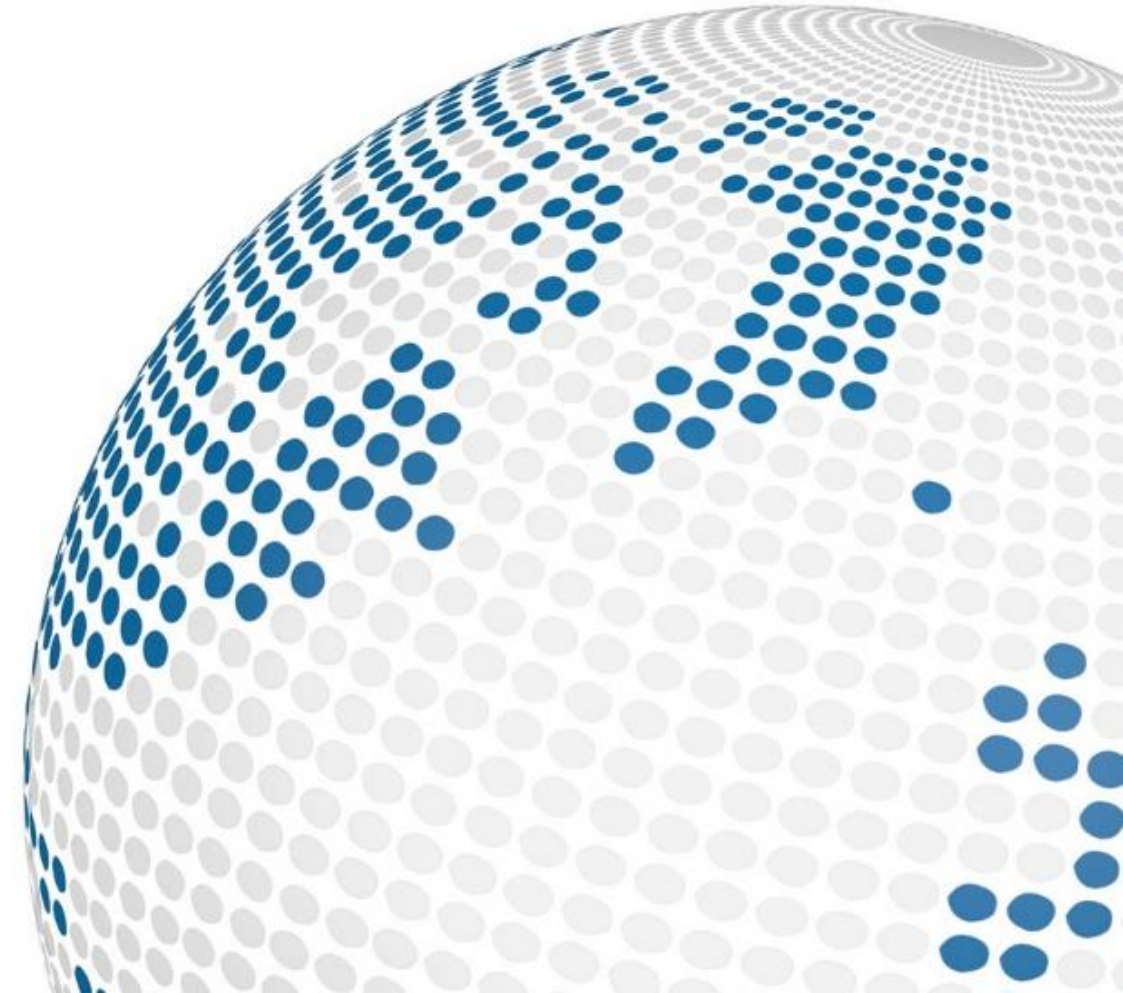


# ams & iESLab

Sensor solutions for Ultrasonic Flow in Gas and Water

Norbert Breyer  
08-Oct-2018



# ams & iESLab Cooperation

Speeding up Meter design by using iESLab Modules based on ams ultrasonic frontend IC

About iESLab

About ams

Water Meter Modules

Gas Meter Modules



# iESLab Electronics Co., Ltd.

## Company Profile



Qingdao iESLab Electronic Co., Ltd (Qingdao iESLab), established in 2001, a subsidiary of Integrated Electronic Systems Lab Co., Ltd. (stock code 002339) who is a leading total solution supplier of smart municipal works. Focusing on smart water service, smart gas, development, production, integration and technical service of metering products, Qingdao iESLab is a national high-tech enterprise, a key software supplier and one of the industrial standard drafters of direct-reading AMR system.

