

GP-1A Sample Grinder & Polisher

Manual Instruction



Contents

1.0 Product Description	1
2.0 Unpacking, shipping & installation	4
3.0 Safety Guidelines	6
4.0 Start-up & operation	8
5.0 Maintenance	14
6.0 Trouble shooting	15
7.0 Schematics	16

1.0 Product Description

1.1 General Description



GP-1A is a 8 or 10 -inch single wheel grinding/ polishing machine for manual wet grinding or polishing of metallographic specimens.

GP-1A is a variable speed (50-600 rpm) with three programmable fast speed buttons (approx. 100, 200 and 300 rpm) polisher.

Model:	GP-1A Single Grinder & Polisher
Speed (rpm)	50-600 rpm
Electrical Requirements:	220 Volts (single-phase input) (Power converted to 3-phase for motor - higher torque)
Frequency:	50/60 Hz
Motor Horsepower:	750 W
Manual Revision Date:	2015.03

1.2 Technical Specifications

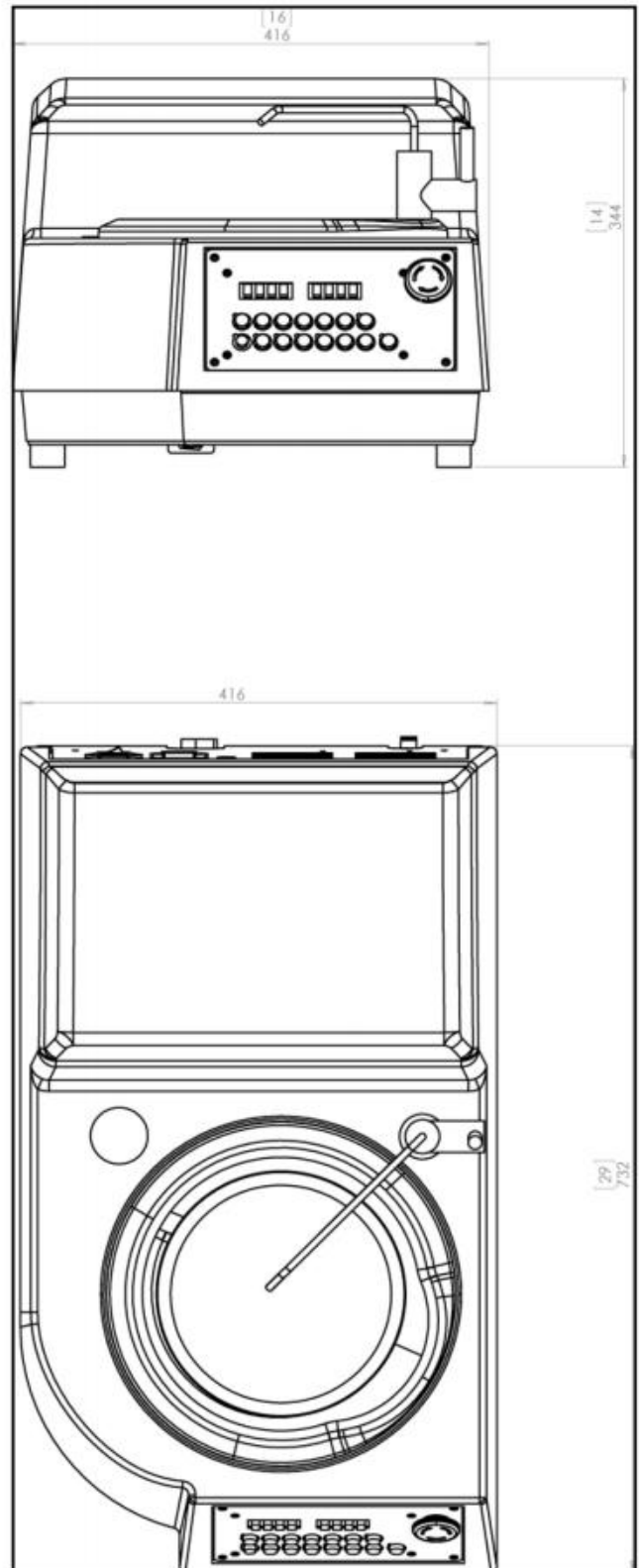
Electrical specifications:	220V(50/60 Hz) (single phase input-motor runs on 3-phase power for more torque)
Working wheel:	8-inch (200 mm) or 10-inch (250 mm) diameter
Motor power:	750 W
Polishing base speed:	50 to 600 rpm variable speed (20 rpm increments). Fast speed buttons pre-programmed for 200, 400 and 600 rpm)
Weight:	Approx. 102 lbs (46 kg)
Dimensions (WxHxD):	Approx. 14" x 10" x 23" (350 mm x 260 mm x 580 mm)
Working temperature:	32° - 100°F (0 - 40°C)
Shipping temperature:	32° - 100°F (0 - 40°C)
Storage temperature:	32° - 100°F (0 - 40°C)
Maximum diameter sample	1/3 diameter of working wheel

1.3 Mechanical Schematic

Note: Installation of the GP-1A should be on a flat sturdy surface, with easy access to drain, water and electrical connections.

