



ARCMaster 401MST

Service Manual



Art # A-12449_AC



Revision: AB

Issue Date: November 11, 2014

Manual No.: 0-5359

Tweco.com



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WARNINGS

Read and understand this entire Manual and your employer's safety practices if applicable before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgment, the Manufacturer assumes no liability for its use.

Service Manual Number 0-5359 for:
Tweco ArcMaster 401MST Power Source

Part Number W1009500

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Publication Date: August 29, 2014
Revision Date: November 11, 2014

Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Equipment Serial #: _____

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SECTION 1:

SAFETY INSTRUCTIONS AND WARNINGS

**WARNING**

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the American National Standard Z49.1 entitled: SAFETY IN WELDING AND CUTTING. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

1.01 Arc Welding Hazards

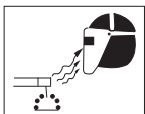
**WARNING**

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semi-automatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.

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WARNING

ARC RAYS can burn eyes and skin; NOISE can damage hearing. Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.

3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.



WARNING

FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

AWS F2.2:2001 (R2010), Adapted with permission of the American Welding Society (AWS), Miami, Florida

Guide for Shade Numbers

Process	Electrode Size in. (mm)	Arc Current (Amperes)	Minimum Protective Shade	Suggested* Shade No. (Comfort)
Shielded Metal Arc Welding (SMAW)	Less than 3/32 (2.4)	Less than 60	7	-
	3/32-5/32 (2.4-4.0)	60-160	8	10
	5/32-1/4 (4.0-6.4)	160-250	10	12
	More than 1/4 (6.4)	250-550	11	14
Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)		Less than 60	7	-
		60-160	10	11
		160-250	10	12
		250-550	10	14
Gas Tungsten arc Welding (GTAW)		Less than 50	8	10
		50-150	8	12
		150-500	10	14
Air Carbon Arc Cutting (CAC-A)	(Light)	Less than 500	10	12
	(Heavy)	500-1000	11	14
Plasma Arc Welding (PAW)		Less than 20	6	6 to 8
		20-100	8	10
		100-400	10	12
		400-800	11	14
Plasma Arc Cutting (PAC)		Less than 20	4	4
		20-40	5	5
		40-60	6	6
		60-80	8	8
		80-300	8	9
		300-400	9	12
		400-800	10	14

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding, cutting, or brazing where the torch and/or the flux produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line of the visible light spectrum.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.

**WARNING**

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

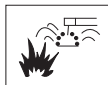
1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

**WARNING**

CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.

**WARNING**

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.

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6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.



WARNING

Engines can be dangerous.



WARNING

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.



WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.



WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.

2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.



WARNING

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and -) on batteries.



WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

**WARNING**

WARNING: This product contains chemicals, including lead, known to the State of California to cause birth defects and other reproductive harm. *Wash hands after handling.*

NOTE

Considerations About Welding And The Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding Power Source and cables as far away from body as practical.

**ABOUT PACEMAKERS:**

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

1.02 General Safety Information for Victor Regulator

A Fire Prevention

Welding and cutting operations use fire or combustion as a basic tool. The process is very useful when properly controlled. However, it can be extremely destructive if not performed correctly in the proper environment.

1. The work area must have a fireproof floor.
2. Work benches or tables used during welding or cutting operations must have fireproof tops.
3. Use heat resistant shields or other approved material to protect nearby walls or unprotected flooring from sparks and hot metal.
4. Keep an approved fire extinguisher of the proper size and type in the work area. Inspect it regularly to ensure that it is in proper working order. Know how to use the fire extinguisher.
5. Move combustible materials away from the work site. If you can not move them, protect them with fireproof covers.

**WARNING**

NEVER perform welding, heating, or cutting operations on a container that has held toxic, combustible or flammable liquids, or vapors. NEVER perform welding, heating, or cutting operations in an area containing combustible vapors, flammable liquids, or explosive dust.

B Housekeeping

**WARNING**

NEVER allow oxygen to contact grease, oil, or other flammable substances. Although oxygen by itself will not burn, these substances become highly explosive. They can ignite and burn violently in the presence of oxygen.

Keep ALL apparatus clean and free of grease, oil and other flammable substances.

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C Ventilation



WARNING

Adequately ventilate welding, heating, and cutting work areas to prevent accumulation of explosive or toxic concentrations of gases. Certain combinations of metals, coatings, and gases generate toxic fumes. Use respiratory protection equipment in these circumstances. When welding/brazing, read and understand the Material Safety Data Sheet for the welding/brazing alloy.

D Personal Protection

Gas flames produce infrared radiation which may have a harmful effect on the skin and especially on the eyes. Select goggles or a mask with tempered lenses, shaded 4 or darker, to protect your eyes from injury and provide good visibility of the work.

Always wear protective gloves and flame-resistant clothing to protect skin and clothing from sparks and slag. Keep collars, sleeves, and pockets buttoned. **DO NOT** roll up sleeves or cuff pants.

When working in a non-welding or cutting environment, always wear suitable eye protection or face shield.



WARNING

Practice the following safety and operation precautions EVERY TIME you use pressure regulation equipment. Deviation from the following safety and operation instructions can result in fire, explosion, damage to equipment, or injury to the operator.

E Compressed Gas Cylinders

The Department of Transportation (DOT) approves the design and manufacture of cylinders that contain gases used for welding or cutting operations.

1. Place the cylinder (Figure 1-1) where you will use it. Keep the cylinder in a vertical position. Secure it to a cart, wall, work bench, post, etc.

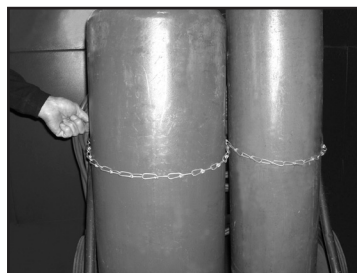


Figure 1-1: Gas Cylinders



WARNING

*Cylinders are highly pressurized. Handle with care. Serious accidents can result from improper handling or misuse of compressed gas cylinders **DO NOT** drop the cylinder, knock it over, or expose it to excessive heat, flames or sparks. **DO NOT** strike it against other cylinders. Contact your gas supplier or refer to CGA P-1 “Safe Handling of Compressed Gases in Containers” publication.*

NOTE

CGA P-1 publication is available by writing the Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923

2. Place the valve protection cap on the cylinder whenever moving it, placing it in storage, or not using it. Never drag or roll cylinders in any way. Use a suitable hand truck to move cylinders.
3. Store empty cylinders away from full cylinders. Mark them “EMPTY” and close the cylinder valve.

4. NEVER use compressed gas cylinders without a pressure reducing regulator attached to the cylinder valve.
5. Inspect the cylinder valve for oil, grease, and damaged parts.

**WARNING**

DO NOT use the cylinder if you find oil, grease or damaged parts. Inform your gas supplier of this condition immediately.

6. Momentarily open and close (called “cracking”) the cylinder valve to dislodge any dust or dirt that may be present in the valve.

**CAUTION**

Open the cylinder valve slightly. If you open the valve too much, the cylinder could tip over. When cracking the cylinder valve, DO NOT stand directly in front of the cylinder valve. Always perform cracking in a well ventilated area. If an acetylene cylinder sprays a mist when cracked, let it stand for 15 minutes. Then, try to crack the cylinder valve again. If this problem persists, contact your gas supplier.

1.03 Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

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1.04 Symbol Chart

Note that only some of these symbols will appear on your model.

	On
	Off
	Dangerous Voltage
	Increase/Decrease
	Circuit Breaker
	AC Auxiliary Power
	Fuse
A	Amperage
V	Voltage
Hz	Hertz (cycles/sec)
f	Frequency
	Negative
	Positive
	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
115V 15A 	Receptacle Rating-Auxiliary Power

1	Single Phase
3	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
X	Duty Cycle
%	Percentage
	Panel/Local
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW)
	Air Carbon Arc Cutting (CAC-A)
	Constant Current
	Constant Voltage Or Constant Potential
	High Temperature
	Fault Indication
	Arc Force
	Touch Start (GTAW)
	Variable Inductance
	Voltage Input

	Wire Feed Function
	Wire Feed Towards Workpiece With Output Voltage Off.
	Welding Gun
	Purging Of Gas
	Continuous Weld Mode
	Spot Weld Mode
	Spot Time
	Preflow Time
	Postflow Time
2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.	
4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.	
	Burnback Time
IPM	Inches Per Minute
MPM	Meters Per Minute
	See Note
	See Note
Art # A-04130_AB	

Note: For environments with increased hazard of electrical shock, Power Supplier bearing the mark conform to EN50192 when used in conjunction with hand torches with exposed tips, if equipped with properly installed standoff guides.

Cannot be disposed with household garbage.

1.05 Precautions De Securite En Soudage A L'arc



MISE EN GARDE

LE SOUDAGE A L'ARC EST DANGEREUX

PROTEGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTE UN MEDECIN). CONSERVEZ CES INSTRUCTIONS. LISEZ LE MANUEL D'OPERATION OU LES INSTRUCTIONS AVANT D'INSTALLER, UTILISER OU ENTREtenir CET EQUIPEMENT.

Les produits et procédés de soudage peuvent sauser des blessures graves ou la mort, de même que des dommages au reste du matériel et à la propriété, si l'utilisateur n'adhère pas strictement à toutes les règles de sécurité et ne prend pas les précautions nécessaires.

En soudage et coupage, des pratiques sécuritaires se sont développées suite à l'expérience passée. Ces pratiques doivent être apprises par étude ou entraînement avant d'utiliser l'équipement. Toute personne n'ayant pas suivi un entraînement intensif en soudage et coupage ne devrait pas tenter de souder. Certaines pratiques concernent les équipements raccordés aux lignes d'alimentation alors que d'autres s'adressent aux groupes électrogènes.

La norme Z49.1 de l'American National Standard, intitulée "SAFETY IN WELDING AND CUTTING" présente les pratiques sécuritaires à suivre. Ce document ainsi que d'autres guides que vous devriez connaître avant d'utiliser cet équipement sont présentés à la fin de ces instructions de sécurité.

SEULES DES PERSONNES QUALIFIEES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE REPARATION, D'ENTRETIEN ET D'ESSAI.

1.06 Dangers relatifs au soudage à l'arc



AVERTISSEMENT

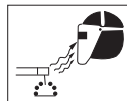
L'ELECTROCUTION PEUT ETRE MORTELLE.

Une décharge électrique peut tuer ou brûler gravement. L'électrode et le circuit de soudage sont sous tension dès la mise en circuit. Le circuit d'alimentation et les circuits internes de l'équipement sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le rouleau ou la bobine de fil, le logement des galets d'entraînement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Un équipement inadéquatement installé ou inadéquatement mis à la terre est dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3. Isolez-vous de la pièce à souder et de la mise à la terre au moyen de tapis isolants ou autres.
4. Déconnectez la prise d'alimentation de l'équipement ou arrêtez le moteur avant de l'installer ou d'en faire l'entretien. Bloquez le commutateur en circuit ouvert ou enlevez les fusibles de l'alimentation afin d'éviter une mise en marche accidentelle.
5. Veuillez à installer cet équipement et à le mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tout équipement après usage. Coupez l'alimentation de l'équipement s'il est hors d'usage ou inutilisé.
7. N'utilisez que des porte-électrodes bien isolés. Ne jamais plonger les porte-électrodes dans l'eau pour les refroidir. Ne jamais les laisser traîner par terre ou sur les pièces à souder. Ne touchez pas aux porte-électrodes raccordés à deux sources de courant en même temps. Ne jamais toucher quelqu'un d'autre avec l'électrode ou le porte-électrode.
8. N'utilisez pas de câbles électriques usés, endommagés, mal épissés ou de section trop petite.

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9. N'enroulez pas de câbles électriques autour de votre corps.
10. N'utilisez qu'une bonne prise de masse pour la mise à la terre de la pièce à souder.
11. Ne touchez pas à l'électrode lorsqu'en contact avec le circuit de soudage (terre).
12. N'utilisez que des équipements en bon état. Réparez ou remplacez aussitôt les pièces endommagées.
13. Dans des espaces confinés ou mouillés, n'utilisez pas de source de courant alternatif, à moins qu'il soit muni d'un réducteur de tension. Utilisez plutôt une source de courant continu.
14. Portez un harnais de sécurité si vous travaillez en hauteur.
15. Fermez solidement tous les panneaux et les capots.



AVERTISSEMENT

LE RAYONNEMENT DE L'ARC PEUT BRÛLER LES YEUX ET LA PEAU; LE BRUIT PEUT ENDOMMAGER L'OUIE.

L'arc de soudage produit une chaleur et des rayons ultraviolets intenses, susceptibles de brûler les yeux et la peau. Le bruit causé par certains procédés peut endommager l'ouïe.

1. Portez une casque de soudeur avec filtre oculaire de nuance appropriée (consultez la norme ANSI Z49 indiquée ci-après) pour vous protéger le visage et les yeux lorsque vous soudez ou que vous observez l'exécution d'une soudure.

AWS F2.2 : 2001 (R2010), Modifié avec l'accord de l'American Welding Society (AWS), Miami, Florida

Guide de teinte des lentilles				
Procédé	Taille de l'électrode en mm (po)	Courant d'arc (ampères)	Gamme d'intensité minimum	Numéro de teinte recommandée* (Confort)
Soudage à l'arc avec électrode enrobée (procédé SMAW)	Moins de 2,4 (3/32) 3/32-5/32 (2,4-4,0) 5/32-1/4 (4,0-6,4) Plus de 1/4 (6,4)	Moins de 60 60-160 160-250 250-550	7 8 10 11	- 10 12 14
Soudage à l'arc sous gaz avec fil plein (procédé GMAW) et soudage avec fil fourré (procédé FCAW)		Moins de 60 60-160 160-250 250-550	7 10 10 10	- 11 12 14
Soudage à l'électrode réfractaire (procédé GTAW)		Moins de 50 50-150 150-500	8 8 10	10 12 14
Coupage à l'arc avec électrode de carbone et jet d'air (procédé AAC)	(Clair) (Sombre)	Moins de 500 500-1000	10 11	12 14
Soudage à l'arc au plasma (procédé PAW)		Moins de 20 20-100 100-400 400-800	6 8 10 11	6 à 8 10 12 14
Coupage plasma (procédé PAC)		Moins de 20 20-40 40-60 60-80 80-300 300-400 400-800	4 5 6 8 8 9 10	4 5 6 8 9 12 14
* En règle générale, commencer avec une teinte plus foncée pour voir la zone de soudage. Réduire ensuite progressivement vers la teinte qui permet de voir la zone de soudage sans dépasser le minimum. Lors du soudage, du coupage ou du brasage au gaz oxygéné, la torche ou le fondant produit une puissante lumière jaune; il est préférable d'utiliser un filtre qui absorbe cette lumière jaune ou le sodium du spectre de la lumière visible.				

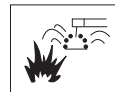
2. Portez des lunettes de sécurité approuvées. Des écrans latéraux sont recommandés.
3. Entourez l'aire de soudage de rideaux ou de cloisons pour protéger les autres des coups d'arc ou de l'éblouissement; avertissez les observateurs de ne pas regarder l'arc.
4. Portez des vêtements en matériaux ignifuges et durables (laine et cuir) et des chaussures de sécurité.
5. Portez un casque antibruit ou des bouchons d'oreille approuvés lorsque le niveau de bruit est élevé.

**AVERTISSEMENT**

LES VAPEURS ET LES FUMÉES SONT DANGEREUSES POUR LA SANTÉ.

Le soudage dégage des vapeurs et des fumées dangereuses à respirer.

1. Eloignez la tête des fumées pour éviter de les respirer.
2. A l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est inadéquate, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consommables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et ainsi causer des malaises ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques au moment du soudage.

**AVERTISSEMENT**

LE SOUDAGE PEUT CAUSER UN INCENDIE OU UNE EXPLOSION

L'arc produit des étincelles et des projections. Les particules volantes, le métal chaud, les projections de soudure et l'équipement surchauffé peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode ou du fil-électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et du métal chaud.
2. Ne soudez pas dans un endroit où des particules volantes ou des projections peuvent atteindre des matériaux inflammables.
3. Enlevez toutes matières inflammables dans un rayon de 10, 7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des projections brûlantes de soudage susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure réalisée sur un plafond, un plancher, une cloison ou une paroi peut enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, tel un réservoir ou un baril.
8. Connectez le câble de soudage le plus près possible de la zone de soudage pour empêcher le courant de suivre un long parcours inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne dégelez pas les tuyaux avec un source de courant.
10. Otez l'électrode du porte-électrode ou coupez le fil au tube-contact lorsqu'inutilisé après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon revers, des bottines de sécurité et un casque.



AVERTISSEMENT

LES ETINCELLES ET LES PROJECTIONS BRULANTES PEUVENT CAUSER DES BLESSURES.

Le piquage et le meulage produisent des particules métalliques volantes. En refroidissant, la soudure peut projeter du éclats de laitier.

1. Portez un écran facial ou des lunettes protectrices approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements appropriés pour protéger la peau.



AVERTISSEMENT

LES BOUTEILLES ENDOMMAGEES PEUVENT EXPLOSER

Les bouteilles contiennent des gaz protecteurs sous haute pression. Des bouteilles endommagées peuvent exploser. Comme les bouteilles font normalement partie du procédé de soudage, traitez-les avec soin.

1. Protégez les bouteilles de gaz comprimé contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchaînez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Eloignez les bouteilles de tout circuit électrique ou de tout soudage.
4. Empêchez tout contact entre une bouteille et une électrode de soudage.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des boyaux et des raccords conçus pour chaque application spécifique; ces équipements et les pièces connexes doivent être maintenus en bon état.
6. Ne placez pas le visage face à l'ouverture du robinet de la bouteille lors de son ouverture.

7. Laissez en place le chapeau de bouteille sauf si en utilisation ou lorsque raccordé pour utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux équipements connexes, ainsi que la publication P-1 de la CGA, identifiée dans la liste de documents ci-dessous.



AVERTISSEMENT

LES MOTEURS PEUVENT ETRE DANGEREUX

LES GAZ D'ÉCHAPPEMENT DES MOTEURS PEUVENT ETRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utilisez l'équipement à l'extérieur dans des aires ouvertes et bien ventilées.
2. Si vous utilisez ces équipements dans un endroit confiné, les fumées d'échappement doivent être envoyées à l'extérieur, loin des prises d'air du bâtiment.



AVERTISSEMENT

LE CARBURANT PEUT CAUSER UN INCENDIE OU UNE EXPLOSION.

Le carburant est hautement inflammable.

1. Arrêtez le moteur avant de vérifier le niveau de carburant ou de faire le plein.
2. Ne faites pas le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
3. Si c'est possible, laissez le moteur refroidir avant de faire le plein de carburant ou d'en vérifier le niveau au début du soudage.
4. Ne faites pas le plein de carburant à ras bord: prévoyez de l'espace pour son expansion.
5. Faites attention de ne pas renverser de carburant. Nettoyez tout carburant renversé avant de faire démarrer le moteur.



AVERTISSEMENT

DES PIÈCES EN MOUVEMENT PEUVENT CAUSER DES BLESSURES.

Des pièces en mouvement, tels des ventilateurs, des rotors et des courroies peuvent couper doigts et mains, ou accrocher des vêtements amples.

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs soient bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.
4. Pour empêcher un démarrage accidentel pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.
6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.



AVERTISSEMENT

DES ÉTINCELLES PEUVENT FAIRE EXPLODER UN ACCUMULATEUR; L'ELECTROLYTE D'UN ACCUMULATEUR PEUT BRULER LA PEAU ET LES YEUX.

Les accumulateurs contiennent de l'électrolyte acide et dégagent des vapeurs explosives.

1. Portez toujours un écran facial en travaillant sur un accumulateur.
2. Arrêtez le moteur avant de connecter ou de déconnecter des câbles d'accumulateur.
3. N'utilisez que des outils anti-étincelles pour travailler sur un accumulateur.
4. N'utilisez pas une source de courant de soudage pour charger un accumulateur ou survolter momentanément un véhicule.

5. Utilisez la polarité correcte (+ et -) de l'accumulateur.



AVERTISSEMENT

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRULANT SOUS PRESSION PEUVENT BRULER LA PEAU ET LES YEUX.

Le liquide de refroidissement d'un radiateur peut être brûlant et sous pression.

1. N'ôtez pas le bouchon de radiateur tant que le moteur n'est pas refroidi.
2. Mettez des gants et posez un torchon sur le bouchon pour l'ôter.
3. Laissez la pression s'échapper avant d'ôter complètement le bouchon.



AVERTISSEMENT

AVERTISSEMENT: Ce produit contient des produits chimiques, notamment du plomb, reconnu par l'État de la Californie pour causer des malformations congénitales et d'autres dommages touchant le système reproductif. **Se laver les mains après manipulation.**

REMARQUE

Facteurs relatifs au soudage et aux effets des champs magnétiques et électriques de basse fréquence

Voici une citation tirée du chapitre des conclusions générales du document de base de l'Office of Technology Assessment (bureau des évaluations technologiques) de l'U.S. Congress, « Biological Effects of Power Frequency Electric & Magnetic Fields », OTA-BP-E-63 (Washington, DC : U.S. Government Printing Office, mai 1989) : « ... il existe de nos jours, un nombre très élevé de travaux scientifiques qui rapportent les résultats d'expériences menées au niveau cellulaire et d'études auprès d'homme et d'animaux qui établissent nettement le rapport entre les champs magnétiques de basse fréquence et les systèmes biologiques, soit par des interactions ou des modifications. Quoique la plupart de ces travaux soient de très bonne qualité, les résultats sont complexes. À la lumière des connaissances scientifiques actuelles, il nous est encore impossible d'interpréter les évidences en un seul cadre de référence cohérent. La situation est toutefois très contrariante. En effet, il nous est aussi impossible de tirer des conclusions définitives quant aux risques éventuels ou de proposer des stratégies

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fondées sur des faits scientifiques visant à atténuer ou éviter des risques potentiels ».

Pour atténuer les champs magnétiques sur les lieux de travail, respectez les procédures qui suivent :

1. Maintenez les câbles l'un près de l'autre en les entrelaçant ou les reliant ensemble au ruban.
2. Acheminez les câbles à un côté du soudeur, le plus loin possible.
3. N'enroulez pas de câble autour du corps.
4. Maintenez le bloc d'alimentation du poste de soudage et les câbles aussi loin que possible du corps.



STIMULATEURS CARDIAQUES :

Les procédures décrites ci-dessus sont habituellement celles recommandées pour les porteurs de stimulateurs cardiaques. Pour de plus amples renseignements, consulter un médecin.

