Installation manual Spirit

(Original instructions)

Document ID: Sup-Rim-Eng | Date of issue: October 22, 2014 | Revision date: December 8, 2022

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Designation

This manual applies to the 2-group and 3-group Spirit espresso machines with touchpad or Bastone operation manufactured by Kees van der Westen Espressonistic Works B.V. Separate rotational pumps with electric motors are part of the appliance.

Safe operation

- The espresso machine has to be placed in a horizontal position on a sturdy and flat surface.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- The new hose-sets supplied with the appliance are to be used. Old hose-sets should not be reused.
- Intended use of the appliance is restricted to well-trained personnel only.
- The appliance must be installed in locations where it can be overseen by trained personnel.
- The appliance may not be left unattended when there is the possibility that children and/or vulnerable people can reach the machine.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- The mains electricity the appliance is connected to must include a residual-current-circuit-breaker of 30 mA.
- The appliance may not be cleaned with the aid of a water jet.
- The appliance is not suited for outdoor use.
- Ambient temperature for correct operation of the appliance is 10-30°C (50-86°F).
- If ambient temperature falls below 5°C (41°F), keep the machine at ECO or ON to prevent freezing of water inside the machine.
  Note that the external rotational pump should be kept above freezing point of water as well. Whenever the machine and/or pump have suffered freezing conditions, ask a technician to start-up the appliance again.
- It is advised to install a leak prevention system as the appliances is directly connected to the water mains. An unattended leak can cause serious damage to the premises.

Advice for installation personnel

We do our utmost to have the machine in optimal condition before it is crated. Unfortunately storage and/or shipment sometimes has a negative effect on the state of the machine upon arrival.

Notes!
We recommend to check and bench-test each machine in your workshop immediately after delivery and certainly before installation at a client's location.

Check tension on the different electric leads at the area of installation before connecting the machine.

Body panels may become affected by prolonged exposure to salty air (transport by sea). Stains on shiny stainless steel and polished aluminium can be removed with silver-polish and a soft cloth. Stains on painted parts may be wiped off with wet towel, possibly with the addition of a mild detergent.

Prolonged storage may also result in deposition/crystallisation of water-dissolved minerals that can block the small openings in the machine (restrictors underneath fill valve, group valves and such) thus affecting the performance of the machine.

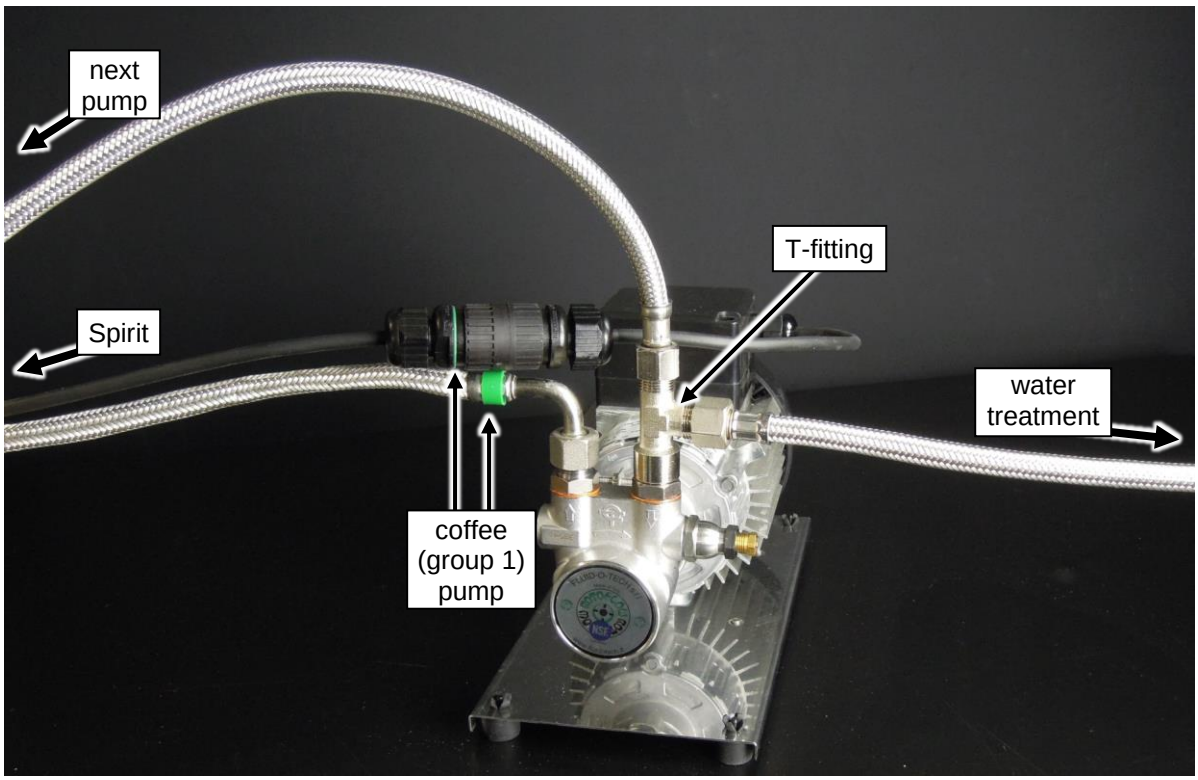
Despite our careful packaging, handling of the crate may be so rough that the frame bends or parts get damaged during transport. It is noted that the customer is responsible for additional insurance during transport as standard compensation from the shipping company will not cover all costs.

Installation quickstart

If the information in this section is not sufficient, we refer to the “installation manual” which you can find in a following section (page 17 onwards) of this manual, or contact your local installation technician.

1. Connect water

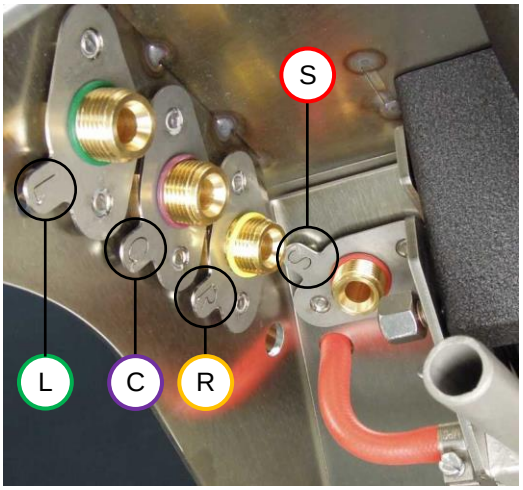
Install water treatment system (not in shipment), flush new cartridge, and connect water treatment system to all pumps. Mount steam boiler pump as the last one “downstream” of water treatment system. Make sure water has run through the pump(s) before the electric motors start.



First pump downstream of water treatment system. Note corresponding colour-coding on hose and cable-plug. The elbow end of the high pressure hose would normally be on the machine side..

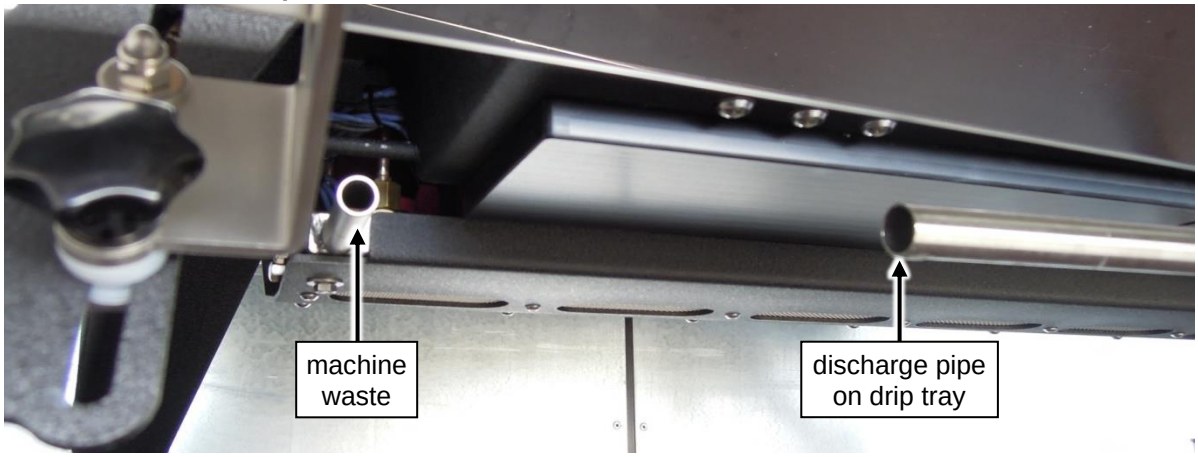
Connect high pressure hoses of all pump outlets to Spirit according to table and picture below.

	coffee system	group 1	group 2	group 3	steam boiler
2-pump machines	“C” green				“S” red
pump/gr Duette		“L” green	“R” purple		“S” red
pump/gr Triplette		“L” green	“C” purple	“R” yellow	“S” red



The photo shows letter and colour-coding on a pump/group Triplette.

2. Connect water disposal



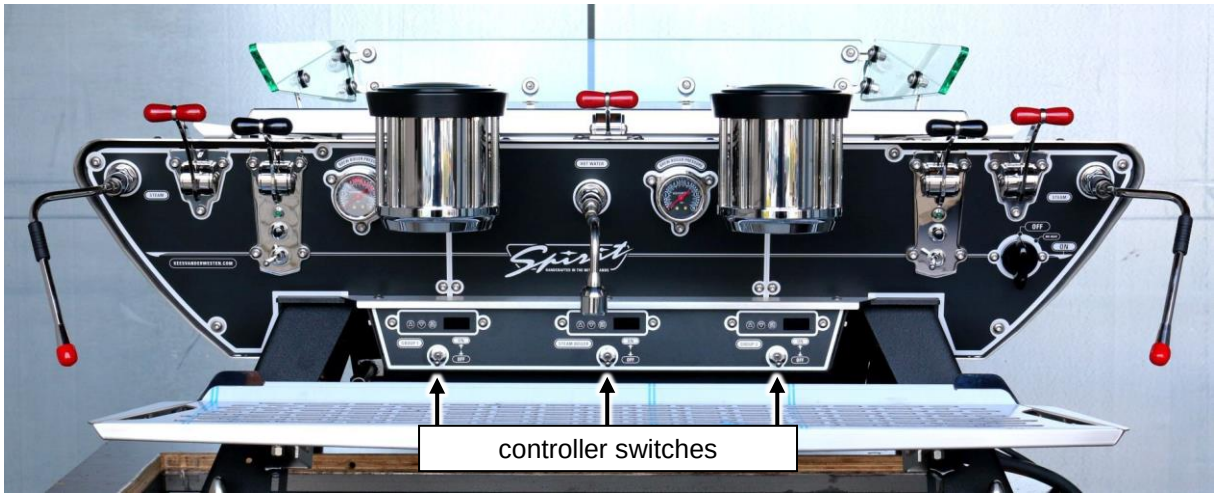
Attach both drain hoses to Spirit and fixate with hose clamp. Insert other end into sewer. Make sure hoses slope down and cannot get pinched.

3. Open water mains

(The coffee-boilers will start to fill.)
Check for leaks at all connections just made.

4. Make sure that machine is switched "OFF"

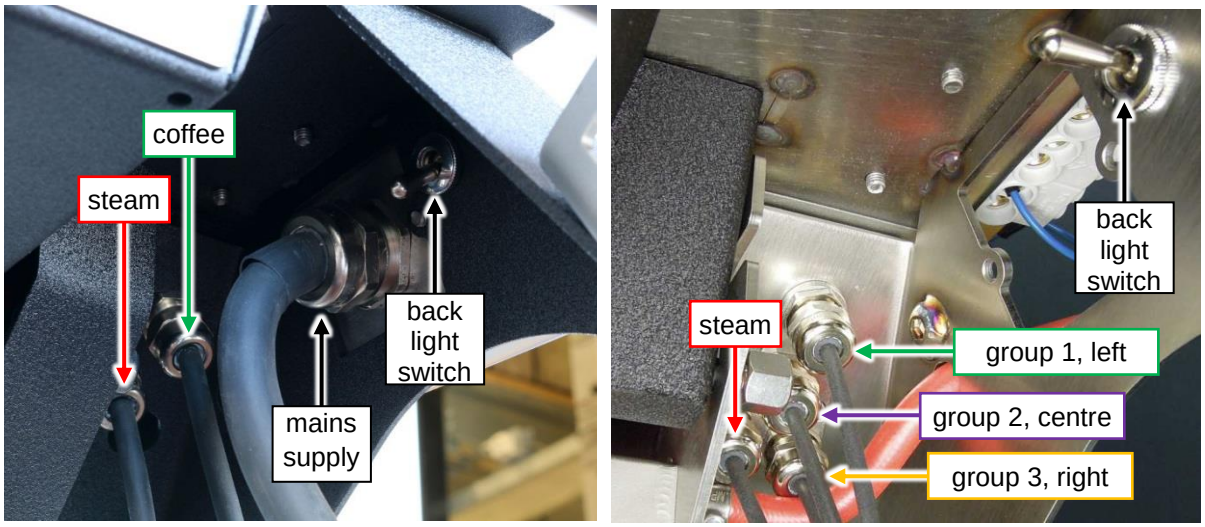
Mains switch = "OFF" and …



… all temperature controller switches point down.

