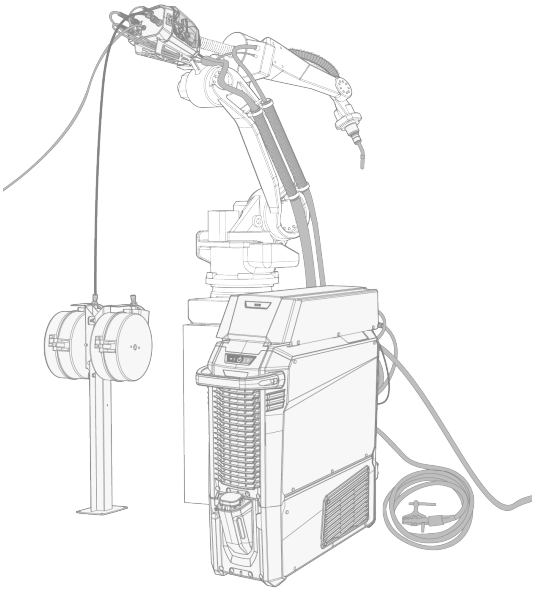
AX MIG WELDER



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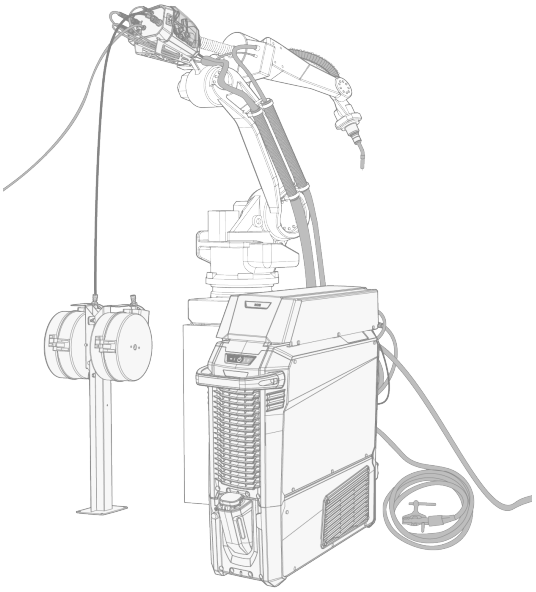
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1. GENERAL

These instructions describe the integration and use of AX MIG Welder equipment. The equipment consists of a welding power source, wire feeder, assistive wire feeder (optional), Robot Connectivity Module (RCM) and cooling unit (optional) designed for robotic MIG/MAG welding. The user interface, AX Manager, can be accessed with an internet browser.



AX MIG Welder can be integrated with all major robot brands. For robot-specific information, refer to the robot manufacturer's operating instructions.

The AX MIG Welder integration consists of the following general steps:

1. Install the hardware
   >> Make sure all components are intact.
   >> Install the power source mains plug and cooling unit, if any.
   >> Attach all necessary components to the robot and welding cell.
   >> Connect cables.
   >> Turn on the welding system.
   >> Install wire guide tubes and wire feed rolls.
2. Connect to the AX Manager user interface (refer to "Connecting to AX Manager user interface" on page 33)
3. Configure the system
   >> Configure the network, device, robot and fieldbus settings.
   >> Create memory channels (apply welding programs).
   >> Make a system backup, if necessary.

The integration steps are listed in more detail here: "System integration checklist" on page 263.

Important notes

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

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.

General notices

https://kemp.cc/ud/notices

EULA (End User License Agreement)

https://kemp.cc/ud/eula

Warranty

https://kemp.cc/ud/warranty

DISCLAIMER

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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.

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)
- Welding guns and torches

  (https://kemp.cc/safety/torches)

1.2 EQUIPMENT DESCRIPTION

AX MIG Welder has multiple power source and two wire feeder options to choose from.

X5 power sources are available with a set of welding programs (work pack) that are available with 1-MIG and pulse processes as applicable. The equipment technical data and welding programs included in the work packs are shown here: "Technical data" on page 198 and "Welding program work packs" on page 261.

X5 power sources (400 A):

- X5 Power Source 400
  >> Standard power source with support for automatic 1-MIG process as well as MAX Speed and MAX Cool processes
- X5 Power Source 400 MV
  >> Multi-voltage power source with support for automatic 1-MIG process as well as MAX Speed and MAX Cool processes
- X5 Power Source 400 Pulse
  >> Pulse power source with support for automatic 1-MIG process, pulse and double pulse processes, and all MAX processes
- X5 Power Source 400 Pulse+
  >> Pulse power source with support for automatic 1-MIG process, pulse and double pulse processes, and all Wise and MAX processes
- X5 Power Source 400 MV Pulse+
  >> Multi-voltage pulse power source with support for automatic 1-MIG process, pulse and double pulse processes, and all Wise and MAX processes.

X5 power sources (500 A):

- X5 Power Source 500
  >> Standard power source with support for automatic 1-MIG process as well as MAX Speed and MAX Cool processes
- X5 Power Source 500 Pulse
  >> Pulse power source with support for automatic 1-MIG process, pulse and double pulse processes, and all MAX processes
- X5 Power Source 500 Pulse+
  >> Pulse power source with support for automatic 1-MIG process, pulse and double pulse processes, and all Wise and MAX processes.

For the power source part descriptions, refer to "X5 Power Source 400 and 500" on page 12.

Main wire feeders:

- R500 Wire Feeder EUR
- R500 Wire Feeder EUR+ / RH EUR+
  >> Includes connections for using compressed air for welding torch cleaning
  >> Includes gas sensor
  >> Includes voltage sensing cable connection required for the WiseThin+ and WiseRoot+ processes
- R500 Wire Feeder HD EUR+
  >> Heavy-duty wire feeder
  >> Includes connections for using compressed air for welding torch cleaning
  >> Includes gas sensor
  >> Includes voltage sensing cable connection required for the WiseThin+ and WiseRoot+ processes

For the wire feeder part descriptions, refer to "R500 Wire Feeder EUR/EUR+" on page 14 and "R500 Wire Feeder HD EUR+" on page 18.

Assistive wire feeder (optional)

- RA50 4R Assistive Wire Feeder

For the wire feeder part descriptions, refer to "RA50 4R assistive wire feeder (optional)" on page 25.

Robot Connectivity Modules:

- RCM
- RCM+
  >> Includes wireless connectivity features.

For the RCM part descriptions, refer to "Robot Connectivity Module (RCM)" on page 29.

X5 cooling unit:

- X5 Cooler 1400, 1.4 kW

For the cooling unit part descriptions, refer to "Cooling unit (optional)" on page 31.

Welding torches:

- Kemppi GX-ROBOT System welding torch solution
- Flexlite GXe-C cobot welding torches

For information, refer to Userdoc.

- Third party robot welding torches

For information on third party welding torches, refer to the manufacturer's operation instructions.

Welding programs:

For information on selecting welding programs, contact your local Kemppi dealer.

Optional accessories:

- Torch cleaning station
- Stand for AX MIG Welder
- 4-wheel undercarriage
- Wire feeder mounting brackets
- Wire spool holder
- Protective cover for wire spool
- Floor stand for wire spool holder.

For more information on optional accessories, refer to the product catalog at Kemppi.com or contact your local Kemppi 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.

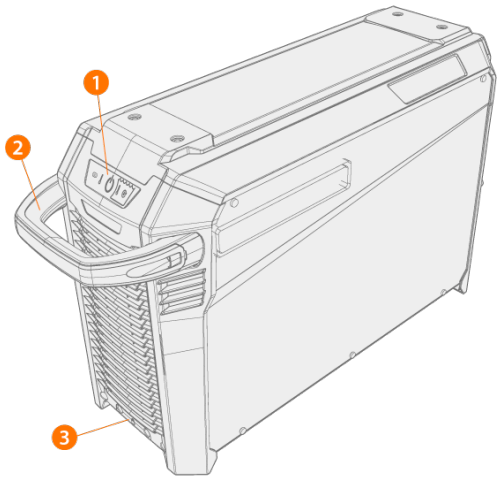
Quick Response (QR) code

Device-related information or a web link to such information may be found in the form of a QR code on the device. The code can be read, for example, with a mobile device camera and a QR code application.

1.3 X5 POWER SOURCE 400 AND 500

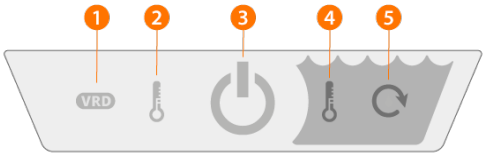
This section describes the structure of X5 Power Source 400 and X5 Power Source 500 models.

Front



1. Indicator panel *
2. Transportation handle (not intended for mechanical lifting)
3. Front locking interface (locking e.g. on top of the cooling unit)

Indicator panel *



1. VRD (Voltage Reduction Device) indicator

VRD is used only in manual welding in MMA mode.

2. High temperature indicator (overheating)
   >> The LED is yellow when the unit is overheating.

If the power source overheats, a thermal cutoff switches the unit off and does not allow it to be used until it has cooled down.

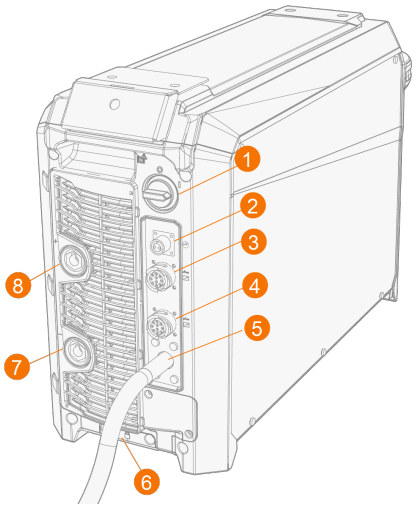
3. Power on/off indicator
   >> The LED is green when the unit is on.
4. Coolant temperature warning
   >> The LED is yellow when the cooler is overheating.

If the coolant liquid overheats, a thermal cutoff switches the welding system off and does not allow it to be used until the coolant liquid has cooled down.

5. Coolant circulation warning
   >> The LED is green when the coolant circulation is working normally.
   >> The LED is red when there is a problem in the coolant circulation.

If the circulation of the coolant liquid is obstructed, a thermal cutoff switches the welding system off. Check and fix the error before using the welding system again.

Rear

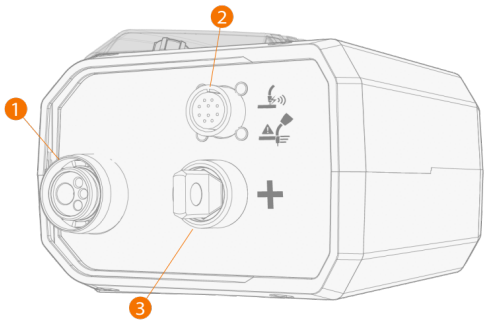


1. Power switch
2. Voltage sensing cable connector (Pulse+ power sources only)
3. Control cable connector
4. Control cable connector
5. Mains cable
6. Rear locking interface
   >> For locking e.g. on top of the cooling unit
7. Earth return cable connector, minus (-) connector
8. Welding current cable connector, plus (+) connector.

1.4 R500 WIRE FEEDER EUR/EUR+

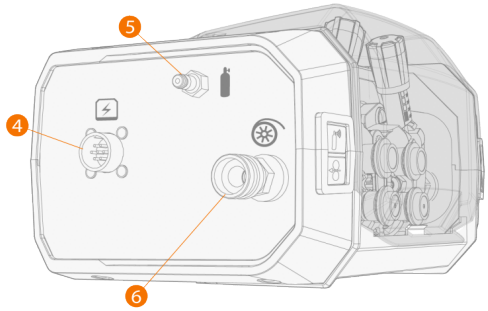
This section describes the structure of R500 Wire Feeder EUR/EUR+.

R500 Wire Feeder EUR, front



1. Euro connector for welding torch connection
2. Peripheral connector for welding torch auxiliary products
3. Welding current cable connector, positive (+) connector

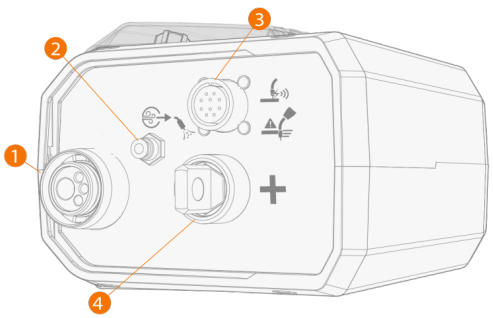
R500 Wire Feeder EUR, rear



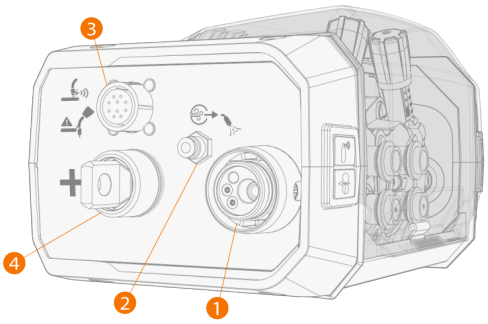
4. Control cable connector
5. Shielding gas hose connector
6. Wire conduit connector
   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector.

R500 Wire Feeder EUR+, front

R500 Wire Feeder EUR+



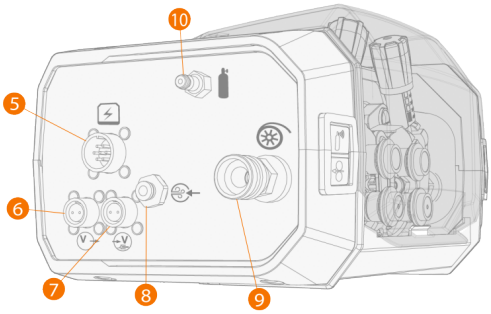
R500 Wire Feeder RH EUR+



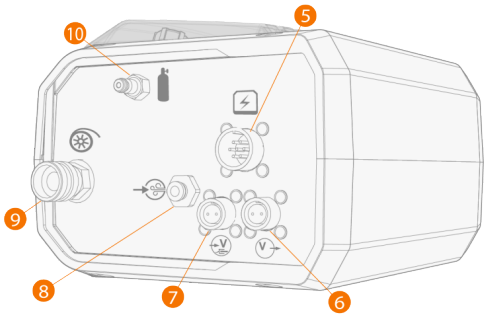
1. Euro connector for welding torch connection
2. Compressed air outlet connection (for welding torch cleaning only)
3. Peripheral connector for welding torch auxiliary products
4. Welding current cable connector, positive (+) connector.

R500 Wire Feeder EUR+, rear

R500 Wire Feeder EUR+



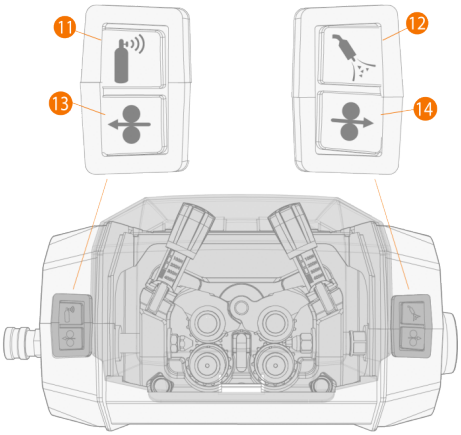
R500 Wire Feeder RH EUR+



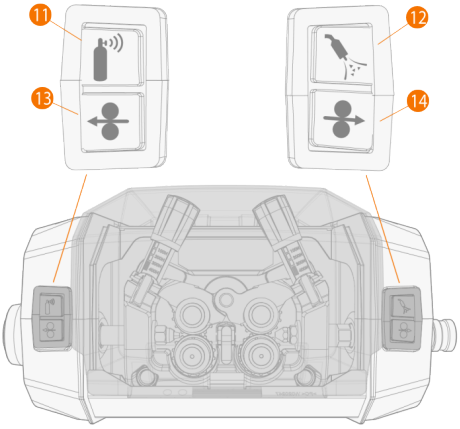
5. Control cable connector
6. Voltage sensing cable connector for interconnection cable (required for WiseThin+ and WiseRoot+ processes)
7. Voltage sensing cable connector for work piece (required for WiseThin+ and WiseRoot+ processes)
8. Compressed air inlet connection (for welding torch cleaning only)
9. Wire conduit connector
   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector
10. Shielding gas hose connector.

R500 Wire Feeder EUR/EUR+, top

R500 Wire Feeder EUR/EUR+



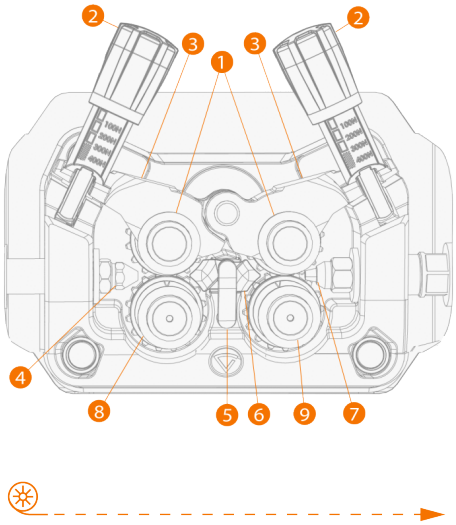
R500 Wire Feeder RH EUR+



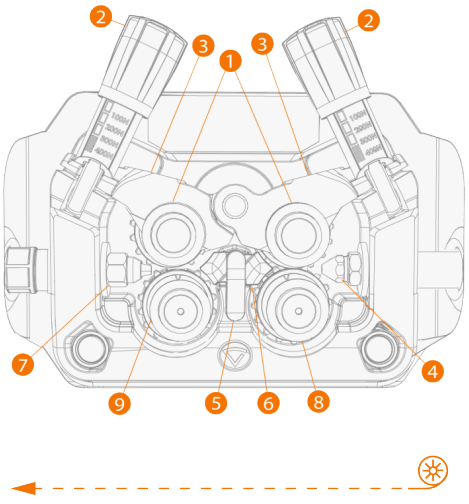
11. Gas test button
12. Air blow button (usable in R500 Wire Feeder EUR+ only)
13. Wire inch backward button
    >> Drives the filler wire backward (with arc off)
14. Wire inch forward button
    >> Drives the filler wire forward (with arc off).

1.4.1 WIRE FEED MECHANISM

R500 Wire Feeder EUR/EUR+



R500 Wire Feeder RH EUR+



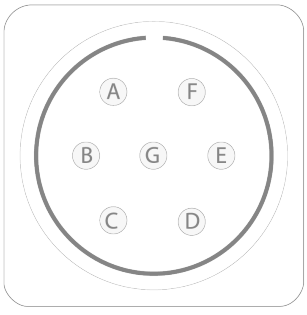
1. Pressure rolls and pressure roll mounting pins
2. Pressure handles
3. Pressure roll locking arms
4. Inlet guide tube
5. Middle guide tube locking clip
6. Middle guide tube
7. Outlet guide tube
8. Rear drive roll and drive roll mounting cap
9. Front drive roll and drive roll mounting cap.

For installing the feed rolls, refer to "Installing feed rolls (R500 WF EUR/EUR+ / RA50 4R)" on page 92.

For installing the wire guide tubes, refer to "Installing wire guide tubes (R500 WF EUR/EUR+)" on page 79.

1.4.2 WIRE FEEDER CONTROL CABLE CONNECTOR

This section describes the purpose and order of the pins in the wire feeder's control cable connector.

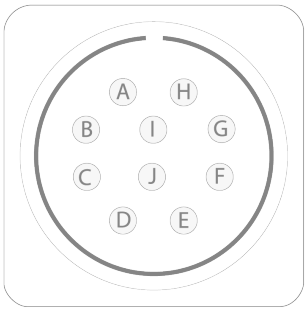


Pin	Signal	Description
A	Power supply GND	Power supply ground

B	Data in/out	Systembus to welding system
C	Power supply input	Power supply (+48 V)
D	Wire feeder ID (1 / 2)	Wire feeder identification signal in a dual wire feeder system
E	Touch sensor voltage input	Touch sensor voltage from the RCM (50 ... 200 V)
F	Reserved	Reserved for future use
G	Reserved	Reserved for future use

1.4.3 WIRE FEEDER PERIPHERAL CONNECTOR

This section describes the order and purpose of the pins in the peripheral connector used for connecting welding torch auxiliary products.

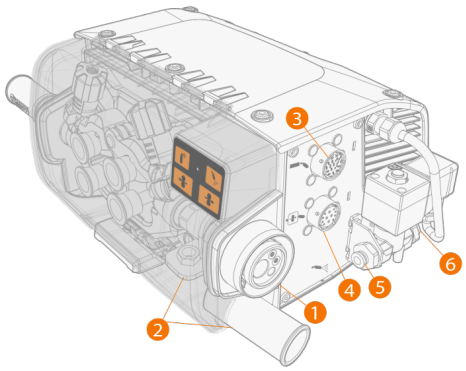


Pin	Signal	Description
A	Motor (+)	For a push-pull welding torch
B	Motor (-)	For a push-pull welding torch
C	Supply (+24 V)	For a collision sensor with LED status indicators
D	Wire inch input	For a welding torch's wire inch button
E	Collision sensor input	For a collision sensor (ensure that your welding torch supports a collision sensor)
F	Touch sensor output (+50...+200 V)	For touch sensing with gas nozzle (ensure that your welding torch supports touch sensing with gas nozzle)
G	Tachometer (+5 V)	For a push-pull welding torch
H	Supply GND	- For a welding torch's wire inch button - For a collision sensor
I	Tachometer GND	For a push-pull welding torch
J	Tachometer input	For a push-pull welding torch

1.5 R500 WIRE FEEDER HD EUR+

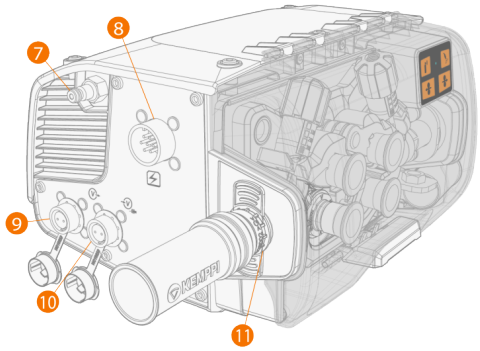
This section describes the structure of R500 Wire Feeder HD EUR+.

R500 Wire Feeder HD EUR+, front



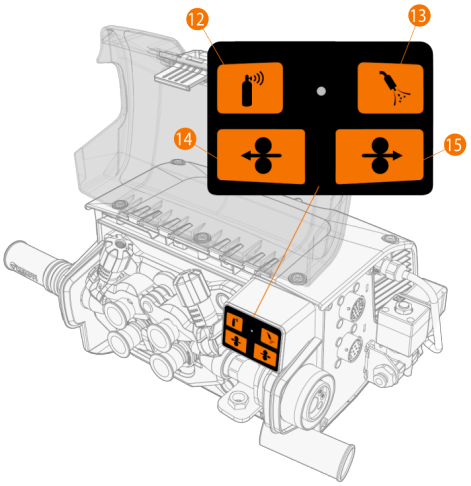
1. Euro connector for welding torch connection
2. Positive (+) welding current cable connector and the welding current cable's protective sleeve
3. Robot welding torch control cable connector
4. Push-pull welding torch control cable connector
5. Compressed air valve, outlet connector (for welding torch cleaning only)
6. Compressed air valve, inlet connector (for welding torch cleaning only)

R500 Wire Feeder HD EUR+, rear



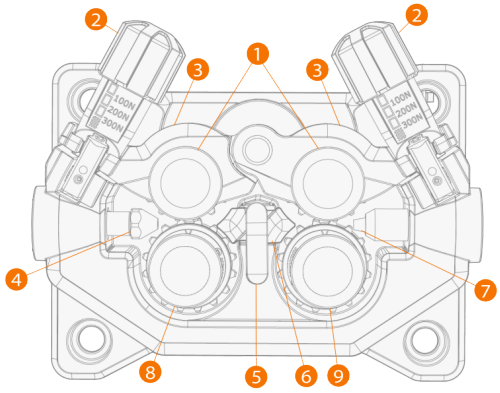
7. Shielding gas hose connector
8. Wire feeder control cable connector
9. Voltage sensing cable connector for interconnection cable (required for WiseThin+ and WiseRoot+ processes)
10. Voltage sensing cable connector for work piece (required for WiseThin+ and WiseRoot+ processes)
11. Wire conduit connector
    >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector

R500 Wire Feeder HD EUR+, top



12. Gas test button
13. Air blow button
14. Wire inch backward button
>> Drives the filler wire backward (with arc off)
15. Wire inch forward button
>> Drives the filler wire forward (with arc off).

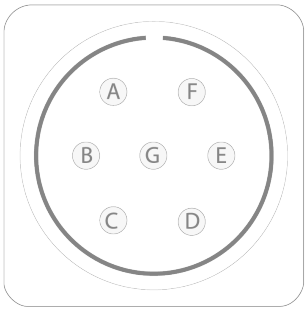
1.5.1 WIRE FEED MECHANISM



1. Pressure rolls and pressure roll mounting pins
2. Pressure handles
3. Pressure roll locking arms
4. Inlet guide tube
5. Middle guide tube locking clip
6. Middle guide tube
7. Outlet guide tube
8. Rear drive roll and drive roll mounting cap
9. Front drive roll and drive roll mounting cap.

1.5.2 WIRE FEEDER CONTROL CABLE CONNECTOR

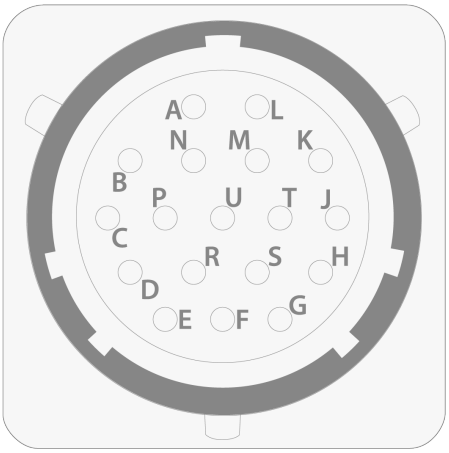
This section describes the purpose and order of the pins in the wire feeder's control cable connector.



Pin	Signal	Description
A	Power supply GND	Power supply ground
B	Data in/out	Systembus to welding system
C	Power supply input	Power supply (+48 V)
D	Wire feeder ID (1 / 2)	Wire feeder identification signal in a dual wire feeder system
E	Touch sensor voltage input	Touch sensor voltage from the RCM (50 ... 200 V)
F	Reserved	Reserved for future use
G	Reserved	Reserved for future use

1.5.3 WELDING TORCH CONTROL CABLE CONNECTOR

This section describes the order and purpose of the pins in the robot welding torch control cable connector.



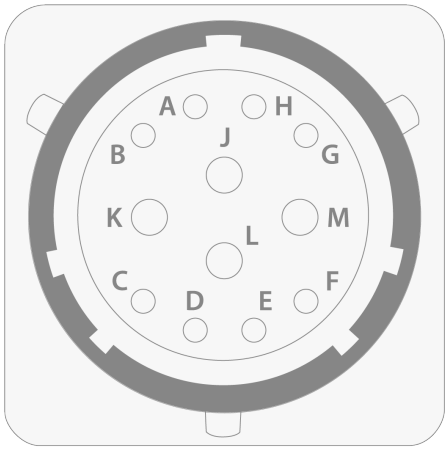
Pin	Signal	Description	Pairing pin and signal
A	GND (48 V)	Power supply ground for Kemppi peripherals.	C: 48 V output

B	Data in/out	Communication data for Kemppi peripherals.	-
C	48 V output	48 V power supply for Kemppi peripherals.	A: GND (48 V)
D	Wire brake output	Output signal for the Kemppi wire brake.	C: 48 V output
E	Touch sensing with gas nozzle	Touch sensing voltage (50...200 V) output for touch sensing with gas nozzle.	-
F	Collision sensor 24 V	24 V output for collision sensor input.	G: Collision sensor input
G	Collision sensor input	Collision sensor input.	F: Collision sensor 24 V (when pin R is left open) K: GND (External 24 V) (when pin R is connected to pin P)
H	Welding torch LED, red C / green A	Current limited [~ 5 mA] output for the welding torch's status LED (C = Cathode, A = Anode).	J: Welding torch LED, red A / green C
J	Welding torch LED, red A / green C	Current limited [~ 5 mA] output for the welding torch's status LED (C = Cathode, A = Anode).	H: Welding torch LED, red C / green A
K	GND (External 24 V)	Ground for the signal External 24 V output (pin P).	P: External 24 V output G: Collision sensor input (when pin R is connected to pin P) L: Wire inch forward input (when pin R is connected to pin P) M: Gas blow input (when pin R is connected to pin P) N: Wire inch backward input (when pin R is connected to pin P)
L	Wire inch forward input	Input for wire inch forward.	P: External 24 V output (when pin R is left open) K: GND (External 24 V) (when pin R is connected to pin P)
M	Gas blow input	Input for gas blow.	P: External 24 V output (when pin R is left open) K: GND (External 24 V) (when pin R is connected to pin P)

N	Wire inch backward input	Input for wire inch backward.	P: External 24 V output (when pin R is left open) K: GND (External 24 V) (when pin R is connected to pin P)
P	External 24 V output	24 V voltage output for peripheral devices.	K: GND (External 24 V) G: Collision sensor input (when pin R is left open) L: Wire inch forward input (when pin R is left open) M: Gas blow input (when pin R is left open) N: Wire inch backward input (when pin R is left open) R: Welding torch input logic
R	Welding torch input logic	Enables low-active logic for the welding torch input signals: Collision sensor, wire inch forward / backward, gas blow (input signals are active when connected to pin K: GND (External 24 V)).	-
S	Reserved	Reserved for future use.	-
T	Reserved	Reserved for future use.	-
U	Reserved	Reserved for future use.	-

1.5.4 PUSH-PULL WELDING TORCH CONTROL CABLE CONNECTOR

This section describes the order and purpose of the pins in the push-pull welding torch control cable connector used with third party push-pull welding torches.



Pin	Signal	Description
A	Encoder channel A input	Input for encoder channel A.

B	Encoder channel B input	Input for encoder channel B.
C	Hall sensor / encoder 5 V output	5 V output for Hall sensors and encoder.
D	Hall sensor 1 input	Input for motor winding 1 Hall sensor.
E	Hall sensor 2 input	Input for motor winding 2 Hall sensor.
F	Hall sensor 3 input	Input for motor winding 3 Hall sensor.
G	Analog sync positive output	Differential analog voltage output for 3rd party push-pull welding torch control units.
H	Analog sync negative output	Differential analog voltage output for 3rd party push-pull welding torch control units.
J	Motor winding 1	Output for motor winding 1.
K	Motor winding 2	Output for motor winding 2.
L	Motor winding 3	Output for motor winding 3.
M	Hall sensor / encoder GND	Ground for push-pull Hall sensors / encoder.

1.5.5 SUPPORT FOR PUSH-PULL WELDING TORCHES

A third party push-pull welding torch can be connected to R500 Wire Feeder HD EUR+ using either of the following:

- Direct motor control
- Analog output

Direct motor control

The direct motor control means that the R500 Wire Feeder HD EUR+ controls the push-pull torch's motor directly (the push-pull welding torch's synchronization unit is not in use).

R500 Wire Feeder HD EUR+ supports the following push-pull welding torches in direct motor control mode:

Welding torch	Notes
Dinse FD300	Refer to "Connecting Dinse FD300 welding torch (R500 WF HD EUR+)" on page 69.

Analog output

The R500 Wire Feeder HD EUR+ provides an analog synchronization output for connecting push-pull welding torches equipped with a synchronization unit for welding torch motor control. The analog synchronization output is available on the push-pull welding torch control cable connector's pins G and H (refer to "Push-pull welding torch control cable connector" on the previous page). The analog synchronization output provides a low current analog voltage that corresponds linearly to the wire feed speed of the wire feeder. The output is differential, and the output voltage is positive when the wire feeder feeds the filler wire forward, and negative when it feeds the filler wire backward.

Because the output signal is not isolated from the wire feeder's system ground, the push-pull welding torch's synchronization unit should not have any other electrical connections to the wire feeder to prevent any unwanted ground loops.

The analog output voltage corresponding to the wire feeder's wire feed speed is calculated using the following formula:

$$OUT = \frac{WFS}{25\ m/min} * OUT_{MAX}$$

Symbol	Description	Notes
OUT	Output voltage (V)	
WFS	Wire feed speed (m/min)	Range: 0 ... 25 m/min
OUT_{MAX}	Output voltage range (V)	Either 10 V or 20 V depending on the AX Manager setting (refer to "Device settings" on page 158).

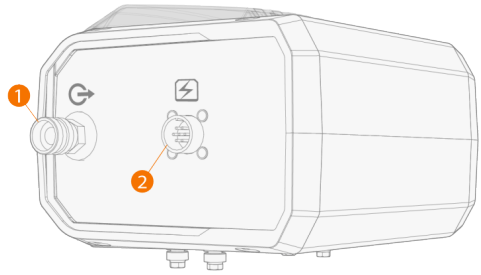
1.6 RA50 4R ASSISTIVE WIRE FEEDER (OPTIONAL)

The AX MIG Welder's RA50 4R assistive wire feeder is a solution for feeding filler wire over long distances from a wire drum or spool to the main wire feeder (R500) in automated welding. The RA50 4R assistive wire feeder automatically synchronizes and balances with all models of the AX MIG Welder's R500 wire feeders, requiring no additional configuration from the user.

The following are the recommended maximum distances between the main wire feeder and the RA50 4R assistive wire feeder, depending on the filler wire material:

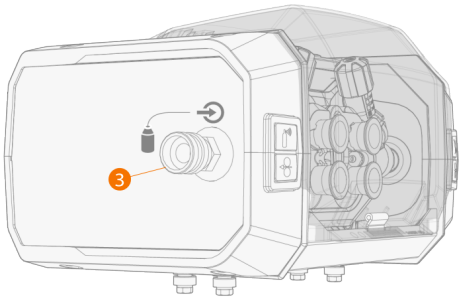
Filler wire material	Maximum distance (m)
Fe/Ss	50
Al	30

RA50 4R assistive wire feeder, front



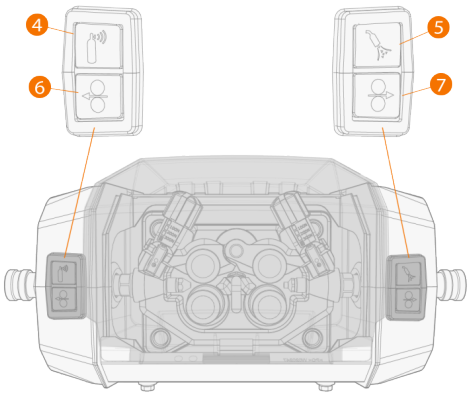
1. Wire conduit connector (outlet)
   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector
2. Control cable connector

RA50 4R assistive wire feeder, rear



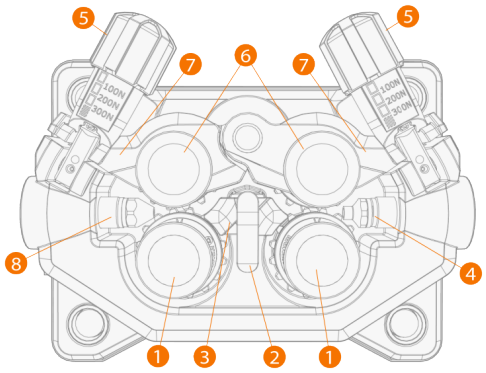
3. Wire conduit connector (inlet)
   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector

RA50 4R assistive wire feeder, top



4. Gas test button
5. Air blow button
   >> This function is available when supported by the main wire feeder
6. Wire inch backward button
   >> Drives the filler wire backward (with arc off)
7. Wire inch forward button
   >> Drives the filler wire forward (with arc off).

1.6.1 WIRE FEED MECHANISM



1. Drive rolls and drive roll mounting caps
2. Middle guide tube locking clip
3. Middle guide tube
4. Inlet guide tube
5. Pressure handles
6. Pressure rolls and pressure roll mounting pins
7. Pressure roll locking arms
8. Outlet guide tube.

For installing the feed rolls, refer to "Installing feed rolls" on page 92.

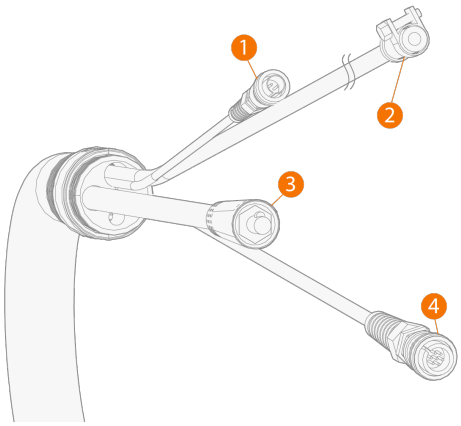
For installing the wire guide tubes, refer to "Installing wire guide tubes (RA50 4R)" on page 89.

1.7 AX MIG WELDER INTERCONNECTION CABLE

The AX MIG Welder interconnection cables come in multiple different lengths and configurations to suit your equipment setup.

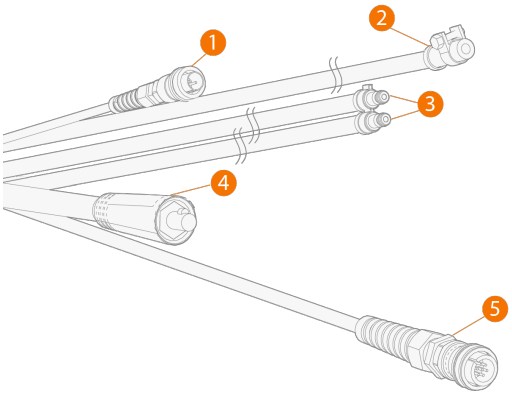
For installing cables, refer to "Connecting cables" on page 71.

Power source end of interconnection cable



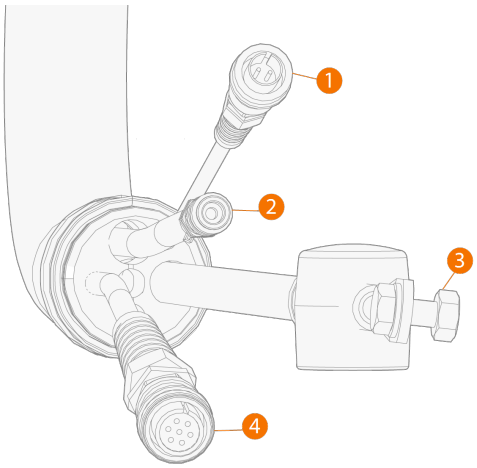
1. Voltage sensing cable (required for WiseThin+ and WiseRoot+ processes)
2. Shielding gas hose
3. Welding current cable
4. Wire feeder control cable.

Power source end of interconnection cable - water cooling



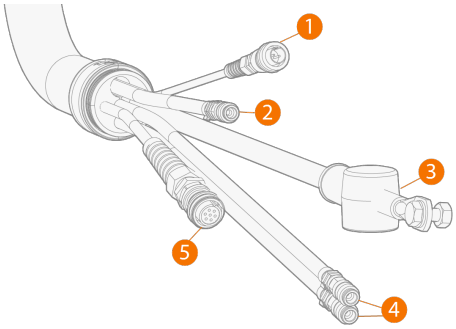
1. Voltage sensing cable (required for WiseThin+ and WiseRoot+ processes)
2. Shielding gas hose
3. Cooling liquid hoses (inlet/outlet)
4. Welding current cable
5. Wire feeder control cable.

Wire feeder end of interconnection cable



1. Voltage sensing cable (required for WiseThin+ and WiseRoot+ processes)
2. Shielding gas hose
3. Welding current cable
4. Wire feeder control cable.

Wire feeder end of interconnection cable - water cooling

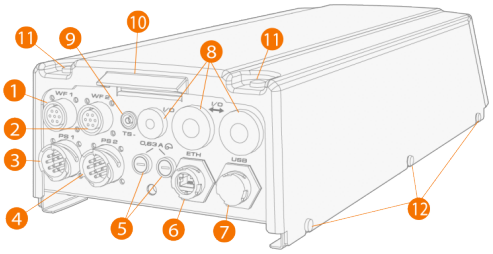


1. Voltage sensing cable (required for WiseThin+ and WiseRoot+ processes)
2. Shielding gas hose
3. Welding current cable
4. Coolant hoses (inlet/outlet)
5. Wire feeder control cable.

1.8 ROBOT CONNECTIVITY MODULE (RCM)

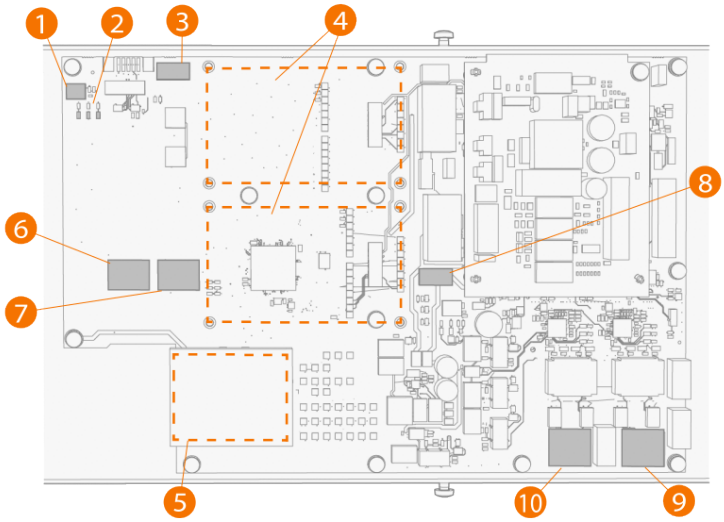
Robot Connectivity Module (RCM) handles the communication between the welding system and the robot.

For connecting cables, refer to "Connecting cables to power source and RCM" on page 76.



1. Wire feeder control cable connector
2. Reserved for future use
3. Power source control cable connector
4. Reserved for future use
5. Fuse
6. Ethernet port 1 (LAN 1)
7. USB port
8. Cable inlet (with grommet)
9. Touch sensor negative (-) connector
10. Cable inlet with cable clamp
11. Cover fixing screws
12. Alignment holes and screws (for securing the cover in place).

Inside RCM

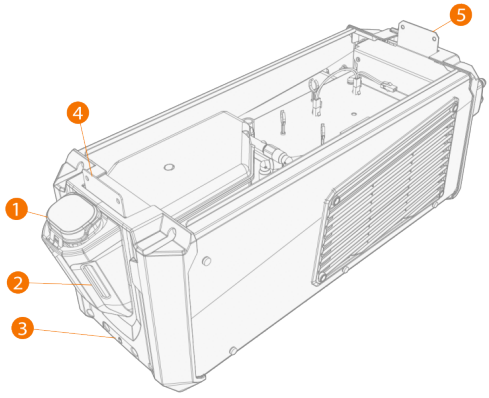


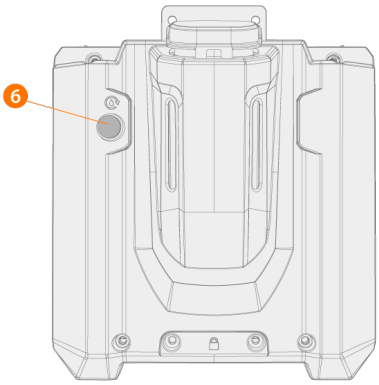
1. S1 button (forced factory reset, refer to "Troubleshooting" on page 186)
2. Indicator LEDs
3. Touch sensor fast output terminal
4. Add-on card slots
5. Fieldbus module slot
6. Door switch terminal

7. Stop switch terminal
8. Backup power supply terminal
9. Ethernet port 1 (LAN 1)
10. Ethernet port 2 (LAN 2).

1.9 COOLING UNIT (OPTIONAL)

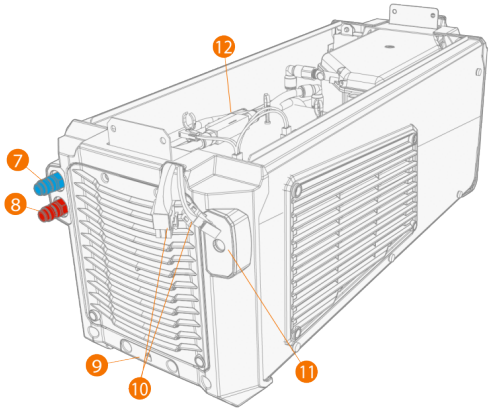
Front





1. Cooler container cap
2. Cooling liquid level indicator
3. Front locking interface (for locking on the stand)
4. Front locking interface (for locking to the power source)
5. Rear locking interface (for locking to the power source)
6. Cooling liquid circulation button
   >> Keeping the button pressed activates the pump and circulates the cooling liquid throughout the system. Once released, the pump stops.

Rear



7. Coolant outlet connector (color-coded)
8. Coolant inlet connector (color-coded)
9. Rear locking interface (for locking on the stand)
10. Cooling unit to power source connectors
11. Additional strain relief mount
12. Coolant flow sensor.

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.

Do not attempt to move or hang the equipment mechanically (e.g. with a hoist) from the handle on the power source unit. The handles are for manual moving only.

When installing the full set of equipment stacked as a tower – water cooler at the bottom, power source in the middle and RCM at the top – always install and secure the equipment onto a Kemppi stand compatible with AX MIG Welder or secure the equipment to other adequate support on site.

Place the machine on a horizontal, stable and clean ground. Protect the machine from rain and direct sunshine. Check that there is enough space 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.

X5 power source 400 A: Provided that the short circuit power of public low voltage system at the point of common coupling is higher than 5.8 MVA, this equipment is compliant with IEC 61000-3-11:2017 and IEC 61000-3-12:2011 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

X5 power source 400 A Pulse and Pulse+ : Provided that the short circuit power of public low voltage system at the point of common coupling is higher than 6.3 MVA, this equipment is compliant with IEC 61000-3-11:2017 and IEC 61000-3-12:2011 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

X5 power source 500 A: Provided that the short circuit power of public low voltage system at the point of common coupling is higher than 6.4 MVA, this equipment is compliant with IEC 61000-3-11:2017 and IEC 61000-3-12:2011 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

X5 power source 500 A Pulse and Pulse+: Provided that the short circuit power of public low voltage system at the point of common coupling is higher than 6.7 MVA, this equipment is compliant with IEC 61000-3-11:2017 and IEC 61000-3-12:2011 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

2.1 CONNECTING TO AX MANAGER USER INTERFACE

This section describes how to connect to the AX Manager user interface.

For operating modes and default values for different network interfaces, refer to "Network settings" on page 156.

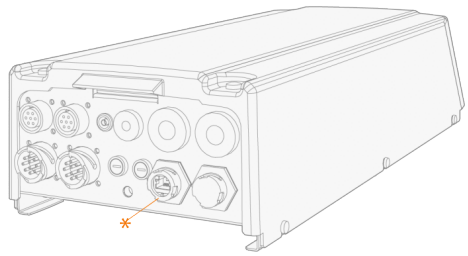
2.1.1 ETHERNET PORT 1 (LAN 1), DHCP SERVER MODE

In the DHCP server mode the DHCP server allocates IP addresses to external devices. For information on network settings, refer to "Network settings" on page 156.

The Ethernet port 1 is intended for point-to-point connections, i.e. connecting to the network directly from the user's device (e.g. laptop) with a cable. This network interface is not intended to be used to connect to a larger network.

The RCM serial number and security code can be found in the serial number sticker on the RCM device.

1. Connect your PC to the Ethernet port 1 (*) on the rear of RCM.



2. Open an internet browser and enter the default network address AX<*RCM serial number*>.local.
   >> You are now connected to AX Manager.

If the network address AX<RCM serial number>.local does not work, use the numeric IP address (192.168.2.1.).

Tip: You can also connect to RCM via the Ethernet port 2 inside RCM. Using the Ethernet port 2 depends on the user's network and settings and requires knowing the RCM's LAN address received from the network or assigned statically (refer to "Ethernet port 2 (LAN 2), user configurable" on page 35).

For information on how to log in to AX Manager, refer to "Logging into AX Manager" on page 122.

2.1.2 WLAN ACCESS POINT MODE (RCM+ ONLY)

Access point mode is the default WLAN operating mode. In this mode RCM+ acts as an access point to which other devices (PC, mobile device) can connect. For information on network settings, refer to "Network settings" on page 156.

The RCM serial number and security code can be found in the serial number sticker on the RCM device.

1. Connect your device to the WLAN network.
   >> The WLAN default name (SSID) is AX<*RCM serial number*>, e.g., AX1234567.
   >> The default password is KemppiAX<*RCM security code*>, e.g., KemppiAX1234.
2. Once connected (connecting may take a few seconds), open an internet browser and enter the default network address AX<*RCM serial number*>.local.
   >> The web address for RCM is AX<*RCM serial number*>.local, e.g., AX1234567.local.
   >> You are now connected to AX Manager.

If the network address AX<RCM serial number>.local does not work, use the numeric IP address (192.168.3.1.).

For information on how to log in to AX Manager, refer to "Logging into AX Manager" on page 122.

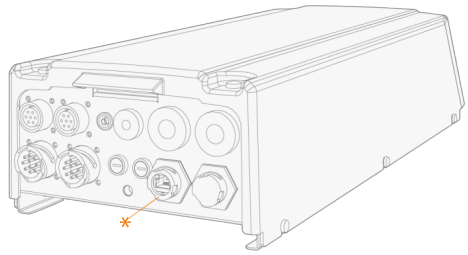
2.1.3 WLAN CLIENT MODE (RCM+ ONLY)

In the WLAN client mode, RCM+ connects to an existing WLAN network. When your device (PC, mobile device) is connected to the same WLAN network as RCM+, you can access the AX Manager user interface either with the default network address or the IP address that RCM+ obtains from the WLAN network. For information on network settings, refer to "Network settings" on page 156.

Connect RCM+ only to a secured WLAN network to prevent device intrusions!

To configure WLAN client mode:

1. Access AX Manager preferably by connecting your PC to the Ethernet port 1 (*) on the rear of RCM+.



The Ethernet port 1 connection is recommended because making changes to the currently used connection's settings, the connection to AX Manager will be lost when the new settings are applied.

2. Open an internet browser and enter the default network address AX<*RCM serial number*>.local.

The RCM serial number and security code can be found in the serial number sticker on the RCM device.

   >> You are now connected to AX Manager.
3. Go to the "Network settings" on page 156 view and select 'Configure'.
4. Configure the settings as explained in the table 'WLAN IP configuration (RCM+ only) - client mode' in the "Network settings" on page 156 view and save the settings.
   >> RCM+ connects to the network automatically (connecting may take approximately 1 minute), after which the IP address obtained from the network appears in the **Network settings** view.

To connect to AX Manager in WLAN client mode:

1. Connect your device to the same WLAN network as RCM+.
2. Open an internet browser and enter the default network address AX<*RCM serial number*>.local. You can also use the IP address that was shown in the **Network settings** view (step 4 above).

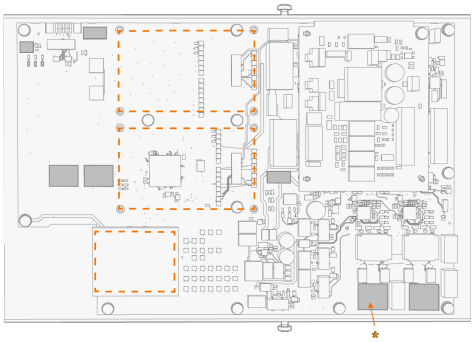
*If the default network address AX<RCM serial number >.local does not work, use the IP address that was shown in the **Network settings** view.*

For information on how to log in to AX Manager, refer to "Logging into AX Manager" on page 122.

Also a WeldEye cloud service connection can be established in the WLAN client mode.

2.1.4 ETHERNET PORT 2 (LAN 2), USER CONFIGURABLE

The Ethernet port 2 (LAN 2) network interface can be configured by the user to adapt to different network configurations and allows access to the AX Manager user interface from the connected network. The LAN 2 port is located inside RCM (*).



The LAN 2 network interface also allows RCM to establish a connection to the WeldEye cloud service if the network has an internet connection.

A WeldEye cloud service connection cannot be established with the LAN 2 port when the LAN 2 network interface operates in the DHCP server mode.

A WeldEye cloud service connection can also be established in the WLAN client mode, refer to "WLAN client mode (RCM+ only)" on the previous page.

For the operating modes supported by the LAN 2 network interface, refer to "Network settings" on page 156.

The AX Manager user interface can be accessed from the LAN 2 port by using the default network address AX<*RCM serial number*>.local or the IP address that the network interface has been configured to use.

The RCM serial number and security code can be found in the serial number sticker on the RCM device.

2.2 INSTALLING EQUIPMENT

2.2.1 INSTALLING POWER SOURCE MAINS PLUG

Only an authorized electrician is allowed to install the mains cable and plug.

Do not connect the machine to the mains before the installation is complete.

Install the mains plug according to the power source and site requirements.

