ZHEJIANG BAIAN TECHNOLOGY CO., LTD.

浙江百岸科技有限公司

BAIAN
NCDx SENSOR

1 COMPANY PROFILE

2 PRODUCTS AND TECHNOLOGY

3 PRODUCE AND DELIVER

① COMPANY PROFILE

BAIAN' s NOx sensor technical strength is in the leading position in China, with 5 doctors, and more than 20 electronic, mechanical & quality engineers and technicians; At present, we have obtained 21 patents (including 6 invention patents and 15 utility model patents) and 10 software Copyrights. Baian Technology is ***the only OEM Supplier in China*** for YUCHAI, JMC and other commercial automotive OEMs; ***the only NOx Supplier*** in China with chip, circuit, software, testing equipment and other key technologies, ***the only professional factory*** with a ***Total Sales Volume of more than 1 Million*** and ***Annual Production Capacity of more than 1 Million***.

With nearly 400 SKUs, BAIAN has been exporting to Europe & America. Over the past five years, BAIAN has maintained high growth; In 2021, nearly 400,000 PCS NOx sensors had been produced and sold worldwide, with an output value of more than 300 million RMB.

The new location covers an area of 13,333 square meters, building area of 30,000 square meters, with a production capacity of 1.2 million units. The company attaches great importance to quality control, effectively implements IATF16949:2016 management system, and has obtained international quality certifications.

Looking to the future, Baian will continue to specialize in technology, to develop and manufacture high-performance NOx sensors, to seek win-win cooperation with global customers, and to make its own contribution in the field of automotive environmental protection.

① COMPANY PROFILE

➢ Milestone

1996 Founding of the business in Auto parts industry

1998 Founded Yicheng Auto Parts Co., Ltd.

2000 Established Ruian Baian Trade Co., Ltd.

2002 Established branch office in central Asia and Europe

2005 Founded Wenzhou Baian Auto Parts Co., Ltd. .Relocation to Middle-north Industrial Zone

2013 Mass production of oxygen sensor; R&D for NOx sensors started

2017 Mass production of NOx sensor

2018 Sales of NOx sensors reached 80,000 units

September 2019 Upgraded to Zhejiang Baian Technology Co., Ltd.. Annual production up to 160,000 units

2020 Sales of 250,000 units. In August, the government approved a new location of 30,000 square meters with a planned output of 800,000 units.

2021 Production & sales up to 400,000 units

2022 The new plant of Zhejiang Baian Technology Co., Ltd. was officially put into use Production & sales up to 350,000 units

2023 Production and sales volume was 320,000 units

5-year Mid-term plan: an output of 2 million units

① COMPANY PROFILE

➢ Corporate Culture

✓Mission

Technology promotes emission reduction and enjoys a green life

✓ Vision

Become a world-renowned intelligent manufacturer of sensor products

✓ Core Values

Diligent, Pragmatic, Innovative, Outstanding

① COMPANY PROFILE

➢ Certification

Certificate of Registration

nqa.

This is to certify that the Quality Management System of

ZHEJIANG BAIAN TECHNOLOGY CO., LTD.
Building 1 and 2, No. 1, Jixiang Road, Tangxia Town, Rui'an, Wenzhou City, Zhejiang Province, 325204, China.

applicable to

The manufacture of NOx sensors

has been assessed and registered by
NQA, Warwick House, Houghton Hall Park, Houghton Regis, Dunstable LU5 5ZX, Bedfordshire, England

against the provisions of

IATF 16949 : 2016

(Clause 8.3 product design of IATF 16949 : 2016 is justifiably excluded)

This registration is subject to the company maintaining a quality management system, to the above standard, which will be monitored by NQA

Managing Director

NQA Certificate No: T 86588
IATF Certificate No: 0378111
Date: 18 December 2020
Valid Until: 17 December 2023
Version: 1

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NQA is a trading name of NQA Certification Limited. Registration No. 05511758. Registered Office: Warwick House, Houghton Hall Park, Houghton Regis, Dunstable LU5 5ZX.
This certificate is the property of NQA and must be returned on request

