

GasCVD Natural Gas Calorimeter

Model CVM400

OVERVIEW

The CVM400 GasCVD Natural Gas Calorimeter measures the thermal conductivity of a gas mixture such as natural gas at different temperatures and calculates the calorific value of the gas based on its thermal conductivity. Drawing upon expertise in gas analysis and gas calorific value measurement accumulated for more than 20 years since the release of the first Smart Gas Chromatograph, Azbil Corporation now offers compact, lightweight, and high-precision natural gas calorimeters that comply with international legal metrology standards.

FEATURES

- (1) OIML R 140 compliant device. Can be used as a calorimeter or calorific value determining device (CVDD) for natural gas. (OIML R140: International Organization of Legal Metrology recommendation that includes specifications for CVDDs.)
- (2) Innovative structure compatible with various installation sites
 - Unlike conventional gas calorimeters, the CVM400 is small and lightweight, allowing a variety of installation site choices.
 - Explosion-proof: compliant with IECEx and ATEX, and suitable for Zone 1 use
- (3) Revolutionary continuous measurement. Can detect a change of calorific value in processes in near real time by measuring every 2 seconds.
- (4) Fast response. The time constant for 90 % response is within 30 seconds (sample flow rate: 50 ml/min) resulting in very fast output of natural gas calorific value.
- (5) Automatic calibration for prolonged stability. Automatic calibration using pure methane guarantees long-term stable operation.
- (6) A wealth of diagnostic functions
 - Ambient temperature diagnostic function. Determines whether the operating environment is suitable, making use of a temperature sensor embedded on the same chip as the thermal conductivity sensor.
 - Operation time tracker function. Keeps track of the total operation time for comparison with the recommended replacement period (70000 hours) for the calorimeter.
 - Automatic calibration history check function. Shows up to 5 of the latest automatic calibration records to check changes in the calibration factor.

MEASUREMENT PRINCIPLE

The CVM400 measures the thermal conductivity of natural gas at different temperatures, changing the temperature of the thermal conductivity sensor in multiple stages. The calorimeter uses the support vector regression (SVR) method that is also employed on Azbil Corporation's differential pressure transmitters. The calorific value is calculated from the measured thermal conductivity values of the process using a characteristics formula created in advance based on thermal conductivities measured at different temperatures of the natural gas.



STANDARD SPECIFICATIONS

Instrument

Process gas connection port:	NPT 1/8 (F), Rc 1/8
Electrical conduit:	NPT 1/2 (F), M20
Case structure:	IEC IP66
Flame-proof structure:	
ATEX:	II 2G Ex d IIB T6 Gb; II 2D Ex tb IIIC T80 °C Db
IECEx:	Ex d IIB T6 Gb, Ex tb IIIC T80 °C Db
Display:	LCD
Calorie display:	5 digits
Units:	SCV, MJ/m ³
Measurement range:	t ₁ /t ₂ (0 °C/0 °C) 37–47 MJ/m ³ t ₁ /t ₂ (15 °C/15 °C) 35–45 MJ/m ³
% display:	setting range is shown by a % and by a bar graph
Automatic calibration setting display:	● and ○ light up alternately when set.
Calibration factor display:	a flag is shown if calibration fails
Communications:	HART protocol ver. 7.0 (with CommStaff and HART 475 Communicator)
Power:	24 Vdc ±10 %, 0.3 A max. (inrush current at startup)
Output:	Analog output: 4–20 mAdc
Contact output:	24 Vdc ±10 %, 50 mA max. (transistor contact for status); 24 Vdc ±10 %, 1 A max. (transistor contact for calibration)
Paint:	Baked acrylic resin finish
Color:	
Housing:	Light beige
Front cover:	Dark beige
Terminal cover:	dark beige

Material

Case material:

Housing:	aluminum alloy (ADC 12)
Front cover:	aluminum alloy (ADC 12)
Terminal cover:	aluminum alloy (ADC 12)
Window:	reinforced glass
Cover O-ring:	NBR rubber

Wet parts materials:

Manifold:	SUS304 stainless steel
Adapter:	SUS304 stainless steel
μ TCD sensor:	platinum, glass, gold, Kovar, silicon
O-ring:	Fluoro rubber

