

VAPORIX

VAPORIX-Flow and VAPORIX-Control



5/2007
Edition: 5
Art. no.: 207083

Table of contents

Characteristic features of the VAPORIX system	3
Safety instructions	4
Measuring value sensor VAPORIX-Flow	5
1 Structure and function	5
2 Installation	7
3 Technical data	11
Measurement evaluation system VAPORIX-Control	12
1 Structure and function	12
2 Installation	15
3 Technical data	17
Error prevention and troubleshooting (following installation)	19
1 Checking the dispenser settings	19
2 Checking the vapour recovery system	19
3 Check measurements using monitoring system	19
4 Troubleshooting	20
ANNEX	21
1 EC declaration of conformity	21
2 EC type-examination certificate – measuring value sensor VAPORIX-Flow	22
3 EC type examination certificate – measurement evaluation system VAPORIX-Control	25
4 Operating instructions – measuring value sensor VAPORIX-Flow	30
5 Operating instructions – measurement evaluation system VAPORIX-Control	31

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Characteristic features of the VAPORIX system

The VAPORIX system (vapour recovery information system) is an automatic monitoring system (AMS) to check the function of vapour recovery systems (Stage II) at filling stations. The VAPORIX system fulfils the requirements of AMS in compliance with the 21st BImSchV (German Regulation) dated May 6th, 2002.

Monitoring vapour recovery on both sides of the dispenser is possible using only one VAPORIX system. During the filling process, the vapour flow is registered, together with the fuel flow of the respective fueling point, whereby the fuel flow data is taken over from the pulse outputs of the dispenser computer. After the filling process has been completed, an analysis is carried out and the status of the vapour recovery system is signalled with two light-emitting diodes.

The VAPORIX system includes two measuring value sensors of type VAPORIX-Flow to monitor both sides of the dispenser and one measurement evaluation system VAPORIX-Control. The measuring value sensors VAPORIX-Flow are fitted in the vapour recovery pipe. Connections are made using 3/8" pipe threads. The measurement evaluation system VAPORIX-Control is fitted in the computer head of the dispenser. The measuring value sensor, the pulse inputs, the output terminals and the auxiliary power are connected to the measurement evaluation system. Then the maintenance-free system must be configured.

In addition, optional VAPORIX components can be connected to the measurement evaluation system:

- VAPORIX-Master
Signal set-up to display the function status of the vapour recovery and VAPORIX system (display, save and acknowledge faults)
Configuration of the VAPORIX system
- VAPORIX Service Dongle
Access protection, user identification and easy service functions of the VAPORIX system
- VAPORIX Diagnostics
Excel-based programme for automatic reading and graphical representation of the VAPORIX history data of both dispenser sides
- VAPORIX PCM
Module for corrective control of active vapour recovery systems

Safety instructions

The VAPORIX system is used to measure and assess the vapour flow of the vapour recovery systems at filling stations. Please use the system for this purpose only. The manufacturer will not be liable for any form of damage resulting from improper use!

The measuring value sensor and the measurement evaluation system were developed, manufactured and inspected in accordance with state-of-the-art technology and with recognised safety rules and regulations. Nevertheless, hazards may arise from the use of these devices. Therefore, please observe the following safety instructions:

- Do not make any changes, add anything to or rebuild the system without obtaining the manufacturer's permission first.
- Use original replacement parts only. These comply with the technical requirements specified by the manufacturer.
- Only qualified personnel may carried out the installation, operation and maintenance of the measuring value sensor and the measurement analysis as well as the configuration of the system. Only qualified electricians may install and maintain the VAPORIX system in compliance with the relevant national regulations. Specialist knowledge must be obtained by undergoing regular training.
- Operators, installers and service personnel must observe all applicable safety regulations. This also applies to the local safety regulations and accident prevention regulations not mentioned in these operating instructions.
- VAPORIX-Flow and VAPORIX-Control are subject to construction supervisory certification and are therefore only allowed to be repaired by FAFNIR or by companies authorized by FAFNIR. In case of failure, the complete measuring value sensor or the complete measurement evaluation system must always be replaced.
- The measurement evaluation system VAPORIX-Control is only to be fitted in the protective casing of the dispenser computer and not to be used in hazardous locations. It is only intended for use within the VAPORIX system.

The safety instructions in this manual are identified as follows:



If you do not observe these safety instructions, there is a risk of accidents or the VAPORIX system could be damaged.



Useful information which ensures proper functioning of the system and facilitates your work.

Measuring value sensor VAPORIX-Flow

1 Structure and function

The measuring value sensor VAPORIX-Flow is a calorimetric flow sensor with an integrated vapour concentration sensor with which precise measurements can be obtained, even if the vapour concentration fluctuates.

The measuring value sensor is made up of a measuring pipe with an inlet section (1) and an outlet section (2), as well as the sensor casing on the side (3) (see Fig. 1).

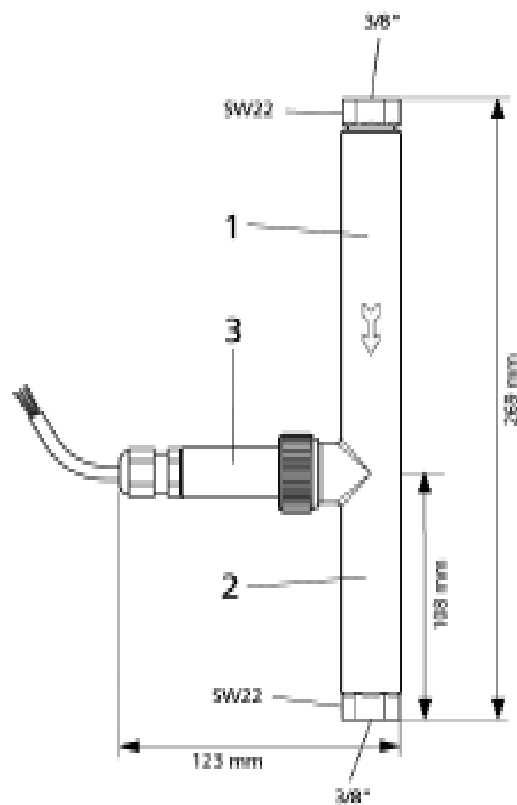


Fig. 1: Measuring value sensor VAPORIX-Flow

Three sensors have been fitted in the sensor casing (3): a temperature sensor to measure the temperature of the vapour, a heat abstraction sensor to determine the flow, and a heat abstraction sensor to measure the concentration of the vapour.

