

FEIN REPAIR TOOLS

FSC 1.6 Q / FSC 2.0 Q





Summary

1. **Technical data**
2. **Maintenance**
3. **Electrical function check**
4. **Disassembly**
5. **Assembly**
6. **Tools**
7. **Extracts from the operating instructions**
8. **Modifications, extras, repair information**

Spare parts lists and exploded view diagram are available online at:

www.fein.de/Fein Service/Fein Ersatzteile



1. Technical data

Order number	new	7 236 42	7 236 36
Model	new	<u>FSC 1.6 Q</u>	<u>FSC 2.0 Q</u>
Power / consumption	watts	400	
Power / output	watts	220	
Oscillations	rpm	11000 - 18500	
Mains supply type		1~	
Protection class		II	
Length of cable with plug	m	5	
Weight without cable	kg	1.25	



2. Maintenance

- 2.1. Provisions
- 2.2. Cleaning and care
- 2.3. Replacing carbon brushes
- 2.4. Repair and maintenance intervals



2.1. Provisions

Provisions:

Please note that power tools may only be repaired, maintained and checked by a trained electrician, as improper repairs can result in serious risks to the user (*BGV A2*).

Repeated inspections are to be carried out in accordance with *DIN VDE 0702-1*.

The regulations in accordance with *DIN VDE 0701 Part 1* should be observed after repairs.

Only use original FEIN spare parts!

The relevant accident prevention regulations of the employers' liability insurance associations are to be observed when commissioning.

The German Equipment and Product Safety Act applies for correct use.

Outside Germany, the regulations applicable in the relevant country must be observed!



2.2. Cleaning and care



Risk of injury through accidental switching on.

Unplug before undertaking any maintenance.



Once a week, or more often in the case of frequent use:

- **Check cable (160) for damage**
- **Clean cooling apertures**
- **Blow out the inside of the power tool from the outside with dry compressed air through the ventilation openings.**



2.3. Replacing carbon brushes

The machine is fitted with carbon brushes with self-cutoff.

When checking the carbon brushes, make sure they are reinserted in the same position and can move easily in the carbon brush holder.

When the carbon brushes wear down to a length of 7mm they need to be replaced with new ones.

Only use original FEIN carbon brushes as this is the only way to ensure compliance with EMC requirements!

Run in new carbon brushes for 20 minutes without load at the lowest possible speed.



2.4. Repair and maintenance intervals

After approx. 300 operating hours:

- **Dismantle machine, clean, and blow out or brush down insulating parts, replace spherical bearing (500)**

Depending on type and duration of use, but at least every 6 months:

- **Dismantle machine**
- **Clean machine thoroughly**
- **Replace bearing (armature)**
- **Clean electronics (dry cleaning only)**
- **Check cable and inner stranded wires for chafe marks**
- **Check that plug contacts are snugly fitting**
- **Replace spherical bearing (500)**



3. Electrical function check

- 3.1. **Function check**
- 3.2. **Test data**
- 3.3. **Test equipment and tools**
- 3.4. **Circuit diagram / connection diagram**
- 3.5. **Safety test**



3.1. Function check

3.1.1. Without mains, connected to mains

3.1.2. Motor

3.1.3. Electronics



3.1.1. Without mains, connected to mains

Without mains

- **Check cable (160) for damage**
- **Can the slide switch (20) be easily moved and does it engage cleanly?**
- **Can the speed adjustment button (80) be moved from positions 1 - 6?**
- **Check cooling and ventilation slits for dirt**
- **Is the fan wheel on the armature (255) undamaged?**

Connected to mains

- **Plug in mains plug**
- **Switch on machine using slide switch (20)**
- **Adjust speed using speed adjustment button (80)**
- **Manually check oscillating movement on drive shaft (430)**



3.1.2. Motor

Checking the motor without electronics

- **Disconnect motor feed cable from the electronics**
- **Apply test voltage to motor feed cable as per the table.**

Rated voltage	100 – 120 V AC	220 – 240 V AC
Test voltage	max. 65 V AC	max. 130 V AC



3.1.3. Electronics

- **The electronics cannot be tested without load (motor), the control circuit must be closed.**
- **The electronics are assumed to be functioning if the speed values match the test data.**
- **Magnet holder assembly (270), especially the magnet ring, must not be damaged.**

Important!

