Series 3730

Type 3730-4 Electropneumatic Positioner with PROFIBUS-PA communication

Application

Positioners for attachment to pneumatic control valves

Rated travels from 3.6 to 200 mm · Opening angle 24 to 100°

Smart, bus-powered field device complying with PROFIBUS-PA specifications based on IEC 61158-2 transmission technology

CE Ex certified

The microprocessor-controlled positioner compares the reference variable cyclically transmitted over the PROFIBUS-PA network to the travel or opening angle of the control valve and issues a corresponding output signal pressure.

The Type 3730-4 Positioner communicates using PROFIBUS-PA specification according to IEC 61158 and IEC 61784 to exchange data with programmable logic controllers, automation systems and various engineering tools.

Special features

- PROFIBUS-PA Profile 3.01 certified positioner fulfilling all compulsory requirements of PROFIBUS-PA Profile 3.02
- Automatic ID adaptation according to PROFIBUS-PA Profile 3.02 to facilitate replacement of positioners with Profile 2.0 or 3.0 (e.g. Type 3785)
- Classified status alarms acc. to NAMUR Recommendation NE 107
- DTM file available to integrate the positioner into FDT/DTM in compliance with specification 1.2
- Simple attachment to all common linear actuators with interface for SAMSON direct attachment (Fig. 1), NAMUR rib (Fig. 2) or valves with rod-type yokes according to IEC 60534-6-1 or to rotary actuators according to VDI/VDE 3845 (Fig. 3)
- Any desired mounting position
- Single-knob, menu-driven operation
- Automatic start-up
- LCD easy to read in any mounted position due to selectable reading direction
- Integrated EXPERTplus diagnostics (▶ T 8389 EN) with additional partial stroke test for valves in safety-instrumented systems
- Online changing of control parameters
- Automatic zero monitoring
- Calibrated travel sensor without gears susceptible to wear
- Permanent storage of all parameters (protected against power failure)
- Negligible influence of temperature and supply air
- Adjustable output pressure limitation
- Activatable tight-closing function
- Binary input for DC voltage signals
- Certified according to IEC 61508/SIL

Fig. 1: *Type 3730-4*
Direct attachment to Type 3277 Pneumatic Actuator

Fig. 2: *Type 3730-4*
Attachment according to NAMUR

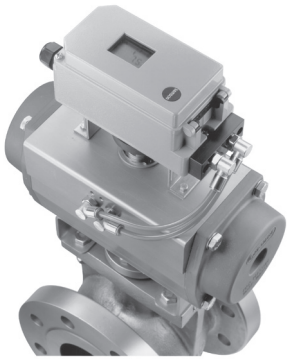


Fig. 3: *Type 3730-4*
Attachment according to VDI/VDE 3845

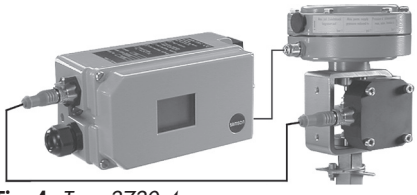


Fig. 4: *Type 3730-4*
External position sensor with Type 3510 Micro-flow Valve

Additional options

- Inductive limit switch with proximity switches
- Integrated solenoid valve
- Binary input for floating contact
- External position sensor (Fig. 4)
- Stainless steel housing

Principle of operation

The positioner is mounted on pneumatic control valves and is used to assign the valve position (controlled variable x) to the control signal (reference variable w). The positioner compares the electric control signal of a control system to the travel or rotational angle of the control valve and issues a signal pressure (output variable y) for the pneumatic actuator.

The positioner mainly consists of an electric travel sensor system, an analog i/p module with a downstream air capacity booster and the electronics with the microcontroller.

When a system deviation occurs, the actuator is either vented or filled with air. If necessary, the signal pressure change can be slowed down with a volume restriction that can be connected as necessary. Using the software, the signal pressure to the actuator can be limited to 1.4, 2.4 or 3.7 bar.

The fixed flow regulator ensures a constant air flow to the atmosphere, which is used to flush the inside of the positioner housing and to optimize the air capacity booster. The i/p module is supplied with a constant upstream pressure by the pressure regulator to compensate for any fluctuations in the supply pressure.