The flow speed and the concentration of the vapour are measured using the calorimetric principle. Here the heat abstraction of the electrically heated sensors into the flowing medium is utilised as the measuring effect. The vapour concentration is required to assess the flow rate precisely.

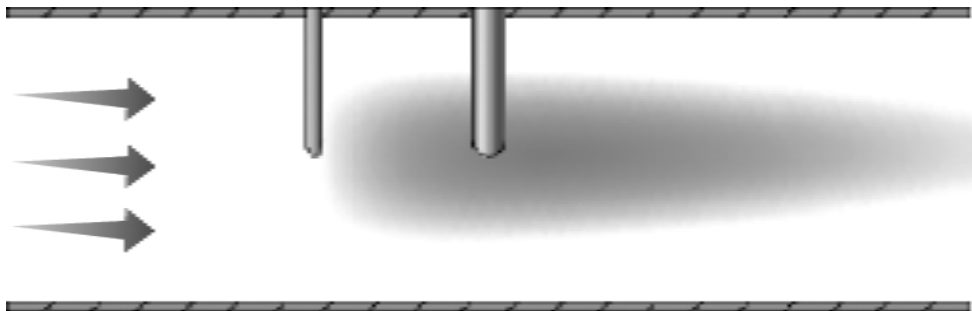


Fig. 2: Function principle of the VAPORIX-Flow: The grey tail represents the heat abstraction into the flowing medium.

2 Installation



Please take note of all national safety and accident prevention regulations as well as all safety instructions in this manual when working on the measuring value sensor.



To set up and operate the measuring value sensor, the regulations as specified in the relevant national regulations, as well as those specified in the equipment safety laws, and the generally recognised rules of technology and these operating instructions, are decisive.



VAPORIX-Flow is subject to construction supervisory certification and is therefore only allowed to be repaired by FAFNIR or by companies authorised by FAFNIR. In case of failure, the complete measuring value sensor must always be replaced.

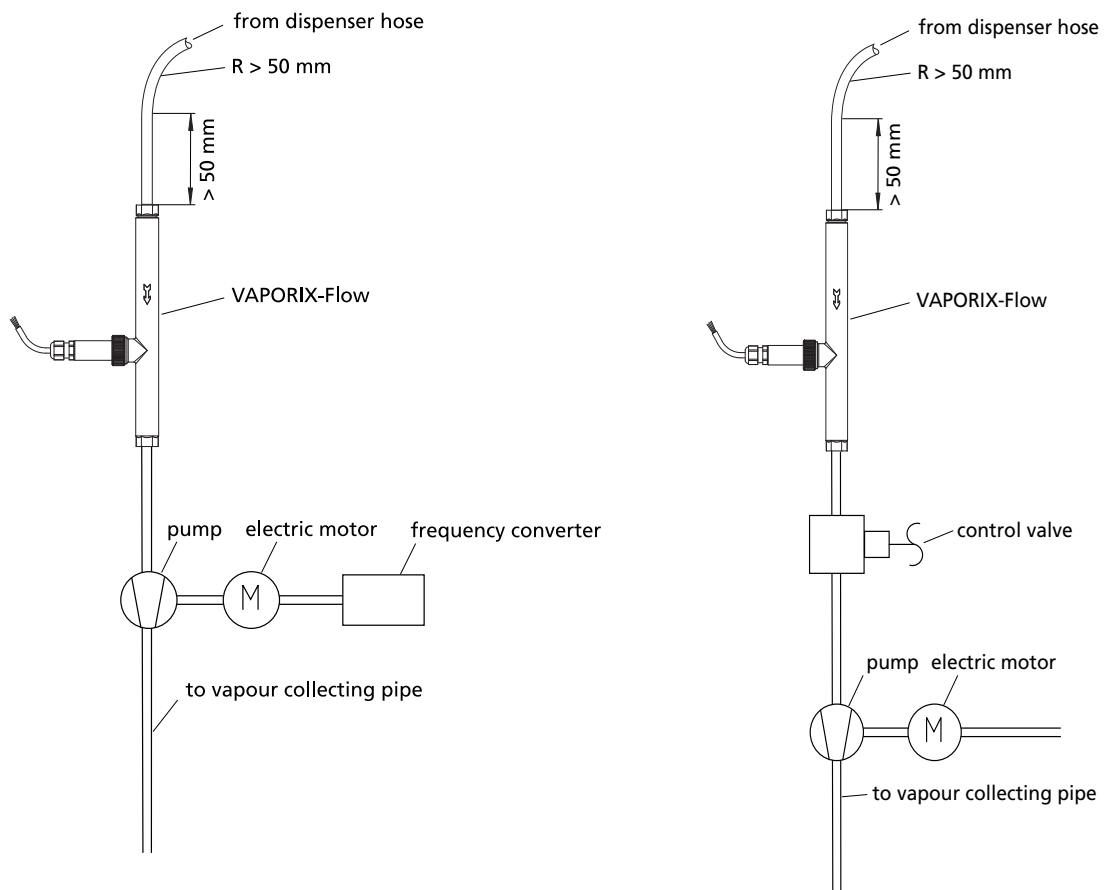


Fig. 3: Examples – positions of the VAPORIX-Flow

2.1 Installation of the VAPORIX-Flow in the dispenser

For proper assembly of the VAPORIX-Flow, the following installation conditions must be fulfilled (see Fig. 3):

- The VAPORIX-Flow is fitted in the vapour recovery pipe before the pump and before the control valve if one has been fitted.
- The unit must be fitted vertically and the inlet section must be at the top. The direction of flow has been cast on the casing.



