

Operating instructions and general safety instructions

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Operating instructions and general safety instructions

1. Introduction:

The machines that are referred to in this operating manual are components for industrial use (as part of machines and plants) and should only be put into operation by specialist companies. The instructions in this information are intended for specialists.

This documentation supplements the legal requirements and current technical standards; it does not replace any installation standards, possible additional requirements or standards that have been issued for accident prevention.

2. General safety instructions

Danger!

Fans have dangerous parts that are either under tension or move during operation. Therefore

- incorrect use
- removal or protection covers
- bridging or removal of protection devices
- insufficient inspection and maintenance

can lead to severe personal injury or severe damage to property.

The safety officer should make sure that the following is carried out only by qualified staff; transported, installed, commissioned, operated, inspected, maintained, and repaired. The operating staff should have the following minimum qualification:

- Specific technical training and experience
- Knowledge of the technical standards and the relevant laws
- Knowledge of the general, national, local, general and machine specific safety regulations
- Ability to recognize dangerous situation and to avoid them

WORK ON THE FAN IS ONLY ALLOWED TO BE DONE WITH THE EXPRESS PERMISSION OF THE SAFETY OFFICER AND ONLY WHEN THE FAN IS STANDING STILL AND NOT CONNECTED TO THE ELECTRICAL SUPPLY!

Because the fan is intended for industrial use the safety officer and the person responsible for the commissioning should provision for additional protective measures in case stricter protective measure are called for.

The fan is a component that is mechanically connected to another machine. It is therefore part of the responsibility that the installing specialist company ensures that with the assembly and the operation of the fan no persons or property can be put in any danger. The observance of a sufficient safety distance between persons and objects is especially to be observed. Furthermore during operation it must not be possible to come into any danger by contact with any fixed or moving parts.

If during operation of the machine something unusual occurs (e.g. excessive current consumption, increased temperatures, strange noises or vibrations) the fan is to be switched off immediately and the responsible maintenance staff informed.

3. Acceptance:

When the fan is delivered the receipt of all parts is to be checked. If damage is apparent the delivery person should be informed immediately. The manufacturer should be informed of any defects.

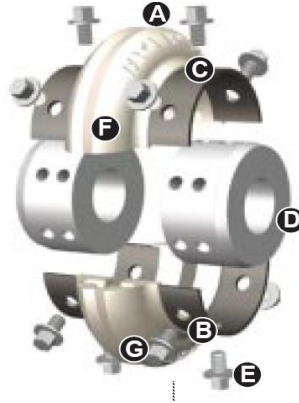
4. Transport and storage:

The fan has transport eyelets and lifting lugs for lifting and transportation purposes. These are designed for the weight of the fan but not for the complete weight of the assembly that is attached to the fan. The load is to be evenly distributed to avoid any deformations. When laying down the fan ensure that it is level, stable and safely stored.

If the fan is to be stored before use, ensure that it is in a protected area that is clean, dry and vibration free. The motor, bearing and drive should be separately covered. When standing still for a lengthy period the fan impeller should be rotated at least once a week.

5. Assembly and disassembly of the drive and clutch:

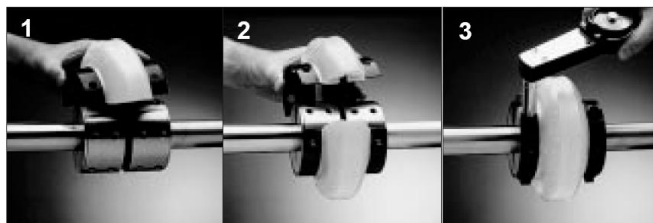
5.1 Description of the clutch type V245:



- A: Two part flexible element, makes possible the simple replacement without the position changes of the hub or shift and re-adjustment of the adjoining machine parts.
- B: The polyurethane material is connected to a corrosion resistant steel shell.
- C: Steel shell
- D: Hub (with finished borehole or clamping sleeve)
- E: Fixing screws with self locking threads
- F: Elastic material, in two parts (consumable part)
- G: V-groove for overload protection

5.2 Installation and removal

- 1.) Both shafts are mounted together and secured. Half an elastic element is used as a template for the hub distance. To install the upper half the borehole should be used that is the most convenient for mounting.
- 2.) To install the other half rotate the shaft through 180°.
- 3.) Check for correct screw torque (table)



5.3 Alignment:

- 1.) Angular alignment: Check using a levelling instrument, fig.1 the difference should be reduced to an absolute minimum. Refer to permissible maximum value (b - a) in table.

