CEV.a

User Manual

Firmware v1.1.3.40



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1. The Machine

1.1 Features

dev.a is a fully automatic, fully customizable, rotary film development machine. It's main features are:

- Supports all commonly available film formats, from 35mm to 8x10.
- Supports all common photographic processes (Black and white, C41, E6, etc.)
- Processing temperature can be automatically controlled using a tempered water bath.
- Up to 6 different chemicals can be used in a process.
- Up to 100 custom processes can be stored on the machine.
- Each process can have up to 30 different steps.
- Repeatable and predictable results.
- All processes are user-defined, no built-in process is provided to allow the user to completely customize the machine's behavior
- The machine can be connected to a pressurized water source for automatic water management.
- A large 7" touch display is used to interact with the machine.
- Chemicals can be discarded or recovered after processing, depending on user needs.
- Automatic cleaning process.
- Processes and settings can be exported and imported using a USB drive.
- Compatible with Paterson, AP and Jobo 1500 series reels for 35mm and 120 film.
- Custom reels for large formats (4x5, 5x7 and 8x10).
- The display backlight and the power LED can be switched off if total darkness is required.



(a) Front of the machine



(b) Back of the machine Figure 1.1: Overview of the machine





Figure 1.2: Details of the machine



Figure 1.3: Chemistry container lid details

Elements of the machine:

- 1. Water bath
- 2. Chemistry containers
- 3. Tank lock bar
- 4. Overflow port
- 5. Chemistry recovery faucet
- 6. Adjustable feet
- 7. Display
- 8. Power LED
- 9. "No-lights" mode switch
- 10. USB port
- 11. Cooling fan vents
- 12. AC socket
- 13. AC socket fuses box
- 14. AC socket ON/OFF switch

- 15. Overflow outlet
- 16. Pressurized water inlet
- 17. Waste outlet
- 18. Tank port connector
- 19. Tank plastic supports
- 20. Tank insertion guides
- 21. Water level sensors
- 22. Temperature sensor
- 23. Water bath recirculation port
- 24. Water bath inlet valve port
- 25. Knob
- 26. Vent gasket
- 27. Lid gasket
- 28. Container number plate

On the front you will find the six chemistry retrieval faucets and the 7" touch display. On the back you will find the water inlet, the waste and overflow outlets and the AC power socket.

Looking from the top you will see the six chemistry containers aligned on the front edge on the machine, each with its own dedicated temperature sensor. Near the rear edge, on the left, you will see the tank connector port, the tank supports and the tank lock bar. On the right you will see the water bath temperature sensor, the water level sensors and the water bath recirculation port.

1.1.1 Containers lids

The machine comes equipped with six chemistry containers lids, numbered one to six. The numbering is there to prevent cross-contamination by accidentally placing the lids on the wrong containers. The lids are equipped with a gasket around the edge to prevent chemistry leaks. They also have a knob that can be screwed-in against another gasket to make the container air-tight.

WARNING: the six chemistry containers are not meant to be used as longterm storage bottles, even if the machine will be used to always execute the same process. Even if the lids can be made air-tight, chemistry should not be left in the machine for more than 24 hours. We suggest to remove the chemistry from the machine and put it back into dedicated storage bottles as soon as the processing session is over.

2. The tanks





Elements of the tanks:

- 1. Tank body
- 2. Tank top lid
- 3. Tank bottom lid
- 4. Tank relief valve
- 5. Tank connector
- 6. Inner column
- 7. Inner column base
- 8. Inner column spring loaded plastic blocks

Three different tank sizes are available and they are all compatible with this machine. For 35mm and 120 film development our tanks are compatible with Paterson reels, AP reels and Jobo 1500 series reels, they are **not** compatible with Jobo 2500 series reels. For sheet film development our custom reels are available for 4x5, 5x7 and 8x10 sheets.

Table 2.1 shows the differences between each tank size and and the corresponding film processing capacities.

Tank size	Required chemistry	Fill/drain time	35mm	120	4x5	5x7	8x10
Small	>= 650ml	15s	2	1	-	-	-
Medium	>= 850ml	20s	4	2	3	3	-
Large	1L	25s	6	4	3	3	1

Table 2.1: Tank capacities

2.1 Loading the tanks

Loading our tanks is just as easy as loading any other daylight processing film tank, if you have used Paterson, AP or Jobo tanks before you will find this procedure very similar.

The tanks are designed to be opened only from the top by unscrewing the top lid while the bottom lid is fixed in place. The inner columns used in the tanks all have spring-loaded plastic blocks whose function is to hold all the supported film reels in place and prevent them from slipping. The flat part of the inner column contains magnets that are used to rotate the film during processing thus, it **must always** be placed in the tank facing the bottom lid.

In complete darkness, once the film is loaded onto the reels, insert the reels on the inner column. Once the inner column is loaded, insert it in the tank, making sure that the flat bottom part is facing the bottom lid. Also make sure that the metal pin mounted on the bottom lid fits inside the bearing in the bottom of the inner column. Align the metal pin mounted at the center of the top lid with the bearing at the top of the inner column and screw the top lid onto the tank. Make sure to tighten the top lid firmly in place to avoid any leaks. You are now ready to load the tank into the machine.

3. Technical specifications

3.1 Size, weight and voltage

- Dimensions:
 - Width: 60 cm
 - Height: 28 cm
 - Depth: 51 cm
- Weight when empty: 19.5 kg
- Weight when fully loaded with full water bath and full chemistry containers: 35.5 kg
- Water bath capacity: about 10L (depending on which tank size is used)
- Input AC voltage: 220V or 110V depending on purchased model
- Input AC voltage frequency range: 50-60Hz
- Total power consumption: 900W

3.2 Electrical requirements

Our machine must be connected to a 220V or 110V socket depending on which model has been purchased, a label on the back of the machine displays the correct voltage. Be careful not to connect the machine to an AC voltage source different from the correct one. The socket on the back accepts power cords terminated with the standard IEC 60320 C13 connector.

Since liquids are involved, the outlet used to supply the machine must be grounded and must be protected by a GFCI (Ground Fault Circuit Interrupter). The socket on the back of the machine is also protected by two fuses. The fuses type depends on the AC input voltage:

- \cdot for the 220V AC version they are 6A, 250V, 5 x 20mm slow-blow
- \cdot for the 110V AC version they are 10A, 125V, 5 x 20mm slow-blow

3.3 Hydraulic requirements

Our machine doesn't have specific hydraulic requirements, it can work even if the water inlet on the back is not connected. In this case, for processes that require a water bath you will be instructed to fill it manually at the right time.

