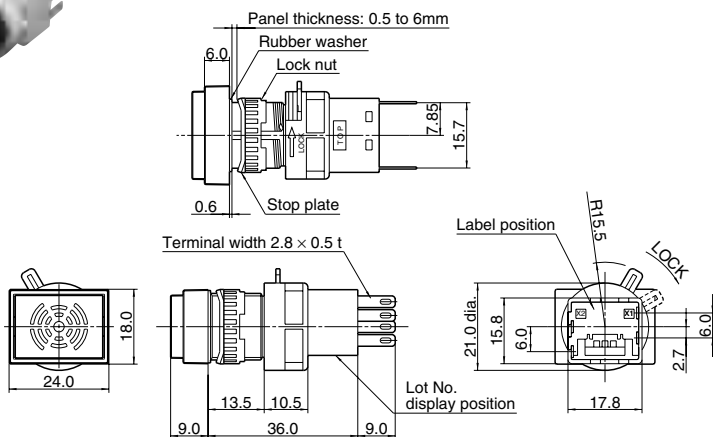
Mounting hole	Shape of panel front	Usage voltage	Part No.
16 mm dia.	18 × 24	12 to 24 V AC/DC ±10%	ACZL4100

Notes: 1. The user can select a continuous buzzing sound, a long intermittent sound, or a short intermittent sound, using a slide switch inside the terminal part.
 2. Buzzers are not sold as block items.

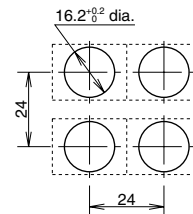
SPECIFICATIONS

Rated insulating voltage	60 V AC/DC
Rated operating voltage	12 to 24 V AC/DC ±10%
Current consumption	DC: 7 mA, AC: 20 mA
Sound pressure (at 0.1 m)	Min. 80 dB for continuous sound (at rated voltage)
Sound frequency	2 kHz ±500 Hz
Buzzer repetitions	Long intermittent: 55 times/min. ±10% Short intermittent: 600 times/min. ±10%
Standard usage conditions	Ambient temperature: -20 to +55°C (Not freezing) Relative humidity: 45 to 85%
Insulation resistance	Min. 100 MΩ (500 V DC megger)
Dielectric strength	Between charging and non-charging parts: 1,000 V AC for 1 min.
Vibration resistance (malfunctioning)	5 to 55 Hz at unilateral amplitude of 0.5 mm
Shock resistance (durability)	1,000 m/s ²
Expected life	1,000 hours min.
Protective construction	Enclosed type (JEM 1030)
Terminal shape	110 terminal with tab that doubles for soldering use

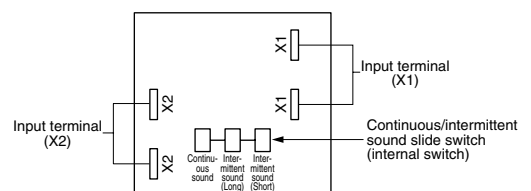
DIMENSIONS (unit: mm)



Panel mounting dimension



Wiring Diagram (BOTTOM VIEW)



Accessories and maintenance items (16 dia.)

Ring tightener



Part No.	ACDL1800
Specifications	Metal
Unit	1 pc.

RoHS Directive compatibility information
<http://www.nais-e.com/>

- This tool is convenient for tightening the lock nuts used when mounting the unit on a panel.
- When tightening rings, the torque should be between 0.68 and 0.88 N·m (7.0 to 9.0 kgf·cm).

Lamp replacement tool



Part No.	ACDL1802
Specifications	For illuminated pushbuttons and indicators
Unit	10 pcs.

- This tool is used to replace lamps when LEDs are being installed or removed.

Removal tool



Part No.	ACDL1804
Specifications	Metal
Unit	1 pc.

- This tool is used to pull off the operating parts (color cap, inscribed plate, and holder) of illuminated pushbuttons, indicators, and pushbutton switches.

LEDs (parts for maintenance)



Part No.	ACDL1861□*	ACDL1861□*	ACDL1861□*
Rated operating voltage	5 V DC±5%	12 V AC/DC±10%	24 V AC/DC±10%
Rated current	8 mA	8 mA	8 mA
Unit	10 pcs.		

Note) The following number/letter combinations indicating the LED voltage and pushbutton color should be entered in the square indicated by the asterisk after the part number.

LED voltage	Pushbutton color	Red	Orange	Yellow	Green	Blue	White
							Opaque LED
5 V DC		1R	4J	4Y	7G	7L	4X
12 V AC/DC		2R	5J	5Y	8G	8L	5X
24 V AC/DC		3R	6J	6Y	9G	9L	6X

- For illuminated pushbuttons and indicators (indicator lamps), the LED is built-in. These LEDs should be ordered only if spares are required.
- The asterisk in the pack part number is where the letter to indicate the lamp color is inserted.

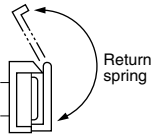
Maintenance parts should be installed by an engineer with specialized expertise in electrical components. When placing orders, please specify the number of marketing units.

Accessories and maintenance items (16 dia.)

Protective cover



- This cover is designed to prevent erroneous operation.
- The cover opens 180°, and closes by means of a return spring.
- Protective construction: Spray-resistant type (IP65)

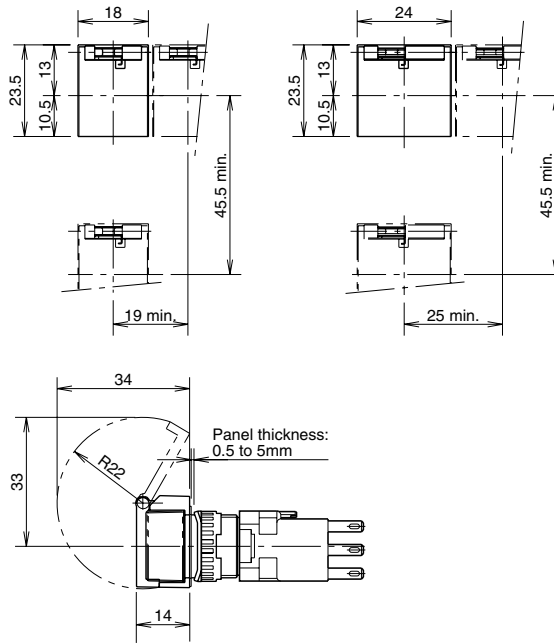


Type	For 18 dia./ 18 square	For 18 × 24
Part No.	ACDL1810	ACDL1811
Unit	10 pcs.	

DIMENSIONS (unit: mm)

18 dia. 18 square (ACDL1810)

18 × 24 (ACDL1811)



Protective cover installation diagram

Dustproof cover



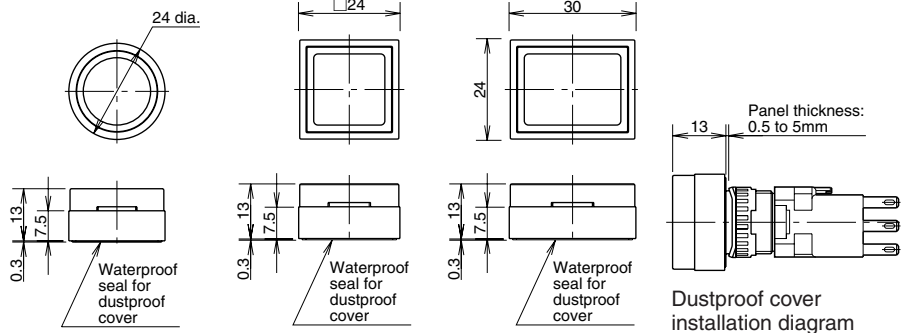
- The minimum installation pitch will be different if the dustproof cover is being used.
- Ambient usage temperature: -10 to +55°C
- Material: Elastomer (front/transparent) and polypropylene (back/non-transparent black)

DIMENSIONS (unit: mm)

18 dia.
(ACDL1812)

18 square
(ACDL1813)

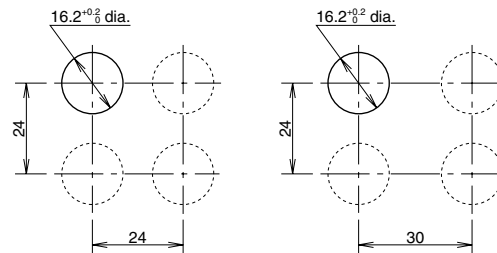
18 × 24
(ACDL1814)



Dustproof cover installation diagram

(Minimum mounting pitch)

- 18 dia. 18 square type
- 18 × 24 type



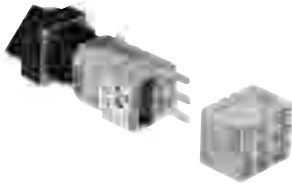
Note) When deciding the mounting pitch, make sure the cover has enough room to operate properly.

Type	For 18 dia.	For 18 square	For 18 × 24
Part No.	ACDL1812	ACDL1813	ACDL1814
Unit	10 pcs.		

Maintenance parts should be installed by an engineer with specialized expertise in electrical components. When placing orders, please specify the number of marketing units.

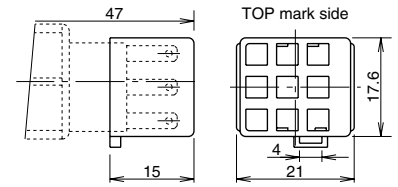
Accessories and maintenance items (16 dia.)

Insulating terminal cover



Part No.	ACDL1850
Specifications	Opaque nylon material
Unit	10 pcs.

DIMENSIONS (unit: mm)



- This terminal cover is made of an opaque nylon material.

Note) When wiring the terminal, insert the lead into the hole in the insulating terminal cover before soldering it.

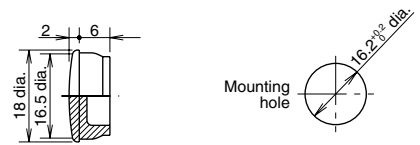
Dimension at inner back of panel when mounting insulating terminal cover: 47 mm

Mounting hole plug (rubber)



Part No.	ACDL1820
Specifications	Nitrile rubber (black) Protective construction: IP65
Unit	10 pcs.

DIMENSIONS (unit: mm)

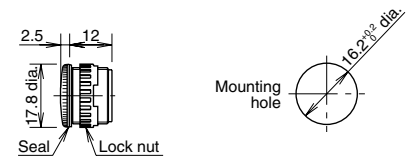


Mounting hole plug (metal)



Part No.	ACDL1821
Specifications	Made of metal Protective construction: IP65
Unit	10 pcs.

DIMENSIONS (unit: mm)



Maintenance parts should be installed by an engineer with specialized expertise in electrical components. When placing orders, please specify the number of marketing units.

Inscribed plate (maintenance part)



Shape	Round	Square	Rectangular	24 dia. mushroom button type	30 dia. mushroom button type
Part No.	ACDL1830	ACDL1831	ACDL1832	ACDL1835	ACDH1836
Unit	1 pack (5 plates)				

- Color: Opaque
- Material: Methacrylic resin
- ACDL1835 and ACDH1836 for mushroom buttons are for illuminating pushbuttons.