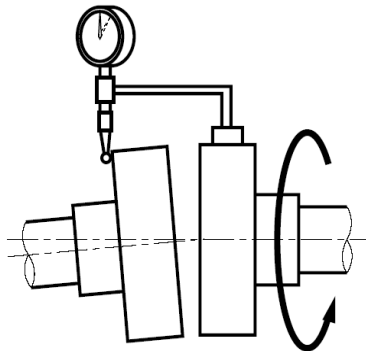


Fig. 1

2.) Radial alignment: Check using a levelling instrument, fig. 2 the difference should be reduced to an absolute minimum. Refer to maximum permissible value (Δr) in table 1.

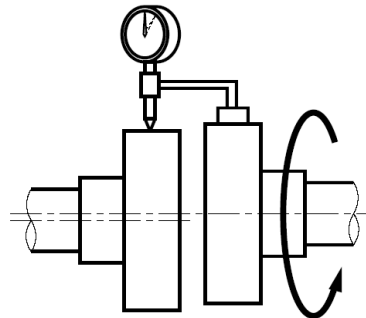


Fig. 2

Recommended value for the maximal deviation:

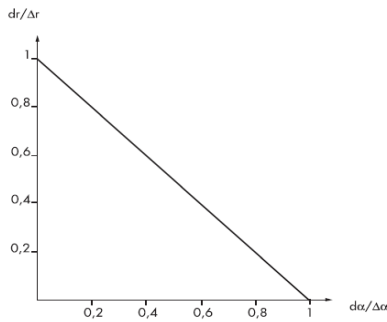
$$dr/\Delta r + d\alpha/\Delta\alpha < 1$$

After alignment the smallest possible error value is to be divided by the corresponding maximum measurement value. The result should be less than one.

where:

- dr= Measurement of the radial error
- Δr = Maximal value of the radial error
- d α = Measurement value of the angular error
- $\Delta\alpha$ = Maximal value of the angular error

The alignment must be improved if the value is greater than one.



Size Baugröße Grandezza	110	125	130	150	170	190	215	245	290	365	425	460
(b - a) mm	4,2	4,9	5,5	6,1	6,6	6,1	7,3	8,9	11,2	8,2	9,9	9,4
* r mm	1,6	1,6	1,6	1,6	1,6	2,4	2,4	2,4	2,4	3,2	3,2	3,2

V110 - V170

V190 - V290

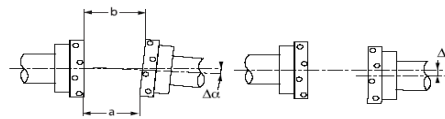
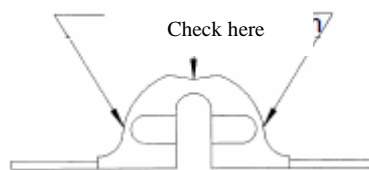


Table 1

We recommend that the clutch is checked after the first 24 hours of operation after assembly and if necessary is to be tightened. Too higher tension of the clutch can lead to premature failure (refer table 2.)

Check the element for:

- + fatigue cracks at the element joints
- + discolouration
- + cracks on the surface of the elastic parts




When a replacement of the shells is necessary:

- + always replace both halves
- + always use the same batch
- + follow the installation instructions
- + observe the correct torque

			Key size	Torque		
Size	Part No	Screw Size	(mm)	Nm	Ft lbs.	In lbs.