If you want to take advantage of the machine's capability of managing its own water supply, you can connect the "WATER IN" inlet on the back of the machine to a pressurized water source. This inlet has a standard G3/4" male thread and can be attached to anything with a G3/4" female thread, like common garden hose connectors. The pressure of the water source connected to the "WATER IN" inlet should be between 1.5 and 3 bar, which are typical values for a household hydraulic system pressure. Lower pressures might result in very slow filling times. The machine is internally equipped with a pressure reducer so slightly higher pressures should not be a problem.

The water supplied to the machine can be just regular cold water from your taps, the machine will be able to heat it up to the desired temperature in case of processes that require temperature control. You can also connect it to a hot water source but be careful, read the chapter about temperature control before making a decision.

The "WASTE" outlet is used to dispose of rinse water and discarded chemicals, you can connect a tube to the outlet and redirect it to the desired location. Depending on regulations in your area you might not be allowed to dump used photographic chemicals down the drain, in this case you can redirect the output of the waste outlet to a bucket or a tank and properly dispose of it later.

The "OVERFLOW" outlet is connected to the overflow port located on the back of the water bath tub, if the water level rises too much it will overflow through this port. This will always be clean water so it's safe to dump it down the drain.

The chemistry recovery faucets on the front of the machine are directly connected to the corresponding containers and they can be used to recover the chemistry after processing. When the handle is in the horizontal position the faucet is completely closed, when it is in the vertical position the faucet is completely open. The faucets **must** always remain closed, you should open them only when you need to recover the chemicals from the containers, after that close them again.

The "WASTE" and "OVERFLOW" outlets and the chemistry recovery faucets are equipped with quick-connect fittings that can accept a tube with an outer diameter of 10mm, we suggest using tubes with an internal diameter of 8mm to avoid flow restrictions.

3.4 Installation

You can place our machine almost anywhere you want, you don't need a darkroom since the actual processing will take place inside a light-tight tank. Our machine is designed to tolerate splashes of water but **is not** waterproof, when choosing its location make sure it will never be immersed in water or it will inevitably be damaged. To avoid any risk of electrical shock the machine itself and the power cord must never be immersed in water. Placing it into a darkroom sink is definitely not a good idea. Anyway, the machine must be leveled to work correctly, dev.a has adjustable feet that can be raised or lowered to reach the desired configuration. A regular spirit level placed on the top plate can be used to adjust the four feet. Remember to check both directions!

The surface must be able to safely support the weight of the machine when fully loaded with water and chemistry. Since liquids are involved, splashes and spills will eventually happen, keep this in mind when choosing where to place the machine.

The "WASTE" outlet destination doesn't need to be at a lower level than the bottom of the machine since it is operated by a pump, on the other hand, the "OVERFLOW" outlet destination must be placed below the bottom of the machine since it works only using gravity.



Part Two: Operations

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- 4.4 Execution of a process
- 4.5 Temperature control
- 4.6 User interface
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4. Using dev.a

4.1 Turning on the machine

To turn on the machine simply connect the socket on its back to the mains and flick the switch right next to it. The machine will then power up, a white led next to the display will turn on and after a while the user interface will appear on the display.

4.2 Turning off the machine

To turn off the machine you can simply cut the power using the switch next to the power socket. The display, the power LED and, in general, the whole machine will immediately turn off. You can turn off the machine at any moment, just be careful to not turn it off while a process is running, you will not be able to resume the process afterward.

After turning off the machine, depending on the situation, you might want to follow some of the suggestions given in chapter 6 about cleaning the machine.

4.3 Processes and steps

The operating principle of our machine is based on the concept of "process". A process is basically a list of steps that must be executed in order to develop photographic film. In the following chapters the word "positive" is used to refer to transparencies, or more in general, to refer to processes that produce a positive image.

4.3.1 Processes

A process is defined by the following elements:

- **Name**: a unique name assigned to the process, it's not possible to store two processes with the same name on the machine.
- Film type: negative or positive.
- Film color: black and white or color.
- Temperature control: can be enabled or not.
- **Process temperature**: the temperature at which the process has to be executed (meaningful only if temperature control is enabled), the valid range is 20-45 °C (68-113 °F).
- **Steps**: a list of processing steps (a process must have at least one step).
- Favourite: bookmark a process.

The film type and color **do not** have any influence on the execution of the process, these information are only used to classify processes using different categories. Processes can also be marked as "favourites", you can mark as favourites the processes that you run most often, they will be easier to find in the user interface.

4.3.2 Steps

A "step" is one of the phases of a photographic process, for example the classic developer, stop and fixer phases of black and white negative development processes. In our case we also include rinse and pre-soak steps in this definition to treat everything uniformly. A step is defined by:

- Name: the name of the step (it cannot be empty).
- **Processing time**: how long the step will be, the valid range is from 1 minute to 2 hours.
- **Type**: the type of the step, it can be "chemistry", "rinse" or "multi-rinse".
- **Source**: where the water or chemistry will be taken from.
- **Discard after processing**: if the liquid must be discarded at the end of the processing time (in case of rinse steps the water will always be discarded).

Step types

We have three different step types, each with its own features. The type of a step will determine a few things: the allowed sources for the liquids, how the machine behaves while the step is being executed and if the chemistry will be discarded or not after processing.

- **Chemistry**: as the name suggests, a chemistry step is one of the steps of your process that involves chemistry or, more in general, something that is not plain water. Chemicals can only be taken from the chemistry containers and you will be able to choose if you want to discard the chemistry or if you want to recover it after processing.
- **Rinse**: a single rinse of the film inside the tank. In this case the tank will be filled with water and then drained after the step processing time. The rinse water can come from one of the containers or from the water bath. After the processing time has elapsed, the water is automatically discarded. This step type can be used for pre-soak steps or for quick washes in between chemistry steps.
- **Multi-rinse**: in a multi-rinse step the tank is continuously filled with water and then drained in cycles. In this case, since a large amount of water is needed, the only allowed source for the rinse water is the water bath. Chemistry containers can contain enough water only for a single rinse. As

with single "rinse" steps, water is automatically discarded after every cycle. If the total processing time is not a multiple of the duration of a cycle, the last cycle will be longer, in order to be over exactly at the end of the step processing time. This step type is particularly suited for final washes, where water should be frequently changed to make sure that the film is properly washed.