1.4 Features

GP-1A is equipped with a powerful motor, connected to the polishing wheel through a maintenance-free V-belt.



2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD:

Weight: Varies, depending upon model
(approximately).

2.2 Shipping

When moving box, lift from bottom.



Caution: Heavy equipment. Take care to avoid bodily injury.

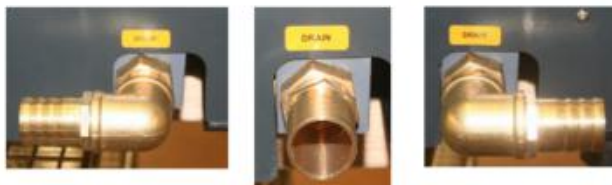
2.3 Installation

! Install unit carefully! Improper installation voids warranty.

GP-1A should be placed on a flat stable surface. Connect to air, water supply, drain and electrical connections.

After water, drain and electrical connections are completed, the system is ready for operation by activating the main power switch.

Backside connections



Connect drain for best direction to drain with fittings

External water supply:

The water supply line requires a 1/4-inch compression fitting. It is recommended that the water supply be turned off when the unit is not in use. Inlet water should be clean and contamination-free to extend the life and performance of the systems.

Electrical connection:

Connect six-foot electrical power cable to source.

Note: Inspect the operating voltage on the name plate.

3.0 Safety Guidelines

3.1 Warning Sign

! This sign points to special safety features on the machine.

3.2 Safety Precautions

! Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the **GP-1A**.

! Proper operator training is required for operation of the **GP-1A**. Any unauthorized mechanical and electrical change, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.

! Operate unit as specified in this manual.

! Disconnect power before opening unit.

! Do not leave any specimen or other parts on the working wheel.

! Ensure that the air slots on polishing base are not obstructed.

! When unit is not in use turn off water.

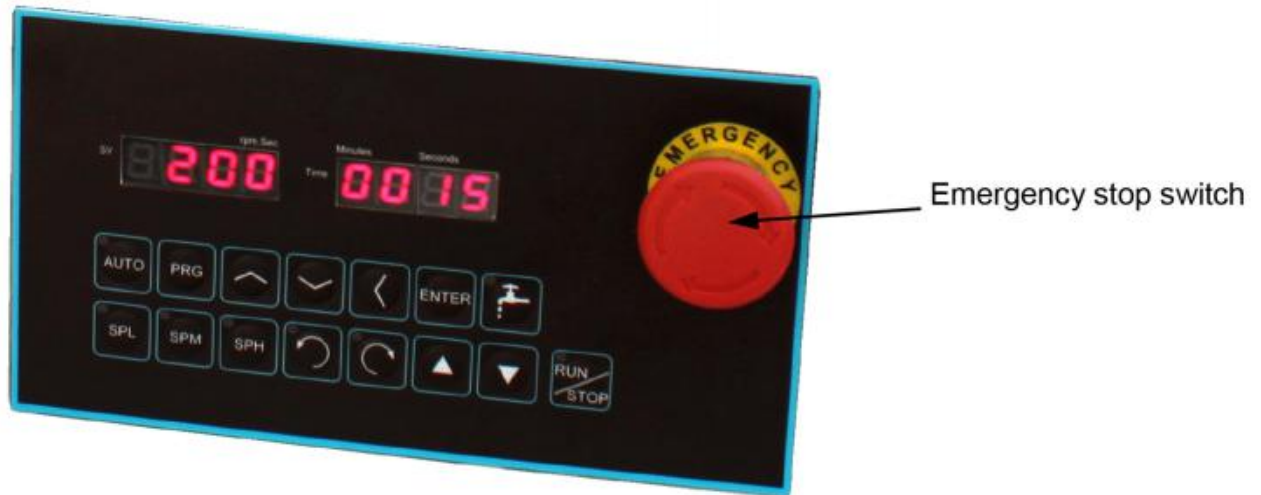
! Securely hold the sample, preferably with two hands.

3.3 Emergency Statement

GP-1A grinder & polisher has been designed for grinding or polishing metallographic specimens up to 2-inch diameter. **DO NOT GRIND OR POLISH** oversize sample (greater than 1/3 diameter of working wheel). Always follow proper operational guidelines and avoid contact with moving parts, lubricants and abrasives. Seek appropriate medical care for cutting injuries.