Screw-torque:



Note:
 . Do not grease the screw threads
 . The screws should be coated with a suitable thread securing adhesive

			Schlüssel Größe	Drehmoment		
Viva Größe	Teile- nummer	Schrauben Größe	(mm)	Nm	Ft Lbs	In. Lbs
110	7393097	M8	13	27	20	240
125	7393097	M8	13	27	20	240
130	7393097	M8	13	27	20	240
150	7393101	M10	13	53	39	468
170	7393101	M10	13	53	39	468
190	7393101	M10	13	53	39	468
215	7393105	M10	13	53	39	468
245	7393105	M10	13	53	39	468
290	7393109	M12	15	92	68	816
365	7393120	M14	19	158	117	1401
425	7393120	M14	19	158	117	1401
460	7393120	M14	19	158	117	1401

Table 2

6. Preparation for the commissioning:

- The information on the identification plate should correspond to the specific information for the electrical supply, the designed plant and the operational data. This should all be checked before installation and commissioning. The assembly of the fan should correspond to the requirements of the manufacturer.
- If the fan is installed indoors make sure that the room is sufficiently ventilated so that the fan, motor and drive have sufficient cooling. The ventilation should not be restricted by objects, walls, or heat sources. There should be sufficient room in all directions for installation, connections and maintenance.
- What is important is the location and installation of protection devices; these prevent contact with moving parts and parts that have a temperature above 50°C. If thermal protection is planned every possible measure should be taken to prevent an unexpected re-start of the motor.
- The fan impeller should be rotated by hand before taking into operation to make sure that all parts can move freely. Also to check that all parts are mounted correctly.
- When connecting the motor to the electrical supply make sure that the wiring in the motor terminal box has the correct voltage rating. The three-phase motor is to be correctly earthed.
- Connect the motor according to the wiring diagram (supplement 8.)

GTG Gebläsetechnik Ges. m. b. H. Perfektastraße 79 A-1230 Vienna Company registration no. FN 279638h 092/1842	Telephone: + 43 1 603 58 19 Telefax: + 43 1 600 77 19 e-mail: gtg@gtg.at DVR-no.:	Bank: RLB NÖ- Vienna Account: 6.610.802 VAT no.: ATU 626 31 655 1013947 Tax no.:
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- Before operating the fan make sure that the impeller direction of rotation corresponds to the information on the rating plate or the direction label.
- We recommend mounting the fan on shock absorbers at the indicated positions; this will reduce noise levels and prevent vibrations. The use of elastic connections on the intake and exhaust openings is also recommended.

7. Commissioning:

- It is recommended to start radial fans with the throttling element or flap closed. In this way the start-up time is reduced and overloading the drive is prevented. It is completely different with axial fans; the maximum motor load is with the minimum amount of air therefore, start-up should be with the flaps open.
- Avoid repeated start-ups if possible. In any event, wait before every restart for the motor to cool down.
- The motor load should be measured on one of the three conductors (L1, L2, or L3.). With star-delta connections the measurement should be made before the converter or measure the phase current on one of the six connections in the terminal box and multiply by 1.73.
- Check the bearing temperature. It is normal that the temperature reduces during operation. If the temperature is too high, operation must cease until the bearing has reached room temperature.
- The fan should rotate without vibration. After a few hours of operation the tightness of the screws should be checked that they have not become loose or if the belt tension has changed.

8. Maintenance and Lubrication

Danger!

BEFORE COMENCING MAINTENANCE WORK MAKE SURE THAT THE ELECTRICAL SUPPLY TO THE FAN IS SWITCHED OFF AND START-UP IS NOT POSSIBLE!

Fans are easy to maintain but do need regular action to ensure full operability of all parts this helps to prevent damage and is for the safety of persons and property.

8.1. Fan housing:

The inside of the fan housing, the exhaust and intake openings, and the fan impeller should be cleaned and freed from foreign objects on a regular basis. If the fan is in operation when starting the cleaning operation, make sure that the fan impeller and all moving parts have come to a complete standstill before opening.

After removal of the impeller make sure that the suction jet, inspection cover and removable covering are re-sealed with industrial rubber tapes and finally the screws are to be evenly tightened (cross method) on the frame and flange.

Caution: All screws and bolt components are-as part of the assembly process-to be carefully collected and placed in a suitable container as evidence that the reassembly of the removed parts is complete and correct. Only when all of the assembly and attachment elements are correctly fitted can the best possible sealing or function be guaranteed.

