General

  CO-S20-3V series is electrochemical technology based CO sensor module, which detect CO concentration in parking lot, offices and residential building or working place or so.

ELT Sensor
Data Sheet for CO-S20-3V

Features

• Electrochemical technology used to measure CO levels.

• Available outputs :   UART, I2C, PWM, ALARM

• Installed re-calibration function

• Zero Calibration is available

• Compensate over Temperature change effect

• 6 years life cycle (8 years are optional)

• Jumper for Auto/Manual Calibration is available

• Size : 33mmx33mmx12.5mm

• Weight : 5 grams

CO-S20-3V Specifications

General Performance

Operating Temperature : -20 ~ 50℃

Operating Humidity : 15 ~ 90% RH (Non-condensing) ('G' option: Coating to prevent from rust)

Operating Environment : Residential, Commercial spaces

Storage Temperature : 0℃ ~20℃

CO Measurement

Sensing Method : Electrochemical type

Measurement Range : 0 ~ 1,000 ppm

Accuracy : ± 2% of reading

Step Response Time : T_{90} < 30 seconds , **T_{90} < 9** seconds

Sampling Interval: 1 seconds

Warming-up Time : < 10 seconds (for Output)

Electrical Data

Power Input : 3.3VDC (3.2~3.5V)

Current Consumption : 3mA

2mm pitch Board-to-Board with J11&J12 Connectors

J-1	Description
1/3	VDD (+3.3V VCC)
2/4	GND

J-2	Description
1	TTL RXD (← CPU of Master Board)
2	TTL TXD (→ CPU of Master Board)

3	I2C SCL
4	I2C SDA
5	GND
6	Alarm (TTL Signal 0V/VDD Switching)
7	Manual Span Calibration (CO 50ppm) (1 min.)
8	Reserved
9	Manual Zero Calibration (CO 0ppm) (1 min.)
10	Reset (Low Active)

UART (J-12:P1&P2) : 38,400BPS, 8bit, No parity, 1 stop bit, 3.3V Level Voltage

I2C   (J-12:P3&P4) : Slave mode only, Pull up resister 10kohm is needed on Main-board.

