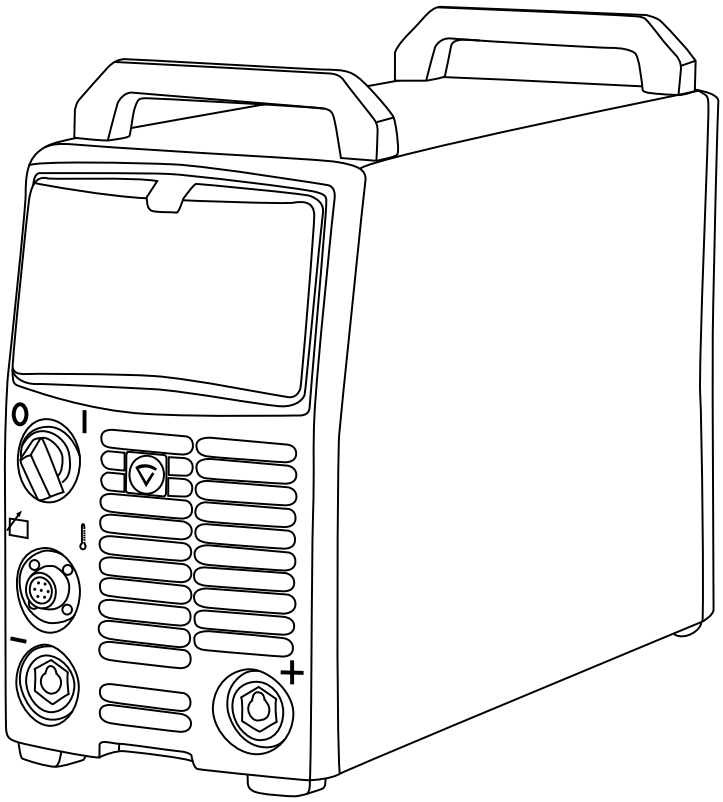
KEMPPI
The Joy of Welding

# FastMig™ | KMS 400 AS




Operating manual • English EN

# OPERATING MANUAL

English

FastMig KMS 400 AS / © Kemppi Oy / 1021

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# 1. PREFACE

## 1.1 GENERAL

Congratulations on choosing the FastMig welding equipment. Used correctly, Kemppi products can significantly increase the productivity of your welding, and provide years of economical service.

This operating manual contains important information on the use, maintenance and safety of your Kemppi product. The technical specifications of the equipment can be found at the end of the manual.

Please read the manual carefully before using the equipment for the first time. For your own safety and that of your working environment, pay particular attention to the safety instructions in the manual.

For more information on Kemppi products, contact Kemppi Oy, consult an authorised Kemppi dealer, or visit the Kemppi web site at www.kemppi.com.

The specifications presented in this manual are subject to change without prior notice.

### Important notes

Items in the manual that require particular attention in order to minimise damage and personal harm are indicated with the *'NOTE!'* notation. Read these sections carefully and follow their instructions.

## 1.2 ABOUT FASTMIG AS PRODUCT

FastMig KMS 400 AS is CC (constant current) / CV (constant voltage) power source designed for demanding professional use. It is suitable for MMA and MIG welding in DC.

FastMig KMS 400 AS is compatible with MSF, MXF and ArcFeed wire feeders.



# 2. GENERAL SAFETY INSTRUCTIONS

Kemppi welding equipments conform to international safety standards. Safety is an important issue in equipment design and manufacturing. Therefore, Kemppi welding solutions are unparalleled in safety. There are, however, always certain hazards involved in using welding equipment. Therefore, to ensure your personal safety and the safety of your working environment, carefully read the safety instructions below and respect them.

### Use of personal protective equipment

- The arc and its reflecting radiation damage unprotected eyes. Shield your eyes and face appropriately before you start welding or observe welding. As the welding current increases, the welding face screen lens darkness should also increase.
- Arc radiation and spatters burn unprotected skin. Always wear protective gloves, clothing and footwear when welding.
- Always wear hearing protection if the ambient noise level exceeds the allowable limit (e.g., 85 dB).

### General operating safety

- Exercise caution when handling parts heated during welding. For example, the tip of the welding torch or gun, and the end of the welding rod and the work piece. The temperature of items burn unprotected skin.
- Never wear any welding device on the shoulder during welding and never suspend it by the carrying strap during welding.
- Do not expose the machine to high temperatures, as this may cause damage.
- Keep intermediate and earth return cables as close to each other as possible throughout their length. Straighten any loops in the cables as this limits inductive effects on welding performance. This also minimizes your exposure to harmful magnetic fields, which may, for example, interfere with a pacemaker.
- Do not wrap the welding cables around your body.

- In environments classified as dangerous, only use S-marked welding equipments with a safe idle voltage level. These work environments include, for example, humid, hot or small spaces, where the user may be directly exposed to the surrounding conductive materials.
- Do not use arc welding equipment for pipe thawing.

