



City of Ketchum | Sun Valley Water and
Sewer District

Ketchum - SVWSD WRF Aeration Upgrades

**Construction Documents
Project Manual – Volume 2**

Issued for Bid

January 10, 2024

HDR Project No. 10360008



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AERZEN HYBRID BLOWER SUBMITTAL

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SCHNEIDER ELECTRIC VARIABLE FREQUENCY DRIVE SUBMITTAL

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APPENDIX A

AERZEN HYBRID BLOWER SUBMITTAL



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AERZEN USA CORPORATION
108 Independence Way * Coatesville, PA 19320
Main Phone: 610-380-0244 * Fax: 610-380-0278

Letter of Transmittal

Company: City of Ketchum 191 Fifth St. W. Ketchum, ID 83340	Transmittal #: SUB-002
	Date: August 28, 2023
Attn: Brad Bjerke / HDR Inc.	PO #: 23103
Subject: Ketchum/SVWSD WRF Equipment Procurement - Blowers	Job #: SO-23-00233

WE ARE SENDNG YOU

Letter Purchase Order Submittal O&M Manual Other
Rev A

DOCUMENT TYPE:
OF COPIES: 1 PDF

TRANSMITTED as checked below:

- For Approval
 For Your Use
 As Requested
 For Record
 Action Specified Below

Remarks: Revised submittal includes responses to submittal review comments of 8/9/23.

Copy To: Trent Donat / Mick Mummert; City of Ketchum
Tom McCurdy, Aerzen USA

PROJECT MANAGER:

Jill Gouert
Tel: 484-889-0241 Cell
Fax: 610-380-0278
Email: jill.gouert@aerzen.com

Signed: *Jill Gouert*



AERZEN

Submittal

Rev A

**Ketchum/SVWSD WRF Equipment
Procurement – Blowers**

Ketchum, ID

Positive Displacement Blowers

Spec Section 43 11 33

Contractor

City of Ketchum
191 Fifth St. W.
Ketchum, ID 83340

Local Representative

Coombs-Hopkins
4380 So. Syracuse Street
Suite 450
Denver, CO 80237
303-477-1970 (tel)
303-477-1981 (fax)

Manufacturer/Service/ Parts

Aerzen USA Corp.
108 Independence Way
Coatesville, PA 19320
800-444-1692 (tel)
610-380-0278 (fax)

www.aerzen.com/en-us



EXHIBIT A

Shop Drawing Transmittal

43 11 33 – 001

Aerzen Blowers

Project Name: Ketchum / SVWSD WRF Equipment Procurement - Blowers		Date Received: 08/03/2023			
Project Owners: City of Ketchum, ID & Sun Valley Water and Sewer District (SVWSD)		Checked By: K. Thomas			
Contractor: Owners		HDR Engineering, Inc.		Log Page: N/A	
Address: 110 River Ranch Road Ketchum, ID 83340		Address: 412 E Parkcenter Blvd Suite 100 Boise, ID 83706		HDR No.: N/A	
				Spec Section: 43 11 33	
				Drawing/Detail No.: N/A	
Attn: Mick Mummert		Attn: Brad Bjerke		1st. Sub <input checked="" type="checkbox"/> ReSub. <input type="checkbox"/>	
Date Transmitted: 08/03/2023		Previous Transmittal Date: N/A			
Item No.	No. Copies	Description	Manufacturer	Mfr/Vendor Dwg or Data No.	Action Taken*
1		Blower	Aerzen		C9
Remarks:					
* The Action designated above is in accordance with the following legend:					

A - Furnish as Submitted

B - Furnish as Noted

C - Revise and Submit

1. Not enough information for review.
2. No reproducibles submitted.
3. Copies illegible.
4. Not enough copies submitted.
5. Wrong sequence number.
6. Wrong resubmittal number.
7. Wrong spec. section.
8. Wrong form used.
9. See comments.

D - Rejected

E - Engineer's review not required

1. Submittal not required.
2. Supplemental Information. Submittal retained for informational purposes only.
3. Information reviewed and approved on prior submittal.
4. See comments.
5. Delegated Design - Submittal received as requested by the Contract Documents. The Engineer did not review the engineering or technical content of the submittal.

Engineer's review and approval is limited to determine whether items covered by this submittal will, after installation or incorporation in the Work, conform in general to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Contractor may not have been reviewed. Review by the Engineer shall not serve to relieve the Contractor of the contractual responsibility for any error or deviation from contract requirements.

Comments: See Review Comments.

		B. Bjerke		08/09/2023	
		By		Date	
Distribution:	Contractor	<input checked="" type="checkbox"/>	File	<input type="checkbox"/>	
	Field	<input type="checkbox"/>	Owner	<input type="checkbox"/>	Other <input type="checkbox"/>

Copyright 1991-2013 HDR Engineering, Inc. - Revised November 2013

Shop Drawing Transmittal No. **43 11 33-001 – Aerzen Blowers**

General Comments:

- 2.2.B.1g: HDR specified an overall differential pressure of 7.5 PSIG, and clarified that 0.6 PSIG of the total differential is on the suction side. It is HDR's understanding that some blower manufacturer casing designs do not necessarily consider this significant vacuum pressure at the inlet. **What is being required here? Does Aerzen need to confirm that the blowers are rated for an inlet vacuum pressure of 0.6 PSIG? Aerzen has thousands of blowers in successful operation with a ducted inlet and external intake filter silencer on the end of the piped inlet.**
- 2.3.A.1: The specification does not intend to have Aerzen supply any control valves external to the blower package. The control valve requirements refer only to valves that may normally be included within a blower package, such as for a blow-off valve. **Noted**
- 2.4.A: Submittal indicates that 2-1/2" discharge pressure gauge (p. 37 of 438), oil pressure gauge (p. 109 of 438), and maintenance indicator (intake filter negative pressure gauge; p. 109 of 438) are needed/included in Aerzen scope for operation of blowers. Please confirm these gauges are provided, as this is the intent of the specification. **As mentioned in the bid comments, Aerzen is providing their standard blower local control panel with standard set of sensors and touchscreen HMI per part 2.4.C, which will display all monitoring parameters and protect the blower package from adverse conditions. Gauges and switches are not provided. Aerzen's blower local control panel will display the discharge pressure, oil pressure and the inlet differential pressure and alert the operator when the inlet differential pressure reaches a certain point and the inlet filter needs to be changed. Gauges can be provided for an added cost but these will ship loose and need to be installed by others in the field, as Aerzen cannot provide the local control panel with touchscreen HMI/transmitters and gauges on the package.**
The O&M is a generic O&M and does not necessarily reflect what Aerzen is providing. The BOM on page 9 should be referenced for Aerzen is providing.
- 2.5.A.3.h.2: Section does not require US P.E. to seal factory test reports. Aerzen may provide reports with German equivalent to a United States P.E. seal as noted in specification.
Aerzen Germany can provide test reports signed by their ISO certified test bay technician but cannot provide German PE sealed test reports.
- 00 41 13: VFDs will be provided by others. Motor provided by Aerzen shall be rated for VFD applications. **Confirm**
- All other clarifications/exceptions are acceptable. **Noted**

Specific Comments:

Action:

- **Item 1 – Blowers: C9 – Revise and Resubmit.**
 - Blower must include flanged inlet connection as specified in 43 11 33 2.2.B.j. Aerzen may propose alternate inlet size as needed. **Inlet connections will be provided. See Sections 1 and 3 for revised inlet information.**
 - Please confirm AERtronics Local Control Panel (LCP) is included in scope of supply. LCP is required per 43 11 33 2.4.C. **Confirm**

- Submittal scope of supply under standard options indicates AERtronics LCP is included on page 37 of 438, but bill of materials on page 9 of 438 indicates the AERtronics LCP is not included. **Refer to Item #100 and #290 for the AERtronic on Bill of Materials.**



Compressed air, gas
and vacuum solutions

Aerzen USA
108 Independence Way
Coatesville, PA 19320 USA

Telephone: (610) 380-0244
Fax: (610) 380-0278
www.aerzen.com

August 2, 2023

City of Ketchum
191 Fifth St. W.
Ketchum, ID 83340

RE: City of Ketchum and Sun Valley Water and Sewer District
Ketchum / SVWSD WRF Equipment Procurement – Blowers
HDR Project No. 10360008

Clarifications and Exceptions to Specifications Section 43 11 33 Rotary Lobe Blowers

- 1.4.A.2.o Aerzen is providing their standard set of sensors. An ammeter is not included.
- 1.4.B.3.a.3 Aerzen does not provide project specific dynamic balancing reports.
- 1.4.D.1.a&d Aerzen is not providing spare bearings, seals, O-rings or gaskets for the blower and motor. Replacing these components requires the blower to be sent to the factory for an overhaul by an Aerzen technician. Replacement components for the motor are stocked by any local motor supply house.
- 2.2.A.6 At the design point, Aerzen's blower will operate at 98% of max which is well within the blower's safe operating limit. At this speed, the blower's theoretical bearing life is 619,000 hrs which far exceeds the bearing life of 100,000 hrs required by part 2.3.C.7.e.
- 2.2.B.1.d At the design conditions, the blower's discharge temperature is 208 F at the design flow rate and at the minimum turndown the blower's discharge temperature is 216 F. This discharge temperature will be comparable to other equal blower packages provided a competing manufacturer.
- 2.2.B.1.g It is Aerzen's interpretation of the spec that the blowers should be sized using a barometric pressure at 5,730 ft. Aerzen's blower sizing program takes into account all losses throughout the pressure. Therefore, Aerzen has not taken into account the max inlet pressure loss of 0.6 PSIG.
- 2.3.A.1 It is not clear what the intent of the control valves is or what exactly is required. Therefore, Aerzen has not included these in the scope/pricing.
- 2.3.F.1 Aerzen is guaranteeing a free field sound level of 76 dBA per ISO-2151 empirical data. Installed sound levels cannot be guaranteed as there are factors outside of the blower manufacturer's scope that can adversely affect the installed sound levels (i.e. other machinery running, external piping configuration, facility layout...etc.).



2.3.H.3.c Sound enclosures are not electrical enclosures and cannot be NEMA rated.

2.4.A Aerzen is providing their standard blower local control panel with standard set of sensors and touchscreen HMI per part 2.4.C, which will display all monitoring parameters and protect the blower package from adverse conditions. Gauges and switches are not provided.

2.5 A 1. All components are tested individually at the time of manufacture. The completed package is going to go through shipment and alignment check in the field before startup. The package will be run tested during startup onsite in lieu of a factory test. Aerzen will provide ISO-1217 testing of each blower stage to verify flow and brake horsepower at blower maximum conditions. A slip test shall not be acceptable.

2.5.A.3 Aerzen is providing ISO-1217, Annex B testing to verify flow and power consumption of the blower stage. This test does not record vibration or bearing temperature.

2.5.A.3.h.2 The ISO-1217 test is performed at Aerzen Germany and cannot be certified by a U.S. PE.

3.2.A.3 Aerzen will provide their standard field testing to verify that the blower is operating safely within its limits.

3.2.A.4 Aerzen will provide their standard field vibration testing to verify that the blower is operating within its allowable vibration tolerance of 0.3 IPS RMS. Anything beyond Aerzen's standard field vibration testing shall be by the contractor.

3.2.A.5 See part 2.3.F.1 comment pertaining to installed sound levels.

Section 00 41 13

Aerzen is providing their standard spring relief valve. A weighted relief valve is not included.

It is Aerzen's interpretation of the spec that the VFD is by others per Section 43 11 33; 1.1.B.



AERZEN

Aerzen USA Project:
SO-23-00233

Customer:
City of Ketchum

Purchase Order:
23103

Project Name:
Ketchum/SVWSD WRF
Equipment Procurement -
Blowers

SECTION 1

**Aerzen Blower Model 98S
Performance Data
Scope of Supply
General Arrangement Drawing
Performance Curves**

SECTION 2

Hybrid Blower Literature

SECTION 3

Hybrid Blower Package Accessories

SECTION 4

Hybrid Blower Controls

SECTION 5

**Motor Spec
Motor Data**

SECTION 6

Corrosion Protection/Paint Spec

SECTION 7

Startup Report

SECTION 1

**Aerzen USA Corporation**

108 Independence Way – Coatesville, PA 19320
 Tel: (610) 380-0244 Fax: (610) 380-0278
 Service Hotline (800) 444-1692
 e-mail: Aerzen@AerzenUSA.com website www.aerzenusa.com

Job Specific Data Package

DATE	Aerzen Job #	Page
28-Jul-23	SO-23-00233	1 of 3
Revision Letter		A

CUSTOMER INFORMATION

CUSTOMER	City of Ketchum
CUSTOMER PO #	23103
PROJECT NAME	Ketchum/SVWSD WRF Equipment Procurement - Blowers.

PACKAGE DESCRIPTION

EQUIPMENT IDENTIFICATION	-		SERIAL NUMBERS
BLOWER MODEL #	D 98 S	QTY. (2)	
PACKAGE DESCRIPTION	Pressure Unit w/ Enclosure		
DISCHARGE CONNECTION TYPE	150# ANSI Discharge Connection		
INLET CONNECTION TYPE	150# ANSI Inlet Connection		
MOTOR CONDUIT LOCATION	F3 Conduit Box		
TOTAL PACKAGE WEIGHT	6477 lbs		

DOCUMENTATION

GENERAL ARRANGEMENT DRAWING	GB-007162-P2432000
MOTOR CABLE ROUTING	IA-004545
OPERATIONS & MAINTENANCE MANUAL	G4-007
WARRANTY TERMS & CONDITIONS	A2-001-USA

PERFORMANCE DATA

MEDIUM		Design	Min
INLET CAPACITY	<i>ICFM</i>	3380	959
INLET CAPACITY	<i>SCFM</i>	2500	710
INLET PRESSURE	<i>PSIA</i>	11.9	12
DISCHARGE PRESSURE	<i>PSI</i>	7.5	8
INLET TEMPERATURE	<i>°F</i>	90	90
DISCHARGE TEMPERATURE	<i>°F</i>	208	216
NOMINAL BLOWER SPEED	<i>RPM</i>	6499	2300
POWER @ BLOWER SHAFT	<i>BHP</i>	127	37
MOTOR RATING	<i>HP</i>	150	
MOTOR SPEED	<i>RPM</i>	3570	1263
SOUND PRESSURE LEVEL *	<i>dB(A)</i>	76	
MOTOR/VFD SPEED	<i>Hz</i>	60	21

* measured in free field at 3 foot distance from the outline of the unit (tol. +/- 2 dB(A))

Tolerance on Power & Flow is +/- 5%



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DATE	Aerzen Job #	Page
28-Jul-23	SO-23-00233	2 of 3
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CRITICAL INFORMATION / NOTES

- PRIOR TO SHIPMENT - AERZEN DOES THE FOLLOWING**
Removes V-Belts from the motor sheave and wraps them around the blower sheave
Locks the motor hinge plate
Fills both bearing compartments with Delta - Lube 06
- LIFTING PACKAGE**
Without Sound Enclosure: lifting eye holes in the corner of the base frame
With Sound Enclosure: lifting through slots in base with fork lift
- READ OPERATION MANUAL FOR INSTALLATION INSTRUCTIONS**
Call Aerzen After-Sales / Service if you have any questions
- AT COMMISSIONING - CUSTOMER / CONTRACTOR IS TO**
Check oil level (refer to operations manual) - and adjust if necessary
Anchor the base or sound enclosure
Make grounding connections
Connect motor cable per Aerzen Drawing IA-004545
Verify correct rotation of motor (counter-clockwise, looking at drive shaft)
Remove locking device from motor pivot plate
Reinstall V-belts
- ALL CUSTOMER PIPING TO BE INDEPENDENTLY SUPPORTED**
- Recommended MINIMUM clearance at front and rear of package for "normal"**
(i.e. inspect machine, change oil, replace belts, etc.) maintenance is 30 inches.



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Job Specific Data Package

Date	Aerzen Job #	Page
28-Jul-23	SO-23-00233	3 of 3
Revision Letter		A

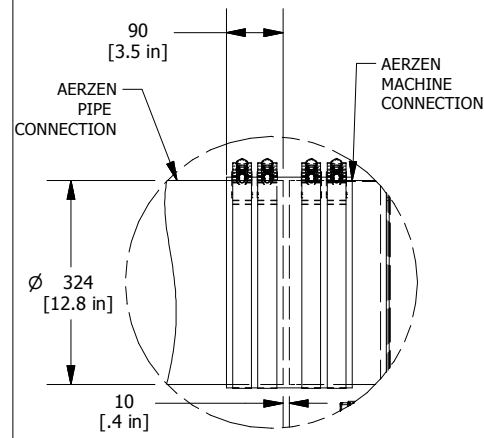
BILL OF MATERIAL

ITEM #	QTY	DESCRIPTION	PART #
1	1	Delta Hybrid Stage	D 98 S
2	1	Electric Motor Motor 150 HP, 2-pole, NEMA, TEFC, 460 V / 60 Hz, NEMA Premium Efficiency, 445TS NEMA Frame, T-Stats, Insulated Bearings, AEGIS Ring, Motor Routine Testing	WEG
3	1	Combination Base Frame / Silencer DN-250	183285
4	1	Sound Enclosure (S.E.) w/ AERtronic	180300
5	1	Inlet Filter / Silencer Assembly	186326
10	1	Filter Element	* 185404000
20	4	Drive Belts	* 2000054434
30	1	One-way Valve EPDM Flap	** 168705
40	1	Expansion Joint - Discharge 10" 150# ANSI Flange	** 21-003168-10X10EG
50	2	Clamps for Discharge Connection for Rubber Exp. Joint	21-000910_290-305
60	1	Stub Pipe - Inlet 8" 150# ANSI Flange	21-004460-12
70	1	Flexible Connector - Inlet for 12" sch. 40 pipe	** 159135
80	4	Clamps for Intake connection for Sleeve	160404
90	1	Safety Relief Valve set @ 750 mbar	** 171107
100	-	Instrumentation	AERtronic
	1	Inlet Pressure Transducer limit setpoint - 20 "H2O	184639
	1	Discharge Pressure Transducer limit setpoint - 9 PSI	179703
140	-	Unloading Valve (optional)	Not Installed
150	1	S.E. - Ventilation Fan Electric Fan	185991
170	1	Motor Sheave Bushing	165692
180	1	Motor Sheave 355 mm	163818
200	1	Blower Sheave 195 mm	183257
250	4	Vibration Isolators	184821
260	1	Safety Relief Valve Hose	166640
290	1	Electrical Panel Wiring Diagram No.	IB-008291-N11
	1	Oil Drain Valve (in service kit)	159298
	1	Oil Drain Hose (in service kit)	159665
	1	Oil Filter Replace after 1st 500 hrs.	* 162539
	1	Oil Demister 2-5 year service item	** 181608
<u>PROVIDED SPARE PARTS</u>			
	1	Set of V-Belts	2000054434
	1	Inlet Filter Element	185404000
	2	Oil Filter	162539
	1	Sheave Set	Aerzen
	4	Touch Up Paint	21-000632
<u>ONSITE SERVICES</u>			
		1 trip(s), 2 day(s) total installation, startup, & training	

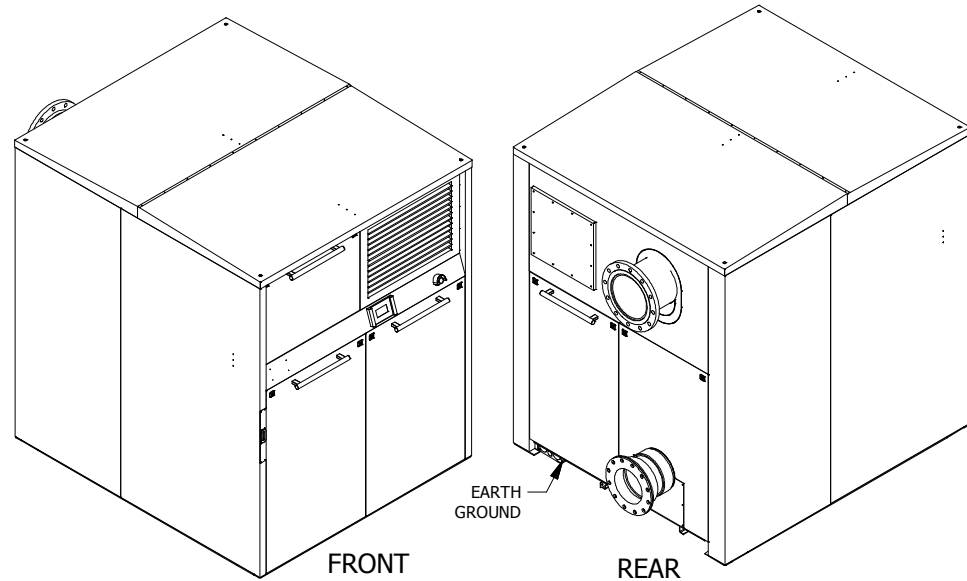
RECOMMENDED SPARE PARTS

- * on hand items
- ** 2-5 year recommended items

NOTE(S): Always reference the blower s/n & the Aerzen Job # (if known) when ordering spare parts

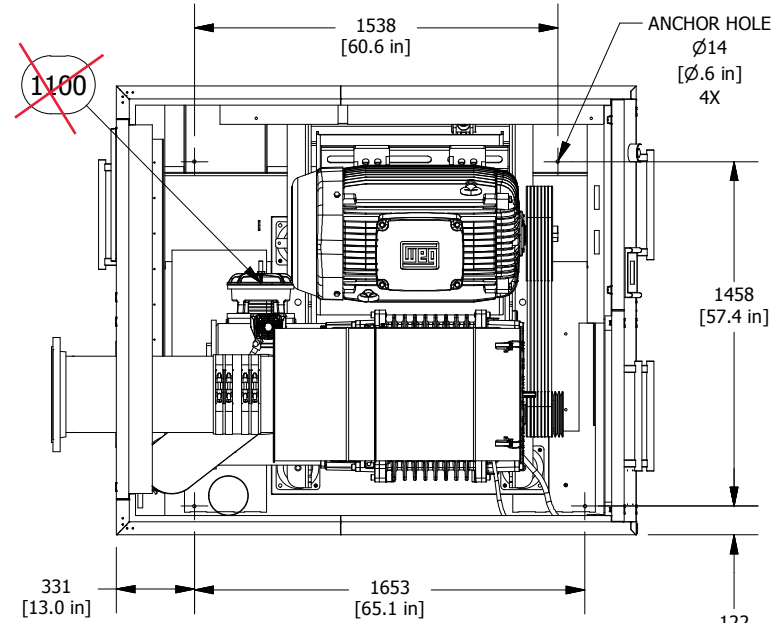


DETAIL A
SLEEVE CONNECTION
STUB PIPE ENGAGEMENT
LEAVES 10 [0.4"] GAP
SCALE 1:12



FRONT

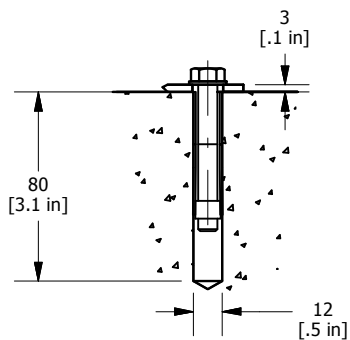
REAR



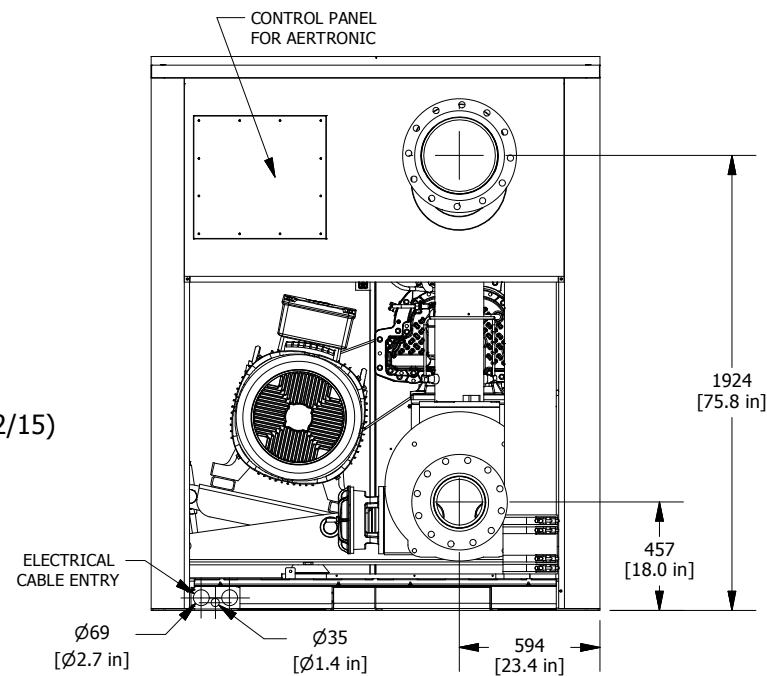
PLAN VIEW

SHOWN WITHOUT ROOF FOR CLARITY

ITEM	QTY	DESCRIPTION	DESCRIPTION 2
100	1	HYBRID TORSO	D98S, DN250
110	1	PRESSURE RELIEF VALVE	
200	1	SOUND ENCLOSURE	
300	1	ELECTRIC MOTOR	
310	1	MOTOR MOUNTING	
320	1	BELT DRIVE	
400	1	BELT GUARD	
600	1	DISCHARGE CONNECTION	10", 150#, ANSI FLANGE
700	1	INLET CONNECTION	12", 150#, ANSI FLANGE
800	1	INSTRUMENTATION	AERTRONIC
1100	1	UNLOADING VALVE	OPTIONAL

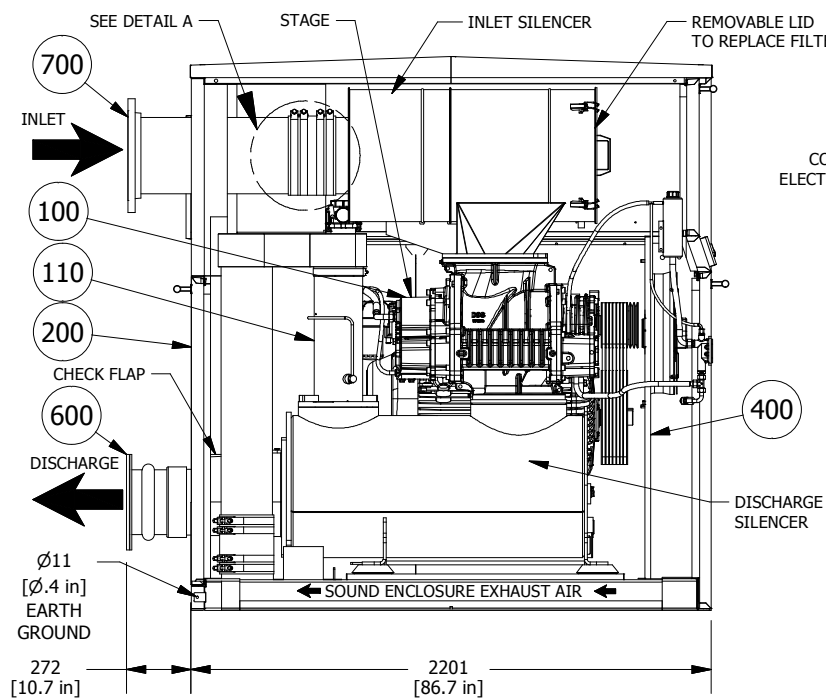


SOUND ENCLOSURE ANCHOR
RECOMMENDATION
SHOWN WITH OPTIONAL ANCHOR
AERZEN PART NO. 120813000 (LIEBIG AB12/15)



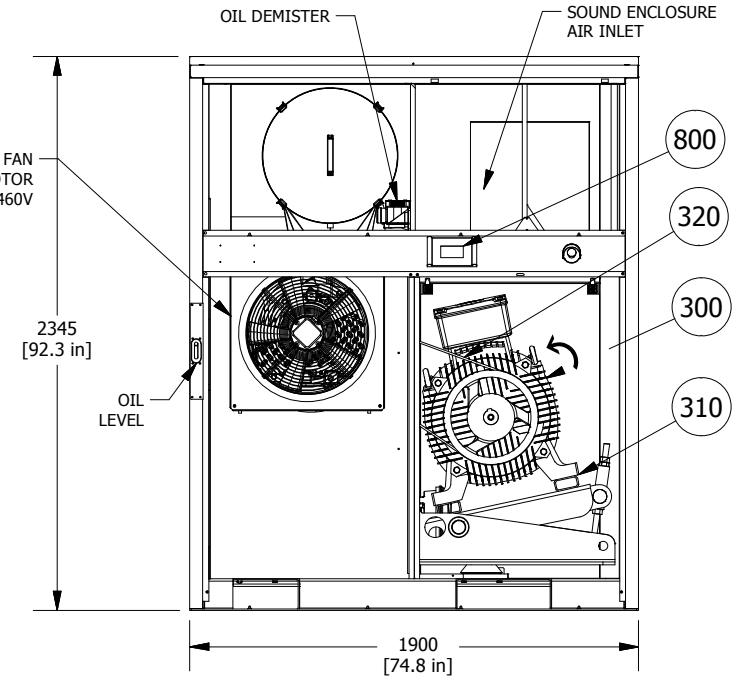
REAR VIEW

SHOWN WITHOUT REMOVABLE PANELS FOR CLARITY



SIDE VIEW

SHOWN WITHOUT SIDE WALL FOR CLARITY



FRONT VIEW

SHOWN WITHOUT REMOVABLE PANELS FOR CLARITY

NOTES:

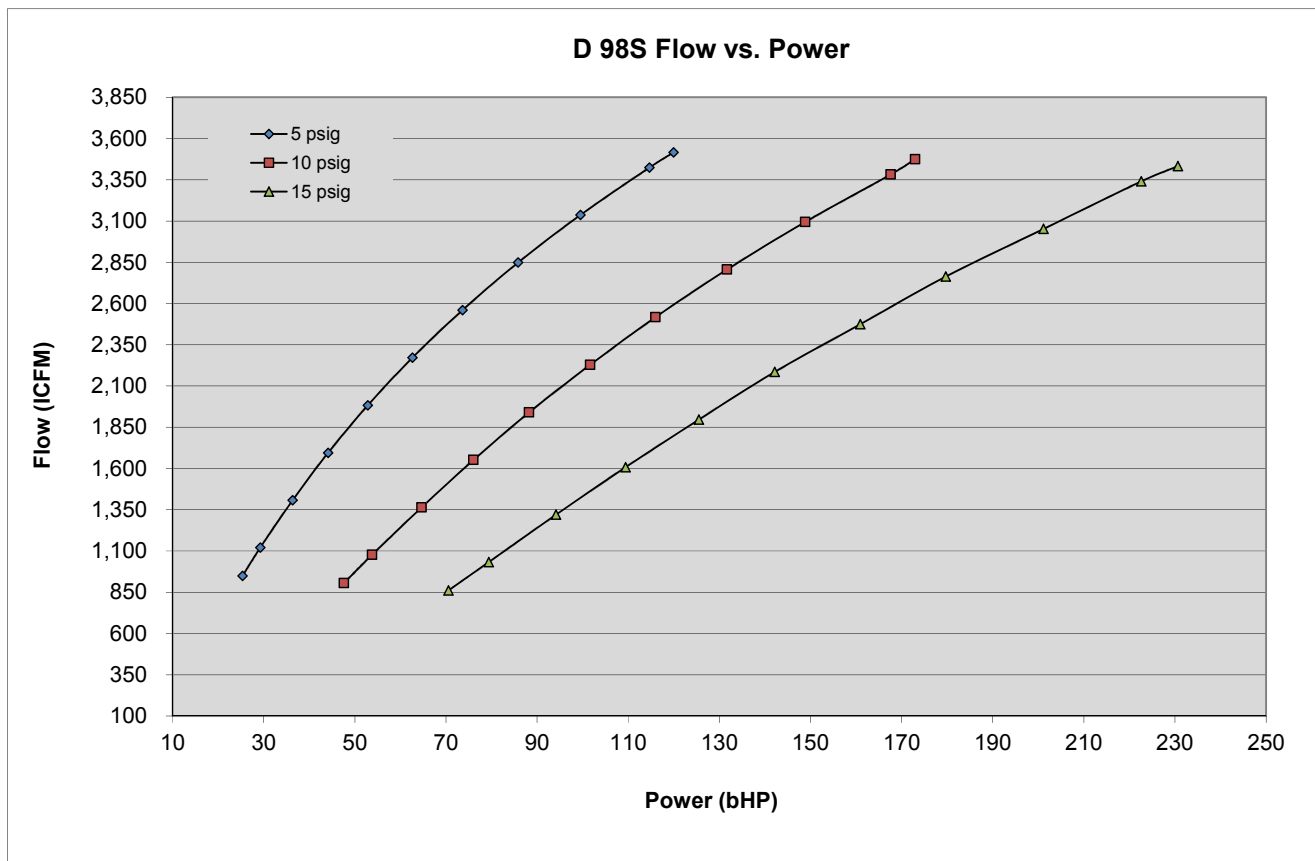
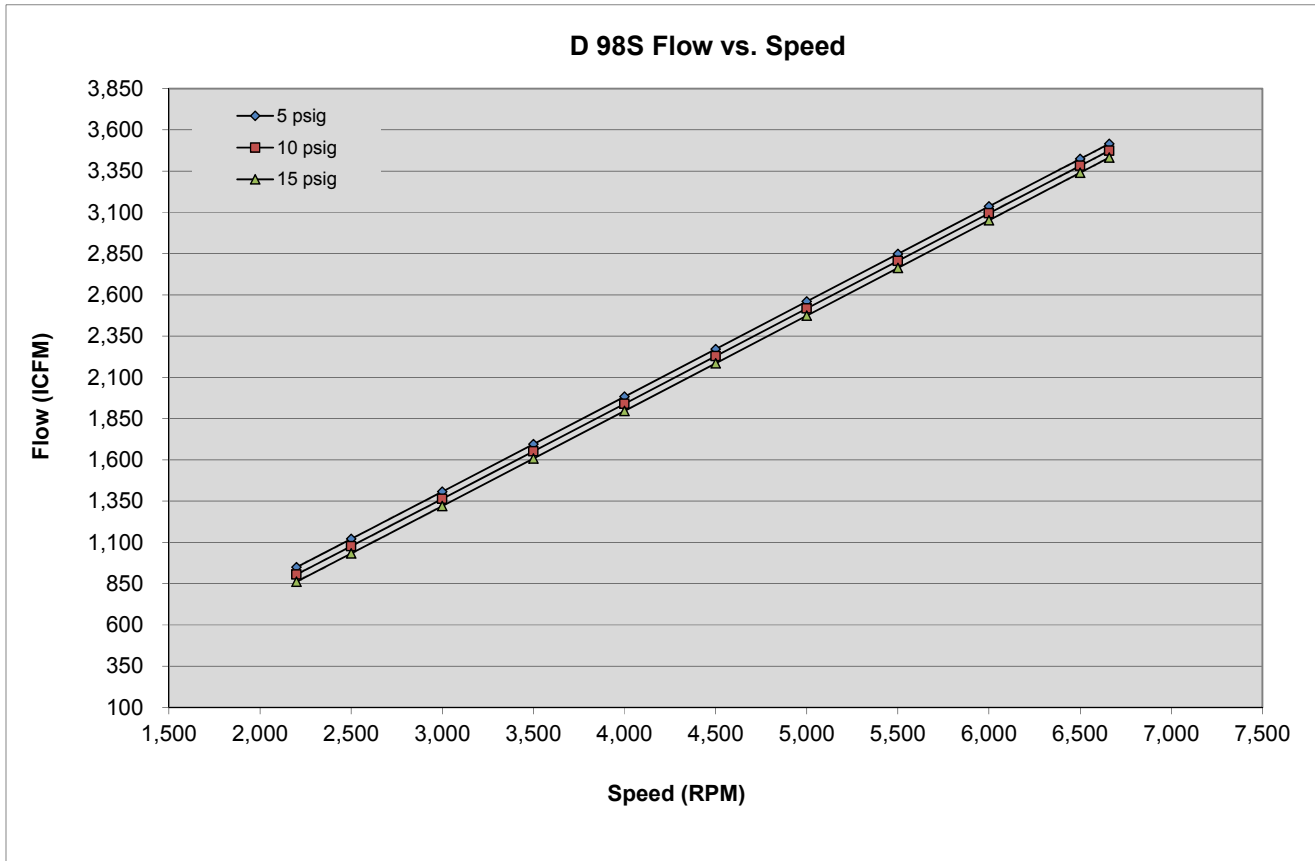
1. TOLERANCE ON ALL DIMENSIONS = ±12mm [0.5"]
2. ITEM 100 (HYBRID TORSO) INCLUDES BLOWER STAGE, INLET SILENCER, BASE FRAME/ DISCHARGE SILENCER, VIBRATION ISOLATORS, COOLING FAN, & CONNECTION HOUSING WITH CHECK FLAP
3. CUSTOMER PIPING TO BE INDEPENDENTLY SUPPORTED
4. LIFT PACKAGE FROM BLOWER SIDE THROUGH FORK LIFT POCKETS IN BASE OR LIFTING HOLES IN CORNER OF BASE USING SPREADER BAR
5. SEE JOB DATA SHEETS FOR PERFORMANCE DATA, PART NUMBERS, TOTAL PACKAGE WEIGHT, INSTRUMENTATION, AND OTHER OPTIONAL EQUIPMENT, & OWNER'S MANUAL
6. REQUIRED SPACE IN FRONT & REAR FOR MAINTENANCE IS 800mm [32"]
7. DISCHARGE FLANGE MUST BE MOUNTED TO A RIGID FLANGE FACE

WEIGHT		
BLOWER PACKAGE (LESS MOTOR)	2099kg	4702lbs
ELECTRIC MOTOR (ITEM 300)		1775 lbs
TOTAL (NET WEIGHT)		6477 lbs

		AERZEN USA CORPORATION 108 INDEPENDENCE WAY, COATESVILLE, PA. PH: (610) 380-0244 FX: (610) 380-0278 WWW.AERZENUSA.COM		CLASS: I 	
		TITLE: GA DRAWING D98S, DN250, G5 F3 SOUND ENCL. PRESSURE		SCALE: 1:24 SHEET: 1 / 1 REV NAME DATE A JRH 12/2/2019	
DRAWN: DFT 4/14/2019 CHECKED: RJP 4/14/2019 APPROVED: DRAWING NO: GB-007162-P2432000 <small>NAVISION PPR</small>	NAME: DFT DATE: 4/14/2019	NAME: RJP DATE: 4/14/2019			
<small>NOTICE: THIS DRAWING AND ALL INFORMATION HEREIN IS THE PROPERTY OF AERZEN USA INC. AND ITS SUBSIDIARIES AND SHALL NOT BE REPRODUCED BY ANY MEANS IN WHOLE OR IN PART USED AS THE BASIS FOR MANUFACTURE WITHOUT WRITTEN PERMISSION</small>					

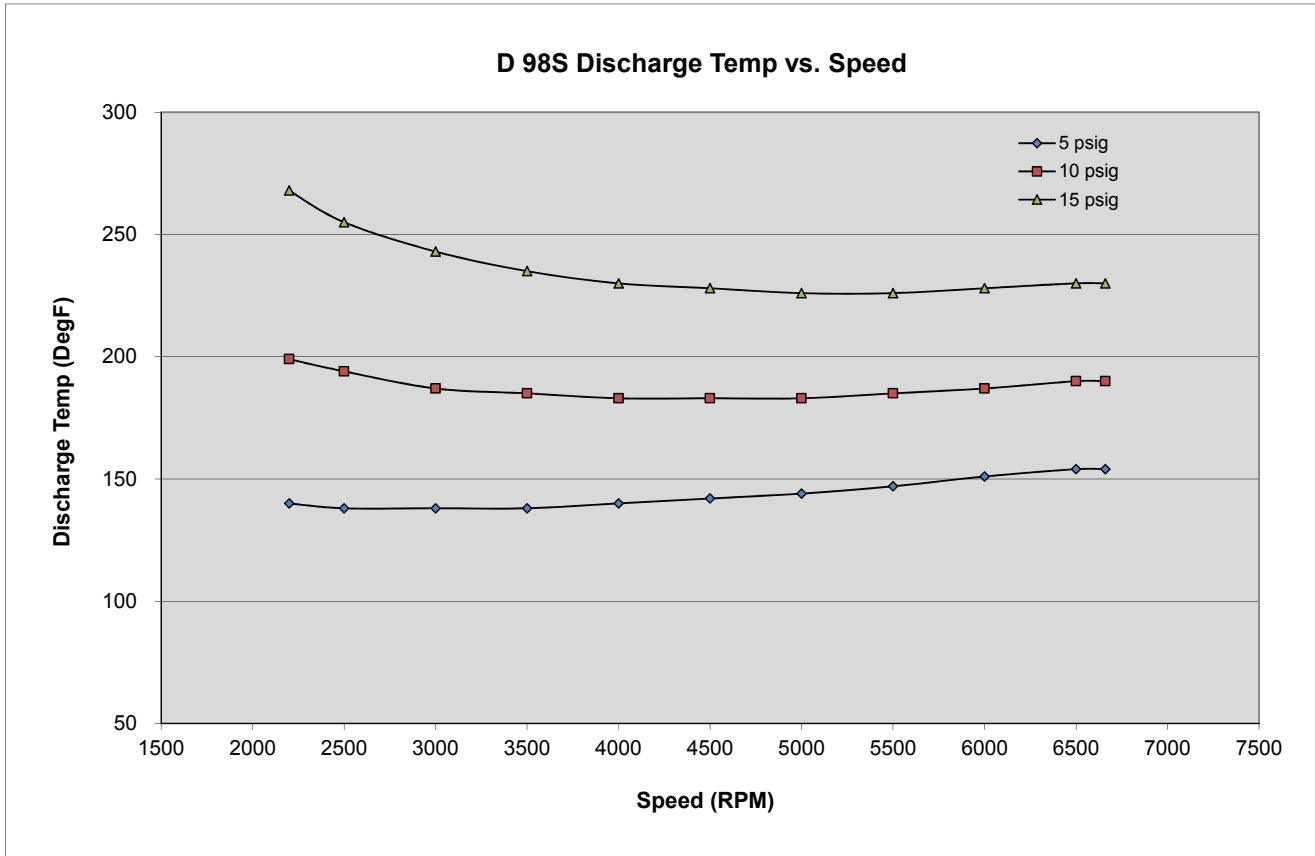
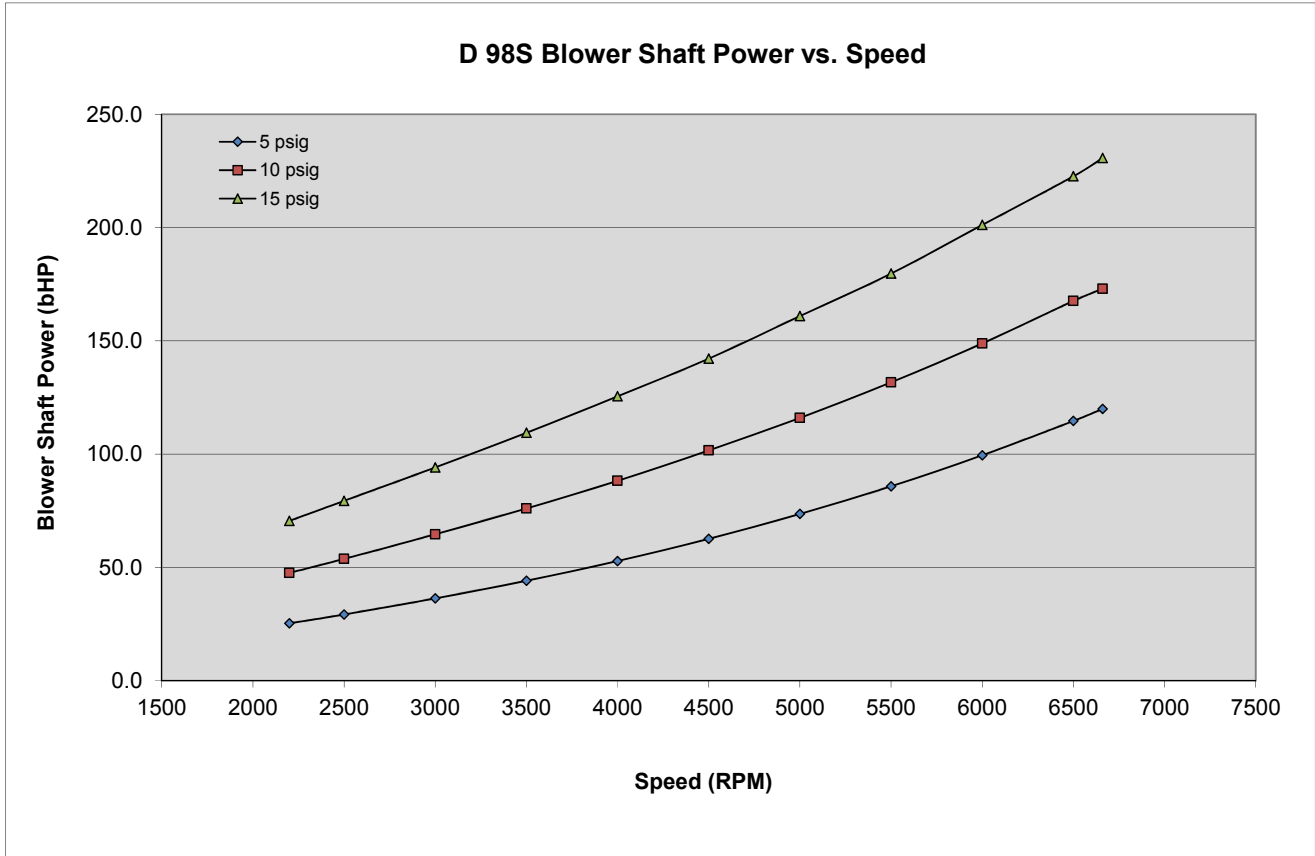
Standard (ASME) Inlet Conditions:
T1 = 68F
P1 = 14.696 PSIA
RH = 36%

Aerzen D 98S Performance Curves Standard ASME Conditions



Standard (ASME) Inlet Conditions:
T1 = 68F
P1 = 14.696 PSIA
RH = 36%

Aerzen D 98S
Performance Curves
Standard ASME Conditions





EC Declaration of Conformity

according to the Machinery Directive 2006/42/EC, Annex II, No.1 A

Company Name : Aerzener Maschinenfabrik GmbH
Reherweg 28
31855 Aerzen
Germany

Product Details :

The Declaration of Conformity for this piston engine is supplemented by the technical details in the chapter entitled "Performance Data".
The details provided therein identify the product and must be applied together with this Declaration of Conformity.

Appointed agent for the
compilation

of the technical documentation : Mr. Irtel, Managing Director
Aerzener Maschinenfabrik GmbH
Reherweg 28
31855 Aerzen
Germany

We hereby declare that the aforementioned product complies with all relevant provisions of Machinery Directive 2006/42/EC for the conveyance and compression of gaseous media.

The aforementioned product also fulfils all provisions of the following relevant EC-directives:

- EMC / Electromagnetic Compatibility 2004/108/EC
 - Pressure Equipment Directive 97/23/EC
 - The protection targets of the Low Voltage Directive 2006/95/EC
- have been fulfilled in accordance with Annex I, No. 1.5.1 of the Machinery Directive.

The following harmonised standards were applied:

- DIN EN ISO 12100 03-2011 Safety of Machines - General Design Principles
Risk Assessment and Risk Reduction
- DIN EN 1012-1 02-2011 Compressors and Vacuum Pumps - Safety Requirements
- Part 1: Compressors

This Declaration of Conformity applies to the product in its original state as placed on the market by the manufacturer. Any retrospective changes and/or retrospective work undertaken shall void this Declaration of Conformity.

Aerzen, 09-01-2012
Place, Date of issue

Mr. Björn Irtel, Managing Director-
Details of the Undersigned

SAMPLE - FOR REFERENCE ONLY

Aerzen USA Corporation

108 Independence Way
 Coatesville, PA 19320
 (610) 380-0244 ph
 (610) 380-0244 fax



Aerzener Maschinenfabrik GmbH

Since 1864
 Reherweg 28 - D31855 Aerzen
 Telefon: 0 51 54 / 810
 Telefax: 0 51 54 / 811 91

Certified Test Report

evaluated date: 28-Nov-18
 evaluated by: Rzepka
 certified by: Abney

Customer Wharton-Smith
Customer PO# 218005-011

Aerzen reference # SO-18-01034

Performance & Order Data

Blower Model D62S

Serial # 1608294

- 1) Inlet flow Q₁
- 2) differential pressure Δp
- 3) Shaft Power kW
- 4) Blower Speed rpm

Metric units

57.21 m³/min
 783 mbar
 77.63 kW
 7664 rpm

US units

2020.52 lcfm
 11.4 psig.
 104.20 Bhp
 7664 rpm

Test Result

5) Volumetric Efficiency	η _{vol, um}
6) Actual Slip	V _{verl, um}
7) Theoretical Volume	V _{0, um}
8) Actual Volume	V _{1, um}
9) Flow Variance	V _{t, um}
10) Actual Power	P _{KU, um}
11) Power Variance	P _{KU, um}

Metric units	
91%	
5.34	m ³ /min
62.08	m ³ /min
56.77	m ³ /min
-0.77%	
77.70	kW
0.09%	

US units	
91%	
188.61	cfm
2,192.28	cfm
2,004.67	cfm
-0.77%	
104.19	Bhp
0.09%	

Explanation and Summary

Lines 1), 2), 3), 4) above show required performance data (what was ordered).
 Lines 5) through 11) show data that resulted from the performance test on the actual blower.
 Line 9) shows a variance of 0.77% in the flow capacity of this unit.
 Line 11) shows a variance of 0.09% in the power consumption of this unit.

Standard accepted tolerance is +/- 5%. The unit would be acceptable if the flow was no more than 5% below the expected flow and the power was no more than 5% of expected power.

For this specific case the flow is -0.77% **less than expected.**
 For this specific case the power is 0.09% **more than expected.**

Serial number 1608294

Model number D62S

meets and exceeds the standard tolerance.



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Test Report AMUSA based on AMD Report

DATE	Document #
5-Sep-19	B-6-0202 rev "F"

Blower Test Report will be provided to the engineer after blower stage has been provided to Aerzen USA and prior to shipment to client.

SECTION 2

ROTARY LOBE COMPRESSORS

DELTA HYBRID

Volume flows from 65 CFM to 5,300 CFM



AERZEN

DELTA HYBRID.

EFFICIENCY AS A COMPRESSION PRINCIPLE.

- Exceptional energy efficiency
- Reduced life cycle costs
- Significantly extended application and pressure ranges
- High reliability and durability
- Reduced maintenance effort
- 100% oil and absorption material free process air
- Made by AERZEN

The best of both worlds.

The compression of air and gases is energy-intensive. As a result, the call for energy-efficient technologies is greatly increasing. It is understandable that the call for energy-efficient technologies is becoming increasingly clear. The answer is Delta Hybrid. The latest generation of assemblies from AERZEN brings a new principle into compression technology. Delta Hybrid was the first series of rotary lobe

compressors worldwide and it combines the advantages of blower and compressor technology into one system. The result offers new possibilities in the generation of negative and positive pressure. With 7 patents or patent applications, Delta Hybrid is one of the most innovative solutions in compressor technology and by far the most efficient assembly for a wide control range from 25 to 100 percent.



SAVE ENERGY. THE BEST FOR THE CORPORATE AND ECOLOGICAL BALANCE SHEET.

Around 90% of the life cycle costs of a compressor are energy costs. This is a number that becomes a challenge wherever environmental concerns and global competition drive the need for more energy efficient technologies. Aerzen meets this challenge with the Delta Hybrid by offering up to 25% energy savings with a return on investment of as little as two years, depending on flows and pressures.

Two technologies. One assembly.

Delta Hybrid is the perfect synthesis of positive displacement blower and screw compressor technology. Unlike the conventional positive displacement blower with a maximum

pressure differential of 14.5 psig, the innovative rotary lobe compressor of the Delta Hybrid uses a 3+4 compressor rotor profile which is designed for pressure up to 22 psig.



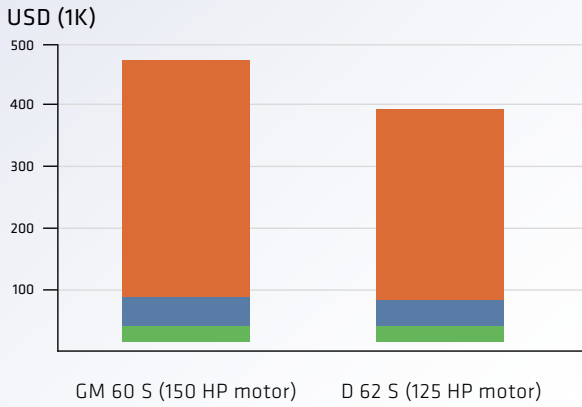
Energy saving arises from many details:

- Very high operating range from 25% to 100%
- Patented suction cone for reduced pressure losses
- Optimized air flow through the acoustic hood leads to cooler intake air into the blower stage, increasing the compression efficiency
- Improved inlet and outlet openings in the blower stage ensures ideal air flow and reduces backflow losses
- Patented discharge silencer reduces pressure losses and contains no absorption material
- Electrically driven acoustic hood fan
- Special silencer insulation for pressures above 15 psig reduce the heat inside the acoustic hood which increases compression efficiency.
- Premium efficiency/NEMA motors
- Similar performance to a turbo compressor even with varying pressures and temperatures (summer/winter operation)
- Belt drive for precise volume flow design

Just clever:

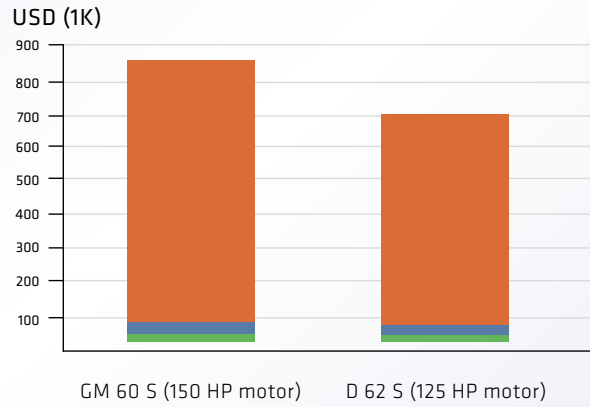
The belt-driven version of the Delta Hybrid has the significant advantage of being designed with pinpoint accuracy, because the greatest savings are made by the energy that does not have to be expended in the first place. For example, a deviation in the volume flow of 5% means an increased energy expenditure of 5%!

LCC comparison GM 60 S and D 62 S for 5-year operation



Operating data: 1,835 cfm, 13 psig, 8000 operating hours/year

LCC comparison GM 60 S and D 62 S for 10-year operation

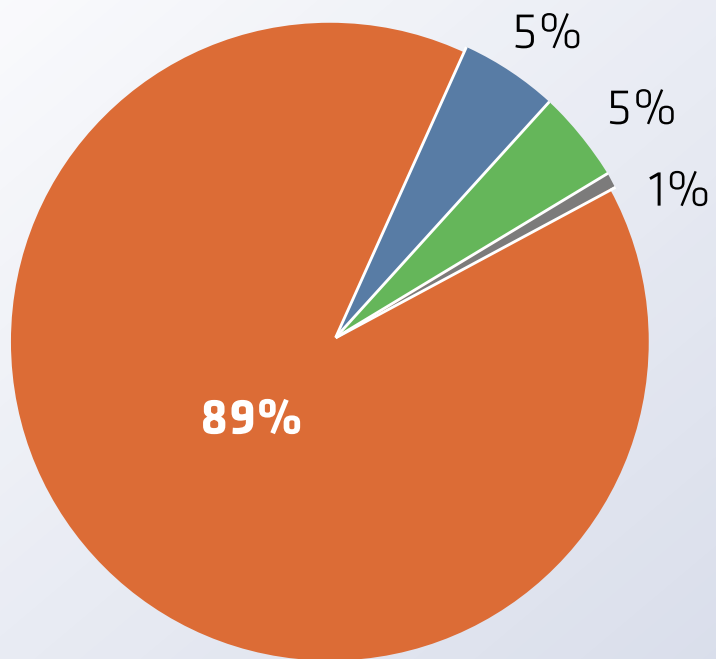


Operating data: 1,835 cfm, 13 psig, 8000 operating hours/year
Savings of around 150K USD; ROI = 2 years

Reduction of Life-Cycle-Costs

Average operating costs of a compressed air generator over 10 years

- Energy
- Investment
- Maintenance
- Installation



EXTEND THE RANGE OF APPLICATION. USE IN A VARIETY OF APPLICATIONS.

Delta Hybrid works in an extremely wide range of key industrial applications. The assemblies are designed for the oil-free conveyance of air and neutral gases. For positive and negative pressure applications with discharge connections ranging from 4" to 12".

Extended pressure ranges. Rising possibilities.

The versatile assemblies extend the range of applications to a pressure range of up to 22 psi (design H). The field of application could also be extended in the negative pressure: From previously -7.25 to -10 psi (design E). Delta Hybrid thus closes the gap in the previous machine mix. Note: Because conventional rotary piston blowers are limited to a maximum pressure difference of 14.5 psi due to their design principle, other types of compressors had to be used for higher pressure ranges in the past. However, some of these were designed for significantly higher pressures and thus also involved higher investment costs.

Hotter Temperatures. More safety.

Delta Hybrid rotary lobe compressors can be used globally even in high elevations and for applications with extreme ambient temperatures.

AERZEN Engineering.

A flexible modular system for Delta Hybrid allows for a variety of compressor stages and motor sizes with belt drives built or adapted within a variety of base frame sizes. Where a standard solution does not meet the customer's needs, AERZEN can develop special designs or machine configurations to meet those needs. AERZEN always has an eye on making the process performance as efficient and effective as possible.



Ideal for pneumatic conveying



Powerful tool in the vacuum generation





Applications

- Wastewater treatment
- Drinking water treatment
- Pneumatic conveying of bulk materials (suction/pressure pneumatics)
- Aeration of rivers and lakes and much more

industries

- Wastewater treatment plants
- Chemistry and process engineering
- Glass and paper
- Food
- Environmental technology and much more

DECADES OF USE COMPRESSED IN ONE SENTENCE: MADE BY AERZEN.

High operational reliability and long service life of the compressors have established the reputation of AERZEN worldwide. Without question, these criteria also apply to our latest series Delta Hybrid. Developed in demanding field tests and proven for years in daily practice, Delta Hybrid is a synonym for quality made by AERZEN.

Absorbent free discharge silencer.

Since the breakdown of absorption material can endanger the safe operation at a facility, the R&D department at AERZEN designed and patented a special discharge silencer containing no absorption material. It reduces the sound exclusively by air deflection ensuring that downstream processes are safe from contamination from absorption material. This prevents the clogging of aeration systems in wastewater technology - eliminating costly maintenance work or operating restrictions. And it achieves food suitability in the pneumatic conveying of bulk materials.



Patented bearing of the Delta Hybrid

Life prolonging measures.

Durability is a question of careful material selection and quality of workmanship. But it is also the result of extensive development work. For the Delta Hybrid this includes special

drive and conveying chamber seals which minimize natural wear as well as the patented AERZEN bearing. At a pressure difference of 14.5 psi it extends the nominal L10 life of the bearing to more than 60,000 hours.

AERZEN bases worldwide



*The heart of the modern compression process:
Delta Hybrid assembly*



Made in Germany



Made in Germany. Made by AERZEN.

Delta Hybrid, from the assembly to the control system, is manufactured by AERZEN following the core concepts of the traditional German family business. For AERZEN this means ensuring its high quality requirements are met without compromise and that only optimally coordinated overall concepts are included in their products. Only in this way can the reliability and high performance of our systems be guaranteed.

Reliably there for you. Worldwide.

Long service life and low maintenance requirements are the hallmarks of our solutions. Should you ever need us, we are there for you. Worldwide with over 2,500 employees in 50 subsidiaries, with representatives in more than 100 countries on all continents. This is how we live reliability.

DRIVE PROCESSES ECONOMICALLY FROM INSTALLATION TO SATISFACTION.

Easy handling, minimum maintenance: these characteristics are also directly reflected in the cost balance. A good reason for AERZEN to keep a special eye on them during the development of the Delta Hybrid Generation. The results convince the coolest calculators. And inspire in years of daily practice.

Extremely compact design

- Space-saving side-by-side installation
- Smaller dimensions for blower room
- Easy access for service and maintenance work

Easy transport

- With pallet jack or forklift truck
- Safe due to innovative lifting system for hinged motor mounting plate

Plug and play

- Completely pre-assembled package
- Immediately ready for connection
- Integrated service package with funnel and first oil filling

Comfortable operating concept

- Operation and maintenance exclusively from the front of the blower package
- Oil level monitoring from the outside of the enclosure while the machine is running without interrupting operation

Belt drive and hinged motor mounting plate

- Fully automatic and maintenance-free belt tensioning
- No need to check the V-belt tension
- Easy installation or replacement of the V-belts
- Accurate design for desired flow rate
- Subsequent power adjustment is quick and easy

Multifunctional adjustment for hinged motor mounting plate

- Transport safety lock
- Easy and safe assembly of V-belts
- Mobile installation of assemblies (e.g. ship installation)/earthquake design
- as hinged motor mounting plate support for heavy motors





Smart oil system

- Long oil change intervals (twice as long as competition). Extended to 16,000 operating hours.
- Elimination of the initial oil change (previously 500 operating hours after commissioning)
- Oil level check during operation.
Readable on the outside of the enclosure
- Robust mechanical oil pump. Oil pressure build-up with main motor start
- Oil instead of grease. Oil-lubricated bearings (oil injection) increase the service life
- No separate oil cooler necessary.
Benefits: No contamination of the oil cooler and no additional component to be maintained
- Additional drive is not required: A plus for the Energy efficiency of the entire machine

100% oil-free according to class 0

- Oil-free process air for sensitive applications. For example, for the chemical and food industries
- TÜV-certified according to ISO 8573-1 class 0

Intelligently reduced sound levels

- Patented discharge silencer without Absorption material
- Silencing exclusively by air deflection
- Innovative pulsation reduction in the compressor stage
- Patented intake cone for reduction of the inlet noises
- Optimised acoustic hood

ATEX certified (optional)

- Discharge silencer certified as spark extinguisher for ATEX applications

Approval according to PED directive (pressure valve)

THERE IS NO EASIER WAY TO BUILD UP PRESSURE.

This also saves resources: Delta Hybrid assemblies are ready for immediate use upon delivery. The effort for the engineering, the optimal configuration, the precise design for your process: all this is done beforehand at AERZEN. And from a single source. We call this delivery concept all-in. What we mean by this is: there is no easier way to bring sophisticated compressor technology to your project.

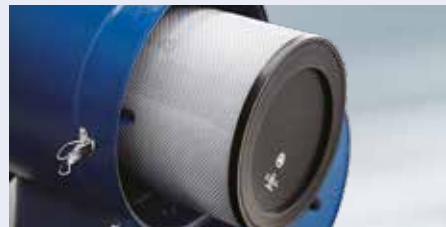
Configured ready for connection: The scope of supply.

- AERZEN rotary lobe compressor stage with integrated oil system:
 - Flanged, mechanical oil pump (exception D 62)
 - Pressurized oil lubrication system for long bearing life
 - No separate oil cooler
 - Wear-free sealing on the drive shaft and the conveying chamber
- Electrical vacuum pressure generator for safe oil chamber ventilation
- Hinged motor mounting plate for optimum, automatic V-belt tension
- Multifunctional lifting system for hinged motor mounting plate
- High-performance narrow V-belt drive
- Three-phase motor with highest NEMA energy efficiency class
- Base support with integrated discharge silencer (without absorption material)
- Vibration damping, flexible machinery mountings
- Connection housing including check valve
- Flexible rubber sleeve with clamps or ANSI flanged connection
- Pressure valve according to PED
- Completely connected and wired pressure sensors and temperature sensors
- Display instruments
- Filter silencer with integrated filter cartridge
- Complete documentation



Intelligent additions. Accessories:

- Acoustic hood for indoor or outdoor installation with electric acoustic hood fan, according to ErP Directive 2005/32/EC
- Start unloading device (necessary for star-delta operation)
- Electronic AERZEN AERtronic controller for efficient and safe operation of the system with display and monitoring of intake, discharge and oil pressure, oil level as well as discharge and oil temperature
- Maintenance packages for 1-year, 2-year or 5-year operation



Easy to maintain: AERZEN Air filter cartridge



Always the right choice: AERZEN Original spare parts



Very easy to operate: AERZEN Multifunctional lifting system for hinged motor mounting plate

Modifications and upgrades:

- Certifications according to ASME, TR, China Licence
- ATEX compliant design
- Acoustic hood for desert installation with special sand collector
- Acoustic hood for earthquake resistance and increased wind loads
- Acoustic hood for low temperatures down to minus -40°C with heating and gravity louvers
- Ship installation
- All-in-one solution with integrated power cabinet (frequency converter, star-delta, direct start, soft start)
- Separate control cabinet (frequency converter, star-delta, direct start, soft start)
- Special varnish
- Further accessories or modifications on request

THE NEW AERTRONIC. THE PATH TO THE DIGITAL FUTURE.

With the new edition of the AERtronic control system AERZEN paves the way to more digitization in compressed air generation. AERtronic offers a user-friendly and clear possibility for the analysis and processing of relevant process parameters and thus provides more transparency, safety and efficiency.



Always at the optimum operating point

In the new control system, all measured values converge and are systematically evaluated. This makes it possible to transfer the data to the production control system via common interfaces and to operate the plant always at the optimum operating point. Operators can achieve full protection and align processes for maximum effectiveness. The integrated maintenance book also makes it easier to plan maintenance and thus increases maintenance efficiency.

Advantages at a glance:

- Process analysis and associated avoidance of quality or output problems
- Direct connection to the master process control system
- Provision of all process parameters as well as maintenance and error information on the display, via interface and WebView
- Simplest possibility of a holistic process view through interfaces
- Full protection of your machine technology
- Avoidance of machine damage
- Best visualisation via 7" touch and user-friendly interface

The smart way to more safety and transparency in the process air system - the new AERtronic



	Basic	Advanced	Premium	
7 inch full touchscreen display	✓	✓	✓	Fully digital display Instrument
Digital display of all measured parameters	✓	✓	✓	
Display of warnings, faults and maintenance	✓	✓	✓	
Version for indoor and outdoor installation up to IP65 and -40°C up to +60°C	✓	✓	✓	
Process control connection via Modbus RTU (RS485)	✓	✓	✓	
Machine control with start release		✓	✓	Active process control
Remote control of the machine incl. emergency shutdown in case of malfunction		✓	✓	
Process control connection via Modbus TCP (RJ45), ProfiNet® or ProfiBus		Option	Option	
Process control according to target pressure and oxygen content		Option	Option	
Visualisation of process parameters in the web browser by WebView		Option	Option	Intelligent interface with cloud compatibility
Increase in machine and plant efficiency through Energy Management Improvement System			Option	
Full transparency of consumption and recommendations for action to reduce energy costs and CO2 consumption			Option	
Optimizing the Availability by the Availability Management of AERZEN Digital Platform			Option	
Maximization of maintenance intervals through the Usage-based Maintenance			Option	

Three variants for individual requirements

The development of the new AERtronic series focused on the customer requirements of the various industries. Therefore AERZEN offers the communication-capable control system in three different versions: Basic, Advanced and Premium. The variants differ in view of the range of functions and are adapted to the individual needs of the system operator.



Mobile visualization of process data

WITH -13.8 PSI VERY CLOSE TO VACUUM. FOR A DECISIVE PLUS IN ECONOMY.

Delta Hybrid is one of the most innovative and successful series of compressor technologies. The symbiosis of positive displacement blowers and screw compressors not only achieves increased energy efficiency in negative pressure by up to 25%, but also breaks through the previous limits of the usual areas of application. The new D 98 V achieves an positive pressure of 21.8 psi and a negative pressure of -13.8 psi at full capacity. Consequently, you will reach the vacuum range with the innovative AERZEN compressor stage.

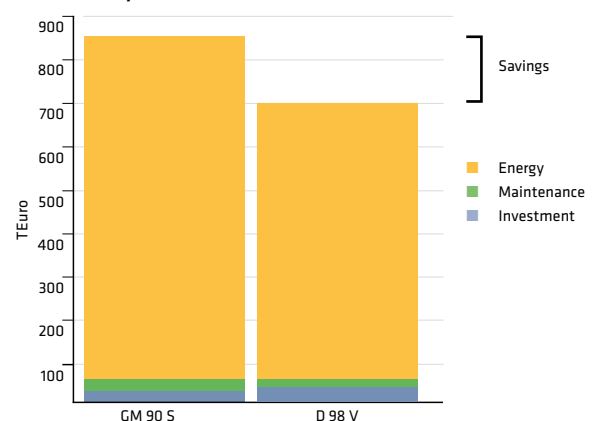


Minus 13.8 psi - the new performance category for negative pressure.

The further development of D 98 V is based on a technical innovation. The newly designed and optimized pre-inlet channels provide a targeted cooling in the range of the compression process which is mostly temperature intense.

The negative pressure of -10 psi, which is already high at standard, can be increased to up to -13.8 psi. This new performance class surpasses the possibilities of conventional positive displacement blowers and screw compressors.

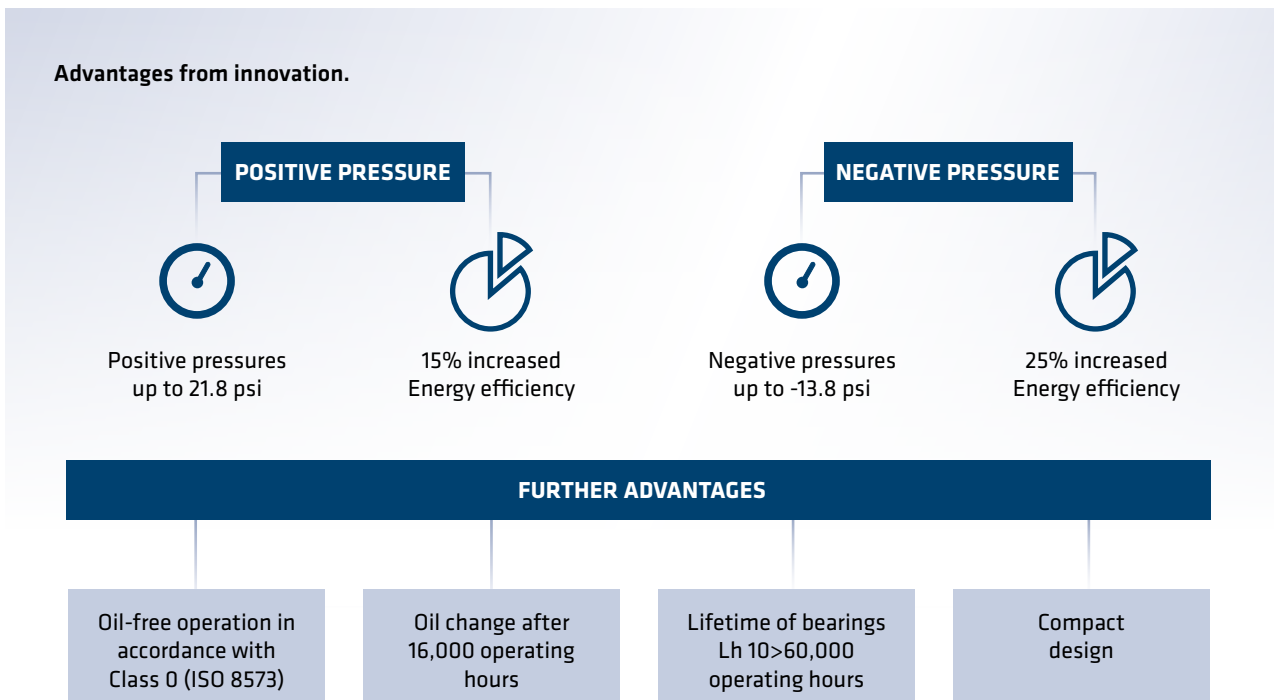
LCC comparison GM 90 S and D 98 S for 10 years of continuous operation



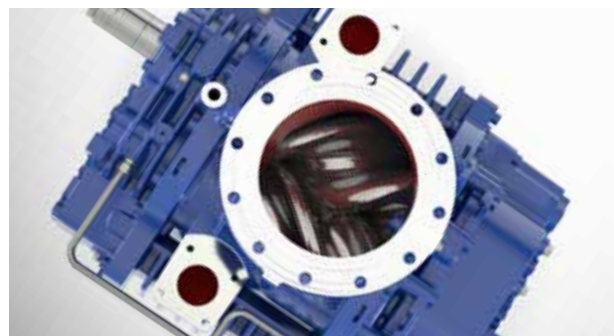
Powerful and flexible.

High performance capability combined with enormous energy efficiency: D 98 V can serve a variety of new applications. With a range from -13.8 to 21.8 psi, the Hybrid option offers an extraordinary range of services from pneumatic conveying to process engineering and can be powered from a diesel engine on a truck to an electric motor for a stationary installation.

Delta Hybrid also provides optimization of loading and unloading times. The newly achieved energy efficiency reduces the energy consumption of systems which has a positive effect on costs. In all cases, the new compressor reliably supplies conveying air for negative and positive pressure ranges without any interruption.



Used when loading a truck



D 98 V - view from top to the rotary lobe compressor stage

DELTA HYBRID IN FIGURES.

PLAN YOUR EFFICIENCY PLUS IN THE COMPRESSION PROCESS.

The innovative rotary lobe compressor series Delta Hybrid is available in H, S and E designs in 10 different sizes. For volume flows from approx. 65 to 5,300 cfm and positive pressures up to 21.8 psi or negative pressures down to -10 psi. A wide range of machines for precise design for a wide variety of processes.

Performance data (subject to technical changes - product is subject to technical change).

Positive pressure				
Size	Differential pressure max. psi	Volume flow max. cfm*	Motor rating max. HP	Sound pressure level max. dB (A) **
D 12 H	21.8	395	50	73
D 12 S	14.5	405	40	72
D 19 S	14.5	670	60	75
D 24 H	21.8	805	100	76
D 24 S	14.5	815	75	74
D 29 S	14.5	1025	100	73
D 36 H	21.8	1115	150	76
D 36 S	14.5	1265	100	76
D 52 S	14.5	1835	150	77
D 62 H	21.8	2000	200	81
D 62 S	14.5	2060	150	79
D 76 H	21.8	2610	200	79
D 76 S	14.5	2675	200	77
D 98 H	21.8	3295	300	81
D 98 S	14.5	3410	300	79
D 152 H	21.8	5120	500	81
D 152 S	14.5	5235	400	80

Negative pressure				
Size	Differential pressure max. psi	Volume flow max. cfm*	Motor rating max. HP	Sound pressure level max. dB (A) **
D 12 E	-10	385	25	72
D 24 E	-10	775	50	73
D 36 E	-10	1,175	75	76
D 62 E	-10	1,940	125	79
D 76 E	-10	2,675	125	76
D 98 E	-10	3,235	150	78
D 152 E	-10	5,000	200	79
D 98 V	-13.8	3,175	-	-

* Corresponds to the delivery volume flow measured according to ISO 1217 and converted to the reference suction conditions according to the (informative) enclosure F of ISO 1217 [inlet pressure = 1.0 bar / inlet temperature = 20°C, rH = 0%]

** Machine noise with acoustic hood and connected, insulated piping, tolerance ± 2 dB(A)

Dimensions and weights (subject to technical changes - product is subject to technical change).



Delta Hybrid.

Size	W inches	D inches	H inches	nominal size inches	weight with acoustic hood lbs.
D 12 H/S/E	49	53	59	4	1300
D 19 S	49	53	59	4	1400
D 24 H/S/E	49	53	59	5	1400
D 29 S	59	71	78	6	2420
D 36 H/S/E	59	71	78	6	2420
D 52 S	59	71	78	6	2710
D 62 H/S/E	67	81	83	8	3375
D 76 H/S/E	67	81	83	8	4405
D 98 H/S/E	75	87	92	10	4630
D 152 H/S/E*	83	112	92	12	7715

* In preparation

Weight without motor

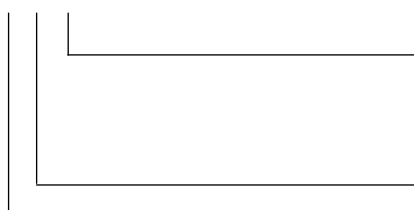
Delta Hybrid with integrated power supply panel.

Size	W inches	D inches	H inches	A inches	B inches	nominal size inches	weight with acoustic hood lbs.
D 12 S-H-E	73	53	59	12	15	4	1630
D 19 S	73	53	59	12	15	4	1730
D 24 S-H-E	73	53	59	12	15	5	1730
D 29 S	83	71	75	15	17	6	3085
D 36 S-H-E	83	71	75	15	17	6	3085
D 52 S	83	71	75	15	17	6	3085
D 62 S-H-E	91	81	83	15	20	8	4145
D 76 S	91	81	83	15	20	8	5180

Weights without motor, power electrics and belt drive

Explanation of the type designation:

Example: D 62 S



Type of construction:

H = Pressure differences up to 21.8 psi

S = Pressure differences up to 14.5 psi

E = Negative pressure version up to -10 psi

V= Pre-inlet up to 13.8 psi

Max. volume flow in m³/min (approx.)

Rotary lobe compressor



AERZEN. Compression - the key to our success.

AERZEN was founded in 1864 as Aerzener Maschinenfabrik. In 1868, we built Europe's first positive displacement blower. The first turbo blowers followed in 1911, the first screw compressors in 1943, and in 2010 the world's first rotary lobe compressor package. Innovations "made by AERZEN" keep driving forward the development of compressor technology. Today, AERZEN is among the world's longest established and most significant manufacturers of positive displacement blowers, rotary lobe compressors, screw compressors and turbo blowers. AERZEN is among the undisputed market leaders in many areas of application.

At our 50 subsidiaries around the world, more than 2,500 experienced employees are working hard to shape the future of compressor technology. Their technological expertise, our international network of experts, and the constant feedback we get from our customers provide the basis for our success. AERZEN products and services set the standard in terms of reliability, stability of value and efficiency. Go ahead - challenge us!

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AERZEN
EXPECT PERFORMANCE

AERZEN DELTA HYBRID GENERATION 5

North American Standard

Positive Pressure

Standard range

Rotary lobe compressor sizes:.....D12S/H, D17L, D24S/H, D28L, D36S/H, D46L, D52S, D62S/H, D75L, D98S/H, D152S/H

Package nominal sizes:.....4” (DN 100) to 12” (DN 300)

Medium:Air

Flow range:88 to 5300 icfm (2.5 to 150 m³/min)

Differential pressure:15 psi (1000 mbar) for “S”, 22psi 1500mbar for “H”, and 10 psi (700 mbar) for “L” machines

Maximum operating temperature:492°F (200°C)

Drive:.....V-belt drive with totally automatic belt tension adjustment


Introduction

The Aerzen Rotary Lobe Compressor is renowned for its performance and its reliability. There is no secret: From the rotary lobe compressor-stage through the accessories, Aerzen enhances key features of each component by applying sound engineering, precision machining, and superior workmanship.

The Delta Hybrid Generation 5 (Hybrid for short) is the synthesis of four previous Aerzen blower package generations combined with an array of new technical innovations to provide five key advantages to our customers:

- The Hybrid combines two of Aerzen’s tried and true pieces of technologies: The economics and features of the Delta Blower G5 and the energy saving technology from the Delta Screw. Combined they generated a new concept but with the reliability and predictability of an Aerzen positive displacement machine.
- The machinery noise level has been lowered yet another 2-3dBa¹ on average compared to the previous Delta Blower
- The energy efficiency of this Hybrid blower is generally between 15 and 30% better than comparable straight lobe positive displacement blowers. Compared to the high speed turbo blower the efficiency is approximately the same, but the Aerzen Rotary Lobe Compressor offers a greater turn down of up to 5 to 1.
- The Hybrid blower package is even more user friendly especially in transport, installation, operation, and maintenance

¹ Measured in 1m free-field conditions

	Aerzen USA Corporation 108 Independence Way – Coatesville, PA 19320 Tel: (610) 380-0244 Fax: (610) 380-0278 www.aerzen.com/en-us	Sales Description – Hybrid Blower – Pressure		
		Date 11/26/2018 RWE	Doc # H-4-0291 revision - “C”	Page 1 of 8

- The oil level is visible from the outside of the package so the rotary lobe compressor does not need to be shut down. The oil change interval is up to 2 years.
- No absorption material is used in the discharge combination silencer; this eliminates the possibility of foreign objects contaminating the air or gas stream
- Use of an auxiliary sound enclosure fan, which provides consistent air flow through the Hybrid package regardless of blower operating speed.
- The compact footprint allows units equipped with sound enclosure to be mounted side-by-side since there is only one main maintenance access side

Aerzen Delta Hybrid Generation 5 are pre-engineered modular compact packages, which offer a wide range of options from proven and standardized components at reasonable costs and short delivery times.


Shipped completely assembled, the Aerzen Delta Hybrid Generation 5 is indoor and outdoor rated. There is no extensive installation work - neither grouting nor special anchoring is required, just simply level it and bolt it to any standard industrial flooring or surface.

Scope of supply: basic configuration

- Aerzen Rotary Lobe Compressor stage, with central lube oil lubrication and filter except models D52S, D62S/H, and D75L
- Combination Base Frame / Silencer combined with hinged motor plate for automatic belt tensioning with integrated motor hinge plate lifting and locking device – with 2 ½” diameter discharge pressure gauge
- Set of vibration isolating mounts under the entire Hybrid package
- Inlet silencer – filter with filter maintenance indicator
- Narrow V-belt drive and protection guard
- Pressure safety valve
- Discharge manifold with integral check valve and flexible pipe connector
- Standard paint system
- NEMA electric motor TEFC, Premium Efficiency, with conduit box on top
- First oil fill Aerzen Delta Lube 06 and “Service kit”
- Packaging for domestic trucking
- Standard documentation in electronic format: English language, drawings with US-customary and metric units of measure

Standard options include (not limited to)

- Inlet pipe connection kit
- Sound enclosure with skid / oil-drip pan and forced ventilation
- Start-unloading valve Aeromat, with or without solenoid valve
- Pressure modulating valve Aeropress or Aeropress10S, pilot operated
- Other motors, e.g. IEC with conduit box on top, etc
- Instrumentation & controls, e.g. AERtronic Aerzen Hybrid controller

	Aerzen USA Corporation 108 Independence Way – Coatesville, PA 19320 Tel: (610) 380-0244 Fax: (610) 380-0278 www.aerzen.com/en-us		Sales Description – Hybrid Blower – Pressure		
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Description of the main components

The combination of key components marked with a * in the description below significantly contribute to the reliability and performance of the Aerzen Hybrid:

At the heart of the package: The Aerzen Rotary Lobe Compressor

Positive displacement characteristic:

- The rotary lobe compressor moves a fixed volume of gas with each shaft rotation, nearly independently from the operating pressure.
- At constant differential pressure, the load torque remains constant.
- For a given pressure, the power is directly proportional to the speed.

Flow across the rotary lobe compressor stage:

- Vertical from top to bottom

Drive shaft location:

- On the left when facing the rotary lobe compressor shaft

Rotation:

- Counterclockwise when facing the rotary lobe compressor shaft

Housing:

- The central section, “the cylinder” and the two side-plates house the rotors, while a gear case and a drive end cover contain the lubricating oil for bearings and gears. Individual side plates allow for optimal setting of the radial rotor clearances: a valuable feature on compressors with the gas flowing perpendicular to the rotors.
- Connections: full-size, flat-faced flanges
- * — Maintaining internal alignment under all operating conditions is paramount for the reliability of any rotating equipment. The housing is, for this purpose, designed to support the entire rotary lobe compressor stage on its outlet flange only; no need to worry about a “soft foot” or uneven base support
- Materials: Gray cast iron EN-GJL-250 equivalent to ASTM A48 35 B / 40 B.

Rotors:

- * — Rotors and shafts are made of a single, forged steel piece made from C45 steel equivalent to AISI Type 1045. Solid rotors do not have any open cavities that can trap contaminants. This is particularly important in food applications and applications requiring high purity. Moreover, rotor balance is maintained and vibration is therefore minimized.
- Stiff rotor design: the rotors' first critical speed is always at least 20% above the maximum operating speed.
- The rotors meet or exceed the ISO 1940 / ANSI S2.19 G2.5 criteria of dynamic balancing

Timing gears:

- Helical gears with hardened and ground teeth to meet AGMA 12 quality standard with an AGMA service factor of 1.70.



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- To maintain the advantage of high quality gears, the gear wheels are secured onto the shafts by means of a tapered interference fit. Optimum concentricity is achieved and neither gear hub nor shaft keys are used. To prevent damaging the seats, gear installation and removal are carried out using hydraulic pressure to expand the gear wheels within their elastic limit.

Bearings:

- The rotors are supported by anti-friction bearings
- The bearings are housed in the side-plates and are sized for an expected 5 years between overhauls at maximum operating conditions.

Lubrication:

- Pressurized lube oil system with integrated oil pump and oil pressure regulator for all models except D52S, D62S/H, and 75L.
- Oil splash lubrication of all bearings and gears through oil spray disks on both rotary lobe compressor ends for models D52S, D62S/H, and 75L.
- An oil sight glass is provided on the blower outboard end oil sump.
- An oil drain valve is provided on oil sump. The oil drain valve is directly mounted to the oil sump. A removable cover for clean, easy and fast oil change is provided.
- Units with sound enclosure are plumbed together to an oil reservoir that serves as oil fill and drain device, and its oil sight glass is visibly mounted to the maintenance side of the enclosure.
- Aerzen USA provides the first oil fill with a lubricant as recommended in the operating manual as well as a service-kit containing oil fill funnel, and oil drain hose.

Seals at the rotor chamber:



- The rotor chamber is sealed from the oil chambers by four, all metal, non-rubbing seals

Seal at the drive shaft:

- Non-contact double knife edge labyrinth seal.

Testing

- Each rotary lobe compressor stage is subject to a full-load test to verify the volumetric flow and power values.



- Acceptance criteria are +5% on power and -5% on flow for all machine sizes.
- Orifice flow measurement and conversion of results to the operating conditions in accordance with ISO 1217, simplified

The package components: Hybrid

Intake air silencer & filter



- Absorption-type silencer upstream of the air filter element. For reasons of cleanliness, there is no silencing material between the filter and the inlet rotary lobe compressor flange.
- The carbon steel housing is powder-coated. Quick-release latches for quick access to the filter element
- Filter performance: G4 per EN 779 (greater than 90% of synthetic dust particles), equivalent to ASHRAE 52.2 MERV 7 (50-70% @3-10 microns)
- Progressively compressed, thermally bound polyester fibers, free of PVC, smoothed and compressed on the clean airside for highest dust separation and retention capacity. The filter media is made of a single, 30 mm thick continuous mat that is white in color, and is food safe. Filter element mounts with a quick release turn and lock arrangement



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- Included is a filter maintenance indicator. If the sound enclosure option is selected, the filter maintenance indicator is mounted to the enclosure wall.

Base with integral discharge silencer:

- The combination discharge, three-chamber reactive silencer is used to further reduce the noise and residual pulsation in the air stream across a wide range of operating speeds. The residual pulsation downstream of the silencer meets or exceeds the API 619 recommended 2% peak-to-peak of the absolute line pressure.
- * — The discharge silencer is combined with the support base into one compact rugged unit. It is made from pressure vessel steel it forms a torsion resistant cylindrical vessel supporting the rotary lobe compressor stage and other components.
- * — The mounting surface for the rotary lobe compressor is a full-size steel flange machined and continuously welded to the base with the full number of tapped holes for the studs to fasten the rotary lobe compressor to the base - no need to align rotary lobe compressor feet or to worry about a soft-foot condition. A surface sealant is used instead of a gasket.
- * — Maximum operating pressure for S and L models: 1.1 bar gauge (16 psig) and 150°C (300°F), built and certified to the latest European Pressure Vessel Code, PED. Test pressure: 1.9 bar g. (27.6 psig)
- * — Maximum operating pressure for H models: 1.7 bar gauge (24 psig) and 200°C (392°F), built and certified to ASME Pressure Vessel Code Section VIII with “U” Stamp. Test pressure: 3.1 bar g. (45 psig)
- The base is mounted on four vibration-isolating mounts²

² Up to 6 foot mounts may be used in conjunction with larger motors and depending on Hybrid model.

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Belt drive

- Narrow, anti-static V-belts
- Selected for a minimum service factor of 1.4 times operating power (BHP), or 1.1 times the motor nominal power (nameplate HP), whichever is larger³
- * — The Aerzen Hybrid package provides entirely automatic tensioning of the belts. Thanks to the package configuration, the drive geometry is such that the motor hinges parallel to the motor shaft centerline, using the only the motor mass to maintain this tension without need for adjustments or springs. This not only reduces maintenance, it also reduces the potential for operating with too little (slipping belts) or excessive belt tension (excessive bearing and shaft load).
- The motor hinge plate that is part of the integral base silencer also includes a lifting and locking mechanism for lifting the motor to change V belts. I may be used for supporting heavier motors and for locking the motor swing in place for some seismic zone and mobile/ ship installations. The maintenance kit provided by Aerzen USA also includes a ratchet wrench used for lifting the motor to change V belts.
- Sheaves and bushings are dynamically balanced to ISO 1940 / ANSI S2.19 G6.3. For linear tip speeds up to 328 ft/s (100 m/s), nodular cast-iron, ventilated sheaves are used.

Belt guard

- OSHA compliant personnel guard, made of galvanized steel: either perforated steel or solid sheets with vents, depending upon the model.
- Units with sound enclosure feature hand protection fan and belt guards, and the enclosure itself serves as the ultimate protection device. The removable maintenance panels comprise lockable latches that help facilitate OSHA prescribed tag-out-lock-out procedures.

Vibration isolating mounts

- A set of vibration isolating mounts are located under the rotary lobe compressor package to hinder the transmission of structure borne noise from the rotary lobe compressor and the discharge silencer into any structure the package is installed on, such as a mounting skid if supplied with acoustic enclosure.

Discharge manifold

- Flange-mounted to the discharge silencer, the discharge manifold serves for mounting the pressure safety valve, an optional start-unloading valve and for connecting the rotary lobe compressor package to the discharge piping.
- Materials of construction: welded carbon steel
- The discharge manifold houses the discharge check-valve

Pressure safety valve

- DN100-300 rotary lobe compressor packages have a vertically mounted, spring loaded, safety pressure valve sized for the full flow of the rotary lobe compressor.
- * — The valve's characteristic is nearly proportional. It not only opens, but also closes at the set pressure
- * — The valve has a built-in dampener that allows the valve to actuate smoothly, which prevents the "pop-off" effect commercially available valves exhibit.
- Pressure rise up to 10% at full flow. Certification of conformity to PED
- Being an all-metal valve, it is not suitable as a pressure modulating valve. If this function is needed use an Aerzen pilot operated Aeropress or Aeropress10S pressure modulating valve.

³ Higher values are not necessarily better as they could lead to belt slippage due to excessive stiffness, and also shaft damage (deflection) caused by higher tension values required by over sized v-belt drives.



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- Materials: seat of gray cast iron and, depending on the size, a brass or anodized aluminum bell and piston, galvanized spring, steel spring rod, and an aluminum or fabricated external steel cylinder.
- Standard set points are 15.2 psig (1050 mbar) for “S” model rotary lobe compressors operating above 10 psi (700 mbar), and 10.9 psig (750 mbar) for all machines operating under 10 psi (700 mbar), including all “L” model rotary lobe compressors⁴.
- Standard set point for all “H” machines is 26 psig (1800 mbar). The valves are ASME Section VIII type lift level valves.
- The valve protects the rotary lobe compressor stage against line surges, and spikes. It does not protect against prolonged overloads or excessive discharge temperature. Therefore, it is not an absolute protection device, nor is it “bubble tight”.