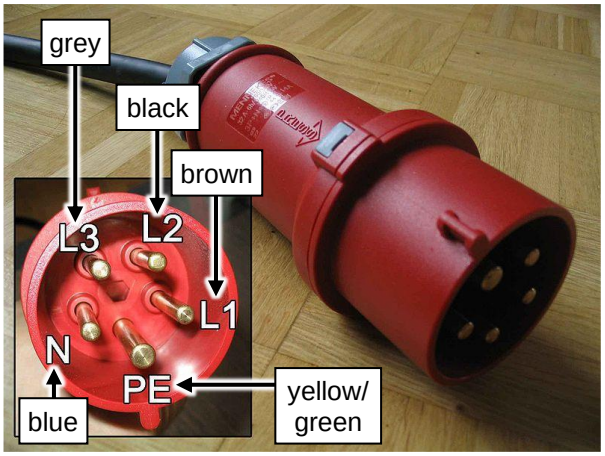
5. Connect electricity

Mount pump cables of machine to correct pump.



Left: pump cables on 2-pump machine. Right: pump cables on pump/group Triplette, mains cable not mounted yet. During 2019 machines colour coding on plugs at pump cables was introduced

Check tension on the leads or contacts and mount the mains cable directly in wall connection box or attach plug to mains power cable and plug in wall socket. Shown below is the 3-phase plug used in Europe.



	3-phase		1-phase	USA
Phase/ Live	P1	brown	brown	black
	P2	black		
	P3	grey		
Neutral	N	blue	blue	white*
Earth	E	yellow/ green	yellow/ green	green

Left: 400V 16Amp 3P-N-E plug. Right: table with mains cable electricity colour coding.
** The white lead in the USA cable must be hooked up to the anti-phase 115Vac live (anti-phase w.r.t. the black 115Vac live).*

6. Fire up and adjust

Turn mains switch to " NO HEAT"
Pumps are engaged and boilers will start to fill.
Engage groups until water runs from group.
After 2 minutes, pump(s) will disengage.

Turn mains switch to "OFF" and back to "NO HEAT" (repeatedly)
Repeat (3-6 times) until pumps stop before 2 minutes have past.

Check if water runs from all groups when these are activated
If not, check water connections.

Turn mains switch to "ON"
And switch back light "on".

Flip controller switches upwards
Boilers will heat up (this takes about 20-30 minutes).

Set coffee brewing pressure
By adjusting coffee system pump pressure (use coffee puck, not blind filter).

Set hot water temperature (when machine is at operational temperature)
Increase hot water temperature by decreasing steam boiler pump pressure.
Decrease hot water temperature by increasing steam boiler pump pressure.

Set dosages for brew shots and hot water
See user manual for details. This must be repeated after some days of use.

If the information in this section is not sufficient, we refer to the "installation manual" which you can find in a following section of this manual (page 14 onwards), or contact your local installation technician.

Welcome

Parts identification

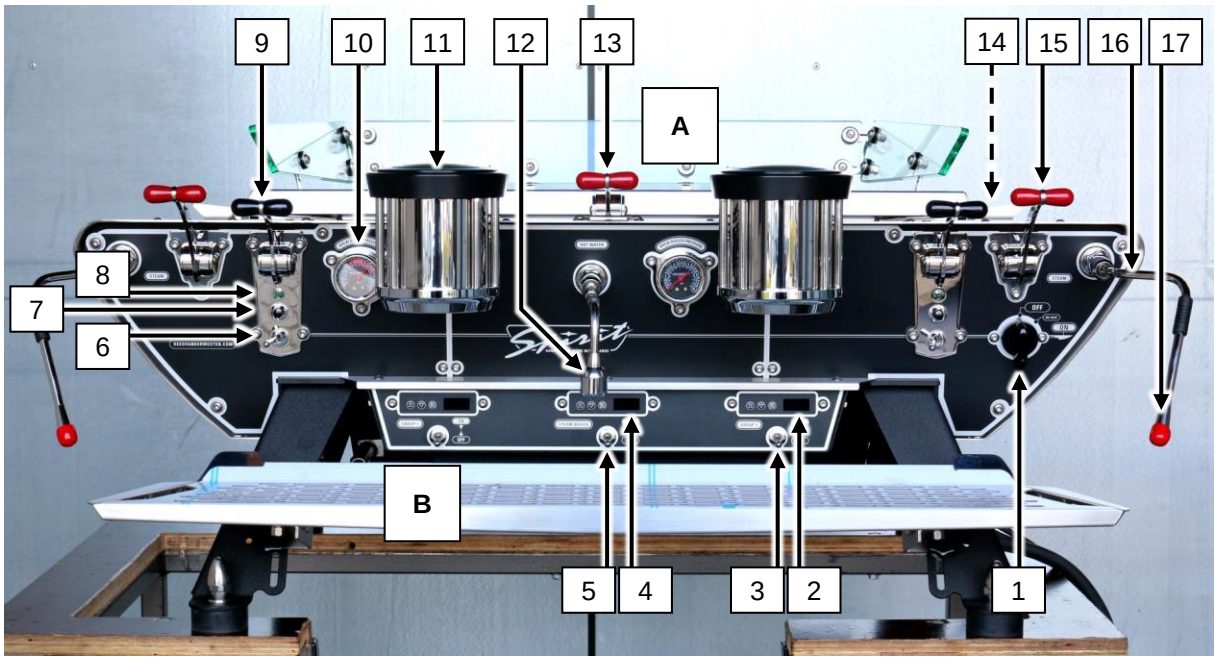


Figure 1. Showing main operational parts of the Spirit Duette Bastone version. The Spirit Triplette is wider since it has three groups but its functions are identical to the Duette. On the Touchpad version, the group brewing lever units are replaced with touchpads (see Figure 3).

1. Mains switch
2. Coffee boiler PID temperature controller (right group)
3. Coffee boiler heating on-off switch (right group)
4. Steam boiler temperature controller
5. Steam boiler heating on-off switch
6. Volume switch (left group)
7. Program button (left group)
8. Brew indicator light (left group)
9. Group brewing lever (left group)
10. Pressure gauge (left group)
11. Group (left)
12. Hot water spout
13. Hot water lever
14. Steam power adjustment lever (right)
15. Steam lever (right)
16. Steam wand (right)
17. Steam tip (right, with protective cap)

A. Cup warmer tray

B. Drip tray

Not visible on this photo:

- Green indicator lights for heating spirals (one for each spiral; see user manual)
- Switch for illumination of transparent back panel (see p. **Fout! Bladwijzer niet gedefinieerd.**).

Note on this manual

Work on the Spirit manual started in March 2012 and is a continuing process. Photographs in the manual are taken in the shop from (pre-production) machines being built at the time. For that reason, body panels and/or parts from the machines on display may be missing and parts in the machine you bought may not look identical to the parts shown in the manual. Over time, sections are added and/or improved, sometimes as result of readers making comments. If you have suggestions for improvements, do not hesitate to send them to: *support@keesvanderwesten.com*.

For more -or more recent- information, we refer you to the files that can downloaded from: http://www.keesvanderwesten.com/spirit-support.html.
The technical manual for the Spirit is meant for maintenance technicians and only available upon request.

Figure 2. The "customer" side of the Spirit Duette Bastone, shown with standard-logo.

Figure 3. A Spirit Triplette Touchpad version seen from the front.

Before installation

See “Advice for installation personnel” (page 2) about checking and bench testing the machine prior to installation on location.

Water quality

Have the local water tested and ask the water supply company if there can be seasonal changes in water quality and when so, in what order these changes occur.

Optimally, the water fed into the espresso machine would fall in the high end of the SCA “core zone”, see Figure 4, and have a pH of 7.0-7.5 (at 25°C).

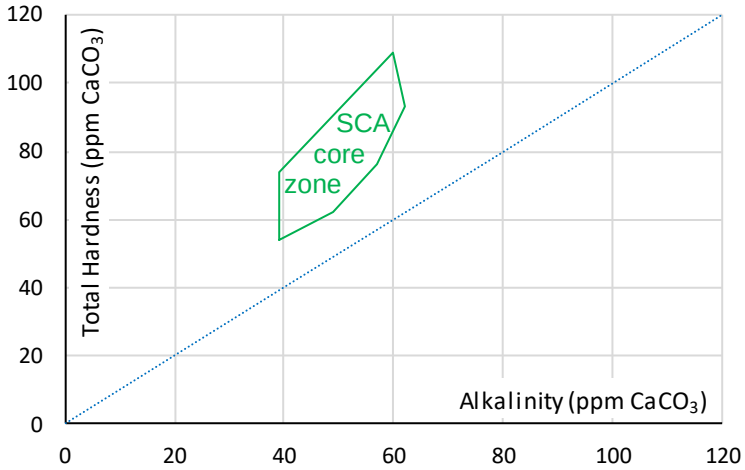


Figure 4. Alkalinity vs-Total Hardness graph showing the SCA “core zone” in green outline.

Besides the Alkalinity and Total Hardness requirements, the water should have the following properties:

Parameter	Target	Acceptable range	unit
Total Hardness	72	50-175#	ppm
Total Alkalinity	40*#	40-75#	ppm
pH	7.0*	6.5-7.5*, 6.5-8.0#	--
Electrical conductivity		< 3 times Alkalinity	µS/cm[1]
Total Dissolved Solids	150*	75-250*	ppm[1]
Calcium Hardness	51-68*	17-85*	ppm
Sodium	10*	at or near 10*	ppm
Sulphate	30	0-50	ppm
Chloride	0	0-30	ppm
Silica	0	0-5	ppm
Odour and colour	clean*, fresh*, odour free*, clear*		
Taste influencing organic compounds*#		not present	
Chlorine#, Hypochlorite#, Chloramines#			
Iron#, Lead#, Manganese			

* SCAA Technical Standards Committee, 2009: water properties for optimum taste.
# Values from “The SCAE water Chart” (2015?).

Table 1. Showing parameter values for water meant to brew coffee with.

[1] The conversion from electrical conductivity to TDS depends heavily on the water composition and temperature, yielding results that can vary significantly. Additionally, even if the estimated TDS value is accurate, it does not contain any information about what the TDS is actually made up of.

Water with properties that lie within the SCA “core zone” and correct pH combines technical aspects enabling a safe operation and sensory aspects yielding a high-quality brew, provided the other parameters are met as well. High brew-ratio’s, as for espresso, shift the optimum of total hardness and alkalinity towards higher values.

Area preparation

Before unpacking the machine, you must be sure that the area where the machine will be placed has been prepared properly. The countertop should be level and firm enough to carry the weight of the machine (up to 135 kg, 300 lbs), even when force is applied to it (to lock in the filter holders, tamp the coffee bed, etc.). A countertop height of 85-100 cm (33-40”) is suitable for most baristas.

The water supply and water treatment system must be nearby (max. 1.5 meter; 5 feet) the machine. Discharge may not be further away than 1.5 meters, have an internal diameter of at least 40 mm (1.5 inch) to accommodate two somewhat flexible hoses with external diameter 20 mm. The discharge should be fitted with a syphon. There must be space nearby to locate the two (or more) water pumps with their individual electric motors (depth x width x height: 30 x 20 x 25 cm each; 12” x 8” x 10”).

