

DEPRAG

Operating instruction booklet

Screw feeding machine

0511 – 0/ P/ 0,75/ 2,5

0512 – 0/ P/ 0,75/ 2,5

0522 – 0/ P/ 0,75/ 2,5

0524 – 0/ P/ 0,75/ 2,5

Customer **XXXXXXXX**
Serial.-No.: **XXX-XXX**
Type : **0511-0/0,75-2**

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Dear Customer:

Congratulations; you chose the enclosed Screwfeeding Machine (designated in this OP-Instruction as SZG) with air operated Screwdriver from an extensive DEPRAG product line. This machine is the result of more than 60 years experience in the design and manufacturing of pneumatic tools and assembly machines for the industrial market. We offer a complete program of pneumatic tools, such as Drills, Tappers, Grinders, Screwdrivers, Impact Wrenches, Metal Working Tools and Hammers. As a competent partner, DEPRAG has the solution to all requirements in the area of screw assemblies, from the simple hand-tool to a complete X-Y-Z Screwdriving Cell.

We kindly ask, that you read these operating instructions carefully, so that you will be able to use this tool safely and for many years to come. If you need additional information, please contact your DEPRAG Representative or contact us direct at DEPRAG. We will be happy to answer any questions.

We hope you will be pleased with your new machine!

1 General Safety / Technical Information



Before operating tool make sure to carefully read and observe this operating instruction.

Generally, the operator of the equipment and/or machinery is responsible for the equipment's perfect condition and operation, while observing all necessary safety regulations. The equipment and/or machinery has been constructed in accordance with the newest stand of the technology, while recognizing all necessary safety-related requirements. Nevertheless, while operating the equipment and/or machinery there is a change of bodily harm to the operator as well as damage to equipment and/or machinery and other property.

Operate the equipment and/or machinery only if equipment/machinery

- Is used for the task it was designed for
- is in perfect working condition and safe to use.

It is important to observe the technical data of the equipment, especially in regards to the environmental temperatures. The designated area of use for this equipment is clearly described in chapter *Designated Equipment Use* and those requirements have to be observed as well. Prerequisite for the safe conduct and the uninterrupted operation of the equipment, is the knowledge of the basic safety tips and the safety regulations. Additionally, all current regulations for a safe operational area, for accident-prevention guidelines of electrical and mechanical installations, as well as noise suppression demands must be observed. During any maintenance or repair work, a clean work surface is recommended. Also, it is not recommended to either eat or smoke during repair or maintenance. Arbitrary changes made to the equipment, which alters its designated use, voids the warranty and cancels the manufacturers liability.

- The tool is not insulated to protect against an electrical power surge.
- It is not recommended to use this tool in explosive hazardous environments, unless it was specifically designed for such a use.
- During the disconnection or reconnection of the tool from the compressed air, an injury is possible because of a whipping pressure-hose.

The operating-instruction booklet, especially the safety-symbols and safety-tips attached to the equipment or included in the documentation, must be observed at all times by all persons coming in contact with the equipment.

Safety Tips for Electrical Equipment

- If several Operators are using this feeder, all safety instructions have to be submitted to all of those operators.
- The F-controller can only be operated, maintained, and repaired by personnel who are familiar with the device and have been instructed about its dangers.
- All relevant accident-preventions instructions, as well as general acknowledged safety rules and workers protection regulations must be adhered to.
- Arbitrary changes made to the controller by the user will void the liability of the manufacturer for resulting damages.



Direct contact with a rotating Screwdriver bit, may cause injury. Since the driver, in conjunction with the Minimat-F controller, is push-to-start. Therefore, always disconnect the controller from the Power source prior to any repair or maintenance.



If the driver is connected directly to an air-outlet, it will run continuously and may cause injury to personnel coming directly in contact with the bit. Therefore, connect the driver to an air-outlet only, to test its function.



Prior to the removal of the safety cover on the Minimat-F Controller. Please ensure that the main electrical power supply is disconnected.

Owner Obligation

The owner is obliged to only let persons operate the equipment, who

- are familiar with basic work environment safety rules and accident-preventing regulations. Also, those persons must have been instructed in the correct use of the equipment.
- have read and understood all safety and warning notifications in the Operating Instruction Booklet, as well as all other documentation pertaining to this equipment.
- check and confirm at regular intervals, that a safety oriented operation is guaranteed.

Only qualified and authorized personnel is allowed to operate, maintain and repair this equipment. A malfunction, which impairs operator safety, must be immediately removed.

Operator Obligation

Personnel, who is engaged in the operation of the equipment, must always be committed to

- observe the basic safety and accident preventing regulations,
- read and observe the safety and warning notifications of this operating instruction booklet.

Warranty and Liability

Unless otherwise specified, our “General Sales and Delivery Conditions” apply. Warranty and liability claims in regards to persons or equipment damages are invalid, if one or several of the following causes apply:

- Use of the equipment in a non-designated application.
- Improper installation, operation, service or maintenance of the machine.
- Operation of the machine with either defective or removed safety and protection devices.
- Non-observance of the requirements stated in the operating instruction booklet, in regards to transportation, storage, mounting, installation, operation, maintenance and service of the equipment.
- Structural change or adjustment on the equipment to a non-designated use.
- Inadequate supervision of wear parts.
- Improper repair, inspection or maintenance.
- Catastrophic cases because of a war, acts of god or other reasons which are beyond our control.

2 Machine Components

Standard Components

E-Control :

- 362509 C
- 362509 F

EP-Control

Custom Made Components

Vibratory Bowl :
Vibratory Drive :
Separator :

} see paragraph 9.