Discharge check valve



- A full-bore check valve that can be easily removed for inspection and maintenance without disconnecting the discharge piping
- With its horizontal top-located steel shaft, the check valve naturally closes by gravity at no-flow.
- Without any springs, the check valve will not chatter, even at low flow conditions (for example in adjustable speed applications)
- Flap material: EPDM on steel for operating temperatures up to the rotary lobe compressor limit
- Optional check valve flap material for elevated discharge temperature: Silicone rubber

Discharge flexible connector




- A reinforced silicone-rubber discharge flexible connector with heavy-duty clamps connects to the discharge piping.
- It prevents the transmission of structure-borne noise from the rotary lobe compressor and its discharge silencer to the discharge piping.
- Located downstream of the silencer and with only a small gap (~1/2”) between the package and the pipe, the noise sent to the outside is maintained at a minimum.
- The sleeves are sized for standard, schedule 40 pipe diameters.

Discharge pressure gauge

- Liquid filled, 2 ½ “ dial. Units: mbar and psi
- If the sound enclosure option is selected, the discharge pressure gauge is mounted to the sound enclosure wall.

⁴ The valves are adjustable, and different springs are available for other set points depending upon operating conditions, motor limitations, or customer’s requests.

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Optional sound enclosure

- Covering the entire rotary lobe compressor package with the drive motor, the enclosure provides suitable protection for outdoor installation up to 50 mph winds and 25 lb/ft² snow load and rain at 45°
- * — The enclosure and the rotary lobe compressor package are both mounted on a skid / oil-drip pan, designed for meeting environmental protection standards as well as for easy transportation and installation.
- * — The unique Aerzen package design makes it possible to mount multiple rotary lobe compressors side-by-side without hindering access to the maintenance side (front). All pipe and wiring connections are made from the backside. This offers the best use of available floor space.
- * — All maintenance activities can be carried out from the front of the package, e.g. air filter, belts, and oil maintenance. The oil level is visible from the outside and eliminates any guesswork. Oil can be filled and drained from a common reservoir that also houses the oil level gauge. The oil level check can be done with the rotary lobe compressor in operation.
- The enclosure reduces the package noise level to less than 81 dB(A) – 75dB(A) in most cases- at 1 m, free field, per DIN 45635.
- * — Quick release panels, each less than 50 lb (as mandated by MSHA) provide quick and easy access to the rotary lobe compressor and the package components for routine maintenance.
- Rotary lobe compressor packages are fitted with a three phase 460V 60Hz electrical auxiliary motor driven cooling fan for sufficient heat removal. For units with AERtronic controller the fan motor is prewired to a starter that is built-in to the control panel. For units without AERtronic controller a third party needs to provide, wire and interlock the auxiliary motor with the main motor starter.
- * — Aerzen mounts the rotary lobe compressor package in the sound enclosure at our factory prior to shipment.
- Panels are made of galvanized steel sheet, with packing self-extinguishing, non-dripping high-density polyester foam as absorption material.
- The enclosure is powder coated in a UV resistant Aerzen Royal Blue color RAL5001, accented with light gray maintenance panels



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Type certificate

Absence of oil acc. to ISO 8573-1 class 0

Aerzener Maschinenfabrik herewith declare, that all oilfree (dry)
rotary lobe compressors series Delta Hybrid

stages and units

depending on type of construction do not enable oil penetration from the oil
chambers into the conveying chamber and consequently the requirements acc. to

ISO 8573-1 (2001) class 0

measured acc. to

ISO 8573-2 (1996)
ISO 8573-5 (2001)


measuring method Aerosols
measuring method oil- and solvent vapours

observe.

The compression principle of the above mentioned Aerzen series
Delta Hybrid (Type D...S, D...L and D...H) assures, that during the compression
process no contamination can develop from the compressor itself or from
components of the unit.

Aerzen, 05.08.2010
Aerzener Maschinenfabrik GmbH

Aerzen, 05. 08. 2010



Klaus-Hasso Heller
CEO

Aerzen, 05. 08. 2010



Björn Irtel
Technischer Leiter

OPERATING INSTRUCTIONS

ROTARY LOBE COMPRESSOR

DELTA HYBRID

Read the instructions prior to performing any task!
Keep for future reference!



G4-007 V

Translation of the original operating instructions
Material no.: 2000020152
Doc content: 01.04.2017
Series: D 12 - 98 S/H // D 17 - 75 L
GB



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1 General Information

1.1 Information about these instructions

These instructions allow for the safe and efficient handling of this machine. These instructions are an integral part of the machine and must be kept in the immediate vicinity of the machine so that it is accessible for personnel at all times. Keep these instructions in a safe place for future reference.

Personnel must read these instructions carefully and have understood them before beginning work. A fundamental requirement for working safely is compliance with all specified safety notes and guidelines in these instructions.

In addition, the local occupational health and general safety regulations apply to the machine's range of applications.

The diagrams in these instructions serve to provide the user with a basic understanding and may deviate somewhat from the actual design.

The following is a list of additional, supplementary documents:

Declaration of Conformity	CE MRL 1012-1 PED
Installation drawing	
Operating manual Drive motor	
Operating manual AERZEN Safety Valve	G4-002...
Lube oil safety data sheet	SDB...

1.2 Explanation of symbols

Safety instructions

Safety instructions in this manual are illustrated using symbols. The safety instructions are organised into signalling words which designate the level of danger posed.



DANGER!

This combination of symbol and signalling word points to an imminently dangerous situation that could be fatal or lead to serious injury if it is not avoided.



WARNING!

This combination of symbol and signalling word points to a potentially dangerous situation that could be fatal or lead to serious injury if it is not avoided.



CAUTION!

This combination of symbol and signalling word points to a potentially dangerous situation that could lead to minor injuries if it is not avoided.



NOTICE!

This combination of symbol and signalling word points to a potentially dangerous situation that could lead to material damage if it is not avoided.



ENVIRONMENT!

This combination of symbol and signalling word points to a potential risk for the environment.

Safety instructions as part of operating guidelines

Safety instructions may relate to certain individual operating guidelines. These safety instructions are integrated into the operating guidelines themselves so as to simplify the task of reading while carrying out work. The signalling words mentioned above are used.

For example:

1. ➤ Loosen screw.

2. ➤



CAUTION!

Pinch hazard on the cover!

Close cover carefully.

3. ➤ Tighten screw.






Tips and recommendations



This symbol draws attention to useful tips and recommendations as well as information about efficient and trouble-free operation.




Special safety instructions

To draw attention to exceptional hazards, the following symbols are used as part of the safety instructions:

Warning signs	Type of danger
	Warning – automatic start-up.
	Warning – hand injuries.
	Warning – high-voltage.
	Warning – flammable substances.
	Warning – danger zone.

Additional designations

To draw attention to operating guidelines, events, listings, references and other elements in this manual, the following designations are used:

Designation	Explanation
 1., 2., 3. ...	Step-by-step operating guidelines
	References to sections of this manual and to relevant documentation
	Lists without a designated sequence
[push-button]	Control elements (e.g. push-buttons, switches), display elements (e.g. signal lamps)
„Display“	Screen elements (e.g. buttons, allocation of function keys)

1.3 Copyright protection

The contents of this manual is protected by copyright. The use of this manual is permitted within the framework of machine use. Any other use is excluded unless there is written approval by the manufacturer.

1.4 Addresses

1.4.1 Manufacturer

Tab. 1: Manufacturer

Address	Aerzener Maschinenfabrik GmbH Reherweg 28 31855 Aerzen Germany
Telephone	+49 (0) 51 54 8 10
Fax	+49 (0) 51 54 8 1 9191
E-mail	info@aerzener.de
Internet	www.aerzen.com

1.4.2 Customer service

Our customer service staff are on hand to provide you with technical information:

Tab. 2: After sales service/service contact

Address	Aerzener Maschinenfabrik GmbH Reherweg 28 31855 Aerzen Germany
Service hotline	+49 171 3 51 18 34
E-mail	info@aerzener.de
Internet	www.aerzen.com

In addition, we are always interested in receiving information and feedback pertaining to machine use that could be useful in helping us improve our products.

2 Safety

This section gives an overview of all important safety aspects relevant to the protection of persons and to safe and trouble-free operation. Further task-based safety instructions are contained in the section on the individual phases of the machine's service life.

Non-compliance with the handling and safety instructions provided in this manual can lead to serious hazards.

The following section outlines the residual risks and hazards during the service life of the product that may arise as a result of non-compliance with safety instructions or the disabling of safety devices.

In order to reduce health and safety risks and to avoid dangerous situations, observe the safety and warning notes in this manual.

2.1 Residual risks and fundamental risks

The following chapter states the general residual risks that have been established on the basis of a risk analysis.

- Compliance with these safety instructions and the safety instructions in the main chapters reduces the risk of personal injury, property damage and environmental harm and prevents dangerous situations.

2.1.1 Electrical hazards

Electric current

**DANGER!****Risk of fatal injury from electric current!**

Coming into contact with live parts poses an immediate and potentially fatal risk of an electric shock. Damage to insulation or individual components can prove fatal.

- Work on the electrical system should only be carried out by qualified electrical personnel.
- If the power supply's insulation is damaged, switch off the machine immediately and have the damage repaired.
- Before starting to work on active parts of the electrical systems and operating equipment, ensure that the machine is completely disconnected from any power source and remains so for the duration of the work.

When doing this observe the following 5 safety rules:

- Disconnect the machine completely.
- Secure the machine against restarting.
- Confirm that the machine is completely disconnected from any power source.
- Earth and short-circuit the device.
- Cover or shut off adjacent live parts.
- Never bypass or deactivate fuses.
- When changing fuses, comply with the correct specified amperage.
- Keep moisture away from live parts. Moisture can cause the machine to short-circuit.

Stored charges



DANGER!

There is a risk of fatal injury from stored charges!

Electrical charges can be stored in electronic components and maintained even after the deactivation and separation of the electric power supply. Coming into contact with these components can lead to fatal injuries.

- Observe all applicable safety rules.
- Before performing any work on the listed components, disconnect them completely from the power supply.
- Observe a waiting period of 15 minutes under all circumstances! This will allow the internal capacitors to discharge.
- Measure to ensure there is no live voltage!

Operating faults caused by short-circuiting



WARNING!

Risk of injury from operating faults!

If the electrical system short circuits this can render the entire system inoperable. Operating faults can lead to serious injuries.

- Connect the machine's earthing connections and acoustic hood to the local equipotential bonding rail.
- Install a fault-current circuit breaker in order to prevent sparks and contact voltage in the event of a fault.
- After all work on the machine has been carried out, ensure that the earthing connection and equipotential bonding are connected correctly.

2.1.2 Hazards associated with the acoustic hood

Inside the acoustic hood

**DANGER!****Risk of injury if the acoustic hood is open during operation!**

By opening the acoustic hood while the machine is in operation there is a risk of direct contact with hazardous zones, e.g. hot surfaces or rotating or moving components.

- Never open the acoustic hood while the machine is in operation or in stand-by mode.
- Never stand on or reach into the acoustic hood while the machine is in operation.
- Always lock the acoustic hood with the key provided and keep it locked.
- Only allow authorised personnel access to the key.

Falling parts

**CAUTION!****Risk of injury from unsecured parts of the acoustic hood!**

Unsecured parts of the acoustic hood can lead to injuries if they fall from the machine.

- Secure loose elements against falling.
- Always wear protective gear.
- Have a second person help you.

Air flow at the air outlet

**CAUTION!****Risk of injury from the strong air flow at the air outlet of the acoustic hood!**

Strong air flows at the air outlet on the acoustic hood can suck in dirt particles from the environment and disperse them.

- Avoid standing in the direct vicinity of the air flow.
- Wear safety goggles and a safety mask.

Noise



WARNING!

Risk of injury from noise!

The noise level present at the installation area can cause hearing damage. The magnitude of the noise level is dependent on operational data, among other factors.

- Never undertake measures to bypass or deactivate sound insulation.
- Wear hearing protection while working.
- Only stand in the high-noise-level area if it is absolutely necessary.

Risk of falling



CAUTION!

Risk of injury from standing on the acoustic hood!

Standing on the acoustic hood carries with it a risk of injury from the potential collapse of the roof elements. Persons could fall into the internal area of the machine.

- Never stand on the acoustic hood.
- Never exert pressure on roof elements.

Spark-generating work



WARNING!

Risk of fire and injury / damage to property from spark-generating work in the immediate vicinity of the machine!

Welding or cutting work on the machine or in the immediate vicinity of the machine can cause fire to break out. This can result in damage to property or personal injury.

Sparks and incandescent or flammable objects could be sucked in through the air openings on the acoustic hood or through the intake silencer. The ventilator can fan flames leading to the formation of smouldering objects. The insulation material may, under unfavourable conditions, begin to smoulder.

- Avoid allowing sparks to fly in the direction of the machine.
- Never carry out work that generates sparks while the machine is in operation.

Risk of fire and injury**WARNING!****Risk of fire from easily-flammable materials that are sucked into the machine!**

Easily-flammable material, fluids or gases can be sucked into the machine and cause it to catch fire. This can lead to serious or fatal injuries.

- Never allow flammable materials to be sucked into the machine.
- In case of emergencies, have extinguishing agents (fire blanket, fire extinguisher, fire-extinguishing powder for fire class A, B, C) at hand.
- Immediately report suspicious materials, liquids or gases to the responsible persons.
- In case of fire, stop your work immediately and make an emergency call.

Use of non-original belts**WARNING!****Risk of fire and injury from using non-original belts!**

If, for a number of possible reasons, the machine is running sluggishly or is blocked, the belts may slip if non-original belts are being used. This results in heat generation which may lead to a fire.

- Only use original belts from the machine manufacturer.
- Adhere strictly to the designated belt type, as only this type will have the required characteristics.
- Never select and use random belts.
- Activate motor overload protection and observe the setting values.

2.1.3 Risks of machines with belt guard

Noise



WARNING!

Risk of injury from noise!

The noise level present at the installation area can cause severe hearing damage. The magnitude of the noise level is dependent on operational data, among other factors.

- Never undertake measures to bypass or deactivate sound insulation.
- Wear hearing protection while working.
- Only stand in the high-noise-level area if it is absolutely necessary.

Spark-generating work



WARNING!

Risk of fire and injury / damage to property from spark-generating work in the immediate vicinity of the machine!

Welding or cutting work on the machine or in the immediate vicinity of the machine can cause fire.

Sparks and incandescent or flammable objects could be sucked in through the intake silencer. The air flow can fan flames leading to the formation of smouldering objects. The insulation material may, under unfavourable conditions, begin to smoulder.

- Avoid allowing sparks to fly in the direction of the machine.
- Never carry out work that generates sparks while the machine is in operation.

**Risk of fire and injury****WARNING!****Risk of fire from easily-flammable materials that are sucked into the machine!**

Easily-flammable material, fluids or gases can be sucked into the machine and cause it to catch fire. This can lead to serious or fatal injuries.

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- In case of emergencies, have extinguishing agents (fire blanket, fire extinguisher, fire-extinguishing powder for fire class A, B, C) at hand.
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- Only use original belts from the machine manufacturer.
- Adhere strictly to the designated belt type, as only this type will have the required characteristics.
- Never select and use random belts.
- Activate motor overload protection and observe the setting values.

2.1.4 Hazards at the installation site and operating site

Securing the machine against restarting



DANGER!

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard zone. Activating the energy supply and starting the machine could result in those people being fatally injured.

- Prevent the machine from restarting by:
 - disconnecting the electrical power supply.
 - activating the EMERGENCY STOP function
 - operating the main circuit breaker
 - attaching a padlock to the main circuit breaker
 - checking and ensuring that the machine is completely disconnected from the power source
 - displaying a sign on the machine that prohibits a machine start
 - displaying a sign on the remote station that prohibits a machine start
- Before restarting, ensure that safety devices are installed and functioning correctly and that there are no potential hazards to the safety of any persons.

Water contact with live components



DANGER!

Risk of fatal injury from water contact with live components!

Risk of fatal injury from cleaning work with water in areas with live components. Water spray may enter electrical and electronic components.

- Do not use water.
- When performing cleaning operations, proceed with care and make sure that no water comes into contact with live components.
- Water spray must not enter electrical and electronic components.
- Under no circumstances must areas with live voltage be cleaned using a high-pressure jet.

Unexpected machine start**WARNING!****Risk of injury or personal shock if the machine starts suddenly!**

For example, a superordinate control system could send a start command to the machine so that it starts operating.

- Shut down the machine for all work and secure it against restarting.
- You must be prepared for the machine to start at any time. Avoid surprise effects.

Sharp edges and corners**CAUTION!****Risk of injury from sharp edges and corners!**

Sharp edges and corners can cause excoriations and cuts on the skin.

- If working in the vicinity of sharp edges and corners, proceed with caution.
- If in doubt, wear protective gloves.

Intake components**WARNING!****Risk of injury from intake components!**

Intake-side silencers, at their inlets, suck in ambient air with great force.

- During operation, never place body parts or objects in front of the inlet of the silencer.
- Maintain a safe distance from intake components.

Sudden gas emission



CAUTION!

Risk of injury from sudden gas emission!

Components such as safety valves and start unloading devices may open suddenly during operation and emit hot compressed gas. Dust particles may be blown around.

- Never attempt to look inside the blow-off opening.
- Wear safety glasses when in the immediate vicinity of these components.
- Never close the blow-off opening.
- Always keep the blow-off opening clean.

Vibrations



WARNING!

Risk of injury from vibrations!

Vibrations may, in the long term, lead to injuries and chronic damage to personal health. The vibration source is decoupled from the surrounding environment by means of a vibration damper.

- Do not deactivate the vibration damper.
- Avoid coming into contact with vibrating areas.

Build-up of fluids



CAUTION!

Risk of injury from slipping as a result of a build-up of fluids!

Slipping on fluids that have built up on the floor area may lead to a fall. A fall may result in injury.

- Immediately remove built-up fluids with a suitable medium.
- Wear non-slip safety shoes.
- Place a warning notice and mandatory sign on or in the vicinity of any area where there could be a build-up of fluids on the floor area.



2.1.5 Mechanical hazards

Rotating components



WARNING!

Risk of injury from rotating components!

Rotating components may cause serious injury.

- During operation never reach into or perform work on rotating components.
- Never open covers during operation.
- Observe the lag time: before opening covers, make sure that no components are still moving.
- When in a hazard area, wear tight-fitting protective work clothing with minimal tensile strength.

Risk of crushing and shearing injuries



WARNING!

Risk of crushing and shearing injury from the hinged motor support!

Risk of injury from moving or adjusting the hinged motor support!

- When transporting the machine, always have the hinged motor support fixed in place.
- Never step or reach into the swivelling range of the hinged motor support.

2.1.6 Thermal hazards

Hot surfaces



WARNING!

Risk of injury from hot surfaces!

Component surfaces may become very hot during operation. Skin contact with hot surfaces causes serious burns.

- For all work performed in the vicinity of hot surfaces, always wear protective work clothing and protective gloves.
- Before beginning any work, ensure that all surfaces have cooled down to the environment temperature.

Hot media



WARNING!

There is a risk of injury from the sudden emission of hot media from the valve, e.g. a pressure valve!

The emission of hot media may lead to scalding.

- Never stand in the immediate vicinity of the outlet vent.
- Never attempt to look inside the outlet vent.
- Never close or cover the outlet vent.

2.1.7 Risks from pressurised components

Pressurised components



WARNING!

Risk of injury from compressed conveyed materials!

When disassembling pressurised components, or in the case of a fault in a pressurised component such as pipes, containers, hoses or valves, hot conveying material can escape with a strong gas flow. This can result in serious injury.

- Before beginning work, fully relieve pressurised components of pressure.
- Check that components are not pressurised.
- Replace malfunctioning components immediately.
- Only disassemble pressurised components when they are not under pressure.

Noise during disassembly



CAUTION!

Risk of injury from noise during the disassembly of pressurised gas pipes!

For the disassembly of pressurised components, such as pipes, containers, hoses or valves, hot conveying material is released, resulting in noise. This can cause hearing damage.

- Before beginning work, fully relieve pressurised components of pressure.
- Check that components are not pressurised.
- Only disassemble pressurised components when they are not under pressure.

2.1.8 Risks from hazardous substances

Hazardous substances

**WARNING!**

Risk of poisoning due to hazardous substances! Risk of skin irritation and allergic reactions!

Substances such as lubricants and cleaning agents contain hazardous components. These can lead to serious poisoning, skin irritation or allergic reactions.

- Observe the safety data sheets.
- Avoid shaking these substances and avoid mist formation.
- If inhalation occurs, bring the affected person out into fresh air immediately. Seek medical help.
- If a substance is swallowed, seek medical help immediately. The mouth must be rinsed out thoroughly with water.
- Avoid skin and eye contact:
Before working with these substances apply suitable hand protection cream.
Wear plastic or rubber protective gloves.
- Remove any soiling from the workspace properly and in an environmentally-friendly way.
Lubricants and cleaning agents must not enter the sewerage system or run into soil.
- Do not eat, drink or smoke when working with these substances.

Hazardous dust

**WARNING!**

Risk of injury from rising dust!

Dust deposits may rise during machine operation.

Inhaling this dust may, in the long term, lead to lung damage or other health problems.

- Avoid the relevant hazardous area.
- For all work in the hazard zone wear light respiratory protection.

2.1.9 Risks from flammable substances

Fire hazard

**WARNING!**

Risk of fire from spark-generating work and ignition sources in the immediate vicinity of the machine!

Easily-flammable substances, fluids or gases may catch fire and cause serious or fatal injury.

- Take measures to protect against the build-up of steam in deep-lying or closed areas.
- Take measures to protect against electro-static pressure charging.
- Do not smoke in the hazard zone or in the direct vicinity of the machine.

Do not use naked lights, fire or ignition sources of any kind.

- Immediately report suspicious materials, liquids or gases to the responsible persons.
- Have extinguishing agents (fire-extinguishing powder) for fire class A, B, and C at hand.
- In case of fire, stop your work immediately. Leave the hazard zone until it is safe to return and notify the fire brigade.

Improper fire protection

**WARNING!**

There is a risk of injury and material damage from limited or improper fire protection!

If, in the event of fire, the fire extinguisher is not operational or not suited to the specific class of fire, there is a risk of serious or fatal injury and considerable material damage.

- Ensure that only suitable fire extinguishers (fire-extinguishing powder for fire classes A, B and C) are at hand.
- Inspect fire extinguishers every 2 years to ensure they are functioning correctly.
- Refill fire extinguishers after each use.
- Only use extinguishing agents and replacement parts that correspond to the recognised model specified on the fire extinguisher.
- In case of use, observe the safety and operating instructions on the fire extinguisher.



2.1.10 Risks associated with conveyance of nitrogen

Leaking gas

**DANGER!****Risk of suffocation from build-up of leaking gases during nitrogen conveyance!**

Gaseous nitrogen displaces the oxygen in the room. High concentrations can cause persons to suffocate. Symptoms here include the loss of physical mobility and loss of consciousness. An affected person will not notice that they are “suffocating”. Escaping nitrogen can accumulate for example in recesses, wells, acoustic hoods.

- Avoid the occurrence of leaks.
- Ventilate the installation site properly.
- After a machine downtime, ventilate the acoustic hood for a period.
- Guide leaking gases directly out of the machine.
- Guide leaking gases directly into a collective line.

Leaking gases during machine downtime

**DANGER!****Risk of suffocation from build-up of leaking gases during machine downtime!**

Depending on the type of sealing used, gaseous nitrogen can escape into the environment during machine downtime. This can lead to a build-up of gases inside the acoustic hood or at the installation site. High concentrations can cause persons to suffocate.

- Interrupt the flow of nitrogen into the conveying system.
- Guide nitrogen away using a collective line.
- Ventilate the installation site properly.

Build-up of gas



DANGER!

Risk of suffocation from build-up of nitrogen during conveyance!

When the safety valve is opened, nitrogen is released from the system. There may be a build-up of gas with high concentrations of nitrogen.

Gaseous nitrogen displaces the oxygen in the room. High concentrations of nitrogen can cause persons to suffocate. Symptoms here include the loss of physical mobility and loss of consciousness. The persons affected do not notice that they are “suffocating”.

Escaped nitrogen can accumulate in recesses, wells, acoustic hoods etc.

- Avoid a build-up of gas
- Guide gases directly out of the machine.
- Guide gases directly into a collective line.
- Ventilate the installation site properly.

2.1.11 Environmental risks

Environmentally hazardous materials



ENVIRONMENT!

Environmental risk due to incorrect and negligent handling of environmentally hazardous materials!

Improper handling of environmentally hazardous operating materials and cleaning and sealing agents and, above all, their improper disposal, can cause considerable damage to the environment. These materials contain poisonous substances.

- Operating materials and cleaning and sealing agents must not be released into the environment.
- Disposal must be carried out by a certified waste management operator.
- If these materials are inadvertently released into the environment, take appropriate action immediately. If in doubt, contact the responsible local authority and inform them about the damage.



2.2 Intended use



Fig. 1: Correct use

The **rotary-piston compressor** machine is intended for conveying and compressing air and non-flammable gases.

The **rotary-piston compressor** machine is intended for operation with non-flammable gases in a non-explosive atmosphere.

The **rotary lobe compressor** machine has been designed and constructed solely for its “intended use” in the industrial field, as described here.

Observe and comply with the job-based operational data and operational limits!

This intended use also includes compliance with all information in this instruction manual.

Any application that deviates from the intended use, or any other type of non-standard application, is considered misuse.



Operating data that deviate from the standard must be coordinated with the manufacturer.

2.3 Foreseeable misuse

Serious injury



DANGER!

Danger in case of misuse! Dangerous situations could occur that may lead to fatal or serious injury!

- Never disregard the instructions for “intended use”.
- Never operate the machine in an operating area other than the one intended.
- Never convey or compress gases that are not listed in the order confirmation and the technical data.
- Never disregard the following information on misuse.

Serious material damage



NOTICE!

Danger in case of misuse! Dangerous situations could occur that may lead to serious machine damage!

- Never disregard the instructions for “intended use”.
- Never operate the machine in an operating area other than the one intended.
- Never convey or compress gases that are not listed in the order confirmation and the technical data.
- Never disregard the following information on misuse.

Misuse



Fig. 2: Prohibited use

The machine is not intended for:

- Conveying media in solid, liquid or powder form.
- Conveying caustic media.
- Conveying corrosive media.
- Conveying flammable or poisonous gases, vapours or mists.
- Alteration, retrofitting or modification of the overall design or of individual equipment parts, with the aim of altering the field of application or scope of use.

Further examples of misuse

The following operating modes/applications and uses are considered improper and must be avoided!

- **Operation:**
 - outside the scope of intended use.
 - outside the scope of the intended operating data.
 - using gases other than those originally intended.
 - with the machine operating in the incorrect direction of rotation.
 - in a potentially-explosive atmosphere.
 - with closed flange connections.
 - with missing or damaged components.
 - without a correctly connected control system, fault transmitter, EMERGENCY STOP function.
 - without any or with damaged protective equipment.
 - with contaminated intake filter/starting strainer.
 - without sufficient ventilation of the room.
 - activation while the machine is coming to a stop or when it is rotating backwards.
 - pole changing to a lower rotational speed before the drive motor has come to a standstill.
 - non-compliance with maintenance intervals.
 - filling beyond the maximum oil level.
- **Operation without:**
 - Intake filter
 - Safety valve
 - Intake silencer
 - oil
- **Applications:**
 - using the machine to “purge” blockages in the conveying pipes. exceeding the maximum permissible discharge pressure.
 - using the safety valve to adjust operating data.
- **Installation:**
 - installation on inclined, sloped or lamellar surfaces.
 - installation outdoors without due consideration of particular protective measures for avoiding the effects of weather conditions.
 - attachment of transportation equipment to the acoustic hood.
 - open flames or spark formation in the immediate vicinity of the machine.

2.4 Responsibility of the operator

Operator

The operator is the person who operates the machine himself, for commercial or business purposes, or who assigns the use/application of the machine to a third party. During operation, the operator holds legal responsibility pertaining to the product, for the protection of the user, personnel or third party.

Operator's obligations

The machine is used for commercial purposes. The operator of the machine is thus subject to the applicable legal obligations for occupational safety.

Alongside the safety instructions in this manual, the safety, occupational and environmental regulations relevant to the field of application for the machine must also be complied with.

The operator is obligated to:

- Inform himself about the applicable occupational protection regulations. As part of a hazard assessment, the operator must also establish the hazards that could result from special working conditions at the machine location. He must implement these for the operation of the machine in the form of operating instructions. The necessary safety data sheets can be obtained from the relevant manufacturer.
- During the entire service life of the machine, check that the operating instructions created by the manufacturer correspond to the current status of the applicable regulations. If necessary, adjust the operating instructions accordingly.
- Clearly structure and specify the responsibilities for installation, operation, fault rectification, maintenance and cleaning.
- Ensure that all persons who come into contact with the machine have read and understood these instructions. In addition, the operator must regularly provide personnel training as pertains to machine use and inform personnel of the related hazards.
- Provide personnel with the necessary protective equipment and communicate to personnel that the wearing of this protective equipment is compulsory.

In addition, the operator is responsible for ensuring that the machine is in perfect technical condition.

For this reason the following applies:

- The maintenance intervals described in this instruction manual must be complied with.
- All safety devices must be regularly inspected to ensure they are in good working order.

Additional obligations

The operator must ensure that the following requirements are complied with and put into practice:

- The machine is only operated in its original delivered condition. In cases where the operator adds his own fittings or makes modifications, the manufacturer's declaration of conformity is rendered void.
- Any working behaviour that jeopardises the safety of the machine is prohibited.
- The machine must always be kept in a technically-perfect and operationally-safe condition. Replace damaged or non-operational components immediately. If in doubt, be sure to contact the manufacturer or the responsible contact person.
- Do not operate the machine when the protective equipment has been disassembled or disabled.

- Observe all warnings and notices displayed on the machine and make sure they are readable. You must replace loose or illegible signs. Ask the manufacturer for replacements.
- Install the separately provided components listed in the scope of delivery onto the machine and incorporate these into the overall safety concept.
- Do not dismantle or incorrectly fit any electrical, mechanical or hydraulic connections.
- For protection against potential damage caused by lightning, make sure a suitable earthing system is in place.
- If the conveyed medium tends to form condensate, the condensate must be bled off (e.g. using discharge tanks, residual gas pipes or by briefly opening the lower condensation holes).
- Separate dusty material before it enters the machine. Material that collects in the conveying chamber or the rotors presents a particular danger for the working safety of the machine.
 - This also applies to the compression of re-sublimating gases. Hard particles could be discharged during the gas phase and collect in the machine.
- Use suitable process control (pressurisation, partial pressurisation, temperature, speed) to prevent re-sublimation in the machine.

Safeguards for the machine stage and pressurised pipelines

The operator must ensure that the following requirements are complied with and put into practice:

- For machines with oil pressure and discharge pressure monitoring, the electrical connection must be safeguarded.

The machine stage is secured by sensors for oil pressure, discharge pressure and discharge temperature.

The sensors are wired at the factory to a fault indicator device or control system. In the event of deviation from the permissible operating parameters, the fault indicator device or control system switches off the drive motor.

For systems without a fault indicator or control system, an operationally reliable control system must be provided by the customer.

Connect the fault indicator or control system to the safety line of the drive motor, in accordance with the wiring diagram.
- The fault indicator or control system and drive motor must be fed from the same electric circuit in order to rule out the possibility of motor operation with no safety line.

Operator's obligations at the installation site

The operator must ensure that the following requirements are complied with and put into practice:

- Machine use only in a stable three-phase power supply. Voltage fluctuations / drops beyond the tolerance level may cause serious damage to the drive system.
- Activate motor overload protection.

- For system variants without a main circuit breaker featuring an EMERGENCY STOP function, the safety circuit of the machine should be incorporated into the EMERGENCY STOP concept for the overall system. Ensure the accessibility of additional EMERGENCY STOP switches in the vicinity of the machine. The machine must be equipped with one or more EMERGENCY STOP command devices for the purposes of operation. The EMERGENCY STOP function must be available and operational at all times, independent of the operating mode.
- It must not be possible for a powered-down machine to start automatically.
- For the purposes of operation, the machine must be equipped with a command device that shuts down the machine in dangerous situations. The power supply to the motor must be cut off. If this is not possible, the “standstill” operating condition must be monitored and maintained.
- Avoid electrostatic charges. Connect an equipotential bonding.
- For accidents and emergencies, incorporate emergency measures for the machine into the overall emergency measures. Make particular efforts to integrate these measures into the evacuation and rescue plan and the fire warning plan.

2.5 Replacement parts

Use of incorrect replacement parts



CAUTION!

Safety risk from using incorrect replacement parts!

Incorrect, defective or unsuitable replacement parts or copies of original components may endanger personal safety and lead to damage, faults or the total failure of the machine.

- Only use the manufacturer’s original replacement parts or parts approved by the manufacturer.
- If in doubt, always contact the manufacturer.

Purchase replacement parts from an authorized dealer or from the manufacturer directly. For contact information see Customer service ☎ *on page 11*.

Replacement parts

Replacement parts that have not been provided by AERZEN have not been tested or approved. They do not correspond to the original components. The use of such products can potentially have an effect on the default design characteristics of the system. The manufacturer assumes no liability for damage resulting from the use of non-original components.

2.6 Requirements for personnel

2.6.1 Qualifications

The various tasks described in this instruction manual represent a variety of requirements in terms of the qualifications of the persons responsible for carrying out these tasks.

Insufficient qualifications

**WARNING!****Risk if persons are not sufficiently qualified!**

Insufficiently qualified persons are unable to gauge the risks presented by the use of the machine and put themselves, and others, at risk of serious or fatal injury.

- Only allow work to be carried out by suitably qualified persons.
- Observe the information on qualifications in this manual.
- Keep insufficiently qualified persons away from the operating range of the machine.

For the purposes of all work with this machine, only allow persons who are expected to carry out their work reliably to do so. Persons whose reaction times have been impaired, e.g. through drug or alcohol consumption or medication, must not be permitted to work.

This instruction manual contains the following qualification requirements for the various tasks:

Authorised electricians

Authorised electricians, on the basis of their field-specific training, expertise, experience and knowledge of the relevant standards and requirements, are able to carry out their work on electrical systems safely while independently recognising and avoiding hazards.

Authorised electricians are specially trained for the environment in which they work and are familiar with the relevant standards and requirements.

Authorised electricians with additional qualifications

Authorised electricians have the additional qualifications needed for working in the field of frequency converters and EMC. Authorised electricians are familiar with the relevant standards and requirements.

Written documentation acts as proof of a completed safety instructional course and evidence of the necessary additional knowledge.

Due to their additional qualifications, these authorised electricians are able to carry out work on electrical systems with frequency converters and can independently recognise and avoid possible hazards. The additional skills that constitute this qualification should be taught through regular practical application.

Manufacturer's customer service division

Certain work may only be performed by the customer service division of the manufacturer. On the basis of its special, field-specific training, expertise and experience, the customer service division is up to the task of performing highly-skilled work.

The customer service division is a competent point of contact for all stages of the machine's service life. It is able to perform all work on the machine with the highest efficiency.

Service personnel

Service personnel are able to carry out their work on the basis of their field-specific training, expertise, experience and knowledge of the relevant standards and requirements. Personnel recognise hazards independently and avoid risks.

Service personnel in particular possess practical experience and extensive field-specific expertise for the variety of tasks.

- Transport
- Set-up / installation
- Commissioning
- Maintenance
- Fault rectification
- Disassembly

Depending on the designated job, the person must have additional qualifications:

- Operation and handling of compressors.
- Parameterisation of compressors.
- Optimisation work within the permissible operating data range.

Skilled staff for industrial waste

Skilled staff for industrial waste possesses comprehensive, field-specific expertise relating to the disposal and recycling of industrial waste. Skilled staff transports the industrial waste to the waste disposal company and holds responsibility for proper sorting of waste. The staff incorporates this sorting into the recycling and disposal processes.

Trained persons

A trained person has been expressly instructed and, if necessary, trained on site by the responsible management about the tasks delegated to him or her and the risks that are posed by improper behaviour. A trained person has been instructed regarding the necessary protective equipment and protective measures. He or she is in a position to work cautiously and to recognise hazards and react accordingly. The trained person may not interfere with the handling and operation of the machine.

Depending on the designated job, the person must have the following expertise:

- Transport and handling of packaged units.
- Ability to perform visual inspections of the machine.

**User**

The machine user is trained by the system operator in terms of operation, maintenance work and basic fault rectification. He or she is informed of possible operational hazards and improper behaviour. Tasks that go beyond those for which the machine user is trained or instructed may only be carried out if these tasks are listed in this instruction manual and the operator has expressly designated these tasks to the user.

2.6.2 Unauthorised personnel**Unauthorised personnel in the installation area****WARNING!****Risk of fatal injury for unauthorised persons in the installation area!**

Unauthorised persons who do not fulfil the requirements described here, are not familiar with the hazards in the installation area. Therefore, unauthorised persons are at risk of serious or fatal injury.

- Keep unauthorised persons away from the installation area.
- If in doubt, instruct such persons to leave the installation area.
- Stop all work as long as unauthorised persons are in the installation area.



2.7 Personal protective equipment

Personal protective equipment serves to protect persons from breaches of safety and health hazards when working.

Personnel, when working near or with the machine, must wear the personal protective equipment described separately in the various sections of this instruction manual.

Description of personal protective equipment

The following is a description of the personal protective equipment:



Hearing protection

Hearing protection serves to protect against hearing damage from noise generation.



Industrial hard hat

Industrial hard hats protect the head against falling or stray objects and loads and from collisions against stationary objects.



Light respiratory protection

Light respiratory protection protects against harmful dusts.



Protective gloves

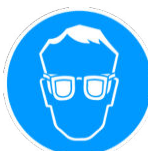
Protective gloves protect hands from friction, abrasion, puncture hazards or more serious injuries and from contact with hot surfaces.

They are oil-resistant and protect hands from coming into contact with lubricants.



Protective work clothing

Protective work clothing is tight-fitting work clothing with minimal tensile strength, tight sleeves and without protruding parts.



Safety goggles

Safety goggles serve to protect the eyes against flying particles and splashing liquids.



Safety shoes

Safety shoes protect feet from being crushed, from falling objects and from slipping on slippery surfaces.

2.8 Safety devices

Correct functioning of safety devices



WARNING!

Risk of fatal injury from non-functioning safety devices!

Non-functioning or deactivated safety devices may cause serious or fatal injury.

- Before beginning work, check that all safety devices are functioning correctly and are correctly installed.
- Never deactivate or bypass safety devices.
- Ensure that all safety devices are accessible at all times.

2.8.1 EMERGENCY STOP function



The EMERGENCY STOP function serves, in cases where there is a hazard or when one is averting a hazard, to bring the machine quickly to a safe stop (standstill).

Depending on the customer's specifications, machine variants are available with or without a power circuit breaker system.

Depending on the model, the machine:

- may not feature a control system
- may not feature an EMERGENCY STOP function

Before operating the machine:

Check whether the EMERGENCY STOP function is in place and installed.

It must function perfectly.

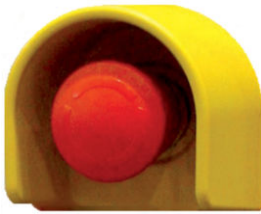
**EMERGENCY STOP command device**

Fig. 3: Example: EMERGENCY STOP command device

An EMERGENCY STOP command device includes a special command unit which is connected to the control system.

The EMERGENCY STOP function allows for the machine to be shut down safely and immediately in case of a potential or existing hazard.

The power supply to all turning components is interrupted immediately when the EMERGENCY STOP function is activated.

It is also possible to install additional EMERGENCY STOP command devices.

Without a power circuit breaker system

- For this variant, an EMERGENCY STOP command device is not installed on the machine at the factory.
- The machine is delivered without an EMERGENCY STOP apparatus.
- The operator must provide a power circuit breaker system with electrical overload protection, an On/Off command unit and an EMERGENCY STOP function.
- Perform Stop Category 0.
- Detail the performance data of the electrical installation in accordance with the operating data of the motor. Take into consideration the necessary data, for example: voltage, current, frequency.
- The connection to the power supply is made using the installed and delivered power cabinet.
- The lines running to the power supply are fed directly to the electric motor and are connected inside a terminal box.
- Feed the connection lead through the cable conduit to the terminal box.
- Protect the motor against overheating.
- A main circuit breaker must be installed.

With a power circuit breaker system

- Depending on the model, an EMERGENCY STOP command device is installed at the factory in the power circuit breaker system.
 - If the factory-installed power circuit breaker system *does not* feature an EMERGENCY STOP command device, this must be provided by the operator.
Perform Stop Category 0.
 - If the factory-installed power circuit breaker system *does* feature an EMERGENCY STOP command device, Stop Category 0 is performed.
- A main circuit breaker must be installed if it is not part of the power circuit breaker system.
- The power supply is connected at the power cabinet.
- Observe the wiring scheme!

Notes on installation by the operator

The EMERGENCY STOP facility must:

- be installed and integrated into the safety line of the system controller.
- be clearly recognisable, highly visible and quickly accessible.
- shut down dangerous operation quickly without causing any additional risks.
- if necessary, trigger specific safety measures or authorise the triggering of safety measures.
- be installed in such a way that the machine user can activate it immediately in an emergency.
- be designed in such a way that, in cases where there is an interruption in the power supply or the power supply is activated after an interruption, no situations can occur in which there is a threat of personal injury or material damage.
- supplement other protective measures without acting as a substitute for them.

Requirements for installation by the operator

The EMERGENCY STOP function must be available and operational at all times, independent of the operating mode.

The EMERGENCY STOP facility must not require the entire machine to be voltage-free. In situations where a risk is detected, it must be possible for the user to stop the machine in order to protect against a hazard. For the purposes of a controlled shut-down, electrical voltage may be necessary. The electrical system is still under voltage.

If several EMERGENCY STOP devices are in place, all of these devices must be able to shut down the machine.

The EMERGENCY STOP function must, after being triggered, remain effective until authorisation is given for a restart.

It must not be possible to attempt to block the EMERGENCY STOP device without a "stop" command being issued.

Ensure that it is only possible to release the EMERGENCY STOP device by means of authorised activation.

This authorisation must not cause the machine to start operating again automatically but rather it should make a machine restart possible.

2.8.2 Insulating sheathing

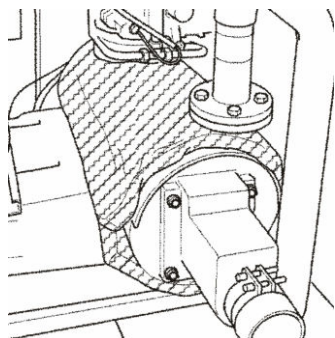


Fig. 4: Example: insulating sheathing



The insulating sheathing serves to protect the machine against thermal hazards.

- Depending on the conditions of use and technical design, an insulating sheathing is fitted, e.g. a discharge silencer
- Type H machines always receive insulating sheathing as a result of the increased discharge temperature.

2.8.3 Hinged support with lifting device

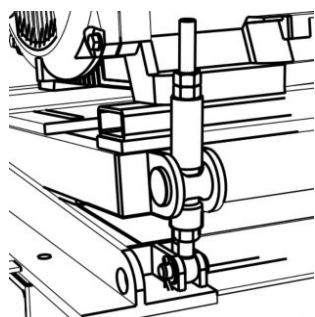


Fig. 5: Hinged support



The hinged support serves to protect against mechanical hazards.

- The hinged support holds the motor hinge in place during transport and assembly. It prevents uncontrolled movement of the motor hinge.
- When operating the machine, the hinged support must be released and positioned accordingly.

2.8.4 Acoustic hood

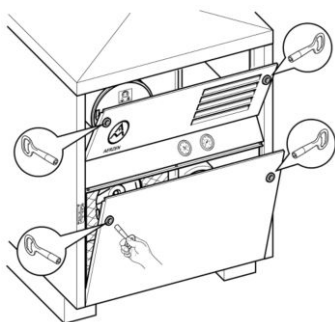


Fig. 6: Acoustic hood, front view (example)



The acoustic hood serves to protect against mechanical and thermal hazards.

- The acoustic hood is an essential safety component of the product.
- The elements of the acoustic hood must be locked with the provided special locks during operation and in stand-by mode.
- Operation with an open acoustic hood is not permissible.
- The locking key for the acoustic hood is a component of the overall safety concept. Access to the key must only be possible for personnel who have been briefed in the safe operation of the machine and the contents of the instruction manual.

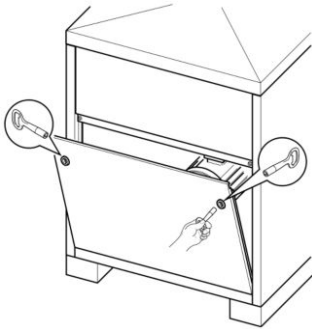


Fig. 7: Acoustic hood, rear view (example)

2.8.5 Belt guard

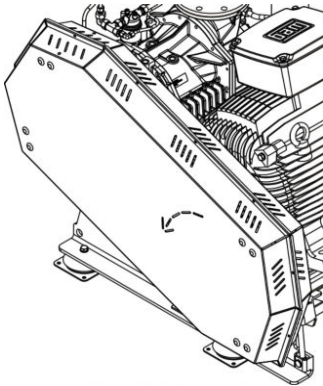


Fig. 8: Belt guard

2.8.6 Cover of the sheave

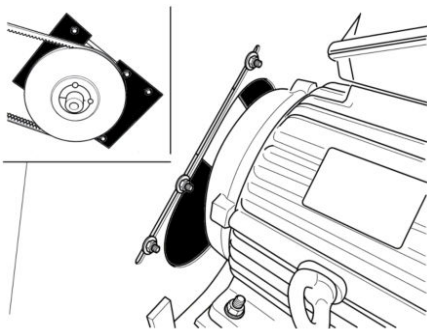


Fig. 9: Cover

2.9 Safety classification

i The belt guard serves to protect against rotating components.

- A belt guard is always used in machines without an acoustic hood. It serves to protect against rotating components.

i The cover serves to protect against rotating components.

- The belt guard features two plastic covers.
- These serve to protect the rotating sheaves and prevent persons from reaching directly into the belt drive.

The following symbols and notices are displayed on the machine. They relate to the immediate vicinity in which they are located.

Safety classification

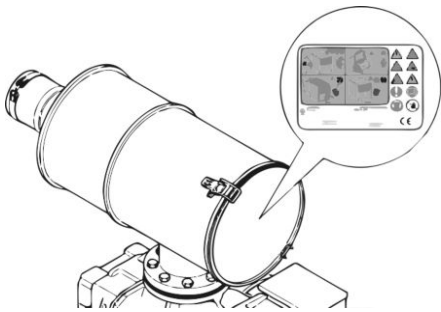


Fig. 12: Position on the belt guard model

Placement of the sticker set on the intake silencer.

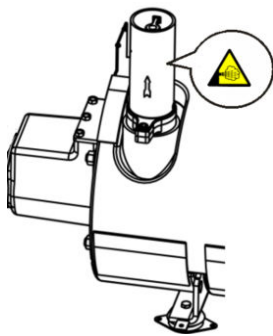


Fig. 13: Position on the AERZEN safety valve

Warning sign on the AERZEN safety valve.

Access for unauthorised persons forbidden



Only persons given authorisation by the operator may enter the hazard area.

Electrical voltage



Only qualified electrical personnel may work in the signposted working area.

Unauthorised persons are not permitted to enter the signposted working area or open the signposted cabinet.

Automatic start-up



The sudden start-up of operational machines in the rest position is possible at any time.

Take heed of the stand-by mode! A sudden start is possible.



Hot surfaces



Hot surfaces, such as hot machine parts, containers or materials - but also hot liquids - are not always noticeable. Do not touch them without protective gloves.

Hand injuries



Keep hands away from areas that carry this warning sign.

There is a risk that hands could be crushed, trapped or injured in some other way.

Gas emission



Risk from sudden gas emission.

The opening of the safety valve results in the emission of gas and accompanying noise emissions. There is a risk of hearing damage and injuries to eyes or skin.

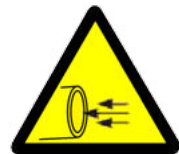
Pressure in the piping



Pipelines may be placed under pressure.

Before carrying out disassembly work, deactivate the pressure in the pipelines.

Draw-in of gas



Pipelines can suck in large volumes of air in the immediate vicinity of the intake openings.

Avoid the air-intake area. Shut down the machine before undertaking any activities in this area.

2.10 Instruction signs

Wear hearing protection



In areas where this symbol is displayed there is a risk of hearing damage. Therefore, wear hearing protection when in these areas.

Information on wearing hearing protection	
< 80 dBA	Hearing protection is not prescribed as mandatory but should be worn as a matter of personal responsibility.
80 to 85 dBA	Hearing protection is recommended
> 85 dBA	Hearing protection must be worn



Observe the instruction manual



Only use the labelled machine once you have read the instruction manual.

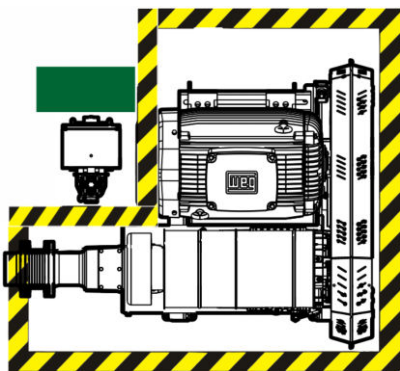
2.11 Hazards in the operating and/or display area





-  Hazard area
-  Operating and/or display area

The hazard area is located in the marked zone (in the acoustic hood interior zone). The opening of acoustic hood elements and protective covers during operation is not permissible. Opening is permissible only for maintenance work or for troubleshooting and provided all safety precautions are observed. The operating and/or display area is the position marked in green (example).

Fig. 14: Hazard area and operating and/or display area (top-down view)



-  Hazard area
-  Operating and/or display area

The hazard area is located in the marked zone. The opening of the protective cover is not permissible. The operating and/or display area is the position marked in green (example).

Fig. 15: Hazard area and operating and/or display area (top-down view)

2.12 Securing the machine against restarting

Sudden restart






**DANGER!**

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard zone. Activating the energy supply and starting the machine could result in those people being fatally injured.

- Prevent the machine from restarting by:
 - disconnecting the electrical power supply.
 - activating the EMERGENCY STOP function
 - operating the main circuit breaker
 - attaching a padlock to the main circuit breaker
 - checking and ensuring that the machine is completely disconnected from the power source
 - displaying a sign on the machine that prohibits a machine start
 - displaying a sign on the remote station that prohibits a machine start
- Before restarting, ensure that safety devices are installed and functioning correctly and that there are no potential hazards to the safety of any persons.

EMERGENCY STOP button (option)

- 1.**  Press the EMERGENCY STOP button
 - ⇒ The power supply is shut off.
- 2.**  Activate the main circuit breaker.
 - ⇒ The machine is free of current.
- 3.**  Attach a padlock to the main circuit breaker.
- 4.**  Ensure that the machine is completely disconnected from the power source.
- 5.**  Inform supervisory personnel of work in the hazard area.

6. ➤ Place a sign on the machine and (where applicable) remote station that notifies persons of the work being carried out in the hazard area and forbids activation of the machine. The sign must contain the following information:
 - Shut-down on:
 - Shut-down at:
 - Shut-down by:
 - Important: Do not switch on!
 - Important: Only switch on the machine once it has been ensured that there is no risk to personal safety.

EMERGENCY STOP feature (operator-installed)



The particular approach to preventing a restart is dependent on the operator-installed EMERGENCY STOP feature.

1. ➤ Secure the machine against restarting in accordance with the operator's instructions.
2. ➤ Follow the instructions of the responsible supervisory personnel.
3. ➤ Once all work has been completed, ensure that there is no risk to personal safety.
4. ➤ Ensure that all safety and protective equipment is installed and operational.

2.13 Environmental protection

Environmentally hazardous materials



ENVIRONMENT!

Improper handling of environmentally hazardous materials presents a threat to the environment!

Incorrect handling of environmentally hazardous materials, particularly in the case of improper disposal, can cause considerable damage to the environment.

- Always observe the information below on the handling of environmentally hazardous materials and their disposal.
- If environmentally hazardous materials are inadvertently released into the environment, take appropriate action immediately. If in doubt, inform the responsible local authority about the damage and seek advice on taking appropriate measures.

The following environmentally hazardous materials are used:

**Lubricants**

Lubricants such as greases and oils contain poisonous substances. They must not be released into the environment. Disposal must be carried out by a certified waste management company.

AERtronic batteries

Batteries contain poisonous heavy metals. They require special waste treatment and must be deposited at local collection points or disposed of by specialist companies.

Electronics

Electrical and electronic components may contain poisonous material. These components must be collected separately and deposited at local collection points or disposed of by specialist companies.

Anti-corrosion agents

Anti-corrosion agents may contain poisonous substances. They must not be released into the environment. Disposal must be carried out by a certified waste management operator.

3 Design and operation

3.1 Overview of assemblies

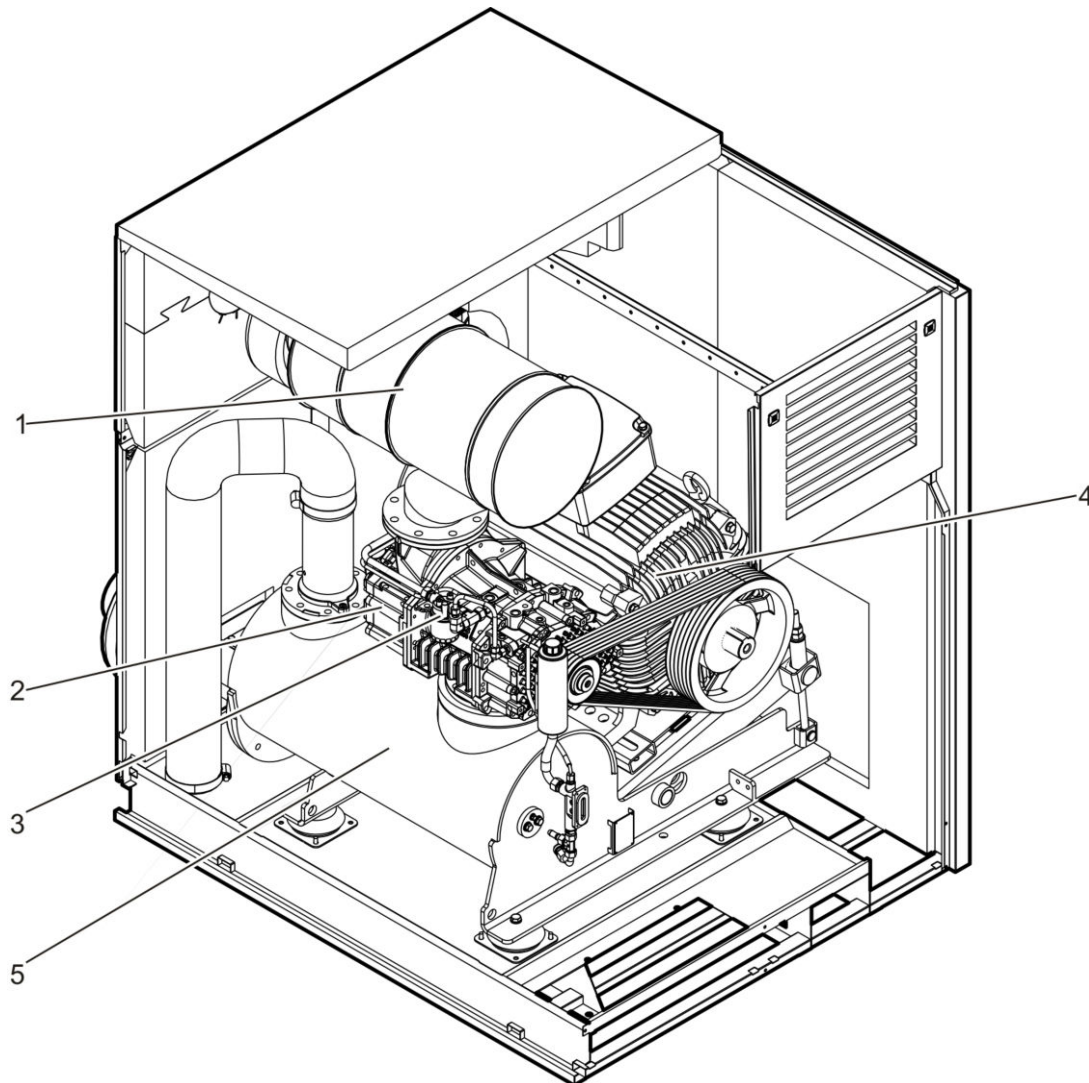


Fig. 16: Overview

- 1 Intake side
- 2 Machine stage
- 3 Oil system
- 4 Drive system
- 5 Discharge side

3.2 Overview of assemblies

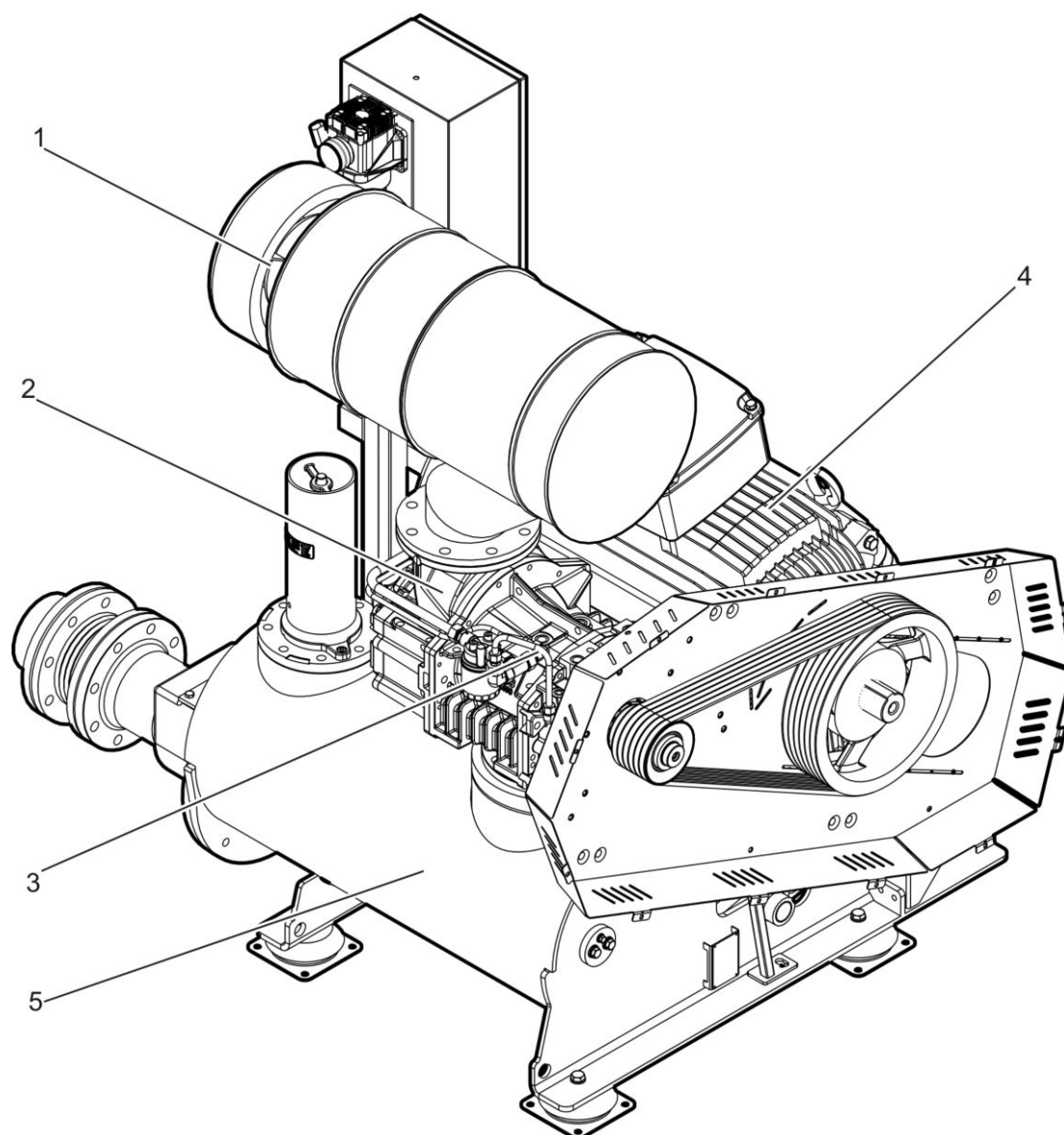


Fig. 17: Overview

- 1 Intake side
- 2 Machine stage
- 3 Oil system
- 4 Drive system
- 5 Discharge side

3.3 Operating principle

The medium to be conveyed is connected using an elastic rubber sleeve or the compensator of the discharge-side connection casing.

The medium to be conveyed enters through the intake silencer. This offers the possibility of a intake-side pipe connection. There is a replaceable filter element located inside the intake silencer. Dirt levels in the filter element can be displayed using a service indicator or the control system display.

The rotary lobe compressor conveys and compresses the medium to be conveyed. The medium then flows through the discharge silencer, via a non-return valve, into the customer's system. The rotary lobe compressor is powered by a drive motor using a belt drive. The belt drive derives tension automatically from the weight of the motor. The drive motor is powered by connecting its power lines in the terminal box.

A safety valve is installed on the base support or on the connection housing. The working pressure can be displayed by a pressure gauge or in the control system screen.

The ventilation of the acoustic hood is carried out by a separate ventilator.

3.4 Operating principle

The medium to be conveyed is connected using an elastic rubber sleeve or the compensator of the discharge-side connection casing.

The medium to be conveyed enters through the intake silencer. This offers the possibility of a intake-side pipe connection. There is a replaceable filter element located inside the intake silencer. Dirt levels in the filter element can be displayed using a service indicator or the control system display.

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A safety valve is installed on the base support or on the connection housing. The working pressure can be displayed by a pressure gauge or in the control system screen.

3.5 Operating modes

On-site operation

Operation of the machine is carried out directly on site.

Remote operation

Operation of the machine is carried out via control station.

Automatic operation

Automatic operation of the machine is carried out by sensors or a system switch.

Load operation

Load operation is the operating mode in which the machine processes the specified operating data.

3.6 Operating methods

3.6.1 Operating information for pneumatic conveyance

Pneumatic conveyance

When the machine is being used for the purposes of pneumatic conveyance, pressure surges must not occur when switching between different delivery lines.

Pressure surges can be prevented by making the switching process for the intake-side and discharge-side valves take at least five seconds. This pre-accelerates the gas column in the pipework. The gas can no longer accelerate suddenly. This prevents damage to the machine.

The distance between the switchover valve and the intake-side flange must be at least $10 \times DN$. DN = nominal diameter of the pipework.

This safety note applies to both pressure and vacuum mode.

3.6.2 Operating information for air-separation systems

Operating information for air-separation systems

When the machine is being used in air-separation systems with alternating air-separation columns, pressure surges must not occur when switching between different delivery lines.

Pressure surges can be prevented by making the switching process for the intake-side and discharge-side valves take at least five seconds. This pre-accelerates the gas column in the pipework. The gas can no longer accelerate suddenly. This prevents damage to the machine.

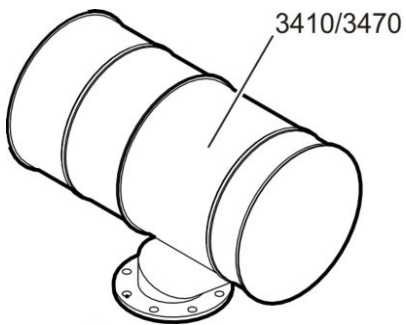
The distance between the switchover valve and the intake-side flange must be at least $10 \times DN$. DN = nominal diameter of the pipework.

This safety note applies to both positive pressure and vacuum pressure mode.

3.7 Description of assemblies

For the purposes of explaining its functionality, the machine is divided into several assemblies. Each assembly consists of a number of components which, combined, perform a specific machine function. One assembly can consist of sub-assemblies and additional components.

3.7.1 Intake side

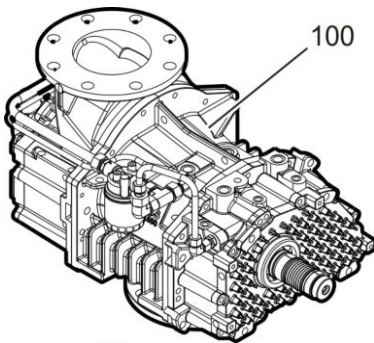


- 3410 Intake silencer, housing
- 3470 Intake filter

The intake side assembly comprises the components of the conveying system's intake side. The intake side assembly includes all components located upstream of the machine stage gas inlet. The medium to be conveyed is drawn into the machine stage by these components. An intake silencer serves to reduce noise emissions. A filter ensures clean intake gas.

Fig. 18: Intake side

3.7.2 Machine stage

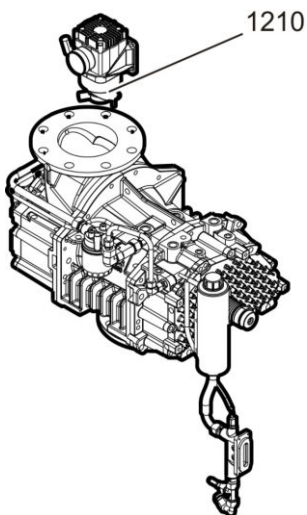


- 100 Machine stage

The machine stage is the core of the machine and includes all components for gas compression. The gas compression process takes place in the machine stage.

Fig. 19: Machine stage

3.7.3 Oil system



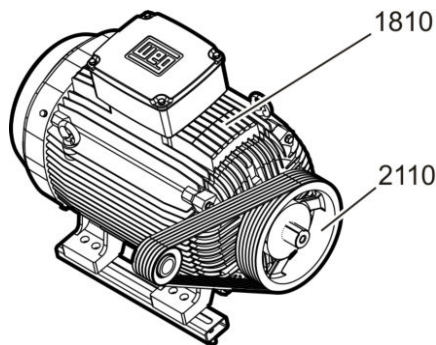
- 1210 Oil demister

The oil system contains all components necessary for providing lube oil to the machine stage.

Fig. 20: Oil system



3.7.4 Drive system

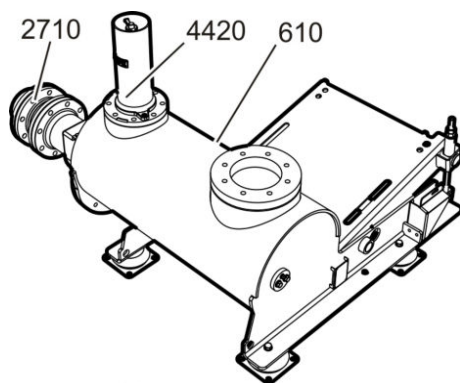


- 1810 Motor
- 2110 Belt drive

The drive system comprises the drive motor and the drive elements, e.g. the belts and sheaves. The drive system provides a high revolution speed for the rotational motion of the machine stage.

Fig. 21: Drive system

3.7.5 Discharge side belt guard version

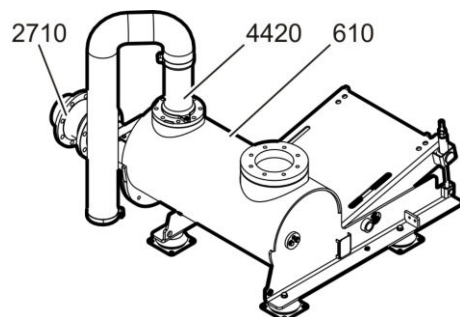


- 610 Base support
- 4420 Safety valve
- 2710 Flexible pipe connection

The discharge-side assembly represents the components of the discharge-side conveying system. The discharge-side assembly includes all components fitted downstream from the machine stage gas outlet. All components are pressurised during operation and have hot surfaces. A discharge silencer serves to reduce noise emissions.

Fig. 22: Discharge side with base support

3.7.6 Discharge side acoustic hood version



- 610 Base support
- 4420 Safety valve
- 2710 Flexible pipe connection

The discharge-side assembly represents the components of the discharge-side conveying system. The discharge-side assembly includes all components fitted downstream from the machine stage gas outlet. All components are pressurised during operation and have hot surfaces. A discharge silencer serves to reduce noise emissions.

Fig. 23: Discharge side with base support

3.8 Control elements (optional)

Factory-installed control element



Observe the AERtronic instruction manual

The AERZEN controller is delivered as standard with overpressures upwards of 1,050mbar.

The AERtronic instruction manual is included with the product.

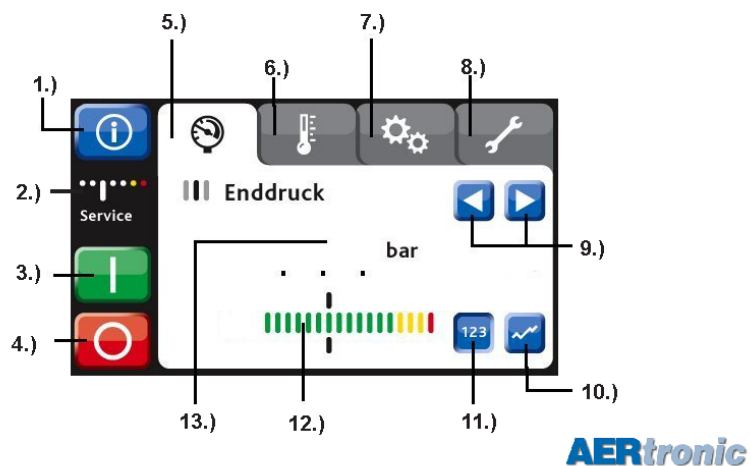


Fig. 24: Operator interface

- 1 Information menu
- 2 Service display
- 3 Local/ LOCATION / START
- 4 Local/ LOCATION / STOP
- 5 Pressure ranges register
- 6 Temperature ranges register
- 7 Additional operating parameters register
- 8 Service and setup register
- 9 Selection buttons of the given display menu within a register
- 10 Graphic representation
- 11 Numerical representation
- 12 Bar graph display
- 13 Measurement value display

3.9 Customer-installed control element

Customer-installed control element



Depending on the model and version - with or without a corresponding controller - the control elements are not part of the scope of delivery. The installation and design of the control elements is then the responsibility of the customer.

3.10 Accessories

The accessories are the total collection of components belonging to the machine or to the supplementary equipment.

3.10.1 Drive motor

Motor connection requirements



The cable and lead sheathing must be resistant to the normal wear expected due to the movement of the hinged motor support and the effects of contaminants in the atmosphere.

General requirements

- Fine-core cable is recommended for the connecting leads.
- The connecting hardware must be suitable for the cross-section and type of the connecting leads.
- Cables, leads and connections must not be subjected to excessive bending and tensile forces. Install the connecting cable via a stayed cable bridge (not provided) to prevent the terminal box being subjected to forces or stress.
- Install cables and leads in such a way that they cannot sustain any external damage.
- Avoid contact with the machine, excessive friction and excessive radiant heat.
- The connecting cable must be resistant to light movements, e.g. the changes in the rotational speed of the motor.

General requirements

- Fine-core cable is recommended for the connecting leads.
- The connecting hardware must be suitable for the cross-section and type of the connecting leads.
- It may be necessary to remove the intake console and the acoustic hood cover to connect the motor, depending on the size and output of the machine.
- Cables, leads and connections must not be subjected to excessive bending and tensile forces. Install the connecting cable via a stayed cable bridge (not provided) to prevent the terminal box being subjected to forces or stress.
- Install cables and leads in such a way that they cannot sustain any external damage.
- Avoid contact with the machine, excessive friction and excessive radiant heat.
- The connecting cable must be resistant to light movements, e.g. the changes in the rotational speed of the motor.

Requirements for the electricity network



NOTICE!

There is a risk of material damage from voltage fluctuations / drops!

Voltage fluctuations / drops beyond the tolerance interval may lead to serious damage to the drive system.

Requirements for operating positive displacement machines with electric induction motors in a three-phase AC supply system:

- Use suitable protective equipment that will shut the motor down and safeguard it against an automatic restart if impermissible electrical operating data is detected.
- Connect the motor and control voltage to a stable common network to ensure that the power contactor is no longer latched if the power supply fails.
- Comply with voltage and frequency limits. ↪ *Chapter 11.9.1 „Voltage fluctuations“ on page 183*

Connection

- Only authorised electricians may perform the connection.
- Electricians must observe all applicable regulations when connecting the drive motor.
- Observe the tightening torques of the terminal screws.
- Secure all connections against inadvertent release or loosening.
- Ensure that the nominal electrical data is complied with during operation.

Control circuit types

- Star-delta connection
- Pole changing
- Speed control using frequency converter
- Direct start

Permissible starting frequency

up to 160 kW	6 starts per hour
from 200 kW	3 cold starts or 2 warm starts per hour

Refer to the operating manual provided by the drive motor manufacturer for further specifications and information.

3.10.1.1 Drive motor - factory installation

Factory installation



Observe the information on the type plate and in the drive motor instruction manual.

Refer to the drive motor instruction manual for electrical operating data, maintenance intervals and suitable lubricants.

3.10.2 AERtronic

AERtronic



Fig. 25: AERtronic Display

The AERtronic is used as a control device and as a display and monitoring device.

The AERtronic is fitted with a colour graphics display with a touch-screen interface.

When starting for the first time, these settings can be changed.

Other handling and operation of the controller is defined on the display; the user is guided through the menu by prompts in a structured manner.

The AERtronic includes all the functions necessary for start and shut-down procedures and displays the operating parameters and prompts.

Observe the operating manual for the purposes of commissioning and operation!

AERZEN reserves the right to change, expand or improve the hardware and software of this product as required. This does not include any obligation to update units already shipped.

3.10.3 Instrumentation

The instrumentation consists of several assemblies.

1.) Pressure and temperature sensors in conjunction with the AERZEN AERtronic controller.

2.) Pressure and temperature switches in conjunction with the AERZEN AERtronic controller.

Shut-down locking

- The shut-down devices are set at the factory.
- All shut-downs must be self-locking. Once the switches have been released, the machine must not be able to start automatically.
- Prior to a restart, the cause of the fault must be determined and eliminated. Start-up must then take place manually.



NOTICE!

The switching points of the switches / sensors are fixed and must not be changed.

Oil pressure switch

To enable the machine to start, the oil pressure limit contact is bypassed for a few seconds by a timer relay.

If the contact is not closed after 25 seconds (there is no oil pressure), the drive motor must power down.

If the oil pressure drops below the preset limit during operation, the floating limit contact will open. The machine must power down!



NOTICE!

The drive motor must power down if:

- after the start phase (after 25 seconds), no oil pressure has been produced
- the oil pressure drops suddenly during operation and falls below the preset limit.



Machine sizes D62S, D62H and D75L do not have an oil pump. Oil pressure monitoring is not necessary.

Pressure and temperature switches

If, to safeguard the machine, an intake pressure, discharge pressure or discharge temperature switch is used, it must also be ensured that the drive motor switches off when the limit switch is triggered.

Contacts open ⇒ Drive motor off.

Pressure switch (optional)

It is also possible to use an additional pressure switch. A calibrated gauge is used to adjust the switching limit point. The scale on the switch only serves as a guide.

3.10.4 Frequency converter

Description



Observe the frequency converter manufacturer's operating manual!

**NOTICE!**

- If the electric motor is driven by frequency converters, we strongly recommend using an engine throttle and power choke. These are specifically designed for the frequency converter and filter dangerous harmonics from the actuator current. This prevents damage to the motor winding. The electromagnetic compatibility of the system is also improved. Reactions of the frequency converter in the current are reduced.
- The maximum current limit of the motor must not be exceeded. Observe the information on the motor name plate.
- To prevent operational faults the function “Interception circuit” must not be parameterised in the control of the frequency converter. When the frequency converter is switched off, a restart should only be possible after a complete shut-down of the blower or compressor.
- The machine must shutdown without braking. The activation of a brake ramp or quick stop is not permissible.

For machine use, observe the following

- Take into account the electrical and mechanical properties of the drive motor.
- The minimum frequency must always be fixed. This frequency must never fall below the fixed minimum during operation.
- The maximum frequency is to be set by taking into account the maximum rotational speed of the motor and the maximum machine speed.
- The run-up time of the drive motor from standstill up to minimum speed can be 3 to 6 seconds.
- The frequency converter must be designed with a constant load torque for operation with a working machine.
- Never exceed maximum and or drop below minimum speed thresholds.
- When exceeding the value, e.g. due to excessively long cables, frequency converter type etc. a motor throttle or motor filter coil to match the frequency converter is to be used.

**NOTICE!**

Not using these components can lead to damage of the motor isolation and a motor breakdown.

- The highest admissible voltage increase speed of the motor is 1,200 V/ μ s.
- The maximum rotational changeover speed must not exceed 1 Hz per second during operation.
- Minimum frequency = 20 Hz // maximum frequency = 50 Hz results in a control time of 30 seconds from minimum to maximum.

Pole changing

For a motor speed changeover from a high to a low speed, the drive motor must have reached zero rotational speed each time.

Changeover from a low to a high speed can take place directly and instantaneously.

3.10.5 Machine terminal box

Terminal box

The machine's terminal box contains the electrical and electronic components that are not located directly on the machine (e.g. sensors).

It contains terminals for connecting electrical and electronic components with the external power supply.

When the terminal box is closed, accidental or unintended contact with voltage-carrying components is not possible.

The distribution cabinet is locked due to internal components which are charged with dangerous voltage. It can only be opened using special tools (distribution cabinet key, triangular/ square wrench).

3.10.6 Discharge pressure gauge

Positive pressure mode

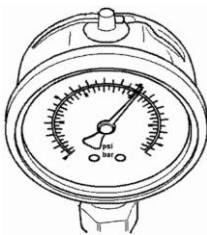


Fig. 26: Gauge

The gauge displays the discharge pressure of the compressed gas.

It is a display instrument without a switching function.

The gauge is connected on the discharge side.



3.10.7 Oil pressure gauge

Positive pressure and vacuum pressure mode

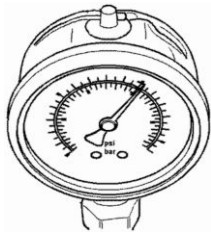


Fig. 27: Gauge

The gauge displays the oil pressure in the oil system. ↪ Chapter 11.10.1 „Oil pressure“ on page 184

It is a display instrument without a switching function.



Machine sizes D62S, D62H and D75L do not have an oil pump. Oil pressure monitoring is not necessary.

3.10.8 Maintenance indicator

Positive pressure mode

The maintenance indicator shows the dirt levels in the intake filter.

The maintenance requirements of the intake filter depend on the dirt levels of the medium taken in.

Replace the filter element when the following display values are reached and no later:

At -45 mbar (red display field): replace intake filter

After the filter has been changed, reset the pointer to its initial position by “pressing” the reset button.

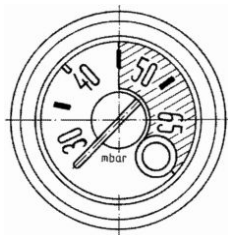


Fig. 28: Variation a)



Fig. 29: Variation b)

When the level of contamination increases, the red trailing pointer will be pulled over with the black pointer and stay at the maximum intake pressure.

Replace the filter element when the trailing pointer reaches the red area of the scale.

Once the filter has been replaced, reposition the trailing pointer between 0 and -10 mbar.

3.10.9 Intake silencer

Intake silencer

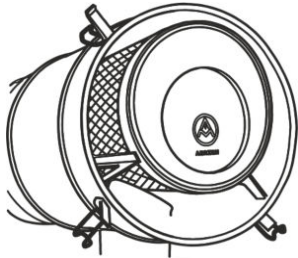


Fig. 30: Opening intake silencer with filter

Machine damage caused by the intake filter

The intake silencer contains the intake filter. The intake filter prevents harmful particulate matter entering the conveying chamber of the machine.

The intake filter corresponds to filter class G4



NOTICE!

Risk of machine damage! Never operate the machine without the intake filter.



NOTICE!

There is a risk of machine damage from the use of contaminated, damaged or non-original intake filters!

Heavily contaminated or damaged intake filters reduce performance. They affect functionality and may cause machine failure. Copies and reproductions of intake filters do not have the necessary properties.

- Inspect for damage.
- Comply with maintenance intervals.
- Only use original replacement parts.

3.10.10 Discharge silencer

Discharge silencer

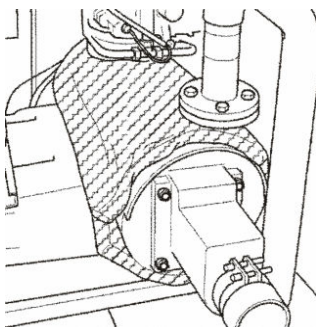


Fig. 31: Discharge silencer

The base support serves as the base for the whole bodywork of the machine. The base support also acts as a discharge silencer. The discharge silencer is an absorption-agent-free component. The acoustic energy inside the discharge silencer is reduced by means of air deflection. Depending on the technical design, the entire external area of the discharge silencer may be isolated. This isolation serves to reduce heat radiation and to minimise noise.



3.10.11 Safety valve

AERZEN safety valve

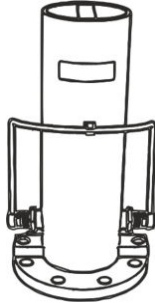


Fig. 32: Safety valve



Observe the valve instruction manual. It is included with the product.

The safety valve is used for the conveyance of air.

The safety valve is set at the factory.

If the set value is exceeded, the valve opens and releases excess conveyed material into the atmosphere.

The safety valve is NOT a control component and is not to be used as such.

The safety valve can be used up to a temperature of 200°C.



NOTICE!

Risk of premature wear and tear and breakdown!
The valve is not intended for controlling the operating data!

The deactivation of the valve, e.g. by increasing the opening pressure, may lead to serious material damage! Risk of total machine failure!

The valve outlet must not be made narrower or closed. Keep the cross-section unobstructed!

3.10.12 Non-return flap

Non-return flap

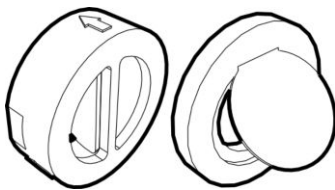


Fig. 33: Non-return flap

The non-return flap prevents the compressed conveyed medium from entering the machine stage once the compressor has been switched off. This prevents the machine stage from running "in reverse".

3.10.13 Start-up relief device for DN80 to DN400

Start-up relief device

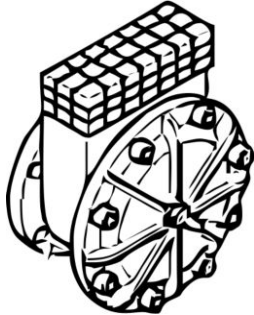


Fig. 34: DN 80 to DN 400



NOTICE!

Risk of premature wear and tear and breakdown!
The start-up relief is not intended for controlling the operating data!

The use of the start-up relief device as a controller for operating data leads to premature wear and tear and breakdown!

The start-up relief device can be used in machines that are run by an electric motor with a “star-delta connection”.

This allows for a relieved start-up against existing mains pressure.

In the case of drives with pole-changing motors, it is also possible to use a start-up relief device with a solenoid valve.

This provides a relieved start-up at higher speeds.

After a correct set-up, the start-up relief device operates maintenance-free.



The start-up relief is not necessary for drives with frequency converters.

3.10.14 Belt drive

Belt drive

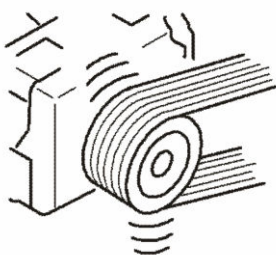


Fig. 35: Belt drive

The belt pulleys are mostly fitted and aligned in the factory.

The belt pulley for the machine stage is fitted to the drive shaft using a taper interference fit. The position and orientation of this belt pulley therefore affects the alignment of the drive motor belt pulley.

Check the alignment:

- Before first commissioning
- According to the maintenance plan
- After replacing the pulley(s)

The maximum permitted belt pulley offset is 0.5 mm.



It is extremely important that only original replacement parts be used for the purposes of belt-pulley operation!

Only use replacement parts that are recommended and approved by AERZEN!

Original replacement parts

NOTICE!

Risk of material damage! Pulleys must only come from one manufacturer and from one production batch.

- Otherwise varying belt tensions can occur which can result in uneven running and premature wear.
- As a result of a risk of snapping, the belt pulleys must be suitable for the peripheral speed encountered!

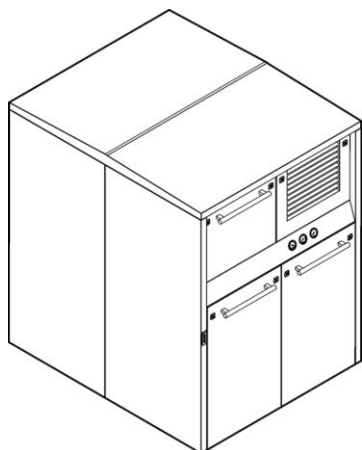
3.10.15 Acoustic hood
Acoustic hood


Fig. 36: Version diagram

The acoustic hood serves to reduce noise and acts as an isolating safety device.

The acoustic hood is a component for product safety with lockable door elements.

Always keep the acoustic hood closed during operation.

The key must only be accessible for authorised personnel.

An earthing strap or threaded hole is located on the outer edge of the floor tray.

The supply air grille is held in place with a mounting bracket. It can be pulled and removed.

Acoustic hood detent


Operation with an open acoustic hood is not permissible!

- Always lock the elements of the acoustic hood with the key provided.
- The key must only be accessible for trained persons.

Acoustic hood ventilator

NOTICE!

Risk of overheating! The drive motor must shut down if the fan malfunctions.

The ventilation of the acoustic hood is carried out by an electric fan. ↪ „Fan performance data “ on page 183

The fan is connected at the factory. The operation of the ventilator is dependent on the direction of flow of the acoustic hood. The ventilator must be activated in parallel with a machine start.

Intake from a pipeline

The acoustic hood makes intake-side suction possible from the system pipeline.

The pipeline is guided through the acoustic hood to the machine through prefabricated openings.

The following steps must be complied with: ↪ *Chapter 5.3 „Installation“ on page 93*

Acoustic hood heater



NOTICE!

There is a risk of material damage from low ambient temperatures!

Provide acoustic hood heating at ambient temperatures of under -10°C !

This prevents damage to the machine by heating up the housing and preheating the lube oil and medium to be conveyed.

3.10.16 Oil demister

Oil demister

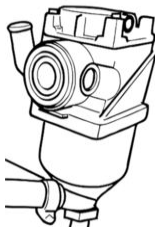


Fig. 37: Oil demister

The oil demister serves to demist the oil vapour that develops in the oil chamber. The demister is connected to the machine oil chamber and draws off the oil vapour produced. The oil that is drawn off runs back to the oil chamber via a separate connection.

3.10.17 Oil pressure regulating valve

Oil pressure regulating valve



Fig. 38: Oil pressure regulating valve

The oil pressure is determined by the setting range of the oil pressure regulating valve and the prevailing operating parameters.

Oil pressures outside this range can be implemented with the introduction of special modifications after consultation with AERZEN.



The D62 S, D62 H and D75 L design sizes do not feature an oil pressure regulating valve!

3.10.18 Oil filter

Oil filter



Fig. 39: Oil filter

The D62 S, D62 H and D75 L design sizes do not feature an oil filter!

The oil filter removes particles from the lubricating oil. An oil pump pumps the lubricating oil through the oil filter which creates a level of filter resistance. This resistance increases depending on the contamination level. Replace the oil filter each time the lubricating oil is changed.

3.11 Required tools

The following tools are required:

Auxiliary materials, aids

including collection containers for oil, drain hose, cleaning rags.

Conveyor rails

The conveyor rails must be made of steel. They act as slide-in modules in the forklift tunnel of the acoustic hood. The cables are pulled by the conveyor rails and joined above the machine using the lifting beams.

Drills

Drills for making fastening holes.

Electric drill

Electric drills, e.g. for drilling fixing holes.

General measurement tools and equipment

For example a steel ruler, plumb line, folding yardstick, spirit level.

General tool kit

including various screwdrivers, combination wrenches, set of socket spanners, set of Allen wrenches, hammers.

Lifting beams

Transverse truss required for crane transport for absorbing cable force.

Lifting equipment

For lifting loads, e.g. ropes, belt anchorages, shackles, eyebolts with nuts.

Locking key

The locking key is a component of the overall safety concept. This must be stored safely and should only be made accessible to trained personnel. It is intended for the proper opening and closing of the acoustic hood elements.

Oil funnel

The oil funnel is used for the precise filling of lubricant oil.



Required tools

Ratchet wrench

The ratchet wrench is used to adjust the hinged motor support fastener.

Strap wrench

The strap wrench is used to disassemble the oil filter.

Test pump

The test pump is used to simulate system pressure in the measurement lines during commissioning. This allows for the operation of the pressure switch or the pressure sensors to be checked.

Tools for authorised electricians

Basic electrical engineering equipment, e.g. multimeter, voltage detector, insulated tools.

Transport equipment

for transporting packaged units and the machine, e.g. with lift trucks, forklifts.

4 Transport, packaging and storage

4.1 Transport

4.1.1 Safety instructions

Improper transport

**WARNING!****Risk of injury and damage from improper transport!**

Improper transport may result in personal injury.

- Proceed with caution upon delivery and unloading of the machine and during in-house transport.
- Observe the symbols and information on the packaging.
- Only use the intended anchorage points.
- Observe the machine's centre of gravity.
- Attach lifting equipment accordingly and hang the load so that it is balanced.
- Remove the packaging shortly before setting up the machine.

Industrial trucks

**WARNING!****There is a risk of fatal injury from industrial trucks!**

Transport with industrial trucks can result in objects and other loads falling accidentally and causing serious or fatal injury. There is also the risk of the driver failing to see persons and running them over.

- Industrial trucks should only be operated by trained drivers (e.g. forklift drivers).
- Only walk past an industrial truck if the driver has signalled that he has recognised the person in his path.
- Only use approved industrial vehicles with sufficient load carrying capacity.
- Never transport materials over persons or the areas in which persons are located.

Suspended loads



WARNING!

There is a risk of fatal injury from suspended loads!

During lifting work, loads may swing out and fall. This can result in serious or fatal injury.

- Never walk under or into the range of a suspended load.
- Move loads under supervision only.
- Observe lashing points.
- Ensure that the lashing equipment is fitted securely.
- Do not hang lashing equipment on protruding machine parts or on the lugs of attached components.
- Only use approved hoists and lashing equipment with sufficient load carrying capacity.
- Do not use damaged hoists such as ropes or pulleys.
- Do not attach hoists such as ropes or belts to sharp edges and corners and do not knot or twist them.
- Set down the load when leaving the work area.

Disregard for the machine's centre of gravity



WARNING!

There is a risk of the unit toppling and falling over if there is disregard for the machine's centre of gravity!

If the machine's centre of gravity is disregarded the packaged unit may topple and cause life-threatening injury.

- Take into account the machine's centre of gravity.
- Observe the packaging information on the machine's centre of gravity.
- Attach lashing equipment in such a way that it is located above the centre of gravity.
- Raise the load carefully and ensure that it does not topple. If necessary, change the position of the lashing equipment.

Risk of slipping**CAUTION!****Risk of injury due to slipping on the packaging foil!**

The packaging foil features a slippery surface that can cause persons to slip on it. Moisture, creases, edges and tension straps on the packaging foil entail a risk of slipping or stumbling. The packaging foil is not suitable for supporting weight. A fall may result in injury.

- Never stand on the packaging foil.
- Never lean on the packaging foil or use it for support.