TTL Level Voltage : : $0 \leq V_{IL} \leq 0.6$, $1.5 \leq V_{IH} \leq V_{DD}$, $0 \leq V_{OL} \leq 0.6$, $2.7 \leq V_{OH} \leq V_{DD}$ (Volt)
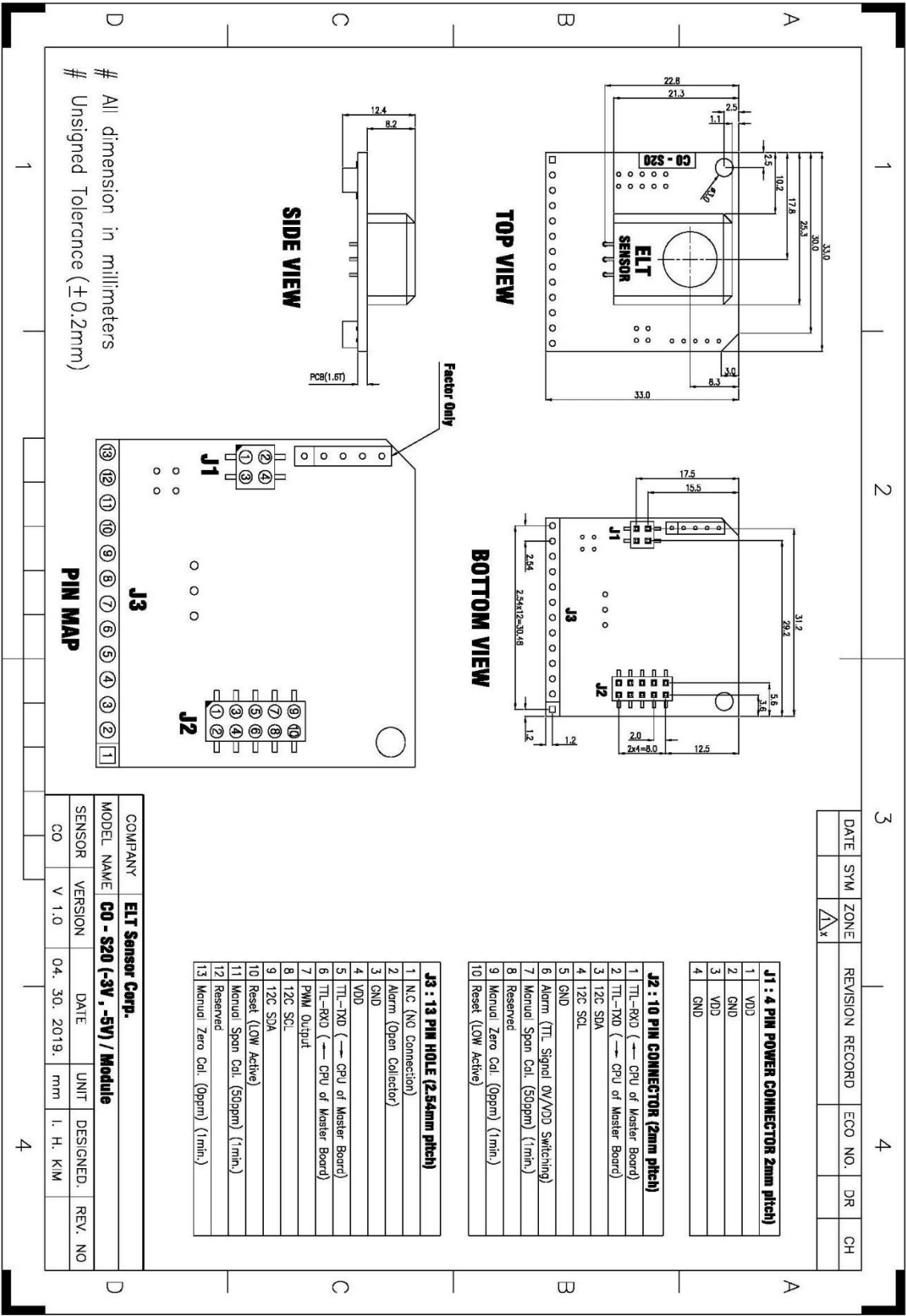
PWM (J-13:pin-7 is available) :

t_H = 2 msec (Start) + 1,000 msec x (Measurement$_{(ppm)}$ / Range$_{(ppm)}$), T_L = 1,000 ms - t_H

ALARM : Open Collector

2.54mm pitch Side-hole (13 pins) Connectors

J-3	Description
1	N.C (No Connection)
2	Alarm (Open Collector)
3	GND
4	VDD (+3.3V VCC)
5	TTL TXD (→ CPU of Master Board)
6	TTL RXD (← CPU of Master Board)
7	PWM Output
8	I2C SCL
9	I2C SDA
10	Reset (Low Active)
11	Span Calibration (CO 50ppm) (1 min.)
12	Reserved
13	Manual Zero Calibration (CO 0ppm) (1min.)

Dimensions (unit : mm)

TOP VIEW

SIDE VIEW

PCB(1.5T)

Factor Only

BOTTOM VIEW

PIN MAP

J1

J2

J3

J1 : 4 PIN POWER CONNECTOR 2mm pitch)

1	VDD
2	GND
3	VDD
4	GND

J2 : 10 PIN CONNECTOR (2mm pitch)

1	TTL-RXD (→ CPU of Master Board)
2	TTL-TXD (→ CPU of Master Board)
3	I2C SDA
4	I2C SCL
5	GND
6	Alarm (TTL Signal 0V/VDD Switching)
7	Manual Span Cal. (50ppm) (1min.)
8	Reserved
9	Manual Zero Cal. (0ppm) (1min.)
10	Reset (LOW Active)

J3 : 13 PIN HOLE (2.54mm pitch)

1	N.C (NO Connection)
2	Alarm (Open Collector)
3	GND
4	VDD
5	TTL-TXD (→ CPU of Master Board)
6	TTL-RXD (→ CPU of Master Board)
7	PWM Output
8	I2C SCL
9	I2C SDA
10	Reset (LOW Active)
11	Manual Span Cal. (50ppm) (1min.)
12	Reserved
13	Manual Zero Cal. (0ppm) (1min.)

