

SAMOS SB - IE3/NP-Version

Side Channel Blowers

SB 0140 D0, SB 0200 D0, SB 0310 D0, SB 0430 D0, SB 0530 D0,

SB 0710 D0, SB 1100 D0, SB 1400, SB 2100 D0

SB 0140 D2, SB 0200 D2, SB 0310 D2, SB 0530 D2, SB 1100 D2

Instruction Manual

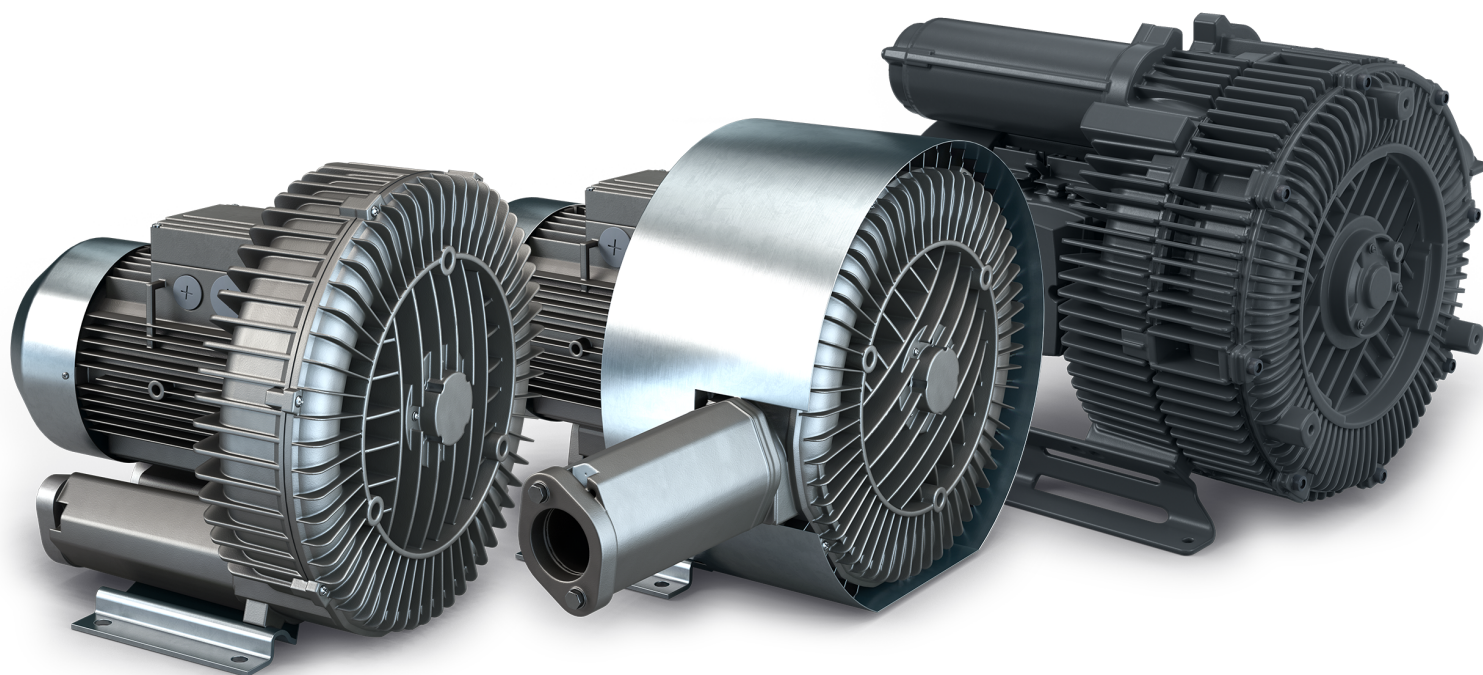


Table of Contents

1	About this Manual.....	4
1.1	Content of this Document.....	4
1.2	Target Group	4
1.3	Explanation of the Terms and Symbols.....	5
1.4	Changes in Comparison to the Previous Version.....	7
1.5	Other Valid Documents	7
2	Safety and Responsibility	8
2.1	Explanation of Warning Signs	8
2.2	Correct Use of the Equipment.....	8
2.3	Unauthorized Operation	8
2.4	Working in a Safety-Conscious Manner	9
2.5	Requirements for Personnel.....	11
2.5.1	Personnel Qualifications and Training	11
2.5.2	Personal Protective Equipment	12
2.6	Requirements of the operator.....	13
3	Product Identification	14
3.1	Structure of the Type Description	14
3.2	Rating Plate	15
3.3	Design of the Machine.....	17
3.4	Ancillaries	18
3.5	Function Principle.....	18
3.6	EC/EU Declaration of Conformity.....	19
4	Transportation and Storage.....	20
4.1	Unpacking and Checking the Condition of Delivery	20
4.2	Lifting and Transporting	20
4.3	Storage	22
5	Installation.....	23
5.1	Measures after Long-term Storage	23
5.2	Mounting Conditions.....	24
5.3	Reduction of Oscillations and Noises	24
5.4	Mounting.....	25
5.4.1	Level Assembly on the Foot.....	26
5.4.2	Vertical Mounting on the Compressor Cover	27
5.5	Fit Loose Silencer.....	28
5.6	Mount the Accessories	28
5.7	Connecting Pipelines and Hoses.....	29
6	Electric Power Connection	31
6.1	General Installation Regulations.....	31
6.2	Controls	32
6.3	Connect the Motor to the Mains	33
6.4	Connect the Frequency Inverter to the Mains.....	35
6.4.1	Connect Adjacent Frequency Inverter from Third-Party Manufacturer	36
6.5	Connecting Accessories.....	37
6.6	Parameterize the Frequency Inverter	37
6.6.1	Parameterize Adjacent Frequency Inverter from Third-Party Manufacturer	37
7	Commissioning	38

7.1	Measures after a Long Shut-down Period	38
7.2	Tests during Commissioning or Re-commissioning.....	39
7.3	Check the Direction of Rotation	40
7.4	Checking the Sensors	40
7.5	Measure the Acoustic Emissions.....	40
7.6	Measure Oscillations.....	40
8	Operation	41
8.1	Switch on	41
8.2	Switch off.....	41
8.3	Switch off in Emergency	41
9	Troubleshooting	42
10	Maintenance	44
10.1	Maintenance	44
10.2	Repairs and Complaints	44
10.3	Ordering Spare Parts	44
11	Decommissioning	45
11.1	Decommissioning	45
11.2	Disassembly	45
11.3	Disposal	45
12	Technical Data	46
12.1	Permitted Conditions for Use	46
12.1.1	Installation Height.....	46
12.1.2	Rotational Speeds.....	46
12.1.3	Temperatures	46
12.1.4	Pressure Differences.....	47
12.1.5	Relative Humidity	47
12.1.6	Minimum Distances for Heat Dissipation.....	48
12.1.7	Speed of Oscillation.....	48
12.1.8	Accelerations.....	49
12.2	Electrical Data	49
12.2.1	Increased Operating Cycle Frequency.....	49
12.2.2	Frequency Inverter Parameters.....	49
12.3	Weight	49
12.4	Acoustic Emissions	50

1 About this Manual

1.1 Content of this Document

These operating instructions:

- is part of the side-channel compressor:

Series	SAMOS SB - IE3/NP
Types:	SB 0140/0200/0310/0430/0530/0710/1100/1400/2100 D0 SB 0140/0200/0310/0530/1100 D2

- describe the safe, proper and efficient use in all phases of its service life.
- must always be available to personnel at the place of use.
- Arranged in the main sections:
 - About these instructions
 - Safety and responsibility
 - Product identification
 - Transportation and storage
 - Mounting
 - Electric power connection
 - Commissioning
 - Operation
 - Troubleshooting
 - Maintenance, repairs and spare parts
 - Decommissioning
 - Technical data

The main section on "Safety and responsibility" must always be observed. The subsequent main sections can be used as a reference and can be read independently from each other. Cross references provided must be observed.

1.2 Target Group

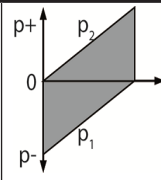
These instructions are intended for operating personnel, qualified personnel, electricians, operators and planners. See also *Personnel Qualifications and Training* [→ 11].

1.3 Explanation of the Terms and Symbols

In these instructions symbols and terms will be used to mean the following.

Symbol	Explanation
	Requirement, pre-requisite
1. 2. 3.	Handling instructions
	Result
[→ 15]	Cross reference with page reference
	Additional information, tips
	Direction of rotation arrow
	Direction of conveyance arrow
	Collect electrical or electronic equipment separately, do not dispose of it via the residual waste bin
	General warning sign (warning of risk of injury)
	SAMOS SB - IE3/NP can start without warning
	Electrical voltage warning
	Hot surface warning
	Disconnect prior to maintenance or repair
	Earth prior to use
	Observe the instructions

Term	Explanation	
Plant	Part provided by the user in which the SAMOS SB - IE3/NP is installed	
SAMOS SB = Side-channel compressor	Vacuum pump/compressor for generating vacuum and/or overpressure. The SAMOS SB - IE3/NP consists of the compressor part and drive, as well as other accessories if required.	
NP	NEMA Premium (efficiency level in North America)	
Drive	Asynchronous motor and possibly frequency inverter	
Side-channel	Compression principle	
Compressor	Mechanical part of the SAMOS SB - IE3/NP without a drive	
Inner chamber of the compressor	Chamber of the compressor part with which the media to be conveyed comes into contact	
Impeller	Rotating component for generating pressure within the inner chamber used to convey material	
Gas inlet	Position for gas inlet	
Gas outlet	Position for gas outlet	
Single-stage	Compressor part with a compressor stage	
Two-stage	Compressor part with two compressor stages operated in series. Generates higher pressure difference.	
Substructure	Mounting plate, base frame or foundation on which the SAMOS SB - IE3/NP is constructed	
Elastic / rigid	When the lowest normal frequency of the system, consisting of the variable and substructure, is less than 25 % above the rotary frequency of the SAMOS SB - IE3/NP per measurement direction, then the substructure is considered to be rigid. All other substructures are considered to be elastic.	
Assembly environment	Space in which the SAMOS SB - IE3/NP is set up and operated (this may differ from the suction environment)	
Suction/discharge environment	Chamber from which the media to be conveyed is suctioned or in which the media to be conveyed is expelled (this may differ from the assembly environment)	
Reference conditions	- Ambient temperature and suction temperature: +15 °C (+59 °F) - Ambient pressure : 1013 mbar abs. (14.7 psi abs.) - Conveyed media: air - Speed: 3600 min⁻¹ (60 Hz) in continuous operation - Maximum pressure difference according to rating plate - Horizontal assembly	
Volume flow	Volume of air or gas that is conveyed per unit of time	
Vacuum operation	Operation with - pressure at gas inlet $p_1 < p_{\text{atm.}}$ and - pressure at gas outlet $p_2 = p_{\text{atm.}}$	
Compressor operation	Operation with - pressure at gas inlet $p_1 = p_{\text{atm.}}$ and - pressure at gas outlet $p_2 > p_{\text{atm.}}$	

Term	Explanation	
Mixed operation	Operation with - pressure at gas inlet $p_1 < p_{\text{atm}}$ and - pressure at gas outlet $p_2 > p_{\text{atm}}$.	
Reverse operation	Operation with change in direction of rotation without intermediate standstill	
Mobile operation	Non-stationary operation	
Anti-clockwise operation (standard)	The direction of rotation is anti-clockwise when facing the compressor cover	
Reverse operation	Operating while the machine runs in the opposite direction of rotation	
Frequency inverter from third-party manufacturer	A frequency inverter purchased by the operator must only be assembled adjacently (e.g. wall assembly)	

1.4 Changes in Comparison to the Previous Version

Changes compared with version 0870232963/-0001_en

- Complete revision of all contents and structure

1.5 Other Valid Documents

In addition to these instructions consider the following documents:

Document	Purpose
Data sheet	Characteristic curve and electrical data for the SAMOS SB - IE3/NP
Dimensional drawing	Technical data for the SAMOS SB - IE3/NP (e.g. box dimensions, connection dimensions, mass)
Repair Manual	List of spare parts and description of the repair steps
SAL	Spare parts and Accessories Lists
Operating instructions Frequency inverter *	See manual(s) of the third-party supplier
Assembly instructions *	Description of the assembly of the manufacturer's accessories
Supplier documentation *	Operating manual and further documentation of the supplier's components

*according to the model option or accessories

2 Safety and Responsibility

The manufacturer is not liable for damage caused by the failure to observe these instructions and the *related documents* [→ 7].