Requirements for staff

Requirements for transport:

Transport of packaged units

Personnel: ■ Trained persons

Transport of unpacked machines

Personnel: ■ Service personnel

Requirements for staff

When checking storage criteria, you require the following:

Personnel: ■ Service personnel

When checking and applying preservation, you require the following:

Personnel: ■ Service personnel

Protective equipment

Requirements for transport:

Protective equipment: ■ Protective work clothing
■ Safety shoes
■ Protective gloves

Protective equipment

Preservation requires:

Protective equipment: ■ Protective work clothing
■ Safety shoes
■ Protective gloves
■ Light respiratory protection

Special tools

Requirements for transport:



NOTICE!

Risk of damage to the machine! Chains, steel cables and similar equipment are not suitable lifting equipment.

Special tool: Lifting equipment
 Transport equipment

Special tool: Lifting beams
 Locking key
 Conveyor rails

Dimensions of the conveyor rails

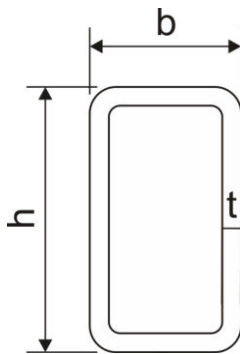


Fig. 40: Rectangular hollow profile

Nominal diameter Discharge nozzles	Profile dimensions H x W x D (mm)	Profile length (mm)
DN 50	80 x 60 x min. 4	950
DN 80	80 x 60 x min. 4	1285
DN 100	100 x 80 x min. 4	1870
DN 125	100 x 80 x min. 4	1870
DN 150	120 x 80 x min. 6	2520
DN 200	120 x 80 x min. 6	2520
DN 250	120 x 80 x min. 8	2750
DN 300	120 x 80 x min. 10	3350

Material: S 235 JR



Profile length of at least 150 mm longer than the dimensions of the acoustic hood.

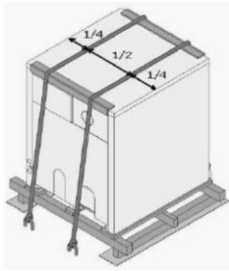
4.1.2 Delivery method

4.1.2.1 Delivery of the machine

The machine is shipped using a freight forwarder. In accordance with the given requirements the machine is sealed in foil and may be additionally packed in wood.



Transport on a truck



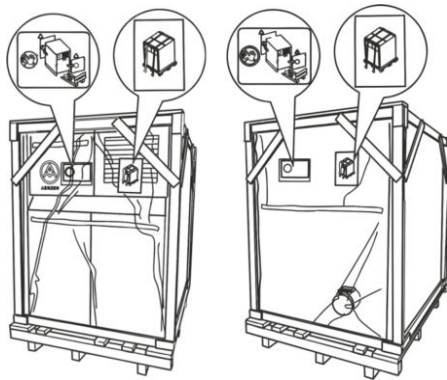
1. ➤ Strap the packaged unit to the truck in accordance with the diagram.
2. ➤ Always use appropriate edge protection to avoid damage to the packaged unit.

Fig. 41: Transport on a truck

4.1.3 Packaging

4.1.3.1 Symbols on the packaging

Symbols on the packaging

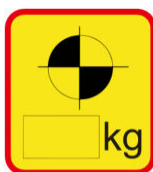


The following symbols are displayed on the packaging. Always observe these symbols during transport.

Fig. 42: Symbols on the front/rear side

Explanations

Centre of gravity



1. ➤ Displays the centre of gravity and weight of the machine.
Observe the location of the centre of gravity for lifting work and transport.

Fig. 43: Centre of gravity

Transport on a truck

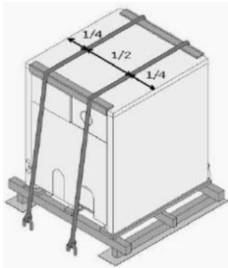


Fig. 44: Transport on a truck

2. ▶ Strap the packaged unit to the truck in accordance with the diagram.
3. ▶ Always use appropriate edge protection to avoid damage to the packaged unit.

Explanations

Transport without a pallette

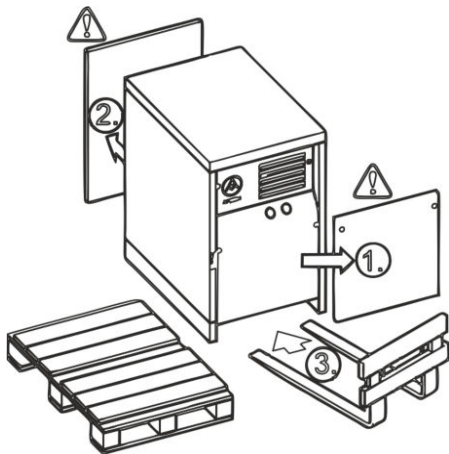


Fig. 45: Transport without a pallette

Comply with the order (pos.1-pos.3) of the work stages.

1. ▶ Open the operating side of the acoustic hood (pos.1).
2. ▶ Open the rear side of the acoustic hood (pos.2).
3. ▶ Separate the machine from the transport pallette by removing the holding screws.
4. ▶ Drive the fork of the forklift under the machine (pos.3).



WARNING!

Risk of injury if the machine topples or falls!
Observe the machine's centre of gravity.

5. ▶ Determine the machine's centre of gravity by raising it carefully.
6. ▶ Transport the machine so that it is balanced. The machine must not lean to one side.
7. ▶ Remove the lifting equipment at the installation area.

4.1.3.2 Handling packaging

Handling packaging

The various packaged items are packed in accordance with the anticipated transport conditions. In as far as it is possible, environmentally-friendly materials are used for the packaging.

The packaging is intended to protect individual components from transport damage, corrosion and other forms of damage. For this reason, do not destroy the packaging and only remove it shortly before assembly.

Only remove packaging for transport to the installation area if it has been expressly permitted.

Removing packaging

Packaging materials made of solid wood (e.g. wooden pallets, wooden crates) comply with the IPPC standard. This material is re-usable. When disposing of the material, national and local requirements must be complied with.

From the machine**1.** ➤**CAUTION!**

Risk of injury from rough packaging material and protruding nails!

Remove packaging material.

2. ➤

First detach the packaging and then remove it.

3. ➤

Separate the machine from the transport pallet by removing the holding screws.

4. ➤**ENVIRONMENT!**

Packaging material is valuable. It can be used several times or processed and then re-used. The improper disposal of packaging material can present a risk to the environment.

5. ➤

Sort packaging according to the material used and dispose of it properly. ➤ *Chapter 10.3 „Disposal“ on page 166*

From the machine**1.** ➤

First detach the packaging and then remove it.

2. ➤

Separate the machine from the transport pallet by removing the holding screws.

3. ➤**ENVIRONMENT!**

Packaging material is valuable. It can be used several times or processed and then re-used. The improper disposal of packaging material can present a risk to the environment.

4. ➤

Sort packaging according to the material used and dispose of it properly. ➤ *Chapter 10.3 „Disposal“ on page 166*

4.1.4 Transport inspection

Completeness



Checking for completeness

Check the goods for completeness immediately after delivery. Register missing parts and contact the manufacturer.

Check the delivery for completeness on the basis of the packing slip.

- The packing slip is provided with the product.

Transport damage



Transport damage

Register transport damage claims as soon as damage is discovered. Compensation claims for damage are only valid within the applicable claim periods.

Check the delivery immediately for transport damage.

In case of perceptible external damage, proceed as follows:

- Do not accept the delivery or only accept it under certain conditions.
- Note the scope of the damage in the transport documents or on the delivery docket provided by the carrier.
- Register the claim.

4.1.5 Transport of packaged units

4.1.5.1 Transport using industrial vehicles

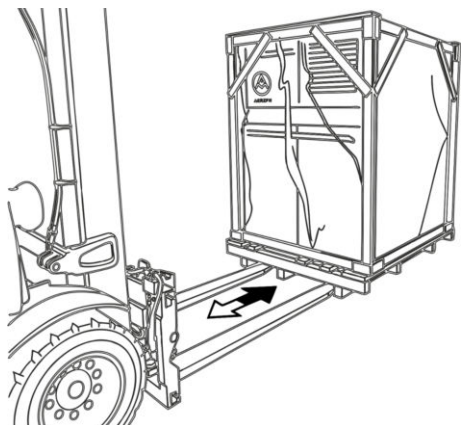


Fig. 46: Transport with acoustic hood

1. ➤



NOTICE!

Risk of toppling loads! The transport of packaged units may only be carried out using lifting equipment that reaches under the machine and fits into the transport palette fully.

2. ➤

Insert the equipment into the provided opening in the transport palette.

3. ➤

Take into account the centre of gravity! See the labelling on the packaging.

4. ➤



DANGER!

Risk of fatal injury from toppling components!

Determine the packaged unit's centre of gravity by raising it carefully.

5. ➤

Transport the machine so that it is balanced. The packaged unit must not lean to one side.

4.1.5.2 Transport using a crane

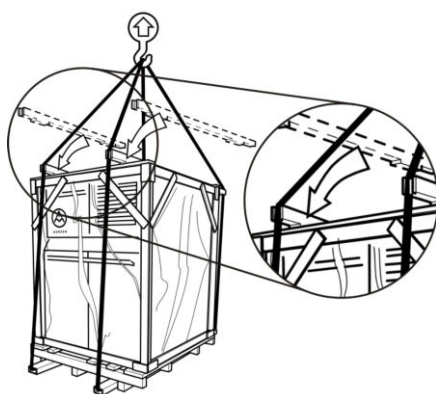


Fig. 47: Transport of packaged units

1. ➤

Guide the conveyor rails through the openings of the transport palette.

2. ➤

Place the lifting beams on to the acoustic hood. Span length of a minimum of 150 mm longer than the dimensions of the acoustic hood.

3. ➤

Guide lifting equipment, such as cables or straps through the conveyor rails and join them above the machine using the lifting beams.

4. ➤

Take into account the centre of gravity! See the labelling on the packaging.

5. ➤



DANGER!

Risk of fatal injury from toppling components!

Determine the packaged unit's centre of gravity by raising it carefully.

6. ➤ Transport the machine so that it is balanced. The packaged unit must not lean to one side.

4.1.5.3 Transport using industrial vehicles

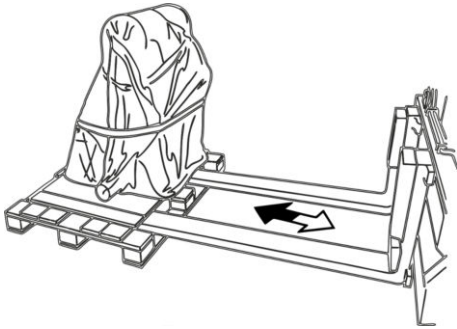


Fig. 48: Transport with belt guards

1. ➤



NOTICE!

Risk of toppling loads! The transport of packaged units may only be carried out using lifting equipment that reaches under the machine and fits into the transport palette fully.

2. ➤

Insert the equipment into the provided opening in the transport palette.

3. ➤

Take into account the centre of gravity! See the labelling on the packaging.

4. ➤



DANGER!

Risk of fatal injury from toppling components!

Determine the packaged unit's centre of gravity by raising it carefully.

5. ➤

Transport the machine so that it is balanced. The packaged unit must not lean to one side.

4.1.5.4 Transport using a crane



Fig. 49: Transport of packaged units



DANGER!

Risk of fatal injury from toppling components!



NOTICE!

Risk of damage to the machine from lifting equipment such as cables or straps.

Transport of the packaged unit with a crane is not permissible! The transport palette is not designed for crane transport.

4.1.6 Transport to the installation site

4.1.6.1 Transport using industrial vehicles

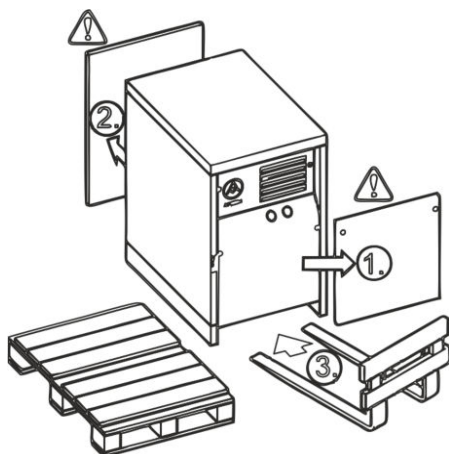


Fig. 50: Transport with acoustic hood

1. → Completely remove packaging material.
2. → Open the operating side of the acoustic hood (pos.1).
3. → Open the rear side of the acoustic hood (pos.2).
4. → Separate the machine from the transport pallet by removing the holding screws.
5. → Drive the transport fork under the machine (pos.3).
6. → Take into account the centre of gravity! See the labelling on the packaging.

7. →



DANGER!

Risk of fatal injury from toppling components!

Determine the machine's centre of gravity by raising it carefully.

8. → Transport the machine so that it is balanced. The machine must not lean to one side.
9. → Remove the lifting equipment at the installation area.



DANGER!

Risk of fatal injury from toppling components!

Transport of the packaged unit using an industrial vehicle is not permissible!

4.1.6.2 Transport using a crane

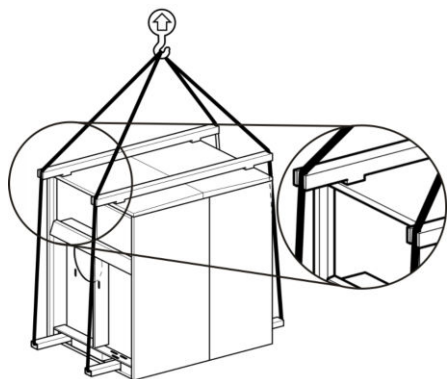


Fig. 51: Transport with acoustic hood

1. ➤ Completely remove packaging material.
2. ➤ Remove the front and rear elements of the acoustic hood and store them safely.
3. ➤ Guide the conveyor rails through the openings of the forklift tunnel.
4. ➤ Place the lifting beams on to the acoustic hood. Span length of a minimum of 150 mm longer than the dimensions of the acoustic hood.
5. ➤ Guide lifting equipment, such as cables or straps through the conveyor rails and join them above the machine using the lifting beams.
6. ➤ Separate the machine from the transport palette by removing the holding screws.
7. ➤ Take into account the centre of gravity! See the labelling on the packaging.

8. ➤



DANGER!

Risk of fatal injury from toppling components!

Determine the machine's centre of gravity by raising it carefully.

9. ➤ Transport the machine so that it is balanced. The machine must not lean to one side.
10. ➤ Remove the lifting equipment at the installation area.

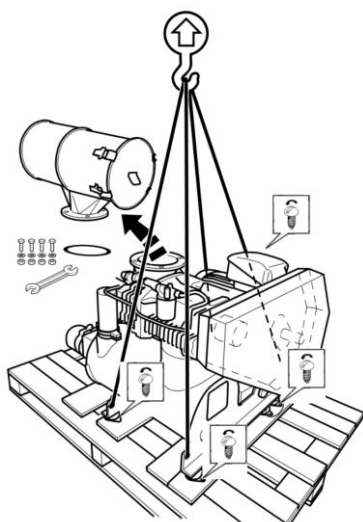


Fig. 52: Transport with belt guards

1. ➤ Completely remove packaging material.
2. ➤ Separate the machine from the transport palette by removing the holding screws.

3. ➤



NOTICE!

Risk of machine damage if the material in the intake nozzle falls! Inspect for cleanliness.

Dismantle the intake silencer on the flange joint.

4. ➤



NOTICE!

Risk of damage from the force exerted by lifting equipment on accessory components!

Only transport the machine with the hinged motor support fixed in place.

Attach the lifting equipment carefully to the fastening device.

5. ➤ Take into account the centre of gravity! See the labelling on the packaging.

6. ➤

**DANGER!**

Risk of fatal injury from toppling components!

Determine the machine's centre of gravity by raising it carefully.

7. ➤ Transport the machine so that it is balanced. The machine must not lean to one side.

8. ➤ Remove the lifting equipment at the installation area.

9. ➤ Mount the intake silencer.

4.2 Storage and preservation

4.2.1 Storage

Storage notes

Store the packaged unit under the following conditions:

- Keep flange connections closed. Avoid entry of foreign substances.
- Do not store outdoors.
- Store in a dry and dust-free place.
- Do not expose it to any aggressive media.
- Protect the packaged unit from exposure to the sun.
- Avoid mechanical vibrations.
- Avoid extreme temperature fluctuations.
- Avoid adverse water affects.
- Storage temperature: -10 to +40 °C.
- Relative humidity: maximum 80 %.
- If a vibration-free storage area is not available, move the movable components by 2 - 3 rotations every 6 - 8 weeks.

**NOTICE!**

Risk of corrosion! To avoid potential damage to the machine, an inspection of the overall scope of supply should be undertaken by the manufacturer every 2 years.



There may be information on the packaged unit regarding storage that goes beyond the requirements listed here. Comply with this information.

Storage information for periods of over 12 months

Additional measures:

- Packaging with VPI paper.
- Sealed in PVC foil.

Storage information for periods of over 12 months in a tropical climate

Additional measures:

- Drying agent (VPI power in a bag) inside the packaging.
- Packaging with VPI paper.
- Sealed in PVC foil.



Storage in air-conditioned rooms with minimum humidity has a positive influence on corrosion protection!

Packaging during storage

- Inspect the general condition of the packaging regularly. Immediately rectify damage to the packaging. If necessary, refresh or replace the anti-corrosion protection ↻ „Carrying out preservation treatment“ on page 88
- After opening the packaging:
 - Inspect uncoated parts for sufficient corrosion protection.
 - Protect against humidity and damaging environmental influences.
 - Sealing flaps from the connection openings must not be removed.
- Replace the drying agent regularly in accordance with climactic conditions.



NOTICE!

Risk of corrosion! Customised packaging is required for tropical climate zones and in the case of special customer requirements.

Damaged packaging



NOTICE!

Risk of corrosion! As a result of damaged packaging, moisture and damaging environmental influences could directly affect the product.

Measures in case of damaged packaging

- Immediately rectify damage to the packaging. If necessary, refresh or replace the preservation material.
- Dry the machine, if necessary.
- Inspect the drying agent, replace if necessary.
- Repair or replacement of the packaging.

4.2.2 Preservation

Preservation

Factory preservation protects the product for a certain time period in accordance with the relevant storage and packaging information.

Factory preservation / standard		
Conveying chamber	BIO-CHEM food tech oil	biodegradable, does not contaminate groundwater
Oil chamber	Delta Lube 06	operating lubricant oil
Shelf-life	up to 12 months	with compliance with storage conditions
Repeat	after 12 months	
Extended shelf-life (no standard)	more than 12 months	only with suitable long-term preservation and packaging

Preservation from assembly to commissioning		
Treat the conveying chamber and move the rotors by 2-3 rotations.	more than 6 weeks of non-use	avoidance of corrosive and standstill damage

Preservation after period of non-use		
Preservation of conveying chamber, oil chamber	more than 6 months	special preservation measures necessary

Carrying out preservation treatment

Preservation measures:

1. ▶ Open the packaging. Check the machine for good accessibility.

2. ▶



WARNING!

Risk of poisoning from inhaling oil vapour!

Preservation treatment of the conveying chamber:

spray suitable preservative oil over the intake nozzle at the machine stage.



NOTICE!

Risk of filter damage!

Do not spray preservative oil into the intake filter. Never treat filter elements with preservative oil!

3. ▶



WARNING!

Risk of poisoning from inhaling oil vapour!

Preservation treatment of the oil chamber:

Spray suitable preservative oil into the machine stage through the oil fill opening and oil drain opening.

⇒ Let excess preservative oil flow out of the oil drain opening.

4. ▶ Seal the oil fill opening and oil drain.

5. ▶



WARNING!

Risk of poisoning from inhaling oil vapour!

Treat the outer, uncoated surfaces with suitable preservative oil.

6. ▶ Inspect the sealing flaps.

7. ▶ Check and restore the packaging.

5 Set-up and installation

5.1 Safety instructions

Improper set-up and installation

**WARNING!****Risk of injury from improper set-up and installation!**

Improper set-up and installation can result in serious injury or damage.

- Before beginning any work, ensure there is sufficient space for installation.
- Check the tidiness and cleanliness of the work area.
- Only use commercially-available tools or, if necessary, special tools.
Unsuitable or damaged tools may cause injury!
- Secure components against falling or tipping over during the installation.
- Install components correctly.
- Comply with the specified screw-tightening torques.

Electrical system

**DANGER!****Risk of fatal injury from electrical current!**

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious, or even fatal injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Electrostatic charges

**WARNING!****Risk of injury from electrostatic charges!**

The belt drive may generate electrostatic charges.

- Before commissioning put in place equipotential bonding.
- Only use electrically-conductive belts.

Requirements for staff

Requirements for set-up and installation:

Set-up and installation of electrical components



Personnel: ■ Authorised electricians

Set-up and installation of mechanical components

Personnel: ■ Service personnel

Protective equipment

Requirements for set-up and installation:

Protective equipment: ■ Protective work clothing
■ Safety shoes
■ Protective gloves
■ Safety goggles
■ Industrial hard hat

Special tools

Requirements for set-up and installation:

Special tool: ■ Tools for authorised electricians
■ Electric drill
■ Drills
■ General tool kit
■ General measurement tools and equipment

Special tool: ■ Locking key

5.2 Requirements for the installation site

Ground properties

Inspect the ground properties. These should be as follows:

- stable
- even
- free of vibrations
- without any incline
- without holes


NOTICE!

Risk of deformation of the acoustic hood substructure! Do not install or mount the machine on "hollow" or lamellar foundations.


Subsurface requirements for the cement floor.

The cement floor should have a recommended surface pressure resistance of 30 - 40 N/mm².

Flatness tolerance according to DIN 18202

	Distance between measuring points in (m)					
	0.1	1	4	10	>15	/
Dimension tolerance in (mm)	2	4	10	12	15	/

Angular tolerance according to DIN 18202

	Distance between measuring points in (m)					
	up to 1	over 1 up to 3	over 3 up to 6	over 6 up to 15	over 15 up to 30	over 30
Dimension tolerance in (mm)	±6	±8	±12	±16	±20	±30

Surroundings

- Ensure there is a suitable fresh air supply.
- Avoid heat build-up.


NOTICE!

There must not be any excessive levels of dust, acids, steam or explosive or flammable gases at the installation site!

Installation with belt guards

The machine is only suitable for indoor installation.

Machine installation site

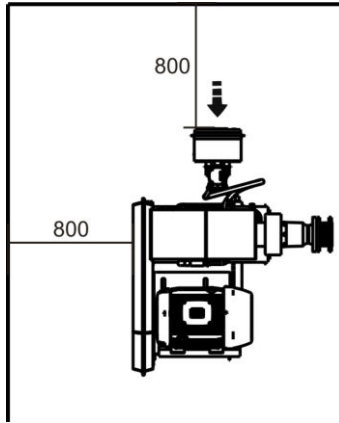


Fig. 53: Overall dimensions

- Comply with the overall dimensions for maintenance work. Observe the installation drawing.
- Provide measures for sound insulation.
- Take the following precautionary measures:
 - If possible, switch off the machine before entering the operating area.
 - Otherwise wear hearing protection.
 - The installation site must only be accessible for trained persons.
 - Provide appropriate signage at the installation site.
 - Choose an operating location where the duration of time persons spend in the immediate vicinity of the machine is extremely limited.

Installation with acoustic hood

The machine is suitable for indoor and outdoor installation.

Machine installation site

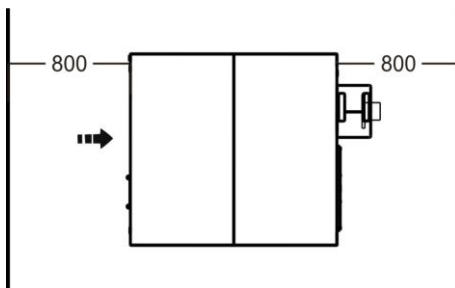


Fig. 54: Overall dimensions

- Comply with the overall dimensions for maintenance work. Observe the installation drawing.
- Take the following precautionary measures:
 - If possible, switch off the machine before entering the operating area.
 - Otherwise wear hearing protection.
 - The installation site must only be accessible for trained persons.
 - Provide appropriate signage at the installation site.
 - Choose an operating location where the duration of time persons spend in the immediate vicinity of the machine is extremely limited.



5.3 Installation

Models with acoustic hoods;
aligning and dowelling

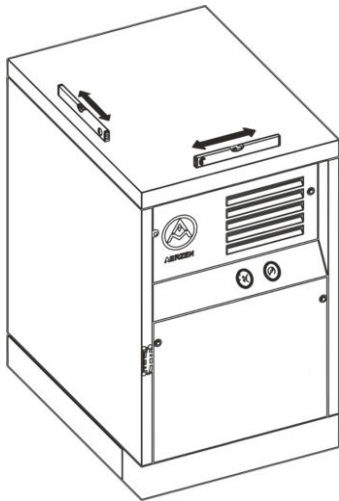


Fig. 55: Spirit level alignment

1. Carefully align the machine.
2. Position it so that it is balanced.

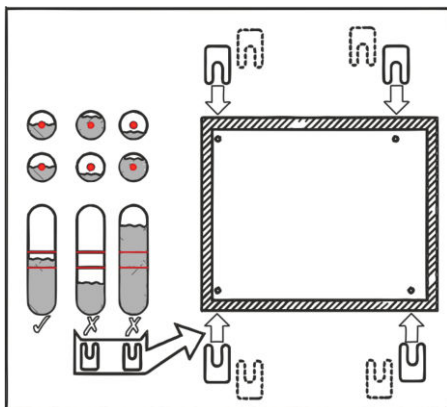


Fig. 56: Shim alignment

3.



NOTICE!

Risk of total machine damage! Installing a machine at an angle may, as a result of an undefined oil level, can lead to a total machine loss. Observe the level and angle tolerances.

If necessary, use the intended shims on the bolting surfaces.

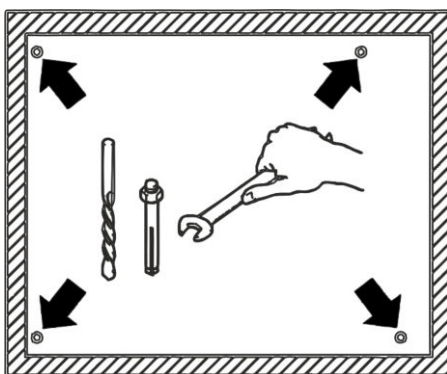


Fig. 57: Mounting holes

4. Recommendation: Drill and dowel four mounting holes and screw the machine into these.

Models without acoustic hoods; aligning and dowelling

1. ▶ Carefully align the machine.
2. ▶ Position it so that it is balanced.
3. ▶



NOTICE!

Risk of irreversible machine failure! Installing a machine at an angle may, as a result of an undefined oil level, can lead to a total machine loss. Observe the level and angle tolerances.

If necessary, use the intended shims on the bolting surfaces.

4. ▶ A single bolt per machine foot is sufficient.
Drilling, dowelling and screwing tight the mounting holes

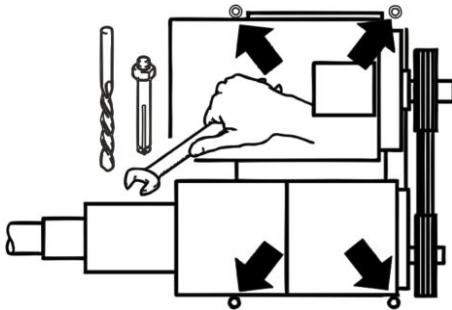


Fig. 58: Mounting holes

5.4 Connecting the system pipeline

System pipeline



NOTICE!

Risk of machine damage! The connected pipeline must not exert forces or moments that affect the machine.

Secure and fasten the system pipeline.



Observe the labelling and dimensions on the installation drawing.

Bushings/2 clamps

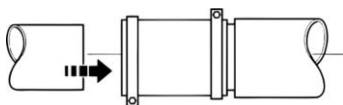


Fig. 59: 2 clamps

1. ▶ Remove the sealing cover from the connection openings.
2. ▶ Connect the system pipeline.
⇒ Make sure that the clamps are offset by 180° to one another.

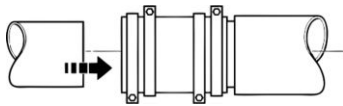
Bushings/4 clamps


Fig. 60: 4 clamps

3. ➤ Connect the system pipeline.
⇒ Make sure that the clamps are offset by 180° to one another.

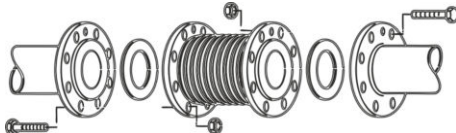
Connection of a compensator


Fig. 61: Connection of a compensator

4. ➤ Connect the system pipeline.
5. ➤ Close off the pipeline duct using a shim.

5.5 Connecting the drive motor

5.5.1 Preparing the connection

Preparation with acoustic hood

1. ➤ ↗ Chapter 3.10.1 „Drive motor“ on page 59

2. ➤


DANGER!

Risk of fatal injury in the case of incorrect electrical connection data!

Compare the electrical connection data of the drive motor with those of the operator-side grid.

3. ➤ Shut down the power from the operator-side grid.
4. ➤ Observe the cable routing on the installation drawing!

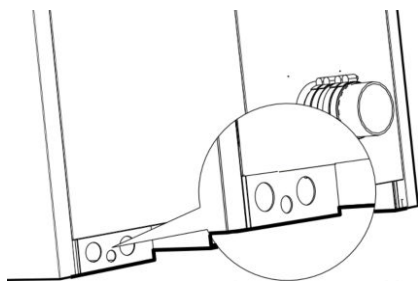


Fig. 62: Position on the acoustic hood

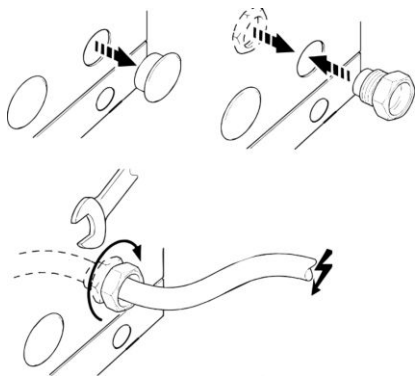


Fig. 63: Preparation

5. Prepare the cable feedthroughs.

6.



DANGER!

Risk of fatal injury from electric current!

Check that there is no live current in the connection cable.

7. Lay the connection cable through the cable feedthroughs.

5.5.2 Routing cables

Routing the connection cable

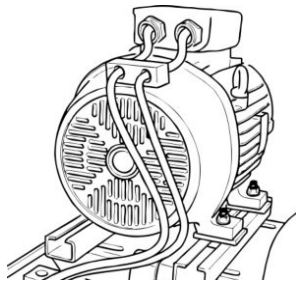


Fig. 64: Cable laying alignment

1. Route the connection cable in accordance with the installation drawing.

2.



NOTICE!

Risk of damage! The minimum bending radius must not be undershot!

Observe the bending radii.

⇒ Bending radius of the connection cable = 15 x cable sheath diameter

5.5.3 Connecting the drive motor

Motor connection

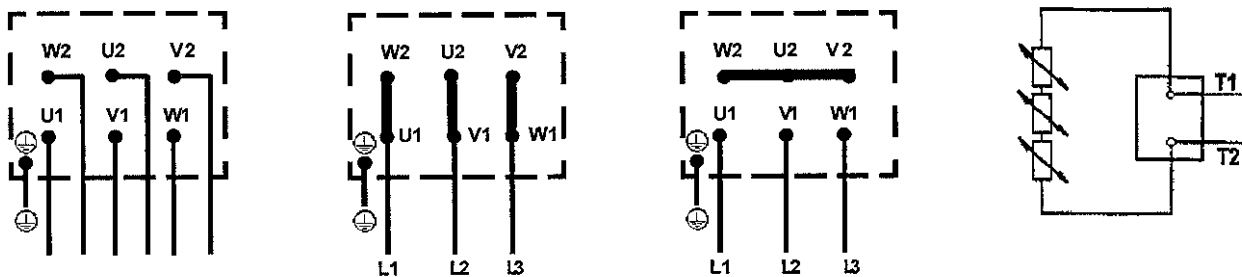


Fig. 65: Connection layout



Star-delta connection

Delta connection

Star connection


Thermal winding shield

1. ➤ Open the motor terminal box.
2. ➤ Check the alignment of the terminal box.
 - ⇒ The terminal box must be aligned with openings for the cable feedthroughs facing in the direction of the motor fan.
3. ➤ Attach a screwed cable gland to the terminal box.
4. ➤ Guide the motor cable through the screwed cable gland.
5. ➤ Connect the cable connections with the motor terminals correctly, in accordance with the connection layout.
6. ➤ Close the terminal box.
7. ➤ Ensure that the connection cable is not damaged by the movement of the hinged motor support.

5.6 Connecting the drive motor

5.6.1 Preparing the connection

Preparation with belt guards

1. ➤  Chapter 3.10.1 „Drive motor“ on page 59.

2. ➤



DANGER!

Risk of fatal injury in the case of incorrect electrical connection data!

Compare the electrical connection data of the drive motor with those of the grid operator.

3. ➤ Shut down the power from the operator-side grid.

4. ➤



DANGER!

Risk of fatal injury from electric current!

Check that there is no live current in the connection cable.

5.6.2 Routing cables

Routing the connection cable

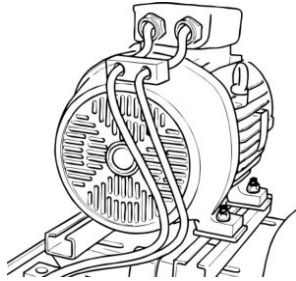


Fig. 66: Routing cables

1. ▶ Route the connection cable in accordance with the installation drawing.

2. ▶



NOTICE!

Risk of damage! The minimum bending radius must not be undershot!

Observe the bending radii.

⇒ Bending radius of the connection cable = 15 x cable sheath diameter

5.6.3 Connecting the drive motor

Motor connection

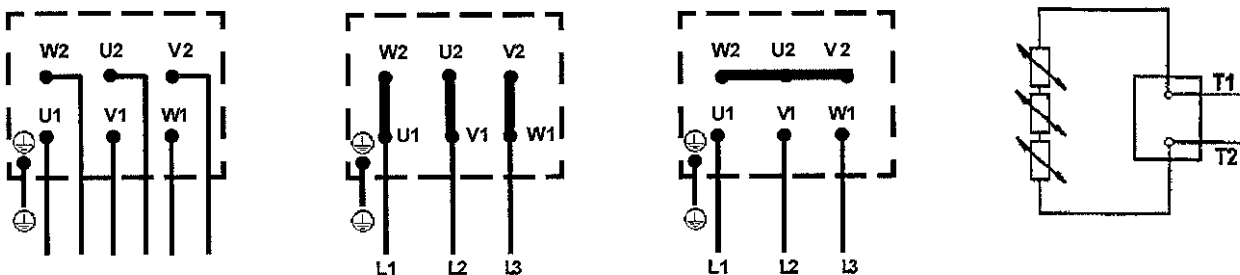


Fig. 67: Connection layout

Star-delta connection

Delta connection

Star connection

Thermal winding shield

1. ▶ Open the motor terminal box.
2. ▶ Check the alignment of the terminal box.
 - ⇒ The terminal box must be aligned with openings for the cable feedthroughs facing in the direction of the motor fan.
3. ▶ Attach a screwed cable gland to the terminal box.
4. ▶ Guide the motor cable through the screwed cable gland.
5. ▶ Connect the cable connections with the motor terminals correctly, in accordance with the connection layout.
6. ▶ Close the terminal box.
7. ▶ Ensure that the connection cable is not damaged by the movement of the hinged motor support.

5.7 Connecting the machine's terminal strip

Machine terminal strip

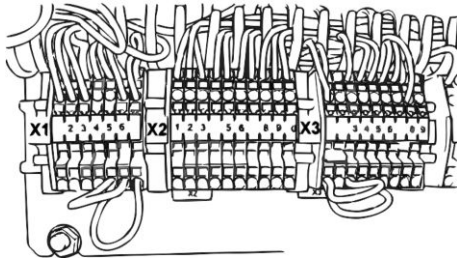


Fig. 68: Terminal box connections

1. → Open the terminal box.

2. → Observe the wiring scheme.

The wiring scheme can be found in the terminal box or in the product documentation.

3. →



DANGER!

Risk of fatal injury from electrical current!

Ensure that the connecting cable is not live.

4. →



Connection layout according to the AERZEN wiring scheme!

Guide the external connecting cable to the terminal box.

5. → Guide the connecting cable correctly through the cable entry (dummy cover) to the terminals.

6. → The cable entry (dummy cover) can be equipped on site with screwed cable glands.

7. → Close the terminal box properly.

5.8 Connecting the earthing

Connecting the earthing

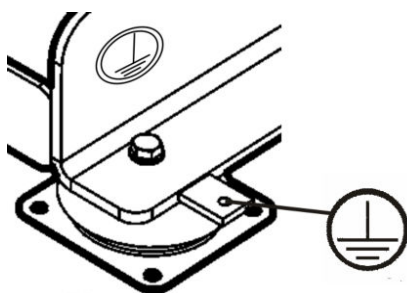


Fig. 69: Example connection

1. →



The exact position of these connections can be found in the installation drawing.

Earth the machine on the provided connections.

2. → Observe the cross-sections of the earthing strap! ↪ Chapter 11.9.2 „Earthing strap cross-sections “ on page 183.

3. → Beware of uncovered metal contact surfaces.

4. → Screw contacts tightly together.

5.9 Connecting the earthing

Connecting the earthing

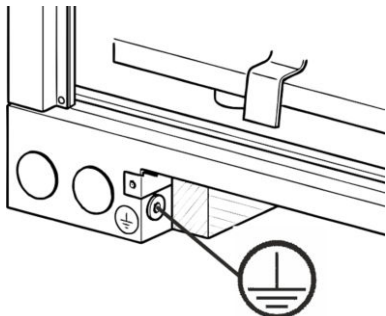


Fig. 70: Example connection

1. ➔



The exact position of these connections can be found in the installation drawing.

Earth the machine on the provided connections.

2. ➔

Observe the cross-sections of the earthing strap!
See [Chapter 11.9.2 „Earthing strap cross-sections“](#) on page 183.

4. ➔

Beware of uncovered metal contact surfaces.

5. ➔

Screw contacts tightly together.

5.10 Laying the insulation mat

Laying the insulation mat

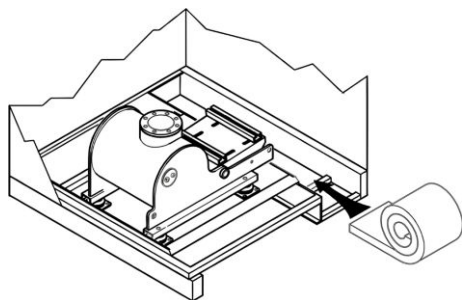


Fig. 71: Laying of the insulation mat

- Depending on the scope of delivery, the insulation mat is delivered separately.
- Lay the insulation mat in the exhaust duct of the acoustic hood.

6 Initial start-up

6.1 Safety instructions

Improper commissioning

**WARNING!****Risk of injury from improper commissioning!**

Improper commissioning may lead to serious injury and considerable material damage.

- Before commissioning, ensure that all installation work has been carried out and completed in accordance with the information and notes in this instruction manual.
- Before commissioning, ensure that there are no persons in the hazard area.

Requirements for staff

Requirements for commissioning:

Commissioning of electrical components

Personnel: ■ Authorised electricians

Commissioning the frequency converter:

Personnel: ■ Authorised electricians with additional qualifications

Commissioning of mechanical components

Personnel: ■ Service personnel

Protective equipment

Requirements for commissioning:

Protective equipment: ■ Protective work clothing
■ Safety shoes
■ Hearing protection
■ Protective gloves
■ Safety goggles
■ Industrial hard hat

Special tools

Requirements for commissioning:

- Special tool:
- Ratchet wrench
 - Oil funnel
 - Test pump
 - General tool kit
 - General measurement tools and equipment
 - Tools for authorised electricians


- Special tool:
- Locking key

6.2 Preparation for commissioning

Preparation


1. ▶ Check that the machine has been correctly installed.
↳ Chapter 5.2 „Requirements for the installation site“ on page 91
2. ▶ Check that the packaging has been fully removed.
3. ▶ Check that all seals and covers on the piping connections have been removed.
4. ▶ Check that the piping connections are clean. Remove any dirt, dust or foreign matter from the intake area.
5. ▶ Ensure that the inlet and exhaust air openings on the acoustic hood are unobstructed.

Ventilation

6. ▶  *Take the ambient temperature into consideration. See operating conditions.*

Ensure that the installation site is adequately ventilated.

Take noise protection into consideration.

7. ▶  *Ducting and foundations may be induced to produce natural vibrations and the associated sound emissions.*

Prevent natural vibrations and associated sound emissions with suitable measures, e.g. insulation.



Ventilation gauge

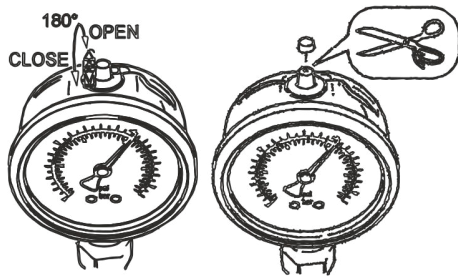


Fig. 72: Ventilation gauge

- 8. ▶ Prepare the gauge in line with its specific design.
 - Cut off the rubber connections on the upper section.
 - Turn the bleeder flap to OPEN.

Maintenance indicator (a)

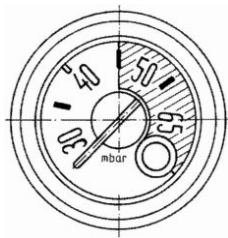


Fig. 73: Variation a)

- 9. ▶ Set to zero.
 - Press the front reset button and set the pointer to the zero position.

Maintenance indicator

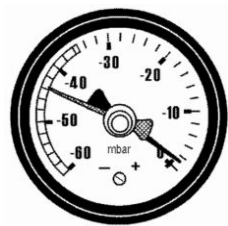


Fig. 74: Variation b)

- 10. ▶ Set to zero.
 - Remove the plugs on the front.
 - Adjust the set screw using a screwdriver.
 - Observe the “+” and “-” markings.
 - Position the red trailing pointer between 0 and -10 mbar.

Aligning the sheaves

- 11. ▶ Check the alignment of the sheaves.
 - The maximum permitted sheave offset is 0.5 mm.

Connecting the piping

- 12. ▶ Connect the depressurised system piping.

Preparing the hinged motor support

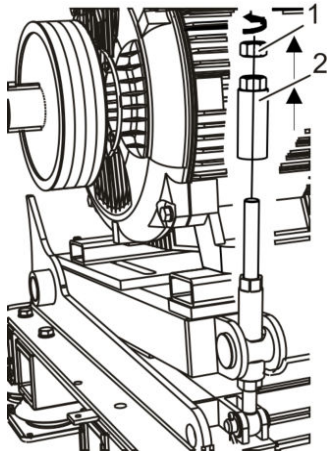


Fig. 75: Hinged motor support preparation

13. ➤ Remove counternut (pos.1) and locking sleeve (pos.2).

Removing sealing plugs

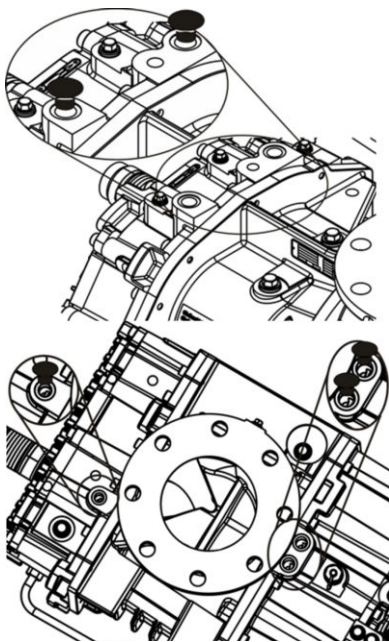


Fig. 76: Sealing plug configuration

14. ➤ Remove the sealing plugs from the balancing holes.



The sealing plugs may be coated in machine paint as part of the manufacturing process.

The number of sealing plugs varies depending on the machine type!

Depending on the design, they may already be removed before shipping.



NOTICE!

Risk of damage if sealing plugs are not removed! If sealing plugs are not removed, there is a risk that the machine will start to leak oil. Lube oil could enter the conveying chamber.

No lube oil



Fig. 77: Do not fill with lubricant oil

15. ➤



NOTICE!

Risk of damage! Lube oil must not enter these bore holes!

These holes are solely intended to discharge leaking gases. Inserting oil results in the need for considerable repairs.

Frequency converter installation and connection
16.


Observe the manufacturer's instruction manual!

Position and assemble the frequency converter.

- Connect it according to the manufacturer's instructions.
- See also the assembly group description for frequency converters. ↪ *Chapter 3.10.4 „Frequency converter“ on page 62*

Checking the EMERGENCY STOP function
17.

Check whether the EMERGENCY STOP function is in place and installed.

- Check for correct operation.
- Enter the test result in the test book.

6.3 Starting commissioning

Oil filling
Models with acoustic hoods


Fig. 78: Filling with oil

1.

Open the maintenance elements of the acoustic hood.

2.


When working with operating materials such as lube oil, wear personal protective equipment.


ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

Fill with lube oil. ↪ *Chapter 8.3.1 „First oil filling“ on page 132*

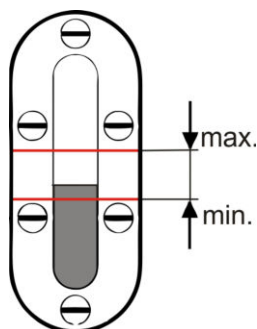
Checking the oil level


Fig. 79: Sight glass for oil level display

3.

Check the lube oil level and correct it if necessary.

Models without acoustic hoods

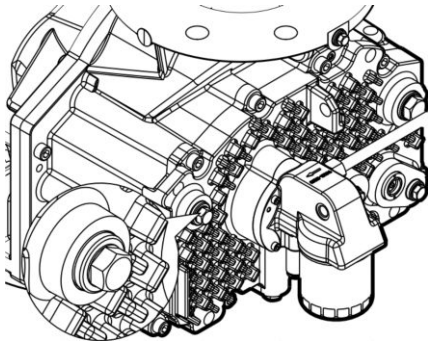


Fig. 80: Filling with oil

Checking the oil level

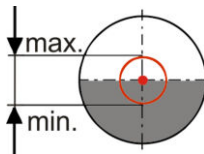


Fig. 81: Sight glass for oil level display

Establishing an electrical connection

4. ▶



When working with operating materials such as lube oil, wear personal protective equipment.



ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

Loosen the locking screw (painted red). Fill with lube oil.
 ↪ Chapter 8.3.1 „First oil filling“ on page 132

5. ▶

Check the lube oil level and correct it if necessary.

6. ▶



DANGER!

Risk of fatal injury from electric current!

Supply electrical components with electricity.

7. ▶

Connect and activate motor overload protection. ↪ Chapter 11.9.3 „Motor overload protection“ on page 183

8. ▶

Observe the permissible starting frequency of the drive motor. ↪ Chapter 3.10.1 „Drive motor“ on page 59



Checking direction of rotation
(models with acoustic hood)

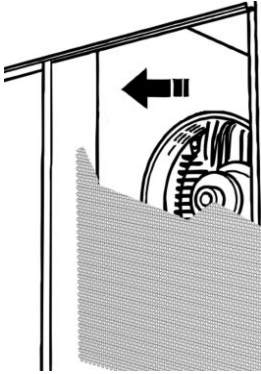


Fig. 82: Motor direction of rotation

9. →



WARNING!

Risk of injury from rotating components!



NOTICE!

Risk of machine damage from incorrect direction of rotation!

Check the direction of rotation **without belts** in place.

- If in place, remove the perforated plate cover of the drive motor's sheave.
- Observe the rotational direction signage on the machine stage and on the drive motor.
- Start the drive motor briefly (approx. 1 to 2 seconds).
- Viewed towards the front of the drive shaft, the drive motor turns anti-clockwise.
 - Direction of rotation is correct = continue commissioning.
- From the viewing position, the drive motor turns right in front of the drive shaft.
 - Direction of rotation is incorrect = correct the electrical connection.
- Where applicable, attach the perforated plate cover of the drive motor.

Checking the direction of rotation (models without acoustic hood)

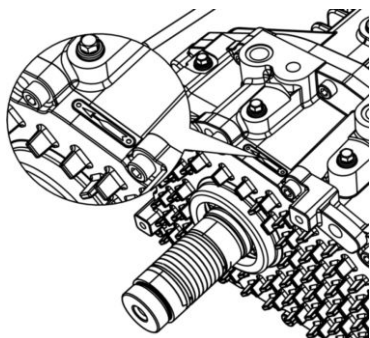


Fig. 83: Machine stage direction of rotation

10.▶



WARNING!

There is a risk of injury from rotating components!



NOTICE!

Risk of machine damage from incorrect direction of rotation!

Check the direction of rotation **without belts** in place.

- Remove the cover from the belt guard.
- Observe the sign with direction of rotation on the machine stage.
- Start the drive motor briefly (approx. 1 to 2 seconds).
- Viewed towards the front of the drive shaft, the drive motor turns anti-clockwise.
 - Direction of rotation is correct = continue commissioning.
- From the viewing position, the drive motor turns right in front of the drive shaft.
 - Direction of rotation is incorrect = correct the electrical connection.
- Mount the cover of the belt guard.

Disconnecting the electrical power supply

11.▶



WARNING!

Risk of injury from an automatic start-up!

Deactivate the machine and secure it against restarting.

Fitting the belt

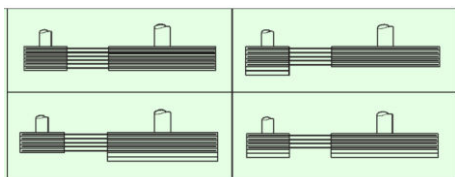


Fig. 84: Permissible belt layout

12.▶



WARNING!

Risk of injury from moving or rotating components!

Observe and comply with the permissible groove layout.



Loosening the self-locking nut

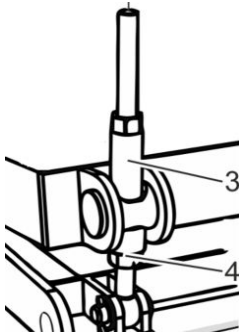


Fig. 85: Loosening the self-locking nut

13. ➔



NOTICE!

Prevention of wear and tear on belts.

Screw the self-locking nut (pos.4) all the way downwards.

⇒ The hinged motor support can be adjusted to the correct position.

Pre-tensioning belts

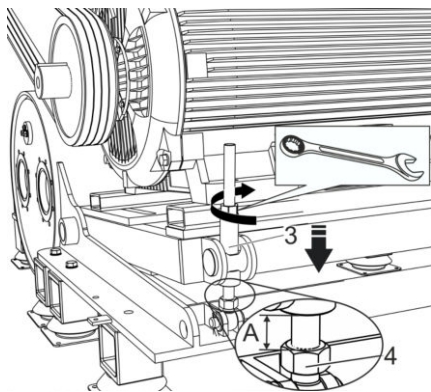


Fig. 86: Pre-tensioning belts

14. ➔



CAUTION!

Risk of injury from tensioning components!

Turn guide bushing (pos.3) clockwise with the ratchet wrench until the belts are pre-tensioned.

⇒ The hinged motor support is partly held by the belt drive and rests lightly on the guide bushing (pos.3).

Adjusting the guide bushing

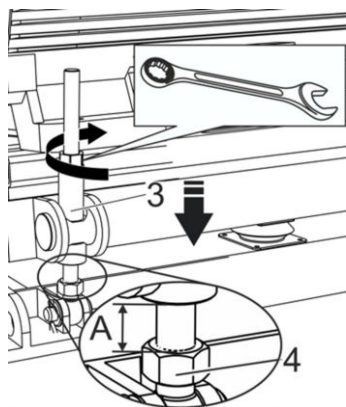


Fig. 87: Adjusting the gauge of the guide bushing

15. ➔

Select measurement A by moving the set guide bushing (pos.3).

- Set self-locking nut (pos.4) to measurement A. Turn guide bushing (pos.3) using the ratchet wrench on to the self-locking nut (pos.4).

DN / discharge side	Measurement A in mm
100	25
125	25
150	30
200	35
250	40
300	45
Delta Hybrid	

Tensioning the belts

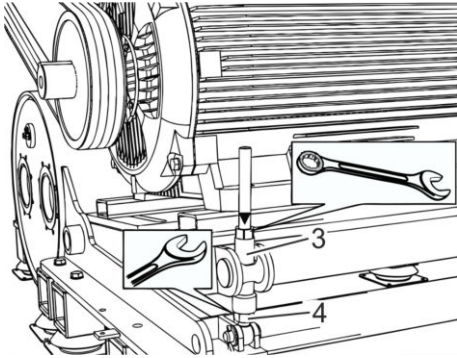


Fig. 88: Tensioning belts

Carrying out a test run

16.▶



CAUTION!

Risk of injury from moving components!

Tensioning belts.

- Secure the guide bushing (3) with the self-locking nut (pos.4).
- The hinged motor support is supported entirely by the belt drive.
- Move the belt drive by hand for one rotation to check that it is sitting correctly.

17.▶



CAUTION!

Risk of injury from moving components!

Carry out a test run of the belt drive.

Start the drive motor briefly (approx. 5 to 10 seconds).

Check for correct operation.

Characteristics:

- quiet, even operation.
- even load.
- no excessive vibrations.
- no whistling noises.
- no increased wear.

End the test-run after the inspection.

Checking the protective cover (models without acoustic hoods)

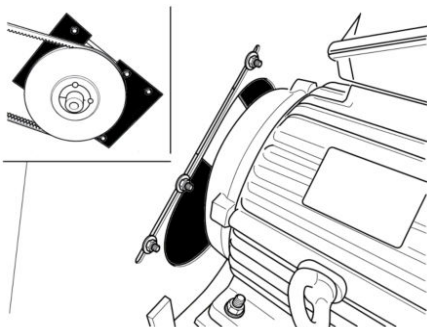
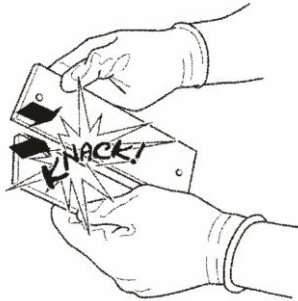
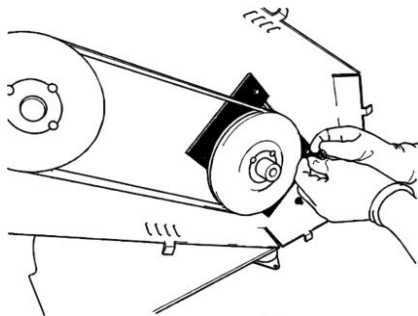


Fig. 89: Protective cover

18.▶

Check the spacing of the pre-mounted protective cover for the motor drive shaft.

- The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
- By loosening the fastening screws, the protective cover can be moved.
- Check the protective cover for firm seating and, if necessary, tighten it.

**Adjusting the protective cover/
models without acoustic hood**

Fig. 90: Adjusting the protective cover
Assembling and adjusting the protective cover/models without acoustic hood

Fig. 91: Assembly/adjusting
Assembling the acoustic hood
Connecting the power supply

- 19.** ▶ If the protective cover is delivered separately, adjust the cover plates if necessary. The cover plates can be snapped off at the required length.

20. ▶


WARNING!

Risk of injury from rotating components!

Assemble the protective cover after tensioning the belts.

- The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
- Operation is only permissible with a mounted cover!

- 21.** ▶ Mount the roof and the corresponding side elements of the acoustic hood.

22. ▶


WARNING!

Risk of injury from electric current!

Supply electrical components with electricity.

Inspecting shut-downs

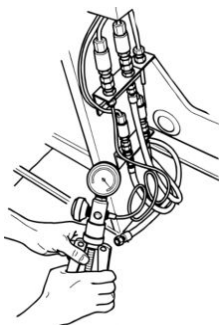


Fig. 92: Test pump

Opening the system line

Starting briefly

Checking the direction of rotation of the fan/version with acoustic hood

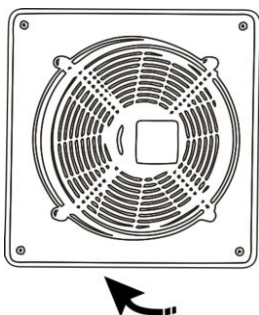


Fig. 93: Fan direction of rotation

23. ▶ Check the correct operation of all pressure switches/sensors that can trigger a shut-down.

- Connect the test pump to the corresponding measurement line.
- Simulate the tripping pressure.
- Check to see if a shut-down process is triggered.
- Remove the measurement line from the test pump.
- Fit the measurement line to the measuring point on the machine.

24. ▶ Open valves on the system side.

25. ▶



WARNING!

Risk of injury from rotating components!



WARNING!

Risk of injury from pressurised components!

Do not loosen or remove any locking screws or pipe connections.

Switch on the drive motor.

- After approx. 20 seconds, switch it off.
- Make sure the machine coasts down smoothly.

26. ▶



WARNING!

Risk of injury from rotating components!

Never operate the ventilator without a cover!

Check the direction of rotation of the ventilator.

- Observe the labelled information on the direction of rotation.
- Observe the direction of flow of the cooling air. Observe the acoustic hood's inlet and exhaust air.



Checking the frequency converter for correct operation

27.▶



Read and follow the manufacturer's operating instructions!



DANGER!

Risk of fatal injury from electric current and residual energy for all work performed on frequency converters!

See also the description of the frequency converter assembly. ↪ *Chapter 3.10.4 „Frequency converter“ on page 62*

Starting the drive motor

28.▶



WARNING!

Risk of injury from rotating components!

As long as there are no malfunctions: restart the drive motor.

- Check the EMERGENCY STOP function.
- Check the machine's protective equipment.

29.▶

Check the oil pressure. If necessary, correct it. ↪ *Chapter 7.8.1 „Adjusting the oil pressure regulating valve“ on page 123*

Checks after first commissioning

30.▶



WARNING!

Only re-tightened or open lubricating and control oil pipes while the machine is in a depressurised state.

Perform the following checks:

↪ *on page 115*

Acoustic hood protection

31.▶



WARNING!

Risk of injury if protective equipment is not present.

Correctly close the elements of the acoustic hood.

- Store the acoustic hood key safely.
- Only allow access for authorised personnel.



Starting commissioning

Belt protection

32.▶



WARNING!

Risk of injury if protective equipment is not present.

Mount the belt protection cover.

Operational readiness

33.▶

If there are no malfunctions, the machine is ready for operation.



After the first few hours of operation, preservative oil may gather in the parting faces as a result of the machine warming up.

**6.4 Performing checks after commissioning**

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Screws	After the machine has cooled down re-tighten if necessary	
Acoustic hood ventilator	Check the direction of rotation check for correct operation	
Safety valve	check for correct operation	
Oil level	check and, if necessary, correct	Check, if necessary correct
Oil pressure	Check, if necessary correct	check and, if necessary, correct
Aligning the sheaves		check, correct if necessary
Condition of the belts		check, change if necessary, establish cause
Control system, fault transmitter, pressure and temperature sensors	check for correct operation	
Motor overload protection	connected and active	
Accumulation of preservative oil		check, remove if necessary
op. hrs = operating hours		

7 Operation

7.1 Safety instructions

Improper operation



WARNING!

Risk of injury from improper operation!

Improper operation may lead to serious injury and considerable material damage.

- Carry out all activities in accordance with the information and notes in this instruction manual.
- Before beginning work, observe the following:
 - Ensure that all covers and safety devices are installed and operating correctly.
 - Ensure that there are no persons in the hazard area.
- Never deactivate or bypass safety devices during operation.

Open acoustic hood



WARNING!

Risk of injury from operation with an open acoustic hood!

Open acoustic hoods may lead to dangerous situations and cause injury during machine operation.

- Always keep the acoustic hood closed during operation.

Explosion and fire hazards



DANGER!

There is a risk of explosion and fire from ignition hazards!

Avoid allowing ignition hazards (open flames, flying sparks, weld spatter) into the vicinity of the machine. Sparks and incandescent or flammable objects could be sucked in through the supply air openings on the acoustic hood or through the intake silencer. The fan may ignite these elements causing fire or an explosion.

- Avoid ignition hazards.
- Never carry out work that generates sparks while the machine is in operation.
- Ventilate the installation site properly.

Adjusting valves**DANGER!****Risk of injury when adjusting valves!**

When the machine is running and an attempt is made to adjust a valve, body parts may be injured by rotating components. Take into account the stand-by mode and/or automatic start-up

Only make adjustments if:

- The machine is not running.
- The machine is secured against a restart.

Requirements for staff

Requirements for operation:

Operating the machine

Personnel: ■ User

Adjusting valves

Personnel: ■ User
■ Authorised electricians

Protective equipment

Requirements for operation:

Protective equipment: ■ Protective work clothing
■ Safety shoes
■ Hearing protection

Special tools

Adjusting the valves requires:

Special tool: ■ General tool kit

Special tool: ■ Locking key

7.2 Shut-down in case of emergency

In hazardous situations, the movements of components must be stopped as quickly as possible and the electric power supply must be shut off.

Shut-down in case of emergency

In an emergency, proceed as follows:

- 1.** ➤ Activate the EMERGENCY STOP immediately.
- 2.** ➤ Inform the responsible staff.
- 3.** ➤ Switch off the main circuit breaker and secure it against restarting.

4. → Assign qualified personnel the task of rectifying the fault.

5. →



WARNING!

An unauthorised or unregulated restart can have fatal consequences.

Before commissioning, ensure that all safety devices are installed and operational.

7.3 Switching on

Operating modes

Depending on the operating mode, the machine can be switched on in the following ways:



If possible, start up the machine without load!

Observe the control circuit types!

When starting and stopping the drive motor, observe all of the machine's protective measures. Power take-offs must be actuated by a potential-free contact or be actuated directly. The start-up of the power take-offs runs in parallel to the drive motor.

AERtronic

The starting and stopping of the drive motor must be carried out by AERtronic. A potential-free contact is already in place.

7.3.1 On-site operation

On-site manual operation



DANGER!

Risk of injury if protective equipment is missing!

Manually activate the starter switch on the machine on site.

⇒ The machine starts and comes on stream.



7.3.2 Remote operation

Via remote station



DANGER!

Risk of fatal injury if protective equipment is missing!



WARNING!

Risk of injury if the machine starts suddenly!

Activate the starter switch in the remote station.

⇒ The machine is started remotely and comes on stream.

Remote station with AERtronic

- Remotely via potential-free contact
- Remotely via MODBUS RTU
- Remotely via PROFIBUS DP

7.3.3 Automatic operation

Automatic activation



DANGER!

Risk of fatal injury if protective equipment is missing!



WARNING!

Risk of injury if the machine starts suddenly!

The starting command is carried out by sensors or a system switch.

⇒ The machine starts automatically and comes on stream.

7.4 Displaying operating parameters

AERtronic (optional)



Fig. 94: AERtronic display



A detailed explanation is contained in the separate operating manual AS-002.

Analogue instruments (optional)

Depending on their design, analogue instruments display the given operating data, e.g. discharge pressure, discharge temperature, oil pressure.

Control system (optional)

Depending on the customer's control system, additional operating parameters can be recorded and displayed.

7.5 Switching off

Operating mode

Depending on the operating setup, the machine can be switched off in the following ways:

7.5.1 On-site operation

On-site manual operation



WARNING!

Risk of injury from unbraked shut-down!

Manually activate the cut-out switch on the machine.

⇒ The machine is switched off and shuts down. The machine does not stop immediately.

7.5.2 Remote-controlled operation

Via remote station

**WARNING!**

Risk of injury from unbraked shut-down!

Activate the cut-out switch in the remote station.

- ⇒ The machine is switched off and shuts down. The machine does not stop immediately.

7.5.3 Automatic operation

Switching off automatically

**WARNING!**

Risk of injury from unbraked shut-down!

The shut-down command is carried out by sensors or a system switch.

- ⇒ The machine is switched off and shuts down. The machine does not stop immediately.

7.5.4 Switching off in nitrogen operation

Switching off in nitrogen operation

1. 



Switch off as described above!

Switch off the machine.

2. 

**DANGER!**

Risk of fatal injury from gas leaks!

For longer downtimes disconnect the unit from the gas network.

- ⇒ Otherwise there is a possibility that gas leaks will occur during downtime.

7.6 Decommissioning



Decommissioning means the shut-down of a machine for a longer period.

Measures

1. ➤ Switch off the machine properly and secure it against an unintentional start.
2. ➤ Disconnect fuses.
3. ➤ Close the shut-off valves of the delivery lines.
4. ➤ Prevent condensate from entering the machine.
5. ➤ For a downtime of over six weeks: preserve the conveying chamber.

Avoiding damage caused by downtime and corrosion

- ➔ **For a downtime of over six weeks**
- preserve the conveying chamber. ↪ „Preservation“ on page 87
- Move the rotors every six weeks by 2-3 rotations.

7.7 Measures for recommissioning

7.7.1 Commissioning after adjustment works

after adjustments

Work stages ↪ „Commissioning“ on page 126

7.7.2 Commissioning after maintenance work

after maintenance

Work stages ↪ „Commissioning after maintenance“ on page 156

7.7.3 Commissioning after fault rectification

After fault rectification

Work stages ↪ „Commissioning after fault rectification“ on page 162

7.8 Adjusting valves



DANGER!

Risk of injury when adjusting valves or equipment!



Preparation/models with acoustic hood

1. ➤ Agree adjustments with the responsible staff at the location.
2. ➤ Switch off the machine.
3. ➤ Activate the EMERGENCY STOP function.
4. ➤ Switch off the main circuit breaker and secure it against restarting.
5. ➤ Ensure there is no live electricity.
6. ➤ Open the maintenance elements.

Preparation/models without acoustic hood

1. ➤ Agree adjustments with the responsible staff at the location.
2. ➤ Switch off the machine.
3. ➤ Activate the EMERGENCY STOP function.
4. ➤ Switch off the main circuit breaker and secure it against restarting.
5. ➤ Ensure there is no live electricity.
6. ➤ Disassemble the belt guard.

7.8.1 Adjusting the oil pressure regulating valve

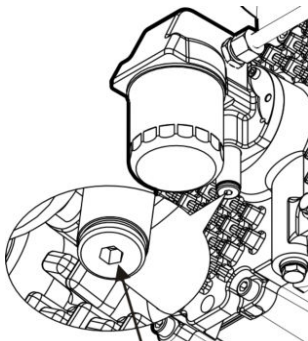


The D62 S , D62 H and D75 L design sizes do not feature an oil pressure regulating valve!

The oil pressure regulating valve is preset at the factory. An adjustment is only necessary if the oil pressure level is outside the necessary parameters.

🔗 *Chapter 11.10.1 „Oil pressure“ on page 184*

Adjusting the valve



1. ➤ Move the spindle clockwise using an Allen key.
⇒ The oil pressure increases.
2. ➤ Move the spindle anti-clockwise using an Allen key.
⇒ The oil pressure drops.
3. ➤ Adjust the oil pressure accordingly.
4. ➤ Mount all protective hardware and covers.
5. ➤ Close the maintenance elements.

Fig. 95: Oil pressure regulating valve

6. ▶



NOTICE!

Observe the starting frequency of the drive motor!

Start the machine.

7. ▶

Check oil pressure.

8. ▶

If oil pressure is in the permissible range:

⇒ adjustments are complete.

9. ▶

If oil pressure is not in the permissible range:

⇒ Repeat the adjustment steps.

7.8.2 Adjusting the start unloading device

DN 80 to DN 400

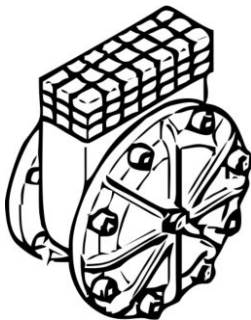


Fig. 96: Start unloading device

The start unloading device is preset with a maximum closing time at the factory. An adjustment is only necessary if the start unloading device does not close or the closing time is too long.

🔗 Chapter 11.10.4 „Start-up unloading device DN 80 to DN 400“ on page 185

Settings with star-delta starting



The start unloading device closes fully after:

- the switch from star to delta.
- the nominal speed is reached.

The closing procedure can be both heard and seen (on the gauge for discharge pressure).

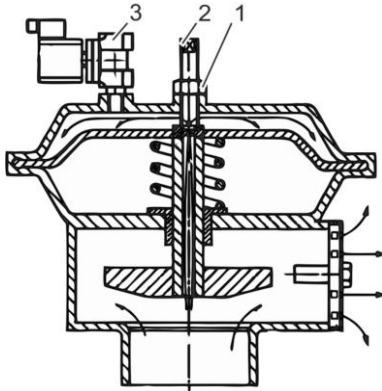
**Setting the closing time**

Fig. 97: Start unloading device positions

1. ➤ Open the maintenance elements.
2. ➤ Loosen the counternut (pos.1).
3. ➤ Move the spindle (pos.2) clockwise.
⇒ The closing time is reduced.
4. ➤ Move the spindle (pos.2) anti-clockwise.
⇒ The closing time is extended.
5. ➤ Set the closing time.
6. ➤ Tighten counternut (pos.1).
7. ➤ Mount all protective hardware and covers.
8. ➤ Close the maintenance elements.
9. ➤

**NOTICE!**

Risk of damage! Observe the starting frequency of the drive motor!

Start the machine.

10. ➤ Check the closing time.
11. ➤ If the closing time is in the permissible adjustment range:
⇒ adjustments are complete.
12. ➤ If the closing time is not in the permissible adjustment range:
⇒ repeat the adjustment steps.

Settings for pole changing

Set start unloading device to a lower speed in accordance with star-delta starting.



The closing time in the lower speed range must be set as long as possible, so that an acceptably long closing time is still available for the upper speed range.

If this is not possible, then an additional solenoid valve is used.

The solenoid valve (pos.3) keeps the start unloading device open to the atmosphere when ramping up to "high-speed" mode directly.

Reasons for the above:

- The differences in conveyed amounts are too large.
- High-speed operation is started from low-speed operation in "star-double-star starting".

The solenoid valve (pos.3) keeps the start unloading device open to the atmosphere during star-double-star starting.

The solenoid valve closes after ramping up.

7.8.3 Commissioning after adjustments

Commissioning

1. ▶ Inform the responsible on-site person about the result of the work carried out and agree commissioning steps with that person.
2. ▶ Check all previously loosened screw connections for tightness.
3. ▶ Ensure that there are no persons in the hazard area.
4. ▶ Re-attach all safety hardware.
5. ▶ Remove all used tools, materials and other equipment from the workspace.
6. ▶ Release the safety on the main circuit breaker and activate it.
7. ▶ Release the EMERGENCY STOP function.
 - ⇒ Start operation in accordance with the instruction in the "Operation" chapter. ↪ *Chapter 7.3 „Switching on“ on page 118*
8. ▶ Inform the responsible on-site person about the result of the work carried out.



8 Maintenance

8.1 Safety instructions

Improperly performed maintenance work

**WARNING!****Risk of injury from improperly performed maintenance work!**

Improperly performed maintenance may lead to serious injury or material damage.

- Only perform maintenance work when the machine has been decommissioned.
- Secure against a restart.
- Allow the machine to cool down to the ambient temperature.
- Before beginning work, ensure that there is sufficient space for installation work.
- Check the tidiness and cleanliness of the work area.
- Only perform maintenance work with suitable tools.
- Ensure removed components are re-installed correctly.
- Re-install all fastening elements and observe the screw tightening torques.

Securing the machine against restarting

**WARNING!****An unauthorised or unregulated restart can have fatal consequences.**

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area.

- Before beginning work, switch off the energy supply and secure it against restarting.

Electrical system

**DANGER!****Risk of fatal injury from electrical current!**

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Rotating or moving components



WARNING!

Risk of injury from rotating or moving components!

Rotating or moving components can cause serious injuries.

- Never touch rotating or moving components.
- Never reach into the clamping area of the belts, for example.
- Keep a safe distance from rotating or moving components.
- Wear tight-fitting protective work clothing with low tensile strength within the hazard area.

Hot operating materials



WARNING!

Risk of injury from hot operating substances!

Operating substances may reach high temperatures during operation. Skin contact with hot operating substances causes serious burns.

- For all work performed with hot operating substances, always wear protective work clothing and protective gloves.
- Before any work with operating substances, check whether they are hot. If necessary, allow them to cool down to the ambient temperature.

Requirements for staff

The maintenance work described here may only be performed by the designated personnel. The personnel entrusted with the respective maintenance tasks are listed in the maintenance plan.

For the preparation of the maintenance plan, the following is necessary:

- Personnel:
- Authorised electricians
 - Service personnel

For cleaning after maintenance, the following is necessary:

- Personnel:
- User

Commissioning after maintenance requires:

- Personnel:
- Authorised electricians
 - Service personnel

Protective equipment

For maintenance, the following is necessary:

- Protective equipment:
- Protective work clothing
 - Safety shoes
 - Protective gloves
 - Safety goggles
 - Industrial hard hat

Special tools

For maintenance the following is necessary:

- Special tool:
- Ratchet wrench
 - Oil funnel
 - General tool kit
 - General measurement tools and equipment
 - Strap wrench
 - Auxiliary materials, aids
- Special tool:
- Locking key

8.2 Maintenance schedule

The following section describes the maintenance work that is required for optimal and fault-free operation of the machine.

If regular inspections reveal an increased level of abrasion, reduce the maintenance intervals in accordance with the signs of wear and tear. For questions on maintenance work and intervals contact the manufacturer. See contact details.

8.2.1 Maintenance schedule for normal operation

Interval	Maintenance work	Personnel
After the first 500 op. hrs	<p>Change the oil filter. ↪ <i>Chapter 8.3.5 „Changing the oil filter“ on page 145</i></p> <p>Check the oil level. ↪ <i>Chapter 8.3.2 „Checking the oil level“ on page 134</i> If necessary, top up. ↪ <i>Chapter 8.3.3 „Correcting the oil level“ on page 135</i> ↪ <i>Chapter 8.3.1 „First oil filling“ on page 132</i></p>	Service personnel
Weekly	<p>Check the intake filter for contamination. (display unit, max. -45 mbar)</p>	User
	<p>Check the oil level. ↪ <i>Chapter 8.3.2 „Checking the oil level“ on page 134</i> If necessary, top up. ↪ <i>Chapter 8.3.3 „Correcting the oil level“ on page 135</i> ↪ <i>Chapter 8.3.1 „First oil filling“ on page 132</i></p>	User
	<p>Check that the belt guard is fully attached and check it for damage and contamination. ↪ <i>Chapter 8.3.16 „Checking the belt guard“ on page 155</i></p> <p>Remove any dirt from the outer belt guard.</p>	User
	<p>Check that the acoustic hood fan is operating correctly. ↪ <i>„Checking fan operation“ on page 153</i></p>	User
	<p>In case of contamination, change the intake filter. ↪ <i>Chapter 8.3.6 „Replacing the intake filter“ on page 146</i></p>	Service personnel
	<p>If the belt guard is not completely stable or is damaged, contact customer service.</p>	Manufacturer's customer service division
Relubrication intervals for the drive motor	<p>Observe the instruction manual and signage of the drive motor!</p>	Service personnel
After every 4,000 op. hrs or 6 months	<p>Check and clean the inlet and exhaust air openings on the acoustic hood. ↪ <i>Chapter 8.3.15 „Checking the inlet and exhaust air openings on the acoustic hood“ on page 153</i></p> <p>Check that the acoustic hood fan is operating correctly. ↪ <i>„Checking fan operation“ on page 153</i></p>	Service personnel
	<p>Check the condition of the belts. If necessary, replace them. ↪ <i>Chapter 8.3.9 „Replacing belts“ on page 148</i></p> <p>Inspect the sheaves for unusual wear and tear or obvious damage. Inspect for alignment and stability. ↪ <i>Chapter 8.3.7 „Checking the sheaves“ on page 147</i></p> <p>Lube oil: Change Klüber 4UH1-46N. ↪ <i>Chapter 8.3.4 „Changing oil“ on page 140</i></p> <p>Replace oil filter for use of Klüber 4UH1-46N. ↪ <i>Chapter 8.3.5 „Changing the oil filter“ on page 145</i></p>	Service personnel
	<p>Check that the safety valve is operating correctly and clean it. ↪ <i>Chapter 8.3.10 „Checking the AERZEN safety valve“ on page 150</i></p>	Service personnel

Interval	Maintenance work	Personnel
	If necessary, replace the sheaves.	Manufacturer's customer service division
After every 8,000 op. hours or 12 months	Replace the intake filter. ↪ <i>Chapter 8.3.6 „Replacing the intake filter“ on page 146</i>	Service personnel
	Check the control system, fault transmitter and pressure and temperature sensors for correct operation.	Manufacturer's customer service division
After every 16,000 op. hrs or every 2 years	Replace belts. ↪ <i>Chapter 8.3.9 „Replacing belts“ on page 148</i>	Service personnel
	Check the alignment of the sheaves. If necessary, correct it. ↪ <i>Chapter 8.3.7 „Checking the sheaves“ on page 147</i>	
	Lube oil: Replace Delta Lube 06. ↪ <i>Chapter 8.3.4 „Changing oil“ on page 140</i>	
	Replace oil filter for use of Delta Lube 06. ↪ <i>Chapter 8.3.5 „Changing the oil filter“ on page 145</i>	
	Check non-return flap for wear and tightness. Replace if necessary. ↪ <i>Chapter 8.3.13 „Checking the non-return flap“ on page 152</i>	
After every 20,000 op. hrs or every 3 years	Check flexible pipe connections on the discharge and intake sides for tightness. Replace if necessary. ↪ <i>Chapter 8.3.17 „Checking pipelines for tightness.“ on page 155</i>	Service personnel
	Replace oil demister, if present. ↪ <i>Chapter 8.3.11 „Changing the oil demister“ on page 151</i>	
	Check hose lines for tightness. Replace if necessary. Recommendation: Replace hose lines every 6 years.	
After every subsequent 30,000 op. hours or every 4 years, at a pressure difference of delta p over 1,000 mbar	Recommended main inspection / servicing.	Manufacturer's customer service division
	Inspection, changing of replacement and expendable parts.	
	Entire machine check.	
After every subsequent 40,000 op. hours or every 5 years, at a pressure difference of delta p up to 1,000 mbar	Recommended main inspection/maintenance.	Manufacturer's customer service division
	Inspection, changing of replacement and expendable parts.	
	Entire machine check. Recommendation: replace hose lines every 6 years.	

op. hrs = operating hours

8.3 Maintenance work

Preparation

1. ➤ Agree maintenance work with the responsible staff at the location.
2. ➤ Switch off the machine.
3. ➤ Activate the EMERGENCY STOP function.

4. ➤ Switch off the main circuit breaker and secure it against restarting.

5. ➤



DANGER!
Risk of injury from electric current!

Ensure there is no live electricity.

6. ➤



DANGER!
Risk of injury during maintenance work!

Open the maintenance elements.

7. ➤



DANGER!
Risk of injury during maintenance work!

Open the belt guard cover.

8.3.1 First oil filling

Oil drainage/models with acoustic hood



Fig. 98: Filling with oil

1. ➤ Check the drain valve for firm seating.

2. ➤ Check that the sealing cap of the drain valve is firmly in place.

3. ➤ Open the oil container.

4. ➤ Make sure the cross-section of the ventilation pipe in the oil filling container is unobstructed.

5. ➤



CAUTION!
Skin irritation from lube oil!



ENVIRONMENT!
Environmental risks from incorrect handling of lubricants!

For oil quantities and specifications see [Chapter 11.7.1 „Lubricant oil specifications“](#) on page 178 Filling oil:

First, fill 3/4 of the listed quantity of oil.

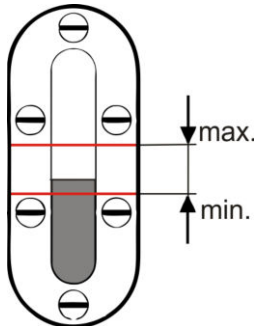


Fig. 99: Sight glass for oil level display

6. → Wait 5 - 10 minutes. The lube oil continues to flow.
 - ⇒ The oil level regulates itself in the oil system and in the oil chamber.
7. → Check the oil level.
8. → Fill the rest of the lube oil up to the mark on the sight glass. Observe the after-run time of the lube oil.
 - ⇒ The oil level is correct when it is between min. and max.
9. → Close the oil filling container.

10. →



ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

Filling with oil (models without acoustic hoods)

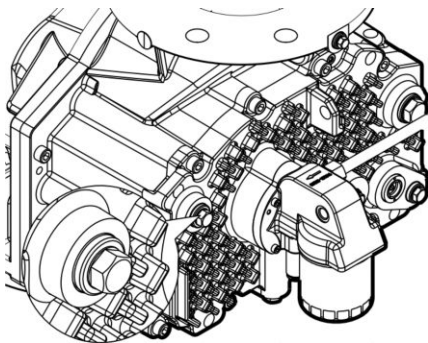


Fig. 100: Filling machine stage oil

1. → Check the drain valve for firm seating.
2. → Check that the sealing cap of the drain valve is firmly in place.
3. → Open the oil fill openings, RED marked sealing screw.
4. →



CAUTION!

Skin irritation from lube oil!



ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

For oil quantities and specifications see ↗ *Chapter 11.7.1 „Lubricant oil specifications“ on page 178* Filling oil:

First, fill 3/4 of the listed quantity of oil.

5. → Wait 5 - 10 minutes. The lube oil continues to flow.
 - ⇒ The oil level regulates itself in the oil system and in the oil chamber.

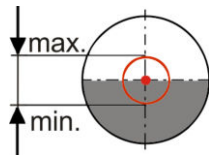


Fig. 101: Sight glass for oil level display

6. ▶ Check the oil level.
7. ▶ Fill the rest of the lube oil up to the mark on the sight glass.
⇒ The oil level is correct when it is between min. and max.
8. ▶ Close the oil fill opening tightly with a seal.
9. ▶



ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

8.3.2 Checking the oil level

Oil system/models with acoustic hood

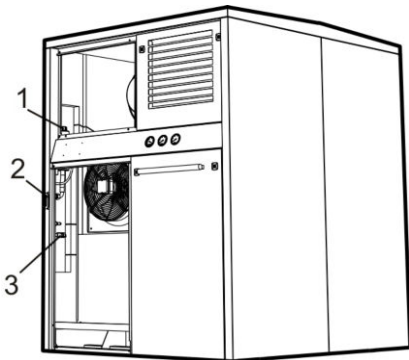


Fig. 102: Oil system

- 1 Oil fill opening (oil filling container)
- 2 Oil level display
- 3 Oil drain

Checking the oil level

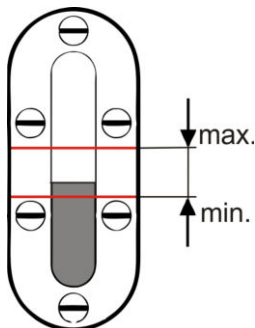


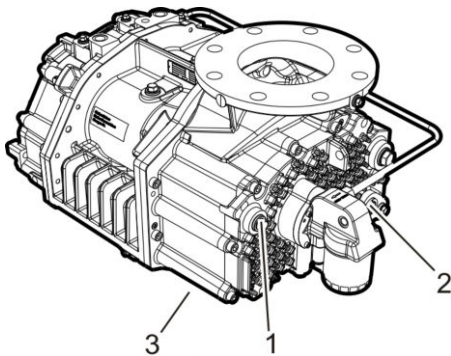
Fig. 103: Sight glass for oil level display



Check after switching off the machine!

The oil level shown during operation is lower than that shown at machine standstill.

Check the lube oil level and correct it if necessary.

Oil system (models without acoustic hood)


- 1 Oil, marked in red
- 2 Oil level display
- 3 Drain valve

Fig. 104: Oil system

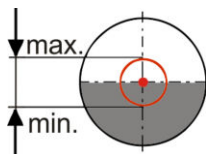
Checking the oil level


Fig. 105: Sight glass for oil level display


Check after switching off the machine!

The oil level shown during operation is lower than that shown at machine standstill.

Check the lube oil level and correct it if necessary.

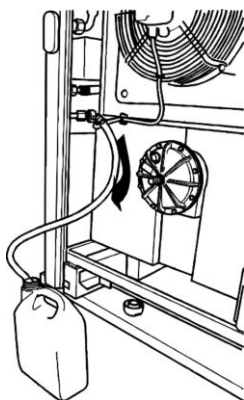
8.3.3 Correcting the oil level
8.3.3.1 Oil level too high
Oil drainage (models with acoustic hood)


Fig. 106: Draining oil


WARNING!

Risk of scalding from hot lube oil!


NOTICE!

Material damage to the drain hose from lube oil temperatures over 60°C!

Allow the lube oil to cool down to the ambient temperature.



Observe the volume of the waste oil and the oil-resistant receptacle. ↪ Chapter 11.7.3 „Lubricant quantities“ on page 181.

Have a receptacle ready.

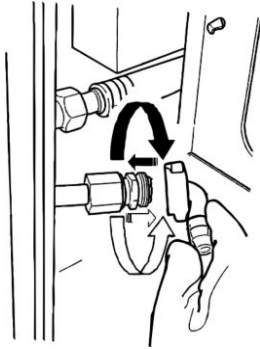


Fig. 107: Mounting the drain hose

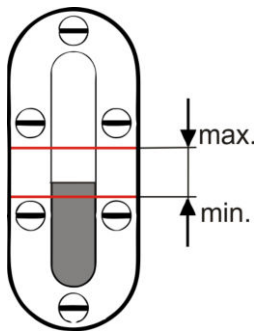


Fig. 108: Sight glass for oil level display

3. ▶ Open the oil opening on the oil filling container.
⇒ Lube oil flows out more evenly from the oil drain.

4. ▶ Place the drain hose into the receptacle.

5. ▶



CAUTION!

Risk of skin irritation from old lube oil!

Remove the sealing cap from the drain valve.

Twist the drain hose onto the drain valve.

⇒ The drain valve opens automatically.

6. ▶



CAUTION!

Risk of slipping from oil spillage!

Guide excess lube oil into the receptacle.

7. ▶ Observe and check the oil level.

8. ▶ If the permissible oil level is reached, remove the drain hose.

⇒ The drain valve closes.

9. ▶ Turn the sealing cap on the drain valve.

10. ▶ Close the oil fill opening.

11. ▶



ENVIRONMENT!

Risk of environmental damage from waste oil!

Collect waste lube oil and residual oil properly and dispose of it in an environmentally-friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.



Oil drainage (models without acoustic hoods)

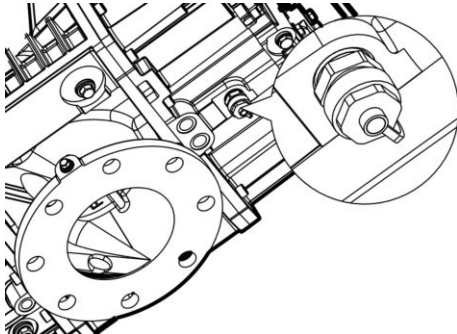


Fig. 109: Draining oil

1. ▶



WARNING!

Risk of scalding from hot lube oil!

Allow the lube oil to cool down to the ambient temperature.

2. ▶

Have a receptacle ready.



CAUTION!

Risk of skin irritation from old lube oil!



Observe the volume of the waste oil and the oil-resistant receptacle. ↪ Chapter 11.7.3 „Lubricant quantities“ on page 181.

3. ▶

Open the oil fill opening.

⇒ Lube oil flows out more evenly from the oil drain.

4. ▶

Remove the sealing cap from the drain valve.

If the sealing cap is very tightly in place, secure the drain valve using a wrench and loosen the sealing cap with an additional wrench.

5. ▶



NOTICE!

Material damage to the drain hose from lube oil temperatures over 60°C!

Place the drain hose into the receptacle.

6. ▶

Turn the drain hose on the drain valve.

⇒ The drain valve opens.

7. ▶



CAUTION!

Risk of slipping from oil spillage!

Guide excess lube oil into the receptacle.

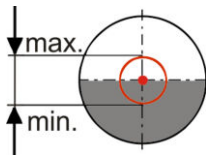


Fig. 110: Sight glass for oil level display

8. ▶ Observe and check the oil level.
9. ▶ If the oil level has been corrected, remove the drain hose.
⇒ The drain valve closes.
10. ▶ Turn the sealing cap on the drain valve.
11. ▶ Close the oil fill opening.

12. ▶



ENVIRONMENT!

Risk of environmental damage from waste oil!

Collect waste lube oil and residual oil properly and dispose of it in an environmentally-friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

8.3.3.2 Oil level too low

Oil drainage/models with acoustic hood



Fig. 111: Filling with oil

1. ▶ Check that the sealing cap of the drain valve is firmly in place.
2. ▶ Open the oil filling container.
3. ▶ Ensure that the ventilation pipe in the oil filling container is unobstructed.

4. ▶



CAUTION!

Risk of skin irritation from lube oil!



ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

Specifications ↗ Chapter 11.7.1 „Lubricant oil specifications“ on page 178

Fill the lube oil in stages and in small quantities.

5. ▶ Observe the oil level. Wait 5 - 10 minutes. The lube oil continues to flow.
⇒ The oil level regulates itself in the oil system and in the oil chamber.

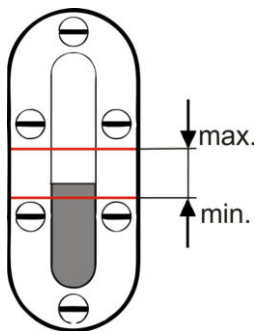


Fig. 112: Sight glass for oil level display

6. ➤ Check the oil level.
7. ➤ If the oil level is between the min.- / max. mark:
⇒ the oil level is OK.
8. ➤ If the oil level is beyond the min.- / max. mark:
⇒ correct the oil level.
9. ➤ Close the oil filling container.
10. ➤


ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

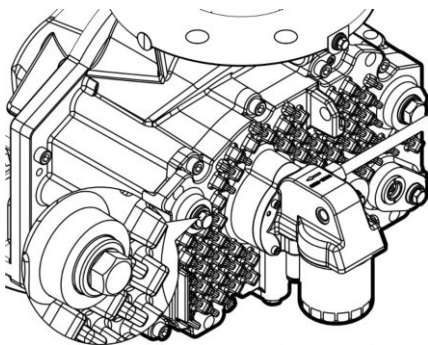
Filling with oil (models without acoustic hoods)


Fig. 113: Filling with oil

1. ➤ Check the drain valve for firm seating.
2. ➤ Check that the sealing cap of the drain valve is firmly in place.
3. ➤ Open the oil fill opening, the RED-marked sealing screw.
4. ➤


CAUTION!

Risk of skin irritation from lube oil!


ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

Specifications ↗ *Chapter 11.7.1 „Lubricant oil specifications“ on page 178*

Fill the lube oil in stages and in small quantities.

5. ➤ Observe the oil level. Wait 5 - 10 minutes. The lube oil continues to flow.
⇒ The oil level regulates itself in the oil system and in the oil chamber.

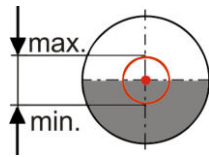


Fig. 114: Sight glass for oil level display

6. ▶ Check the oil level.
7. ▶ If the oil level is between the min.- / max. mark:
⇒ the oil level is OK.
8. ▶ If the oil level is beyond the min.- / max. mark:
⇒ correct the oil level.
9. ▶ Close the oil fill opening tightly with a seal.

10. ▶



ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

8.3.4 Changing oil

Oil drainage (models with acoustic hood)

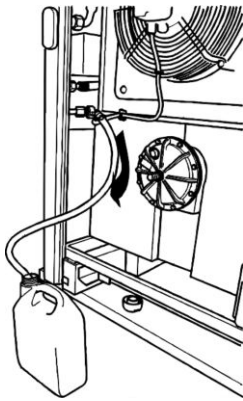


Fig. 115: Draining oil

1. ▶



WARNING!