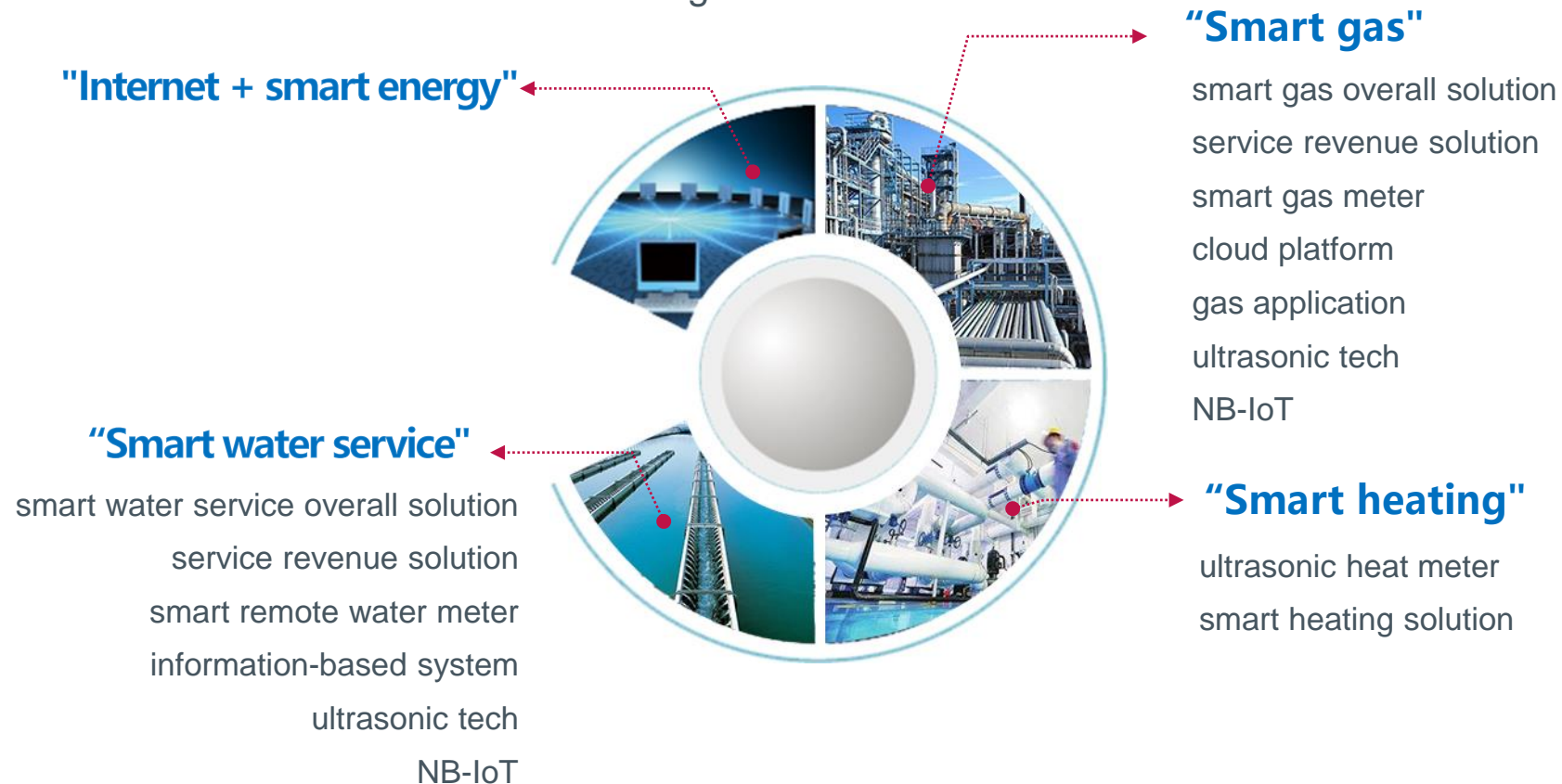
Qingdao iESLab have a long-term strategy partnership with ams AG which is an “Ultrasonic Flow Converters” provider , Qingdao iESLab have set up an ultrasonic laboratory with ams in Germany, and developed the full set of self-developed Ultrasonic Meter technology ,Ultrasonic Meter Module and Production Line

The technical team of Qingdao iESLab consists of dedicated engineers and technicians with great passion. We always make things happen and deliver great products. We have several patented technologies and innovations. In addition, we have participated in drawing and revising of the smart metering standards. In general, our technical team members are all well experienced with development and management of smart gas and smart water service systems.





iESLab offers multi-dimentional, omnidirectional automated services to the market. We are one of the professional solution providers in the information and automation segments.