**Spatter and fire safety**

- Welding is always classified as hot work, so pay particular attention to the fire safety regulations during welding and after it.
- Remember that fire can break out from sparks, even several hours after the welding work is completed.
- Protect the environment from welding spatter. Remove combustible materials, such as flammable liquid from the welding vicinity, and supply the welding site with adequate fire fighting equipment.
- In special welding jobs, be prepared for hazards such as fire or explosion when welding inside enclosed work spaces, such as tanks and vessels. Ensure you have authority to work.
- Never direct the sparks or cutting spray of a grinder toward the welding machine or flammable materials.
- Beware of hot objects or spatter falling on the machine when working above. Welding in flammable or explosive sites is absolutely forbidden.

**General electric safety**

- Only connect the welding machine to an earthed electric network. Note the recommended mains fuse size.
- Do not take the welding machine inside a container, vehicle or similar work piece unless authorized to do so.
- Do not place the welding machine on a wet surface and do not work on a wet surface.
- Do not allow the mains cable to be directly exposed to water.
- Ensure cables or welding torches are not squashed by heavy objects and that they are not exposed to sharp edges or a hot work piece.
- Make sure that faulty and damaged welding torches are changed immediately as they may cause electrocution or fire.
- Remember that the cable, plugs and other electric devices may be installed or replaced only by an electrical contractor or engineer authorized to perform such operations.
- Turn off the welding machine when it is not in use.



**Welding power circuit**

- Insulate yourself from the welding circuit by using dry and undamaged protective clothing.
- Never touch the work piece and welding rod, welding wire, welding electrode or contact tip at the same time.
- Do not put the welding torch or ground cable on the welding machine or other electric equipment.

**Welding fumes**

- Ensure proper ventilation and avoid inhaling the fumes.
- Ensure a sufficient supply of fresh air, particularly in closed spaces. You can also ensure an adequate supply of clean breathing air by using a filtered fresh-air mask.
- Take extra precautions when working on metals or surface-treated materials containing, for example, lead, cadmium, zinc, mercury or beryllium.

**Transportation, lifting and suspension**

- Never pull or lift the machine by the welding torch or other cables. Always use the lifting points or handles designed for that purpose.
- Only use a transport unit designed for the equipment. Try to transport the machine in an upright position, if possible.
- Never lift a gas cylinder and the welding machine at the same time. There are separate provisions for gas cylinder transportation.
- Never use a welding machine when suspended unless the suspension device has been designed and approved for that particular purpose.

- Do not exceed the maximum allowable load of suspension beams or the transportation trolley of welding equipment. It is recommended that the wire coil be removed during lifting or transportation.

### Environment

- Welding equipment is not recommended for use in rain or snow - see manual. Protect the equipment against rain and strong sunlight. Always store the machine in a dry and clean space.
- Protect the machine from sand and dust during use and in storage. The recommended operating temperature range is -20 to +40 °C. The machine's operation efficiency decreases and it becomes more prone to damage if used in temperatures in excess of 40 °C.
- Place the machine so that it is not exposed to hot surfaces, sparks or spatter.
- Make sure the airflow to and from the machine is unrestricted.
- EMC classification of this product is class A in accordance with electromagnetic compatibility standards CISPR 11 and IEC 60974-10, and therefore the product is designed to be used in an industrial environment only.

  *WARNING: This class A equipment is not intended for use in residential locations where the electrical power is provided by a public low-voltage supply system. In those locations it may be difficult to ensure the electromagnetic compatibility due to conducted and radiated disturbances.*
- Arc welding equipments cause electromagnetic disturbance. To minimize the harmful effects, strictly use the equipment according to the operating manual and other recommendations.

### Gas bottles and pneumatic devices

- Adhere to the instructions for handling pneumatic devices and gas bottles.
- Make sure that gas bottles are used and stored in properly ventilated spaces.
- A leaking gas bottle may replace the breathable air, causing suffocation.
- Before use, make sure that the gas bottle contains gas suitable for the intended welding purpose.
- Always fix the gas bottle securely in an upright position, against a bottle wall rack or purpose-made bottle cart.
- Never move a gas bottle when the regulator or flow adjuster is in place. Replace the valve cover during transportation. Close the bottle valve after use.

### Circuit diagram and spare part lists

If the circuit diagram and the spare parts list are not included in delivery package, please inquire for them at your local Kemppi service representative. For more information, please visit www.kemppi.com.

### Disclaimer

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

# 3. INSTALLATION

## 3.1 BEFORE USE

The product is packed in specially designed transport cartons. However, before use always make sure the products have not been damaged during transportation.

Check also that you have received the components you ordered and the instruction manuals needed, as described in the Quick start guide pack. Product packaging material is recyclable.

