

# Field Barrier Ex d/Ex i Type 3770



## Mounting and Operating Instructions

**EB 8379 EN**

Edition February 2010



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### General safety instructions



- ▶ *The device may only be installed, started up or operated by trained and experienced personnel familiar with the product. According to these mounting and operating instructions, trained personnel is referred to as 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 relevant standards.*
- ▶ *Explosion-protected versions of this device may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas.*
- ▶ *Proper shipping and appropriate storage are assumed.*
- ▶ **Note:** *The device with a CE marking fulfils the requirements of the Directives 94/9/EC (ATEX) and 89/336/EEC (EMC). The Declaration of Conformity can be viewed and downloaded from the SAMSON website at [www.samson.de](http://www.samson.de).*

## 1 Design and principle of operation

The field barrier is suitable for operating positioners, positioners with HART® communication, electropneumatic 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 of intrinsically safe field devices and direct attachment to them enables the intrinsically safe circuits of these devices to be connected to the non-intrinsically safe circuits of upstream input and output units. In this way, the benefits of intrinsically safety, such as commissioning and working under voltage, are kept within the hazardous area.

The connecting lead of non-intrinsically safe circuits to the field barrier is guided into the enclosure either over a cable conduit or using metal, type-approved cable glands. The field barrier transmits the analog reference variable, including HART protocol, to electropneumatic converters and positioners.

Field barriers must be connected to the equipotential bonding system of the plant. 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.

The triple channel version additionally allows the connection of two limit switches according to EN 60947-5-6 or an intrinsically safe solenoid valve and a limit switch. An M20 x 1.5 adapter enables the direct con-

nection of field devices through the cable entry.

Channel 1 of the field barrier is especially designed to transmit an analog signal in the range from 4 to 20 mA and also can transmit HART protocol.

The optional channels 2 and 3 are intended to control limit switches that conform to the EN 60947-5-6 standard or Ex i solenoid valves (e.g. Type 3767 Positioners with a solenoid valve coil for 6 V).

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

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### **Note!**

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

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

For safety reasons, the intrinsically safe circuits must be connected to the equipotential bonding system of the plant. 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 is set up to be floating (Fig. 2, left) or for positive potential (Fig. 2, right).