The mains cable includes the following wires:

1. Brown: L1
2. Black: L2
3. Grey: L3
4. Yellow-green: Protective earth

Cable type and fuse rating requirements:

Unit amperage	Cable type	Fuse rating
400 A	4 mm^2	25 A @ 380-460 V
400 A MV	6 mm^2	25 A @ 220-230 V 32 A @ 380-460 V
500 A	6 mm^2	32 A @ 380-460 V

2.2.2 INSTALLING EQUIPMENT ON STAND (OPTIONAL)

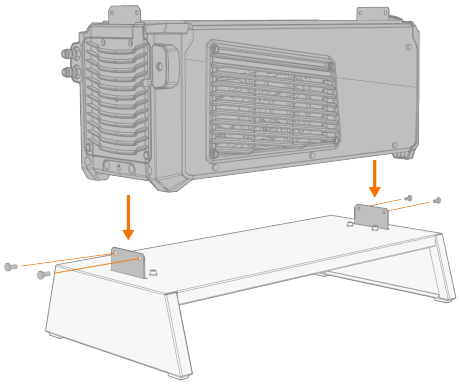
The welding equipment can be installed with or without the cooling unit on a stand or a 4-wheel under-carriage (available as accessories). The equipment installation principle is the same for both.

For more information on installing the power source on top of the cooling unit, refer to "Installing cooling unit (optional)" on the next page.

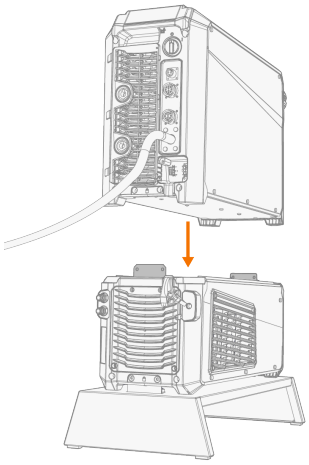
Tools needed:



1. Install the cooling unit on the stand so that the fixing plates align and go into their slots. Fix the cooling unit to the stand with two screws in the front (M5x12) and two screws in the rear (M5x12).



2. Install the power source on top of the cooling unit and fix the units together with two screws in the front and two screws in the rear. Refer to "Installing cooling unit (optional)" below for installation details.



For installing RCM on top of the power source, refer to "Installing RCM on power source (optional)" on page 40.

2.2.3 INSTALLING COOLING UNIT (OPTIONAL)

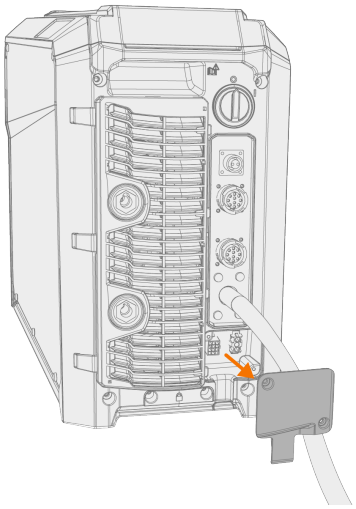
⚠ *The cooling unit must be installed by authorized service personnel.*

Tools needed:



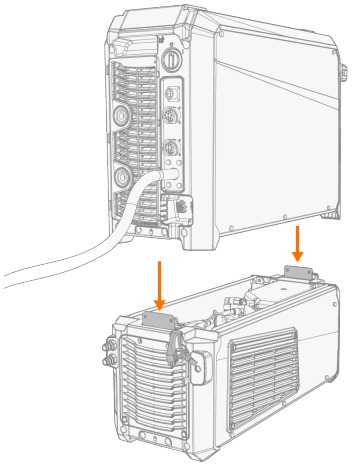
Installing cooling unit

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

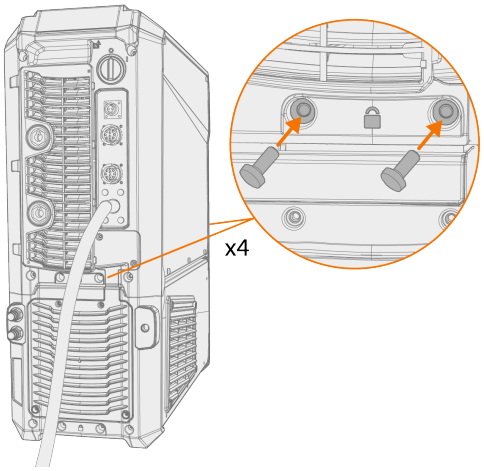


2. Route the cooling unit's connection cables so that they remain accessible through the next steps.
3. Lift the power source on top of the cooling unit so that the fixing plates align and go into their slots.

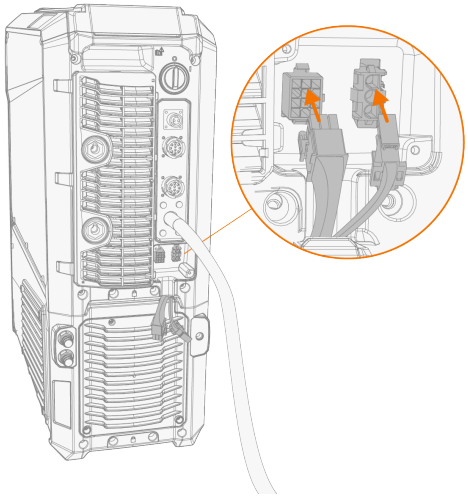
⚠ *Ensure that the cooling unit's connection cables are not caught and/or damaged between the edges.*



4. Fix the units together with two screws in the front (M5x12) and two screws in the rear (M5x12).

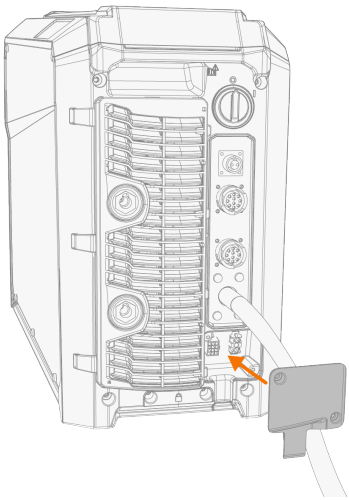


5. Connect the cooling unit cables.

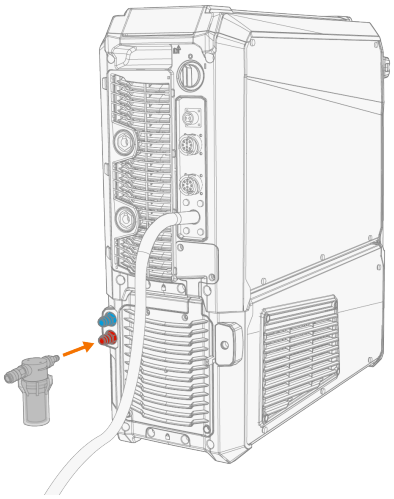


Do not use force, but make sure the connectors are properly connected.

6. Replace the small connector cover.



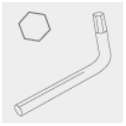
7. Install the coolant filter delivered with the cooling unit to the coolant inlet connector.



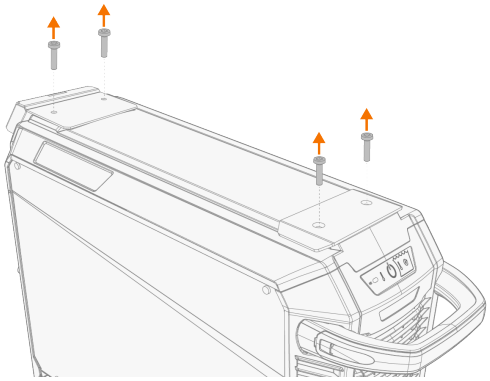
2.2.4 INSTALLING RCM ON POWER SOURCE (OPTIONAL)

Tools needed:

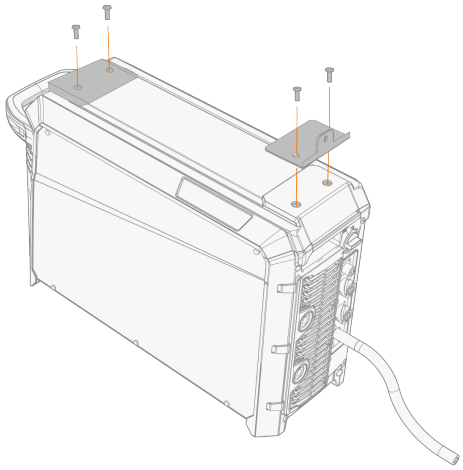




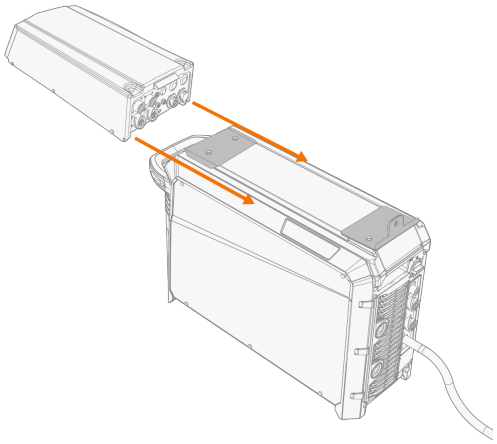
1. Remove the power source top cover screws.



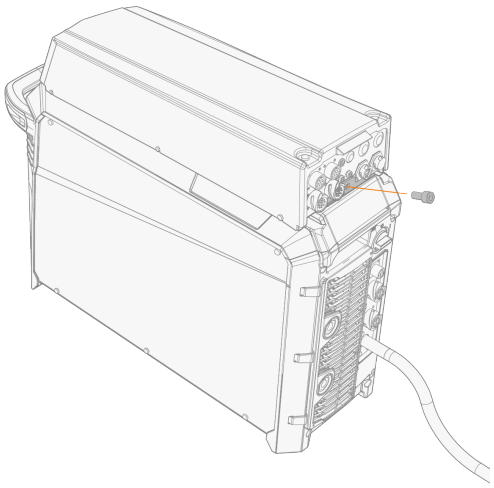
2. Place the fixing plates to the power source and secure them with the screws provided.



3. Slide RCM into place.



4. Fix the units together with the fixing bracket and screw.



2.2.5 MOUNTING R500 WF EUR/EUR+ ON ROBOT ARM

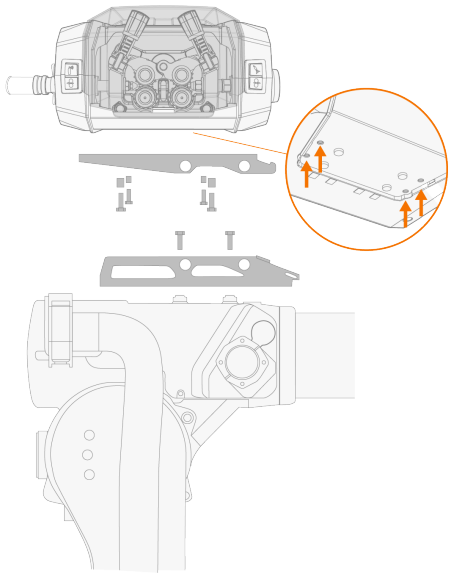
To mount the wire feeder on the robot arm, use a two-part mounting bracket. Mounting brackets are available for the most commonly used welding robots. For a complete list of the available brackets, refer to the product catalog at Kemppi.com.

1. Fasten the upper part of the bracket to the bottom of the wire feeder with bolts.

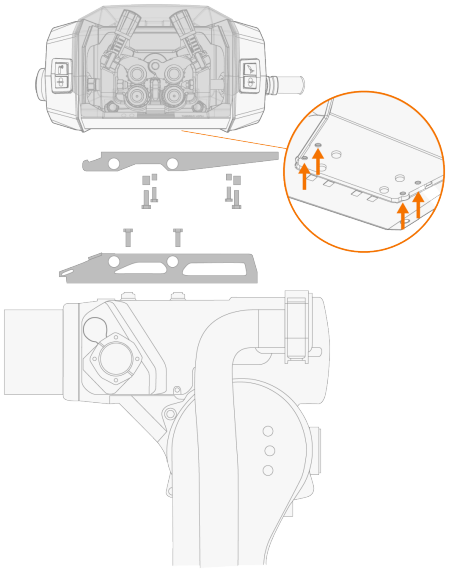
⚠ *Use the insulating bushes with the bolts.*

2. Fasten the lower part of the bracket to the robot arm with bolts.

R500 Wire Feeder EUR

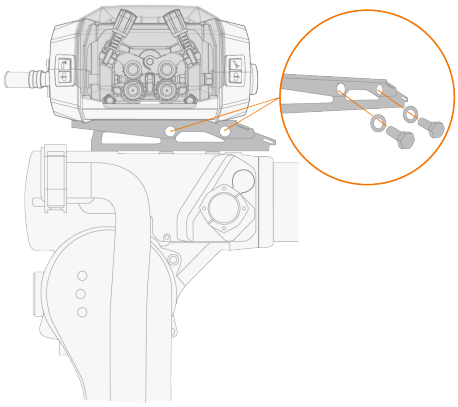


R500 Wire Feeder RH EUR+

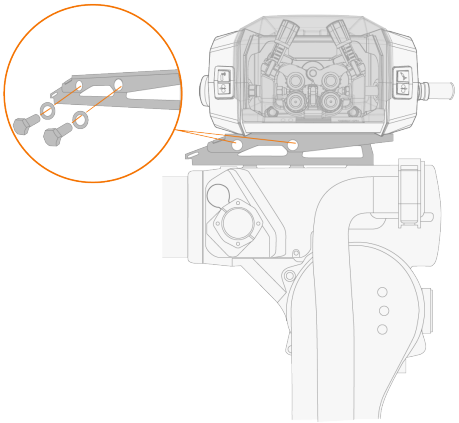


3. Place the upper part of the bracket to the lower part and secure them with bolts.

R500 Wire Feeder EUR



R500 Wire Feeder RH EUR+

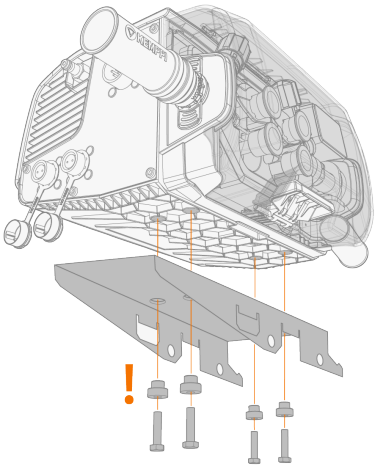


2.2.6 MOUNTING R500 WF HD EUR+ ON ROBOT ARM

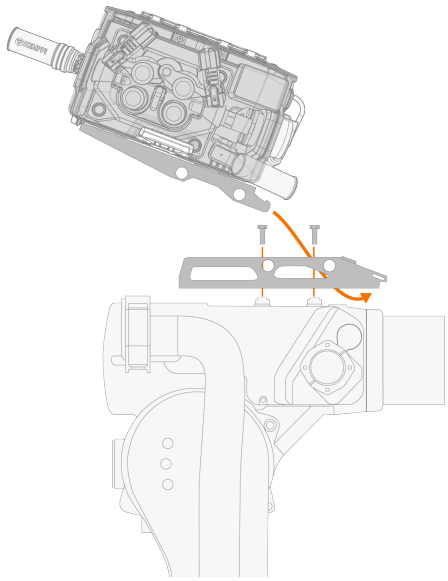
To mount the wire feeder on the robot arm, use a two-part mounting bracket. Mounting brackets are available for the most commonly used welding robots. For a complete list of the available brackets, refer to the product catalog at Kemppi.com.

1. Fasten the upper part of the bracket to the bottom of the wire feeder with bolts.

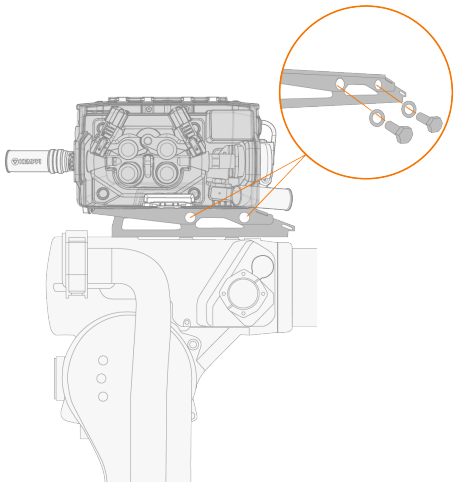
⚠ *Use the insulating bushes with the bolts.*



2. Fasten the lower part of the bracket to the robot arm with bolts. Place the upper part of the bracket onto the lower part so that they lock together.



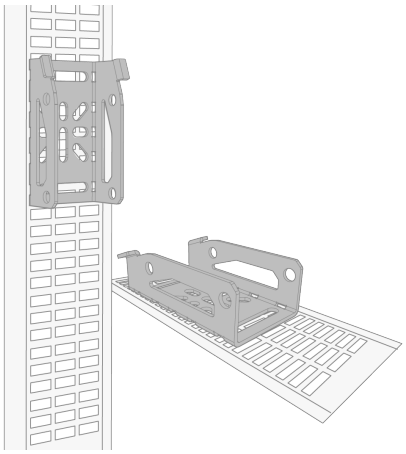
3. Secure the bracket parts together with bolts.



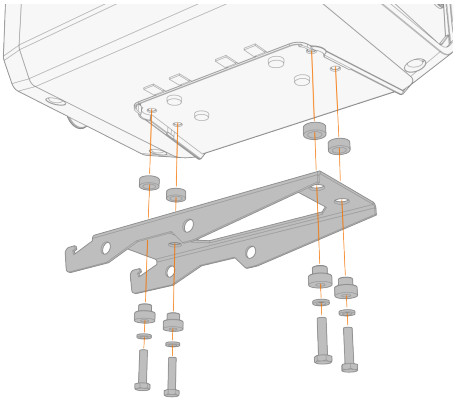
2.2.7 INSTALLING RA50 4R ASSISTIVE WIRE FEEDER (OPTIONAL)

The two-piece RA50 4R mounting bracket allows you to mount the assistive wire feeder in several different ways, e.g. to the wall or floor in the workspace. The RA50 4R mounting bracket is included in the delivery package with dedicated installation instructions.

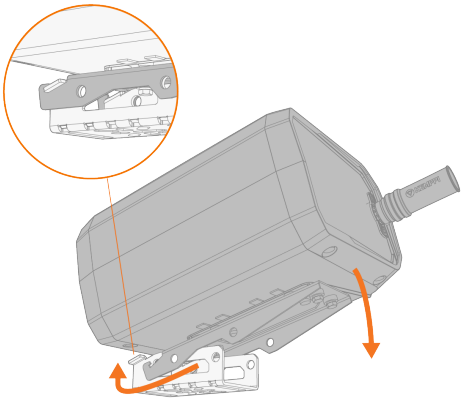
1. Mount the surface bracket in your preferred location within the work environment.



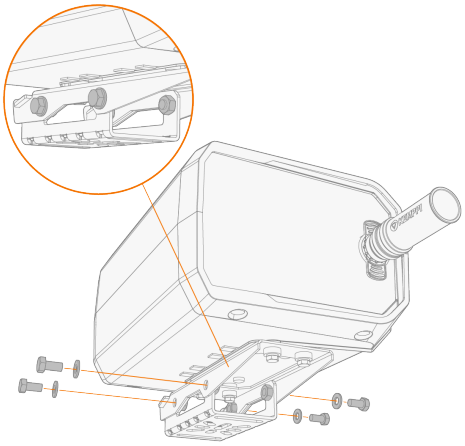
2. Attach the device bracket to the bottom of the assistive wire feeder with bolts.



3. Attach the two brackets together.



4. Secure the brackets together with bolts.



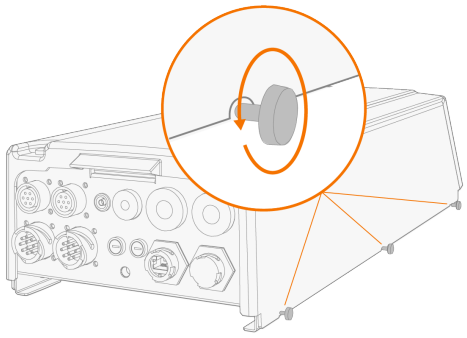
2.3 REMOVING AND ATTACHING RCM TOP COVER

Tools needed:

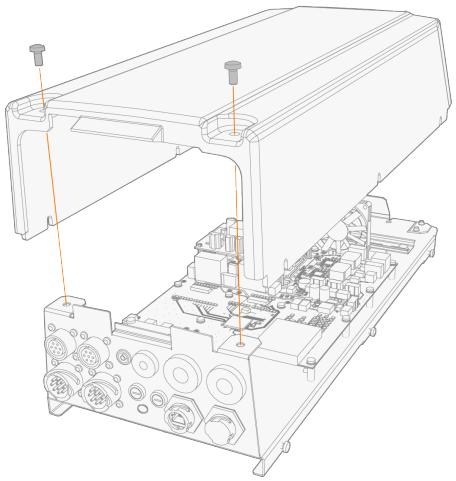


To remove the RCM top cover:

1. Loosen the screws on both sides of the RCM case.

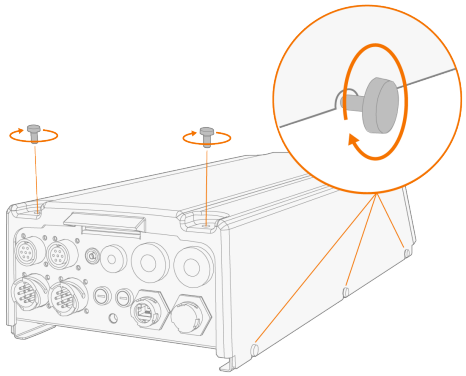


2. Unscrew the fixing screws on the top cover and remove the cover.



To attach the RCM top cover:

Align the holes on the cover with the screws on the sides of the RCM case. Tighten the six screws on the sides and the two screws on the top.



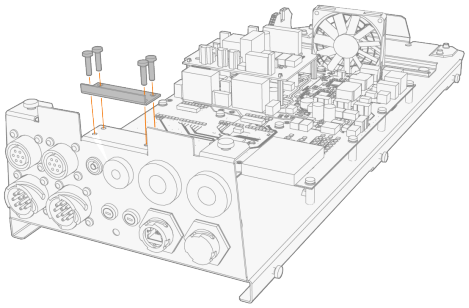
2.4 ROUTING CABLES INTO RCM

RCM has several cable inlets for different sized cables: one cable inlet with a cable clamp (used for strain relief) and three cable inlets with grommets.

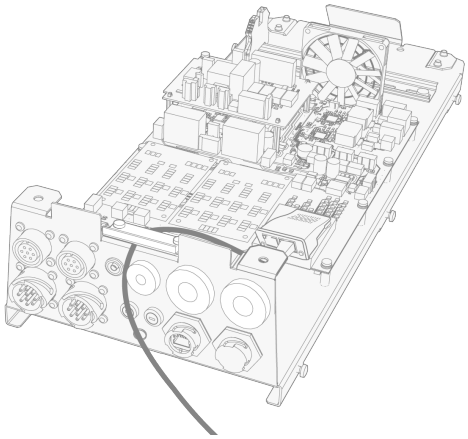
For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

Routing cable through cable inlet with cable clamp

1. Remove the cable clamp by unscrewing the fixing screws.

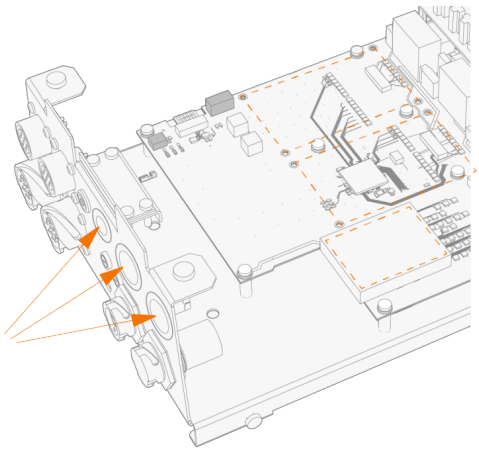


2. Route the cable through the inlet.
3. Reattach the cable clamp and tighten the fixing screws.



Routing cable through cable inlet with grommet

Puncture the grommet and route the cable through the inlet.



2.5 INSTALLING FIELDBUS MODULE (OPTIONAL)

Fieldbus communication between the welding system and the robot can be implemented with Anybus CompactCom M40 fieldbus modules (Anybus is a registered trademark of HMS Industrial Networks). The supported fieldbuses are:

- EtherNet/IP
- EtherCAT
- Profinet
- Modbus TCP
- DeviceNet
- Profibus

2.5.1 INSTALLING FIELDBUS MODULE

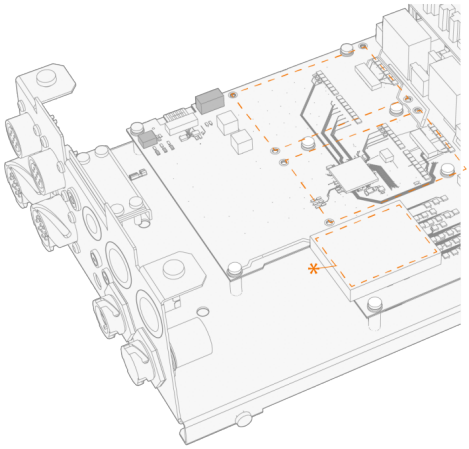
This section describes how to install a fieldbus module. In these instructions the fieldbus module cable is routed through the cable inlet with a cable clamp. For information on other cable inlets in RCM, refer to "Routing cables into RCM" on page 50.

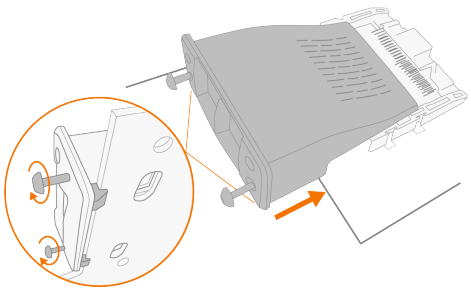
For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

Tools needed:

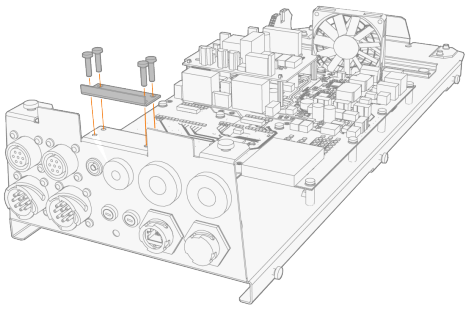


1. Push the fieldbus module into the fieldbus module slot (*). Fasten the fixing screws to secure the fieldbus module in place.



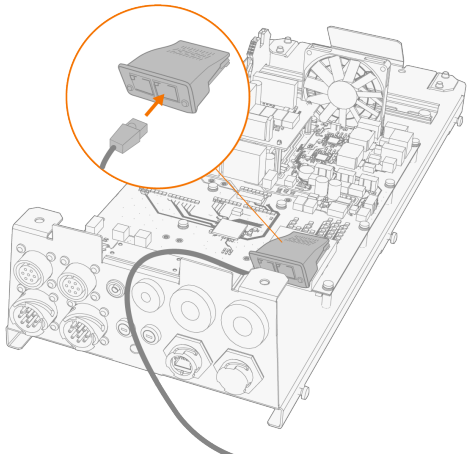


2. Remove the cable clamp by unscrewing the fixing screws.

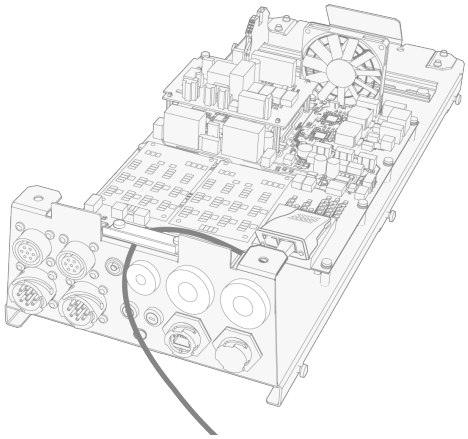


3. Pass the fieldbus module cable through the aperture and connect it to the fieldbus module.

Depending on the fieldbus module, the cable may be different.



4. Reattach the cable clamp and tighten the fixing screws.



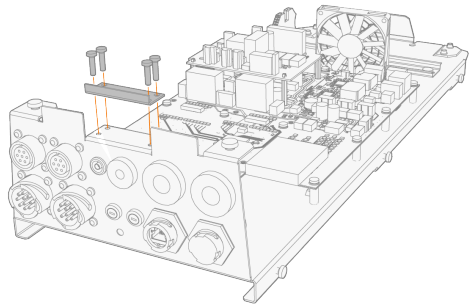
2.5.2 REMOVING FIELDBUS MODULE

This section describes how to remove a fieldbus module. For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

Tools needed:

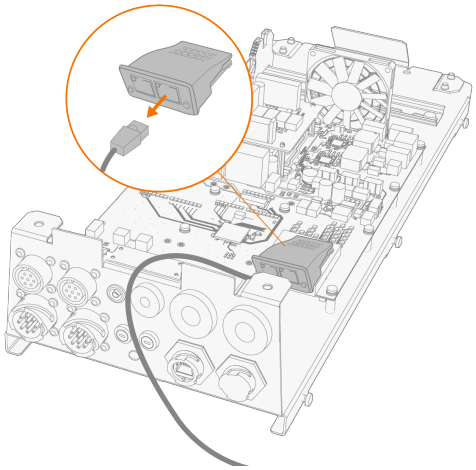


1. Remove the cable clamp by unscrewing the fixing screws.



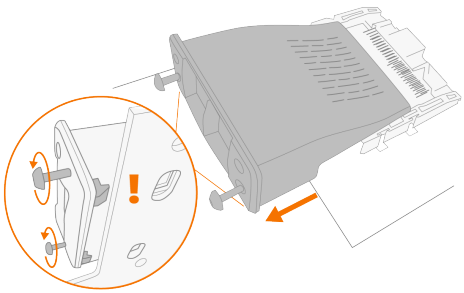
2. Remove the fieldbus module cable from the fieldbus module.

Depending on the fieldbus module, the cable may be different.



3. Loosen the fieldbus module's fixing screws and pull the fieldbus module out of the connector.

The screws must be loose enough to allow the module to be removed.



For information on installing a fieldbus module, refer to "Installing fieldbus module" on page 52.

2.6 INSTALLING ADD-ON CARDS (OPTIONAL)

Add-on cards are used for connecting an external device, such as a gun cleaning station, or a robot that does not have fieldbus connectivity, to the system.

The wiring of add-on cards is customer-specific, therefore this section gives only examples of the wiring.

Add-on cards require a separate 24 V power supply that is not delivered with the AX MIG Welder equipment.

Turn off the power source before installing add-on cards.

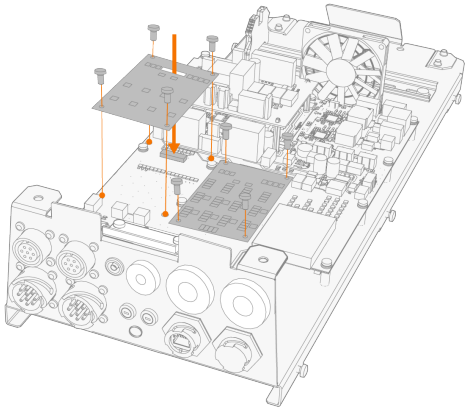
For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

Tools needed



1. Install the add-on card so that the groove on the card aligns with the tab on the add-on card slot.

Keep the add-on card straight/horizontal when installing it.

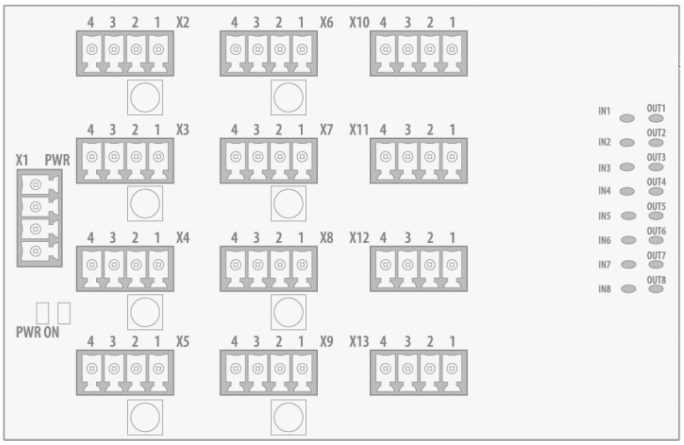


2. Fix the add-on card to the main board with four screws (M2.5 x 12).
3. Route the cable through a cable inlet. (For information on cable inlets, refer to "Routing cables into RCM" on page 50.)

2.6.1 DIGITAL IO ADD-ON CARD

The digital IO add-on card provides 8 digital inputs and 8 digital outputs. These inputs and outputs can be used to connect external devices or sensors to RCM, or to establish communication with a robot that does not have fieldbus connectivity.

The figure below displays an overview of a digital IO add-on card.



LED lights:

LED	Description
PWR ON	Status of the external power supply of the digital IO add-on card.
IN 1, 2, 3, 4, 5, 6, 7, 8	Status of the corresponding input of the digital IO add-on card.
OUT 1, 2, 3, 4, 5, 6, 7, 8	Status of the corresponding output of the digital IO add-on card.

Digital IO add-on card terminals:

Terminal reference	Terminal name, add-on card slot 1	Terminal name, add-on card slot 2
X1	Power supply input	Power supply input
X2	Digital output 1	Digital output 9
X3	Digital output 2	Digital output 10
X4	Digital output 3	Digital output 11
X5	Digital output 4	Digital output 12
X6	Digital output 5	Digital output 13
X7	Digital output 6	Digital output 14
X8	Digital output 7	Digital output 15
X9	Digital output 8	Digital output 16
X10	Digital input 1, 2	Digital input 9, 10
X11	Digital input 3, 4	Digital input 11, 12
X12	Digital input 5, 6	Digital input 13, 14
X13	Digital input 7, 8	Digital input 15, 16

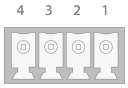
Power supply configuration

Each digital IO add-on card requires an external power supply (not delivered with the AX MIG Welder equipment). The external power supply's minimum supply current is determined based on the output current taken from the outputs and the minimum current used by the digital IO add-on card.

- Example 1: If the output current is 1 A per output and all outputs are active, then the external power supply must be able to supply at least 8.1 A.

- Example 2: If the output current is 0.1 A per output and all outputs are active, then the external power supply must be able to supply at least 0.9 A.

The pins of the power supply terminal are as follows:

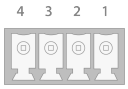


1. 24 V
2. GND
3. 24 V
4. GND

Input configuration

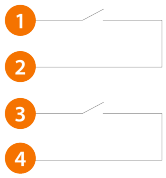
The inputs on a digital IO add-on card are passive inputs that activate when 24 V is supplied to them.

The pins of an input terminal are as follows:



1. 24 V
2. Digital input 1, 3, 5, 7 / digital input 9, 11, 13, 15
3. 24 V
4. Digital input 2, 4, 6, 8 / digital input 10, 12, 14, 16

The following figure displays an input wiring example:



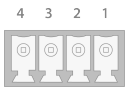
Output configuration

Outputs on a digital IO add-on card are implemented with MOSFET switches and the outputs are short-circuit protected.

Each output of the digital IO add-on card has two output configuration options:

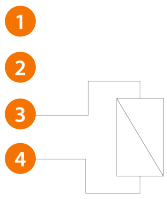
- The output is used as a sourcing output so that 24 V is provided to the external device when the output is activated.
- The output is used as an inverted sinking output so that when the output is set to inactivate state, it provides a grounded connection to the external device.

The pins of an output terminal are as follows:

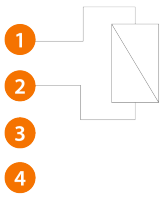


1. 24 V
2. Sinking output (GND)
3. Sourcing output (24 V)
4. GND

The following figures display the output configuration options:



Sourcing output configuration

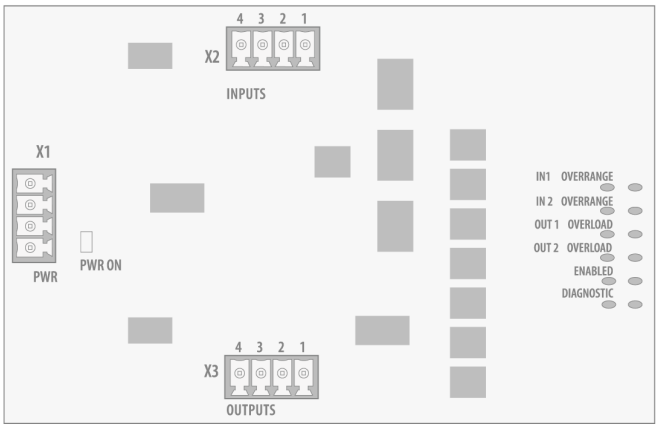


Sinking (inverted) output configuration

2.6.2 ANALOG IO ADD-ON CARD

The analog IO add-on card provides two 0 ... 10 V analog inputs and two 0 ... 10 V analog outputs. The analog IO add-on card can be used when wire feed speed and welding voltage or fine tuning need to be controlled from a robot that does not have fieldbus connectivity.

The figure below displays an overview of an analog IO add-on card.



LED lights:

LED	Description
PWR ON	Status of the external power supply of the analog IO add-on card.
IN1 OVERRANGE	Too high voltage on analog input 1.
IN2 OVERRANGE	Too high voltage on analog input 2.
OUT1 OVERLOAD	Too much load on analog output 1.
OUT2 OVERLOAD	Too much load on analog output 2.
ENABLED	Analog IO add-on card is active.
DIAGNOSTIC	Reserved for future use.

Analog IO add-on card terminals:

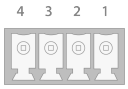
Terminal reference	Terminal name

X1	Power supply input
X2	Analog inputs
X3	Digital outputs

Power supply configuration

The analog IO add-on card requires an external 24 V power supply (not delivered with the AX MIG Welder equipment). The supply current for the analog IO add-on card is 0.1 A.

The pins of the power supply terminal X1 are as follows:

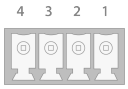


1. 24 V
2. GND
3. 24 V
4. GND

Input configuration

The analog inputs are voltage measuring inputs with a measurement range of 0 ... 10 V. The analog inputs are overvoltage protected up to a voltage of 24 V. If the voltage supplied to the analog input exceeds the measurement range, the corresponding “INx OVERRANGE” LED lights up.

The pins of the input connector X2 are as follows:

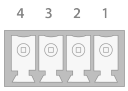


1. Analog input 1
2. GND
3. Analog input 2
4. GND

Output configuration

The analog outputs are voltage sourcing outputs with a range of 0 ... 10 V. The analog outputs are short-circuit protected. If the load connected to the analog output is too high, and the output voltage becomes distorted as a result, the corresponding “OUTx OVERLOAD” LED lights up.

The pins of the output connector X3 are as follows:



1. Analog output 1
2. GND
3. Analog output 2
4. GND

2.6.3 ADD-ON CARD COMBINATIONS FOR EXTERNAL DEVICE CONTROL

When the RCM’s communication mode is set to fieldbus (refer to "Robot settings" on page 160), the robot can control external devices and read the status of external sensors by using digital IO add-on cards. In the fieldbus communication mode, the use of one or two digital IO add-on cards are supported.

The add-on card combinations must be correct for the system to function properly.

Required add-on card combinations

Add-on card slot 1	Add-on card slot 2	Remarks
None	None	No digital IO add-on cards connected. The system operates normally.
Digital IO add-on card (8 inputs + 8 outputs)	None	Digital inputs/outputs in the range of 1 ... 8 can be used.
None	Digital IO add-on card (8 inputs + 8 outputs)	Digital inputs/outputs in the range of 9 ... 16 can be used.
Digital IO add-on card (8 inputs + 8 outputs)	Digital IO add-on card (8 inputs + 8 outputs)	Digital inputs/outputs in the range of 1 ... 16 can be used.

2.6.4 ADD-ON CARD COMBINATIONS FOR DIGITAL ROBOT CONTROL

Digital robot control is a communication mode that allows robots without fieldbus connectivity to be connected to RCM. The digital robot control communication mode utilizes two digital IO add-on cards that provide the basic functions as a generic digital IO interface for the robot.

The digital robot control communication mode is enabled by setting the 'Communication' setting to 'Digital robot control' in the "Robot settings" on page 160 view.

The add-on card combinations must be correct for the system to function properly.

Required add-on card combinations

Add-on card slot 1	Add-on card slot 2	Remarks
Digital IO add-on card (8 inputs + 8 outputs)	Digital IO add-on card (8 inputs + 8 outputs)	Both cards must be installed.

Add-on card slot 1

Input / Output number	Digital input	Digital output
1	Start welding	Ready
2	Wire inch forward	Power source ready
3	Wire inch backward	Cycle ON
4	Gas blow	Arc ON
5	Air blow	Touch sensed
6	Touch sensor tool selection	Error
7	Touch sensor ON	Collision detected
8	Error reset	Gas flow OK

Add-on card slot 2

Input / Output number	Digital input	Digital output
1	Memory channel [bit 0]	Error number [bit 0]
2	Memory channel [bit 1]	Error number [bit 1]
3	Memory channel [bit 2]	Error number [bit 2]
4	Memory channel [bit 3]	Error number [bit 3]
5	Memory channel [bit 4]	Error number [bit 4]
6	Memory channel [bit 5]	Error number [bit 5]
7	Memory channel [bit 6]	Error number [bit 6]
8	Memory channel [bit 7]	Error number [bit 7]

For wiring examples, refer to "Digital IO add-on card" on page 56.

2.6.5 ADD-ON CARD COMBINATIONS FOR ANALOG ROBOT CONTROL

Analog robot control is a communication mode that allows robots without fieldbus connectivity to be connected to RCM. Compared to the digital robot control communication mode, the analog robot control allows the robot to adjust wire feed speed and welding voltage or fine tuning by using analog voltages. The robot also receives analog voltage feedback from RCM on the actual welding current and voltage.

The analog robot control communication mode utilizes one digital IO and one analog IO add-on card. The analog robot control communication mode is enabled by setting the 'Communication' setting to 'Analog robot control' in the "Robot settings" on page 160 view.

The add-on card combinations must be correct for the system to function properly.

Required add-on card combinations

Add-on card slot 1	Add-on card slot 2	Remarks
Analog IO add-on card (2 inputs + 2 outputs)	Digital IO add-on card (8 inputs + 8 outputs)	

Add-on card slot 1

Input / Output number	Analog input	Analog output
1	Wire feed speed / Welding current / Plate thickness	Welding current
2	Voltage / fine tuning	Welding voltage

Add-on card slot 2

Input / Output number	Digital input	Digital output
1	Memory channel [bit 0]	Ready
2	Memory channel [bit 1]	Power source ready
3	Memory channel [bit 2]	Cycle ON
4	Memory channel [bit 3]	Arc ON
5	Start welding	Touch sensed
6	Wire inch forward	Error
7	Wire inch backward	Collision detected
8	Touch sensor ON	Gas flow OK

For wiring examples, refer to "Analog IO add-on card" on page 59 and "Digital IO add-on card" on page 56.

Analog input value scaling

The voltage range for the analog inputs is 0 ... 10 V under normal operating conditions. If the input voltage exceeds 10 V, the 'INx OVERRANGE' status LED corresponding to the input lights up on the card.

Analog input value scaling

Analog input	Minimum voltage	Maximum voltage	Minimum value	Maximum value
Analog input 1, wire feed speed (when adjusting wire feed speed)	0 V	10.0 V	0.0 m/min (restricted internally to 0.5 m/min)	25.0 m/min
Analog input 1, wire feed speed (when adjusting welding current)	0 V	10.0 V	0 A	1024 A

Analog input 1, wire feed speed (when adjusting plate thickness)	0 V	10.0 V	0.0 mm	50.0 mm
Analog input 2, voltage / fine tuning (when adjusting welding voltage)	0 V	10.0 V	0.0 V	46.0 V
Analog input 2, voltage / fine tuning (when adjusting fine tuning)	0 V	10.0 V	-10.0	+10.0

Example: Wire feed speed input with an input voltage of 3.5 V translates to [25.0 m/min / 10.0 V * 3.5 V] = 8.75 m/min, and this value is rounded to 8.8 m/min.

Analog output value scaling

The voltage range for the analog outputs is 0 ... 10 V. If an output is loaded with too low impedance and therefore the output voltage starts to drop, the 'OUTx OVERLOAD' status LED corresponding to the output lights up on the card.

Analog output value scaling

Analog output	Minimum voltage	Maximum voltage	Minimum value	Maximum value
Analog output 1, welding current	0 V	10.0 V	0 A	1024 A
Analog output 2, welding voltage	0 V	10.0 V	0.0 V	46.0 V

Example: Welding current output with a current value of 260 A translates to [10.0 V / 1024 A * 260 A] = ~2.54 V.

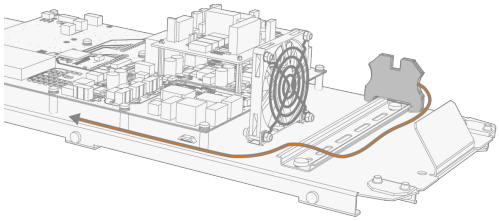
2.7 CONNECTING PE (PROTECTIVE EARTH) WIRE (OPTIONAL)

If RCM is installed on the power source with the official fixing bracket, the PE wire is not needed.

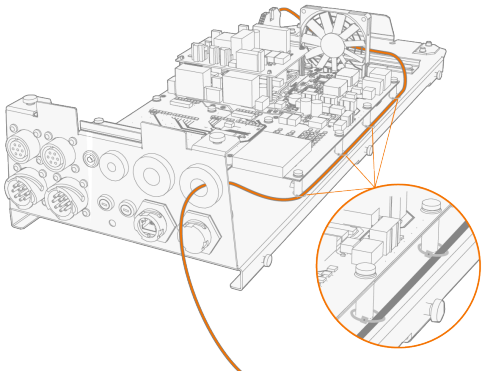
For the RCM part descriptions, refer to "Robot Connectivity Module (RCM)" on page 29.

For removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

1. Connect the PE wire to the DIN rail mount terminal block.



2. Pass the PE wire through a cable inlet and secure the PE wire by tying it to the circuit board mounts with cable ties.



2.8 CONNECTING TOUCH SENSOR FAST OUTPUT (OPTIONAL)

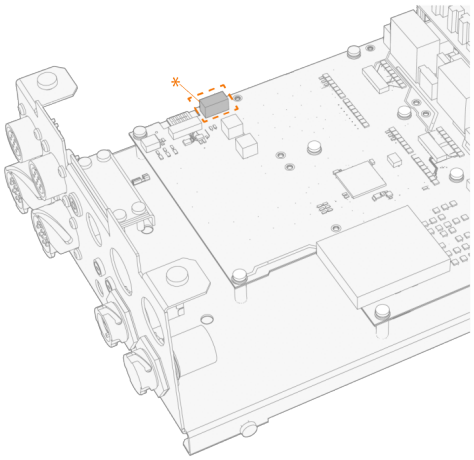
The RCM main board is equipped with a touch sensor fast output which enables transmitting the touch sensing status signal to the robot faster than via the fieldbus connection.

The touch sensor fast output requires a separate 24 V power supply.

Turn off the power source before connecting touch sensor fast output.

For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

1. Route the cable for touch sensor fast output through a cable inlet. (For information on cable inlets, refer to "Routing cables into RCM" on page 50.)
2. Connect the cable to the touch sensor fast output terminal on the RCM main board (*).



Terminal pins:



1. Supply in 24 V
2. Not connected
3. Status signal out
4. Supply GND

3. You can select the output polarity in the Robot settings view.

2.9 CONNECTING BACKUP POWER SUPPLY (OPTIONAL)

The backup power supply is used to ensure that the fieldbus connection stays active even when the main current of the welding power source is cut off. When the backup power supply is used, all control functions are disabled.

Backup power supply technical requirements

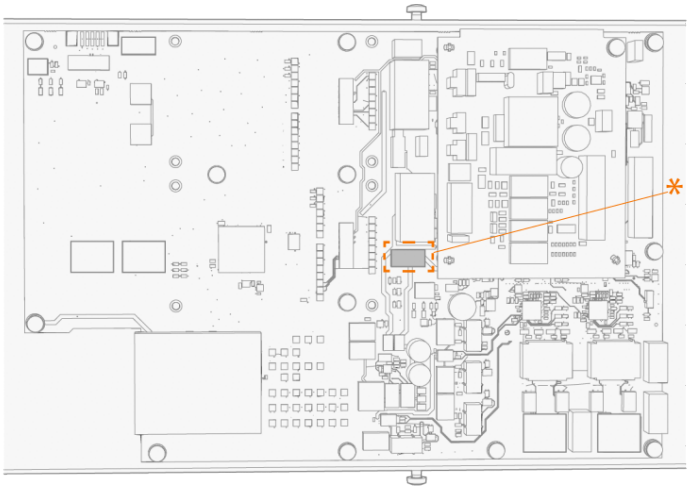
Feature	Value
Supply voltage	24 V +- 10 %
Minimum continuous current	2 A
Output isolation	SELV (Safety Extra Low Voltage)

⚠ *As the backup power supply is not isolated from the RCM's normal system potential, use a separate power supply to avoid connecting different circuit potentials together.*

⚠ *Turn off the power source before connecting the backup power supply.*

For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

1. Pass the cable for the backup power supply through a cable inlet on RCM. (For information on cable inlets, refer to "Routing cables into RCM" on page 50.)
2. Connect the wire to the backup power supply terminal (*) on the RCM main board.



Terminal pins:



1. Backup power input +
2. Backup power input +
3. Backup power GND
4. Backup power GND

2.10 CONNECTING DOOR SWITCH (OPTIONAL)

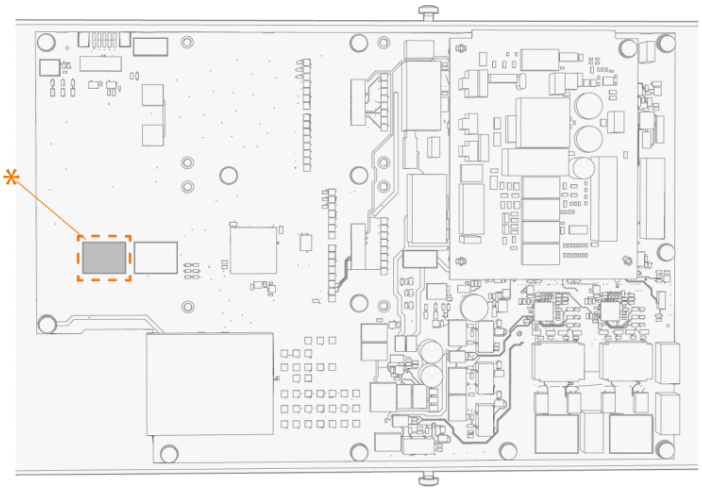
This section describes how to connect a door switch to RCM. The door switch can be used to halt the system if a gate door to the robotic cell is opened. The RCM door switch terminal is intended for door switches that have two normally closed (NC) electrical contacts.

The door switch is not delivered with the AX MIG Welder system.

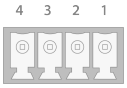
Turn off the power source before connecting the door switch.

For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

1. To enable the use of the door switch terminal, remove the factory-installed jumper wires.
2. Route the door switch cable through a cable inlet into RCM. (For information on cable inlets, refer to "Routing cables into RCM" on page 50.)
3. Connect to the door switch cable to the door switch terminal (*) on the RCM main board.

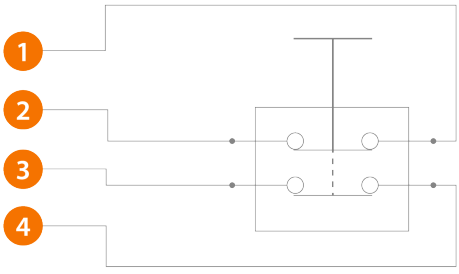


Terminal pins:



1. Channel 1 A
2. Channel 1 B
3. Channel 2 A
4. Channel 2 B

The following displays a door switch wiring example:



To stop using the door switch, reattach the jumper wires to the terminal pins.