Revision Date: Feb 2017 Page 1 of 1 Issue 5

QS IATF 16949:2016
Certification authority：nqa

ZERTIFIKAT ■ CERTIFICATE ■ CERTIFICADO ■ CERTIFICAT

Verification No.: CEZJ20080526199

GTS

VERIFICATION OF EMC COMPLIANCE

Applicant:	ZHEJIANG BAIAN TECHNOLOGY CO.,LTD.
Address of applicant:	1# Jixiang Rd., Tangxia, Ruian, Wenzhou, Zhejiang Province, China 325204
Manufacturer:	ZHEJIANG BAIAN TECHNOLOGY CO.,LTD. 1# Jixiang Rd., Tangxia, Ruian, Wenzhou, Zhejiang Province, China 325204
Product Description:	NOx Sensor
Model No.:	BA036765A, BA037103, BA017400, BA027401, BA036612F, BA037371, BA016619D, BA016628C, BA026675A, BA036752C, BA036786

Sufficient samples of the product have been tested and found to be in conformity with

Test Standard:	EN 55014-1:2017, EN 55014-2:2015, EN 61000-3-2:2014, EN 61000-3-3:2013

As shown in the

Test Report Number(s):	TEZJ20080526199
Date of issue:	August 07, 2020
Date of expiry:	August 06, 2025

Conclusion

This Verification of EMC Compliance has been granted to the applicant based on the results of the TCF, performed by Global Testing Services Co., Ltd. on the sample of the above-mentioned product in accordance with the provisions of the relevant specific standards and the Directive 2014/30/EU. The CE mark as shown below can be used, Under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives. The affixing of the CE marking presumes in addition that the conditions in annexes I, II and IV of the Directive are fulfilled.

Approved by: Hermann Weiher

For and on behalf of
Global Testing Services Co., Ltd

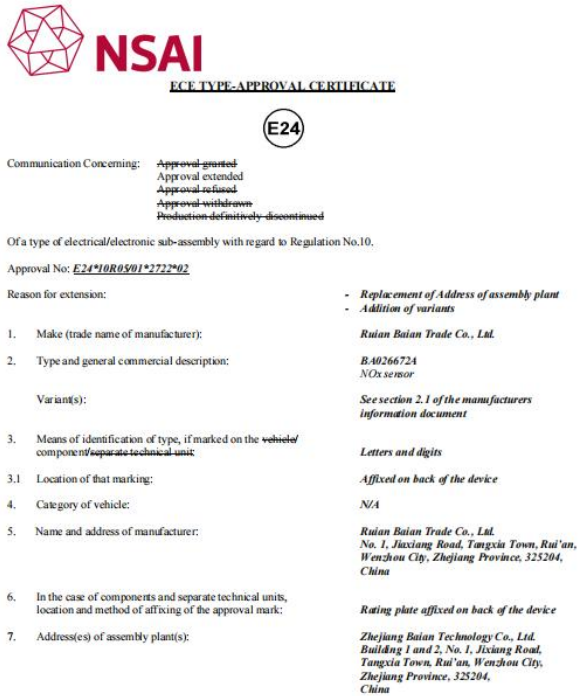
CE

GLOBAL TESTING SERVICES CO.,LTD. GTS CERTIFICATION

Global Testing Services Co., Ltd
E-mail:info@gts-lab.com http://www.gts-lab.com
Floor 2nd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China.

Copyright of this certificate is owned by Global Testing Services Co., Ltd and may not be reproduced other than in full and with the prior approval of the General Manager.

EMC
Certification authority：GTS



NSAI

ECE TYPE-APPROVAL CERTIFICATE

E24

Communication Concerning: ~~Approval granted~~ Approval extended ~~Approval refused~~ ~~Approval withdrawn~~ ~~Production definitively discontinued~~

Of a type of electrical/electronic sub-assembly with regard to Regulation No.10.

