#### **CG** Series **Capacitance Level Sensor (Phase Detection Principle)**

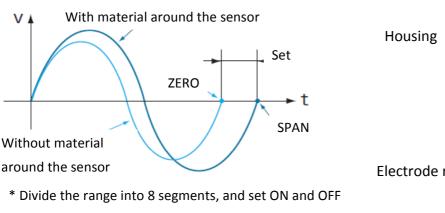
#### **Products Overview**



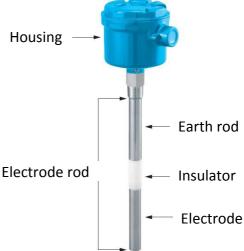
We, NOHKEN INC., have plenty of experience with capacitance level sensor for more than 30 years, and we consolidate all experience into CG series. CG series employ phase detection principle which the changing of resonance frequency is processed by microprocessor (digital circuit) and the changes in capacitance value is detected by changes in frequency value.

#### **Principle of Operation**

The basic oscillator circuit is of the parallel resonance circuit with L (coil) and C (capacitance between the electrodes). The oscillation frequency (f) of this circuit is:  $f = 1/2 \pi \sqrt{LC}$ . The frequency without material around the sensor (f1) is: f1 =  $1/2 \pi \sqrt{LC}$ , where C is the capacitance without material around the sensor (zero point). With material around the sensor, the capacitance increases (C+ $\Delta$ C), and the frequency (f2) is: f2 =  $1/2 \pi \sqrt{L(C+\Delta C)}$ , where C+ $\Delta C$  is the capacitance with material around the sensor (span point). The sensor detects the frequency change from f1 to f2, and gives a relay output. The frequency range can be divided into 8 segments (between zero and span), and the set and reset points can be set on desired segments, thus enabling high limit, low limit and hysteresis settings.



points. Hysteresis setting is also available.



## **Model CG**

**Capacitance Level Sensor (Phase Detection Principle) Integral Type, CE Marking** 

Model		CG-2NK	CG-2FK	CG-3NK	CG-3FK	
Dimensions		¢ 114 (76) Hex.29 R 3/4 ¢ 21.7 0 9 0 9 0 9	¢ 11/2 (76) (76) (76) (76) (76) (77)	¢ 114 (551) (5	¢ 112 (76) (70) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	
Description	า	Star	ndard	Pressure Proof		
Mounting		R3/4 (*1)	JIS5K25A FF (*1)	R1 (*1)	JIS5K25A FF (*1)	
Cable Entry	/	G1/2 Equivalent				
Protection	Electrode	IP68				
Protection	Housing	IP65				
Length of E	lectrode	250mm (4000mm Max.) 250mm (1000mm )		00mm Max.)		
	Housing	ADC12 (Acrylic painting)				
Material	Electrode	304SS (*2)				
Material	Insulator	PTFE (*2)				
	O-ring	FPM/FKM (*2)				
Sensitivity		Dielectric constant 1.2 Min. Capacitance between electrode 1.0pF Min. (But resistance between electrode 10kΩ Min. at L=250mm)				
Relay Output		1 SPDT, 250V 3A AC, 30V 3A DC (Resistive) C-NO: Normally open contact C-NC: Normally close contact				
Detection Time Delay		Programmable between 0.0 to 25.5 seconds				
Power Supply		100 to 240V AC ±10%, 50/60Hz (24V DC in option)				
Power Consumption		Approx. 6VA				
Operating	Electrode		-20 to 60°C (	without dew)		
Temperature	Housing	-25 to 65°C (without dew)				
Operating Pressure		1 MPa Max. 3 MPa Max.			a Max.	
Operating	Humidity	85% RH Max.				

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

## **Model CG**

Capacitance Level Sensor (Phase Detection Principle) Integral Type, CE Marking

Model		CG-4NK	CG-4FK	CG-5FK	CG-6FK	
Dimensions		4 114 (76) (68) (10) (68) (10)		¢114 (76) (66) (77) (76) (77) (76) (77) (77)		
Description	า	Pressure and	Pressure and Heat Proof Flat Type		Wire Type	
Mounting		R1 (*1)	JIS5K50A FF (*1)	JIS5K65A FF (*1)	JIS5K50A FF (*1)	
Cable Entry	y	G1/2 Equivalent				
Protection	Electrode	IP68				
FIOLECTION	Housing	IP65				
Length of E	lectrode	250mm (1000mm Max.)		65mm (1000mm Max.)	100mm (1000mm Max.)	
	Housing	ADC12 (Acrylic painting)				
Material	Electrode	304SS (*2)				
Wateria	Insulator	PTFE	E (*2)	PE	(*2)	
	O-ring	FPM/FKM (*2)				
Sensitivity		Dielectric constant 1.2 Min. Capacitance between electrode 1.0pF Min. (But resistance between electrode 10kΩ Min. at L=250mm)				
Relay Output		1 SPDT, 250V 3A AC, 30V 3A DC (Resistive) C-NO: Normally open contact C-NC: Normally close contact				
Detection <sup>-</sup>	Time Delay	Programmable between 0.0 to 25.5 seconds				
Power Supply		100 to 240V AC ±10%, 50/60Hz (24V DC in option)				
Power Consumption		Approx. 6VA				
Operating	Electrode	-20 to 180°C	(without dew)	-20 to 60°C (	without dew)	
Temperature	Housing	-25 to 65°C (without dew)			-	
Operating Pressure		3 MPa	a Max.	1 MPa Max.	500 kPa Max.	
Operating	Humidity	85% RH Max.				

