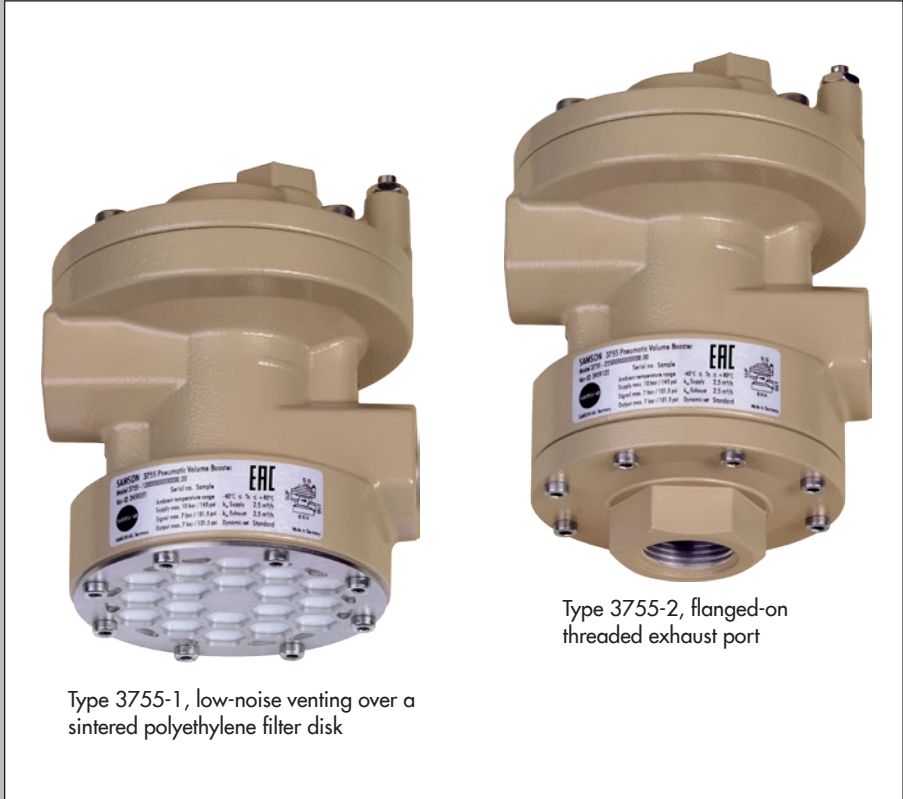


Series 3755

Type 3755

Pneumatic Volume Booster



Type 3755-1, low-noise venting over a sintered polyethylene filter disk

Type 3755-2, flanged-on threaded exhaust port

Translation of original instructions

Safety Manual

SH 8393 EN

Edition February 2016



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. You can enter the document number or type number in the [Find:] field to look for a document.

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

Purpose of this manual

The Safety Manual SH 8393 contains information relevant for the use of the Type 3755 Pneumatic Volume Booster in safety-instrumented systems according to IEC 61508 and IEC 61511. The safety manual is intended for planners, constructors, and operators of safety-instrumented systems.

NOTICE

Risk of malfunction due to incorrect mounting, connection or start-up of the device. Refer to the Mounting and Operating Instructions EB 8393 on how to mount the device, perform the pneumatic connections as well as start up the device. Observe the warnings and safety instructions written in the Mounting and Operating Instructions EB 8393.

Further documentation

The documents listed below contain descriptions of the start-up, functioning and operation of the pneumatic volume booster. You can download these documents from the SAMSON website. The documents marked with an asterisk (*) are supplied with the pneumatic volume booster either in printed or electronic form.

- ▶ T 8393: Data sheet
- ▶ EB 8393*: Mounting and operating instructions

Note

In addition to the volume booster documentation, observe the documentation for the pneumatic actuator, valve, and other valve accessories.

1	Scope	5
2	Technical data	7
3	Safety-related functions	8
4	Mounting, connection, and start-up	8
5	Required conditions	9
6	Proof testing	10
7	Repairs	12

1 Scope

General

The Type 3755 Pneumatic Volume Booster is used together with positioners to increase the positioning speed of pneumatic actuators with an effective area $\geq 1000 \text{ cm}^2$ or a travel volume $\geq 6 \text{ l}$.

Use in safety-instrumented systems

The Type 3755 Pneumatic Volume Booster is suitable for use in safety-instrumented systems according to IEC 61508 and IEC 61511 as follows:

- Up to SIL 2 (single device)
- Up to SIL 3 (redundant configuration) according to IEC 61508

This manufacturer's declaration is based on a development process complying with IEC 61508 as well as on the evaluation of results from devices used in the field.