The arrow indicating the direction of flow must point from the top to the bottom.

- A straight vapour pipe (smooth pipe or corrugated pipe) with a length of at least 50 mm and an inner diameter of 8–12 mm must be fitted before the measuring value sensor.
- The inflow into the inlayed-pipe may be carried out with a radius of at least 50 mm.
- The inlayed-pipe can be connected using a standard pipe-connector.
- The connection to the outlet section of the measuring value sensor can be made in any form desired. The installation of a threaded 90-degree elbow joint is also permissible.
- The casing of the VAPORIX-Flow is to be fixed vertically in the dispenser using fixing brackets.



Deviating installation conditions are only permissible following prior verification and written approval by FAFNIR.



The VAPORIX-Flow is not allowed to be operated using non-volatile media.

2.2 Installation measures in case of suspected pulsation influence by the vapour pump

Due to the pumping process, most vapour pumps in vapour recovery systems produce pressure surges which result in pulsating flow behaviour. This pulsation is very prominent in piston and diaphragm pumps. With double piston pumps, these effects are considerably less than in the case of single-cylinder piston pumps or single-cylinder diaphragm pumps. With vane pumps, the pulsation can usually be neglected.

Within the pipeline system, the pressure surges result in reflections and can therefore give rise to resonances. The measuring accuracy of the VAPORIX system is influenced by the pulsation. The magnitude of the possible effect is a factor of the pulsation amplitude, the average flow velocity and the vapour concentration.

To guarantee the measuring accuracy of the VAPORIX system, the additional installation measures listed below for the vapour recovery system constellations must be carried out:

2.2.1 Diaphragm or piston pumps with proportional valve control

The pulsation is shielded to a large extent by the proportional valve. However, a minimum pipe volume of approx. 50 cm³ should be provided. This corresponds to a total pipe length of approx. 80 cm between the sensor and vapour pump, with an inner diameter of 9 mm.

2.2.2 Double piston pumps with speed control

Here a minimum pipe volume of approx. 50 cm³ should also be provided. This corresponds to a total pipe length of approx. 80 cm between the sensor and vapour pump, with an inner diameter of 9 mm.

2.2.3 Diaphragm or piston pumps with speed control

Here the pulsation has a direct effect on the VAPORIX-Flow. This is why a pulsation damper should be installed between the sensor and pump. Approx. ten times the displacement volume of the pump or 250 cm³ should therefore be used as a typical reference value. This can easily be achieved with a damper pot. The FAFNIR condensate separator has proved to be reliable as a pulsation damper.

2.2.4 Pump systems with a liquid-controlled proportional valve integrated in the nozzle

The pulsation of the pump running at full speed pulsation has a direct effect on the VAPORIX-Flow. This is why a pulsation damper should be installed between the sensor and pump. Approx. ten times the displacement volume of the pump or 250 cm³ should therefore be used as a typical reference value. This can easily be achieved with a damper pot. The FAFNIR condensate separator has proved to be reliable as a pulsation damper.

2.3 Connection of the VAPORIX-Flow to the measurement evaluation system VAPORIX-Control

The 8 core connecting cable (4 m long Ø approx. 6 mm) is a fixed part of the measuring value sensor. To make sure that the cable can be guided to the VAPORIX-Control in the head of the dispenser using suitable cable glands, its connecting plug must be disconnected first and then fitted again as shown in the diagram in Fig. 4.

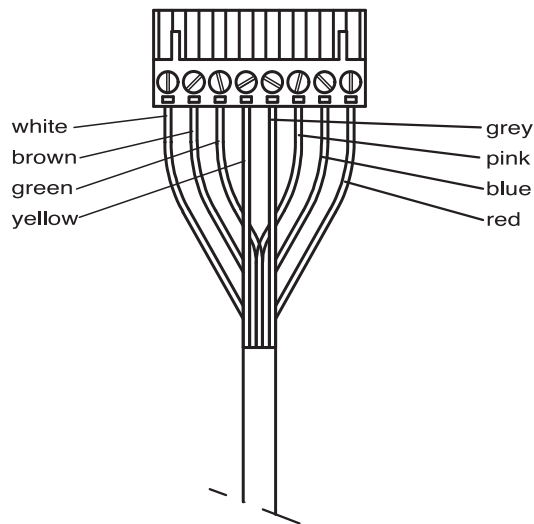


Fig. 4: Pin assignment of the connecting cables for the VAPORIX-Flow – VAPORIX-Control



The connecting cable may not be shortened in length.



The cable of the VAPORIX-Flow, which is fitted in the vapour recovery pipe of the dispenser with the lower fueling point number, should be labelled with the letter A at the upper end for easy identification purposes, and then connected accordingly on side A of the measurement evaluation system. In the same way, mark the cable of the second VAPORIX-Flow with the letter B to connect to side B.



After installing and putting the system into operation for the first time, please also refer to our tips and recommended measures from Chap. "Error prevention and troubleshooting".

