

High Performance Display Units : Serial / Parallel Input



DS / DA Series PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Simple wiring without soldering
 - multi-stage connection using expansion connectors or ribbon cables.
 - power supply and data wiring required on base unit only.
- Various input options
 - Serial input
 - Dynamic Parallel input
 - RS485 communication (Modbus) input (Master, Slave)
 - RS485 communication (Modbus) time sync display
 - PT temperature sensor input
 - PT temperature sensor + RS485 communication input
- Expandable up to 24 units with multi-stage connection
- Available in various sizes: 16 mm, 22.5 mm, 40 mm, 60 mm
- High luminance LED display
- Various unit display plates (switchable) with flashing or ON/OFF options
- Various display types
 - 7-segment display and 16-segment
 - Red and green display types
 - Display 64 characters (0 to 9, A to Z, 27 symbols, decimal point)

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

- 01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Install on a device panel to use.**
Failure to follow this instruction may result in fire.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire.
- 05. Check 'Unit Descriptions' before wiring.**
Failure to follow this instruction may result in fire.
- 06. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

- 01. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 02. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
- 03. Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 12 - 24 VDC≡ model power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise. In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category I

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

D **①** **②** **-** **③** **④**

① Display method

S: 7-segment
A: 16-segment

② Character size

16: W 16 × H 24 mm
22: W 20 × H 33 mm
40: W 40 × H 60 mm
60: W 60 × H 96 mm

③ Display color

R: Red
G: Green

④ Input method (basic unit)

S: Serial input
P: Parallel input

Product Components

- Product × 1
- 16 / 22 mm Cap (left-right 1 set) × 1
- 22 / 40 / 60 Connector (parallel input) × 1
- Instruction manual × 1
- 22 mm Connector (serial input) × 1

Sold Separately

- Expansion unit (DS□□□E / DA□□□E)
: select the same size / display color of basic unit
(available to mix the display method)
- 16 / 22 mm middle bracket (BK-D□□R)
- 16 / 22 mm unit-display unit (DU□□□□)

Specifications

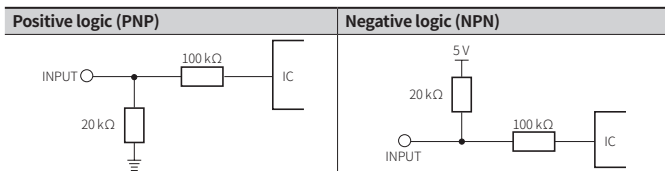
Model	DS16-□□	D□22-□□	D□40-□□	D□60-□□
Display color	Red / green model			
Power supply	12 - 24 VDC≒			
Permissible voltage range	90 to 110 % of rated voltage			
Current consumption (red)	≤ 20 mA	≤ 25 mA	≤ 55 mA	≤ 65 mA
Current consumption (green)	≤ 15 mA	≤ 20 mA	≤ 40 mA	≤ 45 mA
Characters size (W×H)	9 × 16 mm	11.2 × 22.5 mm	22.4 × 40 mm	33.6 × 60 mm
Noise immunity	± 500 V the square wave noise (pulse width: 1 μs) by the noise simulator			
Ambient temperature	-10 to 55 °C, storage: -25 to 65 °C (no freezing or condensation)			
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)			
Protection rating	IP40 (front part)			
Certification	CE ENEC			
Weight (packaged) ⁰¹⁾	≈ 12 g (≈ 52 g)	≈ 17 g (≈ 58 g)	≈ 28 g (≈ 63 g)	≈ 60 g (≈ 110 g)

01) The package weight of 16 mm / 22 mm expansion unit varies, it based on 3 packages.
16 mm: ≈ 77 g / 22 mm: ≈ 92 g