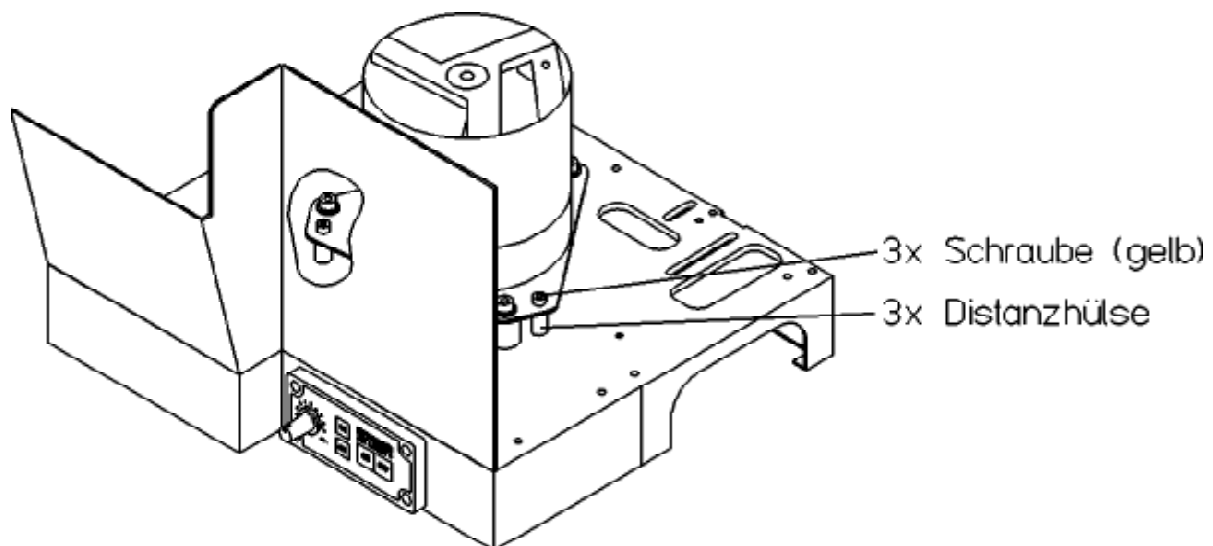
3 Installation and Operation of Feeder

For installation, place feeder into its designated area, which should be even and horizontal. Also, the installation area should be sufficiently secured in regard to weight and dynamic movement of the feeder.

Prior to installation of the feeder, read all operating instructions in full and become familiar with all safety regulations.

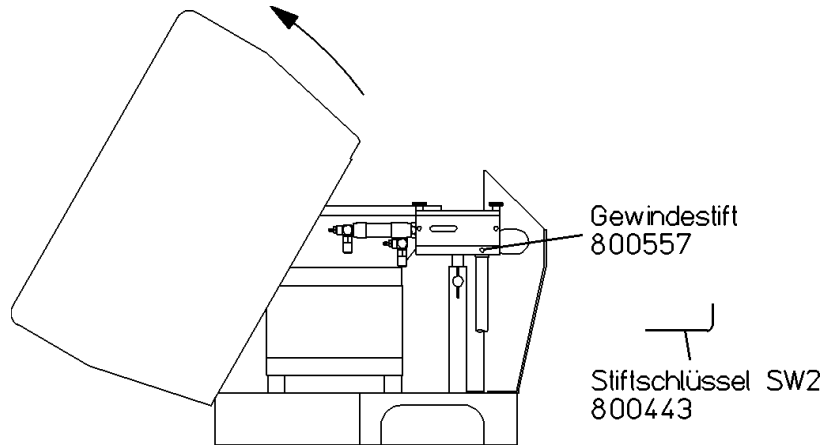
To correctly install and operate the feeder, the following steps should be used:

1. Take out 3 yellow-painted transport screws and spacers (see picture 1).
Keep screws and spacers with the accessories for eventually later transports.



Picture 1: Removal of Transport Screws

2. In order to attach the feedhose to the separator, tilt-back the housing and slide the feedhose with its nozzle through the opening of the front cover into the adapter hole of the separator. Secure the nozzle by clamping it with set-screw 800557 (use allen key AF2, 800443), see picture 2.



Picture 2: Installation of feedhose

3. **For SZG 05XX - 0/P**

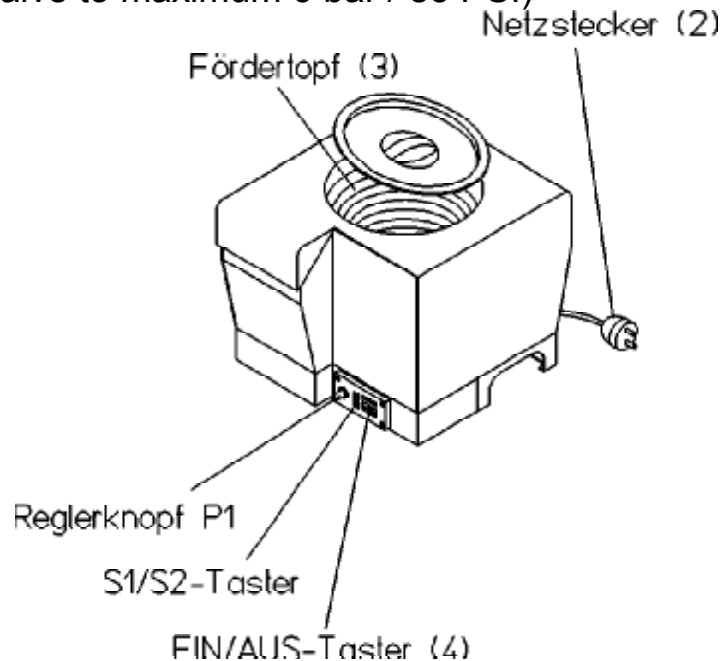
Connect the corresponding air hoses to the individual pneumatic components of the SZG (max. 6 bar / 85 PSI).