Approval No: ***E24*10R05/01*2722*02***

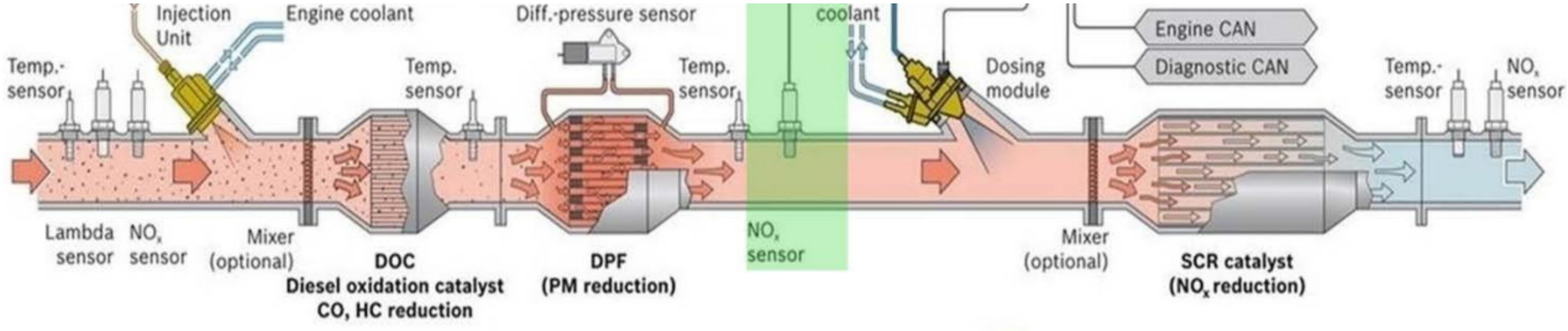
Reason for extension: - *Replacement of Address of assembly plant* - *Addition of variants*

1.	Make (trade name of manufacturer):	*Ruian Baian Trade Co., Ltd.*
2.	Type and general commercial description:	*BA0266724* *NOx sensor*
	Variant(s):	*See section 2.1 of the manufacturers information document*
3.	Means of identification of type, if marked on the ~~vehicle/component/separate technical unit~~:	*Letters and digits*
3.1	Location of that marking:	*Affixed on back of the device*
4.	Category of vehicle:	*N/A*
5.	Name and address of manufacturer:	*Ruian Baian Trade Co., Ltd. No. 1, Jixiang Road, Tangxia Town, Rui'an, Wenzhou City, Zhejiang Province, 325204, China*
6.	In the case of components and separate technical units, location and method of affixing of the approval mark:	*Rating plate affixed on back of the device*
7.	Address(es) of assembly plant(s):	*Zhejiang Baian Technology Co., Ltd. Building 1 and 2, No. 1, Jixiang Road, Tangxia Town, Rui'an, Wenzhou City, Zhejiang Province, 325204, China*

E-mark
Certification authority ： NSAI

② PRODUCTS AND TECHNOLOGY

-Position of NOx sensor in diesel exhaust aftertreatment system

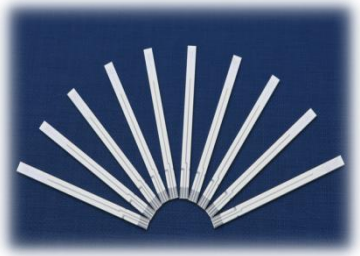


- **NOx sensor** is one of the key components of diesel exhaust aftertreatment system. By measuring NOx content in exhaust gas before and after urea injection to achieve closed-loop management, it provides a basis for the control of urea injection volume in exhaust aftertreatment system and ensures the accuracy of urea injection volume in reduction reaction.

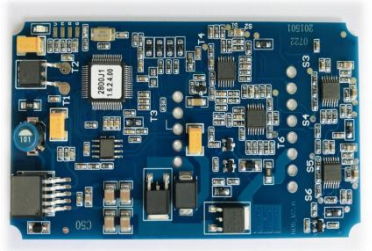
② PRODUCTS AND TECHNOLOGY

- ✓ In 2018, after years of R&D and technical research, the Baian NOx sensor that meets the Euro VI/National VI standard was officially mass-produced and sold.

