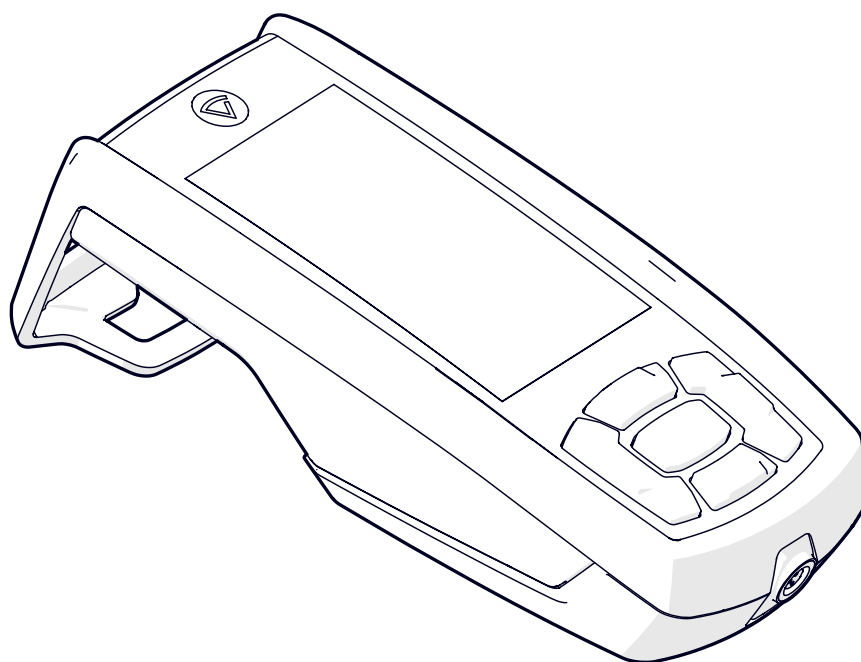


# Smart Reader

OPERATING MANUAL



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# 1 Introduction

## 1.1 Introduction to Smart Reader

Smart Reader is a device that enables automated monitoring of the quality and productivity of arc welding.

Smart Reader records welding parameter data, and transmits the data to the WeldEye cloud service through a wireless network.

Smart Reader is the welder's user interface to WeldEye for inputting identifying information, such as welder identification, the WPS in use, the weld or welding piece, or filler material heat (batch) number.

Smart Reader also displays useful information to the welder. For example, before welding, the welder sees the current and voltage limits of the WPS, and after welding, the welder gets feedback, such as whether the welding parameters stayed within the WPS limits.

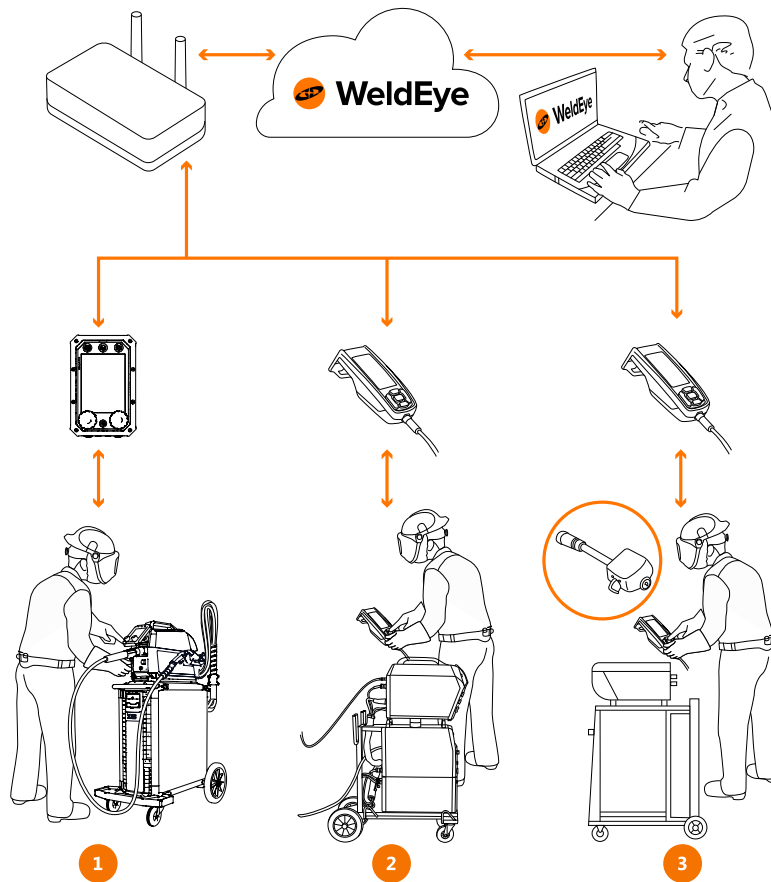
Smart Reader can be connected to any arc welding machine through an adapter, and directly (without an adapter) to certain Kemppi welding machines.

In a typical use case, every welding machine performing critical welding in the factory has a Smart Reader connected to it. For factory-wide productivity use cases, all welding machines can be equipped with one.

Smart Reader is available in the following user interface languages: Chinese, Danish, Dutch, English, Finnish, French, German, Italian, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish.

## 1.2 Introduction to WeldEye

WeldEye is a comprehensive system for collecting and managing welding data, and your primary tool and storage space for keeping your welding-related documents in order.



**Figure 1: 1. X8 MIG Welder 2. Kemppi FastMig, KempArc or A7 MIG Welder 3. Other welding machines**

WeldEye's modular structure is based on various useful functions that serve the needs of wide-ranging industries and welding-related tasks:

### **Welding procedures**

Includes the digital library and management of pWPS, WPQR and WPS templates according to the most important welding standards.

### **Personnel and qualifications**

Includes the management and renewal processes of all personnel - welders and inspectors - qualification certificates.

### **Quality management**

Includes quality verification functionalities with digital WPS and qualification compliance control against automatically collected digital welding data.

### **Welding management**

Includes document register functionalities and features for comprehensive welding project documentation and management.

For more information on the full system and other modules, see [www.weldeye.com](http://www.weldeye.com).

## 1.3 Security

Smart Reader is a handheld IoT device, and the related security issues have been taken into account accordingly.

Smart Reader is a locked-down, embedded Linux-based device. It connects to a WiFi network, communicates via encrypted HTTPS channel, and continuously uploads data as it is recorded. Smart Reader is not dependent on an uninterrupted stable Internet connection; it works seamlessly offline with reduced capability (no new data sent to or received from the server) until the connection becomes available again.

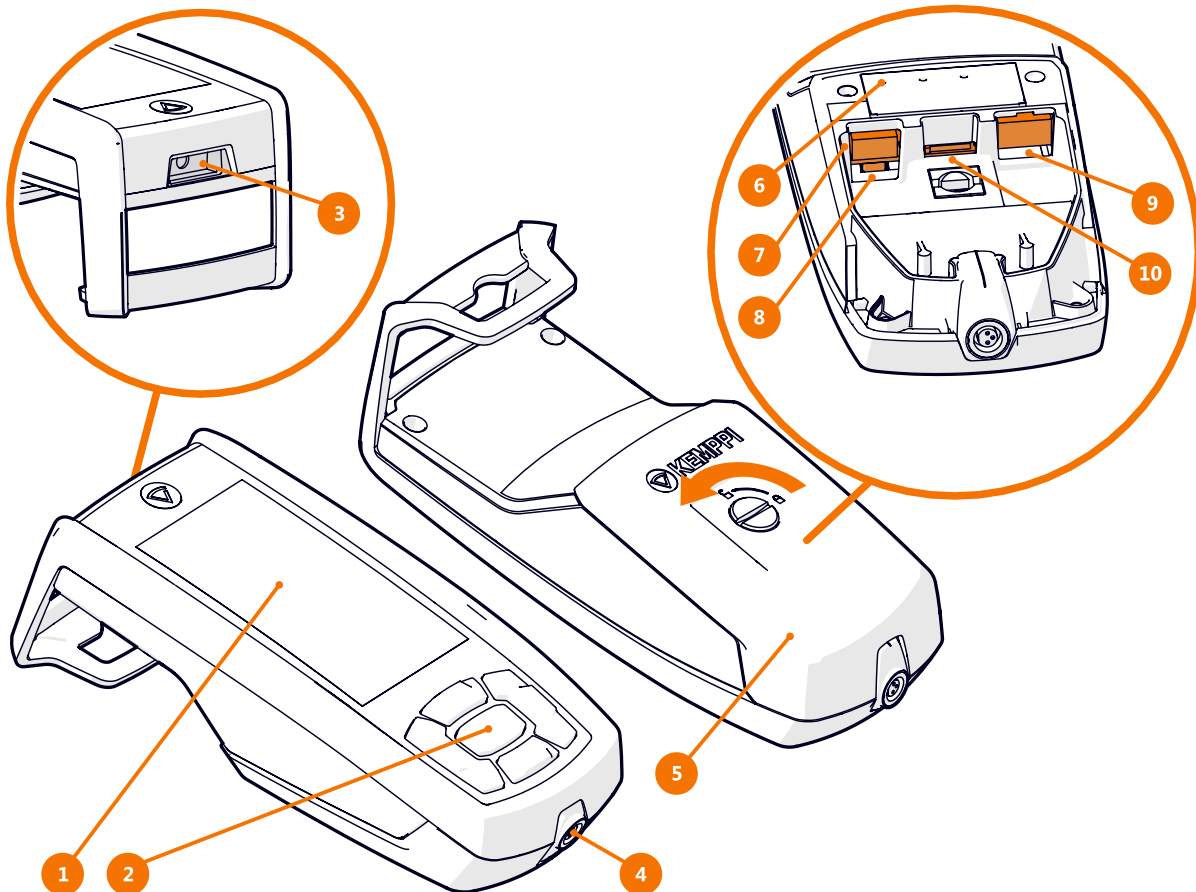
A security inspection was conducted for Smart Reader in May 2016 by a third party. Quote from the final report:

*As a summary, the security status of the Smart Reader is good since no significant security issues were found.*

*The Smart Reader device was found quite secure in normal mode thus not being a threat to the underlying network infrastructure. Using the device as attack tool against the client infrastructure was not found feasible during testing.*

## 2 Structure

### 2.1 Parts



#### 1. Display

Use the keyboard to scroll and select items.

