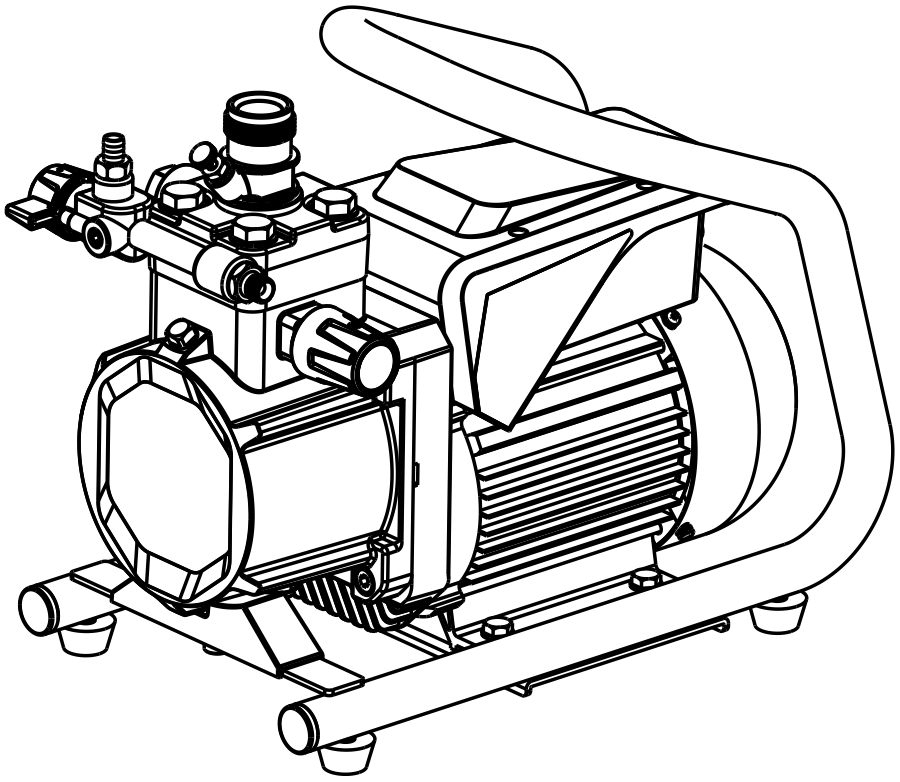
WAGNER

Service manual with electrical repair instructions for electrically instructed persons of the J. Wagner GmbH

SF 21 PRO
HERO 21

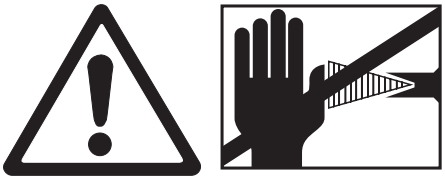


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WARNING!

Attention, danger of injury by injection!

Airless units develop extremely high spray pressures.

	
1	Never bring fingers, hands or other body parts into contact with the spray jet! Never point the spray gun at yourself, other persons or animals. Never use the spray gun without spray jet safety guard. Do not treat a spray injury as a harmless cut. In case of injury to the skin by coating material or solvents, consult a doctor for quick and correct treatment. Inform the doctor about the coating material or solvent used.
2	**The following points are to be observed in accordance with the operating manual before every start-up:** 1. Faulty units may not be used. 2. Secure a Wagner spray gun with the securing lever at the trigger guard. 3. Ensure earthing. 4. Check the permissible operating pressure of the high-pressure hose and spray gun. 5. Check all the connecting parts for leaks.
3	**Instructions for regular cleaning and maintenance of the unit are to be observed strictly.** **Observe the following rules before any work on the unit and at every working break:** 1. Relieve the pressure from the spray gun and high-pressure hose. 2. Secure a Wagner spray gun with the securing lever at the trigger guard 3. Switch the unit off.

Ensure safety!

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1 SAFETY REGULATIONS FOR AIRLESS SPRAYING

All local safety regulations in force must be observed.

The following safety regulations are to be observed in order to ensure safe handling of the Airless high-pressure spraying unit.

1.1 FLASH POINT

 Danger	Only spray coating materials with a flash point of 21 °C or higher. The flash point is the lowest temperature at which vapors develop from the coating material. These vapors are sufficient to form an inflammable mixture over the air above the coating material.

1.2 EXPLOSION PROTECTION

 Danger	Do not use the unit in work places which are covered by the explosion protection regulations. The unit is not designed to be explosion protected. Do not operate the device in explosive areas (zone 0, 1 and 2). Explosive areas are, for example, places where paints are stored and locations in direct proximity to the object being sprayed. Keep the device at least 3 m from the object you are spraying.

1.3 DANGER OF EXPLOSION AND FIRE FROM SOURCES OF IGNITION DURING SPRAYING WORK

 Danger	There must be no sources of ignition such as, for example, open fires, lit cigarettes, cigars or tobacco pipes, sparks, glowing wires, hot surfaces, etc. in the vicinity.

1.4 DANGER OF INJURY FROM THE SPRAY JET

 Danger 	Attention, danger of injury by injection! Never point the spray gun at yourself, other persons or animals. Never use the spray gun without spray jet safety guard. The spray jet must not come into contact with any part of the body. In working with Airless spray guns, the high spray pressures arising can cause very dangerous injuries. If contact is made with the spray jet, coating material can be injected into the skin. Do not treat a spray injury as a harmless cut. In case of injury to the skin by coating material or solvents, consult a doctor for quick and correct treatment. Inform the doctor about the coating material or solvent used.

1.5 SECURE SPRAY GUN AGAINST UNINTENDED OPERATION

Always secure the spray gun when mounting or dismounting the tip and in case of interruption to work.

1.6 RECOIL OF SPRAY GUN

 Danger	When using a high operating pressure, pulling the trigger guard can effect a recoil force up to 15 N. If you are not prepared for this, your hand can be thrust backwards or your balance lost. This can lead to injury.

1.7 BREATHING EQUIPMENT AS PROTECTION AGAINST SOLVENT VAPORS

Wear breathing equipment during spraying work.
A breathing mask is to be made available to the user.

1.8 PREVENTION OF OCCUPATIONAL ILLNESSES

Protective clothing, gloves and possibly skin protection cream are necessary for the protection of the skin.

Observe the regulations of the manufacturer concerning coating materials, solvents and cleaning agents in preparation, processing and cleaning units.

1.9 MAX. OPERATING PRESSURE

The permissible operating pressure for the spray gun, spray gun accessories, unit accessories and high-pressure hose must not fall short of the maximum operating pressure of 20.7MPa (207 bar).

1.10 HIGH-PRESSURE HOSE

 Danger	Attention, danger of injury by injection! Wear and tear and kinks as well as usage that is not appropriate to the purpose of the device can cause leakages to form in the high-pressure hose. Liquid can be injected into the skin through a leakage.

- High-pressure hoses must be checked thoroughly before they are used.
- Replace any damaged high-pressure hose immediately.
- Never repair defective high-pressure hoses yourself!
- Avoid sharp bends and folds: the smallest bending radius is about 20 cm.
- Do **not drive over** the high-pressure hose. Protect against sharp objects and edges.
- Never pull on the high-pressure hose to move the device.
- Do not twist the high-pressure hose.
- Do not put the high-pressure hose into solvents. Use only a wet cloth to wipe down the outside of the hose.
- Lay the high-pressure hose in such a way as to ensure that it cannot be tripped over.

	Only use WAGNER original-high-pressure hoses in order to ensure functionality, safety and durability.

1.11 ELECTROSTATIC CHARGING (FORMATION OF SPARKS OR FLAMES)

 Danger	Electrostatic charging of the unit may occur during spraying due to the flow speed of the coating material. These can cause sparks and flames upon discharge. The unit must therefore always be earthed via the electrical system. The unit must be connected to an appropriately-grounded safety outlet.

