Mounting and
Operating Instructions

EB 8379 EN

Translation of original instructions

Type 3770 Ex d/Ex i Field Barrier

II 2G Ex d[ia] IIC T6 Gb

Edition June 2018

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON's After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at ***www.samson.de > Service & Support > Downloads > Documentation***.

Definition of signal words

⚠ DANGER
Hazardous situations which, if not avoided, will result in death or serious injury

⚠ WARNING
Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE
Property damage message or malfunction

Note
Additional information

Tip
Recommended action

1 General safety instructions

For your own safety, follow these instructions concerning the mounting, start up and operation of the device:

The device is to be mounted, started up or operated only by trained and experienced personnel familiar with the product. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Explosion-protected versions of this device are to be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas.

To avoid damage to any equipment, the following also applies:

Proper shipping and storage are assumed.

i ***Note***

Devices with a CE marking fulfill the requirements of the Directives 2004/108/EC and 2006/95/EC. The Declaration of Conformity is available on request.

2 Design and principle of operation

The field barrier is suitable for operating positioners, smart positioners with HART® communication, i/p converters, solenoid valves or limit switches.

Devices with HART® communication need an adaptation, which is available e.g. with Type 3730-3 and Type 3730-6 Positioners.

Upstream connection and direct attachment to intrinsically safe field devices enable the intrinsically safe circuits of these devices to be connected with the circuits of upstream input and output units that are not intrinsically safe.

In this way, the advantages of intrinsic safety, such as commissioning and operation when connected to a voltage source, remain in effect within the hazardous area.

The connecting cable of the non-intrinsically safe circuit is introduced into the enclosure of the field barrier either over a conduit system or design-certified metal cable entry.

The field barrier transmits the analog reference variable to i/p converters and positioners. The use of HART® protocol is also possible.

The field barriers must be connected to the equipotential bonding system. For this purpose, a version with minus-sided equipotential bonding (non-floating) and a floating version are available. The version is selected to match the earth of the analog output of the controller or control system.

An M20x1.5 adapter allows for a direct connection through the cable entry of the field devices.

Channel 1 of the field barrier is especially designed for transmitting analog signals in the range of 4 to 20 mA, but it also transmits the HART® protocol.

Channels 2 and 3 are intended for controlling limit contacts according to IEC 60947-5-6 or Ex i solenoid valves (e.g. Type 3767 Positioner with a solenoid valve coil for 6 V).

Switching amplifier

When interconnecting the field barrier with multi-channel switching amplifiers, it is important to make sure that the different channels in the switching amplifier do not operate on a common potential. Otherwise unwanted interaction of the limit contacts could occur.

i ***Note***

In case of doubt, only use single-channel switching amplifiers.

Equipotential bonding system

The individual current circuits of the Type 3770 Ex d/Ex i Field Barrier are electrically connected with internal and external equipotential bonding terminals.

For safety reasons, the intrinsically safe circuits must be connected to the equipotential bonding system.

The connection between the equipotential bonding terminal and the equipotential bonding system must be as short as possible.

Channels 2 and 3 are set up to be barriers for positive potential.

Channel 1 can be set up to be floating (Fig. 1, left) or for positive potential (Fig. 1, right).

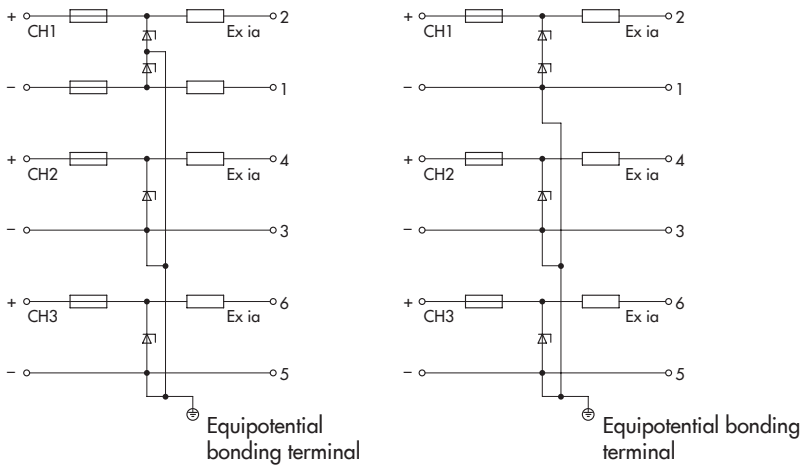

Fig. 1: *Type 3770-1310 (left), Channel 1 floating*
Type 3770-1410 (right), Channel 1 non-floating