*NOTE! When moving the welding machine, always lift it from the handle, never pull it from the welding gun or other cables.*

### Operating environment

This machine is suitable for both indoor and outdoor use. Always make sure that the air flow to the machine is unrestricted. The recommended operating temperature range is -20…+40°C.

Please ensure you read the safety instructions concerning operating environments supplied in this manual.

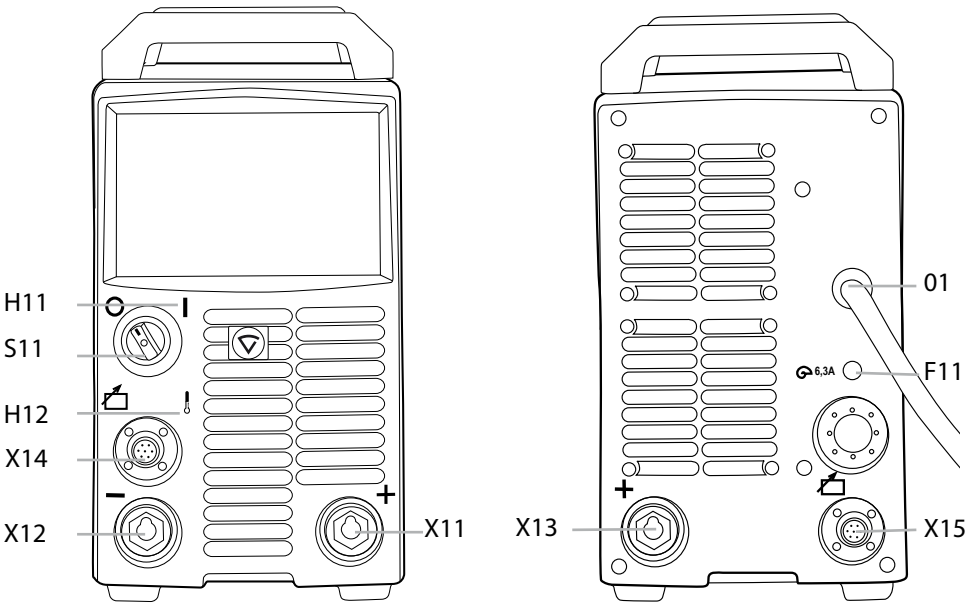
### Distribution network

All regular electrical devices without special circuits generates harmonic currents into the distribution network. High rates of harmonic current may cause losses and disturbance to some equipments.

This equipment complies with IEC 61000-3-12 provided that the short-circuit power $S_{SC}$ is greater than or equal to 4.7 MVA at the interface point between the user's supply and the public supply network. 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 equipment is connected only to a supply with a short-circuit power $S_{SC}$ greater than or equal to 4.7 MVA.



## 3.2 MACHINE INTRODUCTION




| | | | | | |
|---|---|---|---|---|---|
| **F11** | Fuse for connection for control table | 6.3 A delayed | **X12** | Earth connection | |
| **H11** | Signal lamp | I/O | **X14 , X15** | Connection for control cable | parallel |
| **H12** | Warning lamp for thermal protection | | **01** | Inlet of mains cable | |
| **S11** | Main switch | I/O | | | |
| **X11, X13** | Welding connection | parallel | | | |

## 3.3 POSITIONING AND LOCATION OF THE MACHINE

Place the machine on a firm, dry and level surface. Where possible, do not allow dust or other impurities to enter the machines cooling air flow. Preferably site the machine above floor level; for example on a suitable carriage unit.

Notes for positioning the machine

- The surface inclination should not exceed 15 degrees.
- Ensure the free circulation of the cooling air. There must be at least 20 cm of free space in front of and behind the machine for cooling air to circulate.
- Protect the machine against heavy rain and direct sunshine.