Model	D□□□□S	D□□□□P
Input method	Serial	Parallel
Max. Clock ⁰¹⁾	≤ 2 kHz	Dynamic 1: ≤ 3 kHz Dynamic 2: ≤ 1.5 kHz
Input logic	Positive logic (PNP), negative logic (NPN)	
Input resistance	20 kΩ	
Input level	High: 4.5 - 24 VDC≒, Low: 0 - 1.2 VDC≒	
Display character	64 characters and symbols display: 0 to 9, A to Z, 27 symbols, decimal point	
Max. number of multi-stage	24-unit	Dynamic 1: 6-unit (4-bit) or 4 units (6-bit) Dynamic 2: 24-unit (6-bit)

01) Based on 50 : 50 (%) of duty ratio (ON / OFF)

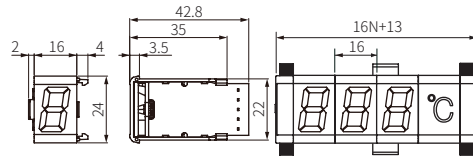
Input Circuit



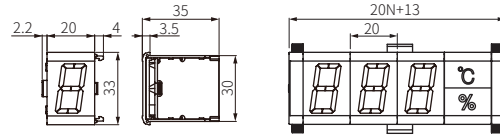
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.
- N: number of units

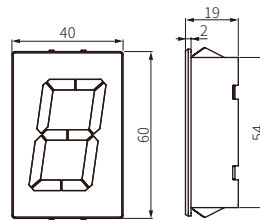
■ 16 mm size



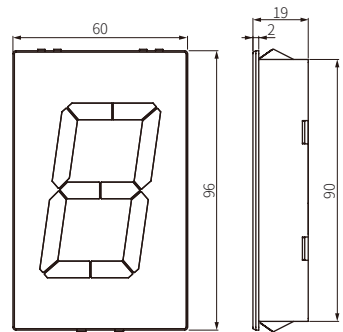
■ 22 mm size



■ 40 mm size

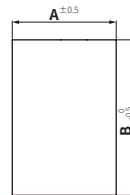


■ 60 mm size



■ Panel cut-out

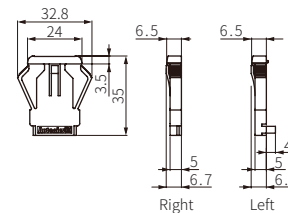
- Panel thickness: 1.5 to 4 mm



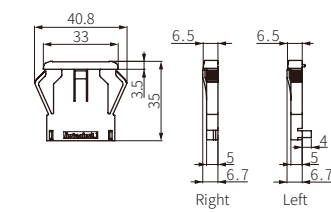
Model	A	B
16 mm	16N+11	23
22 mm	20N+11	31
40 mm	40N-2	55
60 mm	60N-3	91

■ Cap

- 16 mm size



- 22 mm size

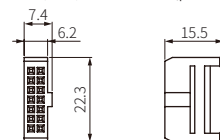


■ Connector

- 22 mm size (serial input)



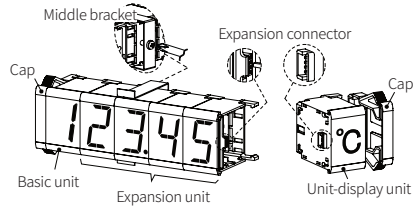
- 22 / 40 / 60 mm size (parallel input)



Connection of Units

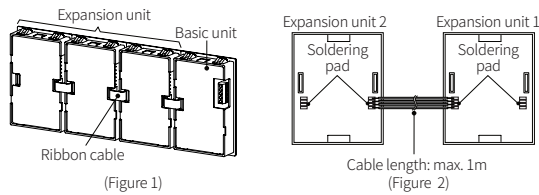
■ 16 / 22 mm size

- Connect a basic unit, expansion units, a unit-display unit from the left and connect the caps the end of right and left.
- Use the middle bracket (sold separately) to protect deflection when connecting over 7 units. Use one middle bracket per 7 units. (tightening torque: $\leq 0.5 \text{ N m}$)



■ 40 / 60 mm size

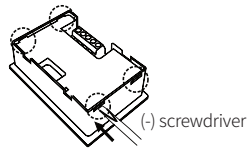
- Connect expansion connectors of units using a ribbon cable. (Figure 1)
- If the distance between expansion units is far as (Figure 2), you can connect the cable at the soldering pad. To use a soldering pad, remove the protection cover which only expansion units have.
- Refer to the 'Removing Protection Cover of Expansion Unit' to detach the cover.