A wall socket or power mains outlet box must be nearby (max. 1.5 meter). Depending on the machine ordered, the power mains is either ~3N 400V or ~230V. All power mains must have an Earth connection and should be able to safely deliver the maximum power consumption of 7.5kW; 32.7 Amps (standard Duette) or 10.2 kW; 44.5 Amps (pump-per-group Triplette).

You may want to have the water, drain and power fed through one or more openings in the countertop (see Figure 5: Footprints of the Duette and Triplette). As the Spirit has full free space underneath, the opening(s) in the countertop can be positioned anywhere. For a visually pleasing result we recommend feeding the pump and drain hoses through an opening located just behind the front left foot, and the mains and pump cables through an opening just behind the front right foot, of the machine.

Notes!

Make sure that the mains and pump cables “bend-upwards” in the cabinet below the machine to prevent the possibility that water dripping along these feeds reaches the wall socket or pump-motors.

Be aware of the location and functioning of the knock-box when planning the design of the connections to your machine.

General tips

- Install the knock-box centred underneath the espresso machine or near the grinder(s) in the back of the bar. This will result in a favourable routing of the filter holder (knock empty, fill, tamp, lock into group).
- Have your cabinet-maker fit the knock-box prior to installing the espresso machine. Whoever installs the machine may not be able or equipped to do so.
- Have approximately 10 cm (4”) of free countertop space at the barista’s side of the machine. This is useful working space for cups and saucers.
- Have a fridge installed as close to the espresso machine as possible. Cold milk is essential for the proper preparation of a cappuccino.

Machine location

The machine is only to be installed in locations where it can be overseen by trained personnel. Areas where a water-jet could be used are not suitable as location for the machine.

Surface

The countertop must be sturdy enough to easily support the machines’ weight (when filled: up to 100kg) plus extra equipment (one or two coffee-grinders, tableware, …). The surface should have a height of 95-100 cm and be smooth, flat and horizontal.
It is advised to think about the location of holes in the countertop where the water and waste hoses and electric cables should pass before the machine is installed.

Pump location

There should be nearby space for the electric motors with rotary vane pump. The pump-assemblies should not be able to touch the walls of the cabinet they are located in to prevent noise. Further noise reduction can be achieved by placing the assemblies on a 2-4cm thick rubber-foam sheet with dimensions: 16x30cm per assembly (not supplied with machine). The pumps will be electrically connected to the espresso machine with an approximately 2 m long cable fitted with a plug.

Areas where a water-jet could be used are not suitable as location for the pump-assemblies.

Make sure there is air-flow possible near the motors to prevent overheating.

Dimensions

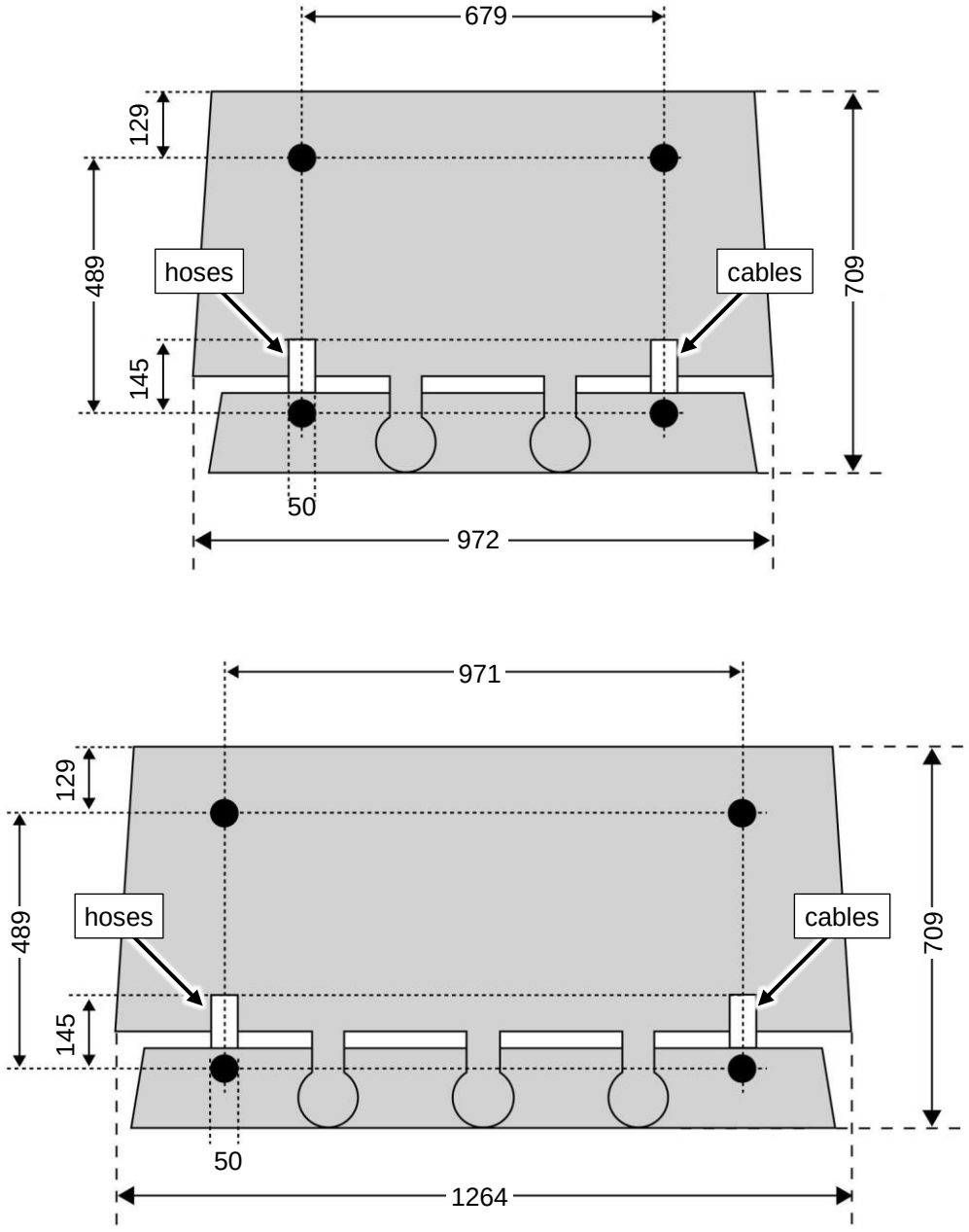


Figure 5. Footprints of Spirit Duette (top) and Triplette (bottom). Actual measurements may deviate up to 5 mm.

Black circle……	Machine foot (diameter = 50 mm)
White rectangles……..	Suggested locations for openings behind front feet to feed connections through the countertop

Minimum sizes of countertop openings

Pump hoses	35 mm (connector diameter is 22 mm, hose is 12 mm)
2 drain hoses	40 mm (20 mm each)
Pump + drain hoses	40 mm (insert pump hoses first)
Electric cables	20 mm (mains cable plus 2 pump cables, no plug)
All feeds through 1 opening	55 mm (insert pump hoses first)

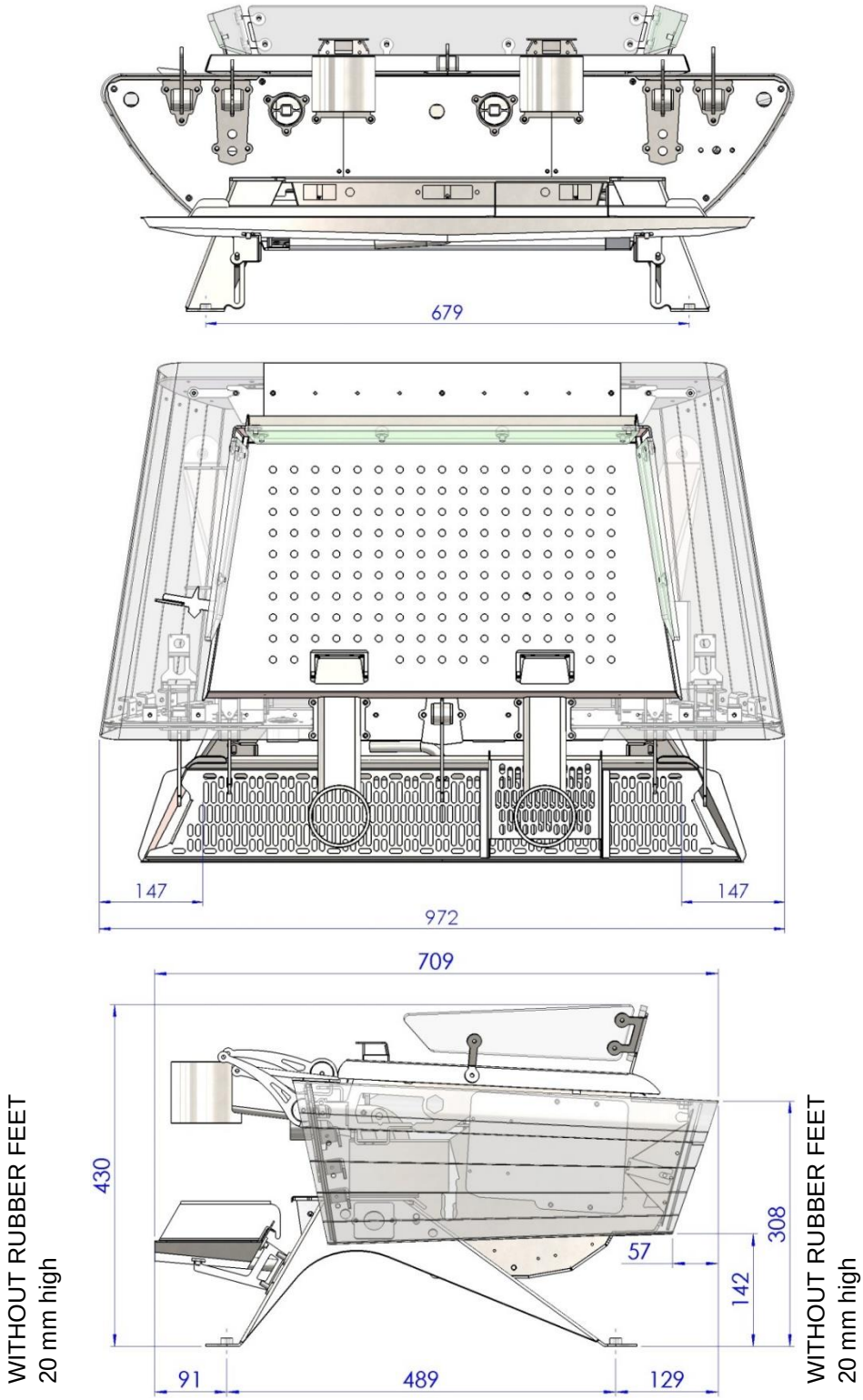


Figure 6. Measurements of Spirit Duette. Note that the rubber feet are not present, these are 20 mm high and have a diameter of 50 mm.