3 Technical data

Explosion protection:	EEx ia IIB T3
Certification:	TÜV 99 ATEX 1509
Protection category:	IP 65
Permissible ambient temperature:	-30 °C to +50 °C
Permissible operating pressure:	max. ATM
Maximum testing pressure:	300 kPa
Connection data:	$U_m = 23.9 \text{ V}$ $I_m = 0.345 \text{ A}$
Connecting thread:	3/8" inside thread
Cable:	PVC – fuel-resistant up to a point
Length:	269 mm
Weight:	approx. 1100 g
Material of the media-contacting parts:	brass, stainless steel 1.4401 and 1.4436, St-zinc-plated

Measurement evaluation system VAPORIX-Control

1 Structure and function

The measurement evaluation system VAPORIX-Control is fitted outside the ex-zone inside the head of the dispenser.

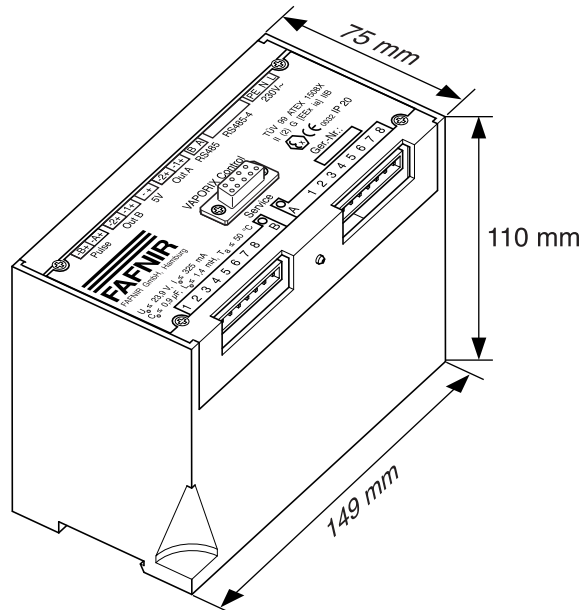


Fig. 5: Measurement evaluation system VAPORIX-Control

It contains the supply and analysis system for two measuring value sensors of type VAPORIX-Flow. Using the values transmitted to the measurement evaluation system, the temperatures, vapour concentrations and vapour flow are determined for two fueling points.

The respective pulse outputs of the dispenser computer, which provide the pulse frequencies proportional to the fuel flow, serve as the reference inputs.

The assessment system of the VAPORIX-Control system compares the fuel flow with the vapour flow, and issues a status signal. The status of the vapour recovery and the monitoring system is indicated using a three colour light-emitting diode (1) per fueling point (A/B) (see Fig. 6).

1.1 Status indicator

The status of the vapour recovery and the monitoring system is indicated on the one hand using the three colours (green, orange, red) and on the other hand using different flashing of the light-emitting diodes (see Fig. 6).

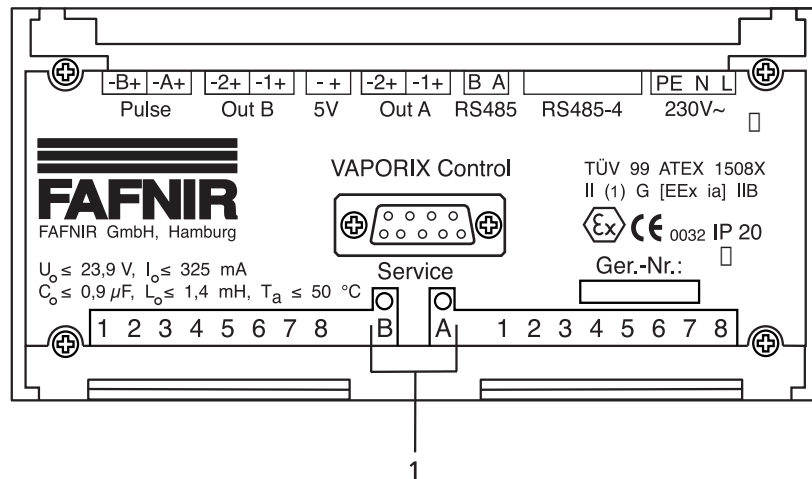


Fig. 6: Light-emitting diodes VAPORIX-Control

1.1.1 Colour codes

- If a diode is flashing green, the respective vapour recovery system and the monitoring system is intact. There are no faults.
- If a diode is flashing quickly and alternating between green and orange, the vapour recovery rate of the respective system was outside the admissible tolerance during the last filling process.
- If the diode is flashing orange, an alarm signal is issued, there is a fault in the respective vapour recovery system which must be rectified within 72 hours by a service technician.
- If the diode is flashing red, time has run out and a signal is issued which switches off the dispenser concerned.

1.1.2 Flashing codes

LED is flashing slowly	System is ready for operation
LED is flashing quickly	Fuel flow is displayed
LED is flashing very quickly	Vapour flow is displayed even though no fuel flow is present (connections of the measuring value sensor Side A/B have been confused). Please rectify error immediately, otherwise an alarm is triggered after 10 tank fillings.

LED is flashing

(ON for a long time,
OFF for a short time)

Measuring value sensor defective or connection
fault

on the plug-in connector. Rectify error immediately
or replace sensor, otherwise an alarm is triggered
after 10 tank fillings.



If the VAPORIX-Control is operated with a DOMS Site Controller PSS5000 (see TÜV certificate 12.4) the signalling in case of a fault of the vapour recovery system will take place on the DOMS controller alarm panel. In this case, the corresponding "orange flashing" or "red flashing" is not displayed on the DOMS controller (see 1.1.1).

2 Installation



To set up and operate the measurement evaluation system, the regulations as specified in the relevant national regulations, as well as those specified in the equipment safety laws and the generally recognised rules of technology and these operating instructions are decisive.



The measurement evaluation system is fitted in a casing with minimum protection classification IP20. It is not suitable for fitting outside.



VAPORIX-Control is subject to construction supervisory certification and is therefore only allowed to be repaired by FAFNIR or by companies authorised by FAFNIR. In case of failure, the complete measurement evaluation system must always be replaced.