Removing Protection Cover of Expansion Unit

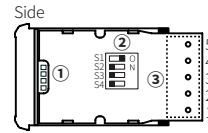
Press the connection parts (4-point) of the protection cover at the top / bottom of the 40 / 60 mm expansion unit with (-) screwdriver and the protection cover is removed. To operate the function set switches, you should remove the protection cover on the rear part.

⚠ Caution: Before removing the protection cover, power must be turned OFF.

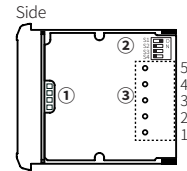


[Serial Input Model] Unit Descriptions

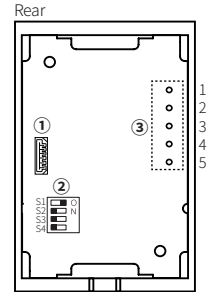
■ 16 mm size



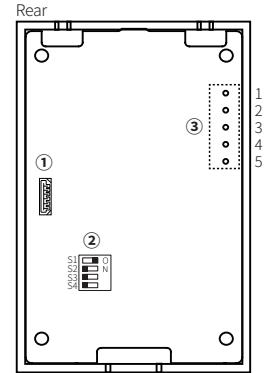
■ 22 mm size



■ 40 mm size



■ 60 mm size



① Expansion connector

Using for connecting expansion unit. Refer to the 'Connection of Units.'

② Function set switches Basic unit only

No.	Switch OFF (■□)	Switch ON (□■)	Function	Default
S1	Positive logic (PNP)	Negative logic (NPN)	Input logic	ON
S2	Not used	Use	Zero Blanking	OFF
S3	Not used	Use	Decimal number display ⁰¹⁾	OFF
S4	8 bits	5-bit	Data input bit	OFF

01) The other data except 0 to 9 are blank.

③ Input terminal Basic unit only

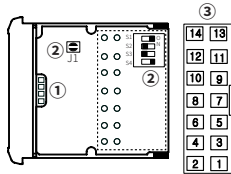
No.	Code	Function
1	VCC	12 - 24 VDC=
2	GND	0 V
3	Data	Data input
4	CLOCK	CLOCK input
5	LATCH	LATCH input

- The basic unit supplies the power for expansion unit and the unit-display unit and DATA input.
- For the 22 mm size model, connect the connector to the input terminal.

[Parallel Input Model] Unit Descriptions

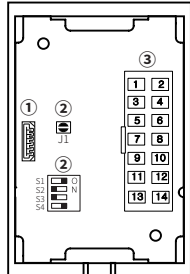
22 mm size

Side



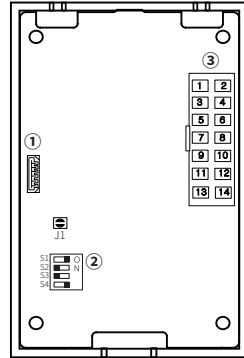
40 mm size

Rear



60 mm size

Rear



① Expansion connector

Using for connecting expansion unit. Refer to the 'Connection of Units.'

② Function set switches Basic unit only

No.	Switch OFF (□)	Switch ON (■)	Function	Default
S1	Positive logic (PNP)	Negative logic (NPN)	Input logic	ON
S2	Not used	Use	Zero Blanking	OFF
S3	6-bit	4-bit	Data input bit	OFF
S4	Dynamic Parallel 1	Dynamic Parallel 2 ⁽⁰¹⁾	Dynamic Parallel 1/2	ON
J1	Open not used ⁽⁰²⁾	Short use ⁽⁰³⁾	All Zero Blanking	OFF

01) 6-bit data input, All Zero Blanking OFF are fixed.