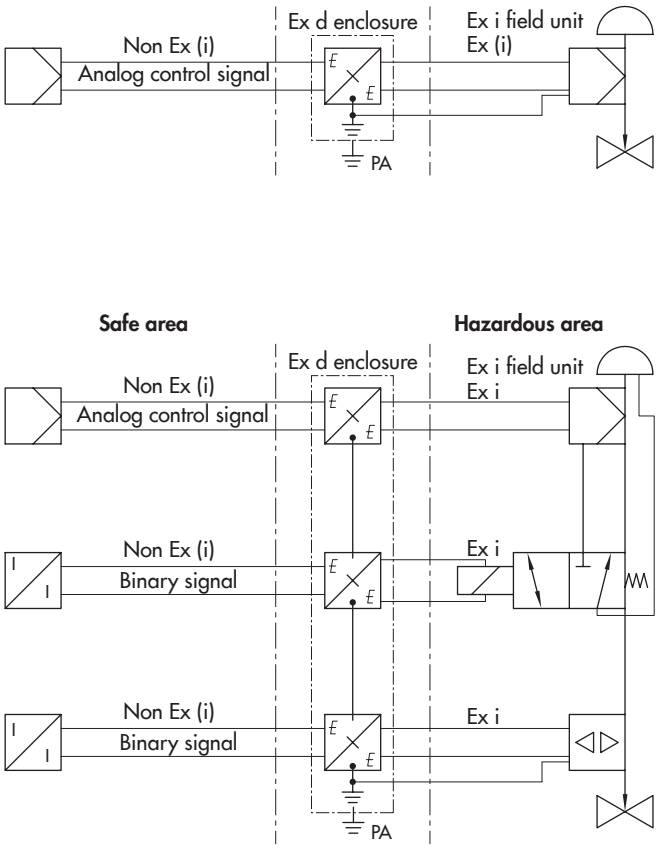

Fig. 2: *Examples of connections with SAMSON positioners*

2.1 Versions

Field barrier acc. to ATEX	Type 3770-	1	x	x	x	0	x	x	x
Three channels: 4 to 4 mA, floating and two circuits according to EN 60947-5-6		3							
Three channels: 4 to 4 mA, non-floating and two circuits according to EN 60947-5-6		4							
Electrical connections									
½ NPT female thread (aluminum)				1	0				
M20x1.5 female thread (stainless steel)				3	1				
Enclosure material									
Die-cast aluminum					0				
Stainless steel (AISI 316)					1				
Special version									
Without							0	0	0
GOST certificate							0	0	1

2.2 Explosion protection certificates

Type	Certification			Type of protection
3770	EAC Ex	Number Date Valid until	POCC DE.08.B00045 2014-12-09 2019-12-08	1Ex d[ia] IIC T6 Gb X
3770-1	EC type examination certificate	Number Date	PTB 98 ATEX 1025 X 2004-01-14	II 2G Ex d[ia] IIC T6 GB

2.3 Technical data

Connection		Channel 1: Ch 1 +/–	Channel 2 and 3: Ch 2 +/– and Ch 3 +/–
Operating values		0/4 to 20 mA or U_N to 15 V DC	0/4 to 20 mA or U_N to 10 V DC
		or limit contacts acc. to EN 60947-5-6 not suitable for transmitter supply	
Input		U_m = 250 V	
Fuse rating		I_N = 80 mA (slow-acting)	
Output circuit		Ex ia IIC	
Maximum values according to EC type examination certificate			
Max. output voltage	U_0	≤17.2 V	≤12.6 V
Max. output current	I_0	≤110 mA	≤49 mA
Max. power	P_0	≤473 mW	≤154 mW
Max. perm. capacitance	C_0	360 nF/IIC · 2.1 µF/IIB	1.15 µF/IIC · 7.4 µF/IIB
Max. perm. inductance i	L_0	3 mH/IIC · 12 mH/IIB	15 mH/IIC · 56 mH/IIB
Series resistance	R_{Lmax}	190 Ω	285 Ω
Load impedance		3.8 V/20 mA	5.7 V/20 mA
Perm. ambient temperature		–45 °C ≤ t_a ≤ +60 °C T6	
Degree of protection		IP 65 according to DIN EN 60529	
Enclosure material		Die-cast aluminum, painted or stainless steel (AISI 316)	