The production is arranged under 7s standard to ensure the orderliness and efficiency, and to make sure the quality of the products are stable and reliable. From production layout, workshop environment, stock management, purchasing to production technology, streamline operation, all the procedures are stick to the "lean production, flexible manufacturing" standard.



Test Zone



Aging Room



Shielded Room



Exam Room



Automatic Potting Machine



Chip Mounter

# iESLab Partnerships with Water Utilities

iESLab 积成

amun  
Sensing is life.



北京顺义自来水有限责任公司  
Beijing Shunyi Water Supply Co., Ltd.



上海城投水务(集团)有限公司  
SHANGHAI SMI WATER (GROUP) CO., LTD.



济南水务集团  
Jinan Water Group Co., Ltd.



哈尔滨供水集团有限责任公司  
Harbin Water Supply Group Co., Ltd.



大连市自来水集团有限公司  
DALIAN WATER SUPPLY GROUP LIMITED COMPANY



长春水务(集团)有限责任公司  
ChangChun Water (Group) Co., Ltd.



南京水务集团有限公司



银川中铁水务集团有限公司  
YIN CHUAN ZHONG TIE WATER GROUP CO., LTD.



太原供水集团有限公司  
TAIYUAN WATER SUPPLY GROUP CO., LTD.



陕西省水务集团有限公司  
SHAANXI WATER AFFAIR GROUP CO., LTD.



石家庄水务集团有限责任公司



长沙水业集团有限公司  
Changsha Water Group Co., Ltd.



合肥供水  
HEFEI WATER



青城供排水  
QINGCHENG WATER SUPPLY AND DRAINAGE



北控水务集团有限公司  
BEIJING ENTERPRISES WATER GROUP LIMITED



杭州市水务控股集团有限公司  
HANGZHOU WATER HOLDING GROUP CO., LTD.



兴蓉集团  
XINGRONG GROUP



华衍水务  
Hua Yan Water



# iESLab Partnerships with Gas Utilities

iESLab 积成

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# Module Roadmap

## Water & Gas



### Water Meters

Module Name	Description	DN	Latest Status	Product launch	MP Delivery
Brass Spool	GP22	DN15 DN20	MP	2018-9-30	2018-9-30
	GP30	DN15 DN20	System test	2018-10-15	2018-11-15
PVC Spool	GP30	DN15 DN20	System test	DN20 : 2018-10-15 DN15 : 2018-10-30	DN20 : 2018-11-15 DN15 : 2018-11-30



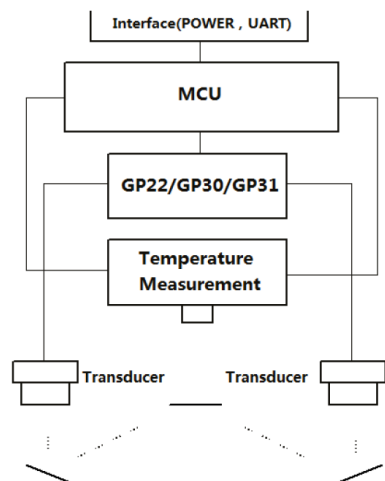
### Gas Meters

Module Name	Description	Range	Latest Status	Product launch	MP Delivery
Commercial	GP22	G6-G25	Calibration	2018-11-30	2019-4-30
Residential	GP22	G1.6-G4	Calibration	2018-12-31	2019-5-31

