

Type 3770 mounted on Type 3780 Positioner

Mounting and Operating Instructions

EB 8379 EN

Edition December 2012

Note on these mounting and operating instructions

These mounting and operating instructions (EB) 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 (aftersaleservice@samson.de).

Referenced documentation

The documents for the devices used in combination with the Type 3770 Field Barrier apply in addition to these mounting and operating instructions.

The mounting and operating instructions for all supplied devices are included in the delivery. The latest versions of the documents are available on our website at www.samson.de > Product documentation.

Definition of signal words



DANGER!

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



NOTICE

Property damage message or malfunction



WARNING!

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



Note:

Additional information



Tip:

Recommended action

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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.



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 M20 x 1.5 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.



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).

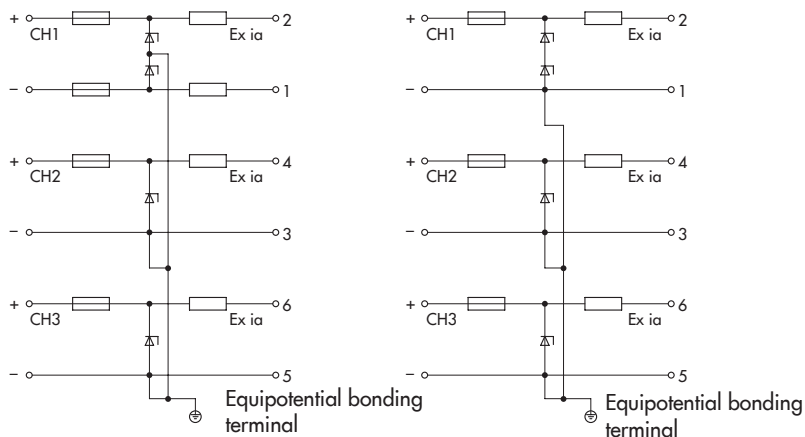


Fig. 1: Type 3770-1310 (left), Channel 1 floating
Type 3770-1410 (right), Channel 1 non-floating

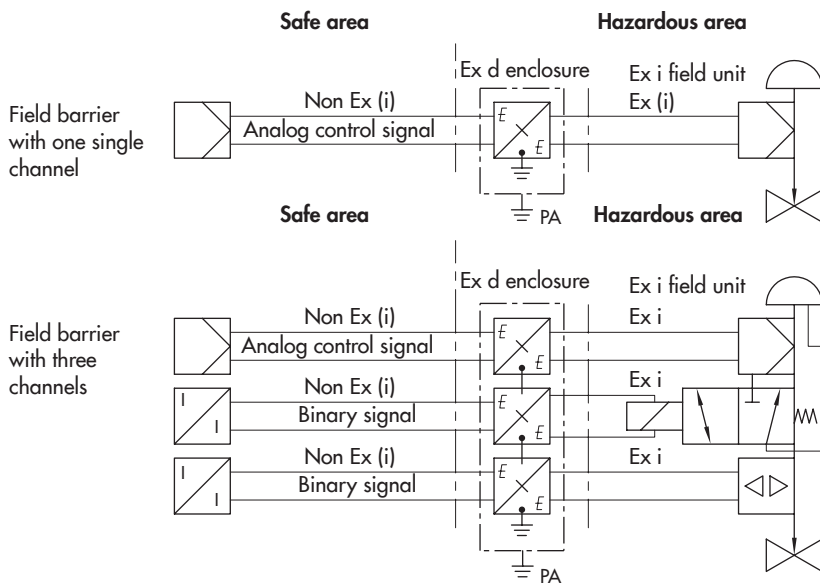




Fig. 2: Examples of connections with SAMSON positioners

2.1 Versions

Field barrier acc. to ATEX	Type 3770-	1	x	x	x	0	x	x	x
Three channels 4 to 20 mA, floating and two circuits acc. to EN 60947-5-6			3						
Three channels 4 to 20 mA, non-floating and two circuits acc. to EN 60947-5-6			4						
Electrical connections									
½ NPT female thread (aluminum)				1	0				
M20 x 1.5 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

