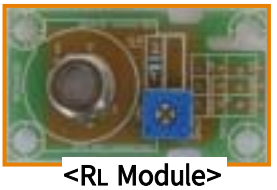
VOCs Sensor

- **for the detection of Formaldehyde Toluene, Organic Solvent**
- **Semi conductor type,**


<GSBT11>


<OP Module>

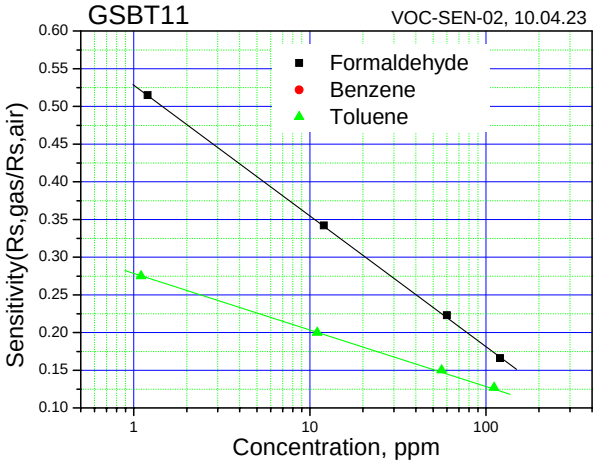

<RL Module>

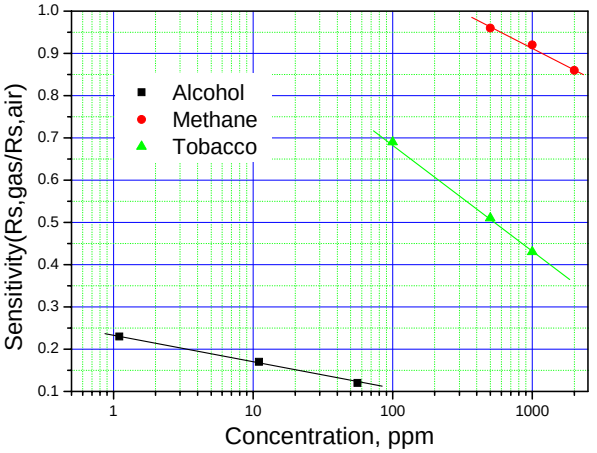
◑ General
It is applied detection of VOCs gases
(Toluene, formaldehyde, Benzene, ect.)

◑ Application : Ventilator, Air cleaner, Hood.

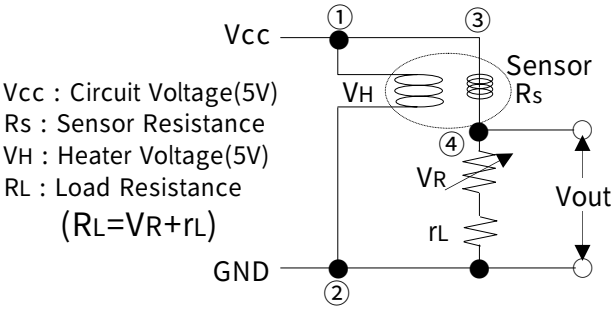
◑ Operation range
- Working temperature : -10°C ~ 50°C
- Working humidity : below saturation point
- Storage temperature : -20°C ~ 80°C

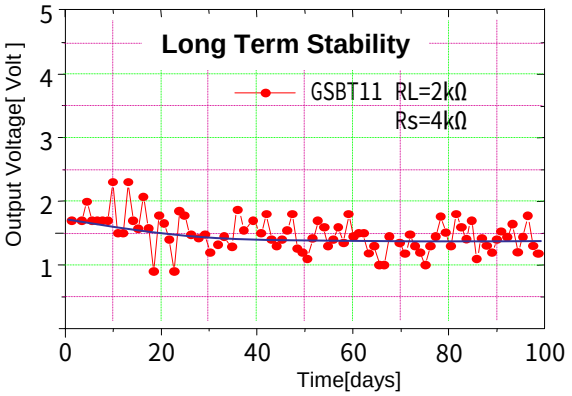
1. Sensitivity Characteristic Slope (β = Rs,gas / Rs,air)