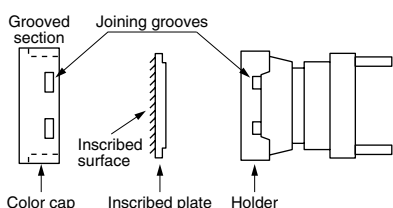
Cautions For Use of the ND Series (16 dia.)

Cautions For Use

1. Mounting and removing the color cap and inscribed plate

1) Removing

Grip the grooved part of the color cap with the removal tool (Part No. ACDL1804), and pull it towards you to remove the operating parts (the color cap, inscribed plate and holder). The inscribed plate can be removed by pushing the color cap outward from the back side, freeing the grooved section that joins it to the holder. The plate is inscribed on one surface, as shown below, and not on the other side.



2) Mounting

Place the inscribed plate in the holder, line up the grooves in the color cap and the holder, and press them together. When doing this, make sure the inscribed plate is facing the correct direction. After the inscribed plate and color cap have been mounted in the holder, insert the assembled unit in the main unit, making sure it faces the correct direction.

3) Precautions when mounting the operating part (non-illuminated type) Like the illuminated pushbutton switch, the pushbutton switch (non-illuminated type) also has an inscribed plate. When mounting and removing the operating part, make sure the plate is mounted in the same way as that of the illuminated pushbutton switch.

2. Mounting and removing LEDs

LEDs can be mounted and removed from the front of the panel, using the lamp replacement tool, but can also be done from the back, by removing the switch block.

1) Mounting and removing the LED from the front of the panel

[Removing the LED]

(1) Insert the lamp replacement tool in the lamp housing, and turn it slightly to the left while pressing lightly on it, to remove the LED cap.

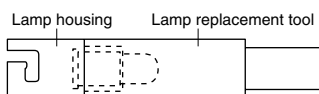


(2) Press on the head of the LED to remove it from the lamp housing.

[Mounting the LED]

(1) First, insert the LED into the lamp housing. Make sure the LED has been pressed firmly all the way into the lamp housing. (This is done more easily using the lamp replacement tool on the side on which the LED is gripped.)

(2) Insert the lamp replacement tool to the position in the lamp housing shown below, and hold it at that position.



(3) If the tool is inserted so that the insertion guide inside the lamp housing is facing the same direction as the TOP mark on the switch block, the mounting base in the switch block will be facing the same direction as the insertion guide in the lamp housing. When these are aligned correctly, turn the tool to the right while pressing lightly on it to install the LED.

2) Removing and mounting the LED by removing the switch block

The LED can be mounted or removed without using any tools if the switch block is removed.

3. Panel mounting



Separate the operation block and switch block and attach the operation block to the panel hole from the front of the panel. Then insert the whirl-stop plate from the back of the panel, and tighten it with the lock nut. Finally, mount the switch block.

1) Mounting and removing the switch block

(1) Move the lock lever of the switch block in the direction opposite the arrow to pull the switch block off of the operation block.

(2) When mounting the switch block, align the TOP marks on the operation block and the switch block, and move the lever in the direction of the arrow to lock the switch block in place.

2) Precautions when mounting the panel



To tighten the ring when mounting the operation block panel, use the special tool (ring tightener, Part No. ACDL1800, sold separately), and tighten the ring to a torque between 0.68 N·m (7 kgf·cm) and 0.88 N·m (9.0 kgf·cm). Using radio pliers to tighten the ring, or tightening it beyond the required torque, can damage the ring, so be careful to tighten it correctly.

4. Inscribed display

With the ND series manual operating illuminated pushbutton switches and indicators (indicator lamps) with 16 dia. mounting holes, the internal inscribed plate can be engraved. The range and depth of the engraving are as shown below. Insertion of inscribed film is not possible due to the internal construction.

Engraving dimensions for ND series with 16 dia. mounting hole

Shape	Plate prod. no.	Outer dimension	Thickness	Engraving range	Engraving depth
Round	ACDL1830	13.7 dia.	0.8	11.8 dia.	Depth 0.5 max.
Square	ACDL1831	13.7 square	0.8	12.0 square	Depth 0.5 max.
Rectangular	ACDL1832	19.7 x 13.7	0.8	18.0 x 12.0	Depth 0.5 max.

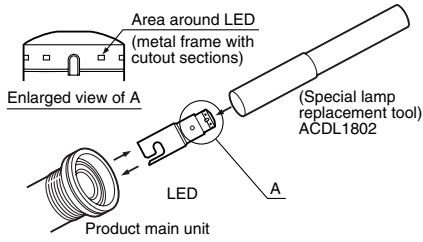
Note) Material: Opaque methacrylic resin
Do not insert film or any other foreign substances between the color cap and the inscribed plate.

5. Precautions when working with blue and green LEDs

With illuminated pushbutton switches and indicators (indicator lamps), the LED has already been installed, but if green or blue LEDs are being replaced, be careful that no static electricity comes in direct contact with the part of the metal frame around the LED module that has the cutouts in it (see illustration below). If static electricity is applied to this part, it can destroy the LED element. When mounting the LED in the main unit, use the special lamp replacement tool (Part No. ACDL1802) designed for that purpose.

Cautions For Use of the ND Series (16 dia.)

For instructions on mounting and removing LEDs, please see "2. Mounting and removing the LEDs".



6. Precautions when connecting wiring

1) Terminals should be soldered at 20 W for less than 5 seconds, or at 260°C for less than 3 seconds, without applying external force. When doing this work, make sure the soldering iron does not come in contact with the switch itself, and that, when connecting the wiring, no tensile force is applied to the terminal. Avoid bending the terminal or subjecting it to excessive force.

2) Non-corroding liquid resin flux should be used.

7. Handling the insulating terminal cover

Align the TOP marks on the main unit and the insulating terminal cover, and insert the cover.

Note) When connecting the wiring, insert the lead into the hole in the insulating terminal cover before soldering it.

8. Connections

Positive Lock connectors (made by AMP Co.) and Easy Lock connectors (made by Nichifu Co.) may be used for the tab terminals. The table below shows the recommended models of connectors.

Item	Positive Lock connectors (by AMP Co.)	Easy Lock connectors (by Nichifu Co.)
Terminal	0.2 to 0.5 mm ² 175412-1	0.2 to 0.3 mm ² OSS-62852F3
	0.5 to 1.25 mm ² 174778-1	0.5 to 1.25 mm ² OSS-62815F3
Housing	174779-1	NET1-28-1P

9. When using LED illumination

LEDs are configured of semiconductors, and if they are used at a voltage exceeding the maximum operating voltage, the LED element can deteriorate because of irregular heat generation, causing a noticeable drop in the intensity, discoloration, failure to light, and other problems. External noise, transient voltage, and transient current applied to the circuit can cause the same types of problems. With LED illuminated types that have a rated voltage of 5 VDC, 12 V AC/DC, or 24 V AC/DC in particular, the following items should be given careful consideration when using the LED.

1) Power supplies of LED blocks with a rated voltage of 5 V DC, 12 V AC/DC, or

24 V AC/DC

LED blocks used with a rated voltage of 12 V AC/DC, or 24 V AC/DC can use both alternating and direct current, and either alternating current or direct current power supplies can be used with these. The voltage used should be within a range of $\pm 10\%$ of the rated voltages for both the alternating and direct current. (if using 5 V DC, the range is $\pm 5\%$)

2) Direct current power supplies

(1) Constant-voltage power supplies for switching and other power supplies
These are ideal power supplies. They should be used within the operating voltage range of the LED block.

(2) Batteries

When charging, and immediately after charging, please be aware that the voltage may exceed the operating voltage for the LED in some cases. Make sure the voltage is within a range of $\pm 10\%$ of the rated voltage for the LED ($\pm 5\%$ for a rated voltage of 5 V).

(3) Full-wave rectification

Since both alternating and direct current can be used, there is no need for rectification using a diode bridge. Please be aware that, if full-wave rectification using a diode bridge is used, the rectifying diode may cause the voltage to drop, resulting in decreased intensity.

(4) Single-phase half-wave rectification

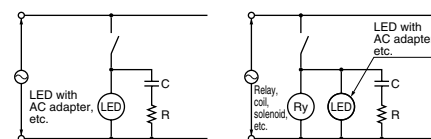
This is not appropriate as the power supply for the LED block. We recommend using a direct current constant-voltage power supply.

3) Noise

External noise can cause the LED element to deteriorate, causing a noticeable drop in the intensity, discoloration, failure to light, and other problems. In situations where this may occur, the preventive measures noted below should be considered. An element such as a CR element or surge absorber should be used to prevent adverse effects caused by noise.

(Circuit example 1)

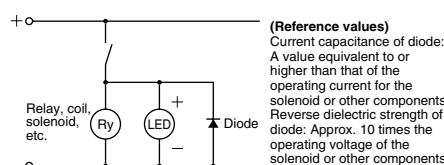
Alternating current cases



(Reference value) C: 0.1 μ F
R: 120 Ω

(Circuit example 2)

Directing current cases



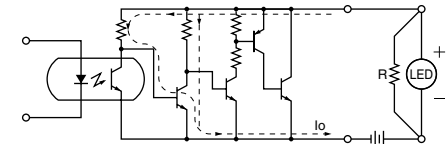
(Reference values)
Current capacitance of diode: A value equivalent to or higher than that of the operating current for the solenoid or other components
Reverse dielectric strength of diode: Approx. 10 times the operating voltage of the solenoid or other components

4) Corrective action for dark illumination

(1) Leakage current

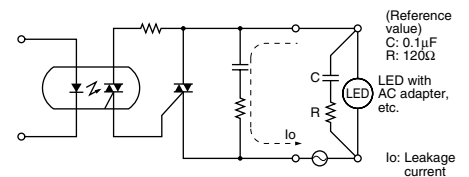
Leakage current from the non-contact switch that lights the LED block or from the contact protective circuit can cause the LED block to light faintly in some cases even if the output is off. If this happens, the following corrective steps should be taken.

[1] If the LED block (direct-current type) is being lighted by a transistor output type of non-contact switch, insert a dividing resistor in parallel with the LED block. (Circuit example)



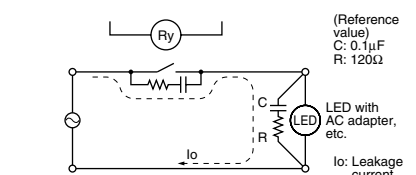
Io: Leakage current when output is off
R: Dividing resistor

[2] If the LED block (alternating-current type) is being lighted by a TRIAC output type of non-contact switch built into a CR element in parallel with the LED block. (Circuit example)



(Reference value)
C: 0.1 μ F
R: 120 Ω
LED with AC adapter, etc.
Io: Leakage current

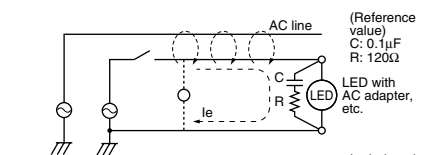
[3] If the LED block (alternating-current type) is being lighted by a relay output to which a CR element that protects the contact has been connected in parallel, insert a CR element in parallel with the LED block. (Circuit example)



(Reference value)
C: 0.1 μ F
R: 120 Ω
LED with AC adapter, etc.
Io: Leakage current

(2) Induction

When using units with AC adaptors, induction from the surrounding AC line may cause the lamp to light dimly. Corrective action: Insert a CR element in parallel with the LED block.