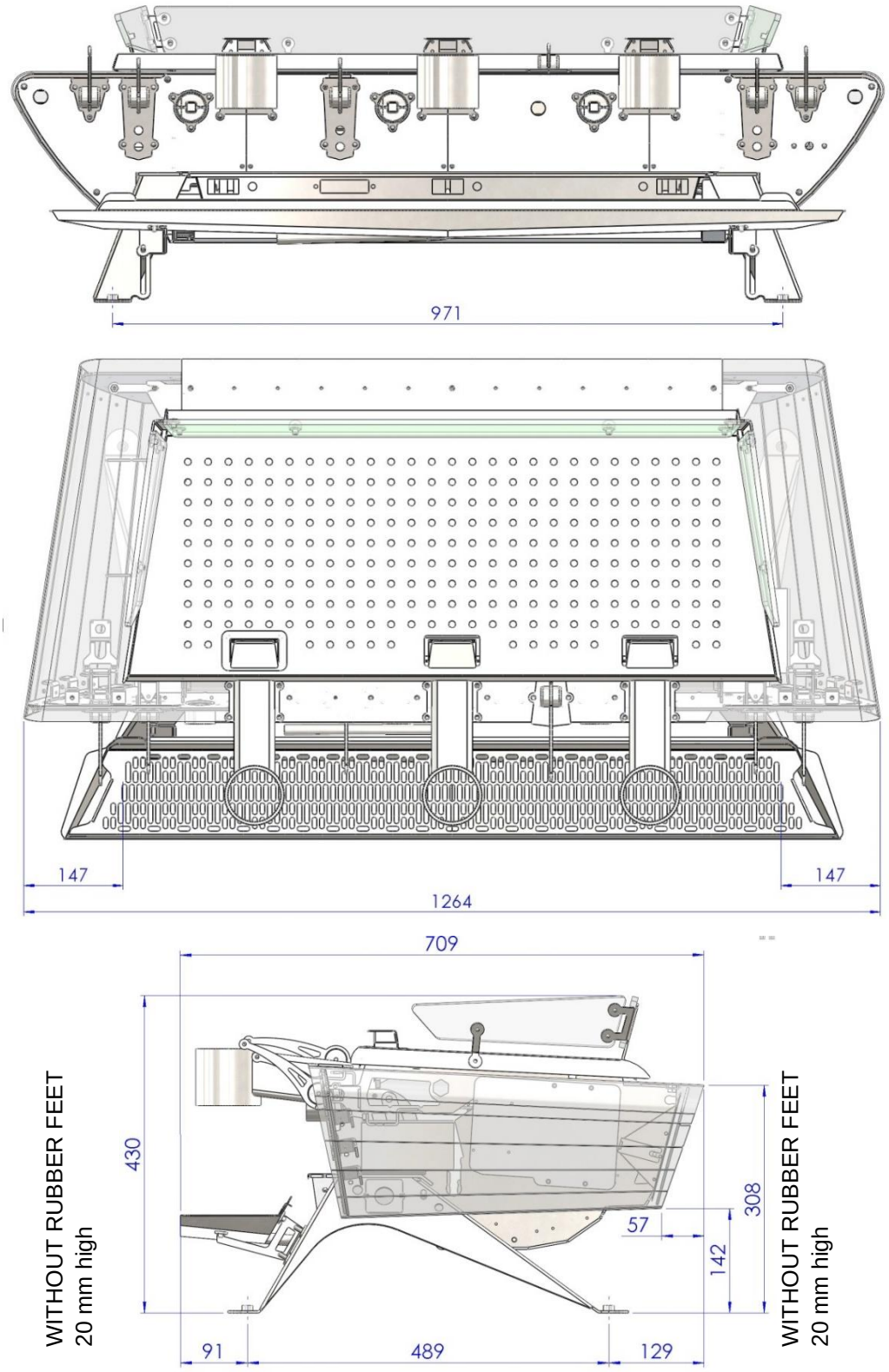


Figure 7. Measurements of Spirit Triplette. Note that the rubber feet are not present, these are 20 mm high and have a diameter of 50 mm.

Upon arrival

Parts included in standard shipment

- Spirit espresso machine

Accessories

standard	p/g Duette	p/g Triplette	
2 pcs	3 pcs	4 pcs	water pumps with electric motors
2 pcs	3 pcs	4 pcs	high-pressure, steel webbed, hoses, each 1.5 m (5 ft)
3 pcs	4 pcs	5 pcs	high-pressure, steel webbed, hoses, each 0.5 m (1 ft 8 in)
1 pcs	2 pcs	3 pcs	T-fitting (3/8M-3/8M-3/8F)

Duette	Triplette	
2 pcs	3 pcs	Filter holders with filter baskets
2 pcs	3pcs	Blind filter: Duette 2 pcs, Triplette 3 pcs

- 2 pcs discharge hose, inner diameter 15 mm (5/8”) with stainless steel hose clamps
- Stainless steel “Kees van der Westen” tamper; compliant with VST specifications
- Jar with cleaning powder
- Group brush
- 2 pcs “Kees van der Westen” shot glasses
- Kit with consumable parts to facilitate maintenance and routine service. Exact content varies over time and may depend on whoever is responsible for maintenance and service.

Extra materials needed

- Water treatment system (at least an effective particle filter and de-scaler)
- Materials to connect the water treatment system to the T-fitting (3/8M) on the first water pump
- Coffee grinder
- Knock box
- Pitcher
- …

Unpack and place

Tools needed

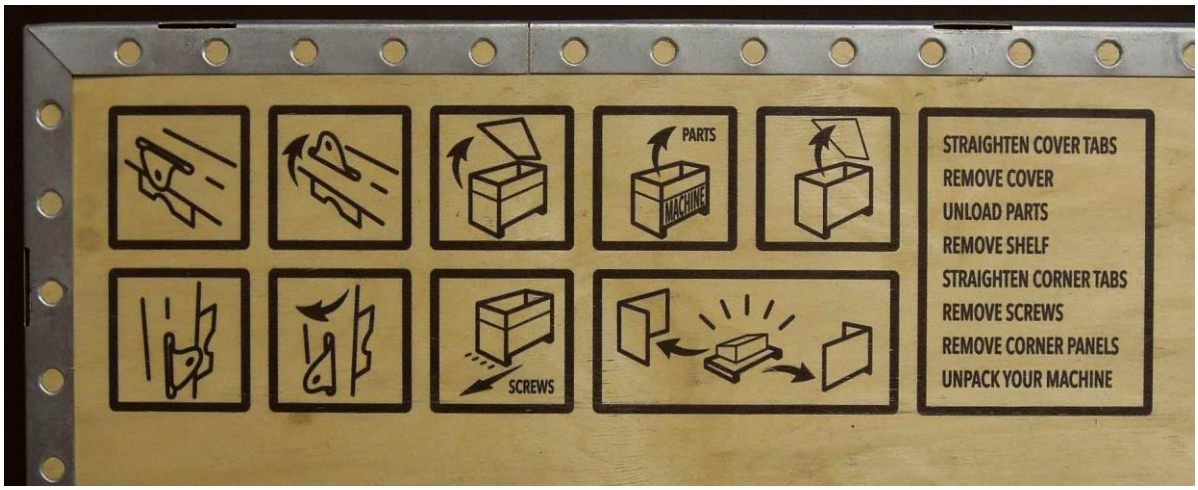
- flat screw driver or alike; pliers; Phillips screw driver no. 2, preferably on a power drill.

Procedure *(follow instructions printed on the crate)*

1. Straighten the top metal tabs with a flat screw driver and pliers and remove the lid of the crate.
2. Unload the individual parts inside.
3. Remove the shelf.
4. Straighten the metal tabs on 2 corners of the crate.
5. Remove the Philips screws and take the side panels from the crate-bottom.
6. Lift the machine by its legs and place on the countertop.

△ **Caution!** Lifting the machine other than by its legs may cause damage. For that reason you have to remove the side panels from the crate.

△ **Warning!** The machine has a considerable weight. Make sure you have assistance while lifting the Spirit to its place.



7. When necessary, adjust the feet such that the machine is level and all feet are firmly touching the countertop. The rubber feet can be individually lowered: loosen the cover nut first, then “unscrew” the foot from the leg. When correct height is achieved, tighten the cover nut (see Figure 8).

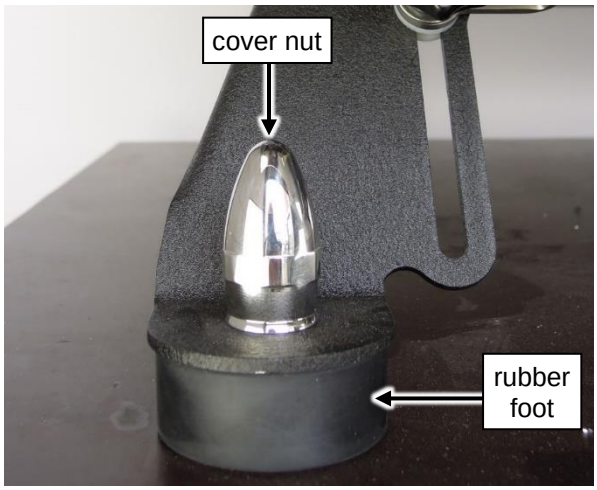


Figure 8. Adjust the height of an individual leg. Loosen the cover nut, “unscrew” the foot from the leg until correct height is reached, then tighten cover nut.

Installation

Precaution

Installation of and maintenance on the Spirit should only be undertaken by a qualified technician. Parts of the machine can reach a temperature of close to 130 °C (266 °F). The steam/hot water boiler contains water and pressurised steam at 125 °C and 1.35 bar overpressure (257 °F and 20 PSI), temperature and pressure in the coffee boiler system may reach up to 96 °C and 12 bar overpressure (205 °F and 175 PSI).

☠ Danger

We cannot be held responsible for damage and/or injuries resulting from actions performed on our machines by non-qualified personnel.

△ Caution!

Always ensure water supply to the machine is in perfect working order before connecting electric power.

Parts needed, included in shipment

- Machine
- 2/3/4* high pressure hoses, 1.5 m (5 ft)
- 3/4/5* high pressure hoses, 0.5 m (1 ft 8 in)
- 1/2/3* T-fittings 3/8M
- 2/3/4* pumps with motor, 30x20x25 cm (length x width x height; 12x8x10 inch)
- 2 discharge hoses with stainless steel clamps

* for amount per machine and version see page 15.

Parts needed, <u>not</u> included in shipment

- Hose that connects water treatment system to 3/8M fitting on first pump
- Water treatment system with supplies to connect it to the water mains

Tools needed

- Spanner 20-22 mm
- Spanner 30 mm or adjustable spanner
- Teflon tape
- Screw drivers (flat no. 2 and 4; Phillips no.2)
- Sharp knife
- Bucket
- Quick response temperature sensor and appropriate meter
- Device to measure tension (up to 400 Vac) of the electric wiring in the wall-box or -socket

Water supply

Rated pressure: 0.1-0.5 MPa (1-5 bar; downstream of treatment system)
Rated flow: minimum 4 litre/minute

The water supply should be able to deliver a minimum amount of 4 litres per minute in the range 0.1-0.5 MPa (1-5 bar). The machine and accompanying rotary vane pumps must be connected with the supplied new set of high-pressure hoses, old hose-sets should not be re-used. The distance between water treatment system and (first) pump cannot be greater than 0.5 meter and the distance between any pump and machine cannot be greater than 1.5 meter, unless there is appropriate material available to increase these distances.

Note! Not included in the shipment are supplies to make the connection between the water-tap and the water treatment system.

Water treatment system

The water treatment system should also be able to deliver a minimum amount of 4 litres per minute and should at least have a carbon block that not only traps drug-remnants, Chlorine and organic compounds but also prevents rigid particles >30 µm to enter the pump.

If the resulting water does not fall into the SCA “core-zone” (see Figure 4) have additional treatment installed.

Notes!
Flush the water treatment system according to the manufacturers instruction before connecting it to the pump-inlet.
Make sure that the functioning of the water treatment system will be checked on a regular basis.

Connect water supply to machine

Connect the water mains to the inlet of an efficient device to remove calcium and magnesium ions and Chlorine from the water entering your machine. Scale and Chlorine are the worst enemies of an espresso machine. Be sure to follow the instructions of the water treatment system before use (rinse!!), also when new.

In 2019 we introduced colour-coding to mark the different pump-cables and hose-connections on the machine. The installation material contains pairs of coloured rings that can be used to colour-code the hoses on both ends accordingly. We suggest to use the rings supplied with the long high-pressure hoses to colour-code them accordingly: put a similar coloured ring on each end of the hose.

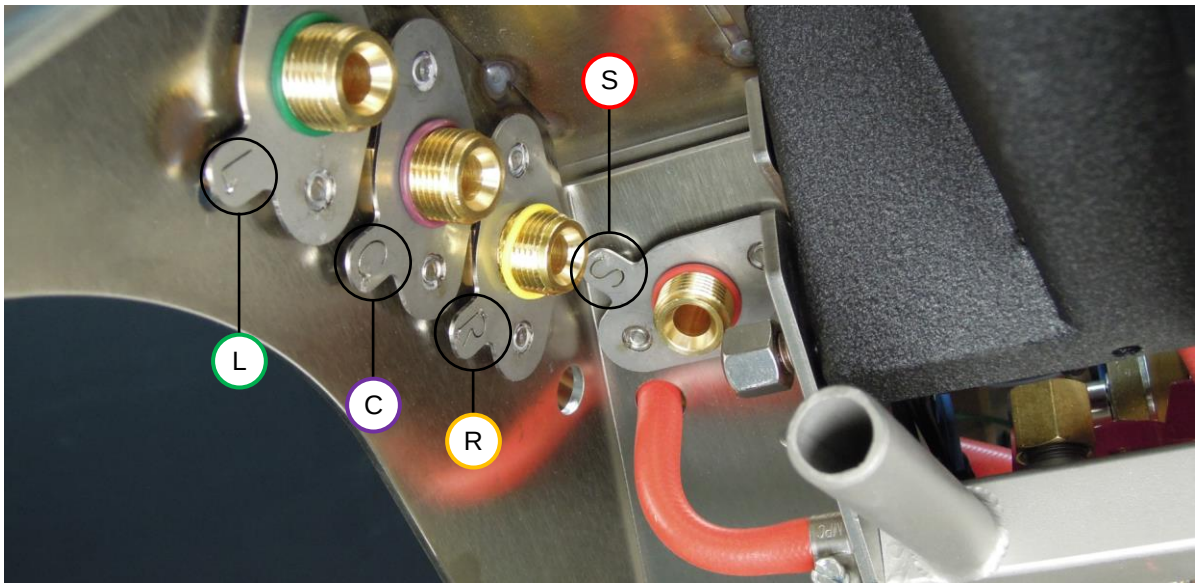


Figure 9. Showing the high pressure hose connections on a pump-per-group Spirit Triplette. Inlet fittings have a coloured O-ring to facilitate installation. Compare to right part of Figure 10.