The measurement evaluation system is positioned outside the hazardous locations in the head of the dispenser in a suitable place, it is either screwed on or plugged on to a mounting rail.



When fitting the measurement evaluation system, please make sure that all plug-in connectors as well as LEDs and the service interface are easily accessible for any service work.

Connect the measuring value sensor, the pulse inputs, the auxiliary power and if necessary the data line to the VAPORIX-Master to the interfaces shown in Fig. 7. The assignment of the switching off outputs and interface is provided by the manufacturers of the dispensers.



Only measuring value sensors of type VAPORIX-Flow which have been certified by an approved European test office may be connected.



After installing and putting the system into operation for the first time, please also refer to our tips and recommended measures from Chap. "Error prevention and troubleshooting".



The VAPORIX-Control is only allowed to be operated in atmospheric environments. Operation in pressure-enclosed casings such as, e.g., natural gas dispensers, is not permitted.

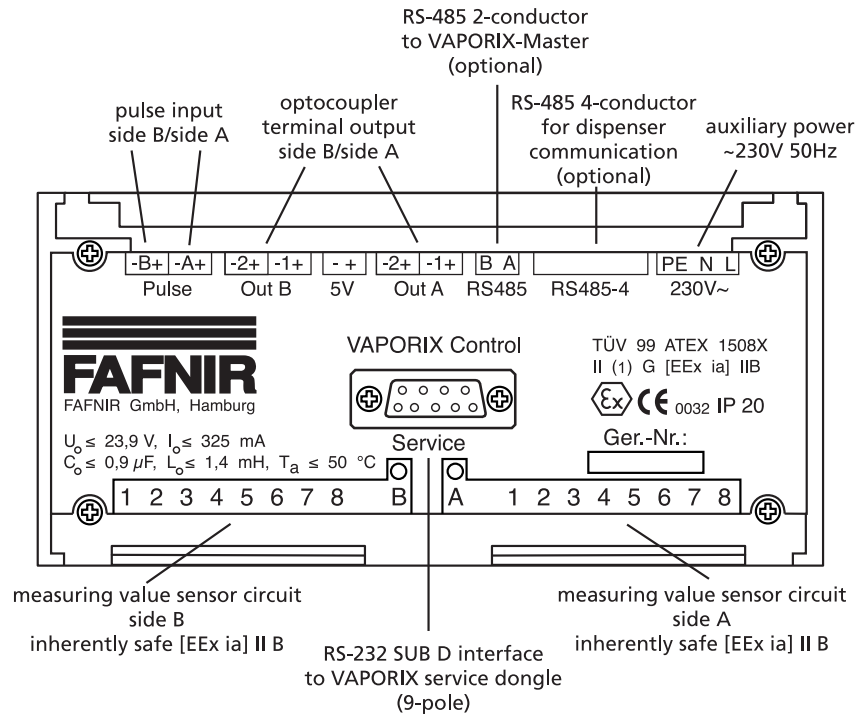



Fig. 7: Connections VAPORIX-Control

3 Technical data

Explosion protection:	 II G [EEx ia] IIB
Certification:	TÜV 99 ATEX 1508X
Casing protection type:	IP 20
Permissible ambient temperature:	-30 °C to +50 °C
Auxiliary power (L, N, PE):	230 V alternating voltage $\pm 10\%$ Max. voltage for safety reasons: $U_m = 253 \text{ V}$
Connection data per sensor circuit:	in type of protection [EEx ia] IIB Max. values for safety reasons: $U_m = 23.9$ $I_m = 0.325 \text{ A}$ max. permissible outer inductance: 1.4 mH max. permissible outer capacitance: 0.9 μF



The intrinsically safe circuits are safely and galvanically separated from the supply circuit up to an apex value of the nominal voltage of 375 V.

Pulse inputs:	Rectangular signal with 5 V (1 mA)...24 V (6 mA) impulse height, max. 1000 Hz, sense ratio 20...80 %, potential-free, safe against reverse connection
Impulse value:	100 impulses / litre have been set as standard, other values (33.3 – 50 – 132 – 200) can be set during configuration.
Terminal outputs (Out A/Out B):	Optocoupler 1...30V, max. 100 mA potential-free, closed in the case of reverse connection: OutX1 closed: Fueling point released OutX1 open: Fueling point locked OutX2 closed: Alarm (residual time 72h) OutX2 open: no alarm



Service interface:	RS-232, 8N1, 9600 baud, max. voltage for safety reasons: $U_m = 30\text{ V}$
RS-485 2-conductor :	data bus for up to 32 dispensing points, 8N1, 9600 baud
RS-485 4-conductor:	RS-422, for dispenser communication, 8E1,9600 baud, pin assignment: Pin 1, 2, 9, 10: not assigned Pin 3: TxD B Pin 4: TxD A Pin 5: RxD B Pin 6: RxD A Pin 7, 8: supply
5 V output:	max. 50 mA
Casing dimensions:	149 x 75 x 100 (110) [mm]
Weight:	approx. 750 g
Casing material:	polycarbonate, glass-fibre-reinforced

Error prevention and troubleshooting (following installation)

FAFNIR recommends that the following measures be carried out before the automatic monitoring system is put into operation.

1 Checking the dispenser settings

The fuel pumping rate is not allowed to exceed the maximum fuel pumping rate specified in the certificate of the vapour recovery system. Please also take the fact into account that the fuel pumping rate can increase after a fuel filter has been replaced.

2 Checking the vapour recovery system

Make sure that:

- the vapour recovery system is gas-tight (pressure test according to manufacturer's specifications).
- there is no leakage of liquids in the vapour recovery system.
- with MPDs (Multi Product Dispenser), the open-close valves available for the selection of the vapour channel open and close correctly at all times.
- the pulse rates of the dispenser are equivalent to those of the vapour recovery system and of the automatic monitoring system.
- with MPDs (Multi Product Dispenser), the assignment of the vapour recovery is set correctly (vapour pump must start up for all petrol engine fuel products but is not allowed to start up in the case of diesel fuel).