With mains voltage the machine may only be operated with the electronics correctly inserted. Otherwise the control circuit will be broken and the speed will become unacceptably high.



3.2. Test data

Order number		7 236 42	7 236 36
Model		FSC 1.6 Q	FSC 2.0 Q
Conformity mark	CE		
Rated voltage	volts	230	
Rated current	amperes	2.3	
Idling current	amperes	0.8 (0.72 - 0.92)	
Rated output	watts	400	
Power / output	watts	220	
Oscillations	rpm	11000 - 18500	
Oscillations / max	rpm	18500 - 18900	
Mains supply type		1~	
Protection class		II	
Length of cable with plug	m	5	
Weight without cable	kg	1.45	



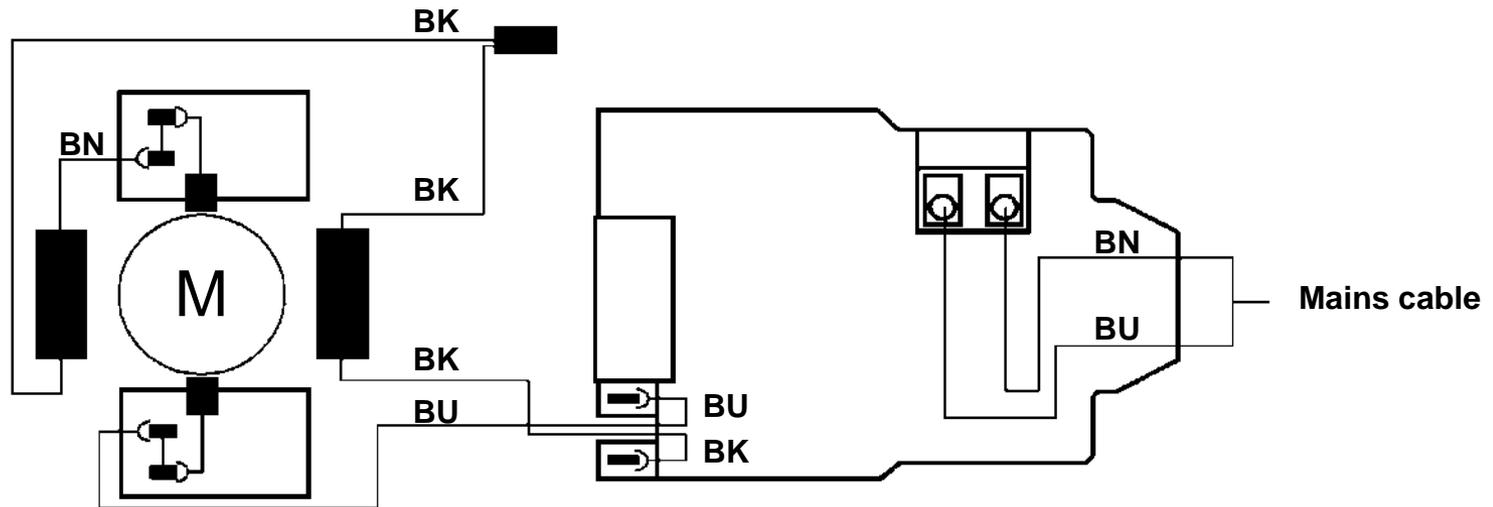
3.3. Test equipment and tools

- **Multimeter for measuring effective values (voltage, current, resistance).**
- **Tachometer, pulse counter (suitable for oscillating motion).**
- **Adjustable isolating transformer
(for testing motor without electronics at 65 V and 130 V AC).**

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3.4. Connection diagram



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3.5. Safety test / (after about 15-minute run-in)

Important!

The safety test must comply with the specifications set out in the current version of DIN VDE 0701 Part 1 (Appendix "E" for power tools).