1.07 Informations Générales de Sécurité

A Prévention D'incendie

Les opérations de soudage utilisent le feu ou la combustion comme outil de base. Ce processus est très utile quand il est correctement contrôlé.

1. La zone doit comporter un sol ignifugé.
2. Les établis ou tables utilisés pendant les opérations de soudage doivent avoir un revêtement ignifuge.
3. Utilisez des écrans résistants à la chaleur ou en matériau approuvé pour protéger les cloisons proches ou le sol vulnérable des étincelles et du métal chaud.
4. Gardez un extincteur approuvé du bon type et de la bonne taille dans la zone de travail. Inspectez-le régulièrement pour vous assurer qu'il est en état de fonctionner. Apprenez à vous en servir.
5. Enlevez tous les matériaux combustibles de la zone de travail. Si vous ne pouvez pas les enlever, protégez-les avec une couvre ignifuge.



AVERTISSEMENT

*N'effectuez **JAMAIS** d'opérations de soudage sur un récipient qui a contenu des liquides ou vapeurs toxiques, combustibles ou inflammables. N'effectuez **JAMAIS** d'opérations de soudage dans une zone contenant des vapeurs combustibles, des liquides inflammables ou des poussières explosives.*

B Entretien des Locaux



AVERTISSEMENT

Ne laissez jamais l'oxygène en contact avec la graisse, l'huile ou d'autres substances inflammables. Bien que l'oxygène elle-même ne brûle pas, ces substances peuvent devenir extrêmement explosives. Elles peuvent prendre feu et brûler violemment en présence d'oxygène.

Gardez **TOUTS** les appareils propres et exempts de graisse, huile ou autres substances inflammables.

C Aération



AVERTISSEMENT

Ventilez les zones de soudage, chauffage et découpage de façon adéquate pour éviter l'accumulation de gaz explosifs ou toxiques. Certaines combinaisons de métaux, revêtements et gaz génèrent des fumées toxiques: Utilisez un équipement de protection respiratoire dans ces circonstances. Si vous soudez ou brasez, lisez et assimilez la fiche technique de sécurité de matériau relative à l'alliage de soudage/brasage.

D Protection Personnelle

Les flammes de gaz produisent une radiation infrarouge qui peut avoir un effet néfaste sur la peau, et particulièrement sur les yeux. Choisissez des lunettes ou un masque avec des verres trempés assombris au niveau 4 ou plus sombre, pour protéger vos yeux des dommages et garder une bonne visibilité sur le travail.

Portez en permanence des gants de protection et des vêtements ignifuges pour la protection de la peau et des vêtements contre les étincelles et le laitier. Gardez col,

manches et poches boutonnés. Il ne faut pas remonter vos manches ou les pantalons à revers.

Quand vous travaillez dans un environnement non dédié au soudage ou découpage, portez toujours une protection des yeux appropriées ou un masque facial.



AVERTISSEMENT

Mettez en pratique les procédures de sécurité et de mode opératoire suivantes à chaque fois que vous utilisez cet appareil de régulation de pression. Si vous déviez de ces procédures, cela peut entraîner incendie, explosion, dégâts matériels et/ou blessures corporelles pour l'opérateur.

E Bouteilles de Gaz Comprimé

Le Département des Transports américain (DOT) approuve la conception et la fabrication des bouteilles qui contiennent les gaz utilisés pour les opérations de soudage ou de découpage.

1. Placez la bouteille (Le schéma 1) là où elle sera utilisée. Gardez-la en position verticale. Fixez-la sur un chariot une cloison, un établi, etc.



Le schéma 1-1: Cylindres de gaz



AVERTISSEMENT

Les bouteilles sont sous haute pression. Manipulez-les avec précautions. Des accidents sérieux peuvent résulter d'une mauvaise manutention ou d'un mauvais emploi des bouteilles de gaz comprimé. NE faites PAS tomber la bouteille, ne la cognez pas, ne l'exposez pas à une chaleur excessive, aux flammes ou étincelles. NE la cognez PAS contre d'autres bouteilles. Contactez votre fournisseur de gaz ou reportez-vous à la publication CGA P-1 "Manipulation sécurisée des gaz comprimés en conteneur" pour plus d'informations sur l'utilisation et la manutention des bouteilles.

AVIS

Ce document CGA peut être obtenu en écrivant à "Compressed Gas Association", 4221 Walney Road, 5th Floor, Chantilly, VA 20151.2923, USA.

2. Placez le bouchon de protection de vanne sur la bouteille à chaque fois que vous la déplacez ou ne l'utilisez pas. Ne faites jamais glisser ou rouler d'aucune manière les bouteilles. Utilisez un diable approprié pour les déplacer.
3. Entrez les bouteilles vides à l'écart des bouteilles pleines. Marquez-les "VIDE" et refermez leur vanne.
4. N'utilisez **JAMAIS** des bouteilles de gaz comprimé sans un régulateur de pression en série sur la vanne de bouteille.
5. Inspectez la vanne de bouteille pour y détecter de l'huile ou de la graisse, ou des pièces endommagées.



AVERTISSEMENT

N'UTILISEZ PAS la bouteille si vous trouvez de l'huile, de la graisse ou des pièces endommagées. Informez immédiatement votre fournisseur de gaz de cet état.

6. Ouvrez et fermez momentanément la vanne de la bouteille, délogeant ainsi d'éventuelles poussières ou saletés qui pourraient être présentes dans la vanne.



Mise en Garde

Ouvrez la vanne de bouteille légèrement. Si vous l'ouvrez trop en grand, la bouteille pourrait se renverser. Quand vous ouvrez/fermez rapidement la vanne de bouteille, ne vous tenez pas directement devant. Opérez toujours cette opération dans une zone bien ventilée. Si une bouteille d'acétylène crache un brouillard, laissez reposer pendant 15 minutes. Essayez de nouveau la vanne. Si le problème persiste, contactez votre fournisseur de gaz.

1.08 Principales Normes De Securite

Safety in Welding and Cutting, norme ANSI Z49.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

Safety and Health Standards, OSHA 29 CFR 1910, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

National Electrical Code, norme 70 NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, document P-1, Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, norme CSA W117.2 Association canadienne de normalisation, Standards Sales, 276 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, norme ANSI Z87.1, American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme 51B NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.09 Graphique de Symbole

Seulement certains de ces symboles apparaîtront sur votre modèle.

	Sous Tension
	Hors Tension
	Tension dangereuse
	Augmentez/Diminuer
	Disjoncteur
	Source AC Auxiliaire
	Fusible
	Intensité de Courant
	Tension
	Hertz (cycles/sec)
	Fréquence
	Négatif
	Positif
	Courant Continue (DC)
	Terre de Protection
	Ligne
	Connexion de la Ligne
	Source Auxiliaire
	Classement de Prise-Source Auxiliaire

	Mono Phasé
	Trois Phasé
	Tri-Phase Statique Fréquence Convertisseur Transformateur-Redresseur
	Distant
	Facteur de Marche
	Pourcentage
	Panneau/Local
	Soudage Arc Electrique Avec Electrode Enrobé (SMAW)
	Soudage à L'arc Avec Fil Electrodes Fusible (GMAW)
	Soudage à L'arc Avec Electrode Non Fusible (GTAW)
	Decoupe Arc Carbone (CAC-A)
	Courant Constant
	Tension Constante Ou Potentiel Constant
	Haute Température
	Force d'Arc
	Amorçage de L'arc au Contact (GTAW)
	Inductance Variable
	Tension

	Déroulement du Fil
	Alimentation du Fil Vers la Pièce de Fabrication Hors Tension
	Torch de Soudage
	Purge Du Gaz
	Mode Continu de Soudure
	Soudure Par Point
	Durée du Pulse
	Durée de Pré-Débit
	Durée de Post-Débit
Détente à 2-Temps Appuyez pour déruarer l'alimentation du fils et la soudure, le relâcher pour arrêter.	
Détente à 4-Temps Maintenez appuyez pour pré-débit, relâchez pour initier l'arc. Appuyez pour arrêter l'arc, et maintenez pour pré-débit.	
	Problème de Terre
	Pouces Par Minute
	Mètres Par Minute
	Voir Note
	Voir Note

Art # A-07639_AB

Note: Pour les environnements avec des risques de choc électrique, le fournisseur d'énergie portant la marque conforme à EN50192 lorsqu'utilisé en conjonction avec des lampes de poche avec des conseils exposés, si équipés avec des guide à l'hauteur de buse correctement installé.

Ne pas déposer avec les déchets ménagers.

Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

SECTION 2: INTRODUCTION

2.01 How To Use This Manual

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings.

Throughout this manual, the words WARNING, CAUTION, and NOTE may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:



WARNING

A WARNING gives information regarding possible personal injury.



CAUTION

A CAUTION refers to possible equipment damage.

NOTE

A NOTE offers helpful information concerning certain operating procedures.

You will also notice icons from the safety section appearing throughout the manual. These are to advise you of specific types of hazards or cautions related to the portion of information that follows. Some may have multiple hazards that apply and would look something like this:



2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the control panel. In some cases, the nameplate may be attached to the rear panel. Equipment which does not have a control panel such as gun and cable assemblies is identified only by the specification or part number printed on the shipping container. Record these numbers on the bottom of page ii for future reference.

2.03 Receipt of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual.

Include all equipment identification numbers as described above along with a full description of the parts in error.

Move the equipment to the installation site before un-crating the unit. Use care to avoid damaging the equipment when using bars, hammers, etc., to un-crate the unit.

ARCMaster 401MST POWER SOURCE

2.04 Description

The Tweco ArcMaster 401MST is a welding power source incorporating to provide Lift TIG, MIG & FCAW, Stick, and Gouging welding process.

The units are also fully compliant to CSA E 60974-1 and UL 60974-1.

The following instructions detail how to correctly and safely set up the machine and give guidelines on gaining the best efficiency and quality from the Power Source. Please read these instructions thoroughly before using the unit.

2.05 User Responsibility

This equipment will perform as per the information contained herein when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Defective equipment (including welding leads) should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated, should be replaced immediately. Should such repairs or replacements become necessary, it is recommended that such repairs be carried out by appropriately qualified persons approved by Tweco. Advice in this regard can be obtained by contacting an Accredited Tweco Distributor.

This equipment or any of its parts should not be altered from standard specification without prior written approval of Tweco. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use or unauthorized modification from standard specification, faulty maintenance, damage or improper repair by anyone other than appropriately qualified persons approved by Tweco.

2.06 Transporting Methods



Disconnect input power conductors from de-energized supply line before moving the welding Power Source.

Lift Power Source with handle on top of case. Use handcart or similar device of adequate capacity. If using a fork lift vehicle, secure the Power Source on a proper skid before transporting.

2.07 Packaged Items

ArcMaster 401MST Inverter Power Source (Part No. W1009500)

- ArcMaster 401MST Inverter Power Source w/10 ft input power cable
- 50mm male Dinse connector × 2
- Operating Manual, English
- CD - Operating Manual (Eng/Fr/Sp)

SECTION 3: SAFETY AND INSTALLATION

3.01 Duty Cycle

The rated duty cycle of a Welding Power Source, is a statement of the time it may be operated at its rated welding current output without exceeding the temperature limits of the insulation of the component parts. To explain the 10 minute duty cycle period the following example is used. Suppose a Welding Power Source is designed to operate at a 40% duty cycle, 170 amperes at 26.8 volts. This means that it has been designed and built to provide the rated amperage (170A) for 4 minutes, i.e. arc welding time, out of every 10 minute period (40% of 10 minutes is 4 minutes). During the other 6 minutes of the 10 minute period the Welding Power Source must idle and be allowed to cool. The thermal cut out will operate if the duty cycle is exceeded.

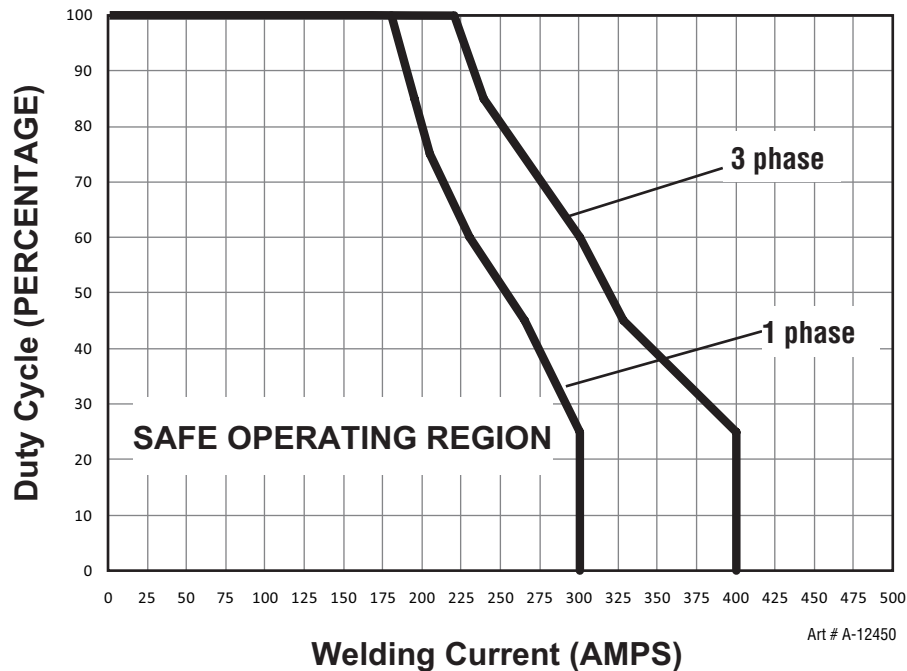


Figure 3-1: Duty Cycle

ARCMaster 401MST POWER SOURCE

3.02 Specifications

Description	ArcMaster 401MST	
Power Source Part Number	W1009500	
Power Source Mass	55lb (25kg)	
Power Source Dimensions	16.5"(H) x 8.3"(W) x 17.7(D) H420mm x W210mm x D450mm	
Cooling	Fan Cooled	
Welder Type	Inverter Power Source	
Output Terminal Type	Dinse™ 50	
Standards	CSA E 60974-1 UL 60974-1	
Number of Phases	1/3 phase	
Nominal Supply Voltage	208-230/460VAC (1 phase) +/-15%	208-230/460VAC (3 phase) +/-15%
Nominal Supply Frequency	50/60Hz	
Welding Current Range	10 - 300A (1 phase)	10 - 400A, (3 phase)
Effective Input Current (I_{1eff}) (note2)	40A (208V, 1 phase) 38.1A (230V, 1 phase) 20A (460V, 1 phase)	26.6A (208V, 3 phase) 24.6A (230V, 3 phase) 14.3A (460V, 3 phase)
Maximum Input Current (I_{1max})	84.7A (208V, 1 phase) 76.2A (230V, 1 phase) 40.1A (460V, 1 phase)	53.2A (208V, 3 phase) 49.1A (230V, 3 phase) 28.6A (460V, 3 phase)
Generator Requirement (note4)	14.40kW	
STICK (SMAW) Welding Output, 40°C, 10 min.	300A @ 22%, 32V (1 phase) 230A @ 60%, 29.2V (1 phase) 180A @ 100%, 27.2V (1 phase)	400A @ 25%, 36V (3 phase) 300A @ 60%, 32V (3 phase) 220A @ 100%, 28.8V (3 phase)
Lift TIG (GTAW) Welding Output, 40°C, 10 min.	300A @ 25%, 22V (1 phase) 230A @ 60%, 19.2V (1 phase) 180A @ 100%, 17.2V (1 phase)	400A @ 25%, 26V (3 phase) 300A @ 60%, 22V (3 phase) 220A @ 100%, 18.8V (3 phase)
MIG & FCAW (GMAW FCAW) Welding Output, 40°C, 10 min.	300A @ 25%, 29V (1 phase) 230A @ 60%, 25.5V (1 phase) 180A @ 100%, 23V (1 phase)	400A @ 25%, 34V (3 phase) 300A @ 60%, 29V (3 phase) 220A @ 100%, 25V (3 phase)
Open Circuit Voltage	80V DC	
Protection Class	IP23S	

Table 3-1: Specification

NOTE

Note 1: Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

Note 2: The Effective Input Current should be used for the determination of cable size & supply requirements.

Note 3: Motor start fuses or thermal circuit breakers are recommended for this application. Check local requirements for your situation in this regard.

Note 4: Generator Requirements at the Maximum Output Duty Cycle.

Due to large variations in performance and specifications of different brands and types of generators, Tweco cannot guarantee full welding output power or duty cycle on every brand or type of generator.

Tweco recommends that when selecting a generator, that the particular power source / generator combination be adequately tested to ensure the combination performs to the users expectations.

Note 5: Tweco reserves the right to change product performance and specifications without notice.

ARCMaster 401MST POWER SOURCE

3.03 Environment

These units are designed for use in environments with increased hazard of electric shock as outlined in IEC 60974-1.

- A. Examples of environments with increased hazard of electric shock are:
1. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts.
 2. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator.
 3. In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.
- B. Environments with increased hazard of electric shock do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

3.04 Location

Be sure to locate the welder according to the following guidelines:

- A. In areas, free from moisture and dust.
- B. Ambient temperature between 32 to 104°F.
- C. In areas, free from oil, steam and corrosive gases.
- D. In areas, not subjected to abnormal vibration or shock.
- E. In areas, not exposed to direct sunlight or rain.
- F. Place at a distance of 300mm or more from walls or similar that could restrict natural air flow for cooling.
- G. The enclosure design of this power source meets the requirements of IP23S as outlined in IEC 60529. This provides adequate protection against solid objects (greater than 1/2", 12mm), and direct protection from vertical drops. Under no circumstances should the unit be operated or connected in a micro environment that will exceed the stated conditions. For further information please refer to IEC 60529.
- H. Precautions must be taken against the power source toppling over. The power source must be located on

a suitable horizontal surface in the upright position when in use.



WARNING

This equipment should be electrically connected by a qualified electrician.

3.05 Ventilation



WARNING

Since the inhalation of welding fumes can be harmful, ensure that the welding area is effectively ventilated.

3.06 Mains Supply Voltage Requirements

The Mains supply voltage should be within $\pm 15\%$ of the rated mains supply voltage. Too low a voltage may cause poor welding performance. Too high a supply voltage will cause components to overheat and possibly fail.

The Welding Power Source must be:

- Correctly installed, if necessary, by a qualified electrician.
- Correctly earthed (electrically) in accordance with local regulations.
- Connected to the correct size power point and fuse as per the Specifications on page 3-2.



WARNING

Any electrical work must be carried out by a qualified Electrical Tradesperson.



WARNING

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

DO NOT TOUCH live electrical parts.

SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Electrical Input Requirements

Operate the welding power source from a single or three-phase 50/60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required. The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

NOTE

This unit is equipped with a three-conductor with earth power cable that is connected at the welding power source end for single or three-phase electrical input power.

Do not connect an input (WHITE, BLACK or RED) conductor to the ground terminal.

Do not connect the ground (GREEN) conductor to an input line terminal.

Refer to Figure 3-2 and:

1. Connect end of ground (GREEN) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. For 3- phase operation, connect ends of line 1 (BLACK) and line 2 (WHITE) and line 3 (RED) input conductors to a de-energized line disconnect switch.

For 1- phase operation, connect BLACK and WHITE input conductors. Insulate the RED Conductor.

3. Use Table 3-2 as a guide to select line fuses for the disconnect switch.

Input Voltage	Fuse Size	
	1 Phase	3 Phase
208 VAC	100 Amps	60 Amps
230 VAC	80 Amps	50 Amps
460 VAC	50 Amps	30 Amps

Table 3-2 Electrical Input Connections

NOTE

Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

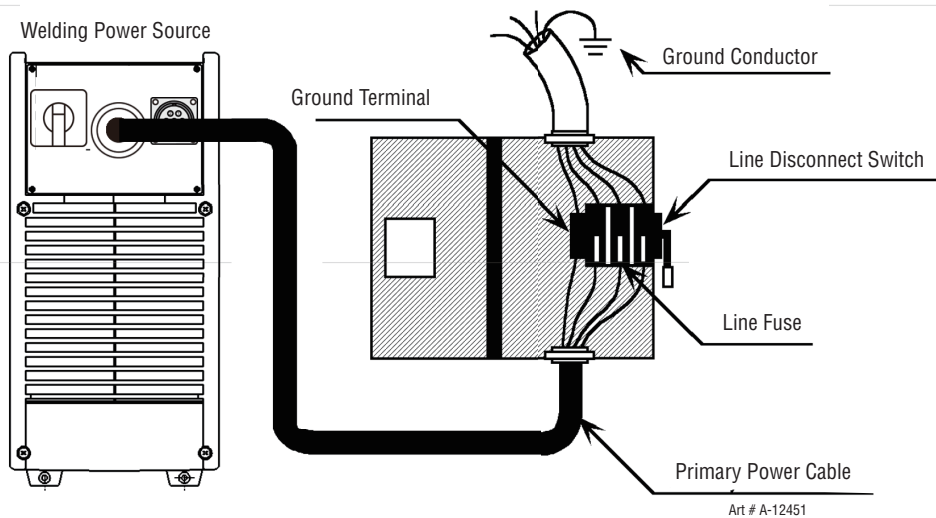


Figure 3-2 Electrical Input Connections

Input Power

Each unit incorporates an INRUSH circuit and input voltage sensing circuit. When the MAIN SWITCH is turned ON, the inrush circuit provides a pre-charging of the input capacitors. A relay in the Main Power PCB2 will turn on after the input capacitors have charged to operating voltage (after approximately 5 seconds).

NOTE

Note the available input power. Damage to the PCB could occur if 529VAC or higher is applied.

3.07 High Frequency Introduction

The importance of correct installation of high frequency welding equipment cannot be overemphasized. Interference due to high frequency initiated or stabilised arc is almost invariably traced to improper installation. The following information is intended as a guide for personnel installing high frequency welding machines.



WARNING EXPLOSIVES

The high frequency section of this machine has an output similar to a radio transmitter. The machine should NOT be used in the vicinity of blasting operations due to the danger of premature firing



WARNING COMPUTER

It is also possible that operation close to computer installations may cause computer malfunction.

3.08 High Frequency Interference

Interference may be transmitted by a high frequency initiated or stabilised arc welding machine in the following ways.