2.1 Explanation of Warning Signs

Warning sign	Explanation
 DANGER	Danger that failure to observe the measures could lead to death or serious physical injuries.
 WARNING	Danger that failure to observe the measures could lead to death or serious physical injuries.
 CAUTION	Danger that failure to observe the measures could lead to minor physical injuries.
NOTICE	Danger that failure to observe the measures could lead to material damage.

2.2 Correct Use of the Equipment

The SAMOS SB - IE3/NP:

- is a machine that is optimized for continuous operation used to generate a vacuum or pressure.
- can be used inside buildings, outside and in dusty or damp environments. The protection class is indicated on the *rating plate* [→ 15].
- can deliver the following conveyed media:
 - air and air/gas mixtures that are non-explosive, non-combustible, non-abrasive and non-toxic with a relative humidity of up to 100 % without condensation forming.
 - Dusts with a particle size <10 µm without moisture or solid matter.
- should only be used within the limits defined in this documentation:
 - *Mounting Conditions* [→ 24].
 - *Permitted Conditions for Use* [→ 46].
 - *Electrical Data* [→ 49].
- only operate when fully assembled and in a technically perfect condition.

Other operating conditions must be agreed with the manufacturer.

2.3 Unauthorized Operation

It is forbidden to:

- operating in a potentially explosive area (ATEX).
- connecting to a potentially explosive area (ATEX).
- conveying explosive, flammable, aggressive, unstable, or oxidative materials.
- operation in salty or aggressive atmospheres.
- using non-commercial facilities without making adjustments for the additional requirements.
- operating in reverse with sudden/abrupt changes in the direction of rotation.
NOTICE! This results in high drive loads and alternating stresses. The machine can be destroyed.
- use in areas with ionizing or non-ionizing radiation.

- operating outside of the limits defined in this document:
 - Mounting Conditions* [→ 24].
 - Permitted Conditions for Use* [→ 46].
 - Electrical Data* [→ 49].

2.4 Working in a Safety-Conscious Manner

Work at a standstill and de-energized	Work on running or energized SAMOS SB - IE3/NP can lead to serious injuries due to body parts being drawn in or crushed or death due to electric shock.
	Work on the SAMOS SB - IE3/NP at a standstill only and in a de-energized condition. ! For SAMOS SB - IE3/NP with a frequency inverter from third-party manufacturer, the frequency inverter continues to be energized after being switched off due to the intermediate circuit voltage, which is reduced slowly. - After switching off wait at least 3 min. - Before opening the frequency inverter, ensure that it is de-energized.
Negative/overpressure and ejected conveyed media	Pressures and ejected conveyed media can cause serious injuries. - Depressurize the system before starting work on the SAMOS SB - IE3/NP. - Check that all components are depressurized. - Check that no conveyed media can escape.
Screw connections	Screws can damage the thread when screwed in repeatedly. This can cause screwed parts to become loose and lead to severe injuries. - Replace damaged screws. - Insert screws into the open thread by hand. - Afterwards, use a screwdriver to tighten the screws.
Hot surfaces 	During operation and after decommissioning, contact with hot surfaces can lead to burns. On the SAMOS SB - IE3/NP, temperatures during operation can reach 160 °C [320 °F]. - Do not touch hot surfaces during operation. - Keep hot surfaces clear of highly inflammable materials. - Allow the SAMOS SB - IE3/NP to cool after shutting it down.
Not fully assembled or damaged	Operation with exposed or damaged parts can lead to serious injuries due to body parts being drawn in and severed or crushed. - Replace damaged parts prior to beginning operation. - Re-attach safety and protective devices and put them back into operation immediately after completion of work. - The SAMOS SB - IE3/NP should only be put into operation when fully assembled.

Changes, additions and conversions	Changes, additions and conversions may lead to unforeseeable risks and thus to serious injuries or death. Modifications, additions and conversions not described in the general documentation are the sole responsibility of the operator. Only use original parts or parts and auxiliary materials (grease, sealant) recommended by the manufacturer. Keep all notices attached to the SAMOS SB - IE3/NP in a clearly legible condition: • Labelling of connections • Rotation arrows • Rating plate • Warning signs
Malfunctions during operation	The following changes compared to normal operation affect the function and can lead to malfunctions and injuries. • Higher power consumption, temperatures or vibrations. • Unusual noises or smells. • Activation of monitoring systems. 1. Notify service personnel immediately. 2. If in doubt, switch the SAMOS SB - IE3/NP off immediately, observing the system-specific safety conditions.

2.5 Requirements for Personnel

2.5.1 Personnel Qualifications and Training



NOTICE

Voiding of the warranty!

Repairs carried out by untrained and unauthorized repair personnel during the warranty period can result in the voiding of the warranty.

- Repairs during the warranty period should be carried out only by trained and authorized personnel.



All those who will work on the SAMOS SB - IE3/NP must have read and understood these instructions and the *related documents* [→ 7]

Personnel in training may only work on the SAMOS SB - IE3/NP under supervision of personnel who have the **required knowledge**

Only personnel with the following knowledge may carry out the work described in these instructions:

Work task	Personnel	Required knowledge
Transportation, storage	Shipper, dealer, fitter	Safe handling with lifting gear such as hoists and fork lift trucks
Assembly, start-up, correcting faults, shut down, dismantling	Fitter	- Safe handling of tools - Laying and connecting pipes and hoses - Mounting mechanical components - Knowledge of vacuum pumps and compressors
Working on the electrical system	Electrician	- Training in the installation, checking, maintenance and repair of electrical installations - Reading, evaluation and safe implementation of instructions, circuit diagrams and technical specifications - Assessing the effectiveness of electrical protection measures
Parameterize the frequency inverter	Operating personnel, electricians	Knowledge of frequency inverters and how to set them
Operation	Operating personnel	Instructions for occupational safety and for handling vacuum pumps and compressors
Maintenance Repair	Maintenance staff	- Safe handling of tools and materials - Disassemble and mount vacuum pumps and compressors - Assess damage to vacuum pumps and compressors
Disposal	Disposal specialist, fitter	- Decontaminating polluted materials - Re-use of materials and substances - Correct and environmentally-friendly disposal of materials and substances

2.5.2 Personal Protective Equipment



WARNING

Danger of crushing and cutting!

Crushing and cutting of body parts due to sharp edges or falling parts on the open SAMOS SB - IE3/NP.

1. Wear protective gloves, safety footwear and safety goggles for all assembly and disassembly, troubleshooting and maintenance work.
 2. In addition, wear head protection for transportation and overhead work.
-



WARNING

Risk of injury!

Serious injuries due to body parts and hair being sucked or drawn in (vacuum) or due to projected particles (pressure).

1. Wear eye protection and tight clothes for all work when in operation.
 2. Wear a hair net for long hair.
 3. Remove jewelry and rings.
-



WARNING

Hearing damage!

Hearing damage due to time spent in noisy area under adverse operating conditions or due to noise caused by conveyed media being discharged from the gas outlet or piping.

1. Wear ear protection when remaining in the excessive noise area.
-

2.6 Requirements of the operator



WARNING

Destruction due to bursting or exploding!

Any machine that is operated at a pressure or speed that is beyond that which is permitted can explode or burst and cause serious injuries due to parts flying off and conveyed media being suddenly ejected.

1. The operator must ensure that the *pressure* [→ 47] that affect the SAMOS SB - IE3/NP are not exceeded.
2. The operator must ensure that the *revolutions* [→ 46] are not exceeded.



WARNING

Risk of injury!

As the SAMOS SB - IE3/NP is not gas-tight, conveying media other than air can lead to severe or fatal injuries (e.g. asphyxiation, burns).

1. Adhere to the safety measures described for the material being conveyed (e.g. check leakage rates and provide for gas monitoring or forced ventilation).

The operator ensures that:

- Assignment, responsibility and supervision of personnel is regulated.
- Personnel have the necessary *Personnel Qualifications and Training* [→ 11].
- Personnel have been sufficiently informed of these instructions and all *related documents* [→ 7].
- The content of these instructions and locally applicable documents are always available to personnel.
- Personnel are informed of dangers related to conveyed material and the necessary safety precautions.
- All local and plant-specific safety measures are complied with:
- The free drawing in or emission of the conveyed media does not place any personnel in danger.
- Dangers due to electrical energy are not possible.

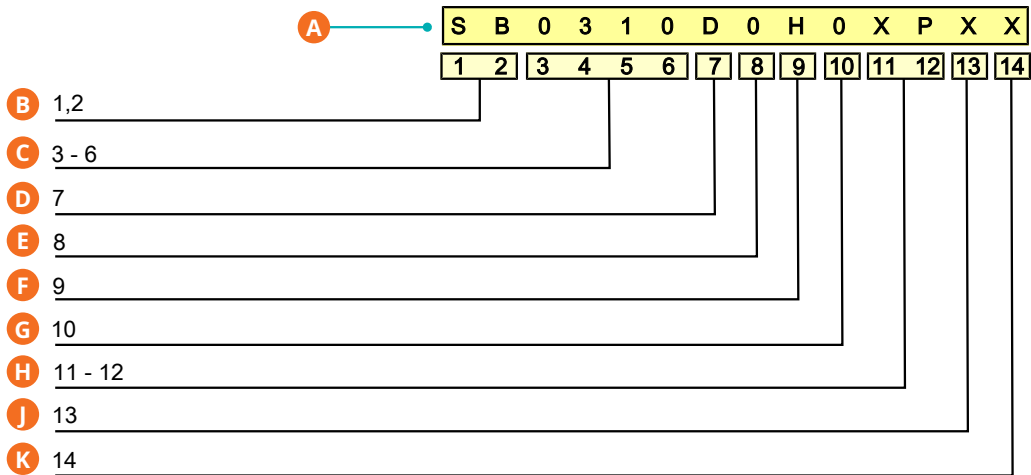
Electromagnetic fields when operating with a frequency inverter

SAMOS SB - IE3/NP generates electromagnetic fields during operation. Staying in the immediate vicinity of the machine can cause life-threatening malfunctions in medical implants, e.g. pacemakers. Data may be lost in magnetic or electronic storage devices.

- Ensure that any personnel working on the SAMOS SB - IE3/NP are protected by using appropriate measures, e.g. labels, safety briefings.
- Prohibit people with pacemakers from approaching the SAMOS SB - IE3/NP.
- Observe any national protection and safety regulations.
- Keep magnetic or electronic storage devices away from the SAMOS SB - IE3/NP.