NOTES:

- 1. the machine cannot know what kind of liquid is poured into the chemistry containers (or even if liquid is present at all!) so it comes down to the user to make sure that no mistakes are made and the containers are always filled with the right chemicals.
- 2. Be careful when using "Multi-rinse" steps if the machine water inlet is not connected to a water source. "Multi-rinse" steps, depending on their duration, use large amounts of water and a full water bath may not contain enough water to reach the end of the process.

4.3.3 Example

For example, suppose you have bought a generic C41 development kit that uses separate bleach and fix. Obviously it must be executed at 38 °C (100.4 °F) and the instructions from the manufacturer report the following steps:

- Pre-soak: 3 minutes
- Color developer: 3 minutes and 15 seconds
- Bleach: 1 minute
- Fixer: 2 minutes
- Final wash: 10 minutes in running water
- Stabilizer: 1 minute

Suppose that the chemistry can be reused many times so it must be recovered after processing.

This process might be the entered in the machine as follows:

Process:

- Name: "C41 bleach+fix"
- Film type: negative
- Film color: color
- Requires temperature control: yes
- Process temperature: 38 °C (100.4 °F)

Steps:

- Step 1:
 - Name: "Pre-soak"
 - Duration: 3 min
 - Type: rinse
 - source: Water bath
 - Discard after processing: yes
- Step 2:
 - Name: "Color developer"
 - Duration: 3 min 15 sec
 - Type: chemistry
 - source: container 1
 - Discard after processing: no
- Step 3:

- Name: "Bleach"
- Duration: 1 min 30 secs
- Type: chemistry
- source: container 2
- Discard after processing: no
- Step 4:
 - Name: "Fix"
 - Duration: 2 min
 - Type: chemistry
 - source: container 3
 - Discard after processing: no
- Step 5:
 - Name: "Final wash"
 - Duration: 10 min
 - Type: multi-rinse
 - source: water bath
 - Discard after processing: yes

The stabilizer must be applied manually outside the machine, see subsection 4.3.4 for more information about this.

Similarly you can create any process you like, you can even repeat chemistry steps if that makes sense in your specific case. The machine comes with just a few **generic presets**, these presets should be intended as examples and starting points for further customization. We decided to avoid specific presets for the following reasons:

- Even standard processes like C41 and E6 present some slight differences depending on the chemistry/kit manufacturer.
- Entering a new process is a very simple procedure that will not take more than 5 minutes.
- We want to encourage you to fine tune the processes in order to suit your needs and to produce the best results for your workflow.

4.3.4 Notes about film processing

Since this a rotary film development machine, remember to adjust the development times according to the film and chemistry manufacturers specifications. Film manufacturers usually specify development times for both "intermittent agitation" and "rotary processing" (sometimes also called "continuous agitation"), when using this machine it's important to use the times given for rotary processing. If no specific time is given for rotary or continuous agitation processing, a good rule of thumb is to reduce the intermittent agitation development time by 15%.

Also, since it's not possible to "pause" a process halfway through, if you want to execute a reversal process that requires the film to be manually re-exposed to light, you can create two different processes, the first one will include the steps up until the re-exposure while the second one will include the steps after the re-exposure.

Finally, steps involving wetting agents, stabilizers or, more in general, chemistry that can produce large amounts of foam and bubbles, must be executed manually **outside** the machine. These steps should not be added to the process and, when processing is over, you can remove the tank from the machine, open the lid and pour into the tank the wetting agent you want to use, as you would with other daylight processing tanks. Foam and bubbles will not damage the machine itself but they will probably overflow out of their container and spill into the water bath or worse, into the other containers.

4.4 Execution of a process

Our machine splits the execution of a process in two different phases, in the first phase the machine performs some preliminary checks and waits for all the necessary conditions to be met, while in the second phase the machine executes all the processing steps in the correct order.

In the preliminary checks phase the machine will:

- Check if the water bath requirements are met. If the process requires a water bath for temperature control or rinse steps the machine will wait until the water reaches the required level, otherwise, if the process doesn't require a water bath this check will be skipped.
- 2. Check if the temperature requirements are met. If the process needs to be executed at a specific temperature the machine will start heating the water bath and wait until the chemistry reaches the desired temperature. If the process doesn't require temperature control this check will be skipped.
- 3. Check if the tank is placed correctly inside the machine and if it's locked in place.
- 4. Check if film is rotating correctly inside the tank.

If a problem is detected, for example the tank is not placed correctly in the machine, the user is notified and he's given two choices. He can ignore the problem and choose to go on at his own risk ("skip") or he can try to fix the issue and instruct the machine to check again if everything is alright ("check again").

Skipping an error message is generally not a good idea, if there is a real problem the process will almost certainly end up with ruined negatives, lost chemistry or both, depending on the issue. The possibility of skipping an error check may help you in case you have a broken sensor that prevents you from using the machine. Let's suppose, for example, that the tank presence sensor is broken. The machine will report the error telling you that the tank hasn't been detected but, if you are sure that the tank is correctly placed inside the machine, you can skip the error and go on with the rest of the process.

In the second phase the machine executes all the processing steps. Once this phase is reached the machine assumes that no further error may happen and keeps executing the processing steps. It wouldn't make sense to stop the processing halfway through if an error is detected, the film might easily be ruined if processing is paused at the wrong time, so the machine goes on and stops only at the end of the process.

Only the user can decide to interrupt the process in this phase. The process can be stopped immediately or at the end of the step that is currently being executed.

4.5 Temperature control

Our machine is equipped with all the necessary components required to heat the chemistry and to maintain it at a constant temperature throughout the execution of a process. The temperature control process doesn't work by directly heating the chemistry, instead, it warms up a water bath that constantly recirculates and warms up the chemistry containers and the tank itself. This temperature control method might be slower than direct heating but gives us three advantages:

- the water used for the tempered water bath can also be used for pre-soak and rinse steps without affecting film temperature
- having a large amount of water at the correct temperature in the machine makes the whole process less subject to temperature variations
- the water used for the tempered water bath can also be used for a cleaning cycle when processing is over

Our machine allows you to set a temperature between 20 °C and 45 °C (68 °F - 113 °F). The temperature control process will heat the water bath and the chemistry and **will automatically start processing as soon as the chemistry temperature rises are above the target temperature**. If, for some reason, the process does not involve any of the chemistry containers, the temperature control process will only heat and monitor the water bath.