An electrostatic charging of spray guns and the high-pressure hose is discharged through the high-pressure hose. For this reason the electric resistance between the connections of the high-pressure hose must be equal to or lower than 1 MΩ.

1.12 USE OF UNITS ON BUILDING SITES AND WORKSHOPS

The unit may only be connected to the mains network via a special feeding point with a residual-current device with INF ≤ 30 mA.

1.13 VENTILATION WHEN SPRAYING IN ROOMS

Adequate ventilation to ensure removal of the solvent vapors has to be ensured.

1.14 SUCTION INSTALLATIONS

The are to be provided by the unit user in accordance with the corresponding local regulations.

1.15 EARTHING OF THE OBJECT

The object to be coated must be earthed.
(Building walls are usually earthed naturally)

1.16 CLEANING THE UNIT WITH SOLVENTS

 Danger	When cleaning the unit with solvents, the solvent should never be sprayed or pumped back into a container with a small opening (bunghole). An explosive gas/air mixture can arise. The container must be earthed.

1.17 CLEANING THE UNIT

 Danger	Danger of short-circuits caused by water ingression! Never spray down the unit with high-pressure or high-pressure steam cleaners.

1.18 WORK OR REPAIRS AT THE ELECTRICAL EQUIPMENT

These may only be carried out by a skilled electrician. No liability is assumed for incorrect installation.

1.19 WORK AT ELECTRICAL COMPONENTS

Unplug the power plug from the outlet before carrying out any repair work.

1.20 MAINTENANCE WORK AND BREAKS

Before carrying out any work on the device and during any work break, release the pressure in the spray gun and high-pressure hose. Secure the spray gun's trigger guard and switch off the device.

2 TECHNICAL DATA

	230-240 V	**110 V**
Voltage :	230-240 V AC, 50 Hz	110-120 V AC, 50 Hz
Fuses :	8 A time-lag	16 A time-lag
Unit connecting line :	6 m long, 3 x 1.0 mm^2	6 m long, 3 x 1.5 mm^2
Max. current consumption:	4.2 A	9.0 A
Degree of protection :	IP 54	
Rated input of device:	900 W	850 W
Max. operating pressure :	20.7 MPa (207 bar)	
Max. volume flow :	2.1 l/min	
Volume flow at 12 MPa (120 bar) with water :	1.6 l/min	1.8 l/min
Max. temperature of the coating material :	43 °C	
Max. viscosity :	15,000 mPas	
Empty weight :	23.6 kg	23.9 kg
Hydraulic oil filling quantity :	0.96 liter	
Max. vibration at the spraygun:	lower than 2.5 m/s^2	
Max. sound pressure level:	77 dB (A)*	

*Place of measurement: 1 m distance from unit and 1.60 m above floor, 12 MPa (120 bar) operating pressure, reverberant floor

JAPAN	50 Hz	60 Hz
Voltage :	100 Volt AC, 50 Hz	100 Volt AC, 60 Hz
Fuses :	15 A time-lag	
Unit connecting line :	3 m long, 3x1.5 mm^2	
Max. current consumption:	13.0 A	9.0 A
Degree of protection :	IP 54	
Rated input of device:	850 W	870 W
Max. operating pressure :	20.7 MPa (207 bar)	
Max. volume flow :	2.0 l/min	2.3 l/min
Volume flow at 12 MPa (120 bar) with water :	1.7 l/min	2.0 l/min
Max. temperature of the coating material :	43 °C	
Max. viscosity :	15,000 mPas	
Empty weight :	23.8 kg	
Hydraulic oil filling quantity :	0.98 l	
Max. sound pressure level:	77 dB (A)*	

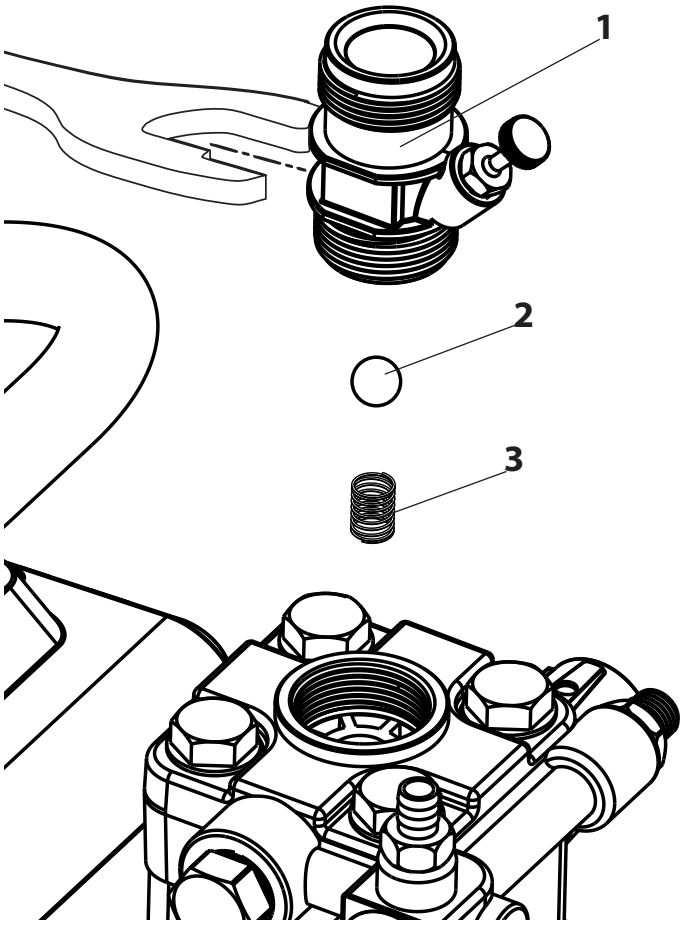
*Place of measurement: 1 m distance from unit and 1.60 m above floor, 12 MPa (120 bar) operating pressure, reverberant floor

3 REPAIRS AT THE UNIT

Danger	Switch the unit off. Before all repair work: Unplug the power plug from the outlet and depressurise the appliance.

3.1 INLET VALVE

1. Place the enclosed 30 mm wrench on the housing (1).
2. Loosen the housing (1).
3. Screw out the housing from the paint section.
4. Remove the ball (2) and spring (3).
5. Clean and check all parts for damage and replace if necessary.



Installation

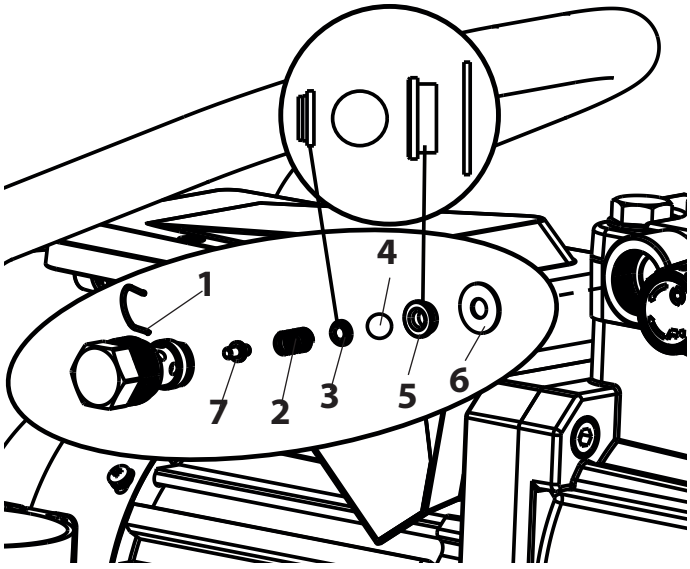
1. Replace the ball (2) and spring (3).
2. Screw the housing (1) into the pump section.
3. Tighten the housing with a 30 mm wrench (70 Nm tightening torque).

