



FIS

MODEL **FIS2001-01**
PARTS NAME **SMART SENSOR**
SPECIFICATION No. **U-0104-01 (Draft 1)**
DATE OF ISSUE **June 25, 2001**



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SPECIFICATIONS**Model: FIS2001-01****Type: Smart Sensor****Specification No. U-0104-01****FIS****1. History of revisions**

Ref.No.	Date	Proposed by	Approved by	Notes
DRAFT 1	June 25, 2001	S. Matsumoto	S. Matsumoto	

2. Scope

This specification applies to "Smart Sensor" for carbon monoxide and methane detector.

3. Parts Name/Number

Name: Smart Sensor

Number: FIS2001-01

Customer's parts number:

4. Features

1. A calibrated sensor module conforming to European standards
2. A small board with eight pins on which SB-95-11 is mounted.
3. Serial (RS232C) gas concentration output
4. Smart Sensor identification output.
5. CO alarm output conforming to European standard (prEN50291, Sept. 1999)
6. CH4 alarm output conforming to European standard (EN50194, March 2000)
7. Supervising the sensor module
8. Low power consumption (5V DC, 27mA max)
9. On-site re-calibration by the customer
10. Small size, light weight and easy operation
11. Long life, low price

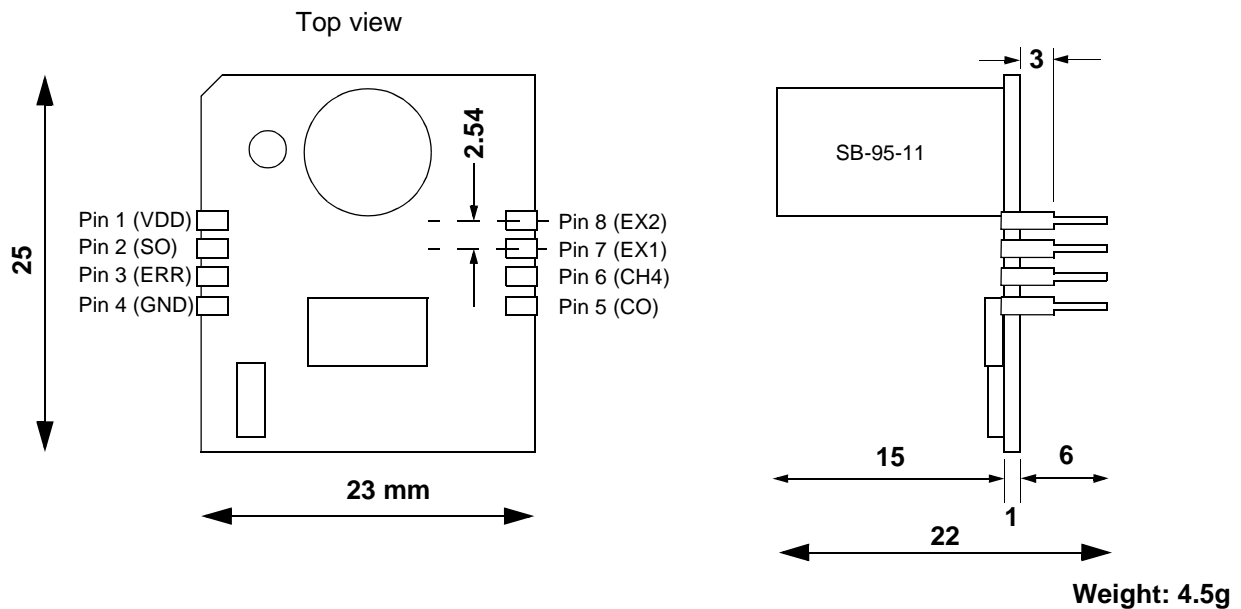
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5. Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating	Remark
Circuit voltage	VDD	6.0VDC	
Input voltage	VIN	-0.3 to VDD+0.3V	
Output voltage	VOUT	-0.3 to VDD+0.3V	
Operating temperature	Top	-10 to 50°C	Without dew condensation
Storage temperature	Tst	-30 to 70°C	Without dew condensation
Note	Filter should not be contaminated by organic solvents like IPA		