#### 2. Keyboard

- Up and down arrow buttons: press to highlight items on the display.
- Middle button: press to select the highlighted item.
- Left and right arrow buttons: press to change the pass within a WPS.

#### 3. Barcode scanner

Smart Reader is delivered with either 1d or 2d barcode scanner.

#### 4. Connection cable port:

Power DC+ in 50V 200mA

#### 5. Back cover

Removable

**6. Buttons on the back under the sticker: BMS, RST, PWR**

For resetting and troubleshooting purposes. Use a thin object, for example, a paper clip, to press the buttons.

**7. USB port**

For maintenance purposes. Only USB flash storages (USB sticks) may be connected to the port. Smart Reader configuration files and update packages are transferred to the Smart Reader via USB port.

**8. Micro USB connector**

For troubleshooting purposes.

**9. Ethernet connector (100 Mbit)**

For troubleshooting purposes.

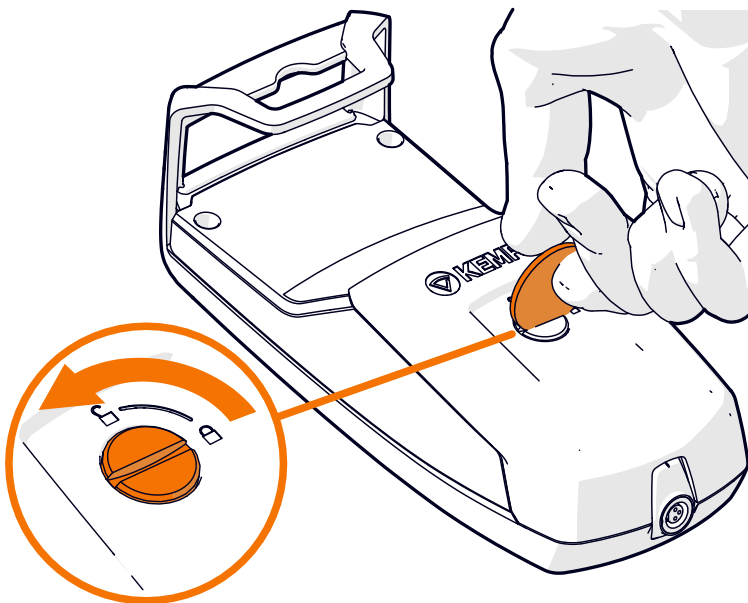
**10. Micro SD card slot**

By default, a 4 Gb memory card is connected. Smart Reader stores all welding and barcode data on the memory card. The first time you power on Smart Reader, the SD card is formatted.

**Removing the back cover**

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Use, for example, a coin to open the back cover lock.

**Silicon cover**

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Silicon cover is available as an accessory, ordered separately. It protects the device from metal dust and provides additional protection if the device, for example, falls from heights.

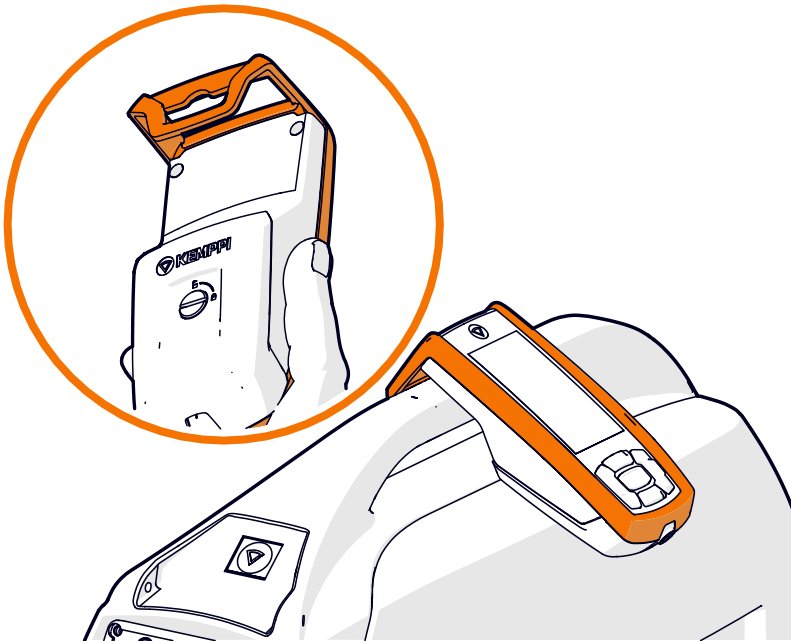




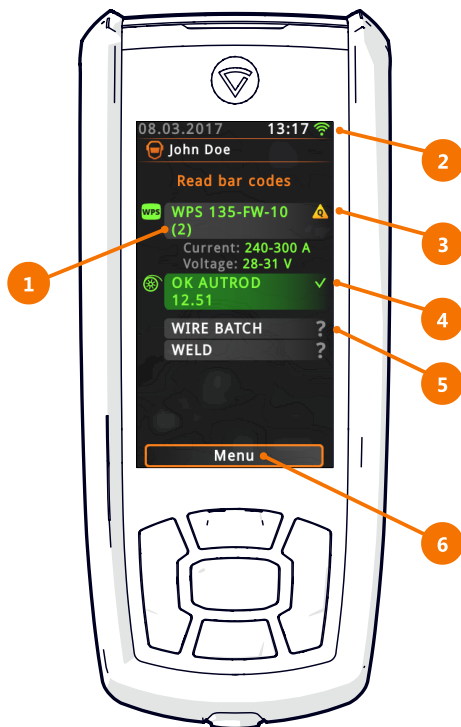
Figure 2: Attaching the silicon cover

**Hanging Smart Reader**

You can hang Smart Reader by the hook on the handle of the wire feeder.



## 2.2 Main screen and navigation



### 1. WPS pass number

To change the pass, press left/right arrow buttons.

### 2. Wifi icon

See [Configure Smart Reader's network connection](#) on page 20.

### 3. Qualification deviation alert

The alert is shown if the welder has no valid qualification certificate for the selected WPS.

### 4. Identified feature

The barcode for the feature has been scanned and the device has recognized the item.

### 5. Unidentified feature

The barcode for the feature has not been scanned. In WeldEye cloud service, you can select which features are always shown on the display. See [Identifiers shown on Smart Reader](#) on page 24.

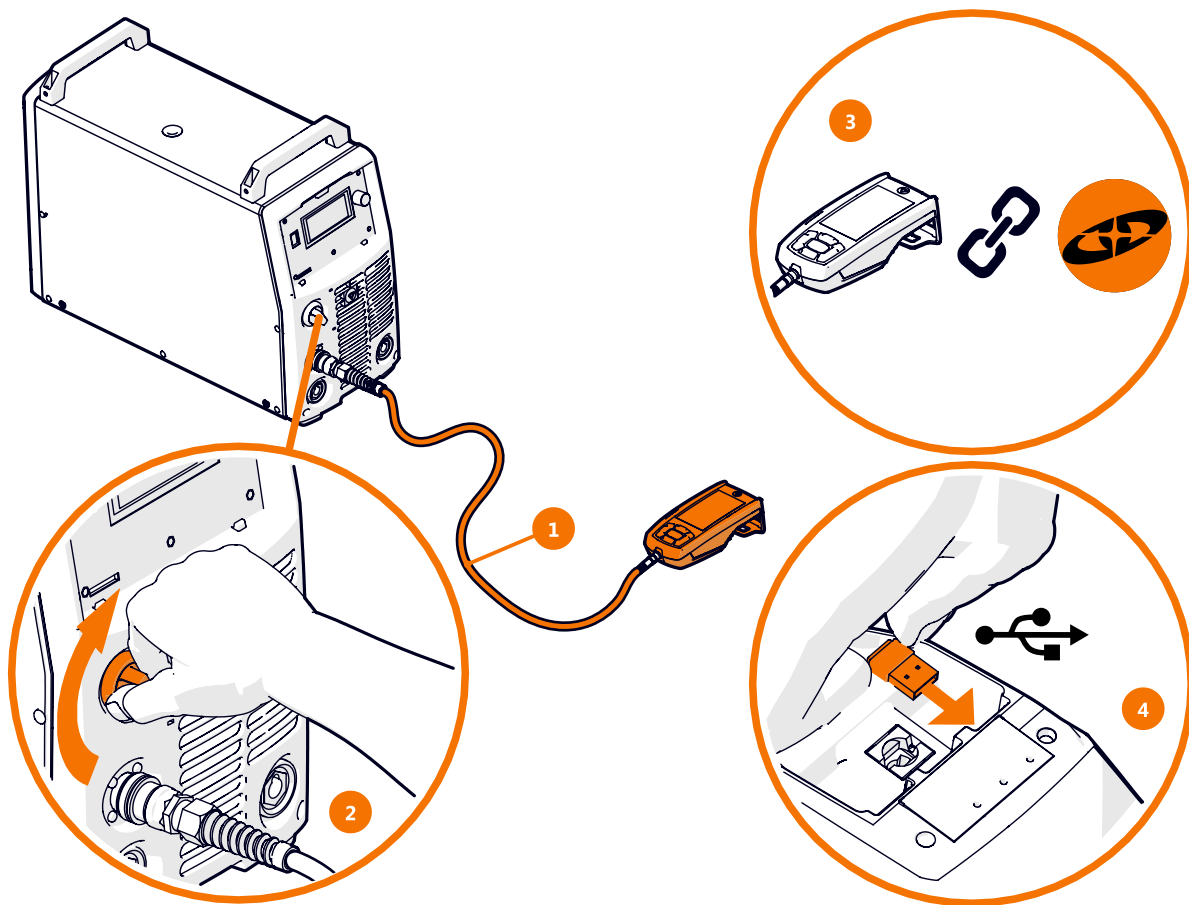
### 6. Menu

Select Menu to go to other views and settings.