3.2 OUTLET VALVE

1. Use a 22 mm wrench to screw the outlet valve from the paint section.
2. Carefully remove the clasp (1) using the enclosed screwdriver. The pressure spring (2) pushes out ball (4) and valve seat (5).
3. Clean or replace the components.
4. Check the O-ring (7) for damage.
5. Check the installation position when mounting the spring support ring (3) (clipped onto spring (2)), outlet valve seat (5) and seal (6), refer to figure.

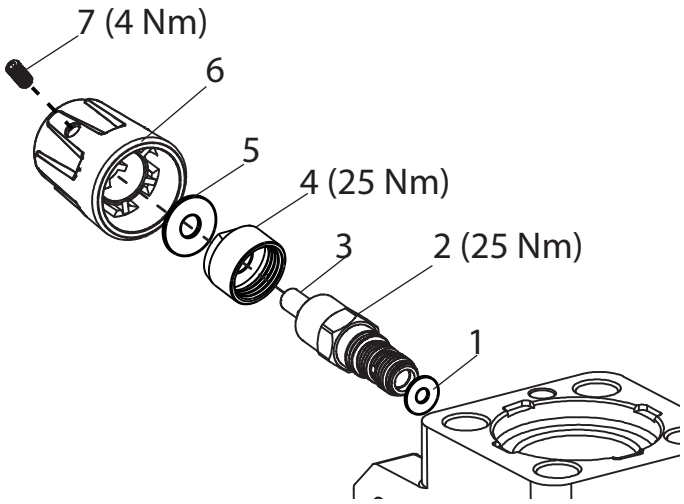
Please also pay particular attention to the following notes:

1. The torque for fitting the outlet valve is 60 Nm.
2. During normal operation, check regularly whether the outlet valve has become loose.
3. Always also replace the seal (6) if you have dismantled the outlet valve, regardless of which component you want to replace. Note: The seal (6) is located inside the paint section.



3.3 PRESSURE CONTROL VALVE

1. Insert seal (1) regulator (2) and tighten it.
2. Turn pressure regulation screw (3) to the left until the spring snaps (pressure = 0).
3. Attach suction system or hopper.
   Test medium: water
4. Mount a pressure gauge (0 – 400 bar), an original pressure hose from Wagner and a high pressure airless gun.



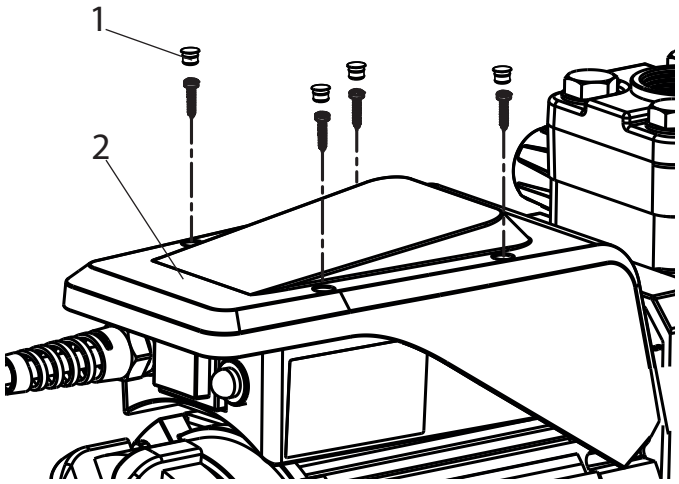
SETTING THE MAXIMUN OPERATING PRESSURE (CLOSING PRESSURE)

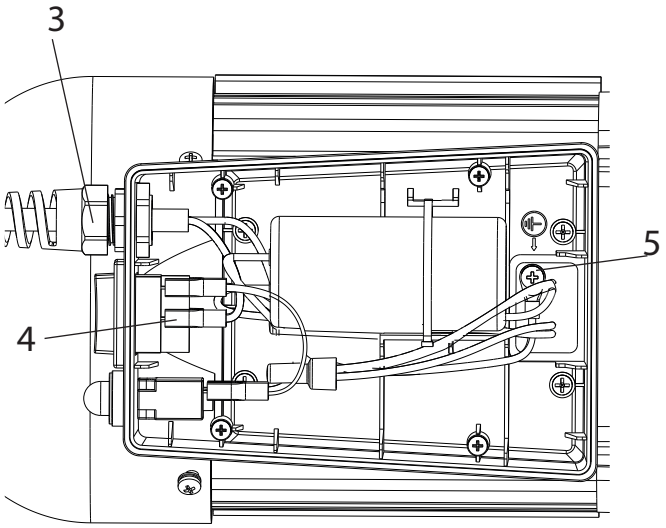
1. Lock the spray gun.
2. Set pressure relief valve to ↻, switch on the machine and let it run for 2-3 minutes for ventilation. Turn the pressure regulation screw (3) slowly until the machine starts to suck in water.
3. Set pressure relief valve to ⚑ and trigger spray gun for ventilating high pressure hose and spray gun. Lock the spray gun .
4. Turn the pressure regulation screw (6) slowly until the pressure gauge shows 195-200 bar (19.5-20.0 MPa).
5. Screw the cap (4) onto regulator (2). Insert washer (5).
5. Put pressure regulation knob (6) on the pressure regulation screw and fully turn it to the right. Hold it in this position and tighten the pin (7) with a hexagonal wrench (2.5 mm).
6. Turn pressure regulation knob to the left.
7. Release pressure by pressing the trigger of the the spray gun.
8. Control setting while the gun is locked again (should be between 200 and 210 bar now).
9. Seal pin with red sealing wax.
10. Set pressure relief valve to ↻.
11. Machine is ready for operation!

3.4 REPLACING THE POWER CABLE

Danger	This may only be carried out by a skilled electrician. No liability is assumed for incorrect installation. Switch the unit off. Before all repair work: Unplug the power plug from the outlet.

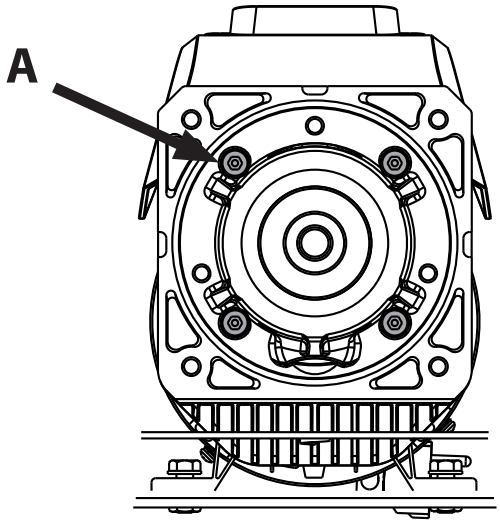
1. Remove the plugs (1).
2. Remove the cover (2) by loosening the screws.
2. Loosen the cable threaded joint (3).
3. Loosen the plug connections (4) and the earthing screw (5).
4. Replace the unit connecting line.
   (only an approved power cable with the designation H07-RNF with a splash-proof plug may be used).
5. Mount green/yellow wire with earthing screw (5).
6. Reconnect the plug connections (4).
6. Remount the cover carefully (do not squeeze any cables!)