3 Check measurements using monitoring system

FAFNIR recommends that the following measures be carried out after the automatic monitoring system has been installed:

- Calibrate the vapour recovery system again (dry equalisation according to manufacturer's specifications). Please only use properly serviced measuring instruments that are in perfect condition. For the dry calibration process, the vapour recovery system must be free of hydrocarbons.
- Use a simulation measurement to check the calibration process.
- Use the status indicator (LED flashing codes and colour codes) on the VAPORIX-Control to check the functions of the automatic monitoring system and of the vapour recovery system (see section "Structure and function" in Chap. "Measurement evaluation system VAPORIX-Control").



Carry out several trial filling operations (> 20 s and > 25 l/min) or wait until several customer filling operations have been completed, and then check the history data using the VAPORIX-Master or the VAPORIX diagnostic programme (see separate operating instructions).

4 Troubleshooting

To facilitate troubleshooting and error-analysis procedures, FAFNIR recommends the use of the FAFNIR PC programme "VAPORIX diagnostics" together with the FAFNIR diagnostics summary.

ANNEX

1 EC declaration of conformity

EG – Konformitätserklärung **EC – Declaration of Conformity**

In Übereinstimmung mit EN 45 014: 1998 – In accordance with EN 45014: 1998

FAFNIR GmbH
Bahrenfelder Str.19
D 22765 Hamburg

erklärt in eigener Verantwortung, dass das Produkt
declares under sole responsibility that the product

Automatische Überwachungseinrichtung
Monitoring System

VAPORIX-Control / VAPORIX-Flow

in Übereinstimmung mit nachfolgenden Richtlinien:
in accordance with the following directives:

EMV-Richtlinie, EMC Directive 89/368/EWG/CEC
RoP-Richtlinie, RoP Directive 90/269/EEC

nach folgenden Vorschriften (Normen) entwickelt und gefertigt worden:
has been designed and manufactured to the following specifications:

EN 61000-4-2: 2001	EN 61000-4-11:2001
EN 61000-4-3: 2001	EN 61000-6-1: 2001
EN 61000-4-4: 2001	EN 61000-6-3: 2001
EN 61000-4-6: 2001	EN 60216: 1987
EN 61000-4-8: 2001	EN 60060: 1994

Das Produkt entspricht der EG-Baumusterprüfbescheinigung
The above mentioned product is in conformity with EC-Type Examination Certificate

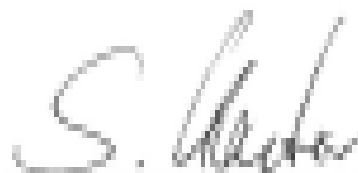
TÜV SE ATEX 1000 / 1000

Die Prüfung erfolgte durch die benannte Stelle Nr.: 0002
The inspection was carried out by the named body No 0002

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D - 30619 Hannover

Hamburg, 01.04.2004

Dir, Sales / Name, Date



Geschäftsführer / Managing Director: R. Kurier

2 EC type-examination certificate – measuring value sensor VAPORIX-Flow



Translation

(1) EC TYPE-EXAMINATION CERTIFICATE

(2) Equipment or protective system intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) EC-Type Examination Certificate Number



TUV 99 ATEX 1009

(4) Equipment: Gas flow measuring system sensor type VAPORIX FLOW

(5) Manufacturer: FAFNIR GmbH

(6) Address: D-20269 Hamburg, Bahrenweg 19, 19

(7) The equipment or protective system and any associated variation thereof is specified in the schedule to the certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0001 in accordance with Article 8 of the Council Directive of the EC of March 23, 1989 (89/391/EEC), certifies that the equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex I to the Directive.

The examination and test results are recorded in the confidential report N° 067911 (see).

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60 014: 1997

EN 50 089: 1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment or protective system must include the following:



TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am Wall 1
D-40225 Essen
Tel.: +49 201 890-1230
fax: +49 201 890-1233


Head of the
Certification Body



Number: 000-00-00

TÜV NORD CERT GmbH & Co. KG
legal successor of the notified body of
TÜV SÜDDEUTSCHLAND ZERTIFIZIERUNG
GmbH, original certificate
number: 00 000001-01



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 99 ATEX 1509**

(15) **Description of equipment**

The gas flow measuring system type VAPORIX is used for the measurement of the gaseous flow in vapor recovery systems of petrol stations. The sensor type VAPORIX FLOW may be applied inside of the hazardous location.

The permissible ambient temperature is -30°C to 50°C.

Electrical data

Power circuit
(as indicated case)

in type of protection 'Extrinsic Safety' EEx ia IIB only for the connection to a certified intrinsically safe circuit with the following maximum values:

U, n: 24,0 V
I, n: 200 mA

The effective internal inductance and capacitance are negligibly small.

(16) Test documents are listed in the test report No. / SUPPLEMENT.

(17) **Special conditions for safe use**

none

(18) **Essential Health and Safety Requirements**

no additional case



Translation

1. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 99 ATEX 1009

of the company: **FAFNIR GmbH**
D-22760 Hamburg

The gas flow measuring system type VAPORIX is used for the measurement of the gaseous flow in vapour recovery systems of petrol stations.

In the future, the device type VAPORIX flow ring also be manufactured according to the test documents listed in the test report and be placed in hazardous locations, as well.

The amendments concern the internal design and the electrical data.