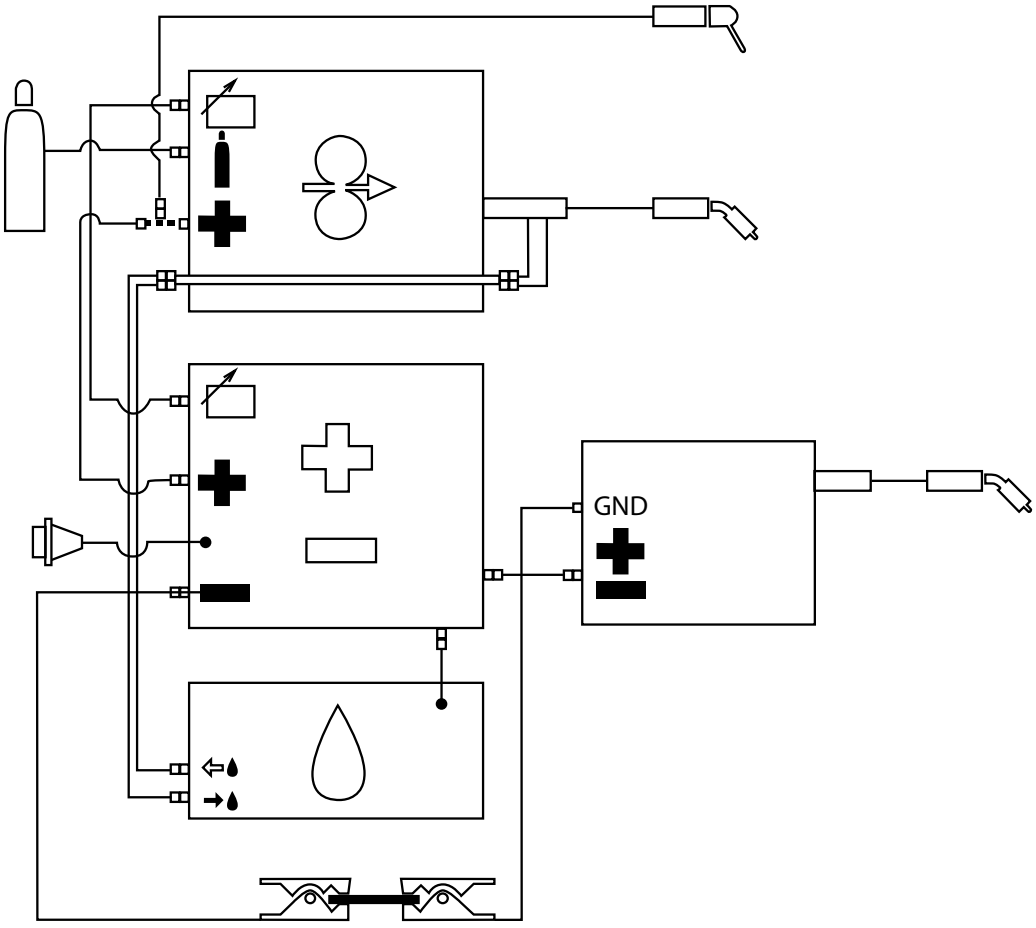
*NOTE! The machine should not be operated in the rain as the protection class of the machine, IP23S, allows for outside preserving and storage only.*

*NOTE! Never aim metallic grinding spray/sparks towards the equipment.*

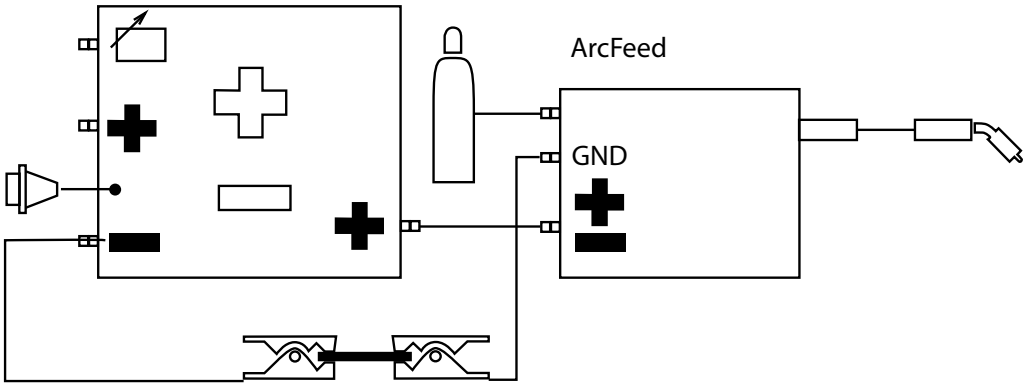
## 3.4 CONNECTING CABLES

*NOTE! Always check before use that the interconnecting cable, shielding gas hose, earth return lead/clamp, and mains cable is in a serviceable condition. Ensure that connectors are correctly fastened. Lose connectors can impair welding performance and damage connectors.*

### 3.4.1 Water cooled system: FastMig KMS AS + MSF/MXF + FastCool 10 + ArcFeed



### 3.4.2 FastMig KMS AS + ArcFeed




## 3.5 CONNECTION TO THE MAINS SUPPLY

FastMig power sources are delivered as standard with 5 meters of mains power cable. No mains plug is fitted at the Kemppi factory.