Process gas specifications

Natural gas (NG), in gas form only

Acceptable limits for components:

$C_2H_6 \leq 11$ mol%
$C_3H_8 \leq 5$ mol%
$C_4^+ \leq 2$ mol% (OIML model: $C_4^+ \leq 1.2$ mol%)
$N_2 \leq 7$ mol%
$CO_2 \leq 2$ mol%

Temperature: -10 to 50 °C

Pressure: 110 kPa (abs) max. (at GasCVD process connection port inlet)

Flow rate: 50 ± 10 ml/min

Dust: Less than $1 \mu\text{m}$ in diameter, 1 mg/m^3 max.

Mist: none at -20 °C

Moisture: dew-point temperature -20 °C max.

Calibration conditions

Calibration: Automatic/Manual

Calibration gas: Pure methane (99.995 purity min.)

Installation conditions

Ambient temperature: -10 to 50 °C

Ambient humidity: 95 % RH max.

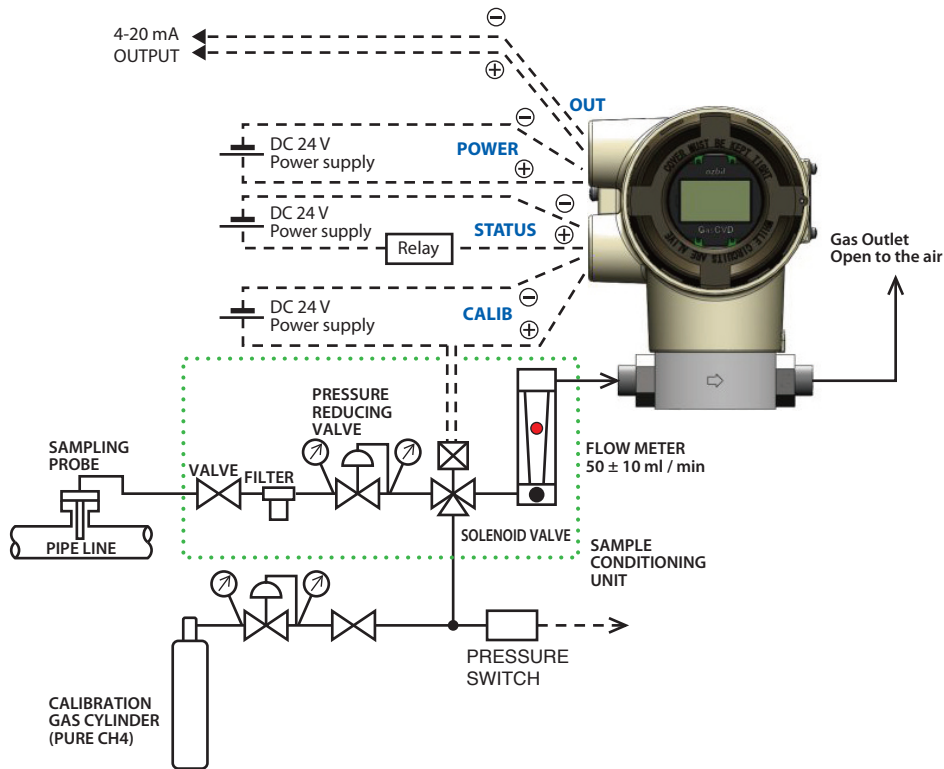
Mass: 2.5 kg

Accuracy

Repeatability: ± 0.5 % of reading (natural gas model),
 ± 0.2 % of reading (OIML R140 CVDD compliant model)

Accuracy: ± 1.5 % of reading (natural gas model),
 ± 1 % of reading (OIML R140 CVDD compliant model)