02) Not using All Zero Blanking

Basic unit				0	Basic unit	4	5
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03) Using All Zero Blanking

Basic unit					Basic unit	4	5
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③ Input terminal Basic unit only

No.	Dynamic Parallel 1				Dynamic Parallel 2	
	4-bit		6-bit		6-bit	
	Code	Function	Code	Function	Code	Function
1	VCC	12 - 24 VDC ≡	VCC	12 - 24 VDC ≡	VCC	12 - 24 VDC ≡
2	GND	0 V	GND	0 V	GND	0 V
3	LE5	LATCH 5	LE3	LATCH 3	LATCH	LATCH input
4	LE4	LATCH 4	LE2	LATCH 2	CLOCK	CLOCK input
5	LE3	LATCH 3	LE1	LATCH 1	-	-
6	LE2	LATCH 2	LE0	LATCH 0	UNIT	Unit
7	LE1	LATCH 1	DP	Decimal point	DP	Decimal point
8	LE0	LATCH 0	D5	2 ⁵ data	D5	2 ⁵ data
9	DP	Decimal point ⁽⁰¹⁾	D4	2 ⁴ data	D4	2 ⁴ data
10	D3	2 ³ data	D3	2 ³ data	D3	2 ³ data
11	D2	2 ² data	D2	2 ² data	D2	2 ² data
12	D1	2 ¹ data	D1	2 ¹ data	D1	2 ¹ data
13	D0	2 ⁰ data	D0	2 ⁰ data	D0	2 ⁰ data
14	GND	0 V	GND	0 V	GND	0 V

01) When Zero Blanking, All Zero Blanking is set as ON, display "-" or "-1" when dot display data at the lowest display unit (minus display).

		1	2	3	→		-	1	2	3	
1	2	3	4	5	→	-	1	2	3	4	5

Input Data Chart

- Based on the Serial / Parallel positive logic (PNP).
- Serial 5-bit / Parallel 4-bit input display 0 to 9, A to F.
- If there is no input data after supplying the power, the basic unit displays input method character (S / P).

7-segment								16-segment								High 2-bit Low 4-bit			
D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D3	D2	D1	D0
L	L	L	H	H	L	H	H	L	L	L	H	H	L	H	H				
0	0	G	W	0	0	0	G	W	0	0	G	W	0	0	0	L	L	L	L
1	H	H	X	0	:	1	H	X	0	1	H	X	0	:	1	L	L	L	H
2	I	I	Y	0	.	2	I	Y	0	2	I	Y	0	.	2	L	L	H	L
3	J	J	Z	0	''	3	J	Z	0	3	J	Z	0	''	3	L	L	H	H
4	K	K	-1	0	*	4	K	-1	0	4	K	-1	0	*	4	L	H	L	L
5	L	L	(	0	w	5	L	(	0	5	L	(	0	w	5	L	H	L	H
6	M	M	)	0	h	6	M	)	0	6	M	)	0	h	6	L	H	H	L
7	N	N	'	0	l	7	N	'	0	7	N	'	0	l	7	L	H	H	H
8	O	O	"	0	J	8	O	"	0	8	O	"	0	J	8	H	L	L	L
9	P	P	^	0	K	9	P	^	0	9	P	^	0	K	9	H	L	L	H
A	Q	Q	.	0	K	A	Q	.	0	A	Q	.	0	K	A	H	L	H	L
B	R	R	/	0	N	B	R	/	0	B	R	/	0	N	B	H	L	H	H
C	S	S	?	0	O	C	S	?	0	C	S	?	0	O	C	H	H	L	L
D	T	T	-	0	T	D	T	-	0	D	T	-	0	T	D	H	H	L	H
E	U	U	_	0	X	E	U	_	0	E	U	_	0	X	E	H	H	H	L
F	V	V	=	Blank		F	V	=	Blank		F	V	=	Blank		H	H	H	H