Safety test:
...as carried out by FEIN

	Test steps	Test type
1.	Visual inspection	<ol style="list-style-type: none"> 1. Remove clamped tool if necessary 2. Cable 3. Housing 4. Mechanical operating elements 5. Check type plate
2.	Measuring insulation resistance	<ol style="list-style-type: none"> 1. Disconnect from mains 2. Connect L1 and N to plug 3. Switch "ON" Measuring points: Gear head and screws (140+200) to L1/N Test voltage: 500 V DC Insulation resistance: min. 2.0 M ohms
3.	High-voltage test High-voltage test according to: EN-60745-1, §15: 2003	<ol style="list-style-type: none"> 1. Disconnect from mains 2. Connect L1 and N to plug 3. Switch "ON" Measuring points: Gear head and screws (140+200) to L1/N Test time: min. 3 sec Test voltage: 2500 V AC Tripping current: 5mA > Overcurrent relay of test rig must not trip
4.	Speed measurement	<ol style="list-style-type: none"> 1. Speed setter (80) at level 6 2. Switch on machine 3. Measuring point: on drive shaft (430) Test time: min. 12 sec Speed tolerance range: min. 18 500/min, max. 18 900/min
5.	Measuring idling current	<ol style="list-style-type: none"> 1. Switch on machine 2. Test time: min. 3 sec Idling current tolerance range: min. 0.72 A, max. 0.92 A



4. Disassembly

- 4.1. Preparation
- 4.2. Electronics
- 4.3. Carbon brushes and carbon holder
- 4.4. Disassembly of gearbox
- 4.5. Disassembly of field magnet
- 4.6. Disassembly of armature
- 4.7. Disassembly of outer bearing



4.1. Preparation

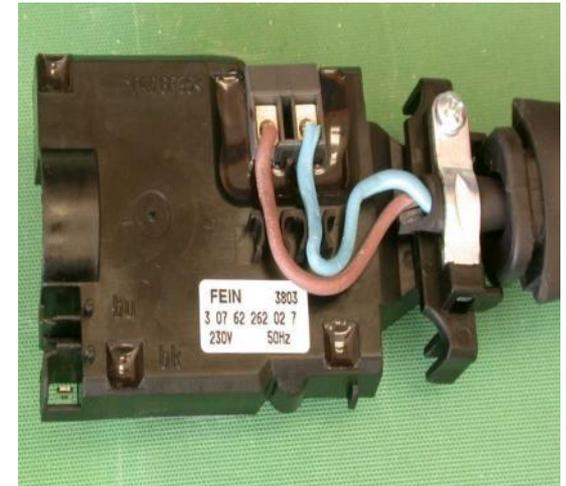
1. Disconnect FSC from the mains
2. Remove clamped tool



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4.2. Electronics



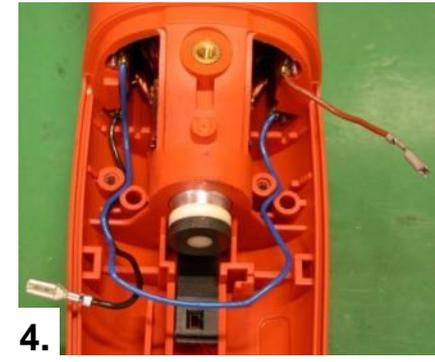
1. Remove screws (140 and 200). Remove cover (90).
2. Disconnect motor connections from electronics, pull cable bridge out of guide and remove electronics from the housing.
3. Release stranded wires from plug connection in electronics (100).

Tool:

- PH 2 cross-tip screwdriver
- Flat nose pliers



4.3. Carbon brushes and carbon holder



1. Lift spring and remove carbon brush (180).
2. Remove screws (140) from carbon brush holder
3. (175)Carbon brush holders (175) are not symmetrical.
4. Note correct position of stranded wires. When disassembling the field magnet, (40) pull out the stranded wires (plug contacts).

Tool:

- PH 2 cross-tip screwdriver
- Cable hooks

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4.4. Disassembly - Gearbox



1. Remove 4x screws (620).
2. Remove outer bearing.
3. Drive out armature and intermediate bearing from the motor housing by gently hitting with the plastic hammer.
4. Release armature(255) from the bearing seat of the intermediate bearing by hitting gently.