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

## Model CG

Capacitance Level Sensor (Phase Detection Principle) Integral Type, CE Marking

Model		CG-7FK	CG-8FK	CG-9FK	CG-25FK	
Dimensions		4114 (76) (5) (5) (5) (5) (5) (5) (5) (5) (5) (5	0114 (76) (55) (55) (55) (55) (55) (55) (55) (5	¢ 112 (76) (5) Holes \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	0114 (76) (57) (50) (77) (60) (77) (60) (77) (7))	
Descriptior	۱	Ріре Туре	Adhesion Proof	Special Type	High Sensitivity	
Mounting		JIS5K50A FF (*1)				
Cable Entry	/	G1/2 Equivalent				
Protection	Electrode	IP68				
	Housing	IP65				
Length of E	lectrode	250mm (2000mm Max.)	250mm (4000mm Max.) 250mm (2000mm Max.)			
	Housing	ADC12 (Acrylic painting)				
Material	Electrode	C3604BD	304SS (*2)			
in accinat	Insulator	FEP (Pipe)	FRP	PTFE (*2)	PE (*2)	
	O-ring		FPM/FKM (*2)			
Sensitivity		Dielectric constant 1.2 Min. Capacitance between electrode 1.0pF Min. (But resistance between electrode 10kΩ Min. at L=250mm)				
Relay Output		1 SPDT, 250V 3A AC, 30V 3A DC (Resistive) C-NO: Normally open contact C-NC: Normally close contact				
Detection Time Delay		Programmable between 0.0 to 25.5 seconds				
Power Supply		100 to 240V AC ±10%, 50/60Hz (24V DC in option)				
Power Consumption		Approx. 6VA				
Operating	Electrode		-20 to 60°C(	without dew)		
Temperature	Housing	-25 to 65°C (without dew)				
Operating Pressure		100 kPa Max. 1 MPa Max.				
Operating Humidity		85% RH Max.				

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

Capacitance Level Sensor (Phase Detection Principle) Separate Type

	Standard	CGS-2N	CGS-2F	CGS-3N	CGS-3F	
Model	ntrinsically Safe	CG65-2N	CG65-2F	CG65-3N	CG65-3F	
Dimensions		¢114 (76) Hex.29 (60) Hex.29 (76) (76) (76) (76) (76) (76) (76) (76)	¢114 (76) (27) (66) Holes 00 Holes 00 Holes 00 Holes	¢114 (76) (56) (56) (76)	¢ 114 (76) (75)	
Descriptio	on	Stan	dard	Pressure Proof		
Mounting	5	R3/4 (*1)	JIS5K25A FF (*1)	R1 (*1)	JIS5K25A FF (*1)	
Cable Entry		G1/2 Equivalent				
Protectio	Electrode	IP68				
	Housing	IP65				
Length of	Electrode	250mm (4000mm Max.) 250mm (1000mm Max.)				
	Housing	ADC12 (Acrylic painting)				
Material	Electrode	304SS (*2)				
	Insulator	PTFE (*2)				
	O-ring	FPM/FKM (*2)				
		Dielectric constant 1.2 Min.				
Sensitivity	ý	Capacitance between electrode 1.0pF Min.				
		(But resistance between electrode 10kΩ Min. at L=250mm)				
Detection	n Time Delay	Programmable between 0.0 to 25.5 seconds				
Operating Temperature	Electrode	-20 to 60°C (without dew) for standard				
	۵	-20 to 50°C (without dew) for Intrinsically Safe				
	e Housing	-25 to 65°C (without dew) for standard				
		-20 to 50°C (without dew) for Intrinsically Safe				
	g Pressure	1 MPa Max. 3 MPa Max.				
Operating Humidity		85% RH Max.				
Connecting Converter		CGS1000 series for standard, CGS6000 series for Intrinsically Safe				