1. **Direct Radiation:** Radiation from the machine can occur if the case is metal and is not properly grounded. It can occur through apertures such as open access panels. The shielding of the high frequency unit in the Power Source will prevent direct radiation if the equipment is properly grounded.
2. **Transmission via the Supply Lead:** Without adequate shielding and filtering, high frequency energy may be fed to the wiring within the installation (mains) by direct coupling. The energy is then transmitted by both radiation and conduction. Adequate shielding and filtering is provided in the Power Source.
3. **Radiation from Welding Leads:** Radiated interference from welding leads, although pronounced in the vicinity of the leads, diminishes rapidly with distance. Keeping leads as short as possible will minimise this type of interference. Looping and suspending of leads should be avoided wherever possible.
4. **Re-Radiation from Unearthed Metallic Objects:** A major factor contributing to interference is re-radiation from unearthed metallic objects close to the welding leads. Effective grounding of such objects will prevent re-radiation in most cases.

3.09 Electromagnetic Compatibility



WARNING

Extra precautions for Electromagnetic Compatibility may be required when this Welding Power Source is used in a domestic situation.

A. Installation and Use - Users Responsibility

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the welding circuit, see NOTE below. In other cases it could involve constructing an electromagnetic screen enclosing the Welding Power Source and the work, complete with associated input

filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

NOTE

The welding circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorised by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel welding current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 60974-10 Arc Welding Equipment - Installation and use (under preparation).

B. Assessment of Area

Before installing welding equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account

1. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the welding equipment.
2. Radio and television transmitters and receivers.
3. Computer and other control equipment.
4. Safety critical equipment, e.g. guarding of industrial equipment.
5. The health of people around, e.g. the use of pacemakers and hearing aids.
6. Equipment used for calibration and measurement.
7. The time of day that welding or other activities are to be carried out.
8. The insulation of other equipment in the environment: the user shall ensure that other equipment being used in the environment is compatible: this may require additional protection measures.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

C. Methods of Reducing Electromagnetic Emissions

1. Main Power Supply

Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the Welding Power Source so that good electrical contact is maintained between the conduit and the Welding Power Source enclosure.

2. Maintenance of Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilising devices should be adjusted and maintained according to the manufacturer's recommendations.

3. Welding Cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

4. Equipotential Bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching the metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

5. Grounding of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth grounding because of its size and position, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be

taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

6. Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening the entire welding installation may be considered for special applications.

SECTION 4: OPERATION

4.01 ArcMaster 401MST Power Source Controls, Indicators and Features



Art # A-12452_AC

Figure 4-1

ARCMaster 401MST POWER SOURCE

1 VRD (Voltage Reduction Device) Indicator Lights

A VRD (voltage reduction device) is a hazard reducing device designed to reduce electric shock hazards present on the output of welding power source when operating in SMAW (STICK) mode. Note that the presence of VRD should not be used as a substitute for the use of appropriate safety practices as indicated in section one of this manual.

Please Note: VRD is factory set to OFF on the 401MST. The red LED will be on when unit is powered up. To enable, turn VRD switch on Control PCB5 (refer to Figure 4-2) to the "ON" position. If VRD is active, green LED will be on (standby below 12V). When arc is established, red LED will blink (above 12V).

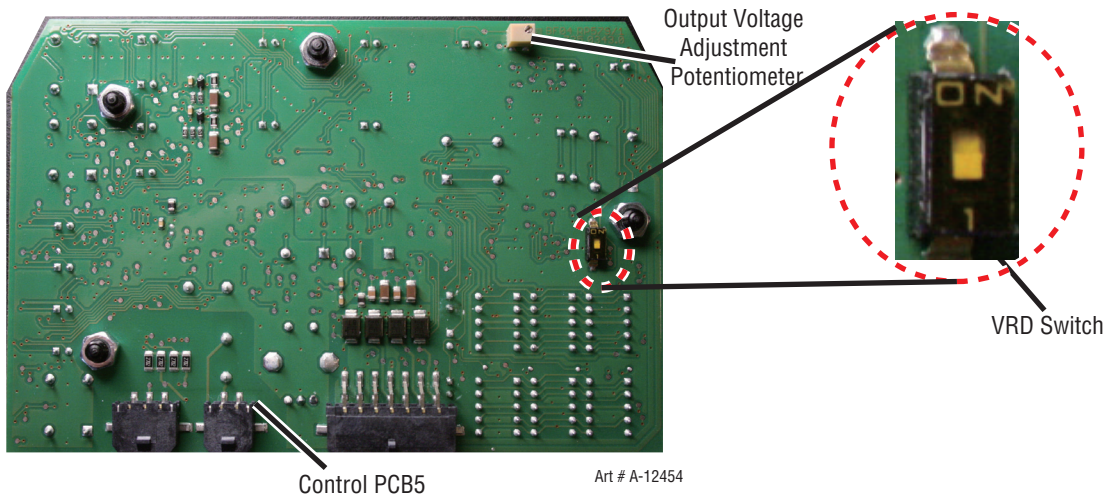


Figure 4-2

2 Amphenol Selector (14 PIN / 19 PIN Remote Button)

This button is used to select 14 PIN or 19 PIN mode of operation. Refer to 4.07 Special Function for more info.

When in 14 PIN Remote mode, the 14 PIN control socket is active and remote voltage controls will be active.

When in 19 PIN Remote mode, the 19 PIN control socket is active and remote voltage controls will be active.

Both 14 pin and 19 pin connectors work in all modes.

3 Parameter Selection Button

This button is used to select between HOT START, WELDING CURRENT, and ARC FORCE while in SMAW (STICK) mode and select between WELDING VOLTAGE and INDUCTANCE CONTROL while in GMAW (MIG) mode. This button is also used in conjunction with the Save/Load buttons to save and load welding programs. Refer to 4.07 Special Function for more info.

4 Digital Meter Volt & Ammeter

Welding amperage, Voltage and parameter values are displayed in this window. Internal warnings such as over temperature, low or high input voltage applied are signaled to the operator by error message on the screen. When welding, it displays average welding current. After weld has been completed, it displays average welding current for 10 seconds.

5 Encoder Control

It allows the operator to adjust the weld parameters within the entire range of the power source, also used to set each parameter value. This control sets the selected weld parameter, rotating it clockwise increases the parameter value and counterclockwise to decrease. A selected weld parameter can be adjusted at any time even while welding. Refer to 4.07 Special Function for more info.

6 Save/Load Buttons

By using the Save & Load buttons the operator can easily save up to 10 welding parameter programs (including welding process, current/ voltage and other parameters such as arc force, inductance and hot start).

To Save a program

- Press and HOLD the SAVE button for 2 seconds.
- Select a job number by rotating the Encoder Control, with job number displayed on the lower meter.
- After selecting the desired job number (i.e. 1 to 10), press Parameter Selection Button (Item 3) to save the job.

To Load a program

- Press and HOLD the LOAD button for 2 seconds.
- Select a job number by rotating the Encoder Control, with job number displayed on the meter.
- After selecting the desired job number(i.e. 1 to 10), press Parameter Selection Button (Item 3) to load the job.

7 Process Selection Button



The process selection control is used to select the desired welding mode. There are seven modes available for the 401MST. In modes where there is more than one symbol, the symbol on the right will be enabled when the light is illuminated. By pressing and holding the process selection button, the light will blink indicating the secondary function, symbol to the left, is enabled. Pressing the button a second time will return to the primary function.

The MIG function has two modes: MIG (GMAW/FCAW)-The Process light is illuminated; CO₂ (GMAW/FCAW)- The Process light is blinking.

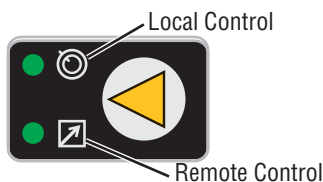
Lift TIG (GTAW)- The Process light is illuminated.

The Stick function has two modes: Stick (SMAW)- The Process light is illuminated; Arc Gouging (CAC-A)- The Process light is blinking.

The 6010 Stick function has two modes: 6010 Vertical Up - The process light is illuminated; 6010 Vertical Down - The process light is blinking.

The standard mode will be MIG with argon or argon mixes. The LED for MIG will be on. The other mode will be dedicated for straight CO₂ gas operation. The same LED will be on, but will blink instead.

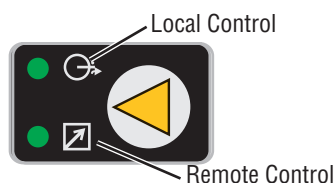
8 Remote Control



The remote control A/V is for both Current or Voltage depending on the process selected. This control toggles between Local and Remote. Refer to 4.07 Special Function for more info.

ARCMaster 401MST POWER SOURCE

9 Contactor Control



Contactor Control either enables the weld output or assigns this function to a remote device. Refer to 4.07 Special Function for more info.

10 Positive Welding Terminal

Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

11 Negative Welding Terminal

Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.

12 Intelligent Fan Control

The intelligent cooling system is designed to reduce dust and foreign material build-up, while providing optimum cooling. Fan speed reduces approximately 30 seconds after machine is turned on and increases when internal components reaches operating temperature.

13 14 Pin Remote Control Socket

The 14 pin Remote Control Socket is used to connect Remote Control devices or wire feeders that use a 14 pin connection to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

Pin	Function	Description
A	24VAC	
B	24VAC Contactor	Connect A&B -> contactor enable
C	+10VDC Remote Ctrl (Max)	10 VDC for remote potentiometer supply
D	Remote Ctrl return/common (Min)	Common
E	Remote Demand/Wiper	Remote control demand signal. Voltage: $0 \leq V_{in} \leq 10V$
F	Amperage output signal	Output current signal. $1V_{out}/100A_{out}$
G	24/115VAC Common	24/115VAC common and chassis ground
H	Output voltage signal	Voltage feedback. $1V_{out}/10V_{arc}$
I	115VAC	
J	115VAC Contactor Enable	Connect I&J --> contactor enable
K	Chassis ground	
M	Arc established	Relay contact between M & N will close while welding is active
N	Arc established	

Table 4-1 14 Pin Interconnection Control Plug Configuration, 401MST

14 19 Pin Remote Control Socket

The 19 pin Remote Control Socket is used to connect Remote Control devices or wire feeders that use a 19 pin connection to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

Pin	Function	Description
A	+16VDC contactor	16 VDC supply voltage for contactor. Connect A & B for contactor enable
B	Contactor in	Contactor input. Connect A & B for contactor enable
C	Volt Meter	Voltage feedback. 1Vout/10Varc
D	24VAC	
E	115VAC	
F	24/115VAC neutral	VAC neutral
G	Ground	
H	+10VDC remote ctrl	10 VDC for remote potentiometer supply
J	Remote Input	0<=Vin<=10V
K	Remote ctrl ground/common	Also control circuit common
L	Control PCB5 ground / common	
M	12VDC arc established	+12 VDC while welding active, otherwise off
N	Ground / common	
P	24VAC	
R	N VAC	24/115VAC neutral and chassis ground
S	CAN_high	CAN bus; positive signal
T	CAN_low	CAN bus; negative signal
U	Amp Meter	Current feedback. 1Vout/100Aout
V	+24VDC	+ 24VDC CAN supply

Table 4-2 19 Pin Interconnection Control Plug Configuration, 401MST

15 ON/OFF Switch

This switch connects the Primary supply voltage to the inverter when in the ON position. This enables the Power Supply.

**WARNING**

When the welder is connected to the Primary supply voltage, the internal electrical components may be at 500V potential with respect to earth.

16 Input Cable

The input cable connects the Primary supply voltage to the equipment.

17.2.5A Circuit Breaker

2.5A Circuit Breaker is for the 115 VAC auxiliary power connected to 14 pin or 19 pin remote control socket.

18.10A Circuit Breaker

10A Circuit Breaker is for the 24 VAC auxiliary power connected to 14 pin or 19 pin remote control socket.

ARCMaster 401MST POWER SOURCE

4.02 Welding Parameters

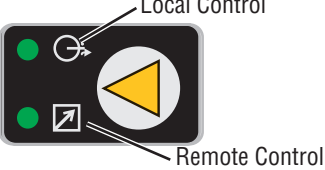
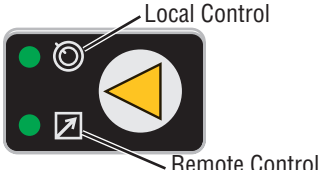
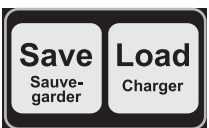
Parameter	Description
 Arc Force	This parameter provides an adjustable short circuit current in STICK welding to improve electrode sticking and arc stability.
 Hot Start	This parameter operates in STICK weld mode and is used to improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. This parameter also works in TIG mode allowing a softer or harder arc start. It sets the peak start current on top of the (WELD) current.
	Weld Current (Amperage) - when lit Encoder Control sets the STICK and TIG WELD current.
	Weld Voltage (Volt) – when lit Encoder Control sets the MIG voltage.
 Contactor Control	Contactor operates in MIG, TIG , and Stick modes. When the local Control LED is illuminated the output is enabled, and when the Remote Control is illuminated the output is enabled by a remote control.
 Remote Control	Selects either local or remote amperage or voltage control depending on the selected process. Local Control allows the voltage or current to be adjusted on the front panel, while Remote Control is used if you have a remote control connected to the welder.
 Inductance	This parameter, similar to the Arc Force in Stick mode. In MIG mode, inductance allows for the adjustment of the dynamic property of the arc. As the inductance is increased the output voltage may need to be adjusted to achieve the desired weld characteristics.
	The SAVE/LOAD buttons are used to save and retrieve a total number of 10 jobs into the 401MST memory.

Table 4-3 Welding Parameters Description

Weld Process Selection

Weld Parameter	Weld Mode				Description
	STICK/ GOUGING	6010 VERTICAL UP/ 6010 VERTICAL DOWN	MIG	LIFT TIG	
<i>WELD (V)</i>	×	×	√	×	Weld voltage MIG Mode.
<i>INDUCTANCE</i>	×	×	√	×	Inductance control in MIG Mode.
<i>HOT START</i>	√	√	×	√	Start current in amps is added or subtracted. In STICK mode the Hot Start is 100% to 200%, factory default 125%; while in TIG mode the range is 50% to 200%, factory default 50%.
<i>WELD (A)</i>	√	√	×	√	WELD (A) current for STICK or LIFT TIG.
<i>ARC FORCE</i>	√	√	×	×	Adjusts percentage increase in welding current and is proportional to arc length (arc voltage).

Table 4-4 Weld Process Selection versus Weld Mode

Weld Parameter Descriptions

WELD (V)

This parameter operates the MIG weld arc voltage in MIG mode.

INDUCTANCE

This parameter operates the INDUCTANCE when MIG welding. It controls the dynamic properties of the arc in dip transfer welding mode. When this parameter is set to 0%, i.e. minimum inductance, the arc has a fast response with a resulting crisp arc noise and coarse spatter. When this parameter is set to 200%, i.e. maximum inductance, the arc has a slow response with a resulting soft arc and fine spatter.

NOTE

As the INDUCTANCE is increased, the WELD (V) may need to be adjusted to achieve the desired weld characteristic.

HOT START

This parameter operates in Stick and TIG modes. Hot start can subtract 50% of the weld current during arc starts some times desirable in TIG welding, or add up to 200% of weld current during arc starts, helping with low hydrogen electrode ignition.

WELD (A)

This parameter operates the Stick, Gouging, and TIG weld current.

ARC FORCE CONTROL

This parameter operates in STICK mode only and is used to adjust percentage increase in welding current and is proportional to arc length (arc voltage). This control provides an adjustable amount of arc control (or dig). This feature can be particularly beneficial in providing the operator with the ability to compensate for variability in joint fit up in certain situations with particular electrodes, e.g. cellulose and hydrogen controlled electrodes. In all welding processes, the amount of penetration obtained is dependent on the welding current; i.e. the greater the penetration, the greater the current.

Arc Force Position	Effect on Welding Performance
Minimum (0)	Soft arc, Low spatter, Low penetration
Medium (100%)	Normal arc, Improved fusion characteristics, Normal penetration
Maximum (200%)	Hard arc, Deep penetration

Table 4-5 Weld Parameter Descriptions

In general, having the Arc Force set at 200% (maximum) allows greater penetration to be achieved. With the ARC set at 0% (minimum) the Power Source has a constant current characteristic. In other words, varying the arc length does not significantly affect the welding current. When the Arc Force is set to 100%, it is possible to control the welding current by varying the arc length. This is very useful for controlling penetration and side wall wash on vertical up fillet welds.

i) Root runs

During root runs the weld pool forms a “keyhole” shape. If too much weld current is used, the hole blows out and the weld collapses. If too little weld current is used, the hole closes up and penetration is lost. The size of the hole also determines the arc length; i.e. as the hole gets bigger, the arc gets longer.

If arc force is used, the increase in the arc length causes the weld current to decrease until the hole starts to close up but if the hole closes up too much then the arc length decreases which causes the weld current to increase. Too little or too much arc force makes this process unstable. The operator must adjust the arc force until a happy medium is reached.

ii) Vertical up welding

When welding vertical up with arc force on, the operator can control the amount of current by changing arc length, i.e. voltage. Weld metal is deposited by “digging” the electrode into the side of the base metal joint and then increasing the arc length with a flicking motion, to allow the weld pool to freeze, before digging the electrode into the other side of the base metal joint.

Without arc force, increasing the arc length does not decrease the weld current sufficiently and the operator has to manually decrease the current via a Remote Control to freeze the weld pool. This welding current reduction also reduces the penetration.

The arc force allows the weld pool to freeze during the “flick” phase without decreasing the amount of weld current available during the “dig” phase thus maximizing penetration.

Weld Parameter	Parameter Range	Factory Setting	Incremental Unit
<i>WELD (V) MIG</i>	10.0 to 38V	20V	0.1V
<i>INDUCTANCE</i>	0 to 200%	100%	1%
<i>HOT START (TIG)</i>	50 to 200%	50%	1%
<i>HOT START (STICK)</i>	100 to 200%	125%	1%
<i>WELD (A) (1 phase) TIG or STICK</i>	10 to 300A	100A	1A
<i>WELD (A) (3 phase) TIG or STICK</i>	10 to 400A	100A	1A
<i>ARC FORCE</i>	0 to 200%	100%	1%

Table 4-6 Weld Parameter Setting

4.03 Setup for LIFT TIG (GTAW) Welding

For TIG welding a TIG torch with valve is required for this power source.

- A. Remove all packaging materials. Do not block the air vents at the front or rear of the Power Source.
- B. Connect the work lead to the positive welding terminal (+). Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- C. Connect the optional TIG Torch to the negative welding terminal (-). Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.



WARNING

Before connecting the work clamp to the work piece make sure the mains power supply is switched off.

Secure the welding grade shielding gas cylinder in an upright position by chaining it to a suitable stationary support to prevent falling or tipping.

- D. Ensure that the gas cylinder is secured to a building pillar, wall bracket or otherwise securely fixed in an upright position.
- E. Select TIG mode by pressing Process Selection Button until TIG indicator lights up.
- F. Connect the TIG Torch trigger switch / remote control to the 14 pin or 19 pin socket on the Power Source as applicable. It will operate in lift TIG mode with either a remote connected to the 14 or 19 pin connector, or the contactor enabled on the panel. The TIG Torch will operate in LIFT TIG mode.
- G. Fit the Flowmeter/ Regulator to the gas cylinder then connect the gas hose from the TIG Torch to the Flowmeter outlet. The Power Source is not fitted with a shielding gas solenoid to control the gas flow in LIFT TIG mode, therefore the TIG Torch will require a gas valve.

TIG Welding Current	Range	Factory setting
Welding current I1	10 to 300 A (1 phase)	100
	10 to 400 A (3 phase)	

Table 4-7 TIG Welding Current

- H. Arc Ignition. Open the valve 19 on the TIG welding torch. Briefly touch the workpiece with the tip of the electrode at the point to be welded. Lift the electrode a little. The arc burns between the workpiece and the electrode

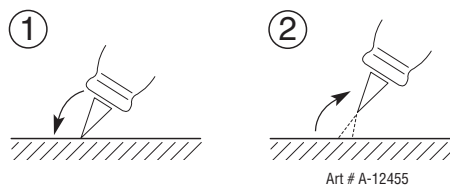


Figure 4-3 Arc Ignition

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Graphic for TIG

I	Current
I ₁	Welding current
I _{st}	Hot start current
I _z	Short circuit
t	Time
t _{st}	Hot start

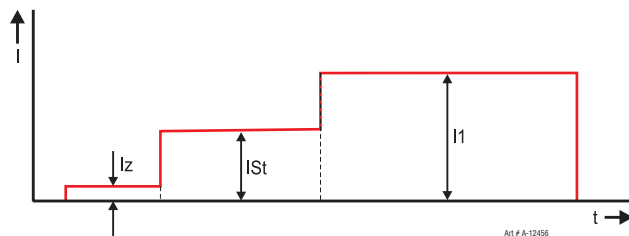


Figure 4-4 TIG Current Routing Diagram

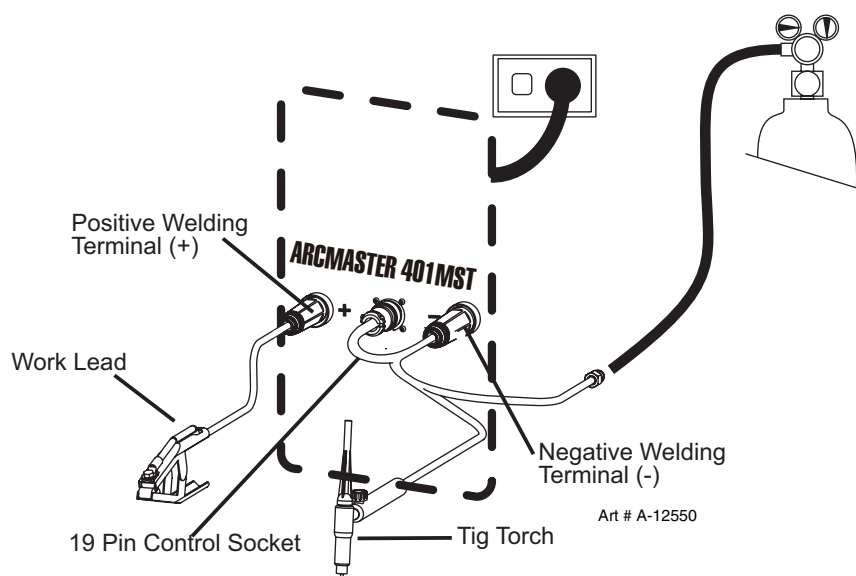


Figure 4-5 Setup for TIG (GTAW) Welding

4.04 Setup for STICK (SMAW) Welding

- A. Remove all packaging materials. Do not block the air vents at the front or rear of the Power Source.
- B. Connect the Electrode Holder to the positive welding terminal (+) (or negative welding terminal (-)). If in doubt, consult the electrode manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- C. Connect the work lead to the negative welding terminal (-) (or positive welding terminal (+)). If in doubt, consult the electrode manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



WARNING

The polarity of the electrode depends on the type of electrode and the welding process. Please follow the manufacturer's instructions on the electrode packaging for this purpose.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.



