

MIG/MAG WELDING MACHINES

Ryval 181 BASIC aXe

Ryval 221 BASIC aXe

INSTRUCTION MANUAL

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1. INTRODUCTION

Congratulations on your new Linde AG, Linde Gas Deutschland product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry.

This Operating Manual has been designed to instruct you on the correct use and operation of your Linde AG, Linde Gas Deutschland product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment. While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Ryval 181 and Ryval 221 BASIC aXe are three phase sturdy welding machines for MIG/MAG welding.

The machines are designed to produce maximum power output combined with high reliability and efficiency.

2. SAFETY INSTRUCTIONS AND WARNINGS

1. OPERATION AND MAINTENANCE OF WELDING EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.
2. Arc welding produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near arc welding applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.
3. Once the packing has been opened, make sure that the machine is not damaged. If in any doubt, call the service centre.
4. This equipment must only be used by qualified personnel.
5. During installation, any electric work must only be carried out by trained personnel.
6. The machine must be used in a dry place with good ventilation.
7. Make sure that no metal dust can be drawn in by the fan inside the machine, as this could cause damage to the electronic circuits.
8. It is prohibited to connect more than one generator in series or in parallel.
9. When installing the machine, follow the local regulations on safety.
10. The position of the machine must allow easy access by the operator to the controls and connectors.

11. When the welding machine is operating, all its covers and doors must be closed and well fixed.
12. Do not expose the welding machine to direct sunlight or to heavy rain. This equipment conforms to protection rating IP23S.
13. The operator must wear gloves, clothes, shoes, and a helmet or a welder's helmet, which protect and are fire-resistant in order to protect him against electric shock, flashes and sparks from cutting.
14. The operator must protect his eyes with safety visor or mask designed for welding, fitted with standard safety filters. He should also be aware that during arc welding ULTRAVIOLET RADIATION is emitted. Therefore it is vital that his face is also protected from radiation. Ultraviolet rays produce the same harmful effect as sun burning on unprotected skin.
15. The operator is obliged to warn anyone near the welding area of the risks that welding involves and to arrange to provide adequate protection equipment.
16. Keep all fumes and gases from the breathing area.
17. Keep your head out of the fume plume.
18. Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
19. The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Nickel	Cobalt	Arsenic
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

20. Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
21. It is very important to arrange for sufficient ventilation, especially when welding in enclosed spaces. We suggest using suitable fume extractors to prevent the risk of intoxication by fumes or gas generated by the welding process.
22. Noise can cause permanent hearing loss. Welding arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.
23. To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
24. Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
25. The operator must ensure all flammable materials are removed from the work area to avoid any risk of fire.

26. The operator must NEVER weld containers that have previously contained petrol, lubricants, gas or similar flammable materials, even if the container has been empty for a considerable time. THERE IS A VERY HIGH RISK OF EXPLOSION.
27. The operator must be aware of all the special regulations which he needs to conform to when cutting in enclosed spaces with a high risk of explosion.
28. To prevent electric shock, we strongly suggest the following rules:
29. Do not work in a damp or humid environment.
30. Do not use the machine if its cables are damaged in any way.
31. Make sure that the earthing system of the electric equipment is correctly connected and operational.
32. The operator must be insulated from the metal components connected to the return wire.
33. The earthing of the piece being worked could increase the risk of injury to the operator.
34. EN 60974-1 Standard: Open-circuit voltage. During the operation of the machine, the highest voltage, with which it is possible to come into contact, is the open-circuit voltage between the clamps.
35. The maximum open-circuit voltage of the plasma machines is established by national and international standards (EN 60974-1) depending on the type of current to be used, on its waveform and on the hazards arising from the work place. These values are not applicable to the strike currents and those for stabilisation of the arc that could be above it.
36. The open-circuit voltage, for as many adjustments as possible, must never exceed the values relating to the various cases shown in the following table:

