HORIBA COMMENT TO GTR BRAKE

70th Anniversary

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12.2.3.2. - PN Sampling Flow

GRPE-87-40e

The PN measurement system shall meet the following provisions for the regulation and measurement of the sampling flow (i.e. flow at the PN sampling probe). These apply to both TPN10 and SPN10 sampling:

(b) Use a flow measurement device calibrated to report flow at both operating and standard conditions. To ensure an appropriate conversion to operating conditions, the temperature sensor shall have an accuracy of ±1.0 °C and the pressure measurements shall have a precision and accuracy of ±1.0 kPa;

(c) The actual normalised sampling flow (NQ_{TPN10} and NQ_{SPN10}) shall not deviate more than ±10 per cent of the average value for the given test. Use a device with a flow control feature (e.g. critical orifice, pressure regulator, feedback controller, or other) to ensure a stable flow;

(e) Ensure the average isokinetic ratio during the emissions measurement section of a specific brake is between 0.60 and 1.50;

(f) Use Equation 12.4 to calculate the average isokinetic ratio for both TPN10 and SPN10. Use the corresponding values for the isokinetic nozzle inner diameters for TPN10 and SPN10 sampling. Use the data of the average normalised tunnel flow (NQ) and the average normalised sample flows (NQ_{TPN10} and NQ_{SPN10}) in the Time-Based file. Report the calculated values as specified in Table 13.6. in paragraph 13.4.;

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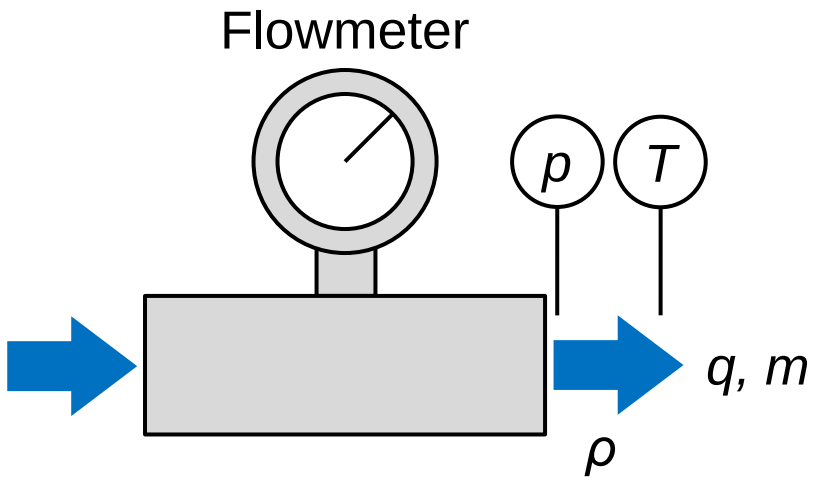
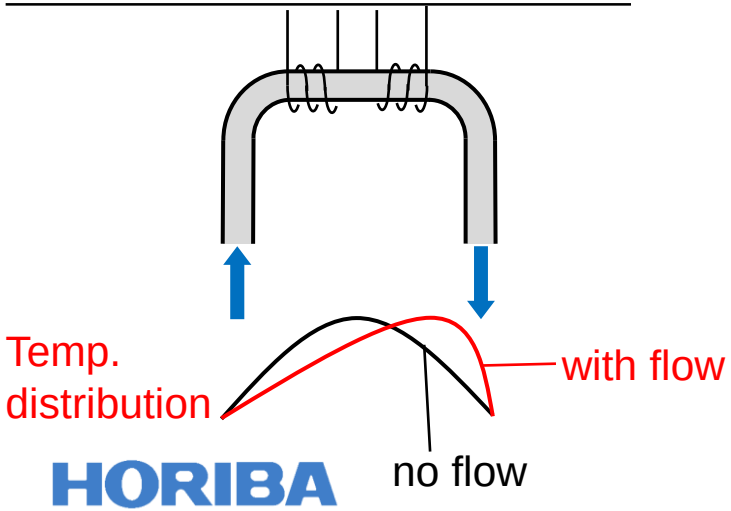
Flow Measurement Principle

Mass / Volumetric Flows



Thermal mass flowmeter



■ **Volumetric flow measurement *q*: (e.g. ultrasonic flowmeter)**

Determination of the flow q_s under standard condition (p_s and T_s)

$$q_s = \frac{p_s}{\boldsymbol{p}} \frac{\boldsymbol{T}}{T_s} q$$

➔Actual pressure ***p*** and temperature ***T*** are required

■ **Mass flow measurement *m*: (e.g. thermal mass flowmeter)**

Determination of the flow q_s under standard condition (p_s and T_s)

$$q_s = \frac{m}{\boldsymbol{\rho}}$$

➔Just a constant gas density ***ρ*** for a specific gas component under a standard condition (p_s and T_s) is required

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HORIBA's proposal

- Mass flowmeters can directly determine the normalised flowrate (e.g. 0°C and 101.33 kPa).
- Even some flowmeters based on volumetric measurement principle which determine normalized flow are calibrated against mass or normalized flow references.
- Mass flow does not require temperature and pressure measurement to determine the normalised flow.
- It is not required to report flow under operating condition, because the average isokinetic ratios for both TPN10 and SPN10 are calculated from normalised flows.

HORIBA's proposal: Change of "12.2.3.2. PN Sampling Flow (b)"

(b) Use a flow measurement device calibrated to report flow at both operating (optional) and standard conditions. Except for mass flow measurement device use case, to ensure an appropriate conversion to operating conditions, the temperature sensor shall have an accuracy of ±1.0°C and the pressure measurements shall have a precision and accuracy of ±1.0 kPa;

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Omoshiro-okashiku

Joy and Fun

Terima kasih

Gracias 谢谢

Danke Σας ευχαριστώ πάρα πολύ

Tack ska du ha **THANK YOU** ধন্যবাদ

Grazie ขอบคุณครับ Obrigado Большое спасибо

ありがとうございました Cảm ơn Merci 감사합니다

Dziękuję

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