WARNING

Before connecting the work clamp to the workpiece make sure the mains power supply is switched off.

- D. Select STICK mode by pressing Process Selection Button until the STICK/Gouging and 6010 Process LEDs are lit (Please refer to Page 4-3 for detailed info).

STICK Welding Current	Range	Factory setting
Welding current I1	10 to 300 A (1 phase)	100
	10 to 400 A (3 phase)	

Table 4-8 STICK Welding Current

- E. Arc ignition. Briefly touch the workpiece at the point to be welded using the electrode and lift the electrode a little. The arc burns between the workpiece and the electrode.

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Graphic for SMAW (STICK)

- I Current
- I1 Welding current
- ISt Hot start current
- t Time
- tSt Hot start time

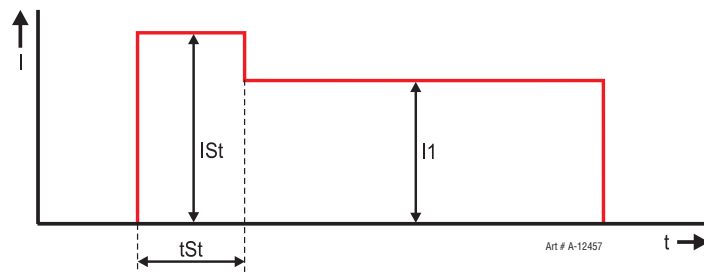


Figure 4-6 STICK Current Routing Diagram

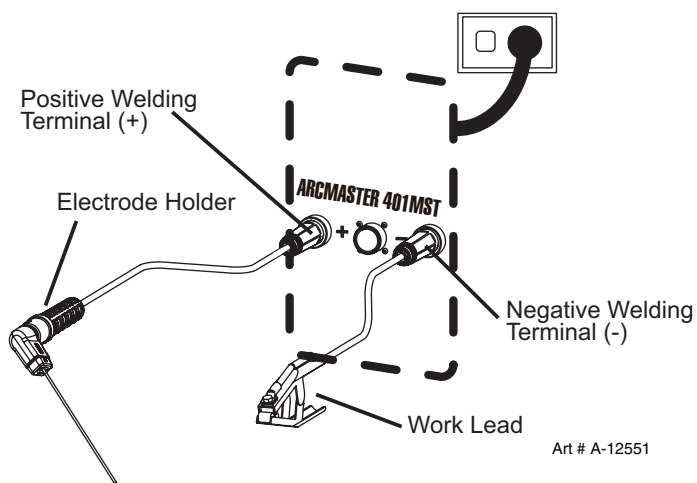


Figure 4-7 Setup for STICK (SMAW) Welding

4.05 Setup for MIG (GMAW) Welding with Gas Shielded MIG Wire

A wire feeder (optional) is required for MIG welding.

NOTE

NOTE 1: The operations required may differ depending on the version and the configuration of the wirefeeder!

NOTE 2: Please read the wirefeeder operating manual!

Power Source Connections

- A. Remove all packaging materials. Do not block the air vents at the front or rear of the Power Source.
- B. Connect the work lead to the negative welding terminal (-) [positive welding terminal(+) for flux cored electrode wire]. If in doubt, consult the electrode wire manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.



WARNING

Before connecting the work clamp to the work piece make sure the mains power supply is switched off.

Secure the welding grade shielding gas cylinder in an upright position by chaining it to a suitable stationary support to prevent falling or tipping.

- C. Ensure that the gas cylinder is secured to a building pillar, wall bracket or otherwise securely fixed in an upright position.
- D. Select MIG mode by pressing Process Selection Button until MIG/ CO₂ symbol lights up (Please refer to Page 4-3 for detailed info).

Wirefeeder Connections

- A. Connect the welding power cable to the positive welding terminal (+) [negative welding terminal (-) for flux cored wire]. If in doubt, consult the electrode wire manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- B. Connect the control cable from the Wirefeeder to the 14 PIN or 19 PIN socket on the Power Source as applicable. Select appropriate connector by pressing the button on front panel.

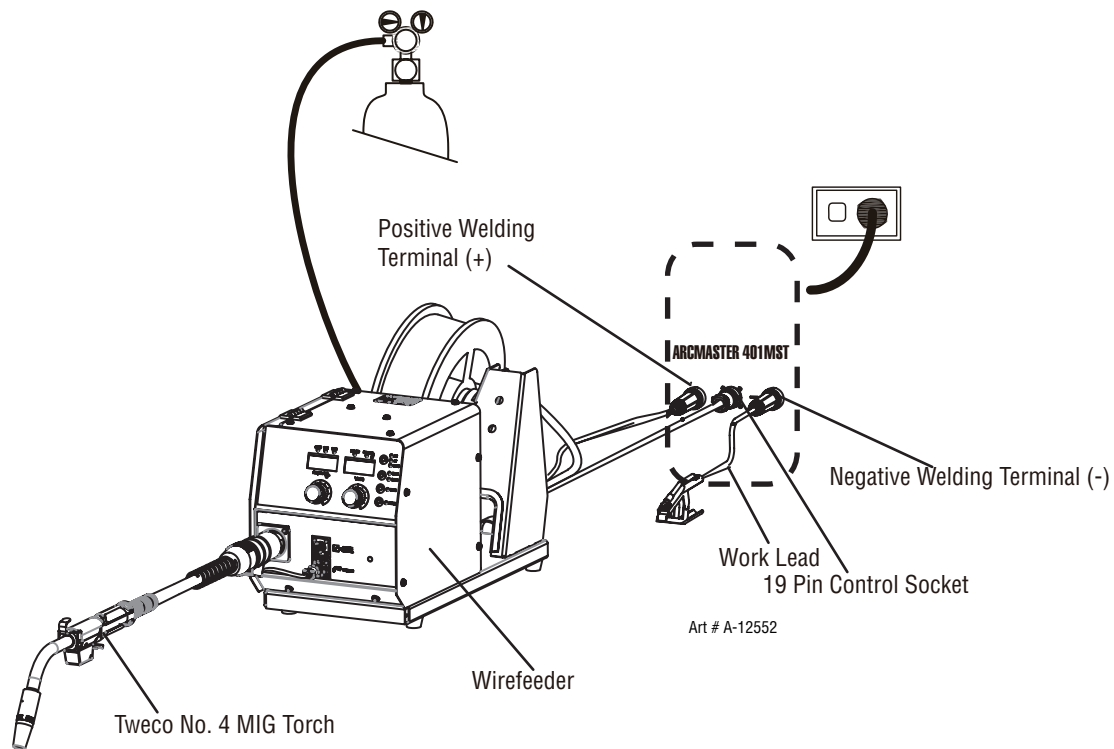


Figure 4-8 Setup for MIG (GMAW) Welding with Gas Shielded MIG Wire

4.06 Setup for FCAW Flux Core Arc Welding

A wire feeder (optional) is required for MIG welding.

NOTE

NOTE 1: The operations required may differ depending on the version and the configuration of the wirefeeder!

NOTE 2: Please read the wire feed operating manual!

Power Source Connections

- A. Remove all packaging materials. Do not block the air vents at the front or rear of the Power Source.
- B. Connect the work lead to the positive welding terminal (+). If in doubt, consult the electrode wire manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.



CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the terminal.



WARNING

Before connecting the work clamp to the work piece make sure the mains power supply is switched off.

- C. Select MIG mode by pressing Process Selection Button until MIG/ CO₂ symbol lights up (Please refer to Page 4-3 for detailed info).

WIREFEEDER CONNECTIONS

- A. Connect the welding power cable to the negative welding terminal (-). If in doubt, consult the electrode wire manufacturer. Welding current flows from the Power Source via dinse type connectors. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
- B. Connect the control cable from the Wirefeeder to the 14 PIN or 19 PIN socket on the Power Source as applicable.

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WARNING

Before connecting the work clamp to the work piece make sure the mains power supply is switched off.

NOTE

Welding Setup Program Storage (10 programs) applies to MIG, Stick and Lift Tig modes.

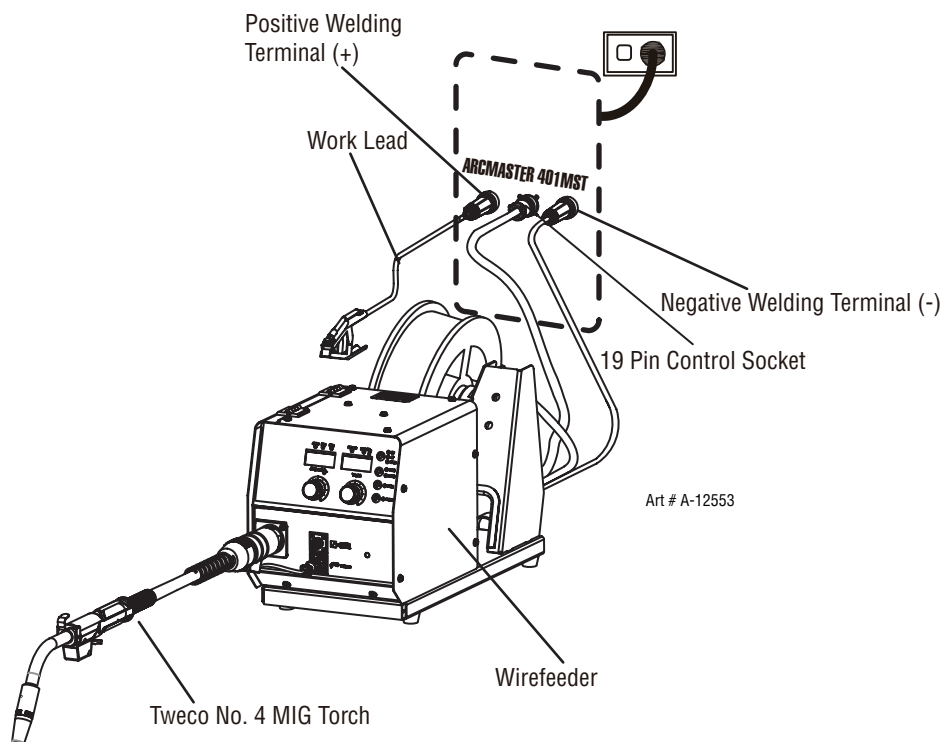


Figure 4-9 Setup for FCAW Flux Core Arc Welding

4.07 Special Function

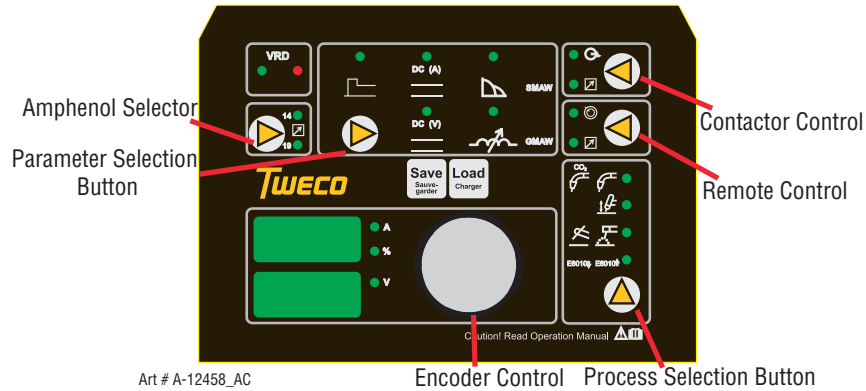


Figure 4-10

MIG CO₂, Gouging and 6010 Vertical Down

There are three special functions that can be accessed by pressing the selection button for 2 seconds: MIG CO₂, Gouging and 6010 Vertical Down.

MIG CO₂ - In MIG mode hold the Process Selection Button for 2 seconds and the LED will blink indicating MIG CO₂ mode is enabled.

6010 Down - In 6010 mode hold the process Selection Button for 2 seconds and the LED will blink indicating 6010 Vertical Down mode is enabled.

Lock/ Unlock User Interface (UI)

UI Lock Function can be enabled or disabled by pressing Encoder Control for 5 seconds.

NOTE

The function lock setting is saved! If the machine is switched off with the function lock activated, the control panel is still locked when the machine is switched back on.

LED Test

Press Amphenol Selector or Parameter Selection Button for 2 seconds to start LED test. The test will last for about 5 seconds. During the test all LEDs are lit.

Enable Calibration in MIG Mode

In MIG mode, the adjustment to output voltage can be enabled or disabled as below:

1. Press Contactor Control and Process Selection Button at the same time for 2 seconds.
2. Rotate Encoder Control to select CAL ON/OFF.
 - 2a. Adjust the output voltage with the potentiometer on Control PCB 5 by +/- 5% (refer to Figure 4-2).
3. Press Encoder Button Encoder Control to save the setting.

Display Software Version

Press Remote Control and Contactor Control buttons at the same time for 2 seconds and it will display the software version of User Interface (UI), master and process.

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Master Reset



WARNING

All personal settings will be lost!

The 401MST can have master reset. All the jobs saved will be deleted and all parameters will be set back to factory setting. This function is accessed by pressing Parameter Selection Button and Remote Control Button at the same time for 2 seconds.

4.08 Shielding Gas Flowmeter/ Regulator Operating Instructions



WARNING

This equipment is designed for use with welding grade (Inert) shielding gases only.

Shielding Gas Flowmeter/ Regulator Safety

Designed to reduce and control high pressure gas from a cylinder or pipeline to the working pressure required for the equipment using it.

If the equipment is improperly used, hazardous conditions are created that may cause accidents. It is the users responsibility to prevent such conditions. Before handling or using the equipment, understand and comply at all times with the safe practices prescribed in this instruction.

SPECIFIC PROCEDURES for the use of flowmeter/ regulators are listed below.

1. NEVER subject the flowmeter/ regulator to inlet pressure greater than its rated inlet pressure.
2. NEVER pressurize a flowmeter/ regulator that has loose or damaged parts or is in a questionable condition. NEVER loosen a connection or attempt to remove any part of a flowmeter/ regulator until the gas pressure has been relieved. Under pressure, gas can dangerously propel a loose part.
3. DO NOT remove the flowmeter/ regulator from a cylinder without first closing the cylinder valve and releasing gas in the flowmeter/ regulator high and low pressure chambers.
4. DO NOT use the flowmeter/ regulator as a control valve. When downstream equipment is not in use for extended periods of time, shut off the gas at the cylinder valve and release the gas from the equipment.
5. OPEN the cylinder valve SLOWLY. Close after use.

User Responsibilities

This equipment will perform safely and reliable only when installed, operated and maintained, and repaired in accordance with the instructions provided. Equipment must be checked periodically and repaired, replaced, or reset as necessary for continued safe and reliable performance. Defective equipment should not be used. Parts that are broken, missing, obviously worn, distorted, or contaminated should be replaced immediately.

The user of this equipment will generally have the sole responsibility for any malfunction, which results from improper use, faulty maintenance, or by repair by anyone other than an accredited repairer.



CAUTION

Match flowmeter/ regulator to cylinder. NEVER CONNECT a flowmeter/ regulator designed for a particular gas or gases to a cylinder containing any other gas.

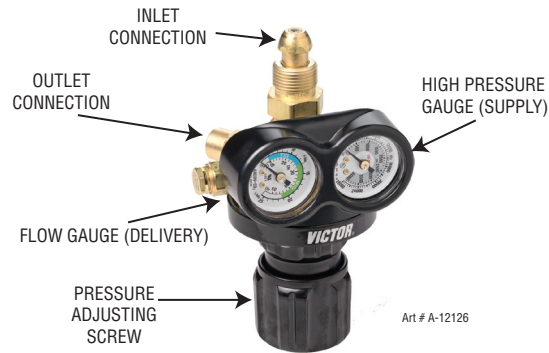


Figure 4-11 Adjusting Flow Rate

NOTE

The flowmeter/ regulator used with argon based and carbon dioxide shielding gases are different. The flowmeter/ regulator supplied is for argon based shielding gases. If carbon dioxide is to be used a suitable carbon dioxide flowmeter/ regulator will need to be fitted.

NOTE

All valves downstream of the flowmeter/ regulator must be opened to obtain a true flow rate reading on the outlet gauge. (Welding power source must be triggered) Close the valves after the pressure has been set.

Installation

1. Remove cylinder valve plastic dust seal. Clean the cylinder valve outlet of impurities that may clog orifices and damage seats before connecting the flowmeter/ regulator.
Crack the valve (open then close) momentarily, pointing the outlet away from people and sources of ignition. Wipe with a clean lint free cloth.
2. Match flowmeter/ regulator to cylinder. Before connecting, check that the flowmeter/ regulator label and cylinder marking agree and that the flowmeter/ regulator inlet and cylinder outlet match. NEVER CONNECT a flowmeter/ regulator designed for a particular gas or gases to a cylinder containing any other gas.
3. Connect the flowmeter/ regulator inlet connection to cylinder or pipeline and tighten it firmly but not excessively, with a suitable spanner.
4. Connect and tighten the outlet hose firmly and attach down-stream equipment.
5. To protect sensitive down-stream equipment a separate safety device may be necessary if the flowmeter/ regulator is not fitted with a pressure relief device.

Operation

With the flowmeter/ regulator connected to cylinder or pipeline, and the adjustment screw/knob fully disengaged, pressurize as follows:

1. Stand to one side of flowmeter/ regulator and slowly open the cylinder valve. If opened quickly, a sudden pressure surge may damage internal flowmeter/ regulator parts.
2. With valves on downstream equipment closed, adjust flowmeter/ regulator to approximate working pressure. It is recommended that testing for leaks at the flowmeter/ regulator connection points be carried out using a suitable leak detection solution or soapy water.
3. Purge air or other unwanted welding grade shielding gas from equipment connected to the flowmeter/ regulator by individually opening then closing the equipment control valves. Complete purging may take up to ten seconds or more, depending upon the length and size of the hose being purged.

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Adjusting Flow Rate



Figure 4-12 Adjust Flow Rate

With the flowmeter/ regulator ready for operation, adjust working flow rate as follows:

1. Slowly turn adjusting screw/knob in (clockwise) direction until the outlet gauge indicates the required flow rate.

NOTE

It may be necessary to re-check the shielding gas flowmeter/ regulator flow rate following the first weld sequence due to back pressure present within shielding gas hose assembly.

2. To reduce flow rate, allow the welding grade shielding gas to discharge from flowmeter/ regulator by opening the downstream valve. Bleed welding grade shielding gas into a well ventilated area and away from any ignition source. Turn adjusting screw counter clockwise, until the required flow rate is indicated on the gauge. Close downstream valve.

Shutdown

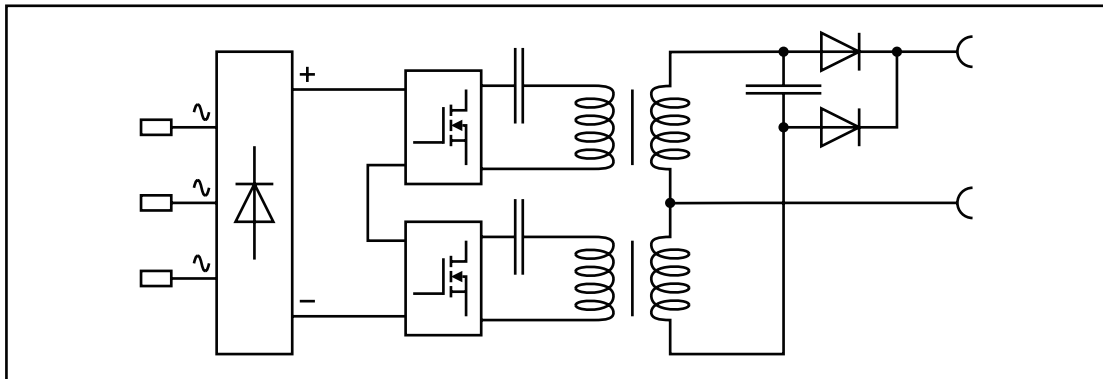
Close cylinder valve whenever the flowmeter/ regulator is not in use. To shut down for extended periods (more than 30 minutes).

1. Close cylinder or upstream valve tightly.
2. Open downstream equipment valves to drain the lines. Bleed gas into a well ventilated area and away from any ignition source.
3. After gas is drained completely, disengage adjusting screw and close downstream equipment valves.
4. Before transporting cylinders that are not secured on a cart designed for such purposes, remove Flowmeter/ Regulators.

SECTION 5: THEORY OF OPERATION

5.01 Inverter Design

A welding inverter is an electronically controlled welding power source. At conventional transformer based machines, the mains voltage with 50/60 Hz is directly switched to the welding transformer. At a welding inverter the mains voltage is rectified first and with electronic power switches (MOSFETs or IGBTs) chopped into a much higher frequency, to drive the transformer. At conventional inverters this is a fixed frequency (e.g. 80kHz) at Resonant machines the frequency is variable (up to 200kHz), because the frequency is also used for controlling the welding process. Driving the transformer, the primary side is a series resonant circuit (primary transformer coil in series with a capacitor) and the secondary side is a parallel resonant circuit, so that the control has an additional influence on the output voltage by shifting the frequency. With this principle an almost ideal output characteristic can be realized.



Art # A-12644

Notes

[illegible]

SECTION 6: TROUBLESHOOTING

6.01 Power Source Status Messages

An error code is displayed in the digital displays in the event of a malfunction. You can switch over between error code and sub-error (sub code) in the digital displays by pressing Process Selection Button.

After the message has been displayed, the machine will only function to a limited extent; the error must be corrected as quickly as possible.

The status message can be deleted by pressing Encoder Control.

Code	Note	Cause	Possible Remedy
H08-00	Short circuit at output	A short circuit at the output sockets was measured during the test of the pole switch.	Electrode has contact to workpiece during switching on the machine. This warning message prevents an unintentional ignition of an arc.
H30-01	Configuration operating hour counter	No data of the operating hour counter could be found/read.	The operating hour counter is reset to "0".
H30-02	Configuration calibration values	No valid calibration values could be found/read.	Standard values are being used instead, that may cause a difference between the displayed current value and the real current value.
H30-03	Configuration maximum current	No valid default value for the maximum current could be found/read.	A standard value is used instead, that may be less than the maximum possible current of the machine.
H30-04	Configuration duty cycle values	No valid duty cycle values could be found/read.	Standard values are being used instead, that may be lower than the true duty cycle of the machine.