Case	Working conditions	Open-circuit voltage	
1	Places with increased risk of electric shock	DC current: 113V peak value	AC current: 68V peak value and 48V effective
2	Places without increased risk of electric shock	DC current: 113V peak value	AC current: 113V peak value and 80V effective
3	Torches held mechanically with increased protection for the operator	DC current: 141V peak value	AC current: 141V peak value and 100V effective
4	Plasma cutting	DC current: 500V peak value	

37. In case 1, the dc machines with rectifier must be built in such a way that, in case of a fault developing in the rectifier (for example open circuit,

short circuit or lack of power), the permitted values cannot be exceeded.

The welding machines of this type can be marked with the symbol: 

38. Before opening the machine switch off the machine and disconnect it from the power socket.
39. Only personnel authorised by this company can carry out maintenance on the machine.

PROTECTIVE UTILITIES

1. Welding helmet with filter shade at least 10
2. Welding gloves
3. Welding apron and cloth
4. Welding boots

RISK OVERVIEW

1. Risk of electric shock.
2. Ultraviolet light and light radiation
3. Risk of inhaling gas fumes and dust particles
4. Burns
5. Noise

NOTE

1. It is forbidden to operate a machine with damaged insulation of the welding torch or supply cable.
2. Never operate the machine taken down or damaged covers.
3. It is forbidden to operate the machine in wet environments and outdoors in rain or snow.
4. Ensure proper grounding clamping pliers, which also reduces the risk of electric shock.
5. Use prescribed protective utilities, keep them dry.
6. Arc welding produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.
7. Never aim the torch against the eyes, body or other person.

3. CONDITIONS OF USE

1. This equipment must only be used by qualified personnel.
2. During installation, any electric work must only be carried out by trained personnel.
3. Device complies with IEC 61000-3-12.
4. Do not expose the plasma machine to direct sunlight or to rain or snow. This equipment conforms to protection rating IP23S.
5. Place the machine the way that the cooling air can enter the vents without restriction to. It is necessary to ensure that no impurities, especially metal particles are not drawn into the machine.
6. Welding machine in terms of interference suppression is intended primarily for industrial premises. In the case of use of other areas may be need for special measures (see EN 60974-10).
7. The machine must be protected against
 - a) Moisture and rain and snow
 - b) Mechanical damage
 - c) Draft and any ventilation of neighbouring machine
 - d) Excessive overloading - crossing technical parameters
 - e) Rough handling

ELECTROMAGNETIC COMPATIBILITY

The welding device is in terms of interference designed primarily for industrial areas. It meets the requirements of EN 60974-10 class A and it isn't designed for using in residential areas, where the electrical energy is supplied by public low-voltage power supply network. It can be here potential problems with ensuring of electromagnetic compatibility in this areas, due to interference caused by power lines as well as the radiated interference.

During operation, the device may be the source of interference.

 Caution 

We warn users, that they are responsible for possible interference from welding.

4. TECHNICAL DATA

		Ryval 181	Ryval 221
Mains voltage	V/Hz	3 x 400/50	3 x 400/50
Mains protection	A	10 @	16 @
Max. input power I1	A	8,9	12,1
Max. effective current I1eff	A	5,9	7,7
Welding current range	A	30 - 180	30 - 210
Open-circuit voltage U20	V	19,3 - 37,7	20,8 - 43,6
Welding current (DC=100%) I2	A	130	150
Welding current (DC=60%) I2	A	150	170
Welding current (DC=x%) I2	A	40%=180	40%=210
Voltage steps		7	7
Insulation class		F	F
Protection		IP 23S	IP 23S
Standards		EN 60974-1; EN 60974-10 class A	
Dimensions (w x l x h)	mm	474 x 888 x 561	474 x 888 x 561
Weight	kg	61	65
Wire speed	m/min	1 - 17	1 - 17
Spool diameter	mm	300	300
Spool weight	kg	18	18