3 Product Identification

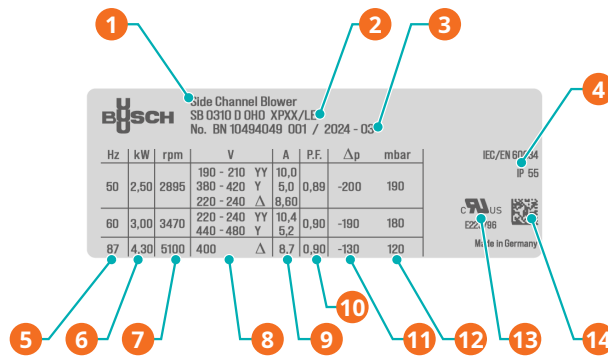
3.1 Structure of the Type Description



Description			
A	Product Identification Code	B	Series
C	Construction size	D	Design status
E	No. of stages 0 = single stage 2 = two stages (serial operating)	F	Mounting position H = horizontal V = vertical
G	Options	H	Motor
J	Accessories for gas inlet X = G-flange 1 = NPT-flange Z = hose flange	K	Accessories for gas discharge X = G-flange 1 = NPT-flange Z = hose flange

3.2 Rating Plate

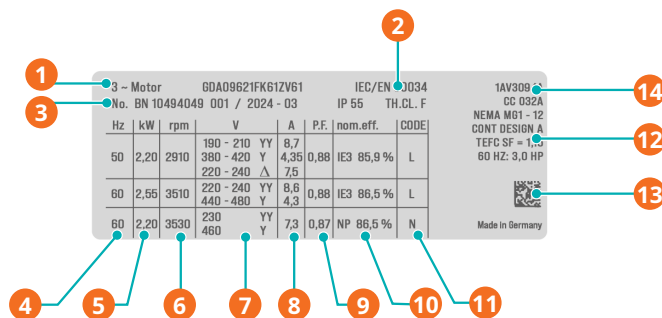
Machine rating plate (standard)



Description

1	Type of machine	2	Series, machine size, amount of stages, further type designation
3	Serial number, date of manufacture	4	Machine type, protection class
5	Frequency	6	Maximum output during continuous operation
7	Rated revolution per minute	8	Voltage
9	Maximum current during continuous operation (setting for overcurrent protection)	10	Power factor
11	Pressure difference: p1 Values with a negative sign apply to vacuuming and vacuum operations	12	Pressure difference: p2 Values with a positive sign apply to pressure and compressor operations
13	UL/CSA Recognition mark + file number (optional)	14	Serial number, date of manufacture as data matrix code

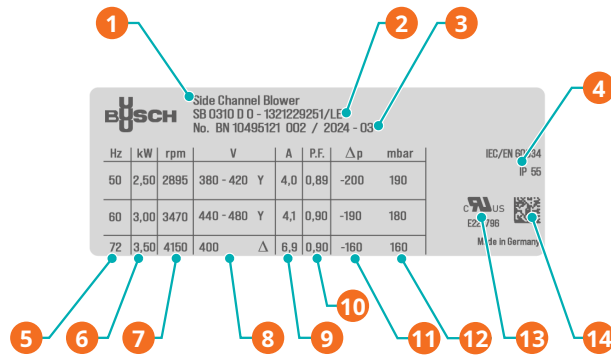
Motor rating plate (standard)



Description

1	Electrical connection, motor type	2	Machine type, protection class, thermal class
3	Serial number, date of manufacture	4	Frequency
5	Measured power output according to IEC 60034-1	6	Rated revolutions per minute
7	Voltage	8	Rated current according to IEC 60034-1
9	Power factor	10	Nominal efficiency
11	Ratio of breakaway starting current to apparent power	12	NEMA rating
13	Serial number, date of manufacture as data matrix code	14	DoE registration with family type number and manufacturer's label

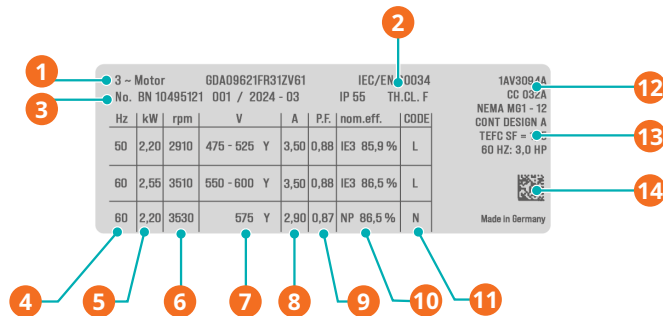
Machine rating plate (variants)



Description

1	Type of machine	2	Series, machine size, amount of stages, part number
3	Serial number, date of manufacture	4	Machine type, protection class
5	Frequency	6	Maximum output during continuous operation
7	Rated revolutions per minute	8	Voltage
9	Maximum current during continuous operation (setting for overcurrent protection)	10	Power factor
11	Pressure difference: p1 Values with a negative sign apply to vacuuming and vacuum operations	12	Pressure difference: p2 Values with a positive sign apply to pressure and compressor operations
13	UL/CSA Recognition mark + file number (optional)	14	Serial number, date of manufacture as data matrix code

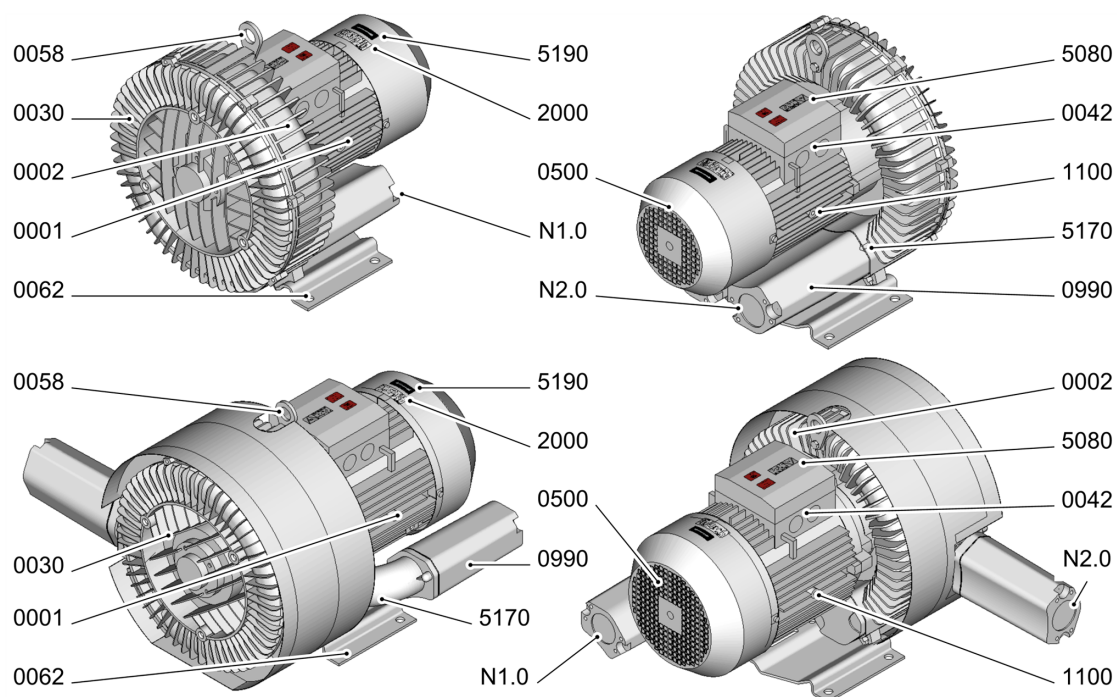
Motor rating plate (variants)



Description

1	Electrical connection, motor type	2	Machine type, protection class, thermal class
3	Serial number, date of manufacture	4	Frequency
5	Measured power output according to IEC 60034-1	6	Rated revolutions per minute
7	Voltage	8	Rated current according to IEC 60034-1
9	Power factor	10	Nominal efficiency
11	Ratio of breakaway starting current to apparent power	12	DoE registration with family type number and manufacturer's label
13	NEMA rating	14	Serial number, date of manufacture as data matrix code

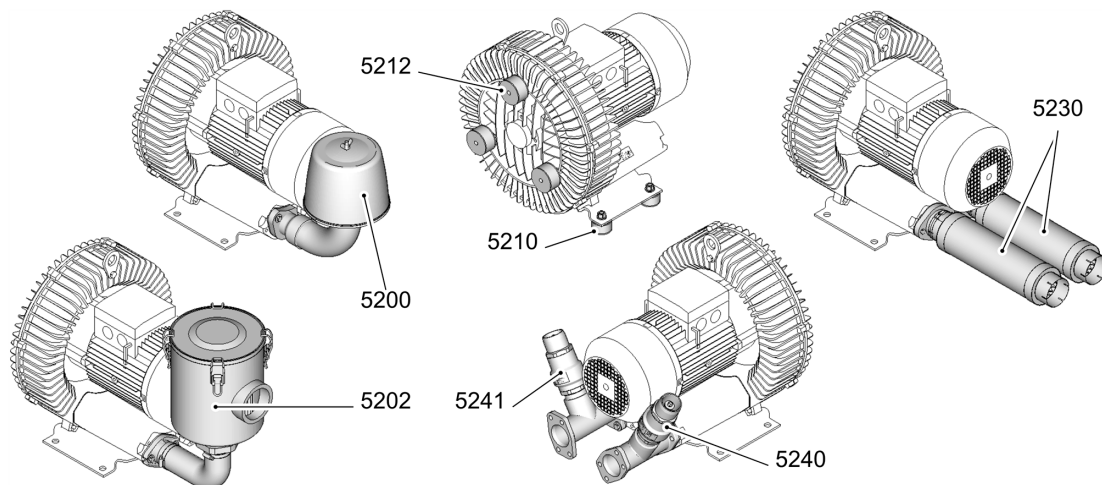
3.3 Design of the Machine



Description			
0001	Drive motor	1100	External earth connection (if explicitly ordered)
0002	Compressor housing	2000	Compressor rating plate
0030	Compressor cover	5080	Adhesive label with CE marking
0042	Junction box	5170	Direction of conveyance arrow
0058	Eye bolt/lifting attachment	5190	Direction of rotation arrow
0062	Foot	N1.0	Gas inlet
0500	Fan guard	N2.0	Gas outlet
0990	Silencer		

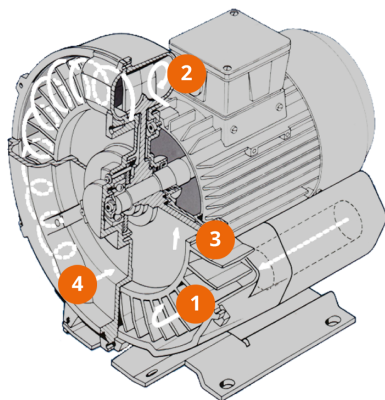
3.4 Ancillaries

The following accessories are available on request:



Description			
5200	Suction filter	5230	Additional silencers
5202	In-line filter	5240	Pressure limiting valve
5210	Foot-mounted spring elements	5241	Vacuum shut-off valve
5212	Cover-mounted spring elements		

3.5 Function Principle



The side-channel compressor consists of a drive (motor) and a compressor part in which an impeller rotates contact-free in the side-channel.

Side-channel compressors can be used as a vacuum pump or are used as the compressor (observe *Correct Use of the Equipment* [→ 8]).

As soon as the motor is switched on, conveyed media is suctioned via the gas inlet (1).

When it enters the side-channel the conveyed media is accelerated in the direction of rotation by the blades of the rotating impeller (3).

The centrifugal force presses the conveyed media to the inner wall of the side-channel (2). From there, the conveyed media is supplied to the impeller blades again.

With every renewed entry of the conveyed media into the impeller, it gains kinetic energy and the pressure increases.

The cross section of the side-channel is limited at the interrupter.

In this manner, the conveyed media is stripped from the impeller blades and expelled via the gas outlet (4).

3.6 EC/EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the nameplate are valid for the machine within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the CE-marking.

The manufacturer

**Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg**

declares that the machine: SAMOS SB - IE3/NP; SB 0140 D0; SB 0140 D2; SB 0200 D0; SB 0200 D2; SB 0310 D0; SB 0310 D2; SB 0430 D0; SB 0430 D2; SB 0530 D0; SB 0530 D2; SB 0710 D0; SB 1100 D0; SB 1100 D2; SB 1400 D0; 2100 D0

fulfill(s) all the relevant provisions from EU directives:

Directives	Title of the Directive
2006/42/EC, OJ L 157, 9.6.2006	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC
2011/65/EU, OJ L 174, 1.7.2011	Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (considering all delegated acts/directives including 2015/863)

and comply(-ies) with the following harmonized standards that have been used to fulfill those provisions:

EN ISO 12100 : 2010	Safety of machinery - Basic concepts, general principles of design
EN 1012-1 : 2010	Compressors - Safety requirements - Part 1
EN 1012-2 : 1996 + A1 : 2009	Vacuum pumps - Safety requirements - Part 2
EN 60204-1 : 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 60034-1:2010 / AC:2010	Rotating electrical machines - Part 1: Rating and performance IEC 60034-1:2010 (amended)

Legal person authorized to compile the technical file and authorized representative in the EU (if the manufacturer is not located in the EU):

**Busch Dienste GmbH
Schauinslandstr. 1
DE-79689 Maulburg**

Maulburg, 02.01.2024



Dr. Martin Gutmann
General Manager
Busch Produktions GmbH

4 Transportation and Storage

4.1 Unpacking and Checking the Condition of Delivery

The SAMOS SB - IE3/NP is secured onto a pallet and protected by a cardboard box for delivery.

1. Remove the packaging, except for the transport protection on the connection openings.
2. Check the delivery for transport damage.
NOTICE! Report any transport damage to the manufacturer immediately.
3. Check that the delivery matches the order.
4. Remove fastening screws on the foot (*item 0062* [→ 17]).
NOTICE! The transport spring elements attached to the machine cannot be used for the installation as they may have been damaged during transport. Dispose of transport spring elements.
5. Dispose of packaging material in accordance with the valid local regulations.