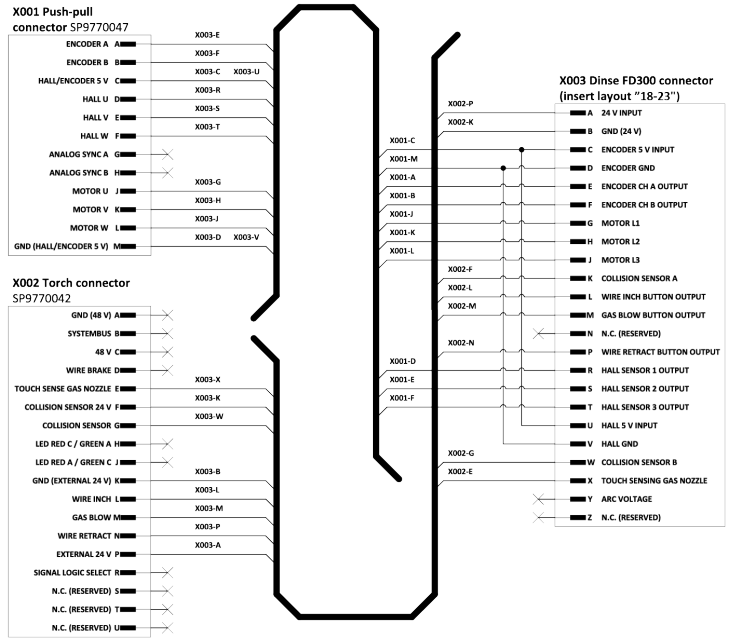
2.11 CONNECTING DINSE FD300 WELDING TORCH (R500 WF HD EUR+)

This section describes how to connect the Dinse FD300 welding torch to R500 Wire Feeder HD EUR+. For more information on the wire feeder control cable connector, refer to "Push-pull welding torch control cable connector" on page 22.

The Dinse FD300 control cable connector does not fit the R500 Wire Feeder HD EUR+ directly. Therefore, there are two options for connecting:

- The Dinse FD300 control cable connector is replaced with connectors suitable for R500 Wire Feeder HD EUR+. These control cable connectors can be ordered from Kemppi.com.
- An adapter is used between Dinse FD300 and R500 Wire Feeder HD EUR+ (not available in the Kemppi product range).

The following illustrates the connection of Dinse FD300 welding torch to R500 Wire Feeder HD EUR+:



2.12 CONNECTING STOP SWITCH (OPTIONAL)

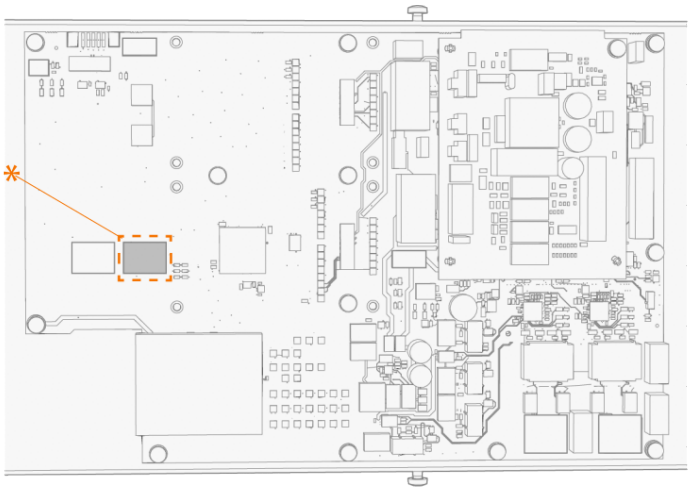
This section describes how to connect the stop switch to RCM. The stop switch can be used to halt the system faster than normal in a problem situation. The RCM stop switch terminal is intended for stop switches that have two normally closed (NC) electrical contacts.

The stop switch is not delivered with the AX MIG Welder system.

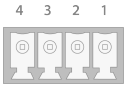
Turn off the power source before connecting the stop switch.

For instructions on removing and attaching the RCM top cover, refer to "Removing and attaching RCM top cover" on page 48.

1. To enable the use of the stop switch terminal, remove the factory-installed jumper wires.
2. Route the stop switch cable through a cable inlet into RCM. (For information on cable inlets, refer to "Routing cables into RCM" on page 50.)
3. Connect to the stop switch cable to the stop switch terminal (*) on the RCM main board.

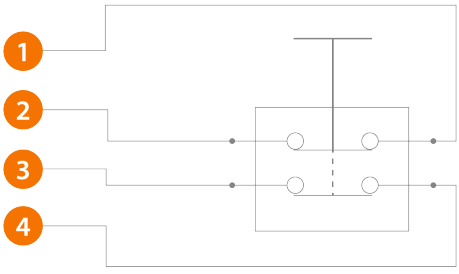


Terminal pins:



1. Channel 1 A
2. Channel 1 B
3. Channel 2 A
4. Channel 2 B

The following displays a stop switch wiring example:



To stop using the stop switch, reattach the jumper wires to the terminal pins.

2.13 CONNECTING CABLES

2.13.1 CONNECTING CABLES TO R500 WF EUR/EUR+

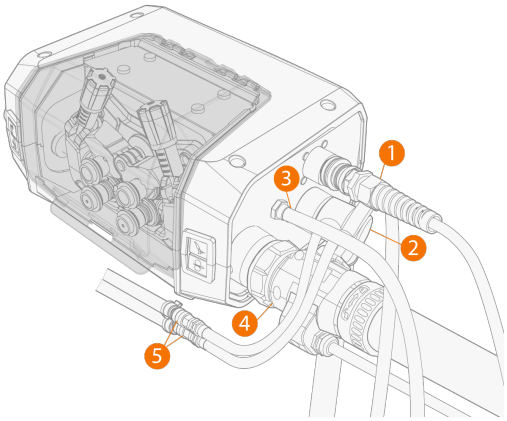
This section describes how to connect cables to the R500 Wire Feeder EUR/EUR+.

For the wire feeder connector descriptions and their locations, refer to "R500 Wire Feeder EUR/EUR+" on page 14.

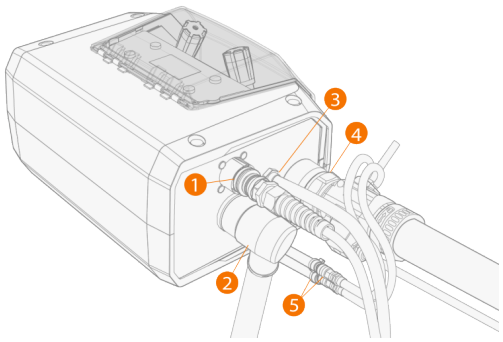
Model-specific variations occur in the connectors.

Front

R500 Wire Feeder EUR+



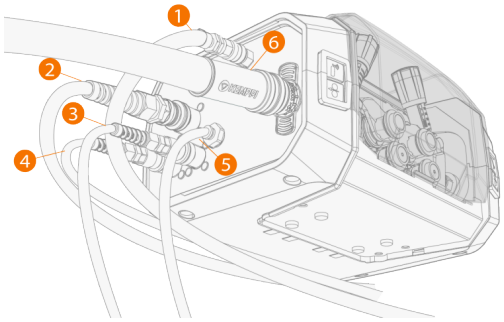
R500 Wire Feeder RH EUR+



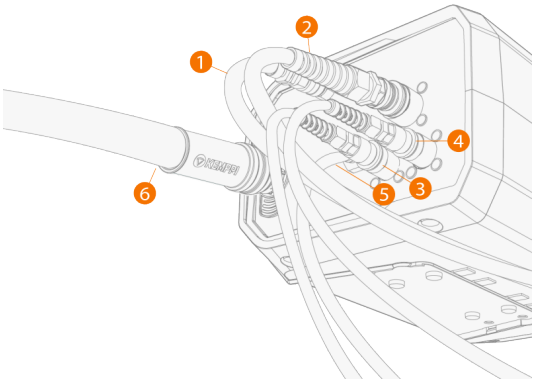
1. Connect the control cable for welding torch auxiliary devices (1) to the peripheral connector.
2. Connect the welding current cable (2) to the positive (+) connector and tighten it with an appropriate tool.
3. R500 Wire Feeder EUR+: To use welding torch cleaning with compressed air, connect the compressed air hose (3) to the outlet connector.
4. Push the welding torch connector (4) to the Euro connector and hand-tighten the collar.
5. If you have the optional cooling unit, connect the cooling liquid hoses (5).

Rear

R500 Wire Feeder EUR+



R500 Wire Feeder RH EUR+



1. Push the shielding gas hose (1) to the connector so that it locks down.
2. Connect the wire feeder control cable (2) to the connector.
3. R500 Wire Feeder EUR+: To use the WiseThin+ or WiseRoot+ process, connect the voltage sensing cable from the workpiece (3) to the connector.
4. R500 Wire Feeder EUR+: To use the WiseThin+ or WiseRoot+ process, connect the voltage sensing cable from the power source (X5 Pulse+ power sources only) to the connector (4).
5. R500 Wire Feeder EUR+: To use welding torch cleaning with compressed air, connect the compressed air hose (5) to the inlet connector.
6. Connect the wire conduit (6) to the connector.

   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector.

2.13.2 CONNECTING CABLES TO R500 WF HD EUR+

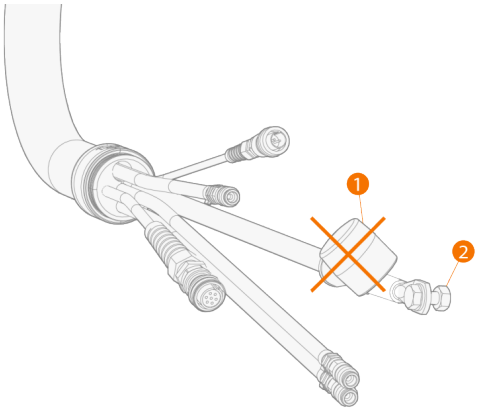
This section describes how to connect cables to R500 Wire Feeder HD EUR+.

For the wire feeder connector descriptions and their locations, refer to "R500 Wire Feeder HD EUR+" on page 18.

Front

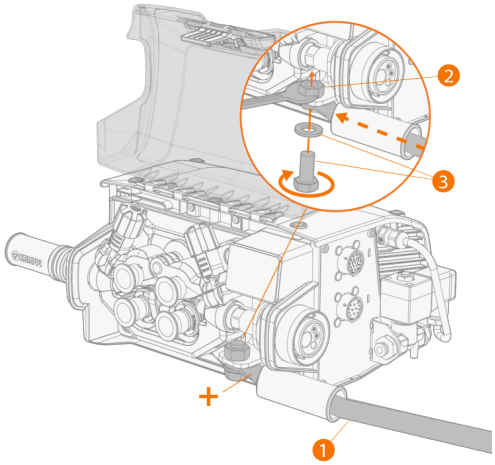
To connect the welding current cable:

1. Remove the protective cap (1) and the fixing bolt (2) from the welding current cable. Keep the fixing bolt for later use.



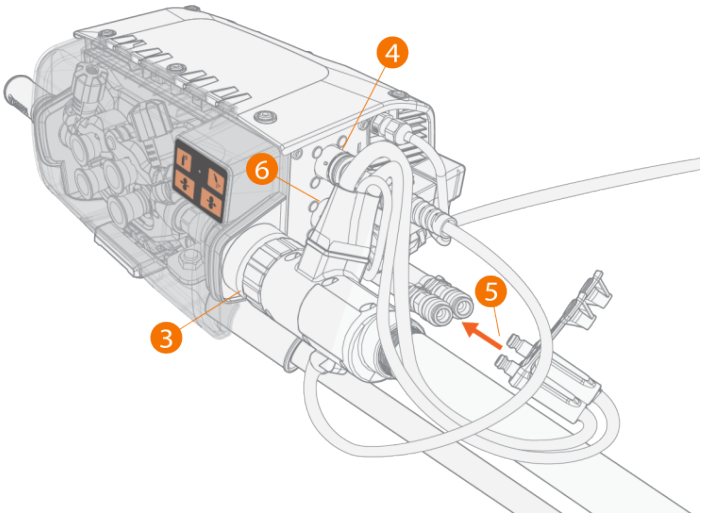
2. Pass the welding current cable through the protective sleeve (1) and secure the cable to the fixing nut (2) with the cable's fixing bolt and washer (3).

Hold the fixing nut with a wrench while fastening the bolt to prevent internal fastenings from loosening.

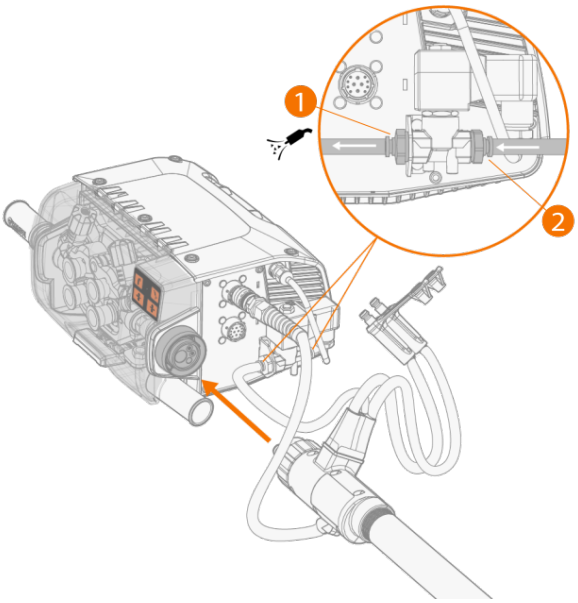


To connect the welding torch:

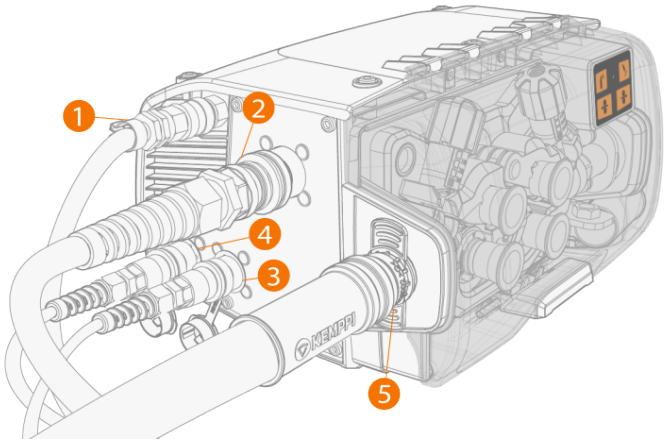
3. Push the welding torch connector (3) to the Euro connector and hand-tighten the collar.
4. Welding torch: Connect the control cable (4) to the connector.
5. If you have the optional cooling unit, connect the cooling liquid hoses (5).
6. Push-pull welding torch: Connect the control cable (6) to the connector.



To use welding torch cleaning with compressed air, connect the compressed air hose of the welding cable to the outlet connector (1) and the compressed air supply to the inlet connector (2) of the air blow valve.



Rear



1. Push the shielding gas hose (1) to the connector so that it locks down.
2. Connect the wire feeder control cable (2) to the connector.
3. To use the WiseThin+ or WiseRoot+ process, connect the voltage sensing cable from the workpiece (3) to the connector.
4. To use the WiseThin+ or WiseRoot+ process, connect the voltage sensing cable from the power source (X5 Pulse+ power sources only) to the connector (4).
5. Connect the wire conduit (5) to the connector so that it locks down.

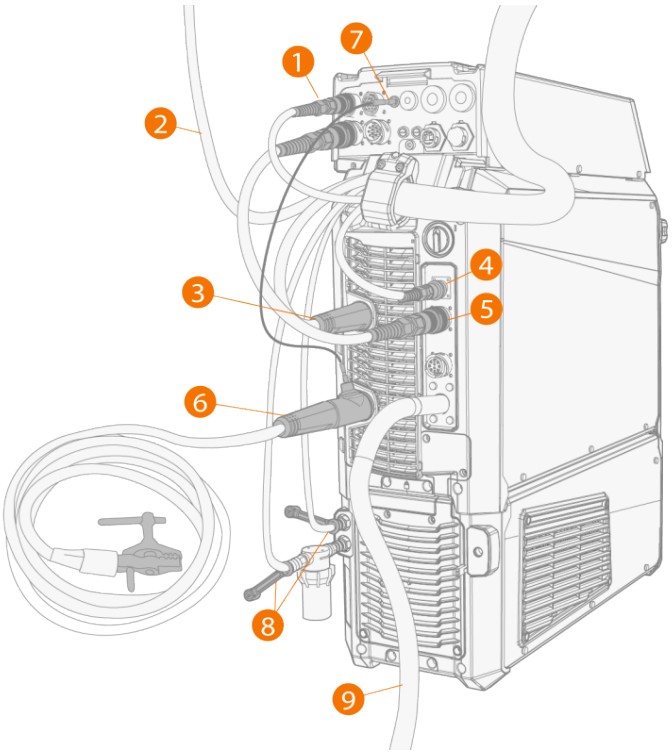
   >> Always use the insulating sleeve (delivered with the wire feeder) in the wire conduit connector.

2.13.3 CONNECTING CABLES TO POWER SOURCE AND RCM

This section describes the cable connections in the power source, RCM and the optional cooling unit. For the connector descriptions and their locations, refer to "X5 Power Source 400 and 500" on page 12 and "Robot Connectivity Module (RCM)" on page 29.

For information on connecting the protective earth cable, refer to "Connecting PE (protective earth) wire (optional)" on page 65.

For information on connecting the fieldbus module, refer to "Installing fieldbus module" on page 52.

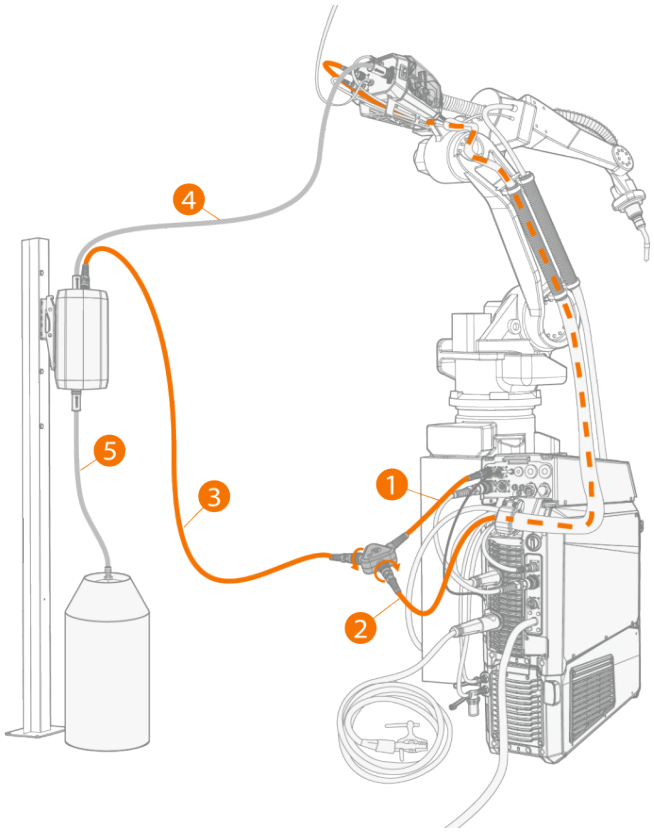


1. Connect the wire feeder control cable (1) to RCM.
2. Connect the shielding gas hose (2) to the gas bottle.
3. Connect the welding current cable (3) to the positive (+) connector on the power source.
4. Pulse+ power source only: If you have the voltage sensing cable in use, connect it to the connector (4).
5. Connect the RCM control cable (5) between RCM and power source.
6. Connect the earth return cable (6) to the negative (-) connector in the power source.
7. Connect the touch sensor cable to the touch sensor negative (-) connector in RCM (7).
8. If you have the optional cooling unit, connect the cooling liquid hoses (8). Note that the coolant filter must be attached to the coolant inlet connector. For information on attaching the filter, refer to "Installing cooling unit (optional)" on page 37.
9. Connect the mains cable (9) to the mains after the installation is complete.

2.13.4 CONNECTING RA50 4R ASSISTIVE WIRE FEEDER TO WELDING SYSTEM (OPTIONAL)

An additional splitter adapter and control cable are required to connect the assistive wire feeder to the AX MIG Welder welding system. For information on installation accessories, refer to Kemppi.com or contact your local Kemppi dealer.

For information on the connector locations, refer to "Robot Connectivity Module (RCM)" on page 29 and "RA50 4R assistive wire feeder (optional)" on page 25.



1. Connect the splitter adapter's control cable to the RCM's control cable connector.
2. Connect the wire feeder control cable to the splitter adapter's connector and to the main wire feeder's control cable connector.
3. Connect the additional control cable to the splitter adapter's connector and to the assistive wire feeder's control cable connector.
4. Connect the wire conduit to the main wire feeder's wire conduit connector and to the assistive wire feeder's wire conduit connector.

   >> Always use the insulating sleeves (delivered with the wire feeders) in the wire conduit connectors.
5. Connect the wire conduit to the assistive wire feeder's wire conduit connector and to the wire drum.

2.14 INSTALLING WIRE GUIDE TUBES

2.14.1 INSTALLING WIRE GUIDE TUBES (R500 WF EUR/EUR+)

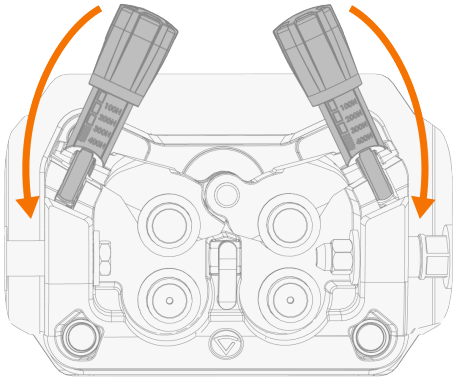
This section describes the installation of the wire guide tubes. For the wire feeder part descriptions, refer to "Wire feed mechanism" on page 16.

Select the wire guide tubes according to the tables here: "Wire feeder consumables" on page 258.

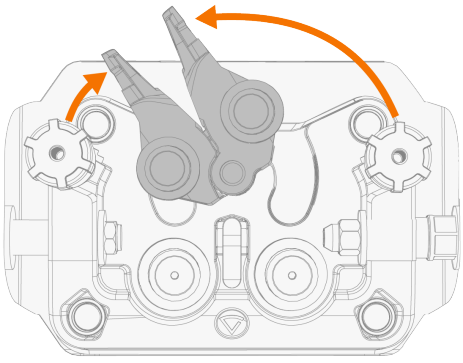
Tools needed:



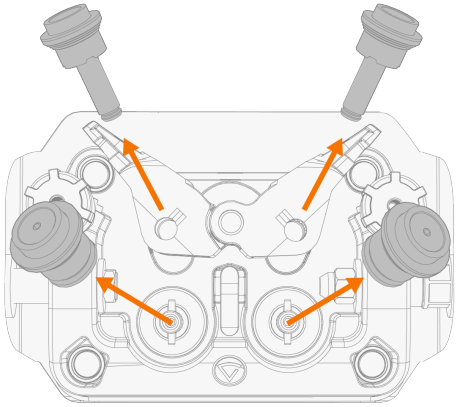
1. Release the pressure handles on the wire feed mechanism.



2. Open the pressure roll locking arms.

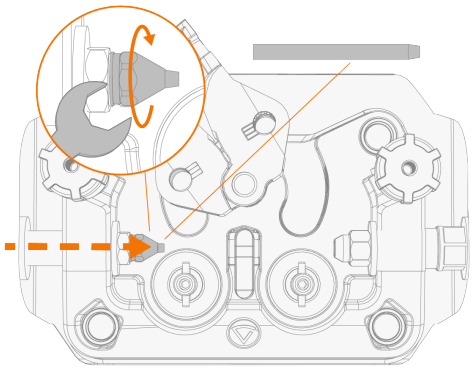


3. First time installation only: Detach the pressure roll mounting pins and drive roll mounting caps.

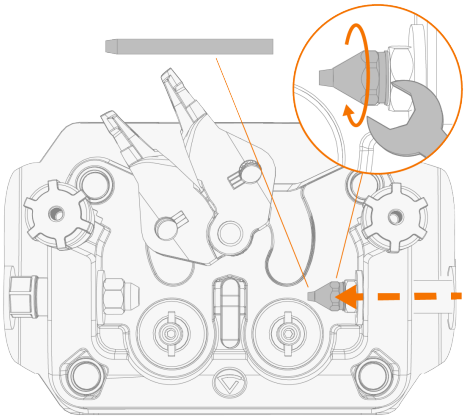


4. Insert the inlet guide tube and tighten the locking tip.

R500 Wire Feeder EUR

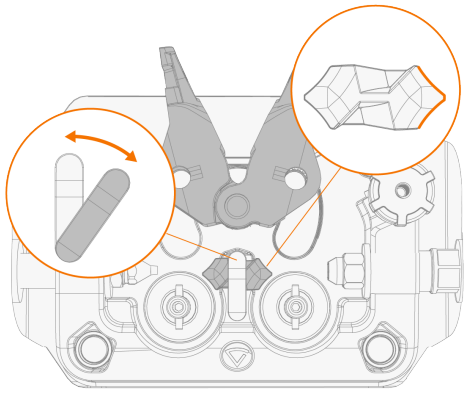


R500 Wire Feeder RH EUR+

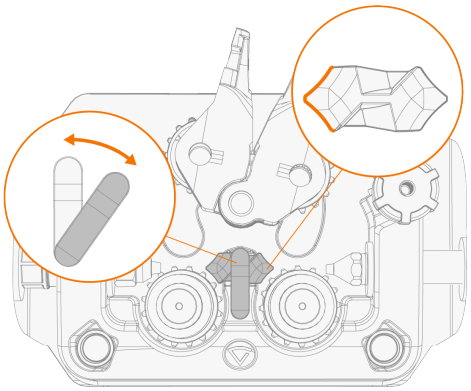


5. Turn the locking clip aside and insert the middle guide tube in its slot. Ensure that the mark arrow points to the wire running direction.

R500 Wire Feeder EUR

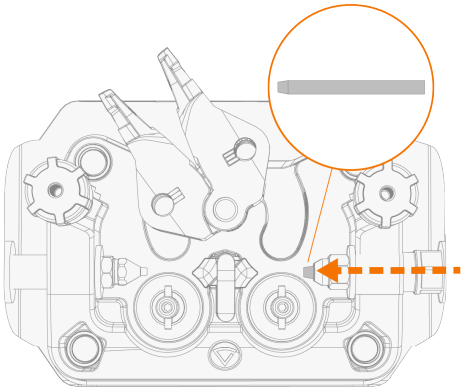


R500 Wire Feeder RH EUR+

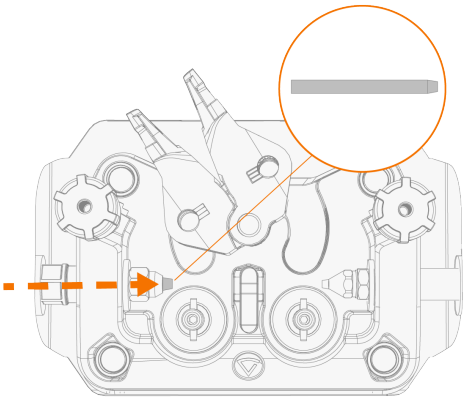


6. Turn the locking clip back to lock down the middle guide tube.
7. Push the outlet guide tube in its place.

R500 Wire Feeder EUR



R500 Wire Feeder RH EUR+



2.14.2 REMOVING WIRE GUIDE TUBES (R500 WF EUR/EUR+)

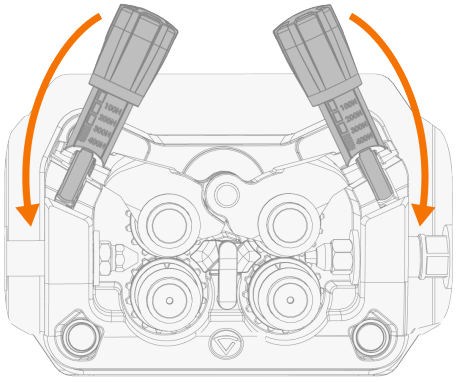
For the wire feeder part descriptions, refer to "Wire feed mechanism" on page 16.

When removing the outlet guide tube, the welding gun must be detached.

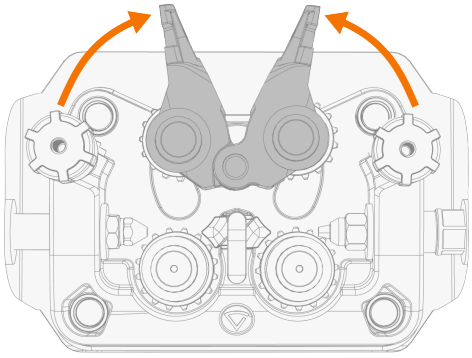
Tools needed:



1. Release the pressure handles on the wire feed mechanism and remove the filler wire from the system.

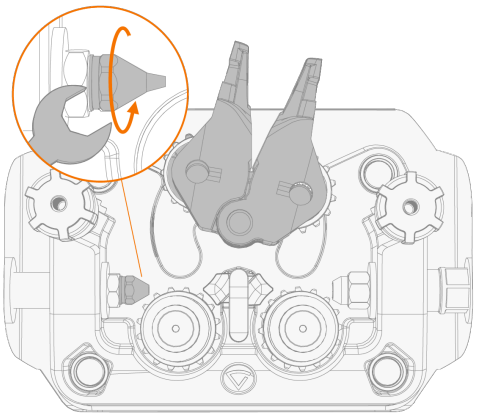


2. Open the pressure roll locking arms.

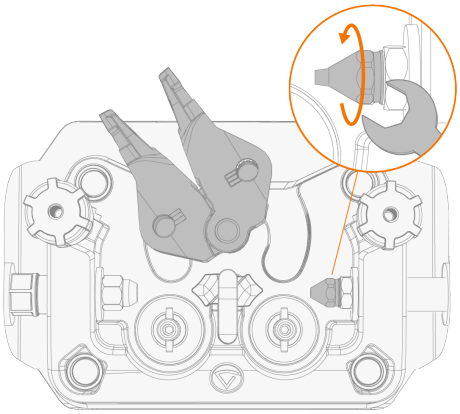


3. Loosen the inlet guide tube's locking tip and remove the inlet guide tube.

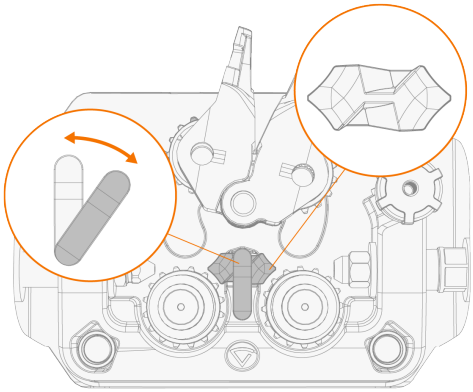
R500 Wire Feeder EUR



R500 Wire Feeder RH EUR+

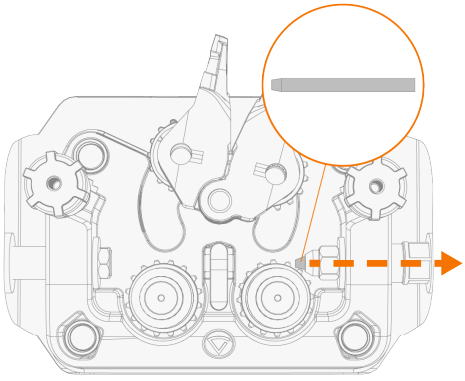


4. Turn the locking clip aside to free the middle guide tube and remove the middle guide tube from its slot.

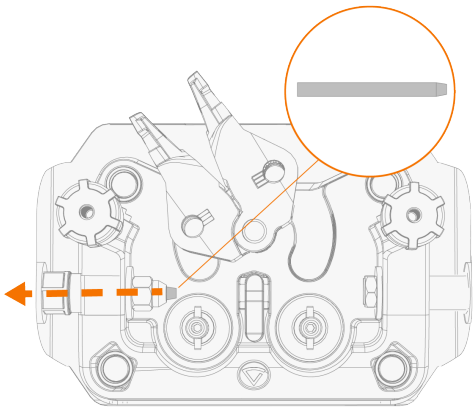


5. Remove the outlet guide tube.

R500 Wire Feeder EUR



R500 Wire Feeder RH EUR+



For information on installing wire guide tubes, refer to "Installing wire guide tubes (R500 WF EUR/EUR+)" on page 79.

2.14.3 INSTALLING WIRE GUIDE TUBES (R500 WF HD EUR+)

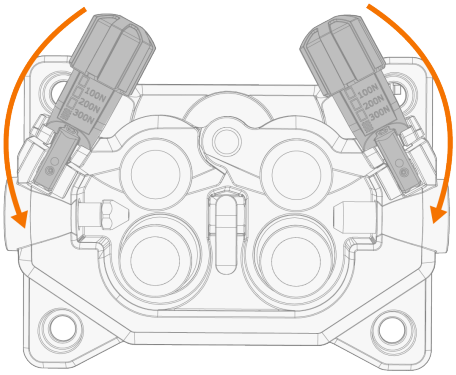
This section describes the installation of the wire guide tubes. For the wire feeder part descriptions, refer to "Wire feed mechanism" on page 19.

Select the wire guide tubes according to the tables here: "Wire feeder consumables" on page 258.

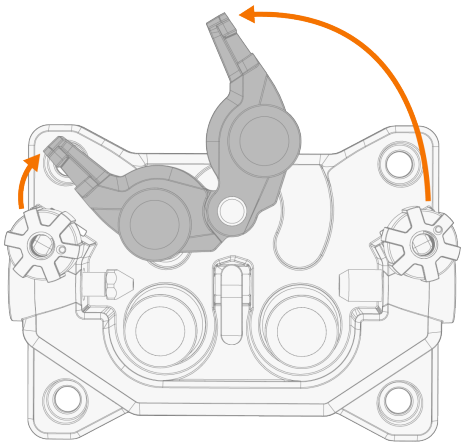
Tools needed:



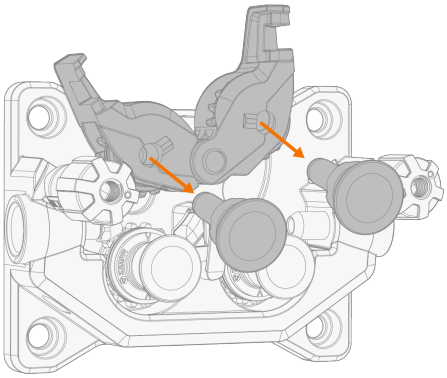
1. Release the pressure handles on the wire feed mechanism.



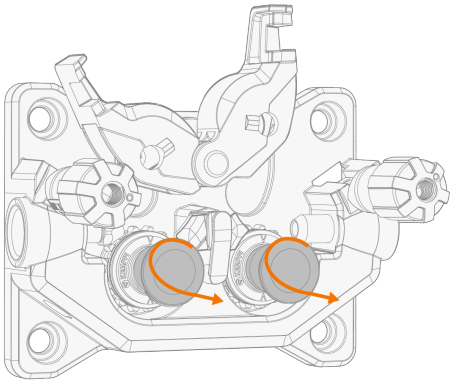
2. Open the pressure roll locking arms.



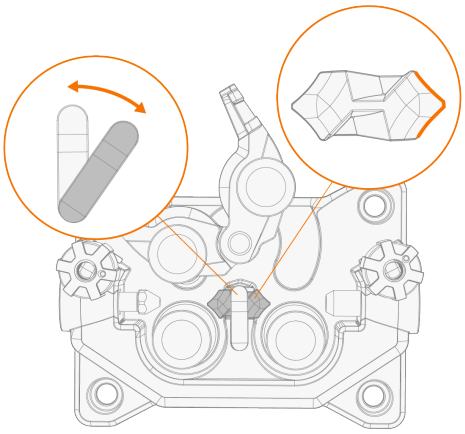
3. Remove the pressure feed roll mounting pins by pulling them.



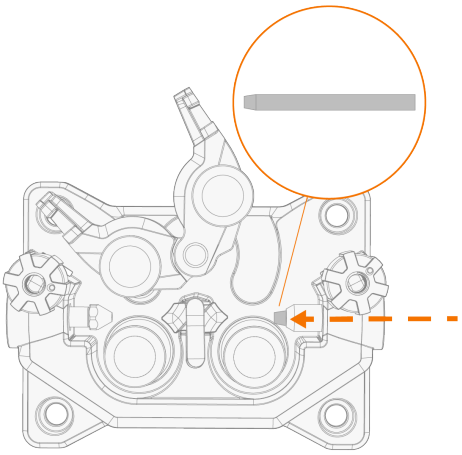
4. Remove the drive feed roll mounting caps by turning and pulling them.



5. Turn the locking clip aside and insert the middle guide tube in its slot. Ensure that the mark arrow points to the wire running direction.



6. Turn the locking clip back to lock down the middle guide tube.
7. Push the outlet guide tube in its place.



2.14.4 REMOVING WIRE GUIDE TUBES (R500 WF HD EUR+)

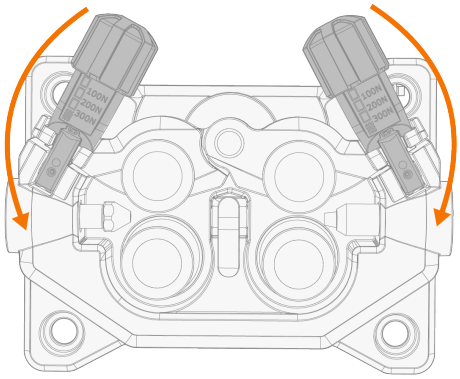
For the wire feeder part descriptions, refer to "Wire feed mechanism" on page 19.

When removing the outlet guide tube, the welding torch must be detached.

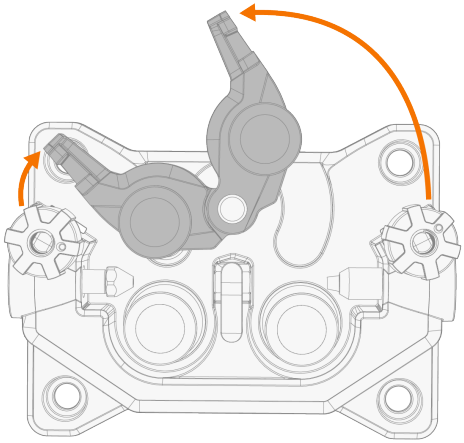
Tools needed:



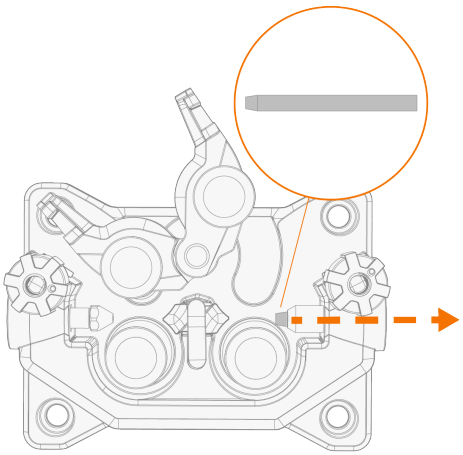
1. Release the pressure handles on the wire feed mechanism and remove the filler wire from the system.



2. Open the pressure roll locking arms.



3. Turn the locking clip aside to free the middle guide tube and remove the middle guide tube from its slot.
4. Remove the outlet guide tube.



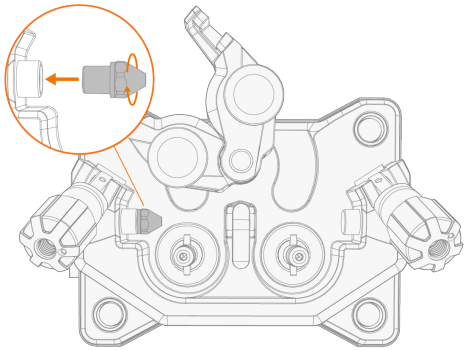
For information on installing wire guide tubes, refer to "Installing wire guide tubes (R500 WF HD EUR+)" on page 85.

2.14.5 INSTALLING WIRE GUIDE TUBES (RA50 4R)

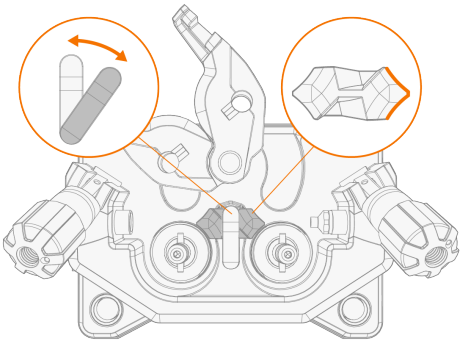
For part descriptions, refer to "Wire feed mechanism" on page 26.

Select the wire guide tubes according to the tables here: "Wire feeder consumables" on page 258.

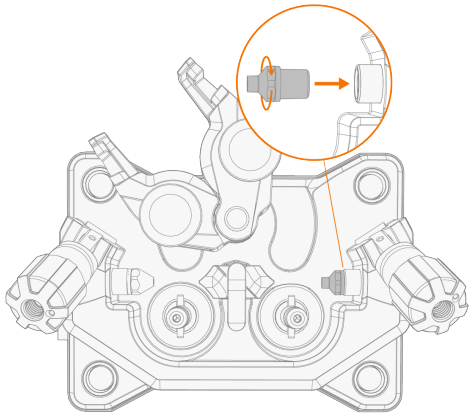
1. Release the pressure handles on the wire feed mechanism.
2. Open the pressure roll locking arms.
3. Insert the inlet guide tube and tighten the locking tip.



4. Turn the locking clip aside and insert the middle guide tube in its slot. Ensure that the mark arrow points to the wire running direction.

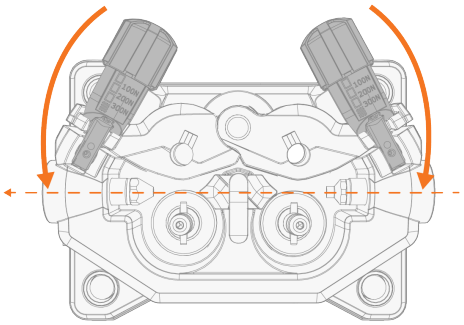


5. Insert the outlet guide tube and tighten the locking tip.

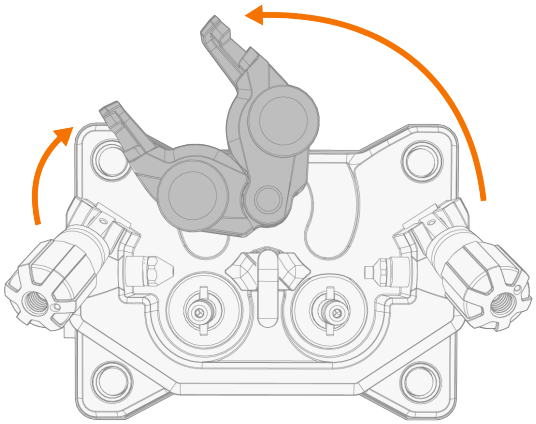


2.14.6 REMOVING WIRE GUIDE TUBES (RA50 4R)

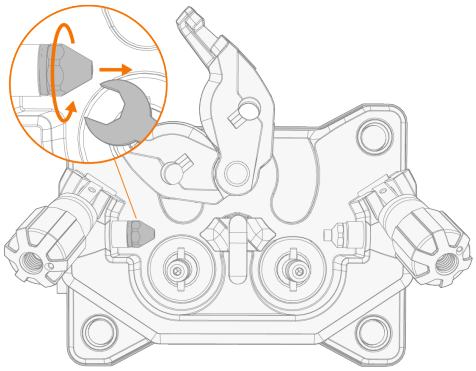
1. Release the pressure handles on the wire feed mechanism and remove the filler wire from the system.



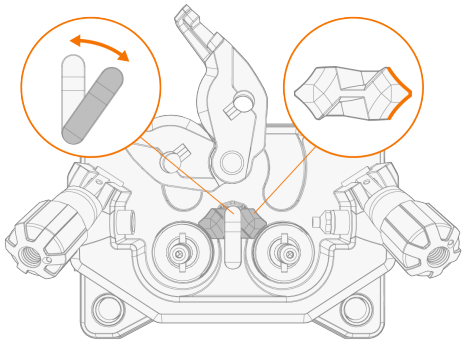
2. Open the pressure roll locking arms.



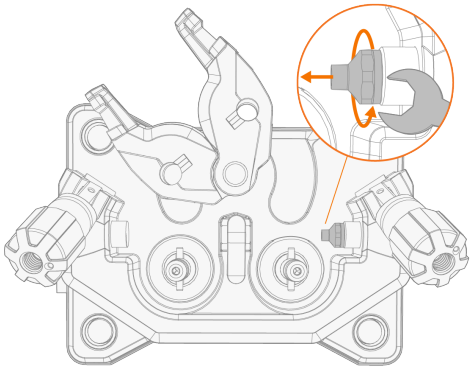
3. Loosen the inlet guide tube's locking tip and remove the inlet guide tube.



4. Turn the locking clip aside to free the middle guide tube and remove the middle guide tube from its slot.



5. Loosen the outlet guide tube's locking tip and remove the outlet guide tube.



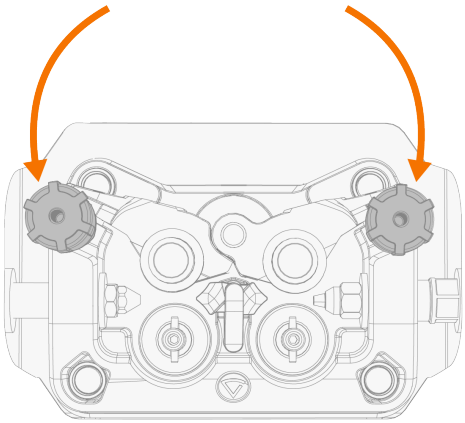
For information on installing wire guide tubes, refer to "Installing wire guide tubes (RA50 4R)" on page 89.

2.15 INSTALLING FEED ROLLS

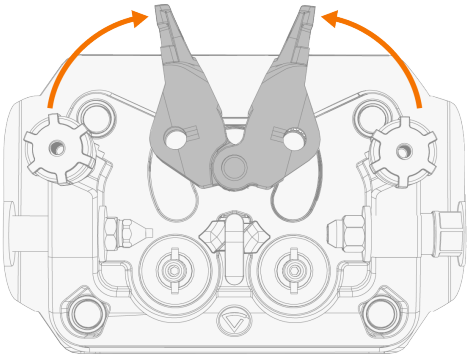
2.15.1 INSTALLING FEED ROLLS (R500 WF EUR/EUR+ / RA50 4R)

Always ensure that the feed rolls are suitable for the filler wire (diameter and material) in question. Select the wire feed rolls according to the tables here: "Wire feeder consumables" on page 258.

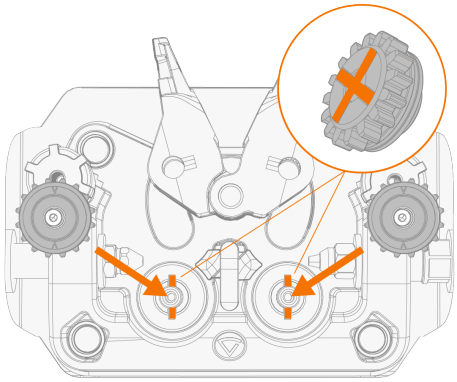
1. Release the pressure handles on the wire feed mechanism.



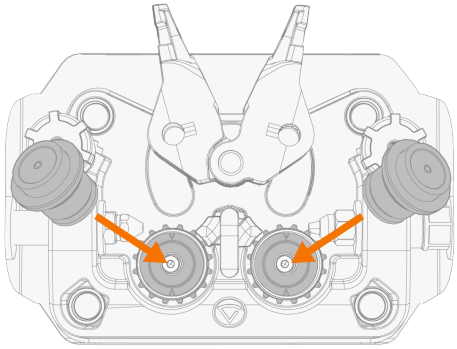
2. Open the pressure roll locking arms.



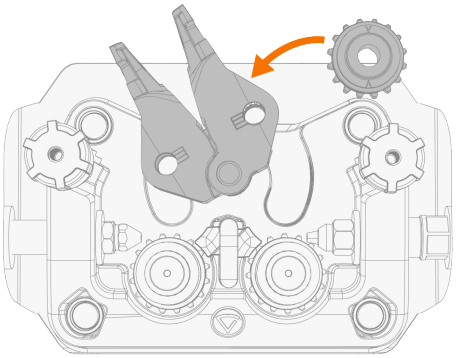
3. Detach the pressure roll mounting pins and drive roll mounting caps.
4. Install the drive rolls. Align the cut on the drive rolls' bottom with the pin on the drive shaft.

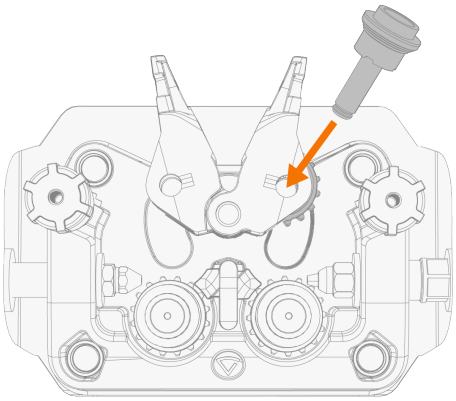


5. Attach the drive roll mounting caps.



6. Install the pressure rolls and mounting pins (there are no alignment cuts on the bottom of the pressure rolls).

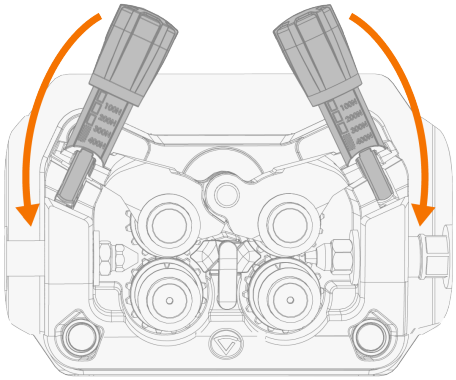




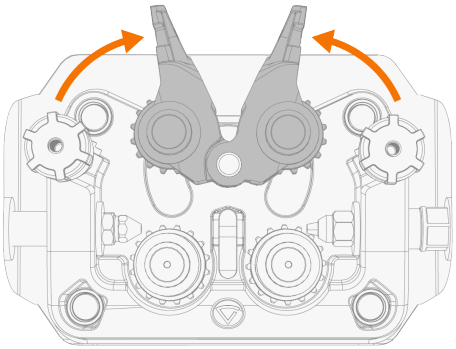
7. Continue to installing the filler wire (refer to "Installing wire (R500 WF EUR/EUR+)" on page 101) or close the locking arms and pressure handles on the feed rolls.

2.15.2 REMOVING FEED ROLLS (R500 WF EUR/EUR+ / RA50 4R)

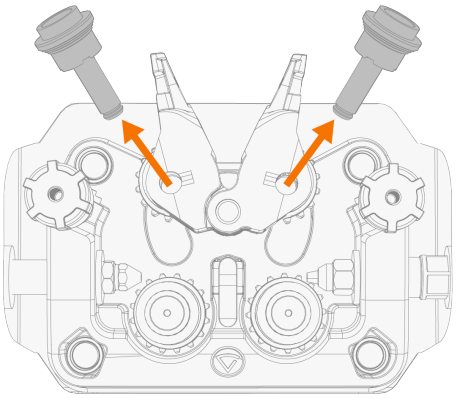
1. Open the wire feeder top cover.
2. Release the pressure handles on the wire feed mechanism.



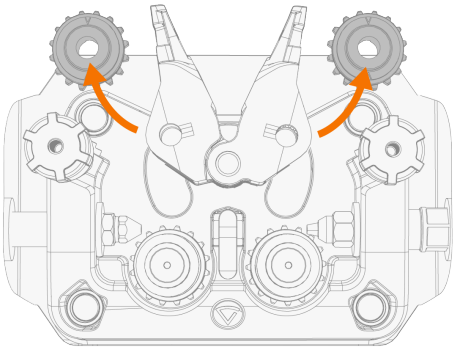
3. Open the pressure roll locking arms.



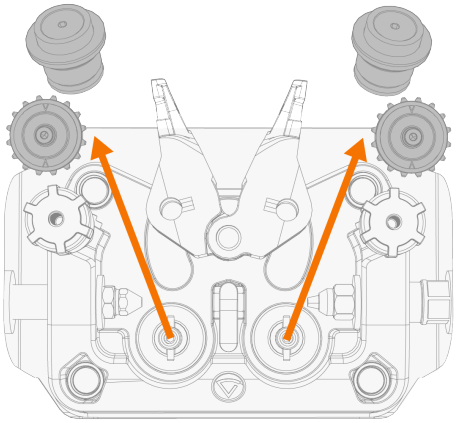
4. Pull the pressure roll mounting pins off.



5. Remove the pressure rolls.



6. Pull the drive roll mounting caps off and remove the drive rolls.

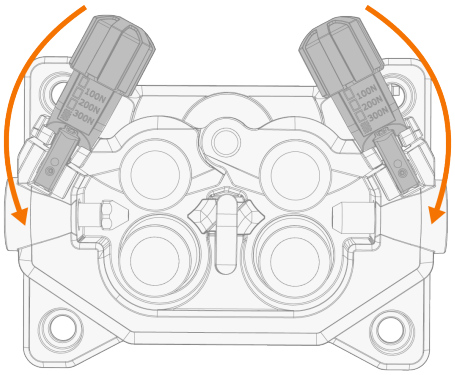


For information on installing feed rolls, refer to "Installing feed rolls (R500 WF EUR/EUR+ / RA50 4R)" on page 92.