6. Structure



7. Pin Specification

No.	Name	I/O	Active	Functions
1	VDD			Power supply voltage. 5V DC±4%, 30mA max.
2	SO	In	Low	For setting re-calibration mode.
		Out	High	Gas concentration (Usual Mode). The serial (RS232C) output of the gas concentration, etc. is released.
3	ERR	Out	Low	Low at the time of failure (Usual Mode)
		Out	Low	From High to Low when re-calibration mode is properly set.
		Out	1 Hz	1 Hz signal is released for re-calibration error.
4	GND			GND

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No.	Name	I/O	Active	Functions
5	CO	Out	Low	Low when releasing CO alarm (Usual Mode)
		In	Low	For setting re-calibration mode
		Out	Low	From High to Low when re-calibration mode is properly set.
		Out	1 Hz	1 Hz signal is released when re-calibration procedure is finished.
6	CH4	Out	Low	Low when releasing CH4 alarm (Usual Mode)
		In	Low	For setting re-calibration mode
		Out	Low	From High to Low when re-calibration mode is properly set.
		Out	1 Hz	1 Hz signal is released when re-calibration procedure is finished.
7	EX1			No connection
8	EX2			No connection

8. Recommended Operating Conditions

Parameter	Symbol	Ratings	Remark
Circuit voltage	VDD	5VDC±4%	
Input High voltage	VIH1	VDD x 0.7 to VDD	
Input Low voltage	VIL1	0 to VDD x 0.3	

Parameter	Condition	Remark
Test temp. and hum.	20°C±2°C, 65%±5% R.H.	Standard test condition
Test gases	Clean air	
	Carbon monoxide and methane (purity: more than 99%)	
Pre-heating time	Four to ten days	20°C±10°C, 65%±15% R.H, in clean atmosphere.

9. Initial operation

1. The smart sensor will not release alarm output during first 80 second warm up time. During this time, the smart sensor is stabilized.

10. Sensor operation

1. A High/Low periodic temperature change is used for the sensing element, "High" for methane, and "Low" for CO detection.
2. The load resistance for methane detection is 0.3kohm.
3. For CO detection, both the load resistance of 300kohm and 10kohm is examined, and the optimum resistance will be selected.
4. The sensor heater is supplied with a pulse-driven 5V.
5. The circuit voltage for the gas sensor is 5VDC.

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6. The temperature/humidity dependency of the gas sensor is compensated with a thermistor.

11. Characteristics of Alarm

METHANE: As per EN50194 (March 2000)

Ref No.	Parameter	Specification		Remark
		Must not alarm	Must alarm	
1	Alarm concentration of methane		1500 to 6500ppm	
2	Response of methane (25%LEL)		Within 30 seconds	

CARBON MONOXIDE: As per prEN50291 (Sept. 1999)

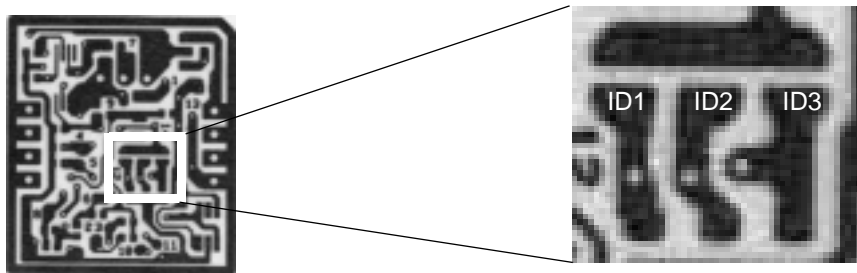
Ref No.	Concentration of carbon monoxide	Specification		Remark
		Must not alarm	Must alarm	
1	33 ppm	Within 120 minutes		
2	55 ppm	Within 60 minutes	Within 90 minutes	
3	110 ppm	Within 10 minutes	Within 40 minutes	
4	330 ppm		Within 3 minutes	
5	Response to 5000 ppm of carbon monoxide	Within 3 minutes		

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12. The module identification

1. The identification number of the FIS2001 can be set for the purpose of multi-point monitoring systems. The number is released through serial output (0 to 7).
2. The number can be identified with three patterns prepared on the substrate as below.
3. The factory setting is "0".