Risk of scalding from hot lube oil!



NOTICE!

Material damage to the drain hose from lube oil temperatures over 60°C!

Allow the lube oil to cool down to the ambient temperature.

2. ▶



Observe the volume of the waste oil and the oil-resistant receptacle. See [Chapter 11.7.3 „Lubricant quantities“](#) on page 181.

Have a receptacle ready.

3. ▶ Open the oil opening on the oil filling container.
⇒ Lube oil flows out more evenly from the oil drain.
4. ▶ Place the drain hose into the receptacle.

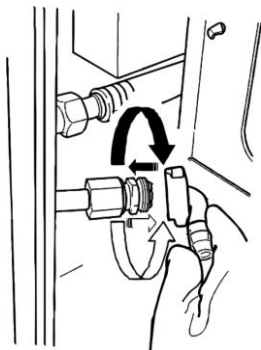


Fig. 116: Mounting the drain hose

5. ➤



CAUTION!

Risk of skin irritation from old lube oil!

Remove the sealing cap from the drain valve.

Twist the drain hose onto the drain valve.

⇒ The drain valve opens automatically.

6. ➤



CAUTION!

Risk of slipping on spraying oil drops!

Guide all emerging lube oil into the receptacle.

7. ➤

Remove the drain hose.

⇒ The drain valve closes automatically.

8. ➤

Screw the sealing cap onto the drain valve.

9. ➤

Close the oil filling container.

10. ➤



ENVIRONMENT!

Risk of environmental damage from waste oil!

Collect waste lube oil and residual oil properly and dispose of it in an environmentally-friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

Oil drainage/models with acoustic hood



Fig. 117: Filling with oil

1. ➤

Check the drain valve for firm seating.

2. ➤

Check the sealing cap of the drain valve for firm seating.

3. ➤

Open the oil filling container.

4. ➤

Ensure that the ventilation pipe in the oil filling container is unobstructed.

5. ▶



CAUTION!

Risk of skin irritation from lube oil!



ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

For oil quantities and specifications see [Chapter 11.7.1 „Lubricant oil specifications“](#) on page 178 Filling oil:

First, fill 3/4 of the listed quantity of oil.

6. ▶

Wait 5 - 10 minutes. The lube oil continues to flow.

⇒ The oil level regulates itself in the oil system and in the oil chamber.

7. ▶

Check the oil level.

8. ▶

Fill the rest of the lube oil up to the mark on the sight glass.

⇒ The oil level is correct when it is between min. and max.

9. ▶

Close the oil filling container.

10. ▶



ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

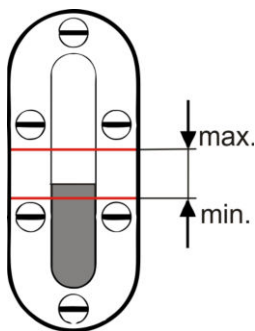


Fig. 118: Sight glass for oil level display

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

Oil drainage (models without acoustic hoods)

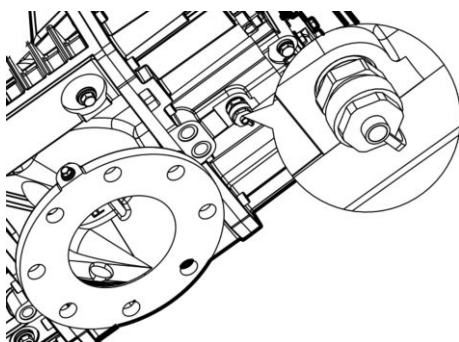


Fig. 119: Draining oil

1. ▶



WARNING!

Risk of scalding from hot lube oil!

Allow the lube oil to cool down to the ambient temperature.



2. ➤



Observe the volume of the waste oil and the oil-resistant receptacle. See [↗ Chapter 11.7.3 „Lubricant quantities“ on page 181.](#)

Have a receptacle ready.

3. ➤

Open the oil fill opening.

⇒ Lube oil flows out more evenly from the oil drain.

4. ➤



CAUTION!

Risk of skin irritation from old lube oil!

Remove the sealing cap from the drain valve.

If the sealing cap is very tightly in place, secure the drain valve using a wrench and loosen the sealing cap with an additional wrench.

5. ➤



NOTICE!

Material damage to the drain hose from lube oil temperatures over 60°C!

Place the drain hose into the receptacle.

6. ➤

Twist the drain hose onto the drain valve.

⇒ The drain valve opens automatically.

7. ➤



CAUTION!

Risk of slipping from oil spillage!

Guide all emerging lube oil into the receptacle.

8. ➤

Remove the drain hose.

⇒ The drain valve closes automatically.

9. ➤

Screw the sealing cap onto the drain valve.

10. ➤

Close the oil fill opening tightly with a seal.

11. ▶



ENVIRONMENT!

Risk of environmental damage from waste oil!

Collect waste lube oil and residual oil properly and dispose of it in an environmentally-friendly manner.

Clean the workspace thoroughly.

Clean all auxiliary equipment.

Filling with oil / models without acoustic hoods

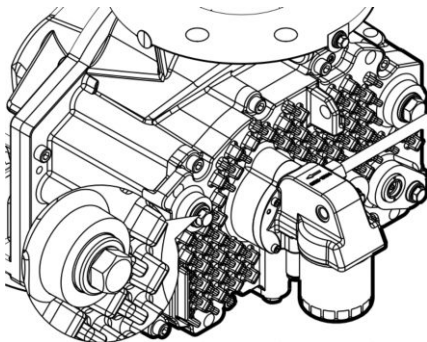


Fig. 120: Filling machine stage oil

1. ▶ Check that the sealing cap of the drain valve is firmly in place.
2. ▶ Open the oil fill opening, the RED-marked locking screw.

3. ▶



CAUTION!

Risk of skin irritation from lube oil!



ENVIRONMENT!

Environmental risks from incorrect handling of lubricants!

For oil quantities and specifications see [Chapter 11.7.1 „Lubricant oil specifications“ on page 178](#)

Fill the lube oil in stages and in small quantities.

First, fill 3/4 of the listed quantity of oil.

4. ▶ Wait 5 - 10 minutes. The lube oil continues to flow.
 - ⇒ The oil level regulates itself in the oil system and in the oil chambers.
5. ▶ Check the lube oil level.
6. ▶ Fill the rest of the lube oil up to the mark on the sight glass.
 - ⇒ The oil level is correct when it is between min. and max.
7. ▶ Close the oil fill opening tightly with a seal.

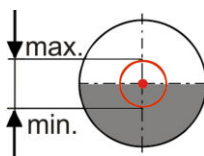


Fig. 121: Sight glass for oil level display



8. ➤



ENVIRONMENT!

Risk of environmental damage from incorrect storage of lube oil!

Clean the workspace thoroughly.

Dispose of residual lube oil in an environmentally-friendly way.

Clean all auxiliary equipment.

8.3.5 Changing the oil filter

Changing the oil filter



Fig. 122: Oil filter



Replace the oil filter each time the lubricating oil is changed.

1. ➤



WARNING!

Risk of scalding and skin irritation from hot, lubricating waste oil!

2. ➤

Allow the lubricating oil to cool down to the ambient temperature.

3. ➤



CAUTION!

Risk of skin irritation from lubricating waste oil!

Loosen the old oil filter using a strap wrench.

A residual quantity of oil may flow out of the filter. Catch the residual oil using a receptacle and cloth.

4. ➤

Remove the old oil filter.

5. ➤

Clean the seal surface.

6. ➤

Lightly oil the sealing ring of the new oil filter.

7. ➤

Screw in the oil filter by hand.

8. ➤



ENVIRONMENT!

Risk of environmental damage from waste oil!

Properly dispose of used oil filters, cloths and receptacles with residual oil.

8.3.6 Replacing the intake filter

Replacing the intake filter

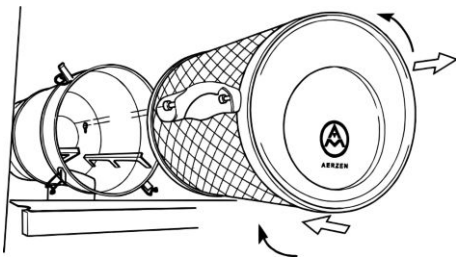


Fig. 123: Replacing the intake filter

1. ➤



CAUTION!

Risk of air contamination from scattered dust particles.

Open the cap locks of the intake silencer.

2. ➤

Remove the maintenance flap.

3. ➤

Loosen the intake filter by turning it anti-clockwise and remove it.

4. ➤



NOTICE!

Risk of machine damage from objects inside the intake silencer that enter the intake opening.

Remove residual dust inside the intake silencer.

5. ➤

Replace the intake filter.

6. ➤

Fasten the intake filter in place by turning it clockwise. Check that it is aligned correctly.

7. ➤

Fasten the maintenance flap on the housing of the intake silencer using the catch.

8. ➤

Reset the maintenance indicator (in accordance with the given variation).

8.3.7 Checking the sheaves

For wear and tear and damage

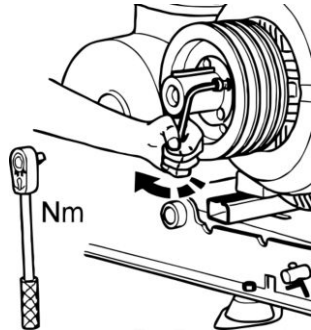


Fig. 124: Sheaves

1. ➤ Check for unusual wear and tear or obvious damage.
2. ➤ Check for alignment and stability.
3. ➤ If necessary, replace the sheaves.
4. ➤ Assemble the sheaves.
5. ➤ Fit the belt. ↪ Chapter 6.3 „Starting commissioning“ on page 105

8.3.8 Moving and checking the protective cover of the sheaves

Moving on models without acoustic hood

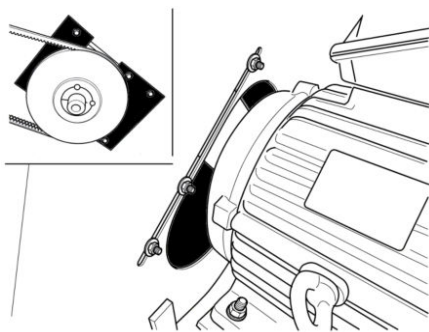


Fig. 125: Protective cover

1. ➤ Loosen the fitting of the protective cover before lifting the hinged motor support.
 - ⇒ The protective cover can now be moved.
2. ➤ Lift the hinged motor support, e.g. for changing the belts.
3. ➤ Lower the hinged motor support.
 - ⇒ The weight of the motor creates tension in the belts.
4. ➤ Push the protective cover in the direction of the motor shaft and tighten it.

Testing on models without acoustic hood

1. ➤ Check the spacing of the protective cover of the motor shaft.

During operation, the protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
2. ➤ Check the protective cover for firm seating and, if necessary, tighten it.

8.3.9 Replacing belts

Raising the hinged motor support

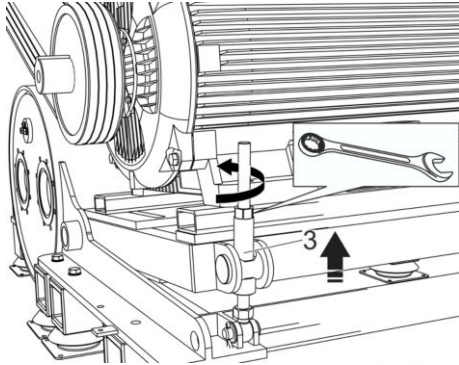


Fig. 126: Raising the hinged motor support

1. ▶



WARNING!

Risk of injury from moving or rotating components!

Lift the hinged motor support using the hinge jig.

2. ▶

Turn guide bushing (pos.3) anti-clockwise using the ratchet wrench.

⇒ The hinged motor support is raised.

3. ▶

Raise the hinged motor support until the belts are fully relieved of tension.

4. ▶



Belts may only be replaced as a set!

5. ▶

Replace belts.



WARNING!

Risk of getting caught by rotating sheaves!

6. ▶

Observe the permissible groove layout.

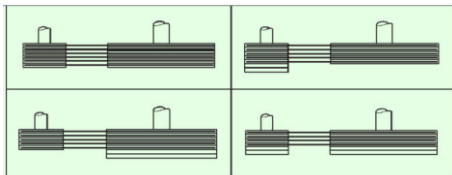


Fig. 127: Permissible belt layout

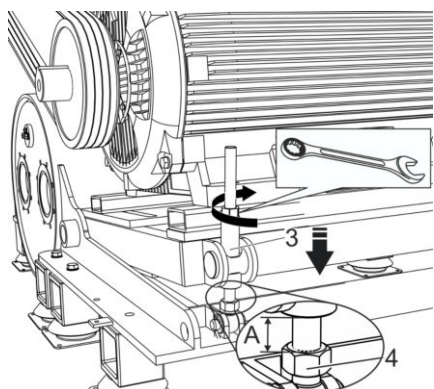
Pre-tensioning belts


Fig. 128: Pre-tensioning belts

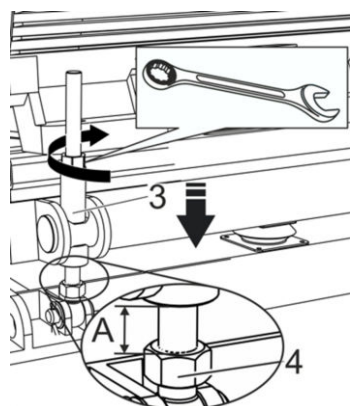
Adjusting the guide bushing


Fig. 129: Adjusting the gauge of the guide bushing

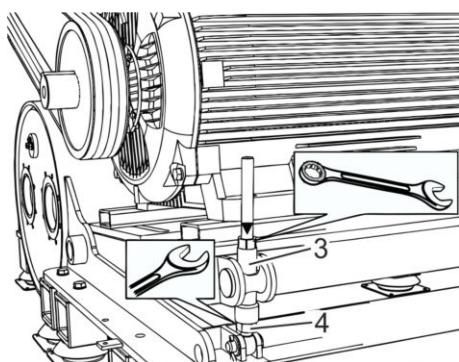
Tensioning the belts


Fig. 130: Tensioning the belts

7. ➔


CAUTION!

Risk of injury from tensioning components!

Turn guide bushing (pos.3) clockwise with the ratchet wrench until the belts are pre-tensioned.

⇒ The hinged motor support is partly held by the belt drive and rests lightly on the guide bushing (pos.3).

8. ➔ Set gauge A.

- Set self-locking nut (pos.4) to gauge A. Turn guide bushing (pos.3) on to the self-locking nut (pos.4) using the ratchet wrench.

DN/discharge side	Measurement A in mm
100	25
125	25
150	30
200	35
250	40
300	45
Delta Hybrid	

9. ➔


CAUTION!

Risk of injury from moving and rotating components!

Tension the belts.

- Secure the guide bushing (pos.3) with the self-locking nut (pos.4).
- The hinged motor support is supported entirely by the belt drive.

Checking the protective cover

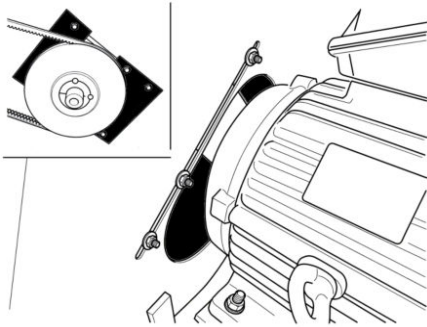


Fig. 131: Inspecting the protective cover of the sheaves

10. ▶ Check the spacing of the protective cover for the motor shaft.
The protective cover should be at a distance of approx. 10 mm from the motor drive shaft.
By loosening the fastening screws, the protective cover can be moved.
Check the protective cover for firm seating and, if necessary, tighten it.

8.3.10 Checking the AERZEN safety valve

Movement test

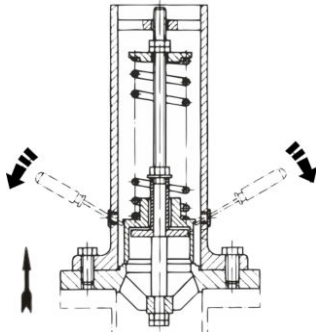


Fig. 132: using a screwdriver

- G2", G3", DN 50, DN 80, DN 125
1. ▶ Remove the protective caps or locking screws from the maintenance holes in the protective cylinder.
 2. ▶ Guide a screwdriver into each hole.
 3. ▶ Raise the valve bell with the screw drivers using leverage force.
 - ⇒ The valve's opening function must be operational and the valve must move.
 4. ▶ Lower the valve bell.
 5. ▶ Remove the screwdrivers.
 - ⇒ An intact valve will close.
 6. ▶ Insert the protective caps or sealing screws into the maintenance holes in the protective cylinder.

Movement test

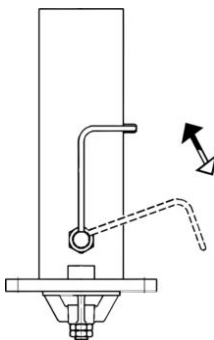


Fig. 133: using the stirrup

- DN 150, DN 200, DN 300
1. ▶ Raise the valve bell using the stirrup.
 - ⇒ The valve's opening function must be operational and the valve must move.
 2. ▶ Release the pressure on the stirrup and lower the valve bell.
 - ⇒ An intact valve will close.



8.3.11 Changing the oil demister

Changing the oil demister

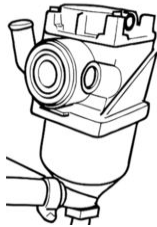


Fig. 134: Oil demister

1. ➔



DANGER!

Risk of fatal injury from electric current!

Remove electrical connections.

2. ➔



ENVIRONMENT!

Environmental risk from escaping residual oil!

Remove the hoses.

3. ➔

Replace the housing.

4. ➔

Mount the hoses.

5. ➔

Mount the electrical connections.

8.3.12 Checking that sealing plugs have been removed

Ensuring the cross-section of the balancing holes is free

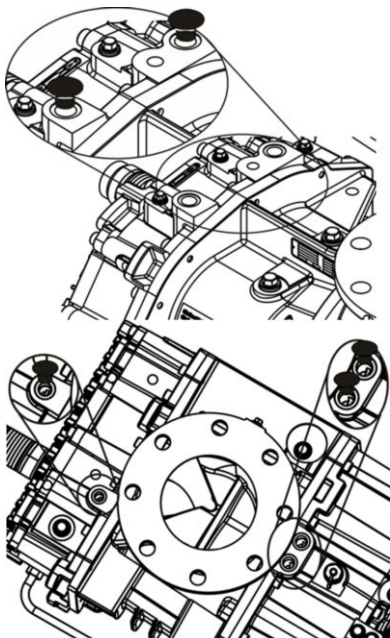


Fig. 135: Sealing plug configuration

1. ➔

Check that the (plastic) sealing plugs have been removed from the balancing holes.



The sealing plugs are coated in machine-colour paint as part of the manufacturing process.

The number of sealing plugs varies depending on the machine type!

Depending on the design, they may already be removed before shipping or during preparations for commissioning.

⇒ If there are no more sealing plugs in place: finish the check.

2. ➔

If the balancing holes are sealed:

⇒ Removing sealing plugs. finish the check.

8.3.13 Checking the non-return flap

Checking for wear and tear and tightness

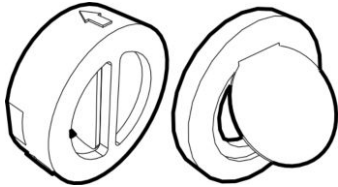


Fig. 136: Non-return flap

1. ▶ Loosen the fastening screws.



Light impact on the flange cover of the non-return flap loosens the sealing and makes disassembly easier.

2. ▶ Remove the non-return flap from the housing.
3. ▶ Carry out a visual inspection.
4. ▶ If no damage and/or hardening is visible, the sealing is acceptable.
 - ⇒ Re-use the non-return flap.
5. ▶ If damage and/or hardening is visible, the sealing is not acceptable.
 - ⇒ Replace the non-return flap.

Assembling the non-return flap

1. ▶ Remove dirt, grease and used sealing agent from the flange surface.
2. ▶ Apply sealing agent (liquid surface sealant) to the flange surface of the housing.
3. ▶ Guide the non-return flap into the housing.



Remove any bleeding sealing agent with a cloth. Observe the curing time of the sealing material!

4. ▶ Screw on the flange cover.

8.3.14 Cleaning the nozzle of the start-up relief device

Cleaning the nozzle

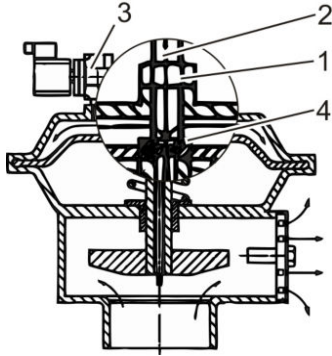


Fig. 137: Start-up relief device

1. ➤ Loosen the counternut (pos. 1).
2. ➤ Remove the spindle (pos. 2).
⇒ The nozzle (pos. 4) in the hole is accessible.

3. ➤



WARNING!

Risk of injury from escaping dirt particles!

Blow compressed air into the nozzle (pos. 4).

⇒ Unobstructed cross-section of the nozzle.

4. ➤ Mount the spindle (pos. 2).
5. ➤ Setting the closing time of the start-up relief device. ↪ Chapter 11.10.4 „Start-up unloading device DN 80 to DN 400“ on page 185
6. ➤ Secure the spindle (pos. 2) with the nut (pos. 1).

8.3.15 Checking the inlet and exhaust air openings on the acoustic hood

Checking the inlet and exhaust air openings

1. ➤ Visual inspection of the supply air and exhaust air openings on the acoustic hood.
2. ➤ Clean the openings. Remove dirt.

Checking fan operation

1. ➤ Check the direction of flow in the operating position with a closed acoustic hood. Observe the information in the installation drawing.
2. ➤ If exhaust air is extracted from the acoustic hood, the check is finished.
⇒ The acoustic hood ventilator is operating correctly.
3. ➤ If no waste air emerges from the acoustic hood, then the direction of rotation must be checked.
⇒ The ventilator's direction of rotation is incorrect.
4. ➤ If no waste air emerges from the acoustic hood, the ventilator is malfunctioning.
⇒ Replace the ventilator.

Correcting the ventilator direction of rotation

1. ▶ Open the maintenance elements of the acoustic hood.

2. ▶



DANGER!

Risk of fatal injury from electric current!

Open the terminal box of the ventilator motor.

3. ▶ Replace the connecting cable in the terminal box.

4. ▶ Close the terminal box.

5. ▶ Close the maintenance elements of the acoustic hood.

6. ▶ Check the direction of the air flow during machine operation.

Replacing the ventilator

1. ▶ Open the maintenance elements of the acoustic hood.

2. ▶



DANGER!

Risk of fatal injury from electric current!

Remove the electrical connection,

3. ▶



WARNING!

Risk of injury from rotating components!

Loosen the fastening screws on the ventilator.

4. ▶ Replace the ventilator.

5. ▶ Mount the ventilator with fastening screws.

6. ▶



DANGER!

Risk of fatal injury from electric current!

Establish an electrical connection.

7. ▶ Close the maintenance elements of the acoustic hood.

8. ▶ Check the cooling air flow during machine operation.



8.3.16 Checking the belt guard

Damage and stability

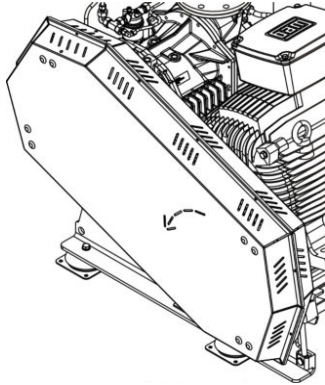


Fig. 138: Belt guard

1. ➤



WARNING!

Risk of injury from hot surfaces!

Check for damage and thorough stability.

(stable on the base support and machine stage)

2. ➤

Remove dirt from the belt guard.

3. ➤

If necessary, tighten the belt guard fastener. If damaged, replace it.

4. ➤

Beware of any lubricant bleeding out of the drive motor. If lubricant bleeds out, inform the responsible staff at the location.

Seal any leaks.

8.3.17 Checking pipelines for tightness.

Checking discharge-side pipelines for tightness

1. ➤

Check pipelines for tightness (visual inspection).



Ensure that the pipelines have been depressurised!

2. ➤

If there are leaks

⇒ Replace seals or bushing.

3. ➤

Reinforce the pipelines if necessary.

4. ➤

Disassemble leaking pipe connections.

5. ➤

Use new seals or bushing.

6. ➤

Assemble pipe connections.

8.4 Cleaning after maintenance

Cleaning after maintenance work

1. ➤



NOTICE!

Risk of damage! Do not use high pressure cleaners, steam jet pumps, grease removal agents, thinners, compressed air etc. as cleaning methods.

2. ➤

Dust and dirt must be cleaned with suitable cloths.

3. ▶ Clean components susceptible to scratches, display units and touch panels of control systems, gauges etc. with a soft, wet towel.
4. ▶ Remove all cleaning agents from the immediate vicinity of the machine before commissioning.
5. ▶ Dispose of cloths in an environmentally-friendly way.

8.5 Commissioning after maintenance

Commissioning after maintenance

1. ▶ Inform the responsible on-site person about the result of the work carried out and agree commissioning steps with that person.
2. ▶ Check all previously loosened screw connections for tightness.
3. ▶ Mount all protective hardware and covers that were previously removed.
4. ▶ Remove all used tools, materials and other equipment from the workspace.
5. ▶ Clean the workspace. Remove operating substances, operating material, processing material and similar materials and dispose of them appropriately.
6. ▶ Ensure that there are no persons in the hazard area.
7. ▶ Release the main circuit breaker and activate it.
8. ▶ Release the EMERGENCY STOP function.
 - ⇒ Start operation in accordance with the instruction in the "Operation" chapter. ↪ *Chapter 7.3 „Switching on“ on page 118*
9. ▶ Inform the responsible on-site person about the result of the work carried out.



8.6 Checks after maintenance work

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Acoustic hood ventilator	Check the direction of rotation Check for correct operation	
Safety valve	check for correct operation	
Oil level	check and, if necessary, correct	Check, if necessary correct
Oil pressure	Check, if necessary correct	check and, if necessary, correct
Aligning the sheaves		check, if necessary correct
op. hrs = operating hours		

9 Malfunctions

The following chapters describe possible causes of faults and steps to be taken to rectify them.

If faults cannot be rectified using the following instructions, contact the manufacturer.

9.1 Safety instructions

Improper fault rectification

**WARNING!****Risk of injury due to improper operation fault rectification!**

Improper fault rectification may lead to serious injury or material damage.

- Only rectify faults after decommissioning the machine.
- Secure the machine against restarting.
- Allow the machine to cool down to the ambient temperature.
- Before beginning work, ensure that there is sufficient space for installation work.
- Check the tidiness and cleanliness of the work-space.
- Only attempt to rectify faults with suitable tools.
- Ensure removed components are re-installed correctly.
- Re-install all fastening elements and observe the screw tightening torques.
- Before restarting, check that:
 - All safety and protective equipment is installed and functioning correctly.
 - There are no persons in the hazard area.

Electrical system

**DANGER!****Risk of fatal injury from electrical current!**

There is a risk of fatal injury from touching live components. Live electrical components may make uncontrolled movements and cause extremely serious injury.

- Before beginning work, switch off the electric power supply and secure it against restarting.

Securing the machine against restarting**WARNING!**

An unauthorised or unregulated restart can have fatal consequences.

An unauthorised or unregulated restart of the machine can lead to serious or fatal injuries. There may be people located in the hazard area.

- Before beginning work, switch off the energy supply and secure it against restarting.

Requirements for staff

The fault rectification work described here may only be performed by the designated personnel. The personnel entrusted with the respective fault rectification tasks are listed in the table of fault descriptions in addition to their designated tasks.

Requirements in the event of malfunctions and for preparations for fault rectification work:

- Personnel:
- Authorised electricians
 - Service personnel

for commissioning after rectification of a malfunction, the following is necessary:

- Personnel:
- Authorised electricians
 - Service personnel

Protective equipment

For fault rectification work the following is necessary:

- Protective equipment:
- Protective work clothing
 - Protective gloves
 - Safety shoes



Special tools

For fault rectification work the following is necessary:

- Special tool:
- General tool kit
 - Ratchet wrench
 - Tools for authorised electricians
 - General measurement tools and equipment

- Special tool:
- Locking key

Behaviour in the event of faults


1.  **DANGER!**
Risk of injury during fault rectification!
2. In the event of a malfunction, activate the EMERGENCY STOP immediately.
3. Switch off the main circuit breaker and secure it.
4. Immediately inform the responsible staff on location about the fault.
5.  **DANGER!**
Risk of fatal injury from electric current!
6. Ensure there is no live current.
7. Ground and short-circuit the unit.
8. Cover or shut off adjacent live parts.
9. Establish the cause of the fault.

9.2 Fault displays

AERtronic (optional) fault message




Fig. 139: AERtronic display

 A detailed explanation of fault messages is contained in the separate operating manual AS-002.

Control system fault message

Depending on the customer's control system, additional fault messages can be recorded and displayed.

9.3 Fault diagnosis and troubleshooting

If, among the faults listed here, a fault occurs that can only be rectified by the manufacturer, contact customer service immediately.  Chapter 1.4.2 „Customer service“ on page 11

Fault description	Cause	Remedy	Personnel
<i>Abnormal running sounds</i>	Sheaves are not aligned properly.	Check and, if necessary, correct alignment. ↪ <i>Chapter 8.3.7 „Checking the sheaves“ on page 147</i>	Service personnel
	Bearing damage.	Replace bearings.	Manufacturer's customer service division
	Foreign bodies in gear wheels.	Check gear wheels, rectify the damaged areas and if necessary, replace them.	Manufacturer's customer service division
	Shaft deflection.	Locate shaft deflection, replace it.	Manufacturer's customer service division
<i>Start unloading device does not close.</i>	Nozzle is contaminated.	Clean the nozzle. ↪ <i>Chapter 8.3.14 „Cleaning the nozzle of the start-up relief device“ on page 153</i>	Service personnel
<i>The machine becomes too hot.</i>	Intake filter is contaminated (display unit max. -45 mbar).	Replace intake filter. ↪ <i>Chapter 8.3.6 „Replacing the intake filter“ on page 146</i>	Service personnel
	The ambient temperature is too high.	Ensure there is adequate ventilation.	User
	Openings of the acoustic hood for inlet and exhaust air are contaminated.	Clean the openings. ↪ <i>Chapter 8.3.15 „Checking the inlet and exhaust air openings on the acoustic hood“ on page 153</i>	User
	The acoustic hood fan is malfunctioning.	Replace the ventilator. ↪ <i>Chapter 8.3.15 „Checking the inlet and exhaust air openings on the acoustic hood“ on page 153</i>	Authorised electricians Service personnel
	The fan's direction of rotation is incorrect.	Check the direction of rotation. ↪ <i>Chapter 8.3.15 „Checking the inlet and exhaust air openings on the acoustic hood“ on page 153</i>	Service personnel
	The permissible operating data have been exceeded.	Check and comply with the operating data.	User
	Foreign bodies on the belt guard.	Remove dirt.	User
<i>Oil present in conveyed medium.</i>	Wear and tear on seals.	Replace seals.	Manufacturer's customer service division

Fault description	Cause	Remedy	Personnel
	Oil level too high.	Correct the oil level. ↪ <i>Chapter 8.3.3 „Correcting the oil level“ on page 135</i>	Service personnel
	Balancing holes are sealed.	Remove sealing cap. ↪ <i>Chapter 8.3.12 „Checking that sealing plugs have been removed“ on page 151</i>	Service personnel
<i>Intake volume is too low.</i>	Intake filter is contaminated (display unit max. -45 mbar).	Replace intake filter. ↪ <i>Chapter 8.3.6 „Replacing the intake filter“ on page 146</i>	Service personnel
	Intake piping is leaking.	Seal intake piping.	Service personnel
<i>The motor requires too much power.</i>	The operating data differs from the order data.	Check operating data, comply with correct data.	User
	Mechanical damage.	Replace malfunctioning components.	Service personnel
<i>Belts are vibrating.</i>	Wear and tear on belts.	Replace belts. ↪ <i>Chapter 8.3.9 „Replacing belts“ on page 148</i>	Service personnel
	Sheaves are not aligned properly.	Check and, if necessary, correct alignment. ↪ <i>Chapter 8.3.7 „Checking the sheaves“ on page 147</i>	Service personnel
<i>Machine turns in reverse after being shut down.</i>	Non-return flap is leaking or malfunctioning.	Replace the non-return flap. ↪ <i>Chapter 8.3.13 „Checking the non-return flap“ on page 152</i>	Service personnel

9.4 Status and error messages (component suppliers)

Control system fault message

Depending on the customer's control system, additional fault messages can be recorded and displayed.

9.5 Commissioning after malfunction rectification

Commissioning after fault rectification

1. ➤ Check all previously loosened screw connections for tightness.
2. ➤ Mount all protective hardware and covers that were previously removed.
3. ➤ Remove all used tools, materials and other equipment from the workspace.
4. ➤ Clean the workspace. Remove operating substances, operating material, processing material and similar materials and dispose of them appropriately.
5. ➤ Inform the responsible on-site person about the result of troubleshooting.
6. ➤ Ensure that there are no persons in the hazard area.

7. ▶ Release the main circuit breaker and activate it.
8. ▶ Release the EMERGENCY STOP function.
9. ▶ Confirm the removal of the fault in the control system.
10. ▶ Start operation in accordance with the instructions in the "Operation" chapter. ↪ *Chapter 7.3 „Switching on“ on page 118*
11. ▶ Inform the responsible on-site person about the result of the work carried out.

9.6 Checks after rectifying a malfunction

Inspection	After the first 3 op. hrs	After the first 25 op. hrs
Acoustic hood ventilator	Check the direction of rotation Check for correct operation	
Safety valve	Check for correct operation	
Oil level	check and, if necessary, correct	Check, if necessary correct
Oil pressure	Check, if necessary correct	check and, if necessary, correct
Aligning the sheaves		check and, if necessary, correct
op. hrs = operating hours		

10 Disassembly and disposal

Protecting the environment and conserving resources are among AERZEN'S foremost priorities.

Once the machine's service life is over, it must be disassembled and disposed of in an environmentally-friendly way. The following is a set of recommendations for environmentally-friendly disposal.

10.1 Safety instructions

Improper disassembly



WARNING!

Risk of injury from improper disassembly!

Stored residual energy, sharp components, edges and corners on or in the machine or on the necessary tools can cause injury.

- Before beginning work, ensure there is sufficient space.
Allow the machine to cool down to the ambient temperature.
- Proceed with caution when working with open, sharp-edged components.
- Ensure the tidiness and cleanliness of the workspace! Components and tools that are loosely stacked or lying around can cause accidents.
- Disassemble components correctly. Take into consideration the weight of each component. If necessary, use hoists.
- Secure components, so they do not topple or fall.
- If in doubt, contact the manufacturer.

Electric current



DANGER!

Risk of fatal injury from electrical current!

Disassembly of live components can cause serious or fatal injury.

- Switch off the power to the operating cable.
- Check there is no live current.

Disassembling the delivery line**WARNING!****Risk of injury from compressed conveyed materials!**

For the disassembly of pressurised components such as pipes, containers, hoses or valves, hot conveying material escapes with a strong gas flow. This can result in serious injury.

- Before beginning work, fully relieve pressurised components of pressure.
- Check that components are not pressurised.
- Only disassemble pressurised components when they are not under pressure.

For conveyance of nitrogen**DANGER!****Risk of suffocation from escaping residual gas!**

Opening piping and screws can allow gas to escape freely into the atmosphere, potentially leading to suffocation.

- Minimise residual gas as much as possible.
- Ventilate the work environment properly.
- Make a record of disassembly works after approval measurement by the operator

Requirements for staff

Requirements for disassembly:

Disassembly of electrical components

Personnel: ■ Authorised electricians

Personnel: ■ Authorised electricians with additional qualifications

Requirements for disassembly:

Disassembly of mechanical components

Personnel: ■ Service personnel

Protective equipment

Requirements for disassembly:

- Protective equipment:
- Protective work clothing
 - Safety shoes
 - Hearing protection
 - Protective gloves
 - Safety goggles
 - Industrial hard hat

Special tools

Requirements for disassembly:

- Special tool:
- General tool kit
 - Tools for authorised electricians
 - Auxiliary materials, aids
 - Lifting equipment
 - Transport equipment

- Special tool:
- Locking key

10.2 Disassembly

Preparing for disassembly:

1. ▶ Immediately inform the responsible staff on site about the disassembly.
2. ▶ Switch off the machine and secure it against restarting.
3. ▶ Seal off the pressure line and remove it.
4. ▶ Physically separate the entire electric power supply from the machine. Release stored residual energy.
5. ▶ If necessary, separate the machine control system from a connected process control system.
6. ▶ Remove operating and auxiliary materials and residual processing materials and dispose of them in an environmentally-friendly way.
7. ▶ In addition, clean assemblies and components thoroughly. Dismantle them in accordance with local regulations for occupational safety and environmental protection.
8. ▶ Remove the machine's foundation bolts.
9. ▶ During disassembly, there should be a general sorting of parts in accordance with disposal categories. ↪ „Categories for sorting“ on page 168

10.3 Disposal

The machine is composed primarily of steel, casting material and various non-ferrous metals. In general, metallic materials are fully recyclable.

Proper disposal

In as far as no agreement has been made on the return or disposal of the machine, send dismantled components for recycling:

- Scrap metals.
- Send plastics for recycling.
- Sort and dispose of other components according to material composition.

Improper disposal**ENVIRONMENT!****Environmental risk from improper disposal!**

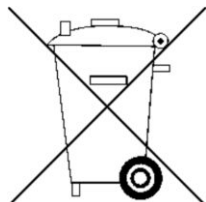
Improper disposal can present a risk to the environment.

- Have insulating materials, electronic waste, electronic components, auxiliary materials and chemicals disposed of by professional waste disposal companies.
- If in doubt, contact the local authorities or specialist companies for information on environmentally-friendly waste disposal.

Oil and lubricants**ENVIRONMENT!****Environmental risk from oil!**

The improper disposal of oil and lubricants can present a risk to the environment.

- Collect oil carefully, store it and dispose of it properly or recycle it.
- If in doubt, contact the local authorities or specialist waste disposal companies for information on environmentally-friendly waste disposal.

Battery**ENVIRONMENT!****Environmental risk from batteries!**

The improper disposal of batteries, e.g. from the control system, can present a risk to the environment.

- Collect batteries and dispose of them properly at local collection points.
- If in doubt, contact the local authorities or specialist waste disposal companies for information on environmentally-friendly waste disposal.

Disposal

Requirements for personnel

Disposal requirements:

Personnel: ■ Skilled staff for industrial waste

Protective equipment

Disposal requirements:

Protective equipment: ■ Protective work clothing
 ■ Safety shoes
 ■ Hearing protection
 ■ Protective gloves
 ■ Safety goggles
 ■ Industrial hard hat

Special tools

Disposal requirements:

Special tool: ■ Lifting equipment

Categories for sorting

Scrap iron	Non-ferrous metal (except for scrap iron)	Insulation material	Electronic waste (encoder electronics)	Auxiliary materials and chemicals
Scrap ■ Scrap steel ■ Foundry scrap ■ Scrap from non-rusting steels ■ Stainless steel scrap	Aluminium	Various isolators (in terminal boxes)	Electrical tools	Lubricant and gear oils Grease
Used metal/2A materials ■ Steel beams ■ Steel sheets	Copper	Voltage and current transformers	Measurement, control and regulatory systems	Cleaning agents and solvents
Machines made of metal ■ Without electronics	Brass	Electric cables and leads		Paint residue
	Motor windings	Instrument wiring		Anti-corrosion agents
		Surge absorbers		Cloths (soaked in agents or chemicals)

Scrap iron	Non-ferrous metal (except for scrap iron)	Insulation material	Electronic waste (encoder electronics)	Auxiliary materials and chemicals
		Heat insulation materials		AERtronic batteries
This does not include: <ul style="list-style-type: none"> ■ Hazardous adhesions ■ Sealed hollow parts (due to danger of deflagration or hazardous contents) 	Valve disposal <ul style="list-style-type: none"> ■ Remove the medium before disposal! Neutralise residual medium in the valves. 		This does not include: <ul style="list-style-type: none"> ■ PCB capacitors 	<ul style="list-style-type: none"> ■ Solvents, cleaning agents and paint residue must not be allowed to mix! ■ Sort oils separately according to emulsions and solvents. ■ Agents and chemicals must be collected in separate, labelled containers.

Disposal of accessories
Motor

- For safety reasons, disposal may only be carried out by specialists for industrial waste or by return to the manufacturer!
- The encoder electronics are electronic waste.

Frequency inverter

DANGER!

Danger due to explosion of the capacitor and the formation of toxic gases!

- For safety reasons, disposal may only be carried out by specialists for industrial waste or by return to the manufacturer!
- The encoder electronics are electronic waste.

11 Technical specifications

11.1 Dimensions and weights

General information

The following dimensions and weights relate to standard variants and can vary depending on the specific design.

Exact details can be found on the installation drawing.

Information on weight can be found on the packing note and the designation on the type plate.

Dimensions, including packaging, are included in the forwarding order.

Tab. 3: Dimensions and weights

Size	Width (W) mm	Depth (D) mm	Height (H) mm	Nominal diameter DN	Weight with acoustic hood, excluding motor and belt drive approx. kg
D 12...	1250	1350	1500	100	520
D 17...	1250	1350	1500	125	525
D 24...	1250	1350	1500	125	565
D 28...	1500	1800	1980	125	575
D 36...	1500	1800	1980	150	1095
D 46...	1700	2055	2111	150	1100
D 52...	1500	1800	1980	150	1180
D 62...	1700	2055	2111	200	1510
D 75...	1900	2200	2345	250	1880
D 98...	1900	2200	2345	250	2115
D 152...	2100	2850	2345	300	3000

These dimensions and weights relate to the standard design and are approximate values. The information can vary depending on the order.



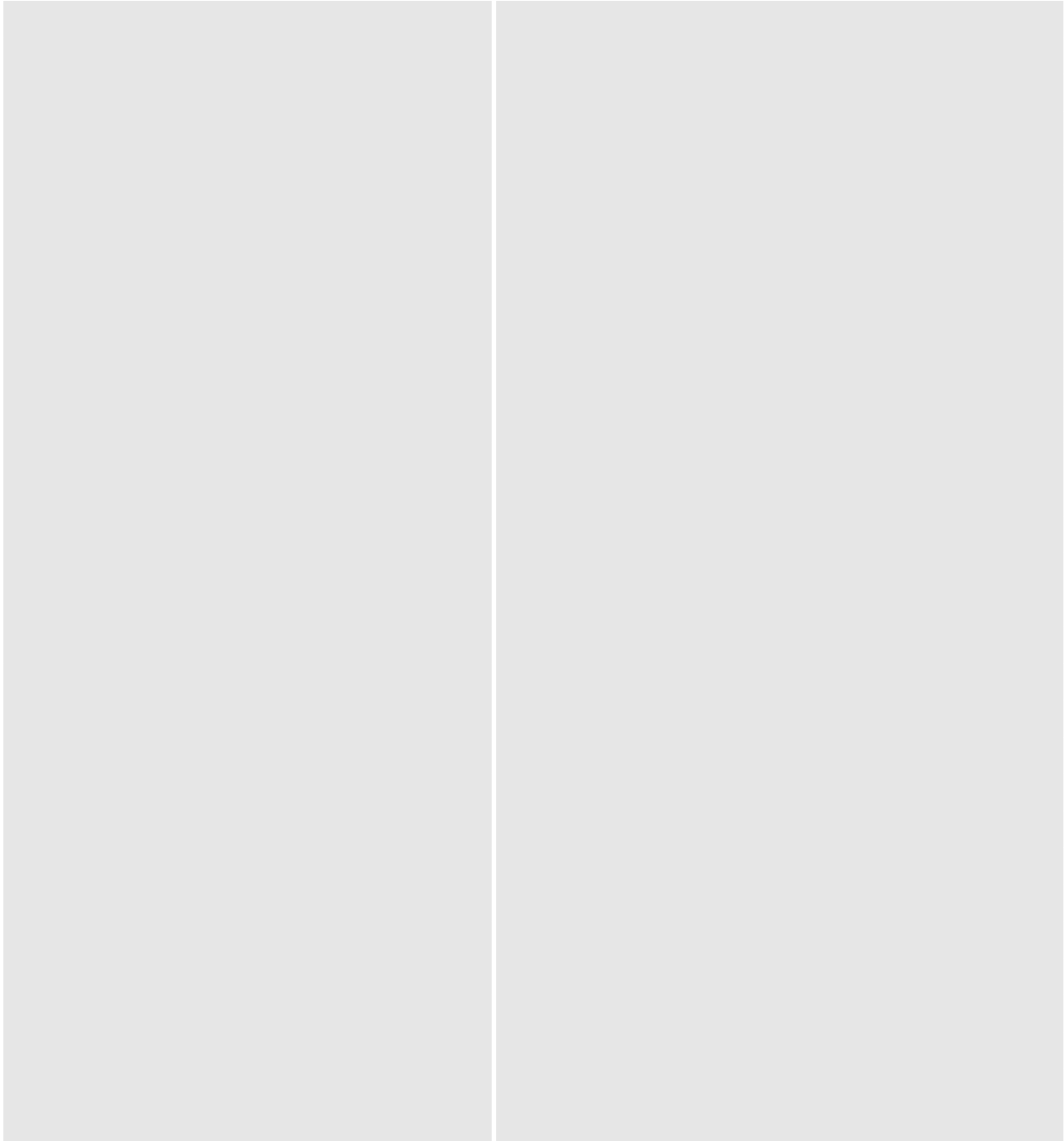
11.2 Dimension specifications sheet

An accompanying dimension specifications sheet is provided with the product documentation.

These documents contain important dimensions for installation and set-up.



11.3 Operating data



11.4 Technical performance data

Tab. 4: Operating and application limits

Positive pressure operation			
Size	Differential pressure max. mbar	volume flow max. m ³ /h	Motor rating max. kW
D 12 H	1500	670	37
D 12 S	1000	690	30
D 17 L	800	810	30
D 24 H	1500	1370	75
D 24 S	1000	1390	55
D 28 L	800	1340	45
D 36 H	1500	1900	110
D 36 S	1000	2150	75
D 46 L	800	2350	75
D 52 S	1000	3120	90
D 62 H	1500	3400	160
D 62 S	1000	3500	110
D 75 L	800	3870	132
D 98 H	1500	5600	250
D 98 S	1000	5800	200
D 152 H	1500	8700	400
D 152 S	1000	8900	315

These operating limits are maximum values. Difficult operating conditions can adversely affect these data.

Rotation speed / pressure limits for Klüber oil

☞ „Rotational speed and pressure limits for use of Klüber 4UH1-46N“6 on page 180

Environmental limits

Data	Value	Unit
Temperature range	-10 to 40	°C
Relative humidity	0 to 80	%
Chemical-free atmosphere		

Type plate(s)

Maximum installation elevation

Data	Value	Unit
max. installation elevation above NN*	1000	m

If installing at a different elevation, observe the order-specific design data sheets.

Environmental limits

Data	Value	Unit
Temperature range	-10 to 40	°C
Mounting of acoustic hood heating	less than -10	°C
Relative humidity	0 to 80	%
Chemical-free atmosphere		

Operating period

Data	Value	Unit
Maximum continuous operating period	24	hrs
Pause until next operation	/	h

11.5 Type plate(s)

Type plates and placement

Placement on the machine stage

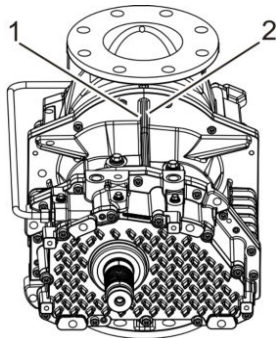


Fig. 140: Placement of signage

Placement on the unit

- Pos.1 Manufacturer plate
- Pos.2 Type plate

Manufacturer plate - pos.1



Fig. 141: Manufacturer plate

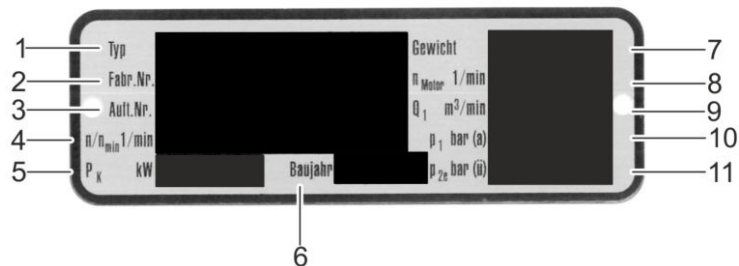
Type plate - pos.2


Fig. 142: Type plate

- Pos.1 Machine type
- Pos.2 Factory/serial number
- Pos.3 Order no.
- Pos.4 Machine rotational speed
- Pos.5 Power consumption
- Pos.6 Year of manufacture
- Pos.7 Weight
- Pos.8 Motor rotational speed
- Pos.9 Conveyed amount
- Pos.10 Intake pressure (absolute) - p1
- Pos.11 Positive pressure, discharge - p2e

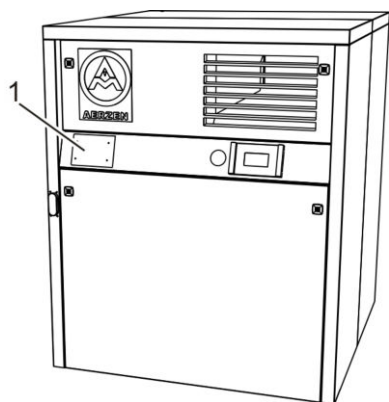
Placement on the acoustic hood


Fig. 143: Acoustic hood signage

The manufacturer/type plate is on the operating side of the acoustic hood.

Pos.1 / acoustic hood Manufacturer and type plate

Type plate(s)

Manufacturer and type plate - pos.1



Fig. 144: Acoustic hood manufacturer/performance data plate

- Pos.1 Manufacturer, including address
- Pos.2 Designation
- Pos.3 Machine type
- Pos.4 Customer order no.
- Pos. 5 Serial number
- Pos.6 Year of manufacture
- Item 7 max. intake pressure (absolute)-p1
- Item 8 max. discharge pressure (absolute) -p2
- Item 9 Nominal power of motor
- Item 10 Machine weight (total)

Type designation

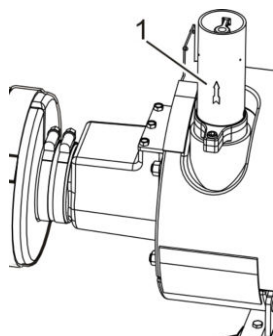
The type designation is derived from the following table:

Tab. 5: Example: **D 62 S**

Designation	Explanation	Details
D	Product designation	Rotary lobe compressor
62	Maximum flow volume in m ³ /min (approx.)	
S	Design	E: Vacuum design up to -700 mbar
		L: Pressure differences up to 800 mbar
		S: Pressure differences up to 1000 mbar
		H: Pressure differences up to 1500 mbar

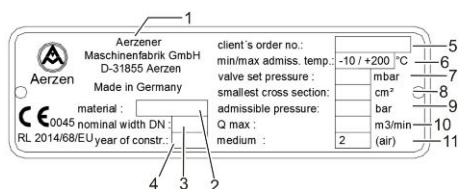
Safety valve signage

When using the AERZEN safety valve the type plate is on the valve housing.



Pos. 1 Manufacturer and type plate

Fig. 145: Signage

Safety valve type plate


Pos. 1 Manufacturer, including address
 Pos. 2 Material
 Pos. 3 Nominal diameter
 Pos. 4 Year of manufacture
 Item 5 Customer order no.
 Pos. 6 Application temperatures
 Pos. 7 Valve set pressure
 Pos. 8 Narrowest cross-section
 Pos. 9 Maximum permissible pressure
 Pos. 10 max. flow rate
 Pos. 11 Medium type

Fig. 146: Manufacturer/performance data plate

11.6 Noise levels

Information on noise emissions

This information is determined in accordance with the performance data. ↪ *Chapter 11.4 „Technical performance data“ on page 173.*

No-load operation or operation below the maximum performance values reduces noise emissions.

Machines without an acoustic hood have considerably higher noise emissions. Observe the measures for noise emission reduction. ↪ *Chapter 5.2 „Requirements for the installation site“ on page 91*

Measurement requirements

- applied basic standard DIN EN ISO 2151
- measured according to basic standard DIN EN ISO 3744
- with acoustic hood
- connected, insulated pipelines
- tolerance: ± 2 dB(A)

Positive pressure

Size	A-weighted sound pressure level, L_{pA} dB(A) (anechoic room conditions)
D 12 H	73
D 12 S	72
D 17 L	66
D 24 H	76
D 24 S	74
D 28 L	70
D 36 H	76
D 36 S	76
D 46 L	70
D 52 S	78
D 62 H	81
D 62 S	79
D 75 L	77
D 98 H	81
D 98 S	79
D 152 H	81
D 152 S	80

11.7 Operating materials

11.7.1 Lubricant oil specifications

Lube oil specification



Choice of lubricants

When operating the machine only use the following operating substances!

The quality of lube oil has a considerable effect on the service life of the machine.

When selecting the type of lube oil, the application conditions and the relevant additives and viscosity class are decisive.

	Lubricant designation
AERZEN	DELTA LUBE 06

11.7.2 Lube oil in the food and pharmaceutical industry

Lubricant allocation

Lubricant oil in the food and pharmaceutical industry

Selection criteria for the required lubricants			
	Lube oil		
Lubricant designation	ISO VG 46		
Lubricant designation	KLÜBER OIL 4UH1-46N.		

Lubricant oil in the food and pharmaceutical industry

Requirements for use

permissible pressure difference $\Delta p_{zul} = \Delta p_{max} \times 0.8 \text{ bar}$	X		
permissible rotational speed $n_{permissible} = n_{max} \times 0.8$			

Oil change interval: KLÜBER 4UH1-46N
After every subsequent 4,000 op. hours.
Longer operating hours are only permissible upon evidence of their suitability on the basis of an oil analysis!

Operating data below or above the following are not approved!
Consult AERZEN for further information.

Tab. 6: Rotational speed and pressure limits for use of Klüber 4UH1-46N

Machine type	n Maximum permissible rotational speeds 1/min	Δp Maximum permissible pressure mbar for S and H designs	
		Overpressure	Vacuum pressure
D 12 S/H	12000	1200	-700
D 24 S/H	10500	1200	-700
D 36 S/H	8200	1200	-700
D 52 S	6500	1200	-700
D 62 S/H	6500	1200	-700
D 98 S/H	5200	1200	-700
no Δp limitation for the L range			
D 17 L	12000		
D 28 L	10500		
D 46 L	8200		
D 75 L	6500		

11.7.3 Lubricant quantities

Machine lube oil levels



The following values for lube oil levels are guide values. The main factor in determining the oil fill quantity is the displays of the relevant oil level pointer.

Tab. 7: Models with acoustic hoods

Total oil quantity			
Oil level: Middle sight glass on the acoustic hood			
Operating substance	Machine type	Filling quantity, approx.	Unit
Lube oil	D 12...	2.1	Litre (l)
	D 17...	2.4	
	D 24...	2.6	
	D 28...	3.3	
	D 36...	3.5	
	D 46...	4.1	
	D 52...	8.1	
	D 62...	8.1	
	D 75...	9.3	
	D 98...	18	
	D 152...	30.0	

Tab. 8: Models without acoustic hoods

Total oil quantity			
Oil level: With sight glasses on the unit			
Operating substance	Machine type	Filling quantity, approx.	Unit
Lube oil	D 12...	1.9	Litre (l)
	D 17...	2.2	
	D 24...	2.4	
	D 28...	3.1	
	D 36...	3.3	
	D 46...	3.9	
	D 52...	7.9	

Total oil quantity

Oil level: With sight glasses on the unit

Operating substance	Machine type	Filling quantity, approx.	Unit
	D 62...	7.9	
	D 75...	9.1	
	D 98...	17.0	
	D 152...	29.5	

Drive motor grease quantity



Observe the separate motor documentation and the information on the type plate of the motor.

Operating material	Motor size	Filling quantity, approx.	Unit
Grease	Observe the information in the motor documentation and on the type plate!		

11.8 Coating

Corrosion protection

The housing surfaces receive the following coatings to protect them against corrosion:

Standard coating

Undercoat	Corrosion protection on alkyd resin basis
End coating	Alkyd resin surface coating

Coating for increased corrosion protection

Undercoat	Corrosion protection on 2-component, epoxy resin, micaceous iron oxide basis
Intermediate coating	
End coating	Polyurethane surface coating

11.9 Electrical details

11.9.1 Voltage fluctuations

Permissible voltage fluctuations

Permissible voltage fluctuations are described in the international standard IEC 60038 subject to country-specific supply voltage tolerances.

Machine use only in a stable three-phase power supply. Voltage fluctuations or drops beyond the tolerance level may cause serious damage to the drive system.

11.9.2 Earthing strap cross-sections

Earthing strap

	kW	mm ²
to	55	14
to	200	70
to	315	2 x 70

11.9.3 Motor overload protection

Setting value

Max. ... % value, nominal motor current

110 %

11.9.4 Fan performance data

Fan performance data



The listed values are for free bleed-off

Machine size	Rotation frequency 1/min / 50Hz	Volume flow m ³ /h	Consumption KW	Nominal voltage V	Frequency Hz
DN 100	2800	3200	0.36	400	50-60
DN 125	2800	3200	0.36	400	50-60
DN 150	1450	4000	0.16	400	50-60
DN 200	875	5550	0.34	400	50-60
DN 250	1060	6800	0.82	400	50-60

11.10 Accessory information

11.10.1 Oil pressure

Technical data

Oil pressure		Unit
Factory setting	1.1 to 5.0	bar
Recommended oil pressure at operating temperature	3.0	bar
Shut-down	≤1.1	bar

Oil pressures outside this range can be implemented with the introduction of special modifications after consultation with AERZEN.

↪ Chapter 7.8.1 „Adjusting the oil pressure regulating valve“ on page 123



Machine sizes D62S, D62H and D75L do not have an oil pump. Oil pressure monitoring is not necessary.

11.10.2 Oil filter

Technical data

Oil filter		Unit
Filter fineness	7	µm
Filter resistance in clean condition	approx. 0.2	bar
max. Filter resistance	2.0	bar

↪ Chapter 3.10.18 „Oil filter“ on page 71

11.10.3 Intake filter

Technical data

Intake filter		Unit
Filter resistance in clean condition	> 10	mbar
max. filter resistance	45	mbar
Filter class G4		

11.10.4 Start-up unloading device DN 80 to DN 400

Technical data

Start-up unloading device DN 80 to DN 400		Unit
Voltage	230	V
Frequency	50	Hz
Protection type	IP 65	
Power	8	W
closed without current		

11.10.5 Balancing grade

Balancing type



The vibration behaviour of the machines is determined not only by the balancing grade of the drive shafts but also by the balancing grade of the drive elements.

The drive shafts of the pistons and rotors are balanced according to the half-key principle. Sheaves and couplings must therefore correspond to balancing type "H".

12 Notes on the Declaration of Conformity



This document is provided for informational purposes only and gives an account of the contents of the Declaration of Conformity. The original document is provided with the product or is sent in a separate document.


CE MRL 1012_1

Declaration of Conformity

pursuant to the EC Machinery Directive 2006/42/EC, Annex II 1A			
Translation of Original Declaration of conformity	CE		
Manufacturer	Representative pursuant to the Machinery Directive		
Representative for technical documentation			
Aerzener Maschinenfabrik GmbH Phone: +49 5154 81-0 Fax: +49 5154 81-9191 E-mail: info@aerzener.de Internet: www.aerzener.com Reherweg 28 31855 Aerzen, Germany	Mr Björn Intel Aerzener Maschinenfabrik GmbH Phone: +49 5154 81-0 Fax: +49 5154 81-9191 E-mail: info@aerzener.de Internet: www.aerzener.com Reherweg 28 31855 Aerzen, Germany		
Product			
Designation			
Type			
Serial no.			
Order no.			
Year of construction			
We hereby declare that the above product complies with all applicable provisions of the Machinery Directive 2006/42/EC.			
The aforementioned product fulfils the requirements of the following applicable directives:			
▶ Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) 2006/42/EC			
The following harmonised standards were applied:			
▶ DIN EN ISO 12100:2011-03 Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)			
▶ DIN EN 1012-1:2011-02 Compressors and vacuum pumps - Safety requirements - Part 1: Air compressors; German version EN 1012-1:2010			
Information on	Managing director	Signature	Location, date of issue
Signatory			

Z7.10.2014_Design CE MRL 1012_1 01_2014_1_en_GB

13 Glossary

•**Bar chart display**

A bar chart display is a display method which uses a scale to represent the size of a signal with a representative bar that changes in length depending on the signal size.

•**Belt run**

The belt section between two sheaves is termed a “belt run”.

•**EMERGENCY STOP function**

A function intended to alleviate the danger of impending hazards in terms of injury or damage to persons and machines during operation or to reduce the danger of hazards that are already present.

A function that is activated by one single action by an individual person.

The purposeful shut-down of the machine to avoid a dangerous situation. Voltage-carrying components are still active.

Emergency stop.

•**Machine**

A machine is an assembly of linked parts or components, at least one of which moves. A machine is fitted or intended to be fitted with a drive system. The machine has a proper intended use and is assembled for a specific purpose. Another technical term for “machine” is “unit”.

•**Machine stage**

A machine stage is an incomplete machine. It is an assembly that almost constitutes a machine, but that does not fulfil a specific function. A machine stage is only intended to be installed in and added to other machines or other incomplete machines.

•**Modbus RTU**

Modbus RTU transfers data in binary form. This ensures a good data throughput rate. The data cannot be evaluated directly by persons, rather they must first be converted into a readable format.

•**PROFIBUS-DP**

PROFIBUS DP involves the communication of central control equipment via a fast serial connection with decentralized input /output modules.

•**Stop category 0**

Stop category 0.

Shut-down by means of immediate interruption of the power supply to the machine.

Shut-down by means of mechanical separation (uncoupling) of components that pose a danger and their mechanical drive elements and, if necessary, by means of a braking procedure.



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SECTION 3

DELTA Hybrid Combination Base - Discharge Silencer

Description: Combination base - discharge silencer

Base/discharge silencer includes three-chamber reactive silencer built as a pressure vessel, stage mounting-flange with studs, discharge connection with integrated check valve, hinged motor plate, entirely supported on vibration isolating feet. The silencer is also free of any absorption material that would break down over time. The silencer is designed as an ATEX Spark Arrestor, contact Aerzen for certification details.

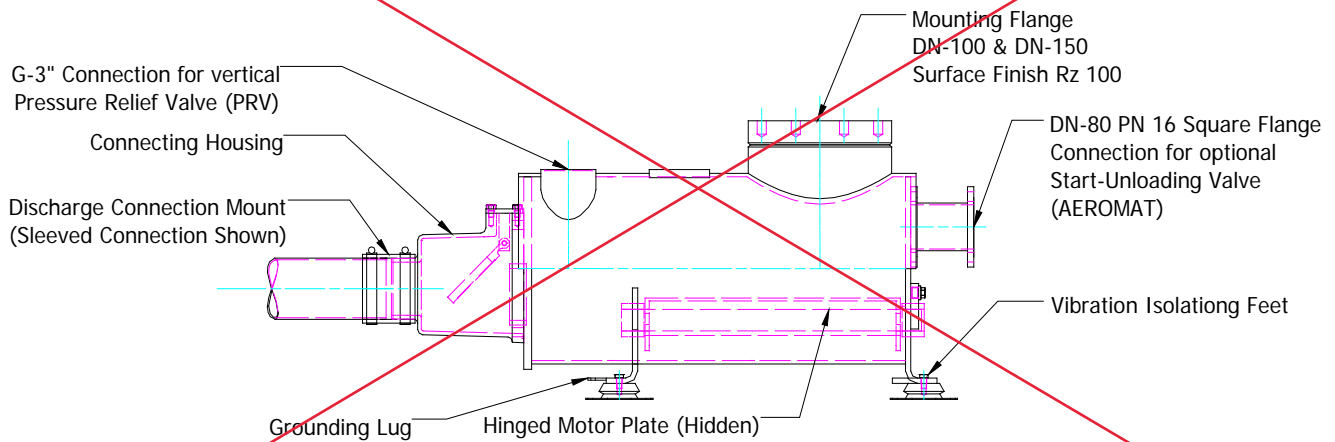
Materials of construction:

Silencer: Pressure vessel quality carbon steel S 235 JR (St 37-2) equivalent to ASTM A 283 Grade B
 Pressure vessel code: PED (European directive) PED – AD 2000, DGRL 97/23/EG with consideration given to static and dynamic stress (fatigue resistance)
 Maximum operating temperature: 200 °C (392 °F)
 Maximum operating pressure: 1.7 bar gauge (25 psig)
 Test pressure: 3.1 bar gauge (45 psig)
 Shell thickness varies by size: 6mm (1/4”) for DN-100 → 13mm (1/2”) for DN-250 & DN-300
 ASME (pressure vessel code): Hybrid “H” units utilize an ASME coded base/discharge silencer

Performance:

Pressure drop of the entire Base-Silencer with connecting housing and check valve, at the maximum allowable flow is 35 mbar (0.5 psi). This difference in pressure is accounted for in the power calculations of the Delta Hybrid package.

~~Combination Base – Discharge Silencer DN-100 & DN-125~~



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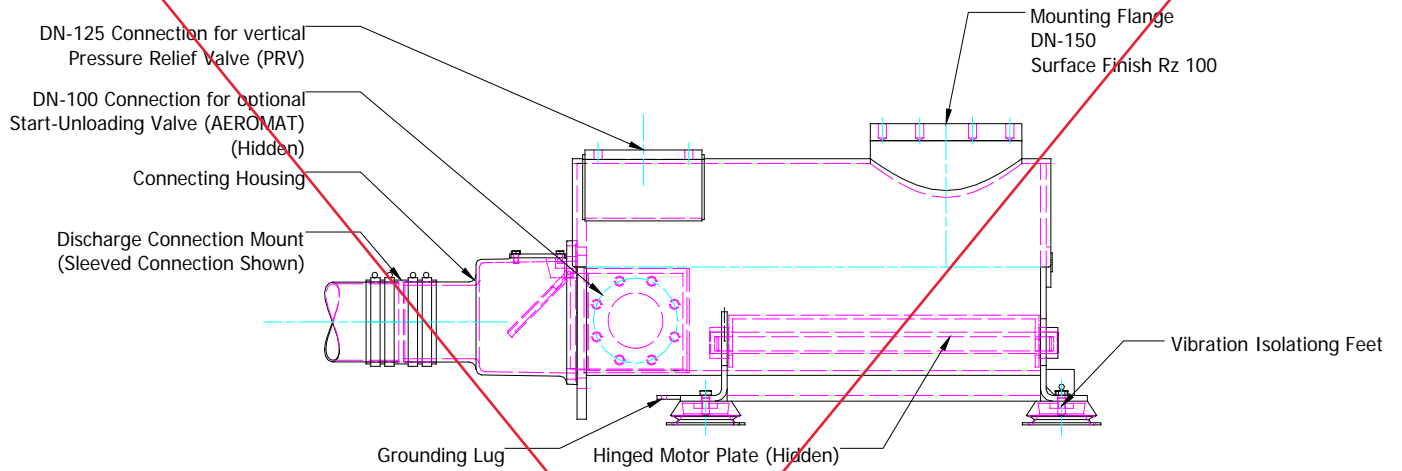
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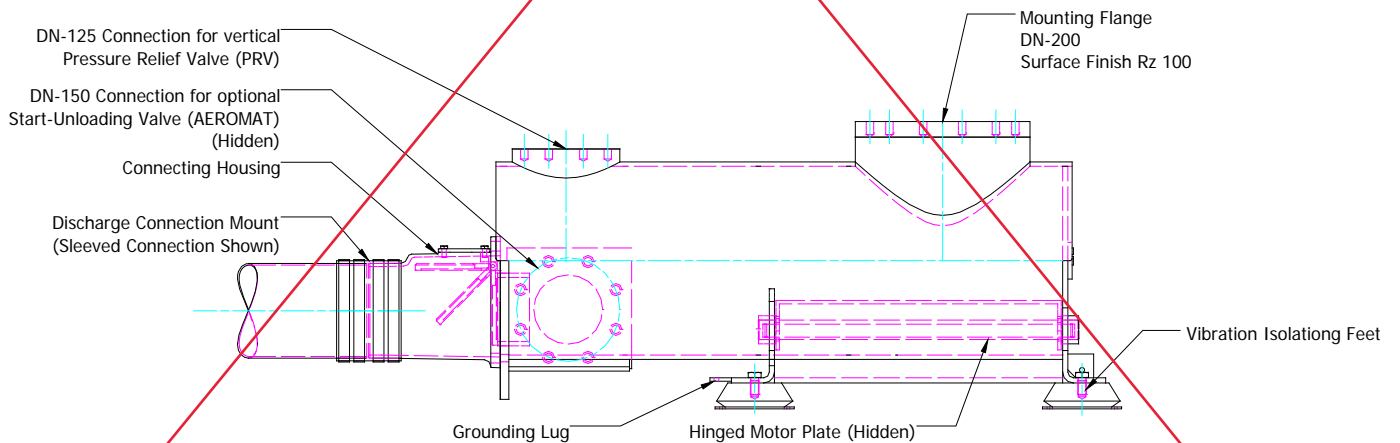
**Combination Base Frame – Silencer
Delta Hybrid**

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Combination Base - Discharge Silencer DN150



Combination Base - Discharge Silencer DN-200



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Combination Base Frame – Silencer Delta Hybrid

Date

09/10/2019

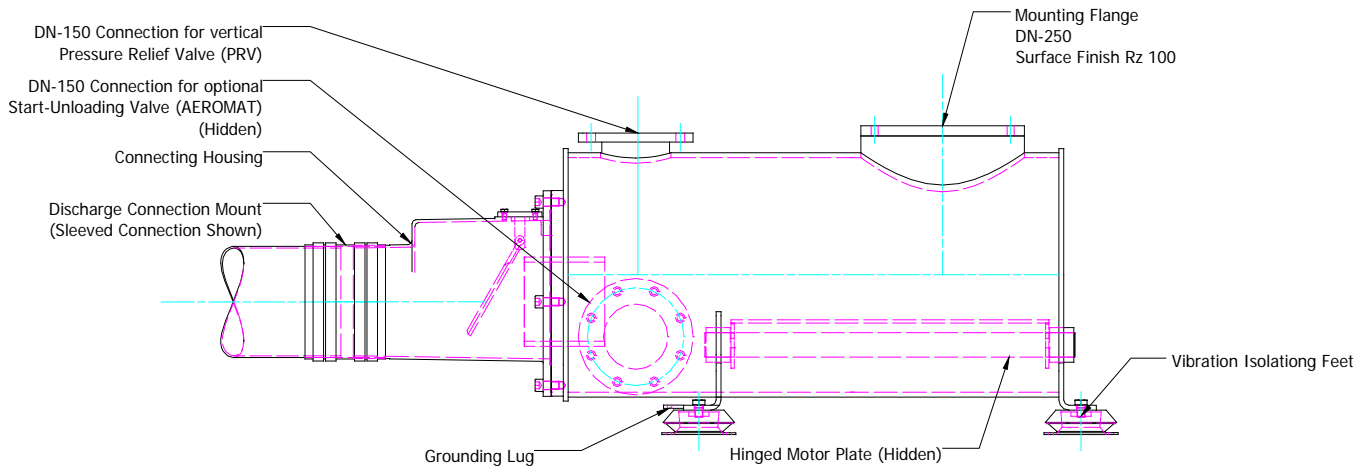
Doc #

H-6-0246 revision "C"

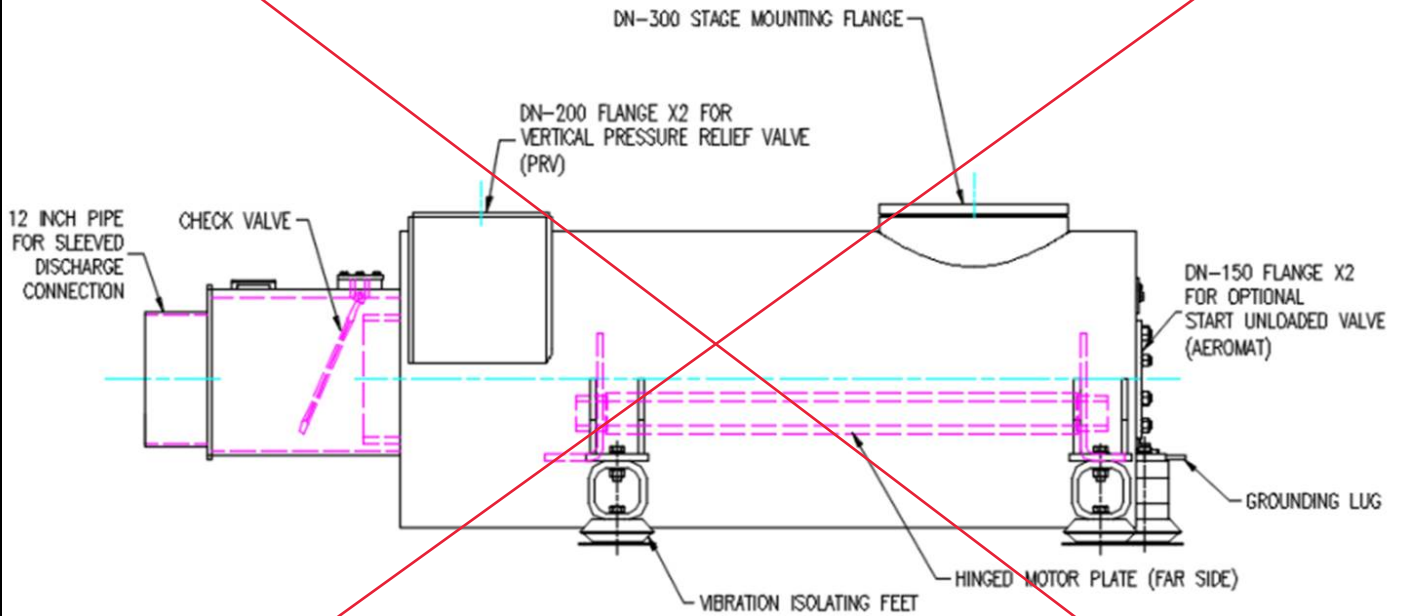
Page

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Combination Base - Discharge Silencer DN-250



Combination Base - Discharge Silencer DN-300



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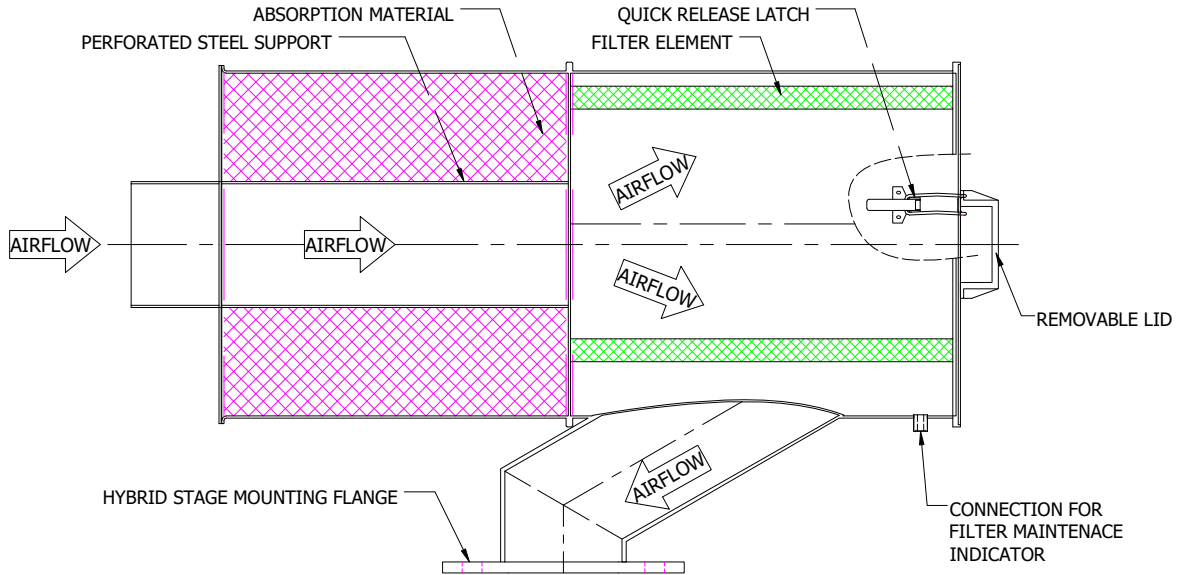
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Combination Base Frame – Silencer Delta Hybrid

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DELTA HYBRID Pressure Inlet Filter/ Silencer DN 100 - DN 300



Description: Combination dry air intake filter and absorption type silencer with filter element located downstream from the silencer chamber. The filter element is arranged, looking in direction of flow, directly upstream of the blower stage and protects the Hybrid Stage from wear as a result of dust particles carried along in the air current.

Materials of construction:

- Casing: Powder coated (RAL# 5001) Carbon Steel
Maximum operating data: 60 °C (140 °F) and – 70 mbar (-2.07"Hg)
Removable maintenance lid is held in place with quick release clamps
- Absorption material: Flame retardant, polyester based urethane foam, grey in color, secured in place with perforated steel
- Filter element: Thermally bound, food safe, polyester fibers, free of PVC, white in color
Filter element mounts with a quick release turn and lock arrangement.

Performance:

- Filtration class: G4 per EN 779 (greater than 90% of synthetic dust particles), equivalent to ASHRAE 52.2 MERV 7 (50-70% @3-10 microns)
- Pressure-drop of the entire silencer and clean filter at the maximum allowable flow: 10 mbar (0.15 psi)
- Pressure drop filter element: 5 mbar (2" WC) clean, or replace at 45 mbar max. (18" WC)
- Noise reduction: 10-15 dB mean noise reduction across audible octave bands.



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**DELTA Hybrid
Pressure Inlet/Filter Silencer DN-100 to DN-300**

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DELTAHybrid
Inlet Silencer Part Numbers

Package Size	DN-100	DN-125		DN-150		DN-200	
Stage Size	D12S/H	D19S	D24S/H	D29S	D36S/H	D52S	D62S/H
Pressure Filter / Silencer Assembly	181160	181179	181179	180949	180949	2000023357	186330
Replacement Filter Element	2000049286	2000049286	2000049286	2000049287	2000049287	182759000	2000049288

DELTAHybrid
Inlet Silencer Part Numbers

Package Size	DN-250	DN-300	
Stage Size	D76S	D98S/H	D152S/H
Pressure Filter / Silencer Assembly	2000055731	186326	2000013126
Replacement Filter Element	170836000	185404000	2000049289 (X2)

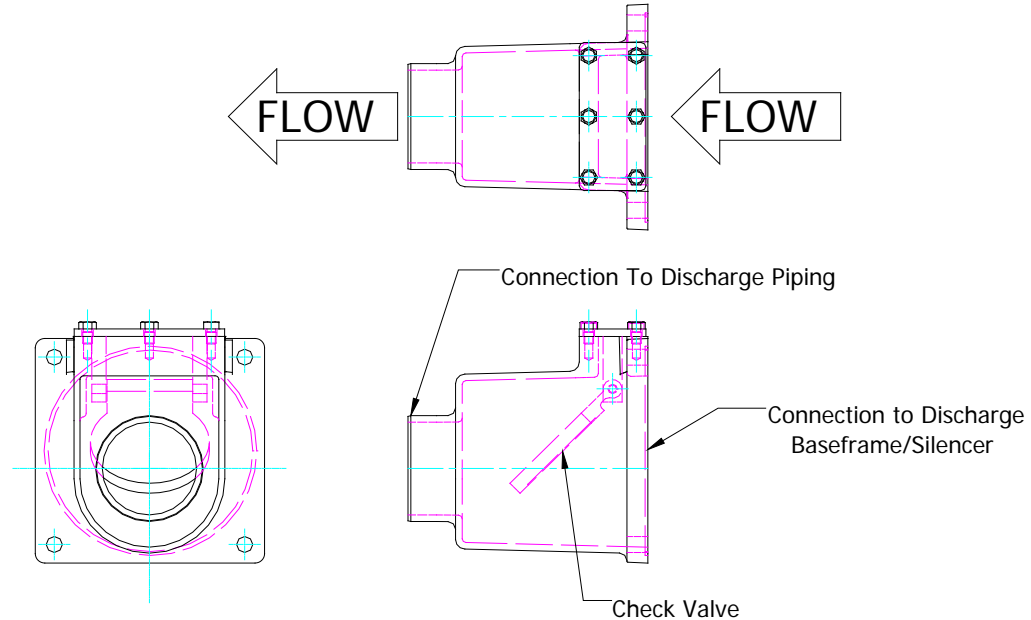


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DELTA Hybrid Pressure Inlet/Filter Silencer DN-100 to DN-300		
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Discharge Connecting Housing DN-100 – DN-250

Low Pressure Application Connection Housing
(< 1000 mbar)



Description: Discharge “Connecting Housing” DN100 through 250 (<1000 mbar)

Connection Housing flanged to the outlet of the combination base - discharge silencer

It houses a full-bore check-valve: steel embedded in rubber, closes naturally by gravity without use of a spring. The check-valve flap can easily be pulled out for inspection, maintenance or replacement without disconnecting the piping – simply by removing the bolts and lifting the cover.


Connection to the discharge piping via flexible sleeve connector (standard for air applications) or flanged expansion joint (optional).

Materials of construction:

Connecting housing: DN 100 to 250 connecting housings are made from EN-GJL-250 cast iron equivalent to ASTM A48 Grade 40B. Pressure code: PED 97/23/ED (European directive), maximum operating data: 200 °C (392 °F) and 1.7 bar gauge (25 psig).

Check-valve: Seat: metal, flap: steel embedded in EPDM up to 135°C (275°F) – Option: Silicone rubber.

(Low Pressure Applications) DELTA HYBRID Discharge Housing (<1000 mbar) Part Numbers										
Filter nominal size	DN-100	DN-125		DN-150			DN-200		DN-250	DN-300
Stage Designation	D12S	D19S	D24S	D29S	D36S	D52S	D62S	D76S	98S	152S
Discharge Housing (Sleeved)	178664	178665		178666			178667		180295 *Some versions are integral to Base Frame*	Integral to Base Frame

	<p>Aerzen USA Corporation 108 Independence Way – Coatesville, PA 19320 Tel: (610) 380-0244 Fax: (610) 380-0278 www.aerzen.com/en-us</p>	<p>Delta Hybrid – Discharge Connecting Housing DN-100 – DN-250</p>		
		<p>Date 05/05/2022</p>	<p>Doc # H-6-0247 revision “F”</p>	<p>Page 1 of 2</p>

DELTAHYBRID

SOUND ENCLOSURE COOLING FAN



The **DELTAHYBRID** is equipped with an electric cooling fan when a sound enclosure is supplied. The electric cooling fan uses 460Vac/3ph/60Hz motor. Each **DELTAHYBRID** cooling fan is wired to a motor starter located in the control panel integrated into the rear of the sound enclosure.

For units with or without an **AERtronic** controller, the cooling fan will be setup from the factory to have the fan start immediately when the main drive motor starts and run-on for 10 minutes after the main drive motor is stopped. If the **AERtronic** controller is installed, the controller can turn the cooling fan on/off based on ambient temperature inside the sound enclosure to reduce overall power consumption. For controller to manage the cooling fan, an additional RTD must be installed to monitor ambient temperature.

Fans Data by Sound Enclosure Size:

Sound Enclosure	kW (HP)	Rated Amps	RPM	Volume Displaced cfm (m ³ /h)	Part No.
DN-100/125	0.13 (0.17)	0.27	1600	1686 (2400)	185992000
DN-150	0.47 (0.63)	0.67	1520	2825 (4800)	185993000
DN-200	0.71 (0.96)	1.15	1600	4217 (7165)	185994000
DN-250/300	1.22 (1.63)	1.86	1570	6650 (11300)	185991000

Material of Blades: Sheet Steel with Black plastic coating or Black plastic (size dependent)
Motor Protection: each motor is equipped with thermal overload switches and the motor starter monitors for current overload
Approvals: UL1004-1; CSA C22.2 Nr.100; EN60034, CE



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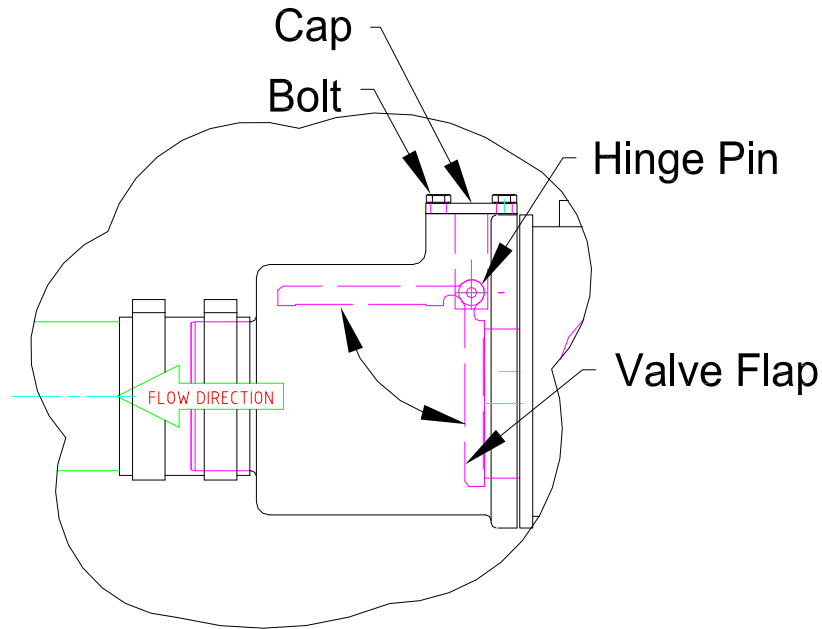
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DELTAHYBRID – Sound Encl. Cooling Fans

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Check Valve: DN-100 through DN-300

Description: Housed in the connecting housing is a full-bore, steel embedded in rubber check-valve that closes naturally by gravity without use of spring. The check-valve flap can easily be pulled out for inspection, maintenance, or replacement without disconnecting the piping by removing the bolts and lifting the cap.



Materials of construction:

Temperature	Discharge Pressure	Flap Sealing Material
Up to 149 °C (300 °F)	Low pressure (≤ 14.5 PSI)	EPDM (standard)*
Up to 200 °C (392 °F)	High pressure (> 14.5 PSI)	Silicone*

*DN-250 & DN-300 units: Stainless steel plate with an outer ring made of the sealing material

**DN-200 and smaller units: Steel plate fully embedded in the sealing material

Part Numbers:

Size DN	EPDM Check Valve Assembly P/N	Silicone Check Valve Assembly P/N
100	178654	180878
125	178654	180878
150	178655	180879
200	178655	180879
250	168705	168711
300	158608	178266



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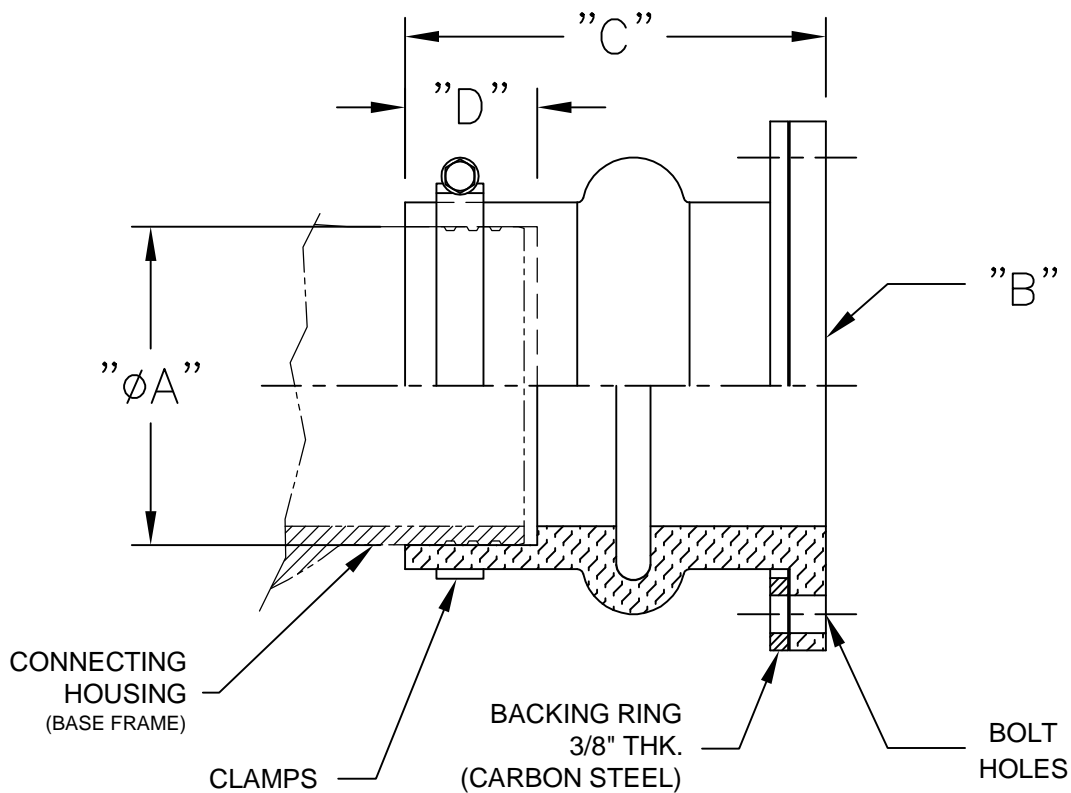
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Delta Hybrid – Check Valve

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MEDIA BEING CONVEYED = AIR OR NITROGEN

BACKING RING INCLUDED WITH JOINT

MATERIALS OF CONSTRUCTION: EPDM

MATERIAL	MAX. TEMP.	DESIGN PRESSURE
EPDM	300°F	-15" Hg to 25 psig

PACKAGE SIZE	Ø A (Sleeve ID)	B (150# ANSI Flange size)	C (Length)	D (Pipe Engagement)	PART No. 21-003168-_____	EXPANSION JOINT SPECIFICATIONS				CLAMPS	
					MATERIAL EPDM	AXIAL COMPRESSION	AXIAL EXTENSION	LATERAL OFFSET	ANGULAR ROTATION	QTY	PART No. 21-000910-_____
DN-050	2 3/8	2	8.00	2.31	-02X02EG	0.50	0.25	0.50	2°	1	_079-085
DN-080	3 1/2	3	8.00	2.31	-03X03EG	0.50	0.25	0.50	2°	1	_104-112
DN-080	3 1/2	4	8.00	2.31	-03X04EG	0.50	0.25	0.50	2°	1	_104-112
DN-100	4 1/2	4	8.00	2.31	-04X04EG	0.50	0.25	0.50	2°	1	_130-140
DN-125	5 9/16	5	9.00	2.5	-05X05EG	0.50	0.25	0.50	2°	2	_150-162
DN-125	5 1/2	5	9.00	2.5	-05X05EG-A1	0.50	0.25	0.50	2°	2	_150-162
DN-125	5 9/16	6	9.00	2.5	-05X06EG	0.50	0.25	0.50	2°	2	_150-162
DN-125	5 1/2	6	9.00	2.5	-05X06EG-A1	0.50	0.25	0.50	2°	2	_150-162
DN-150	6 5/8	6	9.00	2.5	-06X06EG	0.50	0.25	0.50	2°	2	_187-200
DN-150	6 5/8	8	10.00	2.5	-06X08EG	0.50	0.25	0.50	2°	2	_187-200
DN-200	8 5/8	8	10.00	2.75	-08X08EG	0.75	0.25	0.50	2°	2	117191 (AMD)
DN-200	8 5/8	10	10.00	2.75	-08X10EG	0.75	0.25	0.50	2°	2	117191 (AMD)
DN-250	10 3/4	10	10.00	2.75	-10X10EG	0.75	0.25	0.50	2°	2	_290-305
DN-250	10 3/4	12	10.00	2.75	-10X12EG	0.75	0.25	0.50	2°	2	_250-305
DN-300	12 3/4	12	10.00	2.75	-12X12EG	0.75	0.25	0.50	2°	2	160404000

* Dimension in INCHES



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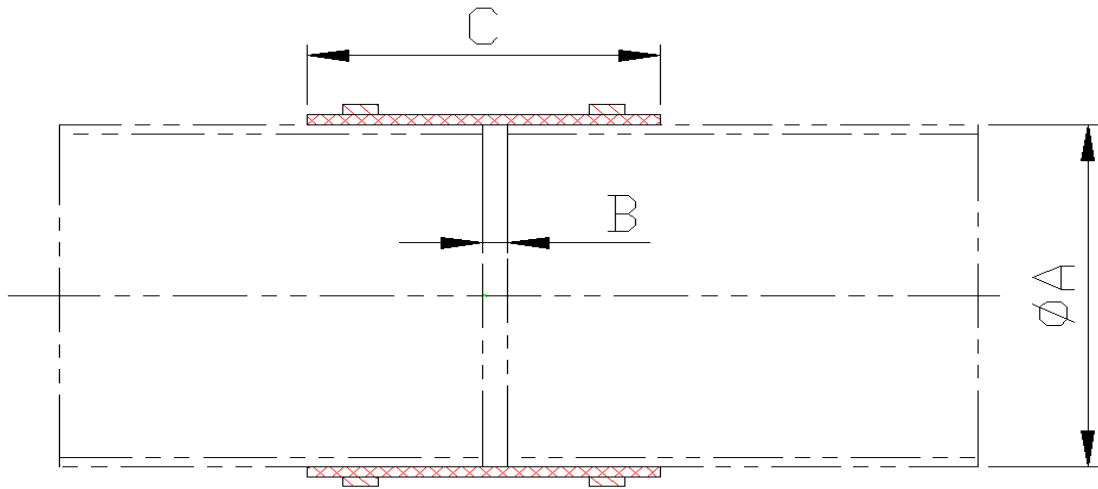
EPDM EXPANSION JOINT WITH CLAMPS
 PIPE SLEEVE TO ANSI FLANGE

DATE
7/29/2013

DOCUMENT NO.
XA-005207_EG

REVISION
B

SHEET
1 of 1



Nominal Pipe		Sleeve P/N	Pipe O.D A		End Clearance B		Maximum Misalignment		Sleeve Length C		# of clamps	Clamp P/N
DN	USA		mm	in.	mm	in.	mm	in.	mm	in.		
50	2"	159127	60.3	2-3/8	10	3/8	3	.12	50	2	2	168036
80	3"	159128	88.9	3-1/2	10	3/8	3	.12	100	4	2	163238
100	4"	159129	114.3	4-1/2	10	3/8	3	.12	100	4	2	169603
125	5"	162677	139.7	5-1/2	10	3/8	5	.20	150	6	2	162923
150	6"	159131	168.3	6-5/8	10	3/8	5	.20	150	6	4	165903
200	8"	159132	219.1	8-5/8	10	3/8	5	.20	150	6	4	168658
250	10"	159134	273	10-3/4	15	5/8	7	.28	200	8	4	159353
300	12"	159135	323.9	12-3/4	20	3/4	11	.43	200	8	4	160404
400	16	157607	406.3	16	20	3/4	15	.59	300	12	4	157608

Technical Data

Maximum operating pressure: 1.2 bar g (17.4 psig)
 Test pressure: 2.4 bar (34.8 psig)
 Operating temperature -40 to 180° C (-40 to 356° F)

Materials

Silicone Rubber with embedded woven fiber reinforcement up to DN-300
 Perbunan rubber in DN-400
 60 +/- 5 Shore A
 Shelf-life: up to 20 years, under clean, cool & dry conditions

CAUTION:

- Pipe misalignment could cause leaks and premature failure of the sleeve.
- It is imperative to maintain the recommended pipe-end clearance for the pipe connection to retain its flexibility and reduce the transmission of noise and vibrations from the blower package to the process piping.



