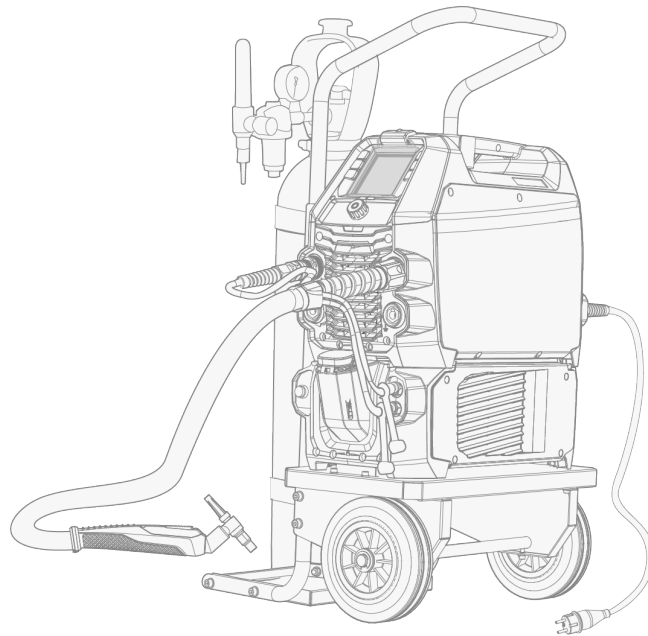


# MINARC T 223 ACDC



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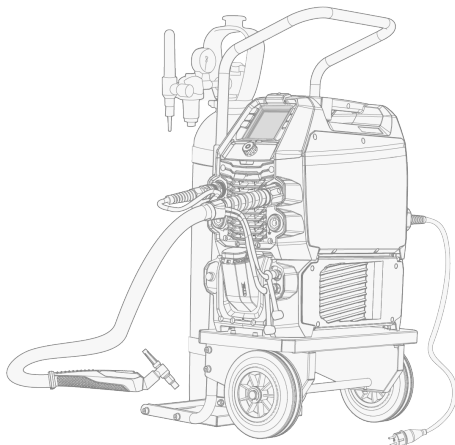
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## 1. GENERAL

These instructions describe the use of Kemppi's Minarc T 223 ACDC welding device designed for demanding professional use. The equipment consists of the Minarc T 223 ACDC power source with a control panel, optional Master Cooler 05M cooling unit and an optional cart.

The Minarc T 223 ACDC power source is suitable for TIG and pulsed TIG welding with both direct current (DC) and alternating current (AC), as well as MMA welding with DC current. Minarc T 223 ACDC can also be used for post-weld cleaning and polishing to remove impurities from the welded area.





Minarc T 223 ACDC is designed to be used together with Kemppi's Flexlite TX TIG torches.


### Important notes

Read the instructions through carefully.

Items in the manual that require particular attention in order to minimize damage and harm are indicated with the below symbols. Read these sections carefully and follow their instructions.

 *Note: Gives the user a useful piece of information.*

 *Caution: Describes a situation that may result in damage to the equipment or system.*

 *Warning: Describes a potentially dangerous situation. If not avoided, it will result in personal damage or fatal injury.*


### DISCLAIMER

While every effort has been made to ensure that the information contained in this guide is accurate and complete, no liability can be accepted for any errors or omissions. Kemppi reserves the right to change the specification of the product described at any time without prior notice. Do not copy, record, reproduce or transmit the contents of this guide without prior permission from Kemppi.

The source language for this document is English. All other language versions available are either professional human translations or advanced machine translations. Any feedback regarding translation terminology can be sent to [userdoc@kemppi.com](mailto:userdoc@kemppi.com).

## 1.1 WELDING SAFETY

Welding is always classified as hot work, and welding equipment typically contains high-voltage circuits. If you are not familiar with welding and welding principles, it is recommended that you acquire welding training or professional guidance before commencing welding. The welding equipment mentioned in this manual is intended for professional use in an industrial environment.

 *For your own safety, and that of your working environment, pay particular attention to the safety instructions delivered with the equipment.*

You can also access and download the safety instructions by using these links:

- [Safety](https://kemp.cc/safety/general)  
(<https://kemp.cc/safety/general>)
- [Personal protection](https://kemp.cc/safety/ppe)  
(<https://kemp.cc/safety/ppe>)
- [Welding guns and torches](https://kemp.cc/safety/torches)  
(<https://kemp.cc/safety/torches>)

## 1.2 EQUIPMENT DESCRIPTION

### Power sources

- Minarc T 223 ACDC GM (220 A AC/DC)
  - >> Multi-voltage and generator compatible power source
  - >> A VRD (voltage reduction device) model version, where the VRD function is locked on is also available.

For the power source part descriptions, refer to "Minarc T 223 ACDC power source" on the next page.

### Control panel

- Color LCD display with one control knob (with push button function) and six push buttons

For more information, refer to "Minarc T 223 ACDC control panel" on page 29.

### Cooling unit (optional)

- Master Cooler 05M

For the cooling unit part descriptions, refer to "Cooling unit (optional)" on page 10.

### TIG welding torches

- Flexlite TX TIG torches

For more information, refer to [Kempfi Userdoc](#).

### Optional accessories

- 2-wheel carts
- Remote controls
- Protective sliders
- Power source air filter

For more information on optional accessories, contact your local Kempfi dealer.

## EQUIPMENT IDENTIFICATION

### Serial number

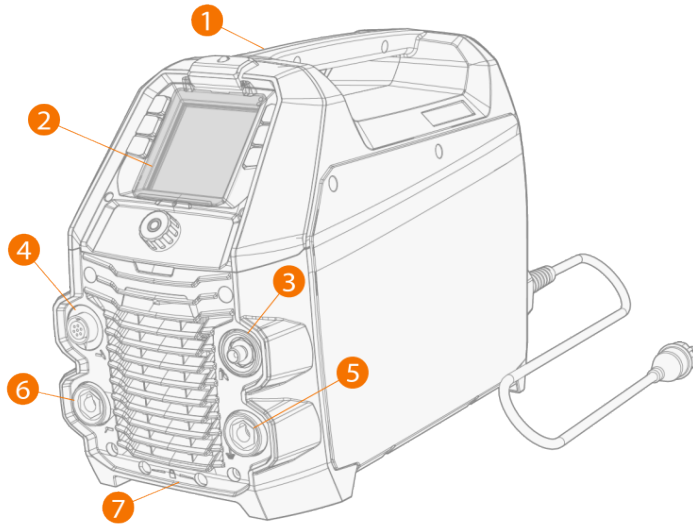
Serial number of the device is marked on the rating plate or in another distinctive location on the device. It is important to make correct reference to the serial number of the product when ordering spare parts or making repairs for example.

### Quick Response (QR) code

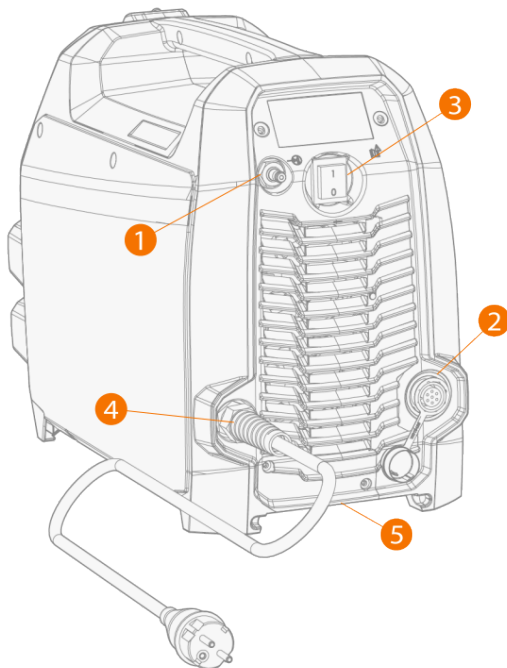
The serial number and other device-related identification information may also be saved in the form of a QR code (or a barcode) on the device. Such code can be read by a smartphone camera or with a dedicated code reader device providing fast access to the device-specific information.

## 1.3 MINARC T 223 ACDC POWER SOURCE

### Front



1. Lifting handle (also for mechanical lifting when the power source is not installed on a cooling unit or cart)
2. Control panel (and hinged control panel cover)
3. Welding cable connector
4. Control cable connector
5. Earth return cable connector
6. Connector for MMA electrode holder
7. Front locking interface  
>> For locking on top of the cooling unit or on the cart

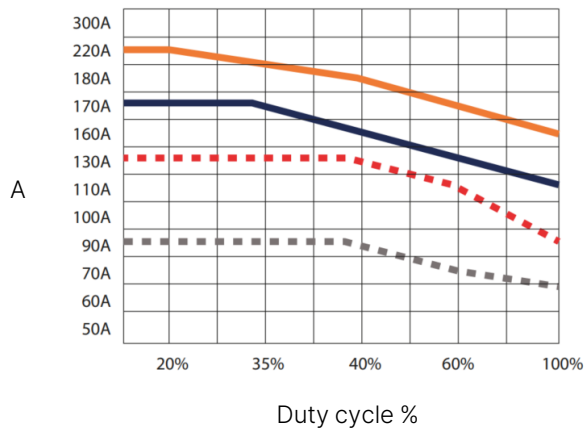
**Rear**

1. Shielding gas hose connector
  2. Remote control connector
  3. Power switch
  4. Mains cable
  5. Rear locking interface
- >> For locking on top of the cooling unit or on the cart.

### 1.3.1 MINARC T 223 ACDC WELDING PERFORMANCE

The following describes the welding performance of Minarc T 223 ACDC. For technical data, refer to "Minarc T 223 ACDC power source" on page 57.