5. ACCESSORIES

DELIVERED WITH THE MACHINE

1. Earthing cable 3m with a clamp
2. Feed roll 0,6 - 0,8 mm for ALF 181; 0,8 - 1,0 mm for ALF 221
3. Gas hoses
4. Reduction for the wire spool

ACCESSORIES TO ORDER

1. Wire cleaner
2. CO2 Gas pre heating cable
3. Reduction valve KU 5, K 2
4. Gas cylinder
5. Torch consumables
6. Earthing cable 4 - 5 m
7. Feed rolls 0,6-0,8, for carbon steels, aluminium, flux core wires
8. Welding torches

6. DESCRIPTION OF THE APPLIANCE

MAIN PARTS

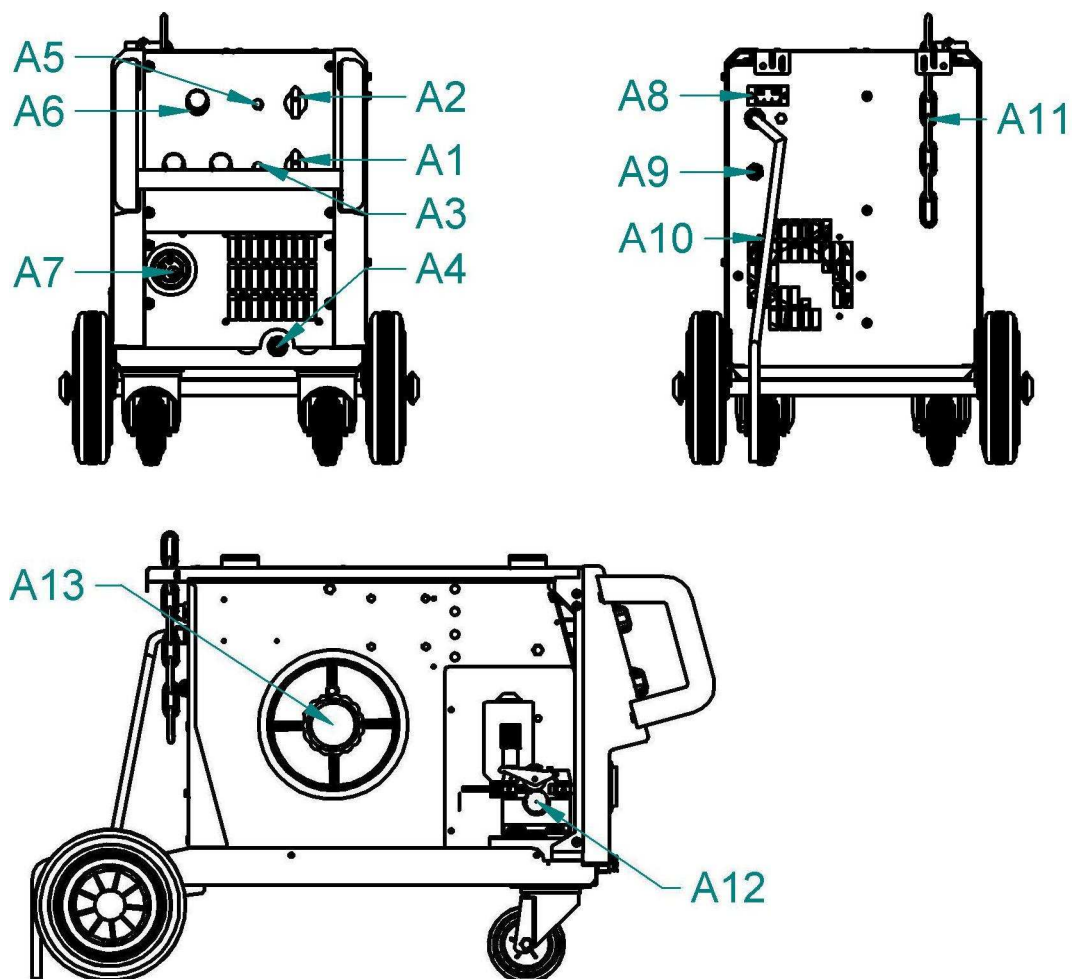


Fig. 1 - Main parts

A1	ON / OFF Switch
A2	Voltage switch
A3	LED ON Indicator
A4	Work leads
A5	LED over heating indicator
A6	Wire speed potentiometer
A7	EURO connector
A8	Gas heater connector