Electrical data

Source circuit (pre-fabricated cable) in type of protection „Intrinsic Safety“ IIS in III only for the connection to a certified intrinsically safe circuit with the following maximum values:

$U_{i,0} = 25,0 \text{ V}$
 $I_{i,0} = 100 \text{ mA}$
 $P_{i,0} = 2,50 \text{ W}$

The effective internal inductance and capacitance are negligible small

All other data apply unchanged for this supplement.

(16) Test documents are listed in the test report N° of TÜV 104800.

(17) Special conditions for safe use
none

(18) Essential Health and Safety Requirements
no additional ones

TÜV SÜD CERT-GmbH & Co. KG
 TÜV SÜD Certification Body
 90471 München
 0 89 30 92 30 00
 Fax: 0 89 30 92 30 00

Hamburg, 2003-09-05


 Head of the
 Certification Body

3 EC type examination certificate – measurement evaluation system VAPORIX-Control



Translation

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment or protective system intended for use in potentially explosive atmospheres. - Directive 94/9/EC



(3) EC-Type Examination Certificate Number

TUV 99 ATEX 1500 X

(4) Equipment: Gas flow measuring system evaluation unit type VAPORIX CONTROL.

(5) Manufacturer: FAFNIR GmbH

(6) Address: D-20705 Hamburg, Bernhardtstr. 58, 19

(7) The equipment or protective system and any acceptable variation therein are specified in the schedule to this certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0001 in accordance with Article 9 of the Council Directive of the EC of March 23, 1984 (94/9/EC), certifies that the equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 067914500.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60 814: 1997

EN 50 089: 1994

(10) If the sign 'X' is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to the certificate.

(11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment or protective system must include the following:



TÜV NORD - CERT GmbH & Co. KG
 TÜV NORD Certification Body
 Als TÜV 1
 D-40225 Düsseldorf
 Tel.: 0211 995-1470
 Fax: 0211 995-1200


 Head of the
 Certification Body



Reference: 067914500

TÜV NORD CERT GmbH & Co. KG legal
 representative of the notified body of
 TÜV NORD CERT MANAGEMENT G.M.B.H.

German original certificate
 issued on 2007-04-24

REVISED BY 1000 15.09.07

This certificate remains in effect provided no change, applicable notified
 authority of change claim or license to the TÜV NORD CERT GmbH & Co. KG

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(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 95 ATEX 1608 X**

(15) **Description of equipment**

The gas flow measuring system type VAPORIX is used for the measurement of the gaseous flow in vapor recovery systems of petrol stations. The measuring system evaluation unit type VAPORIX CONTROL must only be installed outside of the explosion hazardous area.

The maximum permissible ambient temperature is 50 °C.

Electrical data

Supply circuit (terminals PE, N, L)	U = 230 V a.c. ±10% U _{max} = 252 V
Clock input (terminals A1, A2, B1, B2)	U = 24 V U _{max} = 24 V
Data output (Sub D socket)	for the connection to a data interface (RS232) U _{max} = 252 V
Safety circuits (terminals 1A, 1A, and 1B, 1B)	in type of protection intrinsic safety EX ia IIB maximum values per circuit U _{max} = 24.2 V I _{max} = 245 mA Characteristics see: manual
	max. permissible cable inductance 1.4 mH max. permissible cable capacitance 0.0 µF

(16) Test documents are listed in the test report No. : 02/03 14 000.

(17) **Special conditions for safe use**

1.
The PA connection has to be connected to explosion-protected bonding system of the explosion hazardous area.
2.
Since the intrinsically safe circuits are galvanically connected with the earth potential, potential equalization has to exist in the complete course of the section of the intrinsically safe circuits

(18) **Essential Health and Safety Requirements**

no additional ones



Translation

4. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 08 ATEX 1008 X

of the company: **FAFNIR GmbH**
 Bahrendorfer Str. 10
 D-22789 Hamburg

In the future, the gas flow measuring system evaluation unit type **VAPORIX CONTROL**, may also be manufactured according to the test documents listed in the test report.

The amendments concern the internal design.

Electrical data

Supply circuit (terminals PE, N, L)	U = 230 V a.c. ±10%, 50/60 Hz, about 16 VA U _{ins} = 250 V
Clock input (terminals -B+, -B+) (Plate)	U = 5...24 V U _{ins} = 30 V
Control outputs (terminals -O+, -O+) (Out B) (-O+, -O+) (Out A)	U = 24 V, I = 100 mA U _{ins} = 30 V
Voltage output (terminals -V) (5 V)	U = 5 V, I = 100 mA
RS-485 (two-wire) (terminals B A) (RS 485)	U = 12 V U _{ins} = 30 V
RS-485 (four-wire) (ring connection) (RS 485-4)	U = 12 V U _{ins} = 30 V
RS 232 CONNECTION (Out D system) (Service)	U = 12 V U _{ins} = 30 V



1. Supplement to CE Type-Examination Certificate No. TÜV 03 ATEx 1008 X

Barrier circuits
(terminals 1...8B)
(1...8A)

in type of protection intrinsic safety EXi to IIB
Maximum voltage per circuit:
 $U_0 = 27.9 \text{ V}$
 $U_1 = 245 \text{ Vdc}$
characteristic time limit

max. permissible cable inductance 1.4 mH
max. permissible cable capacitance 0.9 µF

All other details and special conditions for safe use apply unchanged for this supplement.

(16) Test documents are listed in the test report N° 02 TÜV 164917.

(17) Special conditions for safe use
unchanged

(18) Essential Health and Safety Requirements
no additional ones

TÜV SÜD CERT GmbH & Co. KG
TÜV SÜD Certification Body
Am Platz 1
85374 München
Tel: 089 309 240
Fax: 089 309 242



Head of the
Certification Body

Number: 2003-03-03

Original signed certificate
issued on 2003-03-03



Translation

3. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 99 ATEX 1500 X

of the company: FAFNIR GmbH
Bismarckstr. 79
D-22765 Hamburg

In the future, the gas flow measuring system evaluation unit type VAPORIX Control may also be manufactured according to the test documents listed in the test report.