Minarc T 223 ACDC welding performance (40°C)



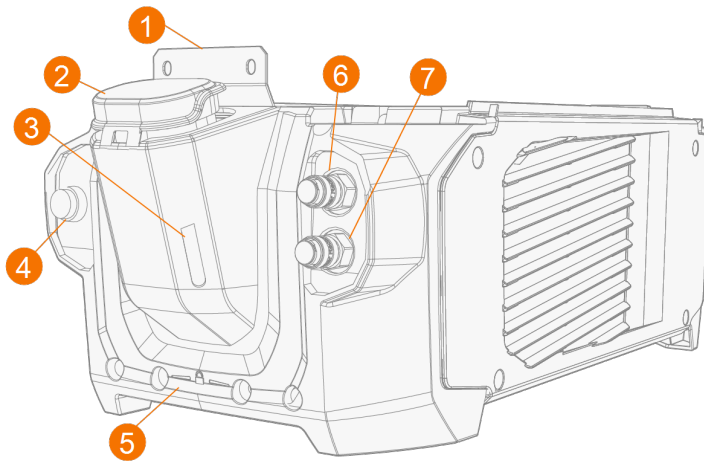
Mains connection voltage (1-phase)

TIG 220...240 V		MMA 220...240 V	
TIG 110...120 V		MMA 110...120 V	

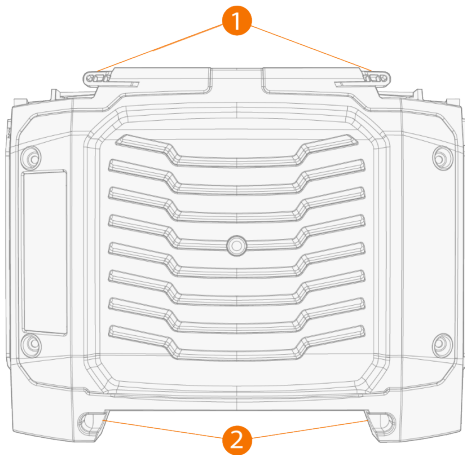
## 1.4 COOLING UNIT (OPTIONAL)

**i** The cooling unit is not available for Minarc T 223 ACDC with 110...120 V supply voltage.

Front






- 1. Front locking interface**  
>> For locking to the power source
- 2. Cooler container cap**
- 3. Cooling liquid level indicator**
- 4. Cooling liquid circulation button**  
>> Keeping the button pressed activates the pump and circulates the cooling liquid throughout the system. Once released, the pump stops.
- 5. Front locking interface**  
>> For locking on the cart
- 6. Coolant inlet connector (red)**
- 7. Coolant outlet connector (blue).**

**Rear**

- 1. Rear locking interface**  
>> For locking to the power source
- 2. Rear locking interface**  
>> For locking on the cart.


## 2. INSTALLATION

-  *Do not connect the equipment to the mains before the installation is complete.*
-  *Do not modify the welding equipment in any way, except for the changes and adjustments covered in the manufacturer's instructions.*
-  *Place the machine on a horizontal, stable and clean ground. Protect the machine from rain and direct sunshine. Check that there is enough space (> 15 cm) for cooling air circulation in the machine vicinity.*

### **Before installation**

- Make sure to acknowledge and follow the local and national requirements regarding installation and use of high voltage units.
- Check the contents of the packages and make sure the parts are not damaged.
- Before you install the power source on site, see the requirements for the mains cable type and fuse rating.

### **Distribution network**

-  *This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated radio-frequency disturbances. However, Minarc T 223 ACDC complies with IEC 61000-3-12 and can also be connected to public low-voltage systems.*

## 2.1 INSTALLING COOLING UNIT (OPTIONAL)

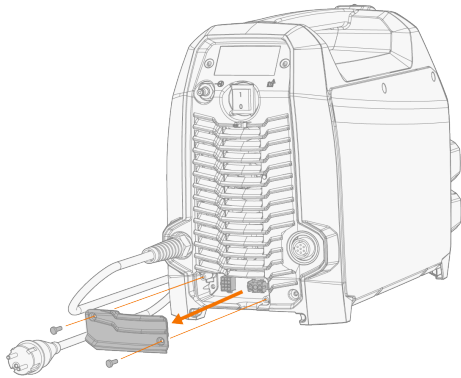
**i** The cooling unit is not available for Minarc T 223 ACDC with 110...120 V supply voltage.

**⚠** The cooling unit must be installed by authorized service personnel.

Tools needed:

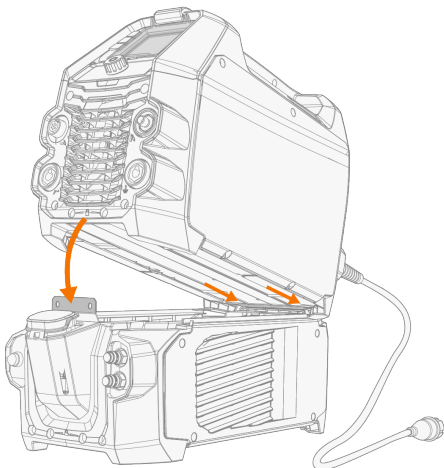


1. Remove the small connector cover in the rear of the power source.

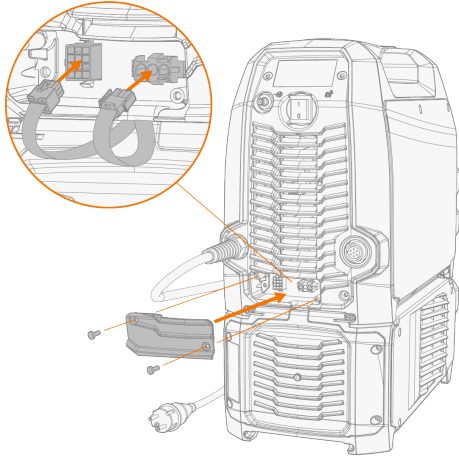


2. Route the cooling unit's connection cables so that they remain accessible through the next steps.
3. Lift the power source on top of the cooling unit so that the locking interfaces align and the fixing plate goes into its slot.

**⚠** Ensure that the cooling unit's connection cables are not caught and/or damaged between the edges.





4. Fix the units together with two screws (M5x12) in the front.
5. Connect the cooling unit cables.



6. Replace the small connector cover.

## 2.2 INSTALLING EQUIPMENT ON CART (OPTIONAL)

Minarc T 223 ACDC has two transport unit options: a 2-wheel cart with a gas bottle rack (T22M) and a 2-wheel cart without a gas bottle rack (T32A).

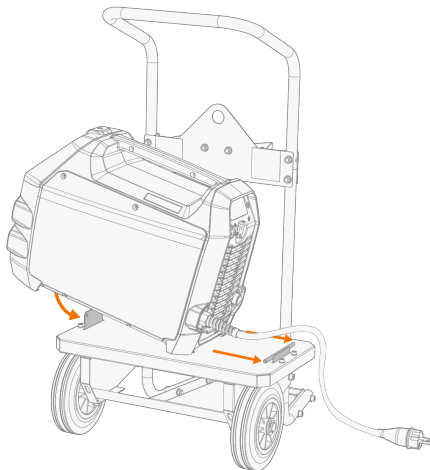
-  *You can install the power source on the T22M cart with or without the cooling unit. Do not install the cooling unit on the T32A cart. Otherwise the bottom securing interface is the same with both carts.*
-  *The maximum recommended size of the gas bottle to be installed on the T22M cart is 20 liters.*

Tools needed:

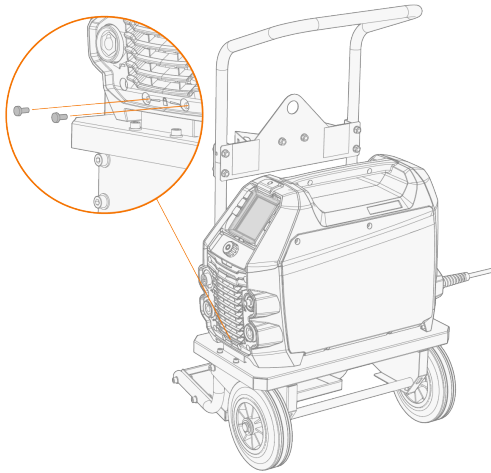


**To install the power source on the T22M cart:**

- 1.** Install the power source on the cart.

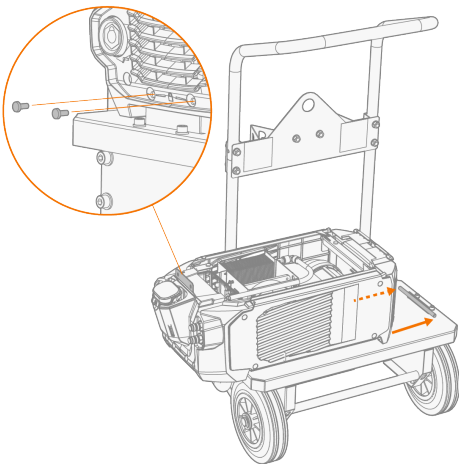


2. Fix the power source to the cart with two screws (M5x12) in the front.

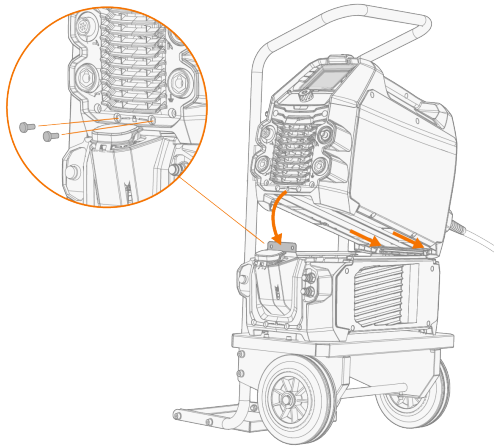


**To install the power source and the cooling unit on the T22M cart:**

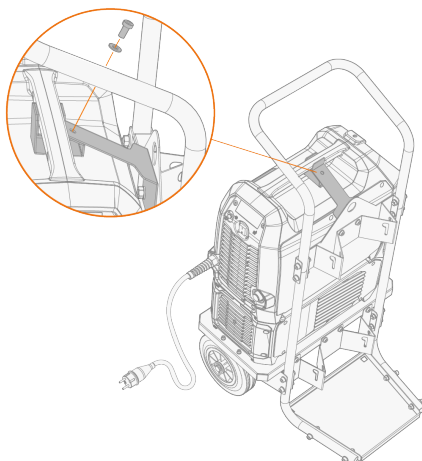
1. Install the cooling unit on the cart.




2. Fix the cooling unit to the cart with two screws (M5x12) in the front.
3. Install the power source on top of the cooling unit. Refer to "Installing cooling unit (optional)" on page 13 for installation details.