The positioner communicates and is powered using IEC 61158-2 transmission technology conforming to PROFIBUS-PA specifications.

As a standard feature, the positioner comes with a binary input for DC voltage signals to signalize process information over the PROFIBUS-PA network.

Operation

A single rotary pushbutton facilitates operation. The parameters are selected by turning the rotary pushbutton, pushing it activates the required setting. In the menu, all parameters are listed in one level, meaning there is no need to search in submenus. All parameters can be checked and changed on site.

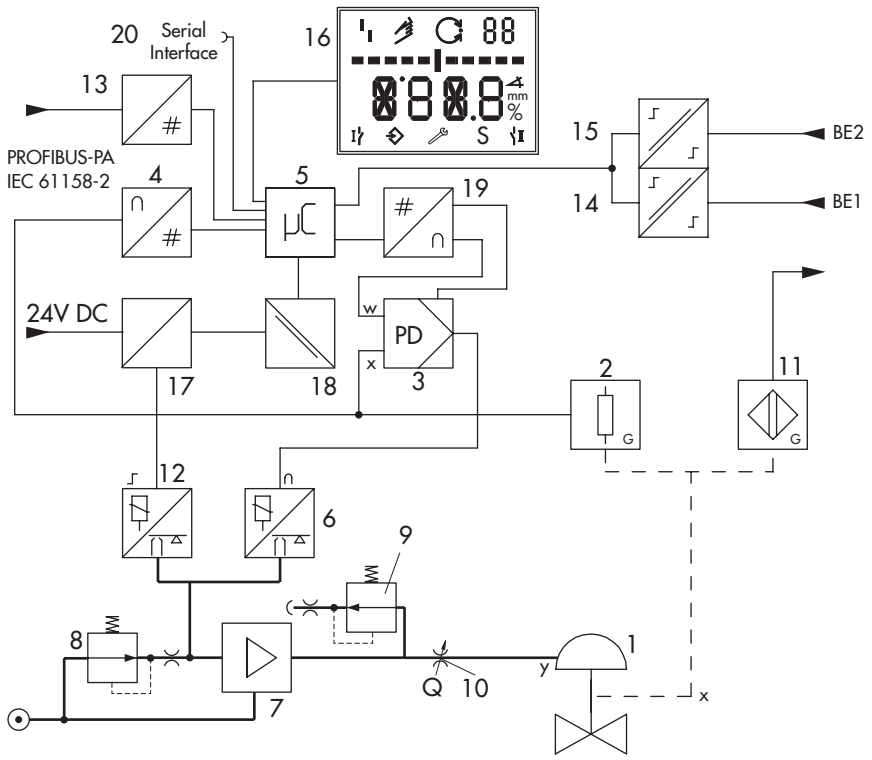
All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180°.

The closing direction of the control valve is indicated to the positioner by setting the DIP switch "Air to open/Air to close". It assigns the CLOSED position of the control valve to the 0 % reading.

The INIT key activates initialization which is started according to the ready adjusted parameters. After initialization is completed, the positioner immediately starts closed-loop operation.

Configuration using TROVIS-VIEW

The SAMSON configuration software, TROVIS-VIEW, can be used to configure the positioner. For this purpose, the positioner is equipped with an additional digital interface to be connected to the RS-232 interface of a PC. TROVIS-VIEW adapts the positioner to any process requirements and allows the process to be checked while the process is running. The control valve is connected to the process over the PROFIBUS-PA network.