## 3 Getting started

To take Smart Reader into use:

1. Connect Smart Reader to the welding machine.
2. Power on the Smart Reader. The first time you power on Smart Reader, the SD card is formatted.
3. Link Smart Reader to your company WeldEye account.
4. Configure Smart Reader's network connection.



To get the all the benefits of WeldEye, also adjust other features, such as cable compensation.

### 3.1 Smart Reader operating principle

Smart Reader is a handheld IoT device with multiple functionalities: it connects to the welding machine or adapter for recording welding parameter data, provides a user interface and reporting tool for the welder, and communicates with the WeldEye servers to send and receive data to/from the WeldEye cloud service.

### 3.1.1 How welding data is recorded

Smart Reader collects welding parameter data automatically. Every weld is recorded, and the data is stored.

Smart Reader communicates with the welding machine via a data link, reading information such as current, voltage, and wire feed speed. This is possible natively with some Kemppi-branded welding machines. For other arc welding machines, an additional adapter device is needed. The adapter has a sensor that measures the current and voltage from the poles of the welding machine's power source.

Smart Reader knows when the welding arc is ignited and stopped, and can thus distinguish individual welding runs and tally arc time.

Smart Reader stores welding parameter data on an SD card. After every weld run, the data is sent to the WeldEye cloud service for analysis and reporting. In a normal situation, the welding data is visible in WeldEye within a few seconds after welding has ended. It is not possible to see ongoing welding in the WeldEye cloud service; the information is transmitted only after welding has ended.

If Smart Reader is not connected to WiFi or cannot connect to the Internet, the data is kept in the buffer/queue until network becomes available again. The SD card has enough space to store several months' welding data (in three shifts around the clock). When network connectivity is restored, the data is sent to WeldEye.

Smart Reader is battle-tested in production use in numerous different environments, with all sorts of arc welding: manual, mechanized and fully automated robotic welding, including MMA, MIG, TIG and SAW processes. Smart Reader can handle welds of all lengths, be it a small tack weld of under a second or long mechanized weld where the arc is lit for many hours.

Smart Reader collects the welding parameters with a resolution of 1/10th of a second (10 samples per second). Some averaging is performed in the WeldEye cloud service to reduce the natural jitter in weld data. It is possible to filter away starts and stops of the weld, as hot start and crater fill mechanisms of welding machines are not compliant with WPSes.

### 3.1.2 Identifier database

Smart Reader can provide 100 % traceability to every weld. To do this, various identifiers are entered to the system before welding in order to give meaning to the welding data; for example, the person welding, the WPS, and the weld number.

The identifying data is created and managed in the WeldEye cloud service. Smart Reader receives this information from the cloud service and matches it with the identifiers that the welder enters manually or with barcodes.

The identifier database is synchronized from WeldEye to the Smart Reader every 15 minutes when the device is online. In Smart Reader, the database is stored in the SD card, so Smart Reader can be used reliably in times when network connectivity is poor. If a new barcode (for example, a new filler batch number) is entered to the system, it becomes available in the cloud service and for all the Smart Readers connected to the service.

The 15 minute delay in updating the identifier database means that it will take up to 15 minutes for Smart Reader to recognize any new identifiers that are added to the WeldEye database.

### 3.1.3 Measurement of parameters

Because of voltage drop and fluctuation in parameters, the measurement values are not necessarily measured and displayed in WeldEye exactly as they are shown on the welding machine, but they are still displayed in a meaningful manner and according to welding norms.

### **Fluctuation and averaging**

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Welding parameters always fluctuate during the welding. To show parameter data in a useful format, WeldEye uses averaging to filter out extremes and to show the average graph of the welding performance. You can adjust the averaging according to your needs in the **Settings** view.

### **Voltage drop**

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In MIG welding machines with long cables (from power source to wire feeder to gun), the voltage drop can be significant due to electrical resistance. Therefore, welding machine power sources generate a voltage ("pole voltage") that is higher than the voltage in the welding arc. Therefore, voltage can be measured either at the poles of welding machine or at/near the arc. WeldEye always tries to measure the effective arc voltage, but if this is not possible, WeldEye calculates it based on cable lengths.

It is possible to define the cable length in Smart Reader to compensate for the voltage drop. When you use WeldEye with Kemppi X8 MIG Welder and Kemppi FastMig X welding machines, the compensation is done automatically.

### **Accuracy of measurements**

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Welding machine power sources often conform to the standard IEC 60974-1, which states that 2.5% accuracy is required when displaying amps and volts. It means that the displayed value must be within 2.5% of the actual value, measured at the maximum power. For example, for a power source rated capable of producing 300A, the error may be up to  $\pm 7.5A$ . Therefore, the power source display may not always show the true value.

Standard IEC 60974-1 and accuracy also applies to WeldEye's Universal Adapters. Thus, there can be quite a large difference between what the welding machine displays and what the sensors measure. However, in practice, the error is usually much smaller than what the standard allows.

Welding machines and measurement devices must be validated every two years to ensure they are still accurate.

## **3.1.4 Time-keeping**

To provide an accurate picture of welding activities, Smart Reader has a built-in real-time clock. It is used to record the time of weld run starts, stops, parameter samples, and other events. It is automatically kept synchronized through the cloud service.

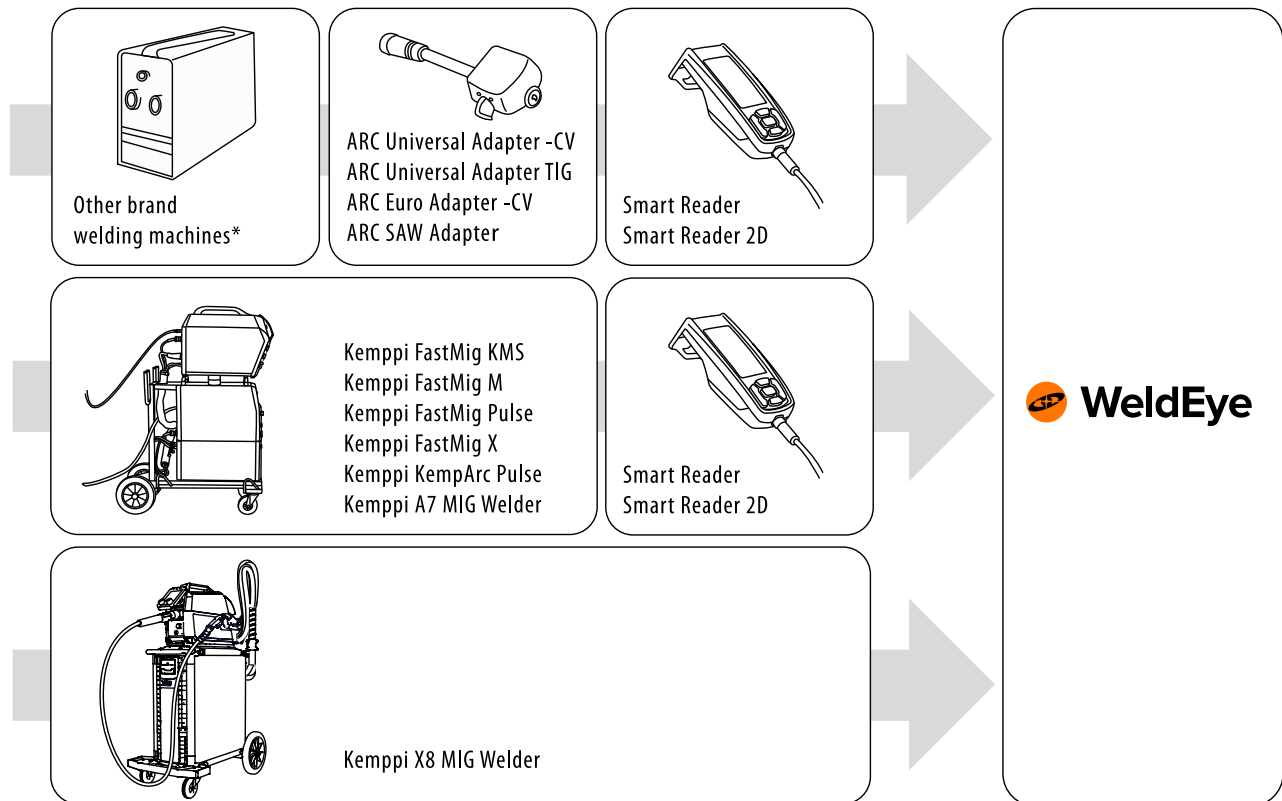
Internally, Smart Reader uses global UTC time (Coordinated Universal Time), but adjusts it to the time zone of the user. The time zone is controlled site-wide in the WeldEye cloud service.