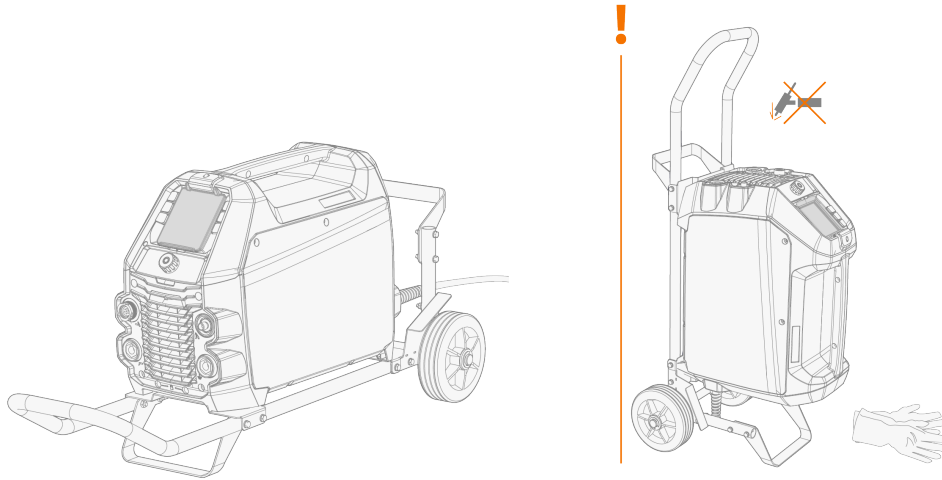


4. Secure the transportation handle to the cart with an additional bracket and a screw (M8x16).

**To install the power source on the T32A cart:**

1. Install the power source on the cart.
2. Fix the device to the cart with two screws in the front (M5x12).

 *The T32A cart must be in horizontal position during welding.*



For lifting the equipment, refer to "Lifting equipment" on page 47.

## 2.3 CONNECTING EARTH RETURN CABLE

**⚠** *Keep the work piece connected to earth to reduce the risk of injury to users or damage to electrical equipment.*

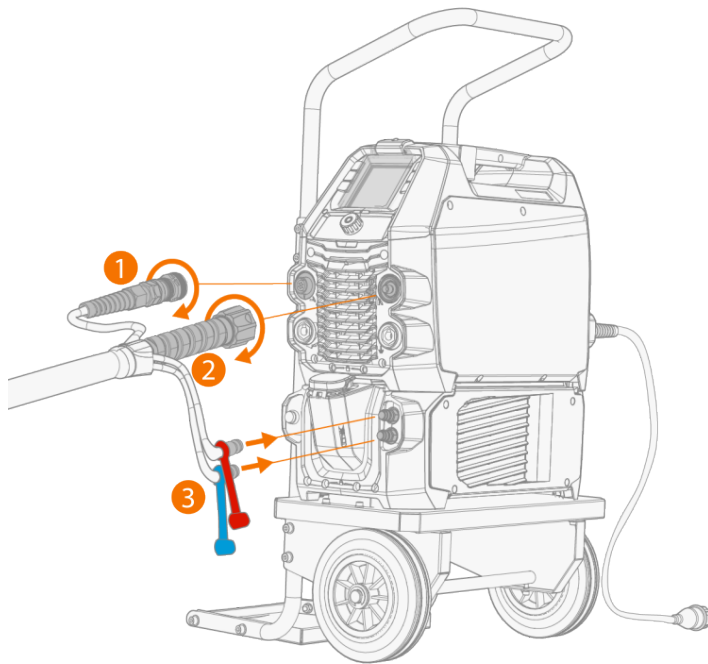
Connect the earth return cable to the earth return cable connector on the power source.



## 2.4 CONNECTING TIG WELDING TORCH

Minarc T 223 ACDC is designed to be used with the Kemppi Flexlite TX TIG welding torches. For more information, refer to [Kemppi Userdoc](#).

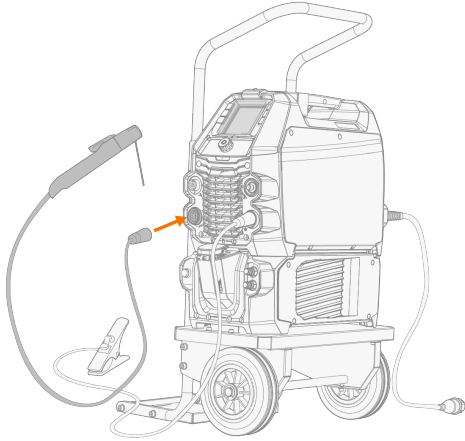
1. Connect the control cable (1) and welding cable (2) to the corresponding connectors in the power source. Secure by turning the connectors clockwise.
2. If your setup includes a water-cooled torch, connect the cooling liquid hoses (3) to the cooling unit. The hoses are color-coded.



3. Check the gas flow. For more information, refer to "Installing gas bottle and testing gas flow" on page 23.

## 2.5 CONNECTING MMA ELECTRODE HOLDER

Connect the MMA electrode holder to the corresponding connector in the power source.



## 2.6 INSTALLING REMOTE CONTROL

Remote controls are optional. Connect the remote control to the Minarc T 223 ACDC power source or the Flexlite TX welding torch. To enable remote operation, set the remote mode in the control panel (refer to "Minarc T 223 ACDC control panel" on page 29).

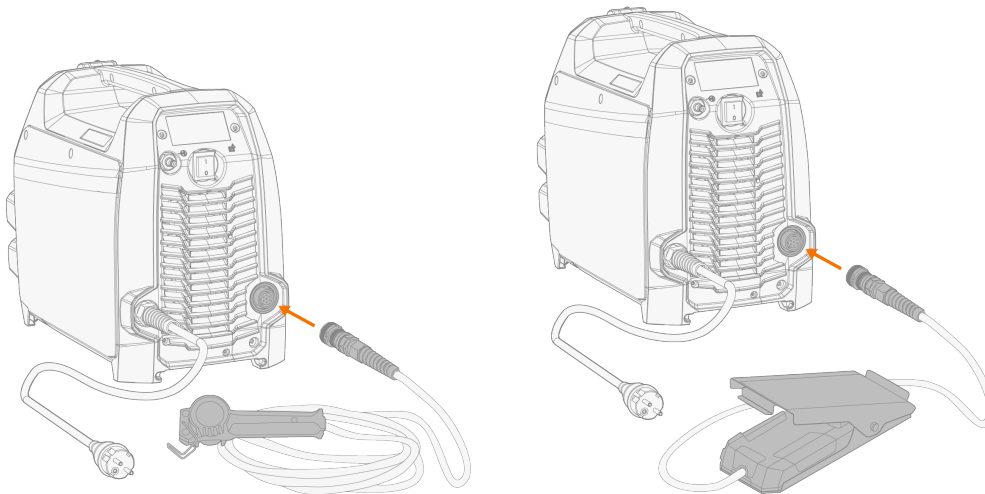
Minarc T 223 ACDC is compatible with the following Kemppi remote controls:

- R10 hand remote control
- FR41 foot pedal remote control
- TXR10 torch remote control
- TXR20 torch remote control (rocker switch).




For information on installing a torch remote control, refer to [Kemppi Userdoc](#).

### Remote control R10/FR41

1. Connect the remote control cable to the power source.

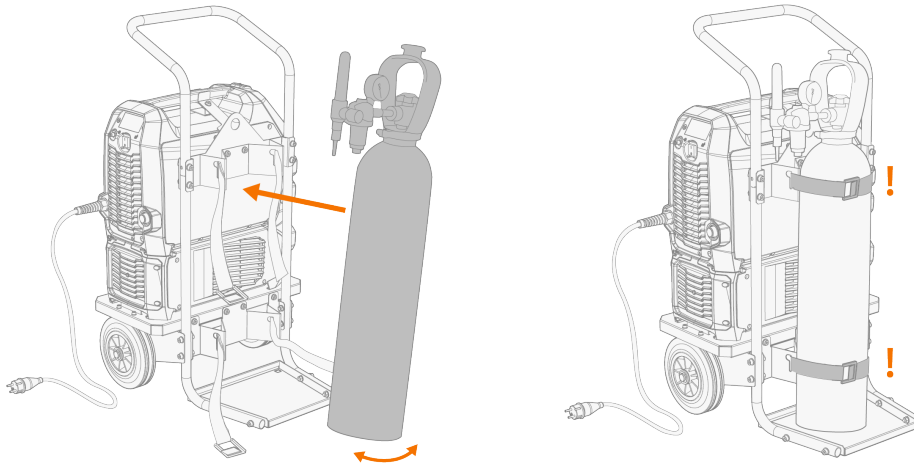


## 2.7 INSTALLING GAS BOTTLE AND TESTING GAS FLOW

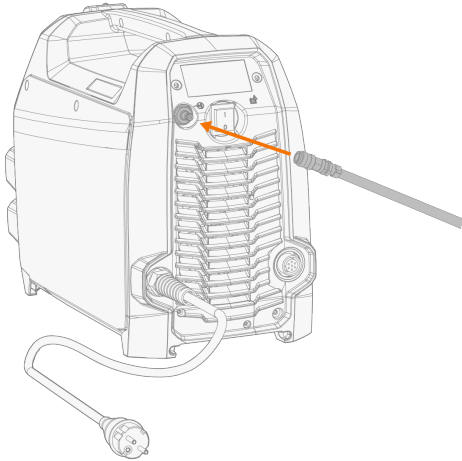
-  *Handle gas bottles with care. There is a risk of injury if the gas bottle or the bottle valve is damaged!*
-  *Always secure the gas bottle properly in an upright position to a special holder on the wall or on the welding equipment cart. Always keep the gas bottle valve closed when not welding.*
-  *- If a cart with a gas bottle rack is used, install the gas bottle on the cart first, then make the connections.*
  - The maximum recommended size of the gas bottle to be installed on the T22M cart is 20 liters.*
  - Install the welding torch to the power source before installing and testing the gas bottle.*

Contact your local Kemppi dealer for choosing the gas and the equipment.

1. Without gas bottle cart: Place the gas bottle in a suitable, secure location.
2. With gas bottle cart: Move the gas bottle on the transport unit's gas bottle rack and secure it in place with the straps and fixing points provided.








3. If not already, connect the welding torch to the power source (refer to "Connecting TIG welding torch" on page 20).
4. Connect the gas hose to the power source.



5. Open the gas bottle valve.
  6. Start gas test by long-pressing the control panel's control knob button in the main view.
- i** *By default, the gas test time is 20 s. During the gas test, you can adjust the time (between 0 ... 60 s, step 1 s) by turning the control knob.*
- i** *You can end the gas test by pressing the control knob button.*
7. Check and adjust the gas flow. Use an external flow meter and regulator for measuring and adjustment.

### 3. OPERATION

Before using the equipment, ensure that all the necessary installation actions have been completed according to your equipment setup and instructions.

-  *Welding is forbidden in places where there is an immediate fire or explosion hazard!*
-  *The welding device is intended for use in environments where the risk of electric shock is not increased.*
-  *Check that there is enough space (> 15 cm) for cooling air circulation in the machine vicinity.*
-  *If the welding equipment is left unused for a longer period, disconnect the mains plug from the mains.*
-  *Always check before use that shielding gas hose, earth return cable and clamp and mains cable are in serviceable condition. Ensure that the connectors are correctly fastened. Loose connectors can impair welding performance and damage connectors.*

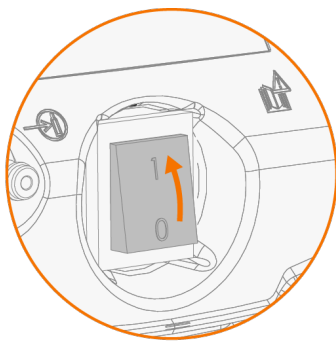
## 3.1 PREPARING WELDING SYSTEM FOR USE

Before starting the use of the welding equipment:


- Ensure the installation has been completed
- Switch the welding equipment on
- Prepare the cooler
- Connect the earth return cable.