4.2 Lifting and Transporting



WARNING

Danger of crushing and cutting!

Danger of crushing and cutting of body parts due to tipping or falling loads during transportation.

1. Only transport SAMOS SB - IE3/NP in a horizontal position (exception: SB 2100 D0).
2. The load-bearing capacity of the lifting gear and load-handling equipment must correspond to the *mass* [→ 49].
3. Secure against tipping over or falling.
4. Do not remain under supported loads.
5. Set up the SAMOS SB - IE3/NP on a stable and level surface.



NOTICE

Mechanical damage!

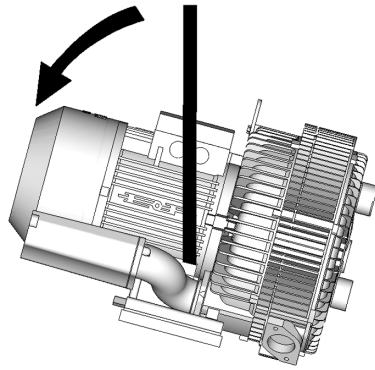
SAMOS SB - IE3/NP can be damaged during transportation.

! The SAMOS SB - IE3/NP is designed for transport with a crane or forklift.

1. The SAMOS SB - IE3/NP should not be exposed to impacts and blows during transportation.

The type of transportation depends on the mass:

- SAMOS SB - IE3/NP up to **20 kg** (44 lbs) **without** lifting attachment/eye bolt: Transportation by hand
NOTICE! Observe the health and safety requirements!
- SAMOS SB - IE3/NP over **20 kg** (44 lbs) **with** lifting attachment/eye bolt: Transportation with a crane.

Transport with crane (except for SAMOS SB 2100 D0)

! The eye bolt/lifting attachment is exclusively designed for the mass of the SAMOS SB - IE3/NP, including the original accessories (except for the In-line filter, *item 5202* [→ 18]).

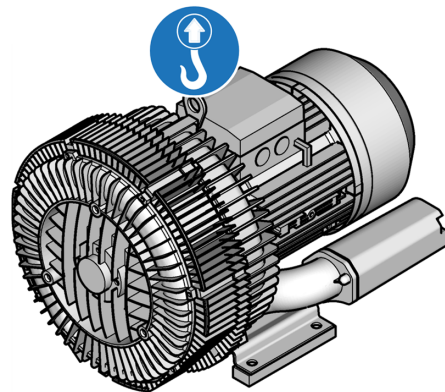
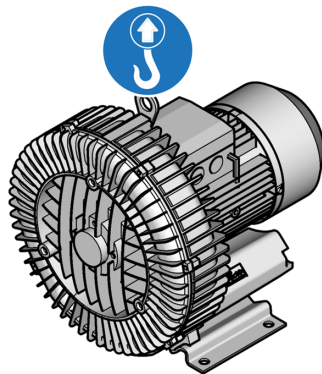
! The SAMOS SB - IE3/NP on the compressor cover (*item 0030* [→ 17]) must be placed horizontally for transportation with lifting attachment (*item 0058* [→ 17]).

1. Remove the attached In-line filter before transporting the SAMOS SB - IE3/NP.
2. Guide the lifting strap between the compressor housing (*item 0002* [→ 17]) and the motor (*item 0001* [→ 17]) through openings or on edges.

**WARNING**

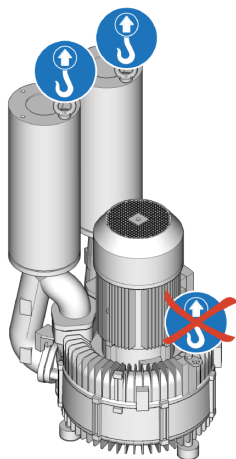
Make sure that the lifting strap cannot slip off!

3. Lift the SAMOS SB - IE3/NP until the lifting strap is taut.



4. Tilt the SAMOS SB - IE3/NP with one or two people on the foot, depending on the type.
5. Check that the eye bolt/lifting attachment is firmly fastened and tightened again as necessary.
 - M8: **18 – 22 Nm** (13.3 – 16.2 ft lbs)
 - M12: **18 – 42 Nm** (13.3 – 31.0 ft lbs)
 - M16: **138 – 165 Nm** (102 – 122 ft lbs)
6. Attach the crane hook to the eye bolt/lifting attachment.
7. Lifting and transporting the SAMOS SB - IE3/NP.
8. Set the SAMOS SB - IE3/NP down and, if necessary, secure from slipping and falling.
9. Remove the lifting device.

Transporting the SAMOS SB 2100 D0 with a crane



1. Screw an eye bolt into each silencer (*Design of the Machine* [→ 17]) - not included in scope of delivery.
- M16: **138 – 165 Nm** (102 – 122 ft lbs)
2. Lifting and transporting the SAMOS SB - IE3/NP.
3. Set the SAMOS SB - IE3/NP down and, if necessary, secure from slipping and falling.
4. Remove the lifting device.

4.3 Storage



NOTICE

Mechanical damage and corrosion!

Failure to adhere to the storage conditions can lead to mechanical damage and corrosion, as well as shorten the grease service life.

1. Adhere to the storage conditions.
 2. The maintenance intervals of the ball bearings (*Maintenance* [→ 44]) become shorter as the time of storage increases.
-
1. Connect all suction vents so that no dirt or solid particles can enter.
 2. Turn the rotor once a year to avoid permanent standstill marks.
 3. If the storage conditions specified in the table cannot be met, suitable corrosion protection, preservation, packaging and drying measures must be taken.

Storage conditions	Permitted values	
Ambient pressure	Atmospheric	
Composition of the environment	Dry, dust-free environment (relatively humid <60 %)	
Ambient temperature	-20 °C to +40 °C	-4 °F to +104 °F
Static loads	None	
Abrupt impacts	None	
Speed of oscillation V_{eff}	<1.5 mm/s	<0.059 in/s

5 Installation

5.1 Measures after Long-term Storage

Replace ball bearings and radial shaft seal

! If the length of storage until assembly is exceeded by 4 years under the storage conditions specified in *Storage* [→ 22].

1. Replace the rolling bearing.
2. Clean adjacent bearing areas for open ball bearings and re-grease.
3. Replace and grease the radial shaft seal.

If the bearing conditions vary (*Storage* [→ 22]), a reduced ball bearing service life is to be expected.

Measuring the motor insulation resistance

1. Measure the insulation resistance of the motor at 500 V DC voltage and +40 °C wrapping temperature between the conductors of the main circuit and protective conductive system.
 - Value $\geq 5 \text{ M}\Omega$: no measures necessary
 - Value $< 5 \text{ M}\Omega$: Dry winding

Converting to the reference temperature

For wrapping temperatures other than +40 °C, convert the measured value to the reference temperature of +40 °C using the following equations.

$R_C = (0.5)^{(40-T)/10} * R_T$	R_C	Insulation resistance converted to a +40 °C reference temperature
	40	Reference temperature in °C
	T	Measuring/wrapping temperature in °C
	10	Halving/doubling the insulation resistance by 10 K
	R_T	Measured insulation resistance at measuring/wrapping temperature T in °C

- The insulation resistance is halved for every 10 K temperature increase.
- The resistance is doubled for every 10 K drop in temperature.

Option with standstill heating: Measuring the electric band heater insulation resistance

1. Measure the electric band heater insulation resistance against the machine housing at 500 V DC voltage.
 - Value $\geq 1 \text{ M}\Omega$: no measures necessary
 - Value $< 1 \text{ M}\Omega$: Dry the electric band heater

5.2 Mounting Conditions

For safe operation of the SAMOS SB - IE3/NP:

- Always secure the SAMOS SB - IE3/NP to an even (± 0.5 mm) installation surface or base frame using screws. The dimensions and load-bearing capacity must be designed for the SAMOS SB - IE3/NP (see dimensional drawing).
- When installing outdoors, take protective measures against the effects of weather.
- When installing in enclosed spaces, ensure that there is sufficient ventilation. For conveyed media other than air, take leaks from the SAMOS SB - IE3/NP into account (e.g. forced ventilation, gas monitoring).
- Exhaust air from other machines must not be sucked in by the motor fan.
- No external vibrations, shock loads or accelerations are permitted.
- No external mechanical loads are permitted on the SAMOS SB - IE3/NP and its attachments (e.g. support the piping, and do not climb the SAMOS SB - IE3/NP or its attachments).
- If there is a risk of condensation forming in the interior of the SAMOS SB - IE3/NP, take protective measures (e.g. heating, moisture separators).

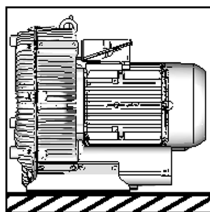
5.3 Reduction of Oscillations and Noises

Noise emissions and vibrations can be reduced by the following measures:

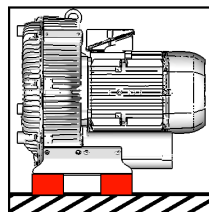
- Do not set up the SAMOS SB - IE3/NP in set-up areas that conduct or radiate sound.
- Equip installation surfaces with intermediate layers of noise damping material.
- Use additional silencer (*item 5230* [→ 18]).
- When installing horizontally, use spring elements on the foot (*item 5210* [→ 18]).

5.4 Mounting

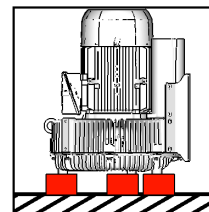
The following installation positions are permitted by the manufacturer:



1



2



3

Description

1	Mounting without spring elements	2	Mounting with spring elements - Pos. 5210, [→ 19]
3	Mounting with spring elements - Pos. 5212, [→ 19]		

Type	kW (50 / 60 Hz)	Fig.1	Fig.2	Fig.3
SB with frequency converter of third-party supplier	-	✗	✓	✓ ₁
SB 0140 D0	0.95 / 1.10 1.30 / 1.60	✓	✓	✓ ₁
SB 0140 D2	1.75 / 2.00 2.50 / 3.00	✓	✓	✓ ₁
SB 0200 D0	0.95 / 1.10 1.30 / 1.60 1.75 / 2.00 2.50 / 3.00	✓	✓	✓ ₁
SB 0200 D2	3.45 / 4.00 4.60 / 5.30	✗	✓ *	✓ ₁
SB 0310 D0 SB 0430 D0	1.75 / 2.00 2.50 / 3.00 3.45 / 4.00 4.60 / 5.30	✓	✓	✓ ₁
SB 0310 D2	2.50 / 3.00	✓	✓	✓ ₁
SB 0310 D2	3.45 / 4.00 4.60 / 5.30 6.30 / 7.30 8.60 / 9.90	✗	✓ *	✓ ₁
SB 0530 D0 SB 0710 D0	4.60 / 5.30 6.30 / 7.30 8.60 / 9.90	✓	✓	✓ ₁
SB 0530 D2	8.60 / 9.90 12.6 / 14.5 17.3 / 19.9	✓	✓	✓ ₁
SB 1100 D0	8.60 / 9.90	✓	✓	✓ ₁

Type	kW (50 / 60 Hz)	Fig.1	Fig.2	Fig.3
SB 1100 D0	12.6 / 14.5		 *	 ¹
SB 1100 D2	17.3 / 19.9			
SB 1400 D0	21.3 / 24.5			
SB 1100 D2	25.3 / 29.0			 ¹
SB 1400 D0	8.60 / 9.90			 ¹
SB 2100 D0	25.3 / 29.0			 ¹

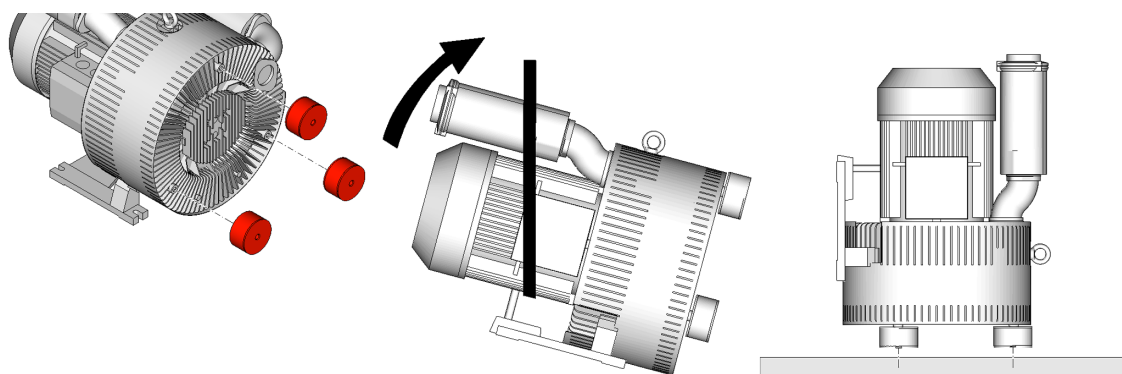
* Spring elements included in the scope of delivery.