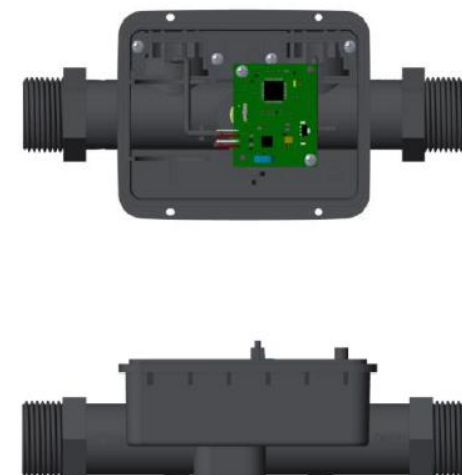
## Water Meter Modules

# Ultrasonic Water Metering Modules

## Brass and Plastic Housing



DN15 brass pipe  
Length 164mm & 109mm  
Height 63mm  
Width 83mm



DN20 plastic pipe  
Length 194mm  
Height 60mm  
Width 93mm

iESLab brass module is based on  
ams TDC-GP22

iESLab plastic module is based on  
ams TDC-GP30

# Ultrasonic Water Metering Modules

## GP22 solution:

Nominal Diameter (DN)	15	20	25	32	40
Starting Flow (m <sup>3</sup> /h)	0.002	0.003	0.003	0.005	0.005
Minimum Flow Rate Q <sub>1</sub> (m <sup>3</sup> /h)	0.010	0.016	0.025	0.040	0.064
Transitional Flow Rate Q <sub>2</sub> (m <sup>3</sup> /h)	0.016	0.025	0.040	0.064	0.100
Permanent Flow Rate Q <sub>3</sub> (m <sup>3</sup> /h)	2.5	4.0	6.3	10.0	16.0
Overload Flow Rate Q <sub>4</sub> (m <sup>3</sup> /h)	3.125	5.0	7.875	12.5	20.0
Flow Range Ratio (Q <sub>3</sub> /Q <sub>1</sub> )	400 <sup>①</sup> 、250 (default)				
Accuracy Class	Class 2				
Temperature Classes	T30				
Sample Rate	0.5Hz~4Hz, fixed or self-adaption(default)				
Maximum Admissible Pressure	1.0MPa				
Pressure Loss Range	<63KPa、<40KPa				
Flow data storage	Accumulation flow(90 days)				

## GP30/GP31 solution:

Nominal Diameter (DN)	15	20	25	32	40
Starting Flow (m <sup>3</sup> /h)	0.002	0.003	0.003	0.005	0.005
Minimum Flow Rate Q <sub>1</sub> (m <sup>3</sup> /h)	0.010	0.016	0.025	0.040	0.064
Transitional Flow Rate Q <sub>2</sub> (m <sup>3</sup> /h)	0.016	0.025	0.040	0.064	0.100
Permanent Flow Rate Q <sub>3</sub> (m <sup>3</sup> /h)	2.5	4.0	6.3	10.0	16.0
Overload Flow Rate Q <sub>4</sub> (m <sup>3</sup> /h)	3.125	5.0	7.875	12.5	20.0
Flow Range Ratio (Q <sub>3</sub> /Q <sub>1</sub> )	400、250 (default)				
Accuracy Class	Class 2				
Temperature Classes	T50 <sup>②</sup> 、T30(default)				
Sample Rate	8Hz~32Hz, 8Hz (default)				
Maximum Admissible Pressure	1.0MPa				
Pressure Loss Range	<63KPa、<40KPa				
Flow data storage	Accumulation flow(90 days)				



# Ultrasonic Water Metering Modules



## Power and Communication

- Power: Regulated power supply, in the range of 3.4V~5.5V, can provide 20mA peak current. The higher power is recommended.
- Communication Interface: UART, 3.3V, Baud Rate: 2400bps、 Even parity check, Data bit: 8bit, Stop bit: 1bit. UART TX can be used to wake up the user's board, falling edge active(water flow every 1L@normal mode, water flow every 1s@test mode, abnormalities). After UART TX wakes up the user's board, UART communication can be performed after 100μs.
- Communication Command: information read、 setup and etc.
- Power consumption:
  - » GP22 solution: < 30uA @ Self-adaptation sample rate, 4Hz~0.5Hz
  - » GP30/GP31 solution < 15uA @ Sample rate, 8Hz

Four core shielded lines	Wire 4*0.12mm <sup>2</sup> ,
	External diameter 3.4mm, length 100mm
	Power positive: (Red)
	Power negative: (Black)
	UART TX: (Yellow)
	UART RX:(White)

# Ultrasonic Water Metering Modules

## Ordering Information

Water metering module	Part number	Markup information
With brass pipeline (with calibration parameter)	IA-UWM-1-GPxx-DNxx	IA-UWM-1-GPxx-DNxx-YYYYMMDD-SSSSSS
With brass pipeline (without calibration parameter) <sup>⑦</sup>	IA-UWM-2-GPxx-DNxx	IA-UWM-2-GPxx-DNxx-YYYYMMDD-SSSSSS
With plastic pipeline (with calibration parameter)	IA-UWM-3-GPxx-DNxx	IA-UWM-3-GPxx-DNxx-YYYYMMDD-SSSSSS
With plastic pipeline (without calibration parameter)	IA-UWM-4-GPxx-DNxx	IA-UWM-4-GPxx-DNxx-YYYYMMDD-SSSSSS