The time is displayed as the user's local time in the Smart Reader's display and in the WeldEye cloud service. In the cloud service, it is possible to search for weld runs according to the time the welding took place.

## **3.2 Connect Smart Reader to the welding machine**

Smart Reader needs to be connected to a welding machine to be able to record the measured current and voltage parameters. The way to connect it depends on the type of welding machine. In most cases, you need an additional adapter that measures the current and voltage.

With the following welding machines you do not need an adapter, as the machines have native measurement functionality: Kemppi FastMig KMS/M/Pulse/X, KempArc KMS/Pulse, Kemppi A7 MIG Welder.



**Figure 3: Welding machines and accessories for WeldEye usage. \* Other brand welding machines can be any welding machines.**

When you are using Smart Reader together with:

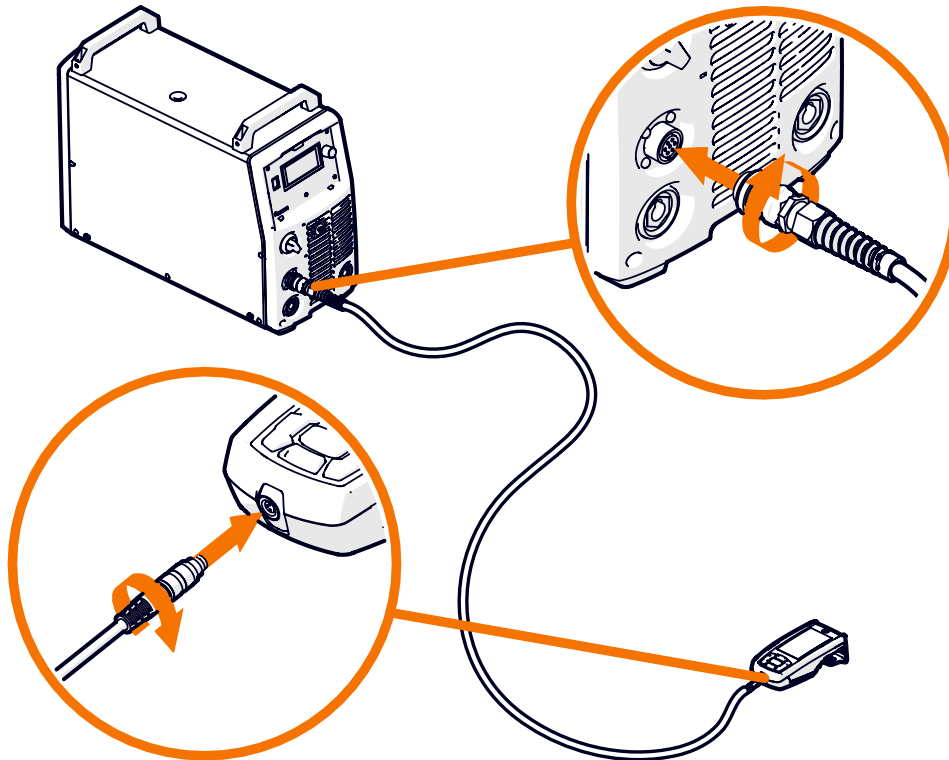
- An adapter for measuring voltage and current - connect Smart Reader to the adapter with the connection cable.
- Kemppi welding machine with Kemppi MSF wire feeder – connect Smart Reader directly to the power source with the connection cable.
- Kemppi welding machine (with no Kemppi MSF wire feeder) – connect Smart Reader either to the power source or to the wire feeder, depending on which is more convenient to you.

**i Note:** Smart Reader cannot be connected to Kemppi FastMig KM machines. Smart Reader is not required for Kemppi X8 MIG Welder, as it has built-in WeldEye functionality.

### 3.2.1 Connect Smart Reader to Kemppi FastMig KMS/M/Pulse/X, KempArc KMS/Pulse, Kemppi A7

You do not need an adapter, when you connect Smart Reader to one of these welding machines.

1. Connect the 4-pin connector of the connection cable to the Smart Reader: align the pins, push, and turn.
2. Connect the 7-pin round connector of the connection cable either to the welding machine power source or to the wire feeder, whichever is more convenient for you.



### 3.2.2 Connect Smart Reader to other welding machines

Use an adapter for measuring voltage and current. Available adapters include:

#### **ARC Universal Adapter - CV**

Compatible with all MIG/MAG and MMA machines, and with TIG welding machines without High frequency ignition. Connects to the power source. Rated for maximum 500 A welding current.

#### **ARC Euro Adapter - CV**

Compatible with MIG/MAG welding machines with Euro gun connector. Connects to the wire feeder. Rated for maximum 500 A welding current.

#### **ARC Universal Adapter TIG**

Always use this adapter with TIG welding machines with High Frequency ignition. Shielded against the high voltage ignition spark. Rated for maximum 500 A welding current.

#### **ARC SAW Adapter**

Always use this adapter with (high-voltage) submerged arc welding machines. Compatible with heavy automatized welding machines used for SAW/121/125 welding processes. Rated for maximum 1600 A welding current.

For detailed information, see the user manual of each device.



**Warning:** Universal Adapter -CV, TIG and SAW Adapter must be installed by a licensed electrician.

### 3.2.2.1 Connect Smart Reader with ARC Universal Adapter - CV

1. Connect the connection cable from Smart Reader to the adapter.
2. Connect the adapter to a separate power supply with ARC Control Cable (required to power the Smart Reader).
3. Connect the adapter to the welding machine ground connector, and the Dix branch connector to the opposite pole.

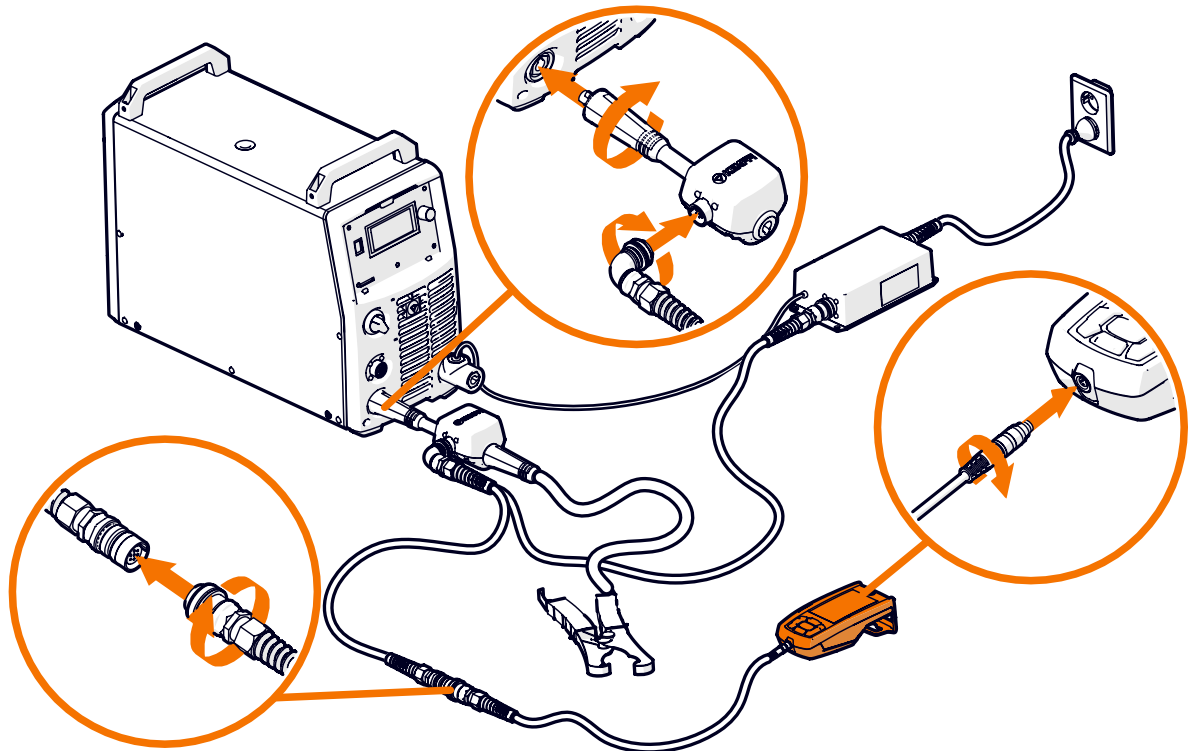
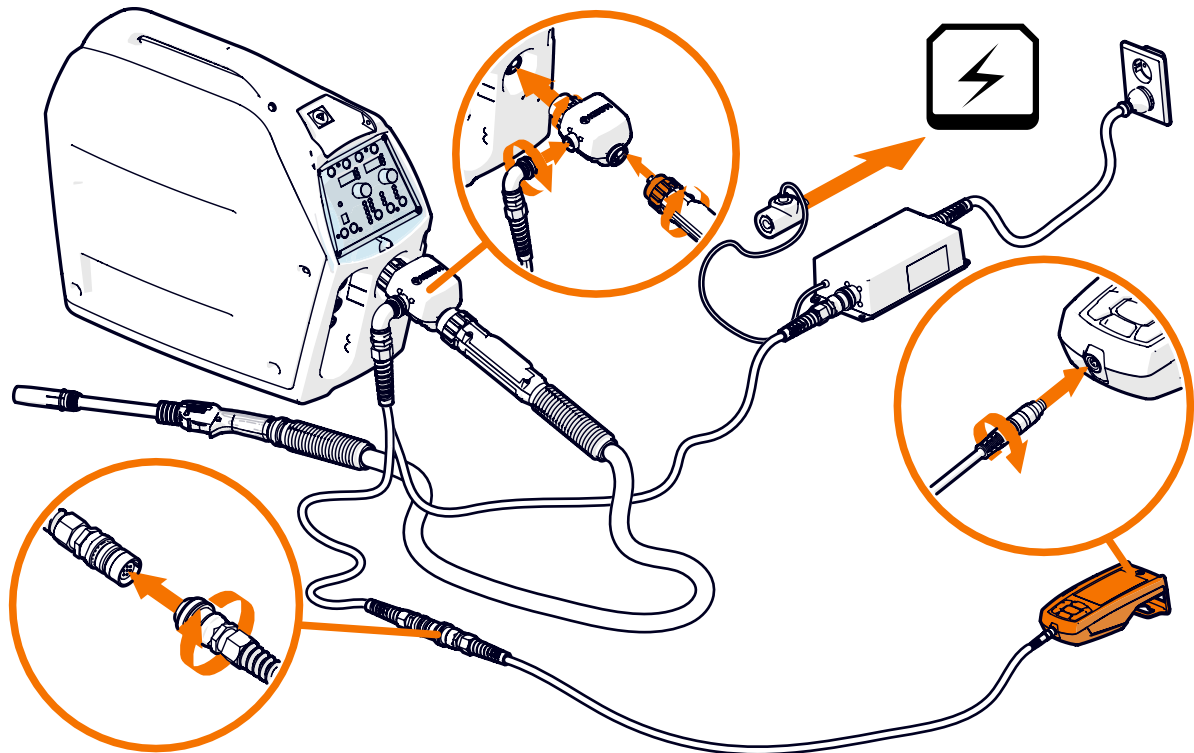