(Reference value)
C: 0.1 μ F
R: 120 Ω
LED with AC adapter, etc.
Ie: Induced current

Cautions For Use of the ND Series (16 dia.)

9. Handling and Usage Precautions

1) Aggregate tight mounting

Please be aware that heat caused by aggregate tight mounting of indicator lamps and illuminated pushbutton switches or continuously lit lamps can cause the ambient temperature to exceed the prescribed amount. Measures must be taken to ventilate or lower the operation voltage if the mounting panel is not metal or if the product is being used in a sealed control panel.

2) Replacement of buttons (illuminating and non-illuminating)

Do not replace alternate type buttons (illuminating and non-illuminating) when they are locked. (Replacing while locked might damage the internal mechanism.) You must release the locks before replacing.

3) Storage and place of use

(1) Please use within the working ambient temperature and humidity ranges given on the ratings display.

(2) When using in a location where oil, water and dirt are present, install a dust cover so that foreign substances cannot enter the sliding part of the pushbutton.

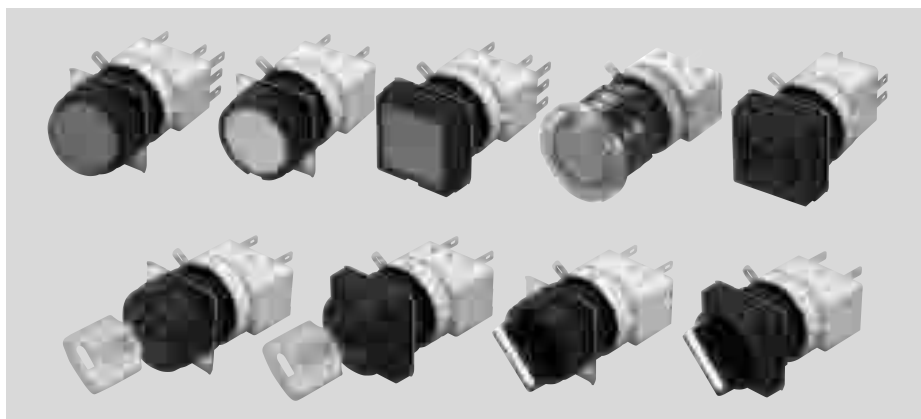
4) Contact (microswitch)

When using identical NC (normal close) and NO (normal open) microswitch contacts, do not connect to the wrong voltage or to the wrong type of power supply. Doing so will cause a dead short.

5) Oil resistance

The product has been evaluated with commonly used standard machining oil and cooling oil. Please inquire about other oils, since use of some special oils may not be possible.

Bright, clear illumination (ultra-high intensity LED used)
Separate mounting model features removable lock lever
Addition of mushroom button type



FEATURES

1. Bright, clear LED illumination

- 1) Uses brilliantly illuminating LEDs that are much brighter than incandescent bulbs.
- 2) Brightness greatly increased for vastly improved recognition and safety. Yellow and green are particularly easy to distinguish.

Makers who are especially concerned about product liability laws and worker safety and sanitation are calling for machines that are designed and manufactured based on the ISO12100 series of international safety standards (general regulations governing basic conceptual design for machine safety). With the ISO12100 series, the man-machine interface must be designed so that the status of the machine can be recognized clearly and correctly by anyone running the machine, without special training or expertise. For that reason, display lamp colors are standardized under IEC60073, IEC60204-1 and other standards cited in the ISO12100 series, and are covered by JIS standards as well. The LED illumination of the ND type meets safety needs such as these, and beyond.

Note) IEC60073:
 JIS C 0448 Colors for Display Units and Operation Devices
 IEC60204-1:
 JIS B 9960-1 Safety of Machines and Electrical Units of Machines

Display lamp colors and meanings indicating machine status (taken from International Electrical Standards Conference IEC-60073 and 60204-1)

Color	Meaning	Explanation	Operator action
Red	Emergency	Hazardous situation	Action appropriate to hazardous situation
Yellow	Caution	Problem status/urgent or critical situation	Visual monitoring and (or) intervention
Green	Normal	Normal status	As appropriate
Blue	Obligatory	Displays status of action required by operator	Obligatory action
White	Neutral	Any other status; Can be used when using red, yellow, green, or blue might be interpreted erroneously.	Visual monitoring

3) Power consumption greatly reduced (12 V type).

The power consumption has been reduced by 50% in the 12 V type (mounting hole 22 dia. type).

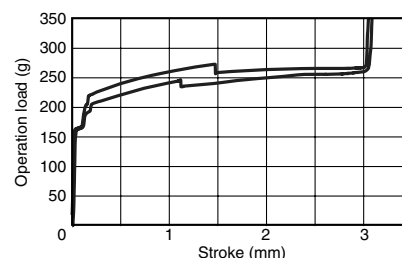
4) Continuous illumination with no need for replacement for 5 years (50,000 hours).

	Rated current	
	Mounting hole 16 dia. type	Mounting hole 22 dia. type
12 V AC/DC type	8 mA (10 mA in previous model)	10 mA (20 mA in previous model)

5) Products available in 6 illuminated colors: red, orange, yellow, green, blue, and white.

2. Nice, light switching feel. Light operation load due to snap action mechanism. Short stroke type.

Relationship between operation load and stroke (Mounting hole 22 dia. type: 1 Form C contact momentary action)



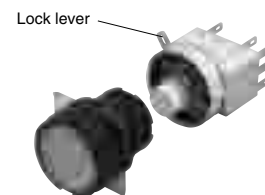
- 1) Stroke: 3 mm
- 2) Mechanical life (mounting hole 22 dia. type)
 Momentary type: Min. 10⁶
 (Twice that of earlier products)
 Alternate type: Min. 5 x 10⁵
 (5 times better than previous)

3. Removal/installation type with lock lever system.

Smooth installation now possible.

- 1) It is easy to install in tight spaces and maintenance is easy.
- 2) Operation efficiency is greatly increased since surface installation and wiring operations can be carried out separately.

Mounting hole 22 dia. type



4. Mushroom button type for easier operation.

5. Wiring work simplified thanks to screw terminal type.

6. Splashproof type protective construction (IP65).

Conforms to IEC 60529.

7. Safety standard

- 1) UL and CSA certified (excluding buzzer).
- 2) Conforms to EN standard (excluding buzzer), has received CE marking.

ND Series: 22 dia. types (ACEL, ACBL, ACCL, ACKL, ACZL)

8. Durability

Thermoplastic materials are used for durability in the outer casing and installation points.

9. Contacts made of cadmium-free material.

RoHS Directive compatibility information
<http://www.nais-e.com/>

ORDERING INFORMATION

1. Illuminated pushbutton switches (LED illumination) and indicators (indicator lamps)

<p>Illumination type EL: LED type</p> <p>Mounting holes and flange shapes Mounting hole Flange shape 6: 22 dia. 25.8 dia. projecting type (illuminated pushbutton switches only) 7: 22 dia. 25.8 dia. flat type 8: 22 dia. 25.8 square flat type (With mushroom button only) 9: 22 dia. 30 dia.</p> <p>Protective construction 2: Splashproof type (IP65)</p> <p>No. of poles and operating characteristics 0: Indicator (indicator lamp) 3: Single-pole (1 Form C) alternate 1: Single-pole (1 Form C) momentary 4: Double-pole (2 Form C) alternate 2: Double-pole (2 Form C) momentary</p> <p>Contact material 0: Indicator (indicator lamp) (No contact) 2: Low-level circuit type (Gold-clad contact) 1: Standard type (Silver alloy contact)</p> <p>LED voltages and pushbutton colors</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Pushbutton color</th> <th colspan="6">Color</th> </tr> <tr> <th>Red</th> <th>Orange</th> <th>Yellow</th> <th>Green</th> <th>Blue</th> <th>White (LED: opaque)</th> </tr> </thead> <tbody> <tr> <td>5 V DC</td> <td>1R</td> <td>4J</td> <td>4Y</td> <td>7G</td> <td>7L</td> <td>4X</td> </tr> <tr> <td>12 V AC/DC</td> <td>2R</td> <td>5J</td> <td>5Y</td> <td>8G</td> <td>8L</td> <td>5X</td> </tr> <tr> <td>24 V AC/DC</td> <td>3R</td> <td>6J</td> <td>6Y</td> <td>9G</td> <td>9L</td> <td>6X</td> </tr> </tbody> </table>	Pushbutton color	Color						Red	Orange	Yellow	Green	Blue	White (LED: opaque)	5 V DC	1R	4J	4Y	7G	7L	4X	12 V AC/DC	2R	5J	5Y	8G	8L	5X	24 V AC/DC	3R	6J	6Y	9G	9L	6X	<div style="display: flex; justify-content: space-around; align-items: center;"> ACEL <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> 2 <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> </div>
Pushbutton color		Color																																	
	Red	Orange	Yellow	Green	Blue	White (LED: opaque)																													
5 V DC	1R	4J	4Y	7G	7L	4X																													
12 V AC/DC	2R	5J	5Y	8G	8L	5X																													
24 V AC/DC	3R	6J	6Y	9G	9L	6X																													
<p>Terminal shape and mounting dimensions Nil: Standard mounting 1: Terminal for PC board and standard mounting (only gold contact) 4: Screw terminal (2 Form C only)</p> <p>Color cap types Nil: Regular K: Mushroom button type *There is no mushroom button type in the indicator (indicator lamp).</p>																																			

ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

2. Pushbutton switches (non-illuminated types and transparent buttons)

ACBL 2

Mounting holes and flange shapes
 Mounting hole Flange shape
 6: 22 dia. 25.8 dia. projecting type
 7: 22 dia. 25.8 dia. flat type
 8: 22 dia. 25.8 square flat type
 (With mushroom button type)
 Mounting hole Flange shape
 9: 22 dia. 30 dia.

Protective construction
 2: Splashproof type (IP65)

No. of poles and operating characteristics
 5: Single-pole (1 Form C) momentary 7: Single-pole (1 Form C) Alternate
 6: Double-pole (2 Form C) momentary 8: Double-pole (2 Form C) Alternate

Contact material
 1: Standard type (Silver alloy contact) 2: Low-level circuit type (Gold-clad contact)

Types of color caps
 0: Transparent button K: Mushroom button

Pushbutton colors

Transparent button (Mushroom button: not clear)	R	J	Y	G	L	X	B
	Red	Orange	Yellow	Green	Blue	White	Black

Note: Mushroom button type is not available in orange.