Anyway, it's important to note that since we only have heating capabilities, setting a process to run at a temperature lower than the ambient temperature will probably prevent it from running at all, likewise, using chemistry that is preheated to a temperature higher than the target temperature will make the process run immediately but at the wrong temperature. The simplest way to avoid problems is simply to use chemistry that is colder than the target temperature and let the machine do the rest of the job.

If, after executing a high temperature process, you need to execute another one at a lower temperature (e.g., from 38 °C to 30 °C), the only way to do this is to drain the hot water from the machine, fill it again with cold water and restart the process from a lower temperature. Or, if you are not in a hurry, you can simply wait until everything cools down enough.

The machine can manage two different heating methods:

- **Regular heating**: The machine warms up the water bath at a temperature slightly higher than the target temperature and then maintains it until the chemistry itself reaches the target temperature. This method is slower it's not possible to heat the water bath too much because otherwise the chemistry temperature will also rise above the target. You can speed up this process by connecting the water inlet on the back of the machine to a hot water source but you must be careful to set its temperature to be **not** higher than the target temperature of the process. If the water that comes in is too hot the machine will not be able to keep the chemistry temperature fixed at the target one and the it will overheat.
- **Fast heating**: The machine keeps warming up the water bath constantly, as much as it can, even if the water temperature rises above the target one significantly. When the chemistry reaches the target temperature the heating stops and cold water from the water inlet is brought in to cool down the water bath. As soon as the water bath cools down to the target temperature the machine stops bringing in cold water and start to main-

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tain the water bath temperature. This method is much faster than "regular heating" but a considerable amount of hot water is discarded from the waste outlet in the cooling phase. You should consider using this method only if, for some reason, you really need to shorten the heating time. Also, this method is available and works correctly only if the water inlet on the back of the machine is connected to a **cold** water source, otherwise it will not be possible to cool down the water bath. Since the water that gets discarded in the cooling phase is basically clean water, it can be recovered by temporarily redirecting the waste outlet to a bucket or to an external tank, this water can later be reused for other purposes.

NOTE: to correctly use the fast heating method it's important that all the chemistry containers involved in the process are at a temperature that is at least 1°C lower than the target temperature. If even a single container is above this threshold the fast heating phase will be skipped. Otherwise the

temperature of the chemistry might rise too much and above the target. Consider a generic process in which all 6 containers must be heated starting from a water and chemistry temperature of around 18 °C (about 64 °F). Table 4.1 shows the differences in heating time using regular or fast heating (only heating times are shown, processing times are not counted) and the amount of wasted water in case of fast heating.

Target	Regular heating	Fast heating	Wasted water
38 °C (100.4 °F)	72 min	44 min	6-7 L
32 °C (89.6 °F)	50 min	32 min	6-7 L
25 °C (77 °F)	38 min	19 min	6-7 L

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These times may vary depending on ambient temperature, water bath initial temperature and chemistry initial temperature. The purpose of this table is only to give you a rough estimate of the advantages of the fast heating method.

By default the machine will use the "regular heating" method, you will be able to switch to the "fast heating" method right before starting a process (and only if the water inlet on the back is connected).

4.5.1 Important notes about temperature control and water management

When the machine is connected to a pressurized water source, the water level is constantly monitored and, when necessary, more water is let in by the machine. In this case the temperature control process has no problem because all the water it needs is always present in the water bath.

On the other hand, if the water inlet is not connected and the water bath is filled manually before starting the process, there is the risk of running out of water mid-process. This might easily happen if the process contains many rinse steps or a long multi-rinse step. If this happens, as soon as the water flow stops in the water recirculation circuit, the heating control process must be suspended because the pump cannot run dry and the heating element should not overheat.

If this happens the machine will:

- \cdot suspend the heating process
- display a warning message on the user interface (shown in Figure 4.1)

play a warning sound every 15 seconds



Figure 4.1: The warning dialog that will be displayed when there is not enough water to run the temperature control process

In this case the user should refill the water bath as soon as possible to allow the process to resume. The machine will try to restart the water pump and the whole temperature control process:

- every 2 minutes or
- if one of the water level sensors is active

In both cases the pump will try to restart ten times to allow air bubbles to be displaced and to refill the water recirculation circuit. If the machine cannot resume the temperature control process it will stay in the suspended state.

Note that even if temperature control gets suspended, the process itself will keep going, it won't be suspended. Given the complete freedom that the user has in setting up a process, the machine can run out of water at any time and we cannot risk suspending the process during one of its critical phases.

4.6 User interface

After the splash screen you will be presented with the main interface. It has three different tabs (Processes, Configuration and Tools) that can be selected by clicking on the corresponding icon on the left of the screen.

4.6.1 Main interface - Processes tab

Shown in Figure 4.2, in this tab you will find the list of processes stored on the machine sorted in alphabetical order. For each process some essential information will be displayed, such as its name, if temperature control is required and the type and color of the film it is supposed to develop. If a process requires temperature control the temperature is displayed near the thermometer icon otherwise the thermometer icon is crossed out and no temperature is displayed.

By clicking on one of the processes in the list you will move to the process detail view. You can add add a new process by clicking on the "plus" icon in the top right corner. The interface will change to show an empty process edit view.

Main interface - Process list filtering

The list can be filtered in case you need to find a specific process. In the top left corner there is a "Filter" button, clicking on it will display the filter dialog,

4	Filters (none)		+
Processes	C41 bleach+fix	38.0 °C 🜡	Color Negative
ŝ	C41 bleach+fix push 1	38.0 °C 🌡	Color Negative
Configuration	E6 six baths	38.0 °C 🜡	Color Positive
ß	HP5@400 in Rodinal 1+25	Ł	B&W Negative
Tools	Tmax 100 in T-Max dev 1+4	Ł	B&W Negative
		^	D 014/

Figure 4.2: The "Processes" tab

shown in Figure 4.3. In this dialog you can set a combination of filters that will be applied to the list, you can filter by:

- Process name: processes whose name contains a specific string will be shown.
- Film color: you can choose to show only black and white or color processes.
- Film type: you can choose to show only negative or positive processes.
- Favourites: you can choose to show only processes that are marked as "Favourites"

Once you have set up the filters you can click on the "Apply filter" button and the list will be refreshed. The label near the "Filters" button will also be updated to show, between parenthesis, how many filters are currently applied to the list. Clicking on the "Reset" button in the filter dialog will disable all filters, effectively showing all processes.