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

Capacitance Level Sensor (Phase Detection Principle) Separation Type

Model –	Standard	CGS-4N	CGS-4F	CGS-5F	CGS-6F	
	Intrinsically Safe	CG65-4N	CG65-4F	CG65-5F	CG65-6F	
Dimensions		¢ 114 (76) (61)	€130 €130	¢ 114 (76) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2		
Descripti	on	Pressure and	d Heat Proof	Flat Type	Wire Type	
Mountin	g	R1 (*1)	JIS5K50A FF (*1)	JIS5K65A FF (*1)	JIS5K50A FF (*1)	
Cable En	try	G1/2 Equivalent				
Protectio	Electrode	IP68				
FIOLECTIC	Housing	IP65				
Length o	f Electrode	250mm (1000mm Max.) 65mm (1000mm Max.) 100mm (1000mm			100mm (1000mm Max.)	
	Housing	ADC12 (Acrylic painting)				
Matarial	Electrode	304SS (*2)				
Material	Insulator	PTFE (*2) PE (*2)				
	O-ring	FPM/FKM (*2)				
Sensitivity		Dielectric constant 1.2 Min. Capacitance between electrode 1.0pF Min. (But resistance between electrode 10kΩ Min. at L=250mm)				
Detectio	n Time Delay	Programmable between 0.0 to 25.5 seconds				
	Ele el contr	-20 to 180°C (without dew) for standard -20 to 60°C (without dew) for standard				
Operating Temperature	Electrode	-20 to 180°C (without dew) for Intrinsically Safe -20 to 50°C (without dew) for Intrinsically Safe				
		-25 to 65°C (without dew) for standard				
	Housing	-20 to 50°C (without dew) for Intrinsically Safe				
Operating Pressure					500 kPa Max.	
Operating Humidity		85% RH Max.				
Connecting Converter						

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

Capacitance Level Sensor (Phase Detection Principle) Separation Type

	Standard	CGS-7F	CGS-8F	CGS-9F	CGS-25F	
Model	Intrinsically Safe	CG65-7F	CG65-8F	CG65-9F	CG65-25F	
Dimensions		4114 (76) (15) (	¢ 114 (76) (35) (4×015) ( (4×015) ((4×015)) ((	¢ 112 (76) (27) Holes 00 ¢ 27.2	¢114 (76) (66) (77) (66) (77) (77) (77) (77)	
Descripti	on	Ріре Туре	Adhesion Proof	Special Type	High Sensitivity	
Mountin	g	JIS5K50A FF (*1)				
Cable En	try	G1/2 Equivalent				
Protectio	Electrode	IP68				
	Housing	IP65				
Length o	f Electrode	250mm (2000mm Max.)				
	Housing	ADC12 (Acrylic painting)				
Material	Electrode	C3604BD	304SS (*2)			
Wateria	Insulator	FEP (Pipe)	FRP	PTFE (*2)	PE (*2)	
	O-ring		FPM/FKM (*2)			
Sensitivity		Dielectric constant 1.2 Min. Capacitance between electrode 1.0pF Min. (But resistance between electrode 10kΩ Min. at L=250mm)				
Detectio	n Time Delay	Pr	rogrammable betwe	en 0.0 to 25.5 secon	ds	
	Ele el cont	-20 to 60°C (without dew) for standard				
Operating	Electrode	-20 to 50°C (without dew) for Intrinsically Safe				
Temperatu		-25 to 65°C (without dew) for standard				
	Housing	-20 to 50°C (without dew) for Intrinsically Safe				
Operating Pressure		100 kPa Max. 1 MPa Max.				
Operating Humidity		85% RH Max.				
Connecti	ng Converter	CGS1000 series for standard, CGS6000 series for Intrinsically Safe				

\*1: The other mounting is optionally available.

\*2: The other material is optionally available.

Capacitance Level Sensor (Phase Detection Principle) Separation Type

Madal	Standard	CGS1000	CGS1010	CGS1100	CGS1110	
Model	Intrinsically Safe	CGS6000	CGS6010	CGS6200	CGS6210	
Dimensions		250 50 50 50 50 50 50 50 50 50		50 N 2×+15		
Descript	ion	Wall N	lount	Rack Mount		
Materia	I	А	С	SPCC (Acrylic painting)		
Protecti	on	IPS	54	IP20		
Cable Er	ntry	3 × (	G1/2	2×φ 15 holes		
Mountir	ıg	$2 \times \phi$ 7 holes $2 \times \phi$ 4.5 holes		.5 holes		
		1 SPDT, 250V 3A AC, 30V 3A DC (Resistive)				
Relay O	utput	C-NO: Normally open contact				
		C-NC: Normally close contact				
Operating Temperature		-20 to 60°C (without dew)				
Power Supply		100-240V AC ±10%, 50/60Hz 24V DC 100-240V AC ±10%, 50/60Hz 24V DC			24V DC	
Power Consumption		Approx. 6VA				
Connecting Sensor		CGS series for standard, CG65 series for Intrinsically Safe				

\*The safety barrier must be connected between sensor and amplifier for intrinsically safe.

\*Z787 (PEPPERL + FUCHS) is recommended for CGS6000 and CGS6010.

\*CGS6200 and CGS6210 are safety barrier (Z787) built-in type.