

INTRODUCTION

MIGATRONIC welding equipment has a good reputation - and we know how important it is to live up to the standards we have set ourselves.

The welding machine you have purchased is the result of **MIGATRONIC'S** years of experience in the field of welding machine manufacture. This experience, combined with correct operation and maintenance of your machine, provides a guarantee of excellent performance in the years ahead.

Thank you for buying a **MIGATRONIC** machine.

INSTRUCTION MANUAL

BDH 320/400/550



Version E

50173005

EC DECLARATION OF CONFORMITY

MIGATRONIC A/S
Aggersundvej 33
9690 Fjerritslev
Denmark

hereby declare that our machines as stated below

Type: BDH 320/400/550
as of: week 49 1995, step 4

conform to directives 73/23/EEC and 89/336/EEC.

European Standards: EN60974-1
EN50199

Issued in Fjerritslev on 4th December 1995.

A handwritten signature in cursive script, appearing to read 'P. Roed'.

Peter Roed
Managing director

Valid from 9715

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IMPORTANT SAFETY INSTRUCTIONS

The safety instructions contained in the **PERSONAL SAFETY** section of this manual should be read and observed when installing and operating the machine.

This instruction manual and the accompanying instructions for use must be accessible at all times to staff engaged in the installation, operation and maintenance of the machine.

Full understanding of this manual requires a skilled welder's knowledge of welding and of the risks involved.

DESCRIPTION OF FUNCTIONS

The BDH range consists of 6 basic models.

BDH 320 TIG: Welding machine for TIG and MMA electrode welding.

BDH 320 MIG/MAG: Welding machine for MIG/MAG and MMA electrode welding. Available as either a compact model with integrate wire feed unit, or as a combi model, this being a compact model fitted with an additional separate wire feed unit.

BDH 320/400/550 MIG/MAG STB: Welding machines for MMA electrode welding, and MIG/MAG welding with a separate wire feed unit.

BDH 320/400/550 TRIPLE: Welding machines for TIG, MIG/MAG and MMA electrode welding.

The BDH is an inverter-based machine. The advantages of this design are as follows:

- programmable welding properties and improved welding characteristics,
- a reduction in power loss,
- increased duty cycle,
- reduced weight and size

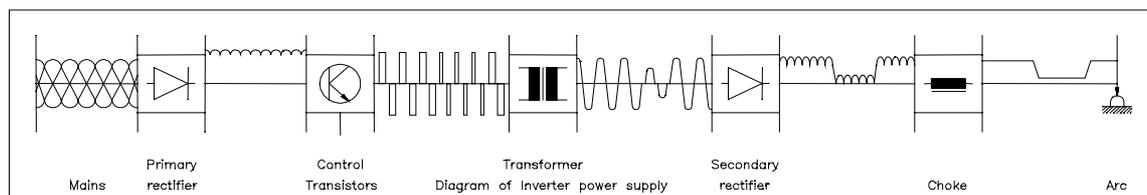
The inverter, like all other components in the machines, is controlled by a central microprocessor, which makes it possible to achieve advanced welding control combined with straightforward operation and ease of use.

The design of the BDH is based to a large extent on modules. This modular construction has two advantages, i.e. (1) great flexibility, enabling users to design the machine that they need to meet their specific requirements, and (2) ease of service, since repairs can be carried out simply by replacing defective modules.

The most important modules are described in brief below.

Inverter

As mentioned above, the BDH is an inverter-based machine. That is, the power source (power module) is constructed in accordance with the switch-mode principle. The BDH power module switches at 100 kHz, which makes it the fastest inverter on the market today. The principle involved is illustrated in the block diagram below.



DESCRIPTION OF FUNCTIONS

The electronic box

The microprocessor is placed in the electronic box, and forms part of a regulating loop in which measurements of welding current and voltage are carried out. The current and voltage references are generated to the inverter based on these measurements, with a frequency of 10 kHz.

In addition to the regulation of welding current and welding voltage, the microprocessor deals with all control and collection of data from modules in the welding machine. It also provides communication with the user via the front of the electronic box and operation using either the torch or remote control.