¹ Not a function of the condensate drain hole in the motor (if explicitly ordered). Carrying moisture and condensate along with the conveyed material reduces the service life of the rolling bearings.

5.4.1 Level Assembly on the Foot

1. Mark the fixing points through the holes in the foot (*item 0062* [→ 17]) or by referring to the dimensional drawing.
2. Lift the SAMOS SB - IE3/NP away and drill the holes for the fixing points.
3. Place the SAMOS SB - IE3/NP with the foot in assembly position.
4. Screw the foot to all anchorage holes with fastening elements.
 - M8 steel (8.8 according to ISO 898-1): **18 – 22 Nm** (13.3 – 16.2 ft lbs)
 - M10 steel (8.8 according to ISO 898-1): **35 – 42 Nm** (25.8 – 31.0 ft lbs)
 - M12 steel (8.8 according to ISO 898-1): **58 – 70 Nm** (42.8 – 51.6 ft lbs)

5.4.2 Vertical Mounting on the Compressor Cover



! Spring elements (*item 5212* [→ 18]) must be used in order to mount vertically on the compressor cover (*item 0030* [→ 17]).

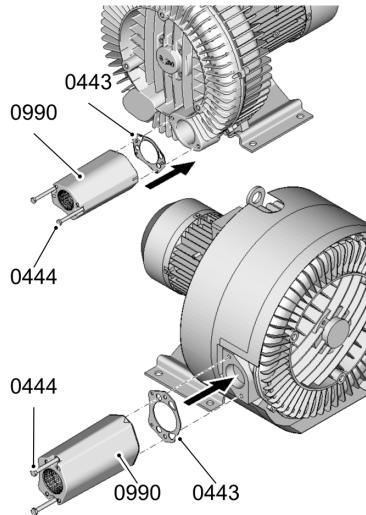
1. Mark the threaded holes for the cover position based on the dimensional drawing.
2. Drill the holes for the fixing points.
3. Screw the threaded studs of the spring elements into the threaded holes for the cover position.
 - M6: **1.0 – 2.7 Nm** (0.75 – 2.00 ft lbs)
 - M8: **2.3 – 5.0 Nm** (1.70 – 3.70 ft lbs)
 - M10: **4.2 – 9.0 Nm** (3.10 – 6.65 ft lbs)
 - M12: **11 – 22 Nm** (8.10 – 16.2 ft lbs)
4. Place the lifting strap around the motor (*item 0001* [→ 17]) between the compressor housing (*item 0002* [→ 17]) and the sleeve.
5. Lift the SAMOS SB - IE3/NP and tilt it with two people onto the compressor cover.
6. Place the SAMOS SB - IE3/NP with the compressor cover in the assembly position.
7. Screw the SAMOS SB - IE3/NP to the mounting surface using the threaded hole in the spring elements and securing elements.
 - M6: **4.2 – 5.0 Nm** (3.10 – 3.70 ft lbs)
 - M8: **7.5 – 9.0 Nm** (5.55 – 6.65 ft lbs)
 - M10: **18 – 22 Nm** (13.3 – 16.2 ft lbs)
 - M12: **35 – 42 Nm** (25.8 – 31.0 ft lbs)
8. Remove the lifting device.

5.5 Fit Loose Silencer

! The silencers are enclosed separately for two-stage and SAMOS SB - IE3/NP or for cover suction and have to be installed.

1. Remove transport protection.

SAMOS SB (without SB 0530 D2)

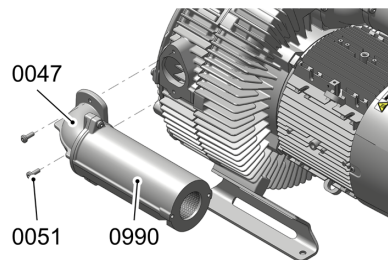


1. Check that the seal (0433) is securely fastened to the silencer (0990) and re-position seal, if necessary.
2. Position the silencer on the compressor cover or center body.

NOTE: Observe the alignment of the silencer!

3. Screw in the silencer using the screws (0444).
 - M6: **7.5 – 9.0 Nm** (5.55 – 6.65 ft lbs)
 - M8: **18 – 22 Nm** (13.3 – 16.2 ft lbs)

SAMOS SB 0530 D2 with elbow



1. Position silencer (0990) on center body with attached flange (0047).

NOTE: Observe the alignment of the silencer!

2. Screw in the silencer using the (0051) screw.
 - M8: **18 – 22 Nm** (13.3 – 16.2 ft lbs)

5.6 Mount the Accessories

1. Mount accessories according the instruction manual supplied with the respective accessory.

5.7 Connecting Pipelines and Hoses



WARNING

Risk of injury due to unpiped gas outlet and gas inlet!

Severe injuries to body parts, hair being pulled in or hot pumped media or solid particles being thrown out.

! Operation without piping and/or without a silencer (free inlet and/or free blowing gas outlet) is only permitted with the following measures:

1. Provide contact protection at the gas inlet and gas outlet in accordance with ISO 13857.
2. Provide protective measures at the gas inlet to prevent hairs from being fall in.
3. At the gas outlet, secure the danger zone with deflectors or a catch basket against hot pumped media or ejected solid particles.
4. Provide noise protection measures.



WARNING

Risk of injury due to overpressure!

Suddenly ejected conveyed media such as impurities and solid particles or pressure surges can lead to serious injuries.

1. Dimension pipes and hoses, securing elements, fittings and containers sufficiently and align them to the maximum pressures.
2. Connect the SAMOS SB - IE3/NP and the system de-energized and flexibly (e.g. using hoses or compensators).
3. Do not fit pipes, hoses, securing elements, fittings and containers to the SAMOS SB - IE3/NP and secure from damage.
4. Protect the SAMOS SB - IE3/NP from non-permitted pressure levels from the plant (e.g. pressure limiting valve, pressure switch).
5. When operating the compressor, the pressure on the gas outlet must be indicated via a pressure indicator.
6. After switching off, ensure that no conveyed media can flow through the SAMOS SB - IE3/NP (external drive through conveyed media), install a check valve if necessary.



WARNING

Risk of burns due to temperatures of up to approx. 160 °C [320 °F]!

Contact with hot surfaces, pipes and hoses, can lead to burns.

1. Fit pipes and hoses with sufficient distance from highly inflammable materials (e.g. wood, plastic).
2. Cover hot surfaces, such as pipes and hoses, with protection (e.g. perforated metal cover or wire covering) or isolate them.
3. Hot surfaces, such as pipes and hoses, that do not have their own safeguard, are supplied with warning signs.

NOTICE

Pressure loss due to reduced cross section of the pipes and hoses!

- As possible, make the cross section of the pipes and hoses the same length or longer than the connections of the SAMOS SB - IE3/NP.

The conveyed material is sucked in via the gas inlet (*item N1.0* [→ 17]) and discharged via the gas outlet (*item N2.0* [→ 17]). The direction of conveyance of the conveyed media is marked by a conveyance arrow (*item 5170* [→ 17]).

The SAMOS SB - IE3/NP can be fitted with pipes or hoses.

Connection dimensions and tightening torques for gas inlet (*item N1.0* [→ 17]) and gas outlet (*item N2.0* [→ 17])

Type	Pipe thread			Direct connection			Hose connection
	ISO 228	ANSI/ASME B 1.20.1	[Nm (ft lbs)]	Opening [mm (in)]	Screw spacing [mm (in)]	[Nm (ft lbs)]	[mm (in)]
SB 0140 D0 SB 0140 D2	G 1½	---	40 – 70 (29.5 – 51.6)	Ø 46 (1.81)	Ø 72 (2.84)	M6: 7,5 – 9,0 (5.55 – 6.65)	Ø 50 (1.97)*
SB 0200 D0 SB 0200 D2 SB 0310 D0 SB 0310 D2 SB 0430 D0	G 2*	NPT 2-8*	58 – 90 (42.8 – 66.4)	Ø 55 (2.17)	Ø 83 (3.27)	M8: 18 – 22 (13.3 – 16.2)	Ø 50 (1.97)* Ø 60 (2.36)*
SB 0530 D0 SB 0530 D2 SB 0710 D0	G 2½	NPT 2½-8*	70 – 110 (51.6 – 81.1)	Ø 65 (2.56)	Ø 108 (4.25)	M8: 18 – 22 (13.3 – 16.2)	Ø 76 (2.99)*
SB 1100 D0 SB 1100 D2 SB 1400 D0	G 4*	NPT 4-8*	100 – 165 (73.8 – 122)	Ø 100 (3.94)	Ø 150 (5.91)	M12: 58 – 70 (42.8 – 51.6)	Ø 115 (4.53)*
SB 2100 D0	G 5*	NPT 5-8*	138 – 200 (102 – 147)	Ø 130 (5.2)	Ø 210 (8.27)	M16: 138 – 165 (102 – 122)	Ø 150 (5.91)*
	* Std	* NPT					* Hose flange

! On delivery, all connection openings are closed with a transport protection. This prevents foreign objects from entering.

- Remove the transport protection from the connection openings.
- For impurities in the conveyed media, fit a filter (accessories) in the suction line.
- Install a check valve if the conveyed media can flow through the SAMOS SB - IE3/NP while at a standstill (external drive through conveyed media).
- Connect the pipe or hose of the system pressure line to the gas outlet (*item N2.0* [→ 17]).
NOTICE! When connecting pipe threads, secure the connection points against turning.
- Connect the pipe or hose of the system suction line to the gas inlet (*item N1.0* [→ 17]).
NOTICE! When connecting pipe threads, check the silencer for leaks and replace the seal if necessary.

6 Electric Power Connection

6.1 General Installation Regulations



DANGER

Lethal electric shock on the housing due to the air gap being too small!

! Air gaps between non-insulated, voltage active components and the earth must be at least 5.5 mm [0.217 in] to one another (for a measured voltage of $U_N \leq 690$ V).

1. Avoid projecting cable ends.
2. Ensure electrical connections are durably resilient.



DANGER



Lethal electric shock due to contact voltage on the housing!

1. Implement protection from contact voltage according to IEC 60204-1. Use the earth connection in the junction box (equipotential bonding protection). For operating the frequency inverter, observe the manufacturer's operating instructions for the frequency inverter.
2. If necessary, connect the equipotential bonding bar to the outer earth connection (if explicitly ordered).
3. Keep the junction box free of foreign objects, dirt, and moisture.
4. Seal junction box lid and cable feed openings so that they are dust and water tight.



NOTICE

Destruction of the drive!

Incorrect operation or incorrect control can destroy the drive.

1. The SAMOS SB - IE3/NP is equipped with an asynchronous motor.
2. Operating on a grid with a non-earthed start point is not permitted.

The electrical installation must properly fulfil the requirements of IEC 60204-1, IEC 60204-11 and IEC 61010-1.

The electrical installation must also be implemented according to the applicable national, local, and plant-specific stipulations, as well as the requirements of the power supply company.

The conditions at the place of use must comply with the details on the *rating plate* [→ 15].

The following conditions are permitted during mains operation:

- ± 5 % variation in voltage without loss of performance (range A, IEC 60034-1) according to the compressor *rating plate* [→ 15].
- ± 10 % variation in voltage with loss of performance (range B, IEC 60034-1) according to the compressor *rating plate* [→ 15].
- ± 2 % deviation in frequency.
- Deviations are indicated on the *rating plate* [→ 15].

The electrical installation must:

- Be designed in accordance with the ambient and operating conditions (ampacity).
- Be correctly attached and protected.
- Be kept away from hot surfaces.
- Be electrically isolated to a sufficient degree.

- Be constructed and fitted in such a way that the following faults do not lead to damage:
 - short circuits
 - mechanical impacts
 - power supply failures or surges
 - electromagnetic fields
 - earth connections

The electrical equipment and control unit must not disable the protective devices for the drive system and the motor protection (e.g. PTC resistor, bimetal switch, frequency inverter current limit).