8.2. Fan impeller:

Foreign objects, dust, dirt, incrustation on the fan impeller can lead to imbalance. The impeller no longer has a circular motion, vibration increases and the noise noticeably increases. The consequences of this, is that damage can occur to the complete fan, the drive or drive unit connected to the fan intake or exhaust openings. The impeller should therefore be cleaned regularly and any foreign objects removed that have become bonded to the impeller blades. When abrasive dust has been drawn into the impeller damaged can be caused due to material wear and an imbalanced can occur, in this case the impeller should be replaced immediately. For this the following steps are necessary:

- Remove the intake-jet gap filling material before disassembly.
- It is also recommended to replace the bearing sealant (connected to the fan casing) refer to accessories.
- Loosen the nuts to separate the intake jet (suction port) from the casing
- Loosen the screw (adjustable) that connects the impeller hub to the drive shaft
- Remove the impeller from the drive shaft using an extraction tool
(Place wooden boards as support between the casing and the impeller!)
- If the impeller is to be raised through the split casing then place the lifting gear onto the hub **(do not lift with the impeller or the cover plate!)**

8.3. Lubrication:

The individual Plummer block bearings are already covered with grease (Lithium-grease, Viscosity $\nu = 74 \text{ mm}^2/\text{s}$, temperature range: $-30^\circ \text{ C} - + 140^\circ \text{ C}$.) Ideal bearing temperature range approx. $20^\circ \text{ C} - 80^\circ \text{ C}$.

The bearings are fitted with grease nipples so that the grease can be forced in using a grease gun and at the same time the shaft should be turned by hand. Turning the drive shaft is necessary to make sure that the fresh grease completely and reliably forces out all the old grease. Only premium grease should be used on the basis of lithium or calcium that is water-resistant and has a melting point of 165° C .

The bearing unit cannot be overfilled because the pressure relief hole is in the middle of the cover, which at the same time serves to remove moisture.

Lubricant chart

lubrication point	Designation Bearing	Lubricant	Manufacturer	Amount per lubrication point	Lubrication- interval	Lubricant change
1	Impeller side 22217 EK C3	Lithium Grease	Shell Alvania 3 FAG Arcanol L71V Klüber Centroplex 3	55 gr	1,300 Hrs.	2,000 Hrs.
2	Drive side 22216 EK C3	Lithium Grease	SKF LG MT 3 Chevron SR 12	50 gr	1,300 Hrs.	2,000 Hrs.

The bearing should be re-lubricated as follows:

- Clean the grease connector lubricating nipple.
- Carry out the lubrication while turning the bearing slowly
- Do not use more than the needed amount of lubricant as this can lead to overheating
- Thoroughly clean the grease connector for example with petrol so that no grease remains.

If the amount of lubricant is not known then calculate as follows:

Formula: $P = 0.005 A B$ (gr)

A = Bearing outer diameter in mm

B = Bearing width in mm

The bearing should be completely disassembled at least once a year in order to be thoroughly checked. When the bearings are separated the lid is removed and the bearing removed. When the bearings are not separated the side cover plate is removed and the bearing removed.

8.4. Clutch:

Before changing the clutch it is recommended first to carry out the following checks:

- Check the wear of the elastic clutch parts for cracks and buckling
- Clean the clutch of any foreign objects like oil marks, buffing dust or debris.
- Check the angular alignment of the transmission line. Only when the pulley is correctly aligned is the maximum life expectancy of the clutch guaranteed. A levelling instrument can be used to check if the complete drive unit is offset or correctly aligned.

9. General information concerning radial fans

9.1. Fans with backward-curved running blades:

With this type of fan the power requirement increases only slightly when the opposing pressure is too low, therefore a motor overload is unlikely. Fans with backward-curved running blades have their maximum power requirement at the point of maximum efficiency.

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9.3. Fan direction of rotation:

The intended impeller direction of rotation is indicated on the rating plate or by an arrow on a label located on the casing. To determine the direction of rotation the fan should be switched on momentarily. If it is driven in the wrong direction for too long there is the danger of overloading the motor and it will burn out. The rotational direction can be determined as follows:

- Place a small piece of wood, a piece of paper or similar on to a free position of the drive shaft, or throw a piece of paper into the impeller intake.
- The fan rotates in the direction that it is thrown.
- Sometimes it is sufficient to determine the rotational direction of the motor cooling blade which is also the rotational direction of the fan.

If it is necessary to alter the rotational direction then change two phases of the supply in the motor terminal box.

10. Spare parts

10.1 Shaft seal

Every time the impeller is disassembled it is recommended to replace the flexible part of the shaft seal. To do this, loosen the screws on the metal plate. When installing the replacement seal make sure that the installation is centralised on the shaft.