4.6.2 Main interface - Configuration tab

In the "Configuration" tab, shown in Figure 4.4, you can find the global settings of the machine, they will be applied for every process executed by the machine. If you are not sure of the meaning of some of these settings, a small question mark icon can be clicked to show a quick help guide related to the setting.

In this tab you can:

- Choose the unit used to display temperatures, Celsius or Fahrenheit.
- Tell the machine if the water inlet is connected to a pressurized water source or not.
- \cdot Tune the temperature sensors.
- \cdot Set the rotation speed of the film inside the tank in RPMs.
- \cdot Set the interval for rotation direction inversion in seconds.
- \cdot Set the overlap percentage between filling and draining times and pro-

—	0 0	Filters (no	ne)			- Ne		+
Processes	Cź	P	rocess	list filte	er	°C	J	Color Negative
		Name		Any name		°C	£	Color
(ଚି)	C2	Color	Both	B&W	Color	C	8	Negative
Configuration	E6	Туре	Both	Negative	Positive	°C	1	Color Positive
ſŊ	rgy HF	F	avourites	only		ŝ	ð	B&W Negative
Tools	Tma	IX 100 III I -I	Reset	Apply fil	ter		ð	B&W Negative
							^	

Figure 4.3: The process list filter dialog

cessing times.

NOTE: the machine has no way of knowing if the water inlet is connected or not so, to ensure everything works correctly, it is necessary to manually set this.

Temperature sensors tuning

All the temperature sensors are factory calibrated using a precision thermometer, but still, they are not perfect. They might report slightly different values and their readings might drift over long periods time. To avoid these issues it is possible to adjust their values using an external trusted thermometer. The tuning procedure is very simple:

- 1. Let the machine temperature stabilize, if you have just finished a process clean the machine and wait some time to allow the machine temperature to be the same as the ambient temperature.
- 2. Make sure that all the sensors are not in contact with water or chemistry, in other words, make sure that they are measuring the current ambient temperature.
- 3. Place your trusted thermometer near the machine and make sure that its probe it's not in contact with anything other than the air.
- 4. Take a reading of the ambient temperature on the external thermometer.
- 5. Enter the ambient temperature value in the text area and click on the "Tune" button. A message with the result of the tuning procedure will popup on the screen.

You don't need to do this every time you use the machine, tuning the sensors once every two or three months or after long periods of inactivity should be perfectly fine.

	Configuration						
Processes	Temperature <u>°C</u> °F Temperature sensors tuning	?					
	Water inlet connection Yes No 20.0 °C	Tune					
ŝ							
Configuration	Film rotation speed	? 60 rpm					
وترج	Film rotation inversion interval	? 5 sec					
Tools	Drain/fill time overlap with processing time	? 50 %					

Figure 4.4: The "Configuration" tab

A note about fill and drain times

Filling and draining the tank can't be done instantaneously and inevitably take some time. The overlap percentage between filling and draining time and processing time let's you choose, depending on your personal preferences, how much of the filling and draining time must be considered as processing time (the time you set for each step of the process). For example, if filling and draining the tank takes 20 seconds and the processing time for an hypothetical step is 60 seconds, depending on the overlap percentage we might have the following situations:

- Overlap 0%: filling takes 20s, processing takes 60s and draining takes 20s, filling and draining times are not counted as processing time.
- Overlap 50%: filling takes 20s, processing time is reduced to 40s and draining takes 20s, 10s of filling and 10s draining (50% of their time) are counted as processing time.
- Overlap 100%: filling takes 20s, processing time is reduced to 20s and draining takes 20s, all 20s of filling and all 20s of draining (100%) are counted as processing time.

as the overlap percentage grows more and more of the filling and draining time ends up as counting as processing time.

Figure 4.5 shows, in a schematic way, how the overlap percentage parameter influences process execution. Fill and drain times are represented in green.

By comparison with manual film processing, you can think of this option as the moment in which you start the timer when pouring chemistry into the tank:

• Setting the overlap to 0% is the same as starting the timer *after* you have poured all the chemistry into the tank and stopping it *before* pouring it



Figure 4.5: Schematic representation of the different overlap possibilities

out.

- Setting the overlap to 50% is the same as starting the timer halfway thorough the pouring, both when filling and draining the tank.
- Setting the overlap to 100% is the same as starting the timer when you start pouring the chemistry into the tank and stopping it when you have finished pouring the chemistry out of the tank.

As with manual film processing, there is no "correct" setting, we suggest you to experiment with this setting to find out which value works best for.



4.6.3 Main interface - Tools tab

Figure 4.6: The "Tools" tab

The "Tools" tab, shown in Figure 4.6, is split in four sections. In the "Maintenance" section you can find the three special processes: the cleaning process, the draining process and the valve check process. You can start them by clicking on the corresponding "play" icon on the right. At the bottom you can find the "Statistics" section. It contains some information about your machine usage.

In the right column, at the top, you can find the "Utilities" section. Here you have two green boxes with the "Import" and "Export" functions. To know more about these functionalities read the dedicated chapter.

WARNING: be very careful with the import function! By importing processes and configuration from a USB drive you will completely overwrite the current configuration of the machine and the operation cannot be undone.

At the bottom you can find the "Software" section. Here you can see the serial number of the machine and the version number of the installed software. The "Upgrade" button will open a dialog that will start the software upgrade procedure. See the dedicated chapter for a detailed description of the upgrade procedure.



4.6.4 Process detail view

Figure 4.7: The "Process detail" view

In the "Process detail" view, shown in Figure 4.7, you can see all the details of a process, at the top you have the process name, on the left you have the steps list and on the right you can see other properties of the process, such as temperature control, target temperature and if the process is marked as favourite.