The amendments concern the covering of the special conditions for safe use and the amendment of the marking.

The marking in the future is: II CT1 G (Ex) ic) MB.

The electrical data and all other data apply unchanged for this supplement.

(16) Test documents are listed in the test report NF 03 VEX 550416.

(17) Special conditions for safe use

Due to the galvanic isolation of the sensor circuits from the PA resp. PE connection the special conditions for safe use do not apply any longer.

(18) Essential Health and Safety Requirements

no additional ones

by name and date of issue of the
type examination certificate
No. 99 X
TÜV SÜD
TÜV SÜD Industrie
AG, 90471 München
Tel.: 089 309 24-0
Fax: 089 309 24-200

Hannover, 2023-08-14



Head of the
Certification Body

4 Operating instructions – measuring value sensor VAPORIX-Flow, as of: 05.2002

4.1 Mode of operation

As part of the flow measuring system VAPORIX, the measuring value sensor VAPORIX-Flow serves the purpose of monitoring the flow in the vapour recovery system inside the dispensers at filling stations. Determining the flow rate and the concentration of the varying vapour concentrations is carried out via the abstraction of heat. The ambient temperature is also measured. The temperature sensor and the heat abstraction sensors reach into a pipe-shaped element through which the vapour to be measured is conducted. The heat abstraction sensors relate to a fixed temperature difference, adjusted to the ambient temperature, and then their power input is determined. This power input is a measure for the flow speed and the vapour concentration.

The measuring value sensor is firmly connected to an eight-core, shielded cable. This cable is connected to VAPORIX-Control measurement evaluation system set up outside the endangered zone in the head of the dispenser.

4.2 Technical data

Auxiliary power

Voltage	U_i - 23.9 V DC
Current	I_i - 0.345 A
Power input	P_i - 2.06 W
Max. permissible ambient temperature:	-30 ... +50 °C
Inductance (outward acting):	L_i < mH
Capacitance (outward acting):	C_i < 0 nF
Type of protection	II (1) 2 G EEx ia IIB T3
Protection class	IP 68

4.3 Installation

The wiring work is only allowed to be carried out with the equipment in de-energized condition. The special VDE regulations or the local installation regulations must be observed. The wiring system from the measuring value sensor to the power supply system is made using an eight-core, shielded cable.

4.4 Operating instructions

In the case of proper operation, the flow sensor is basically maintenance-free.

Prior to putting the measuring value sensor into service, all devices must be checked with respect to correct connection and proper operation. The electrical power supply, including the supply of the downstream devices, must be checked.

The general operating instructions for the devices being used must be observed.

5 Operating instructions – measurement evaluation system VAPORIX-Control, as of: 06.2002

5.1 Mode of operation

As part of the flow measuring system VAPORIX, the measurement evaluation system VAPORIX-Control serves the purpose of monitoring the flow in the vapour recovery system inside the dispensers at filling stations. The measurement evaluation system VAPORIX-Control is installed outside the ex-zone in the head of the dispenser. The VAPORIX-Control measurement evaluation system supplies two measuring value sensors of the type VAPORIX-Flow, which are installed in the bottom part of the dispenser in the vapour recovery pipe. The flow rate measurement and the measurement of the vapour concentration is carried out via the abstraction of heat.

The measuring value sensors are connected to the measurement evaluation system using an eight-core, shielded cable.

5.2 Technical data

Auxiliary power

Voltage	230 V \pm 10% ($U_m = 253$ V), 50–60 Hz
Power input	- 18 VA
Terminals (PE, N, L)	230 V~

Measurement and control circuits



Pulse input	U = 5 ... 24 V ($U_m = 30$ V)
Terminals (- B + - A +)	Pulse
Control outputs	U - 24 V, max. 100 mA ($U_m = 30$ V)
Terminals (- 2 + - 1 +/- 2 + - 1 +)	Out A/Out B
Voltage output	U = 5 V, max. 50 mA
Terminals (- +)	5 V
RS-485 (two-wire)	U 12 V ($U_m = 30$ V)
Terminals (B A)	RS485
RS-485 (four-wire)	U 12 V ($U_m = 30$ V)
Tank plug-in connector	RS 485-4
RS-232 interface:	U 12 V ($U_m = 30$ V)
Sub-D socket	Service

Sensor circuit (in type of protection intrinsic safety [EEx ia] IIB, linear output characteristic curve)

Voltage	- 23.9 V
Current	- 325 mA
Power	- 1.95 W
Inductance (outer)	- 1.4 mH
Inductance (outer)	- 0.9 µF
Terminals	1 ... 8 B 1 ... 8 A
Sensor cable (terminal = colour)	1 = white 2 = brown 3 = green 4 = yellow 5 = grey 6 = pink 7 = blue 8 = red

The intrinsically safe circuits are safely and galvanically separated from the auxiliary power circuit up to an apex value of the nominal voltage of 375 V.

Labelling

EC prototype test certificate no. TÜV 03 ATEX 1508 X
in compliance with EC Guideline 94/9:  0032,  II (2) G [EEx ia] IIB

5.3 Installation

The wiring work is only allowed to be carried out with the equipment in de-energised condition. The special VDE regulations or the local installation regulations must be observed. The connection of the measuring value sensor to the measurement evaluation system is made using an eight-core, shielded cable.

5.4 Operating instructions

In the case of proper operation, the measurement evaluation system is maintenance-free. Service or repair work is only carried out by replacing the entire assembly unit.

Prior to putting the measurement evaluation system into service, all devices must be checked with respect to correct connection and proper operation. The electrical power supply, including the supply of the downstream devices, must be checked.

The general operating instructions for the devices being used must be observed.