Terminal shape and mounting dimensions
 Nil: Solderable tab terminal, standard mounting
 1: Terminal for PC board and standard mounting (only gold contact)
 4: Screw terminal (2 Form C only)

3. Selector switches

ACSL 2

Mounting holes and flange shapes
 Mounting hole Flange shape
 6: 22 dia. 25.8 dia. flat type
 7: 22 dia. 25.8 round square type

Protective construction
 2: Splashproof type (IP65)

Operation methods
 1: 2-notch manual reset Note) Manual reset: Switch is rotated to turn it on and remains on when released.
 3: 3-notch manual reset (Double poles only)

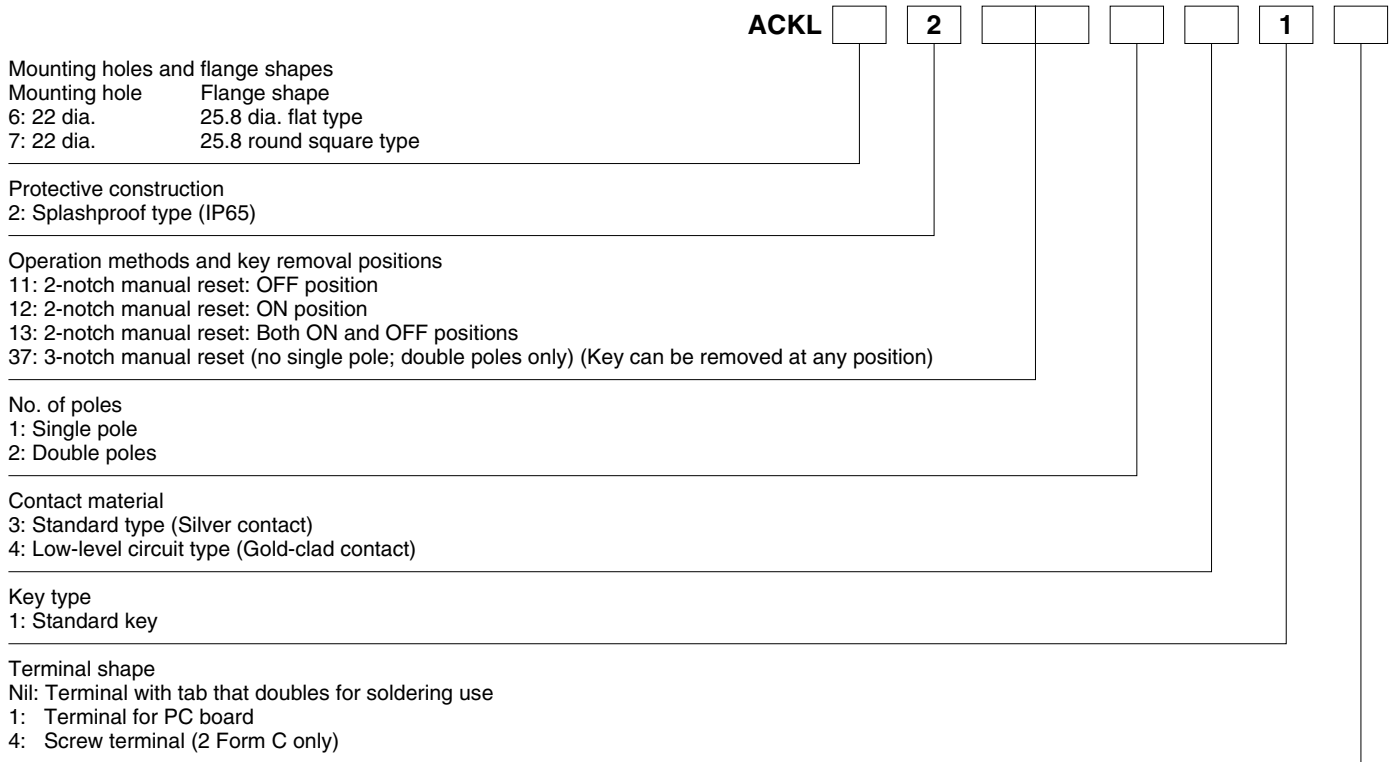
No. of poles
 5: Single pole (2-notch only) 6: Double poles

Contact material
 3: Standard type (Silver contact) 4: Low-level circuit type (Gold-clad contact)

Terminal shape
 Nil: Terminal with tab that doubles for soldering use
 1: Terminal for PC board
 4: Screw terminal (2 Form C only)

ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

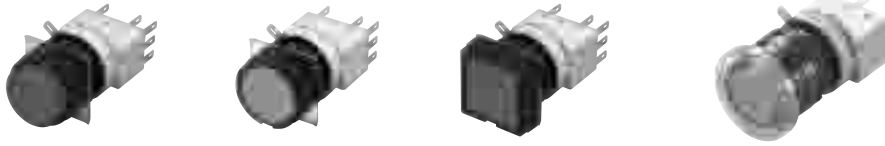
4. Key selector switches



ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

TYPES

1. Illuminated pushbutton switches (LED illumination)



25.8 dia. projecting type 25.8 dia. flat type 25.8 square flat type 30 dia. mushroom button type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			Momentary	Alternate
			Part No.	Part No.
25.8 dia. projecting type	Single pole	Standard type (Silver contact)	ACEL6211□*	ACEL6231□*
		Low-level circuit type (Gold-clad contact)	ACEL6212□*	ACEL6232□*
	Double poles	Standard type (Silver contact)	ACEL6221□*	ACEL6241□*
		Low-level circuit type (Gold-clad contact)	ACEL6222□*	ACEL6242□*
25.8 dia. flat type	Single pole	Standard type (Silver contact)	ACEL7211□*	ACEL7231□*
		Low-level circuit type (Gold-clad contact)	ACEL7212□*	ACEL7232□*
	Double poles	Standard type (Silver contact)	ACEL7221□*	ACEL7241□*
		Low-level circuit type (Gold-clad contact)	ACEL7222□*	ACEL7242□*
25.8 square flat type	Single pole	Standard type (Silver contact)	ACEL8211□*	ACEL8231□*
		Low-level circuit type (Gold-clad contact)	ACEL8212□*	ACEL8232□*
	Double poles	Standard type (Silver contact)	ACEL8221□*	ACEL8241□*
		Low-level circuit type (Gold-clad contact)	ACEL8222□*	ACEL8242□*
30 dia. mushroom button type	Single pole	Standard type (Silver contact)	ACEL9211□*K	ACEL9231□*K
		Low-level circuit type (Gold-clad contact)	ACEL9212□*△K	ACEL9232□*△K
	Double poles	Standard type (Silver contact)	ACEL9221□*K	ACEL9241□*K
		Low-level circuit type (Gold-clad contact)	ACEL9222□*△K	ACEL9242□*△K

Notes) 1. The following combinations of numbers and letters are entered in the square and in the * symbol to indicate the LED voltage and pushbutton color.

Pushbutton color		Red	Orange	Yellow	Green	Blue	White
							Opaque LED
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

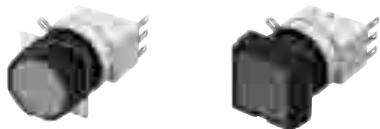
2. The white type has a colorless transparent cap.

3. If you would like PC board terminals, please add a "1" to the end of the part number when ordering. (However, if you would like mushroom button type PC board terminals, please add a "1" in the position marked by a triangle.)

If you would like screw terminal (2 Form C only), please add a "4" to the end of the part number when ordering. (However, if you would like mushroom button type screw terminal (2 Form C only), please add a "4" in the position marked by a triangle.)

However, the PC board terminal only applies to gold contacts.

2. Indicators (indicator lamps)



25.8 dia. flat type 25.8 square flat type

Form	Splashproof type (IP65)
	Part No.
25.8 dia. flat type	ACEL7200□*
25.8 square flat type	ACEL8200□*

Notes) 1. The following combinations of numbers and letters are entered in the square and in the * symbol to indicate the LED voltage and pushbutton color.

Pushbutton color		Red	Orange	Yellow	Green	Blue	White
							Opaque LED
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

2. The white type has a colorless transparent cap.

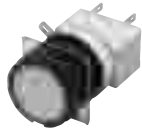
3. If you would like PC board terminals, please add a "1" to the end of the part number when ordering.

4. There is no mushroom button type in the indicator (indicator lamp).

5. There is no screw terminal type.

ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

3. Pushbutton switches (non-illuminated types and transparent buttons)



25.8 dia. projecting type

25.8 dia. flat type

25.8 square flat type

30 dia. mushroom button type

Color cap	Form	No. of poles	Contact material	Splashproof type (IP65)	
				Momentary	Alternate
				Part No.	Part No.
Transparent button	25.8 dia. projecting type	Single pole	Standard type (Silver contact)	ACBL62510*	ACBL62710*
			Low-level circuit type (Gold-clad contact)	ACBL62520*	ACBL62720*
		Double poles	Standard type (Silver contact)	ACBL62610*	ACBL62810*
			Low-level circuit type (Gold-clad contact)	ACBL62620*	ACBL62820*
	25.8 dia. flat type	Single pole	Standard type (Silver contact)	ACBL72510*	ACBL72710*
			Low-level circuit type (Gold-clad contact)	ACBL72520*	ACBL72720*
		Double poles	Standard type (Silver contact)	ACBL72610*	ACBL72810*
			Low-level circuit type (Gold-clad contact)	ACBL72620*	ACBL72820*
	25.8 square flat type	Single pole	Standard type (Silver contact)	ACBL82510*	ACBL82710*
			Low-level circuit type (Gold-clad contact)	ACBL82520*	ACBL82720*
		Double poles	Standard type (Silver contact)	ACBL82610*	ACBL82810*
			Low-level circuit type (Gold-clad contact)	ACBL82620*	ACBL82820*
Mushroom button	30 dia.	Single pole	Standard type (Silver contact)	ACBL9251K*	ACBL9271K*
			Low-level circuit type (Gold-clad contact)	ACBL9252K*	ACBL9272K*
		Double poles	Standard type (Silver contact)	ACBL9261K*	ACBL9281K*
			Low-level circuit type (Gold-clad contact)	ACBL9262K*	ACBL9282K*

Notes) 1. The following letter indicating the pushbutton color is entered in place of the * symbol.

Transparent button	Pushbutton color	Red	Orange	Yellow	Green	Blue	White	Black
	Part No.	R	J	Y	G	L	X	B

2. The white type has a colorless transparent cap.

3. The mushroom button type is not clear.

4. The mushroom button type is not available in orange.

5. If you would like PC board terminals, please add a "1" to the end of the part number when ordering. If you would like screw terminal (2 Form C only), please add a "4" to the end of the part number when ordering. However, the PC board terminal only applies to gold contacts.

4. Selector switches



25.8 dia. flat type

25.8 round square type

2-notch manual reset

3-notch manual reset

1) 2-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)
			Part No.
25.8 dia. flat type	Single pole	Standard type (Silver contact)	ACSL62153
		Low-level circuit type (Gold-clad contact)	ACSL62154
	Double poles	Standard type (Silver contact)	ACSL62163
		Low-level circuit type (Gold-clad contact)	ACSL62164
25.8 round square type	Single pole	Standard type (Silver contact)	ACSL72153
		Low-level circuit type (Gold-clad contact)	ACSL72154
	Double poles	Standard type (Silver contact)	ACSL72163
		Low-level circuit type (Gold-clad contact)	ACSL72164

Note: The screw terminal (2 Form C only) and terminals for PC board are also possible.