Wire feed

A wire feed system is used in MIG/MAG welding, and can be situated either on the left-hand side (seen from the front) of the power source (COMPACT), or in a separate wire feed unit (STB and TRIPLE), or both places (COMBI). The wire feed unit can be fitted with either two or four-wheel drive. Four-wheel drive is recommended for many welding tasks - not least when aluminium or fluxcored wire is used.

It is also important to use wire feed rolls that fit the dimensions of the wire, and that the liners used in the torch hose are of the correct diameter and material to suit the type of welding wire in question (See paragraph: Fitting of welding wire).

HF-module

The HF module consists of an HF box and a coil. The HF module is used to initiate the arc during TIG welding.

Water module

The water module consists of a water tank, a water cooler, a water pump, a filter, and flow control. The flow control system indicates a water cooling error if the cooling water flow is either insufficient or absent altogether.

INITIAL OPERATION

Mains connection

The machine must be connected to a three-phase alternating current (AC) supply (50 or 60 Hz) with a mains voltage between 380 and 415 V. The order of the phases is not important. The earth wire is yellow/green. Fuse type: According to typeplate. Use the mains switch to switch on the machine (pos. 1).



-marking

This machine meets the demands made for machines which are to operate in environments with an increased hazard of electric shock.

In certain types of welding jobs there is an increased hazard of getting an electric shock, e.g. in environments where the welder has to work in a crouched position and is therefore in contact with the work-piece, in places which are partially or totally surrounded by conductive parts, and in wet, damp or hot places.

When welding under such conditions there must be a person nearby who can render help in case of an emergency and he must be able to quickly cut off the current.

Protection class

The machine is designed for indoor operation as it meets the demands of protection class IP21.

It must be ensured that the air intake and outlet are not blocked.

Electromagnetic emissions and the radiation of electromagnetic disturbances

In conformity with the Electromagnetic Compatibility (EMC) Directive within the European Union this high-quality welding machine for industrial and professional use is designed, built and tested in accordance with the European Standard EN50199 on radiation and incident radiation of electromagnetic disturbances, the purpose of this standard being to prevent the occurrence of situations, where the machine is disturbed or is itself the source of disturbance in other electrical equipment or appliances.

The responsibility of the user

A trouble-free performance without disturbances or disruption caused by electromagnetic emissions, does, however, require that certain measures are taken when installing and using the welding equipment.

Thus it is the responsibility of the user to ensure that the operation of this machine does not occasion disturbances of the above mentioned nature.

Before installing and operating the welding machine, an assessment of the surrounding area is therefore required and this assessment is best performed by the specialist installing the welding machine.

Assessment of area

The following shall be taken into account:

1. Supply cables for other equipment, control cables, signalling and telephone cables in the vicinity of the welding machine.
2. Radio or television transmitters and receivers.
3. Computers and any control equipment.

4. Critical safety equipment, e.g. electrically or electronically controlled guards or protective systems around process equipment.
5. The medical health circumstances of people in the area, e.g. the use of pace-makers, hearing aids etc.
6. Equipment used for calibration and measurement.
7. The immunity to disturbance or disruption of other equipment in the environment which may be disturbed and which therefore may require special protection measures.
8. The time of day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and those other activities that are to take place in the environment. Special circumstances may require an extension of this area.

Use in domestic establishments

This welding machine is normally expected to be used in industrial situations and areas, and if used in a domestic establishment the hazard of disturbing other electric appliances is increased and it may be necessary to take special and additional precautions in order to prevent problems of emission.

Methods of reducing electromagnetic emissions

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

- Mains cables and other cables, e.g. telephone, computer, and signalling cables, should not be carried or placed parallel and close to each other, e.g. not in the same cable tray or box.
- Separately-insulated mains supply cables for sensitive electronic equipment, e.g. computers.
- Selective screening of cables may be considered under special circumstances.
- Screening of the entire welding installation may be considered under special circumstances and for special applications.