GPxx = GP22/GP30/GP31 solution, DNxx = nominal diameter, YYYY = year, MM = month, DD = day, SSSSSS = product serial number that day

For example: IA-UWM-1-GP30-DN15-20180913-123456

## Gas Meter Modules

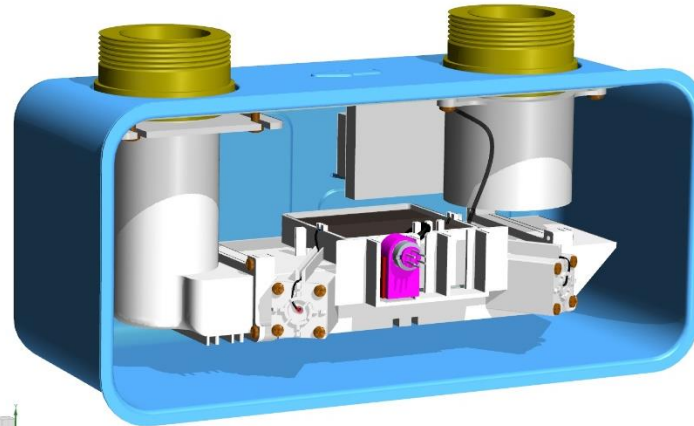
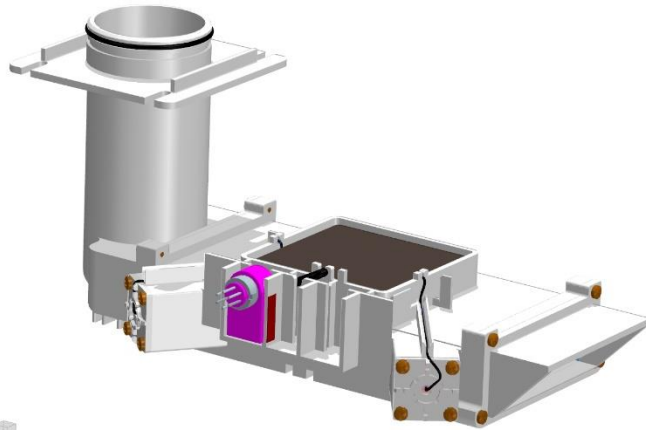
# Ultrasonic Gas Metering Modules

## Key Features

Items	Parameters
	G1.6 to G4 @ Residential, G6 to G25 @ Commercial & Industrial
Precision	Class 1.5
Temp Range	-15 °C to 45 °C
Pressure Range	60 to 150 kPa
Outputs	Temp, Pressure, Flow under working condition or standard condition
R Value	250 @ Residential, 350 @ Commercial & Industrial
Sampling Frequency	0.5 to 4 Hz @ working condition, 16 Hz @ verification mode
Auto-calibration for gas	Y
T and/or P Compensation	Y
	Built-in measurement model, different types of gas meter can be modelled or calibrated or verified by iESLab Ultrasonic Gas-Meter Test Bench. Built-in Gas adaptive mechanism.