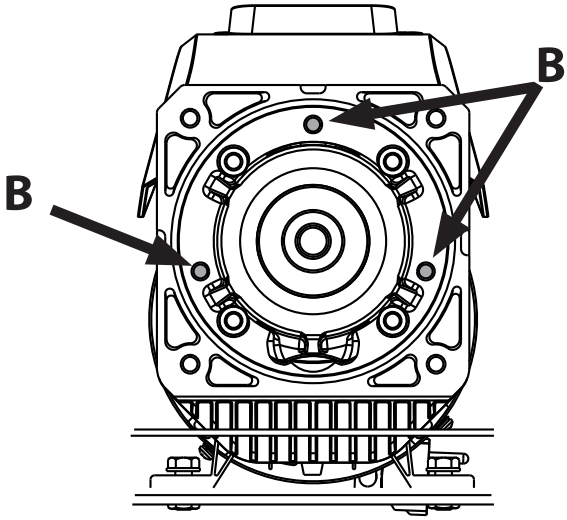




3.5 REPLACING THE ECCENTRIC SHAFT

1. Loosen and remove the 4 screws from the cover (A).
2. Insert the screws into the 3 holes (B) and screw them in.
3. Remove the cover and replace the eccentric shaft.
4. Retighten the cover with the 4 screws.

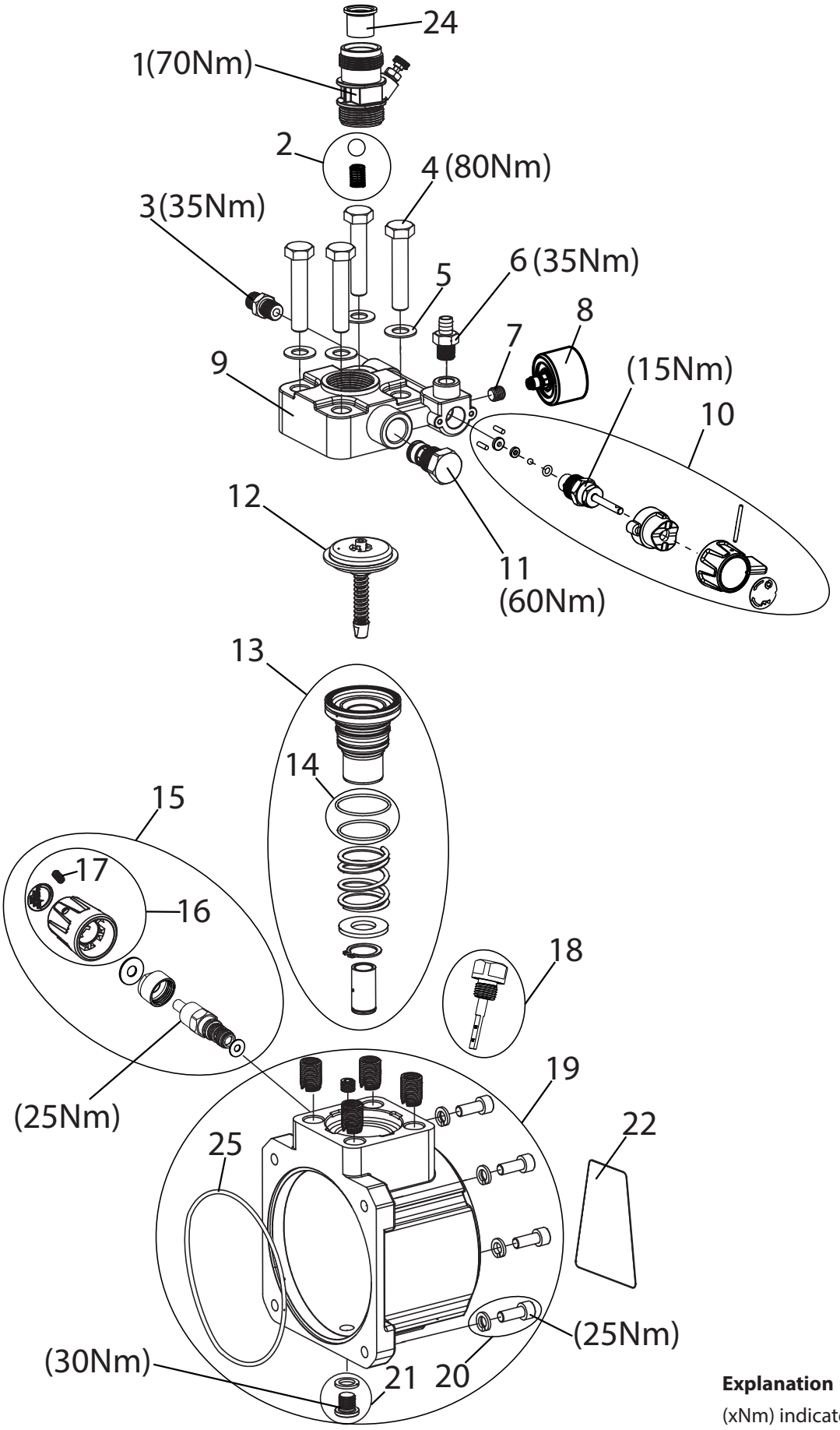




4 SPARE PARTS

4.1 SPARE PARTS LIST SF 21 PRO, HERO 21

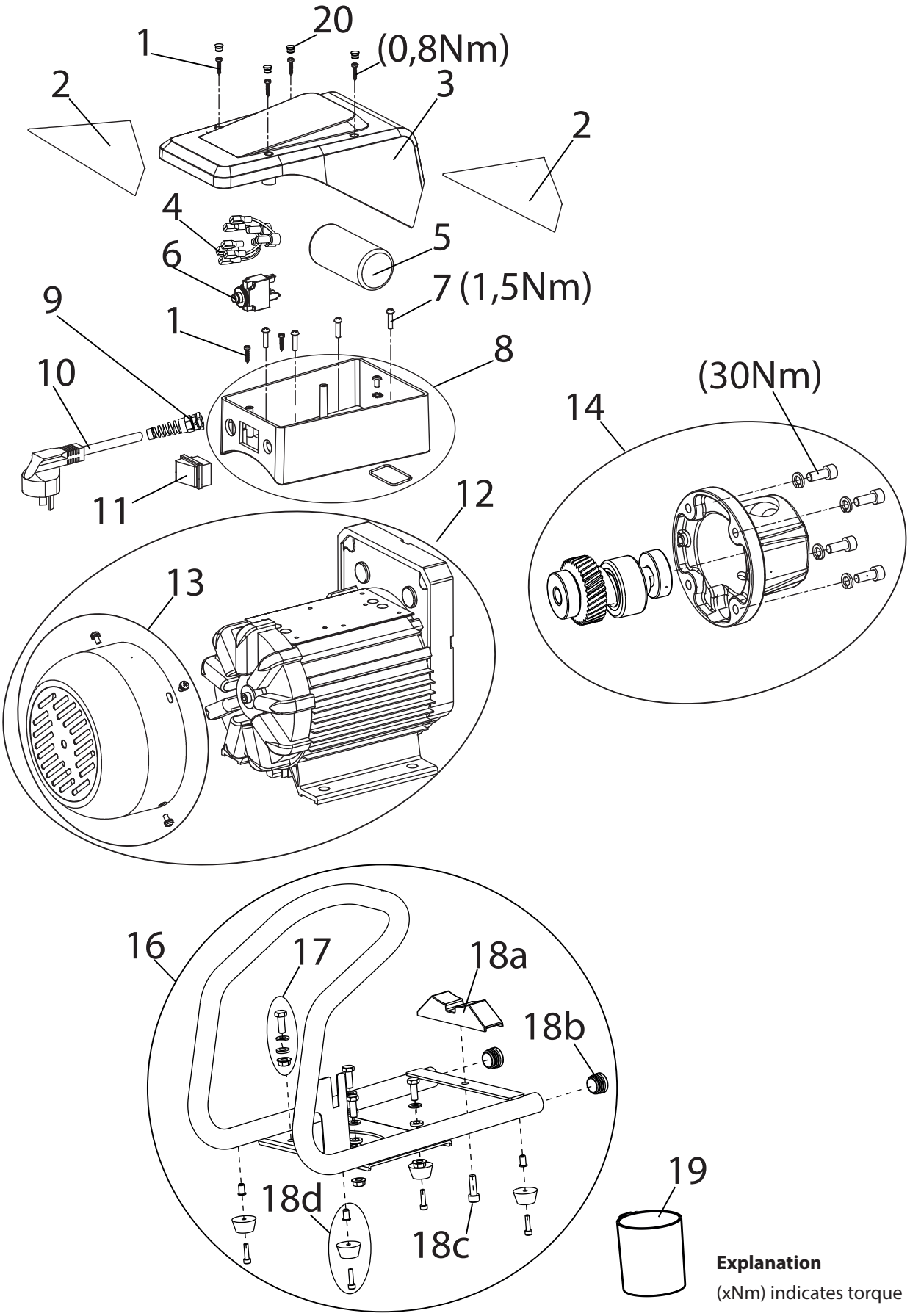
ITEM	ORDER NO.	DESIGNATION
1	2443908	Inlet valve housing assy. (incl. pos. 24)
2	2443943	Inlet valve
3	2443952	Fitting
4	9900217	Screw
5	2444832	Washer
6	2443942	Fitting
7	2445154	Plug
8	0252776	Pressure gauge
9	2444863	Paint head (incl. pos. 3, 6)
10	2443921	Pressure relief valve assy.
11	2443904	Outlet valve
12	2444797	Service kit diaphragm
13	2444800	Service kit pressure inlet
14	2444865	O-ring (2 pcs.)
15	2443862	Pressure regulator
16	2445180	Pressure regulator knob assy.
17	2445610	Grub screw
18	2443941	Oil level measuring set
19	2443916	Hydraulic housing
20	2445232	Screw and washer (4 pcs.)
21	2445224	Sealing screw and seal
22	2438683 2452388	Label SF 21 Pro Label Hero 21
23	2445278	Service kit paint head (pos. 1-11)
24	2452215	Inlet
25	2445254	Seal