- Tool:
- TX15 Torx screwdriver
 - Plastic hammer

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4.5. Disassembly - Field magnet



1. Remove all stranded wires from the motor housing holders (10) and insert into the field magnet (40).
2. Remove screws(50).
3. Drive field magnet out of motor housing (10) by gently hitting with a plastic hammer.
4. Remove field magnet (40).
5. Remove control rod (30) and slide switch (20). Remove spring clip (80) of adjustment button (80) by bending the clamps.

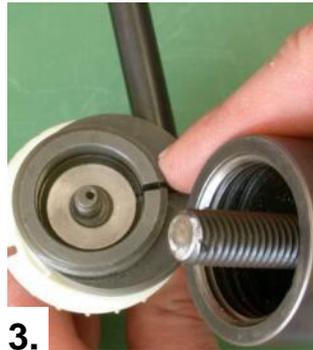
Tool:

- PH 2 cross-tip screwdriver
- Plastic hammer
- Small flat-headed screwdriver (2x40) or scriber

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4.6. Disassembly - armature



1. Carefully remove magnet holder assembly (270) with 2 screwdrivers.
2. **Different drawing-off socket caps are needed to remove the bearings (260, 280) and the balancing ring.**
3. Remove bearing (280) and balancing ring (290) together with chuck cone 26 and drawing-off socket cap without tip.
4. Remove bearing (260) with chuck cone 19 and drawing-off socket cap.

Tool:

- Vice
- Screwdriver 2x
- Drawing-off socket cap (64104150008)
- Drawing-off socket cap without tip (as above)
- Chuck cone 19mm (64107019007)
- Chuck cone 26mm (64107026000)



4.7 Disassembly - outer bearing housing



1. Fix mounting aid at the gearhead and clamp it into vice.
2. Remove the pin with a punch.
3. Remove lever, eccentricing and the spring.

Tool:

- Punch
- Hammer
- Screwdriver Torx 20
- Assembly-Disassembly tool
FSC QI 6 41 22 122 00 0



4.7 Disassembly - outer bearing housing



1. Remove mounting aid from the gearhead.
2. Fix mounting aid with the cylinder pin at the gearhead.
3. Put the whole unit under the arbor press.

Tool:

- Arbor press
- Assembly-Disassembly tool
FSC QI 6 41 22 122 00 0



4.7 Disassembly - outer bearing housing



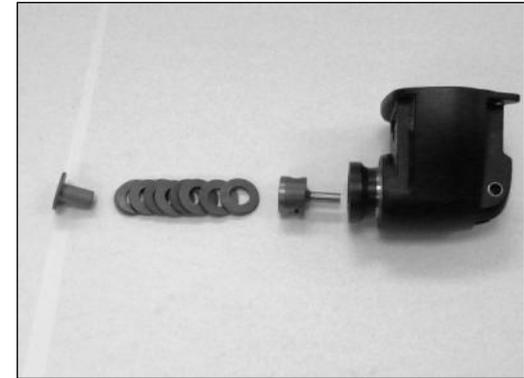
1. Top view shows the circlip with the sleeve of the spring package.
2. Compressing the springs with aid of punch and arbor press.
3. Remove the circlip and release the tension of the spring package slowly.

Tools:

- Arbor press
- Punch
- Circlip player



4.7 Disassembly - outer bearing



1. Remove the sleeve together with the spring package.
2. Remove mounting aid.
3. Remove pressure piece from the gearbox housing.

Tool:
• Punch



4.7. Disassembly - Outer bearing



Because of the specifications for the press-in force of the drive shaft, which cannot be guaranteed after repairs, the gear head (405) is only ever replaced as a complete assembly or spare part.

The other parts shown are available separately as spare parts.



5. Assembly

- 5.1. Armature
- 5.2. Adjustment button / control rod
- 5.3. Field magnet / air guide ring
- 5.4. Motor
- 5.5. Outer bearing
- 5.6. Outer bearing / motor
- 5.7. Carbon holder / carbon brushes
- 5.8. Electronics

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5.1. Armature



1. Press grooved ball bearing (280) on to armature (255).
2. Insert balancing ring (290) in positioning fixture (special tool) and align to armature shaft (! see figure 2. !).
! Balancing ring (290) can also be pressed on after being rotated 180° → false !
3. Place armature in press-on fixture (special tool) and press on aligned balancing ring (290) together with positioning fixture.
4. Press grooved ball bearing (260) on to armature (255).
5. Slide on new magnet holder assembly (because of dirt on magnet) (270) by hand.