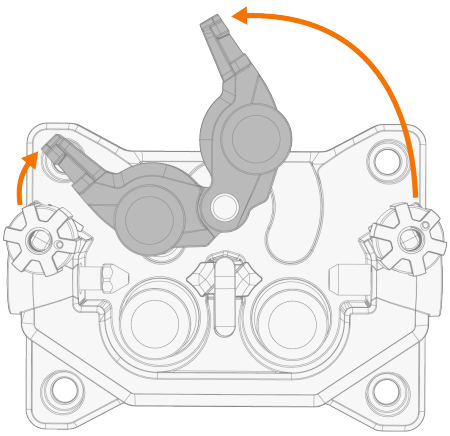
2.15.3 INSTALLING FEED ROLLS (R500 WF HD EUR+)

Always ensure that the feed rolls are suitable for the filler wire (diameter and material) in question. Select the wire feed rolls according to the tables here: "Wire feeder consumables" on page 258.

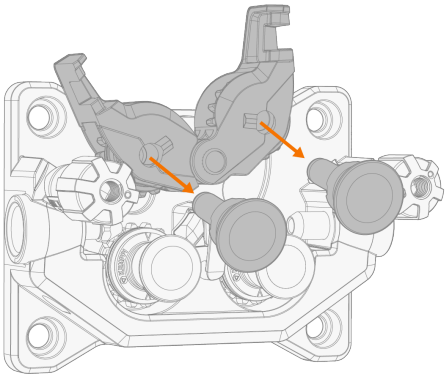
1. Release the pressure handles on the wire feed mechanism.



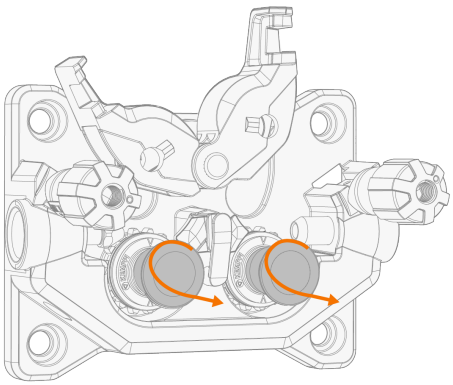
2. Open the pressure roll locking arms.



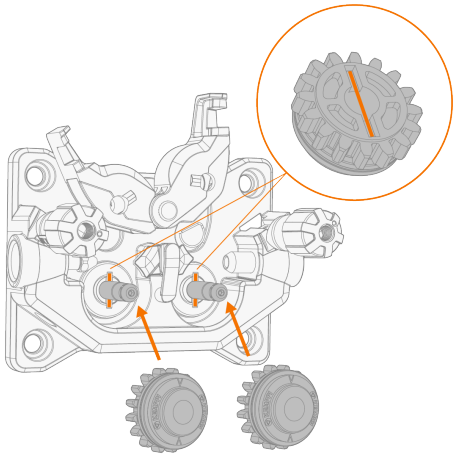
3. Remove the pressure feed roll mounting pins by pulling them.



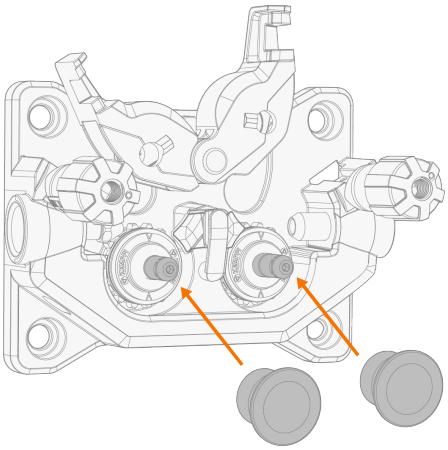
4. Remove the drive feed roll mounting caps by turning and pulling them.



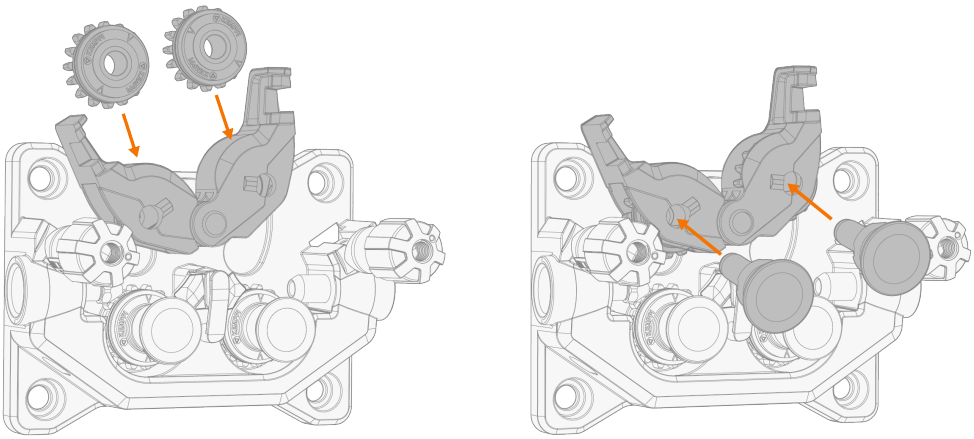
5. Install the drive rolls. Align the cut on the drive rolls' bottom with the pin on the drive shaft.



6. Attach the drive roll mounting caps.



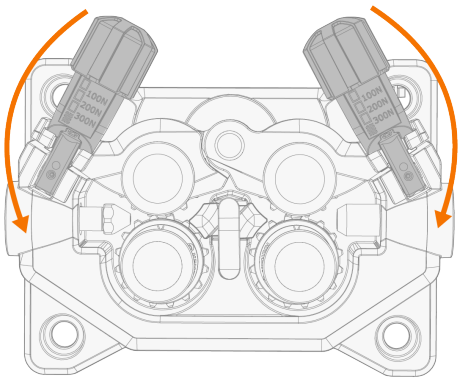
7. Install the pressure rolls and mounting pins (there are no alignment cuts on the bottom of the pressure rolls).



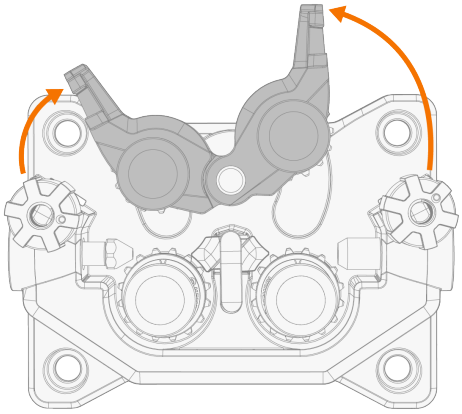
8. Continue to installing the filler wire (refer to "Installing wire (R500 WF HD EUR+)" on page 105) or close the locking arms and pressure handles on the feed rolls.

2.15.4 REMOVING FEED ROLLS (R500 WF HD EUR+)

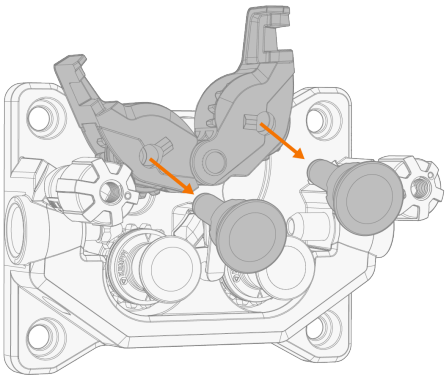
1. Open the wire feeder top cover.
2. Release the pressure handles on the wire feed mechanism.



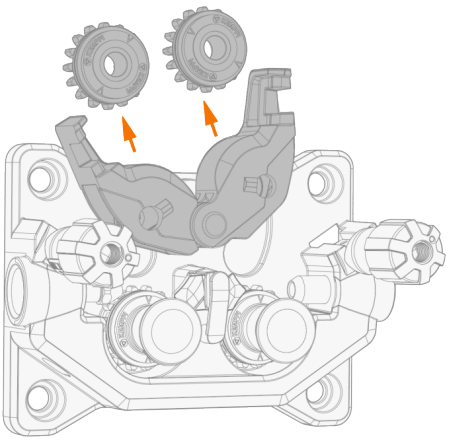
3. Open the pressure roll locking arms.



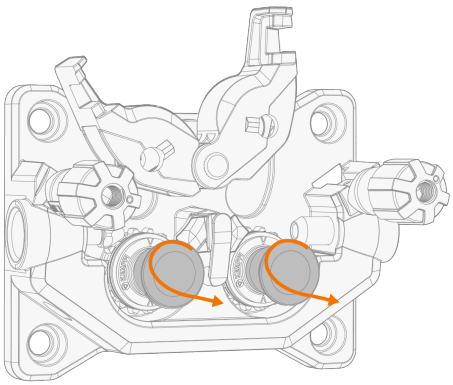
4. Pull the pressure roll mounting pins off.



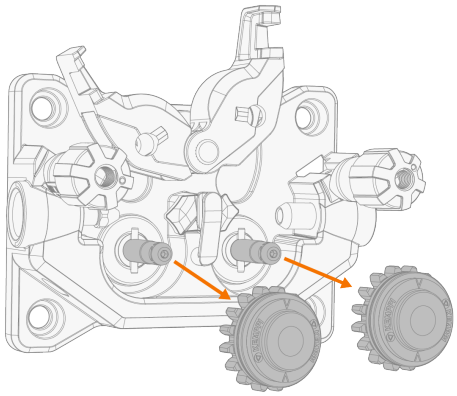
5. Remove the pressure rolls.



6. Remove the drive feed roll mounting caps by turning and pulling them.



7. Remove the drive rolls.



For information on installing feed rolls, refer to "Installing feed rolls (R500 WF HD EUR+)" on page 95.

2.16 INSTALLING WIRE

2.16.1 INSTALLING WIRE (R500 WF EUR/EUR+)

This section describes how to install filler wire on the R500 Wire Feeder EUR/EUR+. For the wire feeder part descriptions, refer to "R500 Wire Feeder EUR/EUR+" on page 14 and "Wire feed mechanism" on page 16.

Install the welding torch to the wire feeder before installing the wire.

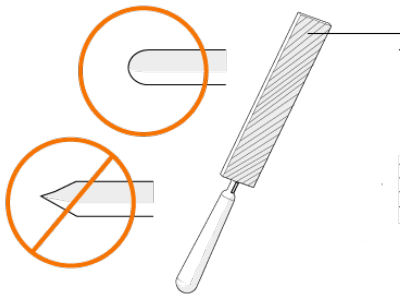
When changing the wire, remove the remaining filler wire from the welding torch and wire feed mechanism.

Always ensure that the feed rolls are suitable for the filler wire (diameter and material) in question. Refer also to "Wire feeder consumables" on page 258.

1. Release the filler wire end and cut off any deformed section so that the end is straight.

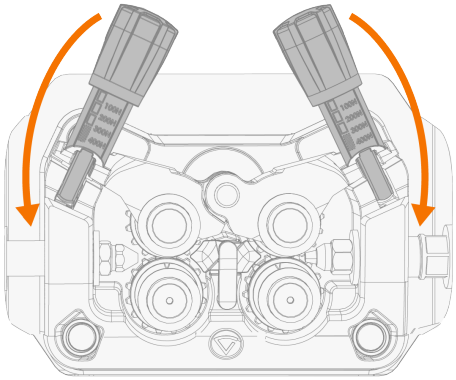
If using a wire spool, ensure that the filler wire does not unravel from the spool when it is released.

2. File the tip of the filler wire smooth.



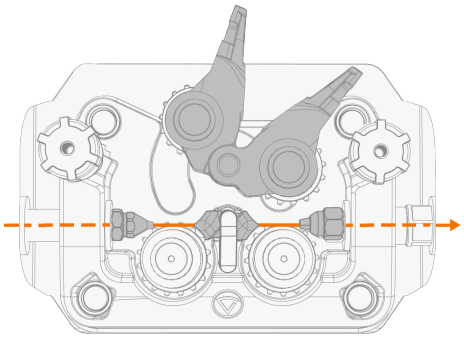
Sharp edges on the filler wire tip may damage the wire liner.

3. Guide the filler wire through the wire conduit between the wire drum and the wire feeder.
4. Release the pressure handles.

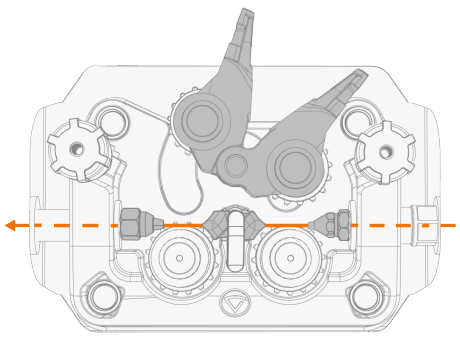


5. Guide the filler wire through the inlet guide tube, middle guide tube and into the outlet guide tube, which feeds the filler wire to the welding torch.

R500 Wire Feeder EUR

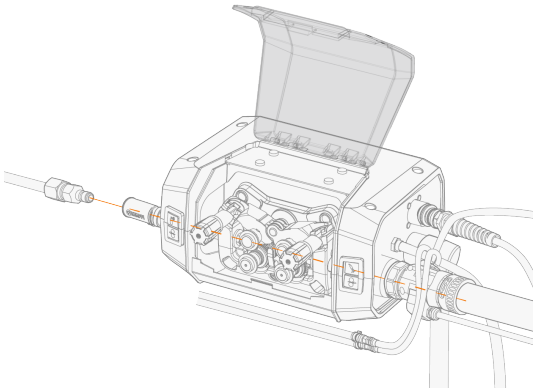


R500 Wire Feeder RH EUR+

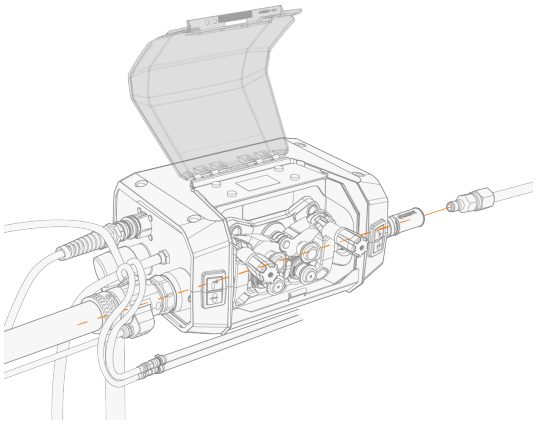


6. Push the filler wire by hand through the euro connector.

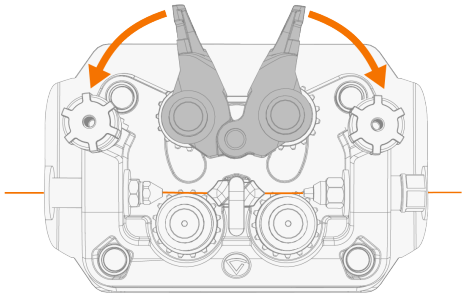
R500 Wire Feeder EUR



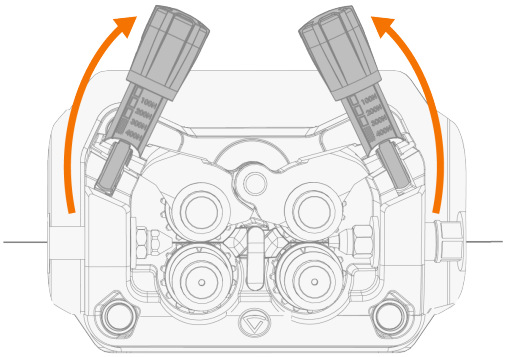
R500 Wire Feeder RH EUR+



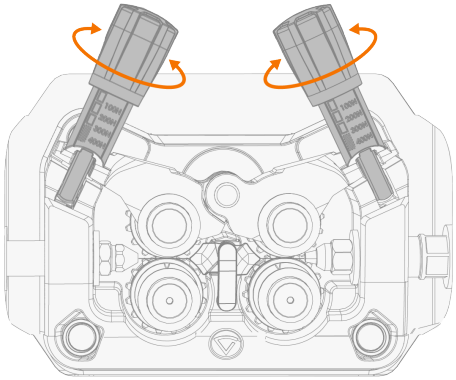
7. Close the pressure roll locking arms.



8. Close the pressure handles.



9. Adjust the pressure of the feed rolls with the pressure adjustment wheels. The pressure is the same for both feed roll pairs.



The graduated scales on the pressure handle indicate the pressure applied to the feed rolls. Adjust the pressure of the feed rolls according to the table below.

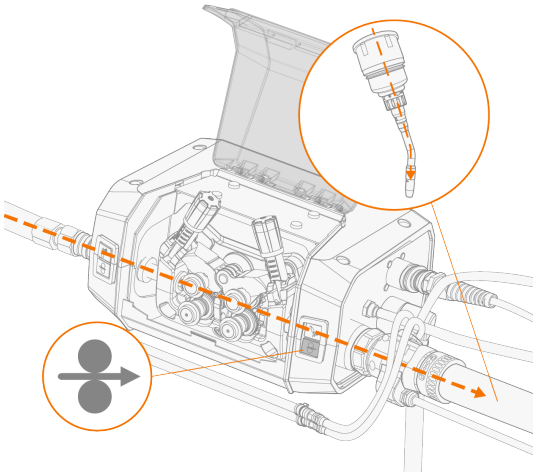
Filler wire	Feed roll profile	Filler wire diameter (mm)	Adjustment (x100N)
Fe/Ss solid	V-groove V	0.8–1.0	1.5–2.0
		≥ 1.2	2.0–2.5
Metal and flux-cored	V-groove, knurled V≡	≥ 1.2	1.0–2.0
Self-shielded (gasless)	V-groove, knurled V≡	≥ 1.6	2.0–3.0

Aluminum	U-groove U	1.0	0.5–1.0
		1.2	1.0–1.5
		1.4	1.5–2.0
		≥ 1.6	2.0–2.5

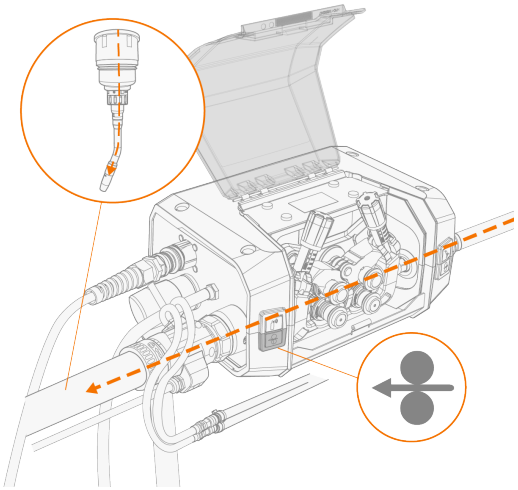
⚠ *Excessive pressure flattens the filler wire and may damage coated or cored filler wires. Excessive pressure also unnecessarily wears the feed rolls and increases gearbox load.*

10. Press the Wire inch forward button to drive the filler wire into the welding torch. Stop when the wire reaches the welding torch's contact tip.

R500 Wire Feeder EUR



R500 Wire Feeder RH EUR+



2.16.2 INSTALLING WIRE (R500 WF HD EUR+)

This section describes how to install filler wire on R500 Wire Feeder HD EUR+. For the wire feeder part descriptions, refer to "R500 Wire Feeder HD EUR+" on page 18 and "Wire feed mechanism" on page 19.

Install the welding torch to the wire feeder before installing the wire.

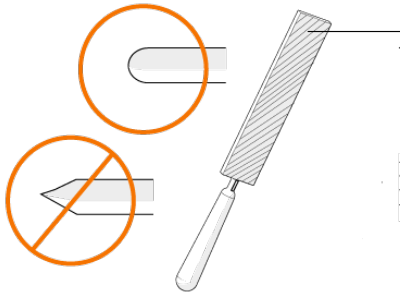
When changing the wire, remove the remaining filler wire from the welding torch and wire feed mechanism.

Always ensure that the feed rolls are suitable for the filler wire (diameter and material) in question. Refer also to "Wire feeder consumables" on page 258.

1. Release the filler wire end and cut off any deformed section so that the end is straight.

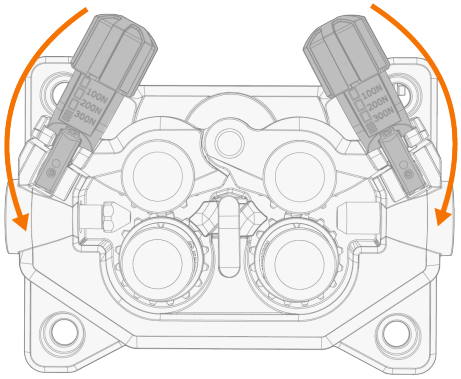
If using a wire spool, ensure that the filler wire does not unravel from the spool when it is released.

2. File the tip of the filler wire smooth.

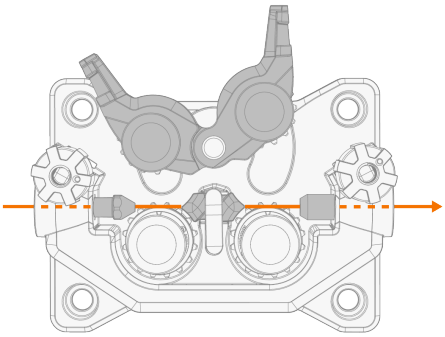


Sharp edges on the filler wire tip may damage the wire liner.

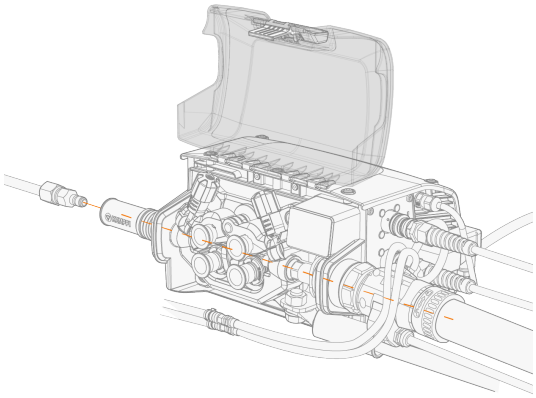
3. Guide the filler wire through the wire conduit between the wire drum and the wire feeder.
4. Release the pressure handles.



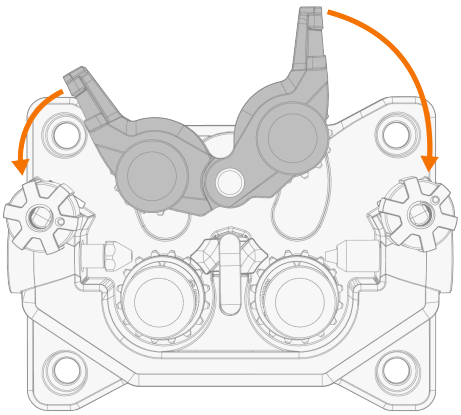
5. Guide the filler wire through the inlet guide tube, middle guide tube and into the outlet guide tube, which feeds the filler wire to the welding torch.



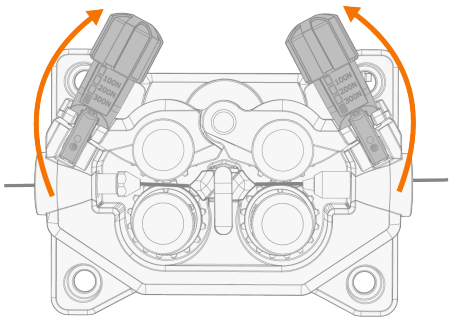
6. Push the filler wire by hand through the euro connector.



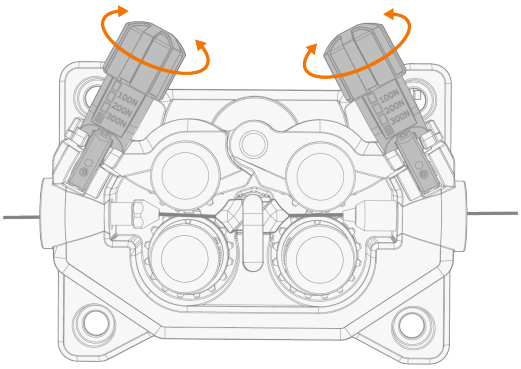
7. Close the pressure roll locking arms.



8. Close the pressure handles.



9. Adjust the pressure of the feed rolls with the pressure adjustment wheels. The pressure is the same for both feed roll pairs.



The graduated scales on the pressure handle indicate the pressure applied to the feed rolls. Adjust the pressure of the feed rolls according to the table below.

Filler wire	Feed roll profile	Filler wire diameter (mm)	Adjustment (x100N)
Fe/Ss solid	V-groove V	0.8–1.0	1.5–2.0
		≥ 1.2	2.0–2.5
Metal and flux-cored	V-groove, knurled V≡	≥ 1.2	1.0–2.0
Self-shielded (gasless)	V-groove, knurled V≡	≥ 1.6	2.0–3.0
Aluminum	U-groove U	1.0	0.5–1.0
		1.2	1.0–1.5
		1.4	1.5–2.0
		≥ 1.6	2.0–2.5

⚠ *Excessive pressure flattens the filler wire and may damage coated or cored filler wires. Excessive pressure also unnecessarily wears the feed rolls and increases gearbox load.*

10. Press the Wire inch forward button to drive the filler wire into the welding torch. Stop when the wire reaches the welding torch's contact tip.

2.16.3 INSTALLING WIRE (RA50 4R)

This section describes how to install filler wire on the RA50 4R assistive wire feeder.

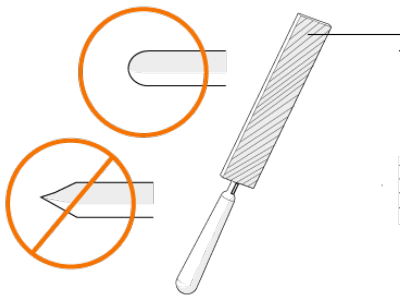
For part descriptions, refer to "RA50 4R assistive wire feeder (optional)" on page 25 and "Wire feed mechanism" on page 26.

⚠ *Always ensure that the feed rolls are suitable for the filler wire (diameter and material) in question. Refer also to "Wire feeder consumables" on page 258.*

1. Release the filler wire end and cut off any deformed section so that the end is straight.

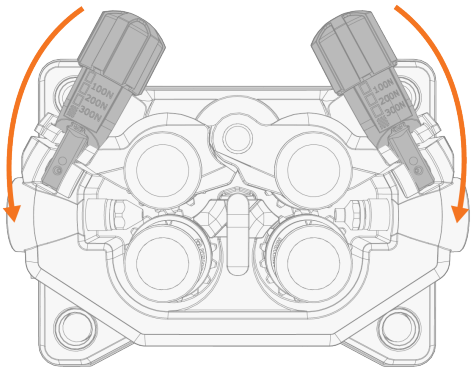
ⓘ *If using a wire spool, ensure that the filler wire does not unravel from the spool when it is released.*

2. File the tip of the filler wire smooth.

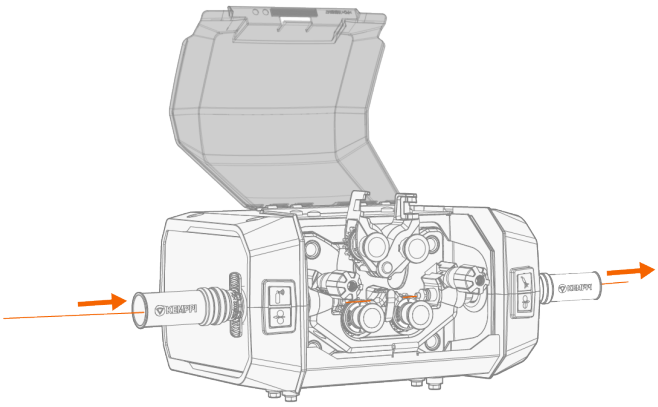


⚠ *Sharp edges on the filler wire tip may damage the wire liner.*

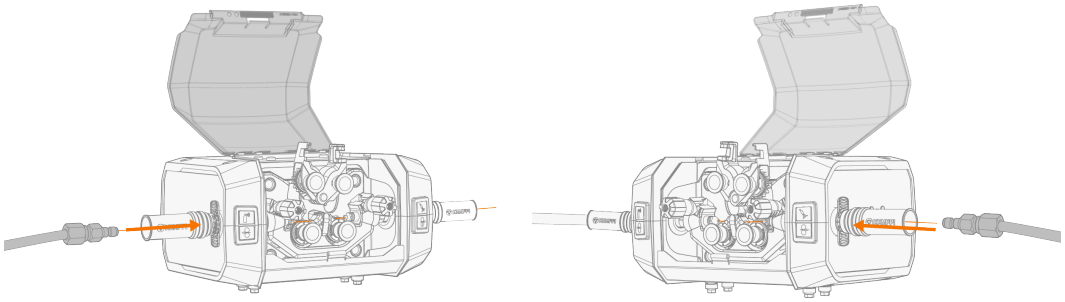
3. Release the pressure handles on the wire feed mechanism.



4. Guide the filler wire through the inlet guide tube, middle guide tube and the outlet guide tube.



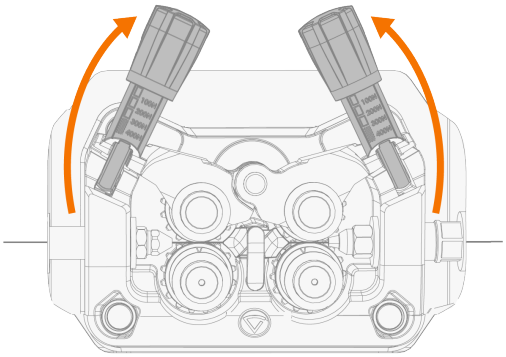
5. Connect the wire conduits to the wire conduit connectors.



6. **Main wire feeder:** Detach the wire conduit from the connector.

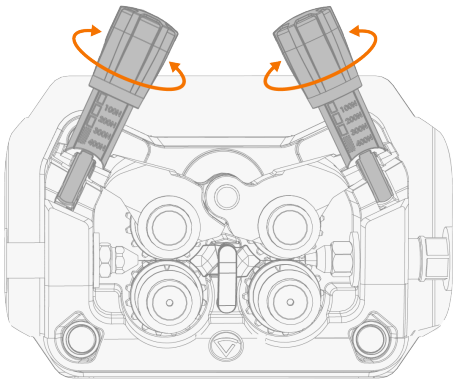
Installing the filler wire to the main wire feeder separately (by using the main wire feeder's wire inch forward button) makes it easier to insert the filler wire into the feed roll grooves.

7. Close the pressure handles.



8. Adjust the pressure of the feed rolls with the pressure adjustment wheels.

⚠ *Apply even pressure on both pressure handles.*

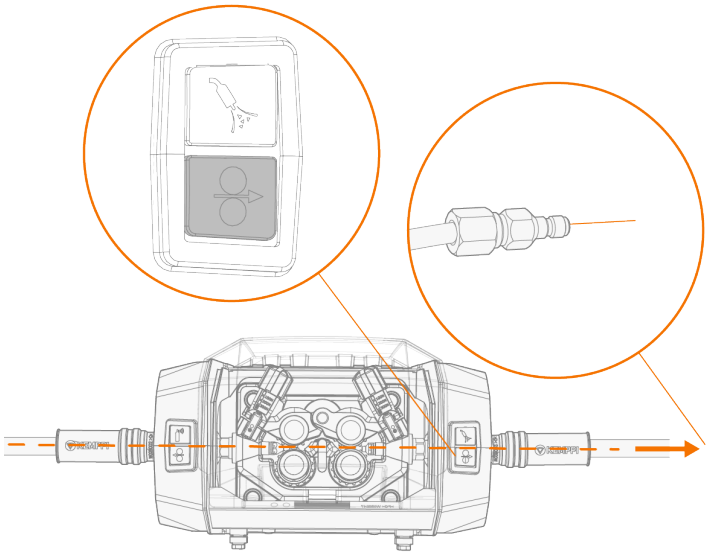


The graduated scales on the pressure handle indicate the pressure applied to the feed rolls. Adjust the pressure of the feed rolls according to the table below.

Filler wire	Feed roll profile	Filler wire diameter (mm)	Adjustment (x100N)
Fe/Ss solid	V-groove V	0.8–1.0	1.5–2.0
		≥ 1.2	2.0–2.5
Metal and flux-cored	V-groove, knurled V≡	≥ 1.2	1.0–2.0
Self-shielded (gasless)	V-groove, knurled V≡	≥ 1.6	2.0–3.0
Aluminum	U-groove U	1.0	0.5–1.0
		1.2	1.0–1.5
		1.4	1.5–2.0
		≥ 1.6	2.0–2.5

⚠ *Excessive pressure flattens the filler wire and may damage coated or cored filler wires. Excessive pressure also unnecessarily wears the feed rolls and increases gearbox load.*

9. Press the wire inch forward button to drive the filler wire through the wire conduit that will be connected to the main wire feeder.



10. **Main wire feeder:** Install the filler wire to the main wire feeder (refer to "Installing wire (R500 WF EUR/EUR+)" on page 101 or "Installing wire (R500 WF HD EUR+)" on page 105) and connect the wire conduit to the connector (refer to "Connecting cables to R500 WF EUR/EUR+" on page 71 or "Connecting cables to R500 WF HD EUR+" on page 73).

2.17 INSTALLING GAS BOTTLE

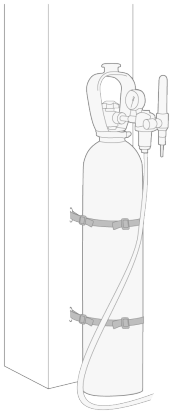
Handle gas bottles with care. There is a risk of injury if the gas bottle or the bottle valve is damaged!

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 transport unit with a gas bottle rack is used, install the gas bottle on the transport unit first, then make the connections.
- Install the welding gun to the wire feeder before installing and testing the gas bottle.
- Do not use the whole contents of the bottle.
- Always use an approved and tested regulator and flow meter.

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

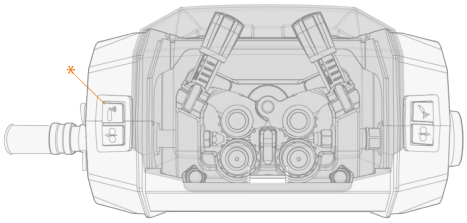
1. Secure the gas bottle properly in an upright position to e.g. a special holder on the wall.



2. If not already, connect the welding torch to the wire feeder.
3. Connect the gas hose to the wire feeder.

In a standard setup, the gas hose is included in the interconnection cable bundle (for more information, refer to "Connecting cables to R500 WF EUR/EUR+" on page 71).

4. Open the gas bottle valve.
5. Press the gas test button on the wire feeder or in the AX Manager's Tools view to run the gas into the system.



Use the gas test also to test that the gas flows through the system properly.

6. Press the gas test button again to adjust the gas flow. Use an external flow meter and regulator for measuring and adjustment.

2.18 HOW TO GET WELDING PROGRAMS

The use of welding programs and Wise and MAX features and processes is possible with the X5 standard and pulse power sources (see Equipment description). WiseRoot+, WiseThin+ and MAX Position processes require a pulse power source (with the Wise processes specifically a Pulse+ power source is required).

Welding programs, Wise processes (WiseRoot+, WiseThin+) and MAX processes (MAX Cool, MAX Speed, MAX Position) for each individual AX MIG Welder equipment are installed at the time of purchase according to your specific welding requirements. This can be done by your local Kemppi dealer. Welding programs as well as the advanced welding features can also be added later on.

For more information on the available welding program options and installing the welding programs or software updates, contact your local Kemppi dealer or go to Kemppi.com.

The manual MIG process doesn't require additional welding programs.

For applying the welding programs installed on your AX MIG Welder equipment, refer to "Applying welding programs" on page 168.

The list of installed welding programs on your equipment can be seen in the AX Manager's info view under **Welding software**.

3. OPERATION

The equipment contains a circuit with high voltage and shall only be used by instructed or skilled persons or experts.

Welding is forbidden in places where there is an immediate fire or explosion hazard!

The interconnection cable heats up during welding. Handle the cables with caution.

Check that there is enough space for cooling air circulation in the machine vicinity.

Always check before use that interconnection cable, 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.

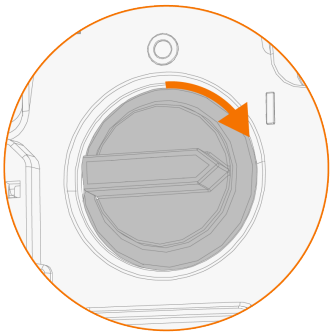
3.1 PREPARING WELDING SYSTEM FOR USE

Before starting the use of the welding equipment:

- Ensure the installation has been completed
- Turn on the welding equipment
- Prepare the cooler
- Connect the earth return cable
- Calibrate the welding cable (refer to "Calibrating welding cable" on page 119 for instructions).

Turning on welding system

To turn on the welding equipment, turn the power source main switch to ON (I).



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

Connecting earth return cable

Keep the welding 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 welding piece.

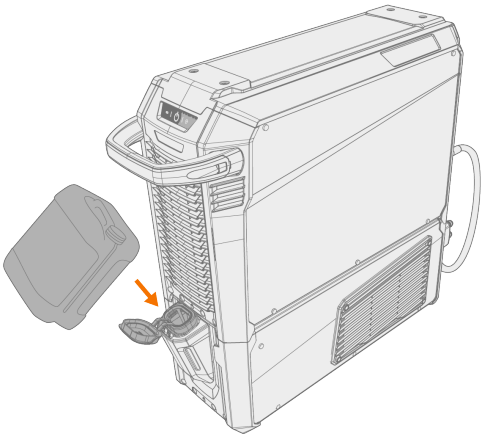
Ensure that the surface contact to the table is clean of metal oxide and paint and that the clamp is firmly secured.

3.1.1 FILLING COOLER AND CIRCULATING COOLANT

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.

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



3. Close the cooler cap.

To circulate 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 gun.

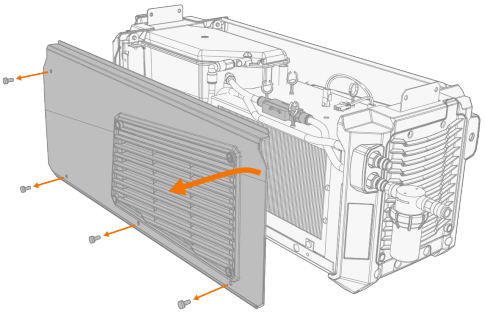
Complete the coolant circulation operation after each time you change the welding gun.

To test coolant flow sensor:

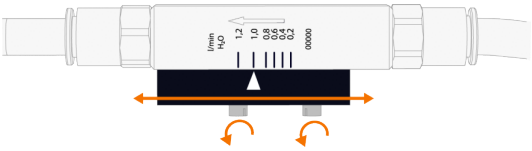
Obstruct the coolant flow by squeezing the coolant inlet hose until error code 26 (Cooling liquid not circulating) is displayed in AX Manager.

To adjust coolant flow sensor:

1. Unscrew the mounting screws on the side of the cooling unit and remove the side plate.



2. Adjust the coolant flow sensor by loosening the locking screws on the slider and moving the slider to the desired flow rate.



3. Tighten the slider locking screws.
4. Replace the cooler side plate and tighten the mounting screws.

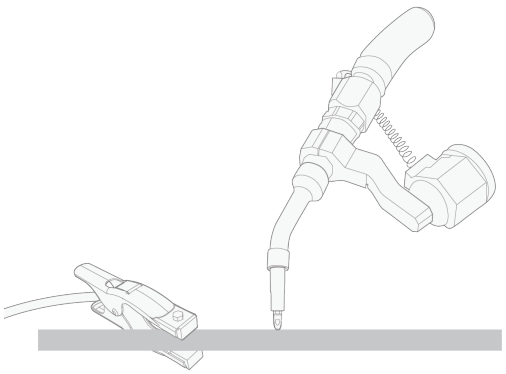
3.1.2 CALIBRATING WELDING CABLE

Welding cable resistance can be measured using the built-in cable calibration function without an additional measurement cable.

For a successful calibration, use a clean/new contact tip and ensure that the work piece surface is clean.

1. Remove the welding torch gas nozzle.
2. Pull back the remaining filler wire from the welding torch by pressing the wire inch backward button (if necessary, cut the wire first).
3. Place the welding torch at a right angle (90°) to approximately 1 mm from the work piece.
4. Move the welding torch so that the contact tip touches the work piece.

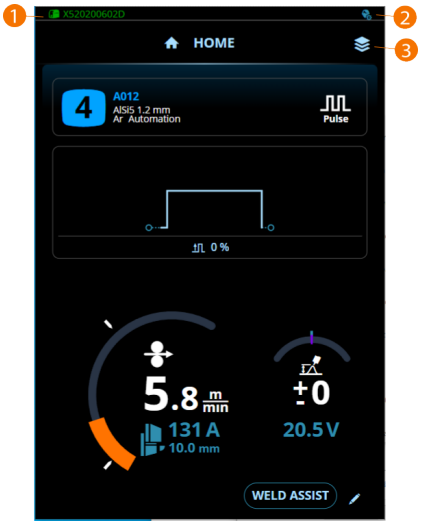
The contact between the contact tip and the workpiece must be sufficient. However, the contact tip must not be pressed too hard against the work piece.



5. In AX Manager, go to **Settings - Device settings** and select **Cable calibration** and follow the on-screen instructions.
6. Check the measured values in AX Manager and repeat calibration if necessary (if, for example, the calibration failed due to poor contact between the contact tip and the work piece).
7. After calibration, lift the welding torch from the work piece, run the wire out of the contact tip and reattach the gas nozzle.

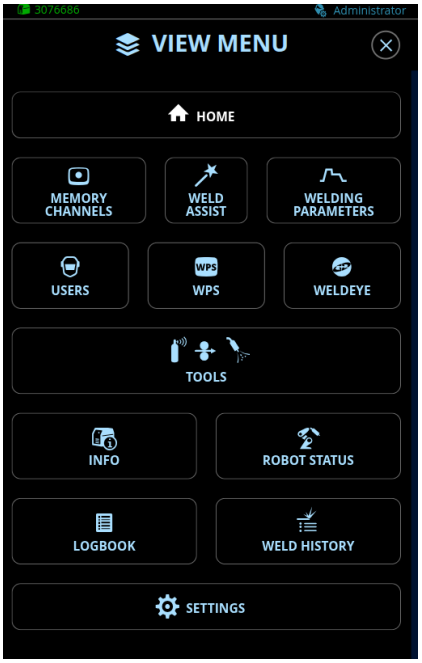
3.2 USING AX MANAGER

AX Manager is the user interface for controlling AX MIG Welder. AX Manager can be used with a PC, tablet and mobile device. The parameters, functions and symbols are shortcuts to the corresponding views.

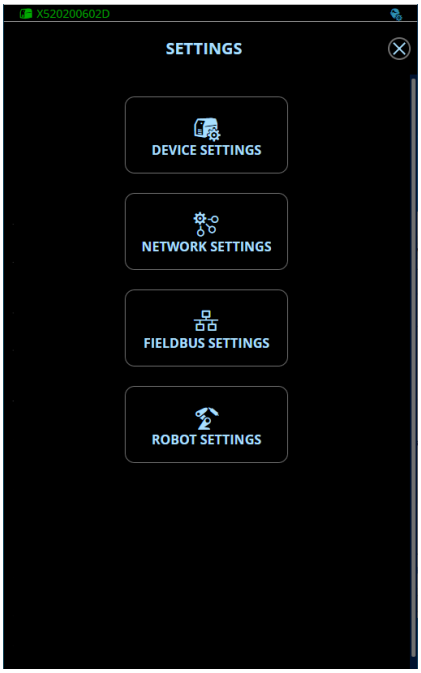


1. Device serial number
2. User
   >> Shortcut to the **Users** view
3. View menu
   >> Enter view selection.

View menu



Settings view menu



Views:

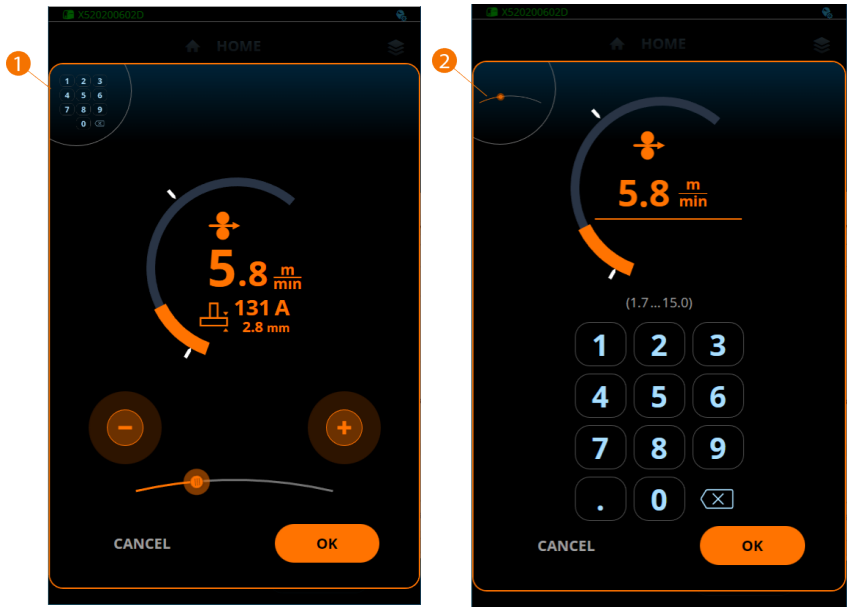
Home

Memory channels

Welding parameters
Weld Assist
Users
WPS
WeldEye
Tools
Info
Robot status
Logbook
Weld history
Device settings
Network settings
Fieldbus settings
Robot settings

Adjustment views

In adjustment views you can adjust parameter values with a number pad or a slider.

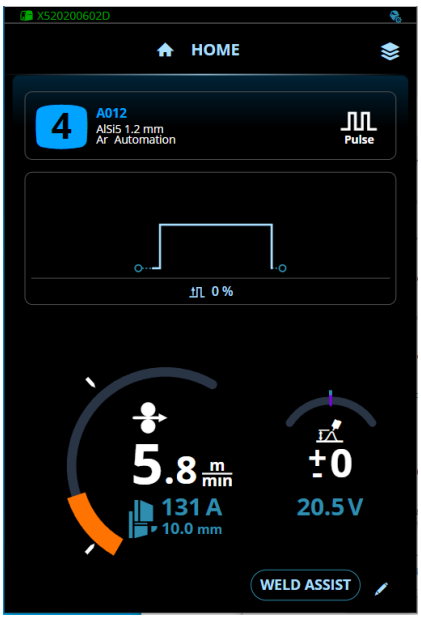


1. Select to change to a number pad.
2. Select to change to a slider.

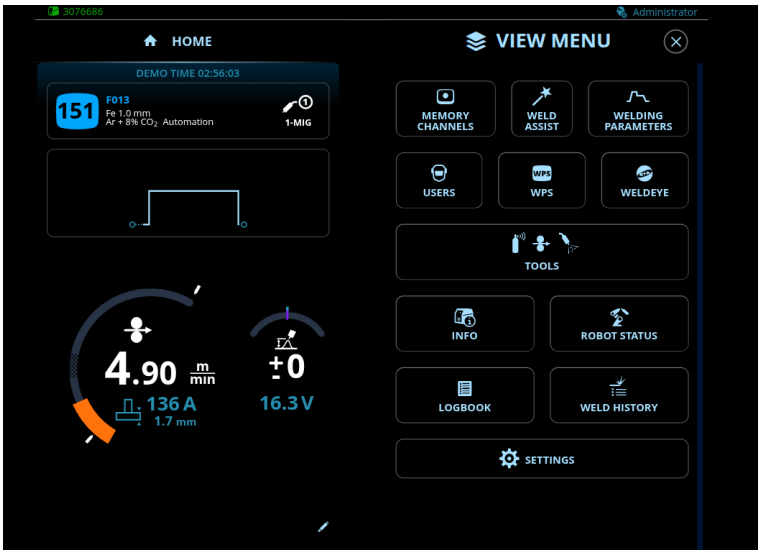
Scaling

The views scale differently depending on the device used.

Scaling in mobile device



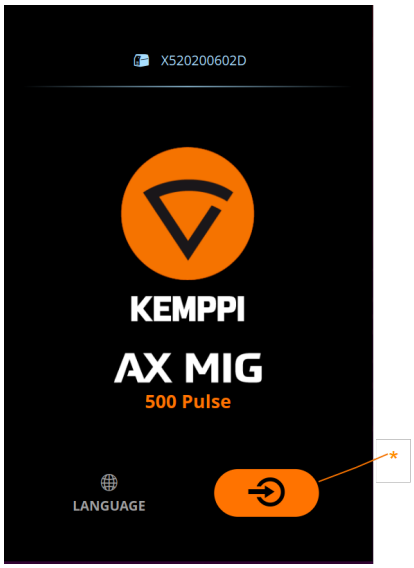
Scaling in tablet and PC



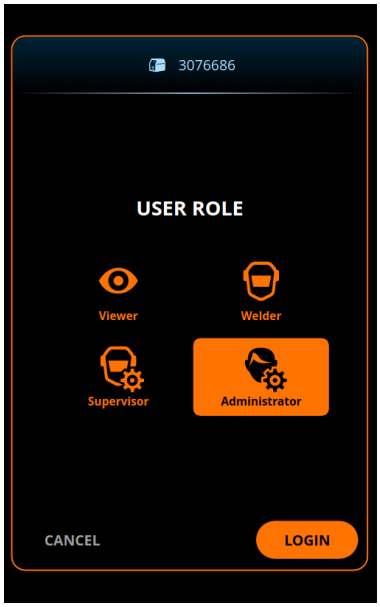
3.2.1 LOGGING INTO AX MANAGER

This section describes a typical scenario for logging into AX Manager. However, note that the content and functionality of the login view vary depending on the administrator's settings.

1. Access the AX Manager user interface in your internet browser.
2. Select the start button (*).

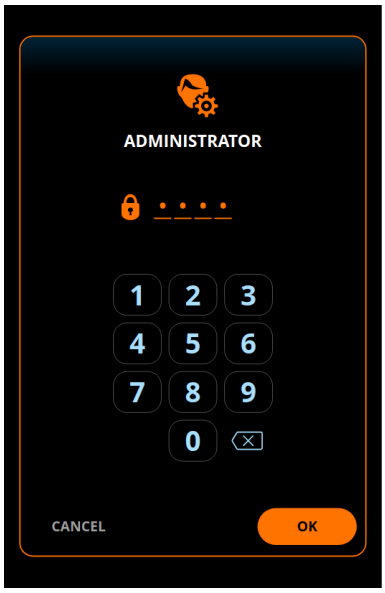


3. Choose a user role and select 'Login'.



4. Insert the PIN code and select OK.

The administrator's default PIN code is the four-digit RCM security code that can be found in the serial number sticker on the RCM device.

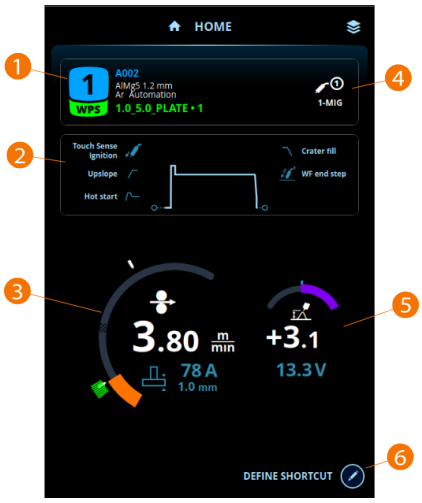


For more information, refer to "Users" on page 127.

For the required network settings for connecting to AX Manager, refer to "Connecting to AX Manager user interface" on page 33.

3.2.2 HOME

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

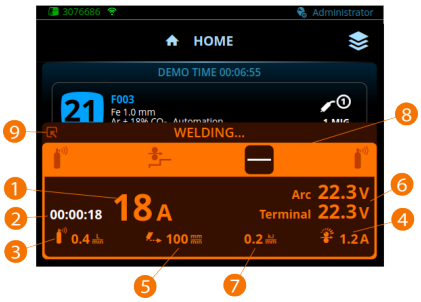


1. Memory channel, welding program and WPS (if in use)
2. Applied welding parameters and functions
3. Wire feed speed
   >> With 1-MIG + WisePenetration and Pulse + WisePenetration combinations current is displayed
   >> With MAX Position process plate thickness is displayed
   >> The white marks indicate the adjustment range
   >> The green mark indicates the adjustment range defined on the active WPS (If you adjust the welding parameters outside the adjustment range defined on the active WPS, a warning is displayed)
4. Active welding process

5. Welding voltage (arc voltage)
   >> With 1-MIG, pulse and double pulse processes voltage fine tuning is displayed
   >> With Wise/MAX process a corresponding Wise/MAX parameter adjustment is displayed
6. Configurable shortcut
   >> To define a shortcut, select the **Edit** button and then select the shortcut from the list of available options.

Home view during welding

During welding, the welding data is displayed in the welding data window.