Explanation

(xNm) indicates torque

ITEM	ORDER NO.	DESIGNATION
1	2444831	Screw
2	2445241	Label (left+right)
3	2444157 2463141	Cover (black) Cover (red)
4	2444789	Elec. cable set
5	2445245 2463142	Capacitor 40µF 450V (CE, AUS,China) Capacitor 120µF 250V (UK, Japan)
6	2444788 2463184 2463145	Fuse 8A (CE, AUS,China) Fuse 16A (UK) Fuse 15A (Japan)
7	2444790	Screw
8	2444748 2463140	Terminal box (black) Terminal box (red)
9	2444751	Cable gland
10	2445609 2444756 2463179 2463185 2463176	Mains cable (CE) Mains cable (China) Mains cable (UK) Mains cable (Japan) Mains cable (AUS)
11	2444787	ON/OFF switch
12	2443858 2463181 2463183	Electric motor 230V (China, CE) Electric motor 110V (UK) Electric motor 100V (Japan)
13	2443944	Cover assy.
14	2444829	Gearbox
16	2443855	Frame assy.
17	2444508	Screw kit (4 pcs.)
18	2444509	Small parts set (incl. pos. 18a, 18b (2x), 18c, 18d (4x)
19	2443953	Cleaning cup
20	2452044 2463174	Plug (black) Plug (red)

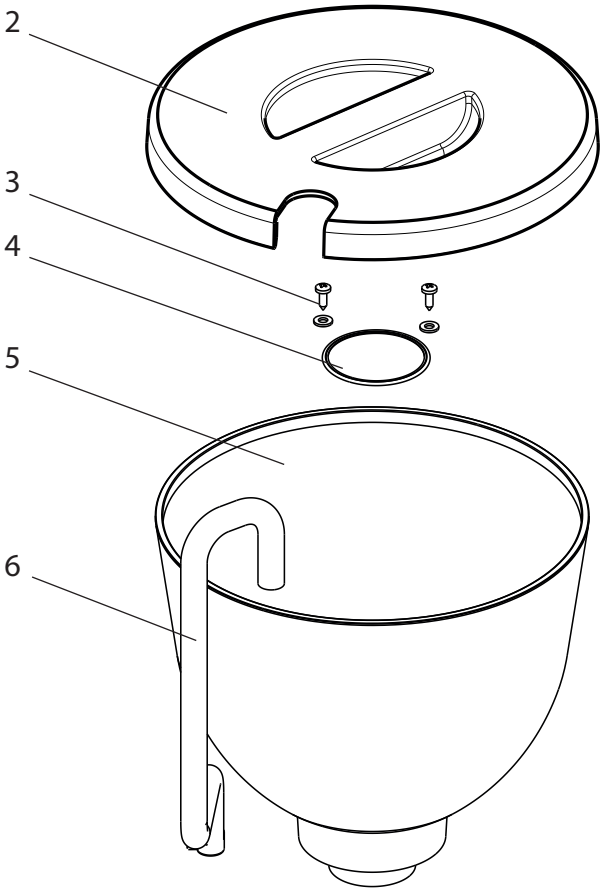


Explanation

(xNm) indicates torque

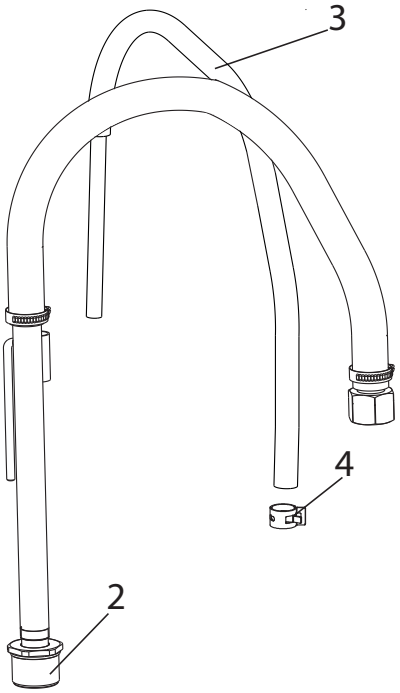
4.2 SPARE PARTS LIST HOPPER

ITEM	ORDER NO.	DESIGNATION
1	2444212 2463293	Hopper yellow 3.7 l, assy. (pos. 2-6) Hopper red 3.7 l, assy. (pos. 2-6)
2	2445295 2463147	Cover (yellow) Cover (red)
3	9902 306	Sheet metal screw 3.9x13
4	0037 607 0003 756	Filter disk, mesh width 0.8 mm Optional: Filter disk, mesh width 0.4 mm
5	2445298 2463148	Hopper (yellow) Hopper (red)
6	2445297	Return pipe



4.3 SPARE PARTS LIST SUCTION SYSTEM

ITEM	ORDER NO.	DESIGNATION
1	2444485	Suction system assy.
2	2444491	Suction filter
3	2444493	Return hose
4	2444494	Clamp



1 BASIC PRINCIPLES

1.1 ELECTRICALLY INSTRUCTED PERSON

In order to carry out work on electrical systems and equipment, a person must at least have training as an electrically instructed person.

However, an electrically instructed person is not authorised to autonomously set up, modify or repair electrical systems and equipment. Such tasks may only be performed under the direction and supervision of a skilled electrician.

The electrically instructed person must be trained on all systems and equipment. This training is carried out by the senior skilled electrician, who highlights the hazards and special features. The senior skilled electrician also ensures that the requirements and guidelines in respect of UVV, VDE and EN standards have been complied with.

All electrically instructed persons must receiving training at least once a year on the hazards, safe handling and correct conduct in relation to electrical systems.

Documents and work instructions must also be made available to electrically instructed persons. These must relate to the exact machine type and indicate potential hazards and special features. The work instructions must include safe and correct replacement of a connecting cable, for example.

1.2 SKILLED ELECTRICIAN FOR DEFINED TASKS

In order to autonomously carry out work on electrical systems and equipment, a person must have training as a skilled electrician for defined tasks.