For SZG 05XX - P

Connect the corresponding PLC-cables to the I/O Bus. (refer to the I/O listing of your Operating Instruction).

4. **For SZG 05XX - P**

Connect air-supply to the pneumatic control. (limit the air pressure for the pressure valve to maximum 6 bar / 85 PSI)



Picture 3: SZG

5. Connect electronic plug (2) to wall socket (see picture 3 and " Technical Data").



Prior to electrical hookup, compare the unit layout with the factory supplied voltage. Non-corresponding voltage may lead to injury by electric voltage or may cause damage to the feeder.

6. Fill vibratory bowl (3) with screws (see picture 3). The maximum fill capacity should not exceed 0,75 liters (bowl half full). If bowl is filled too much, the feeding characteristic may substantially deteriorate, which may cause interference.
7. Switch ON/OFF feeder with switch on front side (see picture 3).
8. Push switch S1 respect. S2 as long as it takes to fill the feedrails and allow the first screw to fill the separator. Also, adjust the vibration speed with rheostat (P1).

If all of the above steps are correctly followed in their sequence, the feeder is now operational.

4 Operation of Feeder

The exact sequence of function of the unit is shown in the function diagram of the document file.

This function diagram is the basis for programming the PLC.

If the feeder is installed and ready, the assembly of parts can start. Position the mouth- and nosepiece with already loaded screw directly over the screwdriving location, axially aligned with the screwdriving axis.

The screwdriver is moving towards the mouth- and nosepiece the bit is pushing into the screw-head and the screwdriver is rotating (push-to-start).

The driver will shut-off audible, when the preset torque is reached. Each unit should be programmed in such a way, that the next screw-separator with subsequent distribution (only with Type SZG 05XX) takes place simultaneously and loads another screw over the mouthpiece into the nosepiece.

For this, the driver has to retract from the assembly position, to clear the feed channel in the mouthpiece.

Once the new screw is **loaded into** the nosepiece, the driver can **be positioned** to the next screw hole.

If the new screw is positioned in the nosepiece, the driver can again be located to the next screw hole.

In case the SZG is used for underfloor assembly, or if an extreme short cycle time is required, it is possible to load the screws through a pre-separator into the corresponding feedhose (SZG 05XX-...-V). After all feedhose are loaded, the screws will then be transported to the corresponding tooling, using the air blast.

Should there be a problem during the operational sequence, those problems can be solved by following the instructions as listed under "8 Removal of errors during operation"). The possible cause of the problem and its removal are listed.

5. Control of Vibratory Drive

5.1 Construction of Vibratory Drive

The control consists of a conductor plate with integrated connector strip and front plate (see picture 4).



Switch-off SZG and disconnect power prior to opening of controller.

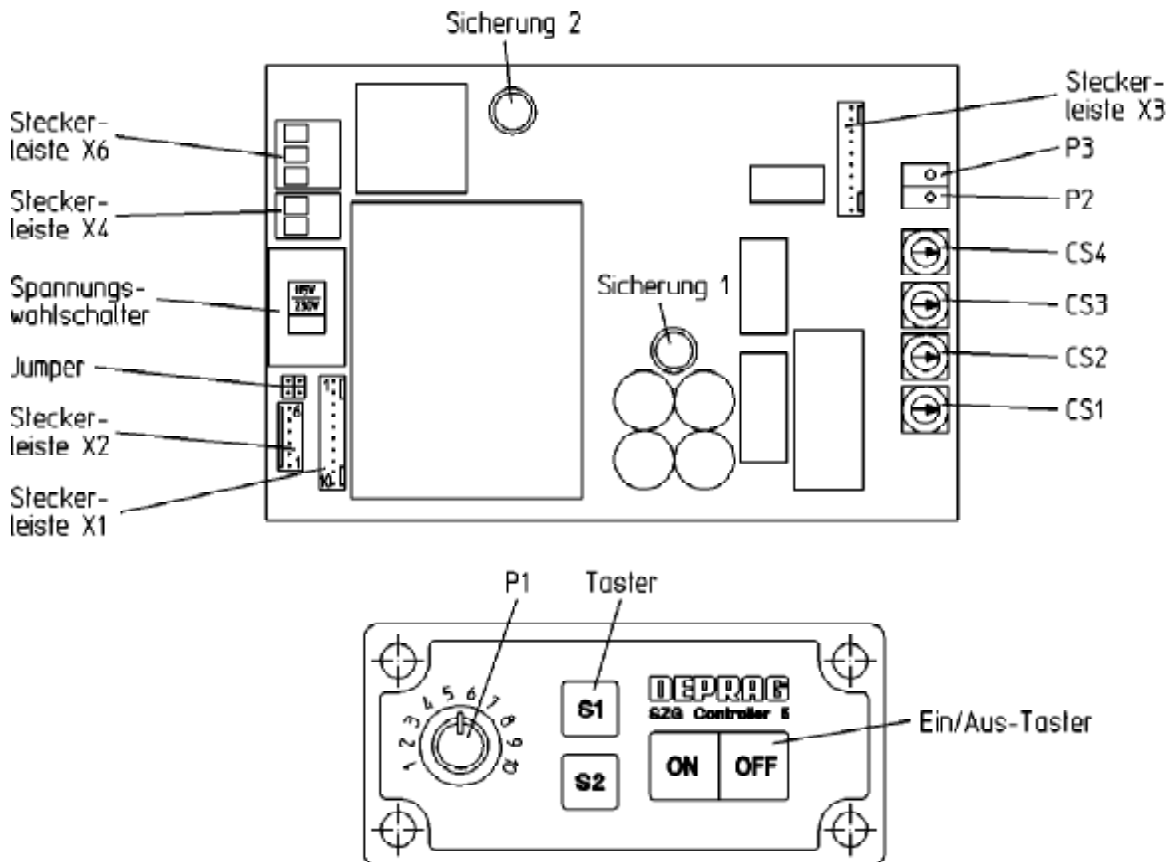
Open 4 screws of front plate to pull-out control-card.