Figure 10 and Figure 11 show schematically how to connect the hoses and pumps to the different versions of the machine. Described below is the standard lay-out for machines with 2 pumps.

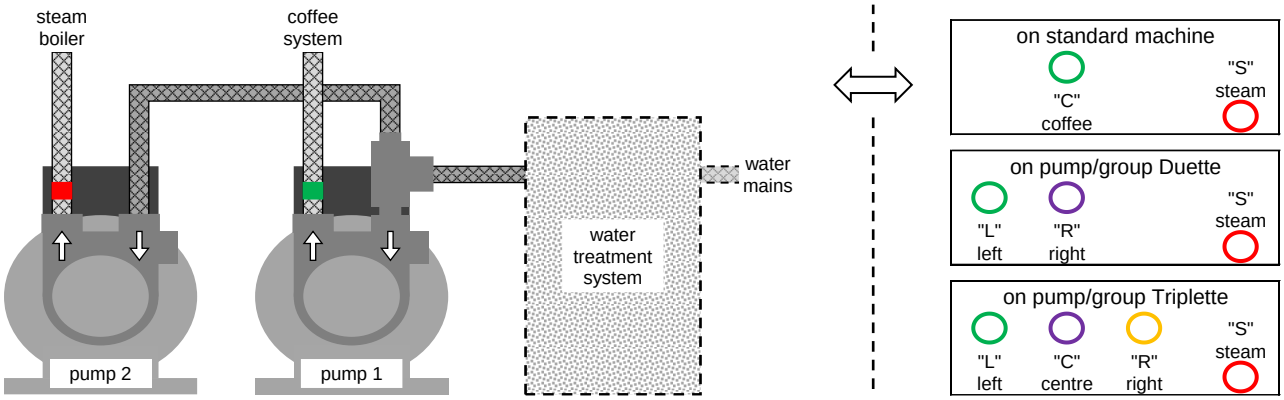


Figure 10. Left: Set-up for standard, 2 pump, machines. Water treatment system on right is connected to the coffee boiler pump. The T-fitting on this pump then supplies water to the steam boiler pump. The water treatment system and the rightmost hose are not included in your shipment. Right: Showing letter-marking and colour coding on machine for the different machine versions. Compare to Figure 9.

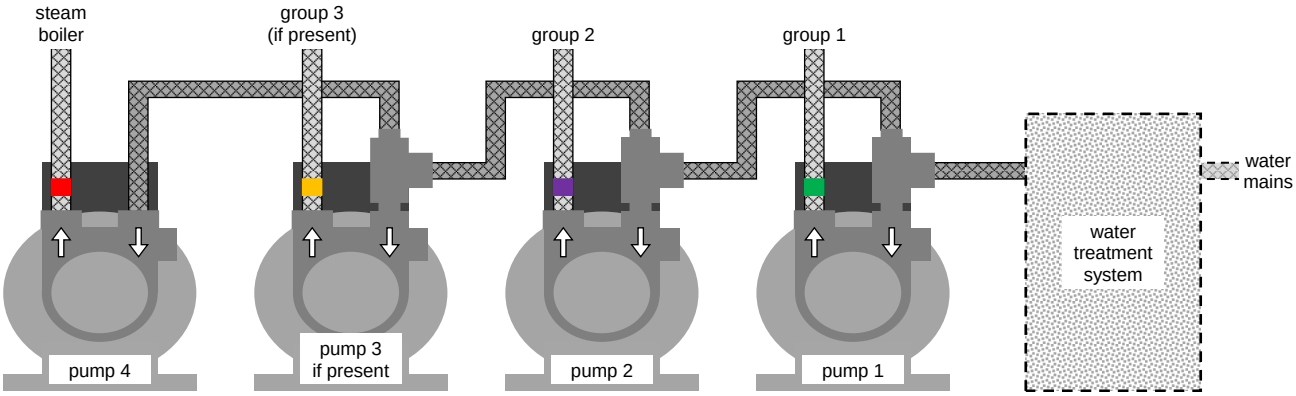


Figure 11. Set-up for pump-per-group machines. In a Duette there is no 3rd group and PUMP 3 in the above scheme is not present.

1. Colour-code the long hoses on both ends with the red and green rings respectively.
2. Attach the knee-shaped end of the red-coded steam boiler hose to the rear fitting on the machine with marked “S” and red O-ring on it (3/8M connections; see Figure 9). There is no need for any type of gasket. The rounded end of the hose fits snugly onto the fitting, providing a leak free connection when turned tight.
3. Do the same with the knee-shaped end of the green-coded coffee system hose (front fitting marked “C”, green O-ring)
4. Attach the other ends of the long high pressure hoses to the outlet of an individual pump (3/8M connections, see Figure 10 and Figure 11). No need for gaskets.

Notes!

The outlet of the pump is marked with an arrow pointing away from the pump-housing.
The inlet of the pump is marked with an arrow pointing towards the pump-housing (see Figure 12).
The steam boiler hose (red) attaches to the pump without T-fitting.

5. “Loop” the pump(s) with short hose(s) as shown on Figure 10 and Figure 11.

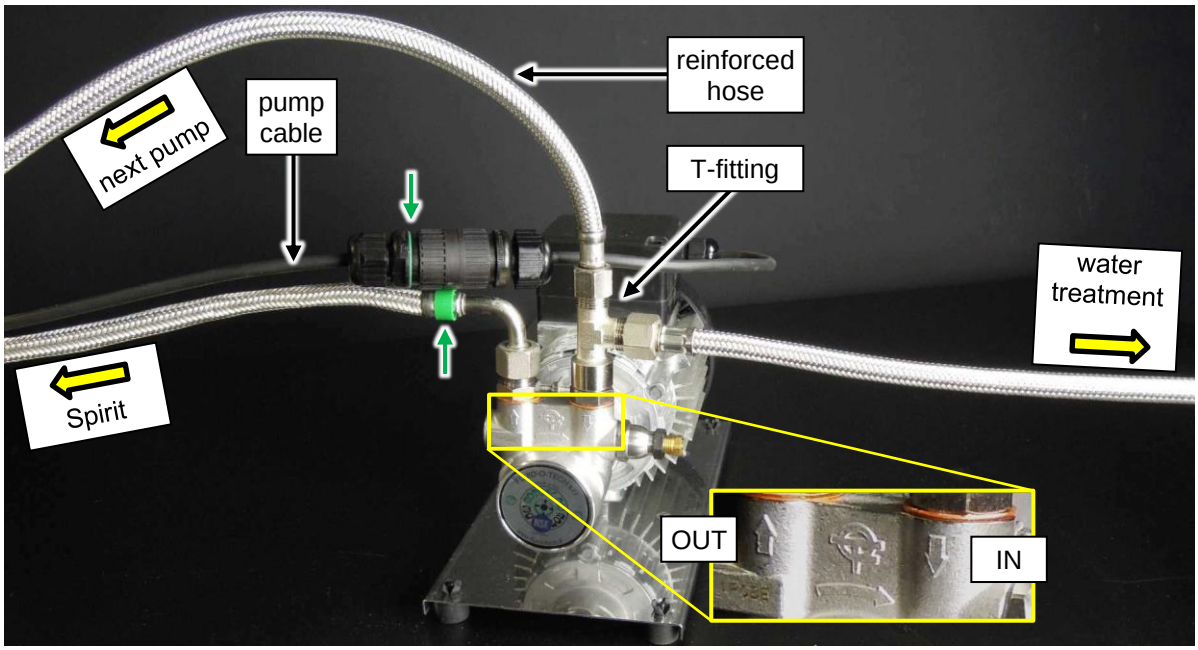


Figure 12. Coffee system (standard machine) or group 1 (pump-per-group machine) pump (green colour coding on hose and cable) with inlet and outlet shown. The reinforced hose to the machine is mounted incorrectly (with knee-shaped end at pump) for better view of parts.

Below, under 5 to 7, the procedure to include a water treatment system is described. Make sure that you install a water treatment system or de-scaler in between the incoming tap water and the high pressure pumps.

6. Use a suitable hose to connect the water mains to the inlet of your water treatment system.
7. Fill/rinse the water treatment system (also when new) until the water runs clear (see the manual of your water treatment system for this procedure).
8. Check the quality of the treated water and adjust when necessary.
9. Use the last short hose to connect the water treatment system to the “first” pump.
10. Open the water supply tap and check the earlier made connections for leakage. Tighten when

Notes!

The coffee boilers will start to fill immediately when the tap is opened, even when there is no power (yet) to the machine. Filling will stop as the air inside the boilers is compressed to water mains pressure.

It takes a while for a new filter cartridge to stabilise. If you want to check the treated water (after filtering) use the new cartridge for a while before taking a water sample.

Waste/drain

The appliance has two drain hoses: one for the drip tray and one for the machine itself. These semi-flexible hoses have an external diameter of 20 mm (inner diameter: 16 mm). The hoses must slope downwards all the way from machine to waste to prevent clogging. The waste at the location should have a minimum inside diameter of 38 mm to accommodate for the two hoses and incorporate a water-lock to prevent smelly odours.

1. Position the stainless steel hose clamp on one end of the discharge hose. Slide the end of the hose over the machines waste-pipe (see Figure 13) and tighten the hose clamp.
2. Do the same with the discharge hose of the drip-tray.
3. Insert the other ends of the discharge hoses into the drain or a discharge container.
4. If necessary, cut the discharge hoses to desired length.

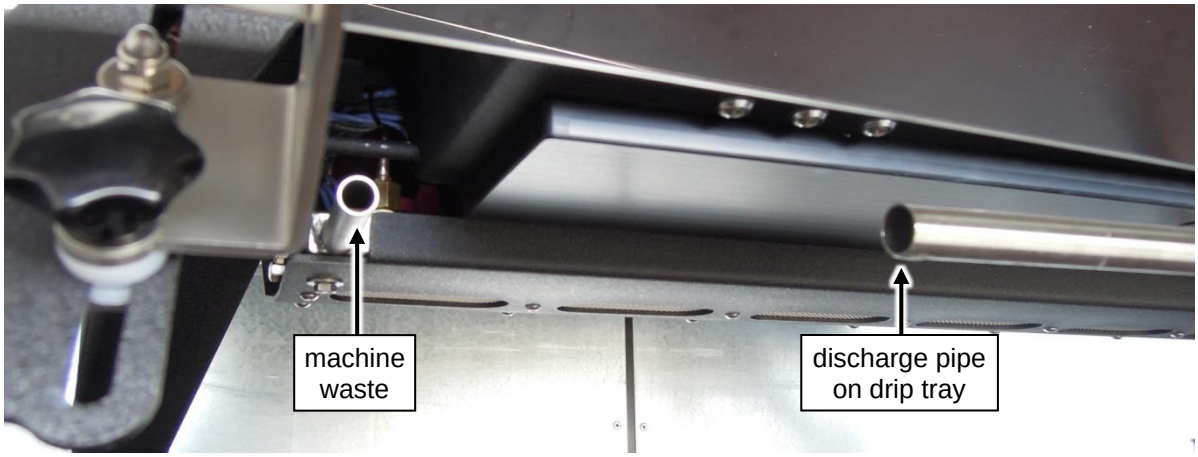


Figure 13. Spirit seen from bottom front without hoses attached to the machine-waste and drain pipe on the drip dray.