However, the skilled electrician for defined tasks must also, like the electrically instructed person, be trained on all systems and equipment. This training is carried out by the senior skilled electrician, who highlights the hazards and special features. The senior skilled electrician also ensures that the requirements and guidelines in respect of UVV, VDE and EN standards have been complied with.
It is also necessary for a responsible skilled electrician to assume professional responsibility.

1.3 LEGAL FOUNDATIONS

Once a system and its equipment has been repaired, modified or set up, it must not constitute any hazard for users and their environment. To ensure that safety can still be guaranteed, an annual inspection is required for mobile systems and equipment.

1.4 WHICH TESTS MUST BE PERFORMED

A test in accordance with the guidelines of BGV A3 **must** be performed and verified. This test must be performed on all electrical equipment, even if "only" a mechanical repair has been carried out.

Contents of BGV A3: The test as per BGV A3 is divided into a visual and a metrological test.

Visual inspection:	- Protective conductors (protection class I)
	- Insulating parts
	- Housing
	- Connecting cables
	- Typeplate
	- Machine-specific components
Metrological test:	- Short-circuit test
	- Protective conductor resistance (RSL)
	- Equivalent leakage current (IEA)
	- Insulation resistance (Riso)
	- Functional test

	**Attention!** If one of the above-specified criteria cannot be fulfilled, then the test is **considered a failure.** If the customer refuses the necessary repair, he must be informed in writing to this effect. Clear reference must be made to the fact that safe operation of the system cannot be assured. This must be counter-signed by the operating company. You must fulfil this obligation as you, as an expert, will be required to produce evidence in the event of damage.

1.5 FIVE SAFETY RULES

The Five Safety Rules are more than just rules. They are the precondition for working on electrical systems and appliances. Please take these rules seriously - they are essential for your safety.

Isolation

Isolation means all-pole disconnection of a system from live parts.
All live cables must be disconnected at all poles at the place of work before starting work. This can be done by means of main switches, expert removal of fuses, disconnection of plug connectors etc.

Protecting against restarting

In order to prevent inadvertent restarting of a system on which work is being carried out, restarting must be prevented reliably and safely. For example the unscrewed fuse elements can be replaced with lockable disabling elements or circuit-breakers can be masked with adhesive film. A "Please do not switch on - work in progress" sign can also be affixed. For appliances which are connected to the network by a plug connector, it is sufficient to store the unplugged connector on the machine in such a way that it cannot be mixed up with another connector. In addition, the connector must always be kept in the worker's immediate vicinity.

Verification of safe isolation from the supply

Verification of safe isolation from the supply in low-voltage networks, i.e. systems with operating voltages below 1000 V, must only be carried out using devices or equipment suitable for this purpose. A two-pole measuring instrument must be used. The voltage detectors used must comply with the respective rated voltage and must be tested before and after verification of safe isolation from the supply. I.e. the function of the detectors must be tested on a reliable live source.

Earthing and short-circuiting

After ensuring safe isolation from the supply, the conductors and earthing must be connected together with short-circuit-proof earthing and shorting jumpers. With this measure, the upstream overcurrent protective devices trigger and the system is immediately isolated in the event of inadvertent restoration of power. It should be noted that earthing is carried out first, then short-circuiting.

Cover or shield any adjacent live parts.

Often inadmissible approach to adjacent live system parts cannot be easily prevented. In such cases these system parts must be protected against accidental contact by permanent and securely fitted insulating covers.

1.6 CATEGORISATION OF PROTECTION CLASSES

Legal basis
In electrical engineering, protection classes enable the categorisation and identification of electrical equipment (for example, devices and installation components) in relation to the existing safety measures for protection against electric shock.
The protection classes are defined for all electrical equipment in DIN EN 61140 (VDE 0140-1).
A distinction is made between four protection classes for electrical equipment. Symbols are provided in order to identify equipment with the relevant protection class. These symbols are defined in IEC 60417. The use of safety precautions in the different classes of electrical equipment is described in DIN EN 61140 (VDE 0140-1):2007-03, section 7.

Protection class 0
There is no special protection against electric shock in addition to the basic insulation. Connection to the protective conductor system is not possible. Appliances with this protection class are not permitted in Germany and Austria. This protection class will not be included in any international standards in future. There is no symbol for protection class 0.

Protection class I 

All electrically conductive housing parts of the equipment are connected to the protective conductor system of the fixed electrical installation, which is at earth potential. Mobile appliances in protection class I have a plug connector with a protective conductor contact or an earthing pin plug. These must be executed so that the protective conductor connection is established as the first connection on plugging in. It must also be ensured that in the event of damage the protective conductor connection is disconnected last. The connecting cable entry into the appliance must be mechanically strain-relieved

Protection class II 

Equipment in protection class II has reinforced or double insulation around live parts, so that no conductive parts can be live even in fault conditions. This is also referred to as total insulation. Appliances in protection class II do not have a protective conductor contact.

Protection class III 

Appliances in protection class III operate with safety extra-low voltage (SELV).
Safety extra-low voltage means voltages that do not exceed 50 V AC (alternating voltage) or 120 V DC (direct voltage). This voltage must be generated by a safety transformer as per DIN VDE 0570-2-6 or EN 61558-2-6 for a mains-operated appliance.
Safety extra-low voltage taken from batteries or accumulators belongs to protection class III without the need for further measures.

1.7 EXPLANATION OF ELECTRIC VARIABLES AND COMPONENTS

Dimensional unit	Arithmetic unit	Explanation
A	I	Electric current in ampere
V	U	Electric voltage in volts
KV	U	Electric voltage in kilo-volts
VA	S	Apparent electric power
W	P	Electric power in watts
KW	P	Electric power in kilowatts
KWh	P	Electric power in kilowatt hours
Ω	R	Electric resistance in ohms
KΩ	R	Electric resistance in kiloohms
MΩ	R	Electric resistance in megaohms

Designation	Explanation
L1	External conductor
L2	External conductor
L3	External conductor
N	Neutral conductor
PE	Protective conductor
3~	Threephase AC voltage

1.8 EXPLANATION OF ELECTRICAL TERMS

Rated current
The rated current In is the rated value for a system, a power circuit or electrical equipment.

Operating current
The operating current Ib is the current that must flow during uninterrupted operation.

Overcurrent
Overcurrent is any current that exceeds the permissible current loading.
Overcurrent is the generic term.
Overload current is an overcurrent that occurs in an electrically fault-free power circuit.
Short-circuit current is an overcurrent that can occur due to an error.

Operating voltage
The operating voltage is the voltage present between the conductors during full function.

External conductor
External conductors are live conductors.

Neutral conductor
A neutral conductor is connected to the neutral point and star point, and is capable of contributing to the transmission of electrical energy.

Protective conductor
A protective conductor is necessary for certain protective measures against shock currents, in order to establish an electrical connection to one of the following parts.
- exposed conductive part of the electrical equipment
- external conductive parts
- earth electrodes, equipotential bonding

Earth fault
An earth fault is an electrical connection between an external conductor or neutral conductor to the protective conductor.

Interwinding fault
An interwinding fault is a short in a winding of the motor. This winding has a different resistance to the other windings.

PEN conductor
A PEN conductor is an earthed conductor which performs the function of protective conductor and neutral conductor simultaneously.

Active part (of an electrical system)
An active part is a live part of an electrical system or device (e.g. fuses, terminals, switches, capacitors, etc.) through which current flows during normal operation

Emergency switch, emergency stop
This switch is identified by its colouring (red on yellow) and serves to stop hazardous states or hazardous movements. The emergency switch does not serve for switching during normal operation or isolation in accordance with the Five Safety Rules (1.5).

Isolation
This is the disconnection of a system or its equipment from all sources.

Basic insulation
This is the insulation of active parts during normal operation to protect against direct contact.