### Turning on welding system

To turn on the welding equipment, switch the power source main switch to 1.



Use the main switch to start and shut down the welding equipment. Do not use the mains plug as a switch.


 *If the machine is left unused for a longer period, detach the mains plug to disconnect it from the mains.*

### Preparing cooler

Fill the coolant container inside the cooler with Kemppi cooling liquid and bleed the cooler before use. For instructions on filling and bleeding the cooler, refer to "Preparing cooler" below.

To weld, you must pump the coolant through the system by pressing the coolant circulation button in the front panel of the cooling unit.

### Connecting earth return cable

 *Keep the work piece connected to earth to reduce the risk of injury to users or damage to electrical equipment.*

Attach the earth return cable clamp on the work piece.

Ensure that the contact surface is clean of metal oxide and paint and that the clamp is firmly secured.

### Selecting process

To select the process (TIG/MMA/Cleaning/Polishing), refer to "Minarc T 223 ACDC control panel" on page 29.

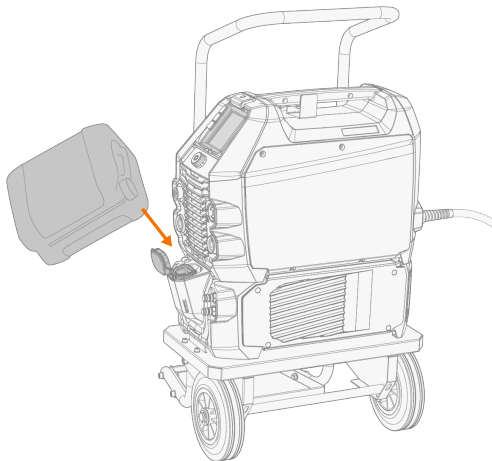
## 3.1.1 PREPARING COOLER

Fill the cooler with pre-mixed coolant solution. The mixing ratio should be 20...50% as standard. Use only ethylene or propylene glycol mixture intended for welding cooling systems, for example Kemppi cooling

liquid. Do not add water to the pre-mixed coolant solution. Do not use automotive cooling solutions or ethanol-based mixtures.

**To fill the cooler:**

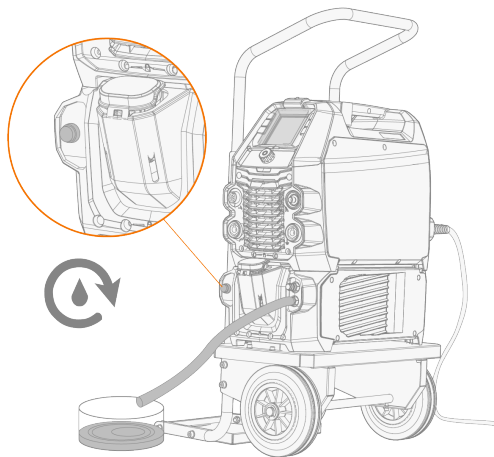
1. Open the cooler cap.
2. Fill the cooler with coolant. Do not fill over the max. marking.



3. Close the cooler cap.

**To bleed the cooler:**

1. Connect the bleeding hose included in the cooler delivery package to the coolant outlet connector.
2. Place a container under the other end of the hose to collect coolant coming from the cooler.
3. Push the cooling liquid circulation button until coolant starts to come out of the hose.

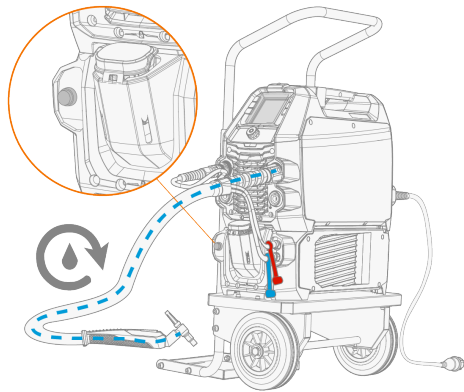


4. Release the cooling liquid circulation button and remove the bleeding hose.
5. Connect the welding torch (refer to "Connecting TIG welding torch" on page 20).

**To circulate the coolant:**

Press the coolant circulation button in the cooler front panel. It activates the motor, which pumps the coolant to the hoses and to the welding torch.

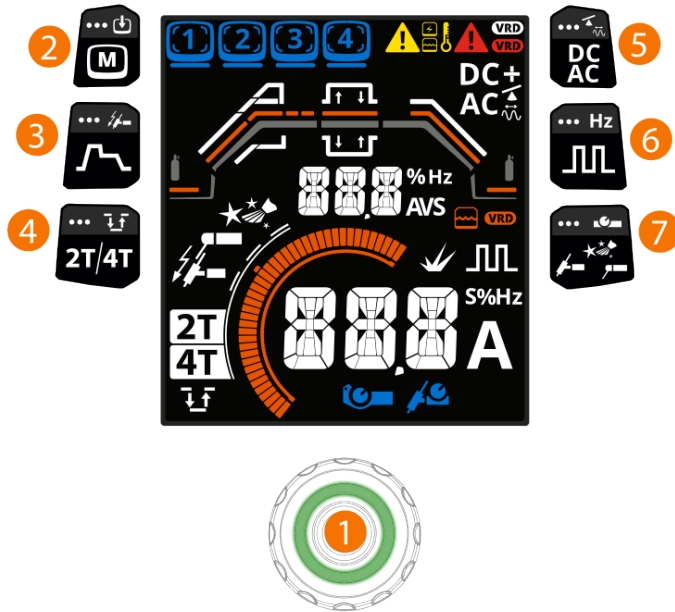
Complete the coolant circulation operation after each time you change the welding torch.



## 3.2 MINARC T 223 ACDC CONTROL PANEL

This section describes the controls and features of the Minarc T 223 ACDC control panel.

You can access different parameter adjustments and setups by pressing the physical buttons (2-7 in the figure below). Once the adjustments have been made, exit by pressing the same button again or by pressing another button.



### General














1. Control knob
  - >> Adjustment and selection (for more information, refer to "Main view" on page 31)
2. Memory channels button
  - >> Short press: Changes memory channel
  - >> Long press: Saves parameters to memory channel
3. Welding parameters and TIG HF ignition button
  - >> Short press: Welding parameter adjustment
  - >> Long press: Toggles between TIG HF ignition ON / OFF (with AC TIG, the HF ignition is always on)
4. Trigger logic button (TIG, cleaning and polishing processes)
  - >> Short press: Toggles between 2T and 4T trigger logic functions
  - >> Long press in 2T: Sets 4T and Minilog on
  - >> Long press in 4T: Sets Minilog on
  - >> Short press when Minilog is on: Sets Minilog off and changes trigger logic to 2T
  - >> Long press when Minilog is on: Sets Minilog off but trigger logic stays in 4T
5. Current mode button
  - >> Short press in TIG: Toggles between DC- and AC current modes
  - >> Long press in AC current mode: AC balance adjustment
  - >> Short press in AC balance adjustment mode: AC frequency adjustment
  - >> Short press in MMA: Toggles between DC- and DC+ current modes
6. Pulse TIG button
  - >> Short press: Toggles between pulse TIG welding ON / OFF
  - >> Long press when pulse TIG is on: Pulse frequency adjustment
7. Process and remote control button
  - >> Short press: Toggles between TIG, MMA, cleaning and polishing processes






>> Long press: Toggles between remote control modes (hand/foot pedal remote, torch remote and remote control OFF). A remote control must be connected to the welding device or welding torch.


### Factory reset

To reset the device to factory settings, long-press the Trigger logic button (4) and the Process and remote control button (7) simultaneously.

### Symbols

Symbol	Description
	Yellow: Warning Red: Error
	Power source error
	Cooling unit Yellow: Cooling unit error Orange: Cooling unit is on
	High temperature indicator (overheating)
	VRD (Voltage Reduction Device): White VRD symbol is on = VRD is on Red VRD symbol is blinking = There is a problem with VRD
	TIG welding process
	AC TIG balance
	AC frequency
	Pulse TIG process
	Pulse TIG frequency Hz
	MMA welding process
	Cleaning process
	Polishing process

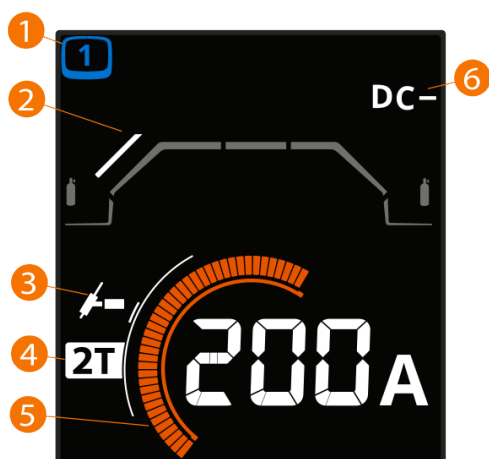
	Minilog
	HF ignition
	Arc force (MMA)
AUT	Auto
Err	Error
4TL	4T LOG
SA	Search arc
TA	Tail arc
	Remote control (hand / foot pedal)
	Torch remote control

 After each weld, a weld summary ("Weld data" on page 38) is displayed for 5 s.

To update the control panel software, contact your local Kemppi service.

### 3.2.1 MAIN VIEW

Main view is the main welding view. The content displayed depends on the welding process and features and functions used.



1. Active memory channel
2. Applied parameters and functions (for more information, refer to "Welding parameters" on the next page)
3. Active welding process


4. Applied trigger logic function
5. Welding current
  - >> In the MMA welding process, pressing the control knob button switches from welding current adjustment to arc force adjustment (for more information, refer to "MMA functions and features" on page 42)
6. Applied current mode.