Tool:

- Arbor press
- Positioning fixture (special tool) (64131013003)
- Press-on fixture (special tool) (64101028003)

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5.2. Adjustment button / control rod



1.



2.



3.



4.



5.

1. Insert adjustment button (80) in motor housing (10). - ! See position 1 !
2. Press open circlip (80) without clearance using WAF 7 nut.
3. Picture: Motor housing (10), slide switch (20) and control rod (30).
4. Insert slide switch (20) (see position) in motor housing with a click.
5. Insert control rod (30).

Tool:
• 1/4" nut WAF 7



5.3. Field magnet / air guide ring



1. Insert field magnet (40) into motor housing (10) with labelling on switch side.
2. Screw field magnet (40) with Ejoy PT screws (50) on to motor housing (10).
3. Insert air guide ring (60) in motor housing.

The fitted air guide ring (60) positions the control rod (30) in the slide switch (20).

4. Route stranded wires from field magnet(40) as shown in picture to avoid later assembly problems with the carbon brush holders (175).

Tool:

- Torx 15 screwdriver
- Cable hooks



5.4. Motor



1. Insert armature in bearing shield.
2. Insert armature and bearing shield into motor housing.

Tool:

- Arbor press



5.4 Assembly - outer bearing housing



1. Add plates prings and sleeve together.
Attention: please watch the position of the washers. (See picture)
2. Add circlip with aid of a circlip player.

Tool:

- Circlip player
- Assembly-Disassembly tool
FSC QI 6 41 22 122 00 0



5.4 Assembly - outer bearing housing



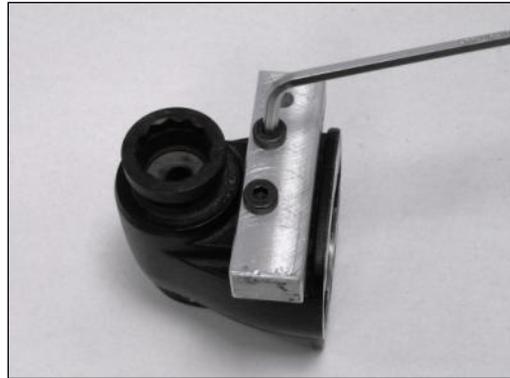
1. Put the bearing housing under the arbor press.
2. Get the spring package under tension with aid of the arbor press.
3. Push the circlip into correct position by using a screwdriver. Make sure, the circlip moved into the groove of the bearing housing.

Tool:

- Arbor press
- Punch
- Screwdriver



5.4 Assembly - outer bearing housing



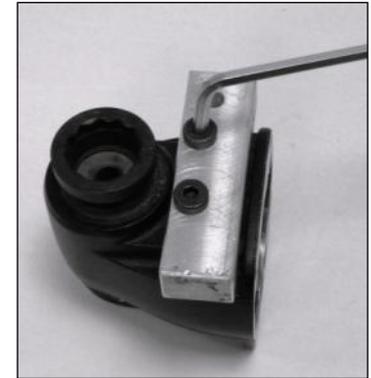
1. Remove mounting aid .
2. Fix the mounting aid at the bottom of the housing, by using allen screws.
3. Put the eccentric ring into the lever.

Tool:

- Punch
- Allen key



5.4 Assembly - outer bearing housing



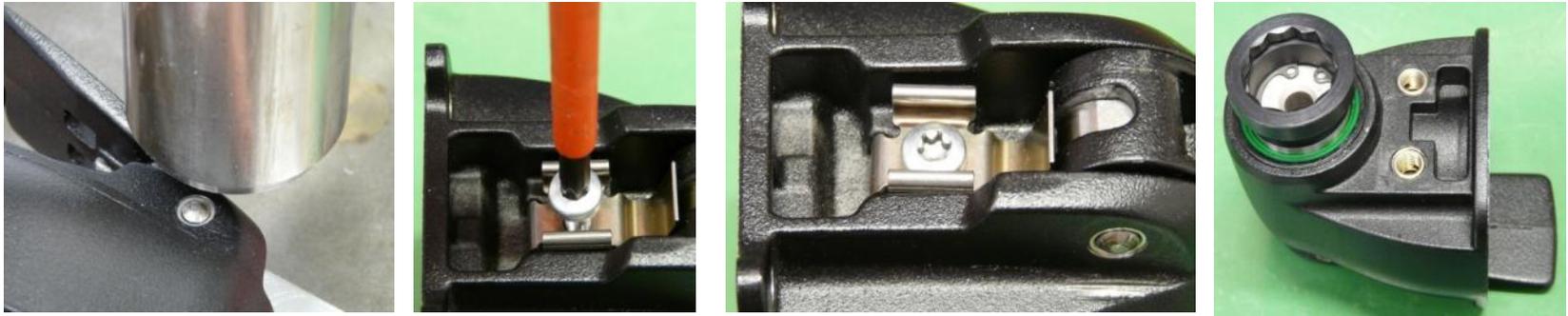
1. Add the lever together with the eccentric ring into the housing and fix it with the cylinder pin.
2. Add the locking spring.
3. Fix the locking spring.
4. Remove the mounting aid.

Tool:

- Hammer
- Screw driver Torx 15
- Allen key 4mm



5.5. Outer bearing



1. Insert clamping lever, eccentric ring and bolt and use press to press in bolt.
2. Fit spring with screw.

Tool:

- Arbor press
- Torx 15 screwdriver
- Special tool

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5.6. Outer bearing / motor



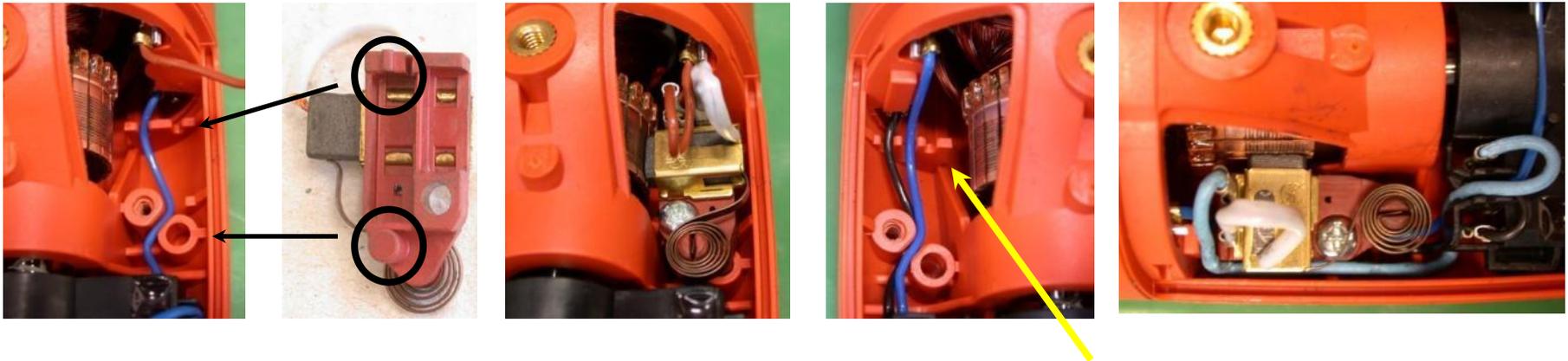
1. Insert spherical needle bearing in fork.
2. Apply grease to outer bearing. (8 g - 0 40 101 0100 4)
3. Screw outer bearing on to motor housing.

Tool:
• Torx 15 screwdriver

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5.7. Carbon brushes



1. Route stranded wires from field magnet (40) through cable guide.
2. Brush holders are precisely positioned by fitting elements and fixed in place with a screw (140). fixiert.
3. Twist protruding stranded wires.
4. Route stranded wires as shown in picture. The free groove on the right (see arrow) is for the brush holder.
5. The blue stranded wire must be routed below the carbon brush shaft.
6. Check that the carbon brushes are free to move and fit the spiral spring from the rear.