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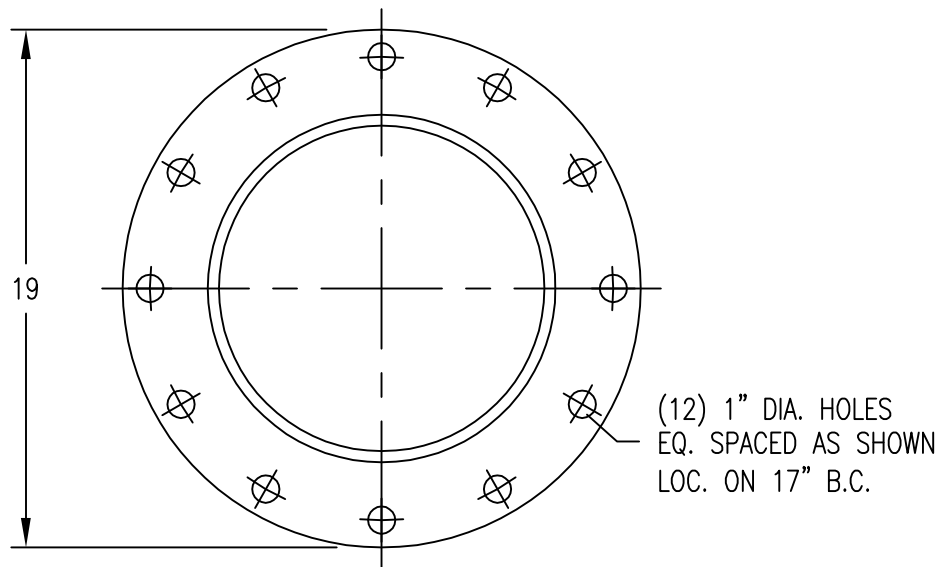
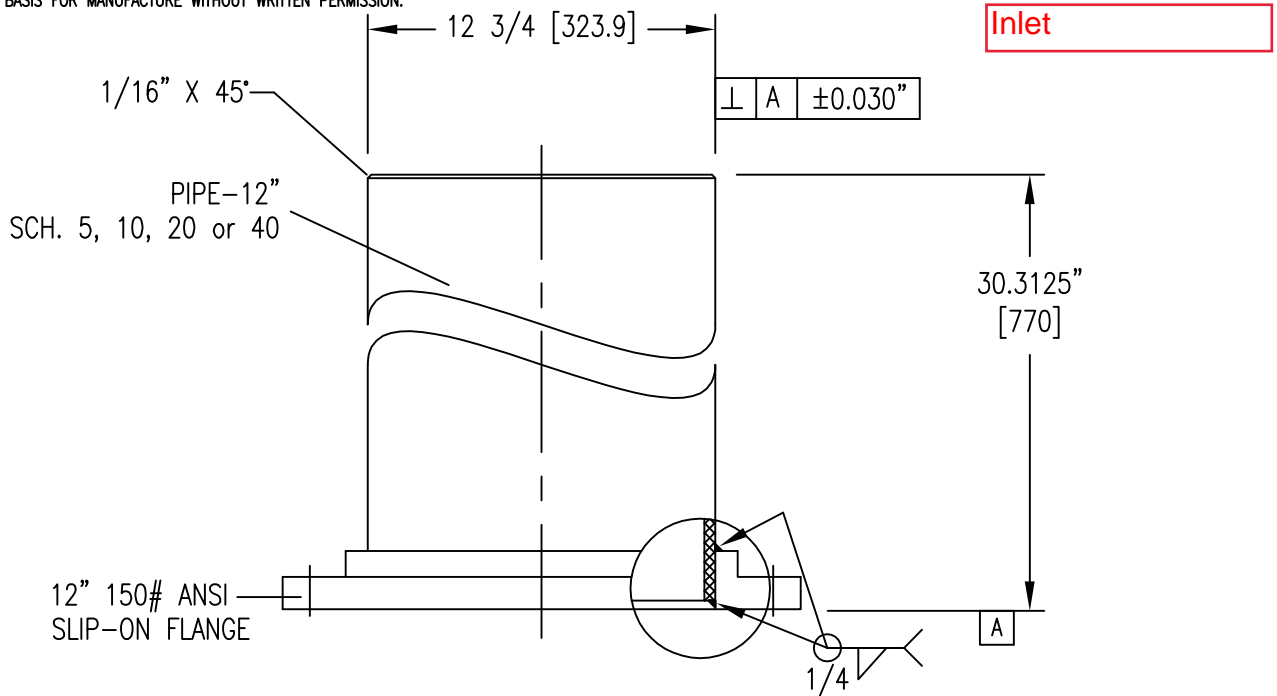
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Flex Connector & Clamps

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NOTES

1. STD TOLER: UNLESS O'WISE NOTED
 FRACTIONAL = ±1/32
 .X=±0.03 .XX=±0.01 .XXX=±0.005
 ANGULAR = ±1/4° (INCL IMPLIED 90°)
 WELDMENTS = ±1/16
2. BREAK ALL SHARP EDGES
3. AIR TIGHT ASSEMBLY
4. PAINT WITH INDUSTRIAL PRIMER

NAVISION #: 21-004460-12

DRAWING NO. PA-005100-12-12 REV "-"

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TITLE
 STUB PIPE - CARBON STEEL
 12" PIPE X 12" 150# ANSI S.O. FLANGE X 30.3125" LONG

SCALE
 MODEL SPACE 1:1

DATE
 05/18/2016

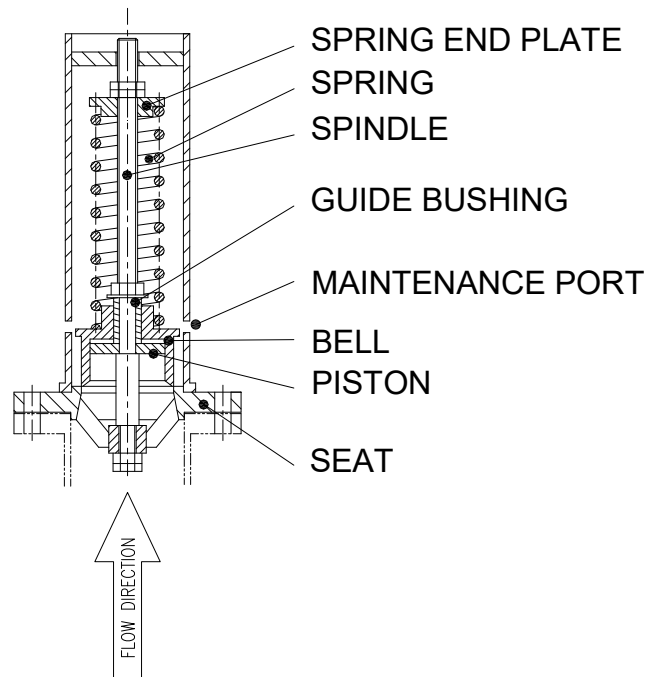
DRAWN BY
 SRM

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Delta Hybrid Pressure Relief Valve

Description:

The Pressure Relief Valve is designed for use with air or inert gasses to protect the Hybrid and its accessories from damage in the event of excessive pressure. It is not to be used as a pressure regulating device. It contains a spring-loaded valve guided by a spindle and surrounded by a protective sheath that is capable of venting the entire volume flow of the blower. In positive pressure machines, it is installed downstream from the Hybrid Stage and before the check valve or any shut-off valve. In vacuum applications, it is installed on the intake side of the stage.



QTY	DESCRIPTION	MATERIAL
1	Connection Flange or Thread with Valve Seat	Grey Cast Iron
1	Valve Spindle	Carbon Steel
1	Bell	Brass
1	Spring End Plate	Carbon Steel
2	Hex Nut	Carbon Steel

QTY	DESCRIPTION	MATERIAL
2	Guide Nut	Carbon Steel
1	Spring	Spring Steel
1	Valve Disc / Piston	Brass
1	Valve Guide / Bushing	Brass
1	Cover	Aluminum

Technical Data:

- Maximum Temperature: 200° C (392° F)
- Conforms to PED 97 / 23 / EG
- Maximum Pressure: 1.65 Bar (26 PSIG)
- Valve Characteristic: Proportional
- Pressure Rise: 10%



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Delta Hybrid – Pressure Relief Valve

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DELTA HYBRID Pressure Relief Valves

Nominal Package Size	Hybrid Designation	Valve Size	Positive Pressure Valve Connection	750 mbar (up to 10.8 psi)	1050 mbar (up to 15.2 psi)
DN-100	D 12S	DN-80	G-3" External	177900114 (180752000)	177900120 (180753000)
	D 19S				
DN-125	D 24S				
DN-150	D 29S	DN-125	DN-125 PN 16 Flange	167368114 (167374000)	167368120 (167375000)
	D 36S				
	D 52S				
DN-200	D 62S				
	D 76S*				
DN-250	D 98S				
DN-300	D 152S*				

*D76S and D152S units can have (1) or (2) PRVs depending on the performance criteria

Note: Refer to Document 0293-H-6 PRVs for H models.

Maintenance:

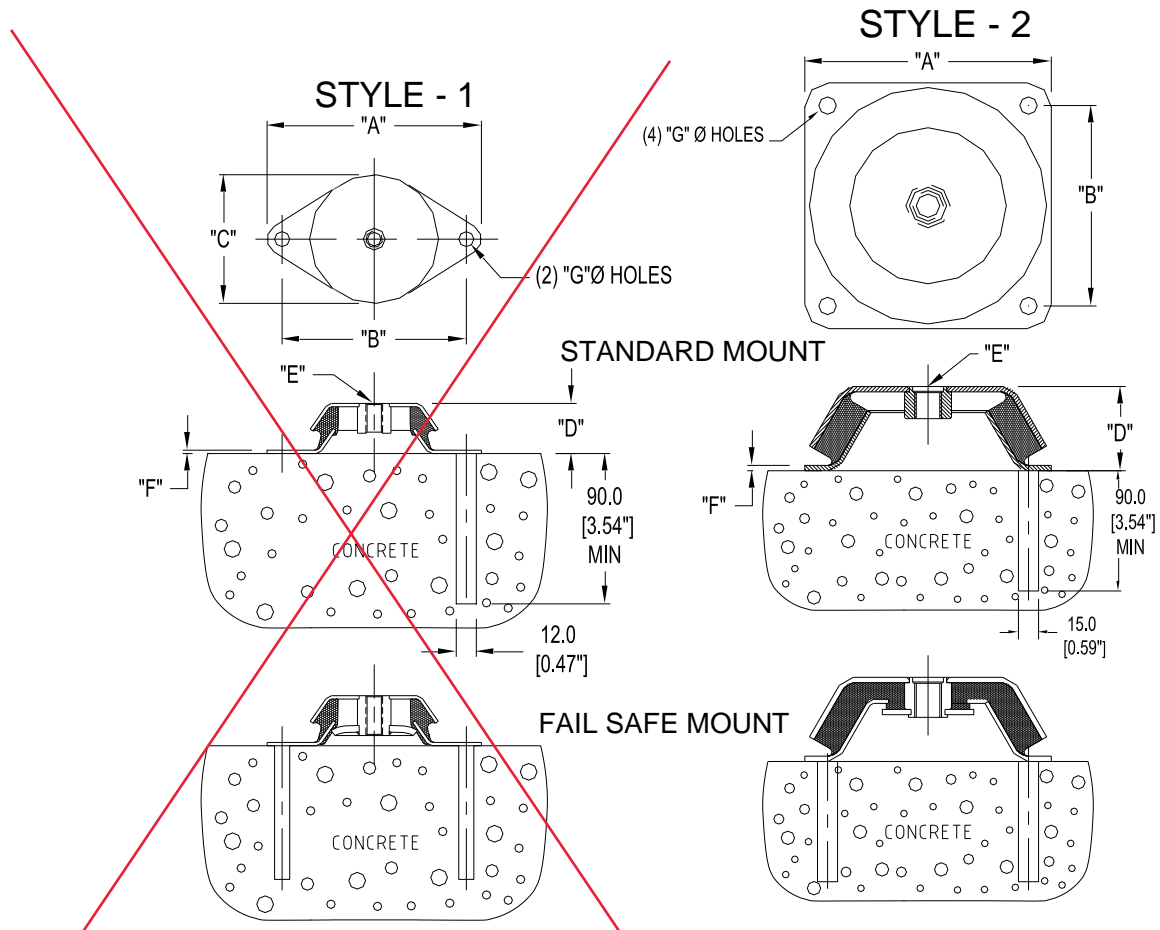
Periodically inspect for free movement of the valve. While the machine is stopped and the motor locked out, insert flat blade screw drivers into both maintenance ports and lift the valve. Remove the screw drivers and visibly ensure the valve is properly seated. When operated in clean environments, inspect valve either every six months or 1000 run hours, whichever occurs sooner. In dusty conditions, inspect every month. Refer to document G4-002 for complete operating instructions.



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Delta Hybrid – Pressure Relief Valve

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Only (1) anchor per foot is required for Standard mounts, anchor each hole ("G") for Fail-safe mounts.

Standard mounts are not recommended for use where negative loads occur, (marine or earthquake zones) use Fail-safe mounts or contact Aerzen for alternates.

All vibrations isolators have a natural frequency that will not interfere with the fundamental blower package frequencies.

Baseframe	Standard P/N	Fail Safe P/N	Style	A (mm)	B (mm)	C (mm)	D (mm)	E	F (mm)	G (mm)	Maximum Load Per Foot		Recommended Anchor
											KN	Lbf	Aerzen P/N
DN-50	184818	184818	1	127	110	77	30	M10	2	9	1,4	315	200053552
DN-80	176394	184819	1	127	110	77	30	M10	2	9	2	450	200053552
DN-100													
DN-125													
DN-150	177128	184820	2	168	132	-	50	M16	4	13	4	899	120835000
DN-200	184821	184821	2	184	150	-	60	M20	4.5	13	9	2023	120835000
DN-250			2	184	150	-	60	M20	4.5	13	9	2023	120835000
DN-300			2	184	150	-	60	M20	4.5	13	9	2023	120835000

SECTION 4

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Nominal Voltage	3/PE~ 460 V 60 Hz
Control Voltage	24 VDC
Rating	UL 508A
Degree of Protection	NEMA 1 / 4X
Machine Type	Delta Hybrid (with Sound Enclosure)
Variants	A - DN 100/125 B - DN 150 C - DN 200 D - DN 250/300

Electrical- documentation

Customer
Higher-Level Designation
Sales Order No.
Commission
P&ID

Rev.	Date	By	Description of Revision	Date Checked	Checked By	Date Drawn	Drawn By	Date Checked	Checked By
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-	02/27/2023	ESW	02/27/2023	JCH
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-				
B	10/07/2022	JRH	Changed EM2 address from 2 to 3	-	-				
A	4/28/2022	TAS	Fixed incorrect address, moved X7 block to middle row	-	-				

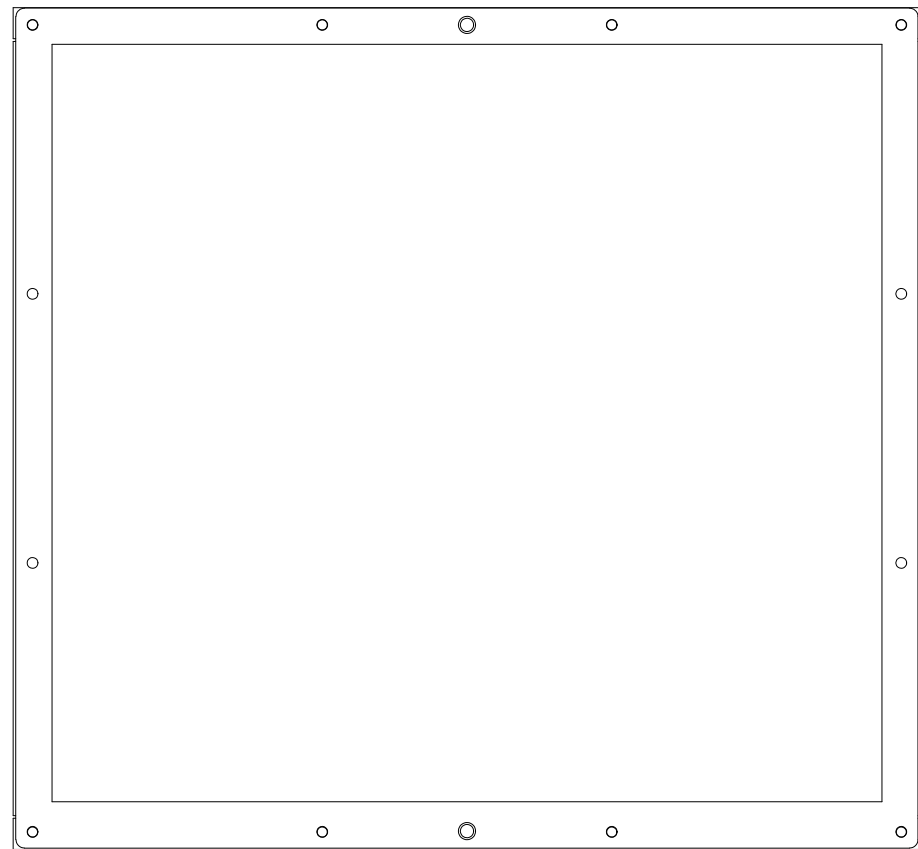


AERTRONIC WIRING DIAGRAM
IB-008291-N11
Rev "D"
CLASS I
SHEET 1 of 9

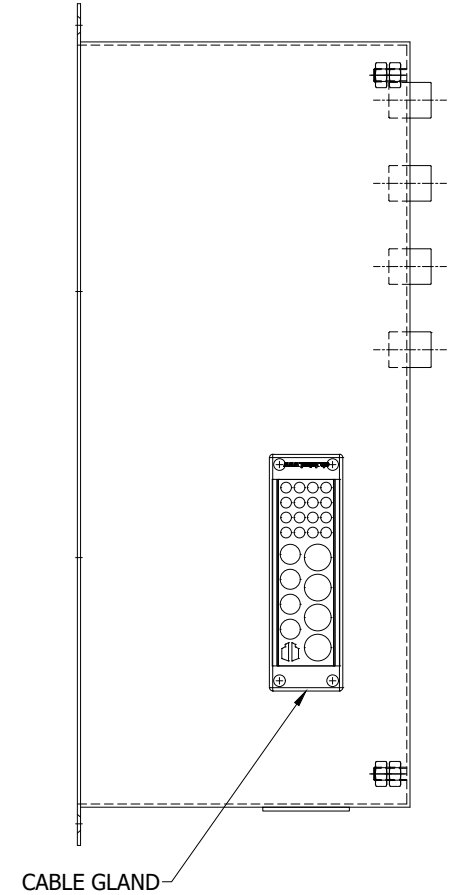
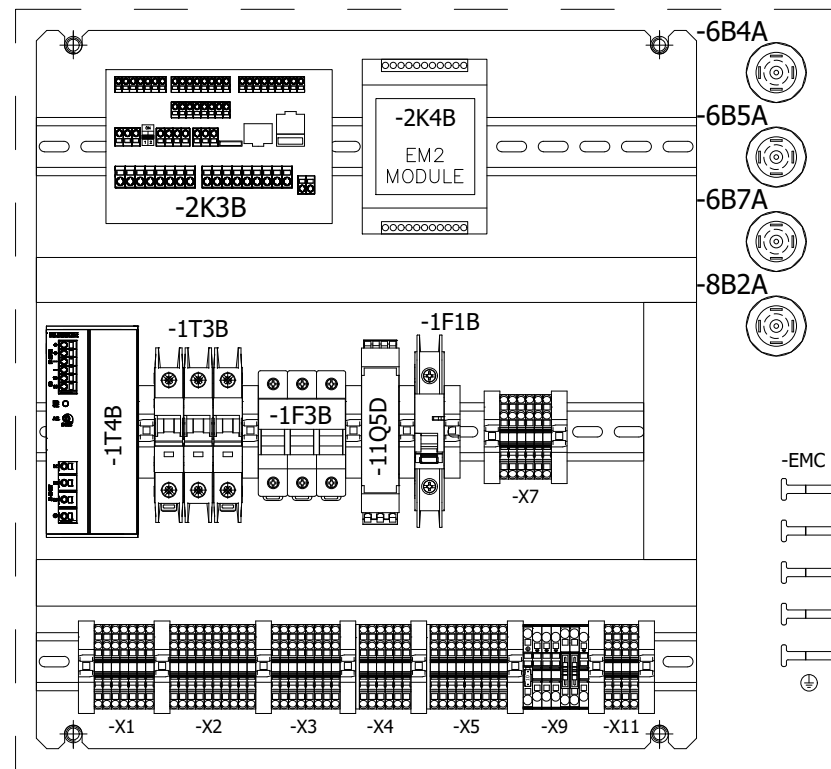
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4	Circuit Diagram	Power Supply, Cooling Fan & Module Interconnections
5	Circuit Diagram	Analog Inputs & Outputs
6	Circuit Diagram	Digital Inputs & Outputs, Oil Demister Wiring
6	Circuit Diagram	Vibration Monitoring
7	Communications Map	
8	List of Components	
9	Reference Sheet	Terminal Quick Reference

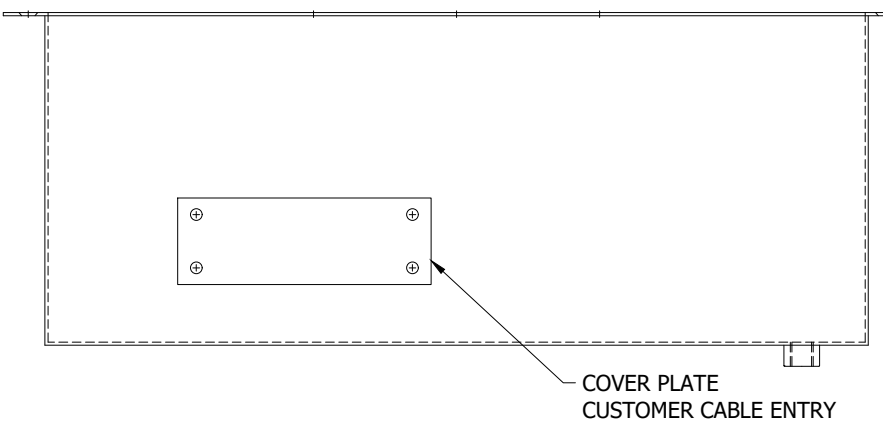
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-	Date Drawn	02/27/2023	Aerzen USA 108 Independence Way Coatesville, PA. 19320	AERTRONIC WIRING DIAGRAM IB-008291-N11	CLASS I SHEET 2 of 9
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-	Drawn By	ESW			
B	10/07/2022	JRH	Changed EM2 address from 2 to 3	-	-	Date Checked	02/27/2023			
A	4/28/2022	TAS	Fixed incorrect address, moved X7 block to middle row	-	-	Checked By	JCH			
Rev.	Date	By	Description of Revision	Date Checked	Checked By	Checked By	JCH	Rev "D"		



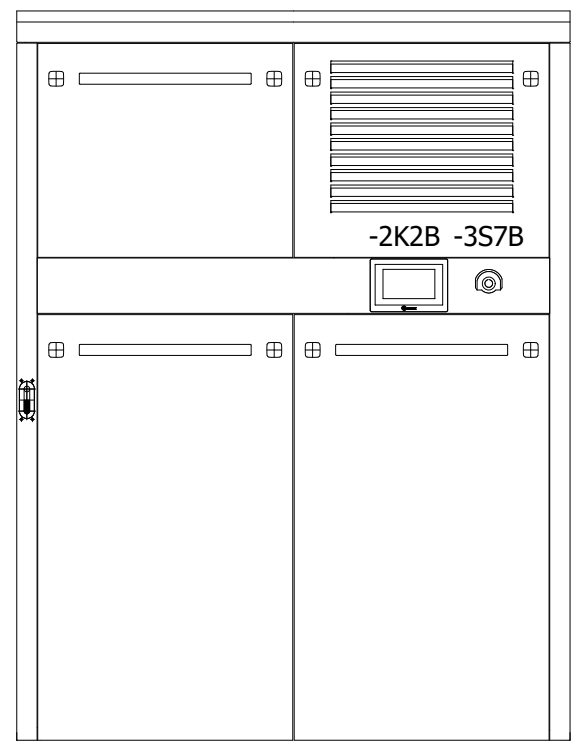
Electrical Cabinet (Rear Side of Sound Enclosure)



CABLE GLAND



COVER PLATE
CUSTOMER CABLE ENTRY



Sound Enclosure Front View

NOTES:

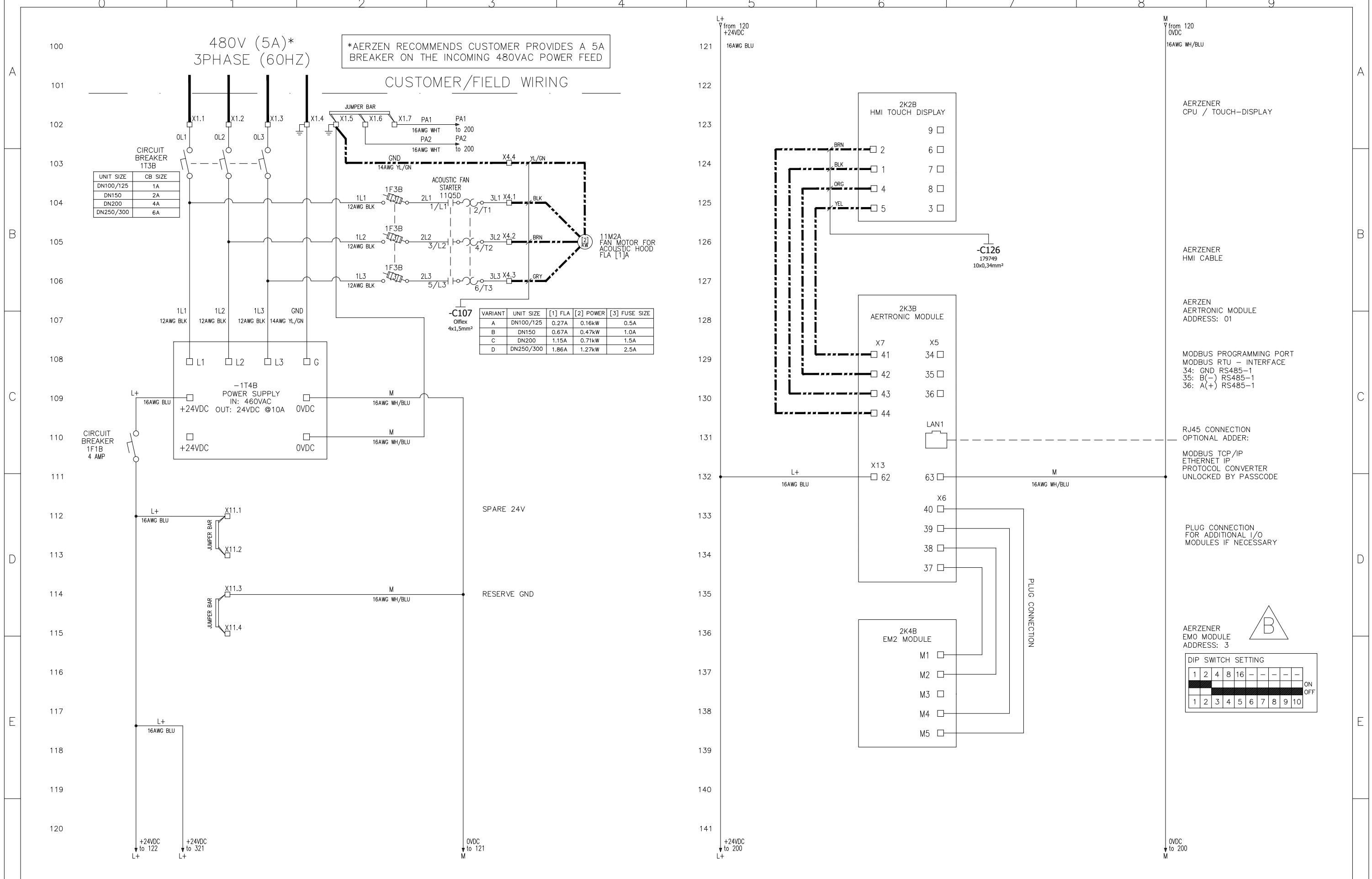
- HMI (-2K2B) is remote mounted on the front of the sound enclosure of the package.
- Dimensions:
 W= 539mm [21.2"]
 H = 500mm [19.7"]
 D = 220mm [8.7"]
 color = same as the sound enclosure

LEGEND

- PANEL WIRING
- AMUSA FACTORY WIRING
- FIELD WIRING

Rev.	Date	By	Description of Revision	Date Checked	Checked By
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-
B	10/07/2022	JRH	Changed EM2 address from 2 to 3	-	-
A	4/28/2022	TAS	Fixed incorrect address, moved X7 block to middle row	-	-

Date Drawn	02/27/2023	Aerzen USA 108 Independence Way Coatesville, PA. 19320 	AERTRONIC WIRING DIAGRAM	CLASS I
Drawn By	ESW			
Date Checked	02/27/2023		IB-008291-N11	Rev "D"
Checked By	JCH			SHEET 3 of 9

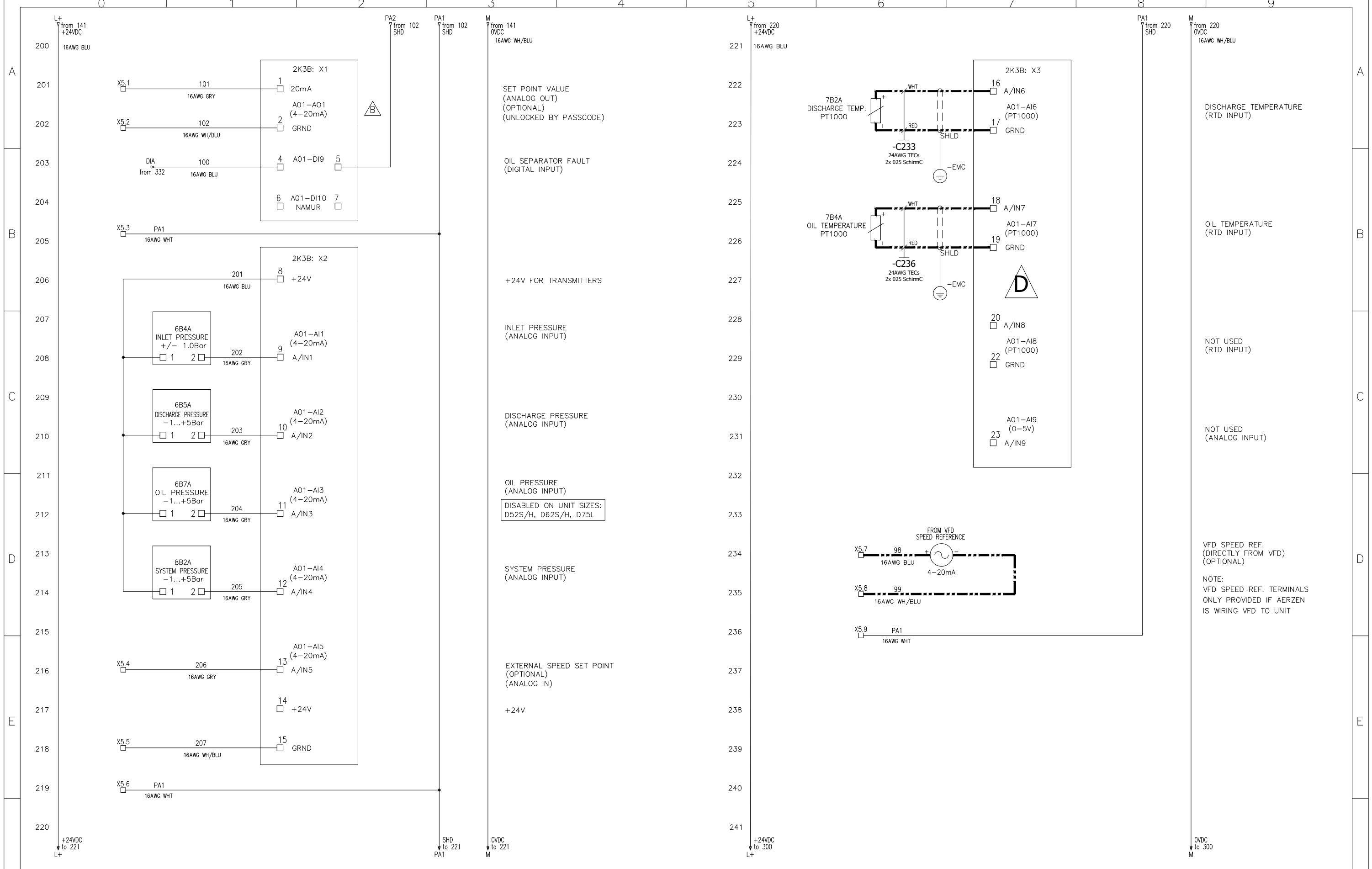


Rev.	Date	By	Description of Revision	Date Checked	Checked By	Date Drawn	Drawn By	Date Checked	Checked By
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-	02/27/2023	ESW	02/27/2023	JCH
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-				
B	10/07/2022	JRH	Changed EM2 address from 2 to 3	-	-				
A	4/28/2022	TAS	Fixed incorrect address, moved X7 block to middle row	-	-				

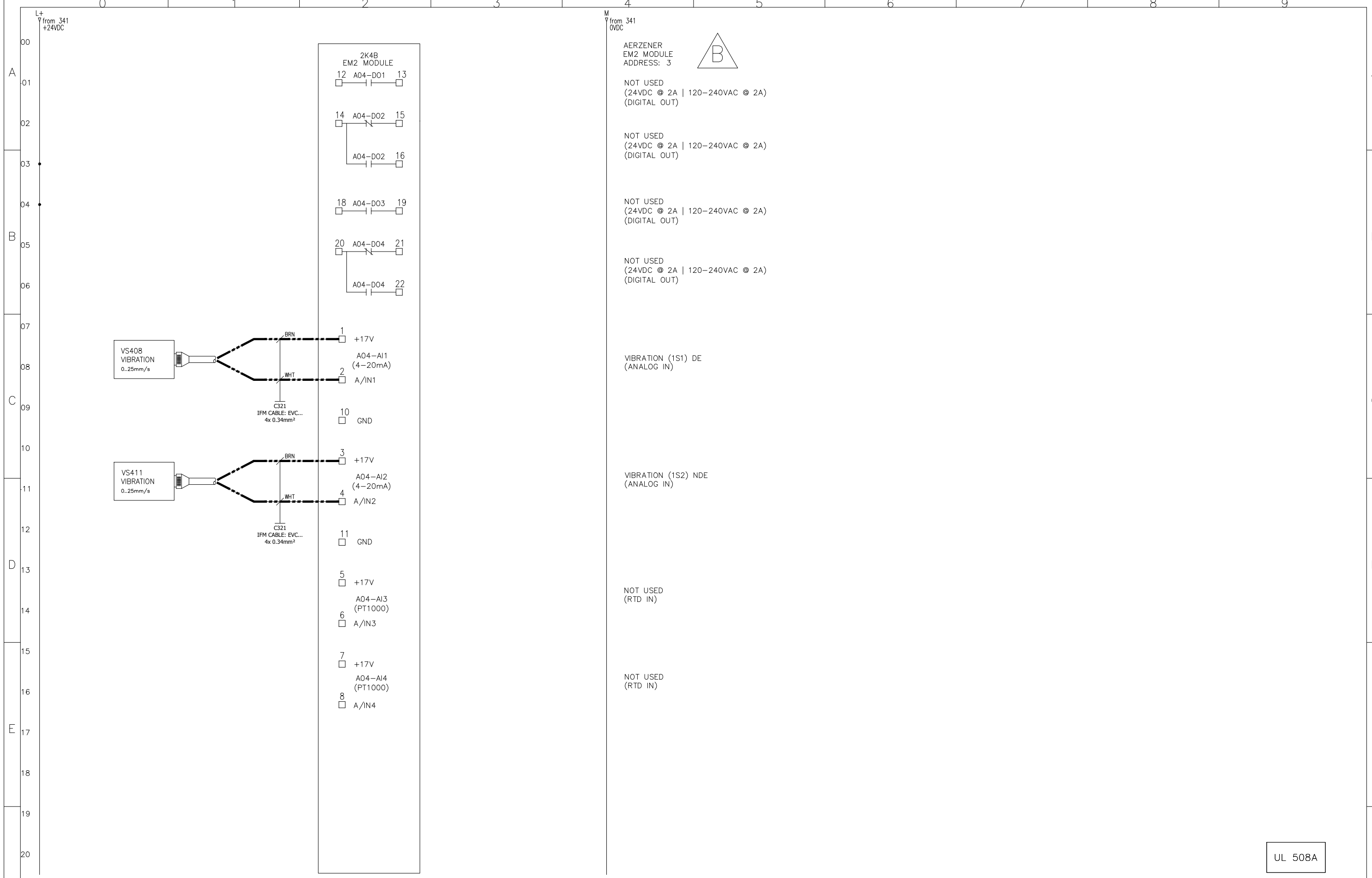


AERTRONIC WIRING DIAGRAM
IB-008291-N11

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SHEET 4 of 9
Rev "D"



Rev.	Date	By	Description of Revision	Date Checked	Checked By	Date Drawn	02/27/2023	 Aerzen USA 108 Independence Way Coatesville, PA. 19320	AERTRONIC WIRING DIAGRAM IB-008291-N11 Rev "D"	CLASS 1
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-	Date Drawn	02/27/2023			SHEET 5 of 9
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-	Drawn By	ESW			
B	10/07/2022	JRH	Changed EM2 address from 2 to 3	-	-	Date Checked	02/27/2023			
A	4/28/2022	TAS	Fixed incorrect address, moved X7 block to middle row	-	-	Checked By	JCH			



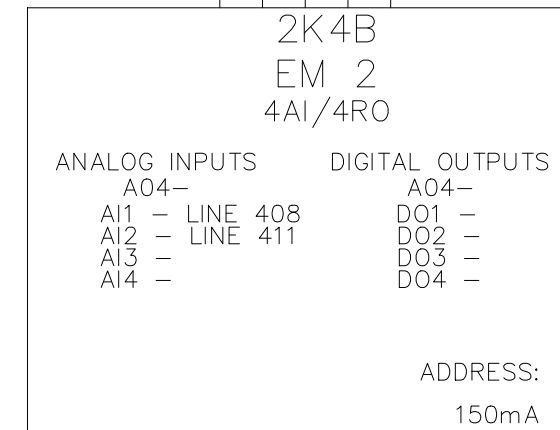
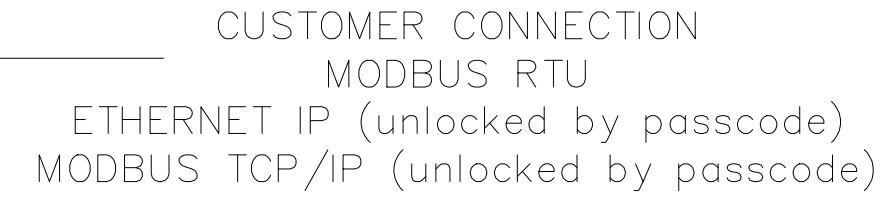
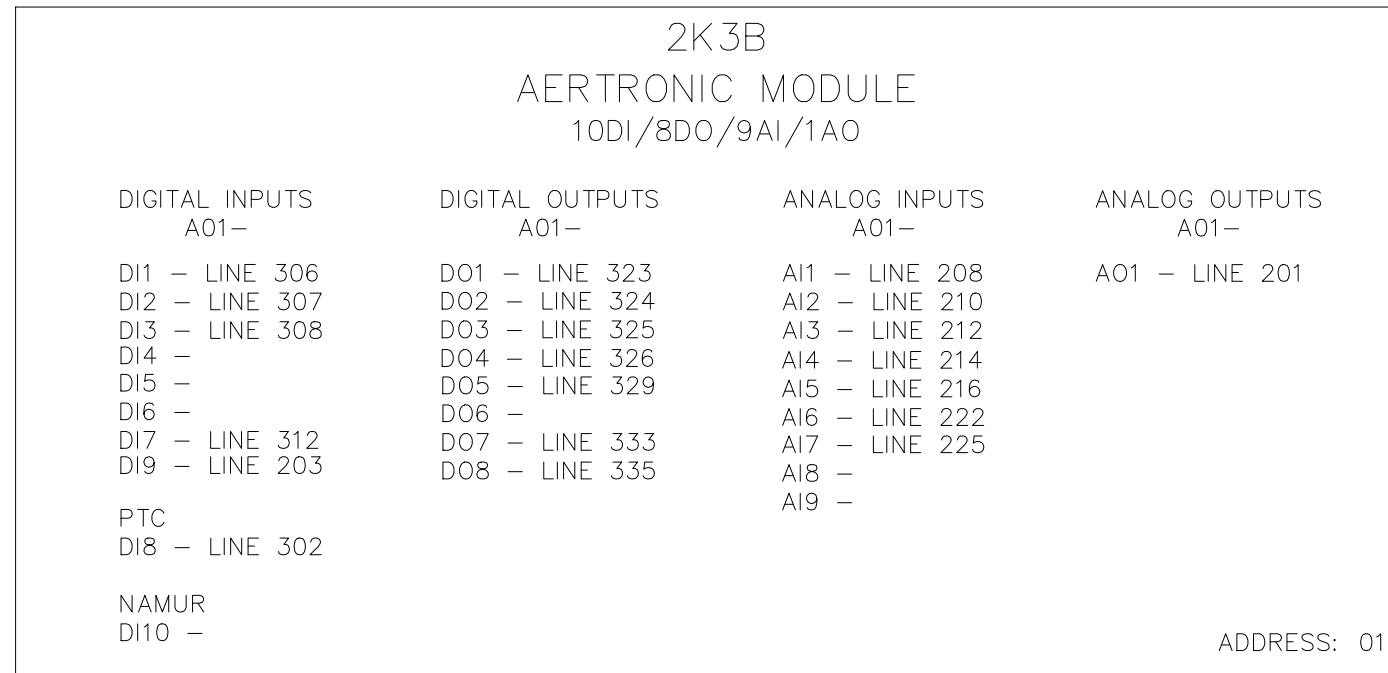
Rev.	Date	By	Description of Revision	Date Checked	Checked By	Date Drawn	Drawn By	Date Checked	Checked By
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B: X3	-	-	02/27/2023	ESW	02/27/2023	JCH
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AERTRONIC WIRING DIAGRAM
 IB-008291-N11
 Rev "D"
 CLASS I
 SHEET 7 of 9

COMMUNICATIONS & PLC OVERVIEW



Rev.	Date	By	Description of Revision	Date Checked	Checked By
D	02/27/2023	ESW	Corrected terminal numbers for 2K3B:X3	-	-
C	2/1/2023	JPS	Degree of Protection1/4X, Updated 1T3B Circuit Breaker	-	-
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AERTRONIC WIRING DIAGRAM

IB-008291-N11 Rev "D" SHEET 8 of 9

LIST OF COMPONENTS

Item	Tag No.	Description	Manufacturer	Manufactures Item Number	Manufactures Model / Type	Aerzen Item Number
1	-2K2B	Touch Display (HMI)	RSI ELECTOTECHNIK	007130	-	2000056926
2	-2K3B	AERtronic Module (CPU)	RSI ELECTOTECHNIK	-	-	2000056927
3	-2K4B	EM2 Module	RSI ELECTOTECHNIK	002240	AM2EM2	179758000
4	-6B4A	Pressure Transmitter (-1...+1 bar)	HUBA Control AG	501.914003141W	DT501	184639000
5	-6B5A	Pressure Transmitter (-1...+5 bar)	HUBA Control AG	501.914003141W	DT501	179702000
6	-6B7A	Pressure Transmitter (-1...+5 bar)	HUBA Control AG	501.914003141W	DT501	179702000
7	-8B2A	Pressure Transmitter (-1...+5 bar)	HUBA Control AG	501.914003141W	DT501	179702000
8	-7B2A	Temperature Sensor (-10...+300°C)	ELECTROTHERM	164681	PT1000, 160mm	164681001
9	-7B4A	Temperature Sensor (-10...+300°C)	ELECTROTHERM	164682	PT1000, 60mm	164682001
10	-1T3B	Circuit Breaker, 3-pole, 5 Amp	EATON	FAZ-C5/3-NA	FAZ Series	21-004882-3-05
11	-1T4B	Power Supply	BLOCK Transformatoren	PC-0324-100-0	PC-0324-100-0	2000020524
12	-11Q5D	Contacteur	Phoenix Contact	29 97 03 1	ELR W3-24DC/500AC	2000011470
13	-3S7B	E-Stop Button	MOELLER	-	M22-PV/(3)CK01	21-000988-01
14	-1F3B	Fuse Holder, 3-Pole	MERSEN (or Equivalent)	USCC3	USCC	21-004792-03
15	-1F3B	Fuse	MERSEN (or Equivalent)	-	ATDR	SEE TABLE
16	-X1 [1-3,5-7,9,10]	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
17	-X1 [4,8]	Terminal Block	Phoenix Contact	32 11 93 5	PTS 2.5-Twin-PE	181625000
18	-X2	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
19	-X3	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
20	-X4 [1-3,5-6]	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
21	-X4 [4]	Terminal Block	Phoenix Contact	32 11 93 5	PTS 2.5-Twin-PE	181625000
22	-X5	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
23	-X7	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
24	-X9 [1]	Terminal Block	Phoenix Contact	32 08 94 3	PT 4-FSI/F	21-005754
25	-X9 [1]	Fuse 10A	Eaton	ATM-10	ATM-10	21-005755
26	-X9 [2-4,7]	Terminal Block	Phoenix Contact	32 11 75 7	PT 4	21-005756
27	-X9 [5,6]	Terminal Block	Phoenix Contact	32 11 92 2	PT 4-TG	21-005749
28	-X9 [5,6]	Component Plug	Phoenix Contact	30 36 79 6	P-CO	21-005750
29	-X9 [5]	Resistor, 3.300kOhm	Conrad	403318-62	403318-62	2000000719
30	-X9 [6]	Resistor, 0.820kOhm	Conrad	403245-62	403245-62	2000000720
31	-X11	Terminal Block	Phoenix Contact	32 11 89 6	PTS 2.5-Twin	181623000
32	-EMC	Cable Shielding Bar	Icotek	36526	KEL-EMC 24 5	21-005984
33	-VS408	Vibration Sensor (0..25 mm/s)	IFM	VTV122	VTV122	21-004208-17
34	-VS411	Vibration Sensor (0..25 mm/s)	IFM	VTV122	VTV122	21-004208-17
35	-1F1B	Circuit Breaker	E-T-A	T110-K0BU-4A	4230	21-009285-1-040

Var.	Unit Size	[3] Fuse Size	Manufactures Model / Type	Aerzen Item Number
A	DN100/125	0.5 A	ADTR1/2	21-004793-0050
B	DN150	1.0 A	ADTR1	21-004793-0100
C	DN200	1.5 A	ADTR1-1/2	21-004793-0150
D	DN250/300	2.5 A	ADTR2-1/2	21-004793-0250

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Aerzen USA 108 Independence Way Coatesville, PA. 19320		AERTRONIC WIRING DIAGRAM IB-008291-N11	CLASS I Rev "D" SHEET 9 of 9
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Blower Control Architecture

MCP, AERTRONIC, & VFD INTEGRATION

Aerzen USA Corporation

108 Independence Way – Coatesville, PA 19320

Tel: (610) 380-0244 Fax: (610) 380-0278

www.aerzen.com/en-us



AERZEN

Document No.: A-1-0510 – Rev “B”

Date: 03.18.2020

Page 1 of 4

Introduction

The purpose of this document is to explore blower integration best practices and provide guidance to engineers and integrators regarding how to properly design and implement a blower control architecture which takes advantage of Aerzen offered features and machine protections.

WARNING! Failure to adhere to the approved integration methods described herein may result in the bypassing of unit safeties, the damage of machinery or personnel, and the voiding of Aerzen’s manufacturer’s warranty.

Aerzen supports two integration methods for our Hybrid, Blower, and Compressor products which will be discussed in detail from which the engineer/end user may choose to best suit their preferences.

Before reviewing the approved methods detailed below, it may help to first to define some terminology used throughout this guide:

- Supervisory Level (DCS)
 - SCADA/DCS/Master Control Panel (MCP) which perform lead/lag rotation, determine system demand, log data, and conduct the energizing or deenergizing of blower packages
- AERtronic LCP (AER)
 - The AERtronic controller is a robust and feature rich machine-mounted local control panel that has been designed with Aerzen’s rotating equipment in mind. The AERtronic has the ability to monitor blower hardware as well as interface with a VFD or RVSS which directly feeds the blower package mounted electric motor.
 - The AERtronic is a local control panel (LCP) [mounted on/near blowers] which monitors and operates blower specific instruments to ensure the blower package is safely operated: Cooling fans, Oil demisters, Temperature, Pressure, etc.
- Motor Power (VFD)
 - The device which powers the blower’s main drive motor: A variable frequency drive (VFD) or reduced voltage soft starter (RVSS)

ATTENTION: Once this document has been reviewed, please indicate which approved control method is preferred. There is a section at the end of this document for this purpose. Communicating facility preferences will enable Aerzen to deliver a package which may be easily integrated to the desired facility control architecture.

Blower Control Architecture

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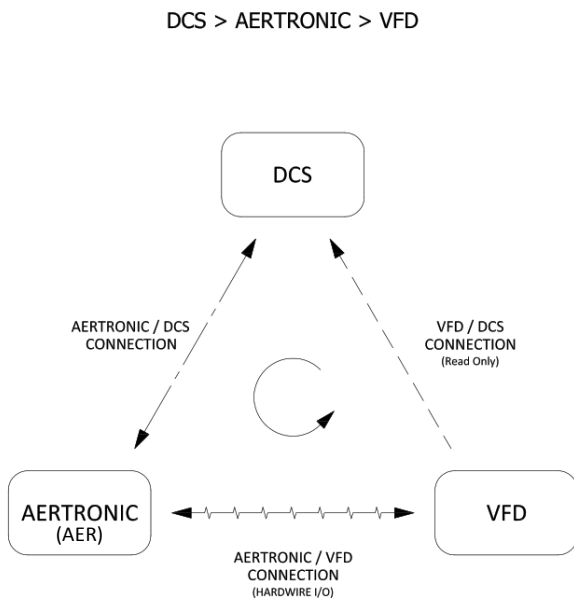
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Methods for Integrating the AERtronic Controller and Blower Package

Using Method 1: DCS -> AERtronic -> VFD

The AERtronic collects signals from the blower to provide a single point from which a DCS may interface for control and monitoring purposes. The AERtronic in this configuration acts as the local control point of operation and communicates all run and speed commands to the VFD/RVSS for implementation. Running all control signals (remote or local) through the AERtronic allows for the AERtronic to control when the unit can energize or de-energize in response to a fault. In this configuration, the blower system is protected. This control architecture described below as **Method 1** requires that the all local operation of the equipment occur through the AERtronic; bypassing the AERtronic to operate the VFD in hand will result in the equipment operating without proper protections in place. As such, proper precautions must be observed to prevent local operation of the equipment from the VFD.

Below, please find visuals which summarize the flow of control signals for blower systems configured according to **Method 1**:



Method 1: Signal Flow

<i>AERTRONIC (AER) / DCS CONNECTION *</i>		
Call to Run (Motor Start)	DCS	→ AER
Speed Command	DCS	→ AER
General Status/Fault Info	DCS	← AER

<i>AERTRONIC (AER) / VFD CONNECTION</i>		
Blower Run (Motor Start)	AER	→ VFD
Speed Command	AER	→ VFD
VFD Fault	AER	← VFD

<i>VFD / DCS CONNECTION * (Optional)</i>		
General Status	DCS	← VFD

* Available via EtherNet/IP or Modbus RTU protocols. Utilizing Ethernet/Serial protocols allows for the collection of additional data. For a full list, please refer to the AERtronic and VFD Manual or contact Aerzen.

Method 1: IO Chart

As depicted above, **Method 1** allows for the DCS to monitor the blower package through the AERtronic LCP and remotely issue run and speed commands. The starting and stopping of the machine shall be governed by the call to run signal, where a 1 or True corresponds with a run command, and a 0 or False corresponds with a stop command. These signals can be communicated via EtherNet/IP, Modbus RTU, Modbus TCP/IP, or through the use of hardwired (discrete and analog) signals.

Blower Control Architecture

MCP, AERTRONIC, & VFD INTEGRATION

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Using **Method 1**, Run and speed commands, are parsed by the AERtronic LCP and subsequently relayed to the VFD for implementation via hardwired communication methods. Please note, that the DCS also has the option to monitor the VFD through a read only connection – this read only connection is typically configured via an Ethernet protocol like EtherNet/IP. All local operation of the blower is performed at the unit on the AERtronic LCP – local operation from the VFD must be disabled.

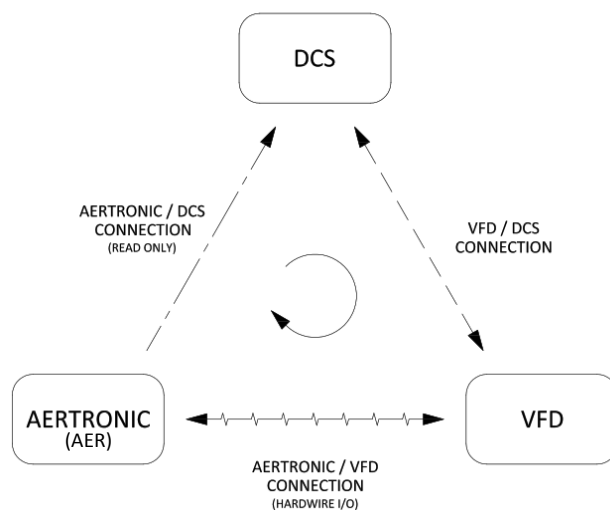
Using Method 2: DCS -> VFD -> AERtronic

Aerzen recommends integration **Method 2** Should the engineer/end user prefer an architecture where the DCS interfaces directly with the VFD. In this mode of operation, the AERtronic can be configured to function as a safety device which provides a fault and ready to run status to the VFD depending on blower conditions. To ensure that the AERtronic is starting the machine run hours counter, activating cooling fans, and running the oil demister (when equipped), the AERtronic will require that the VFD provide a Running status. When this running status is true, the AERtronic will run all safety routines, monitor the blower package, and run all cooling fans and oil demisters.

Please note that while Method 2 is in use, the local run functionality of the AERtronic must be disabled. Additionally, the DCS may set up a separate read-only communication pathway with the AERtronic should the DCS wish to gather machine specific data such as temperature, pressure, maintenance info etc.

Below, please find visuals which summarize the flow of control signals for blower systems configured according to **Method 2**:

DCS > VFD > AERTRONIC



Method 2: Signal Flow

<u>VFD / DCS CONNECTION*</u>	
Call to Run (Motor Start)	DCS → VFD
Speed Command	DCS → VFD
General Data/Fault Info	DCS ← VFD
<u>AERTRONIC (AER) / VFD CONNECTION</u>	
Motor Running	VFD → AER
Ready to Run (Permissive)	VFD ← AER
Blower Fault	VFD ← AER
<u>AERTRONIC (AER) / DCS CONNECTION* (Optional)</u>	
General Data	DCS ← AER

* Available via EtherNet/IP or Modbus RTU protocols. Utilizing Ethernet/Serial protocols allows for the collection of additional data. For a full list, please refer to the AERtronic and VFD Manual or contact Aerzen.

Method 2: Simple IO Chart

Blower Control Architecture

MCP, AERtronic, & VFD INTEGRATION

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Additional Considerations

Communication methods employed to connect the MCP, AERtronic LCP and VFD can be varied in the following manner:

- MCP to AERtronic LCP communication can be Modbus RTU or Ethernet IP
 - Aerzen can provide communication tables/IO maps, guidelines, and additional communication methods upon request
- **AERtronic LCP to VFD communication using Method 1 or Method 2 MUST be hardwired**
 - **4-20 mA Analog & 24VDC Discrete on/off signals**
- VFD to MCP communication is typically performed via Ethernet or Serial
 - Aerzen can provide details on VFD communication options, if VFDs are being provided by others – please contact the equipment provider

The connection between the AERtronic LCP and VFD **must** be hardwired to ensure that when an equipment fault occurs there is a direct path to the VFD to stop the motor. Reliance on a DCS or master control system to coordinate signals between a VFD and AERtronic in the absence of this hardwired communication pathway may result in the damage of the equipment, personal harm, and/or the voiding of Aerzen’s manufacturer’s warranty.

Lastly, Aerzen recommends that all site-specific wiring guidelines be followed. In the absence of a wiring schedule, 18 AWG twisted shielded pair cables are recommended for most (<1000 ft) analog and discrete hardwire applications; Cat5e/Cat6 ethernet cables are recommended for all ethernet communication applications (<300 ft). Should Ethernet via fiber be preferred, please ensure that this preference has been clarified with Aerzen.

Indicate Site Preferences:

I understand the approved integration methods available and select the following:

Method 1 – DCS -> AERtronic -> VFD

Method 2 – DCS -> VFD -> AERtronic

Other – Please contact Aerzen to clarify

The following communication methods / protocols are preferred for each connection:

Between DCS and AERtronic:

EtherNet/IP

Modbus RTU

Hardwired

Between AERtronic and VFD:

Hardwired

Between DCS and VFD:

EtherNet/IP

Modbus RTU

Hardwired

SOFTWARE MANUAL

CONTROL

AERTRONIC 2.0

Read the instructions prior to performing any task!
Keep for future reference!



AS-006 A

Translation of the original software manual
V1.02

Material no.: 2000060951

Doc content: 10-12-2020

Basic module 2000056927

HMI 2000056926

GB



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AERtronic 2.0, 5, en_GB

This manual was created by:
Technical documentation department of Aerzener Maschinenfabrik
GmbH
Technical editing and illustration
T-SE

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1 General Information

1.1 Information about these instructions

This instruction manual allows for the safe and efficient handling of the AERtronic control system. To improve legibility, the text of this manual will refer to the component simply as the “control system”.

This manual is an integral part of the control system and must be kept in the immediate vicinity of the control system so that it is accessible to personnel at all times. Keep this manual in a safe place for future reference.

Personnel must read these instructions carefully and have understood them before beginning work. A fundamental requirement for working safely is compliance with all specified safety notes and guidelines in this manual.

In addition, the local occupational health and general safety regulations applicable at the control system’s site of operation must be observed.

The illustrations in this manual serve to provide the user with a basic understanding and may deviate somewhat from the actual design.

The following is a list of additional, supplementary documents:

Wiring diagram

for delivery in switch cabinet

1.2 Explanation of symbols

Safety instructions

Safety instructions in this manual are illustrated using symbols. The safety instructions are organised into signalling words which designate the level of danger posed.



DANGER!

This combination of symbol and signalling word points to an imminently dangerous situation that could be fatal or lead to serious injury if it is not avoided.



WARNING!

This combination of symbol and signalling word points to a potentially dangerous situation that could be fatal or lead to serious injury if it is not avoided.



CAUTION!

This combination of symbol and signalling word points to a potentially dangerous situation that could lead to minor injuries if it is not avoided.



NOTICE!

This combination of symbol and signalling word points to a potentially dangerous situation that could lead to material damage if it is not avoided.



ENVIRONMENT!

This combination of symbol and signalling word points to a potential risk for the environment.

Safety instructions as part of operating guidelines

Safety instructions may relate to certain individual operating guidelines. These safety instructions are integrated into the operating guidelines themselves so as to simplify the task of reading while carrying out work. The signalling words mentioned above are used.

Example:

1. ➤ Loosen screw.

2. ➤



CAUTION!

Pinch hazard on the cover!

Close cover carefully.

3. ➤ Tighten screw.

Tips and recommendations



This symbol draws attention to useful tips and recommendations as well as information about efficient and trouble-free operation.

Special safety instructions


To draw attention to exceptional hazards, the following symbols are used as part of the safety instructions:

Warning signs






Type of danger

Warning – high-voltage.

Warning signs	Type of danger
	Warning – danger zone.

Additional designations

To draw attention to operating guidelines, events, listings, references and other elements in this manual, the following designations are used:

Designation	Explanation
 1., 2., 3. ...	Step-by-step operating guidelines
	References to sections of this manual and to relevant documentation
	Lists without a designated sequence
<i>[push-button]</i>	Control elements (e.g. push-buttons, switches), display elements (e.g. signal lamps)
<i>'Display'</i>	Screen elements (e.g. buttons, allocation of function keys)

1.3 Copyright protection

The content of this manual is protected by copyright. Its use is permitted within the context of using the control system. Any other use is not permitted unless there is written approval by the manufacturer.

1.4 Addresses

1.4.1 Manufacturer

Tab. 1: Manufacturer

Address	Aerzener Maschinenfabrik GmbH Reherweg 28 31855 Aerzen Germany
Telephone	+49 (0) 51 54 81-0
Fax	+49 (0) 51 54 81-9191

E-mail	info@aerzen.com
Internet	www.aerzen.com

1.4.2 Customer service



The screenshot shows a mobile application interface with a navigation bar at the top containing an information icon (i), a back arrow, and the word "Info". Below the navigation bar, there are several sections:

- Home icon:** Aerzener Maschinenfabrik GmbH, Reherweg 28, D-31855 Aerzen
- Service icon:** Service 100h, 11:42, 11.12.2020
- Phone icon:**
 - Telefon: +49 5154 81-0
 - Telefax: +49 5154 81-9191
 - E-Mail: info@aerzen.com
 - Internet: www.aerzen.com
- Play icon:**
 - AERtronic Basic**
 - Softwareversion: V1.04-RC2
 - Hardwareversion: V1.10
- Up arrow icon:** (No text associated)

On the right side of the screen, there is a QR code with the AERZEN logo in the center. Below the QR code, the text reads: "Entdecke alle Möglichkeiten von AERtronic. Jetzt Upgrade anfragen." and "Scanne den QR-Code, oder besuche www.aerzen.com/getmore".

Fig. 1: Customer service_01

Our customer service staff are on hand to provide you with technical information. Details of whom to contact can be found below the Info button.

In addition, we are always interested in receiving information and feedback pertaining to use that could be valuable in helping us improve our products.



2 Safety

This section gives an overview of all important safety aspects relevant to the protection of persons and to safe and trouble-free operation. Further task-based safety instructions are contained in the section on the individual phases of the control system's service life.

Non-compliance with the handling and safety instructions provided in this manual can lead to serious hazards.

The following section outlines the residual risks and hazards during the service life of the product that may arise as a result of non-compliance with safety instructions or disabling of safety equipment.

In order to reduce health and safety risks and to avoid dangerous situations, observe the safety and warning notes in this manual.

2.1 Residual risks and fundamental risks

The following chapter states the general residual risks that have been established on the basis of a risk analysis.

- Compliance with these safety instructions and the safety instructions in the main chapters reduces the risk of personal injury, property damage and environmental harm and prevents dangerous situations.

2.1.1 Electrical hazards

Electric current

**DANGER!****Risk of fatal injury from electric current!**

Electrical components carry live grid voltage. Coming into contact with live parts poses an immediate and potentially fatal risk of an electric shock.

- Do not touch electrical components without express permission.
- Never open the control system's electrical components.
- Work on the electrical system should only be carried out by qualified electrical personnel.
- Never pull electrical cables.
- If the power supply's insulation is damaged, switch off the machine immediately and have the damage repaired.
- Only open the control system housing when it is electrically dead.
- Only perform work on the control system when it is electrically dead.
- Observe all regulations governing the installation of low-voltage systems.
- Observe the safety notes for the installed switchgear units.
- Install suitable emergency circuit breakers in the power grid connection.
- Install a fault-current circuit breaker with a fault current rating of 30 mA to prevent contact voltages in the event of a malfunction.

2.1.2 Hazards at the installation site and operating site

Water contact with live components

**DANGER!****Risk of fatal injury from water contact with live components!**

There is a risk of fatal injury when performing cleaning using water near live components. Water spray may enter electrical and electronic components.

- Do not use water.
- When performing cleaning operations, proceed with care and make sure that no water comes into contact with live components.
- Water spray must not enter electrical and electronic components.

Electric shock from physical contact



DANGER!

Electric shock through damage to electrical components!

If the control system is not securely fastened at the installation site, it may topple and fall. Electrical components could come loose and be dislodged from their brackets, potentially conducting electrical current to the switch cabinet housing. Touching the switch cabinet can lead to serious or fatal injuries resulting from an electric shock.

- Use suitable fasteners to secure the control system.
- Choose fasteners based on the character of the underlying surface.

2.2 Intended use



Fig. 2: Correct use

The **AERtronic 2.0** is a two-part control system for rotary piston machines, such as positive displacement blowers, screw and rotary lobe compressors.

The control system is designed for commercial use and long continuous operating periods. The intended use is not possible in areas with potentially explosive atmospheres resulting from gas/air mixtures.

The **AERtronic control system** has been designed and constructed solely for its “intended use” in the industrial field, as described here.

Observe and comply with the order-related operating data and application limits.

This intended use also includes compliance with all information in this instruction manual.

Any use beyond the intended use or any other type of application is considered misuse.

2.3 Foreseeable misuse

Serious injury


DANGER!

Danger in case of misuse! Dangerous situations could occur that may lead to fatal or serious injury!

- Never disregard the instructions for “intended use”.
- Never operate it in an operating area other than the one intended.
- Never disregard the following information on misuse.

Serious material damage


NOTICE!

Danger in case of misuse! Situations may occur that result in damage to property!

- Never disregard the instructions for “intended use”.
- Never operate the valve in an operating area other than the one intended.
- Never disregard the following information on misuse.

Misuse



Fig. 3: Prohibited use

The control system is not intended for:

- Controlling machines other than air-displacement machines and turbomachinery.
- Alteration, retrofitting or modification of the overall design or of individual equipment parts, with the aim of altering the field of application or scope of use.

Further examples of misuse

The following fields of application and uses are considered improper and must be avoided!

■ Operation:

- outside the scope of intended use.
- outside the scope of the intended operating data.
- in a potentially explosive atmosphere.
- with missing or damaged components.
- without any or with damaged protective equipment.

- **Installation:**
 - installation on inclined, sloped or lamellar surfaces.
 - installation outdoors without due consideration of particular protective measures for avoiding the effects of weather conditions.
 - open flames or sparking in the immediate vicinity of the control system.

2.4 Responsibility of the operator

Operator

The operator is the person who either operates the control system himself, for commercial or business purposes, or who assigns its use to a third party. During operation, the operator holds legal responsibility pertaining to the product, for the protection of the user, personnel or a third party.

Operator's obligations

The control system is used for commercial purposes. The operator of the control system is thus subject to the applicable legal obligations for occupational safety.

Alongside the safety instructions in this manual, the safety, occupational and environmental regulations applicable to the control system's site of operation must also be complied with.

The operator is obligated to:

- Inform himself about the applicable occupational protection regulations. The operator must also perform a risk assessment to determine the hazards that may result from the specific working conditions at the control system's site of operation. The operator must document these hazards and how to avoid them in operating instructions for the control system. The necessary safety data sheets can be obtained from the relevant manufacturer.
- Check regularly throughout the control system's entire service life that the drafted operating instructions still fulfil the requirements of any applicable regulations. If necessary, adjust the operating instructions accordingly.
- Clearly define and appoint responsibilities for installation, operation, fault rectification, maintenance and cleaning.
- Ensure that all persons who come into contact with the control system have read and understood this manual. Regularly provide personnel training and inform personnel of the work-related hazards.
- Provide personnel with the necessary protective equipment and communicate to them that wearing this protective equipment is compulsory.

**Additional obligations of the operator**

The operator must ensure that the following requirements are complied with and put into practice:

- Only operate the control system in its original delivered condition. In cases where the operator adds his own fittings or makes modifications, the manufacturer's declaration of conformity is rendered void.
- Any working behaviour that may render the control system unsafe is prohibited.
- The control system must always be kept in a flawless technical condition that ensures safe operation. Replace damaged or non-operational components immediately. If in doubt, be sure to contact the manufacturer or the responsible contact person.
- Make sure that all warnings and notices displayed on the control system are observed and kept legible. You must replace loose or illegible signs. Ask the manufacturer for replacements.
- Do not disassemble or incorrectly fit any electrical or mechanical connections.
- For protection against potential damage caused by lightning, make sure a suitable earthing system is in place.

2.5 Spare parts**Use of incorrect replacement parts****CAUTION!****Safety risk from using incorrect replacement parts!**

Incorrect, defective or unsuitable replacement parts or copies of original components may endanger personal safety and lead to damage, faults or the total failure of the control system.

- Only use the manufacturer's original replacement parts or parts approved by the manufacturer.
- If in doubt, always contact the manufacturer.

Purchase replacement parts from an authorized dealer or from the manufacturer directly. For contact information see Customer service .

Replacement parts

Replacement parts that have not been provided by AERZEN have not been tested or approved. They do not correspond to the original components. The use of such products can potentially have an effect on the default design characteristics of the system. The manufacturer assumes no liability for damage resulting from the use of non-original components.

2.6 Requirements for personnel

2.6.1 Qualifications

The various tasks described in this instruction manual represent a variety of requirements in terms of the qualifications of the persons responsible for carrying out these tasks.

Insufficient qualifications

**WARNING!****Risk if persons are not sufficiently qualified!**

Insufficiently trained/skilled persons are unable to gauge the risks presented by the use of the control system and put themselves, and others, at risk of serious or fatal injury.

- Only allow work to be carried out by suitably qualified persons.
- Observe the information on qualifications in this manual.
- Keep insufficiently qualified persons away from the operating range of the machine.

For the purposes of all work with this machine, only allow persons who are expected to carry out their work reliably to do so. Persons whose reaction times have been impaired, e.g. through drug or alcohol consumption or medication, must not be permitted to work.

This instruction manual contains the following qualification requirements for the various tasks:

User control system

The operator has instructed the machine user in machine control system operation. The machine user is capable of using the control system via the user interface. The machine user is prohibited from using the administrator interface. The machine user has been informed of potential hazards resulting from operation and from improper behaviour. Tasks that go beyond those for which the machine user is trained or instructed may only be carried out if these tasks are listed in this instruction manual and the operator has expressly designated these tasks to the user.



2.6.2 Unauthorised personnel

Unauthorised personnel in the installation area



WARNING!

Risk of fatal injury for unauthorised persons in the installation area!

Unauthorised persons who do not fulfil the requirements described here, are not familiar with the hazards in the installation area. Therefore, unauthorised persons are at risk of serious or fatal injury.

- Keep unauthorised persons away from the installation area.
- If in doubt, instruct such persons to leave the installation area.
- Stop all work as long as unauthorised persons are in the installation area.



2.7 Personal protective equipment

Personal protective equipment serves to protect persons from breaches of safety and health hazards when working.

Personnel, when working near or with the control system, must wear the specified personal protective equipment.

Description of personal protective equipment

The following is a description of the personal protective equipment:



Protective work clothing (7010-M010)

Protective work clothing is tight-fitting work clothing with minimal tensile strength, tight sleeves and without protruding parts.



Safety shoes (7010-M008)

Safety shoes protect feet from being crushed, from falling objects and from slipping on slippery surfaces.

2.8 Environmental protection

Environmentally hazardous materials



ENVIRONMENT!

Improper handling of environmentally hazardous materials presents a threat to the environment!

Incorrect handling of environmentally hazardous materials, particularly in the case of improper disposal, can cause considerable damage to the environment.

- Always observe the information below on the handling of environmentally hazardous materials and their disposal.
- If environmentally hazardous materials are inadvertently released into the environment, take appropriate action immediately. If in doubt, inform the responsible local authority about the damage and seek advice on taking appropriate measures.

The following environmentally hazardous materials are used:

Electronics

Electrical and electronic components may contain poisonous material. These components must be collected separately and deposited at local collection points or disposed of by specialist companies.

3 Function

The AERtronic 2.0 is a two-part control system for rotary piston machines, such as positive displacement blowers, screw and rotary lobe compressors. The AERtronic 2.0 TAN is equipped with a colour graphics display and a touchscreen. The AERtronic 2.0 module controls the system via its inputs and outputs. The display unit can only be used in combination with the I/O module, whereas the module unit is also able to function independently. All operating parameters are set to basic settings in the default settings of the AERtronic 2.0 TAN. These parameters can be adapted for the respective system during initial commissioning.

The AERtronic 2.0 TAN is easy and intuitive to operate. All important information and functions, such as start-up and shut-down procedure, operating parameters and current state, are displayed clearly.

The AERtronic 2.0 is available in two versions, which differ from each other in terms of the scope of their functions: Basic and Advanced. The former only offers the option of monitoring the most important operating parameters, while the Advanced version offers the full scope of functions for control and regulation.

The functions of the Advanced version are explained in the following section. Chapter 8 explains the differences between it and the Basic version.

Chapters 4-8 also relate to the Advanced version. Subsequent chapters relate to the Basic version.

4 Installation/configuration

4.1 HMI

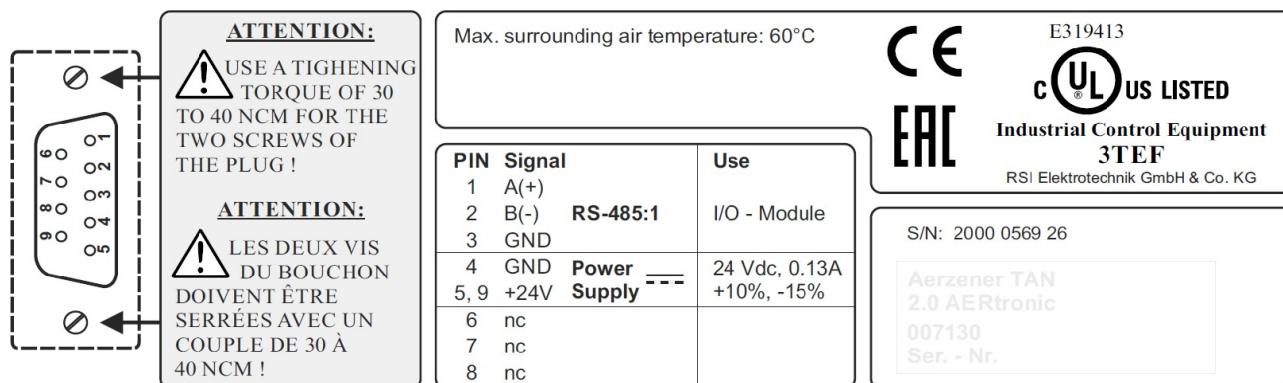


Fig. 4: AERtronic 2.0 HMI sticker

Tab. 2: HMI terminal assignment

Pin	Description	Function	Terminal
1	RS485-1 A(+)	IO module interface	X1 – Sub-D 9-pin
2	RS485-1 B(-)		
3	GND		
4	GND	Ground	
5	24V DC (+10%, -15%)		
6	NC	Supply voltage	
7	NC		
8	NC		
9	24V DC (+10%, -15%)	Supply voltage	

4.2 IO module

The IO module is located in the instrument cabinet of the units.

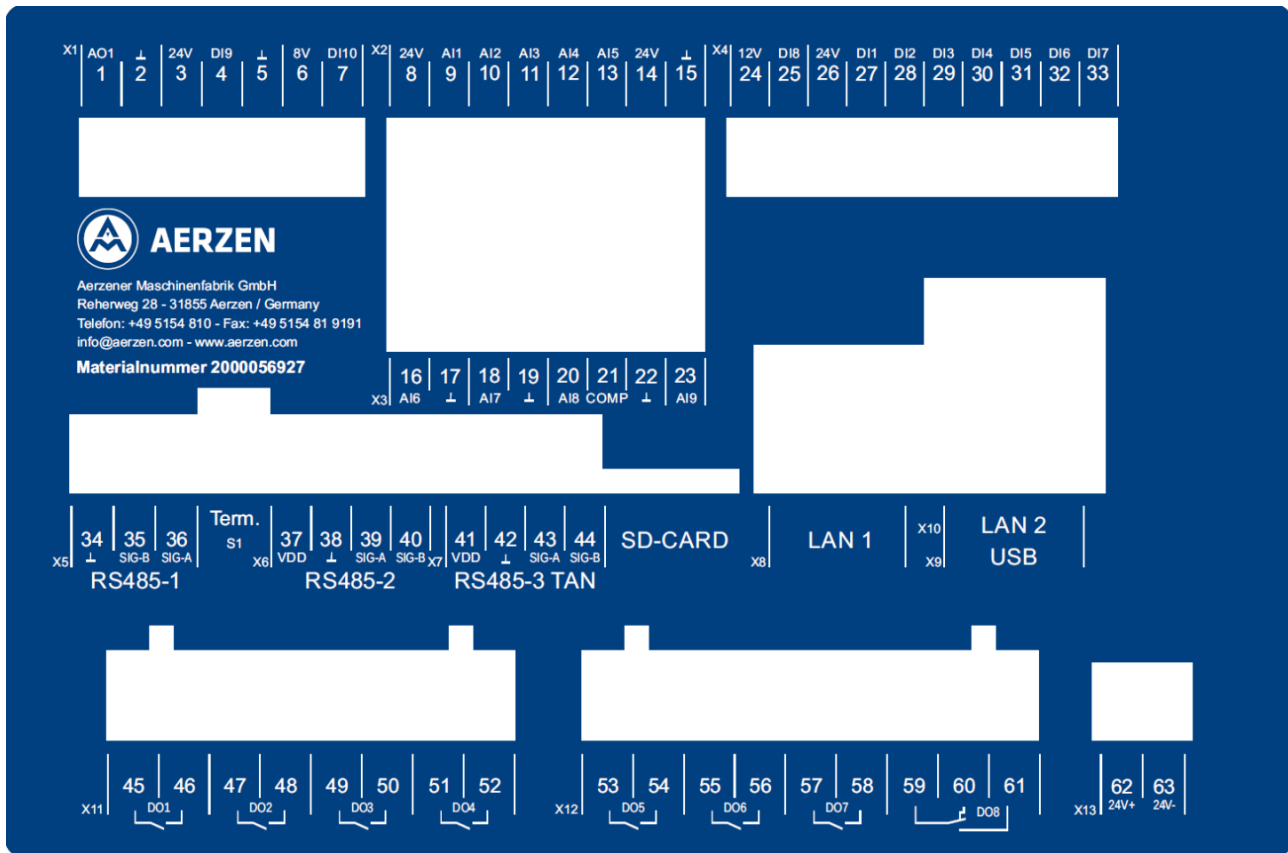


Fig. 5: AERtronic 2.0 IO module front sticker

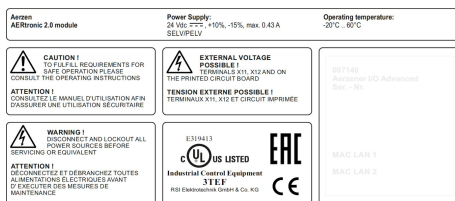


Fig. 6: IO module_01

Tab. 3: AERtronic 2.0 module terminal assignment

Pin	Description	Function	Terminal
1	AO1 4..20mA	Analogue output 4..20 mA	X1 - Phoenix Grid 3.81 mm, 7-pin
2	AO1 GND	Analogue output, ground	
3	DI 24V	Digital input 9 supply voltage	
4	DI9 SEP	Digital input 9 oil demister	
5	GND	Ground	



6	DI10 8V	Digital input 10 supply voltage	X2/3 - Phoenix Grid 3.81 mm, 2 x 8-pin X2/3 - Phoenix Grid 3.81 mm, 2 x 8-pin
7	DI10 Namur	Digital input 10 Namur	
8	V AI	Analogue input supply voltage	
9	AI1 4..20mA	Analogue input 1 4..20 mA	
10	AI2 4..20mA	Analogue input 2 4..20 mA	
11	AI3 4..20mA	Analogue input 3 4..20 mA	
12	AI4 4..20mA	Analogue input 4 4..20 mA	
13	AI5 4..20mA	Analogue input 5 4..20 mA	X2/3 - Phoenix Grid 3.81 mm, 2 x 8-pin
14	V AI	Analogue input supply voltage	
15	AI GND	Analogue input, ground	
16	AI6 PT100 / PT1000	Analogue input 6 PT100 / PT1000	
17	AI6 GND	Analogue input 6, ground	
18	AI7 PT100 / PT1000	Analogue input 7 PT100 / PT1000	
19	AI7 GND	Analogue input 7, ground	
20	AI8 PT100 / PT1000	Analogue input 8 PT100 / PT1000	
21	AI8 PT100 / PT1000	Analogue input 8 PT100 compensation	
22	AI8 GND	Analogue input 8, ground	
23	AI9 0..5V	Analogue input 9 0..5V	X4 - Phoenix Grid 3.81 mm, 10-pin
24	V PTC	PTC 12V supply voltage	
25	DI8 PTC	Digital input PTC	
26	V DI	24V digital input supply voltage	
27	DI1	Digital input 1	
28	DI2	Digital input 2	
29	DI3	Digital input 3	
30	DI4	Digital input 4	
31	DI5	Digital input 5	



IO module

32	DI6	Digital input 6	
33	DI7	Digital input 7	
34	GND	RS485-1	X5 - Phoenix Grid 3.81 mm, 3-pin
35	SIG-B		
36	SIG-A		
37	VDD	RS485-2	X11 - Phoenix Grid 5 mm, 8-pin
38	GND		
39	SIG-A		
40	SIG-B		
41	VDD	RS485-3 HMI interface	X7 - Phoenix Grid 3.81 mm, 4-pin
42	GND		
43	SIG-A		
44	SIG-B		
45	DO1 (Com)	Relay output 1	X11 - Phoenix Grid 5 mm, 8-pin
46	DO1 (NO)		
47	DO2 (Com)	Relay output 2	
48	DO2 (NO)		
49	DO3 (Com)	Relay output 3	
50	DO3 (NO)		
51	DO4 (Com)	Relay output 4	
52	DO4 (NO)		
53	DO5 (Com)	Relay output 5	X12 - Phoenix Grid 5 mm, 9-pin
54	DO5 (NO)		
55	DO6 (Com)	Relay output 6	
56	DO6 (NO)		
57	DO7 (Com)	Relay output 7	
58	DO7 (NO)		
59	DO8 (Com)	Relay output 8	
60	DO8 (NC)		
61	DO8 (NO)		
62	24 V+	Supply voltage Please note: ensure correct polarity!	X13 – Phoenix Grid 3.81 mm, 2-pin
63	24 V-		
LAN 1 interface			X8



USB interface	X9
LAN 2 interface	X10

5 Operation

After being switched on, the display unit displays a welcome screen for approx. 60 seconds. The display then changes to the basic display.

The control unit features a resistive colour touchscreen with a resolution of 800 x 480 pixels. It has the requisite robustness for industrial use and is easy to operate. Gently tapping the relevant control element – with your finger or a pen – is sufficient for making the desired entry. You can also operate it if you are wearing gloves.

5.1 Safety instructions

Improper operation



NOTICE!

Improper operation may lead to considerable damage.

- Carry out all activities in accordance with the information and notes in this instruction manual.
- Knowledge of machine-specific settings and requirements is necessary.

Personnel requirements

Operation requires:

Operating the control system

Personnel: User control system

Protective equipment

Operation requires:

Protective equipment: Protective work clothing (7010-M010)

Safety shoes (7010-M008)

5.2 Display structure

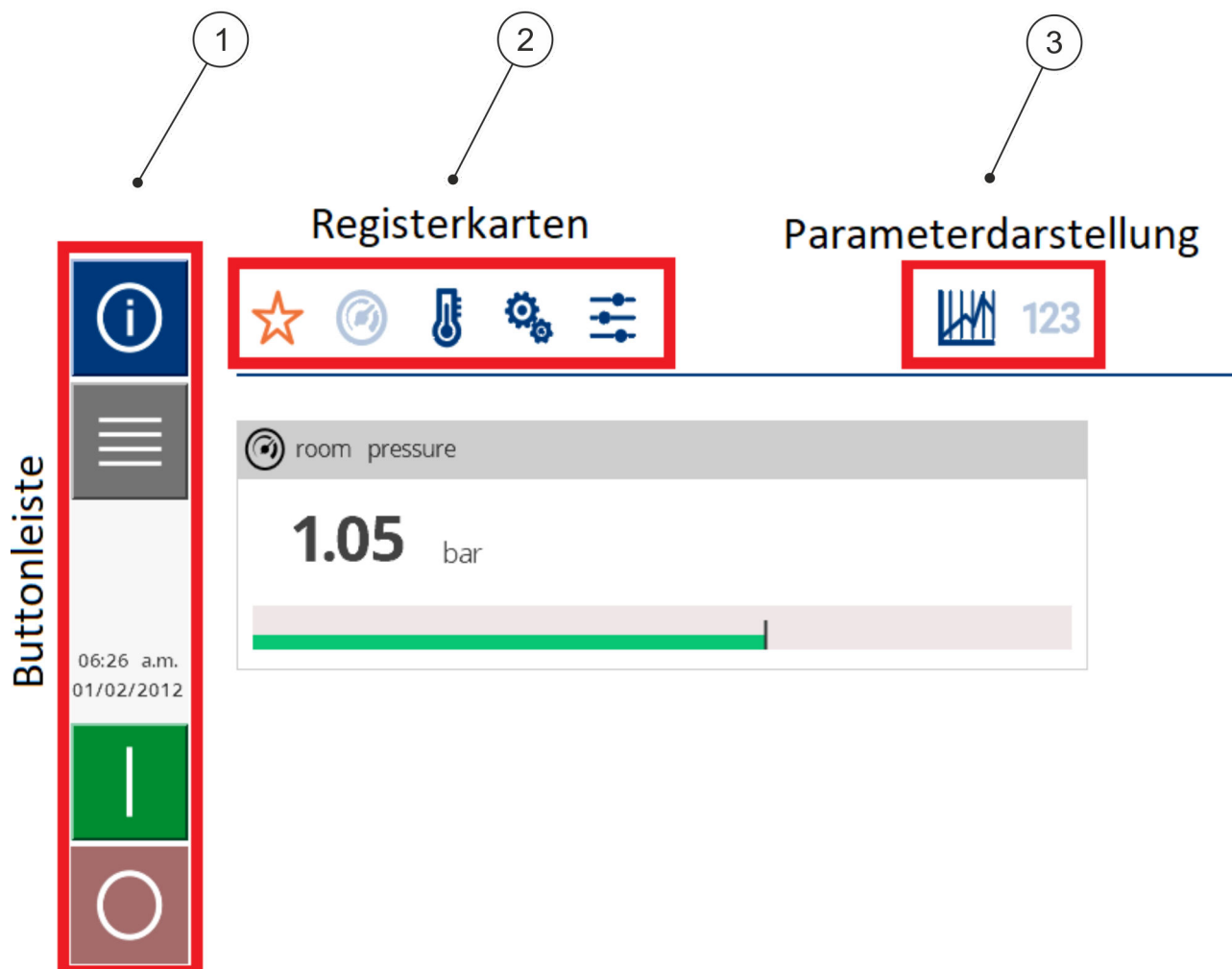


Fig. 7: Display structure

- 1 List of buttons
- 2 Tab

- 3 Parameter representation


The figure depicts the user interface of the AERtronic 2.0 HMI. The following display elements are used on the user interface:

5.2.1 Button bar in the basic display

There are four buttons on the left-hand side of the basic display. These buttons enable access to all important functions and information. The buttons are assigned as follows from top to bottom:



The Messages button indicates whether there are any messages pending and, if so, what such messages are. If an icon has a blue background, this means that the control system is working flawlessly, whereas an icon that has a red or yellow background indicates that there is a fault, a warning or a maintenance message pending. The icon also flashes red if faults are not acknowledged and flashes yellow if warnings are not acknowledged. In addition, the top bar of the default display is covered by a bar of the same colour in which the message code with a description is shown. The button can also be used to call up the Information menu.