10.2 Vibration absorption

The fan has rubber vibration absorbers to absorb vibration between itself and the mounting surface. When installing, make sure that the absorber element is not under tension when fixed to the pedestal and the mounting surface (concrete, sectional frame etc.). The attachment bolts can be connected to the slotted holes provided for this purpose on the mounting base plate and the mounting surface. Depending on the mounting surface suitable fastening material should be used (e.g. for concrete: Hilti segment anchors HSA.)

To position the bore holes in the mounting surface use the mounting plate as a template before the final assembly.

Technical specifications:

Type: T3 Load: 1.14 N / mm²
Temp.: -30/+120 Hardness: Shore 60 A

10.3 Flexible joint

To ensure a flawless assembly the following factors should be taken into consideration:

- The pipe work assembly should be complete (welding, sanding, insulation etc.)
- Weather conditions and surroundings (cover the open areas)
- Mark parts when disassembling
- Check the connecting parts and dimensions:
 - Distance from the opposite flange
 - Position of the flanges to each other
 - Offset and bore hole angular alignment
 - Quality of the mating surfaces
 - Evenness of the welding seams in the area of the mating surfaces
 - Curvature and cleanness of the connection slat and flange

Generally soft material flexible joint should not be covered or insulated. Should insulation be necessary then this should be cleared by the manufacturer.

Maximum permissible tolerance for the flexible joint connection flange:

- Fitting length: - 10 mm, + 5 mm
- Lateral offset (axle offset): ± 10 mm
- Inclination: ± 7 mm

With a measured distance of maximum 150 mm a uniform depression of 0.5 mm or a uniform step-up of 1 mm can be present when taking the theoretical shape into consideration.

General notes:

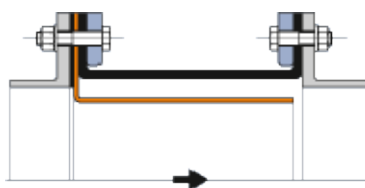
- + The assembly should be carried out only by a skilled and qualified person
- + The transport to the installation site should be done with considerable care
- + Flexible joint orientation, consider the both the inner and outer parts, align and if necessary pre-fit
- + Consideration should be made for different connections.
- + Make holes with drill:
 - Opposite surfaces are to be used as template

- Flexible joint and opposite surfaces should be pressed together with screw or tension clamps
- Carefully drill with moderate pressure
- + Make holes with punch:
 - Mark holes with the available template
 - Punch the holes on a suitable surface (stable wooden board)
- + Screwed connection
 - Position the lapped stub-end flange and align the bore holes
(The lapped stub-end flange should indicate a rounded edge clearance width)
 - The bolt head is always on the side of the lapped stub-end flange
 - Tighten the screws according to the starting torque
 - Observe the settling down of the flexible joint material
- + Clamps and tension connections
 - Position and align the clamps and tension segments
 - Tighten the screws through several turns (the torque has no validity in this case)
- Clamps and tension segments should not come into contact with the screws even after tightening several times, pay attention to the flexible joint material

To ensure the best possible functionality obtain assembly elements from the manufacturer for the assembly.

+ Flexible joint with guiding plate:

The guiding plate should be installed in the direction of the medium
(refer fig 1)



Installation diagram of the guiding plate in the flexible joint
Fig. 1

10.4 Casing drain

If the drain is connected to a fixed drainage system then a siphon bend is to be fitted. If it is necessary to empty locally the drain is to be closed again with the closure valve to prevent the ingress of foreign material and to prevent the suction of infiltrated air.

10.5 Cooling disc

To ensure the best possible cooling efficiency of the cooling disc the following regular checks are required:

- Clean the protection grating of dust and grease residues
- Visual inspection of the cooling-disc fins for possible dirt and fatty deposits
- Check for firm seating of the shaft

10.6 Lubricator

The classic lubricator is to be connected onto the corresponding lubrication hole on the bearing housing using an adapter piece. Depending on the temperature and usage the necessary amount of grease will be automatically applied.

Caution: The time between activation and the initial lubrication injection: 1 day

As the master cylinder is only connected via the thread to the bearing housing, ensure that this does not break off during possible rough operation. If this happens then the cylinder is to be separately connected using a sheet metal console.