# Ultrasonic Gas Metering Modules

## Industrial & Commercial Module

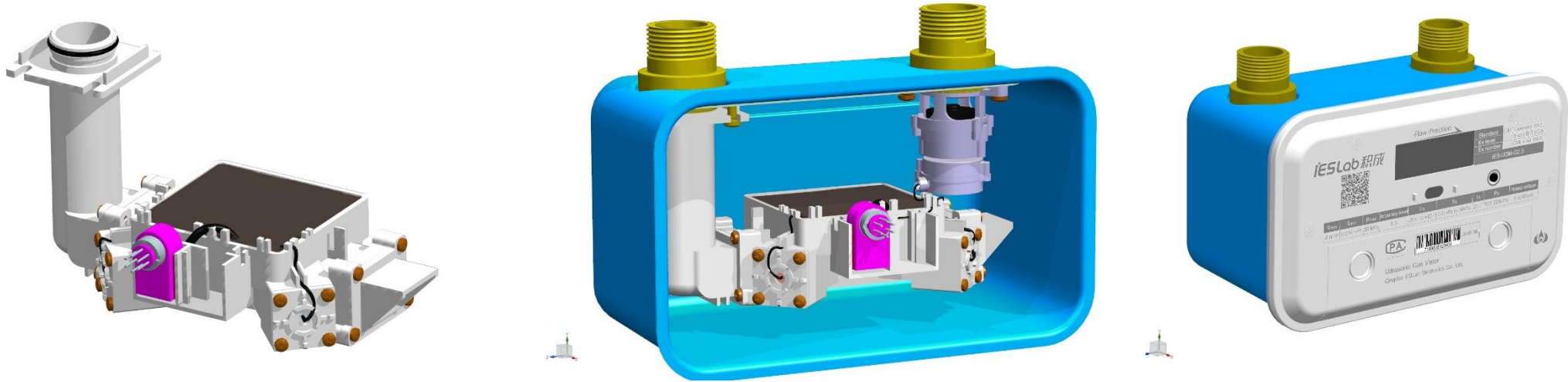


Based on ams TDC-GP22



# Ultrasonic Gas Metering Modules

## Residential Module



# Ultrasonic Gas Metering Modules

## Electrical and Communication Interface

Power supply:	Regulated power supply, 3.4 ~ 5.5 V / 20mA peak current. Higher voltage is recommended.
Power consumption:	< 50 uA @ 4 Hz sampling rate
Communication Interface:	3.3 V UART Baud rate 2400bps, even parity, data bit 8, stop bit 1.
Communication instruction④:	Set sampling rate (4Hz, 2Hz, 1Hz or 0.5Hz) Select the output data item
Installation points:	Make sure that all the gas flows through the measuring tube of the module, and correct the gas flows go through the inlet and outlet appropriately.
Interface leads:	Four-core shielded cable, Core 4*0.15mm <sup>2</sup> , Outer diameter 4.5mm, length 200mm Power positive line (red) Power Ground line (black) UART TX line (yellow) UART RX line (green)

# Ultrasonic Gas Metering Modules

## Ordering Information



Model	Order number	Marking Information
Residential module	IA-UGM-1	IA-UGM-1-YYYYMMDD-SSSSSS
Industry and Commercial module	IA-UGM-2	IA-UGM-2-YYYYMMDD-SSSSSS

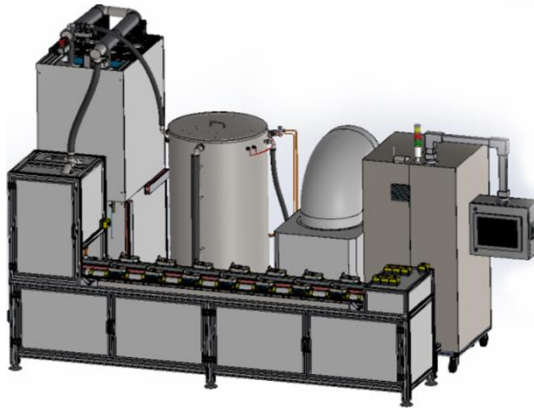
YYYY = **Y**ear, MM = **M**onth, DD = **D**ay, SSSSSS = product **S**erial number that day  
Example, IA-UGM-1-20171205-123456



## iESLab Test Benches

# Calibration/Test Bench

## System Working Principle



- Designed for characterization and calibration
- Based on piston flow reference device
- Three working modes:
  - Characterization Modeling
  - Mass Production (MP) Calibration
  - Metrological Verification
- Automatic control system
- Temperature control, heating & cooling
- DN15, DN20, DN25, DN32 and DN40



### Flow generation

Servo Motor  
Standard Hydraulic Cylinder



### Water tank and pipe

Constant temperature  
Heating & Cooling



### Bracket and tube

Pneumatic clip  
5 types of applicable  
tube session

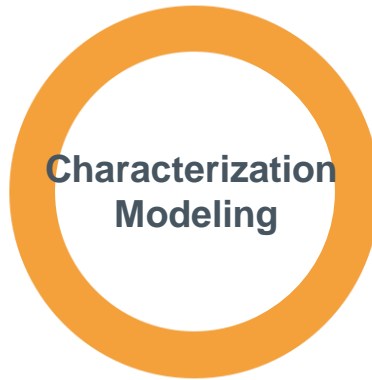


### Control software

Computer based software,  
control device, DCU,  
standard electronics



# iESLab Water Meter Test Bench



5°C ~ 55°C  
0.001m<sup>3</sup>/h ~ 20m<sup>3</sup>/h  
40 flow points  
20 temperature points