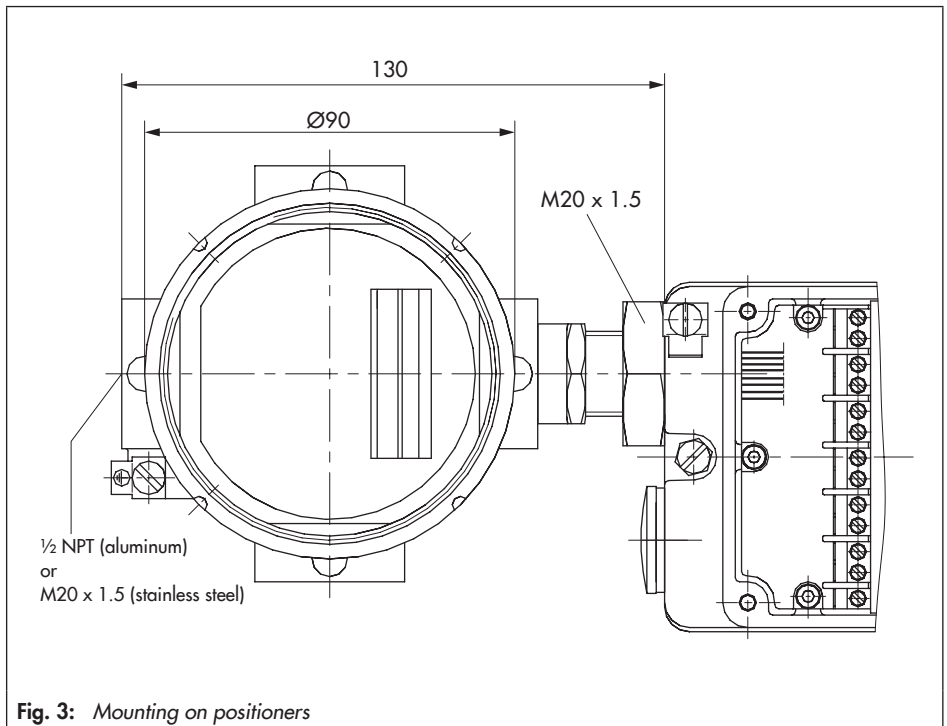
Type	Certification	Type	Number	Type of protection
3770		Number	POCC DE.08.B00045	I Ex d[ia] IIC T6 Gb X
		Date	2014-12-09	
		Valid until	2019-12-08	
3770-1	 EC type examination certificate	Number	PTB 98 ATEX 1025 X	II 2G Ex d[ia] IIC T6 GB
		Date	2004-01-14	

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 μ F/IIB	1.15 μ F/IIC · 7.4 μ F/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
Compliance voltage	3.8 V/20 mA	5.7 V/20 mA
Perm. ambient temperature	-45 °C $\leq t_a \leq +60$ °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 (M20 x 1.5 thread).
3. Turn the enclosure to face the direction you require and secure this position with the coupling nut.
4. Connect the free cable ends to the terminal of the positioner as shown in Fig. 4.



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 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 enclosure.
- 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



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.