On- / Off Switch

The On-/Off Switch of SZG is located on the front cover (see picture 4). A LED shows the switch condition.



If the control is turned off, wait approximately 10 seconds before turning control back on!



Picture 4: Electronic Sequence Control

If switch (S1 or S2) is pushed longer than 0,8 Seconds, the vibratory bowl is activated and screws will be transported up the spiral. As soon as the switch is released, the bowl activation stops.

5.2 Operational Method of Sequence Control

Load Adjustment of Vibratory Bowl

With potentiometer P1 (see picture 4) it is possible to adjust vibration of Bowl to be lower or higher, according to fill level. The adjustment range of the potentiometer is adjustable for every feeder with an upper and lower limit.

The position of the rheostat can be seen on a scale from 0 - 10.

Upper Limit of Adjustment Range

With a nearly empty bowl, the vibration power is increasing, based on the lower weight of the bowl-filling. This can create a bad feeding characteristic. To avoid this, the upper limit of the vibration can be adjusted by rheostat P3 (see picture 4) at max. adjustment of rheostat P1.

- turn clockwise: reduces upper limit.
- turn counter-clockwise: increases upper limit.

Lower Limit of Adjustment Range

If the bowl is full (fill level 1/2 full), the vibratory magnet has to move a large mass (especially with small screws). That this is even possible at minimum adjustment of potentiometer P1, the lower limit can also be adjusted over potentiometer P2.

- turn clockwise: reduces lower limit.
- turn counter-clockwise: increases lower limit.

Voltage Switch

The control has to be adjusted to the voltage requirement of the unit. The corresponding adjustment of the control can be done by use of the voltage selector switch (see picture 4 and "Technical Data").

6 Maintenance and Inspection



Maintenance- and Inspection works always require to switch-off the SZG and to disconnect power- and air supply.

The maintenance- and inspection are works restricted exclusively to the vibratory bowl with feed rails, as well as the separator and the filter / regulator / lubricator.

6.1 Cleaning of SZG

The vibratory bowl with feed rails and the separator have to be inspected for dirt regularly.

Because of dirt in the bowl and on the feed rail, the feed speed will be reduced and the feed characteristics are affected in such a way, that the required pressure in the feed rail for the safe insertion of the separator is not possible. A result in the occurrence of errors during the separator action.

Much dirt in the separator can also produce problem during the separator action. If the movable parts of the separator get wedged or struck together because of resin oil, the screws will be prevented from continued processing.

If above problems occur, the vibratory bowl with feed rails and the separator have to be removed and cleaned.

The vibratory Bowl with feedrails can be taken out by removal of adjustment screw and if mounted, also the removal of the air blast deflector (see picture 5).

The separator can be removed by unscrewing the separator cover and loosening of adjustment screw on clamping stand (see picture 5).

To clean metal- and aluminium parts, we recommend the use of a cleaning solvent. Plastic parts or parts coated with plastic, should be washed with customary resin-free plastic cleaner.

Afterwards, all parts should be blown with compressed air. All metal parts should be greased **lightly** with a light, thin, resin- and acid-free oil, prior to re-assembly.

The re-assembly of the cleaned parts is done in reversed order (see picture 5).

The adjustment of the vibratory bowl with feedrails and also the separator, as well as the starting operation again, is done as shown in paragraph "3 Installation and Operation of Feeder".

6.2 Exchange of Magnetic Valves



The exchange of Magnetic Valves Type MEH-3-0,9, Nr. 810843, requires the removal of the gasket under the top cover of the new valve!

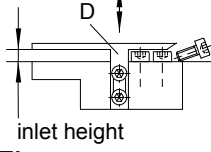
7 Removal of Errors during Operation

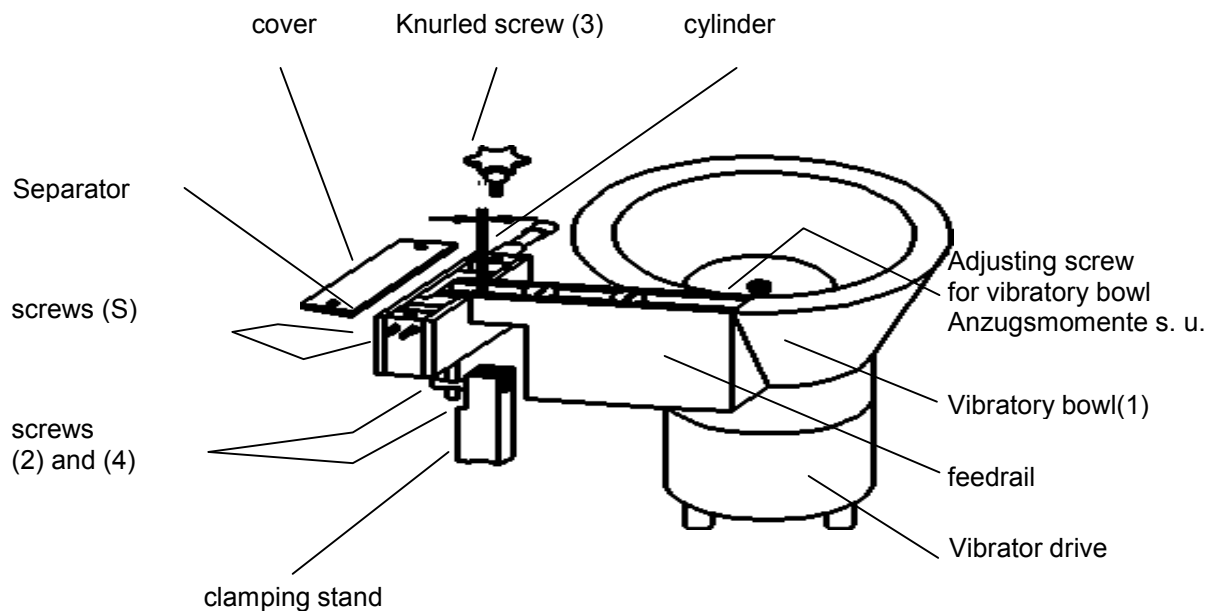


Prior to any repair to remove errors, the feeder has to be switched-off on the toggle switch located on the front plate, the electricity has to be disconnected and the air pressure supply has to be interrupted.