3 Mounting on positioners

1. Remove the cable entry at the side of the positioner or the screw plug from the positioner.
2. Insert the free cable ends and screw in the field barrier (M20x1.5 thread).
3. Turn the enclosure to face the direction you require and secure this position with coupling nut.
4. Connect the free cable ends to the terminal of the positioner as shown in Fig. 4.

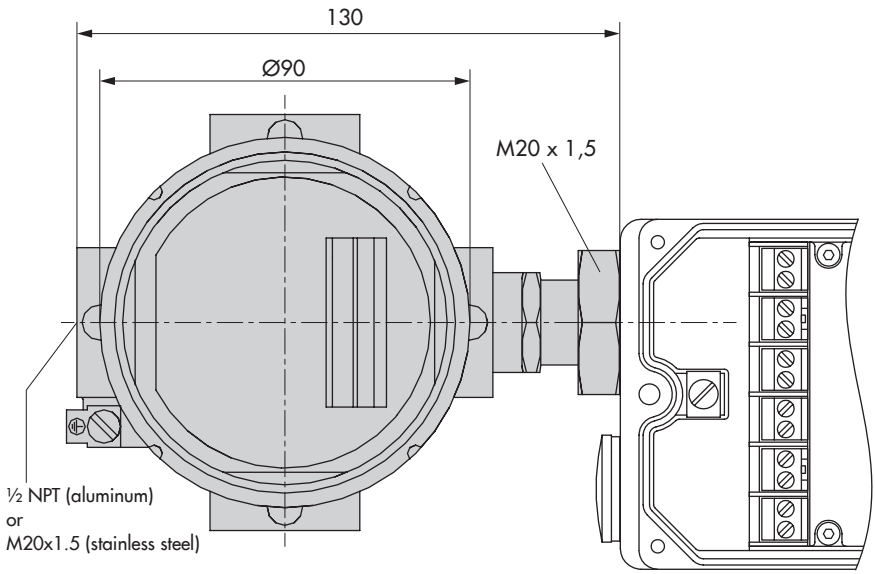

Fig. 3: *Mounting on positioners*

4 Electrical connection

⚠ DANGER

Risk of electric shock!

For electrical installation, observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use.

Valid regulations in Germany:

– VDE regulations

– Accident prevention regulations of the employers' liability insurance.

⚠ DANGER

Risk of fatal injury due to the formation of an explosive atmosphere.

For installation in hazardous areas, observe the relevant standards that apply in the country of use.

Valid standards in Germany:

– EN 60079-14: 2008 (VDE 0165, Part 1) Explosive Atmospheres – Electrical Installations Design, Selection and Erection.

Additional points that apply:

➔ Only use cable entries and blanking plugs with the same degree of protection (IP grade) as that of the field barrier.

4.1 Connection to comply with type of protection

⚠ WARNING

Incorrect electrical connection will render the explosion protection unsafe.

– Adhere to the terminal assignment.

– Do not undo the enameled screws in or on the housing.

– Do not exceed the maximum permissible values (U_0, I_0, P_0, C_0 and L_0) specified in the EC type examination certificates when interconnecting intrinsically safe electrical equipment.

4.1.1 Connection with type of protection Ex d according to EN 60079-1

➔ Connect the Type 3770-1 Field Barrier using suitable cable entries or conduit systems that comply with EN 60079-1 *Explosive Atmospheres – Part 1: Equipment Protection by Flameproof Enclosures "d", Clauses 13.1 and 13.2* and for which a separate test certificate is available.