Example Programs

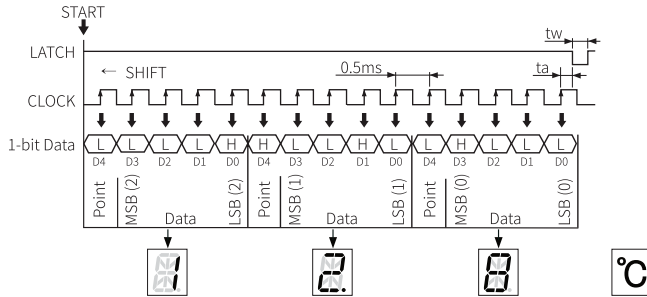
Download the various example programs from the Autonics website.

[Serial Input Model] Data Input Method

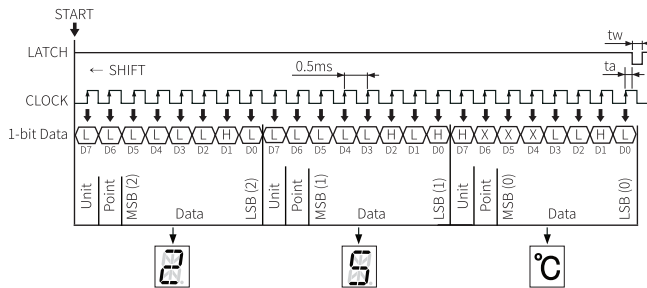
- Clock: ≤ 2 kHz
- $t_a: \geq 0.2$ ms / $t_w: \geq 0.25$ ms
- When using 5-bit serial input, the unit-display unit is available only for turning ON. Do not input data to the unit-display unit.

■ 5-bit Serial input (e.g.: 12.8 °C)

- These are examples for positive logic (PNP).



■ 8-bit Serial input (e.g.: 25 °C)



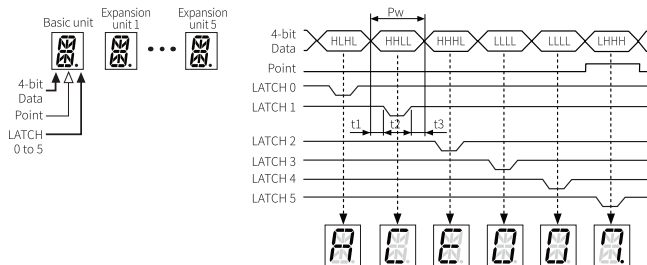
[Parallel Input Model] Data Input Method

- Max. data input speed: 3 kHz
- $P_w = t_1 + t_2 + t_3$
- $P_w: \geq 0.33$ ms
- $t_1: \geq 0.05$ ms \rightarrow Data LATCH
- $t_2: \geq 0.23$ ms \rightarrow Data move
- $t_3: \geq 0.05$ ms \rightarrow Data LATCH
- When using 4-bit / 6-bit Dynamic Parallel 1, the unit-display unit is available only for turning ON. Do not input data to the unit-display unit.

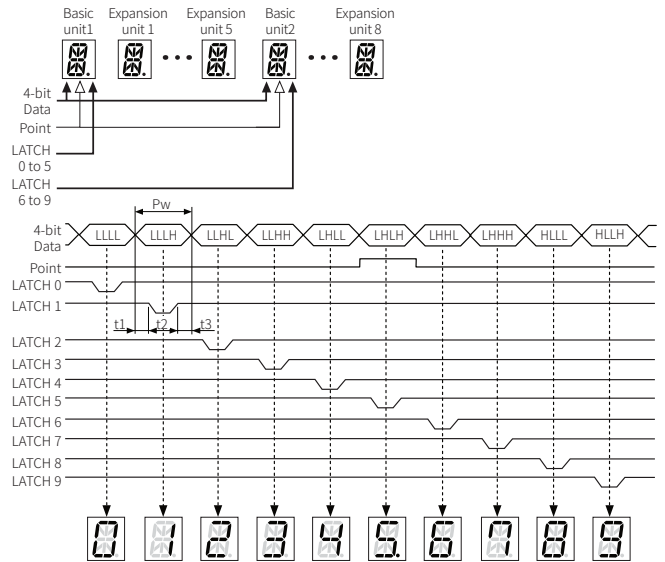
■ Example of unit organization by data input