Table 6-1: Power Source Status Messages

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6.02 Error Messages



WARNING

There are extremely dangerous voltage and power levels present inside this Inverter Power Source. Do not attempt to open or repair unless you are an accredited Tweco Service Provider. Disconnect the Welding Power Source from the Mains Supply Voltage before disassembling.

An error code is displayed in the digital displays in the event of a malfunction. You can switch over between error code and sub-error (sub code) in the digital displays by pressing any button. As long as there is an error code on display welding is not possible.

Code	Error	Cause	Possible Remedy
E01-01	Overtemperature diodes	The maximum temperature limit was exceeded.	Let the machine cool down in standby. Refer to Temperature Monitoring Section on Pg 6-7.
E01-02	Overtemperature primary modules		
E01-04	Overtemperature middle heat sink temp		
E02-02	Bus overvoltage startup	The DRV04 measured a too high bus voltage (>700V DC).	--Check mains and bus voltage. --Check wiring between DRV04 (X6) and MAPRO (X7). --Check flat ribbon cable between DRV04 and MAPRO. Refer to Monitoring Bus Voltage on Pg 6-8.
E02-03	Bus overvoltage DSP	The DSP of the MAPRO measured a too high bus voltage.	
E02-04	Bus overvoltage primary	The DSP of the DRV04 measured a too high bus voltage during operation.	
E02-05	Bus overvoltage FPGA	The FPGA of the MAPRO measured a too high bus voltage at the primary modules.	
E06-00	Overvoltage Secondary	The DSP of the MAPRO measured a too high output voltage (>100V DC).	--Check wiring between power unit and DC01 (X2). --Check wiring between DC01 (X2) and MAPRO (X5). --Check flat ribbon cable between MAPRO and DRV04. Refer to Monitoring Output Voltage on Pg 6-10.
E06-01	Overvoltage secondary FPGA	The FPGA of the MAPRO measured a too high output voltage (>100V DC).	
E07-01	EEPROM initialisation error	Fault during reading of the error memory, accessing the EEPROM memory is not possible (hardware failure).	Switch machine off and on again. At a permanent fault, the MAPRO needs to be exchanged.
E09-00	Voltage measuring	No output voltage could be measured at the output diodes at startup.	--Check wiring between power unit and DC01 (X2). --Check wiring between DC01 (X2) and MAPRO (X5). --Check output sockets for short circuit. Refer to Monitoring Output Voltage on Pg 6-10.

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Code	Error	Cause	Possible Remedy
E12-00	Power unit startup	During the test of the power unit (switching on the machine) no output voltage could be measured. >> Not in CC/CV mode, because a connected MIG feeder could weight the measuring	--Check wiring between power unit and DC01 (X2). --Check wiring between DC01 (X2) and MAPRO (X5). --Check flat ribbon cable between MAPRO and DRV04. Refer to Monitoring Output Voltage on Pg 6-10.
E13-01	Temperature sensor diodes	After a certain time of welding no rise of the temperature was measured, the minimum temperature of -29°C is measured constantly. Faulty sensors or not connected/no connection.	--Check wiring between DRV04 (X6) and MAPRO (X7). --Check flat ribbon cable between MAPRO and DRV04. --Check temperature sensor at X7 of the DRV04. Refer to Temperature Monitoring on Pg 6-7.
E13-02	Temperature sensor primary modules		
E14-00	Supply undervoltage	The 16V supply voltage of the MAPRO is below 12V.	--Check mains and bus voltage. --Check wiring between DRV04 (X6) and MAPRO (X7). --Check fans Refer to Supply Voltages on Pg 6-11.
E15-00	Current offset DSP	The current offset of the shunt resistor is too high.	--Check wiring of the shunt to MAPRO (X5). Refer to Monitoring Welding Current on Pg 6-12.
E15-01	Current offset FPGA		
E18-01	Overload	The power unit was overloaded (usage deviating from “nomal” welding characteristic). An E01 is generated additionally if the temperature of the heat sink is >55°C.	Let machine cool down in standby. Refer to Monitoring Output Voltage on Pg 6-10.
E22-03	Undervoltage Startup	During startup the bus voltage didn't reach the minimum limit of 390V DC.	--Check mains and bus voltage. --Check wiring between DRV04 (X6) and MAPRO (X7). Refer to Monitoring Bus Voltage on Pg 6-8.
E25-01	OCV generator	At startup no open circuit voltage could be measured.	--Check wiring between power unit and DC01 (X2). --Check wiring between DC01 (X2) and MAPRO (X5). --Check output sockets for short circuit. Refer to Open Circuit Voltage Generator & VRD on Pg 6-13.

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Code	Error	Cause	Possible Remedy
E30-00	Configuration	At startup the configuration of the machine could not be read correctly.	--Switch machine off and on again.
E30-04	Configuration primary		--Check wiring between DRV04 (X6) and MAPRO (X7). Refer to Machine Configuration on Pg 6-14.
E30-06	Configuration Software	The actual software does not match to the hardware of the machine.	Re-programm machine with correct software version.
E30-07	Configuration VRD	The VRD voltage was re-programmed.	This is only a status message saved in error memory when the programmed VRD voltage is changed.
E30-08	Configuration front panel	A wrong type of front panel is connected. The internal identification of the front panel does not match with the saved configuration.	--Check flat ribbon cable between MAPRO (X2) and front panel. --Connect correct front panel. Refer to Machine Configuration on Pg 6-14.
E31-04	Communication FPGA-DSP	The FPGA does not recognize any activity of the DSP.	Switch machine off and on again, at a permanent error the MAPRO needs to be exchanged.
E31-05	Communication primary DSP	Fault in the communication between primary DSP (DRV04) and the DSP of the MAPRO	--Switch machine off and on again --Check flat ribbon cable between DRV04 and MAPRO.
E31-06	Communication primary DSP Startup	There is no signal from the primary DSP (DRV04) to the DSP of the MAPRO during startup.	
E32-01	Overcurrent FPGA	A primary input current >80A was measured.	--Check secondary diodes --Check primary modules --Check wiring between DRV04 (X6) and MAPRO (X7). --Check flat ribbon cable between MAPRO and DRV04. Refer to Monitoring Primary Input Current on Pg 6-16.
E32-02	Timeout	When driving the power unit, no zerocrossing of the current was detected after a certain time.	Check wiring between DRV04 (X6) and MAPRO (X7).

Code	Error	Cause	Possible Remedy
E32-04	Overcurrent IPMax	A primary input current >60A was measured.	--Check secondary diodes --Check primary modules --Check wiring between DRV04 (X6) and MAPRO (X7). --Check flat ribbon cable between MAPRO and DRV04. Refer to Monitoring Primary Input Current on Pg 6-16.
E33-01	Unsymmetric bus voltage	The difference between the bus voltages of power module 1 and 2 is >60V.	--Check power modules --Check flat ribbon cable between MAPRO and DRV04.
E33-02	Unsymmetric bus voltage Startup	The difference between the bus voltages of power module 1 and 2 is >60V at startup.	Refer to Monitoring Bus Voltage on Pg 6-8.
E34-00	Current fan too high	The driver current is above the maximum limit (>2.5A) for longer than 0.9s.	Check fans Refer to Fan Control on Pg 6-13.
E40-00	Voltage measuring socket	During the test of the power unit, there is no output voltage at the welding socket.	--Check flat ribbon cable between MAPRO and DRV04. --Check wiring between pole switch to DRV04 (X3). Refer to Schematic of PCB DRV04 on Pg. 6-21 and Monitoring Output Voltage on Pg. 6-10.
E41-00	Phase Loss	The primary DSP detected a loss of at least one phase of the mains.	--Check mains supply --Check wiring between NEFI and DRV04 (X5). Refer to Monitoring Mains Input on Pg. 6-14.

Table 6-2: Power Source Faults

6.03 Test Equipment and Tools

- Digital Multimeter
- DC clip-on ammeter
- Screwdriver and spanner
- CRO (20 Mhz bandwidth) & isolating transformer

6.04 Visually Inspect

Visually inspect the inside of the Power Source. The levels of current present in these units can cause burning or arcing of PCB, transformers, switches, or rectifier when a failure occurs. Carefully inspect all components within these units.

Look in particular for the following:

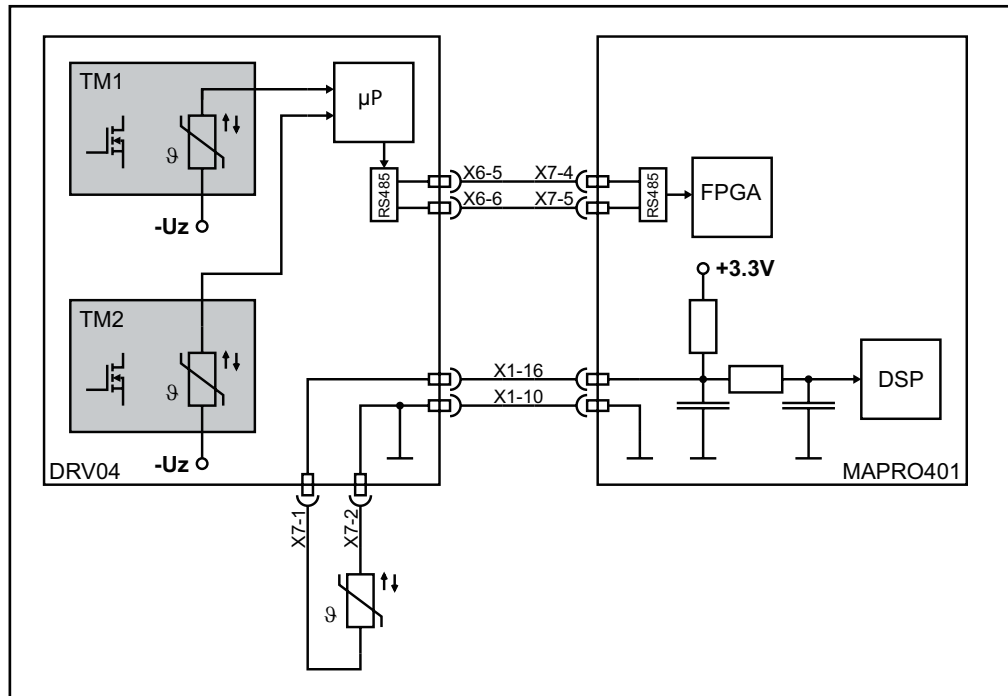
- a) Loose or broken wires or connectors.
- b) Burned or scorched parts or wires or evidence of arcing.
- c) Any accumulation of metal dust or filings that may have caused shorting or arcing.

If any parts are damaged, they must be replaced. Refer to the Spare Parts section for a complete list of components used in the Power Source.

Locate the faulty component(s) then replace where necessary.

6.05 Temperature Monitoring

The ArcMaster has three temperature sensors that are monitored. As soon as one of the sensors is measuring a too high temperature, the machine stops with **E01 Overtemperature**. The sub-code indicates which sensor detected the overtemperature.



Art # A-12645

Sensor	Limit	Code	Monitored by
Secondary diodes	85°C	E01-01	MAPRO
Primary modules TM1 and TM2	90°C	E01-02	DRV
Middle heat sink temperature	Current depending	E01-04	MAPRO

Table 6-3

The middle heat sink temperature is calculated over a longer period of time. The effective limit is current depending, that means if the machine is used with a current setting below the 100% duty cycle, the E01-04 can never come up.

As long as the error message E01 is active, the machine can not be used. The fans keep running to cool down the machine, as soon as the temperature drops below 55°C, the machine is operable again.

If one of the temperature sensors should be faulty or is disconnected from the measuring circuits, the machine stops with **E13 temperature sensor error**.

Sensor	Code	Reason
Secondary diodes	E13-01	After a certain welding time no temperature increase could be detected. The sensor continuously measures the minimum temperature of -29°C.
Primary modules TM1 and TM2	E13-02	

Table 6-4

The temperature sensor at the diodes has a resistance value of about 10kW at 25°C.

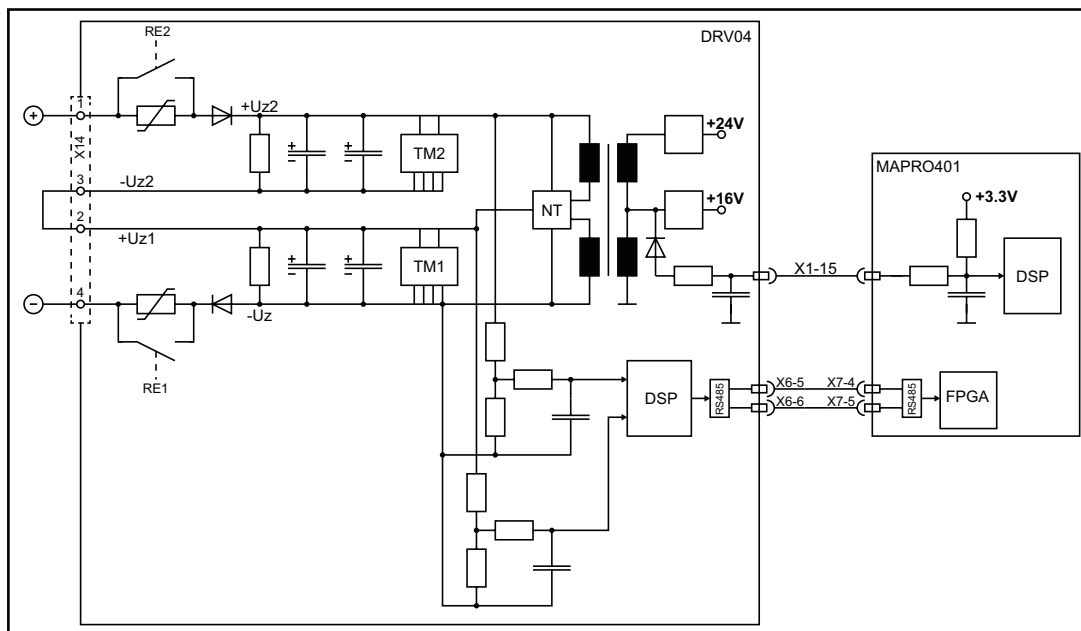
ARCMaster 401MST POWER SOURCE

6.06 Monitoring Bus Voltage

Right from switching on the machine, the bus voltage is monitored directly by the DSP of the DRV04. As soon as the voltage gets too high, the machine stops with E02 Overvoltage. In this case the mains relays (power-up relays) at the DRV04 are switched off, so that the power-up resistors are active again, lowering the input voltage. The actual value of the bus voltage is send from the DSP of the DRV04 to the MAPRO401. The MAPRO401 itself is measuring the bus voltage at the output of the supply unit (internal supply of the MAPRO401) and the voltage at both primary modules (TM1 and TM2).

If the minimum value of 390V DC is not reached during startup (switching on), the machine stops with **E22-03 Undervoltage Startup**.

Schematic



Art # A-12646

In general the values of both bus voltages at the power modules TM1 and TM2 are equal (symmetric). If there should be a difference >60V, the machine stops with **E33-01 Unsymmetric bus voltage**.

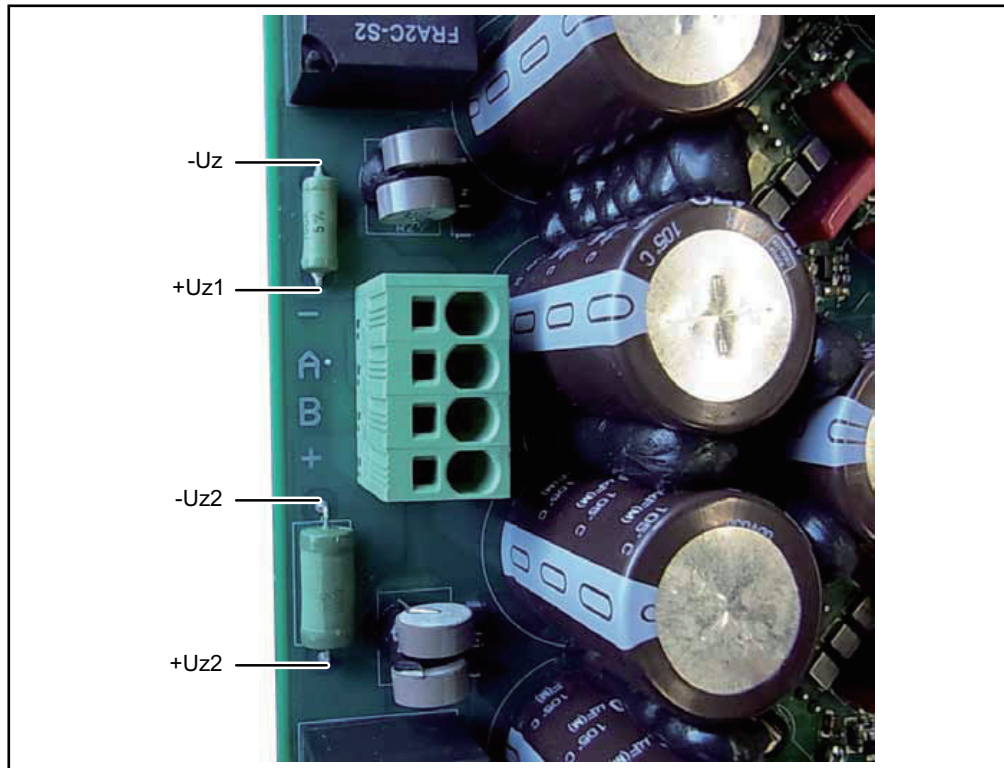
If a difference >60V is detected during startup, the machine stops with **E33-02 Unsymmetric bus voltage Startup**.

As soon as the difference gets below 60V, the error code is reset.

Code	Reason	Trigger
E02-02	During startup the maximum limit of 700V DC was exceeded.	DRV04
E02-03	The DSP of the MAPRO401 measured a too high bus voltage at the supply transformer (secondary).	DSP MAPRO401
E02-04	The maximum limit of 750V DC (or 400V DC at the modules) was exceeded during operation.	DRV04
E02-05	The FPGA measured a too high bus voltage (>400V DC) at the modules.	FPGA MAPRO401
E22-03	During startup the minimum limit of 390V DC was not reached.	DRV04
E33-01	The difference between the bus voltages of module 1 and 2 is greater 60V.	DRV04
E33-02	The difference between the bus voltages of module 1 and 2 is greater 60V at startup.	DRV04

Table 6-5

Measuring points bus voltage



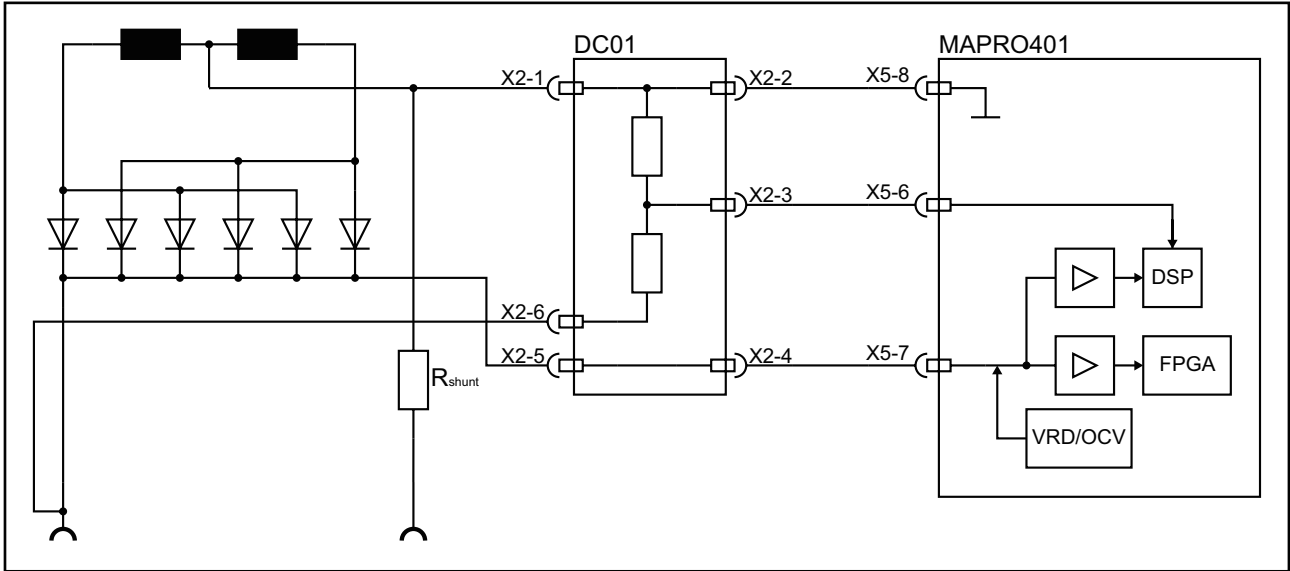
Art # A-12647

6.07 Monitoring Output Voltage

The output-/welding voltage is measured directly by the DSP of the MAPRO401. If a voltage >100V DC is measured for longer than 200ms, the machine stops with **E06-00 Overvoltage secondary**.

In case that the FPGA is measuring the too high voltage, the machine stops with **E06-01 Overvoltage secondary-FPGA**. The output voltage is measured directly at the secondary diodes (via X5-7 of the MAPRO401).

Schematic



If there is no output voltage when the power unit is started (via X5-7), the machine stops with **E09-00 Voltage measuring**.

When switching on the machine the power unit is activated shortly and the output voltage is measured. If there is no output voltage during driving the power unit, the machine stops with **E12-00 Power unit error Startup**. The reason can be a fault in the measuring path or a fault in the primary driver (e.g. interchanged transformer wires at the PCB SF02).

The output voltage is also checked directly at the welding socket during initialisation. If the inverter doesn't create an output voltage, the machine also stops with **E40-00**.

If the machine is used deviating from the "normal" welding characteristic, the machine stops after certain times at too high output voltages with **E18-01 Overload**. If the temperature of the heat sink at that time is too high (>55°C), the machine shows also **E01 Overtemperature** and will only be operable again if the temperature cools down below 55°C.