When the power supply fails or surges, the control must prevent the SAMOS SB - IE3/NP from remaining in operation or starting up.

Protective devices and switches must fulfil the failure safety conditions.

Overcurrent protection

The power supply of the motor must be equipped with an overcurrent protection (e.g. motor protection circuit breaker) according to IEC 60204-1, 7.2.

Set the overcurrent protection device to the maximum current in continuous operation (*item 9* [→ 15]).

Separator for the electrical energy supply

A separator for the electrical energy supply must be:

- Provided according to IEC 60204-1, 5.3 and 5.5.
- Clearly and visibly labelled.

6.2 Controls

Controls and instruments must be constructed and arranged in such a way that:

- They are easily visible and accessible, and can also be operated without excessive effort.
- The operator understands the functions.
- Operating faults are prevented.

A control system must correspond to ISO 12100, 4.11; IEC 60204-1, 9.4, and ISO 13849-1.

When the power supply fails, a "system with oriented failure mode" according to ISO 12100, 6.2.12.3 must be used.

Start and stop devices must be clearly marked in accordance with ISO 13850 and IEC 60417.

EMERGENCY OFF function

An EMERGENCY OFF function must be provided when a dangerous situation can occur that must be rectified manually (see ISO 12100, 6.3.5.2)

- Implement the EMERGENCY OFF function according to EN 418 and EN 50099.
- Implement a manual EMERGENCY OFF function according to ISO 13849-1, 5 (in particular 5.2.1).
- The stop category and colour of the EMERGENCY OFF function must correspond to ISO 13850.
- If a risk assessment determines that the normal switch can fulfil the EMERGENCY OFF function, this should be labelled accordingly.

After an EMERGENCY OFF, start-up is only possible via a deliberate, manually-triggered procedure.

Manual reset

A manual reset after a stop command must correspond to ISO 13849-1, 5.5.2 and IEC 60204-1, 9.2.3.3 and 9.2.3.4.

Start and new start

The requirements of a start and new start, must correspond to ISO 13849-1, 5.2.3.

	If the SAMOS SB - IE3/NP is equipped with an automatic or remote-controlled start control, it must be labelled with the sign to the left.
---	---

It is necessary to prevent an automatic or remote-controlled start during maintenance or repair.

6.3 Connect the Motor to the Mains

Option with standstill heating: Blocking circuit for electric band heater

! When the electric band heater is operated with the SAMOS SB - IE3/NP running, damage can occur due to increased temperatures in the SAMOS SB - IE3/NP.

1. Use a blocking circuit, which switches the electric band heater off when the machine is switched on.
2. Only switch the electric band heater on after the machine is switched off.

Option with PTC: PTC resistor for winding monitoring device

Use a suitable trip unit to monitor the PTC resistor.

Monitoring circuit	Trip device
Temperature sensor (PTC resistor Option)	According to the specifications on the certificate for the corresponding trip unit and the electrical configuration, e.g. thermistor motor protection relay SIRIUS 3RN1011-.B, 3RN1011-.G, 3RN1012-.B, 3RN1012-.G, 3RN1013

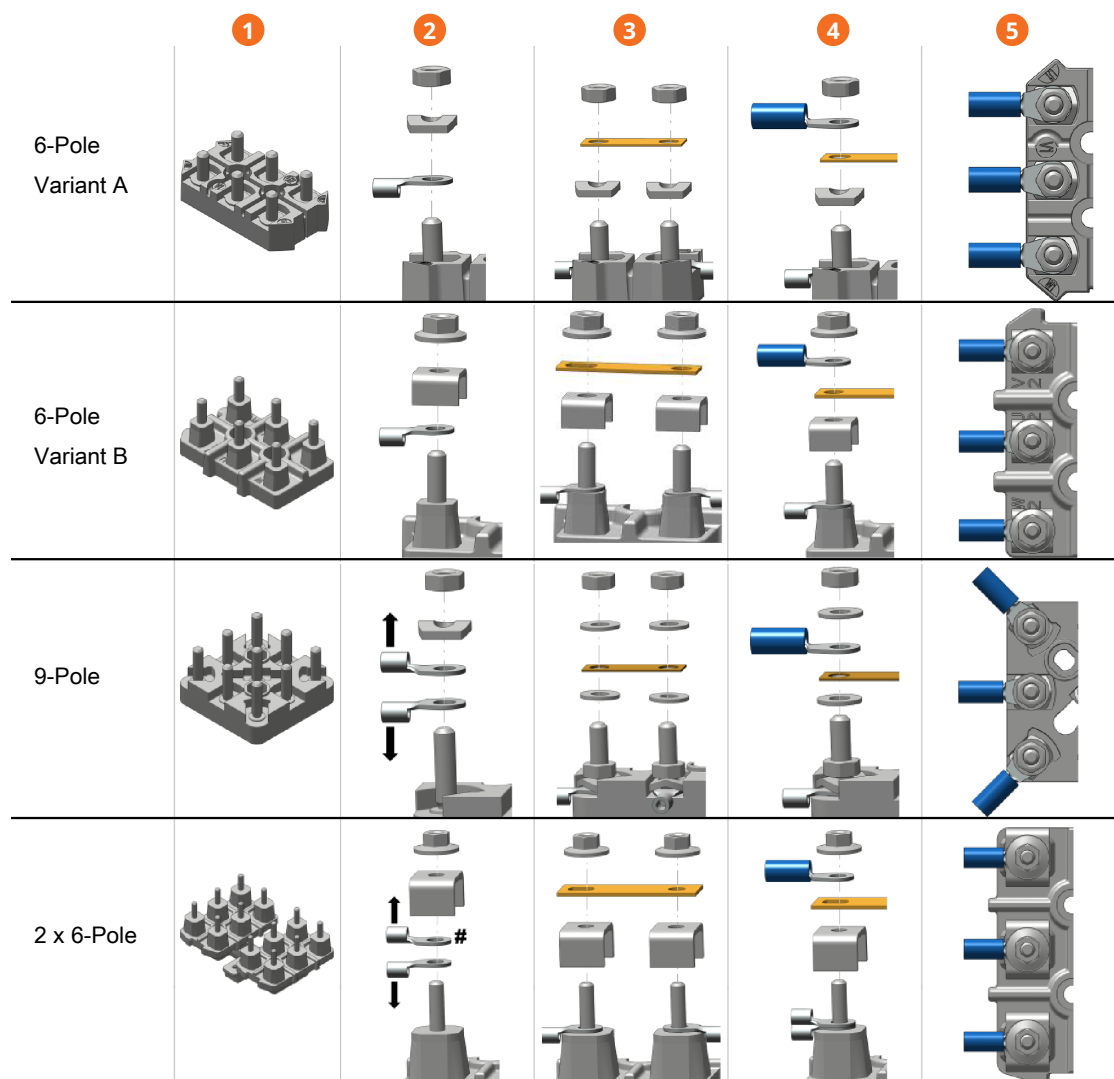
The insulation for the temperature sensor is designed for winding in accordance with the requirements for basic insulation. The connections of the temperature sensor are insulated in the terminal box and are not separated safely.



DANGER

Therefore, in the event of an error, the voltage on the sensor cable can be dangerous, and touching it could lead to death, serious physical injuries, or material damage.

1. When connecting the temperature sensor to an external sensor monitor, take any necessary additional measures to comply with the requirements laid out in IEC 60664-1 and IEC 61800-5-1 to protect against dangers due to electric shock.



Description			
1	Terminal board design	2	Internal motor wiring: Motor connection cables
3	Internal motor wiring: Connecting rail	4	Customer connection / mains connection / plug: Mains connection
5	Customer connection / mains connection / plug: Cable routing*		

* Install cable lugs parallel to the terminal board cases/domes!

Connect up the motor

1. Open the junction box cover.
2. Open necessary access points for cable glands.
3. Screw in or insert cable glands and secure with locknut. Screw in fit reducer, if available.
NOTICE! The cable glands and fit reducers may not lower the IP protection class.
4. With the junction box turned, check the tightening torques of the junction box screw fittings.
 - M4: **4.0 – 5.0 Nm** (2.95 – 3.70 ft lbs)
 - M5: **7.5 – 9.5 Nm** (5.55 – 7.00 ft lbs)
5. Feed the cable to be connected through the cable glands and into the junction box (*item 0042* [→ 17]).
6. Attach cable lugs to cable to be connected.
7. Connect the protective cable to the designated position with this symbol.



- M4: **4.0 – 5.0 Nm** (2.95 – 3.70 ft lbs)
 - M5: **7.5 – 9.5 Nm** (5.55 – 7.00 ft lbs)
8. Attach mains connecting line and connecting rails according to the circuit diagram in the junction box (*item 0042* [→ 17]).
NOTICE! Refer to figures.
 - M4: **0.8 – 1.2 Nm** (0.60 – 0.90 ft lbs)
 - M5: **1.8 – 2.5 Nm** (1.35 – 1.85 ft lbs)
 9. If available, connect PTC resistor, bimetal switch, and electric band heater according to the circuit diagram in the junction box (*item 0042* [→ 17]). Use a suitable trip unit to evaluate the PTC resistor.
 10. Remove any unused parts (e.g. bridges, nuts) from the junction box.
 11. Tighten cable glands according to manufacturer's specifications.
 12. Seal unused openings with appropriate sealing plugs.
 13. Close the junction box cover.
 - M4: **4.0 – 5.0 Nm** (2.95 – 3.70 ft lbs)
 - M5: **7.5 – 9.5 Nm** (5.55 – 7.00 ft lbs)

6.4 Connect the Frequency Inverter to the Mains

**CAUTION****Destruction of the isolation system due to excessive connection voltages!**

1. The SAMOS SB - IE3/NP can be operated at mains voltages ≤ 500 V on the frequency inverter provided the permitted voltage peaks are observed.
2. Permitted voltage gradient ≤ 9 kV/ μ s.
3. $\hat{U}_{\text{Conductor-Conductor}} \leq 1500$ V, $\hat{U}_{\text{Conductor-Ground}} \leq 1100$ V.
4. Wavefront duration $t_s > 0,1$ μ s.

**NOTICE****Failure to reach the pressure values due to insufficient voltages on the motor terminal board!****! The voltages given on the rating plate (*item 8* [→ 15]) apply to mains operation.**

1. For operation of the SAMOS SB - IE3/NP on the frequency inverter, the voltages given on the rating plate must be adhered to on the motor terminal board.

Observe when operating with a frequency inverter

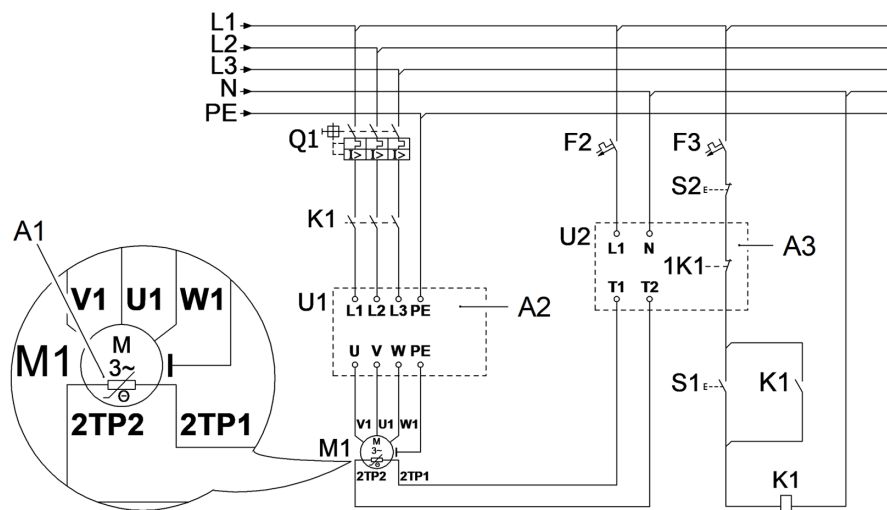
- The SAMOS SB - IE3/NP is equipped with an asynchronous motor and must be controlled correspondingly.
- SAMOS SB - IE3/NP with PTC resistor: When the PTC resistor is activated, the SAMOS SB - IE3/NP must switch off.
- For SAMOS SB - IE3/NP without PTC resistor, provide motor protection measures.
- Comply with *maximum speeds* [→ 46].
- In the case of installed sensors (e.g. PTC resistor), interfering voltages may occur in the sensor wiring depending on the type of frequency inverter.
- Observe the operating instructions of the frequency inverter manufacturer.