A9	Solenoid Valve – gas connector
A10	Mains cable
A11	Chain for fixing the gas cylinder
A12	Wire Feeder
A13	Spool Holder

CONTROL PANEL - OVERVIEW

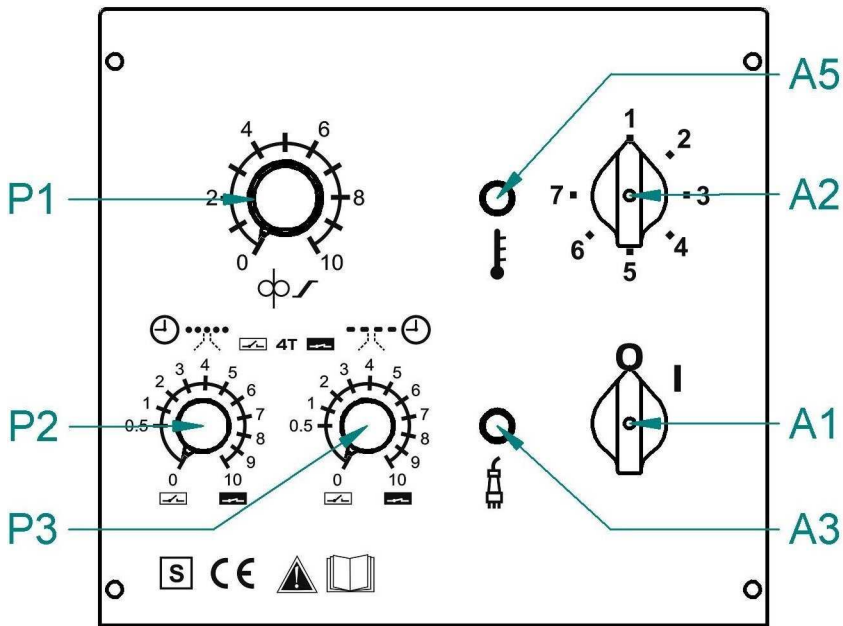


Fig. 2 - Control panel

A1	PCB - encoder ON / OFF Switch
A2	Voltage switch
A3	LED ON Indicator
A5	LED over heating indicator
P1	Wire speed potentiometer
P2	Spot time potentiometer
P3	Interval time potentiometer

WIRE FEEDER

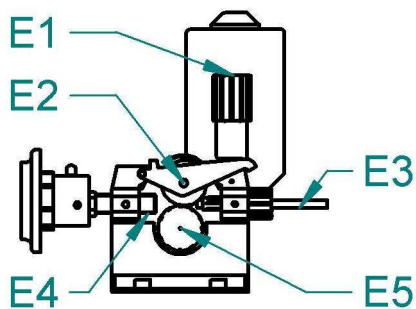
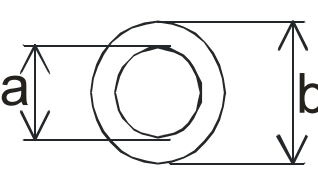
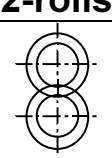
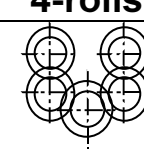
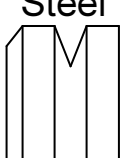
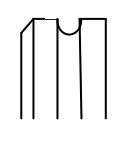
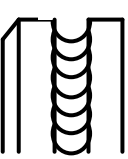