Figure 4: Connecting ARC Universal Adapter CV and Smart Reader to a welding machine

### 3.2.2.2 Connect Smart Reader with ARC Euro Adapter -CV

1. Connect the connection cable from Smart Reader to the adapter.
2. Connect the adapter to a separate power supply with ARC Control Cable (required to power the Smart Reader).
3. Connect the adapter to the wire feeder's Euro gun connector, and the Dix branch connector between the power source and ground cable.





**Figure 5: Connecting ARC Euro Adapter and Smart Reader to welding machine**

### 3.2.2.3 Connect Smart Reader with ARC Universal Adapter - TIG

1. Connect the connection cable from Smart Reader to the adapter.
2. Connect the adapter to a separate power supply with ARC Control Cable (required to power the Smart Reader).
3. Connect the adapter to the welding machine ground connector, and the Dix branch connector to the opposite pole.

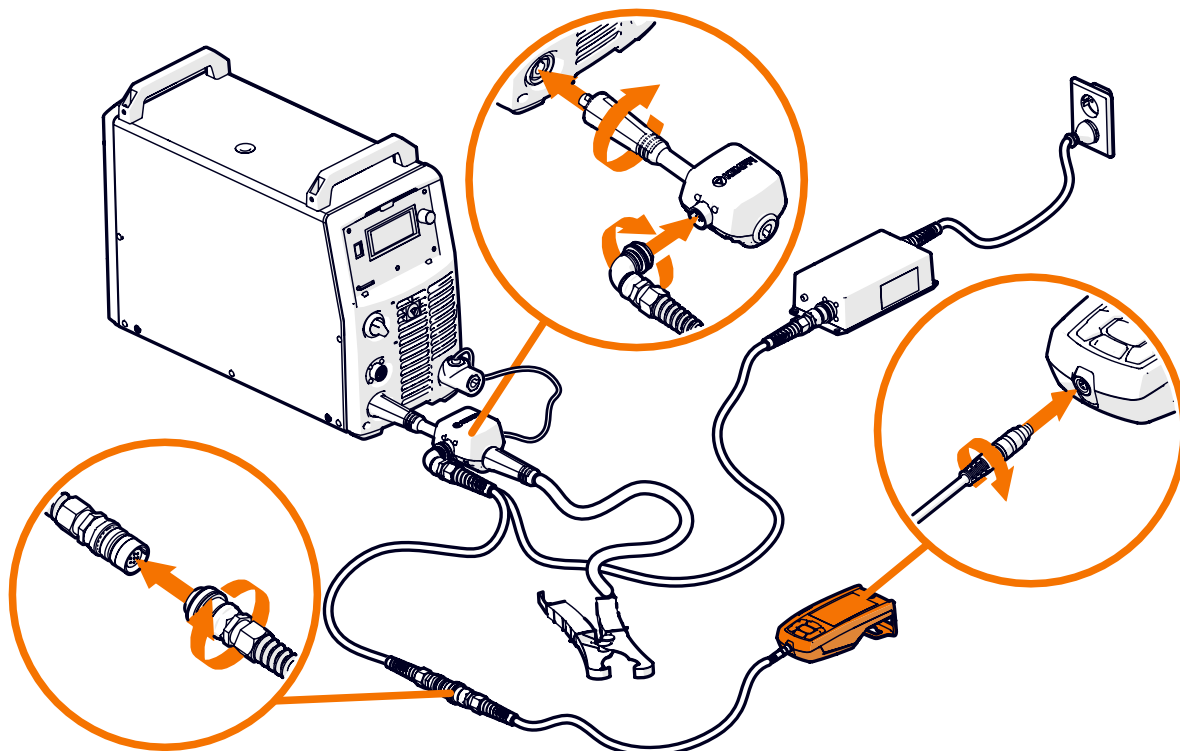
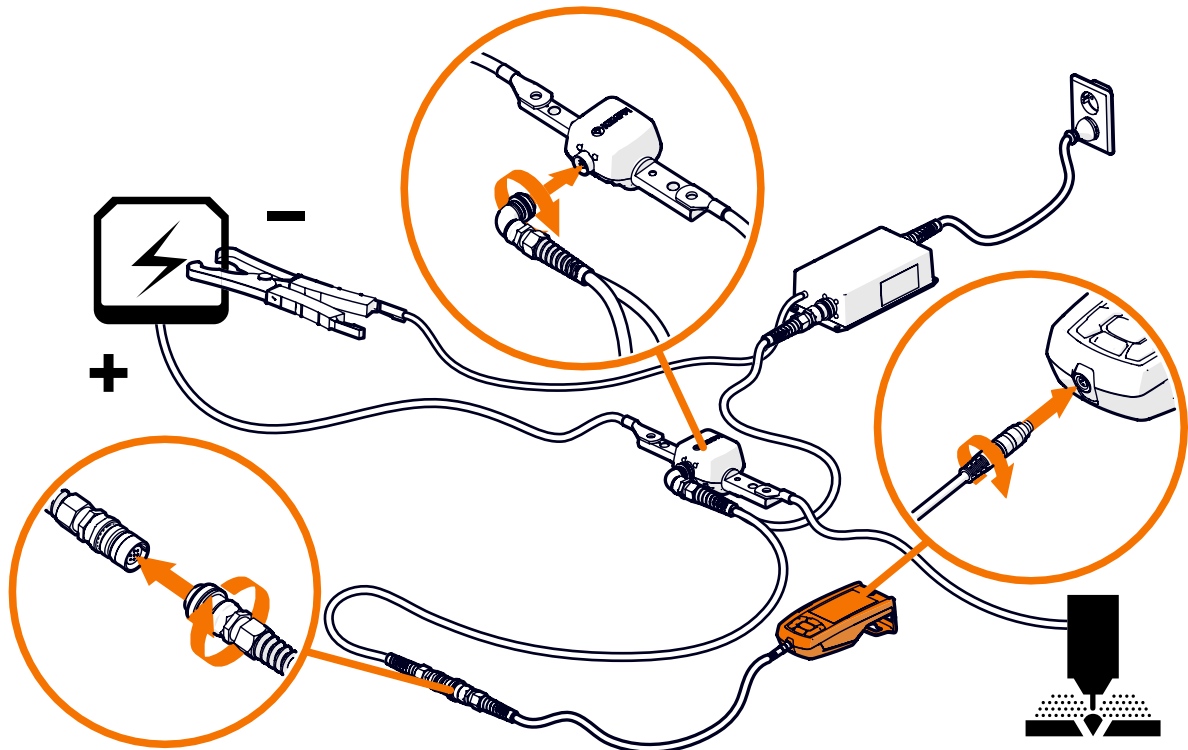


Figure 6: Connecting ARC Universal Adapter TIG and Smart Reader to a welding machine

### 3.2.2.4 Connect Smart Reader with ARC SAW Adapter

1. Connect the connection cable from Smart Reader to the adapter.
2. Connect the adapter to a separate power supply with ARC Control Cable (required to power the Smart Reader).
3. Bolt the adapter to the welding cable.



**Figure 7: Connecting ARC SAW Adapter and Smart Reader to a welding machine**

### 3.3 Switch Smart Reader ON and OFF

If the Smart Reader is directly connected to the welding machine, Smart Reader is automatically switched on or off when the welding machine is powered on or off.

If Smart Reader is connected to an adapter, it is powered on continuously. To switch Smart Reader off, unplug the adapter power source.

When Smart Reader is powering on, the booting phase takes a couple of minutes. During the booting, a logo is displayed. When Smart Reader has started, it asks the user to log in by scanning a barcode.

Smart Reader's barcode reader is automatically turned off after 2 minutes of inactivity to ensure the barcode scanner camera's long life. To read barcodes again, press the middle button in Smart Reader.