Back of PCB

The above shows the factory setting "0".
 Soldering ID1 to the upper "Island" sets "1".

○: open, ●: close

Pattern	Identification No.							
	0	1	2	3	4	5	6	7
ID1	○	●	○	●	○	●	○	●
ID2	○	○	●	●	○	○	●	●
ID3	○	○	○	○	●	●	●	●

13. Serial output

1. The RS232C data is released every second from Pin2 (SO).
2. The protocol is 9600bps (Baud rate), 8bits (Data bits), none parity (Parity bit), stop bits 1 (Stop bits), None (RTS-/CTS protocol), None (XON-/XOFF protocol), CR LF (CR signal), 0-5vdc, ASCII, and active Hi.
3. The data have the following specifications and transmits the ASCII character of 12 digits each for CO, and CH4 (a total of 24 digits) for every second.

	The number of digits																							
	CO												CH4											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATA	X		C	O		X	X	X	X		CR	LF	X		C	H		X	X	X	X		CR	LF

- Digit 1: Numeric from "0" to "7" identifying the independent Smart Sensor
- Digit 2: Space
- Digit 3: Character "C"
- Digit 4: Character "O"
- Digit 5: Space
- Digits 6 to 9: Numeric "0000", "0030" to "0390", or character "OVER".
- Digit 10: Space

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Digit 11: Carriage Return

Digit 12: Line Feed

Digit 13: Same numeric as Digit 1

Digit 14: Space

Digit 15: Character "C"

Digit 16: Character "H"

Digit 17: Space

Digit 18 to 21: Numeric "0000", "0300" to "6900", or character "OVER"

Digit 22: Space

Digit 23: Carriage Return

Digit 24: Line Feed

4. Carbon monoxide is transmitted as characters of "CO", and methane "CH".
5. The concentration of carbon monoxide is released as 0000, 0030 to 0390, or OVER (for more than 390ppm). The unit is ppm and the right last digit is always "0".
6. The concentration of methane is released as 0000, 0300-6900, or OVER (for more than 6900ppm). The unit is ppm and the right last two digits are always "0".

14. Re-calibration (on-site) by the users

1. Pre-heating should be performed for four days or more.
2. Although calibration is performed by one concentration, all concentration regions are adjusted automatically.
3. CO and CH₄ can be calibrated independently. When you calibrate for both gases continuously, carry out in the order of CO and CH₄. In this case, keep more than 5 minutes between CO and CH₄ calibration.
4. Calibration should be performed at about 20 degrees and 65%RH.
5. Be sure that Pin 3 should not be connected to GND.
6. Calibration procedure for CO:
 - 1) Power on the smart sensor.
 - 2) Calibration gas (55 ppm of CO) is exposed to the smart sensor for about 5 minutes and the sensor is kept in the calibration gas.
 - 3) Power off the smart sensor and connect Pins 2 and 5 to GND.
 - 4) Power on to confirm that Pins 3 and 5 are Low.
 - 5) Disconnect Pins 2 and 5 from GND to start the calibration program.
 - 6) Calibration will be completed after 5 minutes.
 - 7) When the calibration is successfully completed, the 1Hz signal is released from Pin 5, and Pin 3 remains

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Low status.

8) If a calibration error occurs, the 1Hz signal is released from both the Pins 3 and 5.

9) Exhaust the calibration gas.

7. Calibration procedure for CH4:

1) Power on the smart sensor.

2) Calibration gas (3000 ppm of CH4) is exposed to the smart sensor for about 5 minutes and the sensor is kept in the calibration gas.

3) Power off the smart sensor and connect Pins 2 and 6 to GND.

4) Power on to confirm that Pins 3 and 4 are Low.

5) Disconnect Pins 2 and 6 from GND to start the calibration program.

6) Calibration will be completed after 5 minutes.

7) When the calibration is successfully completed, the 1Hz signal is released from Pin 6, and Pin 3 remains Low status.