3.4 Safety Test

! Examine and verify that GP-1A machine safety devices and operating performance are in good working condition prior to use. The following safety check is considered important:



Emergency stop switch

Test:	Activate main switch. Depress emergency stop switch.
Proper Response:	Machine powers down.
Malfunction:	Machine does not lose power.
Corrective measure:	If system does not power down, disconnect power supply cord and call service technician.

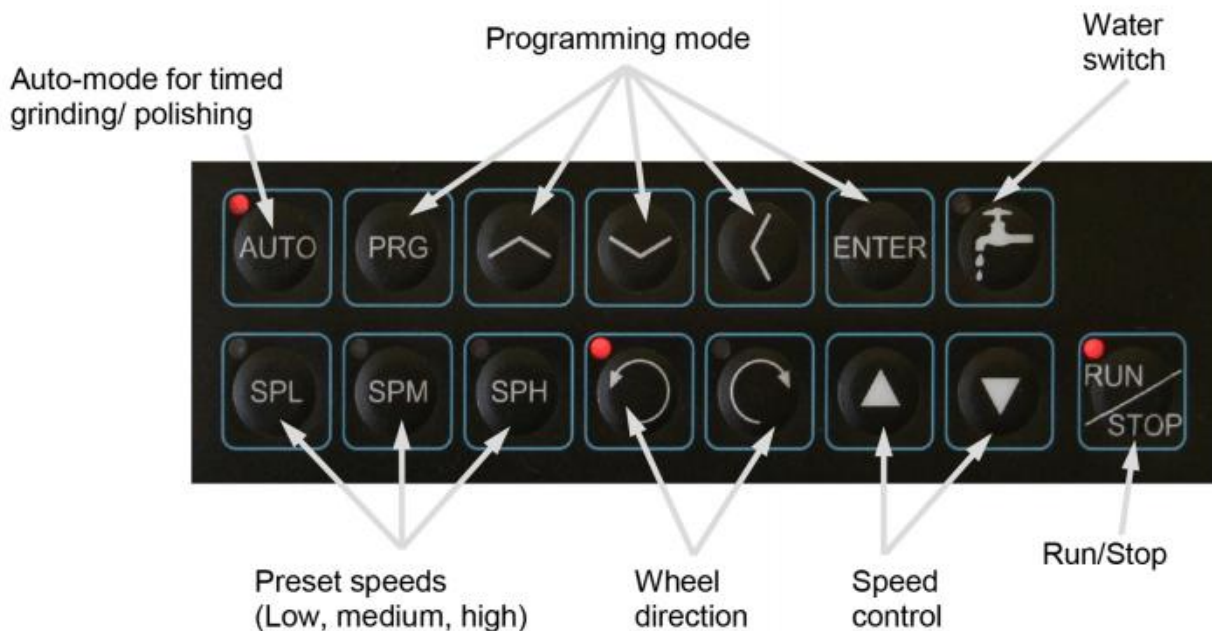
4.0 Start-up and Operation

4.1 General

The **GP-1A** is a hand grinding/polishing machine. By adding the power head, semi-automated polishing can be



4.2 Control Panel



- Emergency stop button:** Emergency stop switch cuts power to the motor immediately.
- Wheel direction:** Clockwise rotation and counter clockwise rotation.
- Run / stop buttons:** Start/stop the polishing wheel in both manual and auto mode.
- Water switch:** Activates the water solenoid for the rinse bowl and rinse spout.
- Preset speeds:** Allows for faster speed control, SPL - low speed, SPM - medium speed, SPH - high speed (factory setting approx. 200, 400, 600 rpm).
- Auto-mode:** Allows for running pre-programmed speeds and times (factory setting approx. 200 rpm, FWD, 30 seconds).

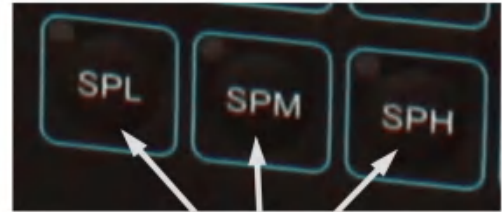
4.2.1 Direction and speed controller (manual)

1. To change direction of the wheel:

-Press clockwise or counter clockwise button,
LED will light

2. To change the speed of the wheel:

Select low, medium or high speed fast buttons
and use up and down arrows to fine tune speed
if required



Fast speed buttons

To change the speed setting for
the fast speed buttons use the
following procedure:

Press the PRG button and use
the up and down keys to SL
(slow speed) and press ENTER.
Use the up and down < key to
change the speed. Use Sn for
changing the medium speed
and SH for the fast speed.

4.2.1 Programmable Mode

- 1 The programming mode can be used to pre-set the
polishing speed, direction and time for automated
polishing. It can also be used to change the fast speed
buttons.