The core components of the NOx sensor:



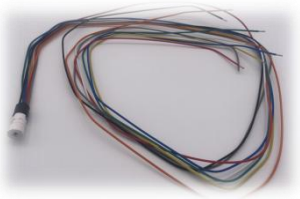
- Ceramic chip



- Circuit board

- Probe and accessories

- Plastic cover and aluminum case



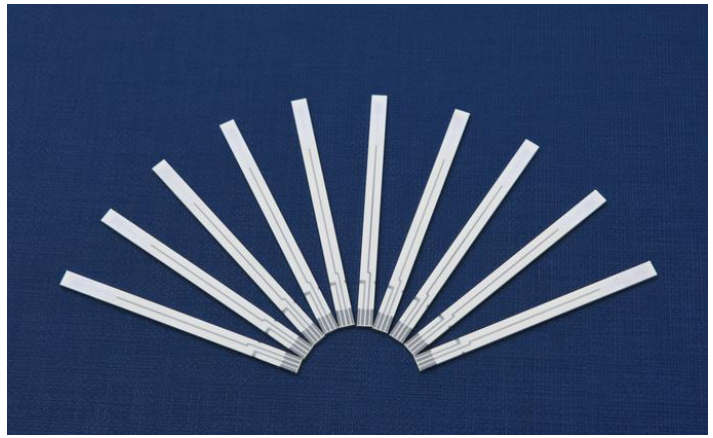
- Wiring harnesses

- Plastic plug fittings

2 PRODUCTS AND TECHNOLOGY

Advanced equipment: The company has introduced complete HTCC process production equipment, printing equipment, hot knife cutting machines, warm water isostatic presses, etc. from KEKO in Europe.

Basic materials: We import German zirconium oxide powder and electrode materials from the Ferro company in the United States. An independent and unique formula material system formed after a lot of experiments and improved material characteristics.



Ceramic chip production: We have a complete technological process, from powder casting to film, printing, lamination, sintering, and finished product performance testing. Our technological level has reached the international level.

Ceramic chip research and development: We have united Shanghai Jiaotong University and Chinese Academy of Sciences. After about 5 years of thousands of electrochemical material experiments, the Baian formula of chip base material has been successfully developed.

Production capacity: There are 10 sintering furnaces, the annual output of chips can reach more than 1,600,000 pieces, and the finished product rate is more than 96%

2 PRODUCTS AND TECHNOLOGY

- Fundamentals of ceramic chips

- **A complete know-how of the core processes of ceramic chips, from material formulation, blank chips production and co-firing**

Formula adjustment of sensitive electrode materials;