The Information menu  on page 78 and Messages menu can both be called up via the Info button. The icon has a blue background if there are no faults pending. In such cases, you are taken directly to the Information page where all necessary information about Aerzen and the control system installed is summarised. Scanning the QR code will take you directly to the Aerzen website.


If there is a message pending, the message icon has a red background for faults or a yellow background for warnings and maintenance. If new messages occur, the icon flashes and the title bar with the tabs also changes colour.



Fig. 8: Information menu



Fig. 9: Messages menu

This bar does not disappear until the Messages menu has been called up by tapping the icon. The individual messages are listed with the date and time as well as the associated colour. The arrow icon in the top left will take you back to the previous display. You can acknowledge warnings with the confirmation button. Faults with a red background cannot be acknowledged until the cause of the fault has been rectified. All messages that have ever been listed in the Messages menu are stored in the Fault memory  Chapter 7.3.3 'Fault memory menu' on page 48. As also applies to the Settings menu and Main menu, you will be returned to the default display automatically following one minute of inactivity. If there are messages pending, the Information menu can be called up by tapping the message icon again.



Please note: The Information menu may also appear at irregular intervals of between one and two weeks! This is not a fault.



The Settings button enables access to the menu system (5). All adjustment and displays parameters are located there.



This button appears as soon as settings have been selected and enables a return to the basic display.



On button. The machine can be switched on here. The icon also indicates the operating status.

The On and Off buttons fade out in the event of digital remote maintenance and a padlock appears in front of them. Both buttons are deactivated at this time.



The On button is displayed as a compressor icon when the machine is in operation. The button flashes when the machine is starting up or coming to a stop.



The Off button can be used to switch off the machine.

5.2.2 Tab in the basic display

The tabs for displaying the parameters are located on the top bar of the basic display.



In the Favourites tab, the numerical values for up to any four operating parameters can be displayed (selection of the available analogue values).



In the Pressure ranges tab, all pressure inputs read by the AERtronic 2.0 module are recorded.



In the Temperature ranges tab, all temperature inputs read by the AERtronic 2.0 module are recorded.



In the Speed/Oil level/Control variable/Vibration tab, all other inputs read by the AERtronic 2.0 module are recorded.

The control variable can also be specified manually here if configured appropriately.



The regulation parameters are displayed via the Regulation tab
 ↪ *Chapter 7.1.1 'Regulation menu' on page 38.*

This is only visible if:

- a regulator has been activated in the Regulation menu.
- the "active" function was set to Yes in the respective submenu of the section ↪ *Chapter 7.1 'Control menu' on page 38*



The Graphical representation tab is only visible if one of the following tabs has been selected: Pressure/Temperature ranges or Speed/Oil level/Control variable/Vibration. This makes it possible to display the parameters, which are displayed via the tabs described above, in a diagram ↪ *Chapter 6.2.2 'Graphic representation' on page 33.*



The Numeric representation tab is only visible if one of the following tabs has been selected: Pressure/Temperature ranges or Speed/Oil level/Control variable/Vibration. This makes it possible to display the parameters, which are displayed via the tabs described above, as numerical values ↪ *Chapter 6.2.1 'Numerical representation' on page 32.*

5.2.3 Other operating and display elements

Scrolling and browsing



If the contents exceed a single page, a bar appears on the right-hand side of the display to indicate the image section currently being displayed. It is possible to scroll up and down using the arrows that appear. This is done by row or page depending on the content.

Arrow keys



The arrow key appears in the Settings, in the Main menu and in the submenus and enables the call-up of the immediately preceding page. It is shown in the top left next to the menu bar.



The confirmation button appears if an entry is to be accepted. The arrow key can also be deselected should you wish to cancel.



The data transmission icon is displayed in the top-right corner if data to be displayed still needs to be loaded (e.g. in the Fault memory menu [Chapter 7.3.3 'Fault memory menu' on page 48](#)). The icon disappears again upon completion.

Keyboard

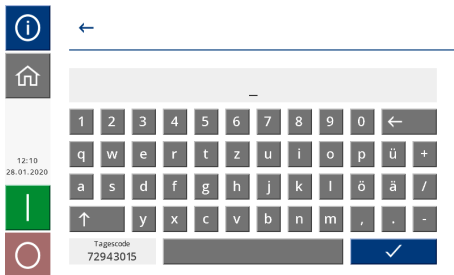


Fig. 10: Password entry

A virtual keyboard appears in some menus for operation purposes. Operation therefore recreates the experience of using a real keyboard. Backspace can be used to delete the most recently entered character and Shift can be used to select capital letters. The password is accepted by pressing the blue confirmation button in the bottom right.

Number entry

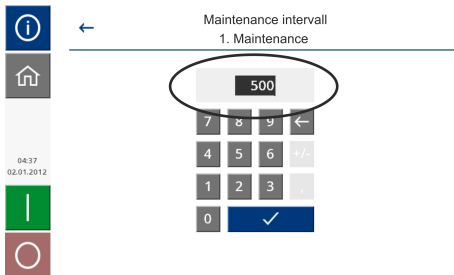


Fig. 11: Number entry

A virtual numeric keypad appears in many input fields. The numbers can be used to enter a numerical value in the light grey upper field. If a value is valid, it can be accepted via the blue field with the tick. The validity of the value is dependent on the respective size. The blue confirmation field is inactive if a value is invalid.

6 Program overview/fundamentals

6.1 Menu structure

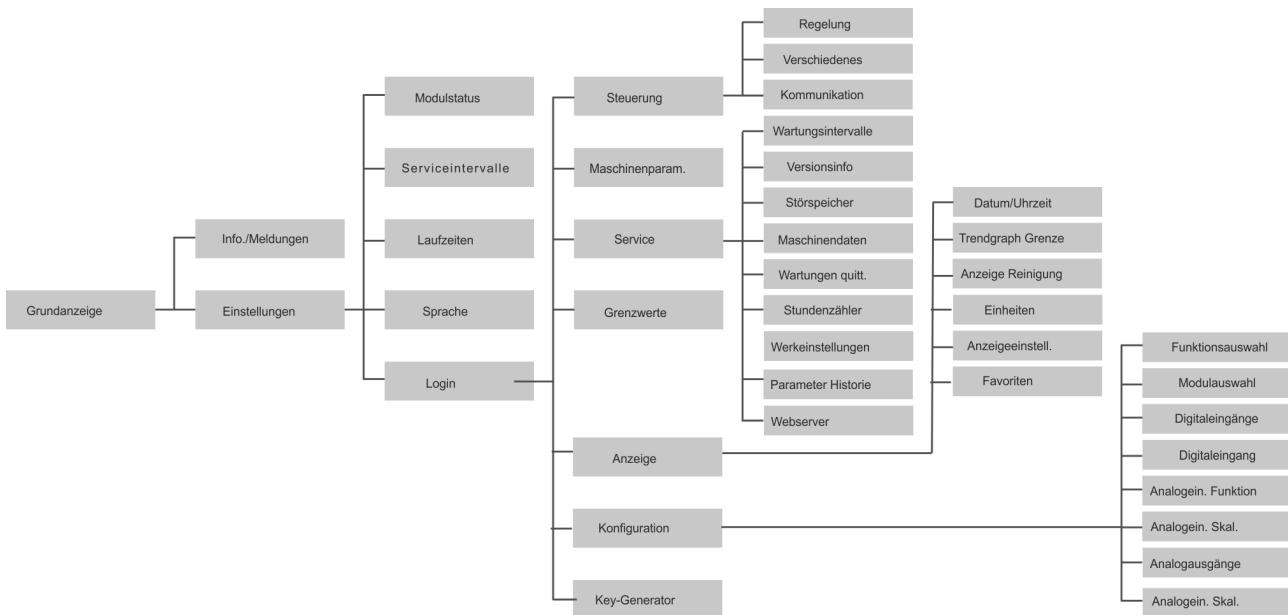


Fig. 12: Menu structure

6.2 Parameter representation in the basic display

Each tab in the basic display enables representation of various operating parameters. Such parameters are dependent on the current configuration in the Configuration menu. If several parameters are available for a type, a scrollbar appears on the right-hand side. This arrow keys of the scrollbar can be used to cycle through the parameters.

6.2.1 Numerical representation

123

Tapping the field displays the operating parameters for the Pressure range, Temperature range and the Speed/Oil level/Control variable/Vibration including name, decimal value and unit in a rectangular box. The parameter type icon is shown in the very top left of the title bar of the rectangle, in the same way as it is used in the tabs (Pressure, Temperature and Speed/Oil level/Control variable/Vibration).

Operating parameters



Fig. 13: Numerical representation of operating parameters

The numerical representation for the Regulation tab is structured differently. Here, the three control variables (set value, actual value and control value with the abbreviations W, X and Y) are displayed line by line with an associated bar, decimal value and unit. Further buttons are also located in this window.

Manual / Auto

Regulation is activated via the Auto button. The Manual button enables direct entry of the control variable. This can also be done in the Regulation menu. Regulation is inactive in this case.

Parameters

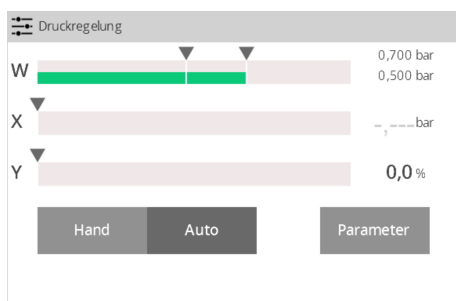


Fig. 14: Numerical representation of regulation

The Parameters button takes you directly to the Regulation menu, in which all parameters and other regulation types can be adjusted.

6.2.2 Graphic representation

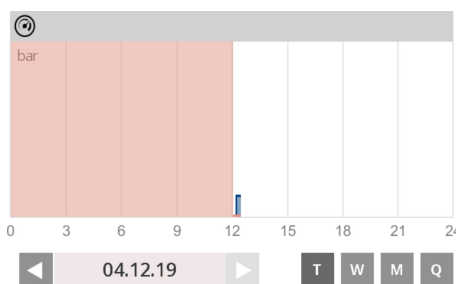


Fig. 15: Operating parameters

Tapping this field shows the time course of the operating parameters in a diagram. The time axis can be adjusted using the buttons in the bottom right. Progression over a 24-hour day (T), a 7-day week (W), a month (M) or a quarter (Q) can be selected. The day/week/month/quarter that the time axis is to represent can be set in the selection field on the left next to the time axis setting.

6.3 Settings

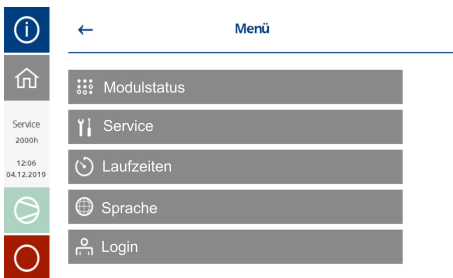


The button can be used to access the Settings menu of the AERtronic 2.0 HMI. Here you have the option of selecting the following submenus:

- Module status
- Service
- Runtimes
- Language
- Login



If a minute elapses without any operation, the display automatically exits the menu and returns to the basic display. Alternatively, the Home button can be used to return to the basic display at any time.



Information elements in the basic display: The time remaining until the next service is shown in hours in the middle of the left-hand bar next to the current date and time.

The following applies to the Settings menu and the respective sub-menu: the control system automatically returns to the basic display after a dwell time of one minute without action has elapsed. Alternatively, the button can also be used to return to the basic display at any time.

Fig. 16: Module status

6.3.1 Module status

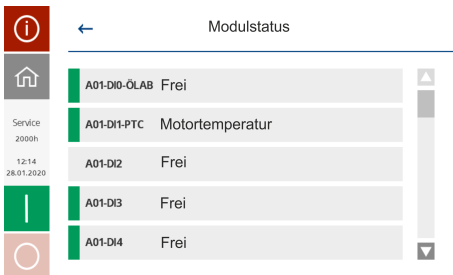
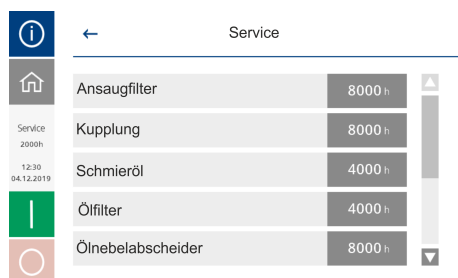


Fig. 17: Module status

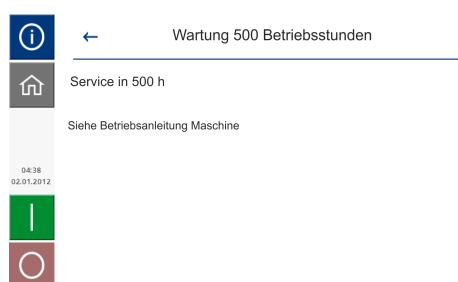
Here you can check the status of all digital inputs and outputs of all connected module units. Each individual input or output is shown in a row. The labelling follows the scheme that the basic module is given the designation A01 and all other modules are given the designation A0x (x = 3, 4 ...) (the numbering follows the familiar scheme from AERtronic 1.0). The function of the input/output is described next to it, whereby unassigned, empty inputs/outputs are also listed. The assignment can be changed in the submenu of the Configuration menu 6.6. An active input/output is indicated by a green bar at the left-hand end of the row, whereas an inactive input/output is indicated by a grey bar. This display is dependent on whether an input/output has been assigned a function or is set to "empty".

6.3.2 Service



The maintenance time with the dark grey background can be selected.

Fig. 18: Service



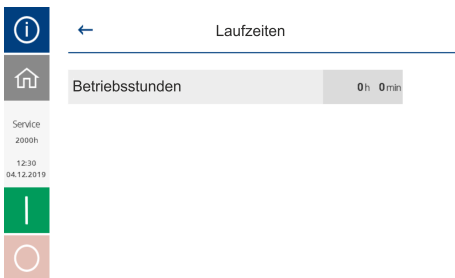
A page appears with additional information about the selected maintenance interval.

Fig. 19: Maintenance interval info

The times until next maintenance are shown on the first page of the Service menu.

- Maintenance every 500 operating hours
- Maintenance daily
- Maintenance weekly
- Maintenance monthly
- Maintenance every 2,000 operating hours or every 3 months (listed in hours and days)
- Maintenance every 4,000 operating hours or every 6 months (listed in hours and days)
- Maintenance every 8,000 operating hours or every 12 months (listed in hours and days)
- Maintenance every 16,000 operating hours or every 2 years (listed in hours and days)
- Maintenance every 20,000 operating hours or every 3 years (listed in hours and days)
- Maintenance every 30,000 operating hours or every 4 years (listed in hours and days)
- Maintenance every 40,000 operating hours or every 5 years (listed in hours and days)
- Motor relubrication device
- Motor maintenance (listed in days and hours)

6.3.3 Runtimes



The current operating hours are displayed.

Fig. 20: Runtimes

6.4 Language

The following languages are available:

- German
- English
- French
- Italian
- Spanish
- Portuguese
- Dutch
- Russian
- Chinese
- Czech
- Polish
- Danish
- Swedish
- Norwegian
- Finnish
- Turkish
- Bulgarian
- Greek
- Estonian
- Croatian
- Hungarian
- Latvian
- Romanian
- Slovakian
- Slovenian



6.5 Login/code entry

A virtual keyboard is shown in the Login menu. This keyboard can be used to log in as Administrator or User. The Day code is also displayed in the bottom left-hand corner. This grants Super Admin rights. The following table provides information about the valid codes that exist in delivery state.

Code	Access level	Description
12345	User	Lowest access level Grants access only to basic functions such as Regulation and Display settings.
Other settable codes (Key generator)		

Using the Login menu and one of the codes from the table above (except for the code for screenshots) will automatically take you to the Main menu of the AERtronic 2.0 HMI. Any other entries will take you to the Settings. The code that is entered determines which adjustment options are available to the user in the Main menu.

7 Main menu

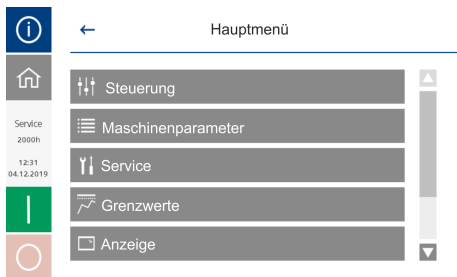


Fig. 21: Main menu

The Main menu ↗ *Chapter 7 'Main menu' on page 38* is only accessible if you have at least the minimum user rights for the console.

You can access the Main menu by navigating to Login in the Settings menu and entering the relevant User/Admin code. ↗ *Chapter 11.1 'Access' on page 101*

The Main menu consists of the following submenus:

- Control
- Machine parameters
- Service
- Limits
- Display
- Configuration
- Key generator

7.1 Control menu

The control menu consists of the following submenus:

- Regulation
- Miscellaneous
- Communication

7.1.1 Regulation menu

This menu contains the following menu subchapters:

Tab. 4: Available regulations

Parameter		
Pressure regulation		
Oxygen regulation		
Fan regulation		
Intermediate cooler regulation		
Aftercooler regulation		

Heating regulation		
Heating regulation active		

If a regulator is active, you are taken to the relevant submenu in which further parameters for the regulation algorithm can be set. The arrow key can be used to return to the Regulation menu. Active regulators are now identified by a green bar on the left-hand side.

7.1.1.1 Pressure regulation parameters

Parameters only available if “No” is activated in the “Oxygen regulation active” parameter

Parameter	Value range/Basic setting/Remarks	Code
Pressure regulation active	Yes/No (note the Regulation and Graphical representation tab, ↪ <i>Chapter 5.2.2 ‘Tab in the basic display’ on page 29</i>)	
Speed set value	Auto/Manual External	
Minimum regulation limit	0-100%	
Speed specification	0-100%; parameters only available if “Manual” activated in the “Speed set value” parameter	
P-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
I-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
D-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
Pressure set value	Internal / External default: Internal Internal specification of the pressure set value as a parameter, or external specification via serial bus.	User
Load pressure / Set pressure	-1.0 – 16.00 bar Only active for internal pressure set value	User



No-load pressure/max. pressure	-1.0 – 16 bar	User
Ramp pressure set value	0 – 600s Only active for internal pressure set value	User
Pressure regulation	Discharge side/intake side default: Discharge side	User
Inlet pressure regulation	System pressure/intake pressure default: System pressure	User
Unit pressure regulation	bar/mbar default: bar	User

7.1.1.2 Oxygen regulation parameters

Parameters only available if “No” activated in the “Pressure regulation active” parameter

Parameter	Value range/Basic setting/Remarks	Code
Oxygen regulation active	Yes/No	
Speed set value	Auto/Manual/External	
Speed specification	0-100%; parameters only available if “Manual” activated in the “Speed set value” parameter	
Minimum regulation limit	0-100%	
P-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
I-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
D-Part	0-100%; parameters only available if “Auto” activated in the “Speed set value” parameter	
Oxygen regulation	Internal / External default: Internal Only visible if the frequency converter option is activated (see Key generator section).	User

Oxygen set value	0.00 – 100.00 mg/l Only active for internal oxygen regulation Only visible if the frequency converter option is activated (see Key generator section). Parameters only available if “Auto” activated in the “Speed set value” parameter	User
Oxygen ramp set value	0 – 600s Only active for internal oxygen regulation Only visible if the frequency converter option is activated (see Key generator section). Parameters only available if “Auto” activated in the “Speed set value” parameter	User
Oxygen regulation Discharge pressure limit	-1.0 – 16.00 bar	User
Oxygen regulation Max discharge pressure	-1.0 – 16.00 bar	User

7.1.1.3 Fan regulation parameters

Parameters	Value range/Basic setting/Remarks	Code
Fan regulation active	Yes/No (note the Regulation and Graphical representation tab, 5.2.2)	
Fan switch-on temperature	°C; parameters only available if “2-point” activated in the “Fan regulation mode” parameter	
Fan switch-off temperature	°C; parameters only available if “2-point” activated in the “Fan regulation mode” parameter	
Fan regulation mode	Speed/2-point default: Speed	User
Fan speed mode	Auto/Manual default: Auto Parameters only available if “Speed” activated in the “Fan regulation mode” parameter	User

Fan speed specification	0 – 100% Only active if manual speed mode has been selected. Parameters only available if “Manual” activated in the “Fan speed mode” parameter	User
Fan regulation sensor	Ambient temperature/System temperature/Oil temperature/Intake temperature 2/Oil temperature 2 default: Ambient temperature	User
Fan setpoint temperature	0 – 100 °C; parameters only available if “Speed” activated in the “Fan regulation mode” parameter	User
Fan P-Part	Value range: 0-100%	User
Fan I-Part	Value range: 0-100%	User
Fan D-Part	Value range: 0-100%	User

7.1.1.4 Intermediate cooler regulation parameters

Parameters	Value range/Basic setting/Remarks	Code
Intermediate cooler regulation active	Yes/No	
Intermediate cooler switch-on temperature	Only active if intermediate cooler regulation mode 2-point was selected.	
Intermediate cooler switch-off temperature	Only active if intermediate cooler regulation mode 2-point was selected.	
Intermediate cooler regulation mode	Speed/2-point default: Speed	User
Intermediate cooler speed mode	Auto/Manual default: Auto Only active if intermediate cooler regulation mode speed was selected.	User
Intermediate cooler speed specification	0 – 100% Only active if manual speed mode has been selected.	User
Intermediate cooler regulation sensor	Ambient temperature/System temperature/Oil temperature/Intake temperature 2/Oil temperature 2 default: Ambient temperature	User
Intermediate cooler setpoint temperature	0-200 °C; only active if intermediate cooler regulation mode speed was selected.	User



Intermediate cooler P-Part	0-100%; only active if intermediate cooler regulation mode speed was selected.	User
Intermediate cooler I-Part	0-100%; only active if intermediate cooler regulation mode speed was selected.	User
Intermediate cooler D-Part	0-100%; only active if intermediate cooler regulation mode speed was selected.	User

7.1.1.5 Aftercooler regulation parameters

Parameters	Value range/Basic setting/ Remarks	Code
Aftercooler regulation active	Yes/No	
Aftercooler switch-on temperature	Only active if aftercooler regulation mode 2-point was selected	
Aftercooler switch-off temperature	Only active if aftercooler regulation mode 2-point was selected	
Aftercooler regulation mode	Speed/2-point default: Speed	User
Aftercooler speed mode	Auto/Manual default: Auto Only active if aftercooler regulation mode speed was selected	User
Aftercooler speed specification	0 – 100% default: 0% Only active if manual speed mode has been selected.	User
Aftercooler regulation sensor	Ambient temperature/System temperature/Oil temperature/Intake temperature 2/Oil temperature 2 default: Ambient temperature	User
Aftercooler setpoint temperature	0-200 °C; only active if aftercooler regulation mode speed was selected.	User
Aftercooler P-Part	0-100%; only active if aftercooler regulation mode speed was selected.	User
Aftercooler I-Part	0-100%; only active if aftercooler regulation mode speed was selected.	User
Aftercooler D-Part	0-100%; only active if aftercooler regulation mode speed was selected.	User



7.1.1.6 Heating regulation parameters

Parameters	Value range/Basic setting/Remarks	Code
Heating regulation active	Yes/No	
Heating regulation sensor	Ambient temperature/Intake temperature/Oil temperature/Oil temperature 2 default: Ambient temperature	User
Heating switch-on temperature	-20 – 120 °C	User
Heating switch-off temperature	-20 – 120 °C	User

7.1.2 Miscellaneous menu (general control)

Parameter	Value range/Basic setting/Remarks	Code
Mode of operation	Shutdown operation/continuous operation	User
Remote load/empty	On site / Digital / Modbus / Profibus / Profinet / GLW RS485	User
Remote on/off	On site / Digital / Modbus / Profibus / Profinet	User
Automatic restart	No/Yes	User
Restart delay	10 – 600s	User
Start clearance in case of warning	No/Yes	User

7.1.3 Communication menu

Parameters	Value range/Basic setting/Remarks	Code
Address	0 – 31	User
Protocol	Standard/MODBUS	User
Write access Port 1	Yes/No	Super Admin
Write access Port 2	Yes/No	Super Admin
Baud rate	4800/9600/19200/57600/115200	User
Data bit/Parity/Stop bit	8/None/1, 8/None/2, 8/Even/1, 8/Odd/1	User
Host name		User
LAN 1 DHCP	Yes/No	User

LAN 1 IP address	Can only be changed if LAN 1 DHCP has been set to No.	Display only
LAN 1 IP Netmask	Can only be changed if LAN 1 DHCP has been set to No. default: 0.0.0.0	Display only
LAN 1 MAC:	Permanently assigned (see sticker)	Display only
LAN 2 DHCP	Yes/No	User
LAN 2 IP address	Can only be changed if LAN 2 DHCP has been set to No. default: 192.168.1.10	Display only
LAN 2 IP Netmask	Can only be changed if LAN 2 DHCP has been set to No. default: 255.255.255.0	Display only
LAN 2 MAC:	Permanently assigned (see sticker)	Display only
Gateway	Can only be changed if LAN 1 DHCP or LAN 2 DHCP has been set to No. default: 0.0.0.0	Display only
DNS 1	Can only be changed if LAN 1 DHCP or LAN 2 DHCP has been set to No. default: 1.1.1.1	Display only
DNS 2	Can only be changed if LAN 1 DHCP or LAN 2 DHCP has been set to No. default: 8.8.8.8	Display only

7.2 Machine parameters menu

This menu contains the most important machine parameters. As this is safety-critical under these circumstances, most menu items can only be changed via the Admin or Super Admin code.

Parameters	Value range/Basic setting/ Remarks	Code
Restart lock	10 – 600 s	Admin
Run-up time	3 – 30 s	User
Star/delta changeover time	10 – 100 ms	Super Admin
Minimum no-load time	0 – 120 s	Admin
Minimum run down time	0 – 1200 s	User
Switch-off time	1 – 60 s	Admin



Oil pump preparation time	0 – 250 s	User
Oil pressure monitoring delay	10 – 60 s	User
Oil pressure 2 monitoring delay	10 – 60 s	User
Oil demister switch-on delay	0 – 250 s	User
Oil demister monitoring delay	0 – 60 s	User
Switching cycles	1 – 60 switching cycles/hours	Admin
Pressure ratio/differential pressure monitoring	No / Pressure ratio / Differential pressure	Super Admin
Mean ambient pressure	50 – 1,500 mbar	Super Admin
Non-return flap warning	0 – 1,500 mbar	Admin
Non-return flap warning delay	0 – 15 s	Admin
Fan run down time	0 – 60 min	Admin

7.3 Service menu

The service menu contains the following menu items:

- Maintenance intervals
- Version information
- Fault memory
- Machine data
- Acknowledge maintenance
- Hour counter
- Factory setting
- Parameter history
- Web server

7.3.1 Maintenance intervals menu

Set the relevant maintenance intervals.

Parameters	Value range/Basic setting/ Remarks	Code
Maintenance interval 1st maintenance:	0 – 40,000 h	Admin
Maintenance interval motor maintenance	0 – 40,000 h	Admin
	0 – 2700 d	Admin

Maintenance interval motor re-lubrication interval	0 – 40,000 h	Admin
Maintenance interval daily:	0 – 40,000 h	Admin
Maintenance interval weekly:	0 – 40,000 h	Admin
Maintenance interval monthly:	0 – 40,000 h	Admin
Maintenance interval every 2,000 op. hrs or every 3 months:	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 4,000 op. hrs or every 6 months:	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 8,000 op. hrs or every 12 months:	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 16,000 op. hrs or every 2 years:	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 20,000 op. hrs or every 3 years:	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 30,000 op. hrs or every 4 years (dp < 1,000 mbar):	0 – 40,000 h	Admin
	0 – 2700 d	Admin
Maintenance interval every 40,000 op. hrs or every 5 years (dp < 1,000 mbar):	0 – 40,000 h	Admin
	0 – 2700 d	Admin

7.3.2 Version information menu

The most important data for the overall system of the AERtronic 2.0 is listed in the Version information menu.

Information	Description	Code
Software version	This is the superordinate version number for the overall software compilation (HMI, Module CPU, Module I/O, Web server). It corresponds to the file name supplied	Display only
Module hardware version	Hardware version of CPU and I/O	Display only
Module serial number	Serial number of CPU and I/O	Display only
HMI software version	Information about the AERtronic 2.0 HMI display unit	Display only
HMI hardware version		Display only
HMI serial number		Display only

I/O module software version	Information about the I/O unit of the AERtronic 2.0 module	Display only
I/O module serial number		Display only

7.3.3 Fault memory menu

Up to 100 fault and warning messages can be stored in the Fault memory. The message number, the message text, the time stamp as well as a yellow warning bar or red fault bar are shown on the left-hand side for each message, *on page 48*. An arrow pointing to the right means that a fault has occurred and an arrow pointing to the left means that a fault has been acknowledged (independently). Tapping on the arrow of a message will take you to an additional information page *on page 49* in which boundary conditions at the time at which the message arrives or is no longer present are stored. An arrow pointing to the right stands for an incoming message and an arrow pointing to the left stands for an obsolete message.

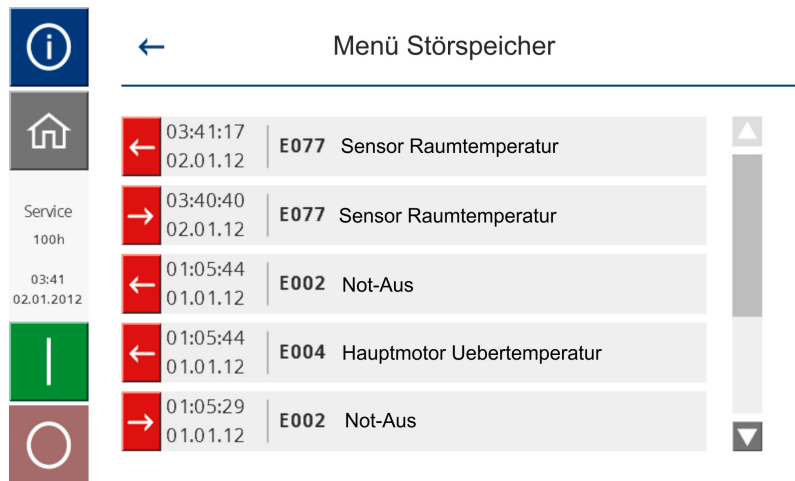


Fig. 22: Fault memory menu 1



7.3.4 Machine data menu

Parameters	Value range/Basic setting/ Remarks	Code
Order number		<i>Super Admin</i>
Factory number		
Equipment number		
Serial number		
Machine name		
Location longitude	Numeric fields	User
Location latitude		

7.3.5 Acknowledge maintenance menu

The following parameters can be reset using the Admin code number:

Parameter	Value range/Basic setting/ Remarks	
Maintenance counter maintenance every 500 operating hours	Reset Yes/No	
Maintenance counter motor maintenance	Reset Yes/No	
Maintenance counter motor relubrication interval	Reset Yes/No	
Maintenance counter daily	Reset Yes/No	
Maintenance counter weekly	Reset Yes/No	
Maintenance counter monthly	Reset Yes/No	
Maintenance counter every 2,000 op. hrs or every 3 months	Reset Yes/No	
Maintenance counter every 4,000 op. hrs or every 6 months	Reset Yes/No	
Maintenance counter every 8,000 op. hrs or every 12 months	Reset Yes/No	
Maintenance counter every 16,000 op. hrs or every 2 years	Reset Yes/No	
Maintenance counter every 20,000 op. hrs or every 3 years	Reset Yes/No	

Maintenance counter every 30,000 op. hrs or every 4 years (dp < 1,000 mbar)	Reset Yes/No	
Maintenance counter every 40,000 op. hrs or every 5 years (dp > 1,000 mbar)	Reset Yes/No	

Any maintenance that is currently due is shown here in yellow.

7.3.6 Hour counter menu

This menu item is only visible and can only be selected in the Admin and Super Admin menu.

Parameters	Value range/Basic setting/Remarks	Code
Operating hours:	Current number of operating hours. Can also be changed.	Admin
Load hours:	Current number of load hours. Can also be changed. ONLY IN THE ADVANCED VERSION!	Admin
Machine rental:	No/Yes	Admin
Hours rental:	Resettable	Admin

No-load hours are calculated automatically from the difference between operating hours and load hours.

7.3.7 Save/load factory setting menu

The Save/load factory setting menu is only visible if you have Admin rights.

Button	Remarks	Code
Load factory setting	Only visible if settings are retrievable	Admin

Maintenance settings	The following parameters can be set: <ul style="list-style-type: none"> ■ Remote maintenance (Yes / No) ■ Remote maintenance duration (settable up to 24h) ■ Display maintenance (Yes / No) ONLY IN THE ADVANCED VERSION! 	Admin
AERtronic restart	This button can be used to restart the AERtronic 2.0.	Admin
Save factory setting	This button can be used to save the factory settings.	Admin

Saving the factory settings

There is the option of saving factory settings in the internal memory of the AERtronic 2.0 or on an SD card. Two buttons are available to the user to this end. The button for saving to SD card can only be selected if an SD card is inserted. It only takes a couple of seconds to save the factory settings. If the settings have been saved successfully, you can use the arrow key to return to the Factory setting menu.

Loading the factory settings

This menu item only appears if factory settings have already been stored. Here, there is again the option of selecting whether to load settings from the internal memory or from the SD card. If the settings have been loaded successfully, the user is taken back to the Main menu.

“Attention: This will overwrite all previous settings!”

It is possible to cancel the factory settings being loaded by leaving the page and to start loading by pressing the “Load” button. In such cases, the “Factory setting loaded!” message appears after loading and the arrow key can be used to return to the Factory setting menu. Please note: Implementing a basic setting deletes any previously stored factory settings.



Please note: Implementing a basic setting deletes any previously stored factory settings.

7.3.8 Parameter history menu



Time	Parameter	Action
23:37:34	function A01-A6:	
15.07.20	final temperatur	+
23:37:31	function A01-A3:	
15.07.20	final pressure	+
23:37:30	function A01-A2:	
15.07.20	oil pressure	+
23:37:28	function A01-A1:	
15.07.20	suction pressure	+
23:37:02	function A01-A3:	
15.07.20	free	+

The Parameter history menu is only visible if you have Admin rights or higher. A record of the AERtronic 2.0 parameter that was changed and the time at which it was changed is kept here. In this context, each individual parameter is assigned a bar with a grey background, inside of which the time and date are shown on the left-hand side. The time and data refer to when the parameter described on the right was changed. The respective change is described underneath the parameter name.

Fig. 24: Parameter history

7.3.9 Web server menu

The passwords for the User and Admin levels for the Aerzen web interface can be reset via the Web server menu.

Parameter	Value range/Basic setting/Remarks	Code
Web server user password	Reset Yes/No	
Web server admin password	Reset Yes/No	

7.4 Limits menu

Limits for warnings and fault messages If the limits set here are exceeded or are not reached, a warning or fault is triggered after a corresponding delay time. All values can only be changed as of the Admin access level. The limits available in this menu depend on the configuration of the control system. If, for example, no analogue input with limits is configured, this menu item is not visible.

Parameter	Value range/Basic setting/Remarks	Code
Intake pressure warning	-0.99 – 1.00 bar	Admin
Intake pressure warning delay	0 – 15 s	Admin
Intake pressure fault	-0.99 – 1.00 bar	Admin
Intake pressure fault delay	0 – 15 s	Admin
Intake pressure 2 warning	-0.99 – 1.00 bar	Admin
Intake pressure 2 warning delay	0 – 15 s	Admin
Intake pressure 2 fault	-0.99 – 1.00 bar	Admin
Intake pressure 2 fault delay	0 – 15 s	Admin



Limits menu

Ambient temperature Lo warning	-20 – 60 °C Ambient temperature lower limit	Admin
Ambient temperature Lo warning delay	0 – 15 s	Admin
Ambient temperature Hi warning	0 – 300 °C Ambient temperature upper limit	Admin
Ambient temperature Hi warning delay	0 – 15 s	Admin
Discharge pressure Lo warning	0 – 16.0 bar	Admin
Discharge pressure Lo warning delay	0 – 15 s	Admin
Discharge pressure Lo fault	0 – 16.0 bar	Admin
Discharge pressure Lo fault delay	0 – 15 s	Admin
Discharge pressure Hi warning	-1.0 – 16.0 bar	Admin
Discharge pressure Hi warning delay	0 – 15 s	Admin
Discharge pressure Hi fault	-1.0 – 16.0 bar	Admin
Discharge pressure Hi fault delay	0 – 15 s	Admin
Discharge temperature warning	0 – 300 °C	Admin
Discharge temperature warning delay	0 – 15 s	Admin
Discharge temperature fault	0 – 300 °C	Admin
Discharge temperature fault delay	0 – 15 s	Admin
System temperature warning	0 – 300 °C	Admin
System temperature warning delay	0 – 15 s	Admin
System temperature fault	0 – 300 °C	Admin
System temperature fault delay	0 – 15 s	Admin
Oil pressure warning	-1.0 – 5.0 bar	Admin
Oil pressure warning delay	0 – 15 s	Admin
Oil pressure fault	-1.0 – 5.0 bar	Admin
Oil pressure fault delay	0 – 15 s	Admin
Oil temperature warning	0 – 300 °C	Admin
Oil temperature warning delay	0 – 15 s	Admin
Oil temperature fault	0 – 300 °C	Admin
Oil temperature fault delay	0 – 15 s	Admin
Intake temp. warning	0 – 300 °C	Admin

Intake temp. warning Delay	0 – 15 s	Admin
Intake temp. fault	0 – 300 °C	Admin
Intake temp. fault Delay	0 – 15 s	Admin
Intake temp. warning 2	0 – 300 °C	Admin
Intake temp. warning 2 delay	0 – 15 s	Admin
Intake temp. fault 2	0 – 300 °C	Admin
Intake temp. fault 2 delay	0 – 15 s	Admin
Discharge pressure 2 warning	0.0 – 16.0 bar	Admin
Discharge pressure 2 warning delay	0 – 15 s	Admin
Discharge pressure 2 fault	0.0 – 16.0 bar	Admin
Discharge pressure 2 fault delay	0 – 15 s	Admin
Discharge temperature 2 warning	0 – 300 °C	Admin
Discharge temperature 2 warning delay	0 – 15 s	Admin
Discharge temperature 2 fault	0 – 300 °C	Admin
Discharge temperature 2 fault delay	0 – 15 s	Admin
Oil pressure 2 warning	-1.0 – 5.0 bar	Admin
Oil pressure 2 warning delay	0 – 15 s	Admin
Oil pressure 2 fault	-1.0 – 5.0 bar	Admin
Oil pressure 2 fault delay	0 – 15 s	Admin
Oil temperature 2 warning	0 – 300 °C	Admin
Oil temperature 2 warning delay	0 – 15 s	Admin
Oil temperature 2 fault	0 – 300 °C	Admin
Oil temperature 2 fault delay	0 – 15 s	Admin
Warning	0 – 300 °C	Admin
Motor bearing temperature DS		
Motor bearing temperature DS warning delay	0 – 15 s	Admin
Motor bearing temperature DS fault	0 – 300 °C	Admin
Motor bearing temperature DS fault delay	0 – 15 s	Admin
Motor bearing temperature NDS warning	0 – 300 °C	Admin



Limits menu

Motor bearing temperature NDS warning delay	0 – 15 s	Admin
Motor bearing temperature NDS fault	0 – 300 °C	Admin
Motor bearing temperature NDS fault delay	0 – 15 s	Admin
Speed warning	0 – 12,000 RPM	Admin
Speed warning delay	0 – 15 s	Admin
Speed fault	0 – 12,000 RPM	Admin
Speed fault delay	0 – 15 s	Admin
Oil level Lo warning	0 – 100%	Admin
Oil level Lo warning delay	0 – 15 s	Admin
Oil level Lo fault	0 – 100%	Admin
Oil level Lo fault delay	0 – 15 s	Admin
Oil level Hi warning	0 – 100%	Admin
Oil level Hi warning delay	0 – 15 s	Admin
Oil level Hi fault	0 – 100%	Admin
Oil level Hi fault delay	0 – 15 s	Admin
Pressure ratio warning	1.00 - 5.00	Super Admin
Pressure ratio warning delay	0 – 15 s	Super Admin
Pressure ratio fault	1.00 - 5.00	Super Admin
Pressure ratio fault delay	0 – 15 s	Super Admin
Differential pressure warning	-1.0 – 16.0 bar	Admin
Differential pressure warning delay	0 – 15 s	Admin
Differential pressure fault	-1.0 – 16.0 bar	Admin
Differential pressure fault delay	0 – 15 s	Admin
Vibration M_DS_Veff warning	0 – 50%	Admin
Vibration M_DS_Veff warning delay	0 – 15 s	Admin
Vibration M_DS_Veff fault	0 – 50%	Admin
Vibration M_DS_Veff fault delay	0 – 15 s	Admin
Vibration M_NDS_Veff warning	0 – 50%	Admin
Vibration M_NDS_Veff warning delay	0 – 15 s	Admin
Vibration M_NDS_Veff fault	0 – 50%	Admin



Parameter	Value range/Basic setting/ Remarks	Code
Vibration M_NDS_Veff fault delay	0 – 15 s	Admin
Vibration M G_DS_Veff warning	0 – 50%	Admin
Vibration G_DS_Veff warning delay	0 – 15 s	Admin
Vibration G_DS_Veff fault	0 – 50%	Admin
Vibration G_DS_Veff fault delay	0 – 15 s	Admin
Vibration M G_NDS_Veff warning	0 – 50%	Admin
Vibration G_NDS_Veff warning delay	0 – 15 s	Admin
Vibration G_NDS_Veff fault	0 – 50%	Admin
Vibration G_NDS_Veff fault delay	0 – 15 s	Admin
Vibration S1_DS_Veff warning	0 – 50%	Admin
Vibration S1_DS_Veff warning delay	0 – 15 s	Admin
Vibration S1_DS_Veff fault	0 – 50%	Admin
Vibration S1_DS_Veff fault delay	0 – 15 s	Admin
Vibration S1_NDS_Veff warning	0 – 50%	Admin
Vibration S1_NDS_Veff warning delay	0 – 15 s	Admin
Vibration S1_NDS_Veff fault	0 – 50%	Admin
Vibration fault	0 – 15 s	Admin
S1_NDS_Veff delay		
Vibration S1_PG_Veff warning	0 – 50%	Admin
Vibration S1_PG_Veff warning delay	0 – 15 s	Admin
Vibration S1_PG_Veff fault	0 – 50%	Admin
Vibration S1_PG_Veff fault delay	0 – 15 s	Admin
Vibration S2_DS_Veff warning	0 – 50%	Admin
Vibration S2_DS_Veff warning delay	0 – 15 s	Admin
Vibration S2_DS_Veff fault	0 – 50%	Admin
Vibration S2_DS_Veff fault delay	0 – 15 s	Admin
Vibration S2_NDS_Veff warning	0 – 50%	Admin
Vibration S2_NDS_Veff warning delay	0 – 15 s	Admin

Vibration S2_NDS_Veff fault	0 – 50%	Admin
Vibration S2_NDS_Veff fault delay	0 – 15 s	Admin
Vibration S2_PG_Veff warning	0 – 50%	Admin
Vibration S2_PG_Veff warning delay	0 – 15 s	Admin
Vibration S2_PG_Veff fault	0 – 50%	Admin
Vibration S2_PG_Veff fault	0 – 15 s	Admin

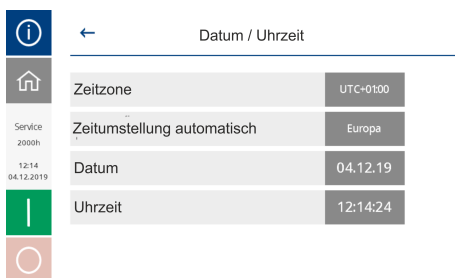
7.5 Display menu

The display menu contains the following submenus:

- Date/time
- Limits trend graph
- Cleaning display
- Units
- Display settings
- Favourites

7.5.1 Date/time

Date/time setting



In addition to the date and time, it is also possible to specify the time zone and location for the automatic summer/winter time changeover here.

The date and the time can also be synchronised via a time server, which needs to be specified.

Fig. 25: Date/time

Parameter	Value range/Basic setting/Remarks	Code
Time zone	Various UTC	
Time changeover automatic	No/Europe/USA/Australia/New Zealand	
Date		

Time		
Automatic synchronisation with time server	Yes/No	

7.5.2 Limits trend graph menu

The limits for the display of the measurement value trends are set in this menu. The theoretically possible minimum and maximum values are generally set in the default setting, regardless of any limitations set in the machine parameters.

Parameter	Value range/Basic setting/ Remarks	Code
System pressure graph lower value:	-1.00 bar – 16.00 bar	User
System pressure graph upper value:	-1.00 bar – 16.00 bar	User
Discharge pressure (1) graph lower value:	-1.00 bar – 16.00 bar	User
Discharge pressure (1) graph upper value:	-1.00 bar – 16.00 bar	User
Discharge pressure 2 graph lower value:	-1.00 bar – 16.00 bar	User
Discharge pressure 2 graph upper value:	-1.00 bar – 16.00 bar	User
Oil pressure (1) graph lower value:	-1.00 bar – 16.00 bar	User
Oil pressure (1) graph upper value:	-1.00 bar – 16.00 bar	User
Oil pressure 2 graph lower value:	-1.00 bar – 16.00 bar	User
Oil pressure 2 graph upper value:	-1.00 bar – 16.00 bar	User
Intake pressure (1) graph lower value:	-1.00 bar – 16.00 bar	User
Intake pressure (1) graph upper value:	-1.00 bar – 16.00 bar	User
Intake pressure 2 graph lower value:	-1.00 bar – 16.00 bar	User
Intake pressure 2 graph upper value:	-1.00 bar – 16.00 bar	User
Room pressure graph lower value	-1.0 bar – 5.00 bar	User
Room pressure graph lower value	-1.0 bar – 5.00 bar	User



Display menu > Limits trend graph menu

Pressure set value graph lower value:	-1.00 bar – 16.00 bar	User
Pressure set value graph upper value:	-1.00 bar – 16.00 bar	User
Room temperature graph lower value:	-50 – 300 °C	User
Room temperature graph upper value:	-50 – 300 °C	User
Ambient temperature graph lower value:	-50 – 300 °C	User
Ambient temperature graph upper value:	-50 – 300 °C	User
Discharge temperature (1) graph lower value:	-50 – 300 °C	User
Discharge temperature (1) graph upper value:	-50 – 300 °C	User
Discharge temperature 2 graph lower value:	-50 – 300 °C	User
Discharge temperature 2 graph upper value:	-50 – 300 °C	User
Oil temperature (1) graph lower value:	-50 – 300 °C	User
Oil temperature (1) graph upper value:	-50 – 300 °C	User
Oil temperature 2 graph lower value:	-50 – 300 °C	User
Oil temperature 2 graph upper value:	-50 – 300 °C	User
Intake temperature (1) graph lower value:	-50 – 300 °C	User
Intake temperature (1) graph upper value:	-50 – 300 °C	User
Intake temperature 2 graph lower value:	-50 – 300 °C	User
Intake temperature 2 graph upper value:	-50 – 300 °C	User
System temperature graph lower value:	-50 – 300 °C	User
System temperature graph upper value:	-50 – 300 °C	User
Motor bearing temperature DS graph lower value:	-50 – 300 °C	User

Motor bearing temperature DS graph upper value:	-50 – 300 °C	User
Motor bearing temperature NDS graph lower value:	-50 – 300 °C	User
Motor bearing temperature NDS graph upper value:	-50 – 300 °C	User
Main rotor bearing temperature graph drive side lower value	-50 – 300 °C	User
Main rotor bearing temperature graph drive side upper value	-50 – 300 °C	User
Main rotor bearing temperature graph gear side lower value	-50 – 300 °C	User
Main rotor bearing temperature graph gear side upper value	-50 – 300 °C	User
Oil tank temperature graph NDS lower value	-50 – 300 °C	User
Oil tank temperature graph NDS upper value	-50 – 300 °C	User
Speed graph lower value	0 – 12,000 RPM	User
Speed graph upper value	0 – 12,000 RPM	User
Vibration graph lower value:	0 – 100 mm/s	User
Vibration graph upper value:	0 – 100 mm/s	User
External control variable graph lower value:	0 – 100%	User
External control variable graph upper value:	0 – 100%	User
Oil level graph lower value:	0 – 100%	User
Oil level graph upper value:	0 – 100%	User
Pressure ratio graph lower value	0.0 - 50.0	User
Pressure ratio graph upper value	0.0 - 50.0	User
Differential pressure graph lower value	-1.00 bar – 16.00 bar	User
Differential pressure graph upper value	-1.00 bar – 16.00 bar	User
Oxygen graph lower value:	0 – 100 mg/l	User
Oxygen graph upper value:	0 – 100 mg/l	User
Power graph lower value	0.0 – 1,000 kW	User
Power graph upper value	0.0 – 1,000 kW	User



7.5.3 Cleaning display

Screen lock for cleaning the display. The following message appears after pressing this menu item:

“Attention: the control system cannot be operated for 1 minute after starting this function.”

Pressing the “Start” button starts the 60-second timer and the display can be cleaned with a soft cloth.

7.5.4 Units

Parameter	Value range/Basic setting/Remarks	Code
Pressure unit	Bar / psi	User
Temperature unit	°C / °F	User
Oxygen unit	% / MG/L / PPM	User

7.5.5 Display settings menu

All settings relating to the screen can be made via the Display settings menu.

Parameter	Value range/Basic setting/Remarks	Code
Screen saver	Yes / No	User
Screen saver delay	1 min – 99 min	User
Standard brightness	20% - 100%	User
Screen saver brightness	0% - 100%	User
Text size	NORMAL / LARGE	User
Background colour selection	BRIGHT / DARK ↩ on page 63 ↩ on page 63	User

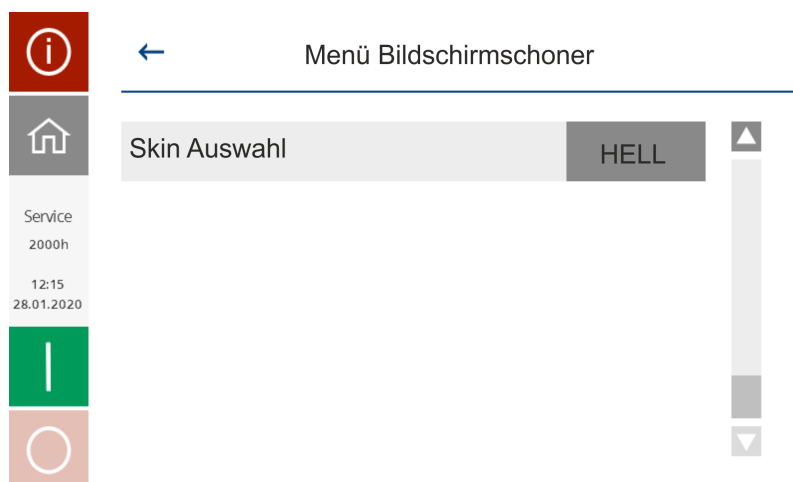


Fig. 26: Background colour selection **BRIGHT**

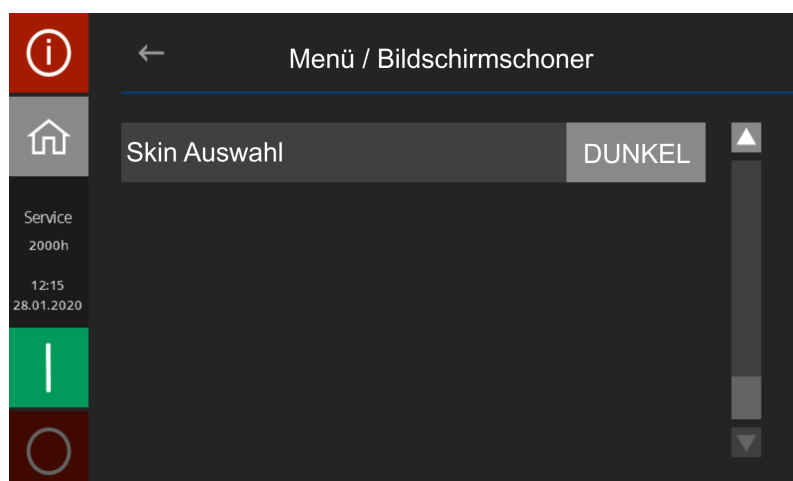


Fig. 27: Background colour selection **DARK**

7.5.6 Favourites menu

It is possible to display up to four operating parameters in the Favourites tab on the default display. In this context, the parameters are only shown in the numeric representation. No Administrator rights are required for this.

7.6 Configuration menu

The configuration menu contains the following menu items:



- Function selection
- Module selection
- Digital inputs
- Digital inputs text
- Digital outputs
- Function analogue inputs
- Scale analogue inputs
- Function analogue outputs
- Scale analogue outputs

Different module types are available for selection. Such types could be installed in addition to the Basic module. A different number of inputs and outputs are available depending on the connected modules. These inputs and outputs can be configured in the relevant menus.

7.6.1 Function selection menu

Parameter	Value range/Basic setting/Remarks	Code
Independent module	No	
Machine type	Blower / Compressor 1-stage / Compressor 2-stage	Super Admin
Motor activation	None / Network / Star/delta / Frequency converter	Super Admin

7.6.2 Module selection menu

Parameter	Value range/Basic setting/Remarks	Code
Module type address 1	Display only! Value is always "Advanced module"	User
Module type address 3	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 4	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 5	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 6	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin

Module type address 7	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 8	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 9	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 10	No module / Module EM1 / Module EM2 / Module EM3 default: No module	Super Admin
Module type address 11	No module / Module EM4 default: No module	Super Admin
Module type address 12	No module / Module EM4 default: No module	Super Admin
Module type address 14	No module / Profinet default: No module	Admin
Module type address 15	No module / Profibus G2 default: No module	Admin

7.6.3 Digital inputs menu

All adjustable digital inputs are listed here. In the event that extension modules are connected, the digital inputs for these modules are also shown. A maximum of 41 digital inputs are possible.

Module	Input	Value range/Basic setting/Remarks	Code
Advanced module address: A01	A01-DI1	Emergency stop Logic: NC	Display only!
Advanced module address: A01	A01-DI2 A01-DI3 A01-DI4 A01-DI5 A01-DI6 A01-DI7	Empty Remote on/off Remote load/empty GLW ready Motor current Fan current	Admin
Module EM1 addresses: A03-A10	Ax-DI1 Ax-DI2 Ax-DI3 Ax-DI4	Oil demister Oil demister 2 Oil pump Vibration Diagnostic	



Module	Input	Value range/Basic setting/Remarks	Code
Module EM3/EM10 addresses: A03-A10	Ax-D11	Cooling water flow	
	Ax-D12	Condensate drain 1	
	Ax-D13	Condensate drain 2	
	Ax-D14	Aftercooler 1	
		Aftercooler 2	
		Motor fan warning	
		Motor fan fault	
		Oil cooler warning	
		Oil cooler fault	
		Priority no load	
		Main motor warning	
		Dryer warning	
		External warning	
		Differential pressure filter	
		External machine differential pressure	
External fault			
External clearance			
Relubrication device DS operation			
Relubrication device DS fault			
Relubrication device NDS operation			
Relubrication device NDS fault			
Oil level			
Remote maintenance Operation			
Acknowledgement			
Warning 1 to 4			
Fault 1 to 4			
Advanced module address: A01	A01-D18	Motor temperature Logic: NC	Display only!
	A01-D19	Empty / Oil demister / Oil demister 2	Admin



Module	Input	Value range/Basic setting/Remarks	Code
	A01-DI10	Empty / Speed logic: N/A	Admin
All except for A01-DI1, A01-DI8 and A01-DI10	Logic of the digital inputs	NO / NC default: NO	User

7.6.4 Digital inputs menu text

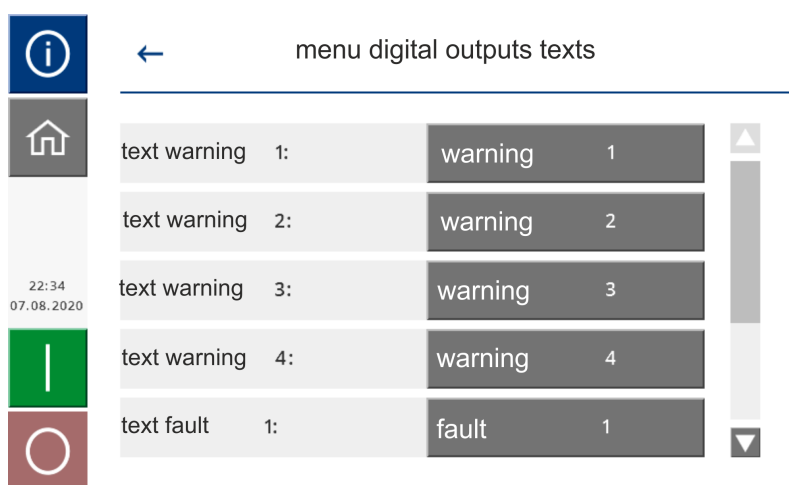


Fig. 28: Digital inputs text

It is possible to configure up to four additional warning and fault messages in the digital inputs. These messages can be labelled freely. As soon as a text has been entered in the relevant text field, the new text for the warning or fault is displayed in the Digital inputs menu.

7.6.5 Digital outputs menu

All adjustable digital outputs are listed here. In the event that extension modules are connected, the digital outputs for these modules are also shown. A maximum of 43 digital outputs are possible.



Module	Output	Value range/Basic setting/Remarks	Code
Module Advanced Address: A01	A01-DO1	Display only	Admin
	A01-DO2	Empty	
	A01-DO3	Motor on	
	A01-DO4	Load valve	
	A01-DO5	Oil pump	
	A01-DO6	Heater	
	A01-DO7	Fan	
	A01-DO8	Intermediate cooler	
Module EM1 address: A03-A10	Ax-DO1	Aftercooler	
	Ax-DO2	Maintenance	
	Ax-DO3	Warning	
	Ax-DO4	Fault	
Module EM2 address: A03-A10	Ax-DO1	Ready	
	Ax-DO2	Operation	
	Ax-DO3	Load run	
	Ax-DO4	Remote	
		Oil demister	
		Condensate drain 1	
		Condensate drain 2	
		Condensate drain warning	
		Aftercooler warning	
		Standby	
		Relubrication device DS	
		Relubrication device NDS	
		Remote maintenance default: Empty	



Please note: If the motor control type is set, digital outputs 1-3 have fixed settings under certain circumstances and are not freely programmable:
 A01-DO1 = Network (for motor control type != none)
 A02-DO12 = Star (for motor control type Star/delta)
 A02-DO23 = Delta (for motor control type Star/delta)

7.6.6 Function analogue inputs menu

All adjustable analogue inputs are listed here. In the event that extension modules are connected, the analogue inputs for these modules are also shown. A maximum of 44 analogue inputs are possible.

Module	Output	Value range/Basic setting/Remarks	Code
Advanced module: Address: A01	A01-AI1 A01-AI2 A01-AI3 A01-AI4 A01-AI5	Empty Room pressure Intake pressure 1 and 2 Oil pressure 1 and 2 Discharge pressure 1 and 2	Admin
Module EM2 Address: A03-A10	Ax-AI1 Ax-AI2	System pressure External control variable	
Module EM3 Address: A03-A10	Ax-AI1 Ax-AI2	Pressure set value Vibration M_DS Veff Vibration M_NDS Veff Vibration G_DS Veff Vibration G_NDS Veff Vibration S1_DS Veff Vibration S1_NDS Veff Vibration S1_PG Veff Vibration S2_DS Veff Vibration S2_NDS Veff Oxygen Oxygen set value Power	
Advanced module Address: A01	A01-AI6 A01-AI7 A01-AI8	Empty Room temperature Ambient temperature Intake temperature 1 and 2	
Module EM2 Address: A03-A10	Ax-AI3 Ax-AI4	Oil temperature 1 and 2 Discharge temperature 1 and 2 System temperature Motor bearing temp. DS	



Module EM3/EM10 Address: A03-A10	Ax-AI3 Ax-AI4	Motor bearing temp. NDS Oil tank temperature	
Module Advanced Address A01	A01-A10	Empty / Oil level	

7.6.7 Scale analogue inputs menu

The settings in the Scale analogue inputs menu are only used if input A01-A10 has been set to Oil level in the Function analogue inputs menu.

Parameter	Value range/Basic setting/ Remarks	Code
Oil level input 0.5V	Oil level percentage at 0.5V -100 .. 200%	Admin
Oil level input 4.5V	Oil level percentage at 4.5V -100 .. 200%	Admin
Room pressure input 4 mA:	-1.0 bar .. 16 bar	Admin
Room pressure input 20 mA:	-1.0 bar .. 16 bar	Admin
Intake pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Intake pressure input 20 mA	-1.0 bar .. 16 bar	Admin
Oil pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Oil pressure input 20 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure input 20 mA	-1.0 bar .. 16 bar	Admin
Intake pressure 2 input 4 mA	-1.0 bar .. 16 bar	Admin
Intake pressure 2 input 20 mA	-1.0 bar .. 16 bar	Admin
Oil pressure 2 input 4 mA	-1.0 bar .. 16 bar	Admin
Oil pressure 2 input 20 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure 2 input 4 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure 2 input 20 mA	-1.0 bar .. 16 bar	Admin
System pressure input 4 mA	-1.0 bar .. 16 bar	Admin
System pressure input 20 mA	-1.0 bar .. 16 bar	Admin
External input	0% .. 100%	Admin

Parameter	Value range/Basic setting/ Remarks	Code
Specification 4 mA		
External input specification 20 mA	0% .. 100%	Admin
Pressure set value input 4 mA	-1.0 bar .. 16 bar	Admin
Pressure set value input 20 mA	-1.0 bar .. 16 bar	Admin
Vibration M_DS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration M_DS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration M_NDS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration M_NDS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration G_DS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration G_DS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration G_NDS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration G_NDS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_DS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_DS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_NDS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_NDS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_PG_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S1_PG_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S2_DS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S2_DS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin

Parameter	Value range/Basic setting/ Remarks	Code
Vibration S2_NDS_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S2_NDS_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S2_PG_Veff input 4 mA	0.00 mm/s .. 50 mm/s	Admin
Vibration S2_PG_Veff input 20 mA	0.00 mm/s .. 50 mm/s	Admin



Oxygen input 4 mA	0 .. 100 mg/l	Admin
Oxygen input 20 mA	0 .. 100 mg/l	Admin
Oxygen set value input 4 mA	0 .. 100 mg/l	Admin
Oxygen set value input 20 mA	0 .. 100 mg/l	Admin
Power input 4 mA	0 kW .. 1,000 kW	Admin
Power input 20 mA	0 kW .. 1,000 kW	Admin

7.6.8 Function analogue outputs menu

Programming the function of maximum five analogue outputs.



Module	Output	Value range/Basic setting/Remarks	Code
Module Advanced Address: A01	A01-AO1	Empty Oil level Room pressure	Admin
Module EM4 Address: A10-A11	Ax-AO1 Ax-AO2	Intake pressure 1 and 2 Oil pressure 1 and 2 Discharge pressure 1 and 2 System pressure Vibration M_DS Veff Vibration M_NDS Veff Vibration G_DS Veff Vibration G_NDS Veff Vibration S1_DS Veff Vibration S1_NDS Veff Vibration S1_PG Veff Vibration S2_DS Veff Vibration S2_NDS Veff Vibration S2_PG Veff Oxygen Power Room temperature Ambient temperature Intake temperature 1 and 2 Oil temperature 1 and 2 Discharge temperature 1 and 2 System temperature Motor bearing temperature DS Motor bearing temperature NDS Bearing temperature main rotor DS Bearing temperature main rotor NDS Oil tank temperature Pressure regulation	



		Fan regulation	
		Intermediate circuit regulation	
		Aftercooler regulation	
		Oxygen regulation	

7.6.9 Scale analogue outputs menu

The settings in the Scale analogue outputs menu are only used if the relevant inputs have been set in the Function analogue outputs menu.

Parameter	Value range/Basic setting/Remarks	Code
Oil level output 0.5V	Oil level percentage at 0.5V 0 .. 200%	Admin
Oil level output 4.5V	Oil level percentage at 4.5V 0 .. 200%	Admin
Room pressure output 4 mA	-1.0 bar .. 16 bar	Admin
Room pressure output 20 mA	-1.0 bar .. 16 bar	Admin
Intake pressure output 4 mA	-1.0 bar .. 16 bar	Admin
Intake pressure output 20 mA	-1.0 bar .. 16 bar	Admin
Oil pressure output 4 mA	-1.0 bar .. 16 bar	Admin
Oil pressure output 20 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure output 4 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure output 20 mA	-1.0 bar .. 16 bar	Admin
Intake pressure 2 output 4 mA	-1.0 bar .. 16 bar	Admin
Intake pressure 2 output 20 mA	-1.0 bar .. 16 bar	Admin
Oil pressure 2 output 4 mA	-1.0 bar .. 16 bar	Admin
Oil pressure 2 output 20 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure 2 output 4 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure 2 output 20 mA	-1.0 bar .. 16 bar	Admin
System pressure output 4 mA	-1.0 bar .. 16 bar	Admin
System pressure output 20 mA	-1.0 bar .. 16 bar	Admin
External output specification 4 mA	0% .. 100%	Admin
External output specification 20 mA	0% .. 100%	Admin



Pressure set value output 4 mA	-1.0 bar .. 16 bar	Admin
Pressure set value output 20 mA	-1.0 bar .. 16 bar	Admin
Vibration M_DS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration M_DS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration M_NDS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration M_NDS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration G_DS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration G_DS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration G_NDS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration G_NDS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_DS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_DS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_NDS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_NDS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_PG_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S1_PG_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_DS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_DS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_NDS_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_NDS_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_PG_Veff output 4 mA	0.00 mm/s .. 99 mm/s	Admin
Vibration S2_PG_Veff output 20 mA	0.00 mm/s .. 99 mm/s	Admin
Oxygen output 4 mA	0 .. 100.00 mg/l	Admin



Oxygen output 20 mA	0 .. 100.00 mg/l	Admin
Power output 4 mA	0 kW .. 100.0 kW	Admin
Power output 20 mA	0 kW .. 100.0 kW	Admin
Room temperature output 4 mA	-50 – 300 °C	Admin
Room temperature output 20 mA	-50 – 300 °C	Admin
Ambient temperature output 4 mA	-50 – 300 °C	Admin
Ambient temperature output 20 mA	-50 – 300 °C	Admin
Intake temperature output 4 mA	-50 – 300 °C	Admin
Intake temperature output 20 mA	-50 – 300 °C	Admin
Oil temperature output 4 mA	-50 – 300 °C	Admin
Oil temperature output 20 mA	-50 – 300 °C	Admin
Discharge temperature output 4 mA	-50 – 300 °C	Admin
Discharge temperature output 20 mA	-50 – 300 °C	Admin
Intake temperature 2 output 4 mA	-50 – 300 °C	Admin
Intake temperature 2 output 20 mA	-50 – 300 °C	Admin
Oil temperature 2 output 4 mA	-50 – 300 °C	Admin
Oil temperature 2 output 20 mA	-50 – 300 °C	Admin
Discharge temperature 2 output 4 mA	-50 – 300 °C	Admin
Discharge temperature 2 output 20 mA	-50 – 300 °C	Admin
System temperature output 4 mA	-50 – 300 °C	Admin
System temperature output 20 mA	-50 – 300 °C	Admin
Motor bearing temperature output DS 4 mA	-50 – 300 °C	Admin
Motor bearing temperature output DS 20 mA	-50 – 300 °C	Admin
Motor bearing temperature output NDS 4 mA	-50 – 300 °C	Admin
Motor bearing temperature output NDS 20 mA	-50 – 300 °C	Admin
Bearing temperature main rotor output DS 4 mA	-50 – 300 °C	Admin
Bearing temperature main rotor output DS 20 mA	-50 – 300 °C	Admin



Bearing temperature main rotor output NDS 4 mA	-50 – 300 °C	Admin
Bearing temperature main rotor output NDS 20 mA	-50 – 300 °C	Admin
Oil tank temperature output 4 mA	-50 – 300 °C	Admin
Oil tank temperature output 20 mA	-50 – 300 °C	Admin
Pressure regulation output 4 mA	0 – 100%	Admin
Pressure regulation output 20 mA	0 – 100%	Admin
Fan regulation output 4 mA	0 – 100%	Admin
Fan regulation output 20 mA	0 – 100%	Admin
Intermediate circuit regulation output 4 mA	0 – 100%	Admin
Intermediate circuit regulation output 20 mA	0 – 100%	Admin
Aftercooler regulation output 4 mA	0 – 100%	Admin
Aftercooler regulation output 20 mA	0 – 100%	Admin
Oxygen regulation output 4 mA	0 – 100%	Admin
Oxygen regulation output 20 mA	0 – 100%	Admin

7.7 Key generator

In order to generate valid clearance codes, the Key generator PC tool is required as a remote station for the Key generator menu.

8 Information and messages



Fig. 29: Information menu


The Information menu and Messages menu can both be called up via the Info button  *Chapter 5.2.1 'Button bar in the basic display' on page 27*. The icon has a blue background if there are no faults pending. In such cases, you are taken directly to the Information page where all necessary information about Aerzen and the control system installed is summarised. Scanning the QR code will take you directly to the Aerzen website.



Fig. 30: Messages menu

If there is a message pending, the message icon has a red background for faults or a yellow background for warnings and maintenance. If new messages occur, the icon flashes and the title bar with the tabs also changes colour. This bar does not disappear until the Messages menu has been called up by tapping the icon. The individual messages are listed with the date and time as well as the associated colour. The arrow icon in the top left will take you back to the previous display. You can acknowledge warnings with the confirmation button. Faults with a red background cannot be acknowledged until the cause of the fault has been rectified. All messages that have ever been listed in the Messages menu are stored in the Fault memory. As also applies to the Settings menu and Main menu, you will be returned to the default display automatically following one minute of inactivity. If there are messages pending, the Information menu can be called up by tapping the message icon again.



Please note: The Information menu may also appear at irregular intervals of between one and two weeks! This is not a fault.

8.1 Fault messages

Error message	Remarks
E001 Power failure	Power failure. Message appears once voltage has returned.
E002 Emergency stop	Emergency stop was actuated.
E003 Main motor overload	The corresponding digital input has tripped.
E004 Main motor excess temperature	
E005 Fan	

E006 Separator	
E007 Separator 2	
E008 Oil pump	
E009 Vibration	
E010 Machine diagnostics	
E011 Differential pressure filter	
E012 Ext. Machine differential pressure	
E013 External fault	
E014 Machine differential pressure	The differential pressure (differential pressure - intake pressure) is outside the permissible range. (Delay acc. to
E015 Motor fan	The measurement value has exceeded or not reached the interference threshold stored in the "Limits" menu.
E016 Oil cooler	
E017 Intake pressure	
E018 Pressure ratio	
E019 Discharge pressure max.	
E020 Discharge temperature	
E021 System temperature	
E022 Oil pressure	
E023 Oil temperature	
E024 Intake temperature 2	
E025 Discharge pressure 2	
E026 Discharge temperature 2	
E027 Oil pressure 2	
E028 Oil temperature 2	
E029 Discharge pressure min.	
E030 Speed	
E031 Oil level Lo	
E032 Oil level Hi	
E033 Intake pressure sensor	Sensor fault: Sensor faulty or cable break.
E034 Ambient temperature sensor	
E035 Discharge pressure sensor	
E036 Discharge temperature sensor	
E037 System pressure sensor	



Fault messages

E038 System temperature sensor
E039 Oil pressure sensor
E040 Oil temperature sensor
E041 Intake temperature 2 sensor
E042 Discharge pressure 2 sensor
E043 Discharge temperature 2 sensor
E044 Oil pressure 2 sensor
E045 Oil temperature 2 sensor
E046 Speed sensor

Error message	Remarks
E047 Oil level sensor	
E048 External set value	
E049 Motor bearing temp. sensor DS	
E050 Motor bearing temp. sensor NDS	
E051 Motor bearing temperature DS	
E052 Motor bearing temperature NDS	
E053 Vibration M-DS-Veff	
E054 Vibration M-NDS-Veff	
E055 Vibration G-DS-Veff	
E056 Vibration G-NDS-Veff	
E057 Vibration S1-DS-Veff	
E058 Vibration S1-NDS-Veff	
E059 Vibration S1-PG-Veff	
E060 Vibration S2-DS-Veff	
E061 Vibration S2-NDS-Veff	
E062 Vibration S2-PG-Veff	
E063 Vibration M-DS-Veff sensor	
E064 Vibration M-NDS-Veff sensor	
E065 Vibration G-DS-Veff sensor	
E066 Vibration G-NDS-Veff sensor	
E067 Vibration S1-DS-Veff sensor	
E068 Vibration S1-NDS-Veff sensor	

The measurement value has exceeded or not reached the interference threshold stored in the "Limits" menu.

Sensor fault: Sensor faulty or cable break.



E069 Vibration S1-PG-Veff sensor	
E070 Vibration S2-DS-Veff sensor	
E071 Vibration S2-NDS-Veff sensor	
E072 Vibration S2-PG-Veff sensor	
E073 Intake temperature	The measurement value has exceeded or not reached the interference threshold stored in the "Limits" menu.
E074 Intake temperature sensor	Sensor fault: Sensor faulty or cable break.
E075 Intake pressure 2	The measurement value has exceeded or not reached the interference threshold stored in the "Limits" menu.
E076 Intake pressure 2 sensor	Sensor fault: Sensor faulty or cable break.

Error message	Remarks
E077 Room temperature sensor	
E078 Room pressure sensor	
E079 Basic module communication	Module or communication with the module interrupted.
E080 Module balancing incorrect	
E081 I/O module address 1	
E082 I/O module address 2	
E083 I/O module address 3	
E084 I/O module address 4	
E085 I/O module address 5	
E086 I/O module address 6	
E087 I/O module address 7	
E088 I/O module address 8	
E089 I/O module address 9	
E090 I/O module address 10	
E091 I/O module address 11	
E092 I/O module address 12	
E094 I/O module address 14	
E095 I/O module address 15	
E096 Parameter incorrect	
E097 Oil tank temperature sensor	Sensor fault: Sensor faulty or cable break.
E098 Power sensor	



Warning and maintenance messages

E099 Oxygen sensor	
E100 Bearing temperature sensor main rotor drive side	Sensor fault: Sensor faulty or cable break.
E101 Bearing temperature main rotor gear side sensor	
E102 Bearing temperature main rotor drive side	The measurement value has exceeded or not reached the interference threshold stored in the "Limits" menu.
E103 Bearing temperature main rotor gear side	

8.2 Warning and maintenance messages

Warning messages

Warning message	Remarks
A002 Intake pressure	The measurement value has exceeded or not reached the warning threshold stored in the "Limits" menu.
A003 Min. ambient temperature	
A004 Max. ambient temperature	
A005 Max. discharge pressure	
A006 Discharge temperature	
A007 System temperature	
A008 Oil pressure	
A009 Oil temperature	
A010 Intake temperature 2	
A011 Discharge pressure 2	
A012 Discharge temperature 2	
A013 Oil pressure 2	
A014 Oil temperature 2	
A015 Speed	
A016 Oil level Lo	
A017 Oil level Hi	
A018 Pressure ratio	
A019 Cooling water flow	
A020 Condensate drain 1	
A021 Condensate drain 2	
A022 Aftercooler 1	

A023 Aftercooler 2	
A024 Machine differential pressure	
A025 Vibration 1S1	
A026 Vibration G1	
A027 Vibration 3S1	
A028 Vibration 1S2	
A029 Vibration G2	
A030 Vibration 3S2	
A031 Motor bearing temperature DS	
A032 Motor bearing temperature NDS	
A033 Main motor excess temperature	
A034 Dryer	
A035 External warning	
A036 Min. discharge pressure	
A037 Relubrication DS wire break	Relubrication device
A038 Relubrication DS system error	
A039 Relubrication DS lubricant supply	
A040 Relubrication NDS wire break	
A041 Relubrication NDS system error	
A042 Relubrication NDS lubricant supply	
A043 Motor fan	
A044 Oil cooler	
A048 I/O module address 13	Module address 13 – GLW module warning
A049 Vibration M-DS-Veff	
A050 Vibration M-NDS-Veff	
A051 Vibration G-DS-Veff	
A052 Vibration G-NDS-Veff	
A053 Vibration S1-DS-Veff	
A054 Vibration S1-NDS-Veff	
A055 Vibration S1-PG-Veff	
A056 Vibration S2-DS-Veff	
A057 Vibration S2-NDS-Veff	
A058 Vibration S2-PG-Veff	

Maintenance messages

The maintenance message number always begins with a “W”.

Maintenance message	Remarks
W01 Maintenance interval 1st maintenance	The time until next maintenance is less than 100 h. (op. hrs = operating hours) Perform maintenance and reset maintenance counter!
W02 Maintenance interval daily	
W03 Maintenance interval weekly	
W04 Maintenance interval monthly	
W05 Maintenance interval every 2,000 op. hrs or every 3 months	
W06 Maintenance interval every 4,000 op. hrs or every 6 months	
W07 Maintenance interval every 8,000 op. hrs or every 12 months	
W08 Maintenance interval every 16,000 op. hrs or every 2 years	
W09 Maintenance interval every 20,000 op. hrs or every 3 years	
W10 Maintenance interval every 30,000 op. hrs or every 4 years	
W11 Maintenance interval every 40,000 op. hrs or every 5 years	
W12 Maintenance interval motor relubrication	
W13 Maintenance interval motor maintenance	

Miscellaneous messages

The miscellaneous message number always begins with an “M”.

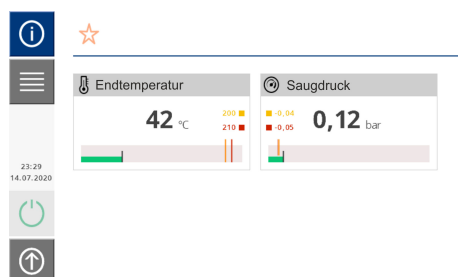
Message	Remarks
M01 Start temperature too low	Start temperature not reached message
M02 Switching cycles exceeded	Switching cycles exceeded message
M03 Restart delay active	Restart delay active message
M04 Wait for time switch	Time switch off message
M05 Automatic restart	Automatic restart message
M06 External clearance	External clearance message

9 Basic version

The Basic version is only suitable for displaying operating data and does not permit any control options. The menu system is therefore significantly reduced in comparison to the Advanced version and will be introduced briefly. The Basic version can be upgraded to the Advanced version using the Key generator.

9.1 Operating the control system

9.1.1 Structure of the display



Display for the Basic version. In contrast to the Advanced version, only the Favourites menu tab is available. The most important operating parameters are shown in this tab. Further tabs are not available.

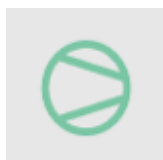
Fig. 31: Basic display

9.1.2 Operating and display elements

As the Basic version is only intended to display parameters, the current status of the main motor is also only displayed in greyed-out icons.



The icon shown on the left indicates that the motor is currently at a standstill and is ready for operation.



The icon shown on the left indicates that the motor is currently running.



This button enables direct access to the Key generator menu in which the Basic version can be upgraded to the Advanced version.

9.1.3 Basic version menu structure

The Basic version does not offer the full scope of functions as the Advanced version does. This is also reflected in the menu structure. The menu tree below shows which windows are available [on page 86](#). Many of the windows correspond to those of the Advanced version, which is why the cross-reference refers directly to the sections there.

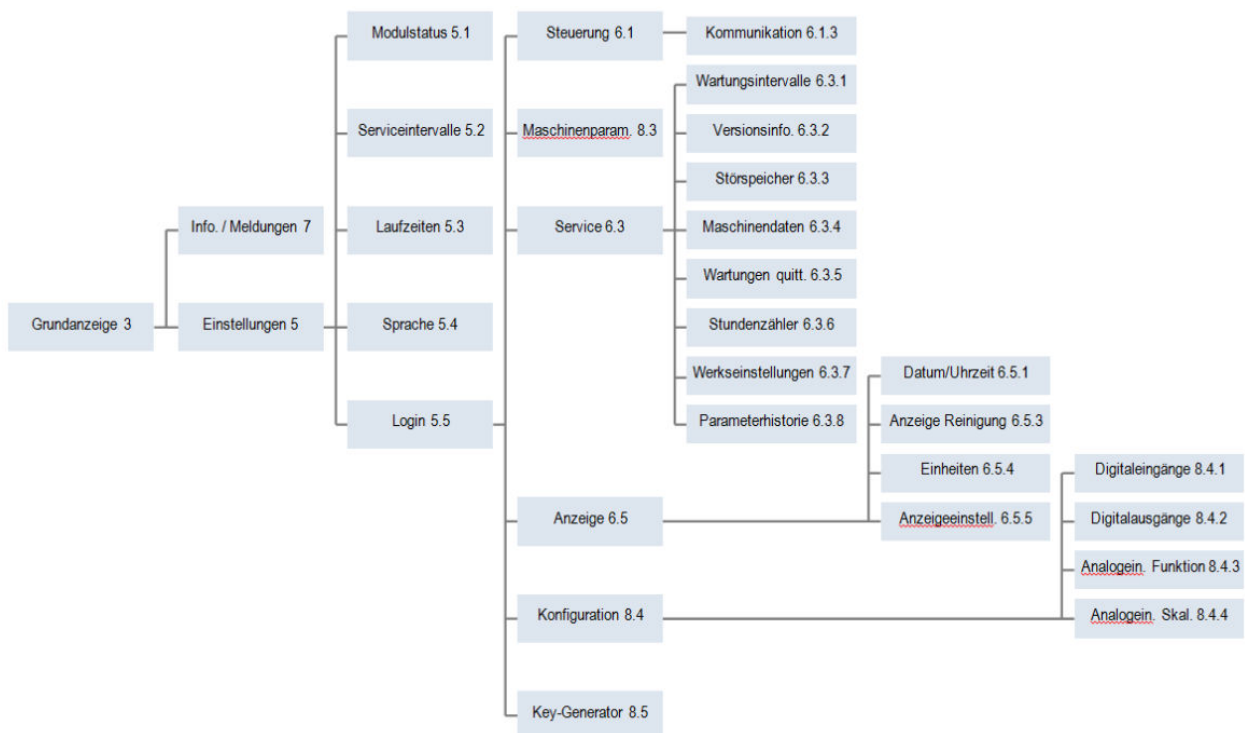


Fig. 32: Advanced menu structure

9.2 Main menu

The Main menu can be called up using the same code that is used in the Advanced version. [Chapter 7 'Main menu' on page 38](#)

9.3 Machine parameters

The Machine parameters menu differs from that of the Advanced version.

Parameter	Value range/Basic setting/ Remarks	Code
Restart lock	10 – 600 s	Admin
Start via discharge pressure	-1.0 – 5.0 bar	Admin
Oil pressure monitoring delay	10 – 60 s	User
Oil demister switch-on delay	0 – 250 s	User
Oil demister monitoring delay	0 – 60 s	User
Switching cycles	1 – 60 switching cycles/hour	Admin
Fan switch-on delay	0 – 250 s	User
Fan run down time	0 – 60 min	Admin

9.4 Configuration menu

9.4.1 Digital inputs menu

All adjustable digital inputs are listed here. In the event that extension modules are connected, the digital inputs for these modules are also shown. A maximum of 41 digital inputs are possible.

Module	Input	Value range/Basic setting/ Remarks	Code
Advanced module address: A01	A01-DI1	Emergency stop Logic: NC	Display only!
Advanced module address: A01	A01-DI2	Empty	Admin
	A01-DI3	Fan current	
	A01-DI4	Oil demister	
	A01-DI5	Oil pump	
	A01-DI6	System	
	A01-DI7	Reset Operation Acknowledgement	
	A01-DI8	Motor temperature Logic: NC	Display only!

	A01-DI9	Empty Oil demister Oil demister 2 Logic: NC	Admin
All except DI1 and DI8	Logic of the digital inputs	NO / NC	User

9.4.2 Digital outputs menu

All adjustable digital outputs are listed here. In the event that extension modules are connected, the digital outputs for these modules are also shown. A maximum of 43 digital outputs are possible.

Module	Output	Value range/Basic setting/Remarks	Code
Module	A01-DO1	Empty	Admin
Advanced	A01-DO2	Oil pump	
Address: A01	A01-DO3	Fan	
	A01-DO4	Warning	
	A01-DO5	Fault	
	A01-DO6	Ready	
	A01-DO7	Oil separator	
	A01-DO8	Empty	

9.4.3 Function analogue inputs menu

All adjustable analogue inputs are listed here. In the event that extension modules are connected, the analogue inputs for these modules are also shown. A maximum of 44 analogue inputs are possible.

Module	Input	Value range/Basic setting/Remarks	Code
Advanced module: Address: A01	A01-AI1	Empty	Admin
	A01-AI2	Intake pressure	
	A01-AI3	Oil pressure	
	A01-AI4	Discharge pressure	
	A01-AI5		
Advanced module address: A01	A01-AI6	Empty	Admin
	A01-AI7	Discharge temperature	
	A01-AI8		

9.4.4 Scale analogue inputs menu

Parameter	Value range/Basic setting/Remarks	Code
Intake pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Intake pressure input 20 mA	-1.0 bar .. 16 bar	Admin
Oil pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Oil pressure input 20 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure input 4 mA	-1.0 bar .. 16 bar	Admin
Discharge pressure input 20 mA	-1.0 bar .. 16 bar	Admin

9.5 Key generator menu

In contrast to the Advanced version, it is not possible to change any codes in the Key generator menu in the Basic version. The menu is intended solely for displaying the current day code and the Device ID. These can be used to purchase activation codes for the following options.

- Modbus TCP option
- Advanced module type

Activation is carried out with the aid of the Device ID and the Key generator PC tool.

10 Extension modules

10.1 Function

The AERtronic 2.0 allows for connection of various extension modules, through which additional functions are made available to the user.

10.1.1 Extension module EM1 (4 digital inputs, 4 digital outputs)

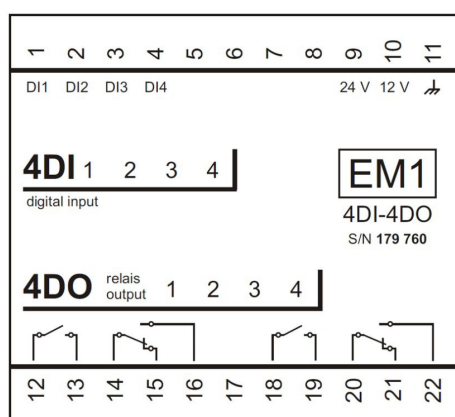


Fig. 33: EM1 labelling

Pin	Description	Function
1	DI1	Digital input 1
2	DI2	Digital input 2
3	DI3	Digital input 3
4	DI4	Digital input 4
9	V DI	24 V Digital inputs supply voltage
10	V PTC	12 V PTC supply voltage
11	GND	Ground
12	DO1 (Com)	Relay output 1
13	DO1 (NO)	
14	DO2 (Com)	
15	DO2 (NC)	
16	DO2 (NO)	
17	NC	Not connected

18	DO3 (Com)	Relay output 3
19	DO3 (NO)	
20	DO4 (Com)	Relay output 4
21	DO4 (NC)	
22	DO4 (NO)	

The following applies to relay outputs: max. 250 V AC, max. 4 A for N.O. contacts, max. 1 A for changeover contacts. The module must be earthed at pin 11 (minimum requirement 1.5 mm², functional earth).

10.2 EM2 extension module (2 current inputs, 2 PT1000, 4 digital outputs)

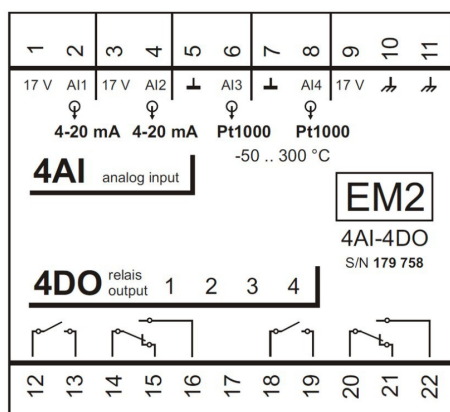


Fig. 34: EM2 labelling

Pin	Description	Function
1	V AI1	17 V analogue input 1 supply voltage
2	AI1	Analogue input 1 4-20 mA
3	V AI2	17 V analogue input 2 supply voltage
4	AI2	Analogue input 2 4-20 mA
5	GND	Ground for analogue input 3
6	AI3	Analogue input 3 PT1000
7	GND	Ground for analogue input 4
8	AI4	Analogue input 4 PT1000



EM2 extension module (2 current inputs, 2 PT1000, 4 digital outputs)

9	V AI	17 V analogue input supply voltage
10	GND	Ground
11	GND	Ground
12	DO1 (Com)	Relay output 1
13	DO1 (NO)	
14	DO2 (Com)	Relay output 2
15	DO2 (NC)	
16	DO2 (NO)	
17	NC	Not connected
18	DO3 (Com)	Relay output 3
19	DO3 (NO)	
20	DO4 (Com)	Relay output 4
21	DO4 (NC)	
22	DO4 (NO)	

The following applies to relay outputs:

max. 250 V AC,

max. 4 A for N.O. contacts,

max. 1 A for changeover contacts.

The module must be earthed at pin 11 (minimum requirement 1.5 mm², functional earth).

10.3 EM3 extension module (2 current inputs, 2 PT1000, 4 digital inputs)

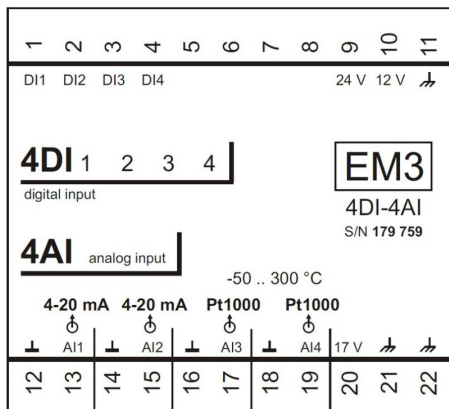


Fig. 35: EM3 labelling

Pin	Description	Function
1	DI1	Digital input 1
2	DI2	Digital input 2
3	DI3	Digital input 3
4	DI4	Digital input 4
9	V DI	24 V digital inputs 1-8 supply voltage
10	V PTC	12 V digital inputs 1-8 supply voltage
11	GND	Ground
12	GND	Ground for analogue input 1
13	AI1	Analogue input 1
14	GND	Ground for analogue input 2
15	AI2	Analogue input 2
16	GND	Ground for analogue input 3
17	AI3	Analogue input 3
18	GND	Ground for analogue input 4
19	AI4	Analogue input 4
20	V sensor	18 V sensor supply voltage
21	GND	Ground
	GND	Ground

EM4 extension module (2 analogue outputs)

The module must be earthed at pin 11 (minimum requirement 1.5 mm², functional earth).