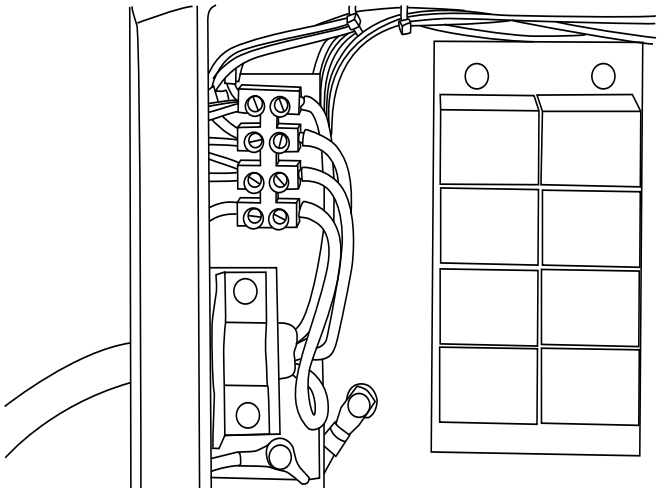
*NOTE! If local country based regulations state an alternative power cable is required, the mains cable must be replaced in conformity with the regulations. Connection and installation of the mains cable and plug, should only be carried out by a suitably qualified person.*

Remove the machine cover plate to enable mounting of a mains cable. FastMig Pulse power sources can be connected to the mains supply of 400 V 3~ .



**If changing the mains cable take into consideration the following:**

The cable is entered into the machine through the inlet ring on the rear panel of the machine and fastened with a cable clamp. The phase conductors of the cable are coupled to connectors L1, L2 and L3. The earth protection coloured green-yellow is coupled to the marked connector ⏚. If you are using 5-lead cable, do not connect the neutral conductor.



Sizes of the mains cables and fuse ratings for the machine at 100 % duty cycle are specified in the table below:

| | Rated voltage | Mains voltage range | Fuses, slow-blow | Connection cable *) $mm^2$ |
|---|---|---|---|---|
| KMS 300 | 400 V 3~ | 360 V… 440 V | 20 A | 4 x 6.0 S |
| KMS 400 | 400 V 3~ | 360 V… 440 V | 25 A | 4 x 6.0 S |
| KMS 500 | 400 V 3~ | 360 V… 440 V | 35 A | 4 x 6.0 S |

*) In cables of S type there is a protective grounding conductor coloured green-yellow.

## 3.6 WELDING AND EARTH CABLES

Recommended copper cables with cross-sectional area are as follows:

FastMig KMS 400 AS 70 ... 90 mm²

In enclosed table are shown typical load capacities of rubber insulated copper cables, when ambient temperature is 25 °C and lead temperature is 85 °C.

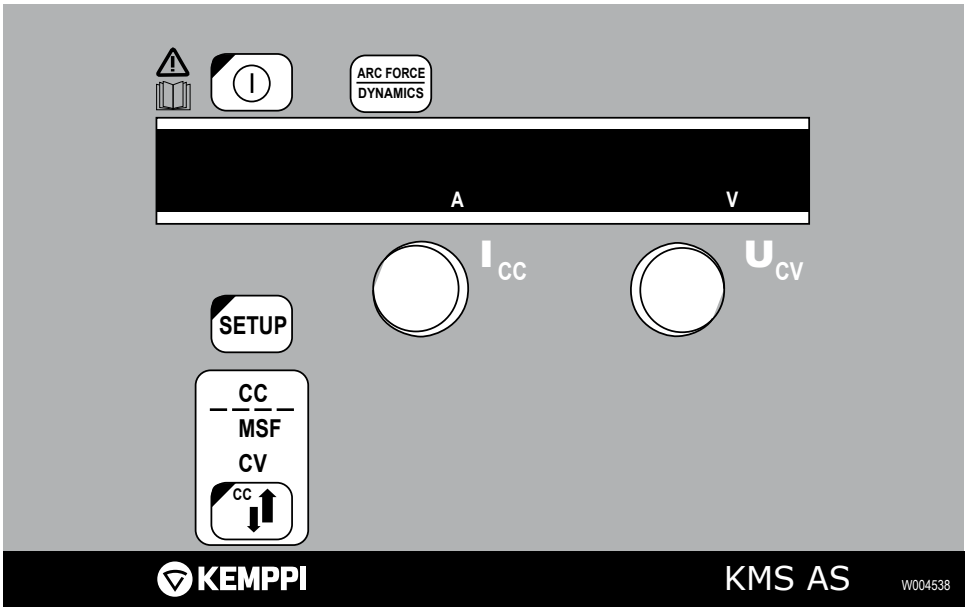
| Cable | Duty cycle ED | | | Voltage loss / 10 m |
|---|---|---|---|---|
| | 100 % | 60 % | 30 % | |
| 50 mm² | 285 A | 370 A | 520 A | 0,35 V / 100 A |
| 70 mm² | 355 A | 460 A | 650 A | 0,25 V / 100 A |
| 95 mm² | 430 A | 560 A | 790 A | 0,18 V / 100 A |

Do not overload welding cables due to voltage losses and heating.

Fasten the earth clamp of the return current cable carefully, preferably direct onto the piece to be welded. The contact surface of the earth clamp should always be as large as possible.

Clean the fastening surface from paint and rust.