1 Control valve
2 Travel sensor
3 PD controller
4 A/D converter
5 Microcontroller
6 i/p converter
7 Air capacity booster
8 Pressure regulator
9 Flow regulator
10 Volume restriction
11* Inductive limit switch
12* Solenoid valve
13 Interface module (IEC 61158-2)
14 Binary input 1 (voltage input)
15* Binary input 2 (for floating contact)
16 Display
17* Actuation of solenoid valve
18 Electrical isolation
19 D/A converter
20 Serial interface (SSP)
* Optional

Fig. 5: *Functional diagram of Type 3730-4 Positioner*

Table 1: *Technical data*

Type 3730-4 Positioner with PROFIBUS-PA communication Technical data in test certificates additionally apply to explosion-protected devices		
Rated travel	Adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm
		Attachment according to IEC 60534-6 (NAMUR): 3.6 to 200 mm
		Attachment to rotary actuators acc. to VDI/VDE 3845: 24 to 100°
Travel range	Adjustable	Adjustable within the initialized travel/angle of rotation; travel can be restricted to 1/5 at the maximum
Bus connection		Fieldbus interface according to IEC 61158-2, bus-powered Field device according to FISCO (Fieldbus Intrinsically Safe Concept)
Communication		
Fieldbus		Data transmission conforming to PROFIBUS-PA specification acc. to IEC 61158 and IEC 61784
		Certified DTM file acc. to FDT specification 1.2, suitable for integrating the positioner into frame applications that support the FDT/DTM concept. Other integrations, e.g. into SIMATIC PDM using EDD
Local		SAMSON SSP interface and serial interface adapter
Software requirements		TROVIS-VIEW with database module 3730-4
Permissible operating voltage		9 to 32 V DC · Powered over bus line The limits in the type examination certificate additionally apply for explosion-protected versions.
Maximum operating current		15 mA
Additional current in case of error		0 mA
Supply air		1.4 to 7 bar (20 to 105 psi) Air quality acc. to ISO 8573-1: 2001 Max. particle size and density: Class 4 · Oil content: Class 3 · Humidity and water: Class 3 Pressure dew point: at least 10 K below the lowest ambient temperature to be expected
Signal pressure (output)		0 bar up to the capacity of the supply pressure
Characteristic		Linear/Equal percentage/Reverse equal percentage · User-defined (over operating software and communication) · Butterfly valve linear/equal percentage · Rotary plug valve linear/equal percentage · Segmented ball valve linear/equal percentage Deviation from characteristic ≤ 1 %
Hysteresis		≤ 0.3 %
Sensitivity		≤ 0.1 %
Direction of action		Reversible
Air consumption		Independent of supply air approx. < 110 l_n/h
Air output capacity	Actuator filled with air	At Δp = 6 bar: 8.5 m_n^3/h · At Δp = 1.4 bar: 3.0 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.09
	Actuator vented	At Δp = 6 bar: 14.0 m_n^3/h · At Δp = 1.4 bar: 4.5 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.15
Permissible ambient temperature		−20 to +80 °C for all versions −45 to +80 °C with metal cable gland −25 to +80 °C with inductive limit switch (SJ2-S1N) and metal cable gland The limits in the test certificate additionally apply for explosion-protected versions
Influences	Temperature	≤ 0.15 %/10 K
	Supply air	None
	Influence of vibrations	≤ 0.25 % up to 2 kHz and 4 g according to IEC 770
EMC		Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
Electrical connections		One M20 x 1.5 cable gland for 6 to 12 mm clamping range· Second M20x1.5 threaded connection additionally exists · Screw terminals for 0.2 to 2.5 mm² wire cross-sections
Degree of protection		IP 66 /NEMA 4X
Use in safety-instrumented systems (SIL)		Observing the requirements of IEC 61508, the systematic capability of the control valve for emergency venting as a component in safety-instrumented systems is given.
		Use is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1).
Binary input 1		
Input		0 to 30 V DC with reverse polarity protection · Static destruction limit 40 V/5.8 mA · Current consumption 3.5 mA at 24 V · Galvanic isolation
Signal		Signal '1' at U_e > 5 V · Signal '0' at U_e < 3 V
Materials		
Housing		Die-cast aluminum EN AC-AlSi12 (Fe) (EN AC-44300) acc. to DIN EN 1706 Chromated and powder paint coated · Special version in stainless steel 1.4581
External parts		Stainless steel 1.4571 and 1.4301
Cable gland		Nickel-plated brass, M20 x 1.5
Weight		Approx. 1.0 kg