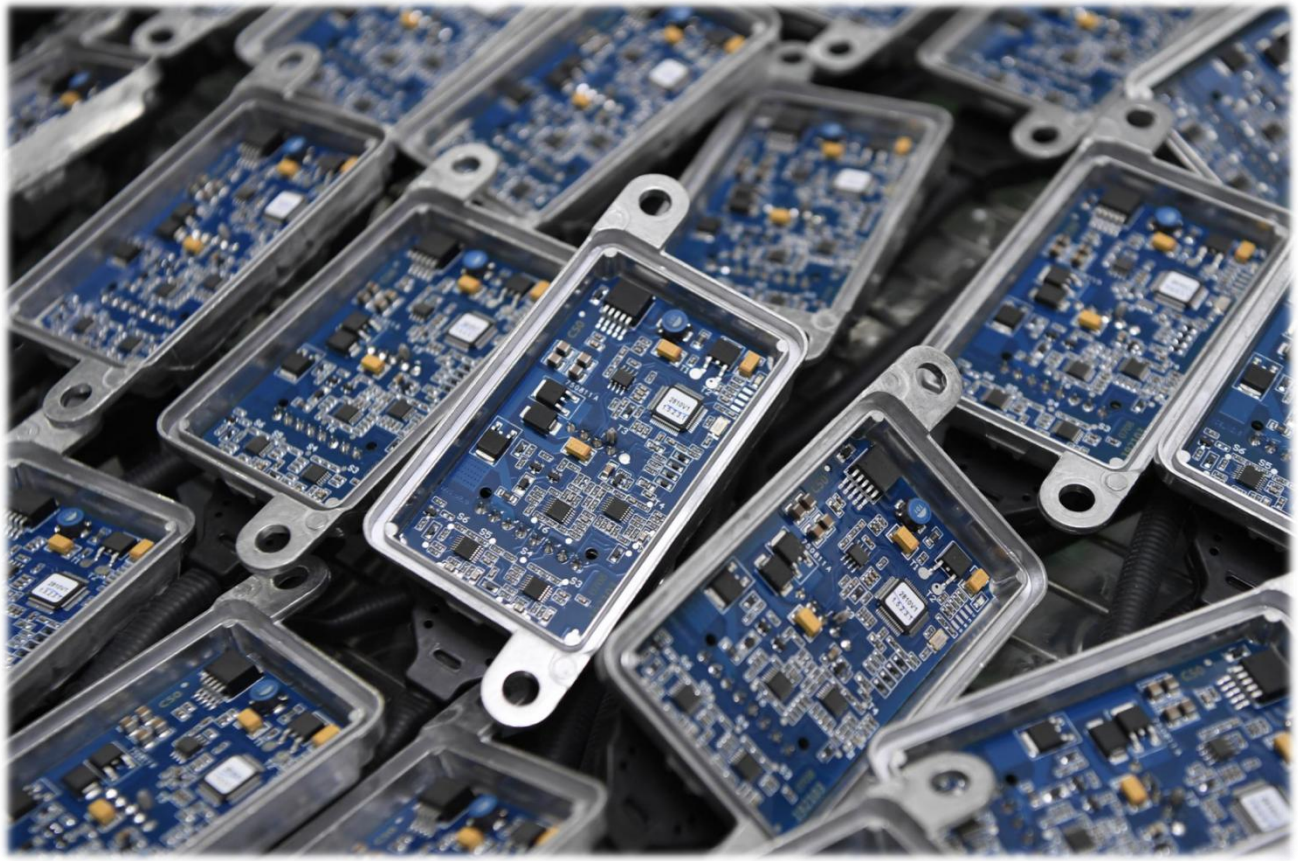
High temperature co-firing process control;

Inspection & analysis of ceramic chip characteristics;

Internal stress relief and aging of raw chips.