The safety function of the pneumatic volume booster is to be regarded as a Type A element in accordance with IEC 61508-2.

i Note

The architecture and the interval between proof tests must be changed accordingly for a higher safety integrity level.

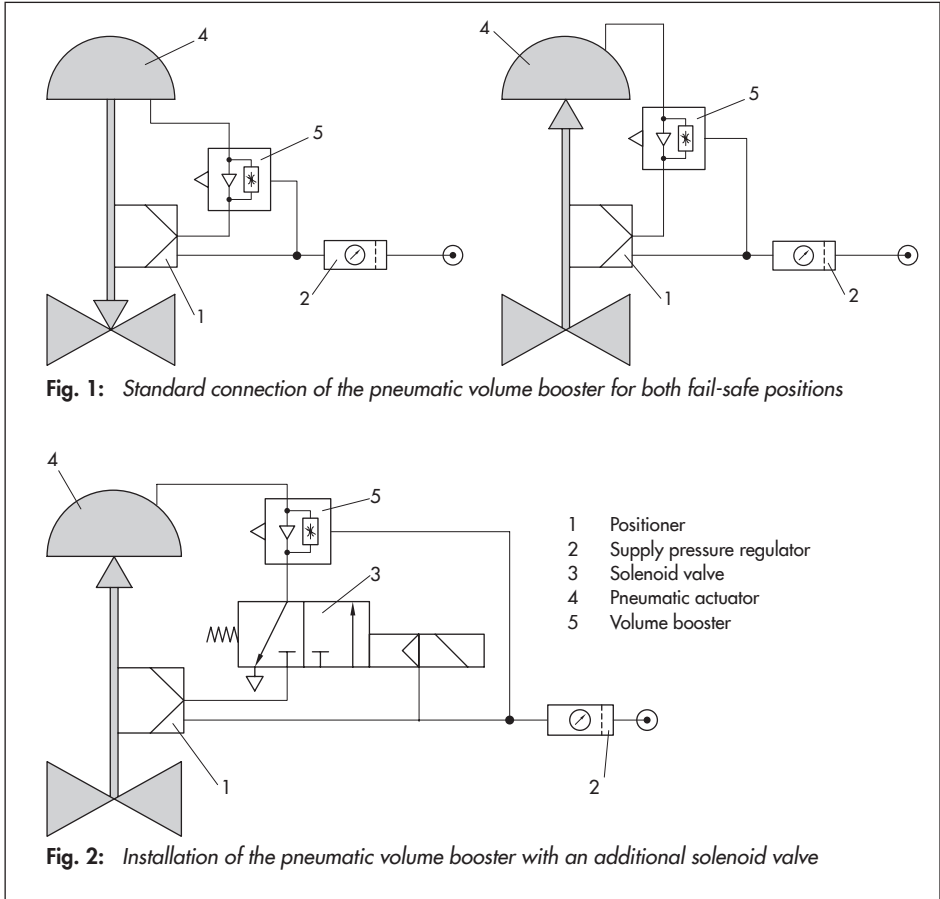
Versions and ordering data

Only the pneumatic volume booster version with standard temperature range and standard dynamic response is suitable for use in safety-instrumented systems. This version has the following article code:


Pneumatic Volume Booster Type 3755-	x	x	x	0	0	x	x	0	0	0	0	0	0	0
Dynamic response														
Standard (normal control)					0									
Temperature range														
Standard, -40 to +80 °C													0	
Low temperature version, -55 to +60 °C														1

Example hook-ups

The pneumatic volume booster is mounted between the positioner and actuator.



2 Technical data

Type	3755-1	3755-2
Flow coefficient		
K _{VS} Supply	2.5 m ³ /h	
K _{VS} Exhaust	2.5 m ³ /h	
K _{VS} Bypass	0.8 m ³ /h	
Closed loop control		
Pressure ratio: Signal to output	1 : 1	
Response pressure	Standard temperature range: 80 mbar	
Pressure		
Supply	Max. 10 bar · Max 145 psi	
Actuator	Max. 7 bar · Max 101.5 psi	
Signal	Max. 7 bar · Max 101.5 psi	
Air quality acc. to ISO 8573-1	Max. particle size and density: Class 4 · Oil content: Class 3 Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected	
Connecting thread		
Supply (SUP)	G ¾ (optionally ¾ NPT)	
Actuator/output (OUT)	G ¾ (optionally ¾ NPT)	
Signal (SIG)	G ¼ (optionally ¼ NPT)	
Exhaust port (EXH)	–	G 1 (optionally 1 NPT)
Safety integrity level (Type 3755-xxx00x000x0000 only, device with standard temperature range)		
Use in safety-instrumented systems acc. to IEC 61508/SIL	Suitable for use in safety-instrumented systems up to SIL 2: applies to a single device Suitable for use in safety-instrumented systems up to SIL 3: applies to redundant configuration according to IEC 61508	
Degree of protection		
Degree of protection provided by enclosure according to EN 60529	IP 44 ¹⁾	IP 66
Compliance		