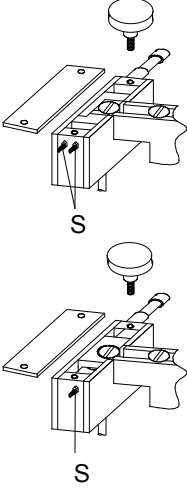
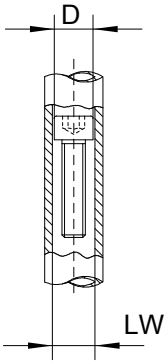
Table 4: Trouble Shooting

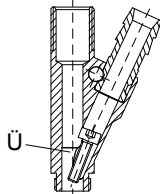
Problem	Reason	Solution
Feed Capacity too low	<p>Vibration speed incorrectly adjusted</p> <hr/> <p>Misadjusted magnetic gap</p>	<p>Increase vibration speed by turning rheostat P4 clockwise (see picture 4 / page 10).</p> <hr/> <ol style="list-style-type: none"> 1. Take out the vibratory drive opening of 3 cyl. head screws 800502 (s. 9.). 2. Check torque of adjustment screw (2) in bowl (10-12 Nm). 3. Remove slide parts of vibrator. 4. Remove cylinder screw (1) from tie rod (3) and push a distance sheet of 0,2 mm between tie rod (3) and magnet (4). 5. Push down the tie rod. 6. Tighten cylinder screw (1) and remove distance sheet. 7. Re- Assemble side parts of vibrator. 8. Place vibratory drive in housing and mount. 9. The adjustment and operation of the vibrator is done by following all steps of paragraph "3 Installation and Operation of Feeder".

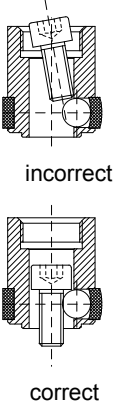
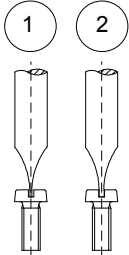
Problem	Reason	Solution
<p>Problem when screws enter feed rail</p>	<p>Cover Rail (D) is miss-adjusted or bent Worn-out misadjusted deflector</p>  <p>The adjustment between vibratory bowl and separator is incorrect</p>	<p>Observe how error occurs!</p> <p>By adjusting cover rail (D), the inlet height can be newly adjusted.</p> <p>Replace old deflector or adjust.</p> <p>Note: To achieve best feed-action, a high measure of experience is necessary. When changing to a different length of screw, the length of the cover rail has to be changed.</p>
		<ol style="list-style-type: none"> 1. Loosen the separator cover by removing the two knurled screws (3) and check, if the screws can easily slide into the separator. 2. If a lateral adjustment is necessary, loosen the adjustment screw (1) in the vibratory bowl and turn the bowl with guide rails in such a way that screws can easily slide into separator. 3. If a height adjustment is necessary, loosen the cylinder screw (2) on the clamping stand and adjust separator to feed rail. The distance between the feed rail and the separator has to be adjusted, so that the two will not touch each other at maximum feed-action. For this, loosen cylinder screw (4) on clamping stand and adjust separator accordingly (see picture 5).

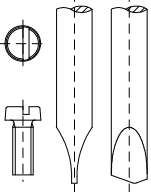
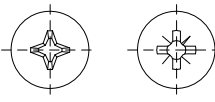
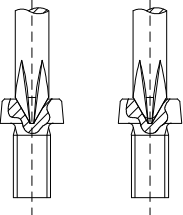


Picture 5: Adjustment of feedbowl

Problem	Reason	Solution
<p>Screws get stuck in separator</p>	<p>The end position of the separator side is miss-adjusted</p> 	<ol style="list-style-type: none"> 1. Remove the separator cover by loosening the two knurled screws. <p>Slide Separator</p> <ol style="list-style-type: none"> 2. With a hand-screwdriver push apart the two separator slides and remove the screw upwards. 3. Adjust the end position of the two slides with the adjustment screws (S), so that the screws can freely fall into the middle of the hose nozzle. <p>Profile Blade Separator</p> <ol style="list-style-type: none"> 2. Remove the screw upwards. 3. Adjust the end position of the slide with the adjustment screws (S), so that the milled screw, head grooves on the Profile Blade and slide cover each other. 4. Re-tighten the separator cover by using the two knurled screws.
<p>Screws get stuck in feedhose</p>	<p>Tolerance of Screw head diameter is too large</p> 	<ol style="list-style-type: none"> 1. Open cover of feeder and remove side panel on separator side, by sliding side panel up. 2. With 2 mm allen key (800443-standard equipment) loosen threaded pin 800557 that fastens feedhose to separator (see picture 2). 3. Pull-out feedhose with hose nozzle. 4. Remove knurled screw on mouthpiece, pull out feedhose with hose nozzle and blow out feedhose with low-pressure gun from the direction of separator. <p>! DANGER OF INJURY!</p> <ol style="list-style-type: none"> 5. Re-install feedhose in reverse order. 6. Use higher screw quality.