- 2 To change the speed of the wheel:

Press the PRG button and use the up and down keys
to SP1 and press ENTER. Use the up and down < key
to change the speed. Press ENTER to save.

- 3 To program a grinding/ polishing time:

Press the PRG button and use the up and down keys
to t1 and press ENTER. Use the up and down < key to
change the time (enter in seconds - displayed min-sec)

- 4 To operate the pre-programmed conditions:

PRESS the AUTO button and then start the program
with the RUN/STOP button. The pre-programmed
conditions will be executed.

4.3 Grinding / polishing by hand

1. Install working wheel and attach grinding papers / polishing cloths.
2. Switch on the machine in the back and set the mode, speed, and time (if required).
3. Position flexible water spout over working wheel. During sample preparation adjust water flow by turning water control knob as required. Note: Initial operation of water valve may contain air in the lines. Turn water on slowly to purge air from system.
4. Press RUN/STOP start and stop the machine in the manual mode.

4.4 Metallographic Specimen Preparation Basics

A typical metallographic specimen preparation consists of the following basic steps:

<u>Preparation Stage</u>	<u>Purpose</u>
Initial documentation:	<ul style="list-style-type: none">• To document the initial condition of the sample,• To map the sample surface,• To highlight the area of interest.
Sectioning / cutting:	<ul style="list-style-type: none">• To reduce the size of large samples and to sample the specimens close to the area of interest.
Rough, or planar grinding:	<ul style="list-style-type: none">• To obtain a planar surface,• To remove sectioning damage,• To approach the area of interest.
Rough polishing:	<ul style="list-style-type: none">• Ideally to remove all the subsurface damage and microstructural damage produced during cutting and rough grinding (Superficial scratches may still be present after this step).
Final polishing:	<ul style="list-style-type: none">• Generally, more for cosmetic purposes than for removing microstructural damage. In most cases, this stage should be minimized to avoid overpolishing and distorting the microstructural features.
Etching:	<ul style="list-style-type: none">• To enhance microstructural features such as grain boundaries, grain size, phase differences, etc.
Examination:	<ul style="list-style-type: none">• A variety of examination techniques are used in metallography, including: optical microscopy, electron microscopy and hardness testing.

4.4.1 Rough / Planar Grinding

Rough or planar grinding, is required to produce flat specimens and to reduce the damage created by sectioning. The planar grinding step is accomplished by decreasing the abrasive grit particle size sequentially to obtain surface finishes that are ready for polishing. Care must be taken to avoid being too abrasive in this step, and actually creating greater specimen damage than produced during cutting. This is especially true for very brittle materials such as ceramics and silicon.

The machine parameters which affect the preparation of metallographic specimens include: grinding / polishing pressure, grinding direction, and the relative velocity distribution between the specimen and the polishing wheel.

Grinding Pressure

Grinding / polishing pressure is dependent upon the applied force (pounds or Newton's) and the area of the specimen and mounting material. Pressure is defined as the Force/Area (psi, N/m² or Pa). For specimens significantly harder than the mounting compound, pressure is better defined as the force divided by the specimen surface area. Thus, for larger hard specimens, higher grinding / polishing pressures increase stock removal rates. However, higher pressure also increases the amount of surface and subsurface damage produced in the specimen.

Note regarding SiC grinding papers: as the abrasive grains dull and cut rates decrease, increasing grinding pressures can extend the life of the SiC paper.

Higher grinding / polishing pressures can also generate additional frictional heat which may be beneficial for the chemical mechanical polishing (CMP) of ceramics, minerals and composites. Likewise for extremely friable specimens (such as nodular cast iron), higher pressures and lower relative velocity distributions can aid in retaining inclusions and secondary phases.

Grinding Direction

The orientation of the specimen can have a significant impact on the preparation results, especially for specimens with coatings. In general, when grinding and polishing materials with coatings, the brittle component should be kept in compression. In other words, for brittle coatings, the direction of the abrasive should be through the coating and into the substrate. Conversely, for brittle substrates with ductile coatings, the direction of the abrasive should be through the brittle substrate and into the ductile coating.

Manual Preparation

In order to ensure that the previous rough grinding damage is removed when grinding by hand, the specimen should be rotated 90 degrees and continually ground until all of the scratches from the previous grinding direction are removed. When necessary, the abrasive paper should be replaced with a newer paper to maintain cutting rates.

4.4.2 Rough Polishing

The purpose of the rough polishing step is to remove the damage produced during cutting and planar grinding. Proper rough polishing will maintain specimen flatness and retain all inclusions or secondary phases. By eliminating the previous damage and maintaining the microstructural integrity of the specimen at this step, a minimal amount of time is required to remove the cosmetic damage at the final polishing step.