10.4 EM4 extension module (2 analogue outputs)

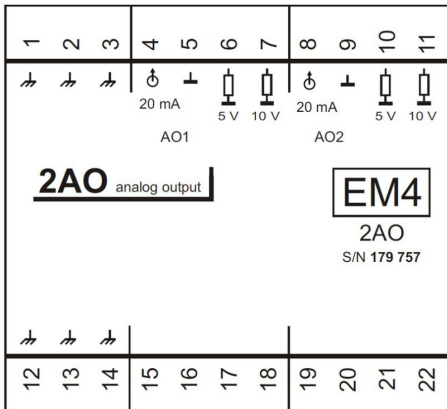


Fig. 36: EM4 labelling

Pin	Description	Function
1	GND	Ground
2	GND	Ground
3	GND	Ground
4	AO1	Analogue output 1 4-20 mA
5	GNDA	Analogue output 1 ground
6	Resistance against GNDA	For voltage output 5 V
7	Resistance against GNDA	For voltage output 10 V
8	AO2	Analogue output 2 4-20 mA
9	GNDA	Analogue output 2 ground
10	Resistance against GNDA	For voltage output 5 V
11	Resistance against GNDA	For voltage output 10 V

Pin	Description	Function
12	Not connected	
13	Not connected	
14	Not connected	
15	Not connected	



16	Not connected	
17	Not connected	
18	Not connected	
19	Not connected	
20	Not connected	
21	Not connected	
22	Not connected	

Both outputs have a common signal ground GNDA and are galvanically isolated from the earthed module ground.

Connection of voltage outputs

Voltages between 0-5 V and 0-10 V can be generated via an internal resistor. For this purpose, terminal 6 or 7 is connected to the current output terminal 4.

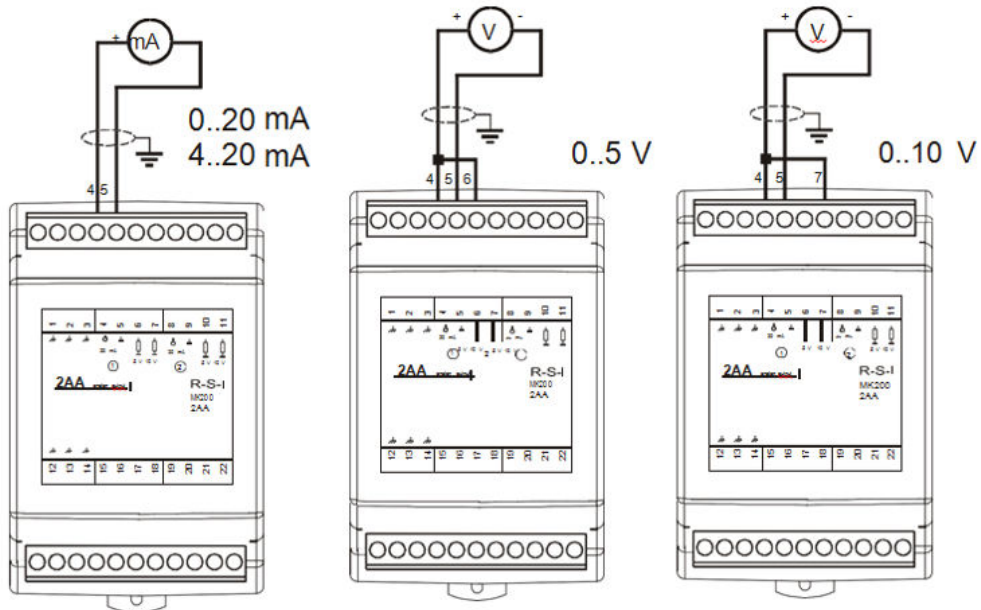


Fig. 37: Analogue outputs EM4

The second output is connected in the same way. The following points should be observed in order to achieve the greatest possible precision:

- Voltage outputs should only be loaded with high impedance ($\geq 100\text{ k}\Omega$).
- The output range used should be set in the control system software in such a way that correct balancing values are used.

RS485 addressing

The module can only be addressed via addresses 11 and 12 in the Module selection menu.

10.4.1 Profinet module EM7

The Profinet module makes it possible to connect a control system to the Profinet as a slave. The control system is connected to the module via the MK200 system bus and queried by the module via the appropriate protocol.

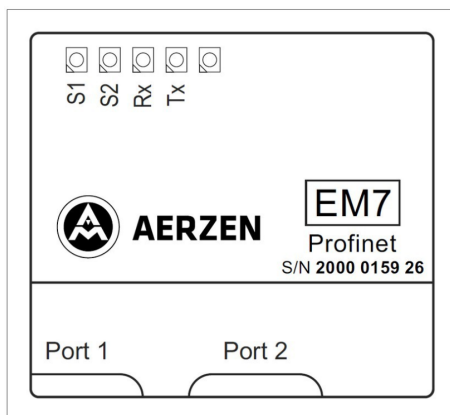


Fig. 38: Profinet module EM7 labelling

The following functions are available for the Profinet:

- Read out data (status data, measurement data and counter):
128 bytes plus Profinet settings
- Write data (16 bytes).

The settings are made via the control system or a configuration tool.

RS485 addressing

The module is supplied with address 14 as standard. It is only necessary to change the address in exceptional cases and requires making a corresponding software change on the control unit.

10.4.2 Profibus module EM9

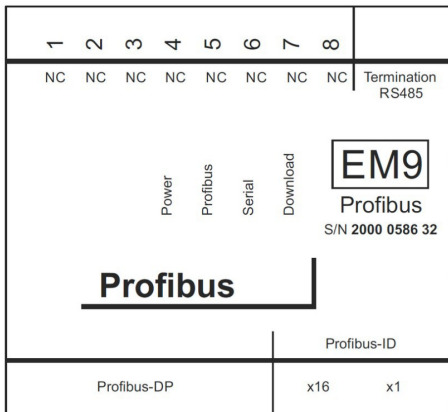
The control system can be connected to Profibus DP via the communication module EM9 as per EN 50170. The functions are analogous to other communication modules such as MODBUS RTU or Profinet IRT. The Profibus can be addressed via the address switch with the designation Profibus ID. Here, the setting is hexadecimal (00 to FF hexadecimal corresponds to 0 to 255 decimal). The left-hand rotary switch represents the high-order address (x16) and the right-hand switch represents the low-order address. The address FF is reserved for the firmware update (for details of firmware updates, please refer to the data sheet for the modules).



Please note: A changed address is only imported when the supply is switched on!



EM4 extension module (2 analogue outputs) > EM10 extension modules (2 current inputs, 2 PT100, 4 digital inputs)



The following functions are available for the Profibus:

- Read out data (244 bytes)
- Write data (16 bytes).

The settings are made via the control system or a configuration tool.

Fig. 39: EM9 labelling

RS485 addressing

The module is supplied with Address 15 as standard. It is only necessary to change the address in exceptional cases and requires making a corresponding software change on the control unit. Please refer to the Profibus module documentation for further details of the Profibus.

10.4.3 EM10 extension modules (2 current inputs, 2 PT100, 4 digital inputs)

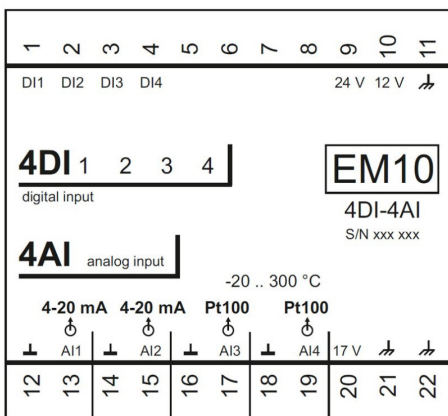


Fig. 40: EM10 labelling

Extension modules



AERZEN

EM4 extension module (2 analogue outputs) > EM10 extension modules (2 current inputs, 2 PT100, 4 digital inputs)

Pin	Description	Function
1	DI1	Digital input 1
2	DI2	Digital input 2
3	DI3	Digital input 3
4	DI4	Digital input 4
9	V DI	24 V digital inputs 1-8 supply voltage
10	V PTC	12 V digital inputs 1-8 supply voltage
11	GND	Ground
12	GND	Ground for analogue input 1
13	AI1	Analogue input 1
14	GND	Ground for analogue input 2
15	AI2	Analogue input 2
16	GND	Ground for analogue input 3
17	AI3	Analogue input 3
18	GND	Ground for analogue input 4
19	AI4	Analogue input 4
20	V sensor	18 V sensor supply voltage
21	GND	Ground
22	GND	Ground

The module must be earthed at pin 11 (minimum requirement 1.5 mm², functional earth).



10.5 Bus address setting and termination of the interface



Fig. 41: DIP switches on the right

The bus address of the RS485 interface needs to be set before the supply and interface connection of the extension modules. This can be done using the DIP switches, which are accessible underneath a small cover on the right-hand side of the module. The cover needs to be removed before any adjustment is made.

The address of the modules is set with the first 5 DIP switches (↪ Chapter 12 'Appendix A' on page 111). DIP switches 6 to 8 are reserved and must always be set to OFF, i.e. be in the down position. DIP switches 9 and 10 are used to terminate the interface. These are normally deactivated (OFF = down). The last module to be connected must therefore have set DIP switches 9 and 10 to ON.

i *Please note: Some modules are only accessible via a few addresses or via a single address. This is indicated on the respective modules!*

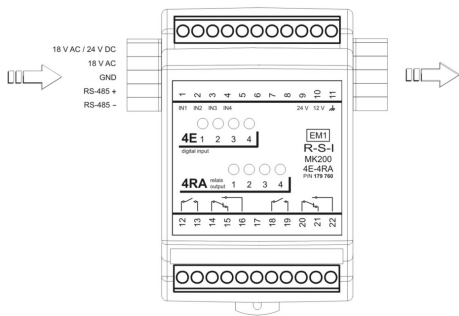
10.6 Supply and interface connection

i *Please note: With regard to the extension modules, a bus address must be set for the RS485 interface BEFORE assembly.*

The supply and interface connection is common to all extension modules. This connection is positioned laterally on the modules. Pin assignment.

Pin	Description	Function
1	18 V AC or 24 V DC	18 V AC or 24 V DC
2	18 V AC	18 V AC

3	GND	Ground
4	SIG-A (+)	RS485 interface
5	SIG-B (-)	



The first extension module connected to the AERtronic 2.0 module can be connected via the top-left connection using a cable (available for order) (). They can be supplied with 24 V DC or 18 V AC. The voltage supply of 24 V DC is connected via the top terminal (pin 1) and the middle terminal (pin 3). The 18 V AC supply (potential-free!) is connected to the two upper terminals marked 18 V AC (pins 1 and 2).

Fig. 42: Connection of extension modules

A direct connector, which is included in the scope of delivery, is needed for every other extension module. This makes it possible to connect the module in series via the connection in the top right.

10.6.1 Configuration

The extension modules can be connected via the Module selection menu. Here, a suitable address must be assigned to the respective modules. This address also needs to be set at the address switches.



11 Aerzen WebView web visualisation

The Aerzen WebView web visualisation enables control and monitoring of the AERtronic 2.0 via a web interface. In order to use WebView's full scope of functions, it is necessary to purchase an activation code (Key generator PC tool). Without activation, WebView can only (!) be accessed and edited with Super-Super Admin rights.

11.1 Access

It is possible to log in as User. The following code number is assigned in delivery state.

Code	Access authorisation	Description
12345	User	Access authorisation as for AERtronic 2.0

The User and Admin passwords can be changed on an individual basis (as of Admin level).



Please note: The codes for web visualisation are identical to those of the AERtronic 2.0 in delivery state. However, the codes for WebView cannot be changed via the Key generator menu, just as the codes for AERtronic 2.0 cannot be changed via WebView.

11.2 Interface

Following login, there are six tabs visualising the current state of a system. (Reference not found). Settings are only possible as of Admin level; the "Super Admin" page is fully locked for "User" and "Admin". The following machine data entered in AERtronic 2.0 is displayed again below the tab bar and is visible in all tabs:

- Order number
- Factory number
- Serial number
- Machine

Pending messages can be viewed below this data in addition to the current machine status.



Fig. 43: WebView interface

11.2.1 Overview

In the Overview tab, all configured analogue inputs of the AERtronic 2.0 are clearly arranged in the numeric representation with the current value, in the same way as they are shown on the AERtronic 2.0 HMI display unit.

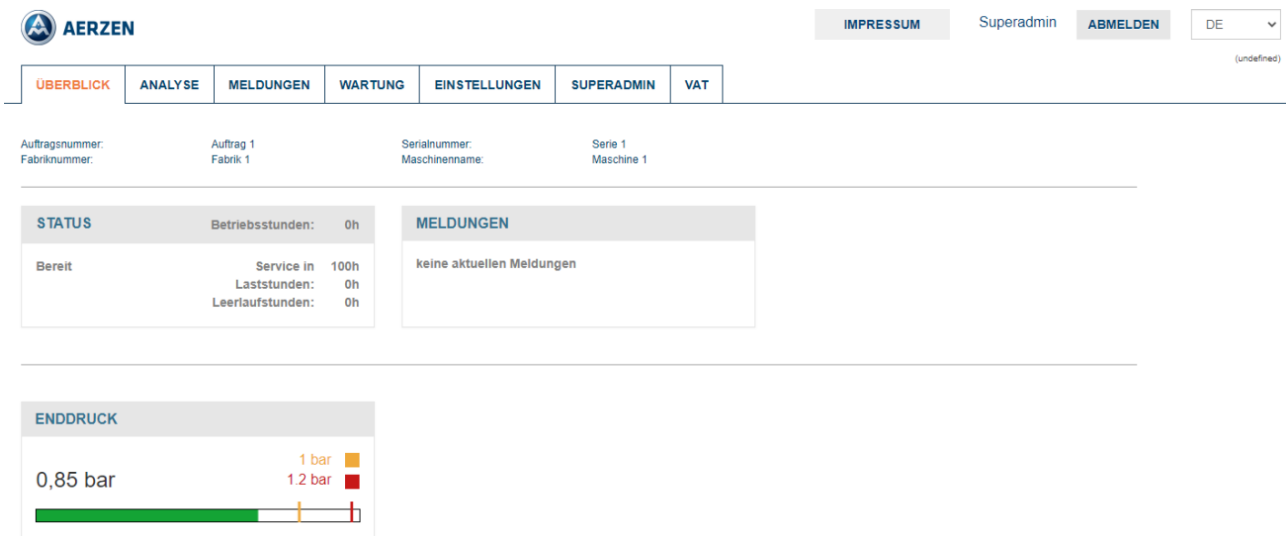


Fig. 44: WebView interface 2

11.2.2 Analysis

The Analysis tab corresponds to the graphic representation in the basic display of the AERtronic 2.0 and displays the time course of the configured parameters.

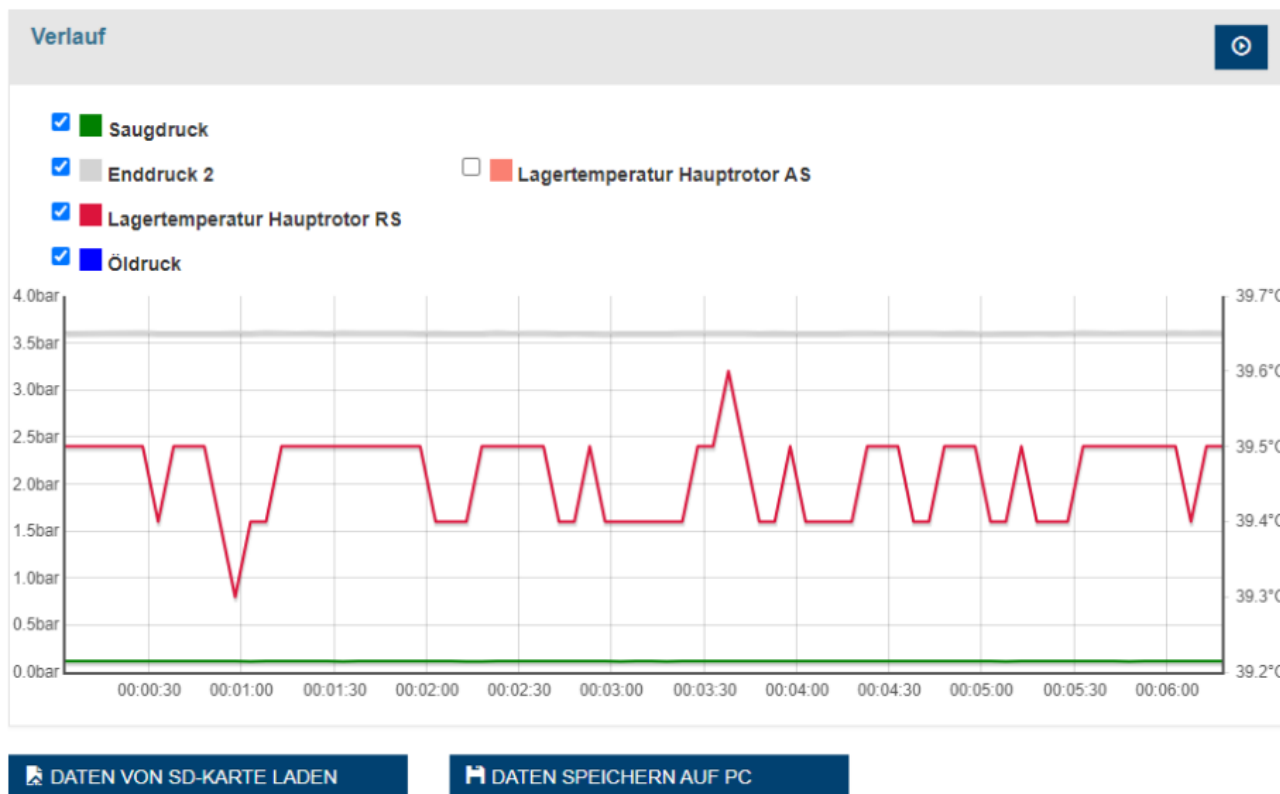


Fig. 45: WebView analysis

It is possible to switch all configured parameters on and off via the radio buttons above the graphic [on page 102](#). Here, the temperature scale is always shown on the right, while the pressure scale is always shown on the left-hand ordinate.

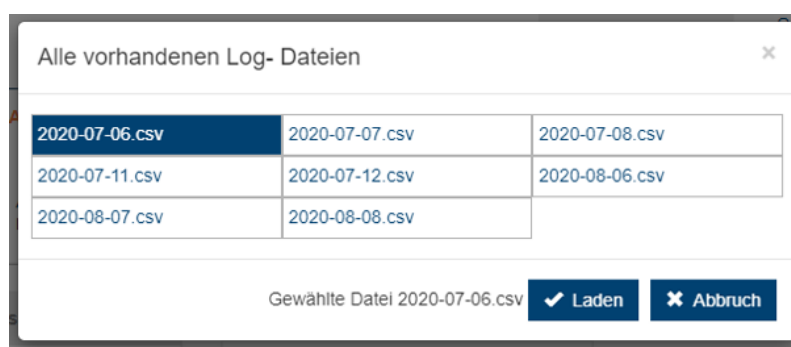


Fig. 46: Log files on SD card

In contrast to the AERtronic 2.0 display, the graphic course is only shown for the last hour and does not allow any further selections. For this reason, WebView offers the option of loading the data from a log file on the SD card inserted in the AERtronic 2.0. The log files are stored in folder aertroniv20 >>graphdate>><year> on the SD card.

If the data has been loaded from the SD card, a blue button with a white encircled arrow appears in the upper right corner of the course; this can be used to reload the current data from the control system. Another button offers the option of saving the data currently displayed as a CSV file on the PC.

11.2.3 Messages

The Messages tab can be made visible, on the one hand, by clicking on the corresponding tab and, on the other hand, via the Messages window below the tab bar.

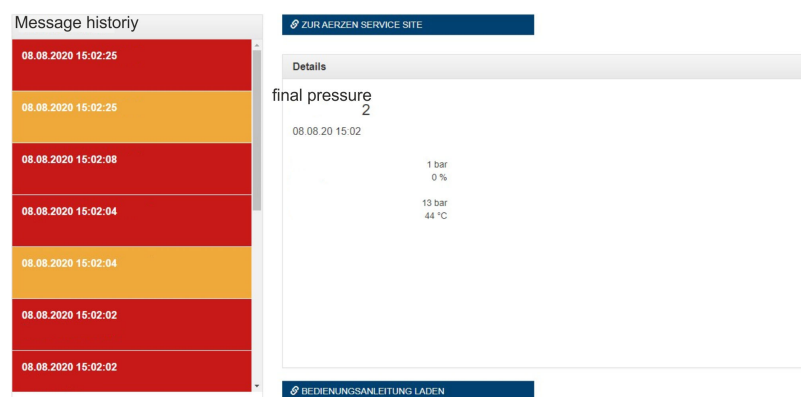


Fig. 47: WebView messages

Clicking on a message displays further details for said message in the detail view on the right. Two buttons take the user to the Aerzen Service website or to the operating manual for the control system. A distinctive feature of the latter is to be noted: Pressing the Load operating manual button will initially trigger a search of the AERtronic 2.0 folder on the SD card and the operating manual subfolder contained within it. If no operating manual is stored on the SD card, the user is referred to the Aerzen website from which the manual can be obtained.

11.2.4 Maintenance

The Maintenance map has a similar structure to the Messages page. Further information about a maintenance task can be found in the detail view. For further details, you can also refer to the Aerzen Service website or the online instruction manual.

11.2.5 Settings

The following windows are visible on the Settings page:

Window	Description
Firmware update	Enables performance of software updates if an SD card with valid itb file is inserted
Edit machine parameters	Enables changes to the machine parameters of the AERtronic 2.0; these parameters can also be changed via the Machine parameters menu.
Web server network settings	View of all available network data for the AERtronic 2.0.
Parameter file	The Save and Load buttons can be used to save or load the current parameters of the AERtronic 2.0 in a directory specified by the user. This can also be performed via the VAT (VisualAERtronic) tab.
Password management	It is possible to change the password for User and Admin. ATTENTION: The changed passwords relate only to the Aerzen WebView and do not have any connection to the passwords of the AERtronic 2.0 HMI.
SD card	Display of all available files on the inserted SD card.
E-mail transmission	Enables e-mails to be sent in the event of warnings, faults or in relation to service.

11.2.6 Super Admin

The parameter history of the AERtronic 2.0 is shown in the Super Admin tab. As already illustrated in the control unit section, all changes to any of the parameters are listed here with the time and date including start value and end value. In the event that the configuration is incorrect, it is possible to retrace the sequence in which the parameters were reset in order to eliminate faults more quickly.

11.2.7 VAT (VisualAERtronic)

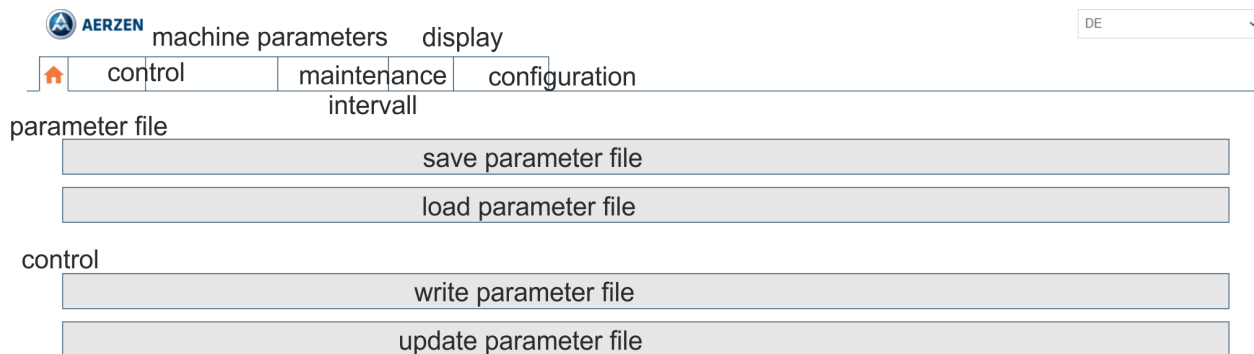


Fig. 48: VAT interface

The VAT menu is the complete menu of the AERtronic 2.0 in the Aerzen WebView and enables any changes to the operating parameters of the AERtronic 2.0 to be made in a clear and straight-forward manner.

The following buttons are visible in the Main menu of VisualAERtronic.

Button	Description
Save parameters	The parameters are saved in a json file in the chosen folder.
Load parameters	The parameters can be loaded via a json file.
Write parameters	The parameters are transferred to the AERtronic 2.0.
Update parameters	Transfers the parameters of the AERtronic 2.0 to the VisualAERtronic.

A green pop-up window in the top right corner reports on the successful loading or transmission process, after which the individual menus of AERtronic 2.0 become visible in the upper tab bar. This bar allows the parameters to be adapted to the respective conditions.



Please note: When VisualAERtronic is called up for the first time, only the Main menu with the Load and Update parameters buttons are visible. It is only possible to load the various menus by updating or loading the parameters from a parameter file.



AERZEN DE

control machine parameter maintenance intervall display configurationration

regulation varius communication

Auto

Druckregelung

Ja	Intern	0,5 bar
0,7 bar	10 s	Druckseite
Systemdruck	bar	0 %
50 %	20 %	0 %

Fig. 49: VAT tab

Changing the parameters

In order to save a changed parameter, it is necessary to return to the main display of the VisualAERtronic and select the Write parameters button. Changed parameters are included in the parameter history in the Super Admin tab.

11.3 E-mail transmission

There is the option of sending messages (faults, warnings, service messages) to up to three different recipients by e-mail. Settings need to be made in the Settings tab to this end.

11.3.1 Activating e-mail transmission

In order to send e-mails, the E-MAIL TRANSMISSION setting first needs to be activated in the Settings tab.

i Please note: If this setting has not been made, no e-mails are sent and the other parameters are not accessible.

11.3.2 Configuring the recipient

Enter the e-mail address of the recipient and define the conditions under which an e-mail is to be sent. The following are available for selection:

- Warnings • Faults • Service

The recipient receives an e-mail should one of these events occur. No e-mail is sent if none of the events is selected.

11.3.3 Configuring sender data

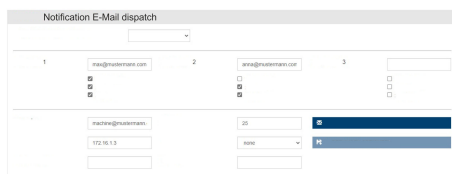


Fig. 50: E-mail transmission

Setting	Description
Sender	Your e-mail address
Port no.	Port number on the outgoing e-mail server
smtp-host	Name or IP address of the e-mail server
Encryption	Only StartTLS or no encryption is supported at present
Username	If you require a username for your e-mail account
Password	If your account is password-protected

11.3.4 Feedback

Unprocessed changes

If the server detects changes to the e-mail settings, the background of the heading turns yellow. The “Unsaved changes” information text is also shown.



Fig. 51: Unprocessed changes

Saving changes

As soon as the server detects changes, the Save changes button is activated. Please save the changes if you are finished with the configuration. Unsaved changes are not applied!

Test

E-mails can be sent to the currently set recipients using the Send test e-mail button. If the configuration is incorrect, the button becomes inactive and cannot be used.

11.4 Software update

It is also possible to update the AERtronic 2.0 to the latest operating software via the web interface, provided that an SD card with a valid itb file is inserted. Clicking on the Software update button in the Settings opens a window for performing the update. Browse in the top of the screen can be used to select the itb update file on the SD card. The update is started by clicking on Perform update.

i Please note

- *It could take some time to load the file depending on the speed of the network connection.*
- *The AERtronic 2.0 is restarted during the update. For this reason, do not perform this process without consulting the operator of the system.*
- *The update is only possible if a micro SD card with sufficient storage capacity is inserted.*



Fig. 52: WebView update

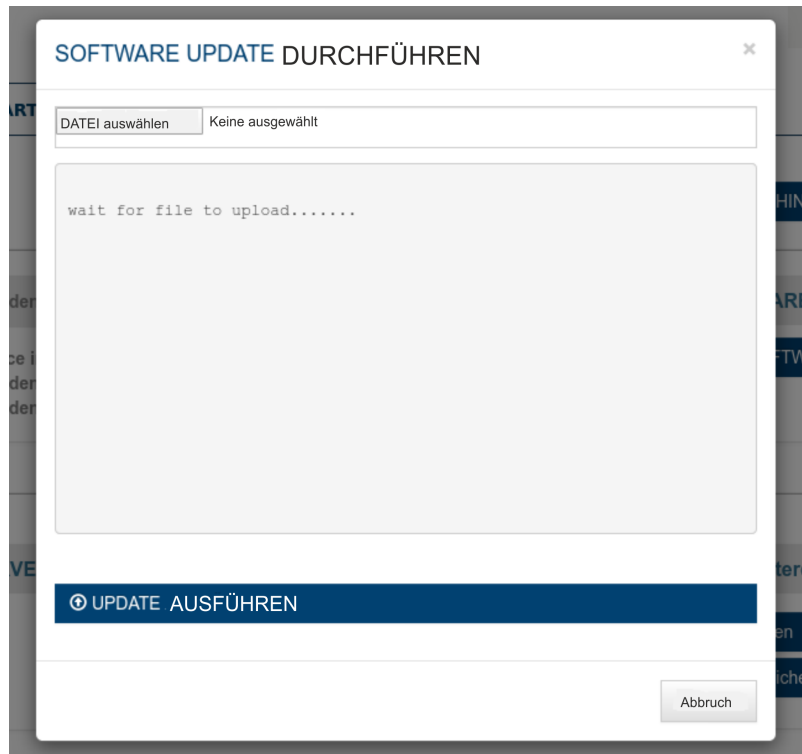


Fig. 53: Dialogue update



12 Appendix A

Address for DIP switches 1 2 3 4 5						Module type	Description
1	1	0	0	0	0	Advanced module	AERtronic 2.0 basic module
2	0	1	0	0	0	EM0 not applicable	The AERtronic 2.0 basic module assumes the role of EM0
3	1	1	0	0	0	4E-4RA (*)	Extension module 1 (*)
4	0	0	1	0	0	4AE-4RA (*)	Extension module 2 (*)
5	1	0	1	0	0	4E-4AE (*)	Extension module 3 (*)
6	0	1	1	0	0	2AA (*)	Extension module 4 (*)
7	1	1	1	0	0		
8	0	0	0	1	0		
9	1	0	0	1	0		
10	0	1	0	1	0		
11	1	1	0	1	0		
12	0	0	1	1	0		
13	1	0	1	1	0		
14	0	1	1	1	0		
15	1	1	1	1	0		
16	0	0	0	0	1		
17	1	0	0	0	1		
18	0	1	0	0	1		
19	1	1	0	0	1		
20	0	0	1	0	1		
21	1	0	1	0	1		
22	0	1	1	0	1		
23	1	1	1	0	1		
24	0	0	0	1	1		
25	1	0	0	1	1		
26	0	1	0	1	1		
27	1	1	0	1	1		
28	0	0	1	1	1		



29	1	0	1	1	1		
30	0	1	1	1	1		
31	1	1	1	1	1		

13 Technical data

Environmental limits


NOTICE!

Display: The service life of the display depends heavily on the ambient conditions. Protect the control system from direct sunlight and high temperatures so that you are able to use the high quality of the display for as long as possible.

Data	Value	Unit
Ambient conditions	-20 to 70	°C
Humidity (storage)	max. 95; non-con- densing	%
Ambient conditions during operation	-20 to 55	°C
Humidity (storage)	max. 95; non-con- densing	%
Chemical-free atmosphere		

Maximum installation elevation

Data	Value	Unit
max. installation elevation above sea level	1,000	m



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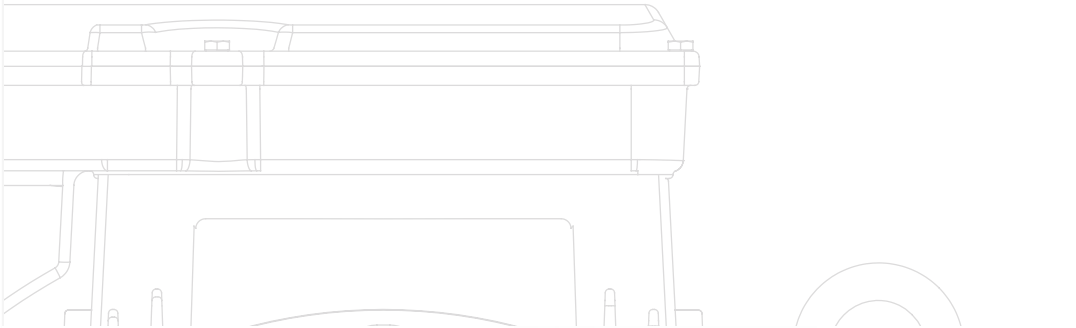


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SECTION 5

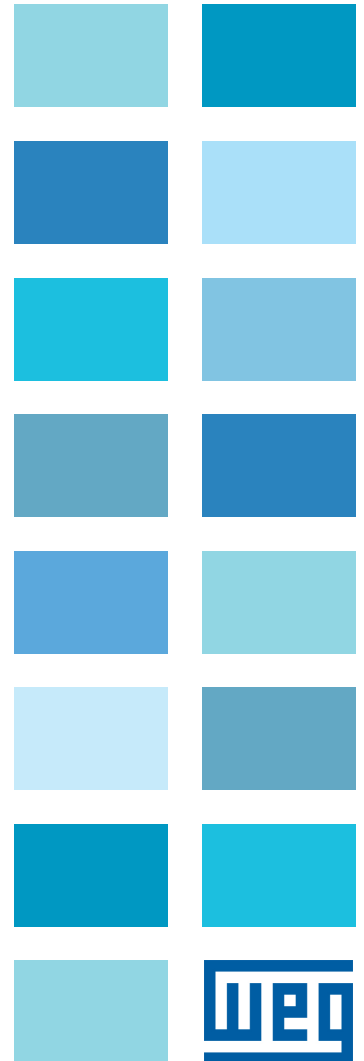
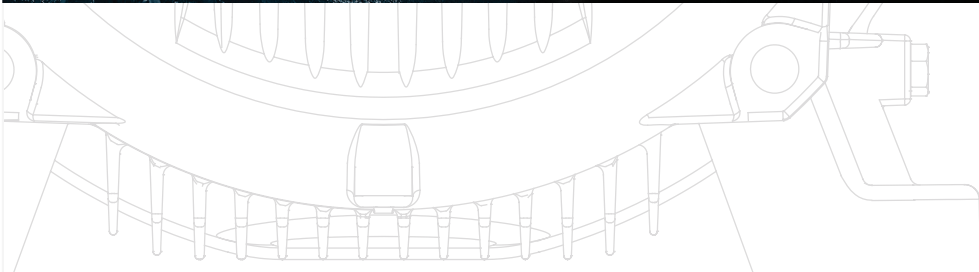
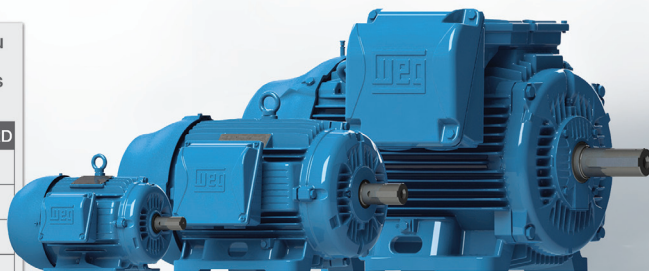
Severe Duty is Standard with **WEG W22** motors.

You do not need a special motor for severe duty. Severe Duty is standard with WEG W22 motors.



No matter what you call it, WEG's W22 standard product is designed for:

DUTY	STANDARD
Mill-Chem	✓✓
Tough Service	✓✓
Severe Duty	✓✓
Crusher Duty	✓✓
WEG Duty	✓✓



You do not need a special motor for severe duty. Severe Duty is standard with WEG.

Features that make a difference:

- All NEMA Premium ratings have a 1.25 service factor (up to 100 HP) resulting in cooler operation and extended life of the motor
- All Cast Iron Construction, including Terminal Box and Fan Cover (*)
- Solid feet for reduced vibration levels and impact absorption
- Optimized ventilation system for cooler operation and extended life
- High Grade FC200 cast iron provides superior mechanical strength and heat dissipation
- All WEG W22 motors are Totally Enclosed Fan Cooled with a true IP55 rating against dust and moisture. (IPW56, IPW65 and IPW66 available as optional)
- Exclusive W-Seal 364T and larger provides superior bearing protection
- Taconite Labyrinth seal 586 Frame and larger
- Exclusive WEG painting system exceed 200hrs ASTM 117 corrosion test (Exceeds IEEE841 standard)
- Balanced to 0.08 inches per second vibration limits (Meets IEEE841 standard)
- Four Bolt Conduit Cover with glued Neoprene Gasket
- Impregnation Resin and magnet wire are insulation class H
- Stainless Steel Nameplate - Laser edged with high contrast background
- Corrosion Proof Drains
- Inverter Duty per NEMA MG1, Part 31
- Certified Class I Div 2, Groups A, B, C & D; Class II, Div 2, Groups F & G

*cast iron fan cover available as an option on 143-215T frames

New Cooling System

Fan Cover

- Aerodynamic design
- Noise level reduction
- Better air flow distribution over frame
- Increased mechanical strength

Fan

- Reinforced fan hub structure
- Noise level reduction
- Increased air flow
- Fan with higher stiffness

Terminal Box

- Better connection quality
- Easier cable handling during installation
- More space available for accessory installation
- Easier Maintenance
- Mounting F1/F2/F3
- Rotation on 90° stages

Bearing Caps

External

- Finned surface for improved bearing heat dissipation

Internal

- Change of grease path for positive lubrication
- Bearing lubrication quality improvement
- Reduced bearing temperature

Seal Subsystem

- Increased dust and moisture protection
- Increased protection to high-pressure cleaning

Frame

- Reduced temperature on windings and bearings
- Noise level reduction
- Terminal box position outlet on top

Pad for vibration sensor

- Displaced 90° from each other

Enhanced Lifting Provisions

- Easier handling - horizontal & vertical
- Higher mechanical strength and handling safety

Solid feet

- More impact resistance
- Ideal for high vibration level applications

Endshields Subsystem

DE (Drive Endshield)

- New fin design
- Bearing moved outwards for better load support
- Improved bearing heat dissipation for reduced bearing temperature
- Reinforced endshield structure

NDE (Non-Drive Endshield)

- New design with smooth exterior surface
- Improved air flow
- Noise level reduction
- Improved structural rigidity for low vibration

DATA SHEET



Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : NEMA Premium Efficiency Three-Phase Product code : 11946168

Frame	: 444/5TS	Locked rotor time	: 39s (cold) 22s (hot)
Output	: 150 HP (110 kW)	Temperature rise	: 80 K
Poles	: 2	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 163 A	Protection degree	: IP55
L. R. Amperes	: 1060 A	Cooling method	: IC411 - TEFC
LRC	: 6.5x(Code G)	Mounting	: F-3
No load current	: 41.0 A	Rotation ¹	: Both (CW and CCW)
Rated speed	: 3570 rpm	Noise level ²	: 81.0 dB(A)
Slip	: 0.83 %	Starting method	: Direct On Line VFD
Rated torque	: 30.5 kgfm	Approx. weight ³	: 805 kg
Locked rotor torque	: 180 %		
Breakdown torque	: 240 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 1.65 kgm ²		
Design	: B		

Output	25%	50%	75%	100%	Foundation loads	
Efficiency (%)	94.0	94.1	95.0	95.0	Max. traction	: 336 kgf
Power Factor	0.60	0.83	0.88	0.89	Max. compression	: 1141 kgf

	Drive end	Non drive end
Bearing type	: NU-314 C3	6314 C3
Sealing	: WSeal	WSeal
Lubrication interval	: 2000 h	4000 h
Lubricant amount	: 27 g	27 g
Lubricant type	: Mobil Polyrex EM	

Notes

This revision replaces and cancel the previous one, which must be eliminated.

- (1) Looking the motor from the shaft end.
- (2) Measured at 1m and with tolerance of +3dB(A).
- (3) Approximate weight subject to changes after manufacturing process.
- (4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date
Performed by				
Checked by			Page	Revision
Date	19/10/2022		1 / 6	

DATA SHEET

Three Phase Induction Motor - Squirrel Cage



Customer : _____

Thermal protection

ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 °C

Rev.	Changes Summary	Performed	Checked	Date
Performed by				
Checked by			Page	Revision
Date	19/10/2022		2 / 6	

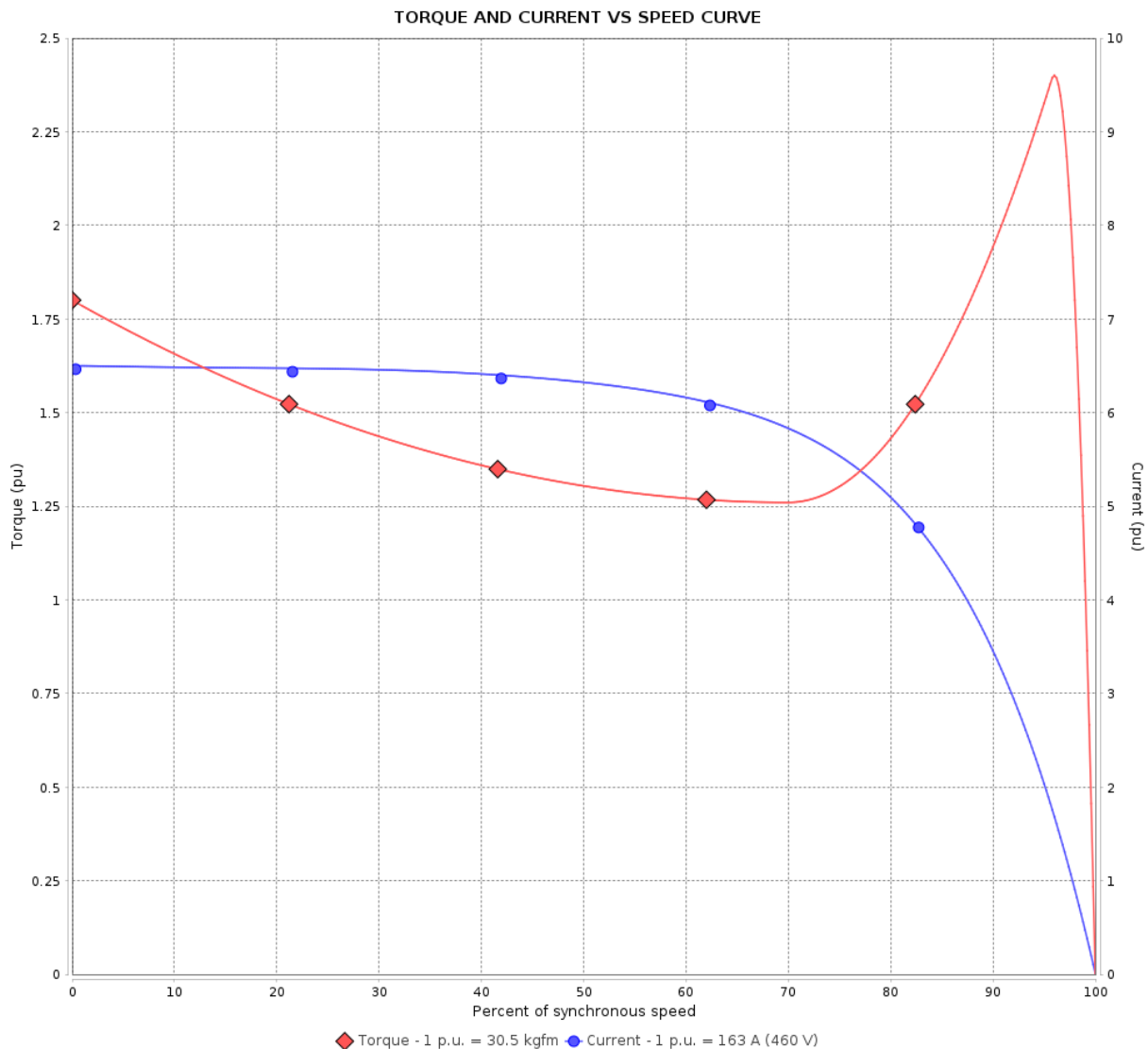
TORQUE AND CURRENT VS SPEED CURVE



Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : NEMA Premium Efficiency Three-Phase Product code : 11946168



Performance : 460 V 60 Hz 2P

Rated current	: 163 A	Moment of inertia (J)	: 1.65 kgm ²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 30.5 kgfm	Insulation class	: F
Locked rotor torque	: 180 %	Service factor	: 1.15
Breakdown torque	: 240 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

Locked rotor time : 39s (cold) 22s (hot)

Rev.	Changes Summary	Performed	Checked	Date
Performed by			Page 3 / 6	Revision
Checked by				
Date	19/10/2022			

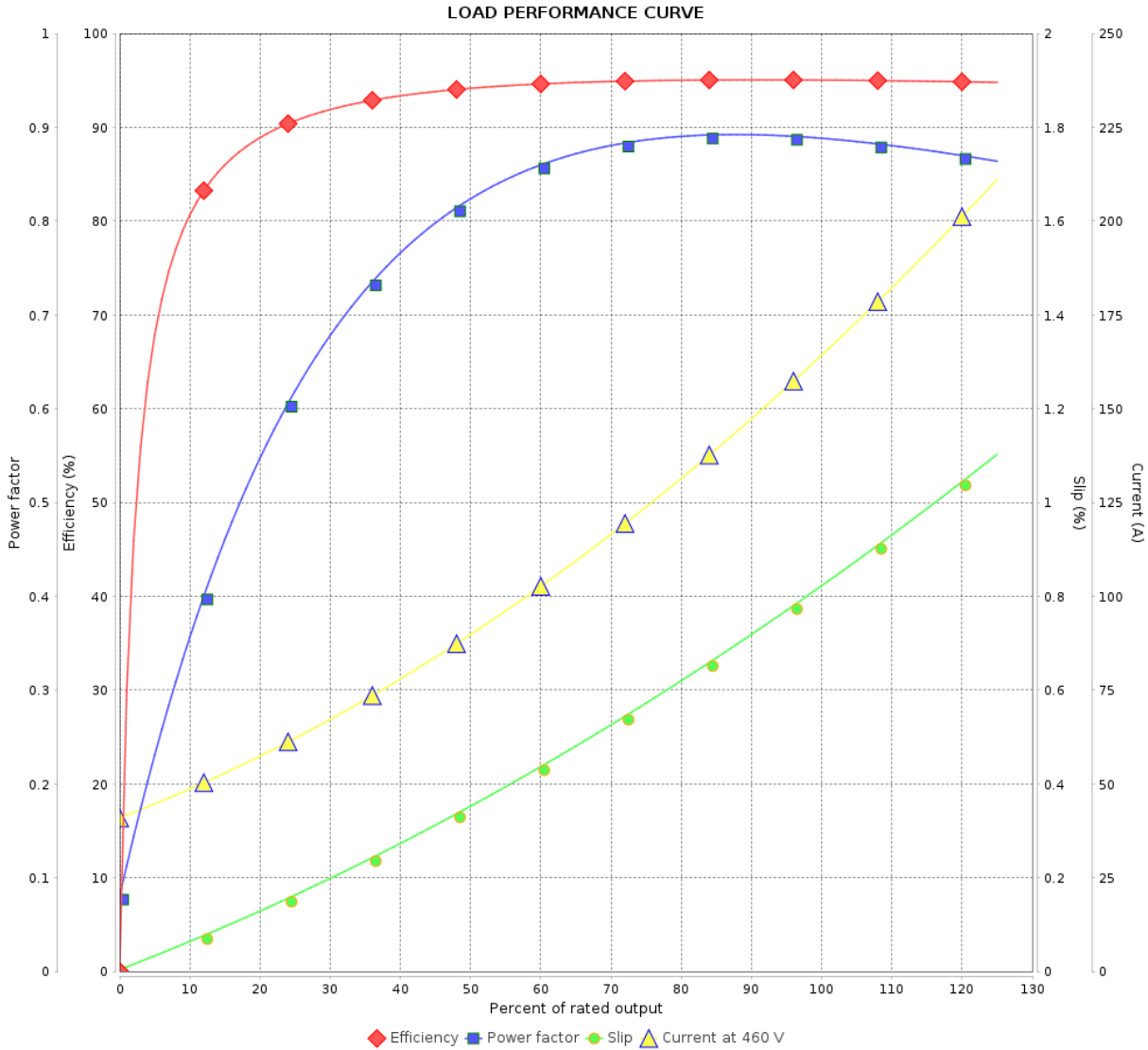
LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage



Customer :

Product line : NEMA Premium Efficiency Three-Phase Product code : 11946168



Performance : 460 V 60 Hz 2P

Rated current	: 163 A	Moment of inertia (J)	: 1.65 kgm ²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 30.5 kgfm	Insulation class	: F
Locked rotor torque	: 180 %	Service factor	: 1.15
Breakdown torque	: 240 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date
Performed by			Page 4 / 6	Revision
Checked by				
Date	19/10/2022			

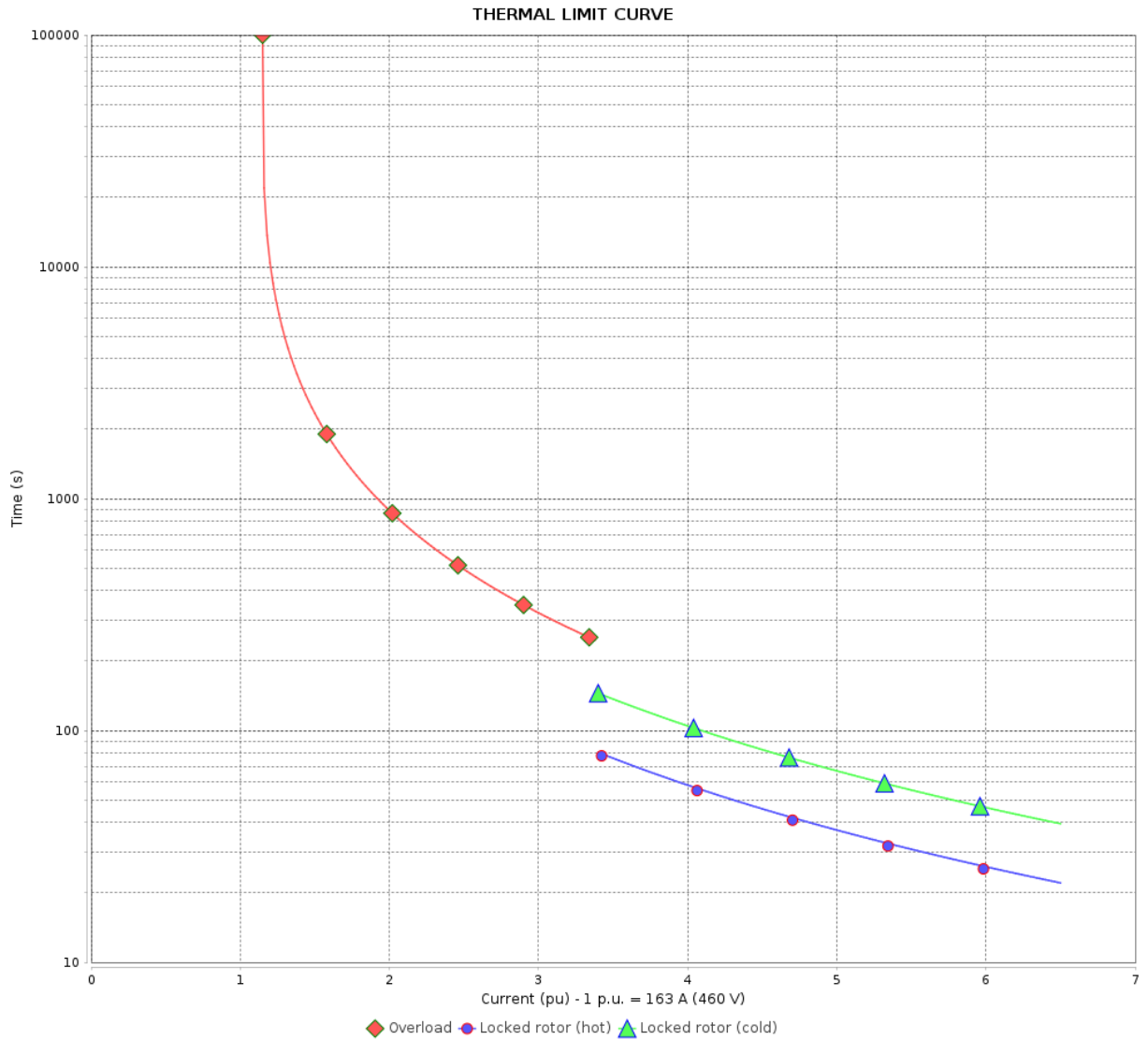
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage



Customer : _____

Product line : NEMA Premium Efficiency Three-Phase Product code : 11946168



Performance : 460 V 60 Hz 2P

Rated current	: 163 A	Moment of inertia (J)	: 1.65 kgm ²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 30.5 kgfm	Insulation class	: F
Locked rotor torque	: 180 %	Service factor	: 1.15
Breakdown torque	: 240 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

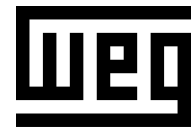
Heating constant

Cooling constant

Rev.	Changes Summary	Performed	Checked	Date
Performed by			Page	Revision
Checked by				
Date	19/10/2022			

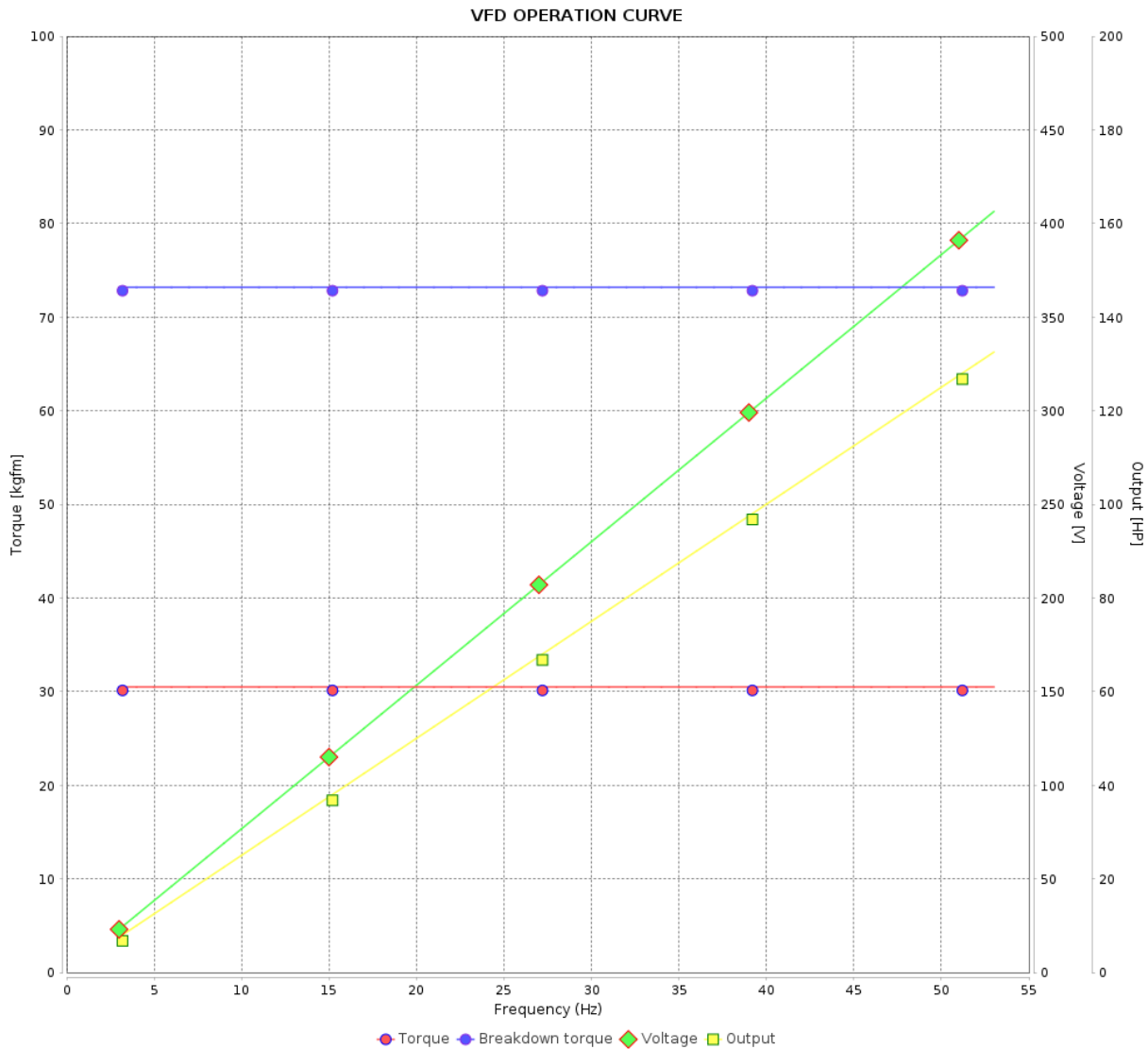
VFD OPERATION CURVE

Three Phase Induction Motor - Squirrel Cage



Customer :

Product line : NEMA Premium Efficiency Three-Phase Product code : 11946168



Performance : 460 V 60 Hz 2P

Rated current	: 163 A	Moment of inertia (J)	: 1.65 kgm ²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 30.5 kgfm	Insulation class	: F
Locked rotor torque	: 180 %	Service factor	: 1.15
Breakdown torque	: 240 %	Temperature rise	: 80 K
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Rev.	Changes Summary	Performed	Checked	Date
Performed by			Page 6 / 6	Revision
Checked by				
Date	19/10/2022			

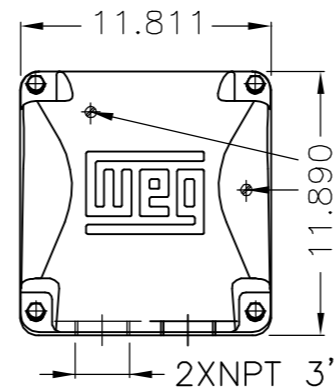
No reproduction of this drawing is allowed without written permission of WEG Motores

EIXO		Dimensões em polegadas
PADRÃO	X	
OPCIONAL		
ESPECIAL		
		Dimensions in inches

CERTIFIED WEG MOTORES

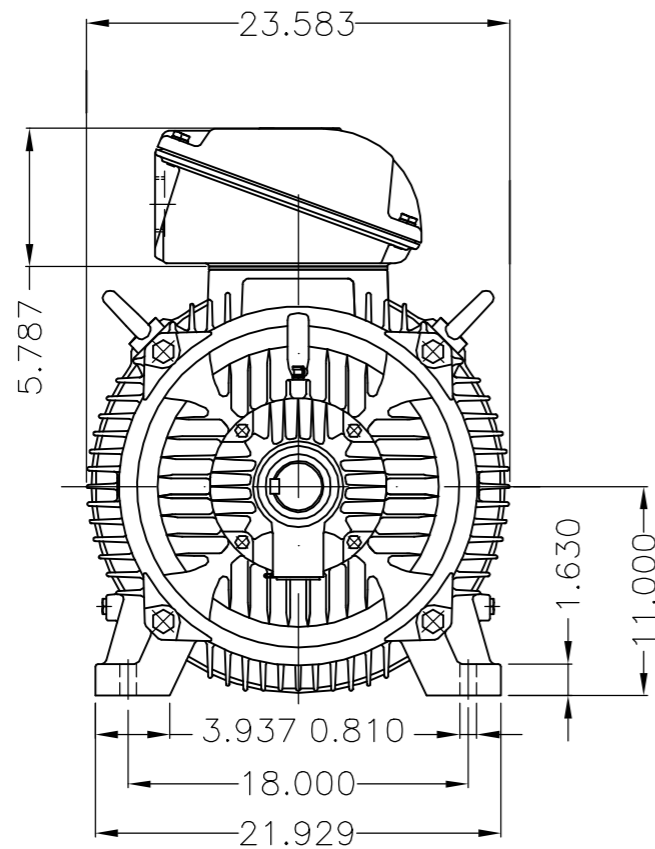
Certified document.
Not subject to changes.

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.

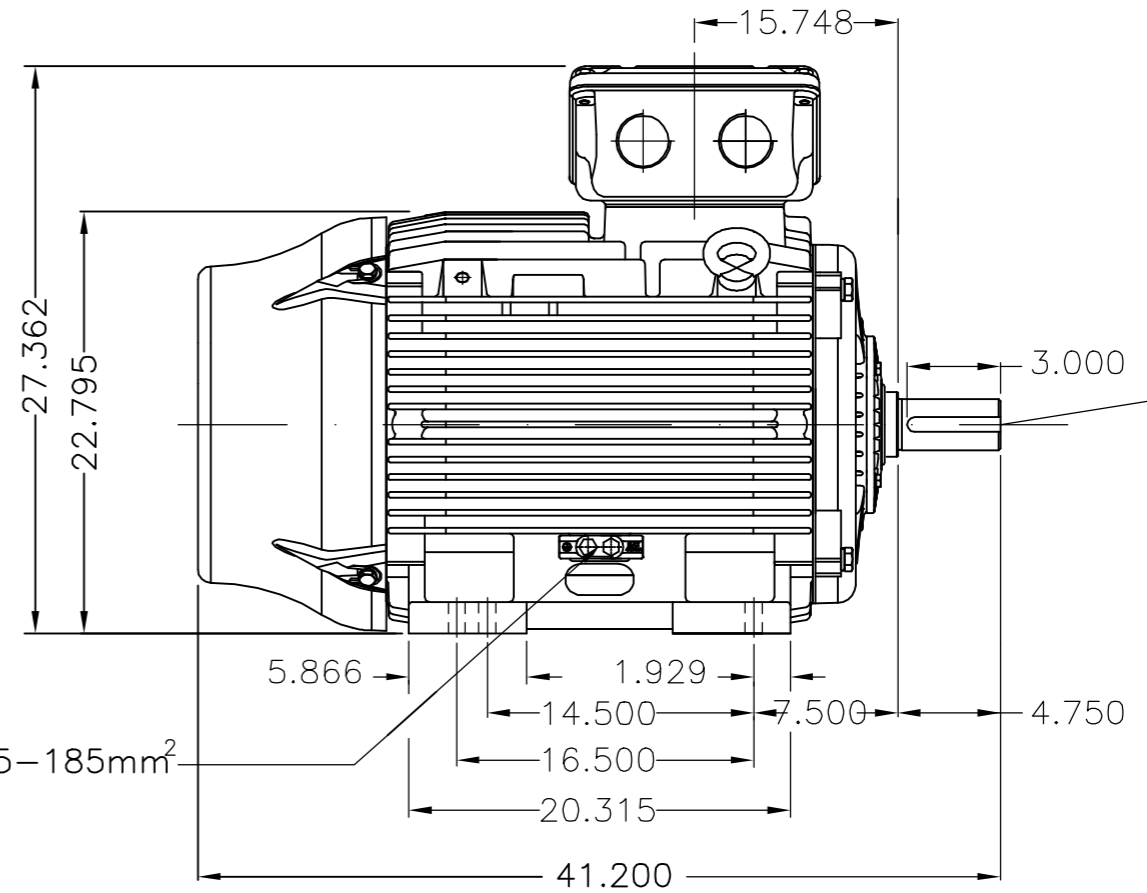


Main terminal box

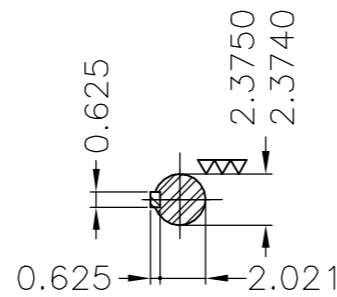
Grounding for leads 35-70mm²



Grounding for leads 35-185mm²



Center Hole
DUNC 3/4"-10 WEG TBG12
(DIN 332)



DE Shaft End

Rolamento dianteiro de rolos NU-314 com gaiola de latão usinado /
NU-314 DE roller bearing with machined brass squirrel cage
Material do eixo - AISI/SAE 4140 / Shaft material - AISI/SAE 4140
Proteção térmica desligamento - Termostato 155°C / Thermostats 155°C to trip
Dispositivo de travamento de eixo / Shaft locking device
Plano de pintura 203A / Painting plan 203A
Forma construtiva B3T / Mounting B3T

WEG ELECTRIC CORPORATION - WEC

500000799977		ALT. CONF ECM 500000799977	DCARDOSO	RICARDOAN	19.09.2013	01
500000550611		DOCUMENTO NOVO	SCARMAGNANI	ALCIDESZ	23.11.2011	00
ECM ECM	LOC LOC	RESUMO MODIFICAÇÃO SUMMARY OF MODIFICATIONS	EXECUTADO EXECUTED	VERIFICADO CHECKED	LIBERADO RELEASED	DATA DATE VER VER

EXEC. /EXECUTED	SCARMAGNANI	THREE PHASE W22 MOTOR - NEMA PREMIUM EFF FRAME 444/5TS IP55	10001525720		
VERIF. /CHECKED			000	01	
LIBER. /RELEASED	ALCIDESZ				
DATA LB /REL DT	23.11.2011	WMO	JARAGUA DO SUL	ENGENHARIA DE PRODUTO	FOLHA/SHEET 1 / 1

150 HP	02 Poles	60Hz			
125 HP	02 Poles	60Hz	412320550/0	MEC	

Thermal motor protector
Temperature limiter
Thermal cut-out

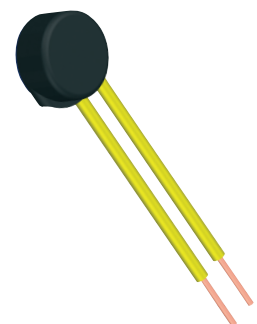
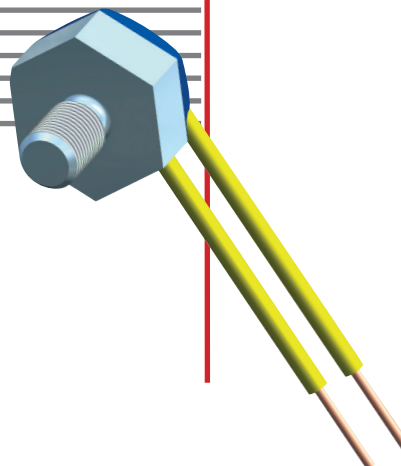
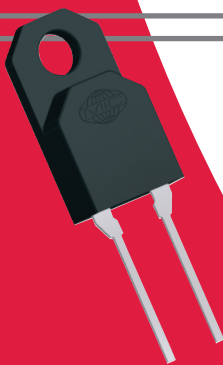
11
20
21

Applications

- Motors
- Transformers
- Coils
- Electronics, sensors

Benefits

- Small dimensions, 4 mm high only
- Shock- and vibrations tested
- Leadframe version
- Tested for audio, video applications (EN 60065)






MICROTHERM



Microthem International Cooperation

Technical data

ratings	control type	F11A / E F20A / E	F20B / G	F21A / E	
version		normally closed	normally open	normally closed	
rated current at 250 V 50/60 Hz (power factor 0.95 / 0.6)		2.0 A / 1.6 A	2.0 A / 1.6 A	3.0 A / 3.0 A	6.3 A / 1.0 A
switching cycles		10,000		10,000	700
max. current at 250 V 50/60 Hz (power factor 0.95)		6.3 A		8.0 A	
switching cycles under max. current		100			
temperature rating Ta (steps in 5 K)		70 °C ... 160 °C	70 °C ... 155 °C	70 °C ... 160 °C	
tolerances		Standard: ± 5 K			
feature of automatic action		1.B, 2.B.M, 1.C, 3.C		2.B, 1.C	
contact resistance (incl. wire of 100 mm)		< 50 mΩ			
hysteresis		30 K ± 15 K			
dielectric strength (standard insulation)		2 kV			
shock- / vibration testing (similar to EN 50155)		400 m/s ² sine half wave / 100 m/s ² 5 Hz ... 2,000 Hz sine			
resistances to impregnation		tight against ordinary resins and lacquers			
degrees of protection provided by enclosures (EN 60529)		IP00			
suitable for use in protection category		I, II			
approvals	VDE / ENEC 	EN 60730-1 / -2-2 / -2-3 ¹⁾ / -2-9			
	UL 	UL 2111 / UL 873			
	CSA 	C22.2 No. 77 / C22.2 No. 24 ²⁾			

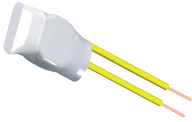
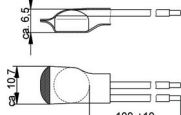

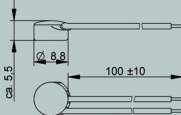
¹⁾ different power rating

²⁾ on demand

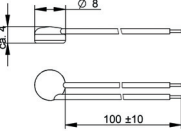
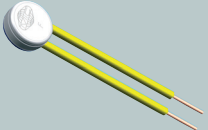
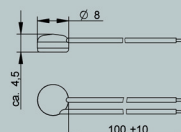

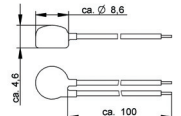
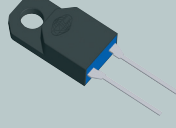
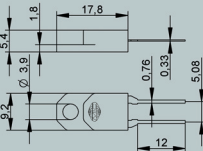

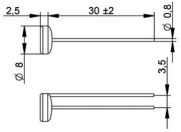
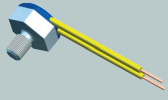
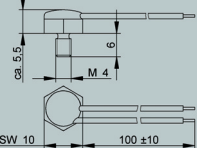
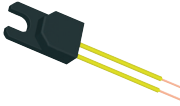
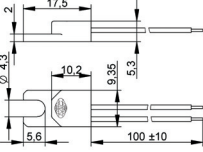
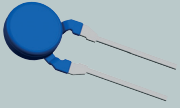
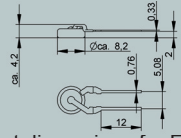
Standard wire (length 100 ± 10 mm, stripped 6 ± 1 mm)

lead	code	temperature max.	operating voltage max.	diameter insulation	cross section diameter	UL style
stranded white	L300	150 °C	300 V	1.57 mm	AWG24 / 0.21 mm ²	3398
	L310			1.80 mm	AWG20 / 0.48 mm ²	
	L330	200 °C	600 V	0.90 mm	AWG24 / 0.24 mm ²	3557
solid yellow	L400	150 °C	300 V	1.40 mm	AWG24 / 0.51 mm	3398
	L410			1.65 mm	AWG20 / 0.81 mm	
	L430	200 °C	300 V	1.21 mm	AWG24 / 0.51 mm	1332
	L440			1.71 mm	AWG20 / 0.81 mm	

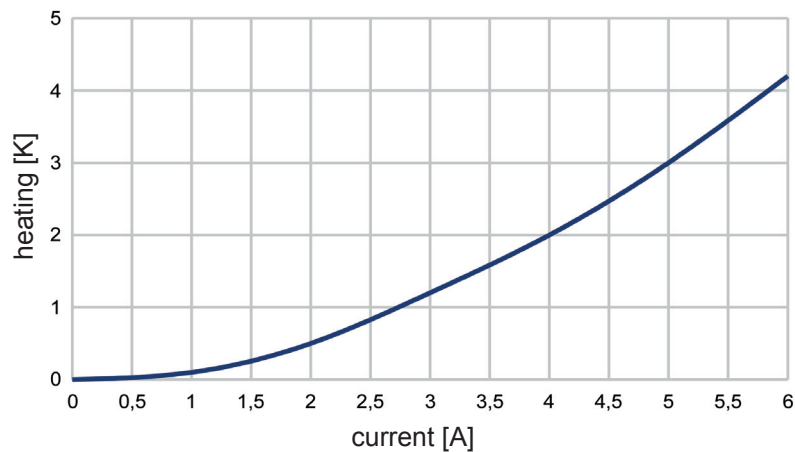
Standard insulation

control type	nc	no	code	illustration	drawing dimensions (mm)	technical specification	approvals
F11, F21 F20	A A	B	U254		 different dimensions for F20, F21	shrink cap potted Ta max. 155°C	VDE, UL
F11	A		U198		 different dimensions for F20, F21	cap of PPS potted	VDE, UL
F20	A	U185					
F21	A	B					

Specific variations

control type	nc	no	code	illustration	drawing dimensions (mm)	technical specification	approvals
F11	A					not insulated potted	VDE, UL, CSA
F20 F21	A A	B				not insulated potted	VDE, UL, CSA
F11, F21 F20	A A	B	U112		 different dimensions for F20, F21	coated	VDE, UL
F20 F21	A A	B	A150 U280			housing of PPS leadframe leads grid dimension 5.08 potted	VDE, UL
F11, F21 F20	A A	B	A800		 different dimensions for F20, F21	not insulated potted	VDE, UL
F20 F21	E E	G	G700			aluminium housing thread M4x6 potted Attention: Ta max. 150 °C	VDE, UL
F11	A		U281			housing of PPS potted	VDE, UL
F11, F21 F20	A A	B	A150 U112		 different dimensions for F20, F21	leadframe leads grid dimension 5.08 coated	VDE, UL

Heating by current



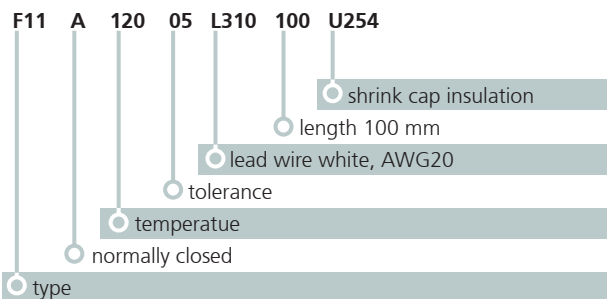
The diagram is measured with a thermal control without any insulation in an oil bath.

Attention:

The heating depends on the thermal conduction of the control to the equipment or part which should be protected.

Ordering and marking example

Ordering example



Deviations from standard controls on request.

Marking

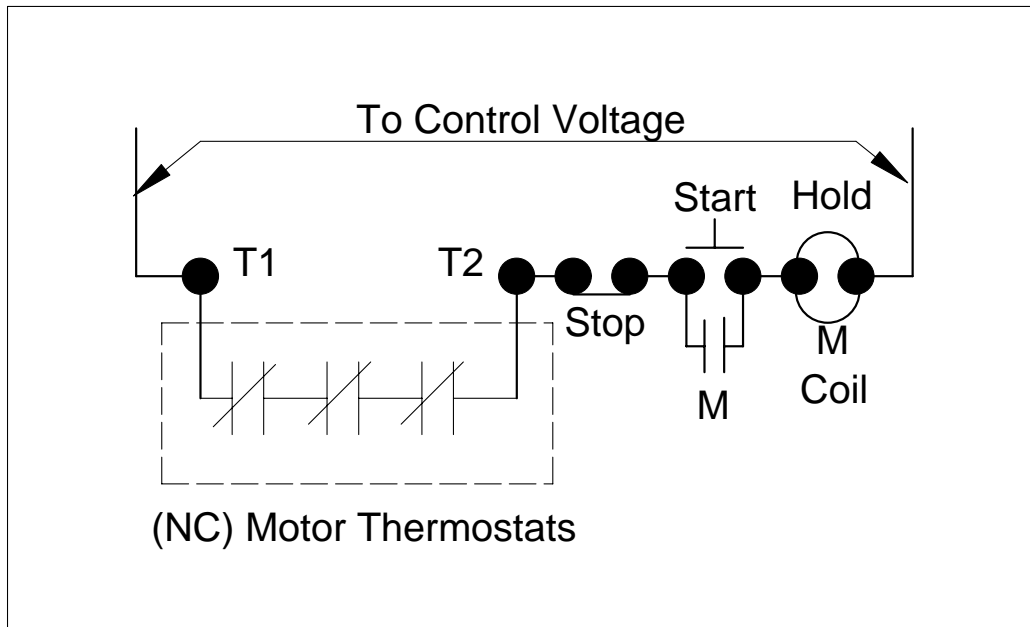
- F11A** type (F11 nc)
- 12005** response temperature (120°C), tolerance ($\pm 5K$)
- 026D** date of manufacture (Feb.2006), country (D=Germany)

Representation office:

Microtherm GmbH
Taschenwaldstraße 3
Postfach 1208
D-75112 Pforzheim

Fon: +49 (0)7231 787-0
Fax: +49 (0)7231 787-155
E-Mail: mic-pforzheim@microtherm.de
Internet: www.microtherm.de

Typical Thermostat Control Schematic



Electrically insulated bearings from SKF



Virtually eliminate the dama

The problem of stray electric current bearing damage

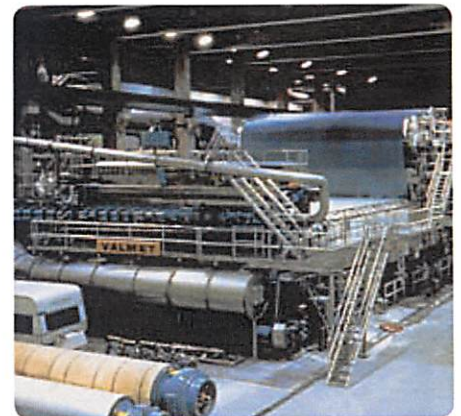
When a stray current in an electric motor uses a bearing as its path to ground, bearing damage can occur. The most common causes of stray electric currents are: asymmetry in the motor's magnetic circuit, unshielded power cables, and fast switching pulse width modulated (PWM) frequency converters used in modern variable frequency drives (VFDs). The increasing popularity of VFDs is directly linked to the increase in electric current related bearing damage.

When an electric current passes through the bearing it can cause micro-cratering in the raceways of inner and outer rings and on

the rolling element surfaces (→ fig. 1). The heat, which is generated by the discharges, causes local melting that creates small craters and changes in the structure of the metal. As a result of this initial damage, a "washboard pattern" may be found on the raceways and rolling elements (for roller bearings) (→ fig. 2). This secondary damage is wear caused by the dynamic effect of the rolling elements when they roll over the smaller craters. Current discharges also cause the lubricant in the bearing to change its composition, degrade rapidly and fail prematurely (→ fig. 3).

Once bearing damage from electric erosion has begun, increased noise levels, reduced effectiveness of the lubricant, increased heat and finally excessive vibration, all contribute to drastically decrease bearing service life.

Stray electric currents can occur almost anywhere from windmills to papermills



ging effects of stray electric currents

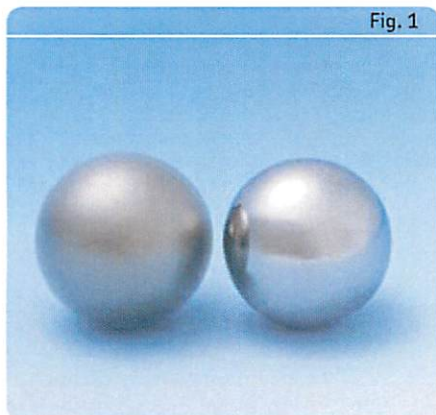
A cost-effective solution

To overcome this problem, SKF has developed two electrically insulating rolling bearing solutions: SKF® hybrid bearings and INSOCOAT® bearings. The solution one chooses depends on the severity and cause of the stray electric current and size of the bearing. In either case, SKF hybrid bearings and INSOCOAT bearings provide a number of benefits

- two functions in one solution:
 - a bearing function
 - electrical insulation
- virtually eliminates premature bearing failures caused by stray electric currents

Micro-cratering

Micro-cratering is the result of electric current passage in bearings. The damaged surface appears dull and is characterized by small craters of a few microns in diameter.



- increases machine uptime
- reduces maintenance costs
- provides an economical solution when compared with other insulation solutions
- global availability.

Recommended range

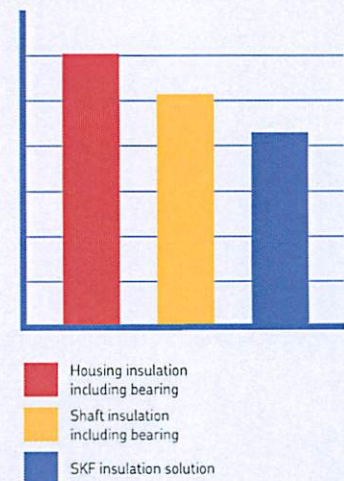
SKF has defined a recommended range of INSOCOAT and hybrid bearings specifically for electric motors and generators. This range enables fast and secure delivery around the globe.

Fluting or washboard pattern

A pattern of lines (fluting) across the raceways can be a sign that current has passed through the bearing. Fluting is not primary damage resulting from stray electric currents but is secondary damage that becomes visible over time.



Total cost of SKF insulated bearing solution relative to other insulation approaches



Grease-blackening

Electric discharges cause the base oil in the lubricant to burn and harden to create a poor lubrication condition.





INSOCOAT

An INSOCOAT bearing is a very economical solution when compared with other insulation methods that protect a bearing against electric current passage. By integrating the electrical insulation function into the bearing, SKF has been able to increase reliability and machine uptime by virtually eliminating the damaging effects of stray electric currents.

INSOCOAT bearing designs

The standard range of INSOCOAT bearings in the most frequently used sizes and variants are available from stock as

- single row deep groove ball bearings
- single row cylindrical roller bearings.

The performance data as well as the dimensional and running accuracy of INSOCOAT bearings are identical to standard non-insulated bearings.

INSOCOAT bearings with coated outer ring

Bearings with an electrically insulating coating on the external surfaces of the outer ring are the most common INSOCOAT bearings. They are identified by the suffix VLO241.

Outer ring coated INSOCOAT bearings are recommended for medium size motors, that use 6215, 6313 size bearings and larger. For applications where smaller bearings are used, SKF recommends hybrid deep groove ball bearings.

INSOCOAT bearings with coated inner ring

Bearings with an electrically insulating coating on the external surfaces of the inner ring provide enhanced protection against electric current damage. The enhanced protection results from the increased impedance due to the smaller coated surface area. Bearings with a coated inner ring are identified by the suffix VL2071 and are recommended for larger size motors (typically from bearing sizes 6226, 6324 sizes and larger), or other applications where the bearings risk being subjected to high shaft voltages.

Technical features and benefits

- The coating is applied using a plasma-spray technique. Sophisticated pre- and post- application processes yield an outstanding coating quality.
- INSOCOAT bearings are treated with a unique sealant to guard against humidity and water from penetrating the coating and reducing its effectiveness.
- Due to the quality of the application and finishing processes, INSOCOAT bearings provide reliable and consistent insulation, that is virtually insensitive to heat, moisture and chemicals.
- SKF can supply values for relevant electric parameters for the bearings (capacitance, impedance) to optimize the insulating solution for any application.
- INSOCOAT bearings are environmentally friendly.
- INSOCOAT bearings with an outer ring coating are suitable for all types of housings. No additional mounting precautions are necessary.

Dimensions

The boundary dimensions of INSOCOAT deep groove ball bearings and cylindrical roller bearings are in accordance with ISO 15:1998.

Tolerances and fits

INSOCOAT bearings are produced to Normal tolerances. Some deep groove ball bearings are also available with higher accuracy to tolerance class P5.

The aluminium-oxide layer applied either to the external outer ring surfaces or the external inner ring surfaces does not influence running accuracy.

INSOCOAT bearings can be mounted with the same fit as a standard bearing in an electric motor or generator, without risk of damaging the coating. Fits up to and including p6 for inner ring coated variants and P6 for outer ring coated variants can be applied.

Internal clearance

Standard INSOCOAT deep groove ball bearings and cylindrical roller bearings are manufactured with the radial internal clearance to the class shown in the bearing designation. Before ordering, check the availability of bearings with clearances other than standard.

Cages

Depending on the bearing type and size, INSOCOAT bearings are equipped with one of the following cages

- a riveted cage of pressed steel, no designation suffix, or
- a two-piece machined brass cage, rolling element centred, designation suffix M.

Electrical properties

INSOCOAT bearings provide effective protection against AC and DC currents. The specifications for different variants are:

- VL0241** Electrical resistance: min. 50 M Ω , breakdown voltage: max. operating voltage 1 000 V DC.
- VL0246** Electrical resistance: > 150 M Ω , breakdown voltage: max. operating voltage 3 000 V DC.
- VL2071** Electrical resistance: min. 50 M Ω , breakdown voltage: max. operating voltage 1 000 V DC.
- VL2074** Electrical resistance: > 150 M Ω , breakdown voltage: max. operating voltage 2 000 V DC.

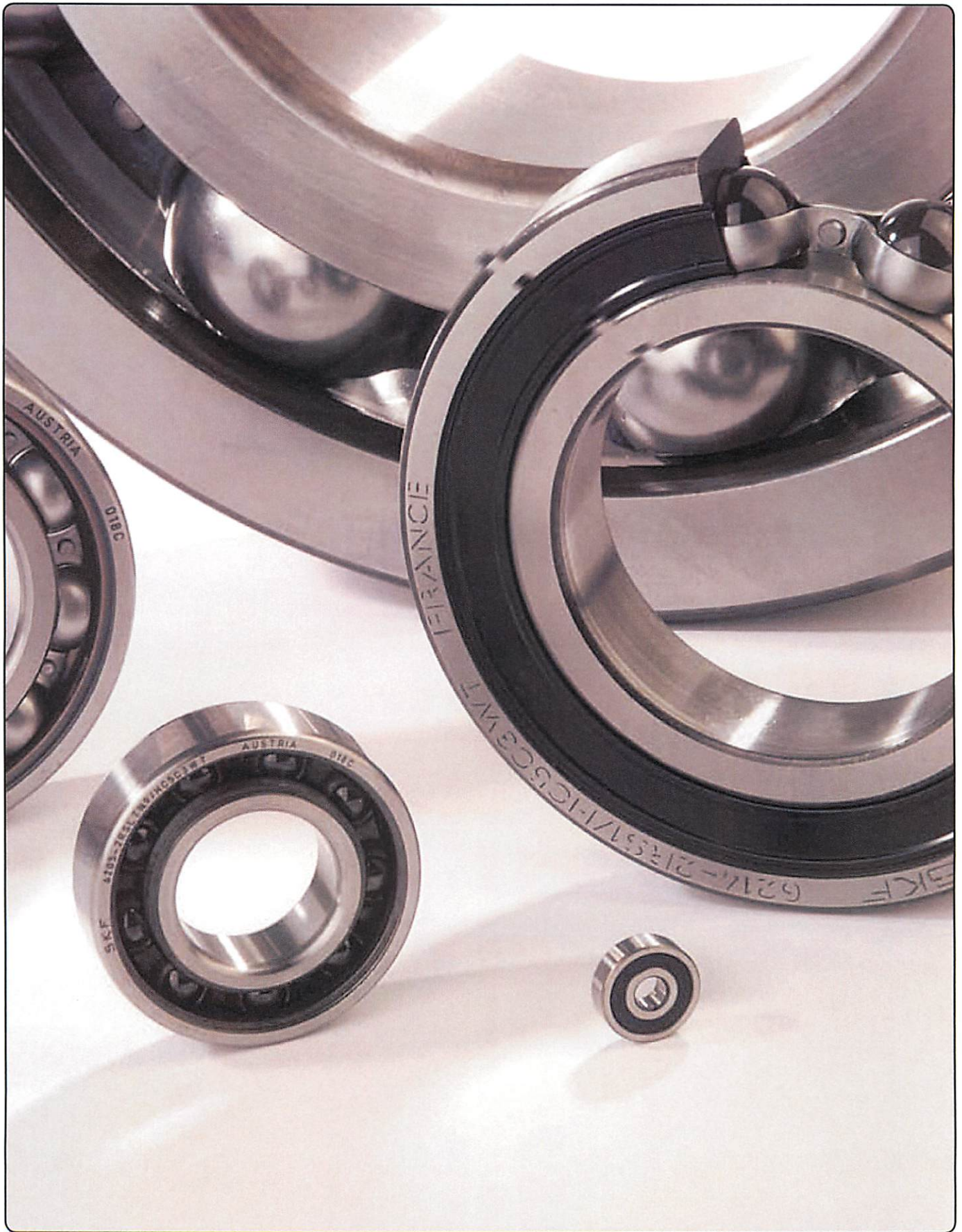
Design of associated components

To maximize the effects of the insulating properties of INSOCOAT bearings, SKF recommends the following:

- For bearings with a coated outer ring designation suffix VL0241, the housing shoulder or spacer sleeve should not have a diameter smaller than the abutment dimension D_a min listed in the assortment tables. For VL0246 abutment dimensions, contact SKF.
- For bearings with a coated inner ring designation suffix VL2071, the shaft shoulder or spacer sleeve should not have a diameter larger than the abutment dimension d_a max listed in the assortment tables. For VL2074 abutment dimensions, contact SKF.



The coating can be applied to either the outer or inner ring to provide protection against electric current damage in bearings. Designation suffix VL0241 or VL2071 respectively.



Hybrid bearings – more than an insulator

Hybrid bearings have rings made of bearing steel and rolling elements made of bearing grade silicon nitride (Si_3N_4). Because silicon nitride is such an excellent insulator, hybrid bearings can be used effectively to insulate the housing from the shaft in both AC and DC motors, as well as in generators.

In addition to being an excellent insulator, hybrid bearings have higher speed capabilities and will provide longer bearing service life under the same operating conditions than a similarly sized all-steel bearing.

Features and benefits

Lower density

The density of a bearing grade silicon nitride rolling element is 60 % lower than a similarly sized rolling element made from bearing steel. Less weight means lower inertia – and that translates into superior behaviour during rapid starts and stops as well as higher speeds.

Lower friction

The lower density of a silicon nitride rolling element combined with its low coefficient of friction, significantly reduces bearing temperatures at high speeds. Cooler running increases the service life of both the bearing and the lubricant.

High hardness and high modulus of elasticity

The high degree of hardness of a silicon nitride rolling element means high wear-resistance, increased bearing stiffness and longer bearing service life in contaminated environments.

Low coefficient of thermal expansion

A silicon nitride rolling element has a lower coefficient of thermal expansion than a similarly sized rolling element made from bearing steel. This means less sensitivity to temperature gradients at high temperatures for better, more accurate preload control.

Runs faster, lasts longer

Combine the lower density of silicon nitride with its lower coefficient of friction, high hardness and the fact that silicon nitride will not smear the raceways under poor lubrication conditions, and the result is a bearing that will run faster and longer even under the most difficult operating conditions.

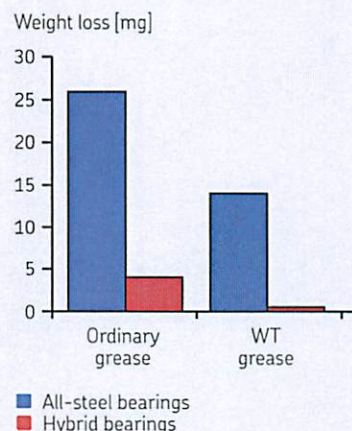
Resists false brinelling

If a stationary bearing is subjected to vibrations there is a risk that "false brinelling" will occur. False brinelling is the formation of small indentations in the raceways that will eventually lead to spalling and premature bearing failure. In cases where steel balls were replaced by ceramic balls the bearings were found to be much less susceptible to false brinelling.

Hybrid bearings supplied with SKF wide temperature grease (WT) were found to sustain less false brinelling damage than bearings containing other types of greases (→ diagram 1).

Diagram 1

"False brinelling" at 25 Hz



Cages

Depending on their size, standard SKF hybrid deep groove ball bearings are fitted with

- an injection moulded snap-type cage of glass fibre reinforced polyamide 6,6 or
- a riveted pressed steel cage.

Hybrid bearings with a polyamide 6,6 cage can be operated at temperatures up to +120 °C (+250 °F).

Polyetheretherketone (PEEK)

The use of glass fibre reinforced PEEK cages is becoming more common for applications where there are high speeds or high temperatures. PEEK provides a superior combination of strength and flexibility and does not show signs of ageing due to high temperatures or oil additives. The maximum temperature for high-speed use is limited to +150 °C (+300 °F) as this is the softening temperature of the polymer. For additional information about PEEK cages, contact the SKF application engineering service.

Seals

The SKF standard range of hybrid bearings for electric motors consists primarily of single row deep groove ball bearings. Sealed and greased-for-life SKF hybrid deep groove ball bearings are protected on both sides by

- a low-friction RSL seal, fitted to bearings with an outside diameter ≤ 52 mm, designation suffix 2RSL
- a low-friction RZ seal, fitted to bearings with an outside diameter > 52 mm, designation suffix 2RZ
- an RS1 contact seal, fitted to bearings with an outside diameter ≥ 90 mm, designation suffix 2RS1.