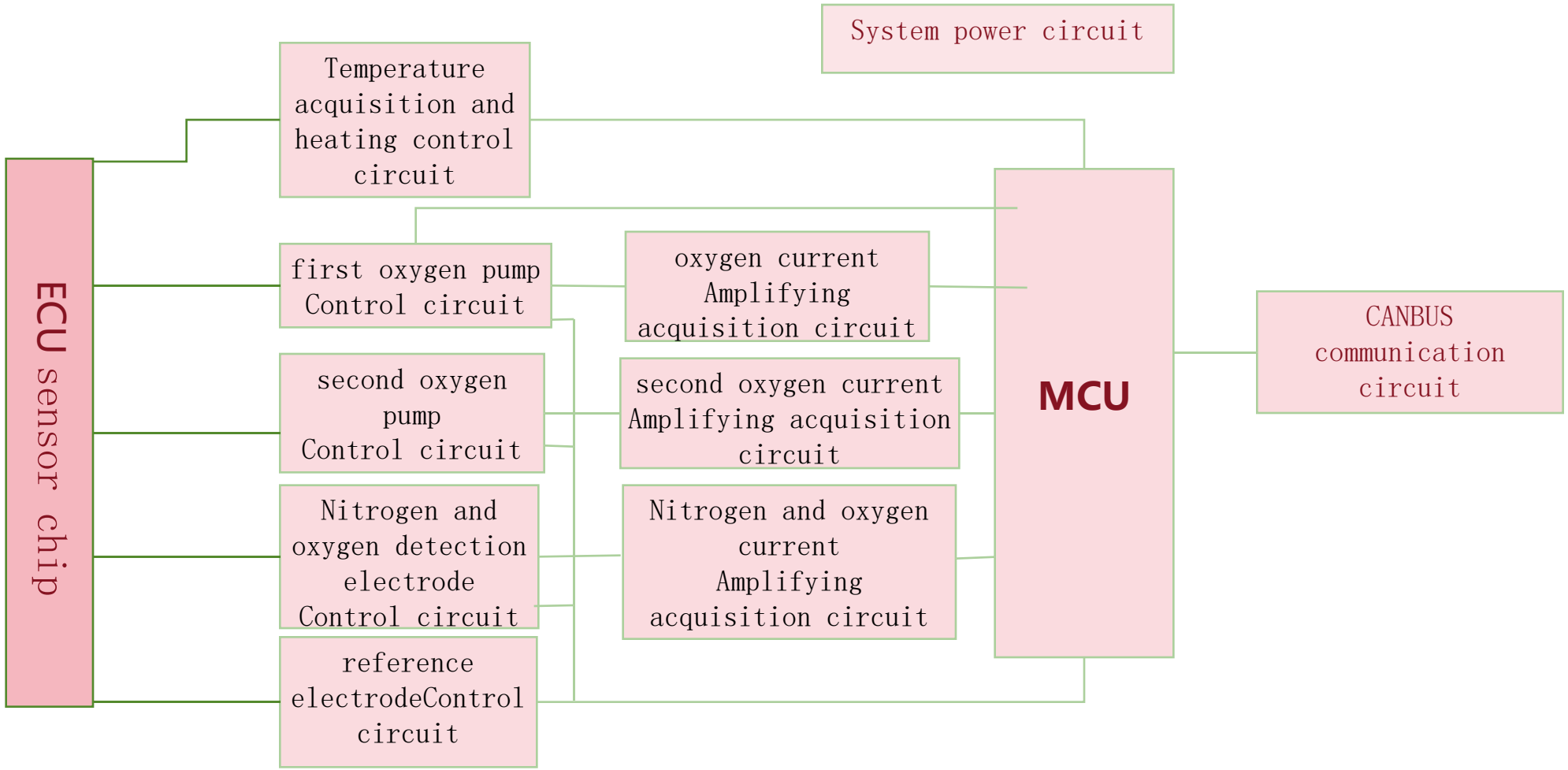
② PRODUCTS AND TECHNOLOGY-ECU

- ECU is the most important control system of NOx Sensor, including CJ 1939 communication protocol, heating control circuit, control circuit of oxygen electrode and control circuit of measuring electrode



② PRODUCTS AND TECHNOLOGY-ECU

- Schematic representation



2 PRODUCTS AND TECHNOLOGY

-Software

- Heating temperature control subroutine
- Standard communication subroutine
- Data acquisition subroutine
- Data calibration algorithm program
- Calibrate the host communication subroutine
- Alarm information subroutine
- Sensor status monitoring subroutine
- Other work flow

2 PRODUCTS AND TECHNOLOGY

-Key Technolody of Circuit

1. Stable heating temperature control
2. Calibration method and algorithm
3. Low noise small signal amplification
4. High reliability circuit design

The research cycle of sensor chip materials and process is very long. Each manufacturer's chip will have different parameters in various aspects. It is necessary to develop supporting driving circuit and software according to the characteristics of its own chip, so as to achieve the optimization of the overall performance index.

② PRODUCTS AND TECHNOLOGY

- Parameters & Specifications

➢ BAIAN

No.	Des.	Symbol	Min.	Max.	Dim.	Remarks
1	NO_x concentration	NOx	0	2500	ppm	NO & NO_2
						1.0≤λ ≤ ∞
						(without NH_3)
2	Linear Air/Fuel-ratio	O_2	-12	21	%	/
3	Response Time NO_x	t33<--->66%NOx	/	1000	ms	fresh
				1200	ms	aged
4	Response time O2	t33<--->66%O2	/	900	ms	fresh
				1050	ms	aged