In the steps list, for each step, from left to right you can see:

- The step type, distinguished by a specific icon:
 - A Chemistry

 - Multi-rinse
- The source of the step ("C1", "C2", etc. for chemistry containers and "WB" for water bath)

- The step's name
- \cdot The step's processing time

It is possible to create a copy of the process by clicking on the clone button in the top right corner, a copy of the process with the same name with "(copy)" appended at the end will be immediately created.

At the bottom right you have four buttons:

- "Back": go back to the process list
- "Edit": enable process editing
- \cdot "Delete": delete the process
- "Play": start the process

4.6.5 Process edit view



Figure 4.8: The "Process edit" view

Clicking on the "edit" button will transform the view to enable process editing, see Figure 4.8. At the top, the process name will turn into an editable text area, on the right, process details will be replaced by various widgets and the "Edit" button will be replaced by a "Save" button. Now, clicking on the "Back" button will go back to the process detail view.

The steps list will change as well. On the right of each step two arrows will appear, they can be used to change the order of the steps and move the corresponding step up or down. Clicking on one of the steps or on the "Add step" button will open the step editing dialog, shown in Figure 4.9. In this dialog you can change everything that regards the step: name, duration, type, source and if the chemistry should be discarded after processing. You can also delete the step using the dedicated button.

Near the source drop-down you can see the current temperature of the selected container. This can be very useful in case of black and white negative processes that are not temperature controlled but are temperature sensitive. In



Figure 4.9: The "Step edit" dialog

such cases you can pour the developer chemistry into the corresponding tank, open the step edit dialog and read the temperature of the developer, then you can adjust the processing time according to the film manufacturer specifications.

Remember that some limitations apply to the step's properties:

- the name cannot be empty
- the duration is limited between 1 minute and 2 hours
- \cdot chemistry steps cannot have the water bath as source
- multi-rinse steps can only have the water bath as source
- in rinse and multi-rinse steps the water will always be automatically discarded after processing

When you are done editing a process you can click on the "Save" button to save it to permanent storage, a dialog will show the result of the operation.

Clicking on the "Play" button while editing a process will start the process as usual but will also automatically save it. It's not possible to execute a process that has not been previously saved.

4.6.6 Process execution view

After clicking on the "Play" button in the process detail or edit view you will be brought to the "Process execution" view. This is composed of various different sub-views.

Tanks size selection view

The first view is the tank selection view, shown in Figure 4.10. Before starting the process the machine needs to know which tank size will be used.

WARNING: choosing the correct tank size is extremely important because it will determine fill and drain times. Since this a rotary film development ma-



Figure 4.10: The "Tank selection" view

chine it's crucial to pump the right amount of chemistry needed to completely submerge the film inside the tank. Starting a process using a smaller tank size by mistake might lead to uneven development since parts of the film may not be properly submerged.

Special processes such as the cleaning or draining process, require the tank to **not** be in the machine, in this case a message will inform you about this.

Below the tank selection buttons you will also see the "Enable fast heating" switch. If the process doesn't require temperature control or if the machine's water inlet is not connected this option will not be available and the switch will be grayed out. You if turn on the switch, instead of *regular heating*, *fast heating* will be used during the process.

Once the correct tank size is selected the process can be started by clicking on the "Start" button.

After starting the process the machine will begin with preliminary checks. You will be presented with three different views depending on process requirements:

- 1. First it will check the water level and fill the water bath.
- 2. Then it will move on to heating the chemistry.
- 3. Finally, it will check if the tank is in position and locked in place and then will check if the film inside the tank is rotating correctly.

These checks are always displayed on the left of the interface and they represent what the machine will do before starting the actual processing. Checks 1 and 2 might be skipped if they don't make sense for the current process.

Water bath filling

In the water bath filling phase the water must reach the correct level, depending on how the machine is set up, this may happen automatically (if the water inlet is connected) or it may be done manually. The machine displays the



Figure 4.11: The "Water bath filling" view

needed instructions in this phase, as shown in Figure 4.11.

In case you're filling it manually using a jug or a bucket, there are two water level sensors inside the machine that indicate which level the water must reach. If the tank is already placed inside the machine the water must reach the top sensor, otherwise the bottom sensor. This is necessary to prevent the water to overflow when the tank will be inserted in the machine. In any case you will see a message on the display that will inform you about the correct sensor to reach.

If the water inlet is connected to a pressurized water source everything happens automatically, the machine knows which sensor must be reached and you don't have to do anything.

When the correct water level is detected the machine moves to the next phase automatically. Using the "Skip" button you can (at your own risk) move to the next phase before the water reaches the correct level.

Water bath heating

When the water bath is full the machine starts heating the water which, in turn, heats the chemistry. On the screen, as shown in Figure 4.12, you will see the current values: the target temperature, the water bath temperature and the chemistry temperature. When the chemistry temperature reaches the target one the machine moves to the next phase automatically.

If, for some reason, there isn't enough water in the machine, it might not be able to correctly detect water recirculation. In this case the heating process can't start because heating the machine without flowing water may generate too much heat and damage the internal components.

If you have filled the water bath manually, the water recirculation circuit may not be completely filled and priming the pump may require some tries. If, at the beginning of this phase, you hear the water pump starting and stopping



Figure 4.12: The "Water bath heating" view

it's because the machine is trying to remove the air in the circuit and prime the pump. If after several tries the machine hasn't been able to start you will see a message on the screen telling you that the water is not recirculating, you can tell it to check again and it will eventually be able to start.

Once started, you can skip the heating phase at your own risk, the heating will continue even during processing but the whole process will be executed at a lower temperature than the target one.

Tank checks

Once the water bath is filled and heated and the chemistry has reached the correct temperature the user interface moves to the "Tank checks" view, shown in Figure 4.13. The last thing to check before starting with the actual processing is to verify that:

- \cdot the tank is in position
- the tank is locked
- \cdot the film inside the tank is rotating correctly

In case of errors you will be notified, the machine will produce a sound and a dialog will appear asking you to choose what to do. In most cases you will be able to retry the check or to ignore the problem (at your own risk), the interface will only prevent you to do anything that may damage the machine itself but otherwise, you are always free to decide what to do.

Processing

After all the preliminary checks are completed the interface will move the actual processing view, shown in Figure 4.14.