➔ Do not use cable entries and blanking plugs of simple construction.

➔ For installation according to the type of protection Ex db, seal cable entries left unused with plugs certified for this purpose.

➔ Install the connecting cable properly so that it is protected against mechanical damage.

➔ If the temperature at the inlet parts exceeds 70 °C, use a temperature-resistant connecting cable.

➔ Include the field barrier in the on-site equipotential bonding system.

4.1.2 Connection with type of protection Ex e according to EN 60079-7

➔ Use cable entries and blanking plugs that are certified according to type of protection Ex e and possess a separate test certificate.

➔ Use metal cable glands for ambient temperatures below –20 °C.

➔ Only connect two cables with different cross-sections to one terminal after they have been secured with a common crimp sleeve.

4.2 Wiring

i ***Note***

The terminals are designed for 0.5 to 2.5 mm² wires.

➔ Guide the free wiring ends of the field barrier from Ch1 or Ch2 and Ch3 (channel 1, 2 and 3) to their assigned terminals in the positioner (Fig. 4 and Fig. 5).

➔ Use the yellow/green cable to connect the equipotential bonding terminal of the field barrier to the equipotential bonding terminal of the device to be connected.

➔ Insulate free wire ends of unused channels.

➔ Insert the connecting cable of the non-intrinsically safe circuit into the enclosure of the field barrier either over a conduit system or a design-certified metal cable entry.

➔ Connect the individual wires to the terminals marked Ch1 or Ch2 and Ch3 (channel 1, 2 and 3) in the enclosure of the field barrier.