Smart Reader has a built-in Li-Ion battery, which is used to gracefully switch off Smart Reader in the case of power loss. The battery helps keep the device functional if the power is unstable. Smart Reader stays powered on for up to 2 minutes after the main is powered off. On the backside of the device, under the plastic cover, there is a red LED light to indicate that the device is still on.

If Smart Reader's battery has been discharged during a long period of shelving or other non-use period, Smart Reader needs to be connected and powered on for up to 2 hours for the battery to become charged and for the Smart Reader to start up.

## 3.4 Link Smart Reader to your company WeldEye account


Only WeldEye support personnel can link a Smart Reader to your WeldEye account. Contact the support personnel and give them the serial number of the Smart Reader printed on the sticker on the back of the device under the cover.

See [Contact information](#) on page 37.

## 3.5 Configure Smart Reader's network connection

Select the wireless network and enter the password in WeldEye cloud service, and transfer the settings configuration file to Smart Reader.

Follow these steps:

1. In WeldEye, go to **Administration** view, and select **Configurations**.
2. Click **Add new**.
3. Fill in the information.
4. Click **Save**. The settings are saved in the Configuration list.
5. To download the settings file to your computer, check the box next to the configuration, and click **Actions** > **Download**.  
 **Note:** Link Smart Reader to WeldEye before downloading the configuration file. The configuration file only applies to Smart Readers that are in the Devices list at the time of the download.
6. Copy the downloaded file on a USB stick, and disconnect it from the computer.
7. Connect the USB stick to Smart Reader.
8. Smart Reader asks whether to change the network settings. Answer YES.

Smart Reader now automatically connects to the network. WiFi icon on the top right corner of the display shows the connection state:

- **No icon** - Smart Reader is not connected to WiFi.
- **White icon** - Smart Reader is connected to WiFi, but cannot communicate with the WeldEye server.
- **Green icon** - Smart Reader is connected to WiFi, and WeldEye communication works.

If the icon is constantly toggling between no-icon and white-icon states, wifi reception may be poor at that spot. Move the device closer to the WiFi access point, or install additional access points.

If the icon is toggling between white-icon and green-icon states, wifi reception may be poor at that spot, or there may be an error. Contact WeldEye support. See [Contact information](#) on page 37.

## 3.6 Internet connectivity requirements

Smart Reader only supports WiFi connections. DHCP (automatic IP addressing) must be enabled in the network. Only IPv4 protocol is supported.

### Wireless network requirements

---

Wireless network should cover the entire area of the factory where devices are being used. Arc welding has minimal effect on the quality of the WiFi signal, but, for example, steel structures between the wireless router and the Smart Reader can block the signal.

Constantly poor wireless signal levels may affect the usage of WeldEye.

It is recommended that the wireless network is an isolated network that is not open to the company internal network.

Smart Reader supports the following WLAN configurations:

- WLAN standards: 802.11b, 802.11g, 802.11n

WLAN encryption methods: Open, WPA-Personal PSK (TKIP and AES), WPA2-Personal PSK (TKIP and AES)



#### Note:

- HTTP authentication cannot be used with Smart Reader. HTTP authentication means that the user is authenticated via HTTP protocol using a web form or similar.
- Bandwidth usage is mostly outbound. Devices send welding parameter data after every weld, causing up to 60 megabytes per day for 10 devices in one shift. Network traffic is compressed.

For inbound traffic, devices fetch updated information every 15 minutes, causing up to 15 megabytes of traffic for 10 devices in a day.

### Firewall configuration requirements

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Devices connecting to WeldEye need unfiltered HTTPS access to the cloud service (address <https://weldeye.prod.api.kemppi.com>) at port TCP 443.

If your firewall uses a MAC address-based filtering, each of the device's MAC addresses must be allowed to connect to the network.

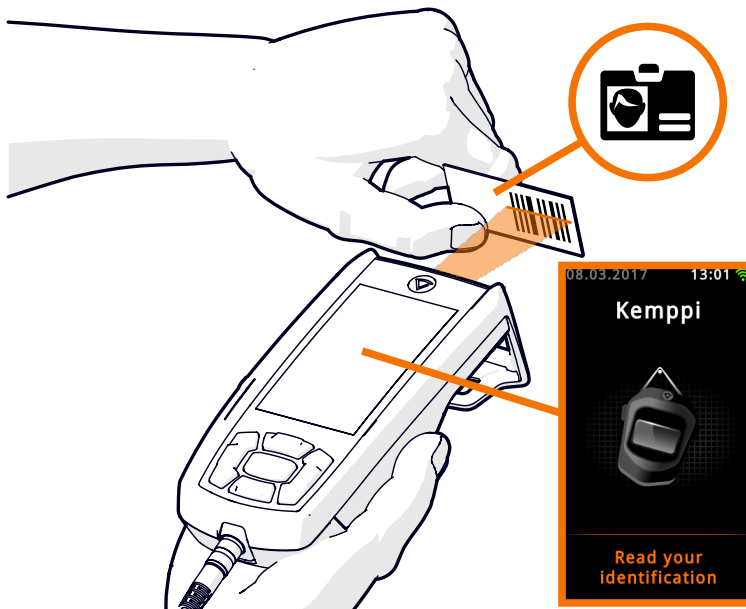
If you have a transparent SSL proxy installed, it must be configured to bypass accesses to the address: [weldeye.prod.api.kemppi.com](https://weldeye.prod.api.kemppi.com).

## 4 Collecting welding data

Smart Reader always collects welding data when connected to the welding machine and powered on, even if no bar codes have been scanned.

### 4.1 Welder's workflow with Smart Reader

- Note:** If your Smart Reader has a 1d scanner, make sure the light is bright enough and the barcode lies on a flat surface so that the device is able to scan the barcode.
1. To associate the welder with the following welding data, log in to the Smart Reader by scanning the welder barcode.



Welder barcodes are created in the Personnel view in WeldEye cloud service.

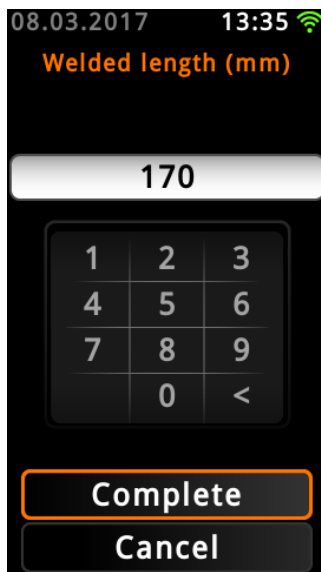
By default, the Smart Reader user interface is in the language defined in the WiFi network configuration file. However, the language can be set for each person separately in the Personnel view in WeldEye.

2. Scan barcodes to give meaning to the welding data. If you do not have a barcode, enter the identifiers manually with the virtual keyboard by selecting **Menu** → **Enter barcodes**. The following information types are supported:
  - Welder
  - WPS
  - Filler material ("Wire")
  - Filler material batch number ("Wire batch")
  - Shielding gas ("Gas")
  - Weld

- Project
- Piece
- Work

**Note:**

- The identifier for which the barcode is scanned does not need to be highlighted on the screen.
  - It is possible to scan identifiers that are not listed on the display.
  - Smart Reader's barcode reader turns itself off after 2 minutes of inactivity. To read barcodes again, press the selection button.
- a) Identify the WPS to be used by scanning the WPS barcode on a printed document. Select pass number on the display. If there is only one pass, the pass selection is not shown. If there is no barcode to scan, select the WPS using arrow buttons: In the main view, select **WPS**. In the WPS list view, select **Filter** to narrow down the list. Then, browse the WPS list to find the correct WPS.
- b) Scan the weld barcode to identify the weld.  
Smart Reader displays the weld number, project and other information about the weld. The following welding data is thus linked to that weld and correctly logged in WeldEye.
- c) Record the filler material batch number to provide traceability. Scan the barcode from the filler material packaging, or enter the number with the keyboard.  
The first time a barcode is scanned, Smart Reader reports that the barcode is unknown. Select **Define > Wire batch**. The batch number becomes a known identifier and will appear in Weldeye.  
To enter filler batch number if there is no barcode, select **Menu > Enter barcode**, and enter the barcode with the virtual keyboard. The first time the barcode is entered, Smart Reader reports that it is an unknown barcode. Select **Define > Wire batch**.
3. To change pass within the WPS, press the left/right arrow button. Alternatively, you can scan the WPS barcode again, or use the menu to find the correct WPS and pass.
4. To mark that the weld is complete, select **Menu > Weld Complete**. Enter the length of the weld. This enables the calculation of heat input. For more information, see [Heat input tracking](#) on page 27.



**Note:** The **Weld complete** function requires that the Weld barcode has been scanned. Availability of the **Weld Complete** function is controlled in WeldEye cloud service settings.

5. When you finish using the welding machine, log out of Smart Reader so that the following welding data will not get registered under your name. To log out, select **Menu > Log out**.

Powering off the Smart Reader will also log out the welder, so that there is no need to manually log out.

- Note:** WeldEye cloud service provides two settings that control logout behaviour:
- **Automatic logout:** when this setting is enabled in WeldEye, and the welder has been identified with a barcode, the welder is automatically logged out from the device after a period of inactivity (non-arc time).
  - **Remember logged in welder:** with this setting, the device remembers the identifiers that are read, so that the welder, WPS, filler material and other identifiers are not lost when the device is rebooted.

## 4.2 Identifiers shown on Smart Reader

In the WeldEye cloud service settings, it is possible to control which identifiers Smart Reader suggests to the welder, that is, which identifiers are displayed on the Smart Reader even before they are scanned (displayed as grey text). For example, you can select to display the identifiers that are compulsory for the welder to scan. Other identifiers can still also be scanned.