On the left you will see information about the current and following steps:

 \cdot "Step source": the source of the current step is displayed

E6 six baths		
Next steps:		
The machine will:		
✓ Fill the water bath	Tank is in position:	Yes
 Heat the water bath and the chemistry 	Tank is locked:	Yes
ightarrow Check tank presence and film rotation	Film is rotating:	Checking
Stop		

Figure 4.13: The "Tanks checks" view

- "Temp. control": the current state of the temperature control process. Its value can be "Off", "Running" or "Suspended".
- "Water temp.": the current temperature measured by the sensor placed in the water bath.
- "Next step": the name of the next step that will be executed. If the current step is the last one, a dash will be displayed instead.

If temperature control is not active the "Temp. control" and "Water temp." labels will be grayed out. If the temperature control process gets suspended because the water level is too low (see subsection 4.5.1 for more information about it) the "Temp. control" label will be highlighted in red to remind the user to refill the water bath.

On the right you will see two progress arcs, the outer one displays the overall progress of the process, the inner one displays the progress of the current step. You will also see two countdowns, the big one at the bottom shows the time left until the end of the process while the smaller one in the center of the arcs shows the time left until the end of the current step. Inside the arcs you can also see the name of the current step and the current operation (filling, draining or processing).

Once the processing has started, the machine (for obvious reasons) cannot be interrupted, the only thing that the user can do is to stop the process. For this purpose, on the bottom left there are two different stop buttons:

- The "Stop after this step" button will wait until the end of the current step and then will stop the process.
- \cdot The "Stop now" button will immediately stop the process.

WARNING: Be extremely careful if you stop the process using the "Stop now" button. The machine will stop processing immediately and everything will stay as is. You might end up with chemistry split between the tank and the con-



Figure 4.14: The "Processing" view

tainer, or completely inside the tank. Consider this button as an "emergency stop" that can be used if something is going completely wrong with the machine and you absolutely need to stop it.

At the end of the process, the machine will play a sound and will show a dialog telling you that the process is over. Once the dialog has been closed the interface will go back to the process details. At this point, processing is over and you can unlock the tank and remove it from the machine.

4.7 Executing a process

Assuming you have already created the process, executing it is very simple. Make sure to follow these steps:

- 1. Make sure that all chemistry recovery faucets are completely closed. The faucets are directly connected to the corresponding container and if they are not completely closed you will find yourself with some lost chemistry some cleaning to do.
- 2. Place the container lids on the corresponding containers to protect the containers from splashes or spills.
- 3. One at a time, depending on how the process is configured, pour the chemistry in the correct containers by temporarily removing the lid. Doing this one a time prevents splashes of chemistry to fall into the adjacent containers (you obviously don't want some of your stop bath to fall into the developer tank by accident).
- 4. After pouring the chemistry close the containers again with the lid. Make sure that the knob/relief valve is open. To make sure of this, unscrew the knob by rotating it counter-clockwise. This is very important since opening the relief valve will allow air to enter the container. Not doing so may

prevent the pump to work correctly. The lids will also help with thermal insulation during the heating phase.

- 5. Make sure the tank and all its components are completely dry before loading it with film.
- 6. Load the film inside the tank and screw on the tank lid. Make sure to tighten the tank lid firmly.
- 7. Place the tank in the correct position inside the machine by aligning the bottom lid of the tank with the plastic guides on the side of the water bath and by aligning the tank port with the connector on the bottom of the water bath. There is only one way to correctly place the tank in the machine, you will notice if something is wrong. Once you have aligned everything make sure to completely push the tank down.
- 8. Lock the tank in place using the lock bar. This is very important since the lock bar, as well as preventing the tank from moving, also opens the tank relief valve. Starting a process with the tank relief valve closed will limit the pump ability to fill the tank up to the correct level.
- 9. Select the process you want to execute using the user interface on the touch display, click on the "Play" button and follow the on-screen instructions.

If your process requires temperature control the chemistry will take some time to heat up, in this case the tank can be placed and locked into the machine later, while the chemistry is heating up. Don't worry, if you forget to place the tank in the machine and the chemistry reaches the desired temperature, the machine will warn you that the tank has not been detected and will not start the process.



Part Three: Maintenance

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5. Other features

The machine sports some other additional features.

5.1 Internal washes

The machine always tries to wash its internals after each chemistry step by letting some clean water flow through. If the process uses the water bath, either because it requires temperature control or because one of its rinse steps have the water bath as source, the water used for internal washes can be taken from there. If the process doesn't use the water bath the machine will try to take the water from container 6. If container 6 is used in the process steps for other purposes the machine will not try to do these internal washes.

For example, if you want to execute a classic black and white process (developer, stop and fix) that doesn't require temperature control, you can use containers 1, 2 and 3 for chemistry and fill container 6 with water, the machine will use it for internal washes.

Internal washes are always enabled and are automatically managed by the machine, you don't need to manually enable them or add them to process steps.

NOTE: in cases where water is taken from container 6, the machine has no way of knowing if the container is actually filled with water so it will try to take water from it anyway, even if it's empty.

5.2 No-lights mode

Using the switch on the control panel it is possible to turn the display backlight and the power LED off in order to stop the machine from emitting light. This feature can be extremely useful if you need complete darkness in the room while the machine is working. For example, if you have placed the machine in your darkroom, you can do other light sensitive work (like printing or loading film in other tanks) while the machine is processing some film for you.

In the "up" position the switch turns on the display backlight while in the "down" position turns them off.

NOTE: be careful because only the display backlight will be turned off, not the whole display, so the touch panel input will still be processed!

6. Maintenance and special processes

6.1 Special processes

The machine also has three special built-in processes that are not related to film development:

- **Cleaning process**: it is used to automatically clean the machine and remove any chemical residues left after processing, more on this later.
- **Drain process**: it is used to drain the water bath after processing. This process can be run as many times as you like depending on the situation, when you notice that there is no more water left in the machine the process can be stopped even if it hasn't reached the end (the machine has no way of knowing how much water is left in the water bath so it always runs for a fixed amount of time). In any case, if you find yourself with a full water bath, consider the possibility of using the water to run the cleaning process instead of draining it.
- Valve check process: this process can be used to verify if all the valves in the machine are working correctly, more on this later.

You can run them directly from the "Tools" tab in the main user interface.

6.2 Cleaning the machine and the "Cleaning process"

Chemical spills should be cleaned immediately to avoid stains, corrosion or contamination. The outside of the machine can be cleaned by wiping it using a damp cloth.