3 calibration points  
10 minutes/cycle  
DN15, 800pcs/day



3 verification points  
10 minutes

# iESLab Water Meter Test Bench

## 5 Types

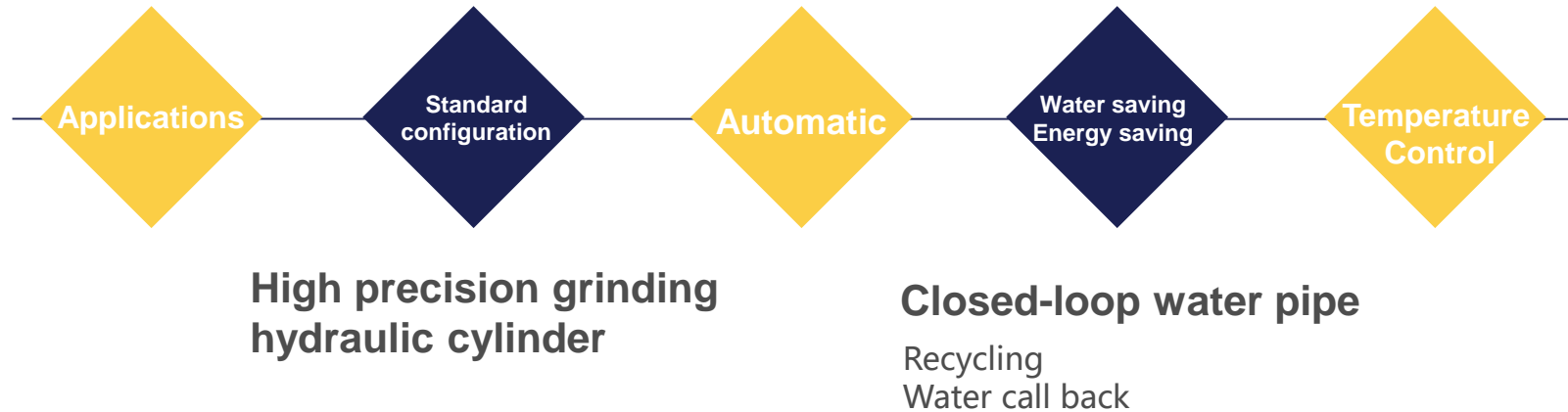
DN15, DN20, DN25, DN32 and DN40

## Automatic operation

Automatic flow point switching  
Automatic temperature point switching  
Continuous testing

5°C~55°C

Temperature control precision = 0.5°C  
Heating & Cooling



# iESLab Water Meter Test Bench

## Independent of pipe network and control system

Professional control device & DCU  
Industrial control panel  
Access to Internet and information system

Control system

Maintenance

## Maintenance free

Regularly water filling up  
Regularly grease  
Regularly filter cleaning

## Three additional functions

Pressure testing  
Pressure loss testing  
Repeatable testing

Additional functions

Materials

## Industrial aluminum & 304 stainless steel

Long lifetime

## Key design and awarded patent

Patents  
Computer software copyrights

Patents

# iESLab Water Meter Test Bench

Parameter	Value
Uncertainly expansion	0.2% (K=2)
Flow range	0.001m <sup>3</sup> /h to 20m <sup>3</sup> /h
Applicable media	Drinking water
No. of meters	Customized, maximum 14 pcs (DN15)
Maximum operation pressure	1.6MPa
Meter clip	Pneumatic clip
Data communication	Infrared
Pressure and temperature testing	Standard configuration
Characterized modelling regulation	Data collection for 10 temperature points and 20 flow points in 24 hours
MP regulation	3 calibration points in 10 minutes, e.g. DN15, 800 pcs/day
Metrological verification	3 verification points in 10 minutes
Temperature range	5°C to 55°C