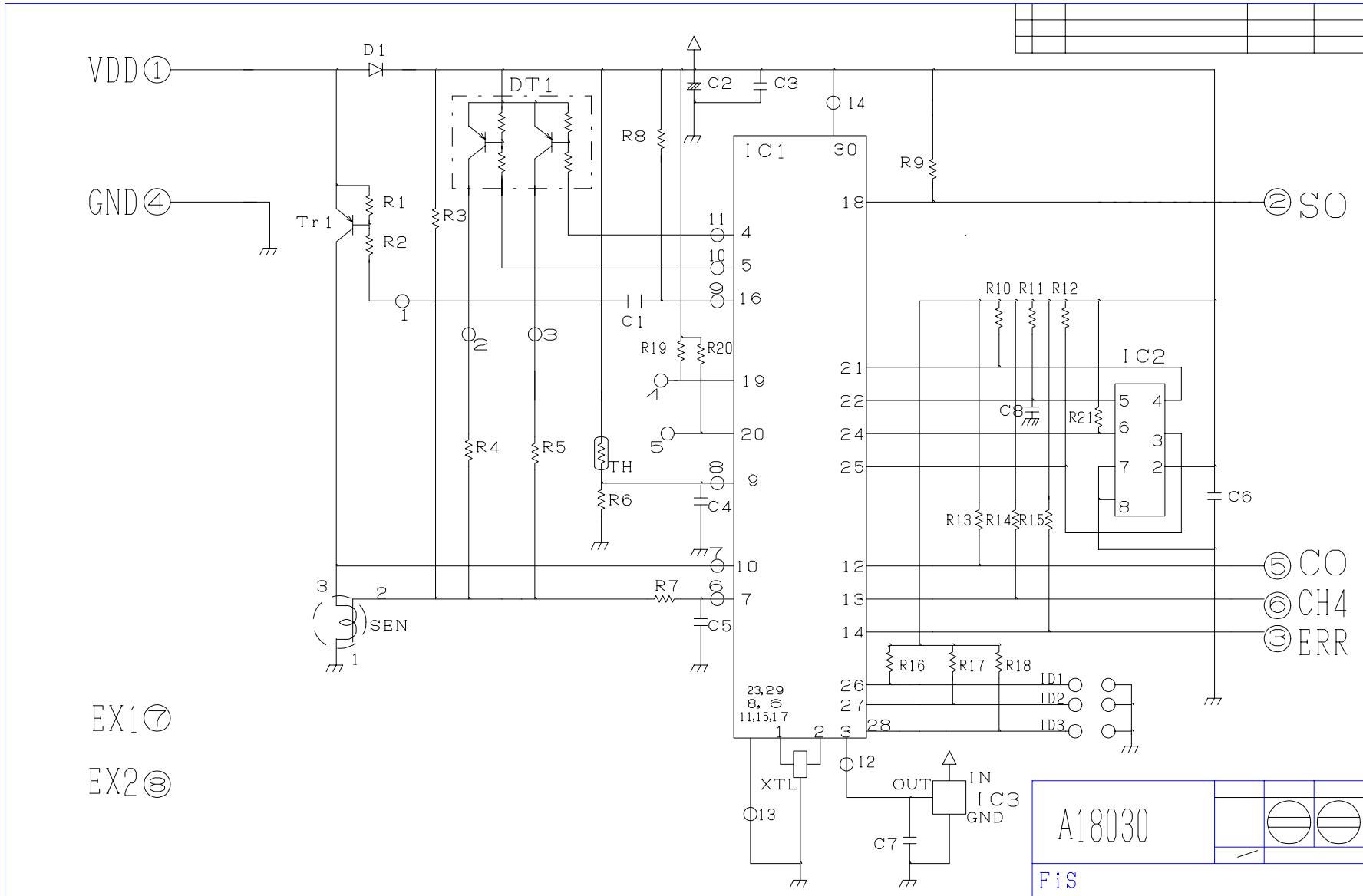
8) If a calibration error occurs, the 1Hz signal is released from both the Pins 3 and 6.

9) Exhaust the calibration gas.