6.4.1 Connect Adjacent Frequency Inverter from Third-Party Manufacturer

When operating with frequency inverters from third-party manufacturers, take into account:

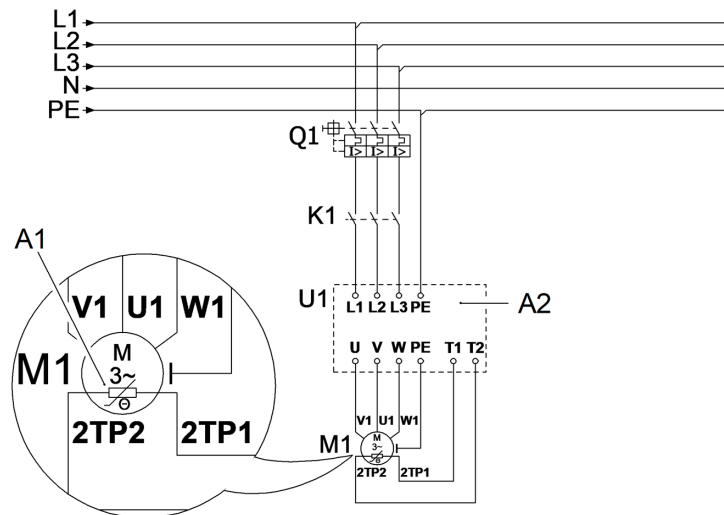
- High-frequency current and voltage harmonics in the motor supply wiring can cause electro-magnetic interference. This is dependent on the type of the frequency inverter (type, manufacture, voltage supply measures).
 - Observe manufactures EMC notes for the frequency inverter.
 - If necessary, use screened cables/wiring. To provide the optimum screening, the screening must be connected to the metal junction box using a large-area metal conducting fastener.
1. Open the junction box cover of the motor (*item 0042* [→ 17]).
 2. Connect the frequency inverter according to the circuit diagram in the junction box cover and the manufacturer's operating instructions for the frequency inverter.
 3. Connect the PTC resistor according to the following examples.
 4. Close the junction box cover.

Circuit diagram with PTC resistor and evaluation unit



Description			
A1	PTC resistor	A3	PTC resistor and evaluation unit
A2	Frequency inverter		

Circuit diagram with PTC resistor evaluation via the frequency inverter from third-party supplier



Description

A1	PTC resistor	A2	Frequency inverter
----	--------------	----	--------------------

6.5 Connecting Accessories

Connect accessories according to the instruction manual supplied with the respective accessory.

6.6 Parameterize the Frequency Inverter

! NOTICE

The SAMOS SB - IE3/NP fails due to an overload of the motor!

! SAMOS SB - IE3/NP are not ventilators! Operation with the setting "Variable torque" or "Square characteristic" is not permitted.

1. Always operate SAMOS SB - IE3/NP with the setting "Constant torque" or "Linear characteristic".

A clock frequency of 8 kHz is recommended. The minimum clock frequency is 4 kHz.

6.6.1 Parameterize Adjacent Frequency Inverter from Third-Party Manufacturer

Set the optimum process parameters within the limits defined in these instructions using the motor data (*Rating Plate* [→ 15]), the *Frequency Inverter Parameters* [→ 49] and the operating instructions of the *Other Valid Documents* [→ 7].

7 Commissioning

7.1 Measures after a Long Shut-down Period

Replace ball bearings and radial shaft seal

! When the downtime exceeds **4 years** since the last commissioning.

1. Replace the rolling bearing.
2. Clean adjacent bearing areas for open ball bearings and re-grease.
3. Replace and grease the radial shaft seal.

If the standstill conditions vary (*Storage* [→ 22]), a reduced ball bearing service life is to be expected.

Measuring the motor insulation resistance

1. Measure the insulation resistance of the motor at 500 V DC voltage and +40 °C wrapping temperature between the conductors of the main circuit and protective conductive system.
 - Value $\geq 5 \text{ M}\Omega$: no measures necessary
 - Value $< 5 \text{ M}\Omega$: Dry winding

Converting to the reference temperature

For wrapping temperatures other than +40 °C, convert the measured value to the reference temperature of +40 °C using the following equations.

$R_C = (0.5)^{(40-T)/10} * R_T$	R_C	Insulation resistance converted to a +40 °C reference temperature
	40	Reference temperature in °C
	T	Measuring/wrapping temperature in °C
	10	Halving/doubling the insulation resistance by 10 K
	R_T	Measured insulation resistance at measuring/wrapping temperature T in °C

- The insulation resistance is halved for every 10 K temperature increase.
- The resistance is doubled for every 10 K drop in temperature.

Option with standstill heating: Measuring the electric band heater insulation resistance

1. Measure the electric band heater insulation resistance against the machine housing at 500 V DC voltage.
 - Value $\geq 1 \text{ M}\Omega$: no measures necessary
 - Value $< 1 \text{ M}\Omega$: Dry the electric band heater

7.2 Tests during Commissioning or Re-commissioning



CAUTION

Overpressure!

Overpressure during the leak test can damage the SAMOS SB - IE3/NP.

1. To test the plant for leaks, the SAMOS SB - IE3/NP must be excluded.

The following list of checks cannot be exhaustive. Additional checks may be required according to the system-specific conditions.

1. Prior to commissioning or recommissioning of the SAMOS SB - IE3/NP, check that:

	The SAMOS SB - IE3/NP is properly fitted and aligned.
	Rotating components move freely.
	Pipes and hoses are correctly connected.
	Attachments, screw fittings and electrical connections are fixed at the given tightening torques.
	The operating conditions match the rating plate details given above.
	The maximum speeds are monitored and adhered to through the control.
	Protection measures against accidental contact have been completed.
	Cooling air supply is not affected.

7.3 Check the Direction of Rotation

Test the direction of rotation of the compressor

1. Switch on the SAMOS SB - IE3/NP briefly and then switch it off again.



WARNING

When the electrical connection is incorrect: Risk of injury as a result of being pulled or sucked in! Do not perform the overpressure test with your hands!

	Perform the overpressure test on the gas outlet using a piece of paper (<i>item N2.0</i> [→ 17]).
	Overpressure present: direction of rotation is correct, no measures.
	Negative pressure present: Direction of rotation incorrect, change direction of rotation by interchanging two phases of electrical supply line.

7.4 Checking the Sensors

1. Check the correct connection and function of the existing additional devices for machine monitoring.

7.5 Measure the Acoustic Emissions

! It is necessary to measure the acoustic emissions for SAMOS SB - IE3/NP without piping, without silencers or without piping.

1. Ensure that all persons in the potentially excessive noise area wear ear protection.
2. Measure sound during operation.
3. If necessary, implement sound protection measures (e.g. *Reduction of Oscillations and Noises* [→ 24], provision of ear protection, identification of noise areas).

7.6 Measure Oscillations

! It is recommended to measure the oscillations for the prescribed operating speeds.

1. Measure oscillations.
2. If the permitted *Speed of Oscillation* [→ 48] is exceeded, provide measures for *Reduction of Oscillations and Noises* [→ 24].

8 Operation



WARNING

Danger of burns from hot surface on the unit and from hot conveyed media!

! On the surface of the SAMOS SB - IE3/NP, temperatures of approx. 160 °C [320 °F] are possible.

1. Do not touch hot surfaces during operation.
2. Allow to cool after removing from service.

When operating the SAMOS SB - IE3/NP, comply with the *Permitted Conditions for Use* [→ 46].

NOTICE! The gas inlet and gas outlet are swapped in reverse operation. Performance data and cooling, as well as the functions of flow-dependent accessories (e.g. valves, filters), can be limited.

8.1 Switch on

1. If fitted, open the shut-off devices in the suction line and pressure line.
2. If fitted, open the shut-off devices in the suction line.
3. Switch the external fan on.
4. Switch on current supply.

NOTE: The SAMOS SB - IE3/NP begins to suction conveyed media.

8.2 Switch off

! The SAMOS SB - IE3/NP can be switched off in each operating condition (i.e. regardless of pressure, temperature, etc.). In doing so, the working process of the system must be observed.

1. Switch the power supply (if necessary) off.
 - The SAMOS SB - IE3/NP interrupts the suction of the conveyed media. The impeller gradually stops and the pressure is slowly released.



WARNING

Risk of injury due to rotating impeller: wait until it comes to a stop.

2. If fitted, close shut-off devices in suction and pressure lines.

8.3 Switch off in Emergency

1. The SAMOS SB - IE3/NP can be switched off in emergency without any particular precautions.
 - If the brakes of the SAMOS SB - IE3/NP are actively employed, restarting in the opposite direction of rotation must be prevented.
2. Determine the cause.
3. Rectify the risk.
4. Put the SAMOS SB - IE3/NP back into *operation* [→ 38].

9 Troubleshooting

Fault	Cause	Corrective measure	To be carried out by
SAMOS SB - IE3/NP does not start up and does not make any noise	The power supply of the was interrupted SAMOS SB - IE3/NP	Eliminate breaks in fuses, terminals or supply lines	Electrician
	Intermediate circuit voltage of the frequency inverter is too low	Check mains voltage and frequency inverter	Electrician
	Frequency inverter blocked	Remove block	Operating personnel
	Incorrect setpoint source	Change setpoint source	Operating personnel
	Target value for frequency inverter is "0"	Specify target value	Operating personnel
SAMOS SB - IE3/NP does not start up and makes noises	Break in one of the power supply lines	Correct the break in fuses, terminals or power supply lines	Electrician
	Stator winding interconnected	Check winding connection in junction box	Electrician
	Impeller and rotor blocked	Open SAMOS SB - IE3/NP, remove foreign objects, clean or replace parts	Service*
	Rolling bearing is faulty	Replace rolling bearing	Service*
SAMOS SB - IE3/NP turns unevenly	Defective motor cable	Check motor cable	Electrician
	Frequency inverter motor underexcited or overexcited	Check the parameterization	Operating personnel
		Check motor data and if necessary, identify the motor	Operating personnel
After release, the frequency inverter switches to fault	Differential pressure exceeds the limits specified on the <i>Rating Plate</i> [→ 15]	Reduce differential pressure	Operating personnel
	Impeller and rotor blocked	Open SAMOS SB - IE3/NP, remove foreign objects, clean or replace parts	Service*
	Rolling bearing in motor or compressor part faulty	Replace rolling bearing	Service*
	Clogged filters, silencer elements or connecting pipes/hoses	Clean filters, silencer elements and connecting pipes/hoses	Service*
Overcurrent protection triggered again after switching motor on; power consumption too high	Motor overloaded. Settings deviate from details on rating plate	Reduce settings	Fitter
	Winding short or phase short in the stator winding	Determine winding resistances and insulation resistances and repair after consulting the manufacturer	Electrician
	Clogged filters, silencer elements or connecting pipes/hoses	Clean filters, silencer elements and connecting pipes/hoses	Service*
	Impeller grinds or rotor is jammed	Open SAMOS SB - IE3/NP, remove foreign objects, clean or replace parts	Service*
SAMOS SB - IE3/NP does not reach the required speed or shows no or too little differential pressure	Incorrect direction of rotation	Check the <i>Direction of Rotation</i> [→ 40]	Electrician
	Fluctuating density of conveyed media	Take into account recalculation of pressure values; consult the manufacturer	Manufacturer
	Leaks in the unit	Seal the unit	Fitter
	Radial shaft seal is defective	Replace the radial shaft seal	Service*
	Change in the blade profile due to contamination	Clean the impeller, check for wear and replace if necessary	Service*
	Clogged filters or silencer elements	Clean filters and silencer elements and replace them, if necessary	Fitter
	Incorrect target speed for the frequency inverter	Correct the target speed	Fitter
	Analogue input on frequency inverter configured incorrectly	Match the setting to the adjacent analogue signal	Operating personnel
SAMOS SB - IE3/NP runs, frequency inverter target values are "0"	Maximum output frequency on frequency inverter is too low	Increase maximum output frequency Do not exceed the maximum speeds given on the rating plate	Operating personnel
	Minimum output frequency <0 Hz set.	No error, as due to the minimum output frequency default, the SAMOS SB - IE3/NP always starts up with a frequency <0 Hz, see <i>Rotational Speeds</i> [→ 46].	--
Abnormal flow noises	Flow rate too high.	Clean pipe/hoses, use pipes/hoses with a larger cross section if necessary	Fitter
	Silencer inserts dirty or faulty	Clean the silencer inserts, check for wear and replace as necessary	Service*

Fault	Cause	Corrective measure	To be carried out by
Abnormal running noises or vibrations that improve after switching off	Electromagnetic cause (e.g. voltage unbalance)	Check electrical supply	Electrician
Abnormal running noises or vibrations that do not improve after switching off	Feet (<i>item 0062</i> [→ 17]) or foot mount loose or defective	Check tightening torques and tighten screws Replace feet or foot mount	Fitter
	Spring elements (<i>item 5210/5212</i> [→ 17]) defective	Replace spring elements	Fitter
	Ball bearing degreased or defective	Relubricate or replace the rolling bearing	Service*
	Other imbalance, e.g. system resonance	Correct the cause of the imbalance	Service*
SAMOS SB - IE3/NP leaks	Screw connections loose	Check tightening torques and tighten screws	Fitter
Other error messages for frequency inverter	See manufacturer's operating instructions for the frequency inverter	See manufacturer's operating instructions for the frequency inverter	Electrician

* To be corrected by maintenance staff if the maintenance manual is available.