#### Control knob functions in the main view:

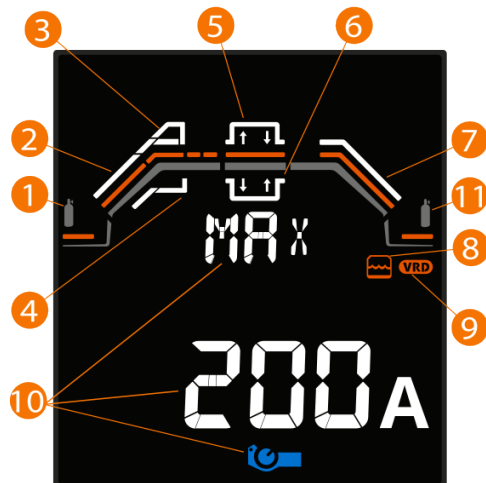
- **TIG:**
  - >> Welding current adjustment
  - >> Long press of the control knob button starts gas test (during the gas test, you can adjust the gas test time by turning the control knob)
- **MMA:**
  - >> Welding current adjustment
  - >> Arc force adjustment
- **Cleaning and polishing:**
  - >> Current adjustment.

### 3.2.2 WELDING PARAMETERS

The Welding parameters view includes a start and stop curve for visualizing and adjusting the parameters for a weld. You can access the welding parameters by pressing the control panel's Welding parameters and TIG HF ignition button (refer to "Minarc T 223 ACDC control panel" on page 29).

 *Many of the welding parameters are welding process specific and are visible and available for adjustment accordingly.*

The parameters are explained in the 'Welding parameters' table.

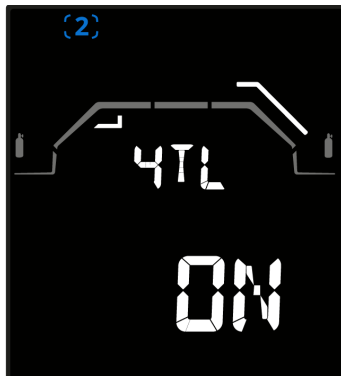


1. Pre gas
2. Upslope
3. Hot start, positive values
4. Hot start, negative values
5. Minilog, positive values
6. Minilog, negative values
7. Downslope

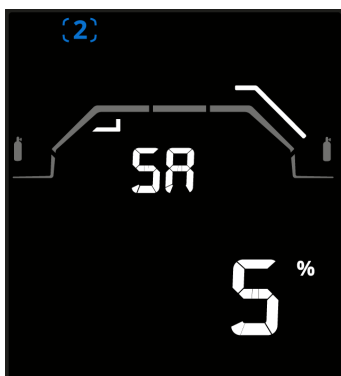
- 8. Water cooling
- 9. VRD
- 10. Min/Max current limit for remote control
- 11. Post gas.

The white line indicates that the parameter is on. The orange line indicates that the parameter value is currently adjustable. If the Auto value of a parameter is used, its numerical value is displayed below the start and stop curve.

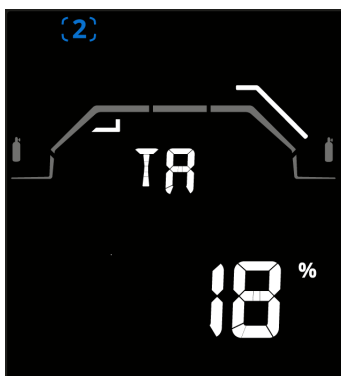
#### 4T LOG parameters



4TL = 4T LOG



SA = Search arc



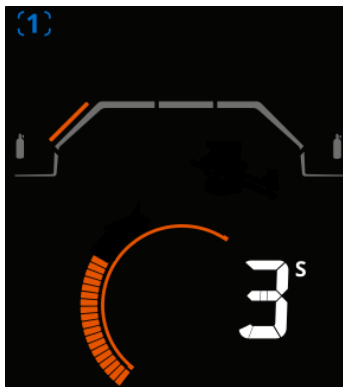
TA = Tail arc

### Adjusting welding parameters

1. Turn the control knob so that the orange line appears at the desired welding parameter (here the Upslope parameter is used as an example).



2. Press the control knob button to select the welding parameter for adjustment.



3. Turn the control knob to adjust the welding parameter value.
4. Confirm the new value / selection by pressing the control knob button.

**Tip:** When a parameter value is adjustable, you can select the parameter's default value by long-pressing the control knob button. This works for all parameters except water cooling and VRD.

## Welding parameters

### TIG welding parameters

The parameters listed here are available for adjustment with the TIG welding process.

Parameter	Parameter value	Description
Pre gas	0.0 ... 10 s, Auto, step 0.1 Default = Auto	Pre gas is a welding function that starts the shielding gas flow before the arc ignites. This ensures that the metal does not come into contact with air at the start of the weld. Used for all metals, but especially for stainless steel, aluminum and titanium. When Auto is selected the pre gas is determined automatically according to the welding current.
Upslope	0.0 ... 5 s, step 0.1 Default = 0 s	Upslope is a welding function that determines the time, during which the welding current gradually increases to the desired welding current level at the start of the weld.
Hot start	ON/OFF Default = OFF	Welding function that uses higher or lower welding current at the start of the weld. After the Hot start period the current changes to normal welding current level. This facilitates the start of the weld especially with aluminum materials. The Hot start time is used only in 2T trigger mode.
- Hot start level	-80 ... +100 %, step 1 Default = +30 %	
- Hot start time	0.1 ... 9.9 s, step 0.1 Default = 1.2 s	
Minilog level	-99 % ... 125 %, step 1 Default = -80 %	Minilog is a TIG welding function, which allows using the torch switch to change between the welding current and Minilog current which can be lower or higher than the welding current. For more information, refer to "Trigger logic functions" on page 40. For information on setting Minilog to ON, refer to "Minarc T 223 ACDC control panel" on page 29.

4T LOG (4TL)	ON/OFF Default = OFF	4T LOG is a TIG welding function, which allows using the welding torch trigger to start and stop welding and change between current levels.
- Search arc (SA)	0 % (OFF) / 5 % ... 90 %, step 1 % Default = 0 %	Search arc allows using lower current for a brief period at the start of the weld. This enables precise start of welding.
- Tail arc (TA)	0 % (OFF) / 5 % ... 90 %, step 1 % Default = 0 %	Tail arc allows using lower current for a brief period at the end of the weld. This reduces welding defects caused by crater formation at the end of welding.
Downslope	0.0 ... 1.5 s, step 0.1 Default = 0.1 s	Downslope is a welding function that determines the time during which the welding current gradually decreases to the end current level.
Post gas	0.0 ... 9.9 s, Auto, step 0.1 Default = Auto	Post gas is a welding function that continues the shielding gas flow after the arc has extinguished. This ensures that the hot weld does not come into contact with air after the arc is extinguished, protecting the weld and also the electrode. Used for all metals. Especially stainless steel and titanium require longer post gas times. When Auto is selected the post gas is determined automatically according to the welding current.
Water cooling	OFF/Auto/ON Default = Auto	When ON is selected, the coolant is circulated continuously, and when Auto is selected, the coolant is circulated only during welding. This parameter applies to all memory channels.
Remote control min	Min = Current limit minimum Max = Current limit maximum	Minimum and maximum welding current limits for remote control. These parameters are used to limit the current adjustment range for analog remote controls. The current limits do not apply to the TXR20 rocker switch remote control.
Remote control max		

### MMA welding parameters

*The parameters listed here are available for adjustment with the MMA welding process.*

Parameter	Parameter value	Description
-----------	-----------------	-------------

Hot start level	-10 ... +10, step 1 Default = 0	Welding function that uses higher or lower welding current at the start of the weld. After the Hot start period the current changes to normal welding current level. This facilitates the start of the weld especially with aluminum materials.
VRD	ON/OFF Default = OFF (In AU power source models VRD is locked ON)	Voltage reduction device (VRD) reduces the open-circuit voltage to maintain below a certain voltage value. This parameter applies to all memory channels.
Remote control min.	Min = Current limit minimum Max = Current limit maximum	These parameters are used to limit the current adjustment range for analog remote controls. The current limits do not apply to the TXR20 rocker switch remote control.
Remote control max.		

### Cleaning and polishing parameters

*The parameters listed here are available for adjustment with the cleaning and polishing processes.*

Parameter	Parameter value	Description
Water cooling	OFF/Auto/ON Default = Auto	When ON is selected, the coolant is circulated continuously, and when Auto is selected, the coolant is circulated only during cleaning and polishing. This parameter applies to all memory channels.
Remote control min.	Min = Current limit minimum Max = Current limit maximum	Minimum and maximum current limits for remote control. These parameters are used to limit the current adjustment range for analog remote controls. The current limits do not apply to the TXR20 rocker switch remote control.
Remote control max.		

### 3.2.3 MEMORY CHANNELS

Each process (TIG, MMA, cleaning and polishing) has 4 memory channels available. You can access the memory channels by pressing the control panel's Memory channels button (refer to "Minarc T 223 ACDC control panel" on page 29).

### Saving changes to memory channel

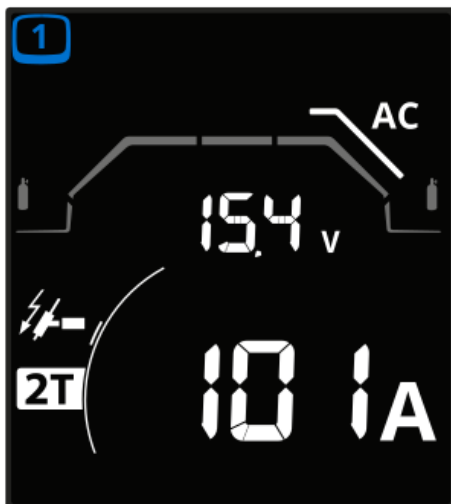
1. Adjust a parameter value.
2. The channel number framed by a dashed line indicates that the set parameters are different from the ones currently saved on the active memory channel:



3. Long-press the memory channels button.
4. Save the changes to the active memory channel by pressing the control knob button or select another channel by turning the control knob and pressing the control knob button.

### 3.2.4 WELD DATA

After each weld, a weld summary is displayed for 5 seconds.



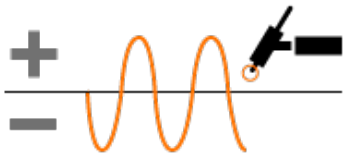
## 3.3 ADDITIONAL GUIDANCE TO FUNCTIONS AND FEATURES

This section summarizes some of the Minarc T 223 ACDC functions and features and how to use them.

### 3.3.1 TIG PROCESSES AND CURRENT MODES

#### AC TIG

AC (alternating current) TIG is a TIG current mode where the polarity of the electrode alternates rapidly between positive and negative. Used especially in aluminum welding.



- >> To select the AC TIG current mode, press the control panel's current mode button in the TIG operation mode.
- >> To adjust the AC balance, long-press the current mode button in the AC TIG current mode.
- >> To adjust the AC frequency, press the current mode button or the control knob button when the AC balance adjustment is active.