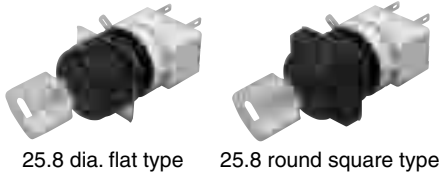
ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

2) 3-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)	
			Part No.	
25.8 dia. flat type	Double poles	Standard type (Silver contact)	ACSL62363	
		Low-level circuit type (Gold-clad contact)	ACSL62364	
25.8 round square type	Double poles	Standard type (Silver contact)	ACSL72363	
		Low-level circuit type (Gold-clad contact)	ACSL72364	




Note: The screw terminal (2 Form C only) and terminals for PC board are also possible.

5. Key selector switches




25.8 dia. flat type 25.8 round square type

1) 2-notch manual reset type

Form	No. of poles	Contact material	Splashproof type (IP65)		
					
			Key removed in OFF position	Key removed in ON position	Key removed in both OFF and ON positions
			Part No.	Part No.	Part No.
25.8 dia. flat type	Single pole	Standard type (Silver contact)	ACKL6211131	ACKL6212131	ACKL6213131
		Low-level circuit type (Gold-clad contact)	ACKL6211141	ACKL6212141	ACKL6213141
	Double poles	Standard type (Silver contact)	ACKL6211231	ACKL6212231	ACKL6213231
		Low-level circuit type (Gold-clad contact)	ACKL6211241	ACKL6212241	ACKL6213241
25.8 round square type	Single pole	Standard type (Silver contact)	ACKL7211131	ACKL7212131	ACKL7213131
		Low-level circuit type (Gold-clad contact)	ACKL7211141	ACKL7212141	ACKL7213141
	Double poles	Standard type (Silver contact)	ACKL7211231	ACKL7212231	ACKL7213231
		Low-level circuit type (Gold-clad contact)	ACKL7211241	ACKL7212241	ACKL7213241

Note: The screw terminal (2 Form C only) and terminals for PC board are also possible.

2) 3-notch manual reset type

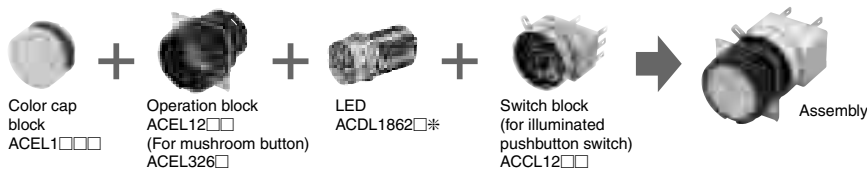
Form	No. of poles	Contact material	Splashproof type (IP65)	
				
			Key removed in all 3 positions	
			Part No.	
25.8 dia. flat type	Double poles	Standard type (Silver contact)	ACKL6237231	
		Low-level circuit type (Gold-clad contact)	ACKL6237241	
25.8 round square type	Double poles	Standard type (Silver contact)	ACKL7237231	
		Low-level circuit type (Gold-clad contact)	ACKL7237241	

Note: The screw terminal (2 Form C only) and terminals for PC board are also possible.

6. Ordering block items

1) 22 dia. mounting hole type illuminated pushbutton switches

The 22 dia. mounting hole type illuminated pushbutton switches consist of the four blocks below. Block items are given on a separate page.

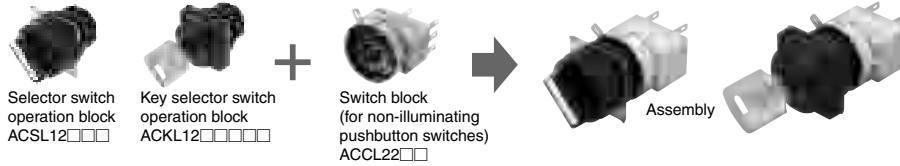


- Notes: 1. For LED, please see the page on accessories and maintenance parts.
2. Indicators (indicator lamps) are also combined as shown above. Please use a dedicated indicator for the color cap and switch block.
3. For the pushbutton switch (non-illuminating), please combine the color cap, operation block and switch block from the blocks above.

ND Series: 22 dia. types (ACEL, ACBL, AC SL, ACKL, ACZL)

2) Selector switches with 22 dia. mounting holes and key selector switches

Selector switches with 22 dia. mounting holes and key selector switches consist of the two blocks below. Block items are given on a separate page.



SPECIFICATIONS

1. Contact rating

1) Gold-clad contact

Load	Rating
Resistive load	0.1 A 125 V AC
	0.1 A 30 V DC
Minute load	1 mA 5 V AC/DC*

Note) The usable range for the minute load indicated by the asterisk may fluctuate depending on the usage conditions and the type of load.

2) Silver contact

Load	AC rating	DC rating
Resistive load	3 A 250 V AC	0.4 A 125 V DC
	3 A 125 V AC	2 A 30 V DC
Induction load*	1.5 A 250 V AC	0.2 A 125 V DC
	2 A 125 V AC	1 A 30 V DC

Note) The values for the induction load indicated by the asterisk are as follows: The alternating current induction load is PF = 0.6 to 0.7, and the direct current induction load is L/R = 7 ms and less.

2. LED rating

Rated operating voltage	Operating voltage range	Rated current	Lighted colors
5 V DC	5 V DC±5%	20 mA	Red, orange, yellow, opaque
		10 mA	Green, blue
12 V AC/DC	12 V AC/DC±10%	10 mA	Red, orange, yellow, green, blue, opaque
24 V AC/DC	24 V AC/DC±10%	10 mA	

Note) The current limiting resistor and protective diode are built into the LED bulb.

3. Characteristics

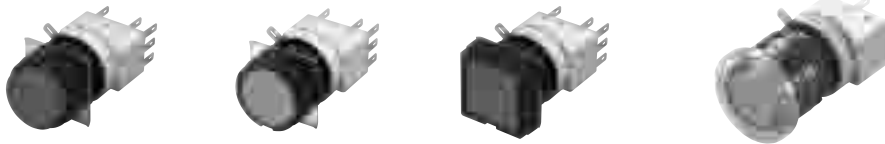
Item	Specifications
Standard usage condition	Ambient temperature: -25 to +60°C (Not freezing) For LED illumination, however, the ambient temperature is -25 to +50°C. (Storage temperature: -40 to +80°C) Relative humidity: 45 to 85% (with no condensation)
Contact resistance	Max. 50 mΩ (initial)
Insulation resistance	Min. 100 MΩ (500 V DC megger)
Dielectric strength	Switch section Between charging part and ground: 2,500 V AC for 1 min. Between terminals with unlike poles: 2,500 V AC for 1 min. Between terminals with like poles: 1,000 V AC for 1 min.
	Illuminating section Between charging part and ground: 2,500 V AC for 1 min.
Vibration resistance	Malfunctioning 10 to 55 Hz at double amplitude of 1.5 mm
Shock resistance	Durability 1,000 m/s ²
	Malfunctioning 196 m/s ²
Expected life	Mechanical Momentary: Min. 10 ⁶ times, switching frequency 1,200 times/hr. Alternate: Min. 5 x 10 ⁵ times, switching frequency 1,200 times/hr. Selector switch (incl. those with keys): Min. 2.5 x 10 ⁵ times, switching frequency 1,200 times/hr.
	Electrical Momentary: Min. 10 ⁵ times, switching frequency 1,200 times/hr. Alternate: Min. 10 ⁵ times, switching frequency 1,200 times/hr. Selector switch (incl. those with keys): Min. 10 ⁵ times, switching frequency 1,200 times/hr.
Protective construction	Splashproof type IP65 (IEC60529)
Terminal shape	110 terminal with tab that doubles for soldering use

ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

DIMENSIONS (unit: mm)

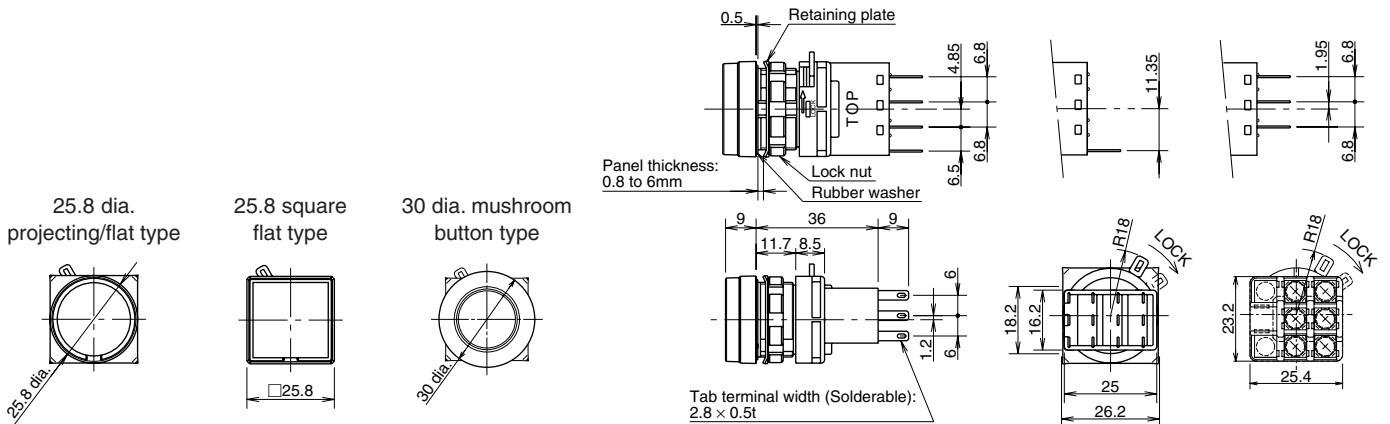
1. Illuminated pushbutton switches, indicators, and pushbutton switches

The photograph shows the illuminated pushbutton switch.

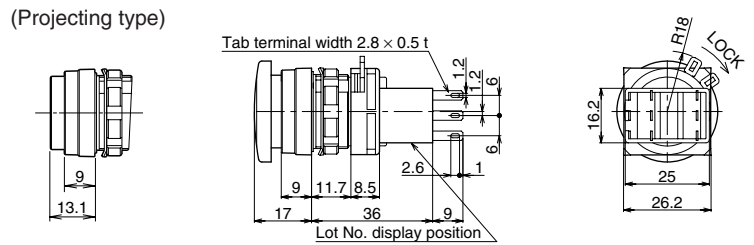


25.8 dia. projecting type 25.8 dia. flat type 25.8 square flat type 30 dia. mushroom button type

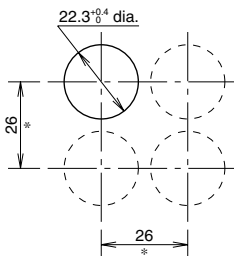
(Illuminated pushbutton switches) (Indicators) (Pushbutton switches)



- Notes
1. Pushbutton switches have only contact terminals, and do not have lamp terminals.
 2. Indicators have only lamp terminals, and do not have contact terminals.
 3. There is no mushroom button type in the indicator.
 4. There is no screw terminal in the indicator (indicator lamp).