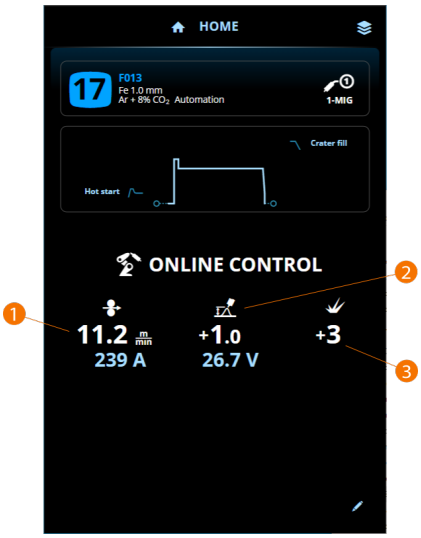
1. Welding current
2. Welding duration
3. Shielding gas flow rate (in R500 Wire Feeder EUR+ models only when the gas flow sensor is activated in Robot settings)
4. Wire feeder motor current
5. Welding travel speed (if the robot provides the welding travel speed in the fieldbus control table)
6. Arc voltage and terminal voltage
7. Heat input calculation (if the robot provides the welding travel speed in the fieldbus control table)
8. Welding cycle with the ongoing phase highlighted.
9. Minimizes the welding data window to an icon. Selecting the icon restores the welding data window.

The welding cycle symbols are explained in the following table:

Symbol	Description
	Pre and post gas
	Creep start
	Upslope
	Hot start
	Continuous welding
	Crater fill

Home view in online control mode

In online control mode the robot controls the values of certain welding parameters directly. For more information, refer to "Online control" on page 178.



1. Wire feed speed
   >> With 1-MIG + WisePenetration and Pulse + WisePenetration combinations current is displayed
   >> With MAX Position process plate thickness is displayed
2. Fine tuning
   >> With manual MIG process welding voltage is displayed
   >> With Wise/MAX process a corresponding Wise/MAX parameter adjustment is displayed
3. Dynamics
   >> Displayed only with 1-MIG, manual MIG, MAX Position and WiseThin+ processes.

After each weld, a weld summary (Weld data) is displayed briefly.

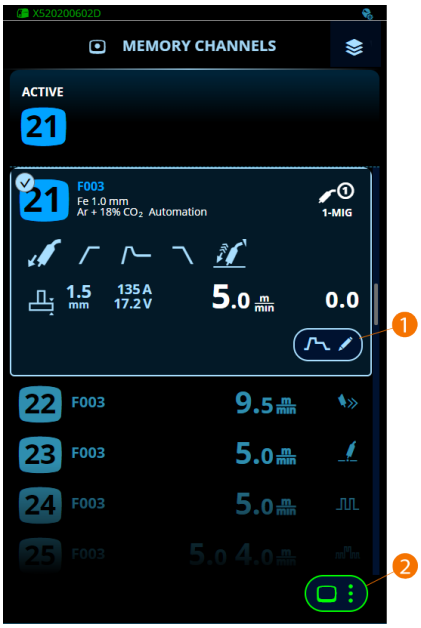
3.2.3 MEMORY CHANNELS

The memory channel view can be accessed via the Home view or the View menu. The number of available memory channels is 200.

The '0' memory channel is always reserved for the manual MIG process and cannot be deleted.

The user can activate a memory channel for editing when welding is not ongoing. The robot selects the memory channel for welding.

To activate a channel for editing, select the desired memory channel and select 'Activate'. In the active memory channel, the 'Welding parameters' edit button (1) opens the "Welding parameters" on page 131 view. The 'Actions' button (2) opens the actions menu.



Managing memory channels

1. Open the actions menu.
2. Select the desired action.
3. Make further selections as required.

The available actions are:

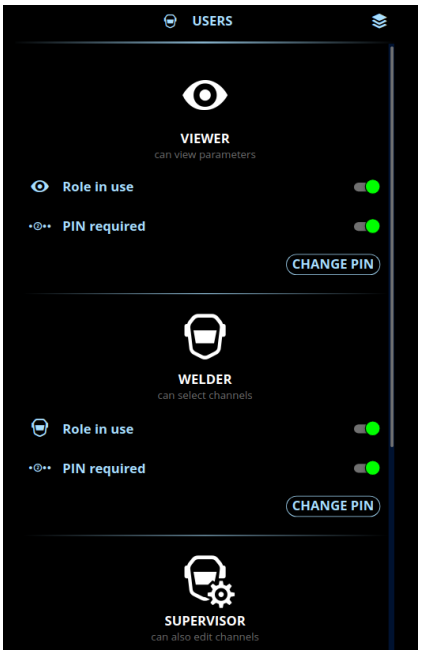
- **Save to**: Save the current settings to another channel
- **Rename**: Give a name to the currently selected channel
- **Delete**: Delete the currently selected channel
- **Create channel**: Create a new channel based on the welding program(s)
  >> Welding programs can be filtered by base material, wire material, wire diameter, shielding gas and process. For more information, refer to "Applying welding programs" on page 168.
- **Create from programs**: Create new channels based on all of the licensed welding programs available
- **Delete all**: Delete all channels.

The skewed channel number indicates that the set welding parameters are different from the ones currently saved on the memory channel:



3.2.4 USERS

User roles are managed in the **Users** view.



In the **Users** view the administrator can:

- choose whether a user role is enabled (the administrator user role is always enabled)
- choose whether a PIN code query is assigned to a user role
- change the PIN code of a user role.

If the 'PIN required' is switched off and on again, a new PIN code must be set to the user role.

Different users have different levels of access and permissions based on their roles. The user roles are described in the following table:

User role	Access level	Description
Viewer	0	The viewer can select language and monitor data.
Welder	1	The welder can adjust welding values within the limits set by the supervisor. The welder cannot change system settings or memory channels.
Supervisor	2	The supervisor specifies welding value limits to be used by welders. The supervisor creates, modifies and deletes memory channels. The supervisor cannot change system settings.
Administrator	3	The administrator manages all settings in the system. The administrator user cannot be disabled.

A maximum of three viewers and one user with the right to modify data (welder, supervisor, administrator) can be logged in at the same time.

If a user is logged in with a role that can modify data and a user with a role of a higher access level logs in, the previous user will be changed to viewer.

3.2.5 WELD ASSIST

Weld Assist is available for 1-MIG and pulse welding processes.

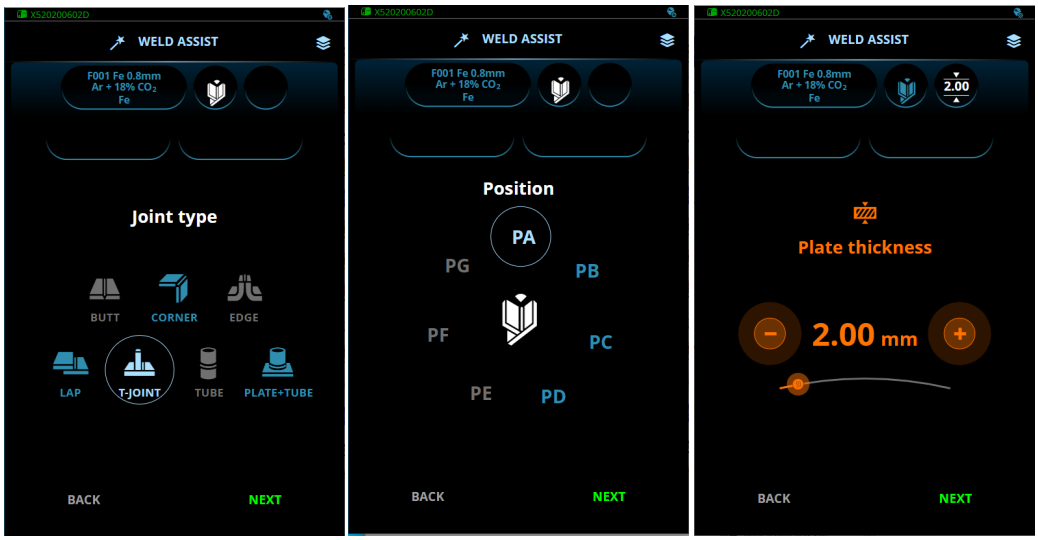
Weld Assist is a wizard-like utility for easy selection of welding parameters. The utility walks the user step-by-step through the selection of required parameters.

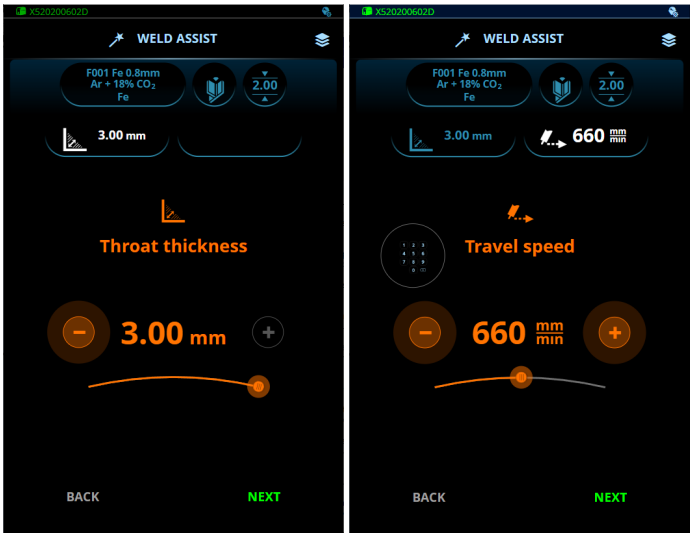
The currently selected welding program, including filler wire and shielding gas information, is shown and used as a basis in Weld Assist. If necessary, the welding program can be changed before continuing by selecting the default welding program and selecting a new one from the list.

1. Go to the Weld Assist view and select 'Next'.



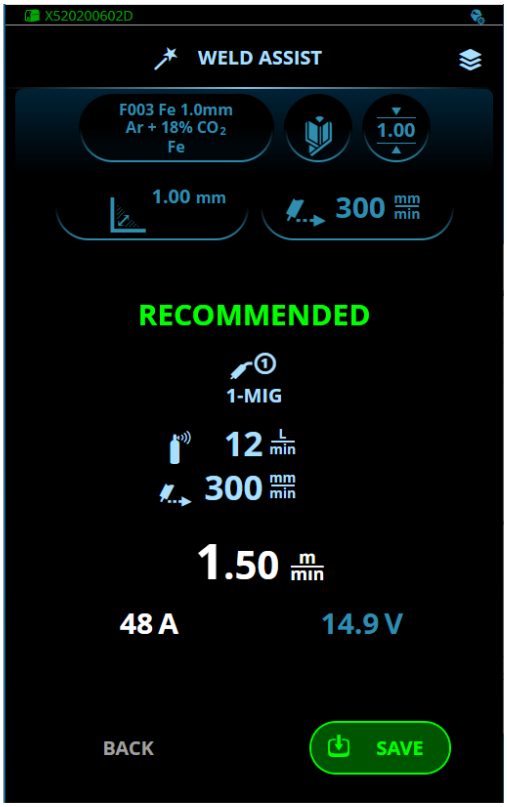
2. Select:
   >> The welding joint type: T-joint / lap joint / corner joint / plate+tube joint
   >> The welding position: PA / PB / PC / PD
   >> The plate thickness (1...12 mm)
   >> The throat thickness (1...6 mm). Note: Throat thickness cannot be selected with corner joint. With lap joint, the throat thickness cannot be selected when the plate thickness is 1...3 mm.
   >> The travel speed (300...1500 mm/min)





3. Weld Assist gives you a recommendation for these welding parameters:
   >> Welding process
   >> Gas flow rate (measured at the gun end)
   >> Wire feed speed
   >> Indicative values for welding current and voltage.

4. Save the Weld Assist's recommendation for welding settings by selecting 'Save'.



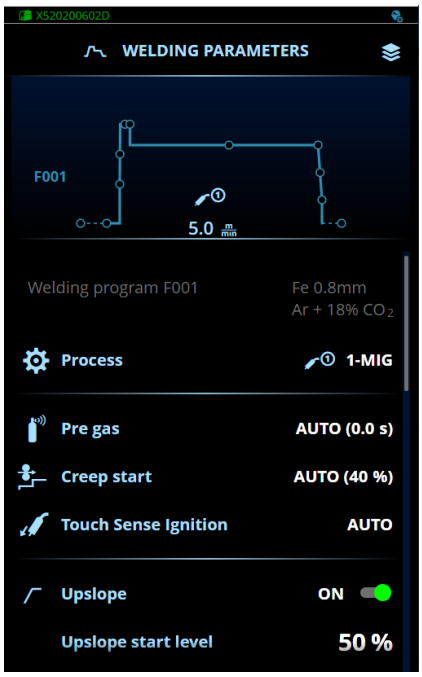
5. Select the memory channel slot for saving.
6. To use the memory channel, select 'Use' in Weld Assist, or later in the **Memory channels** view.

The welding parameters created with Weld Assist are still adjustable as per normal.

3.2.6 WELDING PARAMETERS

The Welding parameters view includes a start and stop curve for visualizing and adjusting the most essential parameters for a weld. The bottom section of the view lists the available adjustments for the selected welding process. The welding process selection is based on the active memory channel and its settings.

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



Adjusting welding parameters

1. Select a welding parameter for adjustment.
   >> You can navigate in the parameter list also by selecting a phase in the start and stop curve.
2. Adjust the welding parameter value.
   >> Depending on the parameter to be adjusted, refer also to the Welding parameter tables below for more details.
3. Confirm the new value / selection and close the adjustment view by selecting 'OK'.

Welding parameters and feature descriptions

Manual MIG welding parameters

The parameters listed here are available for adjustment with the manual MIG process.

Parameter	Parameter value	Description
Process	Manual MIG, 1-MIG, Pulse, DPulse, WiseRoot+, WiseThin+, MAX Cool, MAX Speed, MAX Position	This MIG welding process selection depends on the active welding program. For more information on the additional processes, refer to "Additional guidance to functions and features" on page 172.
Pre gas	0.0 ... 9.9 s, Auto, step 0.1 0.0 = OFF Default = Auto	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. Time value is preset by the user. Used for all metals, but especially for stainless steel, aluminum and titanium.

Creep start	10 ... 100 %, Auto, step 1 Default = Auto	The Creep start function defines the wire feed speed before the welding arc ignites, that is, before the filler wire comes in contact with the workpiece. When the arc ignites, the wire feed speed is automatically switched to the normal user-set speed. The Creep start function is always on.
Touch Sense Ignition	Auto/OFF/ON Default = Auto	Touch Sense Ignition delivers minimum spatter and stabilizes the arc immediately after ignition. For more information, refer to "Touch Sense Ignition" on page 182.
Wire feed speed	0.5 ... 25 m/min, step 0.05 or 0.1 Default = 5.00 m/min	Wire feed speed adjustment. When the wire feed speed is less than 5 m/min, the adjustment step is 0.05 and when the wire feed speed is 5 m/min or more, the adjustment step is 0.1.
Wire feed speed limit min	Min/Max = 0.5 ... 25 m/min, step 0.1 Default = 0.5 m/min	Minimum and maximum limits for the wire feed speed adjustment.
Wire feed speed limit max	Min/Max = 0.5 ... 25 m/min, step 0.1 Default = 25 m/min	
Voltage	400 A: 8 ... 45 V 500 A: 8 ... 50 V Step 0.1 V	Welding voltage adjustment and the minimum and maximum limits for the welding voltage adjustment.
Dynamics	-10.0 ... +10.0, step 0.2 Default = 0	Controls the short circuit behavior of the arc. The lower the value the softer the arc, the higher the value the rougher the arc.
Robot travel speed	20...2000 mm/min, step 1 / Controlled by robot Default = Controlled by robot	The user can set the travel speed in a memory channel to be transmitted to the robot. However, note that: - The robot must have a function that enables the use of the value transmitted from the memory channel. - The travel speed can still be set directly in the robot program, in which case the value of the robot program overrides the value transmitted from the memory channel.

Crater fill	ON/OFF	When welding with high power, a crater is usually formed at the end of the weld. The Crater fill function decreases the welding power / wire feed speed at the end of the welding job so that the crater can be filled using a lower power level. With MIG process, crater fill time, wire feed speed and voltage are preset by the user. When the wire feed speed is less than 5 m/min, the adjustment step is 0.05 and when the wire feed speed is 5 m/min or more, the adjustment step is 0.1. For 1-MIG process, refer to the 1-MIG parameter table.
- Crater fill time	0.0 ... 10.0 s, Auto, step 0.1 Default = 1.0 s	
- Crater fill wire feed speed	0.5 ... 25.0 m/min, Auto, step 0.05 or 0.1 Default = 5 m/min	
- Crater fill voltage	400 A: 8 ... 45 V, Auto 500 A: 8 ... 50 V, Auto Step 0.1 V Default = 18V	
Post current	-30 ... +30	Post current setting affects the wire length at the weld end, for example to prevent the wire from stopping too close to the weld pool. This also enables the optimum wire length for the start of the next weld.
Wire feed end step (WF end step)	OFF/ON Default = OFF	Wire feed end step feature prevents the filler wire from sticking to the contact tip when the welding ends.
Post gas	0.0 ... 9.9 s, Auto, step 0.1 0.0 = OFF Default = Auto	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.

1-MIG welding parameters

The parameters listed here are available for adjustment with the 1-MIG process.

Parameter	Parameter value	Description
Welding program		Displays the welding program in use. You cannot change the welding program in this view. For changing a welding program, refer to "Applying welding programs" on page 168.
Process	MIG, 1-MIG, Pulse, DPulse, WiseRoot+, WiseThin+, MAX Cool, MAX Speed, MAX Position	This MIG welding process selection depends on the active welding program. For more information on the additional processes, refer to "Additional guidance to functions and features" on page 172.

Pre gas	0.0 ... 9.9 s, Auto, step 0.1 0.0 = OFF Default = Auto	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. Time value is preset by the user. Used for all metals, but especially for stainless steel, aluminum and titanium.
Creep start	10 ... 100 %, Auto, step 1 Default = Auto	The Creep start function defines the wire feed speed before the welding arc ignites, that is, before the filler wire comes in contact with the workpiece. When the arc ignites, the wire feed speed is automatically switched to the normal user-set speed. The Creep start function is always on.
Touch Sense Ignition	AUTO/OFF/ON Default = Auto	Touch Sense Ignition delivers minimum spatter and stabilizes the arc immediately after ignition.
Upslope	ON/OFF Default = OFF	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. The upslope start level and time are preset by the user.
- Upslope start level	10 ... 100 %, Auto, step 1 Default = 50	
- Upslope time	0.1 ... 5 s, Auto, step 0.1 Default = 0.1	
Hot start	ON/OFF Default = OFF	Welding function that uses higher or lower wire feed speed and 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 level and time are adjustable by the user. The Hot start slope time adjustment sets the transition time from the Hot start phase to the normal welding current level. The Hot start fine tuning (voltage) is adjustable with 1-MIG, Pulse, DPulse, WiseThin+ and MAX Speed processes.
- Hot start level	-50 ... +200 %, Auto, step 1 Default = 140	
- Hot start fine tuning	-10.0 ... +10.0, step 0.1 Default = 0	
- Hot start time	0.1 ... 9.9 s, Auto, step 0.1 Default = 1.2 s	
- Hot start slope time	0.0 ... 10.0 s, step 0.1 s Default = 0	
Wise feature	None, WiseFusion, WisePenetration, WiseSteel	When selected, a list of available Wise features is opened for selection. For more information, refer to "Additional guidance to functions and features" on page 172. (Not available with WiseRoot+, WiseThin+, MAX Cool, MAX Speed and MAX Position.)

Wire feed speed	0.5 ... 25 m/min, step 0.05 or 0.1 Default = 5.00 m/min	Wire feed speed adjustment. When the wire feed speed is less than 5 m/min, the adjustment step is 0.05 and when the wire feed speed is 5 m/min or more, the adjustment step is 0.1.
Wire feed speed limit min	Min/Max = 0.5 ... 25 m/min, step 0.1 Default = 0.5 m/min	Minimum and maximum limits for the wire feed speed adjustment.
Wire feed speed limit max	Min/Max = 0.5 ... 25 m/min, step 0.1 Default = 25 m/min	
Current	10 ... machine size A, step 1 Default = 50 A	Welding current adjustment. With WisePenetration only.
Fine tuning	Example: -10.0 ... +10.0 V *, step 0.1	Fine tuning of the welding voltage. * The voltage range for fine tuning is defined by the active welding program.
Dynamics	-10.0 ... +10.0, step 0.2 Default = 0	Controls the short circuit behavior of the arc. The lower the value the softer the arc, the higher the value the rougher the arc.
Robot travel speed	20...2000 mm/min, step 1 / Controlled by robot Default = Controlled by robot	The user can set the travel speed in a memory channel to be transmitted to the robot. However, note that: - The robot must have a function that enables the use of the value transmitted from the memory channel. - The travel speed can still be set directly in the robot program, in which case the value of the robot program overrides the value transmitted from the memory channel.
Crater fill	ON/OFF	When welding with high power, a crater is usually formed at the end of the weld. The Crater fill function decreases the welding power / wire feed speed at the end of the welding job so that the crater can be filled using a lower power level. The Crater fill fine tuning (voltage) is adjustable with 1-MIG, Pulse, DPulse, WiseThin+ and MAX Speed processes.
- Crater fill start level	10 ... 150 %, Auto, step 1 Default = 100	
- Crater fill fine tuning	-10.0 ... +10.0, step 0.1 Default = 0	
- Crater fill time	0.1 ... 10.0 s, Auto, step 0.1 Default = 1.0 s	
- Crater fill end level	10 ... 150 %, Auto, step 1 Default = 30	
- Crater fill end level time	0.1 ... 10.0 s, step 0.1 Default = 0.0 s	
Post current	-30 ... +30	Post current setting affects the wire length at the weld end, for example to prevent the wire from stopping too close to the weld pool. This also enables the optimum wire length for the start of the next weld.

Wire feed end step (WF end step)	OFF/ON Default = OFF	Wire feed end step feature prevents the filler wire from sticking to the contact tip when the welding ends.
Post gas	0.0 ... 9.9 s, Auto, step 0.1 0.0 = OFF Default = Auto	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.

Pulse/DPulse welding parameters

The parameters listed here are available for adjustment in addition to the MIG and 1-MIG welding parameters when using an X5 pulse power source. DPulse = Double pulse process.

Parameter	Parameter value	Description
Pulse current	10 ... +15 %, step 1	The pulse current fine tuning relative to the current with Pulse and DPulse welding processes.
DPulse ratio	10 ... 90 %, step 1	This adjusts the double pulse time percentage, i.e. how long the double pulse is at the first pulse level. The second pulse level is determined in relation to the first level setting.
DPulse frequency	0.4 ... 8.0 Hz, Auto, step 0.1	This adjusts the double pulse frequency. How long it takes from the start of 1st level to the end of 2nd level.
DPulse level 1: Wire feed speed	0.50 ... 25 m/min, step 0.05 or 0.1	First double pulse level wire feed speed (and minimum / maximum values for wire feed speed). When the wire feed speed is less than 5 m/min, the adjustment step is 0.05 and when the wire feed speed is 5 m/min or more, the adjustment step is 0.1.
DPulse level 1: Fine tuning	-10 ... +10, step 1	Fine tuning of the welding voltage.
DPulse level 2: Wire feed speed	0.50 ... 25 m/min, step 0.05 or 0.1	Second double pulse level wire feed speed. The DPulse level 2 wire feed speed changes automatically when the DPulse level 1 wire feed speed setting is adjusted. When the wire feed speed is less than 5 m/min, the adjustment step is 0.05 and when the wire feed speed is 5 m/min or more, the adjustment step is 0.1.
DPulse level 2: Fine tuning	-10 ... +10, step 1	Fine tuning of the welding voltage.

MAX Speed parameters

The parameters listed here are MAX Speed process specific.

Parameter	Parameter value	Description
MAX Speed frequency	100 ... 800 Hz, Auto, step 10	MAX Speed frequency setting.

MAX Position parameters

The parameters listed here are MAX Position process specific.

Parameter	Parameter value	Description
MAX Position frequency	-0.5 ... +0.5 Hz, step 0.1 Default = 0	MAX Position frequency fine tuning.
Pulse current	-10 ... 15 %, step 1 Default = 0	MAX Position pulse current adjustment.
Plate thickness	3.0 ... 12.0 mm	MAX Position plate thickness setting.

For more information on the additional welding features and functions, refer to "Additional guidance to functions and features" on page 172.

3.2.7 WPS

The use of digital WPS (Welding Procedure Specification, dWPS) and WeldEye cloud service require a valid Kemppi WeldEye subscription with the Welding Procedures module. The AX MIG Welder equipment includes a link to a free trial registration – featuring also a free trial option for WeldEye ArcVision. For more information on WeldEye, refer to weldeye.com or contact your Kemppi representative.

Trial registration

AX MIG Welder comes preinstalled with a trial license for the WeldEye Welding Procedures module. The trial license can be activated by following these steps:

1. In AX Manager, go to the **WPS** view.
2. Use the QR code reader on your mobile device to open the WeldEye web link or navigate to 'https://register.weldeye.io/arcvision' on your web browser.



3. Complete the registration process as instructed on the registration page.

You will be required to fill in the serial number and four-digit security pin of your X5 power source. These can be found on the power source rating plate.

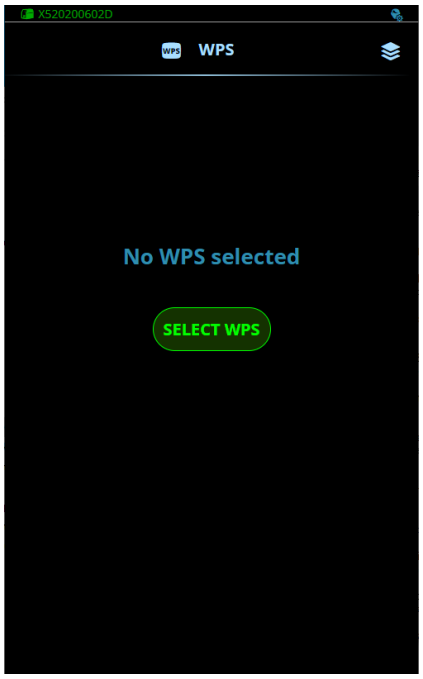
The free trial registration includes both the WeldEye Welding Procedures and WeldEye ArcVision modules.

Using dWPS

The WPS view shows the digital WPSs with one or more weld passes assigned to the welder or welding station in the Kemppi WeldEye cloud service.

To take a dWPS in use:

1. Open the list of WPSs by selecting 'Select WPS'.



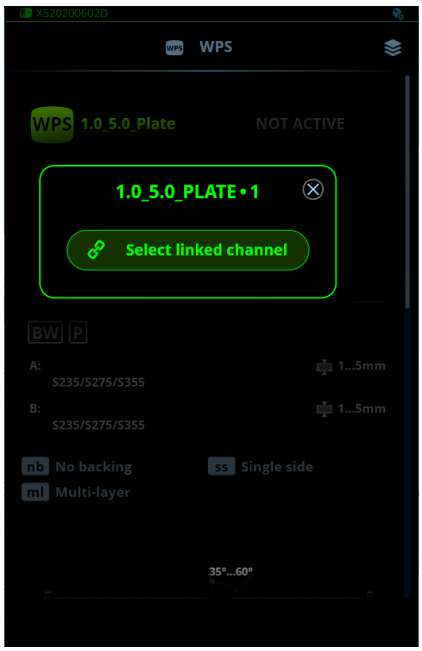
2. Select the desired WPS in the list.
3. Open the WPS details by selecting 'View'.



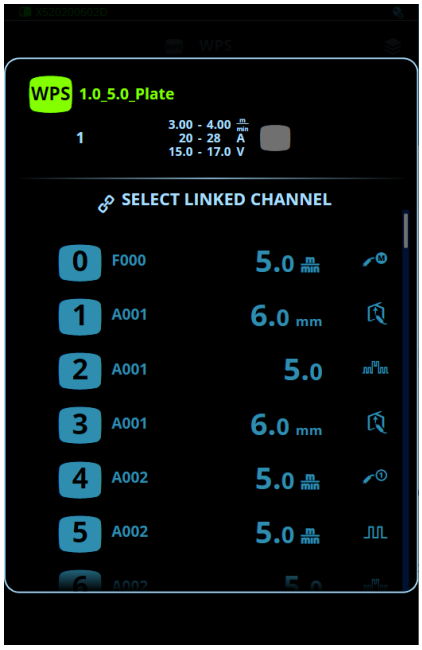
4. Select a weld pass on the WPS.



5. To link the weld pass to an existing memory channel, select 'Select linked channel'.

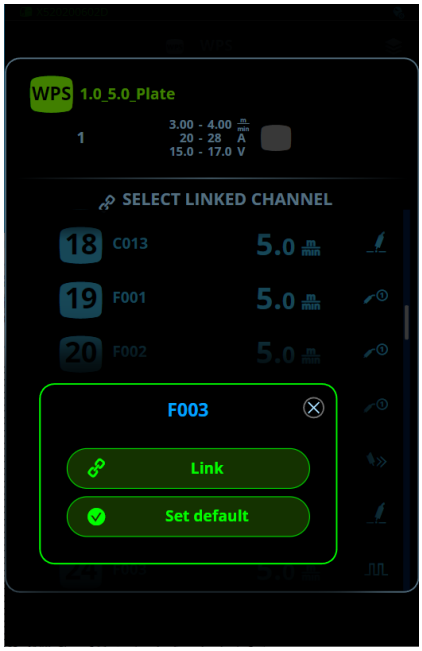


6. Select the channel to which you are linking the weld pass.



7. Confirm selection by selecting 'Link'.

   >> The memory channel set as default is activated with the 'Activate' button later on by default (it does not have to be selected in a list).



The WPS is now in use and the weld pass is linked to a memory channel.



If the selected memory channel is not active, activate the selected weld pass and the memory channel by selecting 'Activate'.

The welding parameters are still manually adjustable, but the adjustment ranges defined on the active WPS are indicated on the screen (1). If you adjust the welding parameters outside the adjustment range defined on the active WPS, a warning (2) is displayed in the home view and in the start and stop graph of the welding parameters view.

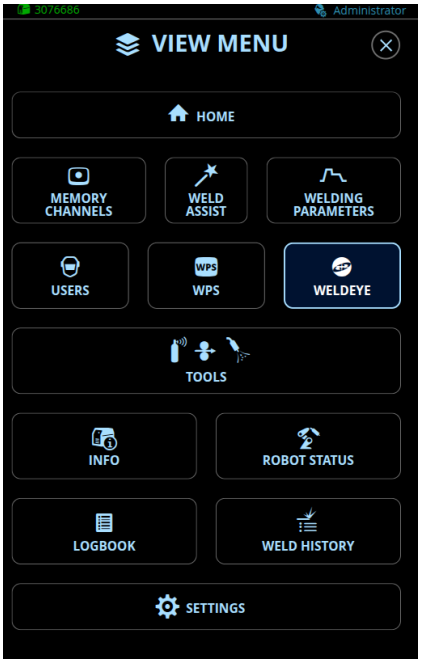


The active WPS can be deactivated by selecting 'Unlink' in the WPS's weld pass actions menu.

More feature descriptions here:

>> "Digital Welding Procedure Specification (dWPS)" on page 176
>> "WeldEye ArcVision" on page 177

3.2.8 WELDEYE



This chapter is about the optional WeldEye feature in AX MIG Welder.

*The use of this WeldEye feature and cloud service require an up-to-date AX MIG Welder and a valid **Kemppi WeldEye Quality Management** subscription. For more information on WeldEye, refer to weldeye.com or contact your Kemppi representative.*

The built-in WeldEye feature collects and passes on welding data, keeping it synchronized between the welding equipment and WeldEye cloud service. The WeldEye cloud service can be accessed using a desktop computer and an internet browser.

To take the WeldEye feature in use, the equipment must be connected to the internet via the built-in wireless connection (WLAN). Refer to "Network settings" on page 156 for instructions.

The welding equipment must also be added to your WeldEye account in the WeldEye cloud service. Once the equipment is connected to the internet and added into WeldEye, the equipment logs in to WeldEye automatically. For more information on using the WeldEye cloud service, refer to the WeldEye documentation in your organization's WeldEye cloud service.

The selections in the WeldEye view are made beforehand for the weld or work in question. The weld data is then saved along with these selections in the WeldEye cloud service after the work has been completed.

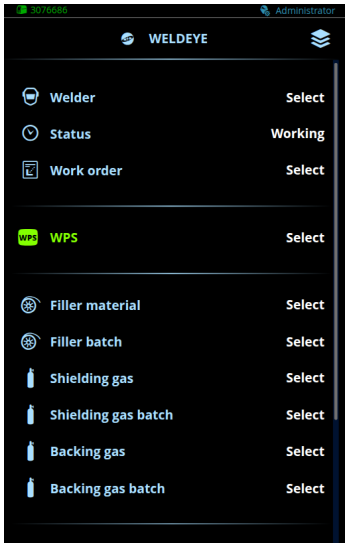
If the welding equipment loses the internet connection during work, the weld data is saved locally and synchronized with the WeldEye cloud service once the connection has been restored.

WeldEye is a highly configurable welding management software. Depending on your WeldEye cloud service settings, some of the attributes or features mentioned here may be disabled or not used in your organization. Refer to your WeldEye administrator for more information.

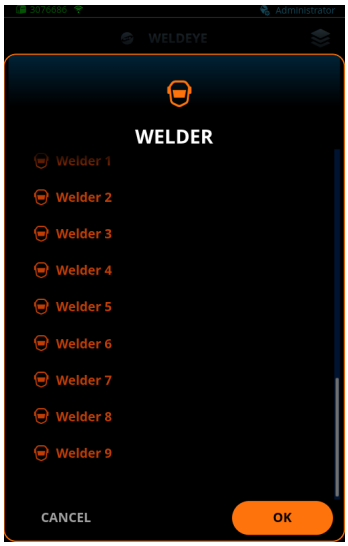
Selecting welder

The **WeldEye view** allows selecting the welder for the welding work at hand. The welders are predefined in the WeldEye cloud service.

1. Go to the WeldEye view and select "Welder".



2. Select your name on the list.



If your name is not on the list, you can leave the welder unselected (unknown).

The welder selection may affect what work orders are available. This depends on how the work orders are assigned in the WeldEye cloud service.

Selecting status

The welder's status can also be reported in the WeldEye view. This is used primarily for reporting when the actual welding work has been interrupted temporarily, typically due to maintenance or some other reason. The status options (reason codes) are specified in the WeldEye cloud service.

By default, the status is not defined, which is indicated by the text "Undefined".

1. In the WeldEye view, select "Status".
2. Select the status from the menu.

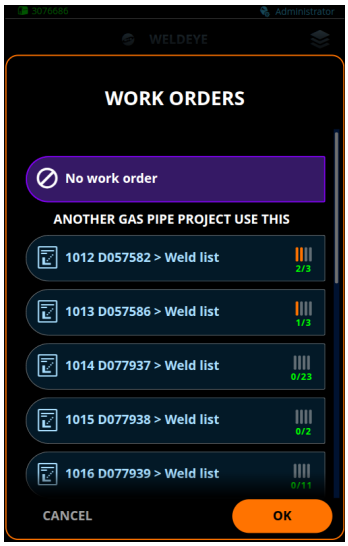
When the welding commences, the status is automatically reset to undefined.

Selecting work order and weld

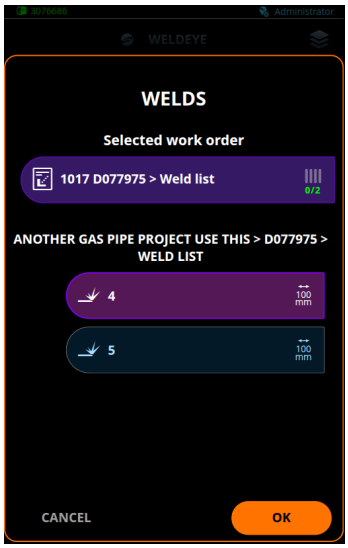
In the **WeldEye view** you can select digital work orders assigned to you in the Kemppi WeldEye cloud service. The work order feature is enabled by default.

In case the use of work orders has been disabled in the WeldEye settings, welds are selected directly from a list (categorized by projects and/or weld lists), and welder-specific weld filtering is not applied.

1. In the WeldEye view, select "Work order".
2. Select a work order from the list.



3. If the work order has more than one weld or weld pass included, select also the specific weld or weld pass to be welded.



The welds and weld passes on the work order can have digital WPSes (welding procedure specifications) attached to them. When a work order is selected, and it has a WPS or WPSes included, a WPS row is shown in the WeldEye view.

A digital WPS may contain one or more requirements or recommendations for the welder's qualification and the filler material and gas to be used. If the welder or the materials selected do not meet the criteria on the work order, it is indicated with a caution symbol.

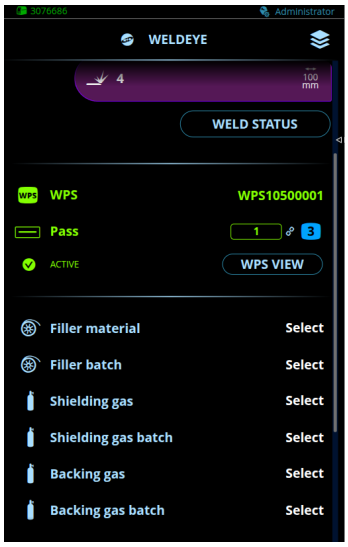
Applying digital WPS

If the selected weld on the work order includes a digital WPS that has already been linked to a memory channel, that memory channel is automatically activated. For more information on digital WPSes, refer to "WPS" on page 138.

If no WPS is selected, you can go to the WPS row in the WeldEye view, and select an available WPS.

Also WPS linking or re-linking can be accomplished directly from the WeldEye view. To link or re-link WPS:

1. In the WeldEye view, select the weld and weld pass below the WPS row.



2. In the menu that opens, select the weld pass and WPS linking you want to edit.



3. Open the actions menu and select "Link to channel".



4. In the memory channel list, select the memory channel you want to link the WPS with.
   >> If needed, select "Filter" to filter memory channels based on the WPS specifications.



You can access the weld pass selection of the active WPS by selecting the weld pass row in the WeldEye view. In the selection dialog that opens, all of the weld passes are listed and each of them can be linked to a memory channel.

When a WPS is linked to a memory channel, that channel is automatically applied.

Entering material information

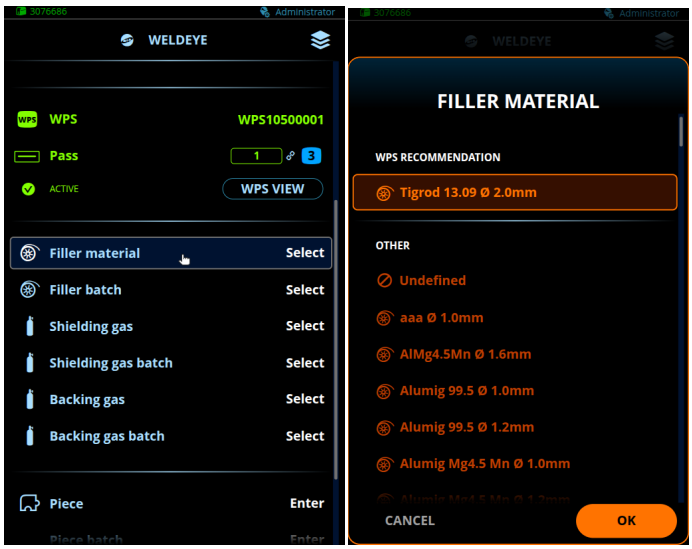
The lower section of the WeldEye view shows the filler wire material and gas information including their batch identification (if and as required).

The material information filled in the WeldEye view should always match with the filler material and gas used in welding (i.e., what is installed in the welding equipment).

A digital WPS may include several recommendations for filler material and gases. You can check and change the recommended materials in the WeldEye view.

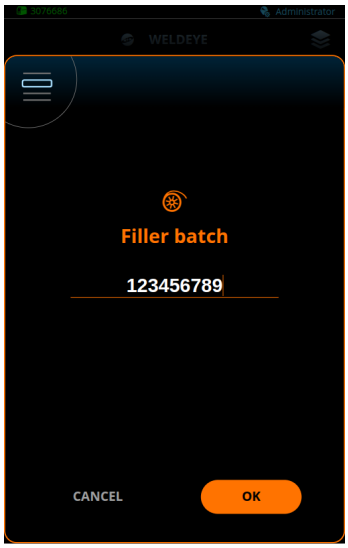
A digital WPS may contain one or more requirements or recommendations for the welder's qualification and/or the filler material and gas to be used. If the welder or the materials selected do not meet the criteria, it is indicated with a caution symbol.

1. Select the filler material and gas in the corresponding menus.



2. Select or enter also the batch information if/as required.

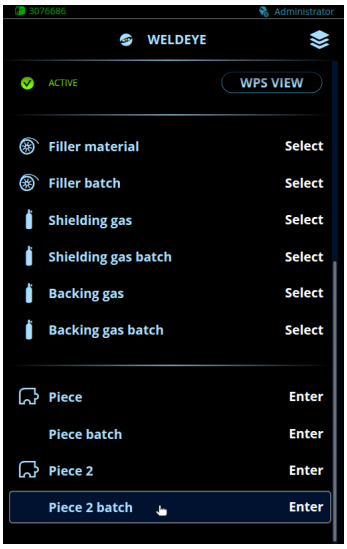
   >> You can enter the filler or gas batch identification manually, if the batch identification is not already on the list. Once the batch identification information has been entered for the first time, it becomes available as a pre-filled list option for later use.



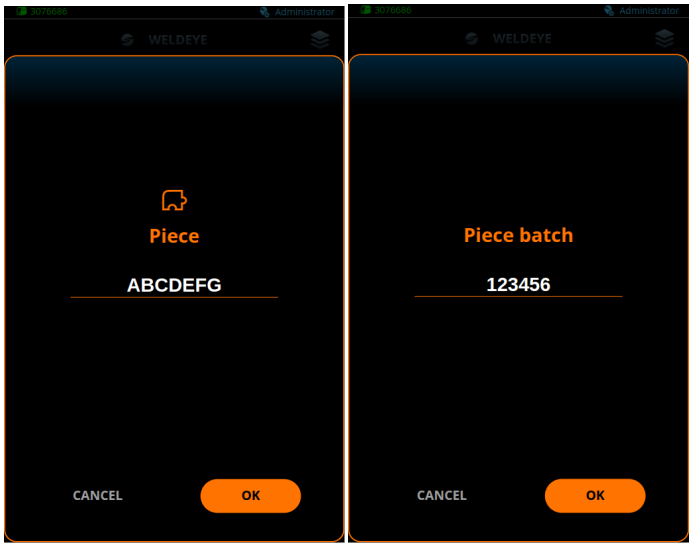
3. Ensure that the selected filler material and gas are installed and ready for welding.

Selecting work piece

Also the work piece information can be used and saved in WeldEye. If this feature is enabled in the WeldEye cloud service settings, the work piece selection is available in the WeldEye view.



1. Select the work piece.
2. Enter the work piece information.

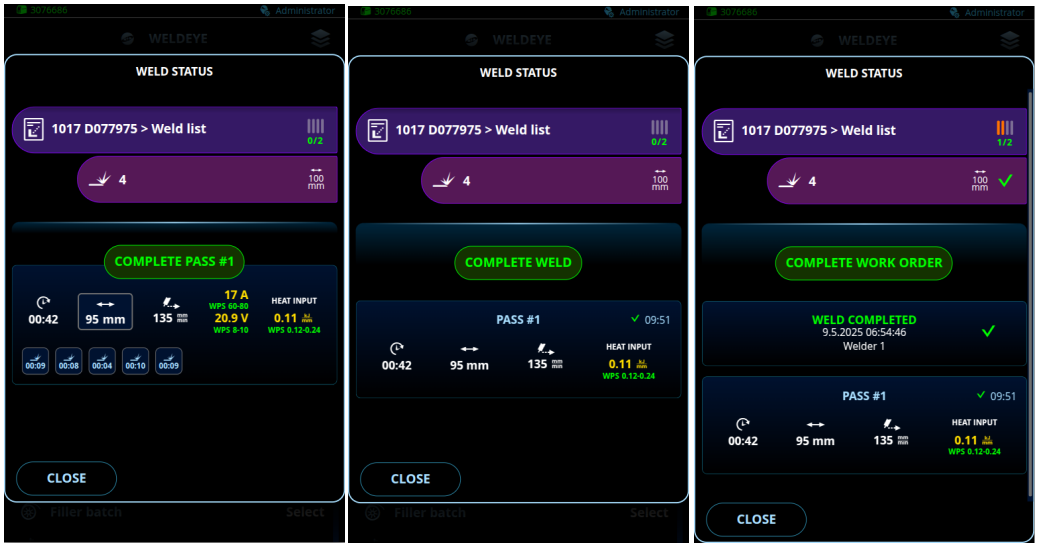


Completing work

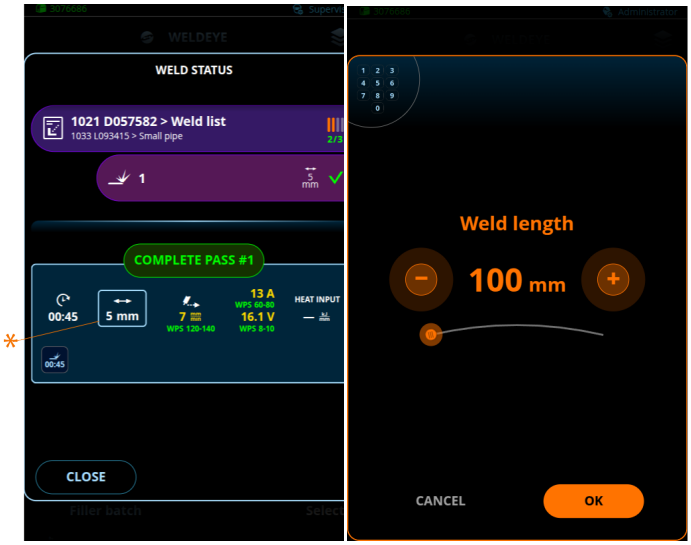
Once work (work order, weld, weld pass) has been completed, it can be confirmed in the weld status view that opens right after finishing a weld. This view also replaces the standard weld data view in WeldEye use.

If the work has not been marked as completed right after finishing the weld, it can be done also in the WeldEye view:

1. Go to the work you finished, and select "Weld status".
2. In the weld status dialog, select "Complete pass", "Complete weld" or "Complete work order", depending on which work stage you're finishing.



When completing a weld pass, the weld length can be entered by selecting the "Set length" (*) in the weld status view.



Even if all of the individual welds are marked as completed, the work order itself must also be completed in the WeldEye view.

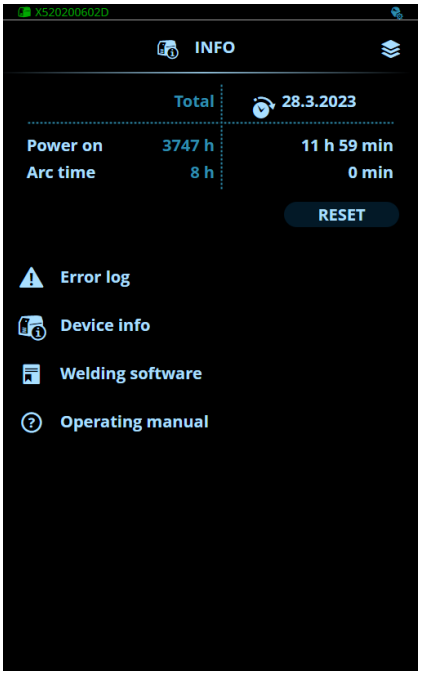
It is possible to mark welds and work orders completed even if they would contain incomplete weld passes and/or welds. Make sure that all of the welding work has been completed as required before completing welds or work orders in WeldEye.

More related feature descriptions here:

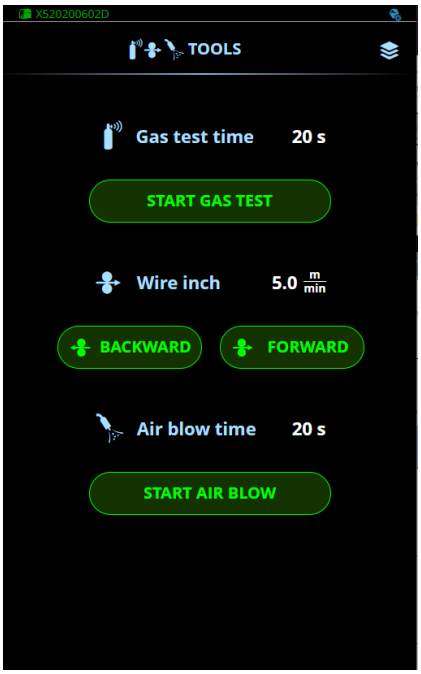
>> "Digital Welding Procedure Specification (dWPS)" on page 176
>> "WeldEye ArcVision" on page 177
>> "WeldEye" on page 177

3.2.9 INFO VIEW

The **Info** view shows information on the device usage. Through this view it is also possible to access the error logs, list of installed welding programs, additional operating information and device info, such as activated licenses, the software version and equipment serial numbers.



3.2.10 TOOLS



Gas test

Gas test is used to flush the previous shielding gas, run new shielding gas into the system, and test that the shielding gas flows through the system properly.

The gas test time can be adjusted by selecting the Gas test time button.

R500 Wire Feeder EUR+ models only: If the Gas flow sensor is ON, the gas flow rate is displayed (refer also to "Robot settings" on page 160).

Wire inch

Wire inch drives the filler wire forward or backward as long as the Forward/Backward button is pressed. Releasing the button takes you back to the Tools view.

If the filler wire touches a grounded workpiece or table when the filler wire is fed with the Forward button, the wire feed stops.

The wire feed speed can be adjusted by selecting the Wire inch button. With the wire inch forward and backward functions, wire feeding starts at 1 m/min for the first 2 seconds and then accelerates to the set wire feed speed. If the set wire feed speed is below 1 m/min, wire feeding starts and continues at that speed.

A counter shows how much wire has been driven. The counter helps to estimate when the filler wire will reach the gun end (forward) or come out of the wire feed rolls (backward).

R500 Wire Feeder EUR+ models only: Air blow

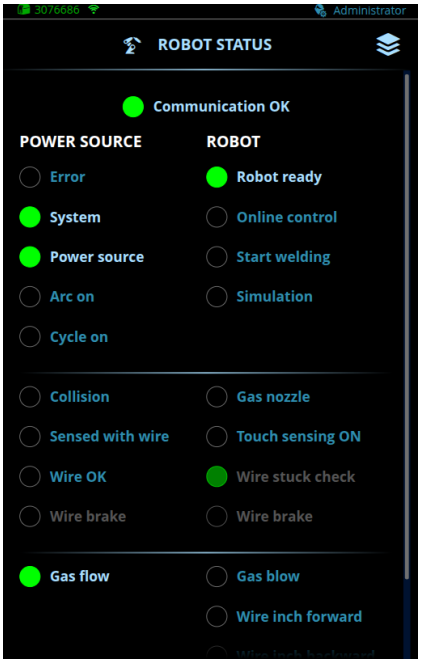
Air blow is used to clean the welding gun with compressed air.

The air blow time can be adjusted by selecting the Air blow time button.

3.2.11 ROBOT STATUS

The robot status view displays the communication between the power source and the robot. For more information on status and control parameters, refer to "Status information" on page 247 and "Control

information" on page 243.



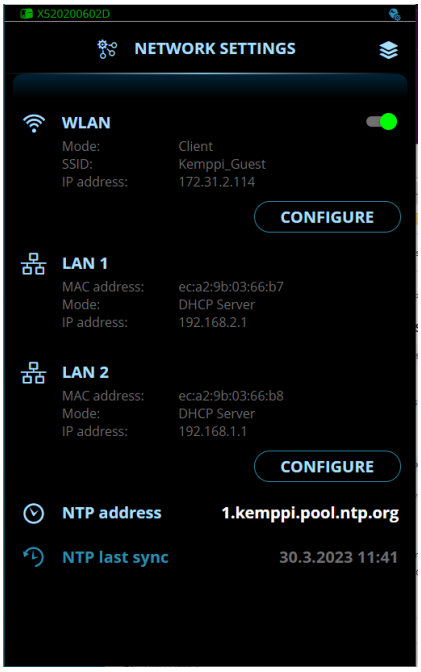
Parameter	Description
General	
Communication OK	Green light: The communication between the welding system and the robot works. No light: The communication between the welding system and the robot does not work.
Power source	
Error	No light: No errors are active. Red light: There is an error in the welding system that prevents welding. Select the error symbol for more information.
System	Green light: The welding system is ready for welding. All system devices are correct and working. No light: The welding system is not ready for welding.
Power source	Green light: The power source is ready to start a new weld. No light: The power source is not ready to start a new weld.
Arc on	Green light: The welding arc is established. No light: The welding arc is not established.
Cycle on	Green light: The welding cycle is in progress (the pre gas and post gas phases are included in the welding cycle). No light: The welding cycle is complete.
Collision	Red light: A collision is detected. No light: No collision is detected.
Sensed with wire / gas nozzle	Green light: A contact between the touch sensor (gas nozzle or wire) and the work piece has been detected. No light: No touch is sensed.
Wire OK	Green light: The filler wire is not stuck to the weld. No light: The filler wire is stuck to the weld. (An error message is displayed.) For more information, refer to "Robot settings" on page 160.