Parameter	Parameter value	Description
AC+ / AC-balance	-60 ... 0 %, step 1, default = -25 %	Adjust the positive and negative current cycles in AC TIG welding. Low percentage means that, on average, the welding current is more on the negative side, and high percentage that, on average, the welding current is more on the positive side.
AC frequency	30 ... 200 Hz, step 1 (up to 100 Hz), step 10 (over 100 Hz) Default = 60 Hz	Adjusts the frequency of the alternating current in AC TIG welding.

#### DC- TIG

DC- (direct current, negative polarity) TIG is a TIG current mode where the polarity of the electrode is negative throughout the welding process. Negative polarity allows high penetration.

- >> To select the DC- TIG current mode, press the control panel's current mode button.

#### Pulse TIG



Pulse TIG is a welding process where the current is pulsed between the base current and the pulse current. Pulse TIG is used for optimizing arc characteristics.

The user can adjust the pulse frequency, other parameters are defined by the active welding program (separately for DC and AC).

- >> To take pulse TIG into use, press the [pulse TIG button](#) in the control panel.
- >> To adjust the pulse frequency, long-press the pulse TIG button. The value ranges are listed in the following table.

Parameter	Parameter value	Description
Pulse frequency, DC	0.1 ... 10 Hz, step 0.1 10 ... 100 Hz, step 1 100 ... 300 Hz, step 10 Default = 1.0 Hz	The pulse frequency determines how many pulse cycles are created per second (Hz). (10 ... 50 Hz strains the eyes.)
Pulse frequency, AC	0.1 ... 5 Hz, step 0.1	The pulse frequency determines how many pulse cycles are created per second (Hz).

### 3.3.2 IGNITION MODES IN TIG WELDING

TIG ignition modes determine the way in which the welding arc is ignited. Two ignition modes are available in TIG welding: Lift TIG ignition (DC TIG only) and High Frequency (HF) ignition.

#### Lift TIG ignition (DC TIG current mode only)

In Lift TIG ignition you briefly touch the work piece with the electrode, then press the trigger and lift the electrode to a small distance from the work piece. The Lift TIG ignition must be activated in the control panel. Also known as "Touch ignition" or "Contact ignition".




#### High Frequency (HF) ignition

In HF ignition, a press on the torch trigger produces a high voltage pulse that creates a spark to ignite the arc. The HF ignition mode is always ON in AC TIG current mode.

- >> To set the HF ignition mode ON/OFF in DC TIG current mode, long-press the control panel's [welding parameters button](#).

### 3.3.3 TRIGGER LOGIC FUNCTIONS

Switch between the 2T and 4T trigger logic by pressing the control panel's [trigger logic button](#). The 2T and 4T trigger logic functions are available for TIG, cleaning and polishing processes.

 *You cannot change trigger logic during welding/cleaning/polishing.*

### 2T (default)

In 2T welding, pressing the trigger ignites the arc. Releasing the trigger switches the arc off.



In 2T cleaning/polishing, pressing the trigger down ignites the current. Releasing the trigger switches the current off.

### 4T

In 4T welding, pressing the trigger starts the pre gas, and releasing the trigger ignites the arc. Pressing the trigger again switches the arc off. Releasing the trigger ends the post gas.



If Hot start is used with 4T, pressing the trigger starts the pre gas for a predefined duration, after which the arc ignites automatically and the current raises to the Hot start level. The current is lowered to the normal welding current level once the trigger is released. If the trigger is released before the start sequence reaches the Hot start phase, the arc is ignited without Hot start.

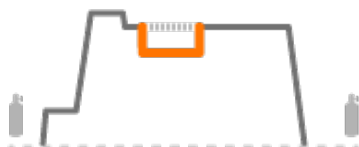
In 4T cleaning and polishing processes, pressing the trigger down and releasing it ignites the current. Pressing and releasing the trigger again switches the current off.

If cleaning or polishing is not started within 10 seconds of the trigger being pressed and released in 4T, the power source is switched off for safety reasons. The user needs to press the trigger down again to start cleaning or polishing.




### Minilog (TIG 4T only)




TIG welding function, which allows using the torch switch to change between the welding current and Minilog current which can be lower or higher than the welding current. The user presets the parameters. Welding over tack welds is one application. It also functions as a "pause current" when the welding position changes, for example. Minilog can be used only with TIG 4T trigger logic.



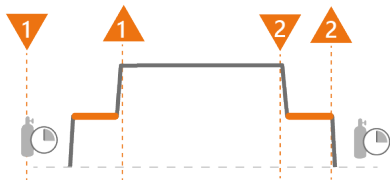
- >> To take the Minilog trigger logic into use, long-press the control panel's [trigger logic button](#) in 2T or 4T mode.
- >> Adjust the Minilog level in the [welding parameters](#).

-  *Minilog trigger logic is not available with MMA and cleaning and polishing processes.*
-  *You can set Minilog to OFF and set the trigger logic to 2T by pressing the trigger logic button in 4T Minilog mode.*
-  *You can set Minilog to OFF (and stay in 4T trigger logic mode) by long-pressing the trigger logic button in 4T Minilog mode.*

#### 4T LOG (TIG only)





-  *4T LOG trigger logic is not available with MMA and cleaning and polishing processes.*

Pressing and holding the trigger starts the pre gas for a predefined duration, after which the arc ignites automatically and the current raises to the Search arc level. After the trigger is released, the current raises to the normal welding current level. When the trigger is pressed again, the current decreases to the Tail arc level. Releasing the trigger switches the arc off and starts the post gas for a predefined duration.



If Hot start is used with 4T LOG, releasing the trigger at the Search arc level raises the current to the Hot start level for the predefined duration. The current is then lowered to the normal welding current level.

Symbols:

	Function
	Set duration
	Trigger press (down)
	Trigger release (up)
	Pre gas / post gas

### 3.3.4 MMA FUNCTIONS AND FEATURES

#### MMA antifreeze

MMA antifreeze function automatically decreases the welding current significantly when the electrode is touching the workpiece. The function can be used to prevent the MMA electrode from getting too hot when it is in contact with the workpiece. The MMA antifreeze function is always on and does not need to be adjusted.

#### MMA arc force

MMA arc force adjusts short circuit dynamics (roughness) of MMA welding by changing, for example, current levels.


Pressing the control panel's control knob in the MMA operation mode changes from the welding current adjustment to the arc force adjustment. The adjustment range is -10...+10, the step is 1, and the default is 0.

**MMA current modes**

The available current modes for MMA welding are DC- and DC+. Select the current mode according to the electrode and the application.

## 3.4 USING REMOTE CONTROL

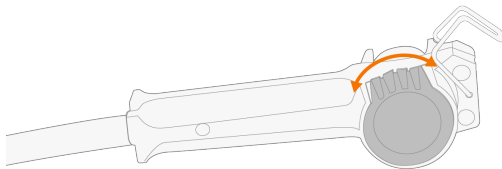
To enable remote control operation, select the remote control mode by long-pressing the control panel's Process and remote control button (refer to "Minarc T 223 ACDC control panel" on page 29).

 You can set the minimum and maximum current limits for the remote controls in [Welding parameters](#).  
The current limits do not apply to the TXR20 rocker switch remote control.

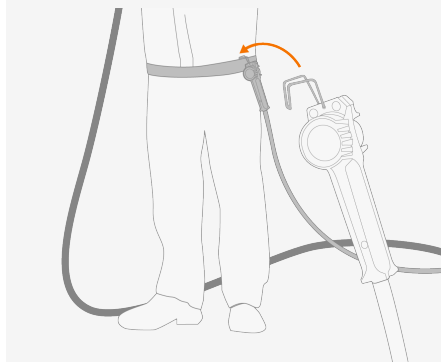
The hand or foot pedal remote control can be used simultaneously with the TXR20 rocker switch remote control.

### R10 hand remote control

To adjust current, turn the knob on the remote control.



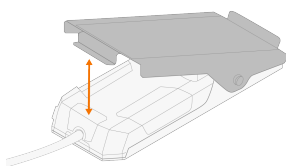
**Tip:** The remote control comes equipped with a handy clip for hanging the remote onto your belt.



When the R10 remote control is used, current adjustment from the control panel is not possible.

### FR41 foot pedal remote control

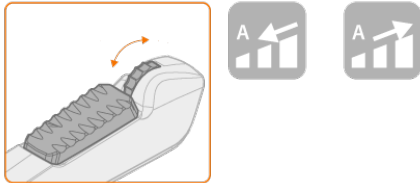
To adjust current, press the pedal.



When the FR41 remote control is used, current adjustment from the control panel is not possible.

**TXR10 torch remote control**

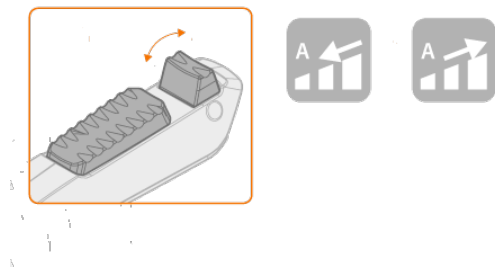
To adjust current, roll the roller switch.



When the TXR10 remote control is used, current adjustment from the control panel is not possible.

**TXR20 rocker switch remote control**

To adjust current, pull/push the rocker switch.



When the TXR20 torch remote control is used, the remote control symbol is not displayed and current can be adjusted on the control panel. The current values affect the resolution of the remote control adjustment as follows:






- step is 1 A when the current is below 50 A
- step is 2 A when the current is 50 ... 150 A
- step is 3 A with minus button and 2 A with plus button when the current is over 150 A.

## 3.5 CLEANING AND POLISHING WELD




Cleaning and polishing processes are used to restore the corrosion protection of stainless steel welds. These processes involve removing contaminants and correcting discoloration on the weld seams.

The cleaning process uses AC current and is more efficient of the two. The polishing process uses DC- current.

The 2T and 4T trigger logic functions as well as memory channels are available with the cleaning and polishing processes.