Notes!

To prevent sedimentation of sludge, the discharge hoses should slope down to your drain or discharge container over the entire length of the hoses.

Prevent leading the discharge hoses over a sharp corner to prevent possible pinching of the hoses over time. A pinched hose may lead to overflowing drip tray or possible water spill inside the machine (out of the discharge aerator).

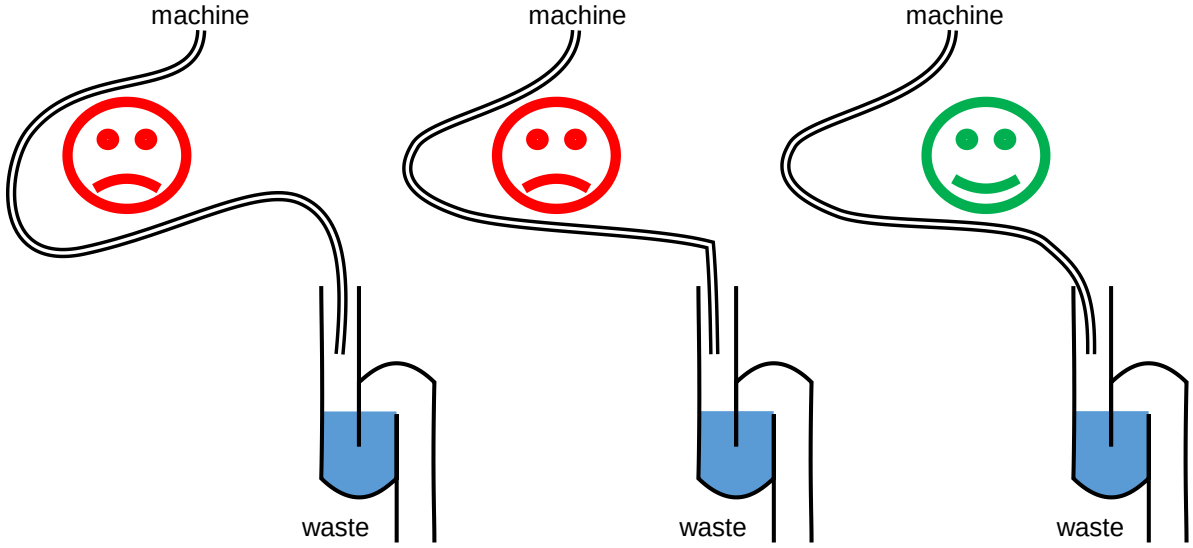


Figure 14. Left: Not OK, hose slopes upwards in between machine and drain. Centre: not OK, Hose makes a sharp bend and will eventually get pinched when (hot) water runs through. Right: OK, hose slopes down from machine to drain, without sharp bends.

Electric mains

Rated voltage: 3N~400V / ~230V, 50 / 60Hz
Rated power: max. 10-19 (400V) / 32-44 (230V) Amp per phase (see Table 2 for details).

☠ Danger

If the supply cord or the pump connection cord is damaged it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

The appliance is to be supplied through a residual current device (RCD) having a rated residual operating current not exceeding 30mA.

SPIRIT	Duette				Triplette			
Version	standard		pump-per-group		standard		pump-per-group	
Tension	230 Vac				230 Vac			
Frequency	50/60 Hz				50/60 Hz			
heating power steam	4.8 kW				6.0 kW			
heating power coffee	2 x 0.9 kW				3 x 0.9 kW			
Peak power	7.3 kW		7.6 kW		9.4 kW		10.0 kW	
# phases	3	1	3	1	3	1	3	1
Peak current phase 1	10.9 A	31.7 A	10.9 A	33.0 A	12.6 A	40.9 A	12.6 A	43.5 A
Peak current phase 2	10.9 A		10.9 A		12.6 A		12.6 A	
Peak current phase 3	10.0 A		11.3 A		15.7 A		18.3 A	

Table 2. Showing peak power in the different phases for different machine versions.

The machines' internal electrics consists of 3 heating circuits and an operation circuit. Each circuit is designed to function on 230Vac. The range in which it can function safely is 208-240Vac. Electric mains can be connected in two ways to the machine (see next two paragraphs). Check if the electric mains of the location matches the configuration of the machine (see identity tag of machine).

3-phase machine (3N~400V, 50/60Hz)

What we call a three-phase machine must be connected to 3P-N-E power (3 Phases + Neutral + Earth, see Figure 15) with 120 degrees phase shift between phases. Such power is characterised by: 230Vac tension between each phase and neutral (or Earth) and 400Vac tension between the phases. For details of peak power per phase in the machine, see Table 2.

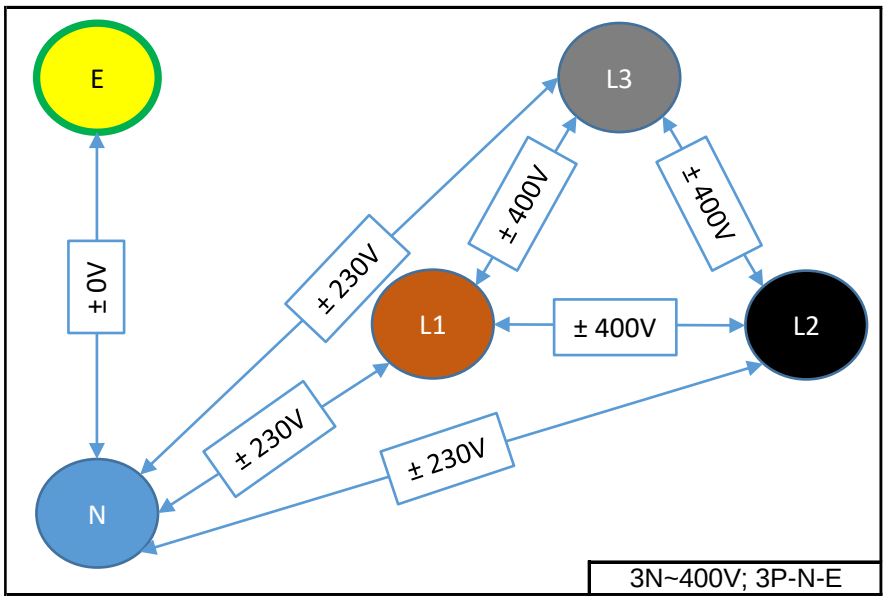


Figure 15. 3P-N-E electric mains. Peak current of the Slim Jim is 10.0-18.3A per phase.

single-phase machine (~230V, 50/60Hz)

What we call a single-phase machine must be connected to P-N-E (single Phase + Neutral + Earth) or 2P-E (split Phase + Earth) power mains, see Figure 16. Note that the split-phase configuration does NOT make use of the neutral wire of the electric mains. For details of peak power, see Table 2.

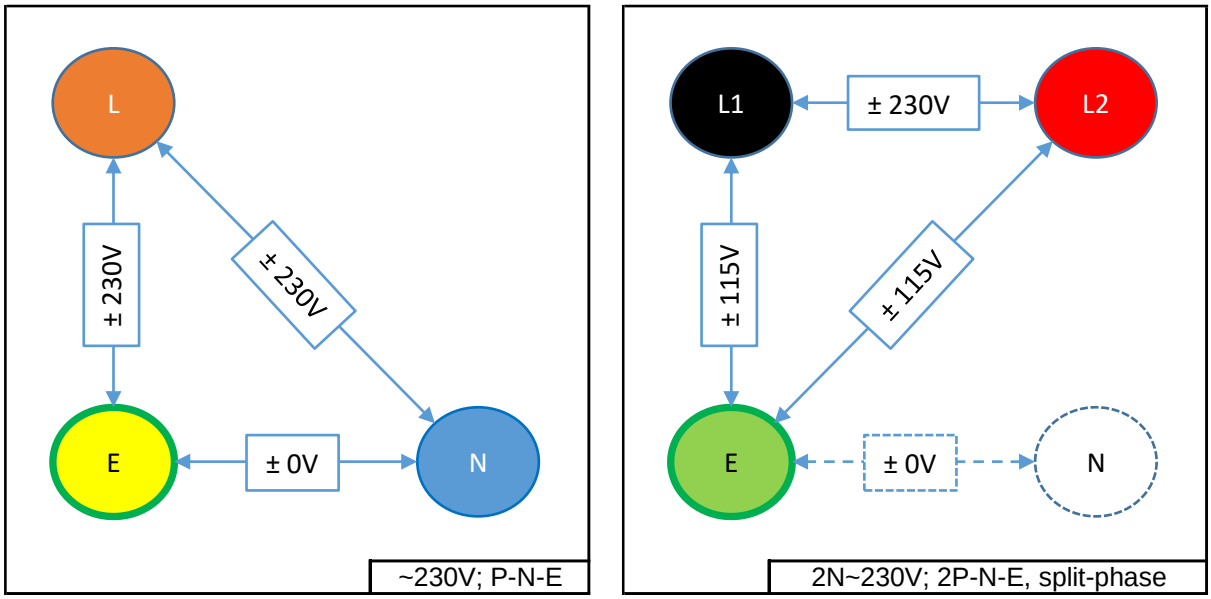


Figure 16. At left P-N-E, at right 2P-N-E. The machine can make use of P1 and P2 plus E (without N) of the split-phase electric mains configuration shown on right. Peak current is 31.7-43.5A.

3-phase / single phase conversion

The machine will be prepared in the factory for connection to either 3P-N-E or P-N-E/2P-E power and will show respectively 3N~400V or ~230V on the identification tag.

Conversion is possible but requires replacement parts. Replacement parts and instruction for the conversion can be obtained at: support@keesvanderwesten.com.

Note!
National rules/regulations may apply when the appliance is connected to the electric mains.

Single- versus three-phase machine

The Spirit is designed to operate on 230Vac with three-phase mains power (3x 230Vac) to divide power consumption over three different mains leads. Such mains is also referred to as 3N~400V as the tension between the phases is 400Vac. The mains cable has five wires (2.5 mm^2 each): three phases, neutral and earth. For safe operation of the machine, a phase shift of 120° per phase (which is common in Europe) is essential, as this 120° phase shift reduces the power flux through the common “neutral” lead of the mains cable.

In order to accommodate different electrical systems around the world, we also produce a so-called “single-phase” version of the machine. When we speak of a single-phase machine, the mains cable has 3 wires. Within the machine, power is divided into three separate circuits, exactly as in three-phase machines. In some countries where our single-phase machines are used the mains voltage is in fact 230Vac (e.g. Australia, New Zealand). In other countries where our single-phase machines are used the mains voltage is in fact 115-120Vac (e.g. USA). See notes on page 25.

Note! Depending on model and type, the Spirit has a maximum power consumption of 7.3-10.0 kW from your outlet. This occurs when all heating elements, pumps and valves are active simultaneously. At 230 Volts this is equivalent to approximately 32-44 Amps. We therefore insist that the machine has its own power circuit breaker(s).

Connect pump cables

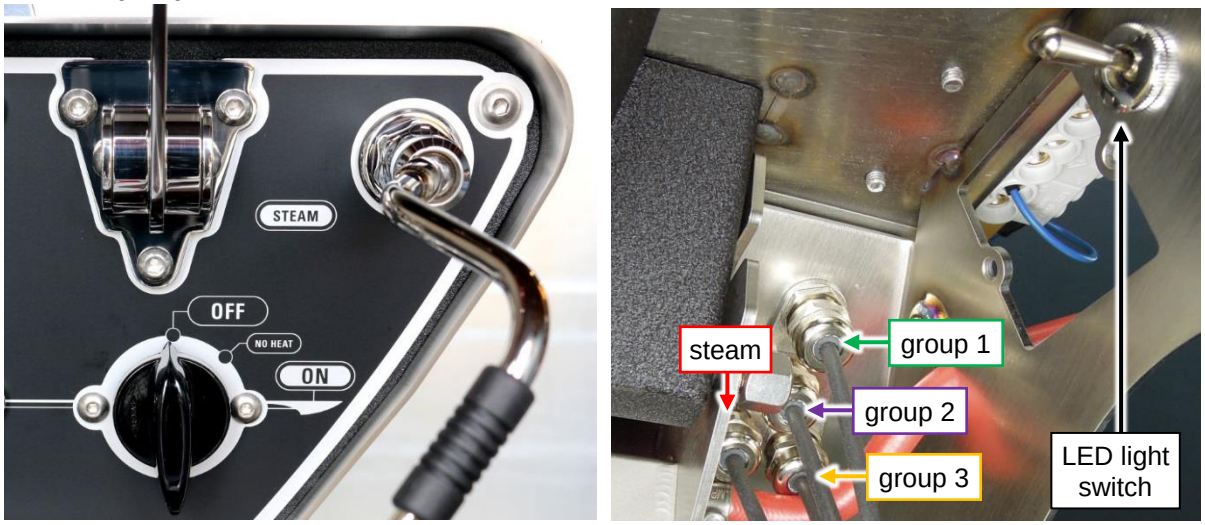


Figure 17 (left). Showing mains switch in "OFF" position. In position "NO HEAT" the machine is functional except that no power is fed to the heating elements (used for testing etc.).
(right). Showing pump cables for a pump-per-group Triplette plus the on/off switch for the LED light (the switch is in "OFF" position: lever pointing down), the mains cable is NOT present.