Water flow	Green light: Coolant is circulating. No light: Coolant is not circulating.
Gas flow	Green light: OK. The gas flow rate is above the minimum gas flow rate set in AX Manager. Note that if the gas flow sensor (available in R500 Wire Feeder EUR+ only) is set to OFF, this status is OK even if the gas flow rate is below the gas flow rate set in AX Manager (for more information, refer to "Robot settings" on page 160). Yellow light: The gas flow rate is below the minimum gas flow rate set in AX Manager. No light: There is no gas flow.
Wire brake	*R500 Wire Feeder HD EUR+ only*. Indicates if the wire brake is active (the wire is currently being held in place). Green light: Wire brake is active. No light: Wire brake is not active.
Robot	
Robot ready	Green light: The robot is ready to start a new weld. Note that in those fieldbus control tables that do not support this field, the status is always 'Robot ready'. No light: The robot is not ready to start a new weld.
Online control	Green light: Online control mode is enabled. In online control mode, the robot controls the values of certain parameters directly. No light: Online control mode is not enabled. The values of the parameters come from the active memory channel. For more information, refer to "Online control" on page 178.
Start welding	Green light: The robot has requested welding or simulation if the simulation mode is on. No light: The robot has not requested welding or simulation.
Simulation	Green light: The simulation mode is on. The StartWelding control bit controls the simulation cycle. In simulation mode the arc is not lit and wire is not fed. No light: The simulation mode is off. The StartWelding control bit controls the welding cycle.
Touch sensing ON	Green light: Touch sensing is used. No light: Touch sensing is not used.
Wire stuck check	Dark green light: Wire stuck detection is ON. A wire stuck check is performed automatically at the end of each weld to detect if the filler wire is stuck to the weld. Green light: Wire stuck check is ongoing. No light: Wire stuck detection is set to OFF or 'Select at robot' and the robot has not requested a wire stuck check. For more information, refer to "Robot settings" on page 160.
Gas blow	Green light: The shielding gas valve is open for gas blow. No light: The shielding gas valve is closed.
Wire inch forward	Green light: The wire inch forward function is ON. No light: The wire inch forward function is OFF.
Wire inch backward	Green light: The wire inch backward function is ON. No light: The wire inch backward function is OFF.
Gas nozzle	Green light: Gas nozzle is used for touch sensing. No light: Filler wire is used for touch sensing.
Air blow	*R500 Wire Feeder EUR+ models only*. Green light: The compressed air valve is open. The compressed air valve cannot be opened during welding or simulation. No light: The compressed air valve is closed.

Wire brake	*R500 Wire Feeder HD EUR+ only.* Dark green light: The wire brake is set to Auto and the wire is currently being held in place. Dark green color, no light: The wire brake is set to Auto but the wire brake is not active (the wire is not being held in place at the moment). Grayed: The wire brake is set to OFF. No light: The wire brake is set to OFF or 'Select at robot' and the robot has not requested the wire brake to be active.

3.2.12 NETWORK SETTINGS

Network settings can be accessed via the **Settings** view menu in AX Manager.



Changing settings

1. To access your network's IP settings, select 'Configure'.
2. Select the settings parameter for adjustment.
3. Select the settings value.
   >> Depending on the settings parameter to be adjusted, refer also to the Network settings table below for more details.
4. Confirm the new value / selection and close the adjustment view by selecting 'OK'.

WLAN IP configuration (RCM+ only) - client mode

Parameter	Value	Description
WLAN	ON/OFF	
MAC address		The unique address of RCM.
WLAN mode	Client	Client mode: RCM connects to the existing WLAN network.
SSID		Local wireless network's SSID (Service Set Identifier), i.e. the name of your WLAN network.
IP address	E.g. 172.31.2.121	RCM WLAN IP address.

Subnet mask	E.g. 255.255.252.0	RCM subnet mask.
Gateway	E.g. 172.31.0.1	IP address of the WLAN router.
Primary DNS	E.g. 8.8.8.8	IPv4 address of Primary DNS server.
Secondary DNS	E.g. 8.8.8.4	IPv4 address of Secondary DNS server.
Security protocol	OFF/WEP/WPA2	Security protocol for wireless networks.
Password		WLAN password.

WLAN IP configuration (RCM+ only) - access point mode

Parameter	Value	Description
WLAN	ON/OFF	
MAC address		The unique address of RCM.
WLAN mode	Access point	RCM acts as an access point to which other devices (PC, mobile device) can connect.
SSID	E.g. AX123456	The SSID (Service Set Identifier), i.e. the name of the WLAN network offered by RCM.
IP address	Default = 192.168.3.1	RCM WLAN IP address.
Security protocol	WPA2	Security protocol for the WLAN.
Password		WLAN password.

LAN 1 / LAN 2 IP configuration

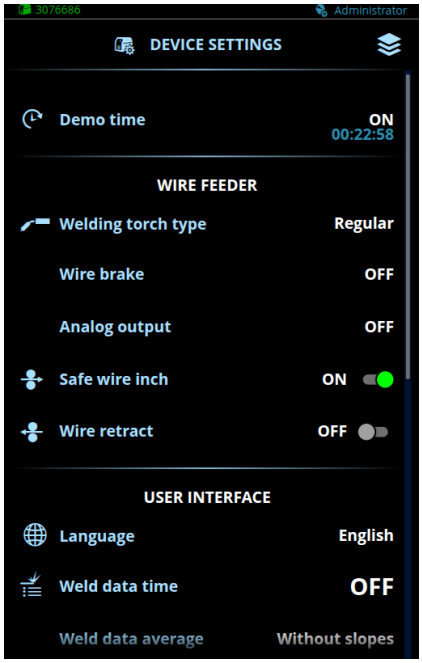
Parameter	Value	Description
LAN 1	DHCP server	Used as a service port to provide access to AX Manager. Not configurable by the user. DHCP server: The DHCP server allocates an IP address to RCM.
LAN 2	Static IP / Client / DHCP server Default = DHCP client	Static IP: RCM is allocated a fixed IP address. Client: RCM requests an IP address from the DHCP server. DHCP server: RCM allocates IP addresses to external devices that are connected to the same network interface and operate in the DHCP client mode. Note that a WeldEye cloud connection cannot be established in the DHCP server mode. OFF: The LAN 2 network interface is disabled.
MAC address		The unique address of RCM.
IP address	Default IP addresses: LAN 1 = 192.168.2.1 LAN 2 = No default IP address	IP address for RCM.
Subnet mask	Default = 255.255.255.0	RCM subnet mask.
Gateway	E.g. 10.0.0.125 / Empty	IPv4 address of the gateway (if used).
Primary DNS	E.g. 10.0.0.125 / Empty	IPv4 address of Primary DNS server.
Secondary DNS	E.g. 10.0.0.125 / Empty	IPv4 address of Secondary DNS server.

NTP (Network Time Protocol) configuration

Parameter	Value	Description
NTP address	Default = 1.kemppi.-pool.ntp.org	This is the address of the NTP server. NTP is used to synchronize the time used for WeldEye.
NTP last sync		The date and time of the last successful time synchronization.

3.2.13 DEVICE SETTINGS

Device settings can be accessed via the **Settings** view menu in AX Manager.



Changing settings

1. Select the settings parameter for adjustment.
2. Select the settings value.
   >> Depending on the settings parameter to be adjusted, refer also to the Device settings table below for more details.
3. Confirm the new value / selection and close the adjustment view by selecting OK.

Device settings

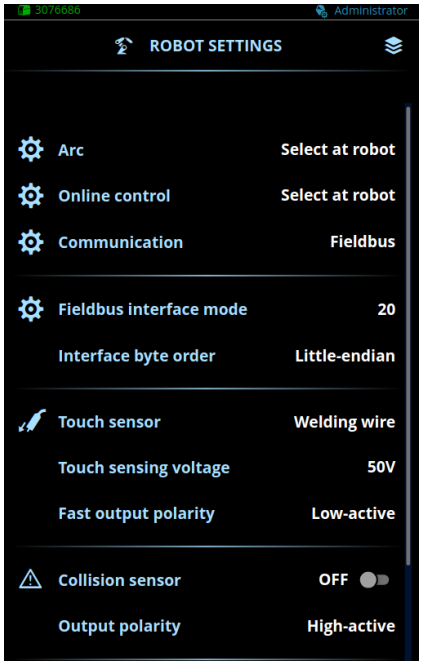
Parameter	Parameter value	Description
Demo time	ON/OFF	The demo time feature allows you to try out optional welding features and functions without a license for a limited time. The total available demo time is 3 hours. The demo time passes only when welding using a welding feature you don't have a license for. For more information, refer to "Demo time" on page 184.
Wire feeder		

Welding torch type	Regular / Dinse MEP200E / Dinse FD200ME / Binzel ROBO WH-PP / Dinse FD300 / TRM 605 WPP Default = Regular	Welding torch type selection. Supported welding torch types vary depending on the wire feeder model.
Wire brake	OFF/Auto/Select at robot Default = OFF	*R500 Wire Feeder HD EUR+ only*. Wire brake is used to hold the filler wire in place when the filler wire is not being driven. When set to Auto, the welding system automatically holds the filler wire in place when the filler wire is not being driven. When set to OFF, the wire brake is not used. When set to Select at robot, the robot requests the wire brake to be active (refer to "Robot status" on page 153 and "Control information" on page 243).
Analog output	OFF 10 V 20 V Default = OFF	*R500 Wire Feeder HD EUR+ only*. The R500 Wire Feeder HD EUR+ provides an analog voltage signal that can be used to control third-party manufacturers' push-pull welding torches. The voltage output signal corresponds to the measured wire feed speed. For more information, refer to "Support for push-pull welding torches" on page 23.
Safe wire inch	OFF/ON Default = ON	When ON, and the arc doesn't ignite, the filler wire is fed 5 cm. When OFF, 5 m of filler wire is fed.
Wire retract	OFF/AUTO Default = OFF	This is an automatic wire retract feature. Once the arc is extinguished, the wire is retracted for additional safety. The user can change the wire retract delay and length settings.
- Retract delay	2...10 s, step 1 Default = 5 s	
- Retract length	1...10 cm, step 1 Default = 2 cm	
User interface		
Language	Available languages	
Weld data time	1 ... 30 s 0 = OFF Default = 5 s	This defines if and how long the weld data summary is shown after each weld.
Weld data average	Without slopes / Entire weld Default = Without slopes	This feature allows the user to change how the weld data averages are calculated: with or without the slope phases in the beginning and in the end of the weld. This setting affects the calculation of the averages for the following: welding voltage (terminal and arc voltage), welding current, welding power and wire feed speed.
Date	Current date	Note: The date and time settings are not affected by the NTP (Network Time Protocol). The user must set the correct date and time.
Time	Current time	
System settings		

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.
Cable calibration	Start/Cancel	The date and time and the calibration information of the previous calibration is also shown. Refer to "Calibrating welding cable" on page 119 for cable calibration.
Device data		
Backup	(Selection)	This allows the settings to be saved on a connected USB memory stick or the user's device (PC, tablet).
Restore	(Selection)	This allows the settings to be restored from a connected USB memory stick or the user's device (PC, tablet).
Factory reset	Start/Cancel	Performs a full reset to factory settings. **Note**: The factory reset may take up to 15 minutes to complete. A progress indicator shows the progress of the procedure. When the factory reset is complete, RCM will reboot automatically, after which it will continue normal operation.

3.2.14 ROBOT SETTINGS

Robot settings can be accessed via the **Settings** view menu in AX Manager. The contents of the view varies depending on the robot communication mode.



Settings

Parameter	Parameter value	Description

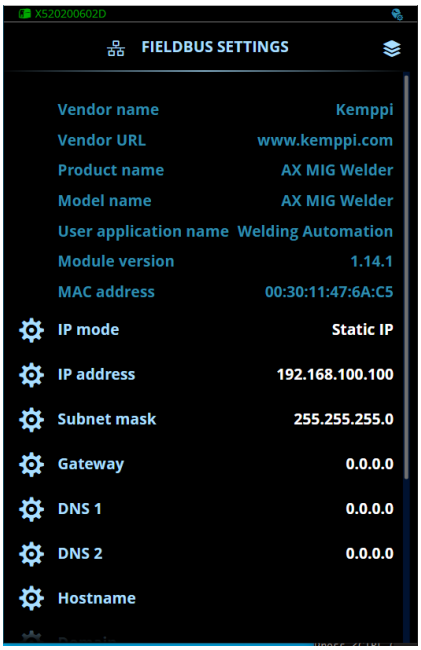
Arc	Simulation / Select at robot Default = Select at robot	When simulation is ON, the arc cannot be established. Select if you want to force the simulation to be ON or let the robot make the selection.
Online control	OFF / Select at robot	In online control mode, the robot controls the values of certain parameters directly. Select if you want to force the online control to be OFF or let the robot make the selection. For more information, refer to "Online control" on page 178.
Communication	Fieldbus / Digital robot control / Analog robot control Default = Fieldbus	Determines whether the communication with the robot takes place via a fieldbus or with a digital robot control or analog robot control.
Fieldbus interface mode	1 ... 99 Default = 20	Identifies the fieldbus control table to be used (refer to "Fieldbus control tables" on page 221).
Interface byte order	Little-endian / Big-endian Default = Little-endian	Byte order in the fieldbus control table.
Touch sensor	Welding wire / Gas nozzle / Select at robot Default = Select at robot	Touch sensing is used for seam searching. Select whether filler wire or gas nozzle is used for touch sensing or let the robot select it. If you select the gas nozzle for touch sensing, connect pin F of the wire feeder peripheral connector to the gas nozzle with a separate cable (refer to "Wire feeder peripheral connector" on page 17).
- Touch sensing voltage	50 V / 80 V / 110 V / 150 V / 160 V 170 V / 180 V / 200 V Default = 50 V	The output voltage used by the touch sensor. For information on touch sensing voltage levels, refer to "Touch sensing voltage levels" on page 257.
- Fast output polarity	Low-active / High-active Default = High-active	Output polarity for the touch sensor fast output. Output behavior in low-active output polarity: Low = Touch sensed High = Touch not sensed Output behavior in high-active output polarity: Low = Touch not sensed High = Touch sensed
Collision sensor	OFF/ON Default = OFF	Collision sensor protects the gun neck from bending and being damaged by hitting an obstacle. The collision sensor sends a signal to the robot to stop welding when a collision is detected at the welding head.

- Output polarity	Low-active / High-active Default = Low-active	Signal behavior in low-active output polarity: 0 = Collision detected 1 = Collision not detected Signal behavior in high-active output polarity: 0 = Collision not detected 1 = Collision detected
Pre and post gas control	Memory channel / Select at robot Default = Memory channel	This setting determines whether the pre and post gas times are controlled by the memory channel or the robot. For more information, refer to "Pre and post gas control" on page 178.
Gas flow sensor (in R500 Wire Feeder EUR+ models only)	OFF/ON Default = OFF	Gas flow sensor is used to measure the shielding gas flow rate. When the gas flow sensor is set to OFF, the gas flow status is OK. When the gas flow sensor is set to ON, the measured values are shown in the Home, Tools and Robot status views during welding.
- Gas flow error	OFF/ON Default = OFF	When set to OFF, the welding system does not give an error even if the gas flow rate is below the sensing level. When set to ON, and the gas flow rate is below sensing level, the welding system gives an error and welding stops.
- Sensing level	5.0 L/min ... 20.0 L/min Default = 10.0 L/min	If the gas flow is below the sensing level and the gas flow error is set to ON, the welding system gives an error and welding stops.
- Gas type	CO2 / Argon / Ar+8%CO2 / Ar+18%CO2 Default = Ar+18%CO2	The gas type used for welding.
- Sensor start time	0.1 s ... 5.0 s Default = 3.0 s	Gas sensor start time when the gas flow sensor is ON.
Wire stuck detection	ON / OFF / Select at robot Default = ON	This determines whether a wire stuck check is performed to detect if the filler wire is stuck to the weld. When this function is ON, the wire stuck check is done automatically at the end of each weld. When this function is OFF, no wire stuck check is done. When set to Select at robot, the robot requests the wire stuck check (refer to "Control information" on page 243). The result of the wire stuck check is shown in the Robot status view (refer to "Robot status" on page 153).

Voltage to robot	Arc / Terminal Default = Terminal voltage	This defines which voltage is shown to the robot, arc or terminal voltage.
Watchdog	OFF/ON Default = OFF	When watchdog is enabled, the robot must toggle the watchdog bit periodically. If the robot stops toggling the watchdog bit, the welding system gives an error and welding stops.
- Watchdog timeout	0.1 ... 5.0 s	Timeout for toggling the watchdog bit.

3.2.15 FIELDBUS SETTINGS

Fieldbus settings can be accessed via the **Settings** view menu in AX Manager. The tables below list the setting parameters for each supported fieldbus. The fieldbus settings view varies according to the fieldbus module used.



Changing fieldbus settings

1. Select the settings parameter for adjustment.
2. Select the settings value.
   >> Depending on the settings parameter to be adjusted, refer also to the Fieldbus settings tables below for more details.
3. Confirm the new value / selection and close the adjustment view by selecting 'Save'.

Fieldbus settings

Modbus TCP

This table lists the Modbus TCP fieldbus settings.

Parameter	Value	Description
Identification information		

Vendor name	Kemppi	Vendor identifier assigned to Kemppi.
Product code		Ordering code of the fieldbus module.
Vendor URL	www.kemppi.com	Vendor's URL address.
Product name	AX MIG Welder	Name of the welding system.
Model name	AX MIG Welder	Name of the welding system.
User application name	Welding automation	Application description.
Module version	Example: 1.23.4	Software version of the fieldbus module.
MAC address	Example: AA:BB:CC:DD:EE:FF	The unique address identifier of the fieldbus module's Ethernet port.
Configuration parameters		
IP mode	Static IP Client	Static IP: The IP address parameter values must be entered manually. Client: The IP address parameter values come from the DHCP server.
IP address		Customer-specific IPv4 address for the fieldbus module.
Subnet mask		Subnet mask for the fieldbus module.
Gateway		IPv4 address of the gateway (if used). This field can be empty.
DNS 1		IPv4 address of the primary DNS server. This field can be empty.
DNS 2		IPv4 address of the secondary DNS server. This field can be empty.
Hostname		Host name limited to 64 characters. This field can be empty.
Domain		Domain name limited to 48 characters. This field can be empty.
Comm 1 mode	Automatic 10 MBit Half Duplex 10 MBit Full Duplex 100 MBit Half Duplex 100 MBit Full Duplex	Ethernet speed / duplex for port 1. In the Automatic mode, the fieldbus module chooses the correct mode automatically.
Comm 2 mode	Automatic 10 MBit Half Duplex 10 MBit Full Duplex 100 MBit Half Duplex 100 MBit Full Duplex	Ethernet speed / duplex for port 2. In the Automatic mode, the fieldbus module chooses the correct mode automatically.
Connection timeout	1 ... 65535 s 0 = Disabled	Time in seconds that a Modbus connection can be open without a function (read or write) before the module closes the connection.
Process active timeout	1 ... 65535 ms 0 = Disabled	Time in milliseconds that the fieldbus module remains in active state after the last Modbus message was received. If the Modbus connection is lost during welding, the equipment stops welding when the module's state changes from active to inactive.

EtherNet/IP

This table lists the Ethernet/IP fieldbus settings.

Parameter	Value	Description
Identification information		
ODVA Vendor ID	0x057B	Vendor identifier assigned to Kemppi by ODVA.
ODVA Device type	0x0064	Indication of the general type of the welding system.
Product code	3	Code from which the robot identifies the welding system.
Serial number	Example: 750012345	Serial number of the welding power source.
Product name	AX MIG Welder	Name of the welding system.
Module version	Example: 1.23.4	Software version of the fieldbus module.
MAC address	Example: AA:BB:CC:DD:EE:FF	Unique address identifier of the fieldbus module's Ethernet port.
Configuration parameters		
IP address configuration	Client / Static IP	Client: The IP address parameter values come from the DHCP server. Static IP: The IP address parameter values must be entered manually.
IP address		Customer-specific IPv4 address for the fieldbus module.
Subnet mask		Subnet mask for the fieldbus module.
Gateway		IPv4 address of the gateway (if used). This field can be empty.
DNS 1		IPv4 address of the primary DNS server. This field can be empty.
DNS 2		IPv4 address of the secondary DNS server. This field can be empty.
Hostname		Host name limited to 64 characters. This field can be empty.
Domain		Domain name limited to 48 characters. This field can be empty.
Comm 1 mode	Automatic 10 MBit Half Duplex 10 MBit Full Duplex 100 MBit Half Duplex 100 MBit Full Duplex	Ethernet speed / duplex for port 1. In the Automatic mode, the fieldbus module chooses the correct mode automatically.
Comm 2 mode	Automatic 10 MBit Half Duplex 10 MBit Full Duplex 100 MBit Half Duplex 100 MBit Full Duplex	Ethernet speed / duplex for port 2. In the Automatic mode the fieldbus module chooses the correct mode automatically.

Profibus

This table lists the Profibus fieldbus settings.

Parameter	Value	Description
Identification information		
Manufacturer	0x0368	Vendor identifier assigned to Kemppi by PNO (PROFIBUS Nutzerorganisation).
PNO Ident number	0x11BF	Manufacturer-specific identification number.
Order ID		Fieldbus module ordering code.

Serial number	Example: PSNK0012345	Serial number of the welding power source.
Hardware version	Example: 1	Hardware version of the fieldbus module.
Module version	Example: 1.23.4	Software version of the fieldbus module.
Configuration parameters		
Node address	0...125 126 = SSA mode	The node address of the fieldbus module. In the SSA mode the node address is defined automatically.

DeviceNet

This table lists the DeviceNet fieldbus settings.

Parameter	Value	Description
Identification information		
ODVA Vendor ID	1403	Vendor identifier assigned to Kemppi by ODVA.
ODVA Device type	100	Identifier of the type of the welding system.
Product code	3	Code from which the robot identifies the welding system.
Serial number	Example: 750012345	Serial number of the welding power source.
Module version	Example: 1.23.4	Software version of the fieldbus module.
Product name	AX MIG Welder	Name of the welding system.
Configuration parameters		
Node address	0...63	The node address of the fieldbus module.
Baud rate	125 kbps 250 kbps 500 kbps Auto	The rate at which information is transferred in a communication channel.

EtherCAT

This table lists the EtherCAT fieldbus settings.

Parameter	Value	Description
Identification information		
ETG Vendor ID	0x00FE0001	Vendor identifier assigned to Kemppi by ETG (EtherCAT Technology Group).
Device type	0x00000000	Identifier of the type of the welding system.
Product code	0x000003<fieldbus interface mode in hexadecimal>	Code from which the robot identifies the welding system. For example, with fieldbus interface mode 20 the product code is 0x00000314.
Serial number	Example: 750012345	Serial number of the welding power source.
Device name	AX MIG Welder	Name of the welding system.
Hardware version	Example: 1	Hardware version of the welding system.

Module version	Example: 1.23.4	Software version of the fieldbus module.
Configuration parameters		
Device ID	1...65535	Node address of the fieldbus module.

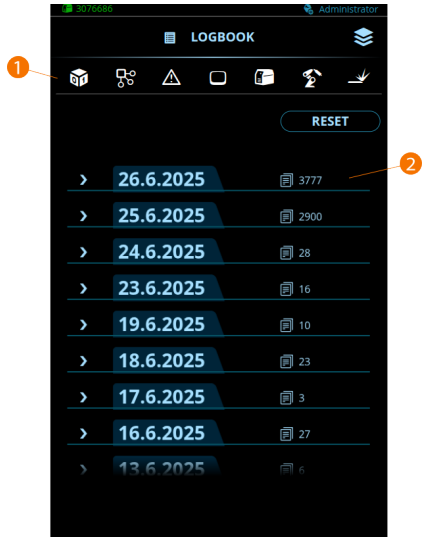
Profinet

This table lists the Profinet fieldbus settings.

Parameter	Value	Description
Identification information		
Device ID	0x0003	Code from which the robot identifies the welding system.
PNO Vendor ID	0x0368	Vendor identifier assigned for Kemppi.
Station type	AX MIG Welder	Name of the welding system.
Order ID		Fieldbus module ordering code.
Serial number	Example: PSNK0012345	Serial number of the welding power source.
Hardware version	Example: 1	Hardware version of the welding system.
Module version	Example: 1.23.4	Software version of the fieldbus module.
Port 1 / Port 2 MAC address	Example: AA:BB:CC:DD:EE:FF	The unique address identifier of the fieldbus module's Ethernet ports 1 and 2.

3.2.16 LOGBOOK

Logbook collects information about system operation and welding into one view for monitoring and troubleshooting. You can use filters (1) to show/hide content. The number of events for the day is shown on the right (2). The view is updated automatically to show the latest logged events. Selecting an event displays additional information if available. **Reset** clears the Logbook and Weld history.



Filter icons from left to right:

- Firmware, licenses and welding programs

- Networks
- Errors and warnings
- Memory channels
- Power source / backup power source
- Robot control
- Welds

3.2.17 WELD HISTORY

The Weld history view collects the information of the past welds into one view for later checking. The number of events for the day is shown on the right (*). The view is updated automatically to show the latest logged events. Selecting a row opens the Weld data view. **Reset** clears the view.

To change how the weld data averages are calculated (with or without slope phases), refer to "Device settings" on page 158.



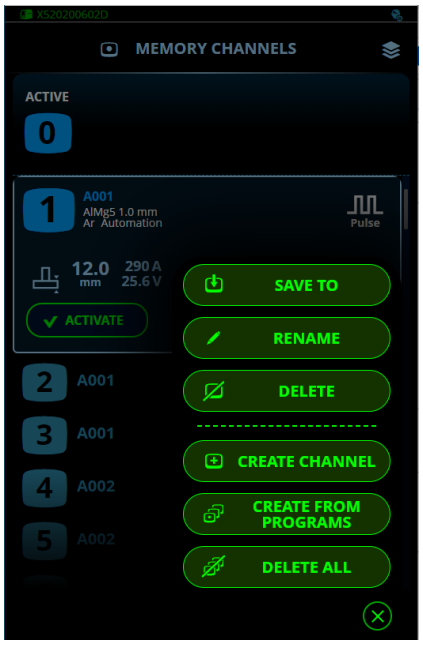
3.2.18 APPLYING WELDING PROGRAMS

To select and apply a MIG welding process and program, a corresponding memory channel must be created.

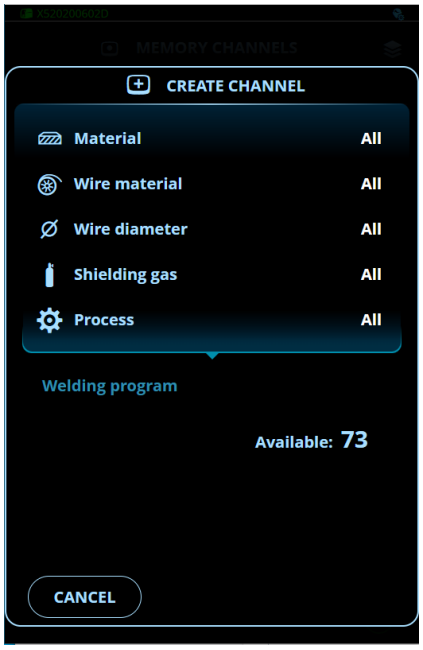
The use of additional welding programs and Wise and MAX features is possible with X5 standard power source. Pulse power source is required for the MAX Position (optional) process and Pulse+ power source for the WiseRoot+ (optional) and WiseThin+ (optional) processes.

Use the welding program that is in accordance with your welding setup (e.g. welding wire and gas properties).

1. Go to the **Memory channels** view.
2. Open the 'Actions' menu.



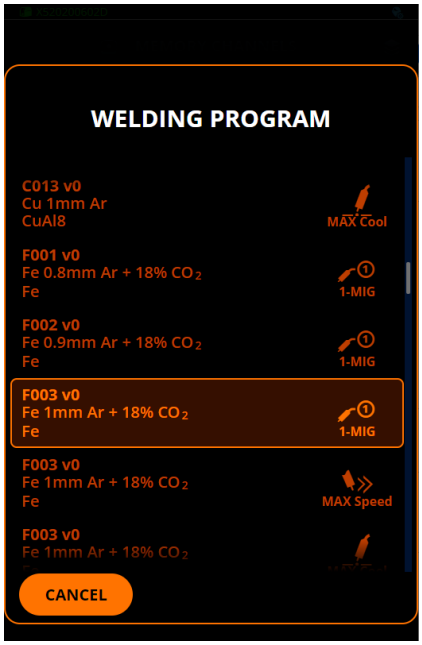
3. Select 'Create channel'.
   >> A filter view opens:



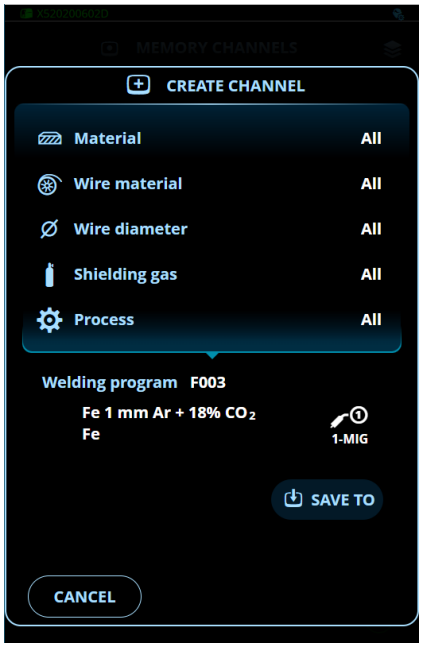
4. Use the filter options (e.g. material, wire material or wire diameter) to find the welding programs best suited for the purpose.

If manual MIG is selected as the process, other filter and welding program selections are disabled.

5. Go to the 'Welding program' selection at the bottom to view the suitable welding programs



6. Select a welding program.
   >> The selected welding program is now shown in the filter view.
7. Select 'Save to'.

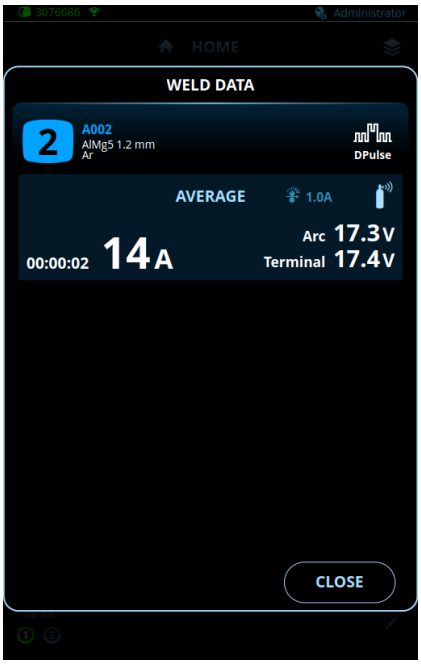


Once ready, you can continue to the **Welding parameters** view to adjust the welding settings for the new channel, create a new channel or go back to the Memory channels view.

Tip: It is also possible to create new channels based on all of the unused welding programs available by selecting Create all in the Memory channel view's Actions menu. This option uses the available memory channel slots.

3.2.19 WELD DATA

After each weld, a weld summary is displayed briefly. To change the weld data view duration or how the weld data averages are calculated (with or without slope phases) refer to "Device settings" on page 158.



3.3 ADDITIONAL GUIDANCE TO FUNCTIONS AND FEATURES

This section summarizes the AX MIG Welder functions and features and how to use them.

Many of the features are optional and device model specific. When the feature is device model specific, the emphasized equipment information in the beginning of the section tells its availability.

3.3.1 1-MIG

1-MIG or "Auto" is a MIG/MAG welding process where the welding voltage is defined automatically when you adjust the wire feed speed. The voltage is calculated based on the welding program in use. The process is suitable for all materials, shielding gases and welding positions. 1-MIG supports WiseSteel, WisePenetration+ and WiseFusion features, as well as various optimized welding programs.

>> To take 1-MIG into use, go to the Memory channels view and select an existing memory channel with 1-MIG process.

If there aren't any 1-MIG memory channels available, create a new one for 1-MIG process by selecting an available 1-MIG welding program for the channel.

The '0' memory channel is always reserved for the manual MIG process.

3.3.2 WISEFUSION FEATURE



The WiseFusion welding feature enables adaptive arc length control, which keeps the arc optimally short and focused. WiseFusion increases the welding speed and penetration and decreases heat input. WiseFusion can be used throughout the power range (short arc, globular arc and spray arc). WiseFusion is compatible with 1-MIG and pulsed MIG welding processes. (Not available with WiseRoot+, WiseThin+, MAX Cool, MAX Speed and MAX Position.)

>> To take WiseFusion into use, go to AX Manager's Welding parameters view and apply the WiseFusion feature.
>> Adjust the welding power/wire feed speed in the Home view.
>> Fine-tune the heat output while welding in the Home view.

For more information on Wise products, visit www.kemppi.com.

3.3.3 WISEPENETRATION FEATURE



In standard MIG/MAG welding, changes in stick-out length cause welding current to fluctuate. WisePenetration feature maintains constant welding current by controlling the wire feed speed according to the stick-out length. This ensures stable and effective penetration and prevents burn through. WisePenetration also adjusts the voltage adaptively, which keeps the arc focused and optimally short. WisePenetration enables welding with Reduced Gap Technology (RGT) and is compatible with 1-MIG welding process.

>> To take WisePenetration into use, go to AX Manager's Welding parameters view and apply the WisePenetration feature.
>> Adjust the welding current while welding in the Home view.
>> Fine-tune the heat output while welding in the Home view.

For more information on Wise products, visit www.kemppi.com.

3.3.4 WISESTEEL FEATURE



The WiseSteel welding feature is based on modifying the conventional MIG/MAG arcs to enable higher quality of welds. WiseSteel improves the arc control, reduces spatter and helps create an optimally-formed weld pool.

>> To take WiseSteel into use, go to AX Manager's Welding parameters view and apply the WiseSteel feature.
>> Adjust the welding power/wire feed speed while welding in the Home view.
>> Fine-tune the heat output while welding in the Home view.

When using WiseSteel, different adjustment methods are applied at different power ranges (different arcs). The wire feed speed / current indicator shows the arc range: Short arc — Globular arc — Spray arc.

Short arc range:

- WiseSteel is based on adaptive short arc control; that is, the process adjusts the short circuit ratio. This creates an easily-adjustable arc and less spatter. Within the short arc range, the shape of the current is similar to the traditional short arc welding. When a short arc is used in vertical up welding where weaving motion is applied, WiseSteel ensures good quality through adapting to the changes in the stick-out length.

Globular arc range:

- Globular arc means that WiseSteel fluctuates the power between short arc and spray arc at a low frequency, so that the average power stays within the globular arc range. This results in less spatter than conventional globular arc welding, and a welding pool that enables excellent structural durability.

Spray arc range:

- Within the spray arc range, WiseSteel is based on adaptive arc length control, which keeps the arc optimally short. WiseSteel also utilizes micro-pulsed welding current. This creates a well-formed weld pool that enables excellent bead geometry and optimal penetration with smooth and durable joints, and speeds up the work. The pulsing is not noticeable to the welder. The shape and control of the current are close to the conventional spray arc welding.

WiseSteel feature is available with selected welding programs. For more information on Wise products, visit www.kemppi.com.

3.3.5 PULSE WELDING

X5 Power Source Pulse/Pulse+

The advantages of pulse welding are a higher welding speed and deposition rate compared to short-arc welding, lower heat input compared to spray-arc welding, a spatter-free globular arc and smooth appearance of the weld. Pulse is suitable for all position welding. It is excellent for welding aluminum and stainless steel, especially when the material thickness is small.

Pulse



Pulse is a synergic MIG/MAG welding process where the current is pulsed between the base current and the pulse current.

>> To take Pulse welding process into use, go to the Memory channels view and select an available Pulse channel.

If there aren't any Pulse memory channels available, create a new one for Pulse process by selecting an available Pulse welding program for the channel.

>> Once selected, the corresponding Pulse welding process parameters become available for adjustment in the Welding parameters view. For more information, refer to the pulse welding parameters in "Welding parameters" on page 131.

DPulse



DPulse is a double-pulse MIG/MAG welding process with two separate power levels. The welding power varies between these two levels. The parameters of each level are controlled independently.

>> To take DPulse welding process into use, go to the Memory channels view and select an available DPulse channel.

If there aren't any DPulse memory channels available, create a new one for DPulse process by selecting an available DPulse welding program for the channel.

>> Once selected, the corresponding DPulse welding process parameters become available for adjustment in the Welding parameters view. For more information, refer to the pulse welding parameters in "Welding parameters" on page 131.

3.3.6 WISEROOT+ PROCESS

X5 Power Source Pulse+, R500 Wire Feeder EUR+

Requires the use of the voltage sensing cable (refer to "AX MIG Welder interconnection cable" on page 27).

The WiseRoot+ welding process improves the quality of root pass welds. WiseRoot+ is based on accurate measurement of arc voltage.

Before welding, attach the voltage sensing cable to the workpiece. For optimal voltage measurement, connect the earth return cable and the voltage sensing cable close to each other and away from the other welding units' cables.

WiseRoot+ is a synergic MIG/MAG process optimized for open-gap root pass welding. The process is based on precise measurement of voltage between the welding gun nozzle and the workpiece. The measurement data serves as input for the current control. The process is suitable for root pass welding in all positions, and provides a smooth and spatter-free arc.

>> To take WiseRoot+ into use, go to AX Manager's Welding parameters view and apply WiseRoot+. Optionally, go to the Memory channels view and create a new memory channel with WiseRoot+ process.
>> Adjust the wire feed speed in the Home view.
>> Fine-tune the heat output while welding in the Home view.

3.3.7 WISETHIN+ PROCESS

X5 Power Source Pulse+, R500 Wire Feeder EUR+

Requires the use of the voltage sensing cable (refer to "AX MIG Welder interconnection cable" on page 27).

WiseThin+ is a synergic MIG/MAG process whose short-arc features are optimal for welding sheet metals (plate thickness 0.8 - 3.0 mm). It is based on precise measurement of voltage between the welding gun nozzle and the workpiece.

Before welding, attach the voltage sensing cable to the workpiece. For optimal voltage measurement, connect the earth return cable and the voltage sensing cable close to each other and away from the other welding units' cables.

The measurement data serves as input for the voltage control. The process reduces heat input, deformation and spatter. WiseThin+ is also optimal for position welding with thicker plates.

>> To take WiseThin+ into use, go to AX Manager's Welding parameters view and apply WiseThin+. Optionally, go to the Memory channels view and create a new memory channel with WiseThin+ process.
>> Adjust the wire feed speed in the Home view.
>> Fine-tune the heat output while welding in the Home view.

3.3.8 MAX COOL PROCESS

MAX Cool is a synergic MIG/MAG welding process that is designed for root pass welds and sheet metal applications. MAX Cool is suitable for all welding positions and provides a smooth arc, reducing spatter.

>> To take MAX Cool into use, go to AX Manager's Welding parameters view and apply MAX Cool. Optionally, go to the Memory channels view and create a new memory channel with MAX Cool process.
>> Adjust the wire feed speed in the Home view. The adjustment's effect on the plate thickness is also shown.
>> Fine-tune the heat output in the Home view.

MAX Cool supports these filler wire and shielding gas combinations:

- Fe solid & Ar + 18...25 % CO_2 (1.0 mm, 1.2 mm)
- Fe solid & CO_2 (1.0 mm, 1.2 mm)
- Ss solid & Ar + 2 % CO_2 (1.0 mm, 1.2 mm)
- CuSi3 & Ar (1.0 mm)
- CuAl8 & Ar (1.0 mm).

3.3.9 MAX POSITION PROCESS

X5 Power Source Pulse/Pulse+

MAX Position is a synergic MIG/MAG welding process optimized for vertical fillet welds (position: PF). MAX Position automatically switches between two separate power levels. The two power levels can use the same welding process or two different welding processes.

>> To take MAX Position into use, go to AX Manager's Welding parameters view and apply MAX Position. Optionally, go to the Memory channels view and create a new memory channel with MAX Position process.
>> In the Welding parameters view, MAX Position frequency can be adjusted and the optional WiseFusion feature can be applied. The ratio of the two power levels is preset.
>> Adjust the average wire feed speed in the Home view. The adjustment's effect on the plate thickness is also shown.

>> Fine-tune the welding voltage in the Home view.

MAX Position supports these filler wire and shielding gas combinations:

- Fe solid & Ar + 18% CO_2 (1.0 mm, 1.2 mm)
- Fe solid & Ar + 8% CO_2 (1.0 mm, 1.2 mm)
- Fe MC & Ar + 18% CO_2 (1.2 mm)
- Ss solid & Ar + 2% CO_2 (1.0 mm, 1.2 mm)
- AlMg & Ar (1.0 mm, 1.2 mm)

MAX Position supports these plate thicknesses:

- 3...12 mm

MAX Position utilizes also other welding processes, depending on the material and equipment type:

- Fe & Fe MC: 1-MIG (with low power) and Pulse MIG (with high power)
- Ss & Al: Pulse MIG (throughout the power range).

3.3.10 MAX SPEED PROCESS

MAX Speed is a synergic pulsed MIG/MAG welding process. It is designed to maximize the welding speed and to minimize the heat input by modifying the conventional MIG/MAG arcs. MAX Speed is designed for steel and stainless steel welding applications mainly in the PA and PB positions. It is suitable for plate thicknesses above 2.5 mm, the ideal maximum plate thickness being approximately 10 mm.

MAX Speed operates within the spray arc range. Welding current is pulsed with constant frequency and amplitude. Arc length is controlled with the normal voltage control. MAX Speed's low-amplitude pulsing enables an effective transfer mode with lower wire feed speed than with conventional MIG/MAG arc.

>> To take MAX Speed into use, go to AX Manager's Welding parameters view and apply MAX Speed. Optionally, go to the Memory channels view and create a new memory channel with MAX Speed process.
>> Adjust the wire feed speed in the Home view. The adjustment's effect on the plate thickness is also shown.
>> Fine-tune the welding voltage in the Home view.

MAX Speed supports these filler wire and shielding gas combinations:

- Fe solid & Ar + 18% CO_2 (1.0 mm, 1.2 mm)
- Fe solid & Ar + 8% CO_2 (1.0 mm, 1.2 mm)
- Fe MC & Ar + 18% CO_2 (1.2 mm)
- Ss solid & Ar + 2% CO_2 (1.0 mm, 1.2 mm).

3.3.11 DIGITAL WELDING PROCEDURE SPECIFICATION (DWPS)

Digital Welding Procedure Specification (dWPS) is a WPS in digital format that can be set to observe the welding parameters of the AX MIG Welder equipment. The **WPS** view shows the digital WPSs with one or more weld passes assigned to the welding station in the Kemppi WeldEye cloud service.

The use of dWPS and WeldEye cloud service requires a valid Kemppi WeldEye subscription with the Welding Procedures module. The AX MIG Welder equipment includes a link to a free trial registration – featuring also a free trial option for WeldEye ArcVision. For more information on WeldEye, refer to weldeye.com or contact your Kemppi representative.

The WPSes can be read in AX Manager display and/or a memory channel can be linked with a WPS. Once a WPS is linked to a memory channel, the welding parameters are still manually adjustable, but the adjustment ranges defined on the active WPS are indicated on the screen.

3.3.12 WELDEYE ARCVISION

To use the WeldEye cloud service, RCM+ requires an internet connection established either in the WLAN client mode or via the Ethernet port 2 (LAN 2). For more information, refer to "Network settings" on page 156 and "Connecting to AX Manager user interface" on page 33.

The use of WeldEye cloud service requires a valid Kemppi WeldEye subscription. The AX MIG Welder equipment includes a link to a free trial registration – featuring also a free trial option for WeldEye ArcVision. For more information on WeldEye, refer to weldeye.com or contact your Kemppi representative.

The WeldEye's ArcVision module (optional) is intended for cloud-based tracking of the welding operations carried out with the welding equipment. The ArcVision on the welding device itself is a connection feature for connecting to the WeldEye cloud service. The actual welding information gathered by the welding equipment is passed on to the WeldEye cloud where it can be accessed using a desktop computer and an internet browser.

AX MIG Welder comes preinstalled with a trial license for ArcVision. The trial license can be activated by following these steps:

1. In AX Manager, go to the WPS view.
2. Use a QR code reader on your mobile device to open the WeldEye web link or navigate to 'https://register.weldeye.io/arcvision' on your web browser.
3. Complete the registration process as instructed on the registration page. Once finished, the equipment is connected to WeldEye ArcVision.

You will be required to fill in the serial number and four-digit security pin of your X5 power source. These can be found on the power source rating plate.

The free trial registration includes both the WeldEye Welding Procedures and WeldEye ArcVision modules.

3.3.13 WELDEYE

*The use of this WeldEye feature and cloud service require an up-to-date AX MIG Welder and a valid **Kemppi WeldEye Quality Management** subscription. For more information on WeldEye, refer to weldeye.com or contact your Kemppi representative.*

The WeldEye feature in the AX MIG Welder equipment is designed to be used in welding quality management. This includes cloud-based tracking of the welding operations carried out with the welding equipment.

Some of the feature highlights:

- Work orders
- Work completion and heat input reporting
- WPS (Welding Procedure Specification) compliance verification
- Welder qualification verification.

The built-in WeldEye feature collects and passes on welding data, keeping it synchronized between the welding equipment and WeldEye cloud service. The WeldEye cloud service can be accessed using a desktop computer and an internet browser.

>> To take the WeldEye feature in use, the equipment must be connected to the internet via the built-in wireless connection (WLAN). Refer to "Network settings" on page 156 for instructions.
>> To use the WeldEye feature on the AX MIG Welder, refer to "WeldEye" on page 144.

Other WeldEye options with the AX MIG Welder equipment:

>> "Digital Welding Procedure Specification (dWPS)" on the previous page
>> "WeldEye ArcVision" above.

3.3.14 ONLINE CONTROL

AX MIG Welder's online control function allows the robot to adjust certain welding parameters directly. This allows the robot to change welding parameters during welding, for example when changing the welding position or welding around a corner.

For more information, refer to "Robot settings" on page 160.

The robot can adjust the following parameters in online control mode:

Parameter	Default value
WireFeedSpeed	0.5 m/min
Current	0 A
PlateThickness	0.0 mm
Voltage	8.0 V
FineTuning	0
Dynamics	0
PostCurrent	0
HotStartOn	OFF (0)
CraterFillOn	OFF (0)

Some parameters may not be available in some fieldbus control tables. In such cases, the missing parameter is automatically set to the default value. For more information, refer to "Fieldbus control tables" on page 221 and "Control information" on page 243.

The online control function is used in the following way:

1. Before welding starts, the robot sets the 'OnlineControl' control bit to state 1. For online control timing, refer to "Online control timing" on page 251.
2. The robot selects the correct memory channel for welding.
3. The robot adjusts the values of all online control parameters available in the selected fieldbus control table.
4. The robot starts welding in online control mode by setting the 'StartWelding' control bit to state 1.
   >> RCM automatically activates the online control mode, and the arc ignites.
5. The robot adjusts online control parameters during welding if necessary.
6. The robot stops welding by setting the 'StartWelding' control bit to state 0.
   >> RCM automatically disables the online control mode.

3.3.15 PRE AND POST GAS CONTROL

By default, AX MIG Welder uses the pre and post gas times set in the memory channels. However, the robot can override these values in order to use longer gas times than the maximum times available in AX Manager.

The following sections describe the different scenarios for pre and post gas control.

Scenario 1: Memory channel-controlled pre and post gas

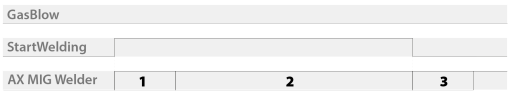
In scenario 1, a memory channel controls both the pre and post gas times. This scenario requires either of the following settings:

a. the setting 'Pre and post gas control' is set to 'Memory channel' (refer to "Robot settings" on page 160)
b. the setting 'Pre and post gas control' is set to 'Robot', but the 'GasBlow' control bit is not controlled by the robot during the welding cycle.

The sequence of phases in the welding cycle is as follows:

1. The robot sets the 'StartWelding' control bit to state 1: the memory channel-controlled pre gas flow starts.
2. Once the memory channel-controlled pre gas time has elapsed, the arc ignites and welding starts.
3. The robot sets the 'StartWelding' control bit to state 0: welding ends and memory channel-controlled post gas flow starts.
4. Once the memory channel-controlled post gas time has elapsed, the gas valve closes and post gas flow ends.

Figure 1: Memory channel-controlled pre and post gas



Item	Description
1	Memory channel-controlled pre gas
2	Welding
3	Memory channel-controlled post gas

Scenario 2: Robot-controlled pre and post gas

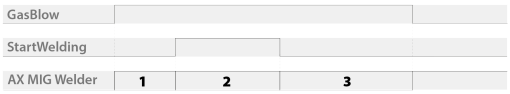
In scenario 2, the robot controls both the pre and post gas times. This scenario requires the following settings:

- the setting 'Pre and post gas control' is set to 'Robot' (refer to "Robot settings" on page 160)
- the robot controls the 'GasBlow' control bit during the welding cycle.

The sequence of phases in the welding cycle is as follows:

1. The robot sets the 'GasBlow' control bit to state 1: the gas valve opens and robot-controlled pre gas flow starts.
2. Once the robot-controlled pre gas time has elapsed, the robot sets the 'StartWelding' control bit to state 1: the arc ignites and welding starts.
3. The robot sets the 'StartWelding' control bit to state 0: the arc is switched off, welding ends and robot-controlled post gas flow starts.
4. Once the robot-controlled post gas time has elapsed, the robot sets the 'GasBlow' control bit to state 0: the gas valve closes and post gas flow ends.

Figure 2: Robot-controlled pre and post gas



Item	Description
1	Robot-controlled pre gas
2	Welding
3	Robot-controlled post gas

Scenario 3: Robot-controlled pre gas and memory channel-controlled post gas

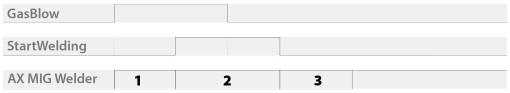
In scenario 3, the robot controls the pre gas time and a memory channel controls the post gas time.

This scenario requires that the setting 'Pre and post gas control' is set to 'Robot' (refer to "Robot settings" on page 160).

The sequence of phases in the welding cycle is as follows:

1. The robot sets the 'GasBlow' control bit to state 1: the gas valve opens and robot-controlled pre gas flow starts.
2. Once the robot-controlled pre gas time has elapsed, the robot sets the 'StartWelding' control bit to state 1: the arc ignites and welding starts.
3. During welding, the robot sets the 'GasBlow' control bit to state 0 to enable memory channel-controlled post gas.
4. The robot sets the 'StartWelding' control bit to state 0: the arc is switched off, welding ends and memory channel-controlled post gas flow starts.
5. Once the memory channel-controlled post gas time has elapsed, the gas valve closes and post gas flow ends.

Figure 3: Robot-controlled pre gas and memory channel-controlled post gas



Item	Description
1	Robot-controlled pre gas
2	Welding
3	Memory channel-controlled post gas

Scenario 4: Memory channel-controlled pre gas and robot-controlled post gas

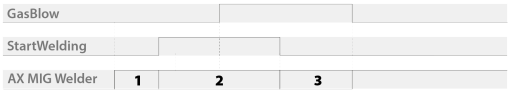
In scenario 4, a memory channel controls the pre gas time and the robot controls the post gas time.

This scenario requires that the setting 'Pre and post gas control' is set to 'Robot' (refer to "Robot settings" on page 160).

The sequence of phases in a welding cycle is as follows:

1. The robot sets the 'StartWelding' control bit to state 1: the gas valve opens and memory channel-controlled pre gas flow starts.
2. Once the memory channel-controlled pre gas time has elapsed, the arc ignites and welding starts.
3. During welding, the robot sets the 'GasBlow' control bit to state 1 to enable robot-controlled post gas.
4. The robot sets the 'StartWelding' control bit to state 0: the arc is switched off, welding ends, and robot-controlled post gas flow starts and goes on as long as the 'GasBlow' control bit is in state 1.
5. Once the robot-controlled post gas time has elapsed, the robot sets the 'GasBlow' control bit to state 0: the gas valve closes and post gas flow stops.

Figure 4: Memory channel-controlled pre gas and robot-controlled post gas



Item	Description
1	Memory channel-controlled pre gas

2	Welding
3	Robot-controlled post gas

3.3.16 THROUGH ARC SEAM TRACKING (TAST)

TAST is used for providing precise welds depending on specific weld characteristics or in setups where the position of the work piece varies during repetitive tasks.