COMPANY	ELT Sensor Corp.		
MODEL NAME	CO - S20 (-3V , -5V) / Module		
SENSOR	CO	DATE	04. 30. 2019.
VERSION	V 1.0	UNIT	mm
		DESIGNED.	I. H. KIM
		REV. NO	

DATE	SYM	ZONE	REVISION RECORD	ECO NO.	DR	CH

All dimension in millimeters
Unsigned Tolerance (±0.2mm)
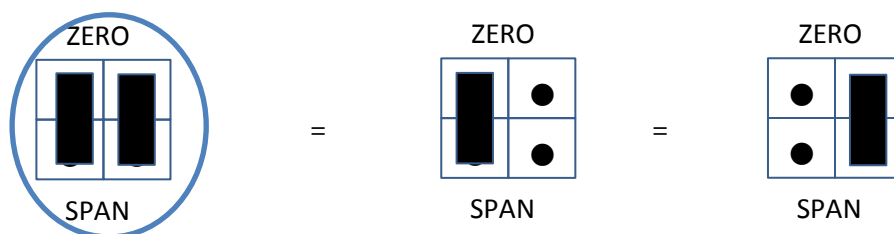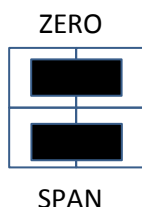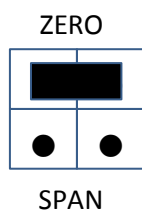
Jumper setting

Normal mode-#1 is for mobile-CO-meter or and fixed type CO-meter installed where always 5~10ppm CO gas existing environment like   basement parking Lot, Construction site, confined worksites or so.
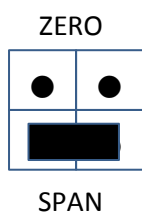

Factory-out status

Automatic Zero Calibration mode-#2 is for CO-gas-detector installed in CO-gas-free area lest unexpected CO-gas-leakage damages lives in residential buildings, commercial restaurants, lodging, or so.

Manual Zero Calibration mode-#3 is used to calibrate CO-gas sensors. Please make sure to locate CO-gas sensors on CO-gas-free area and move jumper setting from #1 or #2 to #3, which calibrate every minute. After calibration, return to previous set #1 or #2.
(Caution: Please don't use N2 100% gas, nor do other gases which not include O2 gas.)

Manual SPAN(50ppm) Calibration mode-#4 is used to calibrate CO-gas sensors after #3 cablibration. Please install CO-sensors on EK-100SL or TRB-100ST and locate in chamber like CMB-10 and calibrate with standard 50ppm CO gas which calibrate every minute. After calibration, return to previous set #1 or #2.

UART Description

Data Transmit

Interval : 1 seconds

Handshake protocol: None

Data Format

D5	D4	D3	D2	D1	SP	'p'	'p'	'm'	CR	LF

D1 ~ D5	5 byte CO density string
SP	Space: 0x20
'ppm'	'ppm' string
CR	Carriage return : 0x0D
LF	Line feed : 0x0A

Above 11byte consist by 5 byte hexadecimal digits,<SP>,0x70 0x70 0x6D, <CR><LF> , where decimal '0' (corresponds to hexadecimal digit '0x30') is replaced by space (corresponds to hexadecimal digit '0x20'),

EX) 5 ppm, results '0x20 0x20 0x20 0x20 0x35 0x20 0x70 0x70 0x6D 0x0D 0x0A', which displays '___5_ppm<CR><LF>'on screen.