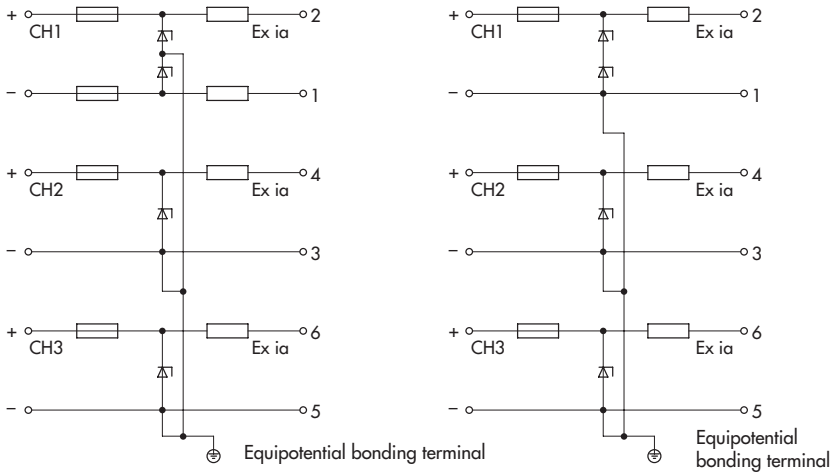


Fig. 2 · Type 3770-1310, Channel 1 floating

Type 3770-1410, Channel 1 non-floating

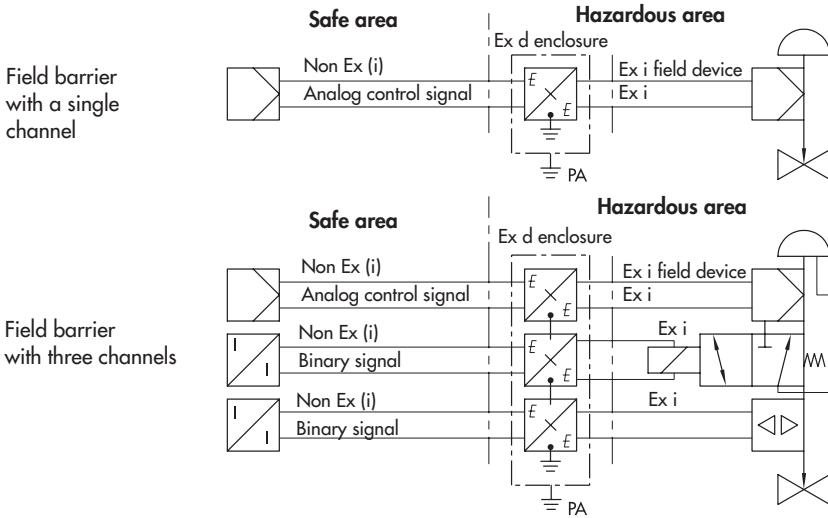


Fig. 3 · Examples of connections with SAMSON positioners

## 1.1 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 2 circuits acc. to EN 60947-5-6		3						
Three channels 4 to 20 mA, non-floating and two 2 circuits acc. to EN 60947-5-6		4						
<b>Electrical connection</b>								
Female thread ½ NPT			1					
Female thread M20 x 1.5			3					
<b>Housing material</b>								
Die-cast aluminum				0				
Stainless steel AISI 316				1				
<b>Special version</b>								
None						0	0	0
GOST approval						0	0	1

## 1.2 Technical data

Type of protection	EExd [ia] IIC T6	
Connection	Channel 1 Ch 1 +/-	Channel 2 and 3 Ch 2 +/-, Ch 3 +/-
Operating values	(0) 4 to 20 mA or $U_N$ up to 15 V DC	(0) 4 to 20 mA or $U_N$ up to 10 V DC
	or limit switches acc. to EN 60947-5-6, not suitable for transmitter supply	
Input	$U_m = 250$ V	
Fuse rating	$I_N = 80$ mA time lag	
Output circuit	EEx ia IIC	
Maximum values according to EC-Type Examination Certificate		
max. output voltage $U_0$	$\leq 17.2$ V	$\leq 12.6$ V
max. output current $I_0$	$\leq 110$ mA	$\leq 49$ mA
max. power $P_0$	$\leq 473$ mW*	$\leq 154$ mW*
max. perm. capacitance $C_0$	360 nF/IIC, 2.1 $\mu$ F/IIB	1.15 $\mu$ F/IIC, 7.4 $\mu$ F/IIB
max. perm. inductance $L_0$	3 mH/IIC, 12 mH/IIB	15 mH/IIC, 56 mH/IIB
Series resistance $R_{Lmax}$	190 $\Omega$	285 $\Omega$
Load impedance	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 acc. to IEC 529	
Enclosure materials	Die-cast aluminum, painted or stainless steel AISI 316	

\* Linear output characteristic

## 2 Mounting on a positioner

Remove the cable entry at the side of the positioner or the screw plug from the positioner. Insert the free cable ends and screw in the field barrier (M20 x 1.5 thread). Turn the enclosure to face the direction you require and secure this position with coupling nut. Connect the free cable ends to the terminal of the positioner as shown in Fig. 5.

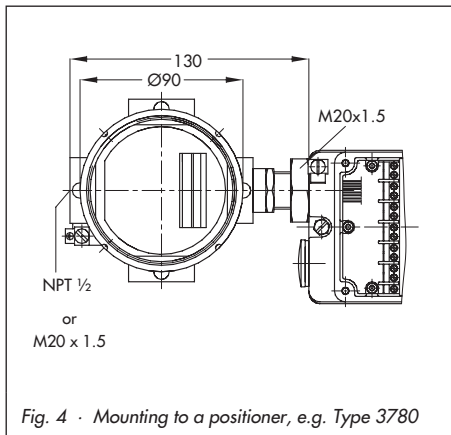


Fig. 4 · Mounting to a positioner, e.g. Type 3780

## 3 Electrical connections



As far as the electrical installation of the device is concerned, the relevant national regulations governing the installation of electrical equipment and the national accident prevention regulations of the country of destination must be adhered to. In Germany, these are the VDE regulations and accident prevention regulations of the employer's liability insurance. For installation in hazardous areas, the following standards apply:

EN 60079-14: 1997; VDE 0165 Part 1/8.98 "Electrical apparatus for explosive gas areas" and EN 50281-1-2: VDE 0165 Part 2/11.99 "Electrical apparatus for use in the presence of combustible dust". For intrinsically safe electrical apparatus that are certified according to the Directive 79/196/EEC, the data specified in the certificate of conformity apply for connection of intrinsically safe circuits.

For intrinsically safe electrical apparatus that are certified according to the Directive 94/9/EC, the data specified in the EC-type examination certificate apply for connection of intrinsically safe circuits.

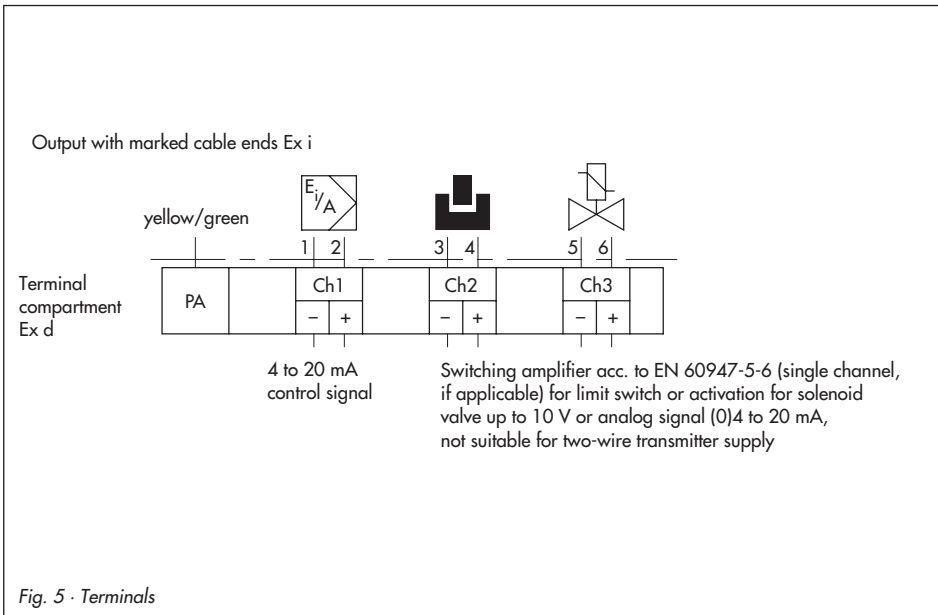
**Caution:** Always use the same terminal assignment as specified in the certificate. Reversal of the electrical connections may cause the explosion protection to be ineffective!

Guide the free wiring ends of the field barrier from Ch1, and if applicable, Ch2 and Ch3 (channel 1, 2 and 3) to their assigned terminals in the positioner (Figs. 5 and 6).

Insulate free wire ends of unused channels.

The connecting lead from the non-intrinsically safe circuit to be connected to the field barrier must be inserted either over a cable conduit or with metal type-approved cable glands.

Connect the individual wires to the terminals marked Ch1, and if applicable, Ch2 and Ch3 (channel 1, 2 and 3) in the enclosure of the field barrier. The terminals are designed for wire sizes of 0.5 to 2.5 mm.