Options for Type 3730-4	
Binary input 2 for floating contact	
Switching input	R < 100 Ω · Contact load 100 mA · Static destruction limit 20 V/5.8 mA · Galvanic isolation
Solenoid valve · Approval acc. to IEC 61508/SIL	
Input	24 V DC · Reverse polarity protection · Static destruction limit 40 V Power consumption: $I = \frac{U - 5.7\ V}{3840\ \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal	Signal '0' no pick-up ≤ 12 V · Signal '1' safe pick-up > 19 V
Service life	> 5 x 10^6 switching cycles
Use in safety-instrumented systems (SIL)	Same as positioner pneumatics
Inductive limit switch	For connection to switching amplifier acc. to EN 60947-5-6
SJ2-SN proximity switch	NAMUR NC contact
SJ2-S1N proximity switch	NAMUR NO contact
External position sensor	
Travel	Same as positioner
Cable	10 m · Flexible and durable · With M12x1 connector · Flame-retardant acc. to VDE 0472 Resistant to oils, lubricants and coolants as well as other aggressive media
Permissible ambient temperature	–60 to +105 °C · The limits in the test certificate additionally apply for explosion-protected versions
Immunity to vibration	Up to 10 g in the range of 10 to 2 kHz
Degree of protection	IP 67

Summary of explosion protection approvals

Type of approval	Certificate number	Date	Comments	Type 3730
EC Type Examination Certificate	PTB 04 ATEX 2109	2004-10-25	II 2G Ex ia IIC T6; II 2D Ex tb IIIC T80°C IP66*	-41
First Addendum		2006-07-13	Adaptions: Bus connection signal circuit, PCB layout	
Second Addendum		2007-08-24	Adaption: Electrical data for forced venting	
Statement of Conformity	PTB 05 ATEX 2010 X	2005-02-16	II 3G Ex nA II T6; II 3G Ex ic IIC T6; II 3D Ex tc IIIC T80°C IP66*	-48
First Addendum		2006-07-13	Revisions: Bus connection signal circuit, PCB layout	
CSA certificate	1675787	2006-06-01	Ex ia IIC T6; Class I, II, Div.1, Groups A, B, C, D, E, F, G; Ex nA II T6; Ex nL IIC T6; Class I, Div.2, Groups A, B, C, D; Class II, Div.1, Groups E, F, G Type 4 Enclosure	-43
FM certificate	3023605	2006-03-15	Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A, B, C, D, E, F, G; Class I, Div.2, Groups A, B, C, D; Class II, Div.2, Groups F, G Type 4X	-43
GOST (valid until 2015-02-27)	POCC DE0.5.B00045	2012-02-28	1Ex ia IIC T6	-41
IECEx	IECEx PTB 06.0054	2006-11-02	Ex ia IIC T6	-41
CCoE	On request			
INMETRO	On request			
NEPSI (valid until 2016-01-23)	GYJ111267	2011-01-24	Ex ia IIC T6	-41
	GYJ111268	2011-01-24	Ex nA II T6; Ex nL IIC T6	-48

* Designation according to the EN 60079 standard series

Electrical and bus connection

The Type 3730-4 PROFIBUS-PA Positioner must be connected to bus segments complying with IEC 61158-2 requirements. A shielded two-wire line is used for both supply power and data communication.

Mounting the positioner

The Type 3730-4 Positioner with PROFIBUS-PA communication can be attached directly to the Type 3277 Actuator over a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm^2), the signal pressure is routed over an internal bore in the actuator yoke to the actuator. In actuators with fail-safe action "Actuator stem retracts" and in actuators with effective diaphragm areas of 240 cm^2 or larger, the signal pressure is routed to the actuator over a ready-made external piping.

Using the appropriate bracket, the positioner can also be attached according to IEC 60534-6-1 (NAMUR recommendation). The positioner can be mounted on either side of the control valve.

A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred to the positioner over a coupling wheel. The characteristic is set over the software.

A reversing amplifier is necessary for double-acting, springless actuators for the second opposing signal pressure.