To thoroughly clean the machine and its internals there is an automatic cleaning process. This process should be run at the end of a processing session or between two different processes, it is not needed if the same process is run multiple times in a row. We suggest running the cleaning process twice if you want to make sure that no chemistry residues will be left in the machine or if you know you that the machine won't be used for a while. **WARNING**: before running the cleaning process make sure that:

- The chemistry has been completely removed from the containers (some residues are fine, they will be removed by the cleaning process).
- The faucets are all completely closed.
- Container lids have been removed.
- The film tank has been removed.

The cleaning process rinses all the containers by filling them with clean water which is then discarded, this is why the chemistry *has* to be removed, otherwise everything will overflow into the water bath, rendering the cleaning process useless. After cleaning all the containers a small amount of water will be left in the water bath, this water can't be used for more rinsing so it's discarded.

When the cleaning process is done, to thoroughly clean the tubes between the chemistry containers and the faucets, open the faucets and manually let some clean water run through the containers and out of the faucets (0.5 liters of water per container should be enough). After that close the faucets again.

The containers lids should be cleaned separately in a sink. Tanks used for processing can be cleaned like any other film development tank, rinse them thoroughly with water and wipe them with a cloth until they are completely dry. Before re-using a tank to execute another process, make sure that all its components are completely dry, drops of water that end up on the film before processing may leave marks on your images.

After the cleaning process some water may be left inside the machine. Small amounts of water left in the water bath will not create a problem but full water baths should not be left in the machine for long periods of time, we suggest to completely drain the water bath after each processing session. After draining the machine, we also suggest to wipe the inside of the water bath with a cloth to prevent build-up of residues over time. Chemistry containers can be cleaned using a damp cloth as well but you have to be extra careful to avoid damaging the temperature sensors inside them.

Depending on the quality of your tap water some lime scale might build up in the machine over time. To remove such residues you can run a cleaning process and pour a 500ml/11 bottle of coffee machine de-scaler in the water bath before starting the process. You can repeat the process until you are satisfied.

6.3 The "Valve checking process"

Our machine contains various valves that open and close during processing to direct the flow of chemistry and water to the right places. If the machine is not used for a long period of time (more than one month) the membrane in some valves may get stuck. This problem can usually be fixed by simply opening and closing the valves repeatedly.

To avoid unpleasant surprises when running the first process after the machine has not been used for a while, it's good practice to run the valve checking special process and verify that everything is working properly. The valve checking process will simply try to open and close each valve repeatedly, a valve that is working correctly will produce a distinctive "clunk" sound every time it is operated while a valve that is stuck will remain silent. You can run the valve checking process until you hear all valves working properly.

7. Software and data

7.1 Software upgrades

Software upgrades are provided as "upgrade packages", these packages are files with the ".afdu" extension that can be downloaded from our website. To perform an upgrade to a more recent version of the software follow these steps:

- Copy the upgrade package file that you want to install on your USB drive. The drive must be formatted as FAT32.
- Insert the drive in the USB port under the display.
- In the interface go to the "Tools" tab in the main view and, under the "Software" section, click on the "Upgrade" button.
- The upgrade dialog will appear, when you are ready click on the "Start" button to begin with the upgrade procedure. The progress bar shows the status of the upgrade. Once started, the upgrade procedure is completely automatic and cannot be stopped.
- When the upgrade is over you will see a message with the outcome of the operation.

After a successful upgrade you will have to reboot the machine to make it effective. After a successful upgrade the "Start" button will change into the "Reboot" button, you can click it and the machine will automatically reboot without needing a power cycle. A failed upgrade does not compromise the machine in any way, you can continue to use it just as before.

NOTE: it's not possible to downgrade the software to an older version, trying to do so will result in an error.

7.2 User data import/export

It is possible to import or export the configuration and the processes stored on the machine to and from a USB drive. This functionality can be useful for backup purposes or to transfer the configuration of a machine to another one. The machine uses a proprietary file format with the ".afdd" extension.

7.2.1 Exporting data

To export configuration and processes follow these steps:

- Insert a USB drive formatted as FAT32 into the USB port under the display.
- In the interface go to the "Tools" tab in the main view and, under the "Utilities" section, click on the "Play" icon of the "Export" green box.
- A dialog will appear on the screen, when you are ready click on the "Export" button.
- A message will appear reporting if the machine was able to export the data or not.
- Remove the USB drive, it should now contain a file named "FilmDevelope-rUserData.afdd"

7.2.2 Importing data

To import configuration and processes follow these steps:

- Insert a USB drive formatted as FAT32 into the USB port under the display. The drive should contain a file with the ".afdd" extension, if more than one file ends with the ".afdd" extension then the first in lexicographical order is selected.
- In the interface go to the "Tools" tab in the main view and, under the "Utilities" section, click on the "Play" icon of the "Import" green box.
- A dialog will appear on the screen, when you are ready click on the "Import" button.
- A message will appear reporting if the machine was able to import the data or not.
- Remove the USB drive.

WARNING: be very careful with the import function! By importing processes and configuration from a USB drive you will completely overwrite the current configuration of the machine and the operation cannot be undone.

8. Troubleshooting

This is a very complex machine and there are almost no user serviceable parts. The only things that we can suggest you to check in case of problems are the power cord and the fuses in the socket.

If the machine doesn't turn on there are a couple of things to check:

- Verify if the switch on the control panel is in the "ON" position. When the switch is in the "OFF" position the machine shows no signs of life even if it's turned on. Move the switch to the "ON" position and check again.
- Check if the power cord is not damaged and it is correctly connected to both the mains and the socket on the back of the machine. If the power cord gets damaged you must replace it with another one of the same type.
- With the power switched off, check if the fuses in the socket are not blown. If they are blown you can try to replace them and check again (make sure to use the correct ones). If the problem persists you should contact us for support.

During the startup phase the machine verifies if all the temperature sensors are working correctly. If it detects that a sensor is malfunctioning it will display an error dialog on the screen. You can still use the machine as long as the processes that you want to execute don't need temperature readings from the broken sensors.

To avoid any risk of damage or electrical shock, **do not** open the machine and **do not** attempt to fix it on your own, opening the machine will also void your warranty! If you are having issues and you are not sure on how to proceed, please don't hesitate to contact us at support@analogico.adel2000.it or to contact your local distributor.

the star of all film developing machines.