Dynamic Parallel 1	4-bit	Connectable 1 basic unit and 5 expansion units (6-digit) E.g.) 10-digit organization: (1 basic unit + 5 expansion units) + (1 basic unit + 3 expansion units)
	6-bit	Connectable 1 basic unit and 3 expansion units (4-digit) E.g.) 10-digit organization: (1 basic unit + 3 expansion units) $\times 2$ + (1 basic unit + 1 expansion units)
Dynamic Parallel 2	6-bit	Connectable 1 basic unit and 23 expansion units (24-digit) E.g.) 30-digit organization: (1 basic unit + 23 expansion units) + (1 basic unit + 5 expansion units)

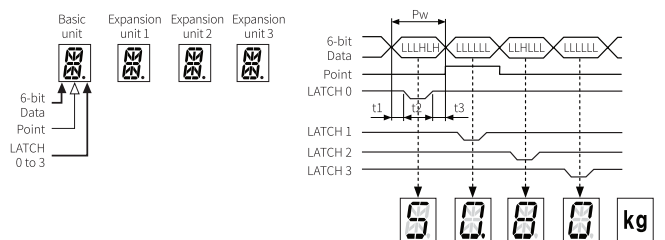
■ 4-bit Dynamic Parallel 1 transmission (e.g.: ACE007.)



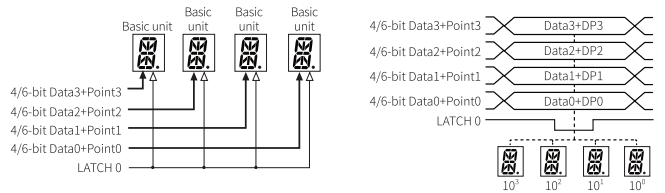
■ 4-bit Dynamic Parallel 1 transmission (e.g.: 012345.6789)



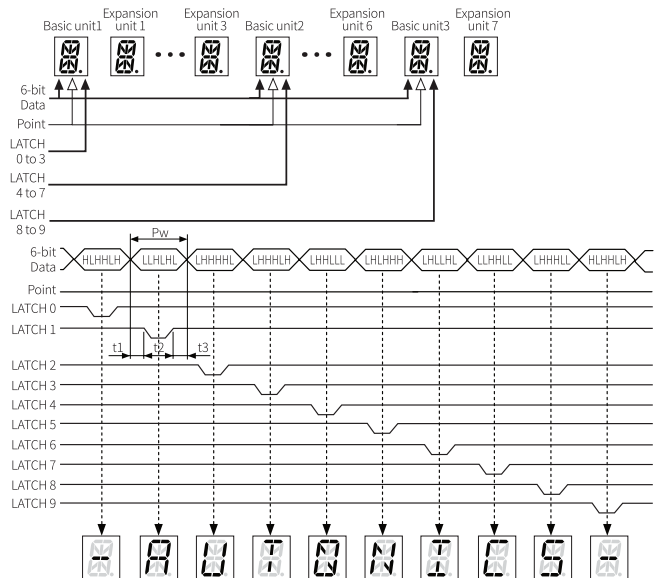
■ 6-bit Dynamic Parallel 1 transmission (e.g.: 50.80 kg)



- General parallel input is only for basic unit (dynamic parallel 1).