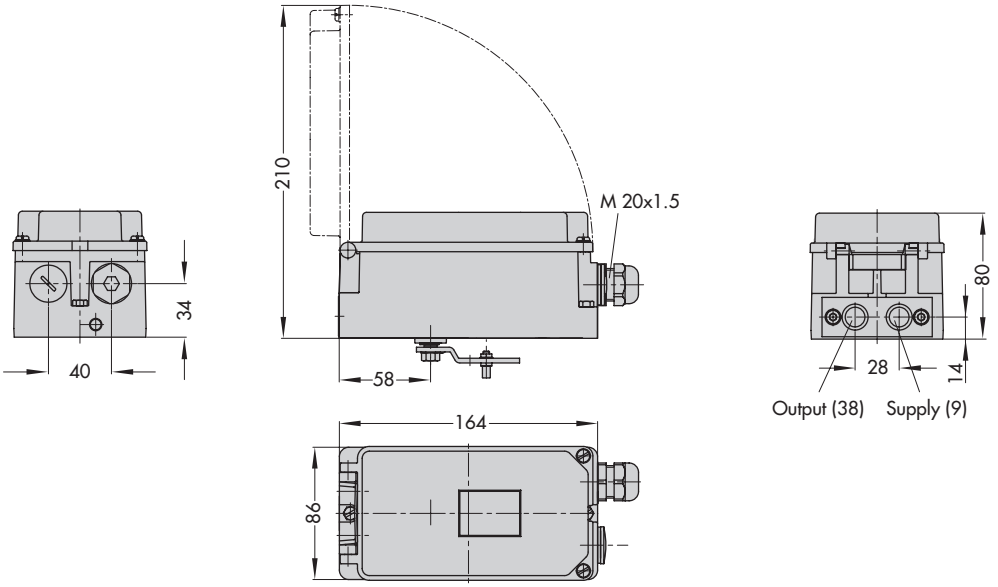
Ordering text

Type 3730-4 Positioner with PROFIBUS-PA communication

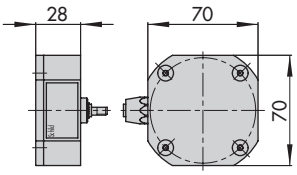
- SAMSON direct attachment
- Attachment according to NAMUR
- Attachment to rotary actuator
- Without/with pressure gauge up to max. 6 bar
- Explosion protection
- Limit contact
- Solenoid valve
- Binary input for floating contact