Rough polishing is accomplished primarily with diamond abrasives ranging from 9 micron to 1 micron. Polycrystalline diamond - because of its multiple and small cutting edges - produces high cut rates with minimal surface damage. Therefore, polycrystalline diamond abrasives are recommended for metallographic rough polishing on low-napped polishing cloths.

Rough Polishing Guidelines

Material	Recommendations
Metals (ferrous, non-ferrous, tool steels, superalloys, etc.)	Rough polishing typically requires two polishing steps, e.g., a 6-micron diamond followed by a 1-micron diamond on low-napped polishing cloths.
Ceramics and ceramic matrix composites (CMC)	Low-nap polishing pads using polycrystalline diamond, alternating with colloidal silica. This provides a chemical mechanical polishing (CMP) effect which results in a damage-free surface
Polymer matrix composites (PMC)	Diamond-lapping films are recommended.
Biomaterials	Low-napped polishing pads with polycrystalline diamond, alternating with colloidal silica. Alternatively, diamond-lapping films may work well.
Microelectronic specimens	Diamond-lapping films are recommended.
Plastics and polymers	800 and 1200 grit SiC abrasive paper are recommended.
Plasma spray materials	Diamond-lapping films or low-napped polishing pads with alternating diamond and colloidal silica abrasives.

4.4.3 Final Polishing

The purpose of final polishing is to remove only the cosmetic surface damage. It should not be used to remove any damage remaining from cutting and planar grinding. If the damage from these steps is not completely removed, the rough polishing step should be repeated or continued.

Final Polishing Guidelines

Material	Recommendation
Metals (ferrous, non-ferrous, tool steels, superalloys, etc.)	High-napped polishing pads with a nanometer alumina polishing abrasive. The polishing times should nominally be less than 30 seconds.
Ceramics and ceramic matrix composites (CMC)	Low-napped polishing pads using 1-um polycrystalline diamond, alternating with colloidal silica or colloidal silica alone.
Polymer matrix composites (PMC)	Fine abrasive diamond-lapping films, followed by a very light polish on a high-napped polishing pad.
Biomaterials	Low-napped polishing pads with polycrystalline diamond, alternating with colloidal silica.
Microelectronic specimens	Diamond-lapping films followed by a very light polish on a high-napped polishing pad.
Plastics and polymers	Light polish with alumina on a high-napped polishing pad.
Plasma spray materials	Diamond-lapping films followed by a very light and short alumina or colloidal silica polish on a high-napped polishing pad.

5.0 Maintenance

5.1 Introduction

The GP-1A requires very minimal maintenance. However, to increase the life of the polisher, it is suggested that the unit be rinsed after use.

5.2 Cleaning outside cabinet

The cabinet should be cleaned occasionally with a moistened cloth. Do not use any chemicals or cleaning abrasives.

6.0 Trouble Shooting

More extensive trouble shooting, repair guides, video's, parts list are provided online at www.trojanchina.com