1. Make sure that the mains switch is in position "OFF" (see Figure 17).
2. The thinner electrical cables attached to the Spirit are the pump cables. Attach each pump cable to its corresponding pump motor by mating the female plug on the cable from the machine to the male plug at the pump-motor.

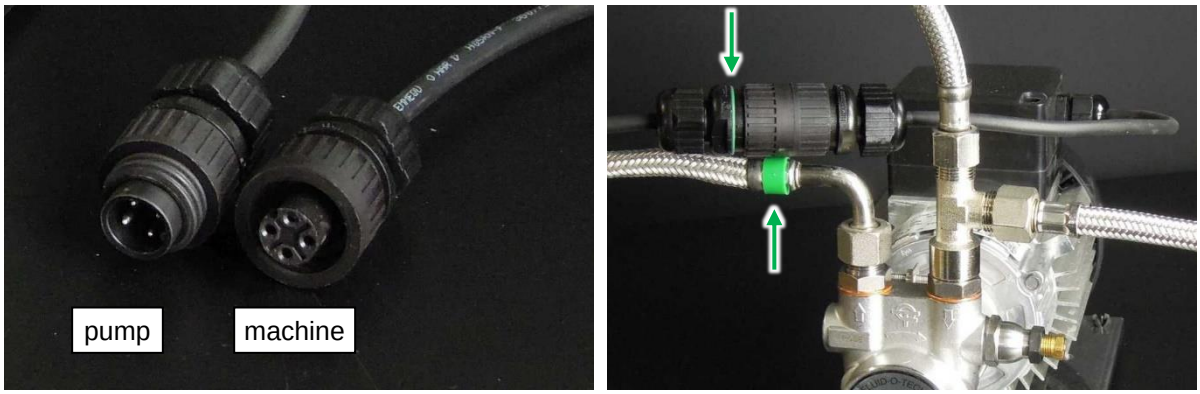


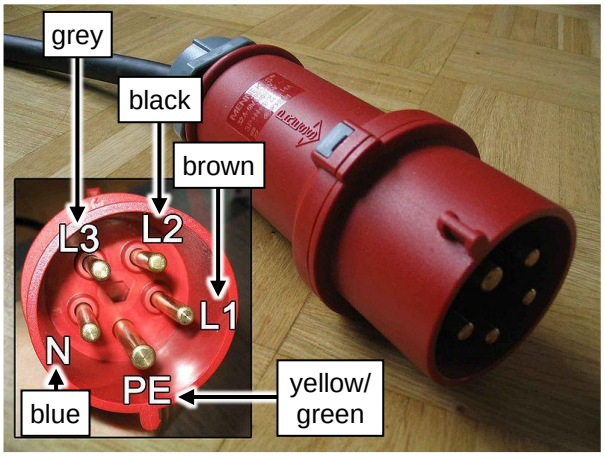
Figure 18. Pump cable plugs. Note that the colour coding on the cable should match the colour coding on the reinforced hose that runs from the pump-outlet to the machine (the knee-shaped end of the reinforced hose shown on the photo should be mounted on the machine, not the pump-outlet).

△ **Caution!** When you accidentally swap the electric cables to the pumps (or the water supply lines from the pumps to the machine), the pumps may remain running and/or brewing coffee is impossible.

colour coding	coffee system	steam boiler	group 1	group 2	group 3
standard machines	green	red			
pump/group Duette		red	green	purple	
pump/group Triplette		red	green	purple	yellow

Connect mains cable

Attach the (thick) mains cable directly to an earthed power outlet (three phases or one phase, depending on model and type) or to a suitable plug (see Figure 19).



	3-phase		1-phase	USA
Phase/ Live	P1	brown	brown	black
	P2	black		
	P3	grey		
Neutral	N	blue	blue	white*
Earth	E	yellow/ green	yellow/ green	green

Figure 19. Shown here is the 3-phase plug (3P+N+E 16A 400V) used in Europe.
** The white lead in the USA cable must be hooked up to the anti-phase 115Vac live (anti-phase w.r.t. the black 115Vac live).*

☠ Danger!

When your machine was ordered without a mains plug or when the mains plug has been removed to fit the cable through a small countertop opening, have a qualified electrician connect your Spirit to the mains.
The yellow/green or green lead must be connected to earth to properly ground the machine. This is essential to work safely with the machine.

Note!

If your machine is equipped with a **5 wire cable** (3 phases 230Vac with 120° phase shift): blue is neutral, grey, brown and black are phases (hot; live), yellow/green is Earth.
If your machine is equipped with a **3 wire cable**:
Australia and New Zealand (single phase 220-240Vac): brown is phase (hot; live), blue is neutral, yellow/green is Earth.
USA and Canada (2 phases 110-120Vac with 180° phase-shift)**:** white is phase (hot; live), black is phase (hot; live), green is Earth.
Connect all wires to the appropriate outlet.

Note on phase shift of 110-120Vac!

When you want to use your machine in a 110-120Vac environment, check whether the mains is a 180 degrees phase shift (most houses) or a 120 degrees phase shift (most commercial buildings). You can measure the resulting voltage between two phase leads of the mains with a common voltage meter set to measure Vac. The resulting voltage should be 220-240Vac. With a 120 degrees phase shift you will measure 201-208Vac. The machine will work fine with a resulting voltage of 208-240Vac*, a resulting voltage lower than 208Vac may lead to erratic behaviour of the machine.
If your location is powered with three-phase 115Vac with a 120 degrees phase shift we suggest to use a 10% booster (a so-called auto-transformer or buck-booster) on two leads of the three phase mains which will raise 201Vac to 221Vac (and 208Vac to 239Vac). **Have a qualified electrician install the necessary equipment as the booster must be able to supply 33-45 Amps**.

* With lower resulting voltage, the heating power is reduced w.r.t. what is listed in table 3. At 208Vac about 18% power is lost (thus 736W for the coffee boilers (was 900W) and 4907W (was 6000W in a Triplette) or 3925W (was 4800W in a Duette) for the steam boiler).

Filling the machine with water from empty

Several restrictors are present within the machine. These restrictors slow down the flow within the machine in order to optimise the coffee extraction process in terms of pressure profiling and temperature stability. While filling the machine from empty, the fill restrictor hampers free flow to the steam/hot water which may thus not fill up as quickly as you possibly expect.

As a safety measurement, the main controller shuts the machine down when any solenoid valve in the machine (apart from the steam solenoid valves) is open for more than 2 minutes continuously (to prevent flooding of the establishment in case of a malfunction).

Δ Caution! Although the coffee boilers start filling as soon as the water mains are opened, the boilers cannot completely fill up because the air inside cannot escape from the groups. The boilers will only fill until the air inside is compressed to water mains pressure. Therefore, **engage the temperature controller on a coffee boiler only after water has run from the group**.

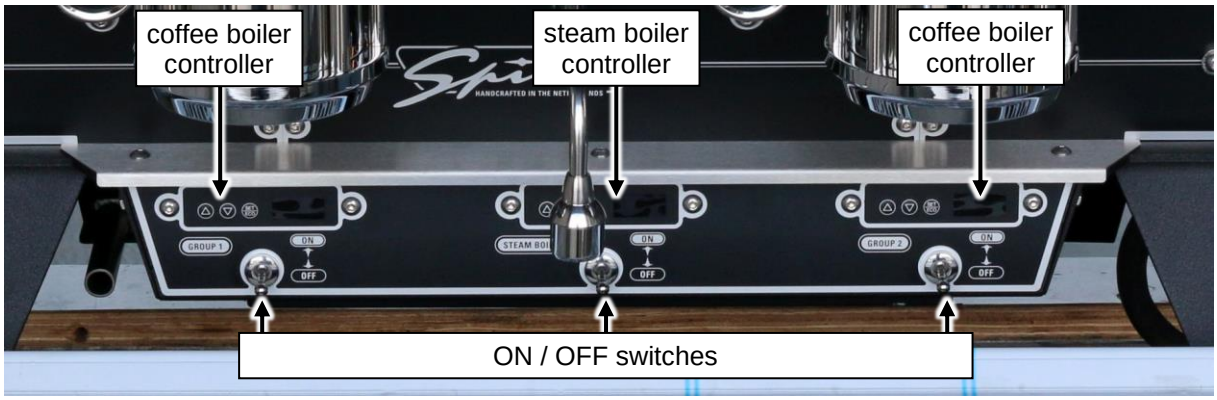


Figure 20. Showing the temperature controllers and their ON/OFF switches of the steam boiler and both groups on a Spirit Duette. Switches are in "OFF" position with levers pointing down, displays are not lit.

Procedure

1. If present, remove the filter holders from all groups.
2. Make sure that all temperature controller switches (PID's for all groups plus the controller for the steam boiler) are in the "OFF" position (lever pointing down, see Figure 20).
3. Make sure that coffee pressure gauges indicate line pressure. If not, check water connections.
4. Turn the mains switch on the machine to "NO HEAT". The mains switch is mounted on the right hand side of the machine (see Figure 17). The machine will wait for approximately 3 seconds before activating the pump and starting to fill the steam/hot water boiler. (Power to the heating elements is disconnected for 3 reasons: 1- mains switch is in position "NO HEAT", 2- The temperature controllers are not switched "ON" yet, 3- Safe water level in the steam/hot water boiler is not yet reached.)

Note! As the machine shuts down when the fill valve is active for more than 2 minutes continuously, the operating level will not be reached yet.

5. While the steam boiler is filling activate the groups (***Bastone***: shortly press programming button; ***touchpad***: shortly press top button) one by one to engage the group solenoid valve and pump and bleed all air from the corresponding coffee boiler.
   Deactivate the group (tap brewing lever down or shortly press top button) when water flow from the group is more or less continuous.

Note! The electronic temperature controllers just behind the drip tray can only be activated when the safety water level inside the steam boiler is reached. (The heating elements should of course at all times be immersed in water when operated.)

6. Turn the mains switch to “OFF” (to reset the main controller) and back to “NO HEAT”, the steam/hot water boiler will continue filling after a 3 second delay.
7. **Repeat step 5 and 6**: Continue activating the groups (one by one) until water flow from all groups is more or less continuous.
8. Turn the mains switch to “OFF” and then to “ON” and then switch the steam boiler controller “ON” (lever pointing up). The display will light up after about 3 seconds and the steam boiler heating elements are now engaged.
9. You may now switch the coffee boiler temperature controllers “ON” (levers pointing up). The displays will light up after about 3 seconds and the coffee boiler heating elements are now engaged.

☑ Check if the machine is leaking.

Expel air from coffee system

You now have to expel remaining air from the coffee system.

Procedure

1. While the machine heats up, let each group run for approximately 10 seconds to expel any remaining air pockets.

☑ Check if the machine is leaking.

First use

Heating up

Heating up all of the boilers takes about 25 minutes after the temperature controllers are turned “ON”. When the temperature in the steam boiler reaches boiling point, some steam will escape the steam boiler through the anti-vacuum valve and is discharged into the drain. The escaping steam makes a hissing or sputtering sound inside the machine and will stop when the valve is shut by the increasing pressure inside the boiler.

The steam boiler temperature (centre digital controller) is factory set at 125 °C or 257 °F, corresponding to approximately 1.35 bar steam overpressure.