**Welding documentation**

**Tracked identifiers** Suggested identifiers are shown in screen of Smart Reader and the X8 Control Pad. If the identifier is missing, a deviation alert can be raised. An unknown barcode may be defined and added to the system by the welder.

	Suggest	Alert if missing	Allow definition
Welder	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
WPS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Shielding Gas	<input type="checkbox"/>	<input type="checkbox"/>	
Filler material	<input type="checkbox"/>	<input type="checkbox"/>	
Filler batch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weld	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Work piece	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 4.3 Alerts shown on Smart Reader

Smart Reader shows alerts for insufficient welder qualifications, wrong filler material, and wrong shielding gas.

WeldEye compares the range of qualifications on the welder's qualification certificates that are stored in WeldEye to the qualifications required by the WPS. (The range of qualifications applies to EN/ISO standards only). If the welder does not have a qualification that matches (or exceeds) the WPS requirements, the system raises an alert. If the welder decides not to weld, the alert is not recorded in the cloud service. If the welder does weld despite the alert, the alert is recorded in the cloud service.

WeldEye also compares the filler material information and shielding gas information that the welder enters with Smart Reader to the filler and shielding gas defined in the WPS. If these do not match, the system raises an alert.

In the WeldEye Settings view, you can select whether the system raises alerts for non-conforming qualifications or not.

**Welding documentation**

**Tracked identifiers** Suggested identifiers are shown in screen of Smart Reader and the X8 Control Pad. If the identifier is missing, a deviation alert can be raised. An unknown barcode may be defined and added to the system by the welder.

	Suggest	Alert if missing	Allow definition
Welder	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
WPS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Shielding Gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Filler material	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Filler batch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Weld	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Work piece	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 4.4 Reason codes

Reason codes are a means of tracking non-welding time, that is, events that cause pauses in the production. Reason codes can mark both expected pauses, like lunch breaks, or unexpected pauses, like machine breakdowns or waiting for a material delivery. Use reason codes to identify bottlenecks in your production.

The welder selects the reason code with the Smart Reader. WeldEye registers and stores the code.

To select a reason code in Smart Reader:

1. Select **Menu > Set reason code**.
2. Browse the list of reason codes with up/down arrow buttons, and select the code you need.



The reason code becomes visible in Smart Reader main screen. Reason code is active until Smart Reader detects welding or until other reason code is selected.



**Note:** Logging out does not erase the reason code, even if Smart Reader does not show that a reason code is active after a new login.

## 4.5 Heat input tracking

Smart Reader can track the heat input of each weld and give feedback to the welder about the heat input values.

Heat input tracking is achieved with the **Pass complete** function. Pass complete function requires the user to read the Weld barcode and weld at least one run after it. After welding, the Pass complete selection appears in the menu.

The heat input is calculated based on travel speed, welding current, voltage, and the welding process. Since there is no automated way to measure welding travel speed, WeldEye calculates it based on the welding arc time and length of the weld entered by the welder.

To track heat input:

1.

Before welding:

- a) Log in to Smart Reader.
- b) Select a WPS.
- c) Scan a weld barcode.

All welding is now considered to be part of a pass, and is taken into account when heat input is calculated.

2.

After welding, select **Menu > Complete pass**.



**Note:**

You can weld several runs, select **Complete pass** at the end of the pass, and enter the total length of the runs.

Smart Reader prompts you to complete the pass before changing the weld or WPS to ensure that all data is recorded and documented. Pass complete can also be triggered if you try to select **Weld complete** but the pass has not yet been completed.

3.

Enter the welded length (mm). Use the virtual keyboard by moving the highlight with the arrow buttons and select the desired highlighted numbers or virtual buttons with the middle button.



**Note:**

The length may be preset in WeldEye, but you can change it if needed.

4.

After the pass has been marked complete, Smart Reader shows the actual average heat input and travel speed and whether they were within the WPS limits. The welder can adjust his parameters or welding technique based on this feedback. The data is also sent to WeldEye cloud service for documentation.

Heat input tracking feature is enabled in the WeldEye cloud service.

## 4.6 Weld Data view after welding

After welding, Smart Reader can display the Weld data view, which shows the minimum and maximum current and voltage of the last welding. The welder can adjust his parameters or welding technique based on this feedback. If a WPS is currently identified, the parameter limits are shown and deviating measured values are shown in red.

It is not necessary to acknowledge this screen after every weld. If several welds have been made, only the latest is shown. The previous welds' data cannot be shown in Smart Reader; that information is available in WeldEye cloud service.

This feature is enabled in WeldEye cloud service settings.

## 5 Other Smart Reader features

### 5.1 Cable compensation

Cable compensation enables the welder to adjust the welding voltage measurement in the case that the welding machine has long intermediate cables, long earth cables, or long torch/gun cables. The higher the welding current is and the longer and thinner the welding cables are, the greater resistance occurs in the electrical circuit, leading to voltage loss. The cable compensation function calculates the actual reduced voltage at the work piece based on the measured value at the power source and the length and area of cables given by the welder.

To set up cable compensation:

1. In Smart Reader, select **Menu > Settings**.
2. Select **Set cable area**, and enter the value  $\varnothing \times \Pi$  (the diameter of the intermediate cables and earth cables multiplied by pi).
3. Select **Set cable compensation length**, and enter the total length of the cables (accuracy of one meter).

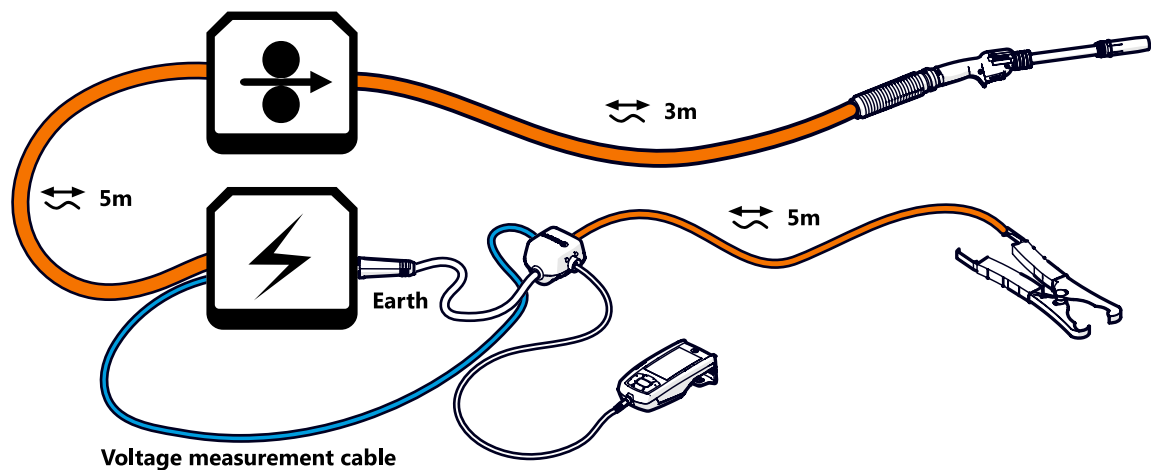
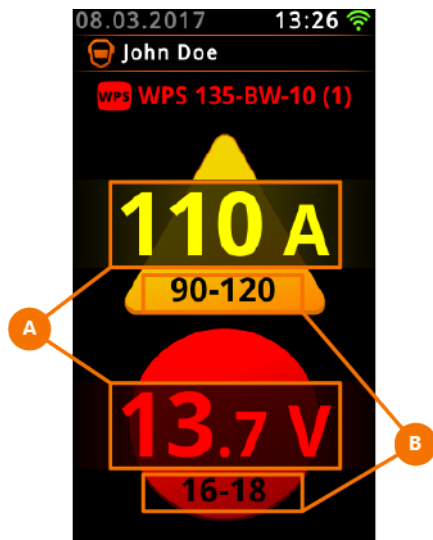


Figure 8: Example of long intermediate cables, total length = 13m

### 5.2 Real-time WPS monitoring

Smart Reader displays the welding current and voltage while welding, and indicates whether the values are within the limits of the currently identified WPS. This information is useful for bystanders observing the welding, and in the case of mechanized welding, for the welding operator.



The measured welding current and voltage are displayed on the screen as large text (A), and the WPS parameter limits as smaller text (B).

#### Color codes:

- **Green:** OK, measured value well within the WPS limits.
- **Yellow:** Warning, measured value near WPS limits.
- **Red:** Alert, measured value outside limits.
- **White:** WPS is not identified, only the measured values are shown with no indication of whether they are correct.

There is a short grace period ("reaction time"), usually a few seconds, before the color changes. This makes the display easier to read and enables the monitoring the overall welding quality.

For more information on Real-time WPS monitoring, see WeldEye help.

## 5.3 Channel WPS

Channel WPS is a feature that can be used with Kemppi welding machines only (FastMig family). Channel WPS is enabled in the Smart Reader's settings for each Smart Reader/welding machine separately.

Channel WPS enables mapping the welding machine's memory channels to welding procedures. When the feature is enabled, Smart Reader automatically associates WPS information with welds based on the selected memory channel. By using the feature, WPS reading is automated, and the welder can work more effectively. The feature fits best to simple welding where the number of WPSes is small. A typical use case for the feature is when the welding job requires welding over corner so that the welding parameters and thus WPS needs to change on the fly without shutting down the arc at any point.

Channel WPS also supports the MatchLog features. In FastMig pulse and FastMig X, the welder is able to switch the memory channel on the fly using the MatchChannel feature. In FastMig KMS and FastMig M, the welder is able to toggle the MiniLog feature during the welding. In both cases, Smart Reader automatically divides the weld into sections based on the memory channel

selection or MiniLog's state changes. The correct WPS is always applied during the welding based on the predefined mappings.