Circuit Diagram of FIS2001-01

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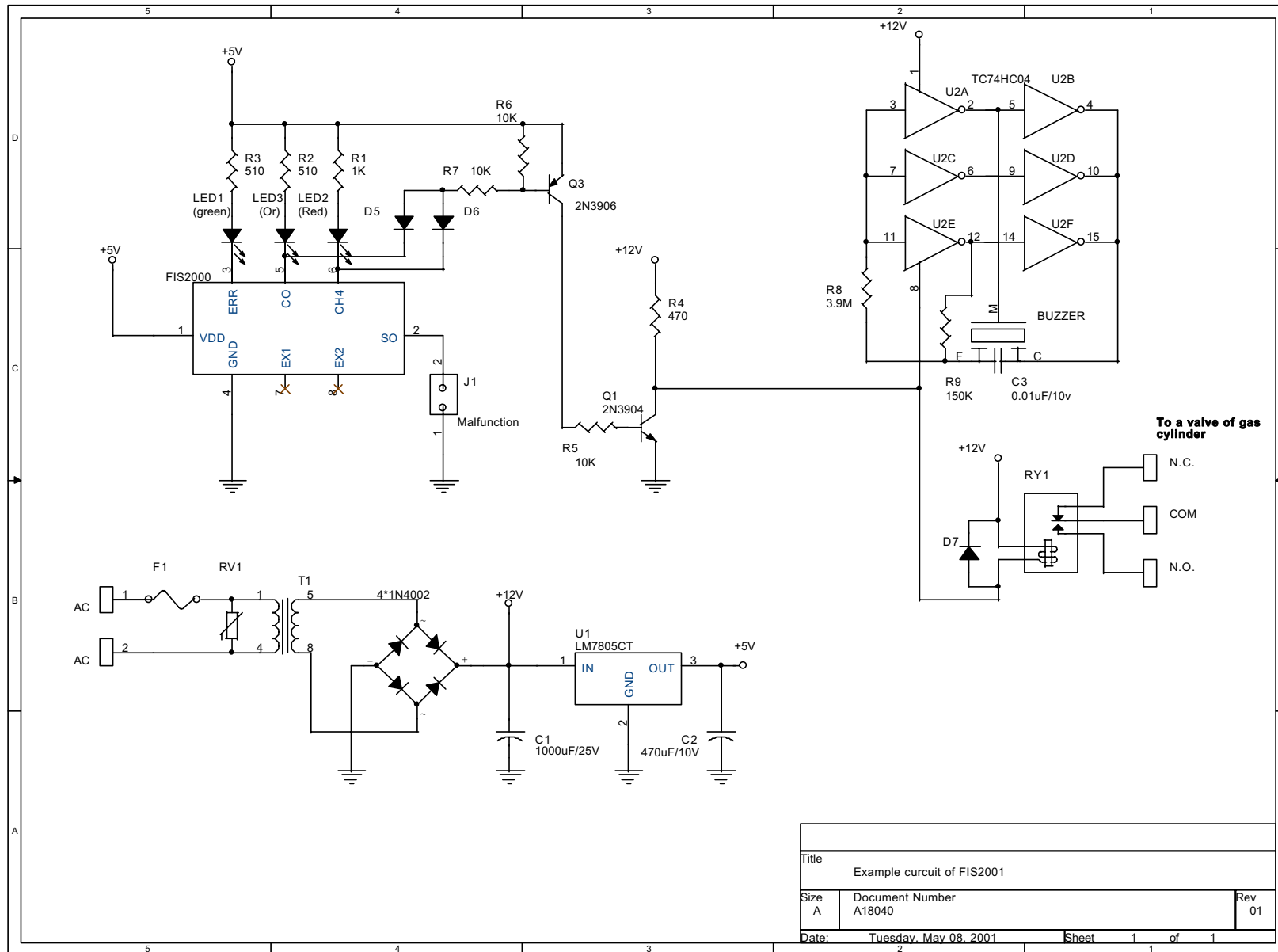
EX1 ⑦

EX2 ⑧

A18030

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An example circuit for FIS2001-01



Title		
Example circuit of FIS2001		
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