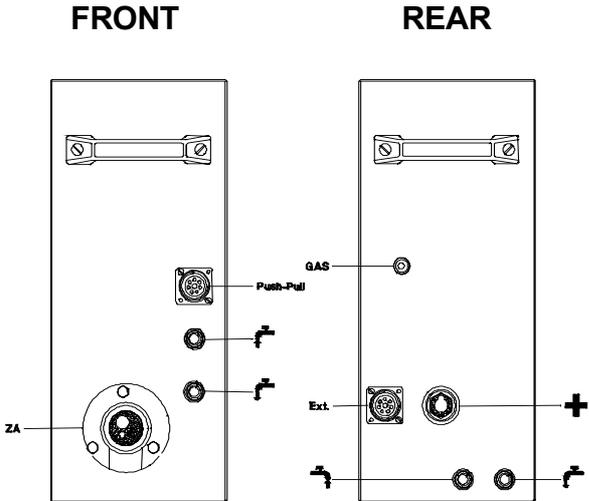
How to connect the gas

The gas hose, which is connected to the rear of the machine, should be connected to a gas supply with a flow setting of 8-20 l/min, depending on the welding operation in use. TRIPLE and COMBI types are fitted with two gas hoses.

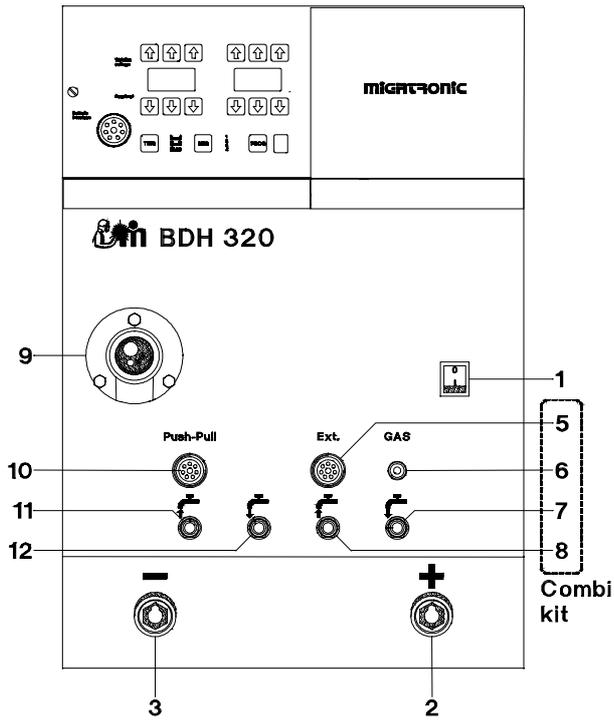
The left-hand gas hose is for use inside the machine, and the right-hand gas hose should be connected to the separate wire feed unit. A gas cylinder or fittings for twin bottles can be fitted to the rear of the machine.

How to connect the separate wire feed unit

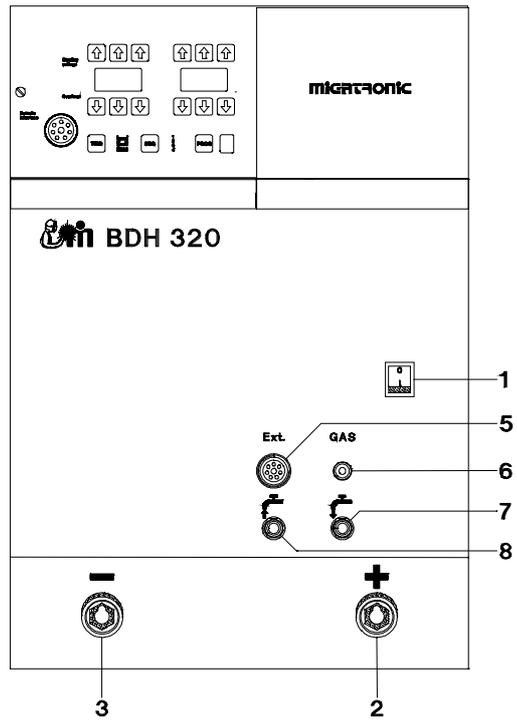
Connect the separate wire feed unit to the machine using an intermediary cable which contains cables and hoses for welding positive (pos. 2), control signals (pos. 5), gas (pos. 6), and cooling water (pos. 7 and 8), if a water module is incorporated in the machine.