2. Basic Measuring Circuit Stability





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Long term stability & High reliability
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3. Specifications

3.1 Package (Transducer or sensor)

a. Characteristics

Index		Spec. & Test condition			
Circuit Voltage	Vc	Sensor input Voltage :1~12Volt, Sensor Resistance : refer to Rank table			
	VH	Heater input voltage : 5volt±1%, Heater Resistance : 31.0Ω±0.2Ω			
	PH	Power consumption : Less than 370mW, Inrush current : Less than 200mA			
Characteristics of sensitivity (β) (Rs,gas / Rs,air)		Gases	Toluene	H_2	i-butane
		Concentration	1.0 ppm	100ppm	100ppm
		Sensitivity	0.30 ≤ β ≤ 0.60	0.35 ≤ β ≤ 0.70	0.20 ≤ β ≤ 0.50
Guarantee		- 3years - Calibration interval 1years recommended			
Operating environment		- Temp. : -10 ~ 50°C, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -10 ~70°C, Humidity : 0 ~90%RH			
Reaction time(T_{90})		- Reaction Time(T_{90}) : Less then 10sec - Recovering Time(T_{90}) : Less then 30sec			

*TMA :Trimethylamine, *T_{90} : 90% of saturation point
*Sensitivity (β) = Rs,gas / Rs,air
- Rs,gas : output resistance after gas inlet, - Rs,air : output resistance in special air

b. Output (Vout)

* Formulation of **Toluene**
Log(ppm) = (-2.610) + 1.774 * (Vout) + (-0.171) * $(Vout)^2$

* Formulation of **Formaldehyde**
Log(ppm) = (-8.188) + 10.093 * (Vout) + (-2.363) * $(Vout)^2$

* Formulation of **Benzene**
Log(ppm) = ((Vout) -0.972)/0.22923

Hydrogen(090924)

농도 ppm	출력 Vout	농도 ppm	출력 Vout	농도 ppm	출력 Vout
0	0.64	24	2.30	48	3.14
2	0.72	26	2.38	50	3.20
4	1.03	28	2.46	52	3.25
6	1.25	30	2.54	54	3.31
8	1.42	32	2.61	56	3.37
10	1.57	34	2.68	58	3.43
12	1.70	36	2.75	60	3.48
14	1.82	38	2.82	62	3.53
16	1.93	40	2.89	64	3.59
18	2.03	42	2.95	66	3.64
20	2.13	44	3.01	68	3.69
22	2.22	46	3.08	70	3.75

Toluene(090924)

농도 ppm	출력 Volt	농도 ppm	출력 Volt
0	1.00	24	3.27
2	2.10	26	3.33
4	2.33	28	3.38
6	2.49	30	3.44
8	2.62	32	3.49
10	2.73	34	3.54
12	2.83	36	3.59
14	2.92	38	3.64
16	3.00	40	3.69
18	3.07	42	3.74
20	3.14	44	3.78
22	3.20	46	3.82

Formaldehyde(090924)

농도 ppm	출력 Volt	농도 ppm	출력 Volt
0	1.00	24	1.42
2	1.16	26	1.43
4	1.22	28	1.44
6	1.26	30	1.45
8	1.29	32	1.46
10	1.31	34	1.47
12	1.33	36	1.47
14	1.35	38	1.48
16	1.37	40	1.49
18	1.38	42	1.50
20	1.40	44	1.50
22	1.41	46	1.51

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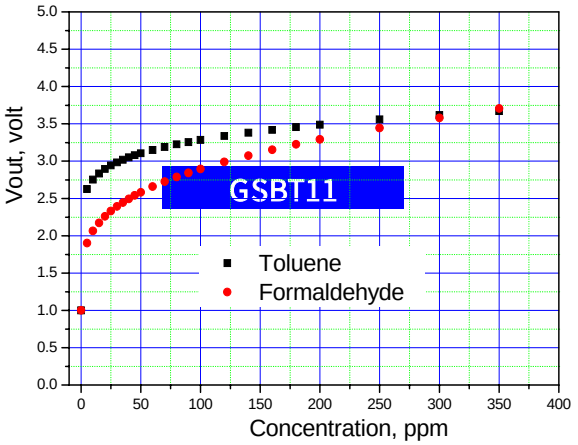
c. Sensor connection