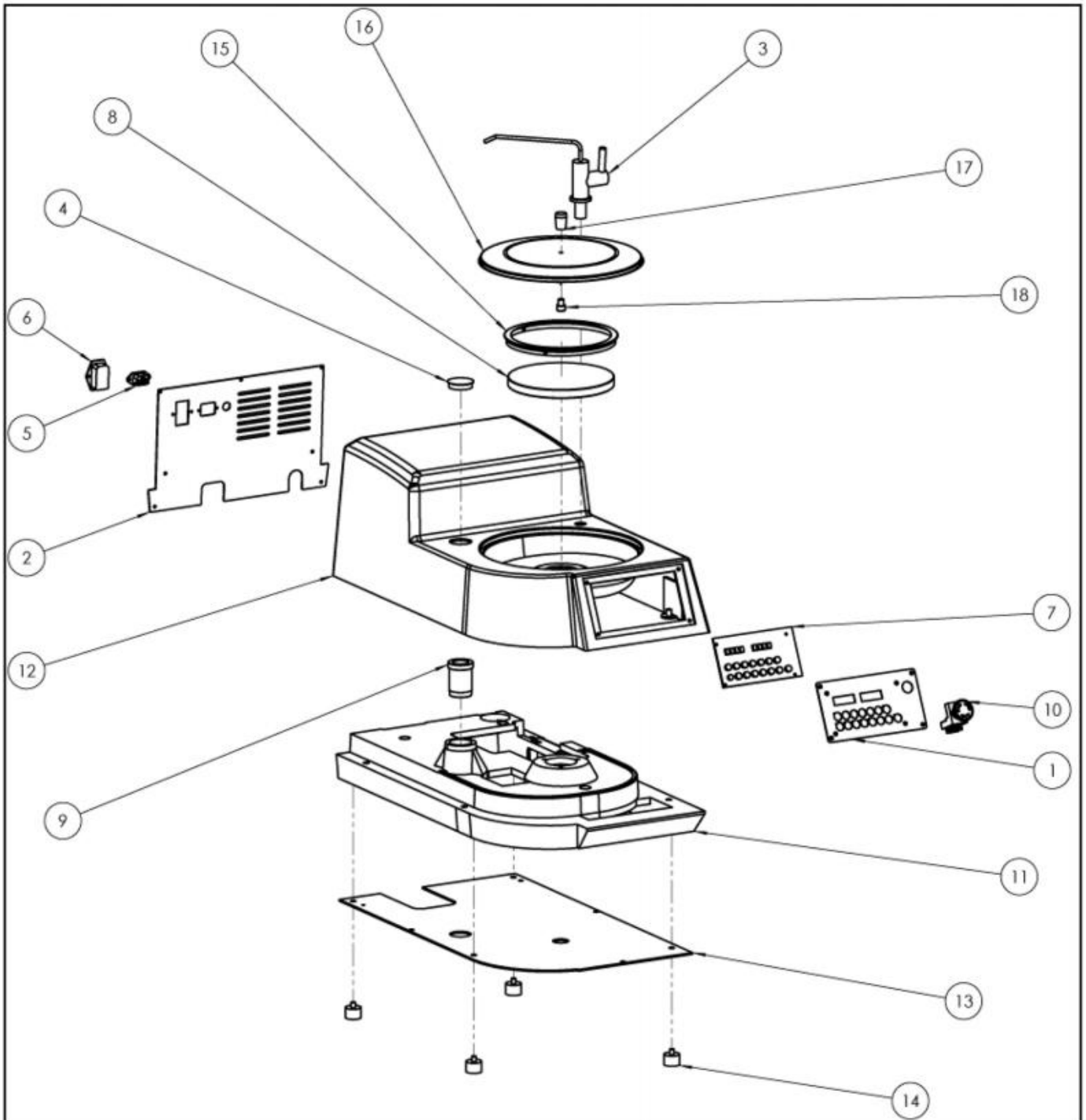
Problem	Cause	Solution
No power or function	<ul style="list-style-type: none"> a. Unit is disconnected from main electrical power supply b. Main power switch is off c. Blown fuse 	<ul style="list-style-type: none"> a. Verify electrical source and connection. b. Turn on main power switch. c. Replace fuse
No water supply	<ul style="list-style-type: none"> a. Water valve closed b. Water tube is extremely bent 	<ul style="list-style-type: none"> a. Open valve b. Straighten out water tube.
Working wheel is not running plane (flat)	<ul style="list-style-type: none"> a. Dirt (abrasive between working wheel and carrier wheel) 	<ul style="list-style-type: none"> a. Clean or replace if necessary.
Error Message E1	<ul style="list-style-type: none"> a. Motor power surge. 	<ul style="list-style-type: none"> a. Turn polisher off and wait until LED discharges. Turn unit back on, if problem persist contact TROJAN service department