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I2C Communication (Only Slave Mode Operation)

10kΩ pull up resister is on Sensor board.

Slave Address: 0x61, Slave Address Byte: Slave Address(0x61) 7 Bit + R/W 1 Bit

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	0	0	0	1	R/W Bit

R/W Bit : Read = 1/Write = 0

When reading the data, Slave Address Byte is 0x83, When writing the data, Slave Address Byte is 0x82.
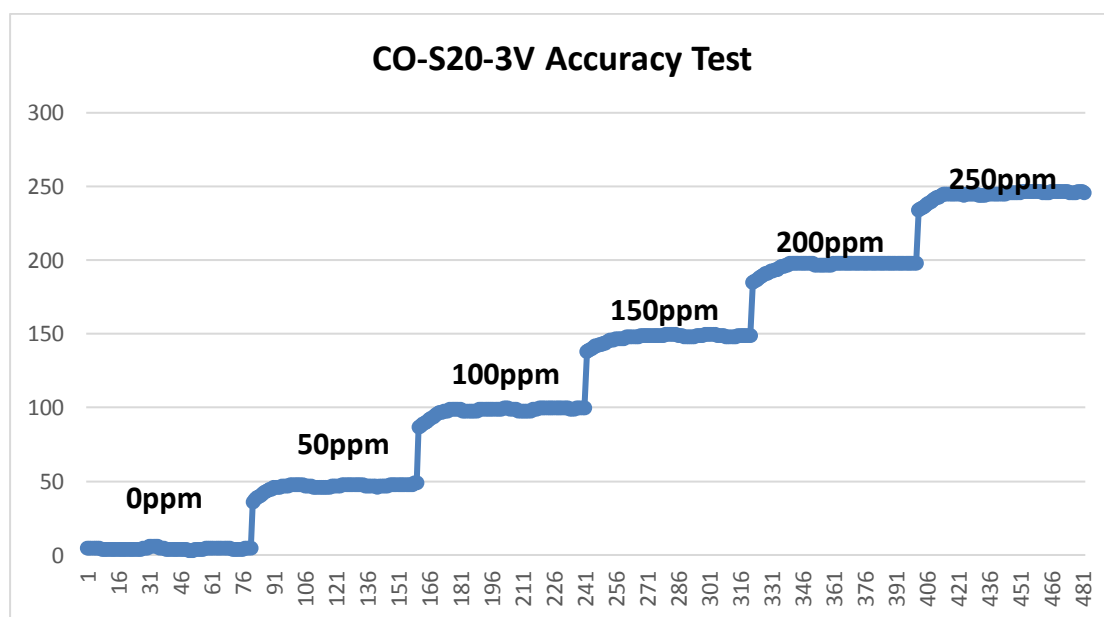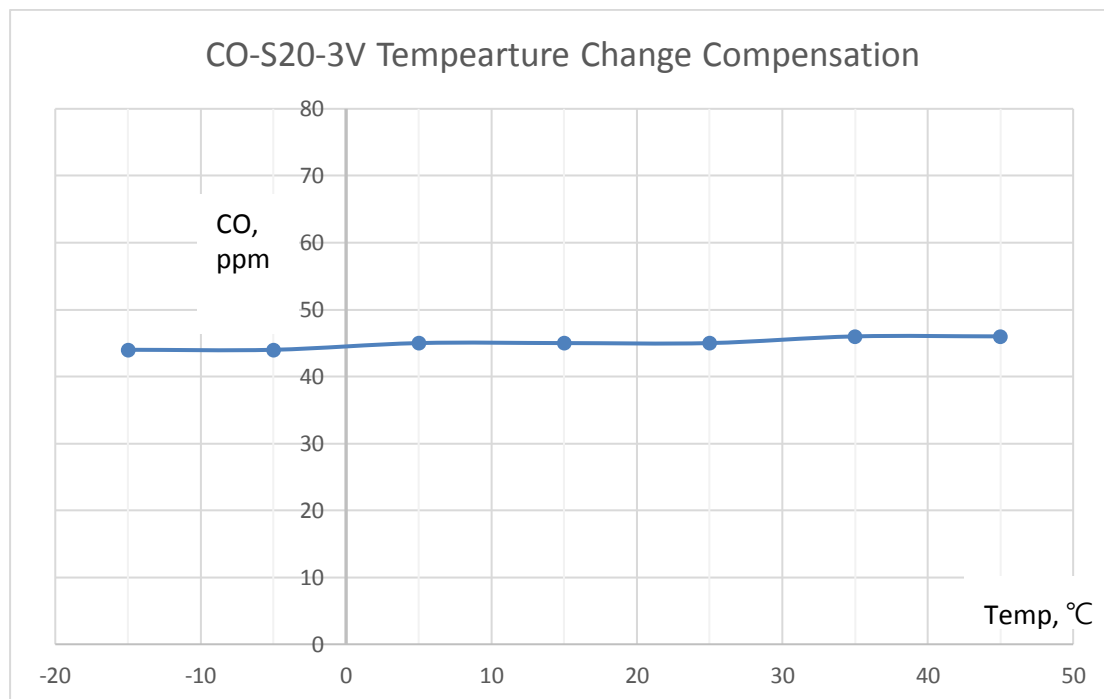
Transmission Sequence in Master