- Be connected to "Basic measuring circuit('2')" after select Sensor resistance (Rs) and RL (reference '3.1-b')

d. Product code

G S B T 1 1 - D■ ■

- D03 : D->Rank No. (Sensor Resistance)
  03->Rank Grade (Sensor resistance)
  in special air



e. Output Curve

- Error : ±15%
- No compensation of Humidity & temperature

Stand. → RL : 3.9kΩ, Sensor resistance : 15.6kΩ
Vout,air : 1.0volt (input voltage 5volt)

f. Sensor Resistance (Only package)

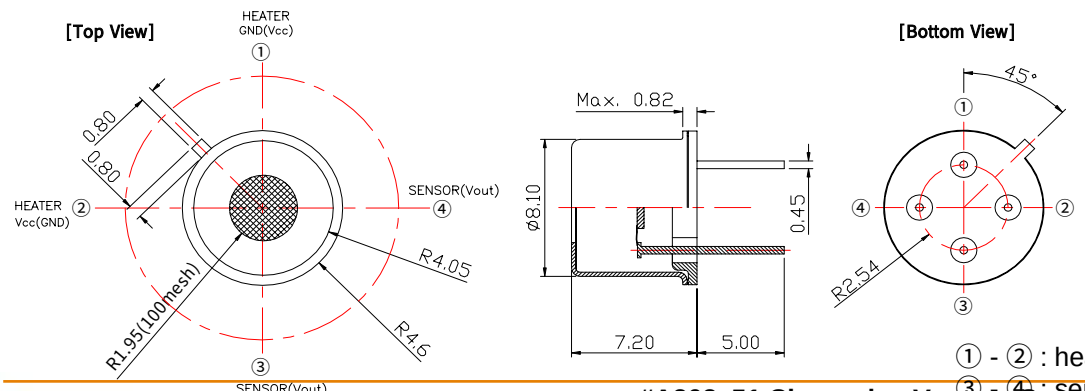
- Sensor Resistance Table(Only package)

Rank Table No.:D(1±0.2Volt)

Rank No.	D Rank Table (kΩ)		
	RL	Low limit	Hi limit
D04	0.95	3.38	4.29
D05	1.21	4.29	5.46
D06	1.54	5.46	6.95
D07	1.96	6.95	9.04
D08	2.55	9.04	11.6
D09	3.24	11.6	14.8
D11	5.23	18.8	23.8
D11	5.23	18.8	23.8

Rank No.	D Rank Table (kΩ)		
	RL	Low limit	Hi limit
D12	6.65	23.8	30.3
D13	8.45	30.3	38.5
D14	10.7	38.5	48.7
D15	13.7	48.7	62.4
D16	17.4	62.4	79.3
D17	22.1	79.3	101
D18	28.0	101	128
D19	35.7	128	163

g. Structure and Dimensions



① - ② : heater
③ - ④ : sensor

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3.2 OP Module (GSBT11-P1xx), MOQ : None

a. Characteristics

Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : 460mW 이하, Inrush current : Less than 140mA
Guarantee		- 3years over - Calibration interval 1years recommended
Worm up Time (T90)		- More then 300sec
Reaction time(T90)		- Reaction Time(T90) : Less then 5sec - Recovering Time(T90) : Less then 30sec

b. Output data

- Output data : 0.5 ~ 5Volt
- Relay Output : Mere than4.0Volt
- Tolerance : ±7% (at 25±2, 60±5%RH)

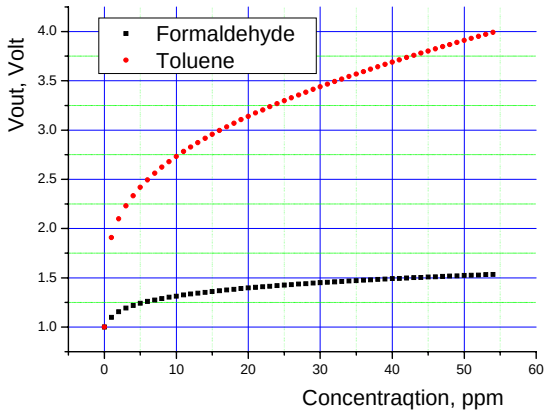
Toluene, Formaldehyde

- Toluene

$$(ppm) = 10^{(-2.071+0.672*(VOLT))}$$

- Formaldehyde

$$(ppm) = 10^{(-0.867+1.274*(VOLT))}$$



[Toluene]