Pry open fuse holder with small flat head screwdriver

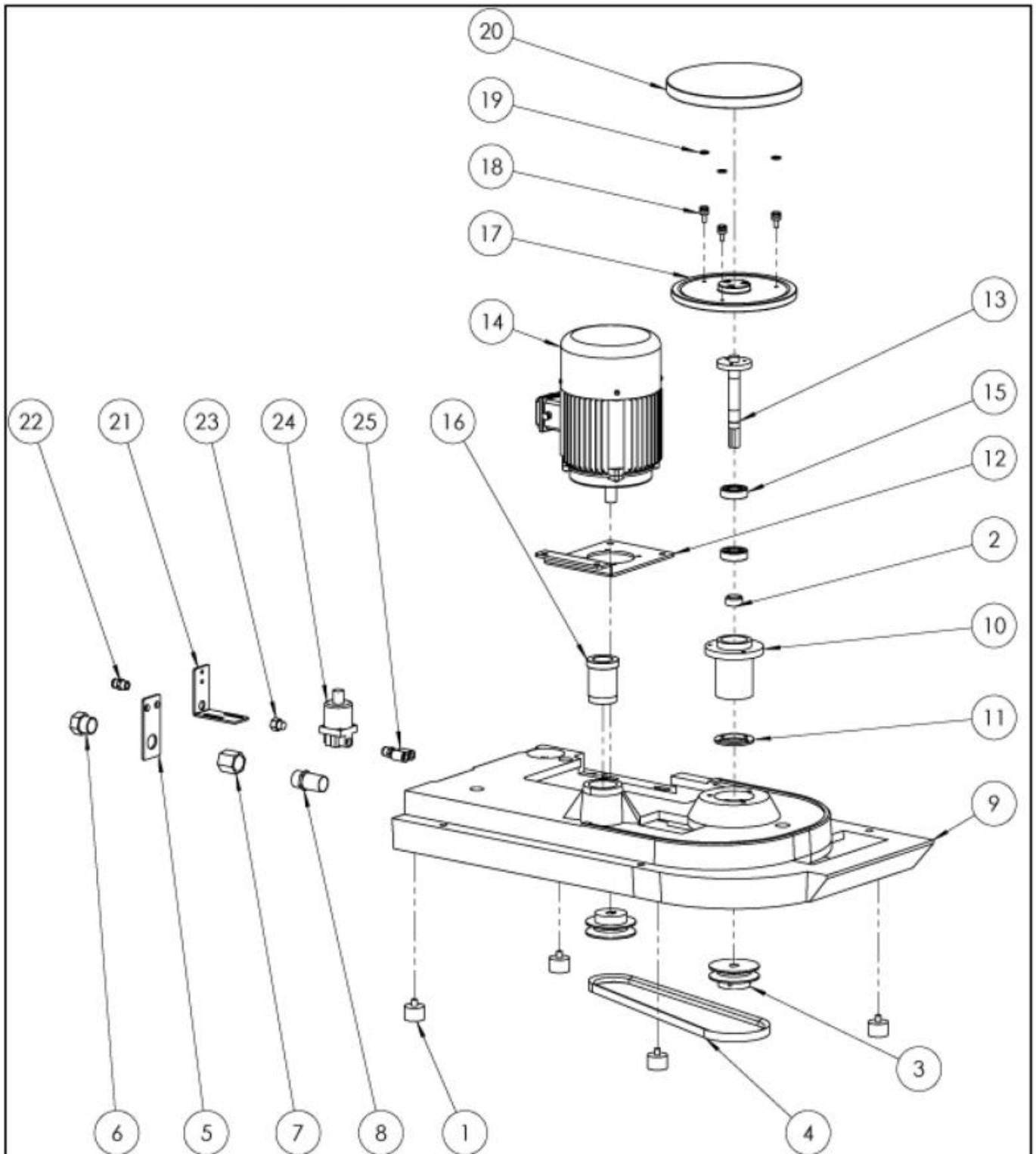


Replace fuse (10 amp fast blow)