Problem	Reason	Solution
Screws get stuck in the feedhose	<p>Feedhose is bent too much</p> <hr/> <p>Feedhose is bent or damaged</p>	<p>Lay-out feedhose to allow largest possible radius.</p> <hr/> <p>Feedhose has to be replaced. The assembly and disassembly is described in this section 1. - 5. (page 18 bottom).</p>
Screws et stuck in Mouthpie ce	<p>After longer use, the change-over (Ü) from screw insertion channel to bit channel has been roughened</p> <hr/> <p>If screws were changed afterwards to a longer length, it is possible that screws cannot pass through change-over</p> <hr/> <p>If shorter screws are being used, screw can either tilt or turn completely in change-over.</p> 	<p>Re-polish the change-over.</p> <hr/> <p>Use screws, feeder was originally manufactured for.</p> <p>Or</p> <p>Install a new mouthpiece, which accommodates longer screws.</p> <hr/> <p>Use screws, feeder was originally manufactured for.</p> <p>Or:</p> <p>Install a new mouthpiece, which accommodates shorter screws. It may also become necessary to use a custom construction (for example: a tilt able mouthpiece)</p>

Problem	Reason	Solution
Screws do not reach nosepiece	Air blast is too low 	Open somewhat throttle on air-blast valve (counter-clockwise)
Screws get shot out of nosepiece	Air blast is too high Rubber-Ring of Nosepiece is worn	Close somewhat on air-blast valve (clockwise). NOTE: Reduce air-blast only so far, that the screw reaches the nosepiece, especially if feedhose is positioned unfavorably. Install new Rubber Ring (see detailed drawing)
When using slotted screws: Bits slip (high bit wear)	Bits are worn 	Replace or grind bits. When regrinding bits, make sure that the blade is parallel to avoid recoil. If the bit is grand to thin it can brake (1). If the bit is too thick in relation to the screw's slot it will not find the slot (2).

Problem	Reason	Solution
<p>When using slotted screws: Bits slip over (high bit wear)</p>	<p>low quality of screws (for example: screws slot is not centered)</p> 	<p>Re-grind bit slightly eccentric and rounded. Or: Use better screw quality.</p>
<p>When using cross-recess screws: Bits slip over (high bit wear)</p>	<p>Bit does not insert into drive of screw deep enough</p> <p>Phillips Pozidriv</p> 	<p>Re-check and confirm that bit and screw correspond in type (Pozidrive or Phillips) and in size. If necessary, exchange bits (see paragraph 6. exchange of bits).</p>
	<p>The bit has too much play in the screw drive</p>	<p>Re-check and confirm that bit and screw correspond in type (Pozidrive or Phillips) and in size. If necessary, exchange bits (see paragraph 6. exchange of bits).</p>
	<p>badly shaped cross. recess of screw</p> 	<p>Use better screw quality Or: If necessary, grind tip of bit-tip</p>

Problem	Reason	Solution
After screw.- assembly, the next screw is not being fed	not enough screws in vibratory bowl	Refill screws (maximum fill-volume of 0,75 liters)
	no signal of control in SZG	Recheck fuses; for this remove the 4 screws on the front plate of the E-Card and pull-out E-Card. If necessary exchange defective fuses and re-install E-Card (picture 4).
Adjustment range of vibratory speed is too small		Open 4 screws of front cover and pull-out E-Card. Adjust the upper limit with rheostat P3 and the lower limit with rheostat P2 (see picture 4/ and "Function of Controller).

8 Terminal Lay-out in E-Card:

Power supply:

Terminals X 6 (see picture 4)

1	brown	(L)
2	yellow/green	(PE)
3	blue	(N)

Feed bowl:

Terminals X 4 (see picture 4)

1	blue	(N)
2	brown	(L)

Connector

1	brown	(L)
2	blue	(N)
3	yellow/green	(PE)

Fuses : Fuse 1 (1A) : 24V
Fuse 2 (1A) : 115/230V

Control of Vibratory Drive:

Terminals on cable 3x0,25:

1	brown	+24V
2	green	signal
3	white	GND

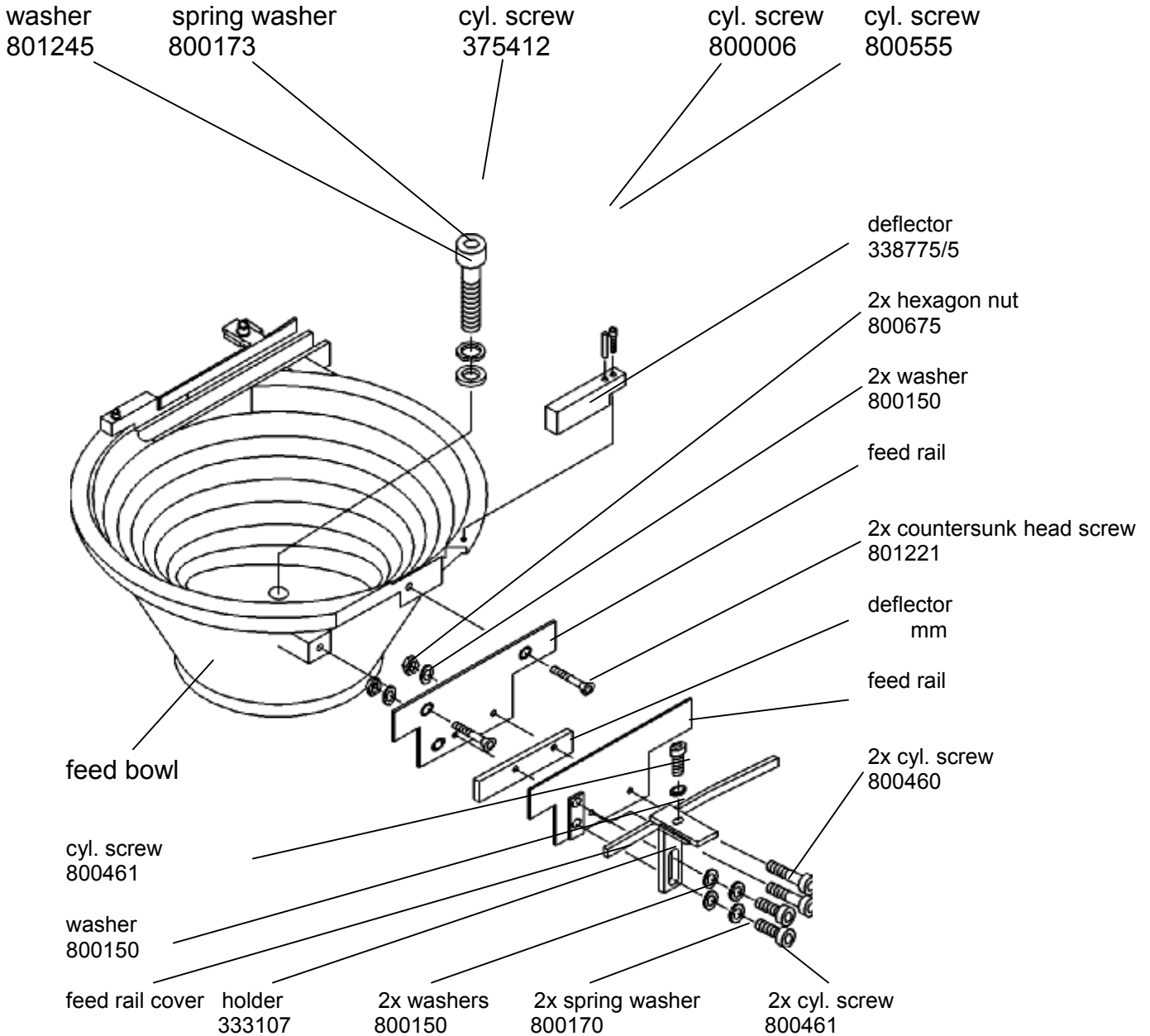
Option 1: Start by potential-free contact:
The potential-free contact
connects terminal 1 and 2

Option 2: Start by PLC-Output:
Connect terminal 3 to ground of PLC.
Connect output of PLC (+ 24V DC) to terminal 2.

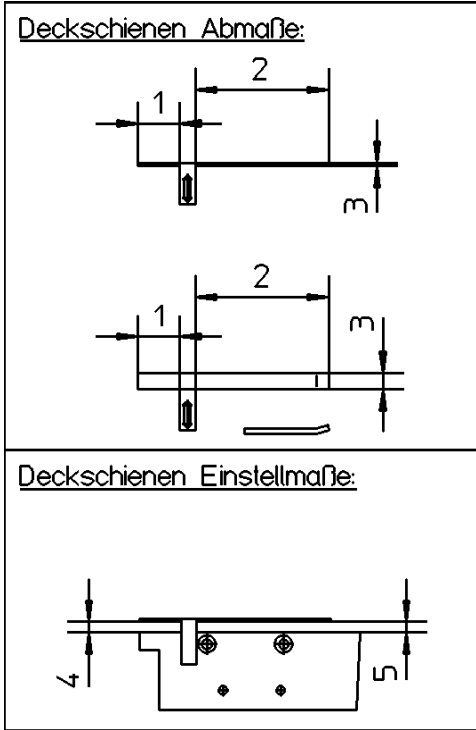
9 Drawing with spare parts Listing

Vibratory Bowl complete

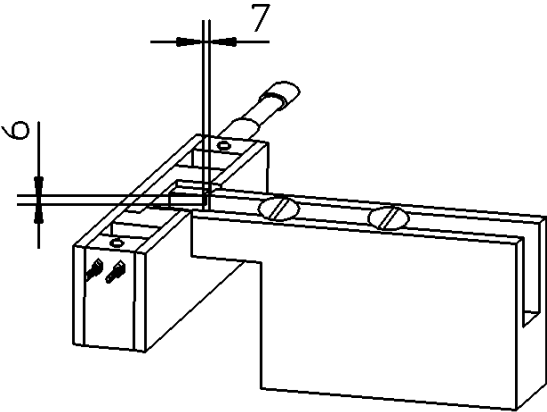
Part.No. / Vibratory Bowl (0,75 Liter) complete :