When heating up from cold, the coffee boiler PID’s will initially “overshoot” the set temperature, for example: it will heat up to 94.7 °C instead of factory set value of 93.0 °C. Although the PID parameters could be set such that this initial overshoot is (nearly) absent, such setting would reduce the temperature stability once the corresponding group is warm and will increase the time it takes to reach the set temperature. The initial overshoot will be taken up by the steel mass of the group which is also heating up from cold.

☑ Check if the machine is leaking.

Even when the boilers have reached their correct operating temperature after firing up the machine from cold, it takes some more time until the groups are at their optimum temperature. You can speed up this process by making 2-cups of coffee 5 times per group to get the groups at the correct temperature (you may use the same coffee puck each time).

Set hot water dosage

The hot water lever (central lever, see Figure 1) activates a timer which, in turn, engages the pump and opens valves in the hot water system so that water will start flowing from the hot water spout. After the set amount of time, flow will stop automatically. The delivered quantity of water depends on pressure in the steam/hot water boiler and the flow of added cold water. Because these may fluctuate slightly, the quantity of water delivered in the set time may vary a little as well.

You can adjust the amount of time that the water will run from the hot water spout.

Procedure touchpad version

- Press-hold the upper button of the left hand touchpad for appr. 6 seconds until the LEDs in the upper button of all touchpads are flashing. No water will flow from the groups: the main controller is now in programming mode.
- Within 20 seconds, activate water dispensing by shortly pressing down the hot water lever: the water will start flowing from the spout and all upper LED’s will remain lit.
  If you wait longer than 20 seconds, the controller will leave the programming mode automatically (all LED’s will dim).
- Shortly press the hot water lever again when the desired quantity of water has been dispensed: water flow will stop and the upper LEDs on all touchpads will flash. The electronic timer has now been set but the new time-interval has not been stored into memory yet.
- Wait 20 seconds or shortly press the top button of the touchpad again: all LEDs dim and programming mode is ended. Upon programming mode exit, the last set time-interval is stored into memory.

Procedure Bastone version

- Press-hold the program button (push button of **left** Bastone unit) for appr. 6 seconds until the control LEDs on all Bastone units start flashing: the main controller is now in programming mode.
- Within 20 seconds, activate water dispensing by shortly pressing down the hot water lever: the water will start flowing from the spout and all control LED’s will remain lit.

If you wait longer than 20 seconds, the controller will leave the programming mode automatically (all LED's will dim).

- Wait 20 seconds or shortly press the program button of the Bastone unit again: all LEDs dim and programming mode is ended. Upon programming mode exit, the last set time-interval is stored into memory.

During delivery of hot water some cold water is mixed in to obtain a non-spattering, quiet flow at the right temperature for preparing Americanos. A secondary goal of this added cold water is to lower the strain on the steam boiler as less hot water is needed from the boiler to get the same quantity. The pump is activated when hot water is being dispensed.

After hot water has been dispensed, the steam boiler will start to re-fill to its pre-determined level automatically. The incoming cold water needs to be heated to 125 °C quickly to retain full steam capacity. For that reason, a flat-jet with a 1.0 mm orifice is installed underneath the boiler fill valve which restricts the flow of cold water to the boiler which allows the heating to (partially) keep up. The pump is activated when the steam boiler is being filled.

The filling procedure is automatically delayed when hot water is (again) dispensed. This prevents changes in steam boiler and (cold) water supply pressure and thus ensures temperature stability of the dispensed hot water.

Adjust coffee system pump pressure

A flat-jet in each group-circuit restricts the flow when a group is activated to prevent channelling in the coffee bed and thus ensure proper pre-infusion. The restrictor is located underneath the group valve (it was relocated during October 2016). The pressure gauge just left of each group displays the pressure in the corresponding coffee system downstream of the group valve. At idle, the pressure shown is thus 0 (minimum value of the gauge). While brewing espresso, with the group valve "open" and the pump activated, water will first fill the empty infusion tube and dispersion plate and then wet the coffee bed (and fill the optional Idro-matic when it is present) such that pressure on the corresponding coffee grinds will gradually increase as the wetted coffee loses in permeability until the set pump pressure (ideally 9 bar) is reached.

The pressure at the outgoing side of the pump depends somewhat on the pressure at the ingoing side of the pump. Therefore, you should check and possibly adjust the pump pressure after installation. Adjustments are made by turning the set screw on the right hand side of the pump housing (see Figure 21).

Procedure

1. Place a filter with ground coffee in a filter holder (this should be fresh coffee).
2. Activate that group:
   touchpad: shortly press the upper button
   Bastone: shortly press the push button
3. Observe the pressure gauge of the activated group to check how the pressure evolves and wait until it no longer increases.
4. Undo the lock-nut on the set screw a few turns.
5. To increase the pump pressure turn the set screw in the pump housing clockwise (see Figure 21). Turn the screw counter-clockwise to decrease the pump pressure.
6. De-activate the group when the pressure is correctly set at 9 bar.
7. Tighten the lock nut again.

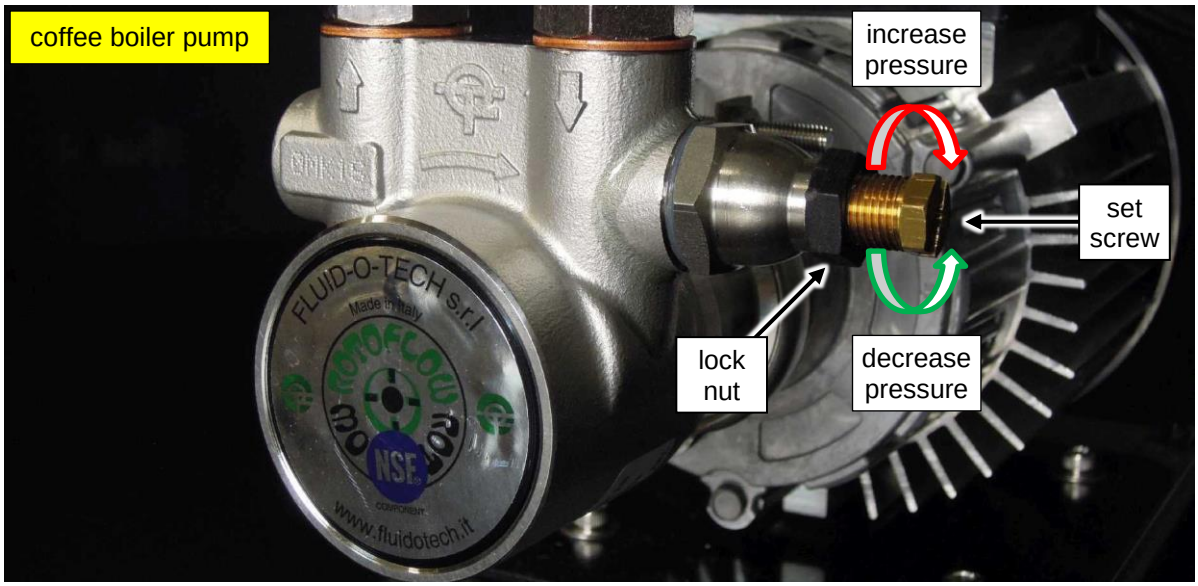


Figure 21. Showing the lock nut and set screw on the pump to change pump pressure.

Notes!
Do not set the pump pressure with a blind filter in the filter holder. When a blind filter is used, water in the system is trapped between a one-way valve and the blind filter. Therefore, the coffee boiler pressure will not drop when the set screw is turned counter-clockwise.

When pump pressure exceeds approximately 12 bar, the expansion valve will open. Increasing the pump pressure further will not result in higher coffee boiler pressure.

Do not set the operational pressure above 9 bar since this will reduce the life-span of valves, etc. in your machine.

Set hot water temperature

Hot water from the steam/hot water boiler is mixed with some cold water before it is dispensed. Water temperature at the hot water spout depends on the temperature and amount of the mixed-in cold water. The temperature of the incoming cold water differs from place to place and possibly by season as well. The amount of cold water inflow is related to the pressure and can thus be adjusted by changing the (outgoing) pressure of the steam/hot water boiler pump. Increasing the pump pressure decreases the temperature at the spout and vice versa.

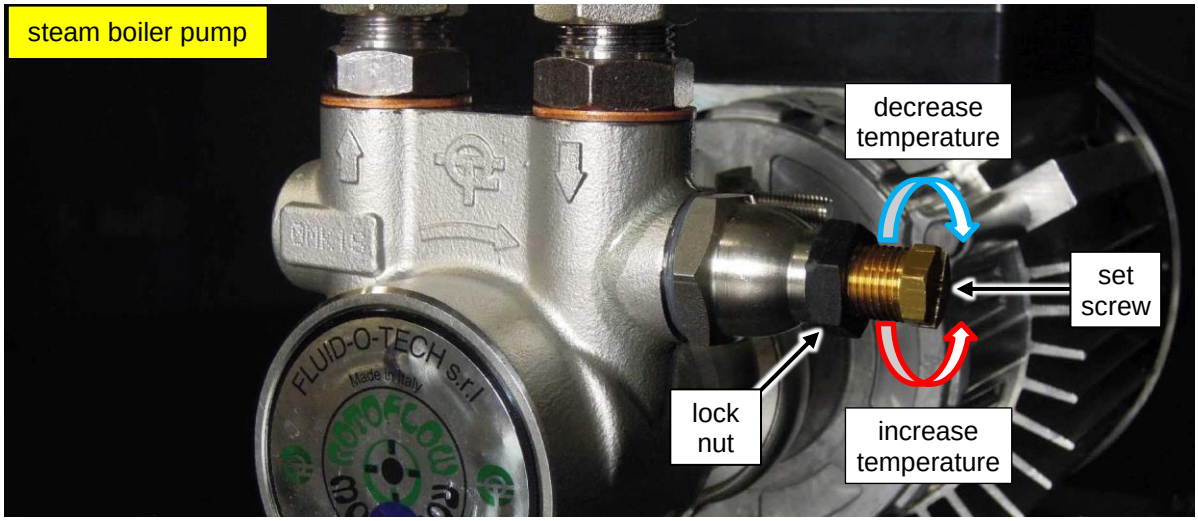


Figure 22. the steam boiler pump pressure is used to set the hot water temperature.

Procedure

1. Wait for the machine to be completely warmed up: at least “ON” and heating for 25 minutes and used to dispense hot water at least 5 times over the last 5 minutes.
2. Get the main controller in programming mode (to get a long lasting flow of hot water):
   touchpad: press-hold the upper button on left hand touchpad,
   Bastone: two-way switch of left hand group in left position, press-hold the program button, for 6 seconds (LED’s will start flashing).
3. Within 20 seconds, activate water dispensing by shortly pressing the hot water lever. Water will start flowing (LED’s are now lit).
4. Measure the temperature of the outflowing water with a quick-response temperature sensor* and then de-activate the hot water by shortly pressing the lever again. We recommend a water temperature of around 95 °C.
5. If the temperature is too low: decrease pump pressure of the steam/hot water boiler pump. If the temperature is too high: increase pump pressure (see Figure 22).
6. After adjusting the pump pressure, make sure that the boiler is at operational temperature and measure the hot water temperature again.
7. When the required temperature is reached, reset the hot water timer to the desired amount of water (see section “set hot water dosage”).

* If you do not have a quick response temperature sensor, decrease the pump pressure until boiling water is flowing from the spout (flow will sputter instead of dispensing a calm flow). Then increase the pump pressure a little until a calm flow is obtained.

Note! Do not adjust the temperature of the hot water by changing the temperature of the steam/hot water boiler as this will decrease the temperature stability of the machine.

More information on our website

Please check the “Spirit user manual” for information on how to operate the machine (set brew volumes and remarks thereabouts, adjust steam power, change temperature settings, etc.).

http://www.keesvanderwesten.com/assets/spirit-user-manual.pdf

Please check the “Spirit parts list” for spare parts.

http://www.keesvanderwesten.com/assets/spirit-parts-list.pdf

Contact information

Please supply machine details (model and number) and full contact information when asking for support or ordering spare parts.

Kees van der Westen Espressonistic Works B.V.
Van Elderenlaan 6
5581WJ WAALRE
The Netherlands

Telephone *+31 40 2223433*
Email *support@keesvanderwesten.com*
Website *www.keesvanderwesten.com*

Ordering replacement parts
Order spare parts via:
spareparts@keesvanderwesten.com