Minimum ambient temperature of ECU (measured at mounting point)	Tmin = -40 °C
Maximum ambient temperature of ECU (measured at mounting point)	Tmax = 125 °C
Minimum storage temperature without powering	Tmin = -40 °C
Maximum storage temperature without powering	Tmax = 90 °C
Maximum storage time in spare part packaging	2 Years
Maximum exhaust gas temperature	Tmax = 800 °C
Maximum sensor hexagon screw temperature	Tmax = 600 °C
Minimum wiring harness connector temperature	Tmin = -40 °C
Maximum wiring harness connector temperature	Tmax = 125 °C

➢ The standard - Continental

No.	Description	Symbol	Min.	Max.	Dim.	Remarks
1	NO_x concentration	NOx	0	2500	ppm	NO & NO_2
						1.0≤λ ≤ ∞
						(without NH_3)
2	Linear Air/Fuel-ratio	O_2	-12	21	%	/
3	Response Time NO_x	t33<--->66%NOx	/	1100	ms	fresh
				1200	ms	aged
4	Response time λ _lin	t33<--->66%O2	/	950	ms	fresh
				1050	ms	aged

Minimum ambient temperature of ECU (measured at mounting point)	Tmin = -40 °C
Maximum ambient temperature of ECU (measured at mounting point)	Tmax = 125 °C
Minimum storage temperature without powering	Tmin = -40 °C
Maximum storage temperature without powering	Tmax = 95 °C
Maximum storage time in spare part packaging	2Years
Maximum exhaust gas temperature	Tmax = 800 °C
Maximum sensor hexagon screw temperature	Tmax = 620 °C
Minimum wiring harness connector temperature	Tmin = -40 °C
Maximum wiring harness connector temperature	Tmax = 125 °C

② PRODUCTS AND TECHNOLOGY

- Comparison test on test bench

➢ Test requirements:

- In this experiment, 4 pcs BAIAN' s NOx sensors and 1 pcs Continental' s were installed on the test bench at the same time.
- According to BAIAN' s standard test procedures, the measurement results of different concentrations of NOx and O2 standard mixed gas were compared to see whether the error was within the prescribed range. (10 pcs BAIAN +1 pcs Continental were tested in mass production, 100% calibration.)

➢ Error range of NOx & O_2 measurement:

Gas type	Concentration range	Allowed error range
1) NOx	0-100PPM	±10PPM (absolute error range)
	101—500PPM	±10% (relative error range)
	501—2500PPM	±10% (relative error range)
2) O_2	0—21%	±1% (absolute error range)