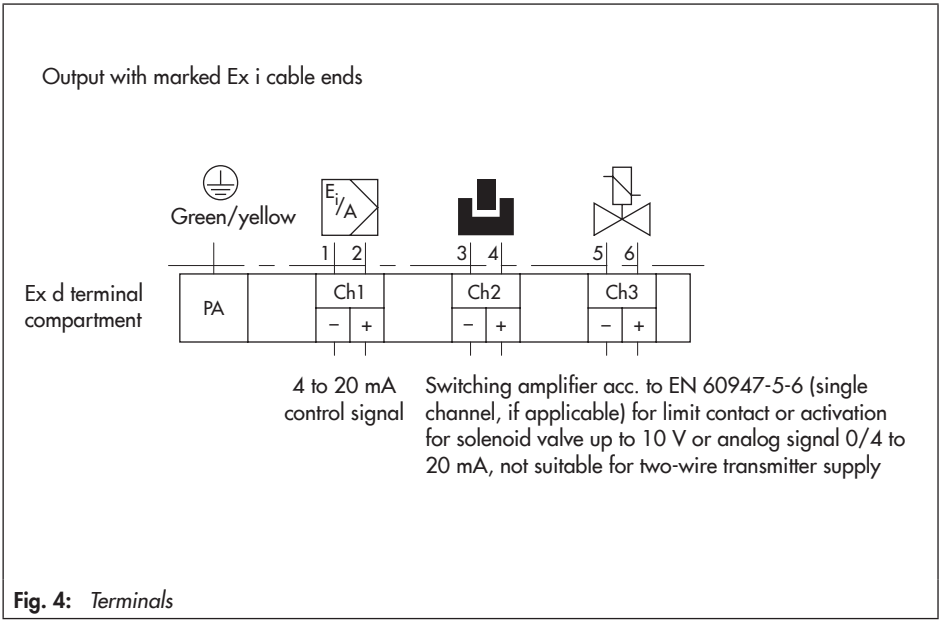

Fig. 4: *Terminals*

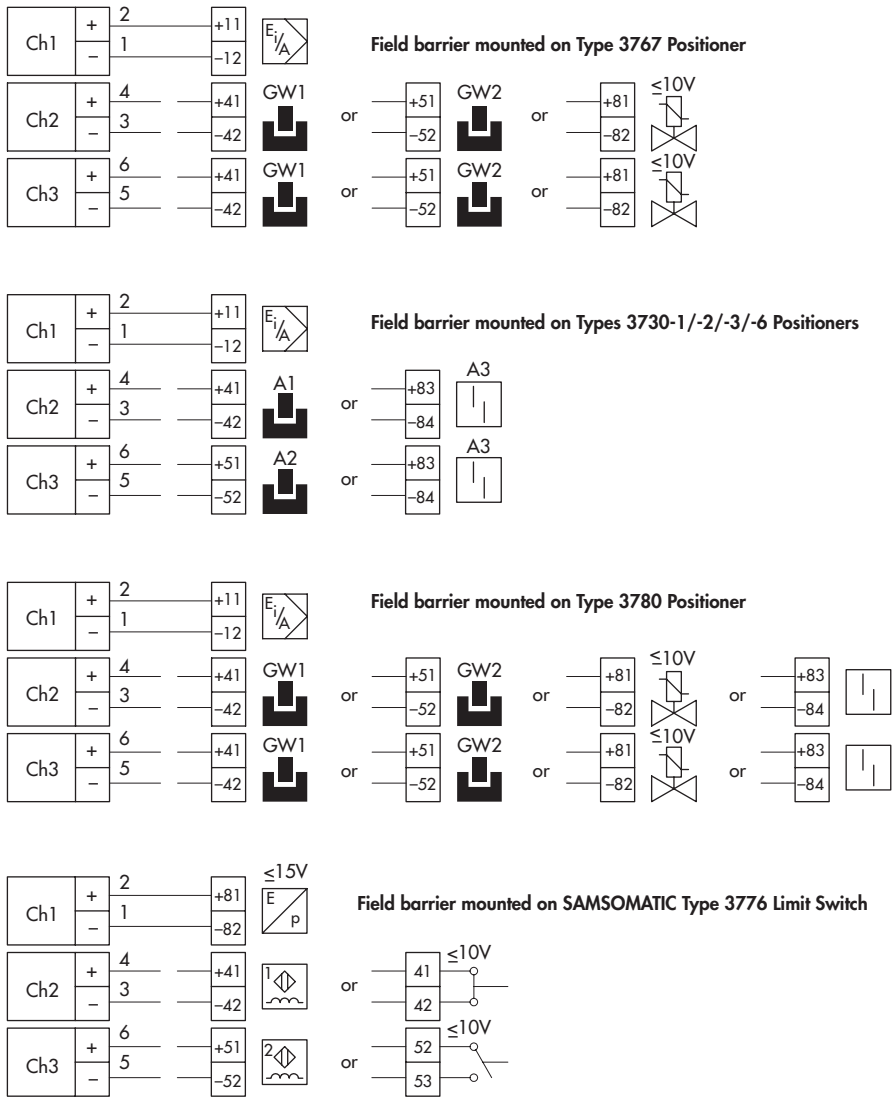

Fig. 5: *Connection examples*

5 Servicing explosion-protected devices

➔ Do not repair the Type 3770-1 Field Barrier when it has been activated (intrinsically safe current circuit has been switched off).

In this case, contact SAMSON's Aftersales Service department:

▶ aftersalesservice@samson.de

TRANSLATION

Physikalisch-Technische Bundesanstalt PTB
Braunschweig und Berlin

(Symbol)

(1) **EC TYPE EXAMINATION CERTIFICATION**

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – Directive 94/9/EC

(3) EC Type Examination Certificate Number

PTB 98 ATEX 1025 X

(4) Equipment: Model 3770-1 Ex d / Ex i Field Barrier

(5) Manufacturer: Samson AG

(6) Address: Weismüllerstr. 3, D-60314 Frankfurt

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirement 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 confidential report No. PTB Ex 98-17005.

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

EN 50014: 1997 **EN 50018: 1995** **EN 50020: 1994**

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

(11) This EC TYPE EXAMINATION CERTFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

(12) The marking of the equipment shall include the following:

(Ex) II 2 G EEx d [ia] IIC T6

Zertifizierungsstelle Explosionsschutz Braunschweig, 18.06.1998
By order

(Signature) (Seal)

Dr. Ing. U. Klausmeyer
Oberregierungsrat

EC Type Examination Certificates without signature and seal are invalid.