## 3.7 KMS AS PANEL




| | |
|---|---|
| | ON/OFF –button |
| ARC FORCE DYNAMICS | Dynamics can be adjusted both in MIG and MMA-welding |
| CC MSF CV | CC= Constant current mode. Selection by longtime press. Selected when operated with Arcfeed with CC-mode or MMA welding |
| | MSF mode = Use with MSF or MXF feeders |
| | CV mode = Constant Voltage. Selected when operating with Arcfeed CV-mode |

### MIG/MAG welding

FastMig KMS AS is designed for MIG/MAG welding with either the Kemppi ArcFeed voltage sensing wire feed unit, or FastMig series MSF and MXF wire feeding units. When using MSF or MXF wire feed units, connect the unit as described in picture on page 7, and select the KMS function from the control panel. For further information see MSF or MXF manuals.

When you use the ArcFeed voltage sensing wire feed unit, you must select either CC or CV (Constant Current or Constant Voltage) mode from the KMS AS control panel. Ensure that the ArcFeed control panel has been set to correspond with the power source control panel. For example if power source is set to CC mode, the ArcFeed should also be set to CC mode. FastMig KMS AS has two welding programs for ArcFeed welding: one for self shielding filler wires and the other for standard cored and solid fillers wires. The welding program can be changed in SETUP function.

It is possible to connect MSF or MXF and ArcFeed feeders to FastMig KMS AS power source simultaneously. For example, this can be an efficient combination when using Kemppi WiseRoot process for root pass welding and then completing hot pass and filler runs with ArcFeed system using self-shielded filler wire.

### MMA welding

FastMig KMS AS is also suitable for MMA welding with basic or rutile electrodes. MMA welding works with CC (Constant current) mode set from the KMS AS power source panel. NOTE: In CC mode FastMig KMS AS has two welding programs: one for ArcFeed CC welding and the other for MMA welding. The desired welding program can be chosen from the KMS AS 'SETUP' function.

## 3.8 SETUP FUNCTIONS

With a long press of button you can move to the Setup menu



| | | | | |
|---|---|---|---|---|
| **Start Power** | StA | -9 ... +9 | 0 | Strenght of start pulse |
| **Device address** | Add | 3 or 6 | 6 | System bus address. Each device in same system must have different address. |
| **Welding program CC** | Pro | Stl, FEE | | Stl is for MMA welding FEE is for ArcFeed |
| **Welding program CV** | Pro | Std, InS | | InS is for innershield wires Std for other wires |
| **Restore factory settings** | FAC | OFF, PAn, ALL | OFF | Restores factory settings, when PAn or ALL is selected |

# 4. OPERATION CONTROL SWITCHES AND POTENTIOMETERS

## 4.1 MAIN SWITCH I/O

When you turn the switch into I-position, pilot lamp H11 on the front face is illuminated and the machine is ready for use.

*NOTE! Always turn the machine on and off with the mains switch, never use the mains plugs as a switch.*

## 4.2 PILOT LAMPS

The pilot lamps of the machine report the electric operation:

The green pilot lamp H11 when lit indicates that the machine is on and ready for use and it is connected to the mains supply with the main switch in the I-position.

H12 indicates when lit that the thermal protection of the machine has been activated due to over heating. The cooling fan will continue to run and cool the machine down and when the lamp is off the machine is ready to weld.

### 4.3 OPERATION OF COOLING FAN

In FastMig KMS 400 AS power source there is two simultaneously operating fans.

- The fan is started for a moment when main switch is placed into position I.
- The fan will start during welding as the machine heats up and it will run for 1 to 10 minutes after the welding has stopped.

## 5. BASIC TROUBLESHOOTING

*NOTE! The problems listed and the possible causes are not definitive, but serve to suggest some standard and typical situations that may present during normal environmental use when using the MIG/MAG process with FastMig.*

| Problem | Check the following |
|---|---|
| Machine won't work? | • Check mains plug is connected<br>• Check mains power distribution is switched on<br>• Check the mains fuse and or circuit breaker<br>• Check power source 0/I switch is ON<br>• Check interconnection cable set and connectors between the power source and wire feed unit are correctly fastened. See the manual schematic<br>• Check earth return lead is connected<br>• Check function panels are switched on – Orange buttons top left, long press. |
| Dirty, poor quality weld? | • Check shielding gas supply<br>• Check and set gas flow rate<br>• Check gas type for application<br>• Check gun/electrode polarity. Example: Fe solid filler wire: Earth return should be connected to the – pole, wire feed unit to the + pole connector<br>• Check correct welding curve selected<br>• Check correct Channel (job) number selected on PF65 function panel<br>• Check power supply – Phase down? |
| Variable welding performance? | • Check wire feed mechanism is correctly adjusted<br>• Check correct drive rolls are fitted<br>• Check wire spool overrun tension is correctly adjusted<br>• Check gun liner is not blocked. Replace if necessary<br>• Check correct gun liner is fitted for the filler wire size and type<br>• Check contact tip for size, type and wear<br>• Check gun is not over heating in application<br>• Check cable connections and earth return clamp<br>• Check welding parameter settings. |
| Filler wire won't feed? | • Check wire feed mechanism. Pressure arms are closed? Close and adjust<br>• Check welding gun switch function.<br>• Check euro gun collar is correctly fastened to euro block<br>• Check gun liner is not blocked<br>• Check contact tip, size, type, wear<br>• Check and try alternative gun. |
| High spatter volume? | • Check welding parameter values<br>• Check inductance/Dynamics values<br>• •Check cable compensation value if long cables are fitted<br>• Check gas type and flow<br>• Check welding polarity – cable connections<br>• Check filler material selection<br>• Check correct welding curve selected<br>• Check correct Channel (job) number selection<br>• Check filler wire delivery system<br>• Check power supply – 3 x phase present? |