TAST can be used with the following welding features and processes:

- 1-MIG
- Pulse
- WiseFusion
- WiseSteel
- WisePenetration
- MAX Speed

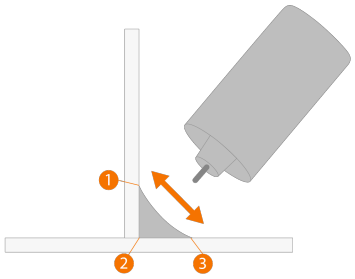
Ensure that the robot supports the use of TAST.

TAST is configured in the robot and its use varies between robot brands. For more information, refer to the robot manufacturer's instructions.

The TAST signal is a reference value based on the welding current that is affected by the arc length and the filler wire stick-out length.

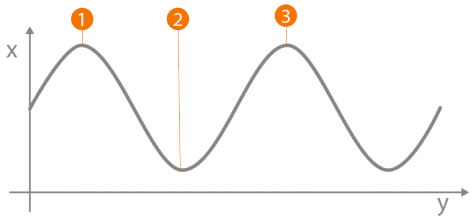
TAST requires weaving for horizontal and vertical seam tracking. The figures below show that at the center of the weld seam, the current is at a minimum. As the gun reaches the edge of its weave cycle, the current peaks.

Gun weaving during seam tracking



1. Short stick-out length
2. Long stick-out length
3. Short stick-out length

TAST signal wave form



x = Time
y = TAST signal value

The power source sends the TAST signal as a reference value to the robot that uses the value to keep the stick-out length stable in relation to the weld seam, and make necessary corrections to the welding path.

3.3.17 TOUCH SENSE IGNITION

The Touch Sense Ignition (TSI) function minimizes spatter and stabilizes the arc immediately after ignition.

In standard ignition the filler wire touches the workpiece and creates a short circuit.

The following describes how TSI operates in ON, Auto and OFF modes.

TSI ON

1. The filler wire is fed forward until it touches the workpiece.
2. The filler wire is retracted until the short circuit is broken and the arc is ignited immediately.

TSI Auto

1. The filler wire is already in contact with the workpiece upon ignition (this is a prerequisite for TSI to work).

If the filler wire is not in contact with the workpiece, standard ignition is performed.

2. The filler wire is retracted until the short circuit is broken and the arc is ignited immediately.

TSI OFF

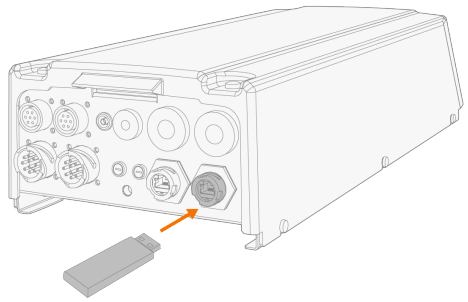
1. Standard ignition is performed.

3.3.18 BACKUP AND RESTORE

This feature allows the current welding parameters, memory channels and other settings to be backed up on a USB memory stick or the user's device (PC, tablet). The backed up settings can be restored later from the USB memory stick or the user's device.

When restoring data, AX Manager allows you to choose the data to be restored.

1. Turn the welding equipment on.
2. If creating a backup, go to the device settings and select **Backup**.
3. If restoring from a backup, go to the device settings and select **Restore**.
4. When using USB memory stick: Connect the USB memory stick to the RCM's USB port.



5. Follow the steps on the AX Manager screen to complete the backup/restore operation.

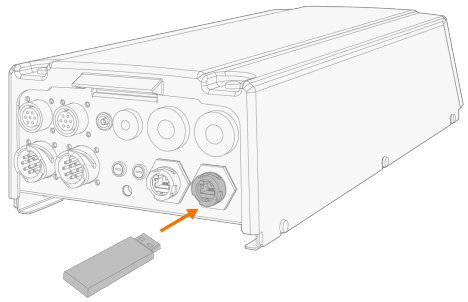
3.3.19 USB UPDATE

The USB update feature allows the firmware to be updated as well as welding programs, processes and features to be installed using a USB memory stick.

There can be only one ZIP file on the USB memory stick inserted into the welding system at once. This can be either a dedicated firmware pack for this welding system or a welding program and license pack (matching the power source serial number). For more information on the available software and compatibility, contact your local Kemppi representative.

Firmware and welding software

1. Ensure you have the correct firmware/software ZIP package saved on your computer for the welding equipment in question.
2. Connect the USB memory stick to the computer.
3. Prepare the USB memory stick by copying the firmware/software ZIP file into the root folder of the memory stick.
4. Turn the welding equipment on.
5. Connect the USB memory stick to the RCM's USB port.

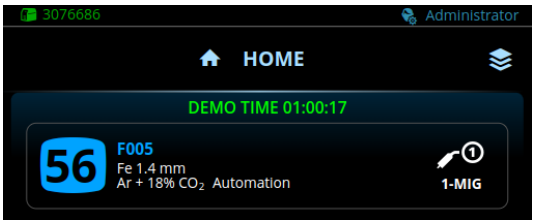


6. The update process starts automatically. Follow the on-screen instructions.

3.3.20 DEMO TIME

The demo time feature allows a free test evaluation of MAX and Wise welding software. Demo time is available (starting from March 2024) in all new X5 Power Source 400/500 equipment with welding program work pack installed.

The total available demo time is 3 hours. The demo time passes only when welding using a welding feature you don't have a license for. When the demo time is set to ON, the remaining time is shown on the display.



Available for test evaluation are:

- WisePenetration
  >> For more information, refer to "WisePenetration feature" on page 172.
- WiseRoot+
  >> For more information, refer to "WiseRoot+ process" on page 174.
- WiseThin+
  >> For more information, refer to "WiseThin+ process" on page 175.
- MAX Cool
  >> For more information, refer to "MAX Cool process" on page 175.
- MAX Speed
  >> For more information, refer to "MAX Speed process" on page 176.
- MAX Position
  >> For more information, refer to "MAX Position process" on page 175.

The demo time feature can be turned on and off in "Device settings" on page 158. By default, the demo time is set to OFF.

When the demo time expires, the features without a license cannot be used anymore. To continue using the optional features, you must buy licenses for them.

3.4 TROUBLESHOOTING

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 system:

Problem	Recommended actions
The welding system 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 all the cables are intact and properly attached.
	Check that the earth return cable is connected.
The welding system stops working	Gas-cooled welding torch may have overheated. Wait for it to cool down.
	Check that none of the cables is loose.
	The wire feeder may have overheated. Wait for it to cool down and see that the welding current cable is properly attached.
	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.

Wire feeder:

Problem	Recommended actions
The wire feeder does not feed the filler wire	Check that the filler wire has not run out.
	Check that the filler wire is properly routed through the feed rolls to the wire liner.
	Check that the pressure handle is properly closed.
	Check that the feed roll pressure is adjusted correctly for the filler wire.
	Check that the welding current cable is properly connected to the wire feeder.
	Blow compressed air through the wire liner to check that it is not blocked.

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 shielding gas type is correct for the application.
	Check that the welding procedure is correct for the application.
Varying welding performance	Check that the wire feed mechanism is adjusted properly.
	Blow compressed air through the wire liner to check that it is not blocked.
	Check that the wire liner is correct for the selected wire size and type.
	Check the welding torch contact tip's size, type and wear.
	Check that the welding torch is not overheating.
	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 welding torch/electrode.
	Check that the filler wire is correct for the current application.

Welding system and AX Manager:

Problem	Recommended actions
The welding system does not work and AX Manager cannot be accessed	Perform a forced factory reset (all devices in the welding system are reset to factory settings) with the S1 button in the RCM main board. (For RCM parts, refer to "Robot Connectivity Module (RCM)" on page 29). 1. Press and hold down the S1 button and turn the welding system on. 2. Still holding down the S1 button, wait until the indicator LEDs H1, H4 and H11 near the S1 button are all on continuously (i.e., not blinking). 3. Release the S1 button. 4. Wait until the indicator LEDs start to blink slowly at the same time (blinking frequency about 1 Hz). 5. Press and hold the button S1 down until the indicator LEDs start to blink fast (blinking frequency about 5 Hz). **Note**: If the button is not pressed within 5 seconds after the LEDs start blinking for the first time, the RCM will cancel the operation and continue normal startup. 6. Release the S1 button. When the S1 button is released, RCM starts the factory reset. **Note**: The factory reset may take up to 15 minutes to complete. When the factory reset is complete, RCM will reboot automatically, after which it will continue normal operation.

3.4.1 ERROR CODES

In error situations, the web UI displays the number and title of the error.

Error			
Code	Title	Possible cause	Proposed action
1	Power source not calibrated	Power source calibration has been lost.	Restart the power source. If problem persists, contact Kemppi service.
2	Too low mains voltage	Voltage in mains network is too low.	Restart the power source. If problem persists, contact Kemppi service.
3	Too high mains voltage	Voltage in mains network is too high.	Restart the power source. If problem persists, contact Kemppi service.
4	Power source is overheated	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	Internal 24V voltage is too low	Power source contains an inoperative 24V power supply unit .	Restart the power source. If problem persists, contact Kemppi service.
7	Wire feeder not found	Wire feeder is not connected to power source or connection is faulty.	Check the control cable and its connectors.
8	Initialization error in FPGA card	Control card is faulty or software fails in power source.	Restart the power source. If problem persists, contact Kemppi service.
9	Measurement cable failure	Voltage sensing cable is not connected to the work piece or measurement cable connection is faulty.	Connect voltage sensing cable to the work piece and check the measurement cable and its connectors.
11	FET unit failure	Power source contains an inoperative FET unit.	Restart the power source. If problem persists, contact Kemppi service.
12	Welding cable failure	Plus and minus cables are connected together.	Check the connections of welding cable and earth return cable.
13	IGBT over-current	Inoperative mains transformer in power source.	Restart the power source. If problem persists, contact Kemppi service.
14	IGBT over-heated	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.
17	Phase is missing from mains supply	One or more phases are missing from the mains supply.	Check the mains cable and its connectors. Check the voltage of mains supply.
20	Power source cooling failure	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	Cooling liquid overheated	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	Cooling liquid not circulating	No cooling liquid or circulation is blocked.	Check the liquid level in the cooler. Check hoses and connectors for blockage.

27	Cooler not found	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.
33	Welding cable calibration failure	Welding cable calibration failed.	Check the welding system cables and their connections.
40	VRD error	Open circuit voltage exceeds the VRD limit.	Restart the power source. If problem persists, contact Kemppi service.
41	Wire feeder not calibrated	Wire feeder calibration has been lost.	Restart the welding system. If problem persists, contact Kemppi service.
42	High current in wire feeder motor	There may be too much pressure in the wire feed rolls or dirt in the wire line.	Adjust the feed roll pressure. Clean the wire line. Change worn parts in the welding torch.
43	Overcurrent in wire feeder motor	There may be too much pressure in the wire feed rolls or dirt in the wire line.	Adjust the feed roll pressure. Clean the wire line. Change worn parts in the welding torch.
44	Wire speed measurement is missing	Faulty sensor or wiring in wire feeder.	Restart the welding system. If problem persists, contact Kemppi service.
50	Welding program error	Required welding program is not installed.	Contact Kemppi service for installing welding programs.
51	Rear drive roll slipping	Wire feeder's rear drive roll is slipping.	Adjust the feed roll pressure. Clean the wire lines.
53	Collision detected	Welding torch has collided with an object.	Move the welding torch away from the collision and check the torch for any damage.
56	Wire feeder hardware fault	There is an internal hardware fault in wire feeder.	Check wire feeder connections and restart the welding system. If problem persists, contact Kemppi service.
57	Low shielding gas flow	Shielding gas flow is below the warning level or missing.	Check and adjust the shielding gas flow.
58	Assistive wire feeder was disconnected	Connection to assistive wire feeder was lost during operation.	Check the connection of assistive wire feeder and ensure that it is operational.
59	Gas sensor unit missing	Faulty gas sensor unit or wiring in the wire feeder. Functions related to the gas sensor are not available.	Check the external cable connections of the wire feeder and restart the welding system. If problem persists, contact Kemppi service.
60	Welding torch speed signal missing	Disconnected push-pull welding torch control cable, or faulty wiring or sensor.	Check the push-pull welding torch control cables, and the push-pull welding torch control cable connector on the wire feeder.
61	Operation not allowed	Subfeeder is connected, but it has not been selected in the system settings.	Go to the system settings menu on the control panel and select your subfeeder model and type.
62	Power source not found	No power source is connected to the wire feeder, or connection is faulty.	Check the control cable and its connectors.

64	Robot control device lost	Wire feeder lost connection to the robot control device.	Check the robot control device and interconnection cables. If problem persists, contact Kemppi service.
65	Subfeeder not allowed	Use of subfeeder is not allowed with selected welding process.	Remove the subfeeder or change the welding process.
81	Welding program data missing	Welding program data has been lost.	Restart the power source. If problem persists, contact Kemppi service.
103	Empty memory channel	Robot tried to start welding using a nonexistent memory channel.	Check the memory channel selected by the robot.
129	Filler wire stuck	Filler wire is stuck to the weld.	Ensure that welding has stopped, and cut the filler wire. Exercise caution around hot surfaces.
130	RCM hardware fault	There is an internal hardware failure within the RCM.	Check any external I/O connections, optional add-on cards and add-on card power supplies, if applicable. If problem persists, contact Kemppi service.
131	Fieldbus initialization failed	RCM failed to initialize the fieldbus module. Either the module is unsupported or it is faulty.	Remove the fieldbus module and check if it is supported by the RCM.
132	Robot not responding	There is a communication problem between robot and the RCM.	Check fieldbus cabling, connectors and the fieldbus module.
133	Stop switch pressed	Welding system has been stopped because the stop switch is pressed.	Release the stop switch.
134	Gate door open	Gate door has been opened.	Close the gate door.
141	High current in welding torch motor	There may be too much pressure in the wire feed rolls or dirt in the wire line. This may cause degraded welding performance.	Adjust the feed roll pressure in the welding torch. Clean the wire line. Change worn parts in the welding torch.
142	Overcurrent in welding torch motor	There may be too much pressure in the wire feed rolls or dirt in the wire line. The push-pull welding torch control cable may be damaged.	Adjust the feed roll pressure in the welding torch. Clean the wire line. Change worn parts in the welding torch. Check the welding torch control cables, and the push-pull welding torch control cable connector on the wire feeder.
161	High current in assistive wire feeder motor	There may be too much pressure in the wire feed rolls or dirt in the wire line.	Adjust the feed roll pressure. Clean the wire line. Change worn parts in the welding torch.
162	Overcurrent in assistive wire feeder motor	There may be too much pressure in the wire feed rolls or dirt in the wire line.	Adjust the feed roll pressure. Clean the wire line. Change worn parts in the welding torch.
163	Wire speed measurement from assistive wire feeder is missing	Faulty sensor or wiring in wire feeder or mechanical obstacle in wire feed mechanism.	Restart the welding system. Check the wire feed mechanism. If problem persists, contact Kemppi service.

164	Main wire feeder is not supported by the assistive wire feeder	Main wire feeder is not supported by the assistive wire feeder.	Check the user manual for supported wire feeder models. Check that the assistive wire feeder has the latest firmware version.
165	Assistive wire feeder hardware fault	There is an internal hardware fault in the assistive wire feeder.	Check the assistive wire feeder connections and restart the welding system. If problem persists, contact Kemppi service.
166	Assistive wire feeder feed rolls slipping	Assistive wire feeder's feed rolls are slipping or the assistive wire feeder ran out of wire.	Adjust the feed roll pressure. Clean the wire lines. Check the wire source.
171	Gas sensor unit not calibrated	The gas sensor unit is not calibrated or the calibration data cannot be loaded.	Restart the welding system. If problem persists, contact Kemppi service.
238	Power source serial number is missing	Communication to serial number card failed.	Restart welding system. If problem persists, contact Kemppi service.
244	Internal memory failure	Initialization failed (%sub-:%device).	Restart welding system. If problem persists, contact Kemppi service.
250	Internal memory failure	Memory communication failed.	Restart welding system. If problem persists, contact Kemppi service.
255	Unsupported hardware	RCM hardware is not supported by the current firmware.	Update the RCM firmware.

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 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.
- Check the wire feeder's feed rolls and the pressure handle mechanism. Clean and lubricate with a small quantity of light machine oil if needed.

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.
- If air filters are used, remove them and clean them by blowing with compressed air.

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.

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.

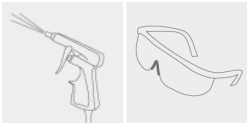
For welding torch maintenance, refer to your welding torch's instructions.

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.

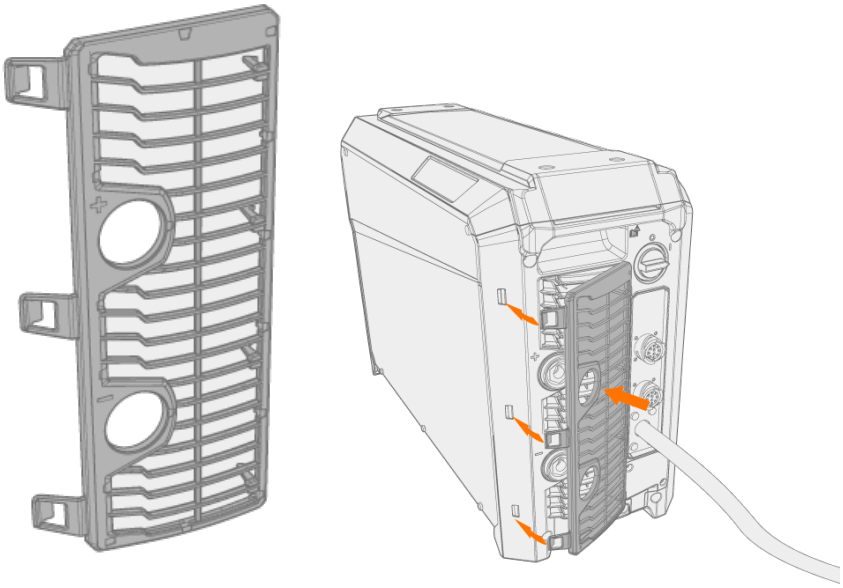
Using the optional air filter decreases the rated power levels of the power source as follows: 60% >>> 45% and 100% >>> 100%-20A (output 40 °C). This is due to the slightly obstructed cooling air intake of the power source unit.

Tools needed:



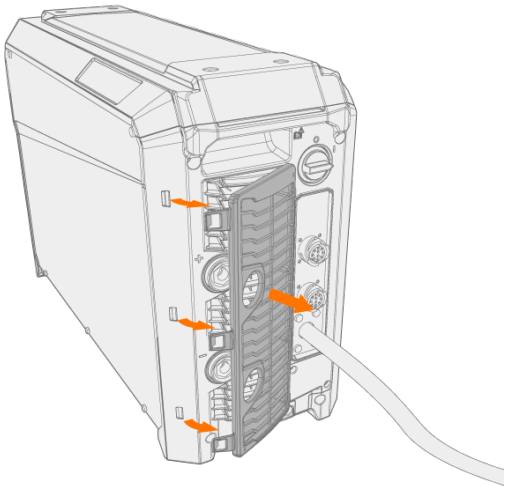
Installation and replacement

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.

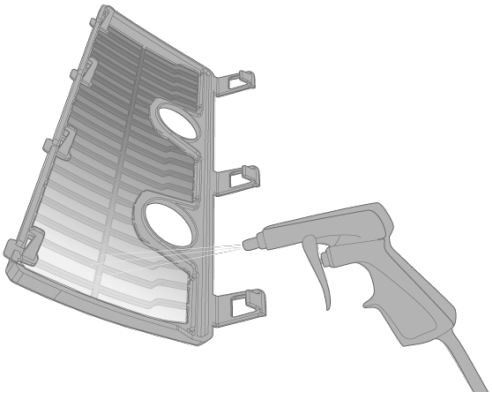


Cleansing

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 Kemppi representative. By applying these European Directives you improve the environment and human health.

For more information:

5. TECHNICAL DATA

Technical data:

"X5 power sources" on the next page
"R500 wire feeders" on page 214
"RA50 4R assistive wire feeder" on page 217
"Robot Connectivity Modules" on page 218
"Cooling unit" on page 219
"Add-on cards" on page 220

Additional information:

"Fieldbus control tables" on page 221
"Timing diagrams" on page 250
"Touch sensing voltage levels" on page 257
"Wire feeder consumables" on page 258
"Welding program work packs" on page 261
"AX MIG Welder ordering info" on page 262
"System integration checklist" on page 263
"Wire feeder compatibility matrix" on page 264

5.1 X5 POWER SOURCES

X5 Power Source 400

X5 Power Source 400			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		4 mm^2
Input power at rated maximum current			20 kVA
Maximum supply current	@ 380...460 V	I_{1max}	28...24 A
Effective supply current	@ 380...460 V	I_{1eff}	24...21 A
Idle state power consumption	@ 400 V	P_{1idle}	30 W
No-load voltage	@ 380...460 V	U_0	52...67 V
Open circuit voltage	@ 380...460 V	U_{av}	52...67 V
Fuse	Slow		25 A
Output at +40 °C	60 %		400 A
	100 %		350 A
Welding current and voltage range			15 A / 12 V ... 400 A / 42 V
Voltage adjustment range			8...45 V
Power factor at rated maximum current	@ 400 V	λ	0.88
Efficiency at rated maximum current	@ 400 V	η	90 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	5.8 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380...460 V, 24 V

Recommended minimum generator power	@ 400 V	S_{gen}	25 kVA
Wired communication type			CAN bus
Standards			IEC 60974-1, -10

X5 Power Source 400 MV

X5 Power Source 400 MV			
Feature			Value
Mains connection voltage 3~50/60 Hz			220...230 V ±10 % 380...460 V ±10 %
Mains connection cable	H07RN-F		6 mm²
Input power at rated maximum current			19 kVA
Maximum supply current	@ 220...230 V	I_{1max}	47 A
	@ 380...460 V	I_{1max}	28...24 A
Effective supply current	@ 220...230 V	I_{1eff}	30 A
	@ 380...460 V	I_{1eff}	23...19 A
Idle state power consumption	@ 400 V	P_{1idle}	30 W
No-load voltage	@ 220...230 V	U_0	51 V
	@ 380...460 V	U_0	52...67 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow, @ 220...230 V		32 A
	Slow, @ 380...460 V		25 A
Output at +40 °C	40 % @ 220...230 V		400 A
	60 % @ 380...460 V		400 A
	100 % @ 220...230 V		300 A
	100 % @ 380...460 V		350 A
Welding current and voltage range			15 A / 12 V ... 400 A / 42 V
Voltage adjustment range			8...45 V
Power factor at rated maximum current	@ 400 V	λ	0.89
Efficiency at rated maximum current	@ 400 V	η	90 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	5.8 MVA

Degree of protection			IP23
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			43.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			220...230 V, 24 V 380...460 V, 24 V
Recommended minimum generator power	@ 400 V	S_{gen}	25 kVA
Wired communication type			CAN bus
Standards			IEC 60974-1, -10

X5 Power Source 400 Pulse

X5 Power Source 400 Pulse			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		4 mm²
Input power at rated maximum current			20 kVA
Maximum supply current	@ 380...460 V	I_{1max}	28...26 A
Effective supply current	@ 380...460 V	I_{1eff}	24...22 A
Idle state power consumption	@ 400 V	P_{1idle}	31 W
No-load voltage	@ 380...460 V	U_0	76...94 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow		25 A
Output at +40 °C	60 %		400 A
	100 %		350 A
Welding current and voltage range			15 A / 10 V ... 400 A / 50 V
Voltage adjustment range			8...50 V
Power factor at rated maximum current	@ 400 V	λ	0.85
Efficiency at rated maximum current	@ 400 V	η	89 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	6.3 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380...460 V, 24 V
Recommended minimum generator power	@ 400 V	S_{gen}	25 kVA

Wired communication type	CAN bus
Standards	IEC 60974-1, -10

X5 Power Source 400 Pulse+

X5 Power Source 400 Pulse+			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		4 mm²
Input power at rated maximum current			20 kVA
Maximum supply current	@ 380...460 V	I_{1max}	28...26 A
Effective supply current	@ 380...460 V	I_{1eff}	24...22 A
Idle state power consumption	@ 400 V	P_{1idle}	33 W
No-load voltage	@ 380...460 V	U_0	76...94 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow		25 A
Output at +40 °C	60 %		400 A
	100 %		350 A
Welding current and voltage range			15 A / 10 V ... 400 A / 50 V
Voltage adjustment range			8...50 V
Power factor at rated maximum current	@ 400 V	λ	0.86
Efficiency at rated maximum current	@ 400 V	η	89 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	6.3 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380...460 V, 24 V
Recommended minimum generator power	@ 400 V	S_{gen}	25 kVA

Wired communication type	CAN bus
Standards	IEC 60974-1, -10

X5 Power Source 400 MV Pulse+

X5 Power Source 400 MV Pulse+			
Feature			Value
Mains connection voltage 3~50/60 Hz			220...230 V ±10 % 380...460 V ±10 %
Mains connection cable	H07RN-F		6 mm²
Input power at rated maximum current			19 kVA
Maximum supply current	@ 220...230 V	I_{1max}	47 A
	@ 380...460 V	I_{1max}	28...24 A
Effective supply current	@ 220...230 V	I_{1eff}	30 A
	@ 380...460 V	I_{1eff}	22...19 A
Idle state power consumption	@ 400 V	P_{1idle}	33 W
No-load voltage	@ 220...230 V	U_0	72 V
	@ 380...460 V	U_0	76...94 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow, @ 220...230 V		25 A
	Slow, @ 380...460 V		32 A
Output at +40 °C	40 % @ 220...230 V		400 A
	60 % @ 380...460 V		400 A
	100 %		350 A
Welding current and voltage range			15 A / 10 V ... 400 A / 45 V
Voltage adjustment range			8...45 V
Power factor at rated maximum current	@ 400 V	λ	0.89
Efficiency at rated maximum current	@ 400 V	η	89 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	5.3 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			43.5 kg

Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			220...230 V, 24 V 380...460 V, 24 V
Recommended minimum generator power	@ 400 V	S_{gen}	25 kVA
Wired communication type			CAN bus
Standards			IEC 60974-1, -10

X5 Power Source 500

X5 Power Source 500			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		6 mm²
Input power at rated maximum current			27 kVA
Maximum supply current	@ 380...460 V	I_{1max}	38...33 A
Effective supply current	@ 380...460 V	I_{1eff}	31...27 A
Idle state power consumption	@ 400 V	P_{1idle}	30 W
No-load voltage	@ 380...460 V	U_0	59...75 V
Open circuit voltage	@ 380...460 V	U_{av}	59...75 V
Fuse	Slow		32 A
Output at +40 °C	60 %		500 A
	100 %		430 A
Welding current and voltage range			15 A / 10 V ... 500 A / 47 V
Voltage adjustment range			8...50 V
Power factor at rated maximum current	@ 400 V	λ	0.88
Efficiency at rated maximum current	@ 400 V	η	90 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	6.4 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380 ... 460 V, 24V
Recommended minimum generator power	@ 400 V	S_{gen}	35 kVA

Wired communication type	CAN bus
Standards	IEC 60974-1, -10

X5 Power Source 500 Pulse

X5 Power Source 500 Pulse			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		6 mm²
Input power at rated maximum current			27 kVA
Maximum supply current	@ 380...460 V	I_{1max}	39...34 A
Effective supply current	@ 380...460 V	I_{1eff}	30...27 A
Idle state power consumption	@ 400 V	P_{1idle}	31 W
No-load voltage	@ 380...460 V	U_0	76...94 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow		32 A
Output at +40 °C	60 %		500 A
	100 %		400 A
Welding current and voltage range			15 A / 10 V ... 500 A / 50 V
Voltage adjustment range			8...50 V
Power factor at rated maximum current	@ 400 V	λ	0.89
Efficiency at rated maximum current	@ 400 V	η	89 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	6.7 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380 ... 460 V, 24V
Recommended minimum generator power	@ 400 V	S_{gen}	35 kVA

Wired communication type	CAN bus
Standards	IEC 60974-1, -10

X5 Power Source 500 Pulse+

X5 Power Source 500 Pulse+			
Feature			Value
Mains connection voltage 3~50/60 Hz			380...460 V ±10 %
Mains connection cable	H07RN-F		6 mm²
Input power at rated maximum current			27 kVA
Maximum supply current	@ 380...460 V	I_{1max}	39...34 A
Effective supply current	@ 380...460 V	I_{1eff}	30...27 A
Idle state power consumption	@ 400 V	P_{1idle}	33 W
No-load voltage	@ 380...460 V	U_0	76...94 V
Open circuit voltage	@ 380...460 V	U_{av}	76...94 V
Fuse	Slow		32 A
Output at +40 °C	60 %		500 A
	100 %		400 A
Welding current and voltage range			15 A / 10 V ... 500 A / 50 V
Voltage adjustment range			8...50 V
Power factor at rated maximum current	@ 400 V	λ	0.89
Efficiency at rated maximum current	@ 400 V	η	88 %
Operating temperature range			-20...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Minimum short-circuit power of supply network		S_{SC}	6.7 MVA
Degree of protection			IP23S
External dimensions	*L* x *W* x *H*		750 x 263 x 456 mm
Package external dimensions	*L* x *W* x *H*		785 x 285 x 505 mm
Weight			39.5 kg
Voltage supply for auxiliary devices			12 V, 48 V
Voltage supply for cooling unit			380 ... 460 V, 24V
Recommended minimum generator power	@ 400 V	S_{gen}	35 kVA

Wired communication type	CAN bus
Standards	IEC 60974-1, -10

5.2 R500 WIRE FEEDERS

R500 Wire Feeder EUR

R500 Wire Feeder EUR		
Feature		Value
Supply voltage		48 V
Supply current at maximum load		6 A
Welding current 60%		500 A
Welding current 100%		430 A
Welding connection type		Euro
Wire feed mechanism		4-roll, Twin-motor
Diameter of feed rolls		32 mm
Filler wire diameter, Fe		0.8...1.6 mm
Filler wire diameter, Ss		0.8...1.6 mm
Filler wire diameter, MC/FC		1...1.6 mm
Filler wire diameter, Al		1...1.6 mm
Wire feed speed		0.5...25 m/min
Maximum shielding gas pressure		0.5 MPa
Wired communication type		CAN bus
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
EMC class		A
Degree of protection		IP23
External dimensions	*L* x *W* x *H*	374 x 234 x 183 mm
Weight without accessories		6.15 kg
Standards		IEC 60974-5, -10

R500 Wire Feeder EUR+

R500 Wire Feeder LH EUR+	
Feature	Value
Supply voltage	48 V
Supply current at maximum load	6 A
Welding current 60%	500 A
Welding current 100%	430 A
Welding connection type	Euro
Wire feed mechanism	4-roll, Twin-motor
Diameter of feed rolls	32 mm
Filler wire diameter, Fe	0.8...1.6 mm
Filler wire diameter, Ss	0.8...1.6 mm

Filler wire diameter, MC/FC		1...1.6 mm
Filler wire diameter, Al		1...1.6 mm
Wire feed speed		0.5...25 m/min
Maximum shielding gas pressure		0.5 MPa
Maximum air blow pressure		0.8 MPa
Air blow rate		0.24 m³/h
Wired communication type		CAN bus
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
EMC class		A
Degree of protection		IP23
External dimensions	*L* x *W* x *H*	374 x 234 x 183 mm
Weight without accessories		6.75 kg
Standards		IEC 60974-5, -10

R500 Wire Feeder RH EUR+

R500 Wire Feeder RH EUR+	
Feature	Value
Supply voltage	48 V
Supply current at maximum load	6 A
Welding current 60%	500 A
Welding current 100%	430 A
Welding connection type	Euro
Wire feed mechanism	4-roll, Twin-motor
Diameter of feed rolls	32 mm
Filler wire diameter, Fe	0.8...1.6 mm
Filler wire diameter, Ss	0.8...1.6 mm
Filler wire diameter, MC/FC	1...1.6 mm
Filler wire diameter, Al	1...1.6 mm
Wire feed speed	0.5...25 m/min
Maximum shielding gas pressure	0.5 MPa
Maximum air blow pressure	0.8 MPa
Air blow rate	0.24 m³/h
Wired communication type	CAN bus
Operating temperature range	-20...40 °C
Storage temperature range	-40...60 °C
EMC class	A
Degree of protection	IP23
External dimensions *L* x *W* x *H*	374 x 234 x 183 mm

Weight without accessories	6.75 kg
Standards	IEC 60974-5, -10

R500 Wire Feeder HD EUR+

R500 Wire Feeder HD EUR+		
Feature		Value
Supply voltage		48 V
Welding current 60%		500 A
Welding current 100%		430 A
Welding connection type		Euro, Euro+Amphenol
Wire feed mechanism		4-roll, Single-motor
Diameter of feed rolls		32 mm
Filler wire diameter, Fe		0.8...1.6 mm
Filler wire diameter, Ss		0.8...1.6 mm
Filler wire diameter, MC/FC		1...1.6 mm
Filler wire diameter, Al		1...1.6 mm
Wire feed speed		0.5...25 m/min
Maximum shielding gas pressure		0.5 MPa
Maximum air blow pressure		0.8 MPa
Air blow rate		0.26 m^3/h
Load on analog output		≥ 100 kΩ
Wired communication type		CAN bus
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
EMC class		A
Degree of protection		IP23
External dimensions	*L* x *W* x *H*	329.62 x 234.1 x 159.2 mm
Weight without accessories		4.73 kg
Standards		IEC 60974-5, -10

5.3 RA50 4R ASSISTIVE WIRE FEEDER

RA50 4R Assistive Wire Feeder		
Feature		Value
Supply voltage		48 V
Wire feed mechanism		4-roll, Single-motor
Diameter of feed rolls		32 mm
Filler wire diameter, Fe		0.8...1.6 mm
Filler wire diameter, Ss		0.8...1.6 mm
Filler wire diameter, MC/FC		1...1.6 mm
Filler wire diameter, Al		1...1.6 mm
Wire feed speed		0.5...25 m/min
Wired communication type		CAN bus
Operating temperature range		-20...40 °C
Storage temperature range		-40...60 °C
EMC class		A
External dimensions	*L* x *W* x *H*	374 x 234 x 183 mm
Weight without accessories		4.5 kg

5.4 ROBOT CONNECTIVITY MODULES

Robot Connectivity Module		RCM	RCM+
Feature		Value	Value
Supply voltage		12 ... 48 V	12 ... 48 V
Supply current at maximum load		1.1 ... 0.3 A	1.1 ... 0.3 A
Fuse	Slow	0.63 A	0.63 A
Maximum touch sensing voltage	U_{vs}	200 V	200 V
Maximum touch sensing current	I_{vs}	20 mA@113 V	20 mA@113 V
USB voltage		5 V	5 V
USB maximum current		4 x 0.5 A	4 x 0.5 A
Maximum power consumption		30 W	30 W
Operating temperature range		-20...+40 °C	-20...+40 °C
Storage temperature range		-40...+60 °C	-40...+60 °C
EMC class		A	A
Degree of protection		IP23	IP23
External dimensions	*L* x *W* x *H*	597 x 241 x 137 mm	597 x 241 x 137 mm
Weight		4.1 kg	4.1 kg
Wireless communication type			
- Wireless local area network (WLAN) standard		-	IEEE 802.11 ac/a/b/g/n
- Transmitter frequency and power, WLAN		-	2.4 GHz: 2.412...2.484 GHz; 5.1 GHz: 5.150...5.240 GHz, 5.250...5.350 GHz, 5.470...5.725 GHz; 9...16 dBm
Wired communication type		CAN bus	CAN bus
Ethernet cable		CAT-5 or better shielded Ethernet RJ-45 cable	CAT-5 or better shielded Ethernet RJ-45 cable
Standards, where applicable, together with the power source		IEC 60974-5, 10	IEC 60974-5, 10

5.5 COOLING UNIT

X5 Cooler 1400			
Feature			Value
Supply voltage		U_1	380...460 V +/- 10 %
Maximum supply current	@ 380...460 V	I_{1max}	0.7 A
Cooling power	@ 1 L/min		1.4 kW
Recommended coolant			MGP 4456 (Kemppi mixture)
Maximum coolant pressure			0.4 MPa
Tank volume			3 l
Operating temperature range	With recommended coolant		-10...+40 °C
Storage temperature range			-40...+60 °C
EMC class			A
Degree of protection	When mounted		IP23S
External dimensions	*L* x *W* x *H*		763 x 263 x 288 mm
Weight	Without accessories		15 kg
Standards			IEC 60974-2, -10

5.6 ADD-ON CARDS

Digital IO add-on card

Add-on card	Digital IO add-on card
Feature	Value
Number of digital inputs	8
Number of digital outputs	8
Supply voltage	24 V +- 10 %
Minimum supply current (no digital outputs active)	0.1 A
Maximum supply current (maximum current on digital outputs)	8.1 A
Maximum current per digital output	1 A
Digital input voltage low level	0 ... 5 V
Digital input voltage high level	11 ... 30 V
Maximum voltage on digital input	30 V
Typical current for single digital input	2 mA ... 10 mA

Analog IO add-on card

Add-on card	Analog IO add-on card
Feature	Value
Number of analog inputs	2
Number of analog outputs	2
Supply voltage	24 V +- 10 %
Supply current	0.1 A
Analog input voltage range	0 ... 10 V
Maximum voltage on analog input	24 V
Analog output voltage range	0 ... 10 V
Load on analog output	≥ 4.7 kΩ

5.7 FIELDBUS CONTROL TABLES

Fieldbus control tables can be used to handle the communication between AX MIG Welder and the welding robot.

This section describes the supported fieldbus control tables, and the control and status parameters.

5.7.1 AX MIG 1: AX MIG WELDER DEFAULT FIELDBUS CONTROL TABLE

Fieldbus interface mode: 20

Table size: 40 bytes

Control parameters (from robot to welding system)

Modbus register address	Byte	Bit/Type (Modbus Coil in brackets)	Control parameter	Control parameter (Robot interface version 1.00.03.0 or older)
0	0	0 (0)	StartWelding (ID 108)	StartWelding (ID 108)
		1 (1)	RobotReadyToWeld (ID 108)	RobotReadyToWeld (ID 108)
		2 (2)	OnlineControl (ID 108)	(Not in use) (ID 108)
		3 (3)	SimulationMode (ID 108)	SimulationMode (ID 108)
		4 (4)	Watchdog (ID 108)	Watchdog (ID 108)
		5 (5)	ErrorReset (ID 108)	ErrorReset (ID 108)
		6 (6)	(Not in use) (ID 108)	(Not in use) (ID 108)
		7 (7)	WireBrakeOn (ID 108)	(Not in use) (ID 108)
	1	0 (8)	GasBlow (ID 109)	GasBlow (ID 109)
		1 (9)	AirBlow (ID 109)	AirBlow (ID 109)
		2 (10)	WireInchForward (ID 109)	WireInchForward (ID 109)
		3 (11)	WireInchBackward (ID 109)	WireInchBackward (ID 109)
		4 (12)	TouchSensorOn (ID 109)	TouchSensorOn (ID 109)
		5 (13)	TouchSensorToolSel (ID 109)	TouchSensorToolSel (ID 109)
		6 (14)	(Not in use) (ID 109)	(Not in use) (ID 109)
		7 (15)	WireStuckCheck (ID 109)	(Not in use) (ID 109)

1	2	0 (16)	HotStartOn (ID 110)	(Not in use) (ID 110)
		1 (17)	(Not in use) (ID 110)	(Not in use) (ID 110)
		2 (18)	(Not in use) (ID 110)	(Not in use) (ID 110)
		3 (19)	CraterFillOn (ID 110)	(Not in use) (ID 110)
		4 (20)	WireFeedSpeedInc (ID 110)	(Not in use) (ID 110)
		5 (21)	WireFeedSpeedDec (ID 110)	(Not in use) (ID 110)
		6 (22)	VoltFinetuningInc (ID 110)	(Not in use) (ID 110)
		7 (23)	VoltFinetuningDec (ID 110)	(Not in use) (ID 110)
	3	0 (24)	(Not in use) (ID 129)	(Not in use) (ID 129)
		1 (25)	(Not in use) (ID 129)	(Not in use) (ID 129)
		2 (26)	(Not in use) (ID 129)	(Not in use) (ID 129)
		3 (27)	(Not in use) (ID 129)	(Not in use) (ID 129)
		4 (28)	(Not in use) (ID 129)	(Not in use) (ID 129)
		5 (29)	(Not in use) (ID 129)	(Not in use) (ID 129)
		6 (30)	(Not in use) (ID 129)	(Not in use) (ID 129)
		7 (31)	(Not in use) (ID 129)	(Not in use) (ID 129)
2	4	UINT16	(Not in use) (ID 137)	(Not in use) (ID 137)
	5			
3	6	0 (48)	DigitalOutput1 (ID 111)	DigitalOutput1 (ID 111)
		1 (49)	DigitalOutput2 (ID 111)	DigitalOutput2 (ID 111)
		2 (50)	DigitalOutput3 (ID 111)	DigitalOutput3 (ID 111)
		3 (51)	DigitalOutput4 (ID 111)	DigitalOutput4 (ID 111)
		4 (52)	DigitalOutput5 (ID 111)	DigitalOutput5 (ID 111)
		5 (53)	DigitalOutput6 (ID 111)	DigitalOutput6 (ID 111)
		6 (54)	DigitalOutput7 (ID 111)	DigitalOutput7 (ID 111)
		7 (55)	DigitalOutput8 (ID 111)	DigitalOutput8 (ID 111)
	7	0 (56)	DigitalOutput9 (ID 112)	DigitalOutput9 (ID 112)
		1 (57)	DigitalOutput10 (ID 112)	DigitalOutput10 (ID 112)
		2 (58)	DigitalOutput11 (ID 112)	DigitalOutput11 (ID 112)
		3 (59)	DigitalOutput12 (ID 112)	DigitalOutput12 (ID 112)
		4 (60)	DigitalOutput13 (ID 112)	DigitalOutput13 (ID 112)
		5 (61)	DigitalOutput14 (ID 112)	DigitalOutput14 (ID 112)
		6 (62)	DigitalOutput15 (ID 112)	DigitalOutput15 (ID 112)
		7 (63)	DigitalOutput16 (ID 112)	DigitalOutput16 (ID 112)
4	8	UINT16	MemoryChannel (ID 105)	MemoryChannel (ID 105)
	9			
5	10	UINT16	WireFeedSpeed/Current/PlateThickness (ID 138)	(Not in use) (ID 138)
	11			

6	12	UINT16	Voltage (ID 139)	(Not in use) (ID 139)
	13			
7	14	UINT16	FineTuning (ID 140)	(Not in use) (ID 140)
	15			
8	16	UINT16	Dynamics (ID 141)	(Not in use) (ID 141)
	17			
9	18	UINT16	PostCurrent (ID 142)	(Not in use) (ID 142)
	19			
10	20	UINT16	(Not in use) (ID 143)	(Not in use) (ID 143)
	21			
11	22	UINT16	(Not in use) (ID 144)	(Not in use) (ID 144)
	23			
12	24	UINT16	(Not in use) (ID 145)	(Not in use) (ID 145)
	25			
13	26	UINT16	RobotTravelSpeed (ID 120)	RobotTravelSpeed (ID 120)
	27			
14	28	UINT16	(Not in use) (ID 146)	(Not in use) (ID 146)
	29			
15	30	UINT16	(Not in use) (ID 147)	(Not in use) (ID 147)
	31			
16	32	UINT16	(Not in use) (ID 148)	(Not in use) (ID 148)
	33			
17	34	UINT16	(Not in use) (ID 149)	(Not in use) (ID 149)
	35			
18	36	UINT16	(Not in use) (ID 150)	(Not in use) (ID 150)
	37			
19	38	UINT16	(Not in use) (ID 151)	(Not in use) (ID 151)
	39			

Status parameters (from welding system to robot)

Modbus register address	Byte	Bit/Type (Modbus Discrete Input in brackets)	Status parameter
0	0	0 (0)	ArcOn (ID 162)
		1 (1)	CycleOn (ID 162)
		2 (2)	WeldingSystemReady (ID 162)
		3 (3)	PowerSourceReady (ID 162)
		4 (4)	Watchdog (ID 162)
		5 (5)	Error (ID 162)
		6 (6)	Warning (ID 162)
		7 (7)	WireBrakeLocked (ID 162)
	1	0 (8)	(Not in use) (ID 163)
		1 (9)	GasFlowOK (ID 163)
		2 (10)	WaterFlowOK (ID 163)
		3 (11)	(Not in use) (ID 163)
		4 (12)	TouchSensed (ID 163)
		5 (13)	CollisionDetected (ID 163)
		6 (14)	BackwardWireFeed (ID 163)
		7 (15)	WireOK (ID 163)
1	2	0 (16)	(Not in use) (ID 179)
		1 (17)	(Not in use) (ID 179)
		2 (18)	(Not in use) (ID 179)
		3 (19)	(Not in use) (ID 179)
		4 (20)	(Not in use) (ID 179)
		5 (21)	(Not in use) (ID 179)
		6 (22)	(Not in use) (ID 179)
		7 (23)	(Not in use) (ID 179)
	3	0 (24)	(Not in use) (ID 180)
		1 (25)	(Not in use) (ID 180)
		2 (26)	(Not in use) (ID 180)
		3 (27)	(Not in use) (ID 180)
		4 (28)	(Not in use) (ID 180)
		5 (29)	(Not in use) (ID 180)
		6 (30)	(Not in use) (ID 180)
		7 (31)	(Not in use) (ID 180)
2	4	UINT16	(Not in use) (ID 213)
	5		

3	6	0 (48)	DigitalInput1 (ID 164)
		1 (49)	DigitalInput2 (ID 164)
		2 (50)	DigitalInput3 (ID 164)
		3 (51)	DigitalInput4 (ID 164)
		4 (52)	DigitalInput5 (ID 164)
		5 (53)	DigitalInput6 (ID 164)
		6 (54)	DigitalInput7 (ID 164)
		7 (55)	DigitalInput8 (ID 164)
	7	0 (56)	DigitalInput9 (ID 165)
		1 (57)	DigitalInput10 (ID 165)
		2 (58)	DigitalInput11 (ID 165)
		3 (59)	DigitalInput12 (ID 165)
		4 (60)	DigitalInput13 (ID 165)
		5 (61)	DigitalInput14 (ID 165)
		6 (62)	DigitalInput15 (ID 165)
		7 (63)	DigitalInput16 (ID 165)
4	8	UINT16	WeldingCurrent (ID 156)
	9		
5	10	UINT16	WeldingWireFeedSpeed (ID 161)
	11		
6	12	UINT16	WeldingVoltage (ID 157)
	13		
7	14	UINT16	TAST (ID 166)
	15		
8	16	UINT16	ErrorNumber (ID 159)
	17		
9	18	UINT16	WeldingProcess (ID 171)
	19		
10	20	UINT16	MotorCurrent (ID 169)
	21		
11	22	UINT16	(Not in use) (ID 214)
	23		
12	24	UINT16	GasFlowRate (ID 167)
	25		
13	26	UINT16	WeldAssistTravelSpeed (ID 178)
	27		
14	28	UINT16	WireFeedSpeedSetpoint (ID 215)
	29		

15	30	UINT16	(Not in use) (ID 216)
	31		
16	32	UINT16	(Not in use) (ID 217)
	33		
17	34	UINT16	(Not in use) (ID 218)
	35		
18	36	UINT16	(Not in use) (ID 219)
	37		
19	38	UINT16	(Not in use) (ID 220)
	39		

5.7.2 AX MIG 2: AX MIG WELDER EXTENDED FIELDBUS CONTROL TABLE

Fieldbus interface mode: 21

Table size: 42 bytes

Control parameters (from robot to welding system)

Modbus register address	Byte	Bit/Type (Modbus Coil in brackets)	Control parameter
0	0	0 (0)	StartWelding (ID 108)
		1 (1)	RobotReadyToWeld (ID 108)
		2 (2)	OnlineControl (ID 108)
		3 (3)	SimulationMode (ID 108)
		4 (4)	Watchdog (ID 108)
		5 (5)	ErrorReset (ID 108)
		6 (6)	(Not in use) (ID 108)
		7 (7)	WireBrakeOn (ID 108)
	1	0 (8)	GasBlow (ID 109)
		1 (9)	AirBlow (ID 109)
		2 (10)	WireInchForward (ID 109)
		3 (11)	WireInchBackward (ID 109)
		4 (12)	TouchSensorOn (ID 109)
		5 (13)	TouchSensorToolSel (ID 109)
		6 (14)	(Not in use) (ID 109)
		7 (15)	WireStuckCheck (ID 109)

1	2	0 (16)	HotStartOn (ID 110)
		1 (17)	(Not in use) (ID 110)
		2 (18)	(Not in use) (ID 110)
		3 (19)	CraterFillOn (ID 110)
		4 (20)	WireFeedSpeedInc (ID 110)
		5 (21)	WireFeedSpeedDec (ID 110)
		6 (22)	VoltFinetuningInc (ID 110)
		7 (23)	VoltFinetuningDec (ID 110)
	3	0 (24)	(Not in use) (ID 129)
		1 (25)	(Not in use) (ID 129)
		2 (26)	(Not in use) (ID 129)
		3 (27)	(Not in use) (ID 129)
		4 (28)	(Not in use) (ID 129)
		5 (29)	(Not in use) (ID 129)
		6 (30)	(Not in use) (ID 129)
		7 (31)	(Not in use) (ID 129)
2	4	UINT16	(Not in use) (ID 284)
	5		
3	6	0 (48)	DigitalOutput1 (ID 111)
		1 (49)	DigitalOutput2 (ID 111)
		2 (50)	DigitalOutput3 (ID 111)
		3 (51)	DigitalOutput4 (ID 111)
		4 (52)	DigitalOutput5 (ID 111)
		5 (53)	DigitalOutput6 (ID 111)
		6 (54)	DigitalOutput7 (ID 111)
		7 (55)	DigitalOutput8 (ID 111)
	7	0 (56)	DigitalOutput9 (ID 112)
		1 (57)	DigitalOutput10 (ID 112)
		2 (58)	DigitalOutput11 (ID 112)
		3 (59)	DigitalOutput12 (ID 112)
		4 (60)	DigitalOutput13 (ID 112)
		5 (61)	DigitalOutput14 (ID 112)
		6 (62)	DigitalOutput15 (ID 112)
		7 (63)	DigitalOutput16 (ID 112)
4	8	UINT16	MemoryChannel (ID 105)
	9		
5	10	UINT16	WireFeedSpeed (ID 285)
	11		

6	12	UINT16	Voltage (ID 139)
	13		
7	14	UINT16	FineTuning (ID 140)
	15		
8	16	UINT16	Dynamics (ID 141)
	17		
9	18	UINT16	PostCurrent (ID 142)
	19		
10	20	UINT16	Current (ID 286)
	21		
11	22	UINT16	PlateThickness (ID 287)
	23		
12	24	UINT16	(Not in use) (ID 288)
	25		
13	26	UINT16	RobotTravelSpeed (ID 120)
	27		
14	28	UINT16	(Not in use) (ID 289)
	29		
15	30	UINT16	(Not in use) (ID 290)
	31		
16	32	UINT16	(Not in use) (ID 291)
	33		
17	34	UINT16	(Not in use) (ID 292)
	35		
18	36	UINT16	(Not in use) (ID 293)
	37		
19	38	UINT16	(Not in use) (ID 294)
	39		
20	40	UINT16	(Not in use) (ID 295)
	41		

Status parameters (from welding system to robot)

Modbus register address	Byte	Bit/Type (Modbus Discrete Input in brackets)	Status parameter
0	0	0 (0)	ArcOn (ID 162)
		1 (1)	CycleOn (ID 162)
		2 (2)	WeldingSystemReady (ID 162)
		3 (3)	PowerSourceReady (ID 162)
		4 (4)	Watchdog (ID 162)
		5 (5)	Error (ID 162)
		6 (6)	Warning (ID 162)
		7 (7)	WireBrakeLocked (ID 162)
	1	0 (8)	(Not in use) (ID 163)
		1 (9)	GasFlowOK (ID 163)
		2 (10)	WaterFlowOK (ID 163)
		3 (11)	(Not in use) (ID 163)
		4 (12)	TouchSensed (ID 163)
		5 (13)	CollisionDetected (ID 163)
		6 (14)	BackwardWireFeed (ID 163)
		7 (15)	WireOK (ID 163)
1	2	0 (16)	(Not in use) (ID 179)
		1 (17)	(Not in use) (ID 179)
		2 (18)	(Not in use) (ID 179)
		3 (19)	(Not in use) (ID 179)
		4 (20)	(Not in use) (ID 179)
		5 (21)	(Not in use) (ID 179)
		6 (22)	(Not in use) (ID 179)
		7 (23)	(Not in use) (ID 179)
	3	0 (24)	(Not in use) (ID 180)
		1 (25)	(Not in use) (ID 180)
		2 (26)	(Not in use) (ID 180)
		3 (27)	(Not in use) (ID 180)
		4 (28)	(Not in use) (ID 180)
		5 (29)	(Not in use) (ID 180)
		6 (30)	(Not in use) (ID 180)
		7 (31)	(Not in use) (ID 180)
2	4	UINT16	(Not in use) (ID 296)
	5		