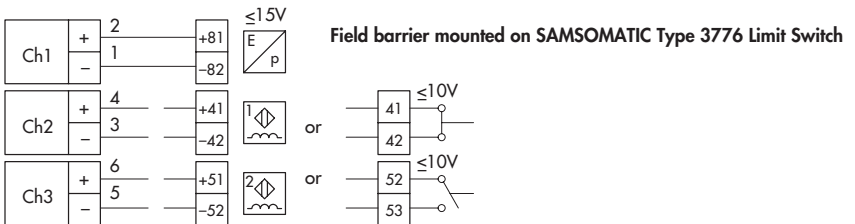
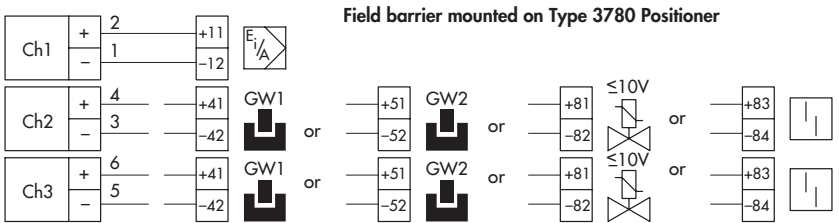
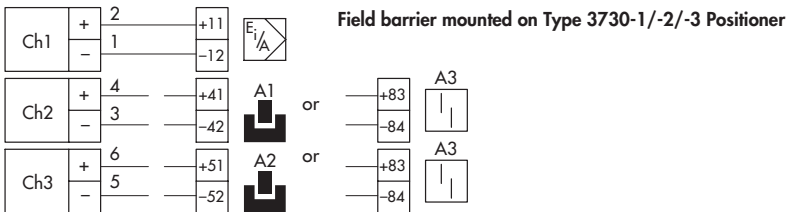
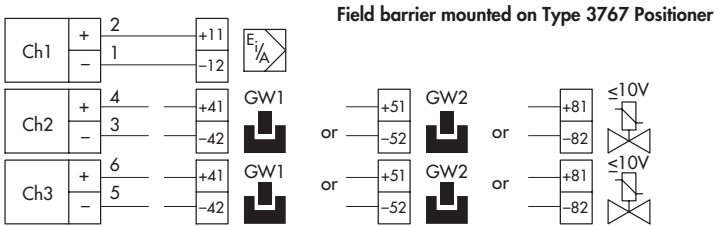


Fig. 6 · Connection examples

## TRANSLATION

Physikalisch-Technische Bundesanstalt  
Braunschweig und Berlin

PTB

(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 tested to comply with the Essential Health and Safety Requirements 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 CERTIFICATE relates only to the design and constructors of the specified equipment. It applies to the 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 Explosionschutz      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

(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 terminal safety barrier assembly encapsulated inseparably inside the connection box. The output terminals 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  $U_a$  up to 10 V, or NAMUR proximity switches

Input:  
 $U_n = 250$  V  
 $I_n = 80$  mA

Output circuits:  
(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

EE:	ia IIC	ia IIB
C <sub>o</sub> :	1.15 $\mu$ F	7.4 $\mu$ F
L <sub>o</sub> :	15 mH	56 mH

Signal circuit  
(terminals Ch 1 +/-)

Circuits parameters:  
Input:  
 $U_a = 2.5$  V  
 $I_a = 80$  mA

Output circuit:  
(terminals Ch 1 +/-)

Maximum values:

$U_o \leq 17.2$ V
$I_o \leq 110$ mA
$P_o \leq 473$ mW

Output characteristic linear

EE:	ia IIC	ia IIB
C <sub>o</sub> :	360 nF	2.1 $\mu$ F
L <sub>o</sub> :	3 mH	12 mH

(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 arms complying with the requirements of EN 50018 clause 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 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  $40$  °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.**

Zertifizierungsgstelle Explosionschutz

By order

(Signature)

(Seal)

Dr.-Ing. K. Klausmeyer  
Oberregierungsrat

Braunschweig, 08.06.1998

## 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. In addition, the EC Type Examination Certificate and 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 October 2000  
By order

(Signature)

(Seal)

Dr.-Ing. U. Johannsmeyer  
Regierungsdirektor

EC Type Examination Certificates without signature and seal are invalid.  
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Edits or changes shall require the prior approval of the

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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

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SAMSON AG · MESS- UND REGELTECHNIK  
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany  
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507  
Internet: <http://www.samson.de>

**EB 8379 EN**

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