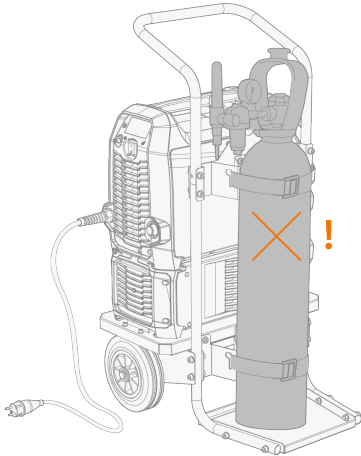
-  *Pay attention to your own safety and the safety of others in the work environment.*
-  *Ensure proper ventilation and use personal respiratory protection.*
-  *Wear suitable protective clothing, including eye, face and hand protection. Use protective gloves that are specifically designed for handling chemicals, such as phosphoric acids, and that comply with the EN ISO 374-1:2016 standard. Also, follow the safety guidelines and recommendations provided by the manufacturer of the chemicals you use.*
-  *Always check before use that earth return lead/clamp and mains cable are in serviceable condition. Ensure that the connectors are correctly fastened.*
-  *Choose the cleaning liquid (e.g., 10...60 % phosphoric acid) and the neutralization liquid (e.g., water) based on the application.*

### To clean/polish a weld:

1. Attach Kempfi's MAX WeldClean cleaning tool to a TIG welding torch body (for more information, refer to [Kempfi Userdoc](#)).
2. Ensure that the earth return cable is connected to the power source and work piece.
3. Select the cleaning or polishing process by pressing the process button in the control panel (refer to "Minarc T 223 ACDC control panel" on page 29).
4. Adjust the current by turning the control knob or by using a remote control.
  -  *The default current for cleaning and polishing is 25 A. With the L-size cleaning tool, a good starting point for finding a suitable current is 50 A. In general, the current is suitable when the cleaning is relatively fast and the formation of fumes is low.*
5. Dip the brush into the cleaning liquid. Ensure that both the brush and the surface to be cleaned are sufficiently moist throughout the cleaning process.
6. Apply the brush to the work piece and ignite the current by pressing the ON/OFF switch on the torch handle.
7. Choose the cleaning technique based on the application. However, always ensure that the brush does not come off the work piece during cleaning.
  -  *If the brush comes off the work piece, an automatic power cutoff is activated to prevent burn marks. If you apply the brush to the workpiece again within 10 seconds, the power is automatically restored.*
8. Turn off the current and lift the brush away from the work piece.
9. Finally, neutralize the cleaned area with a neutralization liquid and wipe dry.
  -  *Wash and rinse the cleaning equipment thoroughly after use to avoid acid damage and to keep the equipment in good condition for future use.*

## 3.6 LIFTING EQUIPMENT

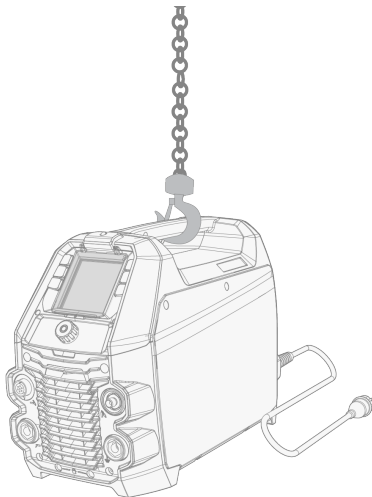
 *If a gas bottle is installed on cart, DO NOT attempt to lift the cart with the gas bottle in place.*



### **Transportation handle:**

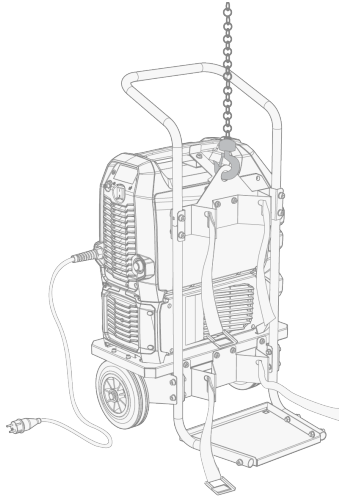
The transportation handle can be used for mechanical lifting (for moving only, not for hanging) when the device is not mounted on a cooling unit or cart.


Connect the hoist hook to the transportation handle.



**2-wheel cart:**

1. Ensure that the welding equipment is properly secured to the cart.
2. Connect the hoist hook to the lifting handle on the cart.



 *Do not lift the device when it is installed on the T32A cart.*

## 3.7 TROUBLESHOOTING

**i** *The problems listed and the possible causes are not definitive, but suggest some typical situations that may turn up during normal use of the welding system.*

*Welding device:*

Problem	Recommended actions
The welding device does not power up	Check that the mains cable is plugged in properly.
	Check that the mains switch of the power source is at the ON position.
	Check that the mains power distribution is on.
	Check the mains fuse and/or the circuit breaker.
	Check that the earth return cable is connected.
The welding device stops working	Check that none of the cables is loose.
	The power source may have overheated. Wait for it to cool down and see that the cooling fans work properly and the air flow is unobstructed.

*Weld quality:*

Problem	Recommended actions
Dirty and/or poor quality weld	Check that the shielding gas has not run out.
	Check that the shielding gas flow is unobstructed.
	Check that the gas type is correct for the application.
	Check that the welding procedure is correct for the application.
Varying welding performance	Check that the welding torch is physically intact and the nozzle is clear of any obstructions.
	Check that the welding torch is not overheating.
	Check that the earth return clamp is properly attached to a clean surface of the workpiece.
	Check that the earth return clamp is properly attached to a clean surface of the workpiece.
High spatter volume	Check the welding parameter values and welding procedure.
	Check the gas type and flow.
	Check the polarity of the torch/electrode.

"Error codes " on the next page

### 3.8 ERROR CODES

In error situations, the control panel displays 'Err' and the number of the error. This section lists the errors, possible causes and proposed actions to fix the issue.

Error		
Code	Possible cause	Proposed action
1	Power source calibration has been lost.	Restart the power source. If problem persists, contact Kemppi service.
3	Voltage in mains network is too high.	Restart the power source. If problem persists, contact Kemppi service.
4	Too long welding session with high power.	Do not shut down, let the fans cool the machine. If fans are not running, contact Kemppi service
5	Power source contains an inoperative 24V power supply unit.	Restart the power source. If problem persists, contact Kemppi service.
12	Plus and minus cables are connected together.	Check the connections of welding cable and earth return cable.
14	Too long welding session with high power or high ambient temperature.	Do not shut down, let the fans cool the machine. If fans are not running, contact Kemppi service.
20	Cooling capacity is reduced in the power source.	Clean the filters and clear any dirt from the cooling channel. Check that the cooling fans are running. If not, contact Kemppi service.
24	Too long welding session with high power or high ambient temperature.	Do not turn off the cooler. Let the liquid circulate until the fans cool it down. If fans are not running, contact Kemppi service.
26	No cooling liquid or circulation is blocked.	Check the liquid level in the cooler. Check hoses and connectors for blockage.
27	Cooling is turned on in the settings menu, but cooler is not connected to power source or cabling is faulty.	Check the cooler connections. Ensure that the cooling is turned off in the settings menu, if the cooler is not in use.
40	Open circuit voltage exceeds the VRD limit.	Restart the power source. If problem persists, contact Kemppi service.
80	Water cooled torch is connected but the cooler is turned off.	Turn the cooler on in the settings menu or change the torch to an air cooled model.
81	Welding program data has been lost.	Restart the power source. If problem persists, contact Kemppi service.

## 4. MAINTENANCE






## 4.1 DAILY, PERIODIC AND ANNUAL MAINTENANCE

When considering and planning routine maintenance, consider the operating frequency of the welding system and the working environment.

Correct operation of the welding machine, regular maintenance, and the use of original Kemppi spare parts and consumables help you avoid unnecessary downtime and equipment failure, while also maximizing the equipment's service life.

Use pre-mixed coolant solution in the cooling unit. The mixing ratio should be 20...50% as standard. Use only ethylene or propylene glycol mixture intended for welding cooling systems, for example Kemppi cooling liquid. Do not add water to the pre-mixed coolant solution. Do not use automotive cooling solutions or ethanol-based mixtures.

For repairs, find your closest Kemppi service workshop at [www.kemppi.com](http://www.kemppi.com) or contact your dealer.

-  *Only an authorized electrician is allowed to carry out electrical work.*
-  *Only qualified service personnel is allowed to carry out periodic and annual maintenance.*
-  *Disconnect the power source from the mains before handling electrical cables and connectors.*
-  *Do not use pressure washing devices.*
-  *Where applicable, use the correct tension torque when fastening loose parts.*

### Daily maintenance

Welding equipment's daily maintenance:

- Check that all covers and components are intact.
- Check all the cables, hoses and connectors. Do not use them if they are damaged.
- Ensure that the connectors are correctly fastened. Loose connectors can impair welding performance and damage connectors.

Cooling unit's daily maintenance (in addition):

- Check the cooling liquid level. Add cooling liquid if needed. Note: Use the correct coolant solution (see above).
- Check the cooling unit surroundings for cooling liquid leakages. If there are signs of significant leakage, contact Kemppi service.
- Check and test the cooling liquid pump operation by circulating the cooling liquid.

### Weekly maintenance

Welding equipment's weekly maintenance:

- Clean the outside parts of the units from dust and dirt, for example, with a soft brush and vacuum cleaner.
- Clean the ventilation grills. Do not use compressed air, there is a risk that the dirt will compact even more tightly into the gaps of the cooling profiles.

### Periodic maintenance

Welding equipment's periodic maintenance, every 1–6 months:

- Check the electrical connectors of the equipment at least every 6 months. Clean oxidized parts and tighten loose connectors.
- Update the welding system to the latest firmware and software versions, as applicable.

Cooling unit's periodic maintenance, every 1–6 months (in addition):

- Check the cooling liquid quality at least once a month. Ensure that the liquid is clear and free of any visible impurities.
- Replace the cooling liquid every 6 months. Note: Use the correct coolant solution (see above).

### **Annual maintenance**

The annual maintenance must be carried out by an authorized Kemppi service workshop. Kemppi service workshops complete the welding system maintenance according to your Kemppi service agreement. Find your closest service workshop at [www.kemppi.com](http://www.kemppi.com).

Welding equipment's annual maintenance program includes:

- Cleaning the equipment.
- Maintenance of the welding tools.
- Checking the connectors and switches.
- Checking all electrical connections.
- Checking the power source mains cable and plug.
- Repairing defective parts and replacing defective components.
- Maintenance test.
- Testing the operation and calibrating the performance values when needed.
- Updating the welding system to the latest firmware and software versions, and installing new welding software.
- If a cooling unit is used: Checking and cleaning the cooling liquid pump. The pump is dismantled and cleaned thoroughly, and if there has been any leakage in the pump's axle seal point, the axle seal is replaced. The axle seal is subject to wear and may need replacement periodically to maintain proper sealing.

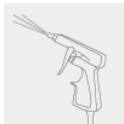
For Kemppi welding torch maintenance, refer to your welding torch's instructions (available also at [user-doc.kemppi.com](http://user-doc.kemppi.com)).

## 4.2 INSTALLING AND CLEANING POWER SOURCE AIR FILTER (OPTIONAL)

An optional power source air filter can be purchased separately. The air filter comes with a fixed casing designed to be mounted directly onto the power source air intake.