3	6	0 (48)	DigitalInput1 (ID 164)
		1 (49)	DigitalInput2 (ID 164)
		2 (50)	DigitalInput3 (ID 164)
		3 (51)	DigitalInput4 (ID 164)
		4 (52)	DigitalInput5 (ID 164)
		5 (53)	DigitalInput6 (ID 164)
		6 (54)	DigitalInput7 (ID 164)
		7 (55)	DigitalInput8 (ID 164)
	7	0 (56)	DigitalInput9 (ID 165)
		1 (57)	DigitalInput10 (ID 165)
		2 (58)	DigitalInput11 (ID 165)
		3 (59)	DigitalInput12 (ID 165)
		4 (60)	DigitalInput13 (ID 165)
		5 (61)	DigitalInput14 (ID 165)
		6 (62)	DigitalInput15 (ID 165)
		7 (63)	DigitalInput16 (ID 165)
4	8	UINT16	WeldingCurrent (ID 156)
	9		
5	10	UINT16	WeldingWireFeedSpeed (ID 161)
	11		
6	12	UINT16	WeldingVoltage (ID 157)
	13		
7	14	UINT16	TAST (ID 166)
	15		
8	16	UINT16	ErrorNumber (ID 159)
	17		
9	18	UINT16	WeldingProcess (ID 171)
	19		
10	20	UINT16	MotorCurrent (ID 169)
	21		
11	22	UINT16	(Not in use) (ID 297)
	23		
12	24	UINT16	GasFlowRate (ID 167)
	25		
13	26	UINT16	WeldAssistTravelSpeed (ID 178)
	27		
14	28	UINT16	WireFeedSpeedSetpoint (ID 215)
	29		

15	30	UINT16	(Not in use) (ID 298)
	31		
16	32	UINT16	(Not in use) (ID 299)
	33		
17	34	UINT16	(Not in use) (ID 300)
	35		
18	36	UINT16	(Not in use) (ID 301)
	37		
19	38	UINT16	(Not in use) (ID 302)
	39		
20	40	UINT16	(Not in use) (ID 303)
	41		

5.7.3 KEMPPI 1: KEMPARC PULSE COMPATIBILITY FIELDBUS CONTROL TABLE

Fieldbus interface mode: 1

Table size: 8 bytes

Control parameters (from robot to welding system)

Modbus register address	Byte	Bit/Type (Modbus Coil in brackets)	Control parameter	Control parameter (Robot interface version 1.00.03.0 or older)
0	0	UINT16	WireFeedSpeed/Current/PlateThickness (ID 100)	(Not in use) (ID 137)
	1			
1	2	UINT16	Voltage/FineTuning (ID 101)	(Not in use) (ID 138)
	3			
2	4	UINT8	MemoryChannel (ID 104)	MemoryChannel (ID 104)
	5	UINT8	Dynamics (ID 106)	(Not in use) (ID 129)
3	6	0 (48)	StartWelding (ID 108)	StartWelding (ID 108)
		1 (49)	SimulationMode (ID 108)	SimulationMode (ID 108)
		2 (50)	WireInchForward (ID 108)	WireInchForward (ID 108)
		3 (51)	WireInchBackward (ID 108)	WireInchBackward (ID 108)
		4 (52)	GasBlow (ID 108)	GasBlow (ID 108)
		5 (53)	TouchSensorToolSel (ID 108)	TouchSensorToolSel (ID 108)
		6 (54)	TouchSensorOn (ID 108)	TouchSensorOn (ID 108)
		7 (55)	OnlineControl (ID 108)	(Not in use) (ID 108)
	7	0 (56)	Watchdog (ID 109)	Watchdog (ID 109)
		1 (57)	ErrorReset (ID 109)	ErrorReset (ID 109)
		2 (58)	AirBlow (ID 109)	AirBlow (ID 109)
		3 (59)	(Not in use) (ID 109)	(Not in use) (ID 109)
		4 (60)	(Not in use) (ID 109)	(Not in use) (ID 109)
		5 (61)	DigitalOutput1 (ID 109)	DigitalOutput1 (ID 109)
		6 (62)	DigitalOutput2 (ID 109)	DigitalOutput2 (ID 109)
		7 (63)	DigitalOutput3 (ID 109)	DigitalOutput3 (ID 109)

Status parameters (from welding system to robot)

Modbus register address	Byte	Bit/Type (Modbus Discrete Input in brackets)	Status parameter
0	0	UINT16	WeldingCurrent (ID 156)
	1		
1	2	UINT16	WeldingVoltage (ID 157)
	3		

2	4	UINT8	ErrorNumber (ID 158)
	5	0 (40)	CycleOn (ID 162)
		1 (41)	ArcOn (ID 162)
		2 (42)	TouchSensed (ID162)
		3 (43)	PowerSourceReady (ID 162)
		4 (44)	Error (ID 162)
		5 (45)	WeldingSystemReady (ID 162)
		6 (46)	LocalRemote (ID 162)
		7 (47)	AutoManual (ID 162)
3	6	0 (48)	DigitalInput1 (ID 163)
		1 (49)	DigitalInput2 (ID 163)
		2 (50)	DigitalInput3 (ID 163)
		3 (51)	DigitalInput4 (ID 163)
		4 (52)	GateDoorOpen (ID 163)
		5 (53)	DigitalInput6 (ID 163)
		6 (54)	CollisionDetected (ID 163)
		7 (55)	GasFlowOk (ID 163)
	7	UINT8	WeldingWireFeedSpeed (ID 160)

5.7.4 KEMPPI 4: A7 MIG WELDER COMPATIBILITY FIELDBUS CONTROL TABLE

Fieldbus interface mode: 15

Table size: 16 bytes

Control parameters (from robot to welding system)

Modbus register address	Byte	Bit /Type (Modbus Coil in brackets)	Control parameter	Control parameter (Robot interface version 1.00.03.0 or older)
0	0	UINT16	WireFeedSpeed/Current/PlateThickness (ID 100)	(Not in use) (ID 137)
	1			
1	2	UINT16	Voltage/FineTuning (ID 101)	(Not in use) (ID 138)
	3			
2	4	UINT8	MemoryChannel (ID 104)	MemoryChannel (ID 104)
	5	UINT8	Dynamics (ID 106)	(Not in use) (ID 129)
3	6	0 (48)	StartWelding (ID 108)	StartWelding (ID 108)
		1 (49)	SimulationMode (ID 108)	SimulationMode (ID 108)
		2 (50)	WireInchForward (ID 108)	WireInchForward (ID 108)
		3 (51)	WireInchBackward (ID 108)	WireInchBackward (ID 108)
		4 (52)	GasBlow (ID 108)	GasBlow (ID 108)
		5 (53)	AirBlow (ID 108)	AirBlow (ID 108)
		6 (54)	TouchSensorToolSel (ID 108)	TouchSensorToolSel (ID 108)
		7 (55)	TouchSensorOn (ID 108)	TouchSensorOn (ID 108)
	7	0 (56)	OnlineControl (ID 109)	(Not in use) (ID 109)
		1 (57)	ErrorReset (ID 109)	ErrorReset (ID 109)
		2 (58)	(Not in use) (ID 109)	(Not in use) (ID 109)
		3 (59)	Watchdog (ID 109)	Watchdog (ID 109)
		4 (60)	HotStartOn (ID 109)	(Not in use) (ID 109)
		5 (61)	CraterFillOn (ID 109)	(Not in use) (ID 109)
		6 (62)	(Not in use) (ID 109)	(Not in use) (ID 109)
		7 (63)	(Not in use) (ID 109)	(Not in use) (ID 109)

4	8	0 (64)	DigitalOutput1 (ID 111)	DigitalOutput1 (ID 111)
		1 (65)	DigitalOutput2 (ID 111)	DigitalOutput2 (ID 111)
		2 (66)	DigitalOutput3 (ID 111)	DigitalOutput3 (ID 111)
		3 (67)	DigitalOutput4 (ID 111)	DigitalOutput4 (ID 111)
		4 (68)	DigitalOutput5 (ID 111)	DigitalOutput5 (ID 111)
		5 (69)	DigitalOutput6 (ID 111)	DigitalOutput6 (ID 111)
		6 (70)	DigitalOutput7 (ID 111)	DigitalOutput7 (ID 111)
		7 (71)	DigitalOutput8 (ID 111)	DigitalOutput8 (ID 111)
	9	(UINT8)	(Not in use) (ID 221)	(Not in use) (ID 221)
5	10	(UINT8)	(Not in use) (ID 222)	(Not in use) (ID 222)
	11	(UINT8)	(Not in use) (ID 223)	(Not in use) (ID 223)
6	12	(UINT8)	(Not in use) (ID 224)	(Not in use) (ID 224)
	13	(UINT8)	(Not in use) (ID 225)	(Not in use) (ID 225)
7	14	(UINT8)	(Not in use) (ID 226)	(Not in use) (ID 226)
	15	(UINT8)	(Not in use) (ID 227)	(Not in use) (ID 227)

Status parameters (from welding system to robot)

Modbus register address	Byte	Bit/Type (Modbus Discrete Input in brackets)	Status parameter
0	0	UINT16	WeldingCurrent (ID 156)
	1		
1	2	UINT16	WeldingVoltage (ID 157)
	3		
2	4	UINT8	ErrorNumber (ID 158)
	5	UINT8	WeldingWireFeedSpeed (ID 160)

3	6	0 (48)	WeldingSystemReady (ID 162)
		1 (49)	PowerSourceReady (ID 162)
		2 (50)	CycleOn (ID 162)
		3 (51)	ArcOn (ID 162)
		4 (52)	GasFlowOk (ID 162)
		5 (53)	(Not in use) (ID 162)
		6 (54)	(Not in use) (ID 162)
		7 (55)	TouchSensed (ID 162)
	7	0 (56)	GateDoorOpen (ID 163)
		1 (57)	Error (ID 163)
		2 (58)	CollisionDetected (ID 163)
		3 (59)	(Not in use) (ID 163)
		4 (60)	(Not in use) (ID 163)
		5 (61)	(Not in use) (ID 163)
		6 (62)	(Not in use) (ID 163)
		7 (63)	(Not in use) (ID 163)
4	8	0 (64)	DigitalInput1 (ID 164)
		1 (65)	DigitalInput2 (ID 164)
		2 (66)	DigitalInput3 (ID 164)
		3 (67)	DigitalInput4 (ID 164)
		4 (68)	DigitalInput5 (ID 164)
		5 (69)	DigitalInput6 (ID 164)
		6 (70)	DigitalInput7 (ID 164)
		7 (71)	DigitalInput8 (ID 164)
	9	UINT16	TAST (ID 166)
5	10		
	11	UINT16	GasFlowRate (ID 167)
6	12		
	13	UINT8	MotorCurrent (ID 168)
7	14	UINT8	WeldingProcess (ID 170)
	15	UINT8	(Not in use) (ID 281)

5.7.5 KEMPPI 6: A7 MIG WELDER WELDEYE COMPATIBILITY FIELDBUS CONTROL TABLE

Fieldbus interface mode: 17

Table size: 49 bytes

Control parameters (from robot to welding system)

Modbus register address	Byte	Bit/Type (Modbus Coil in brackets)	Control parameter	Control parameter (Robot interface version 1.00.03.0 or older)
0	0	UINT16	WireFeedSpeed/Current/PlateThickness (ID 100)	(Not in use) (ID 137)
	1			
1	2	UINT16	Voltage/FineTuning (ID 101)	(Not in use) (ID 138)
	3			
2	4	UINT8	MemoryChannel (ID 104)	MemoryChannel (ID 104)
	5	UINT8	Dynamics (ID 106)	(Not in use) (ID 129)
3	6	0 (48)	StartWelding (ID 108)	StartWelding (ID 108)
		1 (49)	SimulationMode (ID 108)	SimulationMode (ID 108)
		2 (50)	WireInchForward (ID 108)	WireInchForward (ID 108)
		3 (51)	WireInchBackward (ID 108)	WireInchBackward (ID 108)
		4 (52)	GasBlow (ID 108)	GasBlow (ID 108)
		5 (53)	AirBlow (ID 108)	AirBlow (ID 108)
		6 (54)	TouchSensorToolSel (ID 108)	TouchSensorToolSel (ID 108)
		7 (55)	TouchSensorOn (ID 108)	TouchSensorOn (ID 108)
	7	0 (56)	OnlineControl (ID 109)	(Not in use) (ID 109)
		1 (57)	ErrorReset (ID 109)	ErrorReset (ID 109)
		2 (58)	(Not in use) (ID 109)	(Not in use) (ID 109)
		3 (59)	Watchdog (ID 109)	Watchdog (ID 109)
		4 (60)	HotStartOn (ID 109)	(Not in use) (ID 109)
		5 (61)	CraterFillOn (ID 109)	(Not in use) (ID 109)
		6 (62)	(Not in use) (ID 109)	(Not in use) (ID 109)
		7 (63)	(Not in use) (ID 109)	(Not in use) (ID 109)

4	8	0 (64)	DigitalOutput1 (ID 111)	DigitalOutput1 (ID 111)
		1 (65)	DigitalOutput2 (ID 111)	DigitalOutput2 (ID 111)
		2 (66)	DigitalOutput3 (ID 111)	DigitalOutput3 (ID 111)
		3 (67)	DigitalOutput4 (ID 111)	DigitalOutput4 (ID 111)
		4 (68)	DigitalOutput5 (ID 111)	DigitalOutput5 (ID 111)
		5 (69)	DigitalOutput6 (ID 111)	DigitalOutput6 (ID 111)
		6 (70)	DigitalOutput7 (ID 111)	DigitalOutput7 (ID 111)
		7 (71)	DigitalOutput8 (ID 111)	DigitalOutput8 (ID 111)
	9	(UINT16)	(Not in use) (ID 228)	(Not in use) (ID 228)
5	10			
	11	(UINT16)	(Not in use) (ID 229)	(Not in use) (ID 229)
6	12			
	13	(UINT16)	(Not in use) (ID 230)	(Not in use) (ID 230)
7	14			
	15	(UINT16)	(Not in use) (ID 231)	(Not in use) (ID 231)
8	16			
	17	(UINT32)	(Not in use) (ID 232)	(Not in use) (ID 232)
9	18			
	19			
10	20			
	21	(UINT32)	(Not in use) (ID 233)	(Not in use) (ID 233)
11	22			
	23			
12	24			
	25	(UINT16)	(Not in use) (ID 234)	(Not in use) (ID 234)
13	26			
	27	(UINT16)	(Not in use) (ID 235)	(Not in use) (ID 235)
14	28			
	29	(UINT16)	(Not in use) (ID 236)	(Not in use) (ID 236)
15	30			
	31	(UINT16)	(Not in use) (ID 237)	(Not in use) (ID 237)
16	32			
	33	(UINT32)	(Not in use) (ID 238)	(Not in use) (ID 238)
17	34			
	35			
18	36			
	37	(UINT16)	(Not in use) (ID 239)	(Not in use) (ID 239)
19	38			
	39	(UINT8)	(Not in use) (ID 240)	(Not in use) (ID 240)

20	40	(UINT8)	(Not in use) (ID 241)	(Not in use) (ID 241)
	41	(UINT8)	(Not in use) (ID 242)	(Not in use) (ID 242)
21	42	(UINT8)	(Not in use) (ID 243)	(Not in use) (ID 243)
	43	(UINT32)	(Not in use) (ID 244)	(Not in use) (ID 244)
22	44			
	45			
23	46			
	47	(UINT8)	(Not in use) (ID 245)	(Not in use) (ID 245)
24	48	(UINT8)	(Not in use) (ID 246)	(Not in use) (ID 246)

Status parameters (from welding system to robot)

Modbus register address	Byte	Bit/Type (Modbus Discrete Input in brackets)	Status parameter
0	0	UINT16	WeldingCurrent (ID 156)
	1		
1	2	UINT16	WeldingVoltage (ID 157)
	3		
2	4	UINT8	ErrorNumber (ID 158)
	5	UINT8	WeldingWireFeedSpeed (ID 160)
3	6	0 (48)	WeldingSystemReady (ID 162)
		1 (49)	PowerSourceReady (ID 162)
		2 (50)	CycleOn (ID 162)
		3 (51)	ArcOn (ID 162)
		4 (52)	GasFlowOk (ID 162)
		5 (53)	(Not in use) (ID 162)
		6 (54)	(Not in use) (ID 162)
		7 (55)	TouchSensed (ID 162)
	7	0 (56)	GateDoorOpen (ID 163)
		1 (57)	Error (ID 163)
		2 (58)	CollisionDetected (ID 163)
		3 (59)	(Not in use) (ID 163)
		4 (60)	(Not in use) (ID 163)
		5 (61)	(Not in use) (ID 163)
		6 (62)	(Not in use) (ID 163)
		7 (63)	(Not in use) (ID 163)

4	8	0 (64)	DigitalInput1 (ID 164)
		1 (65)	DigitalInput2 (ID 164)
		2 (66)	DigitalInput3 (ID 164)
		3 (67)	DigitalInput4 (ID 164)
		4 (68)	DigitalInput5 (ID 164)
		5 (69)	DigitalInput6 (ID 164)
		6 (70)	DigitalInput7 (ID 164)
		7 (71)	DigitalInput8 (ID 164)
	9	(UINT16)	TAST (ID 166)
5	10		
	11	(UINT16)	GasFlowRate (ID 167)
6	12		
	13	(UINT8)	MotorCurrent (ID 168)
7	14	(UINT8)	WeldingProcess (ID 170)
	15	(UINT8)	(Not in use) (ID 247)
8	16	(UINT8)	(Not in use) (ID 248)
	17	(UINT8)	(Not in use) (ID 249)
9	18	(UINT8)	(Not in use) (ID 250)
	19	(UINT8)	(Not in use) (ID 251)
10	20	(UINT8)	(Not in use) (ID 252)
	21	(UINT8)	(Not in use) (ID 253)
11	22	(UINT8)	(Not in use) (ID 254)
	23	(UINT8)	(Not in use) (ID 255)
12	24	(UINT8)	(Not in use) (ID 256)
	25	(UINT8)	(Not in use) (ID 257)
13	26	(UINT8)	(Not in use) (ID 258)
	27	(UINT8)	(Not in use) (ID 259)
14	28	(UINT8)	(Not in use) (ID 260)
	29	(UINT8)	(Not in use) (ID 261)
15	30	(UINT8)	(Not in use) (ID 262)
	31	(UINT8)	(Not in use) (ID 263)
16	32	(UINT8)	(Not in use) (ID 264)
	33	(UINT8)	(Not in use) (ID 265)
17	34	(UINT8)	(Not in use) (ID 266)
	35	(UINT8)	(Not in use) (ID 267)
18	36	(UINT8)	(Not in use) (ID 268)
	37	(UINT8)	(Not in use) (ID 269)
19	38	(UINT8)	(Not in use) (ID 270)
	39	(UINT8)	(Not in use) (ID 271)

20	40	(UINT8)	(Not in use) (ID 272)
	41	(UINT8)	(Not in use) (ID 273)
21	42	(UINT8)	(Not in use) (ID 274)
	43	(UINT8)	(Not in use) (ID 275)
22	44	(UINT8)	(Not in use) (ID 276)
	45	(UINT8)	(Not in use) (ID 277)
23	46	(UINT8)	(Not in use) (ID 278)
	47	(UINT8)	(Not in use) (ID 279)
24	48	(UINT8)	(Not in use) (ID 280)

5.7.6 CONTROL INFORMATION

Control information from the robot to the welding system is transmitted as parameters and individual bits (signals) in the fieldbus control table.

Control parameters

Parameter	Parameter value	Raw value	Description
WireFeedSpeed	0.5 ... 25.0 m/min, step 0.1	0 ... 250	In online control mode: - WireFeedSpeed controls the wire feed speed in applicable processes. - Current controls the current in 1-MIG + WisePenetration, and Pulse + WisePenetration combinations. - PlateThickness controls the plate thickness in MAX Position process.
Current	0 ... 1024 A	0 ... 1024	
PlateThickness	0.0 ... 50.0 mm, step 0.1	0 ... 500	
Voltage	8.0 ... 46.0 V, step 0.1	80 ... 460	Controls the welding voltage in manual MIG process in online control mode.
FineTuning	-10.0 ... +10.0, step 0.1	0 ... 200	In online control mode, FineTuning controls: - fine tuning in synergic welding processes - the corresponding Wise/MAX parameter in Wise/MAX process.
MemoryChannel	0 ... 199	0 ... 199	Controls the active memory channel.
Dynamics	-10 ... +10	0 ... 20	Controls the dynamics for the synergic welding processes in online control mode. Dynamics controls the short circuit behavior of the arc. The lower the value the softer the arc, the higher the value the rougher the arc. (Not available with pulse, double pulse, WiseRoot+, MAX Cool or MAX Speed processes.)
RobotTravelSpeed	0 ... 65535 mm/min	0 ... 65535	Sets the welding travel speed of the robot for heat input calculation shown in AX Manager.
PostCurrent	-30 ... + 30	0 ... 60	Controls the post current in online control mode. Post current setting affects the wire length at the weld end, for example to prevent the wire from stopping too close to the weld pool. This also enables the optimum wire length for the start of the next weld.

Control bits

Control bit	State 0	State 1	Description
StartWelding	Welding / simulation OFF	Welding / simulation ON	Controls the welding cycle. In the simulation mode, this controls the simulation cycle.
SimulationMode	No simulation mode: Normal welding	Simulation mode: Simulated welding (no arc is lit)	Turns the simulation ON and OFF. Note: The arc parameter must be set to 'Select at robot' in AX Manager (refer to "Robot settings" on page 160).
WireInchForward	Wire inch forward OFF	Wire inch forward ON	Drives the filler wire forward. The wire feed speed is 1.0 m/min for 2 seconds, after which it accelerates to the wire feed speed set in the Tools view (refer to "Tools" on page 153). If the set wire feed speed is below 1.0 m/min, the wire feed starts and continues at that speed. If the filler wire touches a grounded workpiece or table, the wire feed stops.
WireInchBackward	Wire inch backward OFF	Wire inch backward ON	Drives the filler wire backwards. The wire feed speed is 1.0 m/min for 2 seconds, after which it accelerates to the wire feed speed set in the Tools view (refer to "Tools" on page 153). If the set wire feed speed is below 1.0 m/min, wire feeding starts and continues at that speed.
GasBlow	Gas valve closed	Gas valve open	Controls the shielding gas valve. If the setting 'Pre and post gas control' is set to 'Select at robot' (refer to "Robot settings" on page 160), the robot can override the pre and post gas times set in a memory channel. For more information, refer to "Pre and post gas control" on page 178.
AirBlow	Air valve closed	Air valve open	Controls the compressed air valve. The air valve cannot be controlled during welding or simulation.
TouchSensorToolSel	Filler wire is used for touch sensing	Gas nozzle is used for touch sensing	Controls the choice of whether the filler wire or gas nozzle is used for touch sensing. Note: The touch sensor tool must be set to 'Select at robot' in AX Manager (refer to "Robot settings" on page 160).
TouchSensorOn	Touch sensor OFF	Touch sensor ON	Sets the touch sensor power source and the touch tool on. The touch sensing voltage depends on the user settings in AX Manager (refer to "Robot settings" on page 160).
OnlineControl	Channel control (parameter values from memory channel are used)	Online control (robot controls certain parameters)	Enables robot-controlled values for certain parameters. In online control mode, the parameter values in the active memory channel are overridden. In channel control mode, the values from the active memory channel are used. For more information, refer to "Online control" on page 178.
ErrorReset	(No effect)	Rising edge in signal (0 -> 1): Error reset	Resets the ErrorNumber value and the Error signal to zero on the rising edge of the signal when no errors are active in the system.

Watchdog	Falling edge in signal (1 -> 0): Watchdog timer is reset	Rising edge in signal (0 -> 1): Watchdog timer is reset	Resets the watchdog timer in the system on each watchdog bit transition. If the watchdog timer is not reset in 0.5 s intervals, the welding system gives a watchdog error. To enable generation of watchdog errors, the watchdog parameter must be set to ON in AX Manager (refer to "Robot settings" on page 160). The bit is also provided as a loopback bit back to the robot (if available in the fieldbus control table) even when the watchdog parameter is OFF.
HotStartOn	Hot start OFF	Hot start ON	Sets the hot start function ON or OFF in online control mode. For more information, refer to "Welding parameters" on page 131.
CraterFillOn	Crater fill OFF	Crater fill ON	Sets the crater fill function ON or OFF in online control mode. For more information, refer to "Welding parameters" on page 131.
DigitalOutput [1...16]	Digital output is inactive	Digital output is active	Sets the digital output active or inactive. To use digital outputs 1...8, the DIO (Digital Input/Output) card must be installed in the add-on card slot 1. To use digital outputs 9...16, the DIO card must be installed in the add-on card slot 2.
RobotReadyToWeld	Robot is not ready to start welding	Robot is ready to start welding	Safeguards the StartWelding bit so that welding cannot be started if the robot is not ready. If this bit is not available in the selected fieldbus control table, the robot is assumed to be always ready to weld. This bit must be present in the fieldbus control table for the safeguard to work.
WireStuckCheck	Wire stuck detection is OFF	Start wire stuck check	Starts the wire stuck check to detect if the filler wire is stuck to the weld. The 'Wire stuck detection' setting must be set to 'Select at robot' for this control bit to work. (Refer to "Robot settings" on page 160).
WireFeedSpeedInc	(No effect)	Rising edge in signal (0 -> 1): Increment the primary parameter value	This signal increments the primary welding parameter value (wire feed speed, welding current, or plate thickness) by one step. **Note:** This signal cannot be used for online control.
WireFeedSpeedDec	(No effect)	Rising edge in signal (0 -> 1): Decrement the primary parameter value	This signal decrements the primary welding parameter value (wire feed speed, welding current, or plate thickness) by one step. **Note:** This signal cannot be used for online control.
VoltageFineTuningInc	(No effect)	Rising edge in signal (0 -> 1): Increment the secondary parameter value	This signal increments the secondary welding parameter value (welding voltage, or fine tuning) by one step. **Note:** This signal cannot be used for online control.

VoltageFineTuningDec	(No effect)	Rising edge in signal (0 -> 1): Decrement the secondary parameter value	This signal decrements the secondary welding parameter value (welding voltage, or fine tuning) by one step. **Note:** This signal cannot be used for online control.
WireBrakeOn	Wire brake is OFF	The robot has requested the wire brake to be ON	This signal activates the wire brake. **Note:** The wire brake parameter in AX Manager must be set to 'Select at robot' for this signal to work (refer to "Device settings" on page 158).

5.7.7 STATUS INFORMATION

Status information from the welding system to the robot is transmitted as parameters and individual bits (signals) in the fieldbus control table.

Status parameters

Parameter	Parameter value	Raw value	Description
WeldingCurrent	0 ... 65535 A	0 ... 65535	Measured welding current.
WeldingVoltage	0 ... 6553.5 V	0 ... 65535	Measured welding voltage.
WeldingWireFeedSpeed	0 ... 25.5 m/min	0 ... 255	Measured wire feed speed.
MotorCurrent	0 ... 25.5 A	0 ... 255	Wire feeder motor current.
GasFlowRate	0 ... 6553.5 L/min	0 ... 65535	Measured gas flow rate.
ErrorNumber	0 ... 255	-	System error / warning number.
WeldingProcess	0 = Unknown 1 = MIG 2 = 1-MIG 3 = Pulse MIG 4 = DPulse MIG 11 = WiseRoot+ 14 = WiseTh-in+ 16 = MAX Cool 17 = MAX Speed 18 = MAX Position		Welding process from the active memory channel.
TAST	0 ... 8191	0 ... 8191	Through-Arc Seam Tracking (TAST) value. TAST is used for providing precise welds depending on specific weld characteristics or in setups where the position of the work piece varies during repetitive tasks.
WeldAssistTravelSpeed	0 ... 65535 mm/min	0 ... 65535	Travel speed for a memory channel. This value comes from Weld Assist or is set by the user (refer to "Welding parameters" on page 131).
WireFeedSpeedSetpoint	0 ... 655.35 m/min	0 ... 65535	Wire feed speed control value for external wire feeder synchronization.

Status bits

Status bit	State 0	State 1	Description

CycleOn	Welding cycle is not ongoing	Welding cycle is ongoing	Indicates whether welding cycle is ongoing. The welding cycle includes also pre gas, creep start, crater fill and post gas phases.
ArcOn	Welding arc is not established	Welding arc is established	Indicates whether welding arc is established.
TouchSensed	Touch is not detected	Touch is detected	Indicates if a touch is detected between the touch tool and the work piece. The touch sensor must be set active with the TouchSensorOn control bit.
PowerSourceReady	Power source is busy	Power source is ready	Indicates whether the power source is ready to start a new weld. The power source is ready when the robot has not requested welding and crater fill is not ongoing.
Error	No error or only a warning	There is an error in the system	Indicates whether there is an error in the system that prevents welding.
WeldingSystemReady	System is not ready	System is ready	Indicates whether the welding system is ready to be used for welding. The system is ready when all necessary devices are present and no error is active.
LocalRemote	Remote	Local	Not in use. State is always 1.
AutoManual	Manual	Auto	Not in use. State is always 0.
GasFlowOk	Gas flow rate is below the minimum gas flow rate	Gas flow rate is above the minimum flow rate or the gas flow sensor is OFF	Indicates if the gas flow rate is above the minimum gas flow rate or if the gas flow sensor is set to OFF.
GateDoorOpen	Gate door is closed	Gate door is open	Indicates if the gate door to the robotic cell is open or closed.
CollisionDetected	Collision is not detected	Collision is detected	Wire feeder's collision sensor status. The collision sensor must be set ON in AX Manager.

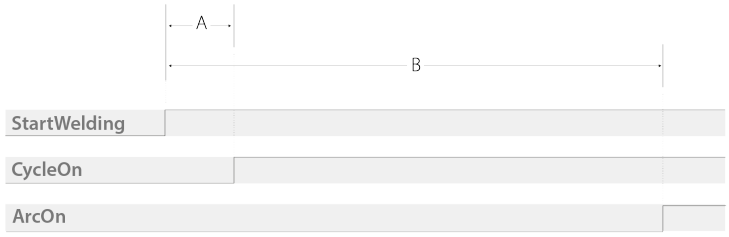
DigitalInput [1...16]	Digital input is in low state	Digital input is in high state	Digital input status. To use digital inputs 1...8, the DIO (Digital Input/Output) card must be installed in the add-on card slot 1. To use digital inputs 9...16, the DIO card must be installed in the add-on card slot 2.
Watchdog	Watchdog control bit is 0	Watchdog control bit is 1	Watchdog loop-back status bit that reflects the value of the watchdog control bit back to the robot. This bit is active even when the watchdog functionality is turned off.
Warning	No warning	Warning active	Indicates if there is a warning in the system. A warning does not prevent welding.
WaterFlowOk	No coolant flow or the cooler is turned off	Coolant is flowing	Indicates the coolant flow status.
BackwardWireFeed	Wire feed direction is forward	Wire feed direction is backward	Indicates the direction of the wire feed for external wire feeder synchronization.
WireOK	The filler wire is stuck to the weld	The filler wire is not stuck to the weld	Indicates the result of the wire stuck check when the 'Wire stuck detection' setting is set to ON or Select at robot (refer to "Robot settings" on page 160).
WireBrakeLocked	The wire brake is not active	The wire brake is active (the filler wire is locked in place)	Indicates whether the wire brake is active (the filler wire is locked in place) or not.

5.8 TIMING DIAGRAMS

This section describes the timing of certain functions when controlled by the robot.

5.8.1 WELDING START AND STOP TIMING

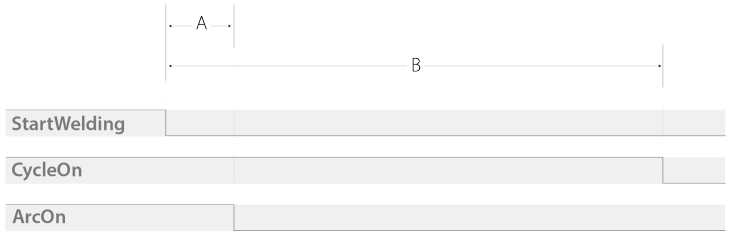
Welding start timing



Item	Description	Min	Typical	Max	Units
A	Cycle on	5	30	50	ms
B	Arc estab-lishment	100	Pre gas time + distance of the wire from the work piece + 150	*	ms

*The maximum time is limited by the wire feeding timeout.

Welding stop timing



Item	Description	Min	Typical	Max	Units
A	Arc OFF time	60	70	-	ms
B	Cycle OFF time	100*	Post gas time + 20	-	ms

* If the post gas time is less than 100 ms, the minimum cycle OFF time is determined by the power source shutdown time.

5.8.2 MEMORY CHANNEL CHANGE TIMING

During welding, memory channel changing between processes is supported as follows:

- 1-MIG <--> Pulse MIG
- Pulse MIG <--> DPulse MIG

During welding, a memory channel can be changed only once per second.

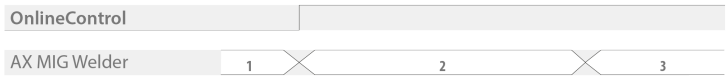
Description	Min	Typical	Max	Units
Total time	0.2	0.3	0.5	s

5.8.3 ONLINE CONTROL TIMING

In online control mode, the robot controls the values of certain parameters directly.

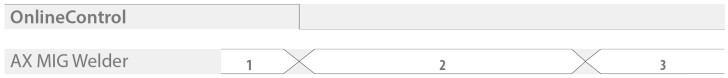
In channel control mode the values of the parameters come from the memory channel.

Switching to online control mode



Item	Description	Min	Typical	Max	Units
1	Channel control mode	-	-	-	-
2	Data setup time	-	1.2	-	s
3	Online control mode	-	-	-	-

Switching to channel control mode

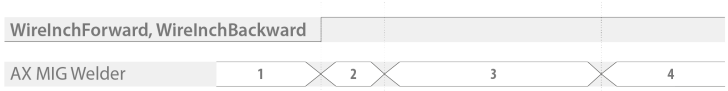


Item	Description	Min	Typical	Max	Units
1	Online control mode	-	-	-	-
2	Data setup time	-	1.2	-	s
3	Channel control mode	-	-	-	-

5.8.4 WIRE INCH TIMING

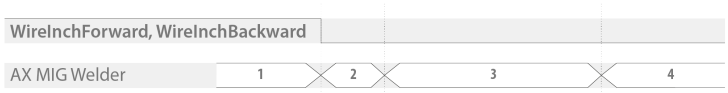
This section describes the timing for the wire inch forward and wire inch backward functions when controlled by the robot.

Wire inch startup timing



Item	Description	Min	Typical	Max	Units
1	Wire feeding OFF	-	-	-	-
2	Startup	20	40	100	ms
3	Wire feeding, slow phase	3	3	3	s
4	Wire feeding, fast phase	-	-	-	-

Wire inch stop timing



Item	Description	Min	Typical	Max	Units
1	Wire feeding ON	-	-	-	-
2	Stop	-	40	-	ms
3	Wire feeding deceleration	-	30	-	ms
4	Wire feeding OFF	-	-	-	-

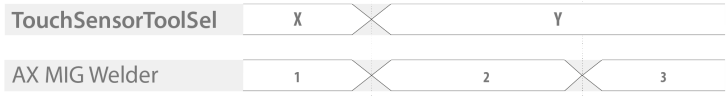
5.8.5 TOUCH SENSOR TIMING

Touch sensor start timing



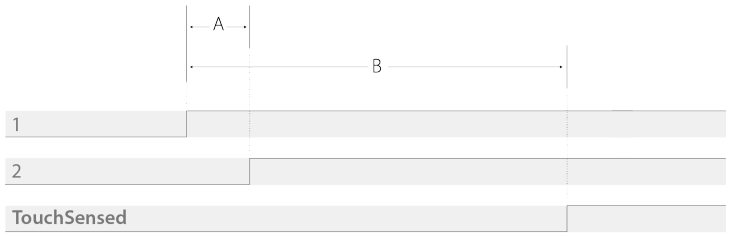
Item	Description	Min	Typical	Max	Units
1	Touch sensor OFF	-	-	-	-
2	Start response time	35	40	80	ms
3	Touch sensor ON	-	-	-	-

Touch sensing tool change timing



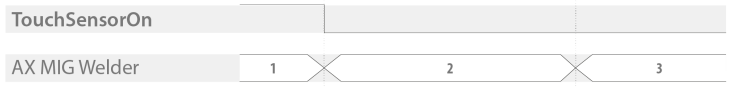
Item	Description	Min	Typical	Max	Units
X	Previous touch sensor tool	-	-	-	-
Y	New touch sensor tool	-	-	-	-
1	Touch sensor ready	-	-	-	-
2	Touch sensor control response time	5	10	50	ms
3	Touch sensor ready	-	-	-	-

Touch response timing



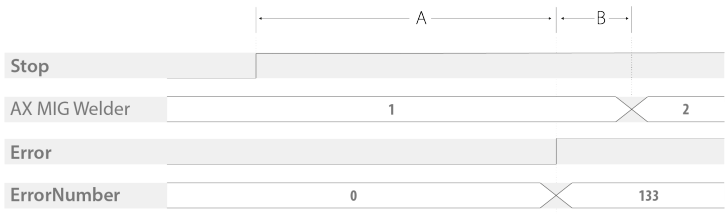
Item	Description	Min	Typical	Max	Units
A	Fast status output reaction time	200	400	1000	µs
B	Touch signal function reaction time	3	10	20	ms
1	Short circuit (touch)	-	-	-	-
2	Fast status output	-	-	-	-

Touch sensor off timing



Item	Description	Min	Typical	Max	Units
1	Touch sensor ON	-	-	-	-
2	Control response time	20	35	60	ms
3	Touch sensor OFF	-	-	-	-

5.8.6 STOP SWITCH RESPONSE TIMING



Item	Description	Min	Typical	Max	Units
A	Stop switch response time	-	25	-	ms
B	Welding system stop time	-	40	-	ms
1	Welding system operating	-	-	-	-
2	Welding system stopped	-	-	-	-

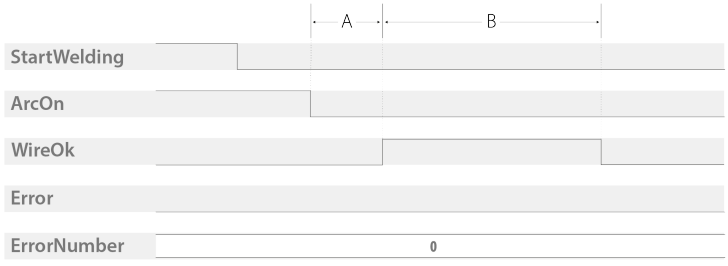
5.8.7 WIRE STUCK CHECK TIMING

This section describes the wire stuck check timing in different scenarios. The purpose of a wire stuck check is to detect if the filler wire is stuck to the weld. For more information, refer to "Robot settings" on page 160.

Scenario 1

Setting: Wire stuck detection is ON

Result: The filler wire is not stuck to the weld

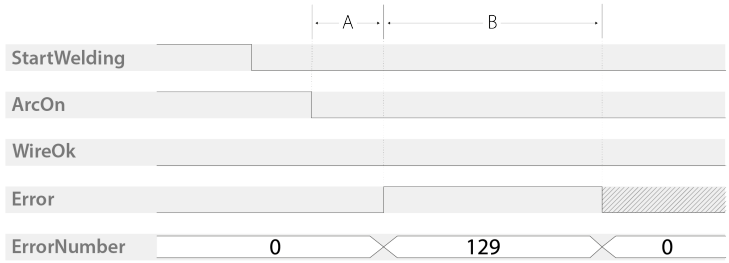


Item	Description	Min	Typical	Max	Units
A	Wire stuck check response time	200	250	300	ms
B	WireOk status bit hold time	-	1000	-	ms

Scenario 2

Setting: Wire stuck detection is ON

Result: The filler wire is stuck to the weld



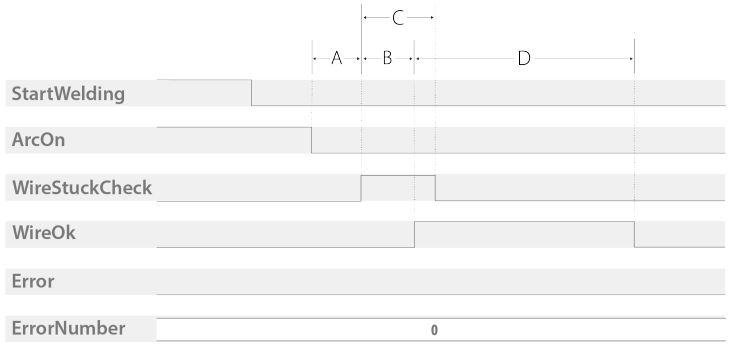
The 'Error' status bit will remain set until the user or the robot dismisses the error 129, 'Filler wire stuck' from AX Manager.

Item	Description	Min	Typical	Max	Units
A	Wire stuck check response time	200	250	300	ms
B	Wire stuck error status hold time	200	-	-	ms

Scenario 3

Setting: Wire stuck detection is set to Select at robot

Result: The filler wire is not stuck to the weld

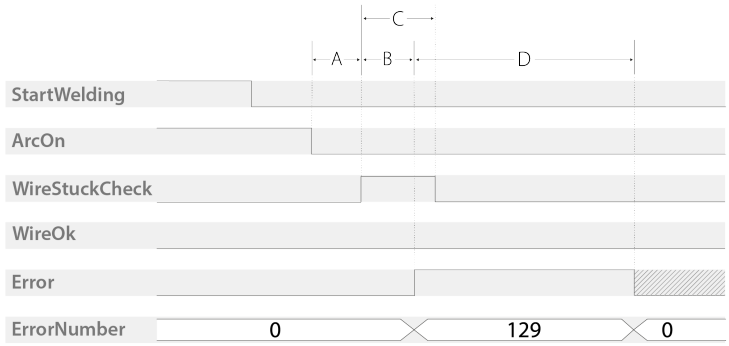


Item	Description	Min	Typical	Max	Units
A	The time between the end of welding and the wire stuck check	200	-	-	ms
B	Wire stuck check status response time	80	100	150	ms
C	WireStuckCheck control bit hold time	20	-	-	ms
D	WireOk status bit hold time	-	1000	-	ms

Scenario 4

Setting: Wire stuck detection is set to Select at robot

Result: The filler wire is stuck to the weld



The 'Error' status bit will remain set until the user or the robot dismisses the error 129, 'Filler wire stuck' from AX Manager.

Item	Description	Min	Typical	Max	Units
A	The time between the end of welding and the wire stuck check	200	-	-	ms
B	Wire stuck check status response time	80	100	150	ms
C	WireStuckCheck control bit hold time	20	-	-	ms
D	Wire stuck error status hold time	200	-	-	ms

5.9 TOUCH SENSING VOLTAGE LEVELS

Touch sensing provides eight software selectable DC voltage levels. The following table lists all setups and their relative voltage levels. The accuracy of all values in the table except for the nominal voltage is +/-5 %.

Nominal voltage	Voltage (gas nozzle)	Voltage (wire)	Voltage (wire + voltage sensing cable) *	Voltage (wire + voltage sensing clamp on) *
50	57	56 (51)	54 (50)	53 (50)
80	80	79 (74)	76 (73)	75 (72)
110	110	109 (93)	106 (83)	105 (72)
150	150	150 (93)	145 (83)	144 (72)
160	160	159 (93)	155 (83)	150 (72)
170	170	169 (93)	165 (83)	150 (72)
180	180	179 (93)	175 (83)	150 (72)
200	200	199 (93)	191 (83)	150 (72)

*Pulse+ power sources only.

The values in brackets are applicable to X5 power sources with the following serial numbers:

- 3105193 – 3105195
- 3105110 – 3105112
- 3105108 and below.

5.10 WIRE FEEDER CONSUMABLES

This section lists the feed rolls and wire guide tubes available both separately and in consumable kits. The consumable kits contain recommended feed roll and wire guide tube combinations for selected filler wire materials and diameters. The wire feeder consumables can be ordered in Configurator.kemppi.com.

In the tables, *standard* refers to plastic feed rolls and *heavy-duty* refers to metal feed rolls. The materials mentioned first refer to primary suitability and the materials mentioned inside brackets refer to secondary suitability.

Wire feeder consumable kits

The table below lists the recommended consumable kits for selected filler wire materials and diameters.

Wire feeder consumable kits				
Filler wire material	Feed roll profile	Filler wire diameter (mm)	Consumable kit code, standard	Consumable kit code, heavy-duty
Fe (MC/FC)	V-groove	0.8–0.9	F000367	F000372
		1.0	F000368	F000373
		1.2	F000369	F000374
		1.4	F000370	-
		1.6	F000371	F000375
Ss, Cu (Fe)	V-groove	0.8–0.9	F000376	-
		1.0	F000377	-
		1.2	F000378	-
		1.4	F000379	-
		1.6	F000380	-
		2.0	F000381	-
		2.4	F000382	-
Ss (Fe)	V-groove	0.8–0.9	-	F000383
		1.0	-	F000384
		1.2	-	F000385
		1.6	-	F000386
MC/FC	V-groove, knurled	1.0	F000387	F000390
		1.2	F000388	F000391
		1.4–1.6	F000389	F000392
Al	U-groove	1.0	F000393	-
		1.2	F000394	-
		1.4	F000395	-
		1.6	F000396	-

Wire guide tubes

The table below lists the wire guide tubes available.

Wire guide tubes					
Filler wire material	Filler wire diameter (mm)	Feed roll identification	Inlet tube	Middle tube	Outlet tube
Fe (MC/FC)	0.8–0.9		W020372	W007274	W011460
	1.0		W020373	W007275	W011461
	1.2		W020374	W007276	W011462
	1.4		W020375	W007277	W011463
	1.6		W020376	W007278	W011464
Ss, Cu (Fe)	0.8–0.9		W020364	W007274	W011446
	1.0		W020365	W007275	W011447
	1.2		W020366	W007276	W011448
	1.4		W020367	W007277	W011451
	1.6		W020368	W007278	W011452
	2.0		W020369	W007279	W011453
	2.4		W020370	W007280	W011454
Ss (Fe)	0.8–0.9		W020364	W007274	W011446
	1.0		W020365	W007275	W011447
	1.2		W020366	W007276	W011448
	1.6		W020368	W007278	W011452
MC/FC	1.0		W020373	W007275	W011461
	1.2		W020374	W007276	W011462
	1.4–1.6		W020376	W007278	W011463
Al	1.0		W020365	W007275	W011447
	1.2		W020366	W007276	W011448
	1.4		W020367	W007277	W011451
	1.6		W020368	W007278	W011452

Feed rolls

The table below lists the standard feed rolls available.

Wire feed rolls, standard					
Filler wire material	Feed roll profile	Filler wire diameter (mm)	Feed roll identification	Drive roll code	Pressure roll code

Fe (MC/FC)	V-groove V	0.8–0.9		W001047	W001048
		1.0		W000675	W000676
		1.2		W000960	W000961
		1.4		W001049	W001050
		1.6		W001051	W001052
Ss, Cu (Fe)	V-groove V	0.8–0.9		W001047	W001048
		1.0		W000675	W000676
		1.2		W000960	W000961
		1.4		W001049	W001050
		1.6		W001051	W001052
		2.0		W001053	W001054
		2.4		W001055	W001056
MC/FC	V-groove, knurled V≡	1.0		W001057	W001058
		1.2		W001059	W001060
		1.4–1.6		W001061	W001062
Al	U-groove U	1.0		W001067	W001068
		1.2		W001069	W001070
		1.4		W008974	W008975
		1.6		W001071	W001072

The table below lists the heavy-duty feed rolls available.

Wire feed rolls, heavy-duty				
Filler wire material	Feed roll profile	Filler wire diameter (mm)	Drive roll code	Pressure roll code
Fe (MC/FC), Ss (Fe)	V-groove V	0.8–0.9	W006074	W006075
		1.0	W006076	W006077
		1.2	W004754	W004753
		1.6	W006078	W006079
MC/FC	V-groove, knurled V≡	1.0	W006080	W006081
		1.2	W006082	W006083
		1.4–1.6	W006084	W006085

5.11 WELDING PROGRAM WORK PACKS

Welding program work packs include a set of automation welding programs to allow welding with e.g. automatic 1-MIG and pulse processes. For more information on the available AX MIG Welder welding program options and installing the welding programs or software updates, contact your local Kemppi dealer or go to Kemppi.com.

In addition to the welding programs, the 1-MIG and pulse work packs include the following features:

- WiseFusion
- WiseSteel
- Demo mode (Demo time).

1-MIG work pack:

Welding program	Process	Wire material	Wire diameter	Shielding gas	Description
A02	1-MIG	AlMg5	1.2	Ar	Automation
A12	1-MIG	AlSi5	1.2	Ar	Automation
F03	1-MIG	Fe	1.0	Ar+18%CO2	Automation
F04	1-MIG	Fe	1.2	Ar+18%CO2	Automation
S03	1-MIG	CrNiMo	1.0	Ar+2%CO2	Automation
S04	1-MIG	CrNiMo	1.2	Ar+2%CO2	Automation

Pulse work pack:

The Pulse work pack includes also all 1-MIG work pack welding programs.

Welding program	Process	Wire material	Wire diameter	Shielding gas	Description
A02	Pulse	AlMg5	1.2	Ar	Automation
A12	Pulse	AlSi5	1.2	Ar	Automation
F03	Pulse	Fe	1.0	Ar+18%CO2	Automation
F04	Pulse	Fe	1.2	Ar+18%CO2	Automation
S03	Pulse	CrNiMo	1.0	Ar+2%CO2	Automation
S04	Pulse	CrNiMo	1.2	Ar+2%CO2	Automation

5.12 AX MIG WELDER ORDERING INFO

For AX MIG Welder ordering information and optional accessories, refer to Kemppi.com.

5.13 SYSTEM INTEGRATION CHECKLIST

This section lists the tasks necessary to complete the system integration. Each task is a link to the corresponding instructions.

Installation:

1. Install the power source mains plug
2. Install the equipment on the stand (optional)
3. Install the cooling unit (optional)
4. Install RCM on the power source (optional)
5. Mount the wire feeder on the robot arm
6. Connect the protective earth cable (optional)
7. Install the fieldbus module (optional)
8. Install the add-on cards (optional)
9. Connect the cables to the wire feeder
10. Connect the cables to the power source and RCM
11. Turn on the welding system
12. Install the wire guide tubes
13. Install the feed rolls
14. Install the gas supply

Configuration:

1. Connect to the AX Manager user interface
2. Configure network settings
3. Configure device settings
4. Configure robot settings
5. Configure fieldbus settings (optional)
6. Apply welding programs (configure memory channels)
7. Make a system backup file (optional).

5.14 WIRE FEEDER COMPATIBILITY MATRIX

Technical data of R500 wire feeders can be found at: "R500 wire feeders" on page 214.

Feature	R500 Wire Feeder EUR	R500 Wire Feeder EUR+	R500 Wire Feeder RH EUR+	R500 Wire Feeder HD EUR+
Compatibility with RA50 4R assistive wire feeder	Yes	Yes	Yes	Yes
Gas flow rate measurement	No	Ar CO2 Ar + 18 % CO2 Ar + 8 % CO2	Ar CO2 Ar + 18 % CO2 Ar + 8 % CO2	Ar CO2 Ar + 18 % CO2 Ar + 8 % CO2
Compatibility with WiseRoot+ and WiseThin+ processes	No	Yes	Yes	Yes
Compatibility with Kemppi GX-R System's collision sensor	Yes[1)]	Yes[1)]	Yes[1)]	Yes[1)]
Compatibility with Kemppi GX-R System's wire brake	No	No	No	Yes
Touch sensing with filler wire and gas nozzle	Yes	Yes	Yes	Yes
Collision sensor input	Yes	Yes	Yes	Yes
Signal inputs for 3rd party welding torch	Wire inch forward	Wire inch forward	Wire inch forward	Wire inch forward Wire inch backward Gas flow
Air blow valve	No	Yes	Yes	Yes
Analog synchronization output for 3rd party push-pull welding torch control	No	No	No	Yes
Direct compatibility with push-pull welding torch	No	Binzel WH-PP (i) (42 V, 17.1:1) Dinse FD200ME Dinse MEP200E TRM 605WPP	Binzel WH-PP (i) (42 V, 17.1:1) Dinse FD200ME Dinse MEP200E TRM 605WPP	Dinse FD300

[1)] There are limitations in compatibility. Refer to Kemppi GX-R System operating manual for specific hardware and firmware requirements.