Example of recommended GasCVD installation

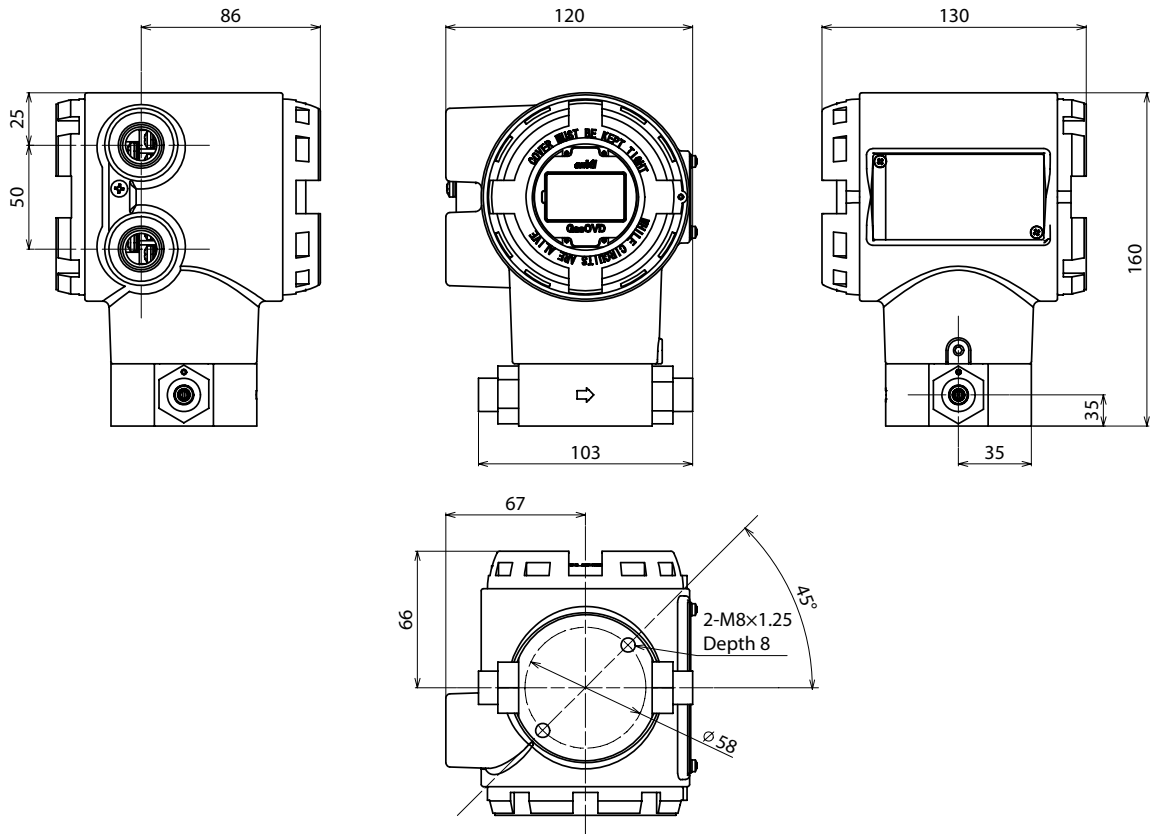


Model number table

Basic Model Number		Selection				Optional Selection			Options	
CVM400										
Process connection	1/8 NPT (F)	1							X	No
	Rc 1/8	3							1	Test report
Electrical conduit connection	1/2 NPT (F)	1							2	Traceability certificate
	M20	2							3	OIML/MID certificate
Accuracy	OIML R140 CVDD		L						4	Material certificate
	±1.5 % of reading		M							
Explosion-proof structure	ATEX flameproof			E						
	IEC flameproof			G						
Communications	HART				H					
Gas type	Gas composition type 1: Natural gas									A
	Gas composition type 6: OIML R140 CVDD compliant									F
Indicator	Without Display								X	
	With Display								A	
Paint	Standard finish								X	
	Corrosion-proof finish								B	
Gas caloric value calculation parameters	15 °C/15 °C								1	
	0 °C/0 °C								2	
Output units	SCV MJ/m ³									1

Dimensions

[Unit: mm]



Please read the "Terms and Conditions" from the following URL before ordering or use:

<http://www.azbil.com/products/bi/order.html>

Specifications are subject to change without notice.

The logo for Azbil Corporation, featuring the word "azbil" in a bold, lowercase, red sans-serif font.

Azbil Corporation
Advanced Automation Company

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: <http://www.azbil.com/>

1st Edition: Issued in Jan.2012
2nd Edition: Issued in Apr.2012

No part of this publication may be reproduced or duplicated without the prior written permission of Azbil Corporation.