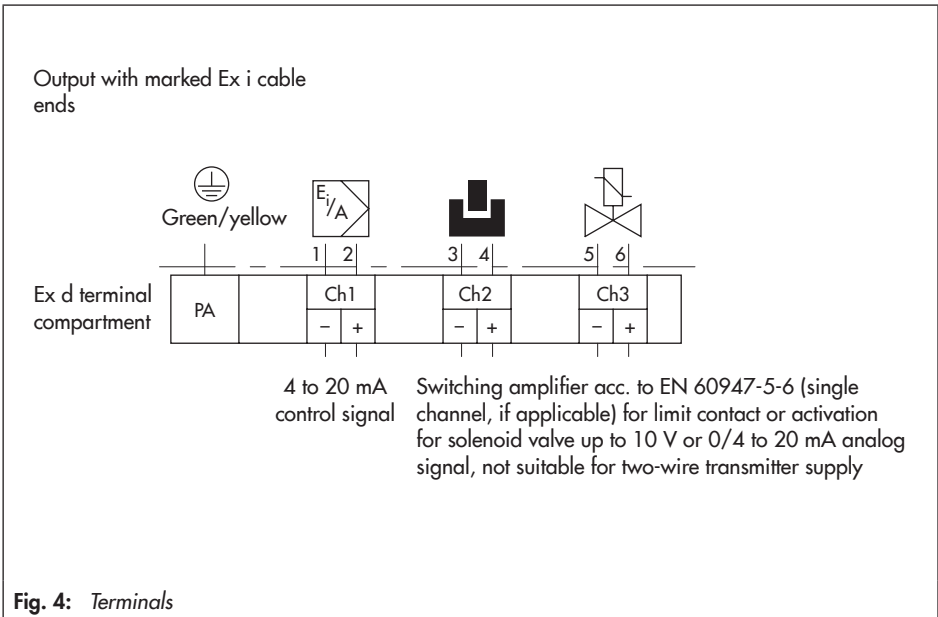


Fig. 4: Terminals

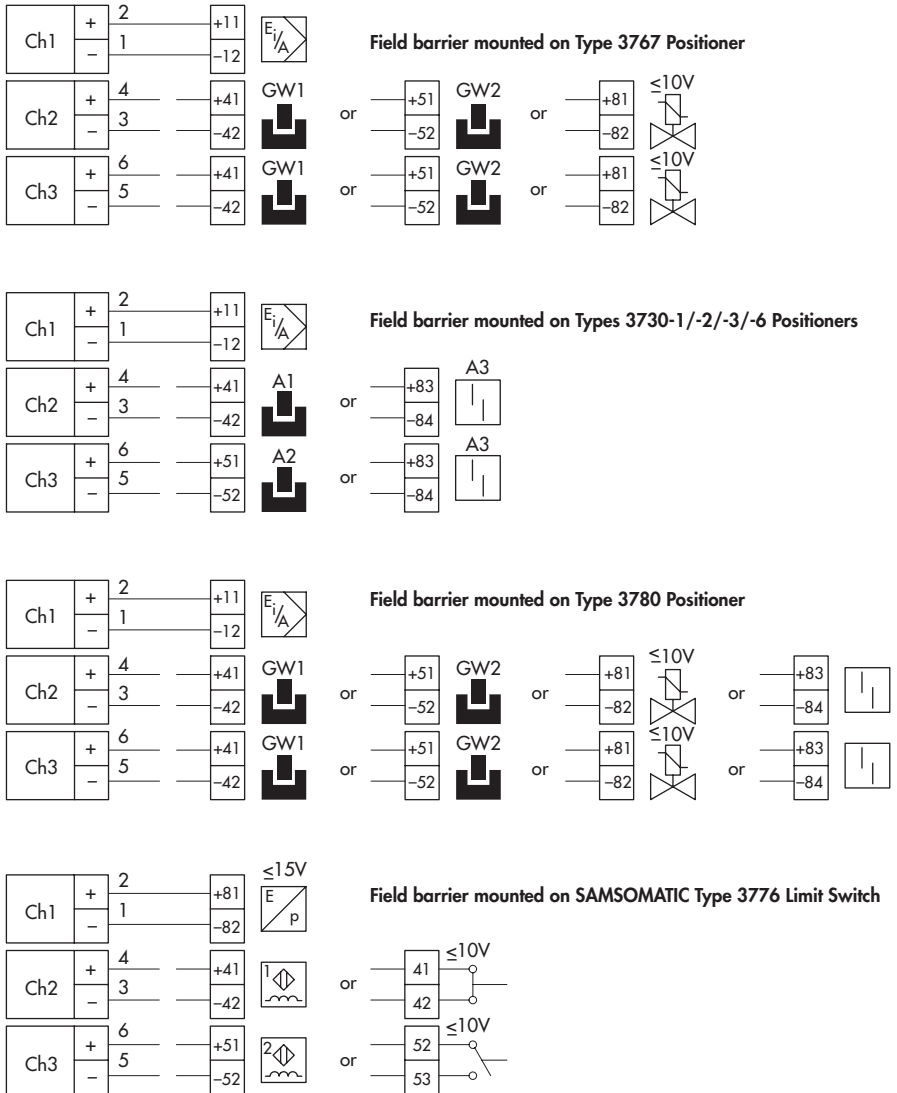


Fig. 5: Connection examples

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 After-sales Service department:

▶ aftersaleservice@samson.de

TRANSLATION

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

(Symbol)

EC TYPE EXAMINATION CERTIFICATION

- (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:** Sanson 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, dated 23 March 1994, certifies that the equipment is designed and constructed in conformity 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.**

TRANS/PTB13.06c

(11) **This EC TYPE EXAMINATION CERTIFICATE 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 [Ic] 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

TRANS/PTB13.06c

(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 enclosure. 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:

Input:

Fuse current rating:

Output circuits:
(terminals Ch 2 +/-; Ch 3 +/-)

Maximum values:

(0,4 to 20 mA or U_b up to 10 V, or NAMUR proximity switches

$U_b = 250$ V
 $I_N = 80$ mA

Type of protection "Intrinsic Safety EEx ia IIC"

$U_b \leq 12,6$ V
 $I_b \leq 49$ mA
 $P_b \leq 284$ mW

Output characteristic linear

EEx	ia IIC	ia IIB
C_c	1,15 μ F	7,4 μ F
L_c	1,5 mH	5,6 mH

Signal circuit
(terminals Ch 1 +/-)

Circuits parameters:

Input:
 $U_b = 250$ V
 $I_N = 80$ mA

Output circuit:
(terminals Ch 1 +/-)

Maximum values:

$U_b \leq 12,6$ V
 $I_b \leq 110$ mA
 $P_b \leq 473$ mW

Output characteristic linear

EEx	ia IIC	ia IIB
C_c	3,60 nF	2,1 μ F
L_c	3 mH	12 mH

Type of protection "Intrinsic Safety EEx ia IIC"

(16) **Report**

PTB Ex 98-17005 comprising description (18 sheets), drawings (5 sheets), Three PTB test 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 11.5.

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

Ambient temperature

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

Routine tests

The tests specified in EN 50018 clause 16.1 are not required according to clause 16.2 because this 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

TRANSLATION

ADDENDUM No. 1

in compliance with the Directive 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-40314 Frankfurt

Description of the additions and modifications

The Model 3770-1 Ex d/Ex i Field Barrier series is expanded by the versions 3770-12 and 3770-14 and in future may be manufactured in compliance with the certification documents identified 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 Braunschweig, 10. Oktober 2000
 By order

(Signature) (Seal)

Dr.-Ing. U. Johannmeyer
 Regierungsdirektor



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