② PRODUCTS AND TECHNOLOGY- Other reliability tests

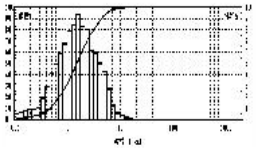
Environmental reliability tests						
NO.	Experiments	Test methods & requirements	Standards	laboratory	Conclusion	Remark
1	Vibration tests sinusoidal & random	①Sinusoidal vibration: 10Hz ~ 25Hz, amplitude 1.2mm, 520Hz, acceleration 120m/s², frequency sweep rate 1oct/min, vertical, back & forth, left & right, 3 directions, for each direction sample should be able to work properly after 8h sinusoidal vibration test. ②10Hz ~ 2000Hz, acceleration m/s², frequency sweep rate 1oct/min, sample should work normally after 8h random vibration test in vertical, back & forth, left & right directions.	GB/T 2423.10-2019 《Environmental tests - Part 2: Test methods Test Fc: Vibration (Sinusoidal)》 GB/T 2423.56-2018 《Environmental testing - Part 2: Test methods - Test Fh: wide-band random vibration and guidelines》	External CANS laboratory	Qualified	See details in test report
2	Free fall test	Free drop impact test, the height 1000mm, the sample fell to the concrete surface or steel plate surface, total 12 tests, the initial surface of the contact surface should be respectively 6 planes of the sample, twice fall for each surface, the drop should be measured from the sample to the nearest of the test surface, the sample should be able to work normally after the test.	GB/T 28046.3-2011 《Environmental conditions and tests for electrical & electronic equipment for road vehicles - Part 3: Mechanical loads》	External CANS laboratory	Qualified	See details in test report
3	Low temperature resistance	Sample placed in a low-temperature box, the temperature in the box reduced to -40℃. After temperature is stable and maintained for 72h, the sample should be able to work normally after the test.	GB/T 2423.1-2008 《Environmental tests for electrical & electronic products - Part 2: Test methods - Test A: Low temperature》	External CANS laboratory	Qualified	See details in test report
4	High temperature resistance	Sample placed in a high-temperature box, temperature in the box rises to 125℃. After the temperature is stable and maintained for 72h, the sample should be able to work normally after the test.	GB/T 2423.2-2008《Environmental tests for electrical & electronic products - Part 2: Test methods - Test B: High temperature》	External CANS laboratory	Qualified	See details in test report
5	Temperature/ humidity combined cycle test	-10℃ ~ 65℃, 10 cycles of humidity & heat test, each cycle time 24h, the sample should be able to work normally after test.	GB/T 2423.34-2012 《Basic environmental test procedures for electrical and electronic products Test Z/AD: temperature/humidity combined cycle test》	External CANS laboratory	Qualified	See details in test report
6	Temperature variation test	temperature change test at -40℃ and 125℃, a cycle of 2h, total 100 cycles, the sample should be able to work normally after test.	GB/T 2423.22-2012《Environmental tests for electrical and electronic products - Part 2: Test N: Temperature change》	External CANS laboratory	Qualified	See details in test report
7	Salt spray test	After 240h neutral salt spray test, the sample should be able to work normally.	GB/T 2423.17-20O8《Environmental tests for electrical & electronic products - Part 2: Test methods - Ka: salt spray》	External CANS laboratory	Qualified	See details in test report
8	Protection grade	According to the shell protection class IPX7, the sample is immersed 0.5m under water for a short time of 30min, the sample should be able to work normally after the test.	GB/T 4208-2017 《Case protection class (IP code)》	External CANS laboratory	Qualified	See details in test report

3 PRODUCE AND DELIVER

➢ **Annual production capacity**

- **1.2 million ceramic chips**
- **1.2 million finished products**

来料控制
Incoming Control



□ 来料检测-各种理化检验&测试

生产过程过程
Industrial Control
球磨+流延+印刷+烧结+装配+校准测试+包装

□ 生产过程控制-印刷检测&装配过程防错等

□ 出货控制-成品的检测&OQC抽检

出货控制
Output Control

EXPRESS 顺丰速运

3 PRODUCE AND DELIVER

-Production workshop layout

- ***7F : Sensing probe assembly workshop***

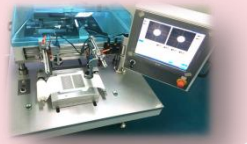

- ***6F: General assembly workshop***


- ***5F: Aging & calibration test workshop***


- ***4F: Final test & packaging workshop***


- ***3F: Ceramic chip test & zirconia film casting***


- ***2F: Ceramic chip printing workshop***




- ***1F: Ceramic chip sintering workshop***


3 PRODUCE AND DELIVER

-Main production equipments

- Automatic casting machine

- High temperature sintering furnace

- High precision chip printing machine

- Automatic machining line

- Automatic welding equipment

- Automatic heat treatment equipment

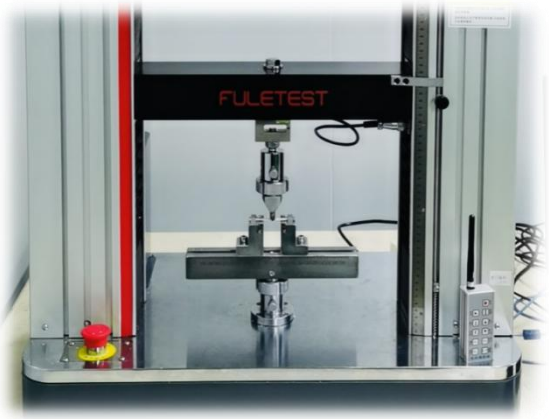
3 PRODUCE AND DELIVER

-Testing and calibration equipments

- Laser particle size detection analyzer

- Image measuring instrument

- Metallographic analysis microscope



- Strength testing instrument

- Ceramic chip performance testing system

- Calibration & Inspection system


Thank you!