1) I2C Start Condition

2) Write Command(Slave Address + R/W Bit(0) = 0x82) Transmission and Check Acknowledge

3).Write Command(ASCII 'R' : 0x52) Transmission and Check Acknowledge

4) I2C Stop Command

5) I2C Start Command

6) Read Command(Slave Address + R/W Bit(1) = 0x83) Transmission and Check Acknowledge

7) Read 7 Byte Receiving Data from Module and Send Acknowledge

(Delay at least 1ms for reading each byte)

Configuration	CO	reserved	reserved	reserved	reserved
1 Byte	2 Byte	0x00	0x00	0x00	0x00

0	0	0	0	1	0	0	0

In need of detail protocol specification and time sequence, **'I2C programming guide'** could be provided by contacting Sales Rep.

CO-S20-3V Accuracy Test

CO-S20-3V Tempearture Change Compensation

Cautions on Installation

I.   The sensor has 5 years or more lify cycle when stored at 0~20℃, not exceeding 6 months before installation and use in clean air environment.

II.   The chemical part of Sensor module should not be held; Its PCB part can be be held instead.

III.   Soldering time and heat shouldn't exceed 3 seconds and 350℃.

IV.   The sensor should be installed 1.5m~2m hight to detect CO gas which is lighter than air. prevented from water or oil or solvent, or high concentration organic gas existence or continuous vibration, or impulse from outside to avoid damage by them

V.   Power should be inserted into right pins because sensor could be damaged when wired into output pins.

VI.   Please make sure to hold PCB of Chemical-Sensor-module and plug/unplug sensor-module into/from main-board little by little left and right in turn. Too harsh force may break 4-pins and 10pins connectors.

VII.   Please install or keep sensors in the places where electro-static or induced electro-magnetic field effect.

VIII.   Please test use air-based standard gas when check Sensor performance.

IX.   The sensors components should be departed or replaced, or manipulated unless request or agree by vendor, Please don't touch electrolyte leaked from sensor when it is damaged or broken. Wash out skins with running water when wet by leaked electrolyte.

X.   Do Manual-Zero-Calibration when sensor gives 10ppm or higher values at clear air.

Revision History

Version	Feature	Date
1.0	Launched	2019.APR
1.1	'G' option (15~99%, Non-condensing condition) is added	2019.JUL
2.0	Measurement update from 3 seconds to 1 second, I2C address change from 0x41 to 0x61, SPAN Calibration function is added	2019.SEP
2.1	Calibration Pin-map change	2020.FEB