Safety-related functions

Type	3755-1	3755-2
Other operating parameters		
Permissible ambient temperature ²⁾	Standard temperature range: -40 to +80 °C	
Service life	≥1 x 10 ⁷ full strokes	
Weight	2.1 kg	2.4 kg
Materials		
Housing	Cast aluminum, powder paint coated (RAL 1019)	
Exhaust side	Silencer with sintered polyethylene filter disk and stainless steel retaining plate	Flanged-on threaded port made of aluminum, powder coated (RAL 1019)
Diaphragm	Standard temperature range: VMQ	
Seat-plug seal	VMQ	
Other seals	NBR	
Other external parts	Stainless steel	

1) Exhaust side facing downward or to the side

2) Versions with a different permissible temperature range are **not** suitable for use in safety-instrumented systems.

3 Safety-related functions

The safety function of the Type 3755 Pneumatic Volume Booster is the emergency venting on demand.

4 Mounting, connection, and start-up

Refer to Mounting and Operating Instructions ► EB 8393 on how to mount, perform the pneumatic connections as well as start up the device.

Only use the specified original mounting parts and accessories.

5 Required conditions

WARNING

Risk of malfunction due to incorrect selection or wrong installation and operating conditions. Only use control valves in safety-instrumented systems after the necessary conditions in the plant have been fulfilled. The same applies to the mounted pneumatic volume booster.

Selection

→ The volume booster's required degree of protection is observed.

Versions	Degree of protection
Type 3755-1	IP 44 (exhaust side facing downward or to the side)
Type 3755-2	IP 66

→ The permissible ambient temperature from -40 to $+80$ °C has been observed.

Mechanical and pneumatic installation

→ The pneumatic volume booster is mounted properly as described in the mounting and operating instructions and connected to the air supply.

→ The maximum supply pressure does not exceed 10 bar.

→ The pneumatic air supply meets the instrument air specifications.

Particle size and quantity	Oil content	Pressure dew point
Class 4	Class 3	Class 3
$\leq 5 \mu\text{m}$ and $1000/\text{m}^3$	$\leq 1 \text{ mg}/\text{m}^3$	-20 °C or at least 10 K below the lowest ambient temperature to be expected

Tip

We recommend installing a supply pressure regulator/filter upstream of the positioner. For example, the SAMSON Type 4708 Supply Pressure Regulator with $5 \mu\text{m}$ filter cartridge can be used.

→ The piping and screw fittings have sufficiently sized cross-sections.

→ The pneumatic volume booster is mounted as prescribed.

→ The exhaust opening (EXH) remains open when the booster is installed on site.

Operation

- The adjusted bypass restriction is lead sealed and protected against subsequent adjustment.
- The exhaust opening (EXH) is protected against icing up or dirt entering it.
- The supply pressure is greater than the maximum signal pressure to be expected, but does not exceed 10 bar.

Tip

The pneumatic volume booster does not have its own diagnostic capabilities. However, the diagnostic data of a connected SAMSON Series 3730 or 3731 Positioner can be used to assess the performance of the volume booster.

6 Proof testing

The proof test interval and the extent of testing lie within the operator's responsibility. The operator must draw up a test plan, in which the proof tests and the interval between them are specified. We recommend summarizing the requirements of the proof test in a checklist.

WARNING

Risk of dangerous failure due to malfunction in the event of emergency (valve does not move to the fail-safe position).

Only use devices in safety-instrumented systems that have passed the proof test according to the test plan drawn up by the operator.

Regularly check the safety-instrumented function of the entire SIS loop. The test intervals are determined, for example on calculating each single SIS loop in a plant (PFD_{avg}).

Function testing

Regularly check the safety function according to the test plan drawn up by the operator.

i Note

Record any faults in the pneumatic volume booster and inform SAMSON of them in writing.