Dimensions in mm

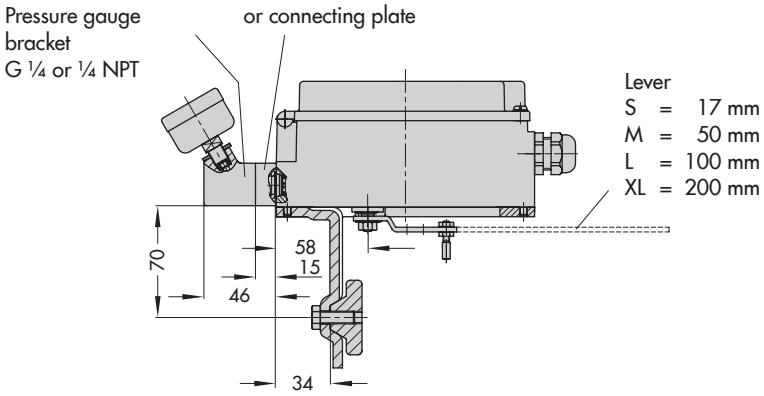
Direct attachment



External position sensor



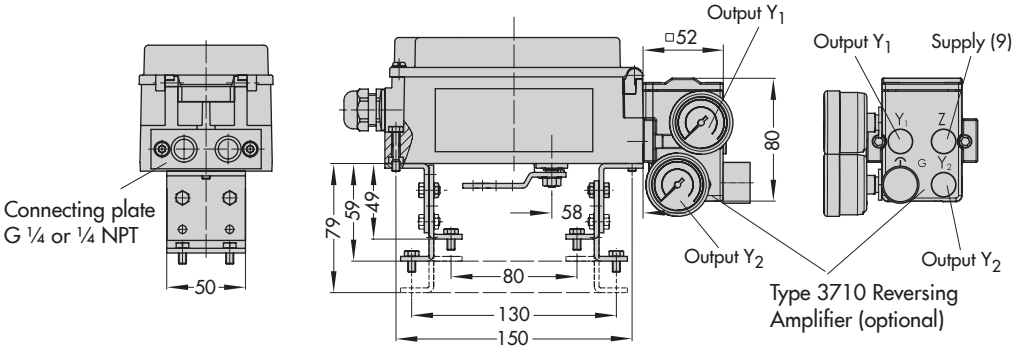
NAMUR attachment



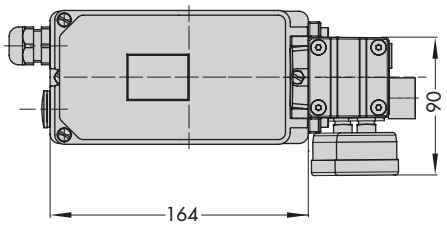
Attachment to rotary actuators

VDI/VDE 3845 (Sept. 2010)
Fixing level 1
Size AA1 to AA4

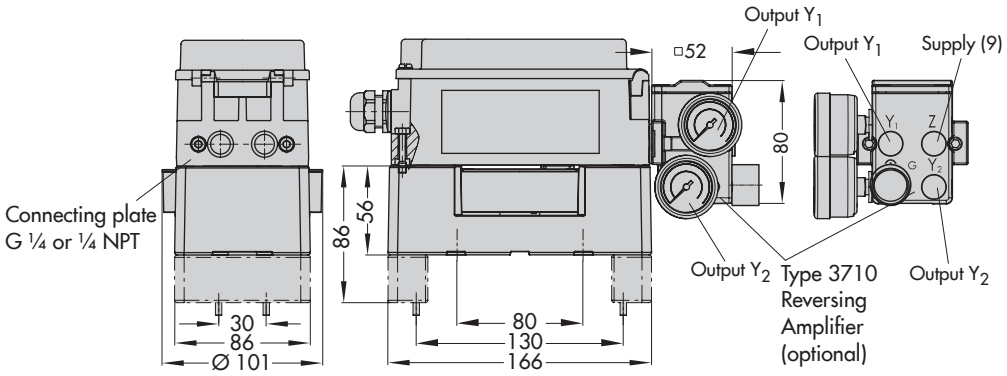
Light version



Mounting unit
CrNiMo steel bracket



Heavy-duty version



Article code

Positioner **Type 3730-4**	x	x	x	0	x	0	x	x	1	x	0	0	x	0	x	x
With LCD and autotune, PROFIBUS-PA																
Explosion protection																
Without	0															
ATEX: II 2G Ex ia IIC T6; II 2D Ex tb IIIC T80°C IP66	1															
FM/CSA: Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A–G; Class I, Div.2, Groups A–D; Class II, Div.2, Groups F, G/ Ex ia IIC T6; Class I, II, Div.1, Groups A–G; Ex nA II T6; Ex nL IIC T6; Class I, Div.2, Groups A–D; Class II, Div.1, Groups E–G	3															
ATEX: II 3G Ex nA II T6; II 3G Ex ic IIC T6; II 3D Ex tc IIIC T80°C IP66	8															
Additional equipment																
Inductive limit switch																
Without		0														
1 x SJ2-SN (NC contact)		1			0											
1 x SJ2-S1N (NO contact)		2														
Solenoid valve																
Without			0													
With, 24 V DC			4													
External position sensor																
Without					0											
With		0	0		1		0			0						
Binary input																
Without							0									
Floating contact					0		1									
Diagnostics																
EXPERTplus								4								
Housing material																
Aluminum (standard)										0						
Stainless steel 1.4581					0					1						
Special application																
Without													0			
Version compatible with paint													1			
Exhaust port with thread ¼-18 NPT		0	0		0		0						2			
Special version																
Without														0	0	0
NEPSI: Ex ia IIC T6	1													0	0	9
NEPSI: Ex nA II T6; Ex nL IIC T6	8													0	1	0
IECEx: Ex ia IIC T6	1													0	1	2
GOST: 1Ex ia IIC T6	1													0	1	4

Specifications subject to change without notice

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