Limits E18-01 Overload

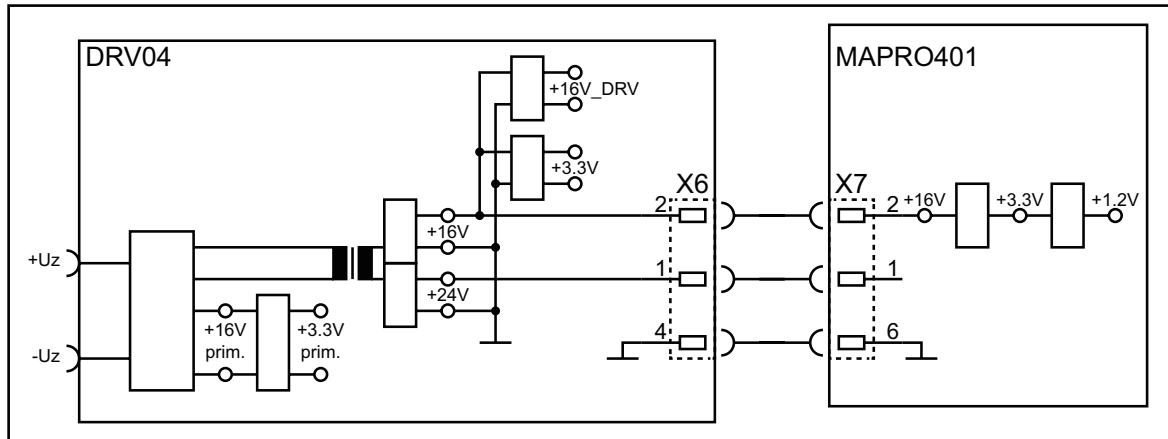
Output Voltage [V]	Time [s]
>40	>30
>46	>15
>60	>5

Table 6-6

6.08 Supply Voltages

The internal supply voltages of the ArcMaster are generated on the primary driver board DRV04.

Schematic



Art # A-12649

As soon as the 16V supply voltage of the MAPRO401 drops below 12V, the machine stops with **E14-00 Supply Undervoltage**.

Possible reasons:

- Fault in supply unit of the PCB DRV04
- Fault or short circuit in the driver (power modules), fans, 3.3V or 1.2V supply voltages.

Measuring points PCB DRV04

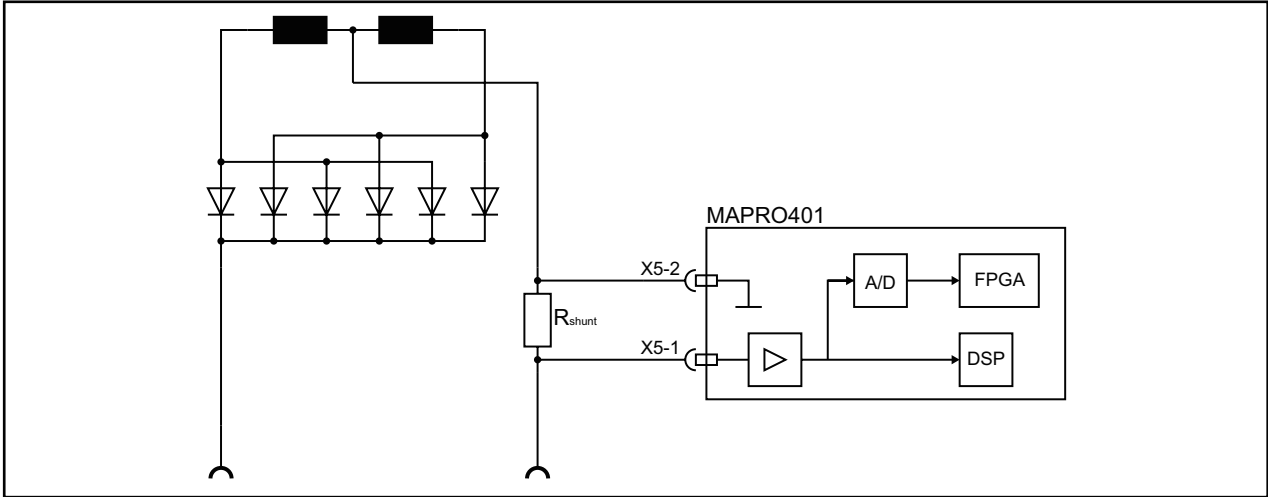
Designation	Measuring Point		Result
Bus voltage	X14-1	+Uz	ca. 580 V DC
	X14-4	-Uz	
Supply voltage +24V	X6-1	+	+24V DC
	X6-4	-	
Supply voltage +16V (primary)	X5-1	+	+16V DC
	X14-4	-	
Supply voltage +16V	X6-2	+	+16V DC
	X6-4	-	
Supply voltage +16V (driver)	X2-1	+	+16V DC
	X6-4	-	

Table 6-7

6.09 Monitoring Welding Current

The DSP is measuring the welding current directly at a shunt resistor. The FPGA is measuring the same current separately via a A/D converter.

Schematic



Art # A-12650

The current offset is measured in regular intervalls from the DSP as well as from the FPGA. If the offset is too high, the machine stops with **E15 Current offset**.

Even if the shunt “gets lost” during the welding process (e.g. loose contact or disconnection of the shunt wires) the active process is stopped with **E15**.

Code	Designation	Reason
E15-00	Current offset too high DSP	--Shunt is missing or not connected to MAPRO401
E15-01	current offset too high FPGA	--Fault in current measuring

Table 6-8

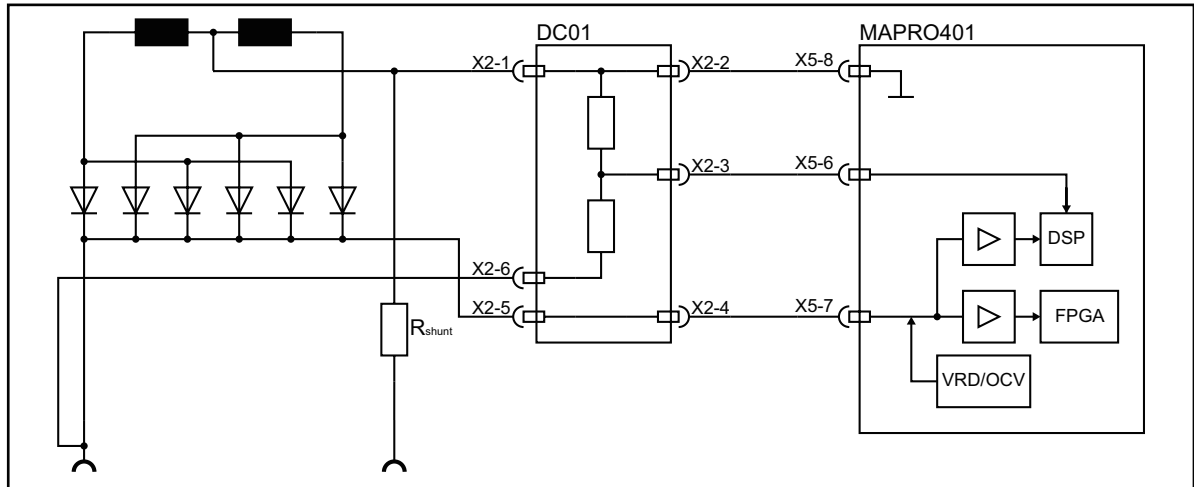
6.10 Open Circuit Voltage Generator & VRD

The machine has a separate “open circuit voltage generator”, that generates the OCV, meaning the OCV is not produced by the power unit of the machine.

At machines with activated VRD (**V**oltage **R**eduction **D**evice), the generator produces the lower VRD voltage.

When switching on the machine, the function of the ocv generator is checked, if no voltage and no current can be measured, the generator must be faulty and the machine stops with **E25-01 OCV generator**.

Schematic



Art # A-12651

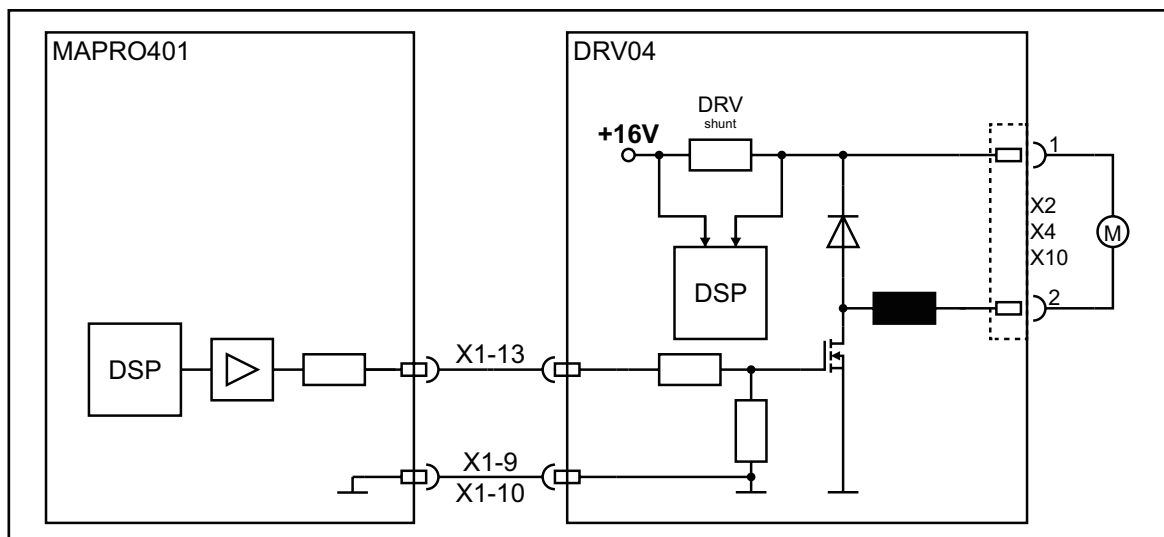
6.11 Fan Control

The current consumption of the fans are monitored by the primary DSP of the DRV04. If the current consumption is too high, the machine stops with **E34-00 Current fan too high**.

Code	Designation	Reason
E34-00	Driver current too high	Driver current >2,5A for longer than 0.9 seconds

Table 6-9

Schematic



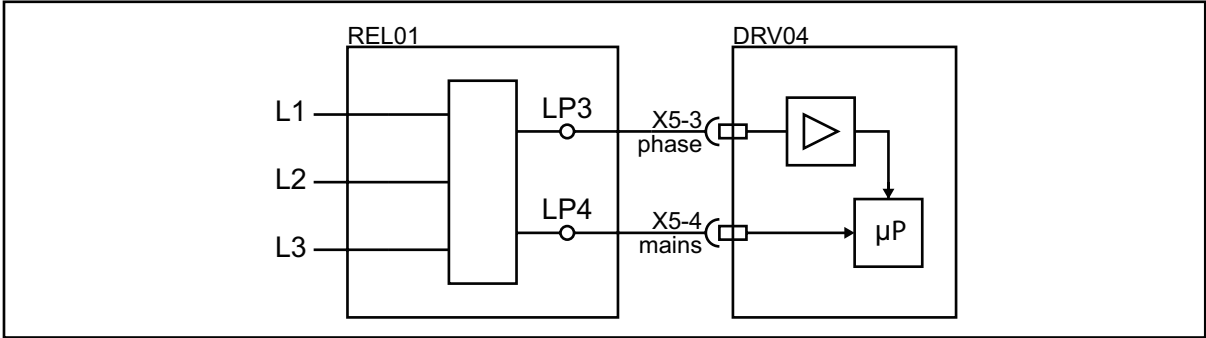
Art # A-12652

ARCMaster 401MST POWER SOURCE

6.12 Monitoring Mains Input

The mains input is monitored directly by the DRV04. If one of the mains phases is missing or gets lost during welding, the machine stops with **E41-00 Phase loss**.

Schematic

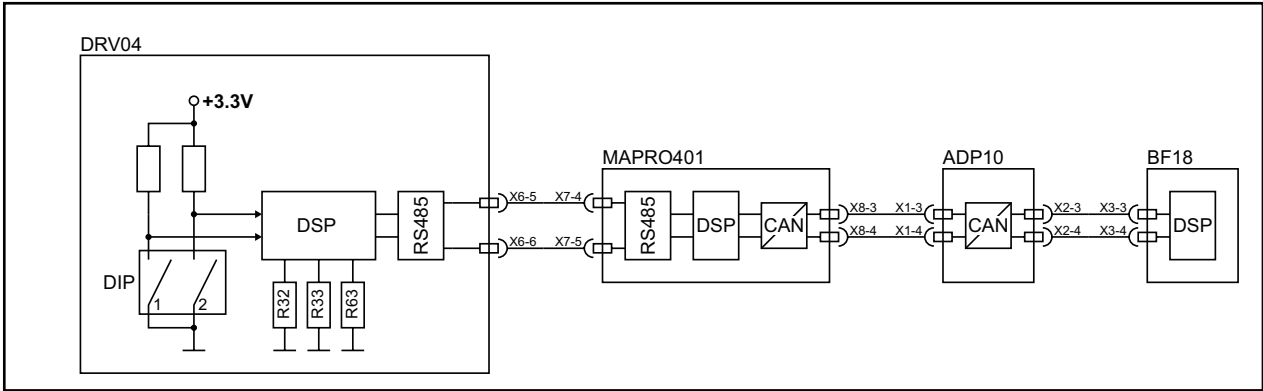


6.13 Machine Configuration

The hardware configuration is saved internally inside the machine. When switching on, the MAPRO401 is reading the configuration and compares it with the actual present hardware identifications of the DRV04 (DIP switch and encoding resistors), the actual software version and the identification of the front panel.

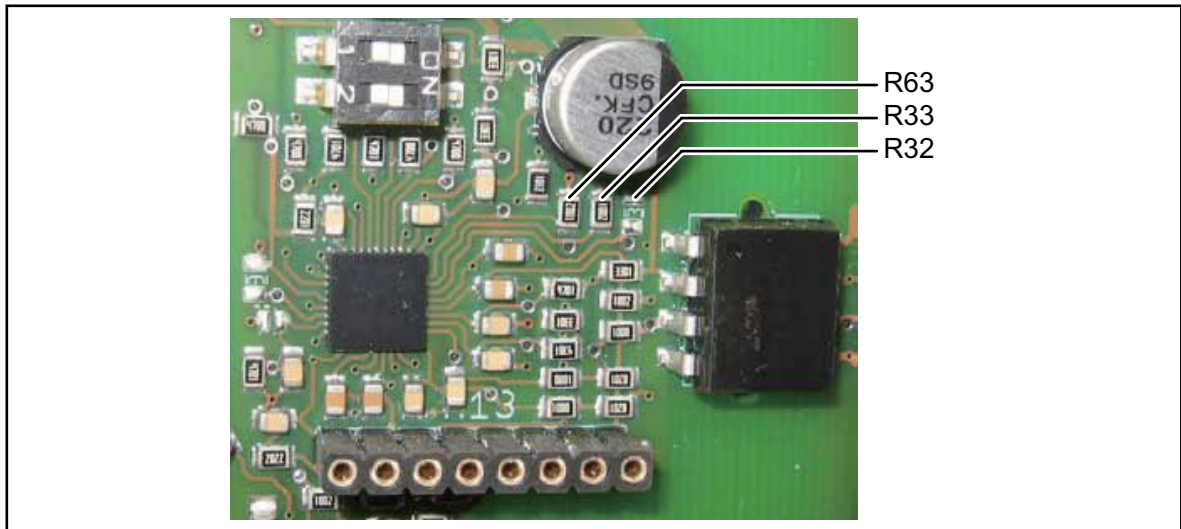
If the configuration could not be read correctly, the machines stops with **E30 Configuration**.

Schematic



Art # A-12654

Encoding Resistors



Art # A-12655

R32	R33	Configuration
-	-	Reserved
x	-	250
-	x	350
x	x	500

Table 6-10

R63	Configuration
-	Module type 1
x	Module type 2

Table 6-11

- : Not mounted

x : Mounted

DIP switch settings

DIP switch	ON	OFF
1	Multi-voltage	Non-multi-voltage
2	230V mains (power units parallel)	400V mains (power units in row)

Table 6-12

When switching on the machine the machine configuration is read out of the memory. If the configuration is not readable/valid, the machine stops with **E30-00 Configuration**.

The configuration of the DRV04 is send by the primary DSP to the MAPRO401. If no configuration data are received from the primary DSP, the machine stops with **E30-04 Configuration primary**. The error code is also shown if the settings of the DIP switch does not match to the measured system configuration (230V, Multivoltage).

If the configuration of the encoding resistors on the DRV04 does not match to the actual present operating system software, the machine stops with **E30-06 Configuration software**.

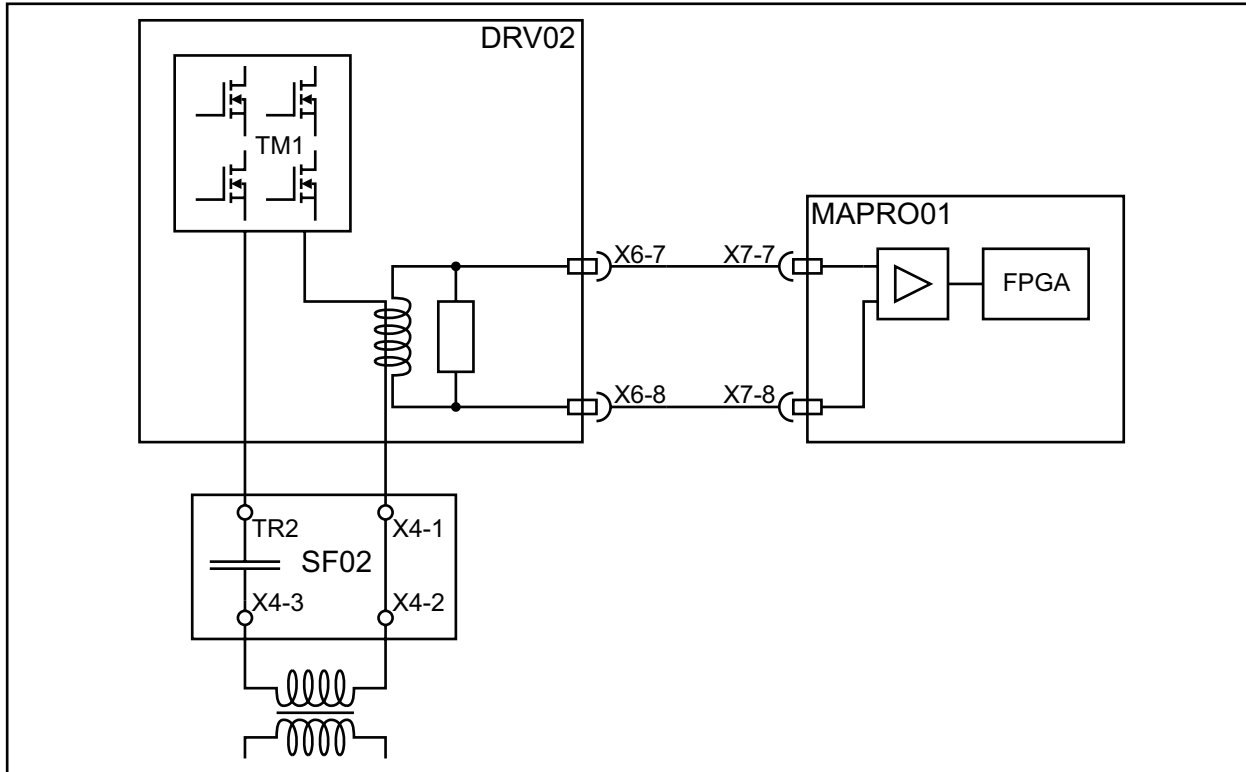
The configuration/type of the front panel is send by the front panel itself to the MAPRO401. If the type of the front panel does not match to the saved machine configuration, the machine stops with **E30-08 Configuration front panel**.

6.14 Monitoring Primary Input Current

The primary input current is measured directly from the FPGA of the MAPRO401. If the input current gets $>60\text{A}$ for a certain time, the machine stops with E32-04 IPMax Error.

If the input current exceeds the absolute maximum limit of 80A , the machine stops with E32-01 Overcurrent FPGA.