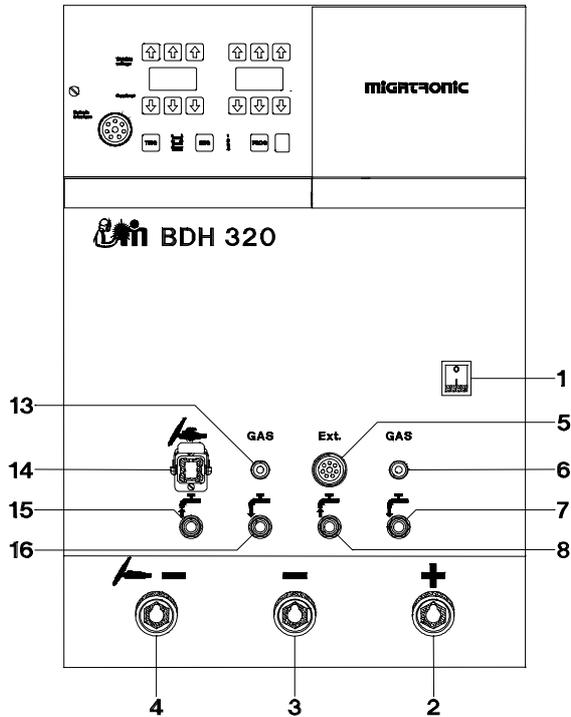
MIG Compact + Combi BDH 320



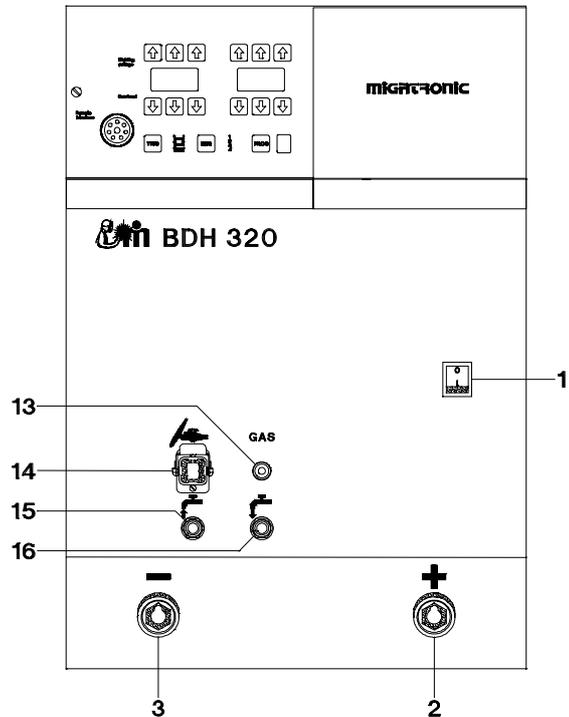
MIG STB BDH 320/400/550



TRIPLE BDH 320/400/550



TIG BDH 320



FRONT PANEL

1. Mains switch
2. Positive outlet
3. Negative outlet
4. TIG negative outlet
5. Multiple plug for connection of separate wire feed unit
6. Quick-release coupling for gas to separate wire feed unit
7. Quick-release coupling for cooling water to separate wire feed unit
8. Quick-release coupling for cooling water returned for separate wire feed unit
9. Euroconnector coupling for MIG hose and torch assembly
10. Connection for push-pull hose and torch assembly
11. Quick-release coupling for cooling water returned to MIG torch
12. Quick-release coupling for cooling water to MIG torch
13. Quick-release coupling for gas to TIG torch
14. Six-pin outlet to TIG torch
15. Cooling water returned from TIG torch
16. Cooling water to TIG torch

CONNECTION FOR MIG/MAG WELDING

Welding hose connection:

The welding hose is mounted in the central connection (pos. 9), and the nut is tightened manually. Connect the return cable to the welding negative (pos. 3). If a water module has been fitted in the machine, the two water hoses should also be fitted: RED for quick water connection (pos. 11), and BLUE for quick water connection (pos. 12). For push-pull hoses and torches fit the control cable plug to the eight-pin multiple plug (pos. 10) next to the central connection.