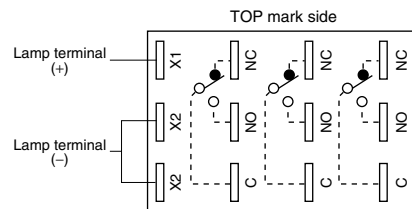


Panel mounting dimension



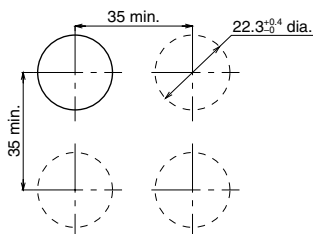
- Notes
1. The mounting pitch values in the above illustration are applicable when cluster adhesion mounting is used. Operability and other factors should be taken into consideration when the mounting pitch is decided.
Tab terminals that double for soldering:
If there is no terminal cover, allow at least 26 mm in the vertical and horizontal directions.
If there is a terminal cover, allow at least 26 mm in the vertical direction and 27 mm or more in the horizontal direction.
 2. Same for all models except mushroom button and screw terminal types.

WIRING DIAGRAM (BOTTOM VIEW)

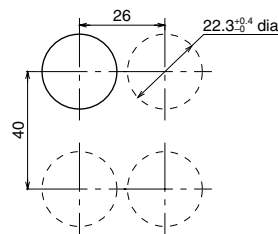


- Notes
1. Pushbutton switches have only contact terminals, and do not have lamp terminals.
 2. Indicators have only lamp terminals, and do not have contact terminals.
 3. The 1 Form C contact type has only the center terminal. The 2 Form C contact type has only a terminal on the right side and a terminal on the left side. (There is no center terminal.)

Mushroom button type



Screw terminal type

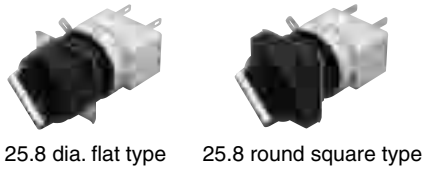


Note) Operability should be taken into consideration when deciding the mounting pitch.

ND Series: 22 dia. types (ACEL, ACBL, ACSL, ACKL, ACZL)

2. Selector switches/Key selector switches

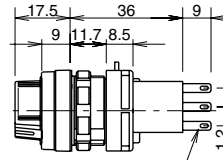
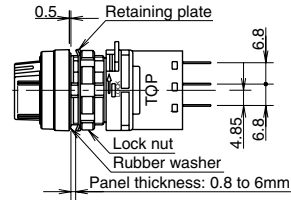
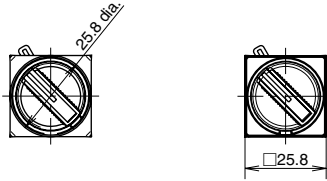
1) Selector switches



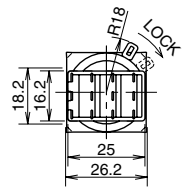
25.8 dia. flat type 25.8 round square type

External dimensions

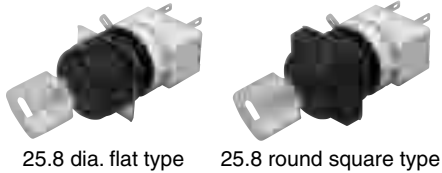
25.8 dia. type 25.8 round square type



Tab terminal width (Solderable): 2.8 × 0.5t



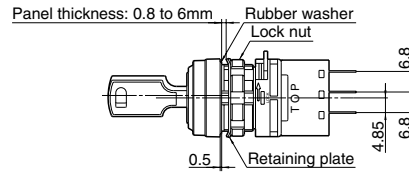
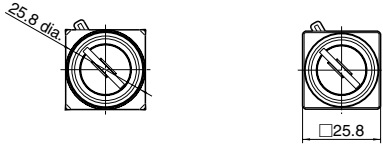
2) Key selector switches



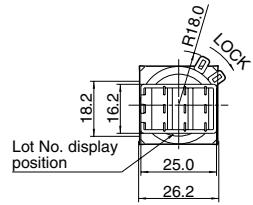
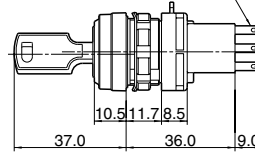
25.8 dia. flat type 25.8 round square type

External dimensions

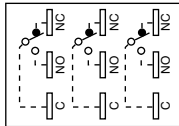
25.8 dia. flat type 25.8 round square type



Tab terminal width (Solderable): 2.8 × 0.5t



- For both selector switches and key selector switches/
WIRING DIAGRAM (BOTTOM VIEW)

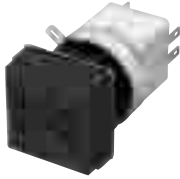


- Mounting hole diagram is same as one on previous page for the illuminated pushbutton switch.

Note) The 1 Form C contact type has only the center terminal. The 2 Form C contact type has only a terminal on the right side and a terminal on the left side. (There is no center terminal.)

Internal circuit diagram (common to Selector switches and Key selector switches)

Notch specifications		Contact arrangement	Notch positions (TOP VIEW)		
			1 (left)	0 (center)	2 (right)
90° -2-notch		1 Form C			
		2 Form C			
45° -3-notch		2 Form C			



FEATURES

The user can select a continuous buzzing sound, a long intermittent sound, or a short intermittent sound, using a slide switch inside the terminal part.

RoHS Directive compatibility information
<http://www.nais-e.com/>

TYPES

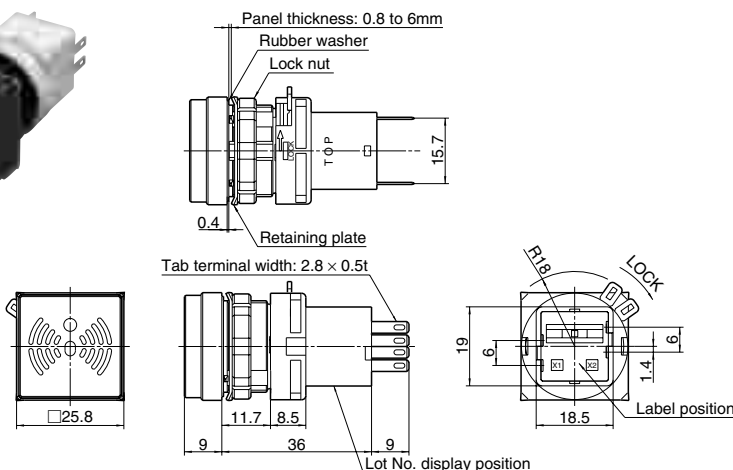
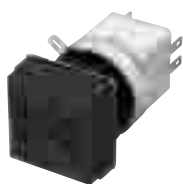
Mounting hole	Shape of panel front	Usage voltage	Part No.
22 mm dia.	25.8 square	12 to 24 V AC/DC $\pm 10\%$	ACZL8100

Note: Buzzers are not sold as block items.

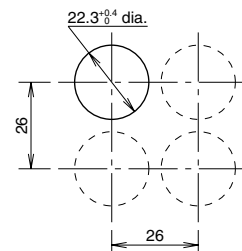
SPECIFICATIONS

Rated insulating voltage	60 V AC/DC
Rated operating voltage	12 to 24 V AC/DC $\pm 10\%$
Current consumption	DC: 7 mA, AC: 20 mA
Sound pressure (at 0.1 m)	Min. 80 dB for continuous sound (at rated voltage)
Sound frequency	2 kHz ± 500 Hz
Buzzer repetitions	Long intermittent: 55 times/min. $\pm 10\%$ Short intermittent: 600 times/min. $\pm 10\%$
Standard usage conditions	Ambient temperature: -20 to $+55^\circ\text{C}$ (Not freezing) Relative humidity: 45 to 85%
Insulation resistance	Min. 100 M Ω (500 V DC megger)
Dielectric strength	Between charging and non-charging parts: 1,000 V AC for 1 min.
Vibration resistance (malfunctioning)	5 to 55 Hz at unilateral amplitude of 0.5 mm
Shock resistance (durability)	1000 m/s ²
Expected life	1,000 hours min.
Protective construction	Enclosed type (JEM 1030)
Terminal shape	110 terminal with tab that doubles for soldering use

DIMENSIONS (unit: mm)

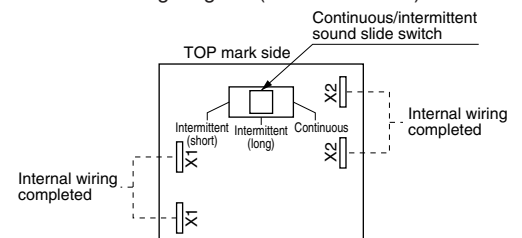


Panel mounting dimension



Note) Wiring operation should be taken into consideration when deciding the mounting pitch.

Wiring diagram (BOTTOM VIEW)



The input terminals are X1 and X2.
 (There is no + or - polarity.)

Accessories and maintenance items (22 dia.)

Ring tightener



Part No.	ACDL1801
Specifications	Metal
Unit	1 pc.

RoHS Directive compatibility information
<http://www.nais-e.com/>

- This tool is convenient for tightening the lock nuts used when mounting the unit on a panel.
- When tightening rings, the torque should be between 1.0 and 1.2 N·m (10.0 to 12.0 kgf·cm).

Maintenance parts should be installed by an engineer with specialized expertise in electrical components. When placing orders, please specify the number of marketing units.

Lamp replacement tool



Part No.	ACDL1803
Specifications	Rubber
Unit	1 pc.

- This is a rubber wrench that makes it easy to remove and install LEDs.

LEDs (parts for maintenance)

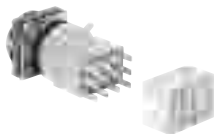


Part No.	ACDL1862□*	ACDL1862□*	ACDL1862□*
Rated operating voltage	5 V DC±5%	12 V AC/DC±10%	24 V AC/DC±10%
Rated current	*20 mA	10 mA	10 mA
	*10 mA		
Unit	10 pcs.		

- Notes) 1. The asterisk mark by the rated current of the 5 VDC type indicates the following:
 20 mA — Red, orange, yellow, opaque
 10 mA — Green, blue
2. The following combinations of numbers and letters are entered in the square and the asterisk of the product number to indicate the LED voltage and pushbutton color.

LED voltage	Pushbutton color	Red	Orange	Yellow	Green	Blue	White
		Opaque LED					
LED voltage	5 V DC	1R	4J	4Y	7G	7L	4X
	12 V AC/DC	2R	5J	5Y	8G	8L	5X
	24 V AC/DC	3R	6J	6Y	9G	9L	6X

Insulating terminal cover



Part No.	ACDL1851
Specifications	Nylon
Unit	10 pcs.

- This terminal cover is made of an opaque nylon material.

Note) When wiring the terminal, insert the lead into the hole in the insulating terminal cover before soldering it.

Accessories and maintenance items (22 dia.)

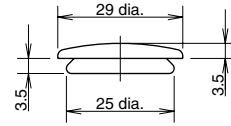
Mounting hole plug (rubber)



- This is used to fill in holes (22.3 dia.) that have been pre-cut in spare panels. The color is black.

Part No.	ACDL1822
Specifications	Rubber
Unit	10 pcs.

DIMENSIONS (unit: mm)



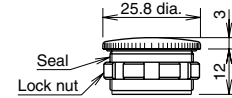
Mounting hole plug (metal)



- This is used to fill in unnecessary mounting holes cut in the panel.
- The tightening torque for the lock nuts should be 1.2 N-m or lower.
- Protective construction: IP66

Part No.	ACDL1823
Specifications	Metal
Unit	10 pcs.