Schematic



Art # A-12656

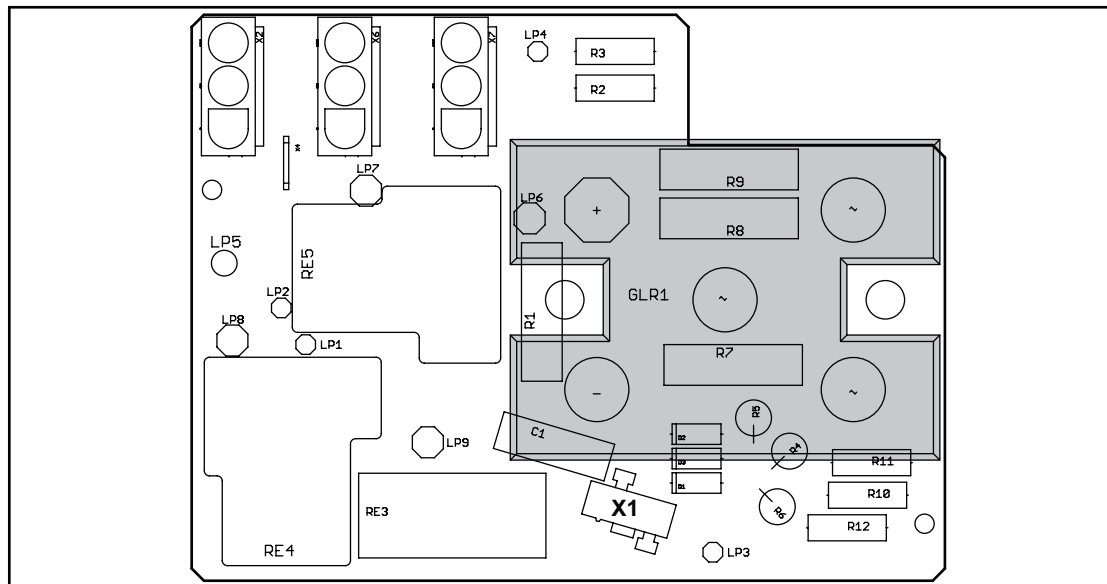
6.15 PCB Connectors

1 PCB REL01

Functions

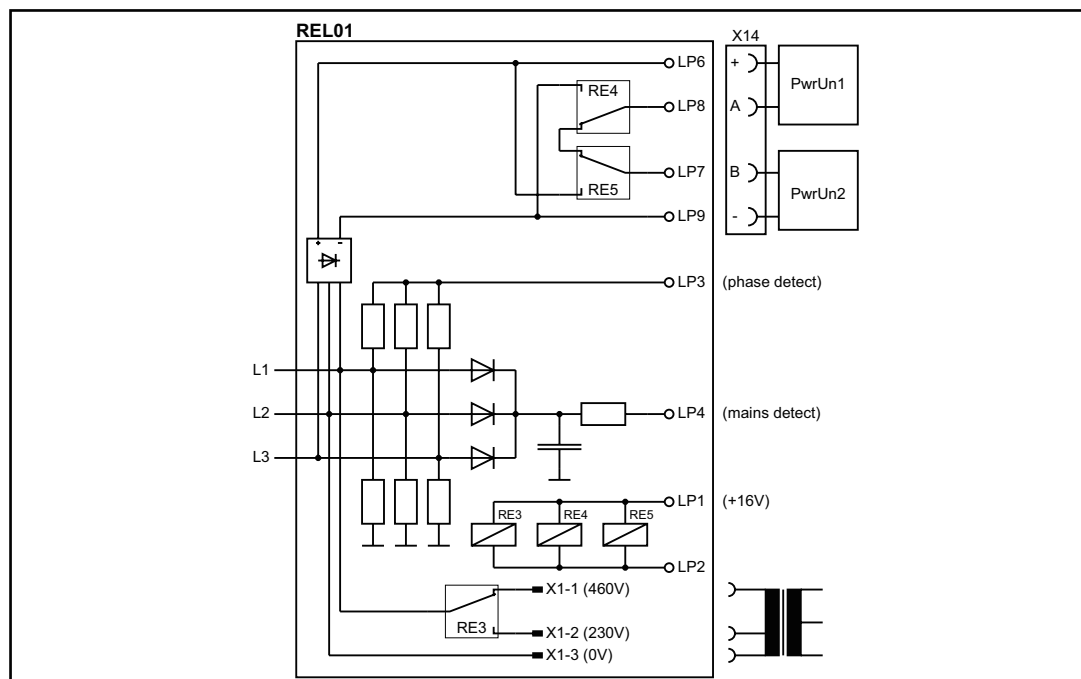
- Switching the power modules in series or parallel
- Mains detection
- Phase detection
- Switching supply for control transformer

Picture PCB REL01



Art # A-12657

Schematic PCB REL01



Art # A-12658

ARCMaster 401MST POWER SOURCE

2 PCB DRV04

Functions

- Primary driving of the transformer
- Capture primary input current
- Measuring temperatures
- Generating internal supply voltages
- Driving fans
- Switching power-up relays
- PE monitoring
- Coding power unit
- Monitoring mains voltage
- Monitoring bus voltage

LEDs

LED	State	Designation
1 (red)	Blinking (1 Hz)	Normal operation
	Blinking (3 Hz)	When switching off the machine (no mains voltage present)
	Lit weak	DSP not programmed
	Off	3.3V supply voltage is missing

Table 6-13

Setting DIP switch

DIP switch	ON	OFF
1	Multi-voltage	Non-multi-voltage
2	230V mains (power units parallel)	400V mains (power units in row)

Table 6-14

Measuring points

Designation	Measuring Point		Result
Bus voltage	X14-1	+Uz	ca. 580 V DC
	X14-4	-Uz	
Supply voltage +24V	X6-1	+	+24V DC
	X6-4	-	
Supply voltage +16V (primary)	X5-1	+	+16V DC
	X14-4	-	
Supply voltage +16V	X6-2	+	+16V DC
	X6-4	-	
Supply voltage +16V (driver)	X2-1	+	+16V DC
	X6-4	-	

Table 6-15

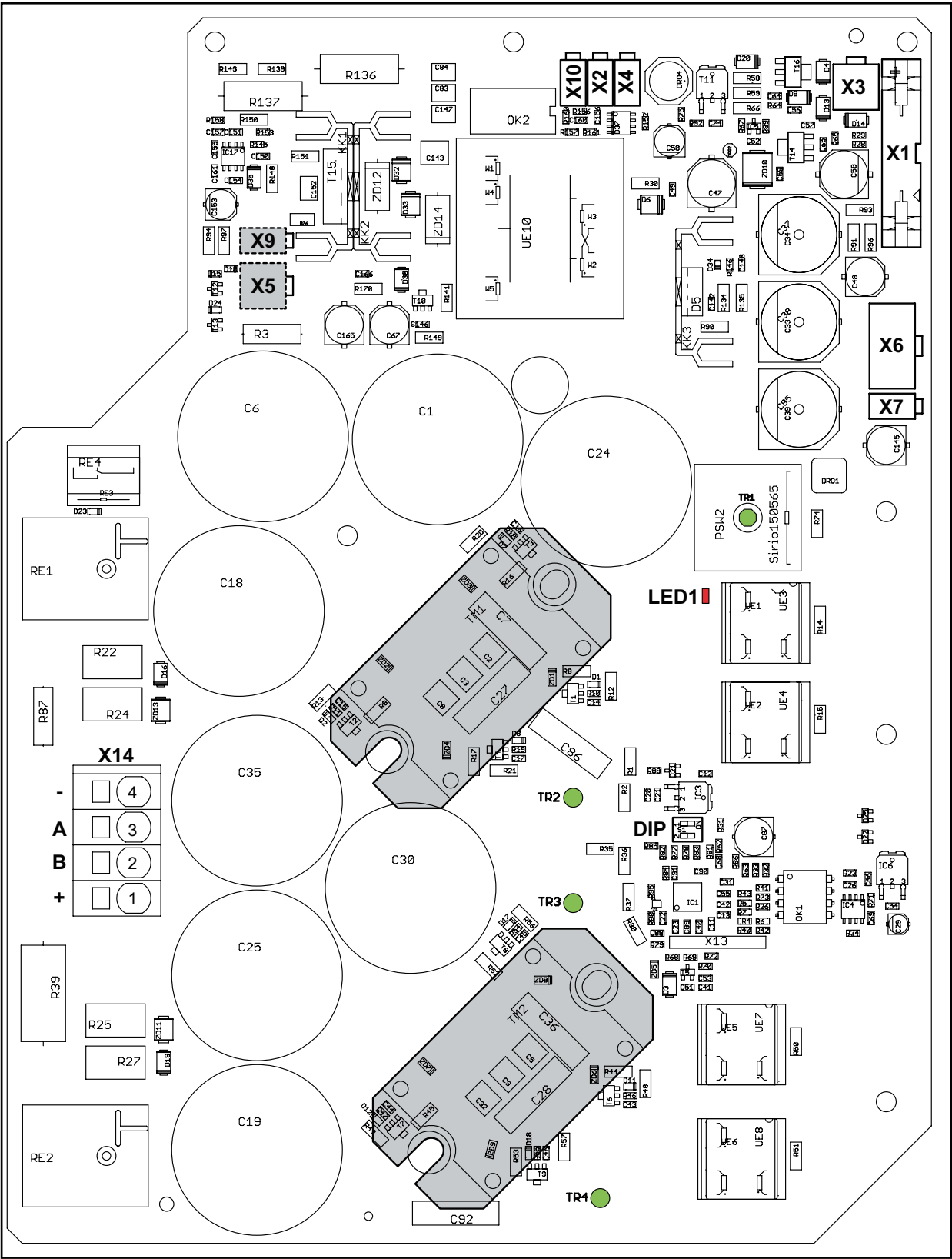
Overview Connectors PCB DRV04

Connector	Designation
X1	Connector flat ribbon cable to PCB MAPRO401
X2	Connector fan
X3	Not used
X4	Connector fan
X5	Connector REL01
X6	Connector to PCB MAPRO401
X7	Connector temperature sensor
X9	Connector PE-monitoring
X10	Connector fan
X14	Connecting terminals bus voltage

Table 6-16

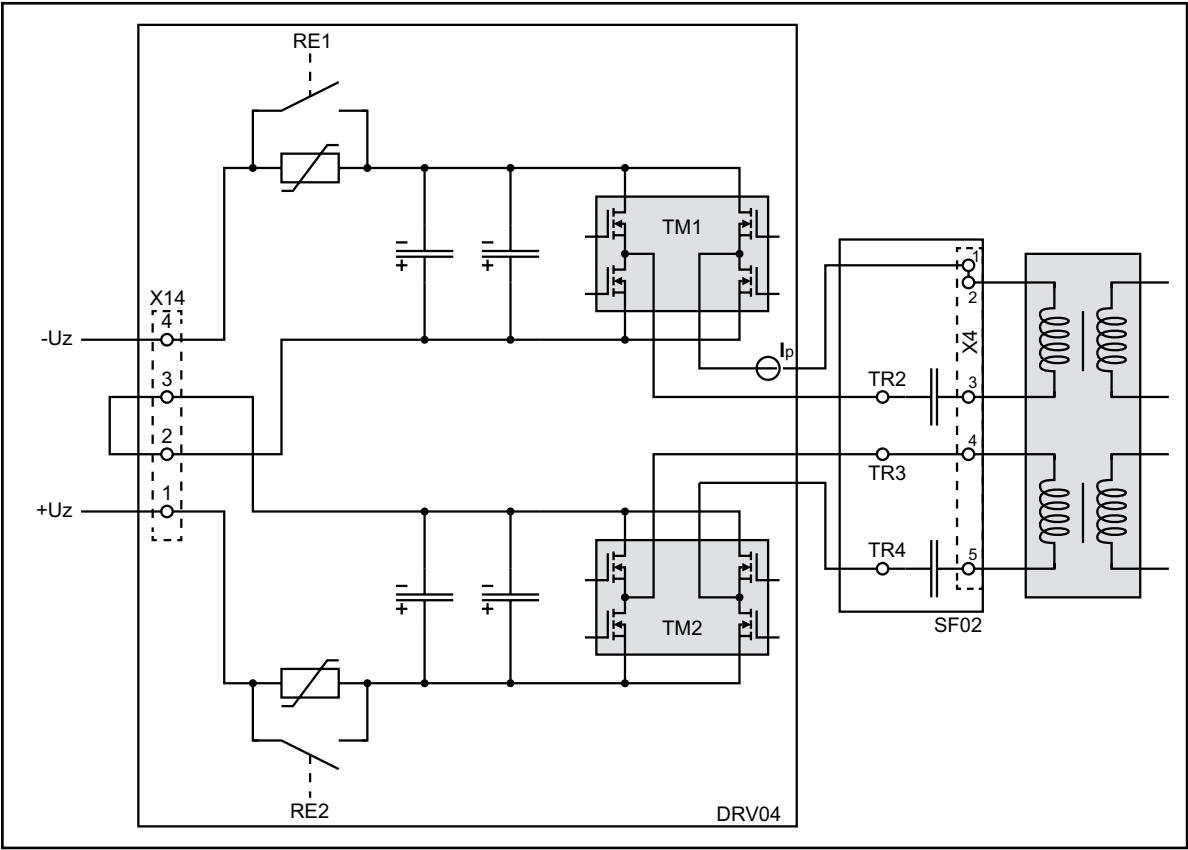
ARCMaster 401MST POWER SOURCE

Picture PCB DRV04



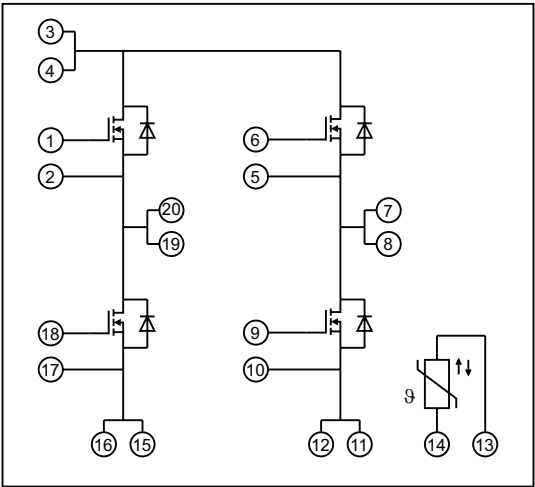
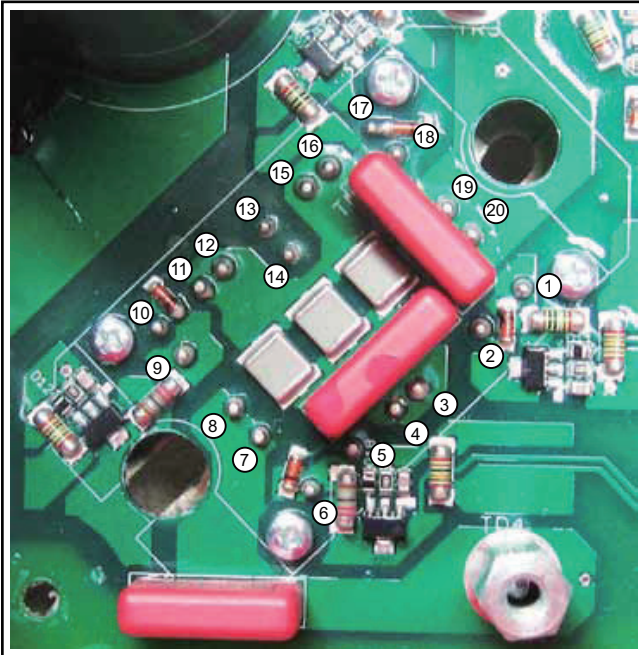
Art # A-12659

Schematic



Art # A-12660

Inside Schematic Power Modules



Art # A-12661

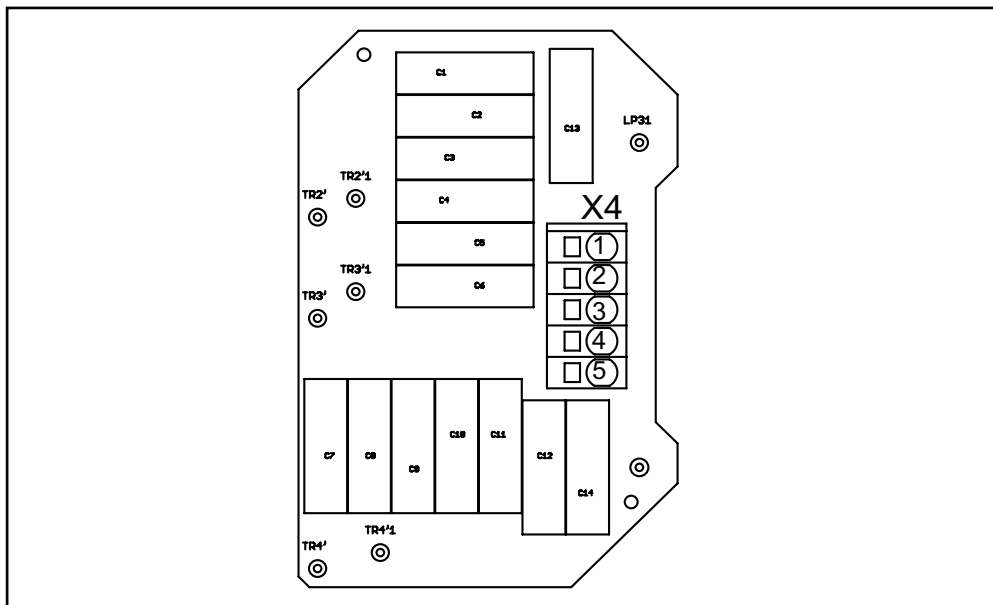
ARCMaster 401MST POWER SOURCE

3 PCB SF02

Functions

- Wiring primary transformer wires
- Connecting primary resonant capacitors

Picture PCB SF02



Art # A-12662

4 PCB DC01

Functions

- Wiring secondary diodes
- Connecting parallel resonant capacitors
- Capturing output voltage

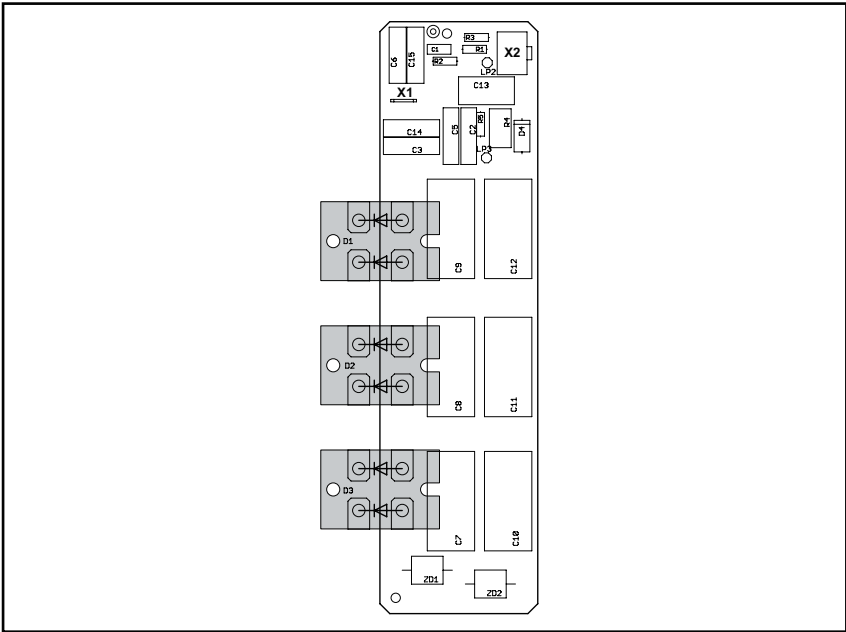
Measuring points

Designation	Measuring Point		Result
No-load voltage	X2-5	+	+80V DC*
	X2-1	-	

Table 6-17

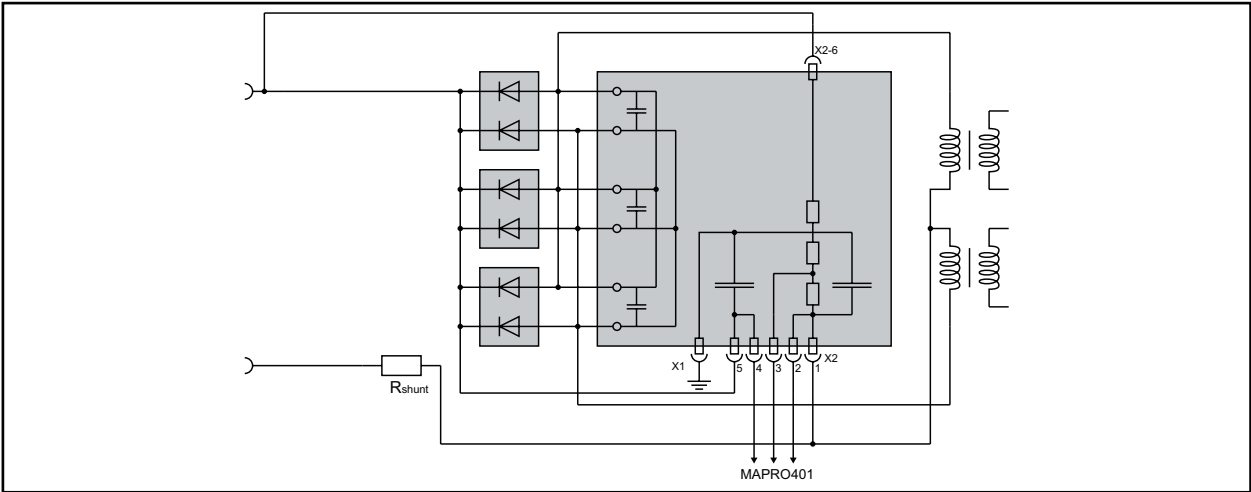
*Only at machines with no VRD, at machines with activated VRD, the VRD voltage is measured.

Picture PCB DC01



Art # A-12663

Schematic



Art # A-12664

ARCMaster 401MST POWER SOURCE

5 PCB MAPR0401

Functions

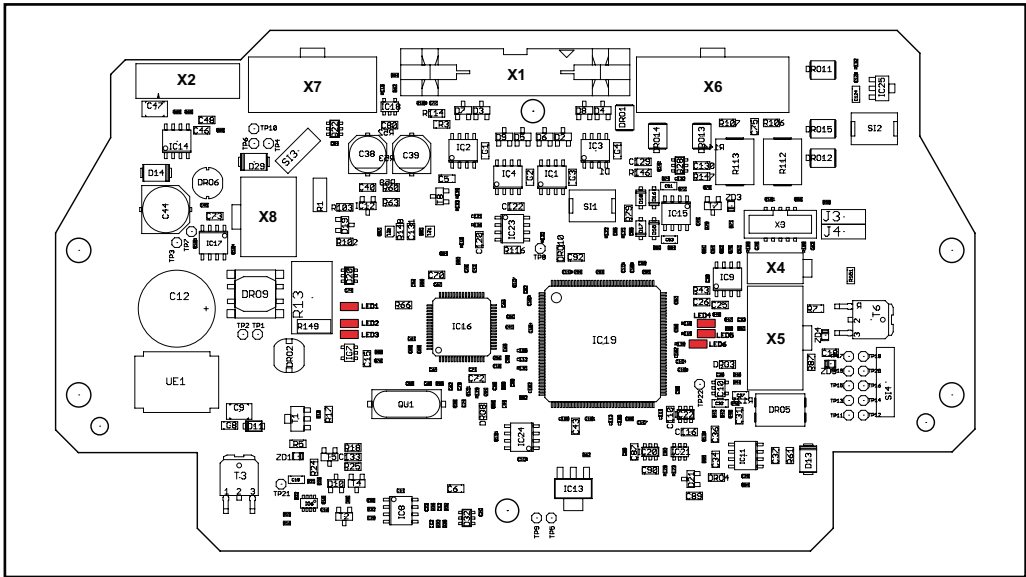
- Welding process control
- Weld sequence control
- Fan control
- Temperature monitoring
- Monitoring primary input current
- Monitoring welding- current/voltage
- Communication operating elements (front panel, remote control)

Measuring points

Designation	Measuring Point		Result
Internal supply voltage 24V	X8-2	+	+24V DC
	X8-1	-	
Internal supply voltage 16V	X5-3	+	+16V DC
	X5-2	-	

Table 6-18

Picture PCB MAPR0401



Art # A-12665

Overview connectors PCB MAPR0401

Connector	Designation
X1	Connector flat ribbon cable to PCB DRV04
X2	Not used
X4	Not used
X5	Connector shunt resistor and PCB DC01
X6	Not used
X7	Connector to PCB DRV04
X8	CAN bus (connection to front panel BF04/BF18)

Table 6-19

6 PCB BF04

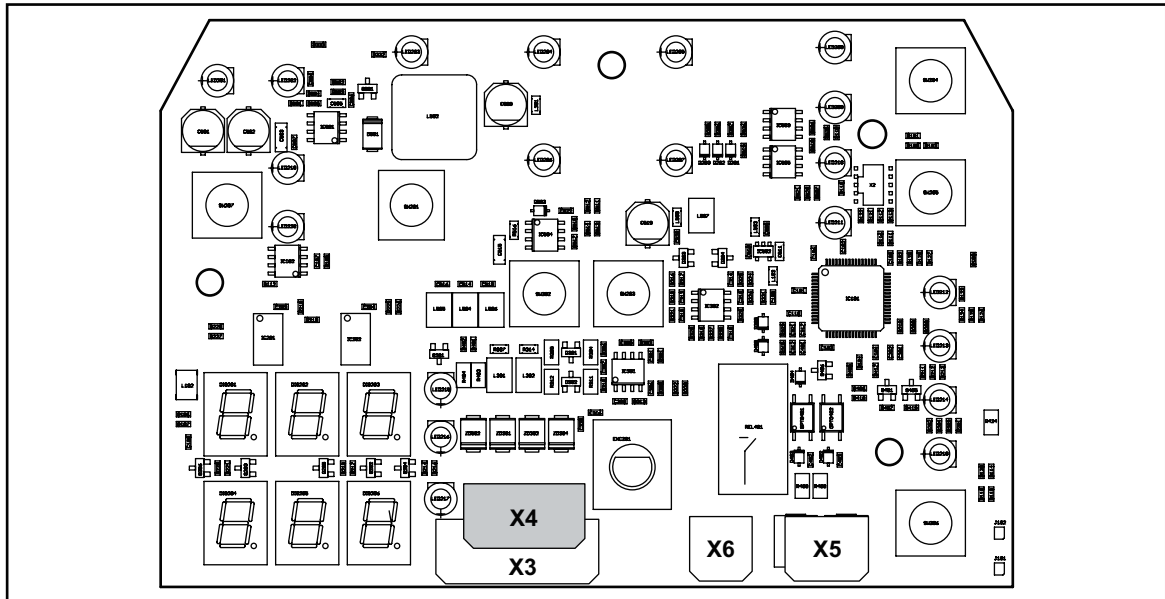
The PCB BF04 is the front panel of the ArcMaster 401 MST.