Fitting the welding wire:

Turn the tension spring aside and tip up the lever (fig. 1). Check that the wire feed roll, wire guide liner, and capillary tube correspond to the wire diameter. Capillary tube and wire guide liner as below are recommended (fig. 3).

Unscrew the contact tip if it is fitted to the welding torch. Insert the wire reel and feed the wire through the teflon inlet nozzle, the wire feed, and then on into the capillary tube. Tip down the lever, turn the tension spring into place. Press the key on the motor control box, and the wire will run through the hose. When the wire is through the hose, the contact tip is fitted. The pressure of the thumbscrew is adjusted to allow the wire feed roll just to slide on the wire when this is stopped at the contact tip.

With the push-pull hose: Remember to leave open the liner unit of the torch when fitting the wire (fig. 2).

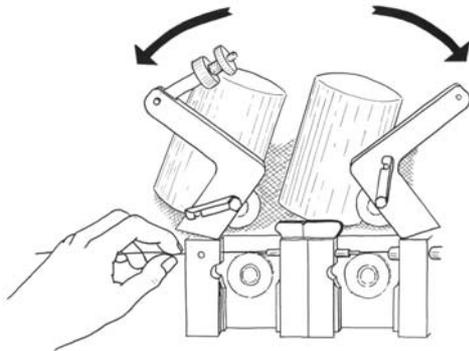


fig. 1

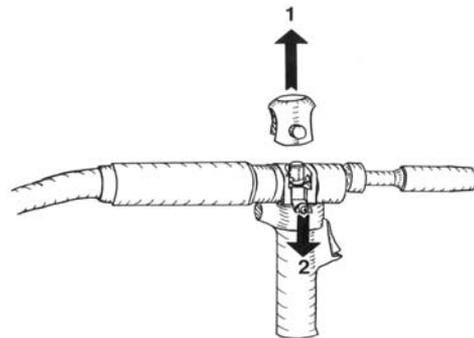


fig. 2

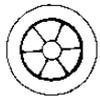
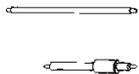
				
0,8	0,8	white	1,2	0,8
1,0	1,0	blue	1,5	1,0
1,2	1,2	red	2,0	1,2
1,6	1,6	red	2,0	1,6
2,0	2,0	yellow	2,7	2,0
2,4	2,4	yellow	2,7	2,4

fig. 3

CONNECTION FOR TIG WELDING

Connect the TIG hose cable to the welding negative (pos. 3) in TIG models or to the special TIG negative outlet (pos. 4) in TRIPLE models.

Connect the return cable to welding positive (pos. 2).

Connect the gas hose for the TIG torch to the quick-release coupling (pos. 13).

If the machine has built-in water module, and if a watercooled hose is used, connect the cooling water to the blue coupling (pos. 16) and the return cooling water to the red coupling (pos. 15).

Connect the control cable for the TIG torch to the six-pin plug (pos. 14).

CONNECTION FOR MMA WELDING

Connect the electrode holder to the positive outlet (pos. 2) and the return cable to the negative outlet (pos. 3).

Select polarity in accordance with the instructions of your electrode supplier.

OPERATION

The operation of the control box is described in the separate instructions for operations, which are enclosed.