Adjusting Measure at the Vibratory Bowl



Adjustment at Separation Position



Sign Explanation for Measure 6

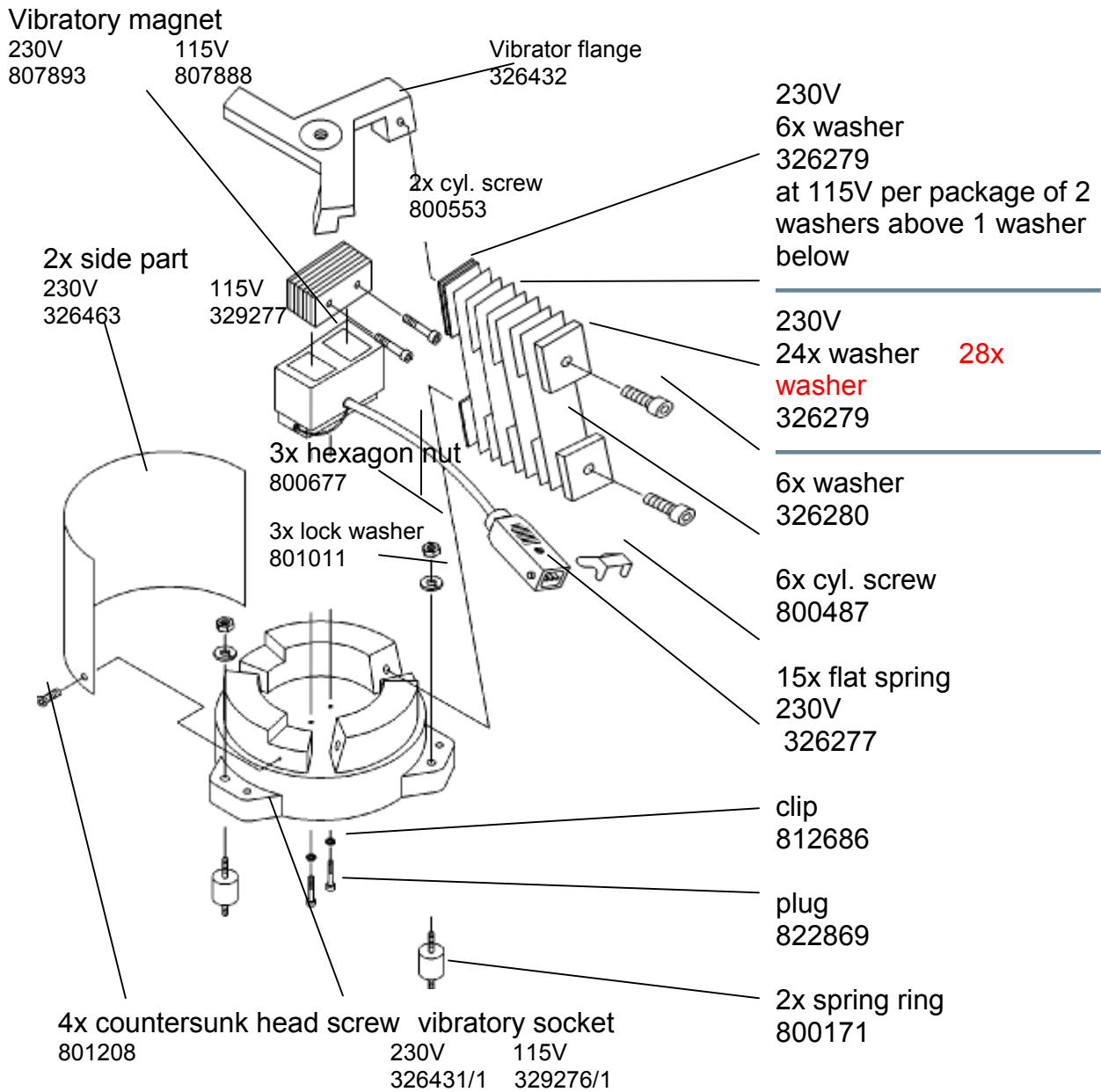
- + Finish edge at the slide is plus measure 6 higher then feed rail
- Finish edge at the slide is minus measure deeper then feed rail

measure	1	2	3	4	5	A	B
	27.5	55	6	3.0	3.3		

Vibratory Drive complete

Filling Volume Vibratory Bowl: 0,75 Liter

	□ 230V	☒ 115V
Type	: 150R 230/50	150R 115/60
Part.No. Vibratory Drive compl.	: 362512 C	362512 D



10 Connection to a PLC

Since the Models 05XX-O/P do not have an internal sequence-control, is necessary to establish the correct sequence and appropriate arrangement of individual operations, utilizing a PLC or another type of controller.

For simplification and help, we provide a function diagram, an I/O listing (only with SZG 05XX-P) and a pneumatic diagram.

These aids are included with the documentation of the Operating Manual.

These aids are filed with the documents of the operating manual.

12 Customer specific informations

13 Confirmation declaration

EC - Conformity

We the

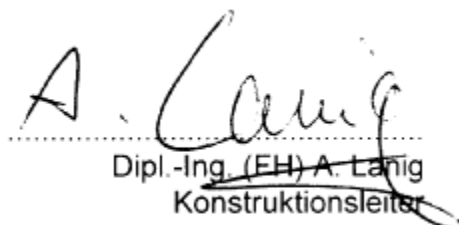
DEPRAG

DEPRAG SCHULZ GMBH u. CO.
Postfach 1352
D - 92203 Amberg,

declare the design and construction of the screwfeeders 0511, 0512, 0522 and 0524 confirm with the respective guidelines as follows:

1. EC-Machine-Guideline 89/392/EEC appendix IIA of edition 93/44, appendix I Nr. 1, 2.2 and 3
Applied standards: EN 292
2. EC-Machine-Guideline "Electromagnetic Compatibility" 89/336 EEC of editions 93/68/EEC
 - EN 55014-1:1997 + A2:1999
 - EN 55014-2:1997
 - EN 61000-3-2:1995 + A1:1998 + A2:1998 + A4:2000
 - EN 61000-3-3:1995
3. EC-Low-Voltage-Guideline 73/23/EEC of editions 93/68/EEC

Amberg, 02.04. 2004


Dipl.-Ing. (FH) A. Lanig
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15 Technical Data

	SZG 0511-0/0,75-2
Part Number	374984 D
Serial Number	1019577
Voltage	115 V
Frequency	60 Hz
Output -0 (0,75/2,5l)	110 / 660 VA
Output -P (0,75/2,5l)	120 / 670 VA
Output -EP (0,75/2,5l)	130 / 680 VA
Operating Air Pressure	max. 6 bar
Protection Class	1
Protection Type	IP 54
Weight -0 (0,75/2,5l)	ca. 25 / 53kg
Weight -P (0,75/2,5l)	ca. 32 / 60 kg
Weight -EP (0,75/2,5l)	ca. 32 / 60 kg
Noise Level	48 dB(A)

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ZERTIFIZIERT NACH DIN EN ISO 9001

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