Con. Ppm	Output Vout	Con. Ppm	Output Vout	Con. ppm	Output Vout
0.0	0.64	1.2	3.13	2.4	3.65
0.1	1.86	1.3	3.19	2.5	3.69
0.2	2.14	1.4	3.24	2.6	3.72
0.3	2.33	1.5	3.29	2.7	3.75
0.4	2.48	1.6	3.34	2.8	3.78
0.5	2.60	1.7	3.38	2.9	3.82
0.6	2.70	1.8	3.42	3.0	3.85
0.7	2.79	1.9	3.47	3.1	3.87
0.8	2.87	2.0	3.51	3.2	3.90
0.9	2.94	2.1	3.54	3.3	3.93
1.0	**3.01**	2.2	3.58	3.4	3.96
1.1	3.07	2.3	3.62	3.5	3.99

[Hydrogen]

Con. ppm	Output Vout	Con. ppm	Output Vout	Con. ppm	Output Vout
0	0.64	24	2.30	48	3.14
2	0.72	26	2.38	50	3.20
4	1.03	28	2.46	52	3.25
6	1.25	30	2.54	54	3.31
8	1.42	32	2.61	56	3.37
10	1.57	34	2.68	58	3.43
12	1.70	36	2.75	60	3.48
14	1.82	38	2.82	62	3.53
16	1.93	40	2.89	64	3.59
18	2.03	42	2.95	66	3.64
20	2.13	44	3.01	68	3.69
22	2.22	46	3.08	70	3.75

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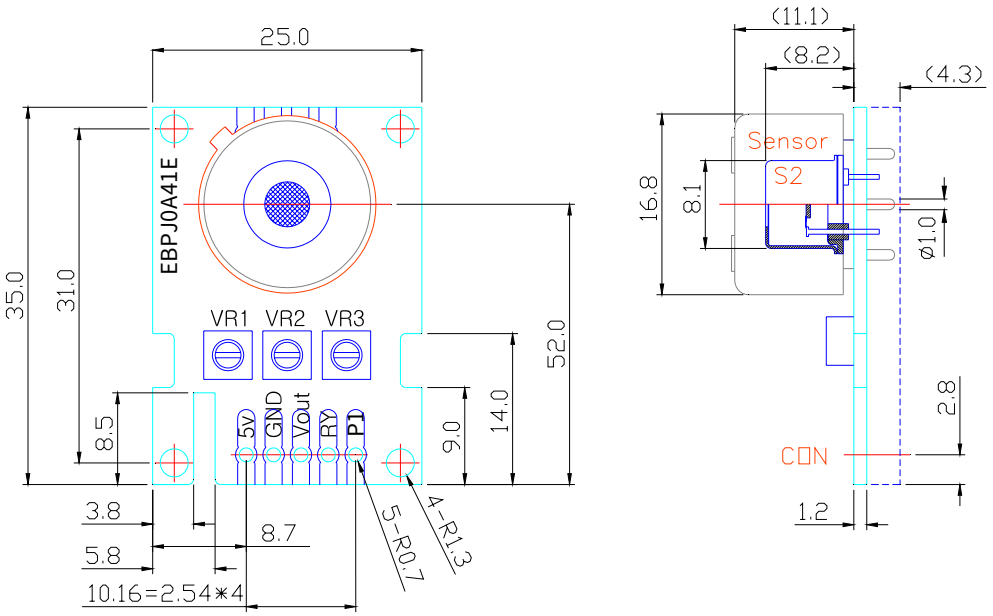
c. Structure and Dimensions