TECHNICAL DATA

Power source	BDH 320	BDH 400	BDH 550
Mains voltage -standard version -version with change-over switch	3x400 V \pm 10% 3x230 V \pm 10% 3x400/440/500 V \pm 10%	3x400 V \pm 10% 3x230 V \pm 10% 3x400/440/500 V \pm 10%	3x400 V \pm 10% 3x230 V \pm 10% 3x400/440/500 V \pm 10%
Fuse	According to typeplate on the machine	According to typeplate on the machine	According to typeplate on the machine
Efficiency	0.85	0.85	0.85
No-load effect	100 W	100 W	100 W
Permitted load: - 35% duty cycle - 40% duty cycle - 60% duty cycle - 100% duty cycle	320 A / 32.8 V - 260 A / 30.4 V 220 A / 28.8 V	400 A / 36.0 V - 355 A / 34.2 V 310 A / 32.4 V	- 550 A / 42.0 V 500 A / 40.0 V 400 A / 36.0 V
Open circuit voltage MMA,MIG/MAG,TIG	80 V	80 V	80 V
Current range	5 - 320 A	5 - 400 A	5 - 550 A
Internal wire feed unit (Compact/Combi)	as KT14	not available	not available
Water module: - Cooling effect - Cooling capacity	850 W 7 l	1600 W 4 l	1600 W 4 l
Application class	S	S	S
Protection class	IP 21	IP 21	IP 21
Norm	EN60974 EN50199	EN60974 EN50199	EN60974 EN50199
Dimensions without wire feed unit	67x46x80 cm	67x46x80 cm	67x46x80 cm
Weight incl. water module	110 kg	115 kg	135 kg
Wire feed unit, type	KT12/KT14	KT22/KT24	KT22/KT24
Operating supply voltage	24 Vac	24 Vac	24 Vac
Effect, 1-2 pcs.	105 W	105 W	105 W
Wire dimension	0.8 - 3.2 mm	0.8 - 3.2 mm	0.8 - 3.2 mm
Wire reel capacity	5 - 15 kg	5 - 15 - 30 kg	5 - 15 - 30 kg
Wire speed	1 - 24 m/min.	1 - 24 m/min.	1 - 24 m/min.
Dimensions	70x40x21 cm	61x22,5x28 cm	61x22,5x28 cm
Weight	22 kg	14.6 kg	14.6 kg

TECHNICAL DATA

Control:		
Arc power	MMA	0 - 100 %
Hot-start	MMA	0 - 100 %
Antifreeze	MMA	on/off
Pilot arc	TIG	5 - 50 A **
Starting current	TIG	0 - 100 % min. 5A
Stop current	TIG	0 - 100 % min. 5A
Slope-up	TIG	0 - 10 secs
Slope-down	MIG/MAG, TIG	0 - 99.9 secs
Gas pre-flow	MIG/MAG, TIG	0 - 10 secs
Gas post-flow	MIG/MAG, TIG	0 - 60 secs
Spot welding time	MIG/MAG, TIG	0.1 - 99.9 secs
Arc adjust (inductance)	MIG/MAG	0 - 100 %
Burn-back	MIG/MAG	0.05 - 0.5 secs
Pulse time	A: B:	0.1 - 99.9 msecs 0.01 - 9.99 secs *
Pulse frequency	A: B:	1 - 999 Hz 0.1 - 50 Hz *
Basic current		0 - 100% min. 5 A
Process library	MIG/MAG	27 synergic processes
Sequence possibilities		1 - 4

*Only valid for TIG box and TRIPLE box

**TRIPLE box: 5 A

MAINTENANCE

However good materials have been used and no matter how carefully the fitting has been done, an advanced product as a **MIGATRONIC MIG/MAG** welding machine requires your contribution if it is to operate perfectly for years. The following items demand special attention:

Wire feed unit

This unit is to be cleaned with clean, dry compressed air and checked regularly at the wire feed roll and the contact tips, as it is of great importance for a satisfactory welding result and a minimum of wear and tear that the wire passes through the wire drive system without deformation of the wire or the wire feed roll.

The contact tips should be checked frequently and changed if the copper plating of the wire is damaged on its way through the tips. Copper dust may totally hinder free passage through the wire liner.

A weekly check and cleaning of the tip and the wire feed roll is recommended.

Welding hose

Great care should be taken to ensure the torch hose assembly is properly protected. It should not be pulled over sharp edges, and heavy machines should not run over it as it may damage the wire lines.