# Ultrasonic Gas Meter Test Bench

## Features & Parameters

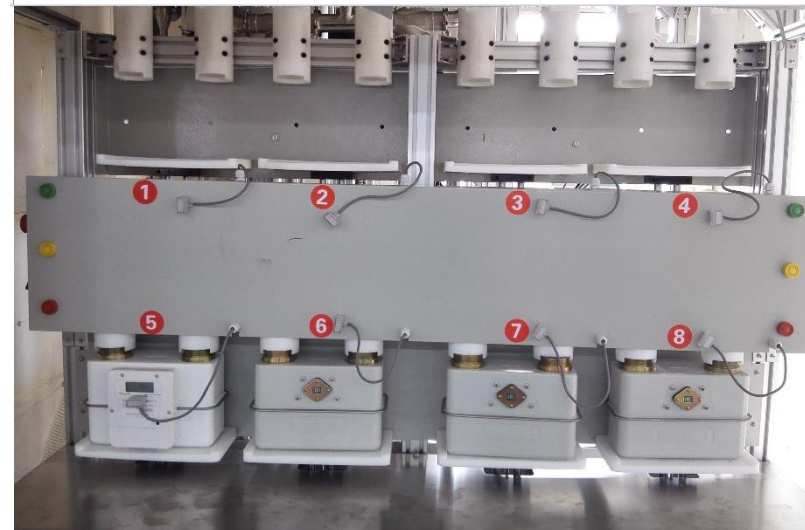
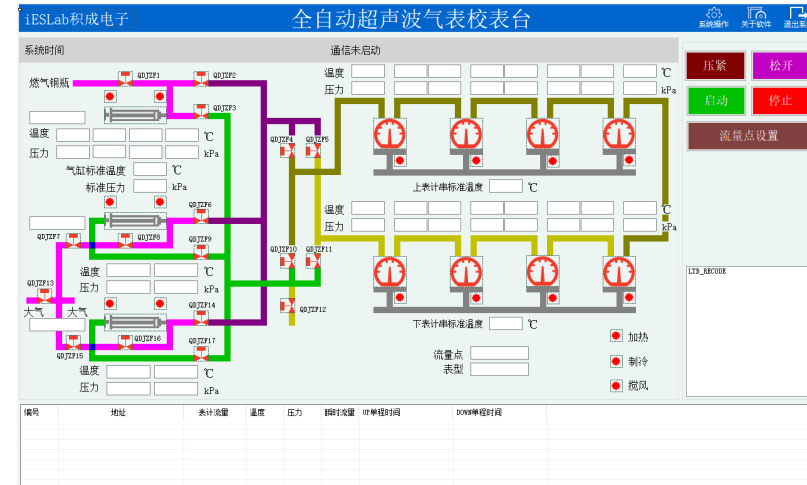
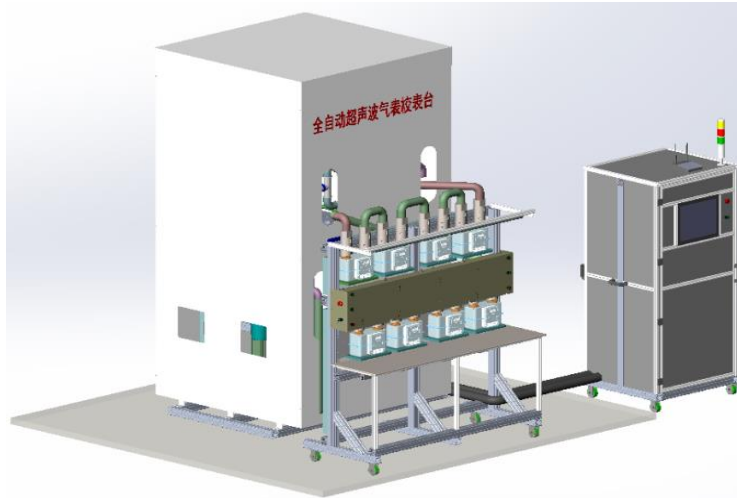
- Support for R&D and mass production of G1.6, G2.5, G4 (residential) and G6, G10, G16, G25 (commercial) gas meters
- High precision grinding hydraulic cylinder, good linear segmented volume
- Three automatic operation modes; continuously testing; automatic switching flow and temperature point; automatic data acquisition of flow, temperature and ultrasonic time difference; automatic generation and release of calibration coefficients; automatic generation of verification error data
- Temperature control, heating and cooling
- Closed-loop, recycling, energy and gas saving
  
- Number of test meters: 8 with G1.6, G2.5 and G4, 8 with G6, G10, G16 and G25
- Flow range: 0.008m<sup>3</sup>/h ~ 25m<sup>3</sup>/h
- Uncertainty: 0.2% (K=2)
- Temperature range: -20°C ~ +65°C
- Working power: 10 KW max @ characterization mode, 5 KW max @ MP mode



# Ultrasonic Gas Meter Test Bench

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# Thank you!

Please visit our website  
[www.ams.com](http://www.ams.com)