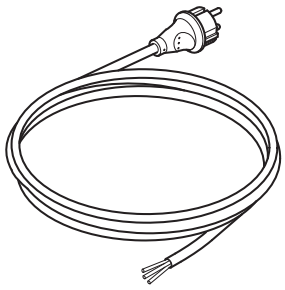
Direct contact
This is direct contact between an active part of an electrical system (an external conductor/phase) and the human body in normal operation.

Indirect contact
This is indirect contact between an active part and the human body due to an existing insulation fault. The housing of an electrical device which is not live under normal conditions is contacted (fault).

2 FUNCTIONAL TEST WORK INSTRUCTION

2.1 FUNCTIONAL TEST OF CORD SET

1. Ensure safe isolation from the supply before commencing work.
2. A multimeter or test buzzer should be used for testing. The function should be checked first of all.
3. Attach a measuring lead to one of the two pins on the connector.
4. Attach the second measuring lead to one of the device terminals N (blue) or L1 (brown). If no tone is audible or if the measuring device indicates an infinitely high resistance, the measuring lead must be attached to the other terminal, as it is not possible to tell to which pin the respective wire is connected on the earthing pin plug. If a tone is now audible or if the measuring device actuates, this wire is ok. Move the connecting cable in order to rule out a defective contact; if no interruption is discernible, this wire is ok. Repeat with the other wire N (blue) or L1 (brown).
5. Repeat point four in order to verify the functionality of the protective conductor (green/yellow). This is only necessary for equipment class I. See chapter 4.3
6. If an interruption or defective contact is found in one of the wires, then the wire is defective.
7. The defective component must be made inoperative in order to prevent further use.



2.2 FUNCTIONAL TEST OF THE CAPACITOR

1. Ensure safe isolation from the supply before commencing work.
2. An insulation resistance tester (e.g. Metriso 500) must be used for the measurement.
3. The capacitor must be electrically isolated from the device. To do this, disconnect the plug connector on the capacitor.
4. Set the measuring device (Metriso 500) to measuring range III.
5. Connect the two test probes of the measuring device to the two terminal lugs on the capacitor.
6. To start the measurement, press the test button on the handle.
7. The measuring device deflects fully, then after approx. 20 sec. the pointer begins to wander to the left. The measurement is only complete when the pointer has moved all the way to the left (zero deflection).
8. Now disconnect the measuring device from the capacitor and switch to the Volt (V=) position.
9. After approx. two minutes, reconnect the test probes to the capacitor (point 5). The display begins to wander from right (full deflection) to left (zero deflection).
10. If a deviation is found at point seven, for instance if the pointer remains at full deflection (right) or zero deflection (left) for more than a minute, then this capacitor is defective.
11. The defective component must be made inoperative in order to prevent further use.



2.3 FUNCTIONAL TEST OF SWITCHES/BUTTONS

1. Ensure safe isolation from the supply before commencing work.
2. A multimeter or test buzzer should be used for testing. The function should be checked first of all.
3. First disconnect all electrical connections at the switch or button.
4. With the switch in the 0 position, all of the switch connections must be checked against each other. If a continuity is found, the switch is defective.
5 In position I of the switch the superimposed switch connections must have continuity. If no continuity is found, the switch is defective.
6. The defective component must be made inoperative in order to prevent further use.



2.4 FUNCTIONAL TEST OF EARTHING CONTACT SOCKET

1. Ensure safe isolation from the supply before commencing work.
2. First perform a visual inspection of the socket for damage.
3 If no mechanical damage is found, work through chapter1.5 (The Five Safety Rules) in the reverse order.
4. A two-pole measuring instrument should be used to check the electrical functionality. If a multimeter is used, it should be set to V~ or VAC.
5. Now check the voltage present between L1 and N. If this is 230 V AC then the voltage between L1 and PE must also be checked.
6. If a deviation is found in point 2 or point 5, there is a defect.
7. The defective component must be made inoperative in order to prevent further use.



2.5 FUNCTIONAL TEST OF THE MOTOR OVERCURRENT PROTECTION SWITCH

1. Ensure safe isolation from the supply before commencing work.
2. First perform a visual inspection of the motor protection switch for damage.
3. A multimeter or test buzzer should be used for testing. The function should be checked first of all.
4. Connect one test probe of the test buzzer to terminal N and the second one to terminal U1/Z1.
5. Now switch the motor overcurrent protection switch on and off two or three times. The buzzing tone sounds when the switch is at one; no buzzing tone should be audible in the OFF position.
6. Now connect the test probes to terminals L1 and U2. Repeat point 5 as a check.
7. If a deviation is found in relation to point 5 or 2, there is a defect.
8. The defective component must be made inoperative in order to prevent further use.



2.6 FUNCTIONAL TEST OF THE THREEPHASE MOTOR

1. Ensure safe isolation from the supply before commencing work.
2. A multimeter should be used for testing; this must be set to ohm (Ω) and tested.
3. In order to obtain a reliable and meaningful measurement, all cables of the motor must be disconnected first of all. Note down the connection plan.
4. In order to determine an interwinding fault, the Y/Δ jumpers must be removed. Note down the connection plan.
5. Measure all motor cables to the housing; if a continuity is found, then the motor has an earth fault and is defective.
6. Measure all three windings individually; they must present the same resistance. If a deviation of ≥ 2.0% is found, the motor has an interwinding fault and is defective.
7. If the motor is equipped with a thermal link, this must be tested for continuity. If no continuity is present or a resistance of ≥ 5Ω is present, the motor is defective.

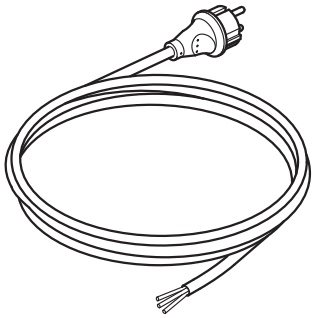
2.7 FUNCTIONAL TEST OF AC MOTOR

1. Ensure safe isolation from the supply before commencing work.
2. A multimeter should be used for testing; this must be set to ohm (Ω) and tested.
3. In order to obtain a reliable and meaningful measurement, all cables of the motor must be disconnected first of all. Note down the connection plan.
4. Measure all cables to the housing; if a continuity is found, then the motor has an earth fault and is defective.
5. Measurement of the individual windings is not possible, as they are internally bridged.
6. If the motor is equipped with a thermal link, this must be tested for continuity. If no continuity is present or if a high resistance is present, the motor is defective.

3 REPAIR WORK INSTRUCTION

3.1 REPLACING A CORD SET

1. Ensure safe isolation from the supply before commencing work.
2. Remove the old cable, noting the contact configuration.
3. Strip new cord set to desired length, taking care not to damage the insulation of the wires.
4. Shorten conductors N (blue) and L1 (brown) by 1.5 cm, to ensure that when there is a tensile load on the cable, the protective conductor (yellow/green) is disconnected from the machine last.
5. Press on the wire end ferrules, to ensure secure contact.
6. Install strain relief in order to prevent the connecting cable from being pulled out. Make sure that the strain relief is not excessively tightened, which could cause the cable to shear off.
7. Ensure secure contact when connecting the individual wires.
8. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality.
9. The defective component must be made inoperative in order to prevent further use.



