The introduction on water meter

Chunhui Li NIM, China



Content

- •TCFF
- •Water meter
- Verification facility for water meter



WGFF vs TCFF

CIPM/CCM/WGFF: Working Group for Fluid Flow

- Consultative Committee for Mass and Related Quantities (CCM)
- The Working Group for Fluid Flow supports the CCM, the CIPM MRA, and NMIs to establish and maintain a validated and robust global measurement system for flow and related quantities:
 - · liquid flow (i.e. water, hydrocarbon liquids, cryogenic liquids),
 - gas flow (air, nitrogen, natural gas, etc.),
 - · liquid volume (from microliters to thousands of liters), and
 - the speed of fluids (air speed and water speed).
- APMP/TCFF: Technical Committee for Fluid Flow
 - Cooperation of APMP technical activities in the field of Fluid Flow, Liquid Volume and Viscosity through periodic meetings and workshops.



Comparisons

•K1, water

- •K2, hydrocarbon liquid
- •K3, air speed
- •K4, volume
- •K5, high pressure gas flow
- •K6, low pressure gas flow



CMCs in APMP

NMI	K1	K2	К3	К4	К5	К6	Sum	
NIM, China	4		3	1	2	2	12	
CMS, Chinese Taipei	8	4	1		2	9	24	• There are total
SCL, Hong Kong, China				6			6	items of CMCs
NPLI, India				3			3	NMIs;
NMIJ, Japan	5	3	6			18	32	 There are total items of CMCs
KRISS, Korea,	3		2	2	1	1	9	NMIs in the fiel
NMC, Singapore			2			2+2	6	water.
NIMT, Thailand						2	2	
VMI-STAMEQ, Vietnam	1			2		1	4	
Total	21	7	14	14	5	37	98	中国计量科学

Water flow facility

- In general flow rate ~m³/h
 - Volumetric/mass principle
 - Master meter principle
 - •<0.1% (*k*=2)
- In micro flow rate ~mg/h
 - •0.2%~2% (*k*=2)



OIML R 49-2013

- Water meters for cold potable water and hot water
 - Part 1: Metrological and technical requirements
 - Part 2: Test methods
 - Part 3: Test report format



Key parameters

• Q_{3} , permanent flow rate

 highest flow rate within the rated operating conditions at which the meter is to operate within the maximum permissible errors

• Q_{4} , overload flow rate

 highest flow rate at which the meter is to operate for a short period of time within the maximum permissible errors, while maintaining its metrological performance when it is subsequently operating within the rated operating conditions

• Q_{2} , transitional flow rate

 flow rate between the permanent flow rate and the minimum flow rate that divides the flow rate range into two zones, the upper flow rate zone and the lower flow rate zone, each characterized by its own maximum permissible errors

• Q_{1} , minimum flow rate

• lowest flow rate at which the meter is to operate within the maximum permissible errors



Metrological requirements

- The flow rate characteristics of a water meter shall be defined by the values of Q_1 , Q_2 , Q_3 , and Q_4 .
- A water meter shall be designated by the numerical value of Q_3 in m³/h and the ratio Q_3/Q_1 .
- The value of Q_3 , expressed in m³/h, shall be chosen from the following list:

1	1.6	2.5	4	6.3
10	16	25	40	63
100	160	250	400	630
1 000	1 600	2 500	4 000	6 300



• The value of the ratio Q_3/Q_1 shall be chosen from the following list

40	50	63	80	100
125	160	200	250	315
400	500	630	800	1 000

- The ratio Q_2/Q_1 shall be 1.6.
- The ratio Q_4/Q_3 shall be 1.25.



Accuracy class 1 water meters

- •The MPE for the upper flow rate zone ($Q_2 \le Q \le Q_4$) is ±1 %, for temperatures from 0.1 °C to 30 °C, and ±2 % for temperatures greater than 30 °C.
- •The MPE for the lower flow rate zone ($Q_1 \le Q < Q_2$) is ±3 % regardless of the temperature range.



Accuracy class 2 water meters

- •The MPE for the upper flow rate zone ($Q_2 \le Q \le Q_4$) is ±2 %, for temperatures from 0.1°C to 30 °C, and ±3 % for temperatures greater than 30 °C.
- •The MPE for the lower flow rate zone ($Q_1 \le Q < Q_2$) is ±5 % regardless of the temperature range.



Cold water meter-in China

- •JJG 162-2009 (OIML R 49-2009), the verification regulation of cold water meter, which will be updated soon according to the new OIML R 49-2013
- •Verification regulation and the program of pattern valuation will be separated



The requirements

- •The test points
 - $Q_1/Q_2/Q_3$
 - Repeat 3 times for each point

Verification period

- For the diameter smaller than DN50 and flowrate smaller than 50m³/h
 - \cdot For the diameter smaller than DN25, it is 6 years
 - For the diameter between DN25 to DN50, it is 4 years
- For the diameter bigger than DN50 or flowrate larger than 50m³/h
 - It is 2 years



Verification facility for water meter

- •JJG 1113-2015, the verification facility for water meter.
- The accuracy of the verification facility is fixed at class 0.2



Collection method

- Volumetric principle
 - Flying start-stop
 - Static
- Mass principle
 - Flying start-stop
 - Static
- Verification period
 - •2 years





The summary

- They are well developed
 - •OIML R 49-2013
 - The water flow meter
 - The verification facility for water meter
- The legal metrology
 - Province institute of metrology
 - Water meter manufacturer
 - Water supply company



•Any question?

- •Chunhui Li, NIM
- •lich@nim.ac.cn