VR1 : Control of Ra,air reference Value
VR2 : Gain (Sensitivity control)
VR3 : Offset (Level shift)

d. Data output

□ □ □ □
① ② ③ ④

① Vcc : 5.0volt
② GND
③ Data(Vout, analogue signal)
④ Relay

e. Relay Output

Max. output range H2 340ppm : Hi(4.0~4.1volt) output at 70ppm(H2)
: Hi(4.0~4.1volt) output at 480ppm(Smoke)

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3.3 RL Module(GSBT11-P3xx), MOQ :More than 500pcs

a. Characteristics

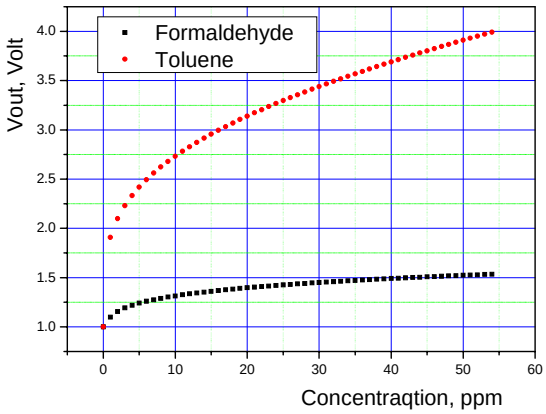
Index		Spec. & Test condition
Circuit Voltage	Vc	Module input Voltage : 5±0.1Volt
	PH	Power consumption : Less than 450mW, Inrush current : Less than 140mA
Characteristics of Output data		Refer to datasheet
Guarantee		- 2years over - Calibration interval 1years recommended
Operating environment		- Temp. : -10 ~ 50°C, Humidity : 5 ~ 90%RH, Non-condensing - Storage → Temp. : -20 ~70°C, Humidity : 0 ~90%RH
Reaction time(T90)		- Reaction Time(T90) : Less then 10sec - Recovering Time(T90) : Less then 180sec

b. Output data

Ref. → RL : 100kΩ, Sensor resistance : 400kΩ
Vout,air : 1.0volt (Input voltage 5volt)

- Tolerance : ±10% (at 25±2, 60±5%RH)

Toluene, Formaldehyde



[Toluene]						Formaldehyde			
Con. ppm	Output Vout	Con. ppm	Output Vout	Con. ppm	Output Vout	Con. ppm	Output Vout	Con. ppm	Output Vout
0.0	0.64	1.2	3.13	2.4	3.65	0	1.00	24	1.42
0.1	1.86	1.3	3.19	2.5	3.69	2	1.16	26	1.43
0.2	2.14	1.4	3.24	2.6	3.72	4	1.22	28	1.44
0.3	2.33	1.5	3.29	2.7	3.75	6	1.26	30	1.45
0.4	2.48	1.6	3.34	2.8	3.78	8	1.29	32	1.46
0.5	2.60	1.7	3.38	2.9	3.82	10	1.31	34	1.47
0.6	2.70	1.8	3.42	3.0	3.85	12	1.33	36	1.47
0.7	2.79	1.9	3.47	3.1	3.87	14	1.35	38	1.48
0.8	2.87	2.0	3.51	3.2	3.90	16	1.37	40	1.49
0.9	2.94	2.1	3.54	3.3	3.93	18	1.38	42	1.50
1.0	**3.01**	2.2	3.58	3.4	3.96	20	1.40	44	1.50
1.1	3.07	2.3	3.62	3.5	3.99	22	1.41	46	1.51