*NOTE! Many of these checks may be carried out by the operator. However certain checks relating to mains power must be completed by an authorised trained electrician.*

# 6. MAINTENANCE

When considering and planning routine maintenance, please consider the frequency of machine use and the working environment.

Correct operation of the machine and regular maintenance will help you avoid unnecessary downtime and equipment failure.

*NOTE! Disconnect the machine from the mains before handling the electrical cables.*

## 6.1 DAILY MAINTENANCE

- Check the overall condition of the welding gun. Remove welding spatter from the contact tip and clean the gas nozzle. Replace worn or damaged parts. Only use original Kemppi spare parts.
- Check the condition and connection of the welding circuit components: welding gun, earth return cable and clamp, sockets and connectors.
- Check the condition of the feed rolls, needle bearings and shafts. Clean and lubricate bearings and shafts with a small quantity of light machine oil if necessary. Assemble, adjust and test function.

## 6.2 PERIOD MAINTENANCE

*NOTE! Period maintenance should only be carried out by a suitably qualified person. Disconnect the plug of the machine from the mains socket and wait approx.2 minutes (capacitor charge) before removing the cover plate.*

Check at least every half year:

- Electric connectors of the machine – clean any oxidized parts and tighten loose connections.

*NOTE! You must know the correct tension torques values before starting the reparation of the loose joints.*

Clean the inner parts of the machine from dust and dirt e.g. with a soft brush and vacuum cleaner. Also clean the ventilation net behind the front grill.

Do not use compressed air, there is a risk that the dirt will compact even more tightly into gaps of cooling profiles.

Do not use pressure washing devices.

Only an authorized trained electrician should carry out repairs to Kemppi machines.

## 6.3 SERVICE SHOP MAINTENANCE

Kemppi Service Workshops complete maintenance according to their Kemppi service agreement.

The major points in the maintenance procedure are listed as follows:

- Cleaning of the machine
- Checking and maintenance of the welding tools
- Checking of connectors, switches and potentiometers
- Checking of electric connections
- Checking of mains cable and plug
- Damaged parts or parts in bad condition are replaced by new ones
- Maintenance testing.
- Operation and performance values of the machine are checked, and when necessary adjusted by means of software and test equipment.

# 7. OPERATION DISTURBANCES

Should you experience a malfunction from your machine, please consult the basic troubleshooting text above first, and complete some basic checks. If the machine malfunction cannot be corrected with these measures, contact your KEMPPI maintenance service workshop.

## 7.1 OPERATION OF THE OVERLOAD PROTECTION

Yellow thermal protection lamp is lit when the thermostat is operating due to loading beyond the stated duty cycle.

The thermostat will operate, if machine is continuously loaded over rated values or cooling air circulation is blocked.

Internal fans will cool the machine, and when the pilot lamp is not lit the machine is automatically ready for welding.

## 7.2 CONTROL FUSES

Fuse, 6.3 A delayed, on the rear wall of machine provides protection for auxiliary devices.

*NOTE! Use same type and rating of fuse which is marked beside the fuse adapter. Damage caused by a wrong type fuse is not covered by the guarantee.*

## 7.3 UNDER- AND OVERVOLTAGES IN THE MAINS SUPPLY

Primary circuits of the machine are protected against sudden, transient overvoltages. The machine is designed to withstand 3 x 440 V voltage continuously (see technical data). Ensure that voltage is kept within this admissible limit, especially when the mains supply is provided by a combustion engine generator. If the mains has under voltage (under approx. 300 V) or overvoltage (over approx. 480 V) machine control stops operation automatically.

## 7.4 LOSS OF A PHASE IN THE MAINS SUPPLY

Loss of a main power phase causes noticeably poor welding properties. In some cases the machine won't start at all. Loss of a phase can be due to following:

- Blowing of mains supply fuse
- Defective mains cable
- Bad connection of mains connection cable on terminal block or plug of machine.

## 8. DISPOSAL OF THE MACHINE

Do not dispose of electrical equipment with normal waste!