DIMENSIONS (unit: mm)



Inscribed plate (maintenance part)



Shape	Round	Square	Mushroom button type
Part No.	ACDL1833	ACDL1834	ACDL1837
Unit	1 pack (5 plates)		

- This product is opaque.
- ACDL1837 for mushroom button is for illuminating pushbutton.

Cautions For Use of the ND Series (22 dia.)

Cautions For Use

1. Mounting and removing the color cap and inscribed plate

1) Removing the cap and plate

(1) Insert a small screwdriver or similar tool into the grooved part of the color cap (the concave part of the flange), and twist it lightly to remove the operating parts (the color cap, inscribed plate and holder).

Removing the operating parts



(2) When the color cap has been removed from the holder, the inscribed plate can be removed. Remove the color cap by pushing from the back on the section that joins the color cap and the holder, in the direction of the color cap.

Removing the color cap



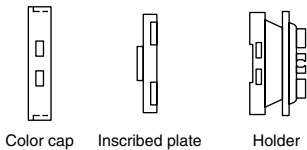
Note) The filter inside the holder is waterproof and cannot be removed.

2) Mounting the cap and plate

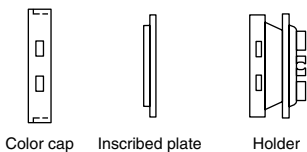
(1) Place the inscribed plate in the color cap, line it up with the section joining the color cap and the holder, and press them together. When doing this, if using the 25.8 dia. type, make sure you align the whirl-stop projection on the inscribed plate with the grooved part of the holder before inserting the plate.

(2) At this point, make sure the inscribed plate is facing the correct direction.

3) When using the 25.8 dia. type



3) When using the 25.8 dia. square type (Make sure the direction is correct)

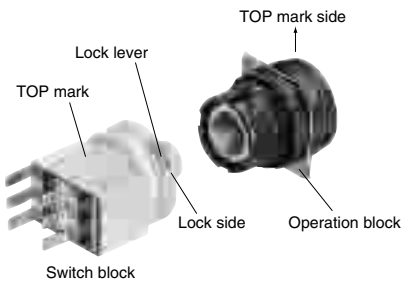


2. Panel mounting

Separate the operation block and switch block and attach the operation block to the panel hole from the front of the panel. Then mount the switch block.

1) Mounting and removing the switch block

(1) Move the lock lever of the switch block in the direction opposite the arrow to pull the switch block off of the operation block.
(2) When mounting the switch block, align the TOP marks on the operation block and the switch block, and move the lever in the direction of the arrow to lock the switch block in place.

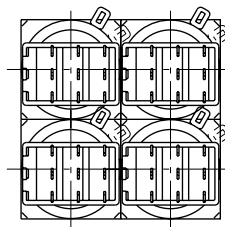


2) Precautions when mounting the panel

To tighten the ring when mounting the operation block panel, use the special tool (ring tightener, Part No. ACDL1801, sold separately), and tighten the ring to a torque of between 1.0 N·m and 1.2 N·m. Using radio pliers to tighten the ring, or tightening it beyond the required torque, can damage the ring, so be careful to tighten it correctly.

3) Collective mounting

The ND Series with a 22 dia. mounting hole can be installed and removed using a lock lever. The lock lever can be easily locked and released from the back side, using a screwdriver or similar tool. This enables collective mounting, and also makes it possible to remove any of the units.



3. Inscribed display

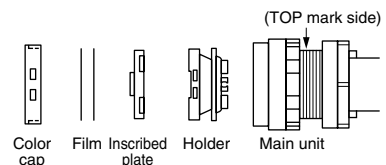
With the ND Series illuminated pushbutton switches and indicators (indicator lamps) with 22 dia. mounting holes, the internal inscribed plate can be engraved, and information can be displayed by inserting film.

1) Inscribed plate and inscribing film sizes

Item	25.8 dia. projection/flat type	25.8 dia. square flat type
Size and engraving range for internal inscribed plate	<p>Engraving range 17.8mm 0.85mm</p>	<p>Engraving range 17.5mm 0.85mm</p>
	Note) * This is 4.4 mm if using the 25.8 dia. projecting type.	
	(The engraving depth is 0.5 mm max.) Inscribed plate material: Opaque acrylic resin	
Applicable size of inscribing film	<p>19.8mm 17.7mm</p>	<p>19.8mm</p>
	Thickness: 0.1 mm x 2 sheets, or 0.2 mm x 1 sheet. Caution: The inscribing film is not built into the unit. Film material: Polyester film (recommended)	

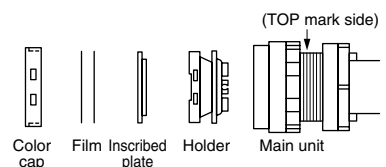
2) Sequence in which the inscribed plate and inscribing film are inserted

25.8 dia. projection/flat type



Note) The inscribing film is not built into the unit.

25.8 square flat type



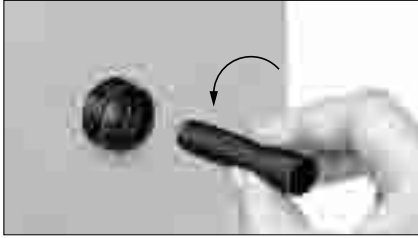
Note) The inscribing film is not built into the unit. Make sure that the inscribed plate is facing the correct direction.

Cautions For Use of the ND Series (22 dia.)

4. Mounting and removing LEDs

LEDs can be mounted and removed from the front of the panel, using the lamp replacement tool (Part. No. ACDL1803). [Removing the LED]

Insert the lamp replacement tool in the head of the LED, and turn it slightly to the left while pressing lightly on it, to remove the bulb.

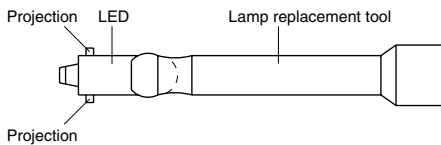


Lamp replacement tool
ACDL1803

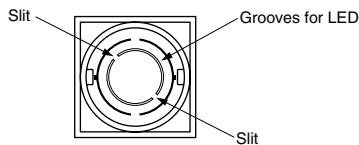


[Mounting the LED]

(1) Insert the lamp replacement tool lightly into the head of the LED, and hold it at that position.



(2) Align the LED's projections with slits of grooves for LED inside the main unit and insert it, turning it to the right while pressing lightly on it to install it.



5. Precautions when connecting wiring

1) Terminals should be soldered at 20 W for less than 5 seconds, or at 260°C for less than 3 seconds, without applying external force. When doing this work, make sure the soldering iron does not come in contact with the switch itself, and that no tensile force is applied to the terminal.

2) Non-corroding liquid resin flux should be used.

3) Positive Lock connectors (made by AMP Co.) and Easy Lock connectors (made by Nichifu Co.) may be used for the tab terminals. The table below shows the recommended models of connectors.

Item	Positive Lock connectors (by AMP Co.)		Easy Lock connectors (by Nichifu Co.)	
	Terminal	0.2 to 0.5 mm ²	175412-1	0.2 to 0.3 mm ²
0.5 to 1.25 mm ²		174778-1	0.5 to 1.25 mm ²	OSS-62815F3
Housing	174779-1		NET1-28-1P	

6. Handling the insulating terminal cover

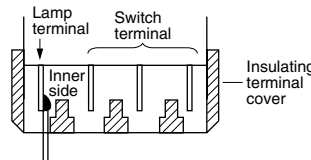
Align the TOP marks on the main unit and the insulating terminal cover, and insert the cover.

Note) When connecting the wiring, insert the lead into the hole in the insulating terminal cover before soldering it.



1) Wiring

When attaching the insulating terminal cover to a switch block with solder/tab terminals, solder the wire to the lamp terminal on the inner side of the terminal (the switch terminal side).



7. When using LED illumination

LEDs are configured of semiconductors, and if they are used at a voltage exceeding the maximum operating voltage, the LED element can deteriorate because of irregular heat generation, causing a noticeable drop in the intensity, discoloration, failure to light, and other problems. External noise, transient voltage, and transient current applied to the circuit can cause the same types of problems. With LED illuminated types that have a rated voltage of 5 VDC, 12 V AC/DC, or 24 V AC/DC in particular, the following items should be given careful consideration when using the LED.

1) Power supplies of LED illumination with a rated voltage of 12 V AC/DC, or 24 V AC/DC

LED illumination used with a rated voltage of 12 V AC/DC, or 24 V AC/DC can use both alternating and direct current, and either alternating current or direct current power supplies can be used with these. The voltage used should be within a range of ±10% of the rated voltages for both the alternating and direct current.

2) Direct current power supplies

(1) Constant-voltage power supplies for switching and other power supplies These are ideal power supplies. They should be used within the operating voltage range of the LED block.

(2) Batteries

When charging, and immediately after charging, please be aware that the voltage may exceed the operating voltage for the LED in some cases. Make sure the voltage is within a range of ±10% of the rated voltage for the LED (±5% for a rated voltage of 5 V).

(3) Full-wave rectification

Since both alternating and direct current can be used, there is no need for rectification using a diode bridge. Please be aware that, if full-wave rectification using a diode bridge is used, the rectifying diode may cause the voltage to drop, resulting in decreased intensity.

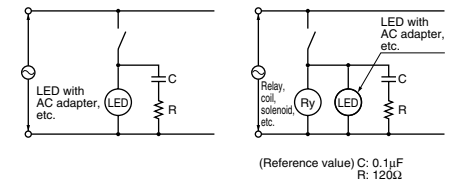
(4) Single-phase half-wave rectification This is not appropriate as the power supply for the LED block. We recommend using a direct current constant-voltage power supply.

3) Noise

External noise can cause the LED element to deteriorate, causing a noticeable drop in the intensity, discoloration, failure to light, and other problems. In situations where this may occur, the preventive measures noted below should be considered. An element such as a CR element or surge absorber should be used to prevent adverse effects caused by noise.

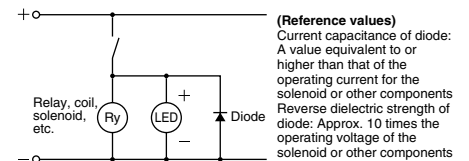
(Circuit example 1)

Alternating current cases



(Circuit example 2)

Direct current case



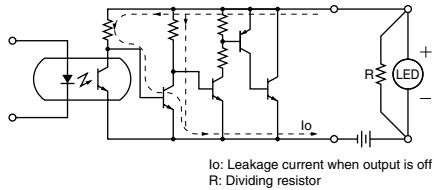
Cautions For Use of the ND Series (22 dia.)

4) Corrective action for dark illumination

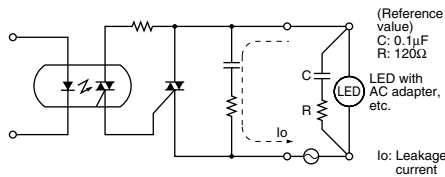
(1) Leakage current

Leakage current from the non-contact switch that lights the LED block or from the contact protective circuit can cause the LED block to light faintly in some cases even if the output is off. If this happens, the following corrective steps should be taken.