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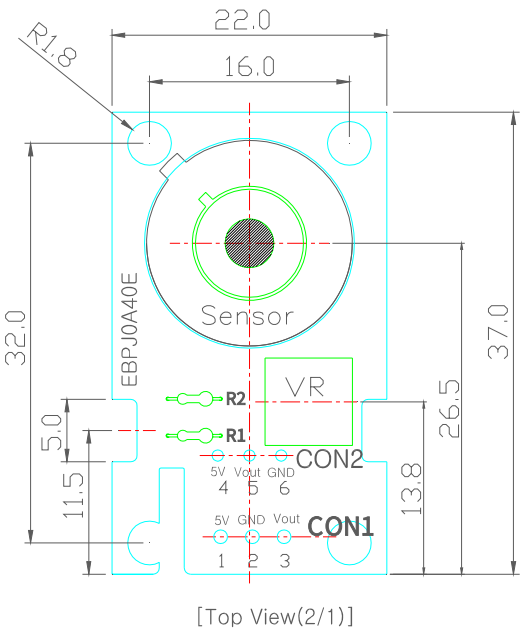
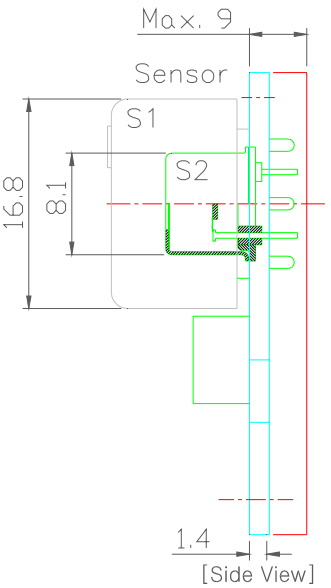
c. Structure and Dimensions



[Top View(2/1)]



[Side View]

d. Data output (Note CON1, CON2 connection)

CON1 □ □ □
① ② ③

CON2 □ □ □
④ ⑤ ⑥

①, ④	→	Vcc : 5.0volt
②, ⑥	→	GND
③, ⑤	→	Data(Vout, analogue signal)

3.4 Product code & characteristics

Product code	Consumption	Circuit	Output	Worm-up time
GSBT11 – P1XX	390mW 이하	OP-Amplifying	Data : Analogue Relay : Hi(4V), Low(0V)	Long
Study- P2XX	↑	μ-processor	Data : Digital Open collect	short
GSBT11 - P3XX	↑		Data : Analogue	Long

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4. Product Index

Index	GSBT11	GSBT11-**P11X**	GSBT11-**P21X**study	GSBT11-**P3XX**
Circuit	Package	OP-Module	MP-Module	RL-Module
Target Gas	TVOC Gas			
Accuracy	±15%	±7%	±5%	±10%
Measuring Circuit	Basic Circuit	Op-Amp	Micro Processor	Basic Circuit
Input Voltage	5Volt±3%	←	←	←
Output	0 ~ 5volt	0 ~ 4.5volt	Open collect	0 ~ 4.5volt
MOQ	None	None	None	More than 500ea

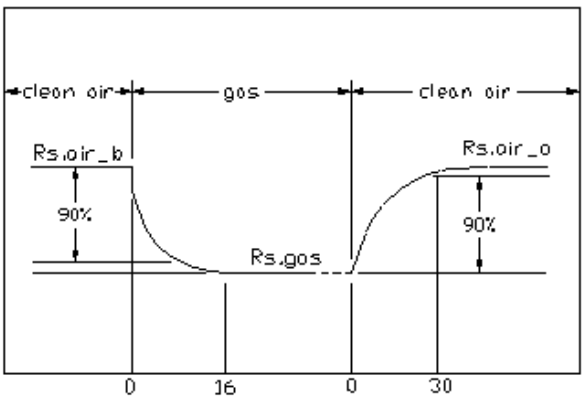
5. Reaction time(T90)

Reaction Time(T90) : Less then 10sec
[Between Rs,air_b & Rs,gas]

Recovering Time(T90) : Less then 30sec
[between Rs,gas & Rs,air_a]

Beginning stability time(T90) : Less then 10 min

Rs,air_b : Sensor Resistance without gases
Rs,gas : Sensor Resistance after blowing gases
Rs,air_a : Sensor Resistance removing gases



6. Application

6.1 Hood, Ventilator, Damper, Gas Leak Alarm (Explosive gases)
6.2 When soldering, certainly avoid the flux.
6.3 If using Epoxy PCB(FR4), the sensor is floated 2~3mm from PCB ground.

7. Product code

GSBT11 – P ■ ■ ■
(1) (2) (3) (4)

(1) GSBT11 → VOCs Sensor
(2) Division Circuit → 1 : Op-amp circuit 2 : Micro processor Circuit 3:Micro-processor
(3) Gas sensing range → **1: Standard**
(4) Connector → 0:None

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