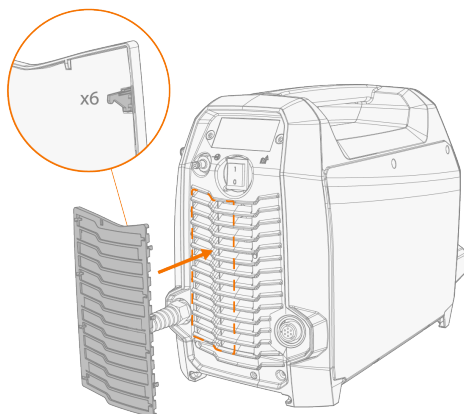
**i** Using the optional air filter decreases the rated power levels of the power source as follows (output 40 °C): 60% >>> 45% and 100% >>> 100%-20A. This is due to the slightly reduced cooling air intake.

Tools needed:



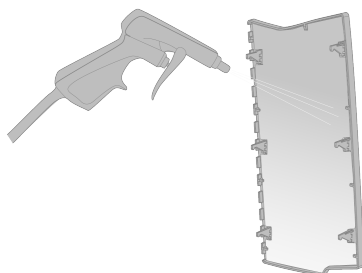
### Installation and replacement

1. Place the air filter assembly onto the power source air intake, and lock it in place with the clips on the edge of the casing.



### Cleansing

1. Remove the air filter from the power source by releasing the clips on the edge of the air filter casing.
2. Blow the air filter clean with compressed air.



## 4.3 DISPOSAL



Do not dispose of any electrical equipment with normal waste!

In observance of WEEE Directive 2012/19/EU on waste of electrical and electronic equipment and European Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment, and their implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and taken to an appropriate environmentally responsible recycling facility. The owner of the equipment is obliged to deliver a decommissioned unit to a regional collection center, as per the instructions of local authorities or a Kempfi representative. By applying these European Directives you improve the environment and human health.

For more information:



## 5. TECHNICAL DATA

### Technical data:

- For Minarc T 223 ACDC power source technical data, refer to "Minarc T 223 ACDC power source" on the next page.
- For cooling unit technical data, refer to "Master Cooler 05M cooling unit" on page 60.

### Additional information:

- For TIG guide tables, refer to "TIG guide tables" on page 61.
- For ordering information, refer to "Minarc T 223 ACDC ordering info" on page 62.

## 5.1 MINARC T 223 ACDC POWER SOURCE

### Minarc T 223 ACDC GM

Minarc T 223 ACDC GM		
Feature		Value
Mains connection voltage		220...240 V ±10 %
Mains connection voltage	MV low range	110...120 V ±10 %
Mains connection phases		1~50/60 Hz
Mains connection cable type		3G, H07RN-F
Mains connection cable size		2.5 mm <sup>2</sup>
Rated maximum input power [ $S_{1max}$ ]		5.5 kVA
Mains fuse		16 A
Mains fuse	@MV low range	16 A
Idle power		10 W
No-load voltage (MMA) [ $U_f$ ]		96 V
No-load voltage (MMA) VRD [ $U_fVRD$ ]		21 V
No-load voltage (MMA/TIG) [ $U_0$ ]		101 V
Open circuit voltage (MMA)		95 V
Effective supply current [ $I_{1eff}$ ]		16 A
Effective supply current [ $I_{1eff}$ ]	@MV low range	16 A
Maximum supply current [ $I_{1max}$ ]		25 A
Maximum supply current [ $I_{1max}$ ]	@MV low range	25 A
Output, duty cycle % at rated max current, TIG		20 %
Output at +40 °C, rated max current, TIG		220 A
Output at +40 °C, 60% TIG		170 A
Output at +40 °C, 100% TIG		160 A
Output, duty cycle % at rated max current, TIG	@MV low range	40 %
Output at +40 °C, rated max current, TIG	@MV low range	130 A
Output at +40 °C, 60% TIG	@MV low range	110 A
Output at +40 °C, 100% TIG	@MV low range	90 A
Output, duty cycle % at rated max current, MMA		35 %
Output at +40 °C, rated max current, MMA		170 A
Output at +40 °C, 60% MMA		130 A
Output at +40 °C, 100% MMA		110 A
Output, duty cycle % at rated max current, MMA	@MV low range	40 %
Output at +40 °C, rated max current, MMA	@MV low range	90 A
Output at +40 °C, 60% MMA	@MV low range	70 A
Output at +40 °C, 100% MMA	@MV low range	60 A

Output range, TIG welding current/voltage		5 A / 8 V ... 220 A / 20 V
Output range, MMA welding current/voltage		15 A / 15 V ... 170 A / 34 V
Output range, TIG welding current/voltage	@MV low range	5 A / 8 V ... 130 A / 16 V
Output range, MMA welding current/voltage	@MV low range	15 A / 15 V ... 90 A / 30 V
Power factor at rated maximum current	$\lambda$	1
Efficiency at rated maximum current	$\eta$	83 %
Voltage supply for cooling unit		220...240 V
Welding connection type		R1/4
Arc striking voltage		12 kV
Stick electrode diameter range		1.6...4 mm
Wired communication type		Analog
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
Recommended minimum generator power [ $S_{gen}$ ]		8 kVA
EMC class		A
Degree of protection		IP23
External dimensions	<i>L x W x H</i>	520 x 250 x 379 mm
Weight without accessories		16.8 kg
Standards		EN IEC 60974-1, -3, -10 IEC 61000-3-12

#### Minarc T 223 ACDC GM AU (VRD locked on)

Minarc T 223 ACDC GM AU		
Feature		Value
Mains connection voltage		230...240 V $\pm$ 10 %
Mains connection voltage	MV low range	110 V $\pm$ 10 %
Mains connection phases		1~50/60 Hz
Mains connection cable type		3G, H07RN-F
Mains connection cable size		2.5 mm <sup>2</sup>
Rated maximum input power [ $S_{1max}$ ]		5.5 kVA
Mains fuse		15 A
Mains fuse	@MV low range	15 A
Idle power		10 W
No-load voltage (MMA) [ $U_r$ ]		21 V
No-load voltage (MMA) VRD [ $U_r$ VRD]		21 V
No-load voltage (MMA/TIG) [ $U_0$ ]		101 V
Open circuit voltage (MMA)		23 V
Effective supply current [ $I_{1eff}$ ]		15 A
Effective supply current [ $I_{1eff}$ ]	@MV low range	15 A
Maximum supply current [ $I_{1max}$ ]		24 A

Maximum supply current [ $I_{1max}$ ]	@MV low range	24 A
Output, duty cycle % at rated max current, TIG		20 %
Output at +40 °C, rated max current, TIG		220 A
Output at +40 °C, 60% TIG		170 A
Output at +40 °C, 100% TIG		160 A
Output, duty cycle % at rated max current, TIG	@MV low range	40 %
Output at +40 °C, rated max current, TIG	@MV low range	120 A
Output at +40 °C, 60% TIG	@MV low range	100 A
Output at +40 °C, 100% TIG	@MV low range	90 A
Output, duty cycle % at rated max current, MMA		35 %
Output at +40 °C, rated max current, MMA		170 A
Output at +40 °C, 60% MMA		130 A
Output at +40 °C, 100% MMA		110 A
Output, duty cycle % at rated max current, MMA	@MV low range	40 %
Output at +40 °C, rated max current, MMA	@MV low range	90 A
Output at +40 °C, 60% MMA	@MV low range	70 A
Output at +40 °C, 100% MMA	@MV low range	60 A
Output range, TIG welding current/voltage		5 A / 8 V ... 220 A / 20 V
Output range, MMA welding current/voltage		15 A / 15 V ... 170 A / 34 V
Output range, TIG welding current/voltage	@MV low range	5 A / 8 V ... 120 A / 15 V
Output range, MMA welding current/voltage	@MV low range	15 A / 15 V ... 90 A / 30 V
Power factor at rated maximum current	$\lambda$	1
Efficiency at rated maximum current	$\eta$	83 %
Voltage supply for cooling unit		230...240 V
Welding connection type		R1/4
Arc striking voltage		12 kV
Stick electrode diameter range		1.6...4 mm
Wired communication type		Analog
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
Recommended minimum generator power [ $S_{gen}$ ]		8 kVA
EMC class		A
Degree of protection		IP23
External dimensions	$L \times W \times H$	520 x 250 x 379 mm
Weight without accessories		16.8 kg
Standards		EN IEC 60974-1, -3, -10 IEC 61000-3-12 AS 6097.1 AS 1674.2

## 5.2 MASTER COOLER 05M COOLING UNIT

Master Cooler 05M		
Feature		Value
Supply voltage		380...460 V ±10 %
Supply voltage	MV low range	220...230 V ±10 %
Maximum supply current [ $I_{1max}$ ]		0.7 A
Maximum supply current [ $I_{1max}$ ]	@MV low range	1 A
Cooling power at 1 l/min		0.5 kW
Maximum coolant pressure		4 Bar
Recommended coolant		Kemppi MGP 4456
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
EMC class		A
Degree of protection		IP23S
Tank volume		2.3 l
External dimensions	<i>L x W x H</i>	555 x 253 x 215 mm
Weight without accessories		11.5 kg
Standards		IEC 60974-2, -10

## 5.3 TIG GUIDE TABLES

**i** The tables in this chapter are given only as a general guidance. The information provided is based solely on the use of WC20 (grey) electrode and Argon gas.

### TIG welding (AC)

Welding current range AC		Electrode (WC20)	Gas nozzle		Gas flow rate
Min. A	Max. A	ø mm	Number	ø mm	l/min (Argon)
15	90	1.6	4 / 5 / 6	6.5 / 8.0 / 9.5	6...7
20	150	2.4	6 / 7	9.5 / 11.0	7...8
30	200	3.2	7 / 8 / 10	11.0 / 12.5 / 16	8...10
40	350	4.0	10 / 11	16 / 17.5	10...12

### TIG welding (DC)

Welding current range DC		Electrode (WC20)	Gas nozzle		Gas flow rate
Min. A	Max. A	ø mm	Number	ø mm	l/min (Argon)
5	80	1.0	4 / 5	6.5 / 8.0	5...6
70	140	1.6	4 / 5 / 6	6.5 / 8.0 / 9.5	6...7
140	230	2.4	6 / 7	9.5 / 11.0	7...8
225	330	3.2	7 / 8 / 10	11.0 / 12.5 / 16	8...10

## 5.4 MINARC T 223 ACDC ORDERING INFO

For Minarc T 223 ACDC ordering information and optional accessories, refer to [Kemppi.com](https://www.kemppi.com).