The front panel is a participant of the internal CAN bus. All data, informations and values are transmitted via the CAN bus.

Functions

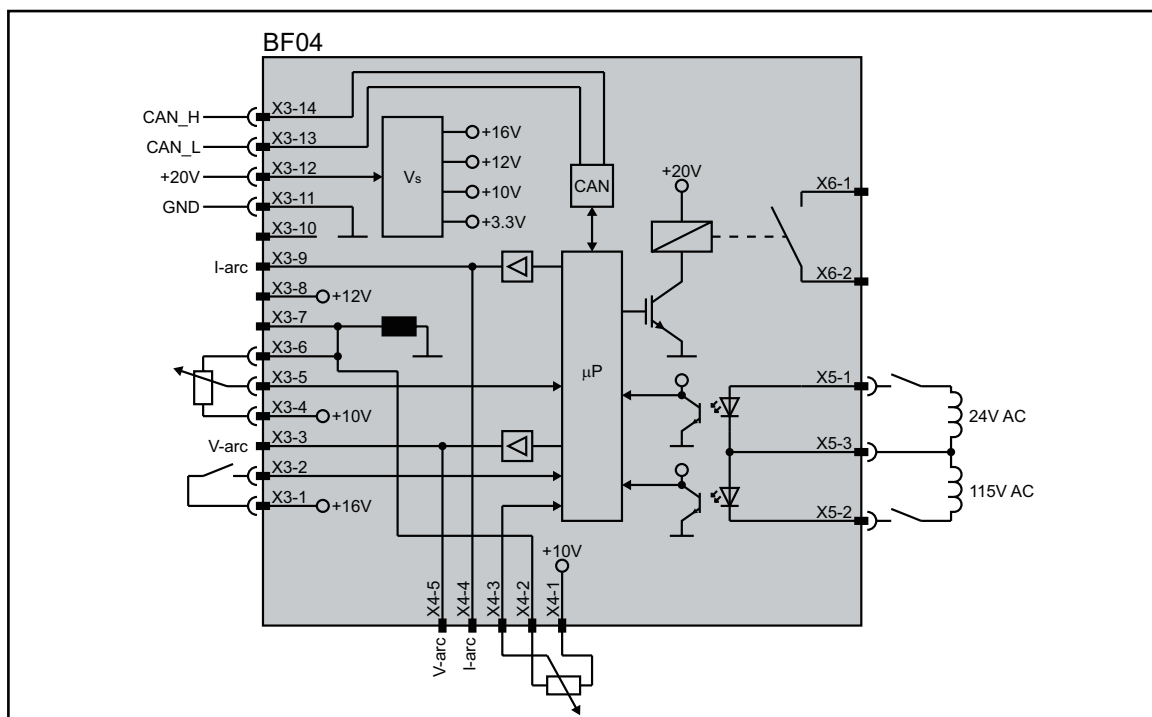
- Operating the machine
- Display of parameters and malfunction codes

Picture PCB BF04



Art # A-12666

Schematic



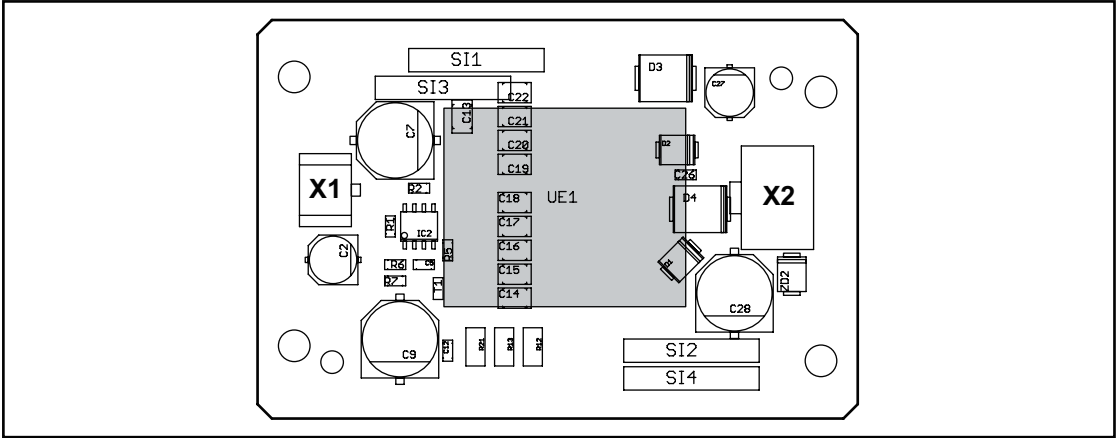
Art # A-12667

ARCMaster 401MST POWER SOURCE

7 PCB ADP10

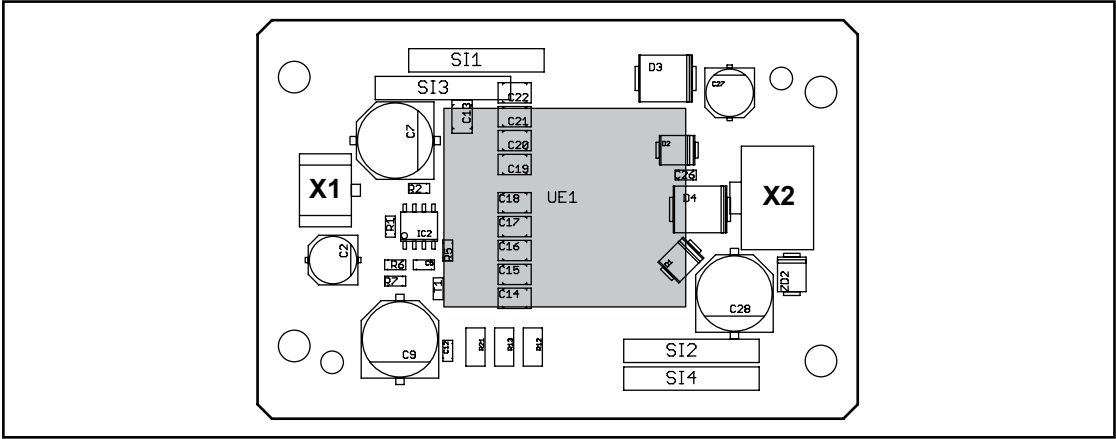
The CAN bus that is available at the 14 pin remote control socket at the rear side, must be electrically separated from the internal CAN bus. The PCB ADP10 is used for a potential separation of the CAN bus.

Picture PCB ADP10

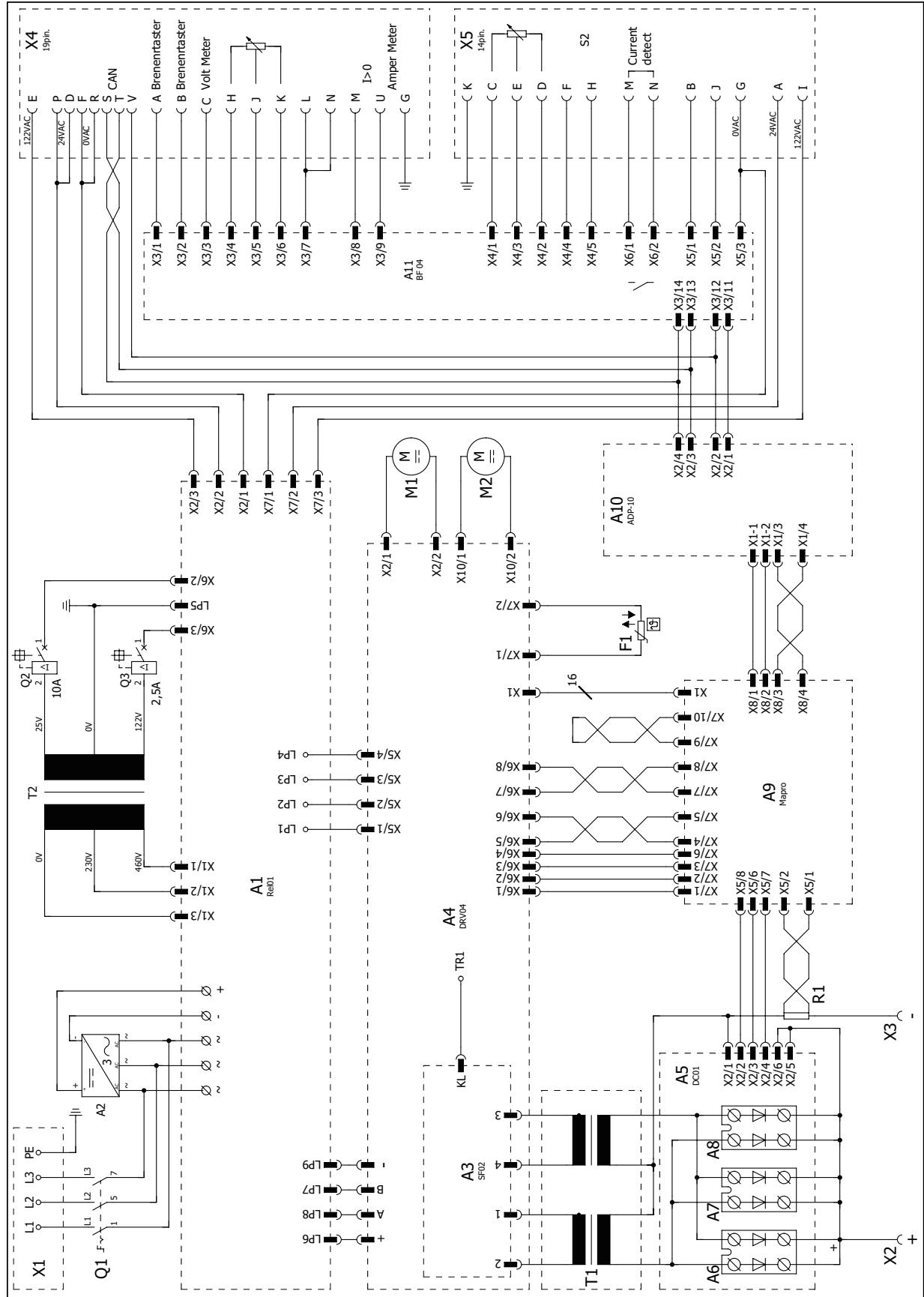


Art # A-12668

Schematic



6.16 Circuit Diagram



Alt # A-12461_AB

ARCMaster 401MST POWER SOURCE

Legend for Circuit Diagram

Pos.		Designation
A	1	PCB REL01
A	2	Rectifier DB 1600V 166A
A	3	PCB SF02 (E)
A	4	PCB DRV 04 (E)
A	5	PCB DC01 (E)
A	6-8	Diode 400V 2x105A ISOTOP
A	9	PCB BG MAPRO 401 (E)
A	10	PCB DC01 ADP10 (E)
A	11	PCB BG BF04 (E)
F	1	Unit thermal sensor 23x7x5 LD3,4
M	1-2	Axial fan 12VDC 80x80x38 310mm
Q	1	Switch 1/0 80A 3ph.
Q	2	Automatic fuse 10A 240V
Q	3	Automatic fuse 2,5A 240V
R	1	Shunt 350A 35mV 0,1m Ohm
T	1	Transformer WA 13000063 (400A)(10:1)
T	2	Control transformer 400V 115V / 24V
X	1	Mains cable 4x AWG8 3AE 1RÖ no plug
X	2	Insert sleeve 35-50 mm ² ; HF; Ø38
X	3	Insert sleeve 35-50 mm ² ; HF; Ø38
X	4-5	Cable loom ArcMaster 401MST

Table 6-20

SECTION 7:
REPLACEMENT PARTS

7.01 401MST Power Source Spare Parts

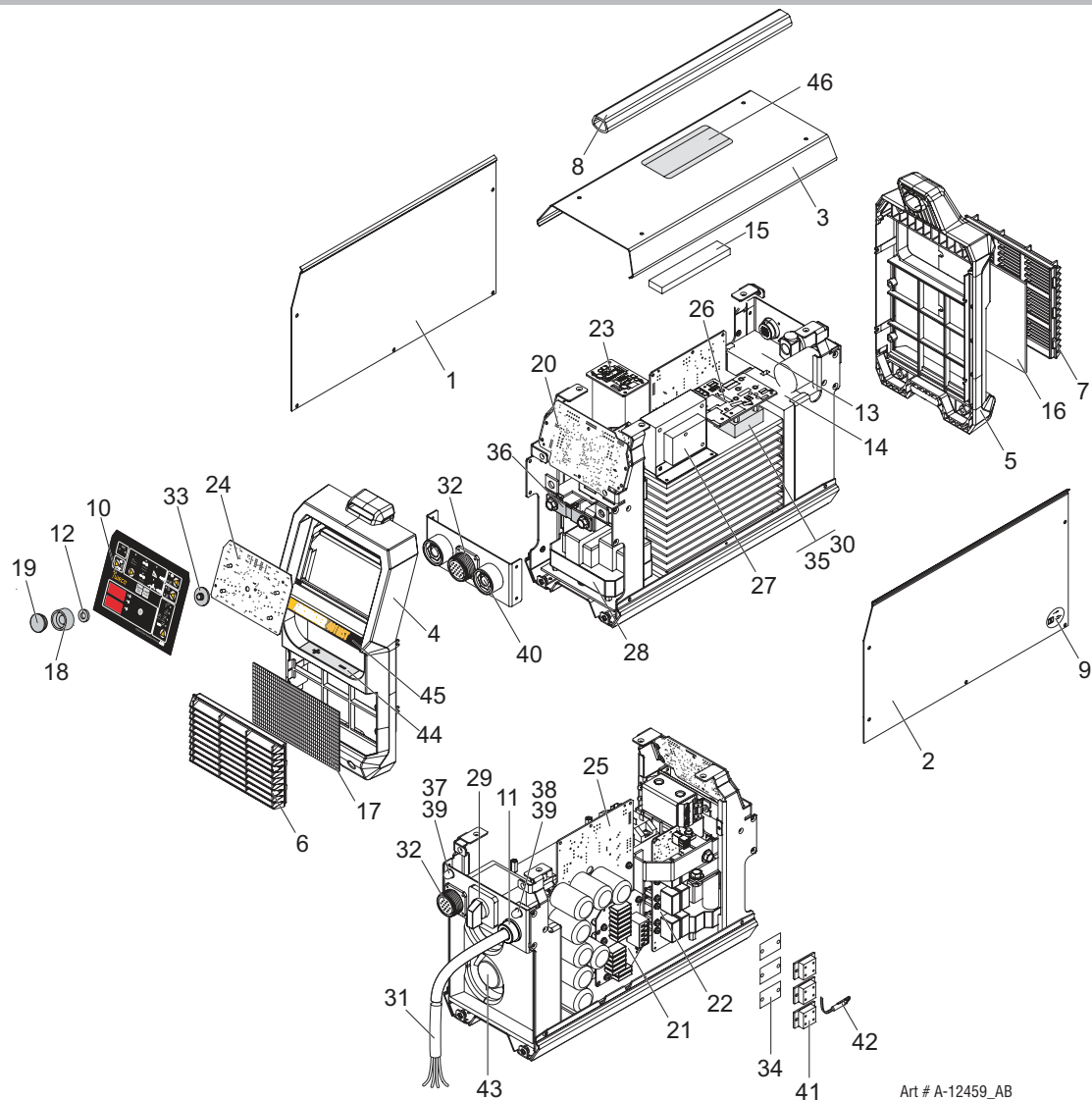


Figure 7-1 ArcMaster 401MST Spare Parts

ArcMaster 401MST Spare Parts				
Item	Description	Des. Ref.	Quantity	Part Number
1	Side Panel Left		1	W7006700
2	Side Panel Right		1	W7006701
3	Top Panel with Display Sheet		1	W7006702
4	Front Panel		1	W7006703
5	Rear Panel		1	W7006704
6	Front Grill		1	W7006705
7	Rear Grill		1	W7006706
8	Handle Tube		1	W7006707
9	Mains Label		1	W7006708

ARCMaster 401MST POWER SOURCE

Item	Description	Des. Ref.	Quantity	Part Number
10	Display Panel Overlay		1	W7006709
11	Strain relief		1	W7006710
12	Foam Spacer		1	W7006711
13	Foam inlay		1	W7006712
14	Foam inlay		1	W7006713
15	Foam Plate Self-adhesive		1	W7006714
16	Rear Filter		1	W7006715
17	Wire Gauze		1	W7006716
18	Knob Body		1	W7006717
19	Knob Cap		1	W7006718
20	Control PCB	PCB 5	1	W7006719
21	Capacitor PCB	PCB 3	1	W7006720
22	Output PCB	PCB 7	1	W7006721
23	ADP10 PCB	PCB 6	1	W7006722
24	Front Panel PCB	PCB 4	1	W7006723
25	Main Power PCB	PCB 2	1	W7006724
26	Input PCB	PCB 1	1	W7006725
27	Aux. Transformer	T2	1	W7006726
28	Main Transformer	T1	1	W7006727
29	ON/OFF Switch	SW1	1	W7006728
30	Bridge Rectifier	BR1	1	W7006729
31	Input Mains Cable		1	W7006730
32	14 pin Remote Socket with Harness		1	W7006731
33	Insulating Bush		1	W7006732
34	Insulation Foil		3	W7006733
35	Insulation Foil		1	W7006734
36	Shunt		1	W7006735
37	Circuit breaker 2.5A 240V (115VAC)	CB1	1	W7006736
38	Circuit breaker 10A 240V (24VAC)	CB2	1	W7006737
39	Protection cover IP64		1	W7006738
40	50 mm Dinse Output Terminal		2	W7006739
41	Output Diode	D1, D2, D3	3	W7006740
42	Unit Thermal Sensor	TS1	1	W7006741
43	Cooling Fan	M1	1	W7006742
44	Label +/- Tweco		1	W7006744
45	Label 401MST		1	W7006745
46	Warning Sticker		1	W7006746
47	Sticker Tweco 261 x 93 (not shown)		1	W7006748

Table 7-1 ArcMaster 401MST Spart Parts

TWECO - LIMITED WARRANTY TERMS

LIMITED WARRANTY: Tweco ®, Inc, A Victor Technologies Company, warrants to customers of its authorized distributors hereafter "Purchaser" that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Tweco products as stated below, Tweco shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Tweco's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Tweco's sole option, of any components or parts of the product determined by Tweco to be defective.

TWECO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHERS, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: TWECO SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, SUCH AS, BUT NOT LIMITED TO, LOST PROFITS AND BUSINESS INTERRUPTION. The remedies of the Purchaser set forth herein are exclusive and the liability of Tweco with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Tweco whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based. No employee, agent, or representative of Tweco is authorized to change this warranty in any way or grant any other warranty.

PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH IN TWECO'S SOLE JUDGMENT MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY TWECO PRODUCT. PURCHASER'S RIGHTS UNDER THIS WARRANTY ARE VOID IF THE PRODUCT IS SOLD TO PURCHASER BY NON-AUTHORIZED PERSONS.

The warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Tweco delivered the product to the authorized distributor.

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WARRANTY SCHEDULE



5 Years Parts* / 3 Years Labor

ArcMaster, Excelarc, Fabricator, Fabstar, PowerMaster

Portafeed, Ultrafeed, Ultima 150, WC 100B

* 5 years on the Original Main Power Transformer and Inductors not mounted on PCBoards.

* 3 years on Power Supply Components

2 Years Parts and Labor Unless specified

Auto-Darkening Welding Helmet (electronic Lens), ** 1 Month Harness Assy

Victor Regulator for Fabricator 141i (No labor)

1 Years Parts and Labor Unless specified

95S, Water recirculators

All Plasma Welding consols (i.e WC-1 Controller, WT Timer,

WF-100 Capstain Feeder, etc)

180 days parts and Labor Unless specified

Plasma Welding Torch and leads packages

Gas Regulators "Supplied with power sources" (No Labor)

90 days parts / No Labor

Remote Controls

MIG and TIG Torches (Supplied with power sources)

Replacement repair parts

30 days parts / No Labor

MIG Torch for Fabricator 141i

5-2-1 years Parts / No Labor

FirePower® Welders



5 Years Parts / No Labor

Victor® Professional

Victor Technologies limited warranty shall not apply to:

Consumable Parts for MIG, TIG, Plasma welding, Plasma cutting and Oxy fuel torches, O-rings, fuses, filters or other parts that fail due normal wear

* Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized VICTOR TECHNOLOGIES® repair facility within thirty (30) days of the repair.

* No employee, agent, or representative of VICTOR TECHNOLOGIES® is authorized to change this warranty in any way or grant any other warranty, and VICTOR TECHNOLOGIES® shall not be bound by any such attempt. Correction of non-conformities, in the manner and time provided herein, constitutes fulfillment of VICTOR TECHNOLOGIES®'s obligations to purchaser with respect to the product.

* This warranty is void, and seller bears no liability hereunder, if purchaser used replacement parts or accessories which, in VICTOR TECHNOLOGIES®'s sole judgment, impaired the safety or performance of any VICTOR TECHNOLOGIES® product. Purchaser's rights under this warranty are void if the product is sold to purchaser by unauthorized persons.

THE AMERICAS

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Fax: 1-800-535-0557 (tollfree)

International Customer Care

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