The hose assembly should be dismantled every week and blown out with clean, dry compressed air. The torch should be disconnected during this process.

Welding torch

There are many parts in the welding torch that have to be cleaned regularly. The main ones are the contact tips and the gas shroud.

During the welding process, these parts are bombarded with spatter that sticks in the shroud. This may disturb the shielding gas flowing from spatter the gas shroud down to the molten pool, and should be removed regularly. Add MIG-SPRAY to loosen this.

During the cleaning process, the gas shroud should be removed. Do not attempt to clean the shroud by beating the torch.

Power source

The power source should be checked and cleaned at least once a year by trained service staff.

Water module

If the level of coolant in the tank falls so low that the machine is disconnected (error information in the control box display), then extra coolant should be added, using the filling nozzle on the rear of the machine. (Waterlevel should be checked regularly and the filter should be cleaned).

To ensure reliable operation, always use Migatronik coolant (order no. 99290400).

Detection of errors in MIG/MAG welding

Errors	Origin
Uneven wire feed	<ol style="list-style-type: none"> 1. The inlet guide and the groove in the wire roll are not in line. 2. The wire reel is running too tight on the spindle. Sometimes the wire is wrongly reeled so it "crosses". 3. The inlet guide or the contact tip is worn, dirty or maybe blocked. 4. The welding wire is dirty, corroded or of poor quality. 5. There is too little pressure on the counter-roll.
Too much spatter	<ol style="list-style-type: none"> 1. Too high a wire speed in relation to the welding job in hand. 2. The contact tip is worn.
The weld has a coked or brittle appearance. When spot welding a characteristic top appears.	<ol style="list-style-type: none"> 1. The gas nozzle is blocked. 2. The system contains leaks so that atmospheric air is sucked in and mixed with the shielding gas due to the injector effect.
The wire sticks in the contact tip several times and runs slowly.	<ol style="list-style-type: none"> 1. Can be caused by a deformation of the wire in the liner. Cut off the wire at the wire roll and pull the deformed wire out of the liner. Fit a new wire roll and check the pressure on the drive roll. 2. The contact tip is worn.

PERSONAL SAFETY



Light and heat emission

A welding arc emits radiation which is damaging to the human eye. Even short-term exposure to this radiation can cause lasting damage. Protect your eyes from powerful radiation by infra-red, visible and also ultra-violet light by installing suitable radiation protection glass in your welding helmet.

Your skin can also be damaged by welding radiation. Radiation can cause serious burns. Protect your skin by wearing a welding helmet, working clothing covering all exposed parts, and gloves.

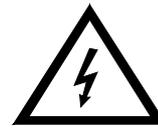
During welding, warn other people in the vicinity of the danger of radiation and sparks. If possible, place a screen between the place of work and the surroundings.

The heat emitted from the arc and pool crater - as well as the sparks emitted during welding - represent a fire hazard. Consequently, welding should never be carried out near combustible materials. Working clothing must not be made of substances which are easily combustible, and should have no folds or open pockets into which sparks can fall. Wear a fire resistant apron if necessary.



Welding fumes

The smoke and gases emitted during welding are damaging to the health. Consequently, the inhalation of welding smoke and gases should be avoided by taking suitable preventive measures (e.g. local air extraction, ventilation, or supply of fresh air to welding helmet).



Electricity

Avoid contact with all live components.

The voltages used in welding are not sufficient to represent a danger in themselves. However, if damp clothing is worn, or if working in damp conditions, electric shocks can be caused, representing an indirect source of danger.

Considerable electric shocks can be caused by HF high voltage ignition during TIG welding in particular, and may lead to minor burns beneath the skin.

Consequently, all contact with live components should be avoided as far as possible.

Always use dry, leather welding gloves and wear dry working clothing and shoes. Keep cables, torches, and the welding machine itself dry at all times.

Make sure that the welding machine's earth connection is properly and safely earthed.

Do not open the machine to expose live components. Maintenance and service which require access to live components inside the machine must be carried out by an authorized electrician.