1. Move the valve clearly away from the fail-safe position (e.g. set point at 50 % in control valves or to the operating position of on/off valves).
2. De-energize (e.g. 0 mA signal) the inputs at the connected devices (positioner, solenoid valve etc.).
3. Check the effect:
Does the valve move to the fail-safe position within the required time?

Visual inspection to avoid systematic failure

To avoid systematic failure, visible inspections of the pneumatic volume booster on a regular basis must be performed. The frequency and the scope of the inspection lie within the operator's responsibility. Take application-specific influences into account, such as:

- Corrosion (destruction primarily of metals due to chemical and physical processes)
- Aging (damage caused to organic materials, e.g. plastics or elastomer, by exposure to light and heat)
- Chemical attack (organic materials, e.g. plastics or elastomer, which swell, leach out or decompose due to exposure to chemicals)

! NOTICE

Risk of malfunction due to the use of unauthorized parts.

Only use original parts to replace worn parts.

7 Repairs

Only perform the work on the pneumatic volume booster described in ►EB 8393.

NOTICE

Fail-safe action impaired due to incorrect repair.

Service and repair work must only be performed by trained staff.

Herstellereklärung

Für folgende Produkte

Pneumatischer
Volumenstromverstärker
Typ 3755-xxx00x000...

Hiermit wird bestätigt, dass der pneumatische Volumenstromverstärker gemäß IEC 61508 für den Einsatz in sicherheitsgerichteten Kreisläufen geeignet ist. Basis dieser Erklärung ist ein mit IEC 61508 konformer Entwicklungsprozess sowie die Auswertung der Ergebnisse aus dem Feldeinsatz des Gerätes

Der pneumatische Volumenstromverstärker hat eine HFT von 0 und kann nach IEC 61511 bis SIL 2 (einzelnes Gerät, HFT = 0) und SIL 3 (redundante Verschaltung, HFT = 1) eingesetzt werden. Das Gerät ist nach Typ A eingestuft.

Geltungsbereich

Diese Erklärung gilt nur für Geräte in den Ausführungen mit Standard-Temperaturbereich und mit Standard-Dynamikverhalten, Typ 3755-xxx00x000....

Sicherheitstechnische Annahmen

Der pneumatische Volumenstromverstärker entlüftet den Antrieb in Abhängigkeit des zwischen Steuereingang und Ausgang anliegenden Differenzdrucks auf einen Wert kleiner 0,2 bar. Die Luftleistung ist abhängig vom anliegenden Differenzdruck, der maximale K_{VS} Wert beträgt 2,5.

Sicherheitstechnische Kenndaten

$\lambda_{safe, undetected}$	2,7 E-7 1/hr
$\lambda_{safe, detected}$	0
$\lambda_{dangerous, undetected}$	2,6 E-8 1/hr
$\lambda_{dangerous, detected}$	0
PFD _{avg.} bei jährlicher Prüfung	0,0001
HFT (Hardware Fault Tolerance)	0
DC (Diagnostic Coverage)	siehe Diagnose
Gerätetyp	A
SFF (Safe Failure Fraction)	>90 %
MTBF	>390 Jahre

Manufacturer's Declaration

For the following products

Type 3755-xxx00x000... Pneumatic
Volume Booster

We hereby certify that the pneumatic volume booster is suitable for use in safety-instrumented systems according to IEC 61508. This manufacturer's declaration is based on a development process complying with IEC 61508 as well as on the evaluation of results from devices used in the field.

The pneumatic volume booster has an HFT of 0 and can be used up to SIL 2 (single device, HFT = 0) and SIL 3 (redundant configuration, HFT = 1) according to IEC 61511. The device is classified as type A.

Scope

This declaration only applies to device versions with the standard temperature range and standard dynamic response:
Type 3755-xxx00x000....

Safety-related assumptions

The pneumatic volume booster vents the actuator when the pressure difference between control input and output falls below 0.2 bar. The air capacity depends on the differential pressure in the device. The maximum K_{VS} coefficient is 2.5.