Maintenance

Maintenance

For the safe operation of the SAMOS SB - IE3/NP, the following maintenance intervals are recommended. They are dependent on the operating conditions and must be adjusted by the user as necessary.

Maintenance interval	Maintenance measure	To be carried out by
Regularly, depending on the amount of dirt	1. Exterior: Check surfaces and attachments for deposits and clean if necessary (e.g. with compressed air).	Operating personnel
	1. Interior: Check any areas that convey material for deposits and clean or replace if necessary.	Fitter
Annually	1. Check the control for error messages by disconnecting the sensors (e.g. bimetal switch, PTC resistor). Remedy the cause of the error for any malfunctions.	Electrician
20,000 h or 2.5 years Exceptions: 40,000 h or 4.5 years for SB 0530 D0 SB 0530 D2 SB 0710 D0	1. Replace the rolling bearing. 2. Replace the radial shaft seal. Maintenance intervals were established based on <i>reference conditions</i> , see <i>Explanation of the Terms and Symbols</i> [→ 6]. Different ambient and operating conditions can increase (e.g. lack of continuous operation, lower pressure differences) or reduce (e.g. operation with frequency inverter, cover-mounting, rapid accelerations, vibrations, extended storage periods) the values. Detailed statements are only possible when taking the actual ambient and operating conditions into consideration.	Service*

* Maintenance and repair by qualified personnel is possible when the Spare Parts & Accessories Lists (0870145122) is available.

Repairs and Complaints

Please consult the local service department or sales company regarding repairs and complaints before sending them to the manufacturer.

- Busch Produktions GmbH
Schauinslandstrasse 1
79689 Maulburg
Deutschland
Tel.: +49 7622 681-0
E-Mail: quality@busch.de

Ordering Spare Parts

The following information must always be provided when ordering spare parts from the manufacturer, see *Rating Plate* [→ 15]:

- Type, see *Rating Plate* [→ 15]
- Serial number, see *Rating Plate* [→ 15]
- No. and designation from the Spare Parts & Accessories Lists (#0870145122)

11 Decommissioning

11.1 Decommissioning



DANGER

Lethal electric shock from SAMOS SB - IE3/NP with frequency converter!

The frequency inverter continues to be live after the intermediate circuit voltage has been switched off, and slowly becomes de-energized.

1. After switching it off, **wait for** at least 3 minutes.
2. Before opening the frequency inverter, ensure that it is de-energized.

! The SAMOS SB - IE3/NP can remain in the unit or be dismantled for storage.

1. Allow the SAMOS SB - IE3/NP to cool, if necessary.
2. Disconnect the SAMOS SB - IE3/NP from the power supply.
3. Depressurize the pipes.

11.2 Disassembly

1. Disconnect the SAMOS SB - IE3/NP from all electrical connections.
2. Dismantle the piping and hoses.
3. Close connections that are open.
4. Loosen the SAMOS SB - IE3/NP from the installation surface.
5. *Store* [→ 22] or *dispose* [→ 45] of SAMOS SB - IE3/NP.

11.3 Disposal



WARNING

Burns, chemical burns or poisoning!

Risk of injury due to contact with residual hazardous substances in the SAMOS SB - IE3/NP.

1. Decontaminate the SAMOS SB - IE3/NP as instructed by the manufacturer of the hazardous substances.

1. Remove the SAMOS SB - IE3/NP according to the Spares Parts & Accessories Lists (0870145122).
2. Collect solvents, residual lacquer and grease and dispose of them in accordance with the valid local regulations.
3. Dispose of components according to the valid local regulations or recycle them.



12 Technical Data

12.1 Permitted Conditions for Use

Any deviations from the following permissible operating conditions must be agreed with the manufacturer.

12.1.1 Installation Height

The maximum installation height is **1000 m above sea level** (3280 ft) provided no other installation height is specified on the rating plate.

12.1.2 Rotational Speeds

The motor slip is not taken into account when specifying the speeds (min^{-1}).

Maximum speeds for operation with no frequency inverter

For speed, see rating plate (*item 7* [→ 15]).

Maximum speeds for operation with a frequency inverter

Type	Min. [min^{-1}]*	Min. [Hz]*	Max. [min^{-1}]	Max. [Hz]
SB 0140-0710 D0 SB 0140-0530 D2	2200	37	5000	87
SB 1100/1400/2100 D0 SB 1100 D2	2200	37	4200	72

* Standby operation without conveying is permitted at 600 rpm (10 Hz)

12.1.3 Temperatures

Temperature of the conveyed media

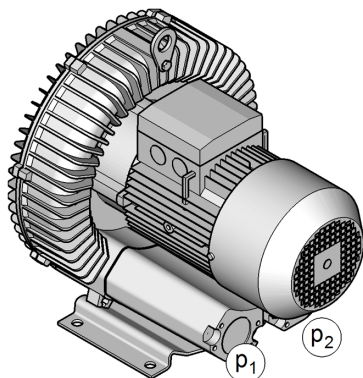
Version	Min. [°C]	Min. [°F]	Max. [°C]	Max. [°F]
Standard	-20	-4	+40	+104
Option up to 45 °C	-20	-4	+45	+113
Option up to 50 °C	-20	-4	+50	+122
Option up to 55 °C	-20	-4	+55	+131
Option up to 60 °C	-20	-4	+60	+140

Ambient temperature

Version	Min. [°C]	Min. [°F]	Max. [°C]	Max. [°F]
Standard	-20	-4	+40	+104
Option up to 45 °C	-20	-4	+45	+113
Option up to 50 °C	-20	-4	+50	+122
Option up to 55 °C	-20	-4	+55	+131
Option up to 60 °C	-20	-4	+60	+140

12.1.4 Pressure Differences

Permitted pressure differences during operation and at a standstill



Maximum compressor operation [mbar]	Maximum vacuum operation [mbar]
p_2 , see <i>Rating Plate Machine</i> [→ 15]	p_1 , see <i>Rating Plate Machine</i> [→ 15]

The pressure differences specified on the rating plate serve as reference conditions and have a tolerance of $\pm 10\%$, see *Explanation of the Terms and Symbols* [→ 6].

Loss of piping must be considered.



NOTE

Mechanical damage or premature failure of SAMOS SB - IE3/NP due to inadmissible pressure loads!

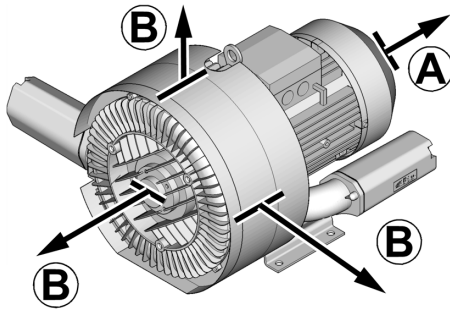
- A long-term, **constant pressure load** at standstill can degrease the rolling bearing.

12.1.5 Relative Humidity

The relative humidity of the environment is permitted up to a maximum of **60 %** at **+40 °C** (+104 °F).

Condensate formation is not permitted in the internal space of the SAMOS SB - IE3/NP.

12.1.6 Minimum Distances for Heat Dissipation

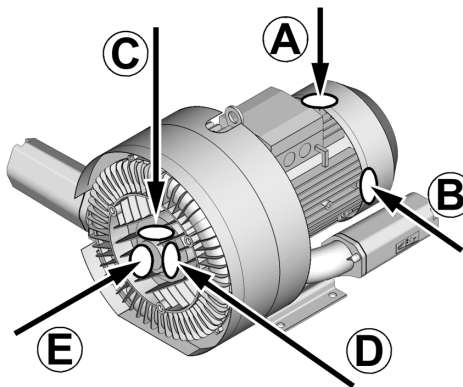


Adhere to the following minimum distances for heat dissipation:

Type	A [mm]	A [in]	B [mm]	B [in]
SB 0140 D0 SB 0140 D2	35	1.38	20	0.79
SB 0200 D0 SB 0200 D2	55	2.17	20	0.79
SB 0310-0430 D0 SB 0310 D2	55	2.17	30	1.18
SB 0530-2100 D0 SB 0530-1100 D2	55	2.17	40	1.57

12.1.7 Speed of Oscillation

Maximum permissible oscillation speed for the assembled SAMOS SB - IE3/NP



Installation	[mm/s]	[in/s]
Rigid (e.g. foundation)	2.8	0.110
Flexible (e.g. spring elements)	4.5	0.177

The oscillation speed must be determined at the following measuring points:

- on the motor side
 - vertically (fan guard screw connection - A)
 - horizontally (fan guard screw connection - B)
- on the compressor part
 - vertically (compressor cover - C)
 - horizontally (compressor cover - D)
 - axially (compressor cover - E)

12.1.8 Accelerations

Maximum permissible acceleration for the constructed machine

0.3 x g

NOTICE! The rolling bearings can be destroyed by excessive alternating stresses.

12.2 Electrical Data

Any deviations from the following electrical data must be agreed with the manufacturer.

The electrical data are provided on the *Rating Plate* [→ 15].

12.2.1 Increased Operating Cycle Frequency

The SAMOS SB - IE3/NP is designed for heavy-duty operation. Consultation with the manufacturer is necessary for increased operating cycle frequency.

12.2.2 Frequency Inverter Parameters

The data for parameterization of the frequency inverter are provided on the *Rating Plate* [→ 15] and in the manufacturer's instructions for the frequency inverter.

12.3 Weight

The maximum possible weight of the largest individual motor are specified. See dimensional drawing for type-specific weights.

Type	Weight [kg]	Weight [lbs]
SB 0140 D0	22	49
SB 0140 D2	36	80
SB 0200 D0	34	75
SB 0200 D2	68	150
SB 0310/0430 D0	55	122
SB 0310 D2	87	192
SB 0530/0710 D0	143	316
SB 0530 D2	208	459
SB 1100/1400 D0	255	563
SB 1100 D2	335	739
SB 2100 D0	363	800

12.4 Acoustic Emissions

Emission sound pressure level L_{pA} according to noise test code ISO 2151 with reference to the basic standard ISO 3744. Measured at a distance of **1 m** [3.28 ft] for 70 % Δp_{max} and connected supply lines, tolerance ± 3 dB(A).

Type	50 Hz [dB(A)]	60 Hz [dB(A)]
SB 0140 D0	63	64
SB 0140 D2	66	69
SB 0200 D0	64	70
SB 0200 D2	72	74
SB 0310 D0	69	72
SB 0310 D2	73	76
SB 0430 D0	69	72
SB 0530 D0	70	74
SB 0530 D2	74	78
SB 0710 D0	70	74
SB 1100 D0	74	79
SB 1100 D2	74	84
SB 1400 D0	75	80
SB 2100 D0	75	84

Sound power level L_w according to noise test code ISO 2151 with reference to the basic standard ISO 3744. Measured at a distance of **1 m** [3.28 ft] for 70 % Δp_{max} with the gas inlet connected and a free-blowing gas outlet, tolerance ± 3 dB(A).

Type	50 Hz [dB(A)]	60 Hz [dB(A)]
SB 1100 D2	--	98
SB 2100 D0	--	99

Notes

Grid of dots for notes.

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