In observance of European Directive 2002/96/EC on waste electrical and electronic equipment, and its 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 centre, per the instructions of local authorities or a Kemppi representative. By applying this European Directive you will improve the environment and human health.

## 9. ORDERING NUMBERS

| | | |
|---|---|---|
| **FastMig KMS 400 AS** | | 6054001 |
| **Wire feeders** | | |
| **ArcFeed 200** | | 6120200 |
| **ArcFeed 300** | | 6120300 |
| **ArcFeed 300P** | | 6120310 |
| **MXF 65** | | 6152100EL |
| **MXF 67** | | 6152200EL |
| **MXF 63** | | 6152300EL |
| **MXF 65** | | 6152100 |
| **MXF 67** | | 6152200 |
| **MXF 63** | | 6152300 |
| **Panels for MSF and MXF feeders** | | |
| **SF 51** | | 6085100 |
| **SF 52W** | | 6085200W |
| **SF 53W** | | 6085300W |
| **SF 54** | | 6085400 |
| **Accessories** | | |
| **Return current cable** | 5 m, 50 $mm^2$ | 6184511 |
| **Return current cable** | 5 m, 70 $mm^2$ | 6184711 |
| **Cable for MMA welding** | 5 m, 50 $mm^2$ | 6184501 |
| **Cable for MMA welding** | 5 m, 70 $mm^2$ | 6184701 |
| **Remote controlled interconnecting cable** | 10 m | 6185481 |
| **Cooling unit Fastcool 10** | | 6068100 |
| **Transport unit PM 500** | | 6185291 |
| **Gun holder GH 30** | | 6256030 |

# 10. TECHNICAL DATA

| FastMig KMS 400 AS | |
|---|---|
| **Connection voltage** | |
| 3~, 50/60 Hz | 400 V -15 %...+20 % |
| **Rated power** | |
| 60 ED | - |
| 80 % ED | 19.5 kVA |
| 100 % ED | 18.5 kVA |
| **Connection cable/fuse delayed** | |
| H07RN-F | 4G6 (5 m) |
| Fuse (delayed) | 35 A |
| **Load capacity 40 °C** | |
| 60 % ED | - |
| 80 % ED | 400 A |
| 100 % ED | 380 A |
| **Welding current and voltage range** | |
| MMA | 10 A ... 400 A |
| MIG | 10 V ... 39 V |
| **Max. welding voltage** | 46 V |
| **Open circuit voltage** | 50 V |
| **Open circuit power** | 25 W |
| **Efficiency at max. current** | 87 % |
| **Power factor at max. current** | 0.9 |
| **Operating temperature range** | -20 ... +40 °C |
| **Storage temperature range** | -40 ... +60 °C |
| **Degree of protection** | IP23S |
| **EMC class** | A |
| **Minimun short circuit power $S_{SC}$ of supply network*** | 4.7 MVA |
| **External dimensions (LxWxH)** | 590x230x430 mm |
| **Weight** | 35 kg |
| **Voltage supply for auxiliary devices** | 50 V DC |
| **X14, X15** | fuse 6.3 A delayed |
| **Voltage supply for cooling unit** | 1~ 400 V AC and 24 V DC |

* See paragraph 3.1.

# 11. WARRANTY POLICY

Kemppi Oy provides a warranty for products manufactured and sold by the company if defects in materials or workmanship occur. Warranty repairs are to be carried out only by an authorised Kemppi Service Agent. Packing, shipping, and insurance are at the orderer's expense.

The warranty starts on the date of purchase. Spoken promises not included in the terms of warranty are not binding on the warrantor.

### Limitations of the warranty

The following conditions are not covered under the terms of warranty: defects arising from normal wear and tear, non-compliance with operation and maintenance instructions, overloading, negligence, connection to incorrect or faulty supply voltage (including voltage surges outside equipment specifications), incorrect gas pressure, anomalies or failures in the electric network, transport or storage damage, and fire or damage due to forces of nature. This warranty does not cover direct or indirect travel costs, daily allowances, or accommodation related to warranty service.

The warranty does not cover welding torches and their consumables, feeder drive rolls, and feeder guide tubes. Direct or indirect damage caused by a defective product is not covered under the warranty.

The warranty becomes void if modifications are made to the machine that are not approved by the manufacturer or if non-original spare parts are used in repairs. The warranty is also voided if repairs are carried out by a repair agent not authorised by Kemppi.

### Undertaking warranty repairs

Warranty defects must be reported to Kemppi or an authorised Kemppi Service Agent without delay.

Before a warranty repair is undertaken, the customer must present proof of warranty or otherwise prove the validity of the warranty in writing. The proof must indicate the date of purchase and the manufacturing number of the unit to be repaired. The parts replaced under the terms of this warranty remain the property of Kemppi and must be returned to Kemppi if requested.

After a warranty repair, the warranty of the machine or equipment, repaired or replaced, shall be continued to the end of the original warranty period.

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