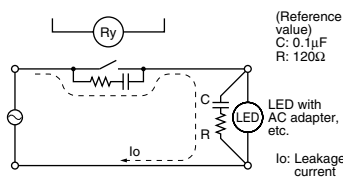
[1] If the LED block (direct-current type) is being lighted by a transistor output type of non-contact switch, insert a dividing resistor in parallel with the LED block. (Circuit example)



[2] If the LED block (alternating-current type) is being lighted by a TRIAC output type of non-contact switch built into a CR element, insert a CR element in parallel with the LED block. (Circuit example)

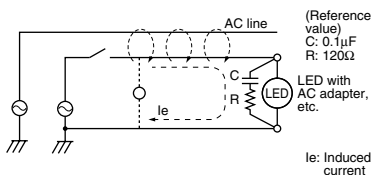


[3] If the LED block (alternating-current type) is being lighted by a relay output to which a CR element that protects the contact has been connected in parallel, insert a CR element in parallel with the LED block. (Circuit example)



(2) Induction

When using units with AC adaptors, induction from the surrounding AC line may cause the lamp to light dimly. Corrective action: Insert a CR element in parallel with the LED block.



8. Handling and Usage Precautions

1) Aggregate tight mounting

Please be aware that heat caused by aggregate tight mounting of indicator lamps and illuminated pushbutton switches or continuously lit lamps can cause the ambient temperature to exceed the prescribed amount. Measures must be taken to ventilate or lower the operation voltage if the mounting panel is not metal or if the product is being used in a sealed control panel.

2) Replacement of buttons (illuminating and non-illuminating)

Do not replace alternate type buttons (illuminating and non-illuminating) when they are locked. (Replacing while locked might damage the internal mechanism.) You must release the locks before replacing.

3) Storage and place of use

(1) Please use within the working ambient temperature and humidity ranges given on the ratings display.
(2) When using in a location where oil, water and dirt are present, install a dust cover so that foreign substances cannot enter the sliding part of the pushbutton.

4) Contact (microswitch)

When using identical NC (normal close) and NO (normal open) microswitch contacts, do not connect to the wrong voltage or to the wrong type of power supply. Doing so will cause a dead short.

5) Oil resistance

The product has been evaluated with commonly used standard machining oil and cooling oil. Please inquire about other oils, since use of some special oils may not be possible.

ND Series Block Items (16 dia.)

Please see "Ordering block items" for information on combining block items with 16 dia. mounting holes.

TYPES

1. Color cap block

1) For illuminated pushbutton and pushbutton (transparent buttons)



Form	18 dia. projecting type	18 square flat type	18 × 24 flat type	
Part No.	Red	ACEL112R	ACEL113R	ACEL114R
	Orange	ACEL112J	ACEL113J	ACEL114J
	Yellow	ACEL112Y	ACEL113Y	ACEL114Y
	Green	ACEL112G	ACEL113G	ACEL114G
	Blue	ACEL112L	ACEL113L	ACEL114L
	White	ACEL112X	ACEL113X	ACEL114X
	Black	ACEL112B	ACEL113B	ACEL114B

Note: "White" is non-colored and transparent.

2) For indicator (indicator lamp) (transparent buttons)

Form	18 dia. projecting type	18 square flat type	18 × 24 flat type	
Part No.	Red	ACEL102R	ACEL103R	ACEL104R
	Orange	ACEL102J	ACEL103J	ACEL104J
	Yellow	ACEL102Y	ACEL103Y	ACEL104Y
	Green	ACEL102G	ACEL103G	ACEL104G
	Blue	ACEL102L	ACEL103L	ACEL104L
	White	ACEL102X	ACEL103X	ACEL104X

Note: "White" is non-colored and transparent.

3) Mushroom button

Form	For 24 dia. illuminated pushbutton	For 24 dia. pushbutton	For 30 dia. illuminated pushbutton	For 30 dia. pushbutton	
Part No.	Red	ACEL120KR	ACEL130KR	ACEL145KR	ACEL155KR
	Orange	ACEL120KJ	—	ACEL145KJ	—
	Yellow	ACEL120KY	ACEL130KY	ACEL145KY	ACEL155KY
	Green	ACEL120KG	ACEL130KG	ACEL145KG	ACEL155KG
	Blue	ACEL120KL	ACEL130KL	ACEL145KL	ACEL155KL
	White	ACEL120KX	ACEL130KX	ACEL145KX	ACEL155KX
	Black	—	ACEL130KB	—	ACEL155KB

Notes: 1. The button for the illuminated pushbutton is transparent and the one for the pushbutton is non-transparent. Black color is only for the pushbutton and orange is only for the illuminated pushbutton.

2. The inscribed plate (ACDH1836) is included with the 30 dia. mushroom button for the illuminated pushbutton.

2. Operation block

1) For illuminated pushbutton, non-illuminated pushbutton and indicator (indicator lamp)



Form	18 dia. projecting type	18 square flat type	18 × 24 flat type	30 dia. mushroom type	
Operation characteristics	Momentary	Part No. ACEL1221	ACEL1231	ACEL1241	ACEL2251
	Alternate	Part No. ACEL1222	ACEL1232	ACEL1242	ACEL2252
Indicator (indicator lamp)	Part No. ACEL1220	ACEL1230	ACEL1240	—	

Note: Use the 18 dia. projecting type for the 24 dia. mushroom pushbutton.

ND Series Block Items (16 dia.) (ACEL, ACSL, ACKL, ACCL, ACDL)






2) For selector switches













Form	18 dia. projecting type		18 square flat type		18 × 24 flat type	
Operation methods	2-notch manual reset	3-notch manual reset	2-notch manual reset	3-notch manual reset	2-notch manual reset	3-notch manual reset
Part No.	ACSL12521	ACSL12523	ACSL12321	ACSL12323	ACSL12421	ACSL12423

3) For key selector switches



Form	18 square flat type				
Operation methods	2-notch manual reset			2-notch automatic reset	3-notch manual reset
Key removal positions	 OFF position	 ON position	 Both ON and OFF positions	 OFF position	 Key can be removed at all 3 positions
Part No.	ACKL1232111	ACKL1232121	ACKL1232131	ACKL1232211	ACKL1232371

Form	18 × 24 flat type				
Operation methods	2-notch manual reset			2-notch automatic reset	3-notch manual reset
Key removal positions	 OFF position	 ON position	 Both ON and OFF positions	 OFF position	 Key can be removed at all 3 positions
Part No.	ACKL1242111	ACKL1242121	ACKL1242131	ACKL1242211	ACKL1242371

Form	18 dia. flat type				
Operation methods	2-notch manual reset			2-notch automatic reset	3-notch manual reset
Key removal positions	 OFF position	 ON position	 Both ON and OFF positions	 OFF position	 Key can be removed at all 3 positions
Part No.	ACKL1252111	ACKL1252121	ACKL1252131	ACKL1252211	ACKL1252371

3. Switch block (tight mounting type)



Form			For illuminated pushbutton switches	For non-illuminated pushbutton switches	For indicator (indicator lamp)
Standard type (Silver contact)	Single pole	Part No.	ACCL16112	ACCL26112	Part No. ACCL16002
	Double poles	Part No.	ACCL16212	ACCL26212	
Low-level circuit type (Gold-clad contact)	Single pole	Part No.	ACCL16122	ACCL26122	
	Double poles	Part No.	ACCL16222	ACCL26222	

Note: Terminals for PC board are also possible.

4. Lamp holder



Part No.	ACDL1870
Unit	10 pcs.

Note: *Please order lamp holders in units of ten pieces.

ND Series Block Items (22 dia.)

Please see "Ordering block items" for information on combining block items with 22 dia. mounting holes.

TYPES

1. Color cap block

1) For illuminated pushbutton and pushbutton (transparent buttons)



RoHS Directive compatibility information
<http://www.nais-e.com/>

Form	25.8 dia. projecting type	25.8 dia. flat type	25.8 square flat type	
Part No.	Red	ACEL116R	ACEL117R	ACEL118R
	Orange	ACEL116J	ACEL117J	ACEL118J
	Yellow	ACEL116Y	ACEL117Y	ACEL118Y
	Green	ACEL116G	ACEL117G	ACEL118G
	Blue	ACEL116L	ACEL117L	ACEL118L
	White	ACEL116X	ACEL117X	ACEL118X
	Black	ACEL116B	ACEL117B	ACEL118B

Note: "White" is non-colored and transparent.

2) For indicator (indicator lamp) (transparent buttons)

Form	25.8 dia. flat type	25.8 square flat type	
Part No.	Red	ACEL107R	ACEL108R
	Orange	ACEL107J	ACEL108J
	Yellow	ACEL107Y	ACEL108Y
	Green	ACEL107G	ACEL108G
	Blue	ACEL107L	ACEL108L
	White	ACEL107X	ACEL108X

Note: "White" is non-colored and transparent.

3) Mushroom button

Form	For 30 dia. illuminated pushbutton	For 30 dia. pushbutton	
Part No.	Red	ACEL169KR	ACEL179KR
	Orange	ACEL169KJ	—
	Yellow	ACEL169KY	ACEL179KY
	Green	ACEL169KG	ACEL179KG
	Blue	ACEL169KL	ACEL179KL
	White	ACEL169KX	ACEL179KX
	Black	—	ACEL179KB

Notes: 1. The button for the illuminated pushbutton is transparent and the one for the pushbutton is non-transparent. Black color is only for the pushbutton and orange is only for the illuminated pushbutton.

2. The inscribed plate (ACDL1837) is included with the 30 dia. mushroom button for the illuminated pushbutton.

2. Operation block

1) For illuminated pushbutton, non-illuminated pushbutton and indicator (indicator lamp)



Form	25.8 dia.	25.8 square flat type	30 dia. mushroom type	
Operation characteristics	Momentary	Part No. ACEL1261	ACEL1281	ACEL3291
	Alternate	Part No. ACEL1262	ACEL1282	ACEL3292
Indicator (indicator lamp)	Part No. ACEL1260	ACEL1280	—	

ND Series Block Items (22 dia.) (ACEL, ACCL, ACKL, ACCL)

2) For selector switches



Form	25.8 dia. flat type		25.8 round square type	
Operation methods	2-notch manual reset	3-notch manual reset	2-notch manual reset	3-notch manual reset
Part No.	ACSL12621	ACSL12623	ACSL12721	ACSL12723

3) For key selector switches



Form	25.8 dia. flat type				25.8 round square type			
Operation methods	2-notch manual reset			3-notch manual reset	2-notch manual reset			3-notch manual reset
Key removal positions								
Part No.	ACKL1262111	ACKL1262121	ACKL1262131	ACKL1262371	ACKL1272111	ACKL1272121	ACKL1272131	ACKL1272371

3. Switch block



Form			For illuminated pushbutton switches	For non-illuminated pushbutton switches	For indicator (indicator lamp)
Standard type (Silver contact)	Single pole	Part No.	ACCL1211	ACCL2211	Part No. ACCL1200
	Double poles	Part No.	ACCL1221	ACCL2221	
Low-level circuit type (Gold-clad contact)	Single pole	Part No.	ACCL1212	ACCL2212	
	Double poles	Part No.	ACCL1222	ACCL2222	

Note: Terminals for PC board and screw terminals are also possible.