All seals are made of acrylonitrile-butadiene rubber (NBR) with sheet steel reinforcement. The permissible operating temperature range for these seals is -40 to +100 °C (-40 to +210 °F) and up to +120 °C (+250 °F) for brief periods. For operating temperatures up to +180 °C (+355 °F), seals made from fluoro rubber are available. For additional information about these seals, contact the SKF application engineering service.

Lubrication

The standard sealed hybrid bearing is filled with a premium quality synthetic ester oil based grease, containing a polyurea thickener (designation suffix WT). This grease, which has an operating temperature range from about +70 to +120 °C (+160 to +250 °F), has excellent lubrication properties and provides extremely long service life.

Hybrid bearings perform extremely well under vibrating or oscillating conditions. It is therefore not usually necessary to use special greases for these conditions.

Comparison of the material properties of bearing steel and bearing grade silicon nitride

Material properties	Bearing steel	Bearing grade silicon nitride
Mechanical properties		
Density (g/cm ³)	7,9	3,2
Hardness, HV 10 (kg/mm ²)	700	1 600
Modulus of elasticity (GPa)	210	310
Thermal expansion (10 ⁻⁶ /K)	12	3
Electrical properties (at 1 MHz)		
Electrical resistivity (Ωm)	0,4 × 10 ⁻⁶ (conductor)	10 ¹² (insulator)
Dielectric strength (kV/mm)	-	15
Relative dielectric constant	-	8

Grease life in hybrid bearings

Tests have shown that when used with sealed hybrid bearings, the wide temperature grease (WT) from SKF has a very long service life even at high speeds and high temperatures. One example (→ **diagram 2**) shows where the life of WT grease in hybrid bearings was four times longer than in all-steel bearings. The shaft diameter was 20 mm, the speed 20 000 r/min and the operating temperature +120 °C (+250 °F).

Most SKF hybrid deep groove ball bearings are sealed and greased-for-life.

SKF recommends relubrication of open bearings with SKF grease LGHP 2. In general, the relubrication interval is 3 to 5 times longer than for an all-steel bearing.

For very high-speed applications at temperatures below +70 °C (+160 °F) the use of either SKF grease LGLC 2 or SKF grease LGLT 2 is recommended.

The recommended bearing operating temperature range for maximum grease life is +70 to +120 °C (+160 to +250 °F).

Equivalent bearing loads

The equivalent dynamic and static bearing loads of hybrid deep groove ball bearings are calculated using the equations for all-steel deep groove ball bearings.

Typical hybrid bearing designations suffixes

The designation suffixes used to identify certain features of SKF hybrid deep groove ball bearings are explained in the following.

C3	Radial internal clearance greater than Normal
HC5	Rolling elements of silicon nitride
TNH	Injection moulded snap-type cage of polyetheretherketone (PEEK)
TN9	Injection moulded snap-type cage of glass fibre reinforced polyamide 6,6
WT	Grease with a polyurea thickener of consistency 2–3 to the NLGI Scale for a temperature range –40 to +160 °C (–40 to +320 °F) (normal filling grade)
2RS1	Sheet steel reinforced contact seal of acrylonitrile-butadiene rubber (NBR) on both sides of the bearing
2RSH2	Sheet steel reinforced contact seal of fluoro rubber (FKM) on both sides of the bearing
2RSL	Sheet steel reinforced low-friction seal of acrylonitrile-butadiene rubber (NBR) on both sides of the bearing
2RZ	Sheet steel reinforced low-friction seal of acrylonitrile-butadiene rubber (NBR) on both sides of the bearing

Dimensions, tolerances, internal clearance

Standard SKF hybrid deep groove ball bearings are manufactured as standard with

- boundary dimensions to ISO 15:1998
- Normal tolerances to ISO 492:2002
- C3 radial internal clearance to ISO 5753:1991.

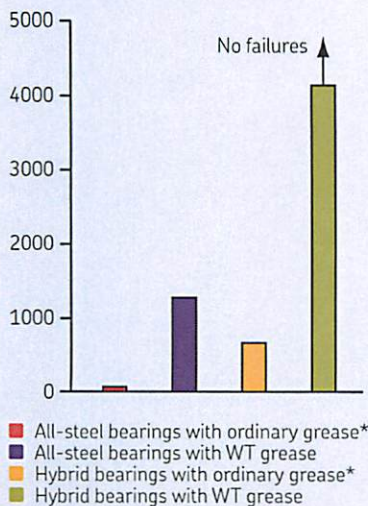
Recommendations for installation

Hybrid bearings should be handled and mounted in the same manner as conventional all-steel bearings. Always use the right tools and correct methods for mounting and dismounting.

Diagram 2

Long grease life with WT grease in hybrid bearings

Median grease life L_{50} [hours]



* At +120 °C (max temperature for ordinary grease)

Grease alternatives offering long service life in hybrid bearings

SKF grease	Temperature range*
WT	– 40 to +160 °C – 40 to +320 °F
LGHP 2	– 40 to +150 °C – 40 to +300 °F

* For additional information about safe operating temperatures, refer to the chapter "Lubrication" in the SKF General Catalogue



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*Sustainable Technology
for
True Inverter Duty Motors*



WEG uses the standard SGR from the AEGIS catalog that is sized based on the motor min/max shaft diameter. They use the type with the mounting brackets which are designed to fit over the shaft shoulder on the motor end-shield.

Bearing Protection For Life!

2009





BEARING PROTECTION RING™



SUSTAINABLE



PROTECTION



RELIABILITY



**HIGHEST
PERFORMANCE**

“The only bearing protection system guaranteed to eliminate harmful shaft currents preventing premature motor failure - for life.”



Guarantee

Electro Static Technology guarantees any new motor up to 100hp/75kW will not fail from electrical bearing fluting damage for the life of the motor when the AEGIS SGR™ Bearing Protection Ring™ is installed in accordance with manufacturer's installation instructions. If electrically induced fluting damage occurs, Electro Static Technology will replace motor bearings. Guarantee is subject to the terms and conditions of the AEGIS SGR™ Guarantee Program.

For program details, visit: www.est-aegis.com

*Don't let
this happen
to your
bearings!*



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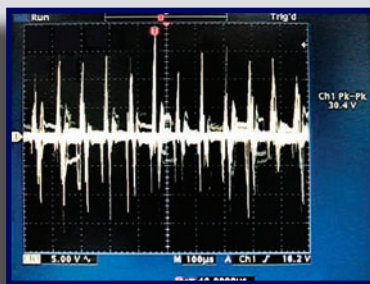
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Sustainable Motor Design - Prevent Bearing Failure

AEGIS Bearing Protection Ring™ - protects motor bearings for life. Variable frequency drives (VFD) induce electrical voltages onto the shaft of AC and DC motors. With AEGIS SGR Bearing Protection Ring installed on the motor, you benefit from sustainability, system up-time, production improvement, and higher reliability.

PROBLEM:

VFD Induced Shaft Voltages Damage Bearings



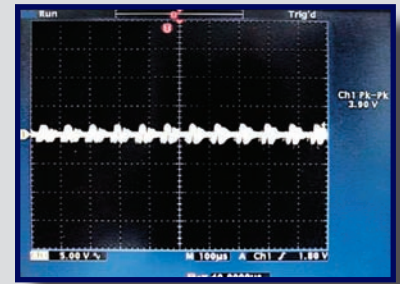
Shaft voltage reading with no protection

Variable frequency drives (VFD) on AC and DC motors induce harmful electrical voltages on the motor shaft. Once these voltages exceed the resistance of the bearing lubricant, they discharge through the motor's bearings causing fusion craters, severe pitting, fluting damage, excessive bearing noise and eventually bearing failure.

SOLUTION:

AEGIS SGR™ - Electrical Bearing Damage Protection

The new AEGIS SGR™ Bearing Protection Ring™ prevents electrical bearing damage by safely channeling harmful shaft voltages away from the bearings to ground. Using proprietary Electron Transport Technology™, the conductive micro fibers inside the AEGIS SGR™ provide the path of least resistance and dramatically extend motor life.



Shaft voltage reading with AEGIS SGR



No bearing protection



VFD

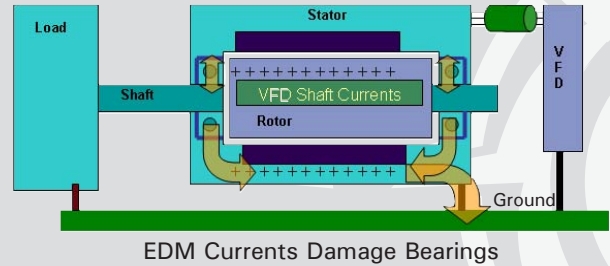


AEGIS SGR™ Bearing Protection Ring™

About Shaft Voltages and Bearing Currents

VFD Induced Shaft Voltages - All Motors

Damaging voltages are induced on the shafts of AC and DC motors controlled by variable frequency drives (VFD). The extremely high on/off switching speeds of the pulse width modulation (PWM), generated by the insulated gate bipolar transistors (IGBT), induce damaging voltages onto the motor shaft through parasitic capacitive coupling between the stator and rotor. This common mode shaft voltage seeks a path to ground, usually through the motor's bearings.



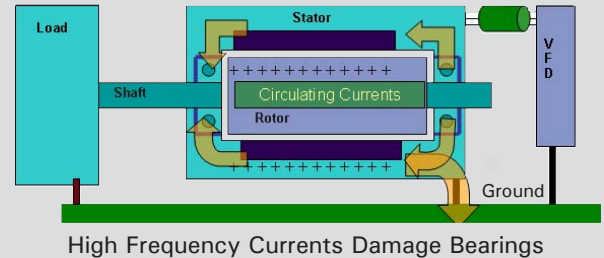
Bearing fluting, "washboard" pattern on bearing race

Electrical Damage in the Bearings (EDM) - Pitting, Fluting, Failure

Damaging currents arc through the dielectric oil film between the rolling elements and the bearing race. This is known as electrical discharge machining (EDM) effect. EDM causes fusion craters, severe pitting, and eventually bearing fluting (a washboard-like pattern in the bearing race) which results in premature bearing failure.

High Frequency Circulating Currents in Large AC and DC Motors

In addition to potential bearing failures in motors from VFD induced EDM currents, AC and DC motors above 100 hp (75 kW) may also experience bearing failures caused by high frequency circulating currents. VFD induced high frequency circulating currents are in the kilohertz or even megahertz range and circulate through the motor's bearings because of magnetic flux imbalances in the stator. This type of VFD induced current becomes the more dominant destructive current in higher hp/kW motors.



AEGIS SGR™ Bearing Protection Ring™ is the most effective solution to protect bearings in motors and attached equipment from EDM currents and VFD induced shaft voltages.

Technology Comparison

	AEGIS SGR™	Insulating sleeve	Ceramic/Hybrid Bearing	Copper or Bronze Metal Brush	Carbon Block Brush	Conductive Grease
Protects Motor and Attached Equipment	Yes	No	No	No	No	No
Long-term Effectiveness	Yes	No	No	No	No	No
Easy to install	Yes	No	No	No	No	No
Contamination Proof	Yes	N/A	N/A	No	No	N/A
Low Lifetime Cost High return on Investment	Yes	No	No	No	No	No
Effective at any RPM	Yes	Yes	Yes	No	No	No
Maintenance Free Operation	Yes	Yes	Yes	No	No	No

Application Notes for AEGIS Bearing Protection Ring™

Improve System Reliability and Production with Sustainable Motor Design

Motors up to 100 HP (75 kW)

Any motor controlled by a variable frequency drive (VFD) requires bearing protection. Motors of 100 hp down to fractional hp motors will experience bearing failures when operated on a PWM drive. AEGIS SGR™ Bearing Protection Ring™ guarantees that bearings will not fail in these motors from fluting damage for the service life of the motor.




Install one AEGIS SGR™ Bearing Protection Ring™ on either the drive end or the non-drive end of the motor. The simplest installation is to slide the AEGIS SGR™ over the drive end and fasten it to the motor end bell with the easy to install mounting hardware included with each AEGIS SGR™

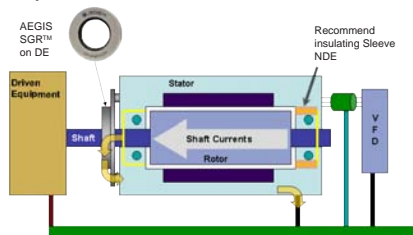
★ Recommend Colloidal Silver Shaft Coating PN CS015

Motors 100 HP to 1000 HP (75 kW to 750 kW)

Large motors above 100 hp may have VFD induced EDM currents as well as high frequency circulating currents when they are controlled by VFDs. To protect the bearings, insulate the bearing on one end and install an AEGIS SGR™ on the other end.

Insulation on one end (usually NDE) and AEGIS SGR™ on opposite end

- This method offers the most reliable protection
- Motor frame must be well grounded
- Non-Drive End: Bearing journal should be insulated or Insulated/ Ceramic Bearing installed to disrupt circulating currents
- Install AEGIS SGR™ Bearing Protection Ring™ on opposite end of insulation and Insulated/Ceramic Bearing (usually DE)
- Protects bearings in attached equipment (gear box, pillow block, encoder etc.)



★ Recommend Colloidal Silver Shaft Coating PN CS015

BEARING PROTECTION FACTS:

Bearing protection for motors and attached equipment: Only AEGIS SGR™ will protect both motor bearings and the bearings in attached equipment. VFD induced currents on the shaft can discharge through motor bearings or coupled equipment like gear boxes, pumps, fan bearings, pillow blocks, encoders, brake motors, etc. AEGIS SGR™ addresses the root of the problem and channels harmful currents to ground.

Maintenance free bearing protection for life: Hundreds of thousands of conductive micro fibers have virtually zero wear during operation, even at high RPM and high surface rates. Unlike carbon block brushes, there is no spring pressure on fibers. AEGIS SGR™ Bearing Protection Ring™ will last for the service life of the motor.

AEGIS SGR™ is effective in grease, oil, dirt or dust: Lab and field tested. The conductive micro fibers “sweep” away contaminants from the shaft surface and maintain a conductive path even when oil, grease, dirt or dust get on the shaft.

Operation in harsh environments where fibers are exposed to excessive debris: To prevent particles from damaging the fibers, install a slinger or O-ring against the AEGIS SGR™.

★ COLLOIDAL SILVER SHAFT COATING: NEW TECHNOLOGY

Improving the conductivity of the steel shaft surface enhances the shaft voltage discharge capability in AEGIS shaft grounding applications. Maintaining a highly conductive shaft surface is especially important in critical applications or in applications where the conductive shaft surface of steel could become compromised. Environmental elements could create a potential for decreased conductivity on the shaft of the motor.



Apply AEGIS CS015 Colloidal Silver Shaft Coating to any VFD driven motor shaft prior to installing AEGIS Bearing Protection Ring™.

BEARING PROTECTION FACTS:

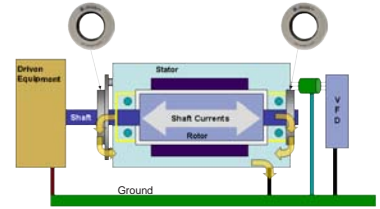
AEGIS SGR™ Bearing Protection Ring™ current handling capability: AEGIS SGR™ is rated to discharge high frequency current. Variable frequency drives (VFD) induce high frequency EDM currents of up to 2 amps in 50 billionths of a second. AEGIS SGR™ protects the bearing by safely channeling the energy away from the motor bearings to ground.

AEGIS Bearing Protection Ring™ - the most reliable bearing protection: Production up-time and reliability improve when AEGIS SGR™ is installed. The patented ring of hundreds of thousands of conductive micro fibers provide protection for the service life of the motor. The fibers will always surround the shaft with a conductive path for destructive shaft currents while the motor is running.

Vertical Motors: Insulate top bearing or shaft with non conductive coating. For bottom bearing, coat shaft with Colloidal Silver Shaft Coating and install AEGIS Bearing Protection Ring.

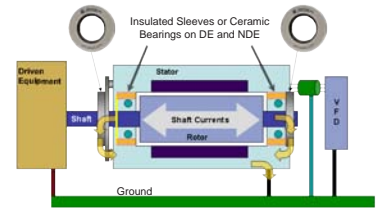
If insulation is not possible, the next best protection is to install AEGIS SGR™ on both ends of the motor

- Motor frame must be well grounded
 - Install AEGIS SGR™ Bearing Protection Ring™ on drive and non-drive end to provide path of least resistance for circulating currents and to channel VFD currents to ground.
 - Protects bearings in attached equipment
 - **NOT SUITABLE FOR CYLINDRICAL ROLLER BEARING**
- ★ Coat shaft with Colloidal Silver Shaft Coating



Critical Applications: Insulate both ends and add AEGIS SGR™ Bearing Protection Ring™ on both ends

- Motor frame must be well grounded
 - Drive and Non-Drive end: Bearing journals should be insulated or Insulated/Ceramic Bearing installed to disrupt circulating currents
 - Install AEGIS SGR™ Bearing Protection Ring™ on drive and non-drive end to provide path of least resistance for shaft voltages and to channel VFD induced currents to ground.
 - AEGIS SGR™ required to protect bearings in attached equipment (gear box, pillow block, encoder, etc.)
- ★ Coat shaft with Colloidal Silver Shaft Coating



Medium Voltage Motors

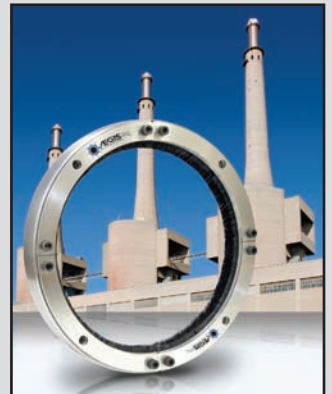
Large Motors and Generators over 1000 HP (750 kW)

Power Generators over 750kW

AEGIS iPRO™ Bearing Protection Ring™

Large motors and generators often have much higher induced shaft voltages and bearing currents which require a high current capable Bearing Protection Ring™. High frequency circulating currents induced by variable frequency drives (VFD) will cause bearing fluting and catastrophic failure in these motors. Generators experience current surges which can cause electrical arcing in bearings and equipment.

- One end of the motor should be insulated. Install AEGIS iPRO™ on opposite end of insulation to protect the non-insulated bearing.
 - Install AEGIS iPRO™ on both ends of motor or generator if bearing cannot be insulated.
- ★ Coat shaft with Colloidal Silver Shaft Coating



AEGIS iPRO™ High Current Bearing Protection Ring™

MOTORS WITH CERAMIC BEARINGS

Insulating both bearing journals or using ceramic coated bearings in the motor **does not prevent VFD induced currents** from discharging through the bearings on attached equipment and may present a voltage hazard.

Whenever ceramic bearings are used in a motor, *AEGIS SGR™ is required* to protect attached equipment and reduce potentially dangerous shaft voltages.

Purpose of Application Notes: Application notes are intended as general guidance to assist with proper application of AEGIS SGR™ Bearing Protection Ring™ to protect motor bearings. All statements and technical information contained in the application notes are rendered in good faith. User must assume responsibility to determine suitability of the product for its intended use.

AEGIS SVP™ Shaft Voltage Probe



Conductive Microfiber Probe for use with Fluke 199C ScopeMeter

Measuring VFD Induced Shaft Voltages



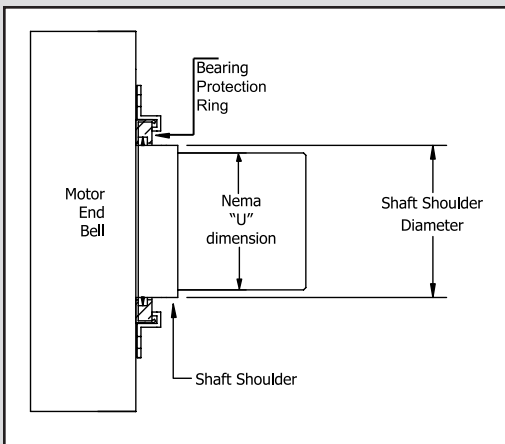
For the first time you can easily and more accurately measure the voltage on a rotating shaft. The AEGIS SVP™ Shaft Voltage Probe's unique design of high density conductive microfibers ensures continuous contact with the rotating shaft. Used with the Fluke 199C ScopeMeter, you can determine if your motor is subject to potentially damaging bearing currents.

Catalog Number	Includes:
SVP-KIT-F199C	3 SVP tips, probe holder with two piece extension rod (fits 3/8" magnetic base)
SVP-TIP-F199C	3 SVP tips

Selecting The Right Size Bearing Protection Ring For Your Motor



Mounting Options shown on page 8

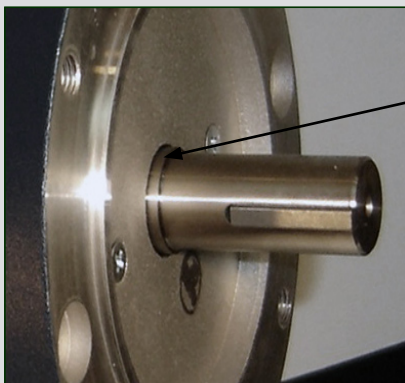


1. Measure shaft diameter at a point 0.125" from motor end bell.
2. Refer to the part lists to locate the correct SGR part number.

Example shaft measurement
0.425"

Note: If you have a slinger or a shaft shoulder that is less than 0.375", you will need the NEMA/IEC kit. See page 13 for more information.

Catalog Number	Min.shaft diameter	Max.shaft diameter	Outside diameter	Thickness Max
SGR-6.9-1	0.311	0.355	1.60	0.295
SGR-8.0-1	0.356	0.395	1.60	0.295
SGR-9.0-1	0.396	0.435	1.60	0.295
SGR-10.1-1	0.436	0.480	1.60	0.295
SGR-11.2-1	0.481	0.520	1.60	0.295



Shaft shoulder: The SGR can be mounted to the shaft shoulder but the shoulder should be at least 0.375" in length so that all of the fibers are in contact with the rotating shaft. Measure the diameter of the shaft shoulder then locate the correct SGR on the part lists.

AEGIS SGR™ Bearing Protection Ring™ Options



pg. 9

NEW PRODUCT!

Conductive Epoxy Mounting

Shaft diameters: 0.311" to 6.02"
Solid and Split Ring
Quick and easy installation to metal motor frame
Conductive Epoxy Included



pg. 10-11

Standard Mounting Brackets

Shaft diameters: 0.311" to 6.02"
Ships with mounting brackets, 6-32 screws and washers
Quick and easy installation to most surfaces



pg. 10-11

Split Ring

Shaft diameter: 0.311" to 6.02"
4 to 6 mounting brackets, M3 screws and washers
Installs without decoupling motor



pg. 10-11

Bolt Through Mounting

Shaft diameters: 0.311" to 6.02"
M3 x 14 socket head cap screws and lock washers
2 mounting holes up to shaft size 3.895"
4 mounting holes for larger sizes



pg. 12

Press Fit Mounting

Shaft diameters: 0.311" to 6.02"
Clean dry 0.004" press fit
Custom sizes available



pg. 13

NEMA-IEC Mounting Kits

Shaft diameter: see chart for standard kits
Custom kits available for other shaft diameters
Clears any slinger, shaft shoulder or protrusion



pg. 14

WTG

Long term reliable performance
Maintenance free system
Solid and Split Ring configurations



pg. 14

iPRO

Long term reliable performance
Maintenance free system
Solid and Split Ring configurations
Available in sizes up to 30" shaft diameter

Standard SGR™ - Conductive Epoxy Mounting



NEW PRODUCT!

Dimensions in inches

Solid SGR Catalog Number	Split SGR Catalog Number	Min. shaft diameter	Max. shaft diameter	Outside diameter	Thickness Max
SGR-6.9-0AW	SGR-6.9-0A4W	0.311	0.355	1.60	0.295
SGR-8.0-0AW	SGR-8.0-0A4W	0.356	0.395	1.60	0.295
SGR-9.0-0AW	SGR-9.0-0A4W	0.396	0.435	1.60	0.295
SGR-10.1-0AW	SGR-10.1-0A4W	0.436	0.480	1.60	0.295
SGR-11.2-0AW	SGR-11.2-0A4W	0.481	0.520	1.60	0.295
SGR-12.2-0AW	SGR-12.2-0A4W	0.521	0.560	1.60	0.295
SGR-13.2-0AW	SGR-13.2-0A4W	0.561	0.605	1.60	0.295
SGR-14.4-0AW	SGR-14.4-0A4W	0.606	0.645	1.60	0.295
SGR-15.4-0AW	SGR-15.4-0A4W	0.646	0.685	2.10	0.295
SGR-16.4-0AW	SGR-16.4-0A4W	0.686	0.730	2.10	0.295
SGR-17.6-0AW	SGR-17.6-0A4W	0.731	0.774	2.10	0.295
SGR-18.7-0AW	SGR-18.7-0A4W	0.775	0.815	2.10	0.295
SGR-19.7-0AW	SGR-19.7-0A4W	0.816	0.855	2.10	0.295
SGR-20.7-0AW	SGR-20.7-0A4W	0.856	0.895	2.10	0.295
SGR-21.7-0AW	SGR-21.7-0A4W	0.896	0.935	2.10	0.295
SGR-22.8-0AW	SGR-22.8-0A4W	0.936	0.980	2.10	0.295
SGR-23.9-0AW	SGR-23.9-0A4W	0.981	1.020	2.10	0.295
SGR-24.9-0AW	SGR-24.9-0A4W	1.021	1.060	2.10	0.295
SGR-25.9-0AW	SGR-25.9-0A4W	1.061	1.105	2.10	0.295
SGR-27.1-0AW	SGR-27.1-0A4W	1.106	1.145	2.10	0.295
SGR-28.1-0AW	SGR-28.1-0A4W	1.146	1.185	2.10	0.295
SGR-29.1-0AW	SGR-29.1-0A4W	1.186	1.230	2.10	0.295
SGR-30.3-0AW	SGR-30.3-0A4W	1.231	1.270	2.10	0.295
SGR-31.3-0AW	SGR-31.3-0A4W	1.271	1.310	2.10	0.295
SGR-32.3-0AW	SGR-32.3-0A4W	1.311	1.355	2.10	0.295
SGR-33.4-0AW	SGR-33.4-0A4W	1.356	1.395	2.10	0.295
SGR-34.4-0AW	SGR-34.4-0A4W	1.396	1.435	2.68	0.295
SGR-35.5-0AW	SGR-35.5-0A4W	1.436	1.480	2.68	0.295
SGR-36.6-0AW	SGR-36.6-0A4W	1.481	1.520	2.68	0.295
SGR-37.6-0AW	SGR-37.6-0A4W	1.521	1.560	2.68	0.295
SGR-38.6-0AW	SGR-38.6-0A4W	1.561	1.605	2.68	0.295
SGR-39.8-0AW	SGR-39.8-0A4W	1.606	1.645	2.68	0.295
SGR-40.8-0AW	SGR-40.8-0A4W	1.646	1.685	2.68	0.295
SGR-41.8-0AW	SGR-41.8-0A4W	1.686	1.730	2.68	0.295
SGR-43.0-0AW	SGR-43.0-0A4W	1.731	1.770	2.68	0.295
SGR-44.0-0AW	SGR-44.0-0A4W	1.771	1.810	2.68	0.295
SGR-45.0-0AW	SGR-45.0-0A4W	1.811	1.855	2.68	0.295
SGR-46.1-0AW	SGR-46.1-0A4W	1.856	1.895	2.68	0.295
SGR-47.1-0AW	SGR-47.1-0A4W	1.896	1.935	2.68	0.295
SGR-48.2-0AW	SGR-48.2-0A4W	1.936	1.980	2.68	0.295
SGR-49.3-0AW	SGR-49.3-0A4W	1.981	2.020	2.68	0.295
SGR-50.3-0AW	SGR-50.3-0A4W	2.021	2.060	3.10	0.295
SGR-51.3-0AW	SGR-51.3-0A4W	2.061	2.105	3.10	0.295
SGR-52.5-0AW	SGR-52.5-0A4W	2.106	2.145	3.10	0.295
SGR-53.5-0AW	SGR-53.5-0A4W	2.146	2.185	3.10	0.295
SGR-54.5-0AW	SGR-54.5-0A4W	2.186	2.230	3.10	0.295
SGR-55.7-0AW	SGR-55.7-0A4W	2.231	2.270	3.10	0.295
SGR-56.7-0AW	SGR-56.7-0A4W	2.271	2.310	3.10	0.295
SGR-57.7-0AW	SGR-57.7-0A4W	2.311	2.355	3.10	0.295
SGR-58.8-0AW	SGR-58.8-0A4W	2.356	2.395	3.10	0.295
SGR-59.8-0AW	SGR-59.8-0A4W	2.396	2.435	3.60	0.295
SGR-60.9-0AW	SGR-60.9-0A4W	2.436	2.480	3.60	0.295
SGR-62.0-0AW	SGR-62.0-0A4W	2.481	2.520	3.60	0.295
SGR-63.0-0AW	SGR-63.0-0A4W	2.521	2.560	3.60	0.295
SGR-64.0-0AW	SGR-64.0-0A4W	2.561	2.605	3.60	0.295
SGR-65.2-0AW	SGR-65.2-0A4W	2.606	2.645	3.60	0.295
SGR-66.2-0AW	SGR-66.2-0A4W	2.646	2.685	3.60	0.295
SGR-67.2-0AW	SGR-67.2-0A4W	2.686	2.730	3.60	0.295
SGR-68.4-0AW	SGR-68.4-0A4W	2.731	2.770	3.60	0.295
SGR-69.4-0AW	SGR-69.4-0A4W	2.771	2.810	3.60	0.295
SGR-70.4-0AW	SGR-70.4-0A4W	2.811	2.855	3.60	0.295
SGR-71.5-0AW	SGR-71.5-0A4W	2.856	2.895	3.60	0.295
SGR-72.5-0AW	SGR-72.5-0A4W	2.896	2.935	4.10	0.295
SGR-73.6-0AW	SGR-73.6-0A4W	2.936	2.980	4.10	0.295
SGR-74.7-0AW	SGR-74.7-0A4W	2.981	3.020	4.10	0.295
SGR-75.7-0AW	SGR-75.7-0A4W	3.021	3.060	4.10	0.295
SGR-76.7-0AW	SGR-76.7-0A4W	3.061	3.105	4.10	0.295
SGR-77.9-0AW	SGR-77.9-0A4W	3.106	3.145	4.10	0.295
SGR-78.9-0AW	SGR-78.9-0A4W	3.146	3.185	4.10	0.295

Solid SGR Catalog Number	Split SGR Catalog Number	Min. shaft diameter	Max. shaft diameter	Outside diameter	Thickness Max
SGR-79.9-0AW	SGR-79.9-0A4W	3.186	3.230	4.10	0.295
SGR-81.1-0AW	SGR-81.1-0A4W	3.231	3.270	4.10	0.295
SGR-82.1-0AW	SGR-82.1-0A4W	3.271	3.310	4.10	0.295
SGR-83.1-0AW	SGR-83.1-0A4W	3.311	3.355	4.10	0.295
SGR-84.2-0AW	SGR-84.2-0A4W	3.356	3.395	4.10	0.295
SGR-85.2-0AW	SGR-85.2-0A4W	3.396	3.435	4.60	0.295
SGR-86.3-0AW	SGR-86.3-0A4W	3.436	3.480	4.60	0.295
SGR-87.4-0AW	SGR-87.4-0A4W	3.481	3.520	4.60	0.295
SGR-88.4-0AW	SGR-88.4-0A4W	3.521	3.560	4.60	0.295
SGR-89.4-0AW	SGR-89.4-0A4W	3.561	3.605	4.60	0.295
SGR-90.6-0AW	SGR-90.6-0A4W	3.606	3.645	4.60	0.295
SGR-91.6-0AW	SGR-91.6-0A4W	3.646	3.685	4.60	0.295
SGR-92.6-0AW	SGR-92.6-0A4W	3.686	3.730	4.60	0.295
SGR-93.8-0AW	SGR-93.8-0A4W	3.731	3.770	4.60	0.295
SGR-94.8-0AW	SGR-94.8-0A4W	3.771	3.810	4.60	0.295
SGR-95.8-0AW	SGR-95.8-0A4W	3.811	3.855	4.60	0.295
SGR-96.9-0AW	SGR-96.9-0A4W	3.856	3.895	4.60	0.295
SGR-97.9-0AW	SGR-97.9-0A4W	3.896	3.935	5.10	0.295
SGR-99.0-0AW	SGR-99.0-0A4W	3.936	3.980	5.10	0.295
SGR-100.1-0AW	SGR-100.1-0A4W	3.981	4.020	5.10	0.295
SGR-101.1-0AW	SGR-101.1-0A4W	4.021	4.060	5.10	0.295
SGR-102.1-0AW	SGR-102.1-0A4W	4.061	4.105	5.10	0.295
SGR-103.3-0AW	SGR-103.3-0A4W	4.106	4.145	5.10	0.295
SGR-104.3-0AW	SGR-104.3-0A4W	4.146	4.185	5.10	0.295
SGR-105.3-0AW	SGR-105.3-0A4W	4.186	4.230	5.10	0.295
SGR-106.5-0AW	SGR-106.5-0A4W	4.231	4.270	5.10	0.295
SGR-107.5-0AW	SGR-107.5-0A4W	4.271	4.310	5.10	0.295
SGR-108.5-0AW	SGR-108.5-0A4W	4.311	4.355	5.10	0.295
SGR-109.6-0AW	SGR-109.6-0A4W	4.356	4.395	5.10	0.295
SGR-110.6-0AW	SGR-110.6-0A4W	4.396	4.435	5.60	0.295
SGR-111.7-0AW	SGR-111.7-0A4W	4.436	4.480	5.60	0.295
SGR-112.8-0AW	SGR-112.8-0A4W	4.481	4.520	5.60	0.295
SGR-113.8-0AW	SGR-113.8-0A4W	4.521	4.560	5.60	0.295
SGR-114.8-0AW	SGR-114.8-0A4W	4.561	4.605	5.60	0.295
SGR-116.0-0AW	SGR-116.0-0A4W	4.606	4.645	5.60	0.295
SGR-117.0-0AW	SGR-117.0-0A4W	4.646	4.685	5.60	0.295
SGR-118.0-0AW	SGR-118.0-0A4W	4.686	4.730	5.60	0.295
SGR-119.2-0AW	SGR-119.2-0A4W	4.731	4.770	5.60	0.295
SGR-120.2-0AW	SGR-120.2-0A4W	4.771	4.810	5.60	0.295
SGR-121.2-0AW	SGR-121.2-0A4W	4.811	4.855	5.60	0.295
SGR-122.3-0AW	SGR-122.3-0A4W	4.856	4.895	5.60	0.295
SGR-123.3-0AW	SGR-123.3-0A4W	4.896	4.935	6.10	0.295
SGR-124.4-0AW	SGR-124.4-0A4W	4.936	4.980	6.10	0.295
SGR-125.5-0AW	SGR-125.5-0A4W	4.981	5.020	6.10	0.295
SGR-126.5-0AW	SGR-126.5-0A4W	5.021	5.060	6.10	0.295
SGR-127.5-0AW	SGR-127.5-0A4W	5.061	5.105	6.10	0.295
SGR-128.7-0AW	SGR-128.7-0A4W	5.106	5.145	6.10	0.295
SGR-129.7-0AW	SGR-129.7-0A4W	5.146	5.185	6.10	0.295
SGR-130.7-0AW	SGR-130.7-0A4W	5.186	5.230	6.10	0.295
SGR-131.9-0AW	SGR-131.9-0A4W	5.231	5.270	6.10	0.295
SGR-132.9-0AW	SGR-132.9-0A4W	5.271	5.310	6.10	0.295
SGR-133.9-0AW	SGR-133.9-0A4W	5.311	5.355	6.10	0.295
SGR-135.0-0AW	SGR-135.0-0A4W	5.356	5.395	6.10	0.295
SGR-136.0-0AW	SGR-136.0-0A4W	5.396	5.435	6.60	0.295
SGR-137.1-0AW	SGR-137.1-0A4W	5.436	5.480	6.60	0.295
SGR-138.2-0AW	SGR-138.2-0A4W	5.481	5.520	6.60	0.295
SGR-139.2-0AW	SGR-139.2-0A4W	5.521	5.560	6.60	0.295
SGR-140.2-0AW	SGR-140.2-0A4W	5.561	5.605	6.60	0.295
SGR-141.4-0AW	SGR-141.4-0A4W	5.606	5.645	6.60	0.295
SGR-142.4-0AW	SGR-142.4-0A4W	5.646	5.685	6.60	0.295
SGR-143.4-0AW	SGR-143.4-0A4W	5.686	5.730	6.60	0.295
SGR-144.6-0AW	SGR-144.6-0A4W	5.731	5.770	6.60	0.295
SGR-145.6-0AW	SGR-145.6-0A4W	5.771	5.810	6.60	0.295
SGR-146.6-0AW	SGR-146.6-0A4W	5.811	5.855	6.60	0.295
SGR-147.7-0AW	SGR-147.7-0A4W	5.856	5.895	6.60	0.295
SGR-148.7-0AW	SGR-148.7-0A4W	5.896	5.935	7.10	0.295
SGR-149.8-0AW	SGR-149.8-0A4W	5.936	5.980	7.10	0.295
SGR-150.9-0AW	SGR-150.9-0A4W	5.981	6.020	7.10	0.295

Conductive Epoxy Included

Parts List



Dimensions in inches

**Standard SGR
Catalog Number**

**Split Ring*
Catalog Number**

**Bolt Through*
Catalog Number**

**Min. shaft
diameter**

**Max. shaft
diameter**

**Outside
diameter**

**Thickness
Max**

Standard SGR Catalog Number	Split Ring* Catalog Number	Bolt Through* Catalog Number	Min. shaft diameter	Max. shaft diameter	Outside diameter	Thickness Max
SGR-6.9-1	SGR-6.9-2A4	SGR-6.9-3	0.311	0.355	1.60	0.295
SGR-8.0-1	SGR-8.0-2A4	SGR-8.0-3	0.356	0.395	1.60	0.295
SGR-9.0-1	SGR-9.0-2A4	SGR-9.0-3	0.396	0.435	1.60	0.295
SGR-10.1-1	SGR-10.1-2A4	SGR-10.1-3	0.436	0.480	1.60	0.295
SGR-11.2-1	SGR-11.2-2A4	SGR-11.2-3	0.481	0.520	1.60	0.295
SGR-12.2-1	SGR-12.2-2A4	SGR-12.2-3	0.521	0.560	1.60	0.295
SGR-13.2-1	SGR-13.2-2A4	SGR-13.2-3	0.561	0.605	1.60	0.295
SGR-14.4-1	SGR-14.4-2A4	SGR-14.4-3	0.606	0.645	1.60	0.295
SGR-15.4-1	SGR-15.4-2A4	SGR-15.4-3	0.646	0.685	2.10	0.295
SGR-16.4-1	SGR-16.4-2A4	SGR-16.4-3	0.686	0.730	2.10	0.295
SGR-17.6-1	SGR-17.6-2A4	SGR-17.6-3	0.731	0.774	2.10	0.295
SGR-18.7-1	SGR-18.7-2A4	SGR-18.7-3	0.775	0.815	2.10	0.295
SGR-19.7-1	SGR-19.7-2A4	SGR-19.7-3	0.816	0.855	2.10	0.295
SGR-20.7-1	SGR-20.7-2A4	SGR-20.7-3	0.856	0.895	2.10	0.295
SGR-21.7-1	SGR-21.7-2A4	SGR-21.7-3	0.896	0.935	2.10	0.295
SGR-22.8-1	SGR-22.8-2A4	SGR-22.8-3	0.936	0.980	2.10	0.295
SGR-23.9-1	SGR-23.9-2A4	SGR-23.9-3	0.981	1.020	2.10	0.295
SGR-24.9-1	SGR-24.9-2A4	SGR-24.9-3	1.021	1.060	2.10	0.295
SGR-25.9-1	SGR-25.9-2A4	SGR-25.9-3	1.061	1.105	2.10	0.295
SGR-27.1-1	SGR-27.1-2A4	SGR-27.1-3	1.106	1.145	2.10	0.295
SGR-28.1-1	SGR-28.1-2A4	SGR-28.1-3	1.146	1.185	2.10	0.295
SGR-29.1-1	SGR-29.1-2A4	SGR-29.1-3	1.186	1.230	2.10	0.295
SGR-30.3-1	SGR-30.3-2A4	SGR-30.3-3	1.231	1.270	2.10	0.295
SGR-31.3-1	SGR-31.3-2A4	SGR-31.3-3	1.271	1.310	2.10	0.295
SGR-32.3-1	SGR-32.3-2A4	SGR-32.3-3	1.311	1.355	2.10	0.295
SGR-33.4-1	SGR-33.4-2A4	SGR-33.4-3	1.356	1.395	2.10	0.295
SGR-34.4-1	SGR-34.4-2A4	SGR-34.4-3	1.396	1.435	2.68	0.295
SGR-35.5-1	SGR-35.5-2A4	SGR-35.5-3	1.436	1.480	2.68	0.295
SGR-36.6-1	SGR-36.6-2A4	SGR-36.6-3	1.481	1.520	2.68	0.295
SGR-37.6-1	SGR-37.6-2A4	SGR-37.6-3	1.521	1.560	2.68	0.295
SGR-38.6-1	SGR-38.6-2A4	SGR-38.6-3	1.561	1.605	2.68	0.295
SGR-39.8-1	SGR-39.8-2A4	SGR-39.8-3	1.606	1.645	2.68	0.295
SGR-40.8-1	SGR-40.8-2A4	SGR-40.8-3	1.646	1.685	2.68	0.295
SGR-41.8-1	SGR-41.8-2A4	SGR-41.8-3	1.686	1.730	2.68	0.295
SGR-43.0-1	SGR-43.0-2A4	SGR-43.0-3	1.731	1.770	2.68	0.295
SGR-44.0-1	SGR-44.0-2A4	SGR-44.0-3	1.771	1.810	2.68	0.295
SGR-45.0-1	SGR-45.0-2A4	SGR-45.0-3	1.811	1.855	2.68	0.295
SGR-46.1-1	SGR-46.1-2A4	SGR-46.1-3	1.856	1.895	2.68	0.295
SGR-47.1-1	SGR-47.1-2A4	SGR-47.1-3	1.896	1.935	2.68	0.295
SGR-48.2-1	SGR-48.2-2A4	SGR-48.2-3	1.936	1.980	2.68	0.295
SGR-49.3-1	SGR-49.3-2A4	SGR-49.3-3	1.981	2.020	2.68	0.295
SGR-50.3-1	SGR-50.3-2A4	SGR-50.3-3	2.021	2.060	3.10	0.295
SGR-51.3-1	SGR-51.3-2A4	SGR-51.3-3	2.061	2.105	3.10	0.295
SGR-52.5-1	SGR-52.5-2A4	SGR-52.5-3	2.106	2.145	3.10	0.295
SGR-53.5-1	SGR-53.5-2A4	SGR-53.5-3	2.146	2.185	3.10	0.295
SGR-54.5-1	SGR-54.5-2A4	SGR-54.5-3	2.186	2.230	3.10	0.295
SGR-55.7-1	SGR-55.7-2A4	SGR-55.7-3	2.231	2.270	3.10	0.295
SGR-56.7-1	SGR-56.7-2A4	SGR-56.7-3	2.271	2.310	3.10	0.295
SGR-57.7-1	SGR-57.7-2A4	SGR-57.7-3	2.311	2.355	3.10	0.295
SGR-58.8-1	SGR-58.8-2A4	SGR-58.8-3	2.356	2.395	3.10	0.295
SGR-59.8-1	SGR-59.8-2A4	SGR-59.8-3	2.396	2.435	3.60	0.295
SGR-60.9-1	SGR-60.9-2A4	SGR-60.9-3	2.436	2.480	3.60	0.295
SGR-62.0-1	SGR-62.0-2A4	SGR-62.0-3	2.481	2.520	3.60	0.295
SGR-63.0-1	SGR-63.0-2A4	SGR-63.0-3	2.521	2.560	3.60	0.295
SGR-64.0-1	SGR-64.0-2A4	SGR-64.0-3	2.561	2.605	3.60	0.295
SGR-65.2-1	SGR-65.2-2A4	SGR-65.2-3	2.606	2.645	3.60	0.295
SGR-66.2-1	SGR-66.2-2A4	SGR-66.2-3	2.646	2.685	3.60	0.295
SGR-67.2-1	SGR-67.2-2A4	SGR-67.2-3	2.686	2.730	3.60	0.295
SGR-68.4-1	SGR-68.4-2A4	SGR-68.4-3	2.731	2.770	3.60	0.295
SGR-69.4-1	SGR-69.4-2A4	SGR-69.4-3	2.771	2.810	3.60	0.295
SGR-70.4-1	SGR-70.4-2A4	SGR-70.4-3	2.811	2.855	3.60	0.295
SGR-71.5-1	SGR-71.5-2A4	SGR-71.5-3	2.856	2.895	3.60	0.295
SGR-72.5-1	SGR-72.5-2A4	SGR-72.5-3	2.896	2.935	4.10	0.295
SGR-73.6-1	SGR-73.6-2A4	SGR-73.6-3	2.936	2.980	4.10	0.295
SGR-74.7-1	SGR-74.7-2A4	SGR-74.7-3	2.981	3.020	4.10	0.295
SGR-75.7-1	SGR-75.7-2A4	SGR-75.7-3	3.021	3.060	4.10	0.295
SGR-76.7-1	SGR-76.7-2A4	SGR-76.7-3	3.061	3.105	4.10	0.295
SGR-77.9-1	SGR-77.9-2A4	SGR-77.9-3	3.106	3.145	4.10	0.295
SGR-78.9-1	SGR-78.9-2A4	SGR-78.9-3	3.146	3.185	4.10	0.295

*Custom Part - No Returns

Parts List



Dimensions in inches

Standard SGR Catalog Number	Split Ring* Catalog Number	Bolt Through* Catalog Number	Min. shaft diameter	Max. shaft diameter	Outside diameter	Thickness Max
SGR-79.9-1	SGR-79.9-2A4	SGR-79.9-3	3.186	3.230	4.10	0.295
SGR-81.1-1	SGR-81.1-2A4	SGR-81.1-3	3.231	3.270	4.10	0.295
SGR-82.1-1	SGR-82.1-2A4	SGR-82.1-3	3.271	3.310	4.10	0.295
SGR-83.1-1	SGR-83.1-2A4	SGR-83.1-3	3.311	3.355	4.10	0.295
SGR-84.2-1	SGR-84.2-2A4	SGR-84.2-3	3.356	3.395	4.10	0.295
SGR-85.2-1	SGR-85.2-2A4	SGR-85.2-3	3.396	3.435	4.60	0.295
SGR-86.3-1	SGR-86.3-2A4	SGR-86.3-3	3.436	3.480	4.60	0.295
SGR-87.4-1	SGR-87.4-2A4	SGR-87.4-3	3.481	3.520	4.60	0.295
SGR-88.4-1	SGR-88.4-2A4	SGR-88.4-3	3.521	3.560	4.60	0.295
SGR-89.4-1	SGR-89.4-2A4	SGR-89.4-3	3.561	3.605	4.60	0.295
SGR-90.6-1	SGR-90.6-2A4	SGR-90.6-3	3.606	3.645	4.60	0.295
SGR-91.6-1	SGR-91.6-2A4	SGR-91.6-3	3.646	3.685	4.60	0.295
SGR-92.6-1	SGR-92.6-2A4	SGR-92.6-3	3.686	3.730	4.60	0.295
SGR-93.8-1	SGR-93.8-2A4	SGR-93.8-3	3.731	3.770	4.60	0.295
SGR-94.8-1	SGR-94.8-2A4	SGR-94.8-3	3.771	3.810	4.60	0.295
SGR-95.8-1	SGR-95.8-2A4	SGR-95.8-3	3.811	3.855	4.60	0.295
SGR-96.9-1	SGR-96.9-2A4	SGR-96.9-3	3.856	3.895	4.60	0.295
SGR-97.9-1	SGR-97.9-2A4	SGR-97.9-3	3.896	3.935	5.10	0.295
SGR-99.0-1	SGR-99.0-2A4	SGR-99.0-3	3.936	3.980	5.10	0.295
SGR-100.1-1	SGR-100.1-2A4	SGR-100.1-3	3.981	4.020	5.10	0.295
SGR-101.1-1	SGR-101.1-2A4	SGR-101.1-3	4.021	4.060	5.10	0.295
SGR-102.1-1	SGR-102.1-2A4	SGR-102.1-3	4.061	4.105	5.10	0.295
SGR-103.3-1	SGR-103.3-2A4	SGR-103.3-3	4.106	4.145	5.10	0.295
SGR-104.3-1	SGR-104.3-2A4	SGR-104.3-3	4.146	4.185	5.10	0.295
SGR-105.3-1	SGR-105.3-2A4	SGR-105.3-3	4.186	4.230	5.10	0.295
SGR-106.5-1	SGR-106.5-2A4	SGR-106.5-3	4.231	4.270	5.10	0.295
SGR-107.5-1	SGR-107.5-2A4	SGR-107.5-3	4.271	4.310	5.10	0.295
SGR-108.5-1	SGR-108.5-2A4	SGR-108.5-3	4.311	4.355	5.10	0.295
SGR-109.6-1	SGR-109.6-2A4	SGR-109.6-3	4.356	4.395	5.10	0.295
SGR-110.6-1	SGR-110.6-2A4	SGR-110.6-3	4.396	4.435	5.60	0.295
SGR-111.7-1	SGR-111.7-2A4	SGR-111.7-3	4.436	4.480	5.60	0.295
SGR-112.8-1	SGR-112.8-2A4	SGR-112.8-3	4.481	4.520	5.60	0.295
SGR-113.8-1	SGR-113.8-2A4	SGR-113.8-3	4.521	4.560	5.60	0.295
SGR-114.8-1	SGR-114.8-2A4	SGR-114.8-3	4.561	4.605	5.60	0.295
SGR-116.0-1	SGR-116.0-2A4	SGR-116.0-3	4.606	4.645	5.60	0.295
SGR-117.0-1	SGR-117.0-2A4	SGR-117.0-3	4.646	4.685	5.60	0.295
SGR-118.0-1	SGR-118.0-2A4	SGR-118.0-3	4.686	4.730	5.60	0.295
SGR-119.2-1	SGR-119.2-2A4	SGR-119.2-3	4.731	4.770	5.60	0.295
SGR-120.2-1	SGR-120.2-2A4	SGR-120.2-3	4.771	4.810	5.60	0.295
SGR-121.2-1	SGR-121.2-2A4	SGR-121.2-3	4.811	4.855	5.60	0.295
SGR-122.3-1	SGR-122.3-2A4	SGR-122.3-3	4.856	4.895	5.60	0.295
SGR-123.3-1	SGR-123.3-2A4	SGR-123.3-3	4.896	4.935	6.10	0.295
SGR-124.4-1	SGR-124.4-2A4	SGR-124.4-3	4.936	4.980	6.10	0.295
SGR-125.5-1	SGR-125.5-2A4	SGR-125.5-3	4.981	5.020	6.10	0.295
SGR-126.5-1	SGR-126.5-2A4	SGR-126.5-3	5.021	5.060	6.10	0.295
SGR-127.5-1	SGR-127.5-2A4	SGR-127.5-3	5.061	5.105	6.10	0.295
SGR-128.7-1	SGR-128.7-2A4	SGR-128.7-3	5.106	5.145	6.10	0.295
SGR-129.7-1	SGR-129.7-2A4	SGR-129.7-3	5.146	5.185	6.10	0.295
SGR-130.7-1	SGR-130.7-2A4	SGR-130.7-3	5.186	5.230	6.10	0.295
SGR-131.9-1	SGR-131.9-2A4	SGR-131.9-3	5.231	5.270	6.10	0.295
SGR-132.9-1	SGR-132.9-2A4	SGR-132.9-3	5.271	5.310	6.10	0.295
SGR-133.9-1	SGR-133.9-2A4	SGR-133.9-3	5.311	5.355	6.10	0.295
SGR-135.0-1	SGR-135.0-2A4	SGR-135.0-3	5.356	5.395	6.10	0.295
SGR-136.0-1	SGR-136.0-2A4	SGR-136.0-3	5.396	5.435	6.60	0.295
SGR-137.1-1	SGR-137.1-2A4	SGR-137.1-3	5.436	5.480	6.60	0.295
SGR-138.2-1	SGR-138.2-2A4	SGR-138.2-3	5.481	5.520	6.60	0.295
SGR-139.2-1	SGR-139.2-2A4	SGR-139.2-3	5.521	5.560	6.60	0.295
SGR-140.2-1	SGR-140.2-2A4	SGR-140.2-3	5.561	5.605	6.60	0.295
SGR-141.4-1	SGR-141.4-2A4	SGR-141.4-3	5.606	5.645	6.60	0.295
SGR-142.4-1	SGR-142.4-2A4	SGR-142.4-3	5.646	5.685	6.60	0.295
SGR-143.4-1	SGR-143.4-2A4	SGR-143.4-3	5.686	5.730	6.60	0.295
SGR-144.6-1	SGR-144.6-2A4	SGR-144.6-3	5.731	5.770	6.60	0.295
SGR-145.6-1	SGR-145.6-2A4	SGR-145.6-3	5.771	5.810	6.60	0.295
SGR-146.6-1	SGR-146.6-2A4	SGR-146.6-3	5.811	5.855	6.60	0.295
SGR-147.7-1	SGR-147.7-2A4	SGR-147.7-3	5.856	5.895	6.60	0.295
SGR-148.7-1	SGR-148.7-2A4	SGR-148.7-3	5.896	5.935	7.10	0.295
SGR-149.8-1	SGR-149.8-2A4	SGR-149.8-3	5.936	5.980	7.10	0.295
SGR-150.9-1	SGR-150.9-2A4	SGR-150.9-3	5.981	6.020	7.10	0.295

*Custom Part - No Returns

Standard SGR™ - Press Fit Mounting*



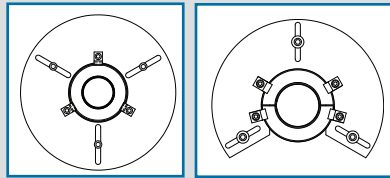
Dimensions in inches

Catalog Number	Min. shaft diameter	Max. shaft diameter	SGR OD Tolerance +0/-0.001	Thickness Max	Bore Tolerance +0.001/-0	Catalog Number	Min. shaft diameter	Max. shaft diameter	SGR OD Tolerance +0/-0.001	Thickness Max	Bore Tolerance +0.001/-0
SGR-6.9-0A6	0.311	0.355	1.580	0.295	1.576	SGR-79.9-0A6	3.186	3.230	4.080	0.295	4.076
SGR-8.0-0A6	0.356	0.395	1.580	0.295	1.576	SGR-81.1-0A6	3.231	3.270	4.080	0.295	4.076
SGR-9.0-0A6	0.396	0.435	1.580	0.295	1.576	SGR-82.1-0A6	3.271	3.310	4.080	0.295	4.076
SGR-10.1-0A6	0.436	0.480	1.580	0.295	1.576	SGR-83.1-0A6	3.311	3.355	4.080	0.295	4.076
SGR-11.2-0A6	0.481	0.520	1.580	0.295	1.576	SGR-84.2-0A6	3.356	3.395	4.080	0.295	4.076
SGR-12.2-0A6	0.521	0.560	1.580	0.295	1.576	SGR-85.2-0A6	3.396	3.435	4.580	0.295	4.576
SGR-13.2-0A6	0.561	0.605	1.580	0.295	1.576	SGR-86.3-0A6	3.436	3.480	4.580	0.295	4.576
SGR-14.4-0A6	0.606	0.645	1.580	0.295	1.576	SGR-87.4-0A6	3.481	3.520	4.580	0.295	4.576
SGR-15.4-0A6	0.646	0.685	2.080	0.295	2.076	SGR-88.4-0A6	3.521	3.560	4.580	0.295	4.576
SGR-16.4-0A6	0.686	0.730	2.080	0.295	2.076	SGR-89.4-0A6	3.561	3.605	4.580	0.295	4.576
SGR-17.6-0A6	0.731	0.774	2.080	0.295	2.076	SGR-90.6-0A6	3.606	3.645	4.580	0.295	4.576
SGR-18.7-0A6	0.775	0.815	2.080	0.295	2.076	SGR-91.6-0A6	3.646	3.685	4.580	0.295	4.576
SGR-19.7-0A6	0.816	0.855	2.080	0.295	2.076	SGR-92.6-0A6	3.686	3.730	4.580	0.295	4.576
SGR-20.7-0A6	0.856	0.895	2.080	0.295	2.076	SGR-93.8-0A6	3.731	3.770	4.580	0.295	4.576
SGR-21.7-0A6	0.896	0.935	2.080	0.295	2.076	SGR-94.8-0A6	3.771	3.810	4.580	0.295	4.576
SGR-22.8-0A6	0.936	0.980	2.080	0.295	2.076	SGR-95.8-0A6	3.811	3.855	4.580	0.295	4.576
SGR-23.9-0A6	0.981	1.020	2.080	0.295	2.076	SGR-96.9-0A6	3.856	3.895	4.580	0.295	4.576
SGR-24.9-0A6	1.021	1.060	2.080	0.295	2.076	SGR-97.9-0A6	3.896	3.935	5.080	0.295	5.076
SGR-25.9-0A6	1.061	1.105	2.080	0.295	2.076	SGR-99.0-0A6	3.936	3.980	5.080	0.295	5.076
SGR-27.1-0A6	1.106	1.145	2.080	0.295	2.076	SGR-100.1-0A6	3.981	4.020	5.080	0.295	5.076
SGR-28.1-0A6	1.146	1.185	2.080	0.295	2.076	SGR-101.1-0A6	4.021	4.060	5.080	0.295	5.076
SGR-29.1-0A6	1.186	1.230	2.080	0.295	2.076	SGR-102.1-0A6	4.061	4.105	5.080	0.295	5.076
SGR-30.3-0A6	1.231	1.270	2.080	0.295	2.076	SGR-103.3-0A6	4.106	4.145	5.080	0.295	5.076
SGR-31.3-0A6	1.271	1.310	2.080	0.295	2.076	SGR-104.3-0A6	4.146	4.185	5.080	0.295	5.076
SGR-32.3-0A6	1.311	1.355	2.080	0.295	2.076	SGR-105.3-0A6	4.186	4.230	5.080	0.295	5.076
SGR-33.4-0A6	1.356	1.395	2.080	0.295	2.076	SGR-106.5-0A6	4.231	4.270	5.080	0.295	5.076
SGR-34.4-0A6	1.396	1.435	2.660	0.295	2.656	SGR-107.5-0A6	4.271	4.310	5.080	0.295	5.076
SGR-35.5-0A6	1.436	1.480	2.660	0.295	2.656	SGR-108.5-0A6	4.311	4.355	5.080	0.295	5.076
SGR-36.6-0A6	1.481	1.520	2.660	0.295	2.656	SGR-109.6-0A6	4.356	4.395	5.080	0.295	5.076
SGR-37.6-0A6	1.521	1.560	2.660	0.295	2.656	SGR-110.6-0A6	4.396	4.435	5.580	0.295	5.576
SGR-38.6-0A6	1.561	1.605	2.660	0.295	2.656	SGR-111.7-0A6	4.436	4.480	5.580	0.295	5.576
SGR-39.8-0A6	1.606	1.645	2.660	0.295	2.656	SGR-112.8-0A6	4.481	4.520	5.580	0.295	5.576
SGR-40.8-0A6	1.646	1.685	2.660	0.295	2.656	SGR-113.8-0A6	4.521	4.560	5.580	0.295	5.576
SGR-41.8-0A6	1.686	1.730	2.660	0.295	2.656	SGR-114.8-0A6	4.561	4.605	5.580	0.295	5.576
SGR-43.0-0A6	1.731	1.770	2.660	0.295	2.656	SGR-116.0-0A6	4.606	4.645	5.580	0.295	5.576
SGR-44.0-0A6	1.771	1.810	2.660	0.295	2.656	SGR-117.0-0A6	4.646	4.685	5.580	0.295	5.576
SGR-45.0-0A6	1.811	1.855	2.660	0.295	2.656	SGR-118.0-0A6	4.686	4.730	5.580	0.295	5.576
SGR-46.1-0A6	1.856	1.895	2.660	0.295	2.656	SGR-119.2-0A6	4.731	4.770	5.580	0.295	5.576
SGR-47.1-0A6	1.896	1.935	2.660	0.295	2.656	SGR-120.2-0A6	4.771	4.810	5.580	0.295	5.576
SGR-48.2-0A6	1.936	1.980	2.660	0.295	2.656	SGR-121.2-0A6	4.811	4.855	5.580	0.295	5.576
SGR-49.3-0A6	1.981	2.020	2.660	0.295	2.656	SGR-122.3-0A6	4.856	4.895	5.580	0.295	5.576
SGR-50.3-0A6	2.021	2.060	3.080	0.295	3.076	SGR-123.3-0A6	4.896	4.935	6.080	0.295	6.076
SGR-51.3-0A6	2.061	2.105	3.080	0.295	3.076	SGR-124.4-0A6	4.936	4.980	6.080	0.295	6.076
SGR-52.5-0A6	2.106	2.145	3.080	0.295	3.076	SGR-125.5-0A6	4.981	5.020	6.080	0.295	6.076
SGR-53.5-0A6	2.146	2.185	3.080	0.295	3.076	SGR-126.5-0A6	5.021	5.060	6.080	0.295	6.076
SGR-54.5-0A6	2.186	2.230	3.080	0.295	3.076	SGR-127.5-0A6	5.061	5.105	6.080	0.295	6.076
SGR-55.7-0A6	2.231	2.270	3.080	0.295	3.076	SGR-128.7-0A6	5.106	5.145	6.080	0.295	6.076
SGR-56.7-0A6	2.271	2.310	3.080	0.295	3.076	SGR-129.7-0A6	5.146	5.185	6.080	0.295	6.076
SGR-57.7-0A6	2.311	2.355	3.080	0.295	3.076	SGR-130.7-0A6	5.186	5.230	6.080	0.295	6.076
SGR-58.8-0A6	2.356	2.395	3.080	0.295	3.076	SGR-131.9-0A6	5.231	5.270	6.080	0.295	6.076
SGR-59.8-0A6	2.396	2.435	3.580	0.295	3.576	SGR-132.9-0A6	5.271	5.310	6.080	0.295	6.076
SGR-60.9-0A6	2.436	2.480	3.580	0.295	3.576	SGR-133.9-0A6	5.311	5.355	6.080	0.295	6.076
SGR-62.0-0A6	2.481	2.520	3.580	0.295	3.576	SGR-135.0-0A6	5.356	5.395	6.080	0.295	6.076
SGR-63.0-0A6	2.521	2.560	3.580	0.295	3.576	SGR-136.0-0A6	5.396	5.435	6.580	0.295	6.576
SGR-64.0-0A6	2.561	2.605	3.580	0.295	3.576	SGR-137.1-0A6	5.436	5.480	6.580	0.295	6.576
SGR-65.2-0A6	2.606	2.645	3.580	0.295	3.576	SGR-138.2-0A6	5.481	5.520	6.580	0.295	6.576
SGR-66.2-0A6	2.646	2.685	3.580	0.295	3.576	SGR-139.2-0A6	5.521	5.560	6.580	0.295	6.576
SGR-67.2-0A6	2.686	2.730	3.580	0.295	3.576	SGR-140.2-0A6	5.561	5.605	6.580	0.295	6.576
SGR-68.4-0A6	2.731	2.770	3.580	0.295	3.576	SGR-141.4-0A6	5.606	5.645	6.580	0.295	6.576
SGR-69.4-0A6	2.771	2.810	3.580	0.295	3.576	SGR-142.4-0A6	5.646	5.685	6.580	0.295	6.576
SGR-70.4-0A6	2.811	2.855	3.580	0.295	3.576	SGR-143.4-0A6	5.686	5.730	6.580	0.295	6.576
SGR-71.5-0A6	2.856	2.895	3.580	0.295	3.576	SGR-144.6-0A6	5.731	5.770	6.580	0.295	6.576
SGR-72.5-0A6	2.896	2.935	4.080	0.295	4.076	SGR-145.6-0A6	5.771	5.810	6.580	0.295	6.576
SGR-73.6-0A6	2.936	2.980	4.080	0.295	4.076	SGR-146.6-0A6	5.811	5.855	6.580	0.295	6.576
SGR-74.7-0A6	2.981	3.020	4.080	0.295	4.076	SGR-147.7-0A6	5.856	5.895	6.580	0.295	6.576
SGR-75.7-0A6	3.021	3.060	4.080	0.295	4.076	SGR-148.7-0A6	5.896	5.935	7.080	0.295	7.076
SGR-76.7-0A6	3.061	3.105	4.080	0.295	4.076	SGR-149.8-0A6	5.936	5.980	7.080	0.295	7.076
SGR-77.9-0A6	3.106	3.145	4.080	0.295	4.076	SGR-150.9-0A6	5.981	6.020	7.080	0.295	7.076
SGR-78.9-0A6	3.146	3.185	4.080	0.295	4.076						

*Custom Part - No Returns

Bearing Protection Ring Kit for NEMA & IEC Motors

Kits include AEGIS SGR™ Bearing Protection Ring and all mounting hardware



NEMA/IEC Bearing Protection Ring™ Kit

SOLID



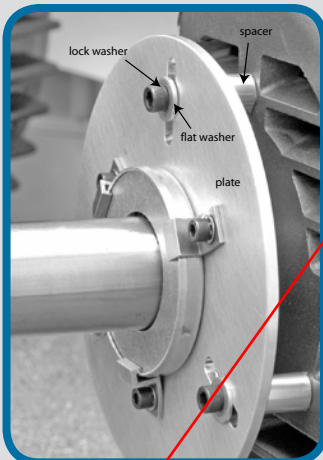
- 1 AEGIS SGR™
- 1 mounting plate
- 3 screws (inches or metric)
- 3 washers
- 3 lock washers
- 3 spacers*

SPLIT



- 1 AEGIS Split Ring SGR™
- 1 split mounting plate
- 3 screws (inches or metric)
- 3 washers
- 3 lock washers
- 3 spacers*

* each kit includes 3 spacer lengths: 1/4", 1/2", and 1" for NEMA kits and 7mm, 17mm, and 27mm for IEC kits.

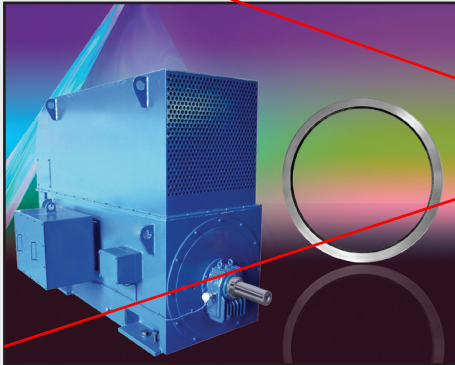


NEMA Motors Solid	NEMA Motors Split			
Catalog Number	Catalog Number	Motor shaft diameter "u"	NEMA Frame	Plate OD
SGR-0.625-NEMA	SGR-0.625-NEMA-1A4	0.625"	56	3.75"
SGR-0.875-NEMA	SGR-0.875-NEMA-1A4	0.875"	143T, 145T	5.60"
SGR-1.125-NEMA	SGR-1.125-NEMA-1A4	1.125"	182T, 184T	5.60"
SGR-1.375-NEMA	SGR-1.375-NEMA-1A4	1.375"	213T, 215T	5.60"
SGR-1.625-NEMA	SGR-1.625-NEMA-1A4	1.625"	254T, 256T	6.30"
SGR-1.875-NEMA	SGR-1.875-NEMA-1A4	1.875"	284T, 286T, 324TS, 326TS, 364TS, 365TS	6.30"
SGR-2.125-NEMA	SGR-2.125-NEMA-1A4	2.125"	324T, 326T, 404TS, 405TS	6.60"
SGR-2.375-NEMA	SGR-2.375-NEMA-1A4	2.375"	364T, 365T, 444TS, 445TS, 447TS, 449TS	6.60"
SGR-2.875-NEMA	SGR-2.875-NEMA-1A4	2.875"	404T, 405T,	7.30"
SGR-3.375-NEMA	SGR-3.375-NEMA-1A4	3.375"	444T, 445T, 447T, 449T	7.60"

IEC Motors Solid	IEC Motors Split			
Catalog Number	Catalog Number	IEC shaft diameter	IEC Frame	Plate OD
SGR-19-IEC	SGR-19-IEC-2A4	19mm	IEC 80 (2, 4, 6, 8 pole)	142mm
SGR-24-IEC	SGR-24-IEC-2A4	24mm	IEC 90S, 90L (2, 4, 6, 8 pole)	142mm
SGR-28-IEC	SGR-28-IEC-2A4	28mm	IEC 100L, 112M (2, 4, 6, 8 pole)	142mm
SGR-38-IEC	SGR-38-IEC-2A4	38mm	IEC 132S, 132M (2, 4, 6, 8 pole)	160mm
SGR-42-IEC	SGR-42-IEC-2A4	42mm	IEC 160M, 160L (2, 4, 6, 8 pole)	160mm
SGR-48-IEC	SGR-48-IEC-2A4	48mm	IEC 180M, 180L (2, 4, 6, 8 pole)	160mm
SGR-55-IEC	SGR-55-IEC-2A4	55mm	IEC 200L (2, 4, 6, 8 pole); IEC 225S, 225M (2 pole)	168mm
SGR-60-IEC	SGR-60-IEC-2A4	60mm	IEC 225S, 225M (4, 6, 8 pole) ; IEC 250M (2 pole)	168mm
SGR-65-IEC	SGR-65-IEC-2A4	65mm	IEC 250M (4, 6, 8 pole); IEC 280M, 280S, 315S, 315M, 315L (2 pole)	185mm
SGR-75-IEC	SGR-75-IEC-2A4	75mm	IEC 280S, 280M (4, 6, 8 pole); IEC 355M, 355L (2 pole)	193mm
SGR-80-IEC	SGR-80-IEC-2A4	80mm	IEC 315S, 315M, 315L (4, 6, 8 pole)	193mm
SGR-95-IEC	SGR-95-IEC-2A4	95mm	IEC 335L, 335M, 355L, 355M (4, 6, 8, 10 pole)	211mm

Custom Kits available for shaft diameters not shown above

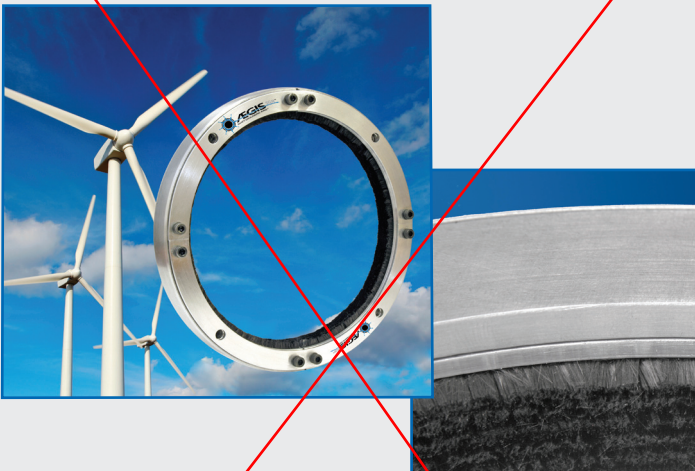
- Easy to order and install for any NEMA or IEC frame size
- Clears any slinger, shaft shoulder or protrusion
- Adjustable slots adapt to most end bells
- Rigid mounting plate ensures alignment
- Split Ring kit allows for installation without decoupling equipment



AEGIS SGR™ Bearing Protection Ring™ for Large Shaft Diameters

- For shaft diameters greater than 6" (152.4mm)
- Long term reliable performance
- Maintenance free system
- Available in solid or split ring design

AEGIS WTG™ Wind Turbine Bearing Protection



- 6 rows conductive microfiber
- High current capable
- AEGIS WTG™ shaft current monitoring compatible
- Long term reliable performance
- Maintenance free system
- Up-tower retrofit capable split ring configuration

AEGIS iPRO™ High Current Bearing Protection for Large Motors and Generators



- 6 rows conductive microfiber
- High current capable
- AEGIS iPRO shaft current monitoring compatible
- Long term reliable performance
- Maintenance free system
- Available in sizes up to 30" (762mm) shaft diameter

WARRANTY: Units are guaranteed for one year from date of purchase against defective materials and workmanship. Replacement will be made except for defects caused by abnormal use or mishandling. All statements and technical information contained herein, or presented by the manufacturer or his representative are rendered in good faith. User must assume responsibility to determine suitability of the product for intended use. The manufacturer shall not be liable for any injury, loss or damage, direct or consequential arising out of the use, or attempt to use the product.

Patent Numbers: 7,136,271; 7,193,836: and other patents pending



Engineering Specification:

All motors driven by a variable frequency PWM drive shall include a maintenance free, circumferential, conductive micro fiber shaft grounding ring (AEGIS SGR) to discharge shaft currents to ground.

Recommended part: AEGIS SGR™ Bearing Protection Ring



BEARING PROTECTION RING™

CONSULTING - SPECIFYING
engineer

2009
PRODUCT OF THE YEAR Finalist



Catalog No. 2009-1

Electro Static Technology™
An ITW Company

31 Winterbrook Road
Mechanic Falls, Maine 04256 USA
Tel.: 866-738-1857
Fax: 207-998-5143
www.est-aegis.com

BEST PRACTICES FOR VARIABLE FREQUENCY DRIVE (VFD) APPLICATIONS

VFD-induced shaft voltage can exist in every VFD driven motor application. It is not specific to the air movement industry, nor is it specific to any particular manufacturer's motors, drives or equipment. However, shaft voltage only becomes a problem when it leads to bearing current and consequential damage to the motor bearings.

NOTICE!

Risk of serious machine damage!

Appropriate measures must be implemented by the installation contractor to limit the shaft induced voltage to 1V – 2V as per IEEE 112.

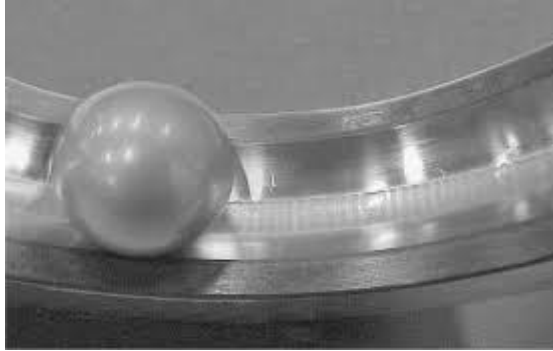


Figure 1 Bearing damage caused by EDM

Frequency converters (also known as variable frequency drives or VFD's) can induce a voltage on the shafts of drive motors and stages due to the high switching frequencies used in these drives. Shaft voltage can become a problem when it reaches a high enough level to discharge across the bearings, causing electrical discharge machining (EDM) and creating small grooves called fluting which can lead to premature bearing failure. The potential for this induced shaft voltage exists in every VFD driven motor application and must be addressed on an installation specific basis.

VFD induced voltage is a phenomenon that is somewhat rare and unpredictable. As additional protection, Aerzen USA offers options for mitigating induced shaft currents such as grounding rings and isolated motor non drive end bearings. Even with these options installed, there is no guarantee that this phenomenon will be entirely eliminated. Damage to the motor bearings from shaft / bearing currents is not covered by warranty from Aerzen, the motor manufacturer or VFD manufacturer.

GENERAL RECOMMENDATIONS:

Motors up to and including 100HP (75kW) – Low Voltage

For induction motors either foot mounted, c-face or d-flange mounted motors with single row radial ball bearings on both ends of the motors

- Install one AEGIS SGR Bearing Protection Ring on either the drive end or the non-drive end of the motor to discharge capacitive induced shaft voltage.

Motors Greater than 100HP (75kW)

For horizontally mounted motors with single row radial ball bearings on both ends of the motor:

- Non-Drive End (Opposite Drive End): Bearing housing must be isolated with insulated sleeve or coating or use insulated ceramic or hybrid bearing to disrupt circulating currents.
- Drive End: Install one AEGIS Bearing Protection Ring.

Motors in Hazardous Areas

Grounding rings are permitted. Consult Aerzen USA or your motor supplier for specific recommendations.



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Best Practices for VFD Applications

Date
09/2019

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1 of 1

SECTION 6

Component Breakdown

Component	Material	Protection Method (Standard)	Quality Document (Standard)	Protection Method (Upgrade)	Quality Document (Upgrade)
Base/Silencer*	Carbon Steel	Painted Externally (Solvent Based)	QH-00408	SikaCor Zinc R	QH-00510
Belt Guard	Galvanized Sheet Metal	N/A	N/A	N/A	N/A
Belt Guard Supports	Galvanized Carbon Steel	N/A	N/A	N/A	N/A
Blower Stage	Cast Carbon Steel	Painted Externally (Water Based)	QH-00408	SikaCor Zinc R	QH-00510
Connecting Housing (DN50)	Cast Aluminum	N/A	N/A	N/A	N/A
Connecting Housing (DN80 - DN250)	Cast Iron	Powder Coated	QH-00552	SikaCor Zinc R	QH-00510
Fasteners - Bolts, Studs, Nuts	Carbon Steel	Zinc Coated	N/A	N/A	N/A
Flex Connector	Silicone	N/A	N/A	N/A	N/A
Hose Clamps	Carbon Steel	Zinc Coated	N/A	N/A	N/A
Inlet Filter/ Silencer Housing	Carbon Steel	Powder Coated	QH-00552	SikaCor Zinc R	A-6-450
Inlet Hose	Reinforced Rubber	N/A	N/A	N/A	N/A
Inlet Silencer	Carbon Steel	Powder Coated	QH-00552	SikaCor Zinc R	A-6-450
Motor Mounting Hardware	Galvanized Carbon Steel	N/A	N/A	N/A	N/A
Piping (Galvanized)	Galvanized Carbon Steel	N/A	N/A	N/A	N/A
Piping (Painted)	Carbon Steel	Painted Externally	QH-00408	SikaCor Zinc R	A-6-450
Pressure Safety/Vacuum Breaker Valves	Carbon Steel (Flange)	Painted Flange	QH-00408	N/A	N/A
Sound Enclosure - Base	Carbon Steel	Powder Coated	QH-00552	SikaCor Zinc R	QH-00510
Sound Enclosure	Galvanized Sheet Metal	Powder Coated	QH-00419	SikaCor Zinc R	QH-00510
Vent Silencer	Carbon Steel	Powder Coated	QH-00552	SikaCor Zinc R	A-6-450

*If made in the USA, Protection Method goes from Painted Externally to Powder Coated (A-6-450)

General Painting Information

The machine castings are fettled, cleaned and primed; the primer used is specially developed for machinery parts and is particularly notable for its excellent bonding characteristic and elasticity. Its base is a quick drying synthetic resin binder possessing a high degree of water resistance. The proportion of pigment to binder is such to ensure the best protection for the machines.

Total dry Film Thickness: 70 µm (2.75 mil)

Surface Preparation

Sand blasting, mechanical cleaning to near white surfaces per SA 2,5 acc. to DIN ISO 8501 or SSPC10

Primer

Alkyd Resin: RAL 6006 Manufacturer: Relius Coatings

Final Coat

Alkyd Resin: RAL 5001 Manufacturer: Relius Coatings (BASF)
(Blue) or Dr. Demuth GmbH

General Powder Coating Information

SP Polyester Powder Paint, RAL 5001, structure, glossy

Relius No.: I536-5401

Total dry film thickness: 80 - 110µm

General Upgraded Protection Information

Surface Preparation

Sa 2 ½

Priming Coat

SikaCorEG4 (80µm max)

Intermediate Coat

SikaCorEG1 (80µm max)

Finishing Coat

SikaCorEG5 (80µm max)



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Delta Blower – Corrosion Protection

Date
11-13-2019

Doc #
B-6-0010 revision "J"

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SECTION 7



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Pre-Commissioning Checklist

Document #

A-7-0288 rev "4"

The purpose of this pre-commissioning checklist is to ensure readiness to successfully commission your Aerzen packages. We will need some information from you in order to better prepare for the commissioning. We ask that your on-site representative complete and return this checklist to Aerzen USA at your earliest convenience.

We will also need to know if you have a target date in mind for our service technician to be on-site, and if the plant maintenance personnel will be on-site at that time to receive maintenance training. This training is normally hands-on in nature and should not take more than 1-2 hours. In addition to the pre-commissioning checklist, we will need an on-site contact and phone number for our service technician.

We will make every effort to meet your target date for commissioning. Please keep in mind that our start-up/commissioning schedule can run three to five weeks out. The earlier we know your target date the better chance we have of reserving your request on our schedule.

Please be aware that should the commissioning prerequisites not be completed prior to our arrival, Aerzen USA reserves the right to charge any and all responsible parties for additional time and travel expenses required to complete the commissioning service.

Below is a checklist of items requiring attention prior to our arrival. Please verify your understanding and completion of the prerequisites by initialing the check the boxes corresponding to each requirement. Please send this checklist to the Aerzen Service Coordinator once all the prerequisites have been verified

- 1 The Aerzen package has not been damaged during shipping and/or while on-site
- 2 The Aerzen package is installed in permanent position, is level, properly grounded and anchored.
- 3 The process pipework for the Aerzen package inlet and discharge is connected in its final position and independently supported (temporary supports are not acceptable)
- 4 Electrical connections have been completed for the motor using flexible conduit to allow the motor to be raised into its operational position.
 - 4A The package safety switches (if applicable) are wired to the PLC or MCC (as applicable).
 - 4B The Aerzen control panel (if applicable) is wired to the PLC or MCC (as applicable).
 - 4C The correct voltage is fed to the control panel. Refer to the project specific wiring diagram for the voltage required
 - 4D If there is a VFD or Soft-Starter and supplied by others, it has been configured with the following motor settings:
 - 4D-1 Horsepower (kilowatt)
 - 4D-2 Voltage
 - 4D-3 Maximum Frequency



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Pre-Commissioning Checklist

Document #

A-7-0288 rev "4"

4D Continued

- 4D-4 Minimum Frequency - based on minimum speed of the blower or compressor in conjunction with the sheave combination
- 4D-5 Full Load Amps
- 4D-6 Time to Minimum Speed (3-5 seconds)
- 4D-7 Coast to Stop (do not brake)
- 4D-8 **CONSTANT TORQUE (VERY IMPORTANT!!!)**
- 4D-9 Restart - only when the machine has come to a complete stop.
- 5 Belts or coupling bolts removed for rotation test
- 6 Verification that machine is filled to proper oil level with correct oil (if delivered without oil)
- 7 Required personnel scheduled to attend startup (electrician, operators, maintenance personnel, etc)
- 8 Proper paperwork completed to allow Aerzen technician on site
- 9 If required, on-site safety training requirements for Aerzen personnel must be scheduled in advance. Please advise type, length and place of training).

Company

Project Name or Number

Number of Packages to be commissioned

Representative completing this check-list

Date Completed

Date requested for start-up



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Start-Up Report

Document # BCH-7-0353_02 rev "B"

1.0 Machine data

Date:	
Customer:	
Service Technician:	
Order # / SEO #:	
Serial #:	
Type:	
Package Serial #:	
Oil Type:	
Equipment ID:	
Operating hours total-Start:	
Operating hours total-End:	

2.0 Motor Data

Model #:		Serial #:		Notes:
Motor Manufacturer		Motor Frame		
Motor HP Rating		Full Load Amps		
Motor Voltage Rating		Hertz		
Motor RPM		Service Factor		
Motor cooling		Motor Protection Type	Thermistor / Thermostat	
Motor Protection	NO / NC	Motor Protection Resistance		

3.0 Starter Data

Manufacturer		Notes:
Starter type - Direct/Soft/VFD		
Actual voltage to motor		
Soft Start ramp up time		
VFD Max. Frequency		
VFD Min. Frequency		
VFD Ramp up Speed/Time		
VFD set to constant torque		
VFD Brake Mode = Coast		

4.0 Inspections

	OK	Not OK		OK	Not OK
Sound Enclosure Aesthetics			Motor rotates in proper direction		
Package is level			Verify all oil lines are tight		
Oil drain hose, jack and funnel present			Oil filter		
Unit is properly anchored			Oil demister		
Expansion joints/flex connectors			Oil drain plugs tight		
Verify package is grounded			Cooling fan clearance in shroud		
Process piping is properly supported			Motor conduit conforms to IA-004545 rev "B"		
Anti-vibration feet			Sheaves are properly installed, set screws tightened		
Inlet air filter in place, clean & housing tightened			Enclosure inlet and outlet are free from obstructions		
Blower room ventilation adequate			All fasteners are secure		
Instrument connections tight			Check process piping path to the termination point		
Neutral chamber venting			Validate process piping will not dead head at startup		
Vent all pressure and vacuum gauges			Validate any customer added safety devices		
Motor and machine rotate freely by hand			Discuss application with end user		

4.1 Notes / Not OK, reason why. Correction needed/taken.



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Start-Up Report

Document # BCH-7-0353_02 rev "B"

5.0 Belt Drive Applications

	OK	Not OK	Notes / Not OK, reason why. Correction needed/taken.
Verify motor alignment			
V belt installed and tensioned?			
Verify V belt has the proper length			

6.0 Direct Drive Applications

	OK	Not OK	Notes / Not OK, reason why. Correction needed/taken.
Coupling bolt			
Compression sleeves			
Coupling halves (properly distanced)			
Coupling Alignment			

7.0 Safety Settings and Verification

7.1 Safety chain - Switch Based

Switch	Unit	Switch Point	Gauge Reading	Shutdown Initiated	Notes:

7.2 Safety chain - Controller Based

Controller:	Unit	Alarm	Fault	Functional	Notes:

8.0 Startup

	OK	Not OK	Notes:
Smooth Start Up			
Lubricate drive motor per O&M			

9.0 Functional Testing

	OK	Not OK	Notes:
Aeromat			Closing time=
Aeropress			Closing time=
Aerovac			Closing time=
Unload/load device are in synch			Closing time=
Unload/Load Solenoid operational			
All gauges and switches operational			
S.E. fan has correct rotation			
PRV manual release functional			Set point =
After fault does unit remain off			
Non-return flap (check valve)			
System is leak free-oil			
System is leak free-air			
Smooth running			
Motor cooling properly			

10.0 Post Run Checks

	OK	Not OK	Notes:
Smooth Coast Down			
Oil Level Correct			
Sheave Alignment			
Bolt Tightness			



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Start-Up Report

Document # BCH-7-0353_02 rev "B"

11.0 Technical data

11.1 Operational Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:
Pressures							
Temperatures							
Miscellaneous							

11.2 Motor Operational Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:

11.3 Vibration Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:	Readings are in:
Motor Non-Drive Horizontal								
Motor Non-Drive Vertical								
Motor Non-Drive Axial								
Motor Drive Horizontal								
Motor Drive Vertical								
Motor Drive Axial								

12.0 Notes/Summary



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Inspection Report

Document # BCH-7-0353 03 rev "C"

1.0 Machine data

Date:	
Customer:	
Service Technician:	
Order # / SEO #:	
Serial #:	
Type:	
Package Serial #:	
Oil Type:	
Equipment ID:	
Operating hours total-Start:	
Operating hours total-End:	

2.0 Motor Data

Model #:		Serial #:		Notes:
Motor Manufacturer		Motor Frame		
Motor HP Rating		Full Load Amps		
Motor Voltage Rating		Hertz		
Motor RPM		Service Factor		
Motor cooling		Motor Protection Type	Thermistor / Thermostat	
Motor Protection	NO / NC	Motor Protection Resistance		

3.0 Starter Data

Manufacturer		Notes:
Starter type - Direct/Soft/VFD		
Actual voltage to motor		
Soft Start ramp up time		
VFD Max. Frequency		
VFD Min. Frequency		
VFD Ramp up Speed/Time		
VFD set to constant torque		
VFD Brake Mode = Coast		

4.0 Inspections

	OK	Not OK		OK	Not OK
Sound Enclosure Aesthetics			Motor rotates in proper direction		
Package is level			Verify all oil lines are tight		
Oil drain hose, jack and funnel present			Oil filter		
Unit is properly anchored			Oil demister		
Expansion joints/flex connectors			Oil drain plugs tight		
Verify package is grounded			Cooling fan clearance in shroud		
Process piping is properly supported			Motor conduit conforms to IA-004545 rev "B"		
Anti-vibration feet			Sheaves are properly installed, set screws tightened		
Inlet air filter in place, clean & housing tightened			Enclosure inlet and outlet are free from obstructions		
Blower room ventilation adequate			All fasteners are secure		
Instrument connections tight			Check process piping path to the termination point		
Neutral chamber venting			Validate process piping will not dead head at startup		
Vent all pressure and vacuum gauges			Validate any customer added safety devices		
Motor and machine rotate freely by hand			Discuss application with end user		

4.1 Notes / Not OK, reason why. Correction needed/taken.

--

5.0 Maintenance

Item Replaced	Yes	No	Part # and Qty.	Notes:
Oil				
Belts				
Oil Filter				
Air Filter				
Coupling Pins				
Coupling Bushing				
Oil Sample Taken			Tracking #:	



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Inspection Report

Document # BCH-7-0353 03 rev "C"

6.0 Belt Drive Applications

	OK	Not OK	Notes / Not OK, reason why. Correction needed/taken.
Verify motor alignment			
V belt installed and tensioned?			
Verify V belt has the proper length			

7.0 Direct Drive Applications

	OK	Not OK	Notes / Not OK, reason why. Correction needed/taken.
Coupling bolt			
Compression sleeves			
Coupling halves (properly distanced)			
Coupling Alignment			

8.0 Safety Settings and Verification

8.1 Safety chain - Switch Based

Switch	Unit	Switch Point	Gauge Reading	Shutdown Initiated	Notes:

8.2 Safety chain - Controller Based

Controller:	Unit	Alarm	Fault	Functional	Notes:

9.0 Startup

	OK	Not OK	Notes:
Smooth Start Up			
Lubricate drive motor per O&M			

10.0 Functional Testing

	OK	Not OK	Notes:
Aeromat			Closing time=
Aeropress			Closing time=
Aerovac			Closing time=
Unload/load device are in synch			Closing time=
Unload/Load Solenoid operational			
All gauges and switches operational			
S.E. fan has correct rotation			
PRV manual release functional			Set point =
After fault does unit remain off			
Non-return flap (check valve)			
System is leak free-oil			
System is leak free-air			
Smooth running			
Motor cooling properly			

11.0 Post Run Checks

	OK	Not OK	Notes:
Smooth Coast Down			
Oil Level Correct			
Sheave Alignment			
Bolt Tightness			



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Inspection Report

Document # BCH-7-0353 03 rev "C"

12.0 Technical data

12.1 Operational Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:
Pressures							
Temperatures							
Miscellaneous							

12.2 Motor Operational Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:

12.3 Vibration Readings

Elapsed Run Time	0:00	0:00	0:00	0:00	0:00		Notes:	Readings are in:
Motor Non-Drive Horizontal								
Motor Non-Drive Vertical								
Motor Non-Drive Axial								
Motor Drive Horizontal								
Motor Drive Vertical								
Motor Drive Axial								

13.0 Notes/Summary



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Training Sign In

Document # BCH-7-0353_06 rev "C"

1.0 Customer

Date:	
Customer:	
End User:	
Site Address:	
Service Technician:	
Equipment Type:	
Equipment Serial Number:	
Order # / SEO #:	

2.0 Trainee's Signatures

	Print	Signature	Title
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

3.0 Training Topics

--

4.0 Signatures

Date	Customer Name	Customer Signature
Date	FST Name	FST Signature



APPENDIX B

SCHNEIDER ELECTRIC VARIABLE FREQUENCY
DRIVE SUBMITTAL

(TO BE PROVIDED VIA ADDENDUM)