To ensure correct lubrication of the bearing it is recommended to periodically visually inspect the lubricant reserve on the lower part of the cylinder which is transparent. We recommend having a replacement cylinder on hand.

Technical specifications:

Drive:	electro-chemical reaction
Dispensing time:	+20°C 3 months (+40°C 1 month) green activation screw
Lubrication volume:	120 cm ³
Operating temperature:	0 - 40° C
Pressure build-up:	max. 4 bar

11. Torque for fixing screws:

The values are given in Nm (maximal value for the assembly is 10% less):

	Screw Strength class 8.8	Screw Strength class 10.9
M6	10	14
M8	25	35
M10	49	69
M12	86	120
M16	210	295
M20	410	580
M24	710	1000
M27	1050	1500
M30	1450	2000
M36	2400	3555

12. Malfunctions - Troubleshooting

Fault	Cause	Action	
Air flow too low	Blocked pipe	Clean pipe and flaps	
	Extraction points closed	Check the position of the flaps	
	Low rotational speed		Check the connection voltage
			Check the motor terminal connection
			Check the transmission ration of the V-belt
		Check the V-belt tension	
	Working pressure higher than planned	Dimensioning error replace the motor and pulley	
	Impeller blocked	Clean the impeller when the machine is still	
Incorrect direction of rotation	Disconnect two phases of the supply in the motor terminal box		
Air flow too high	Filter overloaded	Clean the filter Increase the filter cleaning interval	
	Intake vortex in impeller direction of rotation	Install rectifying blades	
	High rotational speed		Check direction of rotation
			Check transmission ratio
	Flap not closed	Check the machine, close the flap replace defective parts	
Resistance lower than planned	Close flap Reduce air speed		

Low Pressure	Low rotational speed	See above
	Required amount of air too high	Change transformation ratio Replace fan
	Incorrect design	Check design with reference to intake temperature, height above sea level Change transformation ratio Replace fan
	Impeller blocked or damaged	Check installation position and impeller condition
Power decrease after lengthy operation	Leak in fan or in the pipe	Replace seal; check condition of pipe
Difficulty starting	Power consumption too high	Check direction of rotation Check the motor rotational speed
		Check voltage Check for winding error
	Low connection voltage	Check data on the motor performance plate
	Low start-up torque	Use a larger motor Close flap until full speed is reached
	Fuse insufficient	Change fuse
	Incorrect calculation of fan inertia	Re-calculate, new motor



		Tighten loose screws
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13. Spare parts list

The spare part numbering refers to the DWG no.:

Number	English term	German term
1	guiding plate suction side Ø573	Leitblech saugseitig Ø573
2	flexible inlet joint Ø573-150-40	Kompensator saugseitig Ø573-150-40
3	shaped inlet nozzle	Einströmdüse
4	locking bolt and washer for fan	Mutterschraube und Scheibe
5	impeller Ø1102/T2310P7	Laufrad Ø1102/T2310P7
6	guiding plate pressure side 777x494	Leitblech druckseitig 777x494
7	flexible outlet joint 777x494-150-40	Kompensator druckseitig 777x494-150-40
8	identification plate	Leistungsschild
9	Fan-casing section splitting	Ventilatorgehäuse sektional geteilt
10	Pedestal with base frame	Grundrahmen mit Lager-Motorbock
11	shaft seal Ø75/200	Wellenabdichtung Ø75/200
12	bearings impeller side SNL517-22217C3	Lager laufradseitig SNL517-22217C3
13	bearings coupling side SNL516-22216	Lager kupplungsseitig SNL516-22216
14	shaft protection	Wellenschutz
15	main shaft	Hauptantriebswelle
16	cooling disc with protection grid	Kühlscheibe mit Schutzgitter
17	coupling V245	Kupplung V245
18	coupling guard	Schutzblech Kupplung
19	Three-phase electric motor IEC280, 75kW, 1,480 rpm	Drehstrommotor IEC280, 75kW, 1.480min-1
20	anti-vibration damper 10 pieces T3	Schwingungsdämpfer 10 Stk. T3
21	casing drain	Kondensat-Ablassstutzen
22	inspection door	Reinigungsöffnung
23	hitch points	Hebelaschen
24	grease dispenser with connector 2 pieces green 3M	Fettgeber mit Adapter 2 Stk grün 3M