7.0 Schematics (GP case assembly)

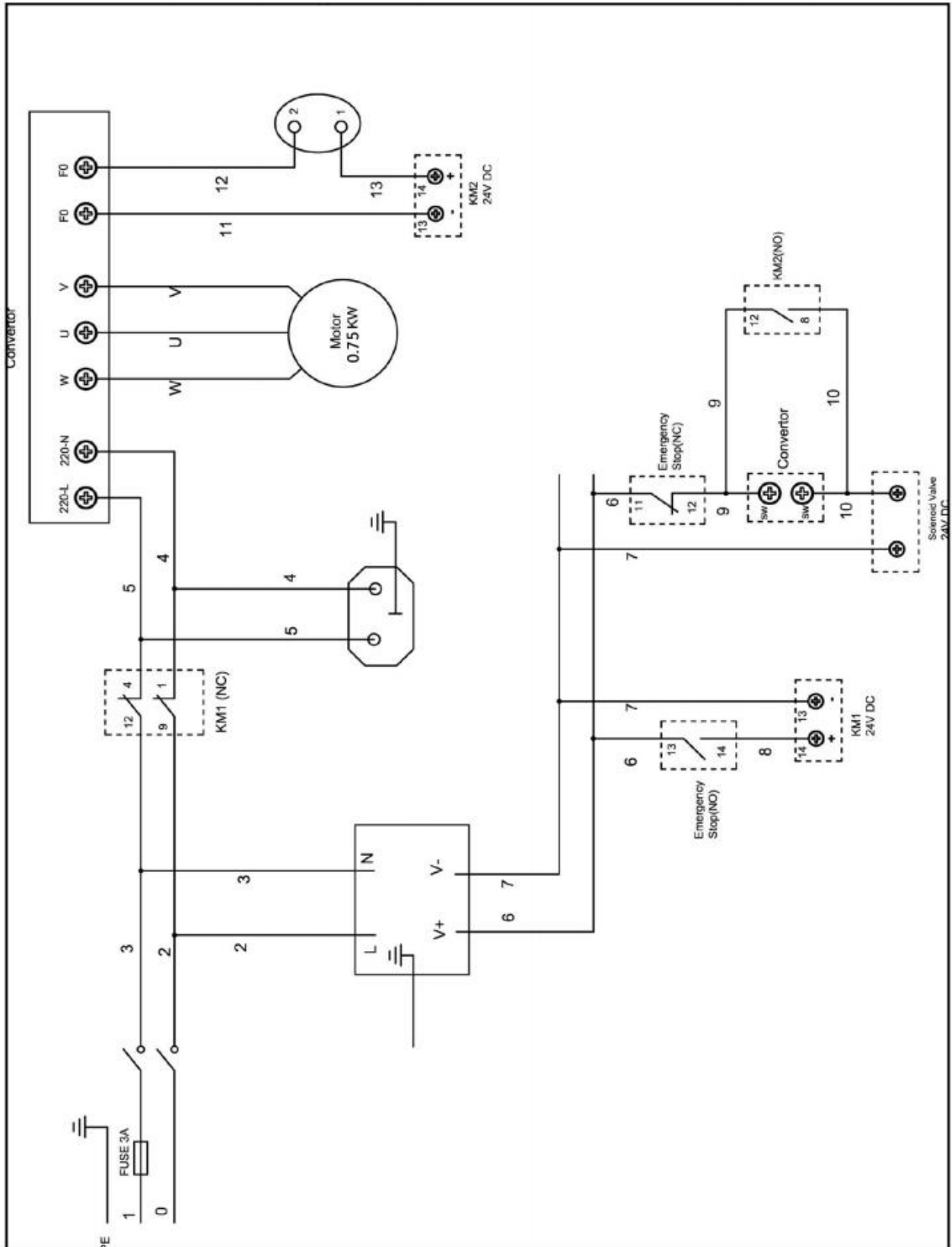


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	G1-M-007	Front panel	1
2	G1-01 4B	Back panel	1
3	PVR	Water valve right side	1
4	G1-M-002	Plastic cover	1
5	IEC INLET	IEC female	1
6	PS-001	ON/OFF switch	1
7	G1-015B	PC board	1
8	PW-1000	10 inch wheel	1
9	G1-025	Post colar	1
10	P150-210	Emergency switch	1
11	G1-M-001	GP-1A Casting	1
12	G1-001	GP-1A FRP cover	1
13	G1-M-004	GP-1A bottom cover	1
14	FT-004	Rubber feet	4
15	PTM-125-005	8 inch plain backed paper ring	1
16	PTM-225-007	Polisher cover	1
17	PTM-225-007H	Cover handle	1
18	PTP-S1-01(M10*12)	M10*12 socket screw	1

7.1 Schematics (GP internal mechanical assembly)

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	FT-004	Rubber Feet	4
2	G1-M-CR	GP-1A Copper ring	1
3	G1-003P	G1-003P	2
4	G1-005	GP-1A Single wheel belt	1
5	G1-M-006	Water adapter bracket	1
6	D-REDUCER	Drain reducer	1
7	G1-P-CFA	Copper female adapter	1
8	D-BARB	Drain hose barb	1
9	G1-M-001	GP-1A casting	1
10	G1-003S3	GP-1A spindle shaft housing	1
11	G1-M-SSA	GP-1A spindle shaft adapter	1
12	G1-M-008	GP-1A motor holder	1
13	G1-003S1	GP-1A spindle shaft	1
14	G1-007B	GP-1A motor	1
15	G1-M-BEARING	GP-1A spindle shaft bearing	2
16	G1-025	Post collar	1
17	G1-002	GP-1A polishing table support platen	1
18	G1-002PEG	Table support PEG's	3
19	G1-002-O-RING	Table support PEG's O-ring	3
20	PW-800	10 inch wheel	1
21	G1-M-005	Solenoid bracket	1
22	W-8MM	8mm water supply hose connector	1
23	D-REDUCER-B	Water reducer	1
24	G1-009B	24V solenoid valve	1
25	W-S-8MM	8 mm water split quick connector	1

7.2 Electrical Schematic



7.3 Full Programming Parameters

Programming Step	Value	Description
SR	1.4	Belt ratio - DO NOT CHANGE (Enter PW 0253 to access)
SP1	SPEED	Disc Speed - VARIABLE
T1	TIME	Runtime for SP1
SP2 to SP8	200	Multiple step disk speed - DO NOT CHANGE
T2 to T8	0	Runtime for multiple steps - DO NOT CHANGE
CN	1	Number of cycles – DO NOT CHANGE
SL	100	Disc speed for SPL - preset to 100 rpm
SN	200	Disc speed for SPM - preset to 200 rpm
SH	300	Disc speed for SPH - preset to 300 rpm
DF		Defaults—DO NOT CHANGE
U		SET 110/220V—DO NOT CHANGE
ST	65	Shutoff motor temperature - DO NOT CHANGE
CT		Current motor temperature - DO NOT CHANGE
CD1	0	Controlled by RUN/STOP button - DO NOT CHANGE
CD2	10	Display speed - DO NOT CHANGE