3.2 REPLACING A 400 V CORD SET

1. Ensure safe isolation from the supply before commencing work.
2. First of all loosen the strain relief until the cable can be freely moved.
3. Disconnect the defective cable, noting the exact pin assignment.
4. Strip the new cable to the desired length, taking care not to damage the insulation of the individual wires.
5. First shorten wires L1, L2, L3 and N by 1.5 cm. This ensures that when there is a tensile load on the cable, the protective conductor (PE) is disconnected last.
6. Now strip the individual wires to the desired length.
7. Now press the wire end ferrules on, making sure that the wires terminate flush with the sleeve and that no individual wires protrude.
8. Now connect the cable in accordance with the pin assignment noted in point 3. Make sure that secure contact is achieved.
9. Now tighten the strain relief - but not too much, as this could cause the cable or an individual wire to shear off.
10. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality. See chapter 1.4

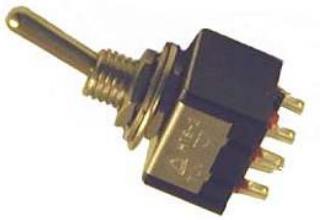
3.3 REPLACING THE CAPACITOR

1. Ensure safe isolation from the supply before commencing work.
2. Remove the wires (plug connector on capacitor).
3. Loosen the fixing nut on the front of the capacitor.
4. Remove the capacitor.
5. Now install and connect the new capacitor in the reverse order.
6. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality. See chapter 1.4.
7. The defective component must be made inoperative in order to prevent further use.



3.4 REPLACING SWITCHES / BUTTONS

1. Ensure safe isolation from the supply before commencing work.
2. Remove the individual wires at the switch, noting the contact configuration.
3. Remove the switch, noting its installation position.
4. Install the new switch.
5. Establish the electrical connection, observing the contact configuration of point 2.
6. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality. See chapter 1.4
7. The defective component must be made inoperative in order to prevent further use.



3.5 REPLACING THE EARTHING CONTACT SOCKET

1. Ensure safe isolation from the supply before commencing work.
2. Loosen the fastening screws and remove the socket from the housing.
3. Loosen and remove all cables at the earthing contact socket, noting the contact configuration.
4. Establish the electrical connection to the new earthing contact socket, ensuring correct and safe contacting.
5. The earthing contact socket can now be re-installed in the housing.
   Pay attention to the installation position of the socket. This must ensure the best possible splash protection, even in operating status.
6. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality.
7. The defective component must be made inoperative in order to prevent further use.



3.6 REPLACING THE MOTOR PROTECTING SWITCH

1. Ensure safe isolation from the supply before commencing work.
2. Mark the individual wires with the relevant terminal designation of the motor protecting switch, in order to prevent mix-up.
3. Now disconnect all electrical connections from the motor protecting switch.
4. The motor protecting switch can now be removed.
5. Now install the new motor protecting switch and restore the electrical connection.
6. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality.
7. In order to prevent further use of the defective motor protecting switch, it must be made unserviceable and disposed of.



3.7 REPLACING THE THREEPHASE MOTOR

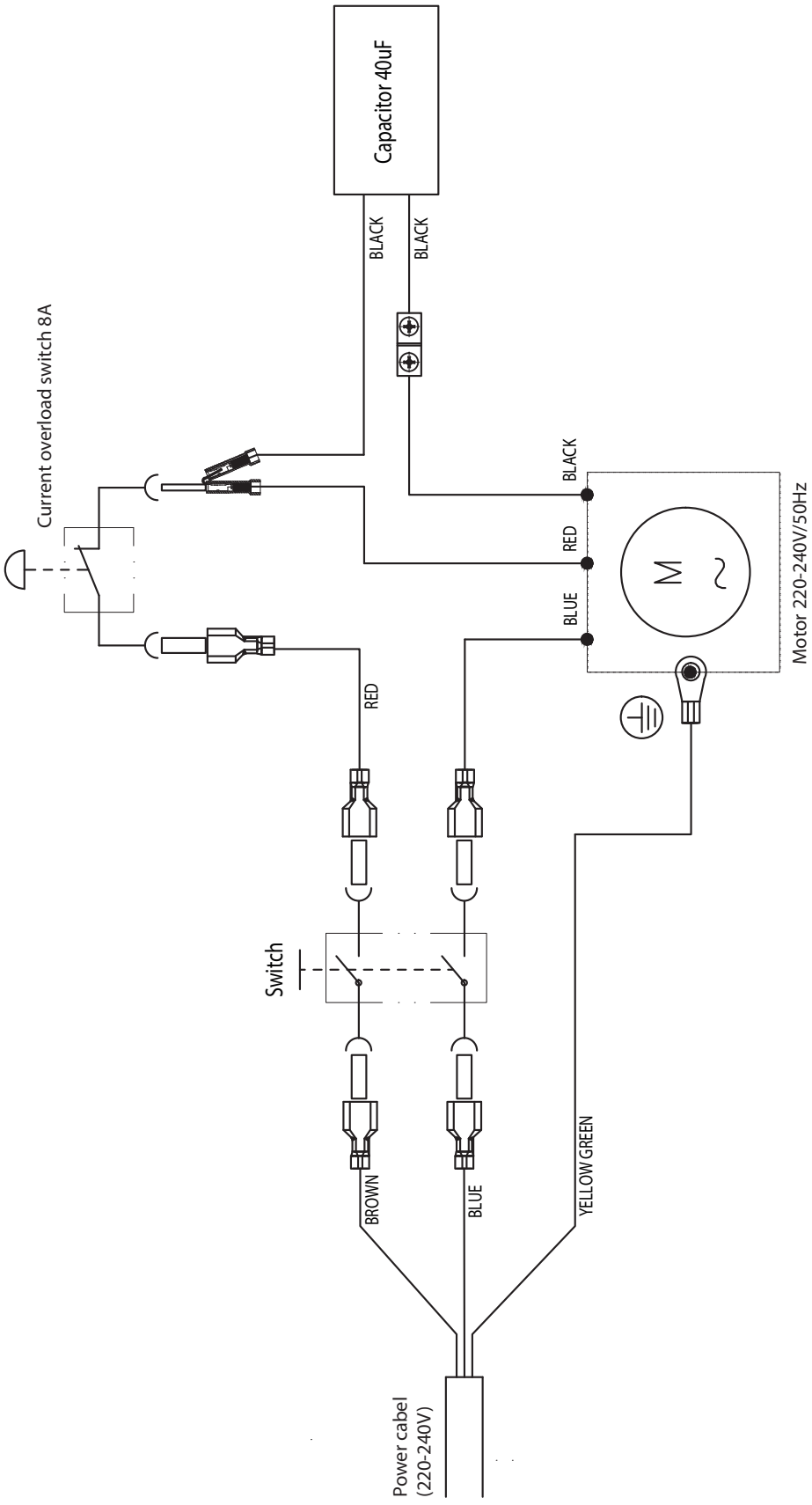
1. 1. Ensure safe isolation from the supply before commencing work.
2. First disconnect the defective motor, noting the exact pin assignment.
3. Now replace the motor.
4. Ensure correct positioning of the Y/Δ jumpers on the motor terminal board.
5. Observe the pin assignment noted in point 2 when connecting the individual wires. Make sure that secure contact is achieved.
6. After completing the repair a measurement in accordance with BGV A3 must be carried out.
7. If the direction of rotation of the motor is incorrect, external conductors L1 and L2 and U and V must be swapped over.
8. In order to exclude further use of the defective motor, all wires must be disconnected directly at the motor.
9. After completing the repair a measurement in accordance with BGV A3 must be carried out, in order to ensure electrical safety and functionality See chapter 1.4

3.8 REPLACING THE AC MOTOR

1. Ensure safe isolation from the supply before commencing work.
2. First disconnect the defective motor, noting the exact pin assignment.
3. Now replace the motor.
4. Observe the pin assignment noted in point 2 when connecting the individual wires.Also ensure secure contact when connecting the wires.
5. After completing the repair a measurement in accordance with BGV A3 must be carried out.
6. In order to exclude further use of the defective motor, all wires must be disconnected directly at the motor.

4 MACHINE-SPECIFIC DOCUMENTS

4.1 CONNECTION DIAGRAM SF 21 PRO (230V/240V)



4.2 CONNECTION DIAGRAM SF 21 PRO (230V/240V)