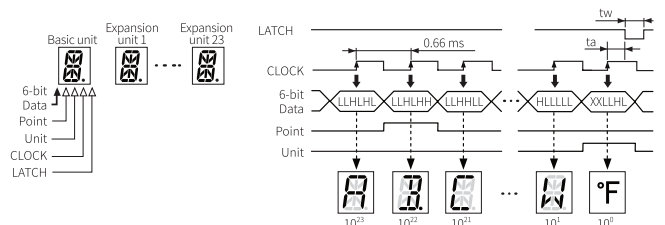


■ 6-bit Dynamic Parallel 1 transmission (e.g.: -AUTONICS-)



■ 6-bit Dynamic Parallel 2 transmission (e.g.: AB.C...W °F)

- Clock: ≤ 1.5 kHz
- $t_a: \geq 0.3$ ms / $t_w: \geq 0.33$ ms



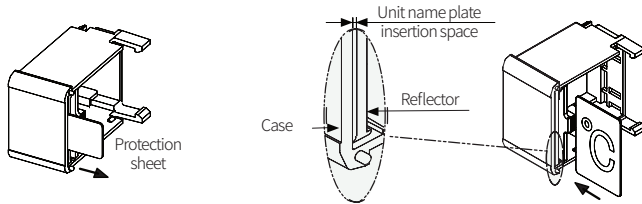
Sold Separately: 16 / 22 mm Unit-display Unit (DU Series)

- This unit is for displaying unit by inserting a name plate.
- Name plate type
 - Single: °C / °F / sec / min / h / g / kg / mm / cm / m / rpm / % / ppm / pcs / pH / A / V / W / VA
 - Dual-stage (top-bottom): °C - °F / °C - %
- Select the same size with the basic / expansion unit.

■ Name plate insertion

Remove the protection sheet and insert the name plate at between the case and the reflector.

⚠ **Caution:** Be sure to insert it with the correct direction.



■ Input data chart

- The unit-display unit does not use the upper bit over D4. (Don't care: X)
- It is only available to use the unit-display unit with Serial 5-bit, Parallel Dynamic 1 input when connecting the unit-display unit at the right side and turning ON. Do not input data to the unit-display unit.

Unit-display unit		High 2-bit			
D5	D4	Low 4-bit			
X	X	D3	D2	D1	D0
No unit		L	L	L	L
Top-bottom OFF		L	L	L	H
Top-bottom ON		L	L	H	L
Top ON		L	L	H	H
Bottom ON		L	H	L	L
Top-bottom flashing		L	H	L	H
Top flashing		L	H	H	L
Bottom flashing		L	H	H	H
If the data is not for the unit-display unit, it maintains former state.		H	L	L	L
		H	L	L	H
		H	L	H	L
		H	L	H	H
		H	H	L	L
		H	H	L	H
		H	H	H	L
		H	H	H	H

■ Zero Blanking

• Using the unit-display unit

If sending unit data signal after data 1 (00123), it applies Zero Blanking function when displaying data 2 (04567).

		1	2	3	%		4	5	6	7
--	--	---	---	---	---	--	---	---	---	---

Do not transfer unit data to basic/expansion unit. Unit bit (D7) of unit data is only for unit. If transferring unit data to basic/expansion unit, unit bit (D7) displays the ignored data value. In this case, Zero Blanking does not operate normally.

• Not using the unit-display unit

No-unit data (HXXXXLLL) is used for data delimiter.

If sending no-unit data after data 1 (00123), it applies Zero Blanking function to display data 2. In this case, transmitted data should be added no-unit data to the display digits.

		1	2	3		4	5	6	7
--	--	---	---	---	--	---	---	---	---

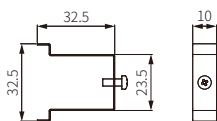
If it does not send no-unit data, it displays data 1 (00123) and data 2 (04567) as one data. Zero Blanking function is applied to data 1 only.

		1	2	3	0	4	5	6	7
--	--	---	---	---	---	---	---	---	---

Sold Separately: 16 / 22 mm Middle Bracket (BK-D□R)

- Unit: mm, For the detailed drawings, follow the Autonics website.

■ BK-D16R (16 mm)



■ BK-D22R (22 mm)