Safety-related data

$\lambda_{safe, undetected}$	2,7 E-7 1/hr
$\lambda_{safe, detected}$	0
$\lambda_{dangerous, undetected}$	2,6 E-8 1/hr
$\lambda_{dangerous, detected}$	0
PFD _{avg.} with annual test	0.0001
HFT (hardware fault tolerance)	0
DC (diagnostic coverage)	See Diagnostics
Device type	A
Safe failure fraction (SFF)	>90 %
MTBF	>390 years

Manufacturer's Declaration	Changed on:	2012-06-14	2014-10-08	2015-03-09
V/HE-1193-2 DE-EN	Changed by:	V4/UV/V44/Tny	V31/Dby/V74/Fix	V31/Dby/V74/Tny

Nutzbare Gebrauchsdauer

- Das Gerät enthält keine alterungskritischen Bauteile
- Gerätespezifische Instandhaltungsempfehlungen liegen vor

Nach IEC 61508-2 (2010) Abschnitt 7.4.9.5 können 8 – 12 Jahre angenommen werden oder ein Wert benutzt werden, der sich durch Betriebsbewährung oder anhand von Maßnahmen des Betreibers entsprechend Fußnote IEC 61508-2 (2010) Abschnitt 7.4.9.5 N3 ergibt.

Useful lifetime

- The device does not contain any components that are critical concerning aging.
- Device-specific maintenance recommendations exist.

According to IEC 61508-2 (2010), section 7.4.9.5, a useful lifetime of eight to twelve years can be assumed. Other values can be used based on the previous experience (prior use/proven-in-use) or based on the measures taken by the operator as described in NOTE 3 of IEC 61508-2 (2010), section 7.4.9.5.

Bestimmungsgemäße Verwendung

- Bedienungsanleitung EB 8393
- Sicherheitshandbuch SH 8393
- Anforderung an Instrumentenluft-Qualität

Intended use

- Operating instructions EB 8393
- Safety Manual SH 8393
- Quality requirements for instrument air

Betriebsbewährtheit

- Die Anforderungen IEC 61511-1 Abschnitt 11.5.3 „Anforderungen an die Auswahl von Komponenten und Teilsystemen auf Basis einer früheren Verwendung“ sind erfüllt.
- Der Nachweis der Leistungsfähigkeit des Gerätes ist durch die bei der Firma SAMSON dokumentierte Feldeinfahrung erbracht.
- Die Verantwortung für den Einsatz in spezifischen Umgebungsbedingungen liegt beim Anwender.

Prior use

- The requirements stipulated in section 11.5.3 in IEC 61511-1 (Requirements for the selection of components and sub-systems based on prior use) are met.
- The evidence of the device's performance is supplied by the documented field experience gained by SAMSON.
- The user is responsible for the use in specific ambient conditions.

Diagnose

Das Gerät enthält keine eigenen Vorrichtungen zur Diagnose. Die Diagnosedaten eines vorgeschalteten Stellungsreglers können jedoch zur Beurteilung der Leistungsfähigkeit des Gerätes herangezogen werden, typische Parameter sind zum Beispiel „Laufzeit“, „Totzeit“, „bleibende Regelabweichung“ des angeschlossenen Ventils. Applikationsabhängig können auch andere Parameter verwendet werden.

Diagnostics

The device does not have its own diagnostic capabilities. However, the diagnostic data of a connected positioner can be used to assess the performance of the device. Typical parameters include the transit time, dead time and set point deviation of the connected valve. Other application-related parameters can also be used.

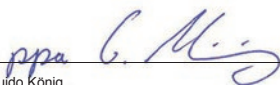
Manufacturer's Declaration	Changed on:	2012-06-14	2014-10-08	2015-03-09
V/HE-1193-2 DE-EN	Changed by:	V4/UJ/V44/Tny	V31/Dby/V74/Fix	V31/Dby/V74/Tny

Voraussetzungen

Die Reparaturzeit ist klein gegenüber dem mittleren Zeitintervall zwischen zwei Anforderungen. Durchschnittliche Beanspruchung in industrieller Umgebung durch Medien und Umgebungsbedingungen. Der Anwender ist für bestimmungsgemäßen Gebrauch verantwortlich.

Requirements

Short mean time to repair compared to the average rate of demand. Normal exposure to industrial environment and fluids. The user is responsible for ensuring that the device is used as intended.



Guido König
Zentralabteilungsleiter
Produktmanagement und -marketing
Mess- und Regeltechnik
SAMSON GROUP

Director
Product Management and Marketing
Instrumentation and Controls
SAMSON GROUP



Karl-Bernd Schärtner
Zentralabteilungsleiter Entwicklung
Anbaugeräte für Stellventile /Mess- und Signalumformer

Head of Central Department
R&D, Valve Accessories, Transmitters and Transducers

Manufacturer's Declaration	Changed on:	2012-06-14	2014-10-08	2015-03-09
V/HE-1193-2 DE-EN	Changed by:	V4/UV/V44/Tny	V31/Dby/V74/Fix	V31/Dby/V74/Tny



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

SH 8393 EN

2017-01-18 · English