Tool:

- PH2 cross-tip screwdriver
- Cable hooks

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5.8. Electronics



1. Connect mains cable to electronics (100). Insert stranded wires in appropriate guide. Route stranded wires from brush holder (175/blue) and field magnet (40/black) to designated plug connection and clamp in the designated channel (thin black cable first)
2. Insert electronics(100) in motor housing (10). Make sure control rod (30), speed adjustment button (80) and protective hose (150) engage precisely.
3. Route all stranded wires cleanly inside the motor housing (10). When replacing the cover (90) make sure that nothing is trapped.
! Lay carbon wires straight upwards - wires must be behind separating ribs > see arrows)
4. Screw on cover (90). Insert fastening element (630).

Tool:

- PH2 cross-tip screwdriver



6. Tools

6.1. Mechanical tools

6.2. Special tools

6.3. Lubricants



6.1. All mechanical tools

• Machine vice		general retailers
• Arbor press		general retailers
• Plastic hammer		general retailers
• Cable hooks		general retailers
• Screwdrivers	PH2, Torx 15, Torx 20	general retailers
• Allen key	WAF 5	general retailers
• Nut	1/4" WAF 7	general retailers
• Snap ring pliers	straight, offset	general retailers
• Flat nose pliers		general retailers
• Scriber		general retailers



6.2. Special tool / press-on fixture

• Drawing-off socket cap		6 41 04 150 00 8
• Chuck cone	19mm	6 41 07 019 00 7
• Chuck cone	26mm	6 41 07 026 00 0
• Sleeve	special tool	6 41 22 109 01 0
• Disc	special tool	6 41 22 110 01 0
• Arbor	special tool	6 41 22 111 01 0
• Centring fixture	special tool	6 41 31 010 00 7
• Ball bearing support	special tool	6 41 31 012 00 0
• Positioning fixture	special tool	6 41 31 013 00 3
• Assembly-Disassembly tool FSC QI		6 41 22 122 00 0

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6.3. Lubricants

Lubricant, operating name	Appearance	Technical data & consistency class	Use	Article code of complete container and container type	Quantity of grease and item
Greases					
0 40 <u>101</u> 0100 4 (previously Sst1)	Light brown, beige, naturally cloudy, ointment-like	Dripping point: approx. 180°C Application range: -30°C to +120°C NLGI:2	Normally loaded spur gears and roller bearings, as well as friction bearings with higher speeds	Tube 85g 32160003014 Can 800g 3213200701 Can 4500g 32132010015	Gearbox (405) 8g Needle bush (520) Apply thin coat of grease



7. Modifications, extras, repair information

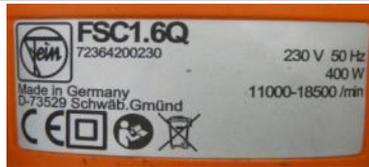
7.1. Difference between 1.6 Q and 2.0 Q

7.2. Service life of carbon and spherical needle bearings

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7.1. Differences between FSC 1.6 Q and FSC 2.0 Q



Type plate

FSC 1.6 Q

FSC 2.0 Q



Intermediate bearing assembly (410)

Size is the same, different labelling and article codes



Armature assembly (255)

Power is the same, different fan wheel colour, eccentric part and article codes



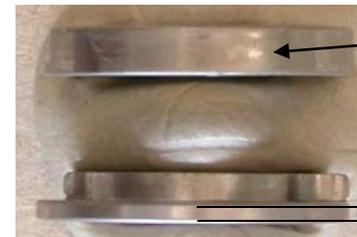
White fan wheel

Black fan wheel

Groove

Balancing ring (290)

Different dimensions and article codes



No groove

1.4 mm

0.85 mm



7.2. Service life of carbon and spherical needle bearings

Carbon (180):

The service life of the carbon is about 150 operating hours.

Run in new carbon brushes at lowest speed without applying load.

Spherical needle bearing (500):

The spherical needle bearing has a service life of about 300 operating hours and should be replaced at the same time as the second carbon replacement.

Run in for about 20 minutes at lowest speed without applying load.

The spherical needle bearing is supplied lubricated with a special grease and need not be re-greased!