## 5.4 WPS suggestion for weld identifiers

In the WeldEye cloud service, it is possible to assign one or more WPSes for a weld identifier. When the weld barcode is scanned with Smart Reader, Smart Reader can automatically select the correct WPS, or display a selection list of WPSes.

This feature is controlled in the WeldEye cloud service settings.

## 5.5 TIG drop-down filtering

To reduce the number of unnecessary warnings on the Smart Reader display, Smart Reader applies TIG drop-down filtering.

When welding long runs with TIG, it is not ideal to stop the arc. However, the welder may need to change the filler wire during welding while keeping the welding bead melting. During this time, the welding current can be dropped to low levels to keep the arc on, but not burning through the base material.

This feature is controlled in the WeldEye cloud service settings.

## 5.6 Smart Reader usage and WPS limit enforcement

Kemppi FastMig X welding machine supports enhanced integration with Smart Reader, enabling Smart Reader usage enforcement and WPS limit enforcement.

For more information about this feature or how to enable it, contact WeldEye support. See [Contact information](#) on page 37.

### Smart Reader usage enforcement

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In some cases, it is desirable to enforce the use of Smart Reader to ensure that all welding parameters are collected. For these occasions, it is possible to adjust FastMig X welding machine so that it cannot be used for welding if Smart Reader is not connected and welder identification scanned. Furthermore, it is possible to require the welder to give the WPS identification before the welding machine is functional.

### WPS limits enforcement

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Smart Reader can adjust the welding machine automatically according to the parameter values defined in the WPS, and enforce the WPS limits so that they cannot be exceeded by adjustments through the welding machine panel. Smart Reader can automatically adjust the following welding parameters: current, voltage, wire feed speed, and the welding program.

## 6 Administration

Administrator section is used mainly for update and troubleshooting purposes. Administrator can log in to Administrator section in two methods:

- Using a Smart Reader administrator's barcode (Note that the device must be attached to the company before this is possible)
- Downloading a Smart Reader network configuration file and place it similarly to the root of the USB flash drive's file system i.e. D:\ArcQ\_NetworkConfiguration.cfg

### 6.1 Administrator section views

#### Device information view

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- Internal serial number of the device
- Currently installed software version
- Default language of the device



#### Network settings view

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The mac addresses of the Smart Reader network interfaces, current network, and connection status, and possible proxy server and server connection status (working or not working).





### Visible networks view

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List of all wireless networks those broadcast their SSID to the air.



### Welding system view

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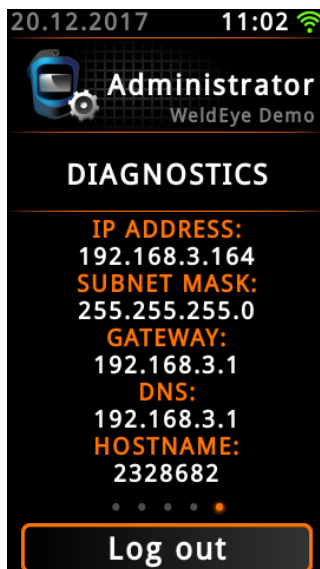
Information that Smart Reader reads from the bus either about the welding machine the Smart Reader is connected to or about the adapter the Smart Reader is connected to.



### Diagnostics view

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Diagnostics information of the Smart Reader state. This view is typically needed when troubleshooting, for example, network connectivity. The page can be scrolled up/down with the arrow keys.



## 6.2 Updating Smart Reader firmware

You can update Smart Reader for new features and improvements. There are two different ways to update Smart Reader: update via USB stick, or online update. In each case, WeldEye support provides the new version of Smart Reader firmware.

For information about administrator login, see [Administrator section views](#) on page 32.

### Update via USB flash drive (USB stick)

Smart Reader administrator receives the update file (a .xpk suffixed file) from WeldEye support. The administrator saves the received file on a proper USB flash drive so that the update package is in the root of the flash drive's file system ( D:\update\_package.xpk.)

Administrator logs in to SmartReader's administration section.

Once the user is logged in as an administrator, Smart Reader automatically prompts for an update. Select to install update. Smart Reader shuts down and starts the update process. Once ready, Smart Reader informs about successful update.

**i** **Note:** If Smart Reader reports an error when the USB stick is inserted, it is possible that the device did not go to administrator mode. To start the administrator mode, press the small **BMS** button on the back side of Smart Reader (for example, with a piece of filler wire) until text appears on screen.

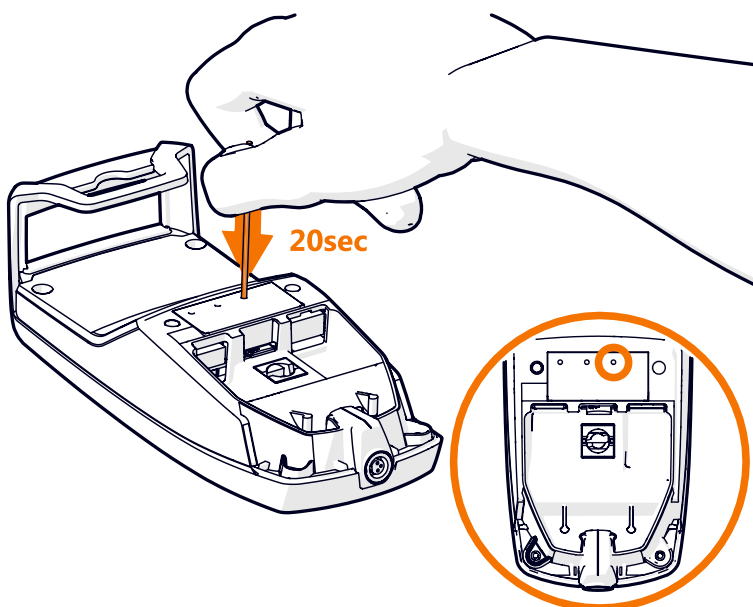
### Online update

Smart Reader can be automatically updated through an online update. In this case, Smart Reader's update package is released in the WeldEye cloud service. Smart Reader automatically downloads the new firmware version (this happens in the background, without disturbing the operation). Once the download is complete, there are two options to perform the update:

- Smart Reader administrator logs into the Smart Reader's admin view. Once the user is logged in as an administrator, Smart Reader prompts automatically to update the device software. Select to install update, and update operation starts.
- Power off the welding machine for over two minutes, and then power it on. On start-up, Smart Reader automatically updates the firmware.

## 6.3 Factory reset

Smart Reader can be reset to the software version that was installed in it in the factory. To reset the device, press the BMS button under the back cover of the device for 20 seconds. When you release the button, the reset process starts.



## 7 Technical specifications

**Table 1:**

<b>Feature</b>		<b>Description</b>
Supported WiFi standards		802.11b, 802.11g, 802.11n
Battery	Type	Non-removeable Li-Ion
	Power	2200 mAh
Display	Size	4.3"
	Resolution	480 x 272 pixels
Materials	Cover	Plastic
Control cable port power		DC+ / 50V /200mA

## 8 Contact information

For support and more information on WeldEye, visit [www.weldeye.com](http://www.weldeye.com).

## 9 Glossary

**Table 2:**

Term	Description
Adapter	WeldEye adapter device that measures current and voltage of a welding machine, and enables the use of Smart Reader with any welding machine.
Configuration file	Smart Reader WiFi configuration file. Used during the setup to configure Smart Reader to connect to a wireless network. The configuration file is created with WeldEye cloud service. Contains the WiFi access point name and password in encrypted format.
Deviation	Alert or warning of non-conformance in welding data. For example, if the welding was done outside WPS limits, or if welder does not have qualifications, a deviation alert is raised.
Filler batch number	Batch number of the filler material can be recorded in WeldEye for detailed welding documentation.
Identifier	A unique number or string, usually in barcode format, that identifies the welder, WPS, weld, or other metadata. Can be scanned with the Smart Reader's barcode scanner or entered manually.
Pass	A single welding pass, such as the root layer. May consist of multiple runs.
Pass complete	Function that allows the welder to report the completion of a single welding pass as completed and enter the length of the weld. WeldEye can calculate the heat input based on this data. The function enables pass level documentation and heat input tracking.

Term	Description
Qualification	Welder's or welding operator's qualification to perform certain kinds of welding. Entering welding certificates in WeldEye enables the system to determine whether the welder is qualified to weld certain types of materials and weld joints according to the relevant standards. Smart Reader displays a qualification warning if the welder is not qualified for a certain WPS.
Reason codes	A list of non-welding activities that a welder typically performs and can report. Use them to track and categorize side times in various reports.
Run	A single welding run with start time, arc time, current and voltage parameter data and associated identifiers.
Smart Reader	A device that enables connecting a welding machine to the WeldEye cloud service. Smart Reader records welding parameters and sends the data to WeldEye using WiFi. The welder can use Smart Reader to enter traceability information by selecting items on the display or by scanning barcodes, and thus give meaning to the weld data.
Travel speed	Welding speed. Movement speed of the welding torch or gun along the weld.
Weld	Weld seam number, referring to a single weld that also appears in technical drawings. Each weld has a barcode in WeldEye to allow welding data to be traced back to the specific individual weld.
Weld complete	Function that lets the welder report that a weld is complete and no further work is required. Weld completion is then visible in the <b>Weld Lists</b> view of WeldEye.
WPS	Welding Procedure Specification document describing various aspects of welding technique, including welding parameters to use.