This EC Type Examination Certificate may only be reproduced in its entirety and without any change, schedule included.

Extracts or changes shall require the prior approval of the

Physikalisch-Technische Bundesanstalt.
Bundesallee 100
D-38116 Braunschweig

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(13) **Schedule**

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 98 ATEX 1025 X**

(15) **Description of Equipment**

The Model 3770-1 Ex d / Ex i Field Barrier is intended for direct attachment to positioners which are constructed and certified to be intrinsically safe (type of protection "intrinsic safety").

The field barrier consists of the Model SC 16.1 Connection Box made by Cortem and a 3-channel safety barrier assembly encapsulated inseparably inside the enclose. The intrinsically safe output circuits of the safety barriers are connected to the intrinsically safe positioner input circuits through bushings.

Technical Data

Signal Circuits
(terminals Ch 2+/-; Ch 3+/-)

Circuits parameters: (0)4 to 20 mA or U_N up to 10 V, or NAMUR proximity switches

Input: U_m = 250 V
Fuse current rating: I_N = 80 mA

Output circuits: Type of protection "Intrinsic Safety EEx ia IIC"
(terminals Ch 2+/-; Ch 3+/-)

Maximum values: $U_o \leq$ 12.6 V
$I_o \leq$ 49 mA
$P_o \leq$ 154 mW
Output characteristic linear

EEx	ia IIC	ia IIB
C_o	1.15 µF	7.4 µF
L_o	15 mH	56 mH

Signal circuit
(terminals Ch1 +/-)

Circuits paramters: 4 to 20 mA
Input: U_m = 250 V
Fuse current rating: I_N = 80 mA

Output ciruit: Type of protection "Intrinsic Safety EEx ia IIC"
(terminals Ch1 +/-)

Maximum values: $U_o \leq$ 17.2 V
$I_o \leq$ 110 mA
$P_o \leq$ 473 mW
Output characteristic linear

EEx	ia IIC	ia IIB
C_o	360 nF	2.1 µF
L_o	3 mH	12 mH

(16) **Report**

PTB Ex 98-17005 comprising description (18 sheets), drawings (5 sheets), Three PTB text records.

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

Connection

1. The Model 3770-1 Ex d / Ex i Field Barrier shall be connected by suitable cable or conduit entries complying with the requirements of EN 50018 clauses 13.1 and 13.2 and for which a separate test certificate has been issued.

2. Cable entries (Pg glands) and plugs of plain construction must not be used. Where the field barrier is connected by means of a conduit entry approved for this application, the associated sealing device shall be provided immediately at the enclosure.

3. Apertures not used shall be closed in accordance with EN 50018 clause 11.9.

These notes shall be added to each appartus in appropriate form.

Ambient temperature

The ambient temperature range for the application of the Model 3770-1 Ex d/Ex i Filed Barrier is –45 °C to 60 °C.

Routine tests
The routine tests specified in EN 50018 clause 16.1 are not required according to clause 16.2 because the type test has been made successfully at a pressure of four times the reference pressure.

Potential equalization
A bonding conductor shall be provided along the intrinsically safe output circuits.

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

Not applicable.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 08.06.1998

(Signature) (Seal)

Dr.-Ing. K. Klausmeyer
Oberregierungsrat

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

TRANSLATION

ADDENDUM No. 1

in compliance with the Diective 94/9/EC Annex III Clause 6

to the EC Type Examination Certificate PTB 98 ATEX 1025 X

Equipment: Model 3770-1 Ex d/Ex i Field Barrier

Manufacturer: SAMSON AG Mess- und Regeltechnik

Address: Weismüllerstr. 3, D-60314 Frankfurt

Description of the additions and modifications

The Model 3770-1 Ex d/Ex i Field Barrier series is nexpanded by the versions 3770-12 and 3770-14 and in future may be manufactured in compliance with the certification documents indentified in the associated test report.

The modifications relate to the design and construction for the type of protection Intrinsic Safety "i"

The electrical data and all the other data apply without change also to this Addendum No. 1

Test report: PTB Ex 00-20259

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 10 October 2000

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirketor

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EB 8379 EN

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
samson@samson.de · www.samson.de

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