Fig 3 – Wire feeder

Pos.	Description
E1	Fixing shaft
E2	Pressure arm
E3	Liner- Feeder
E4	EURO connector
E5	Roll, Plastic cup

		PS 2(W)	PS 4(W)
		2-rolls	4-rolls
			
		a = 22 mm b = 30 mm	a = 22 mm b = 30 mm
Grove type	Wire diameter	Item No	
Steel 	0,6-0,8	2187	
	0,8-1,0	2188	
Aluminium 	0,8-1,0	2270	
	1,0-1,2	2269	
Flux core 	1,6-2,0	2513	
	0,8-1,0	2318	
	1,0-1,2	2319	

7. GETTING STARTED

Getting started must be consistent with technical data and conditions of use.

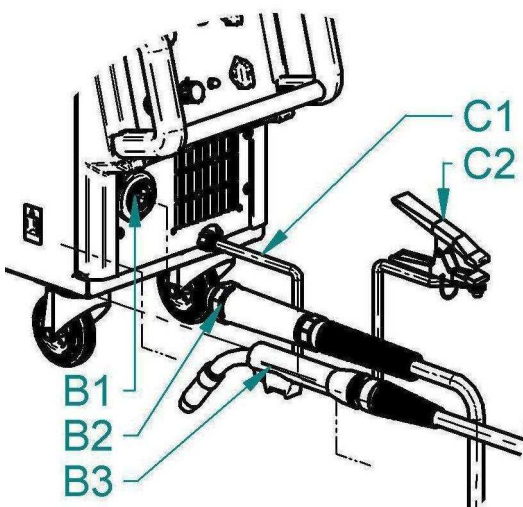
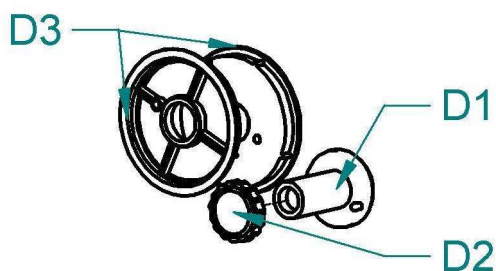


Fig 4 – Earthing cable connecting

B1	Euro connector female
B2	Torch Euro connector
B3	Welding torch
C1	Work lead
C2	Earthing clamp

1. Connect the earthing clamp **C2** to the welding piece.
2. Connect the **B1** and **B2** torch connectors together. Screw them up properly by mean turning the **B2** clockwise.
3. Plug the mains plug to 3x400 V mains.
4. Switch the machine on by the ON/OFF switch **A1**.

INSERTING THE WIRE



D1	Spool holder
D2	Nut spool holder
D3	Adapter

Fig. 5 – Spool holder

1. Open the side cover of the wire feeder space.
2. Put the wire spool on the wire spool holder **D1** using the adapter **D3** and fix it with the fixing nut **D2**.
3. Cut off the curved or damaged end of welding wire and lead it through the inlet liner **E3**, and the roll into the liner inside the EURO torch connector (about 5 cm). Make sure, that you use the suitable groove.
4. Put the pressure arm **E2** down in that way, that the teeth or the gear fit and fix it by setting the lever **E1** into vertical position.
5. Adjust the pressure nut that way that it provides constant movement of wire but it does not deform wire.

INSERTING THE WELDING WIRE INTO THE WELDING TORCH

1. See the manual of the welding torch.
2. Take off the torch gas cup.
3. Take off the torch tip.
4. Press the torch trigger, the wire will start feeding into the torch.
5. When the wire reaches the end of the torch, release the trigger, screw on the tip and the nozzle.

CHANGING THE WIRE FEEDER ROLL

1. Every wire feeding roll in Linde AG, Linde Gas Deutschland machines can be used for two different diameters of welding wire – the rolls have two grooves.
2. When the machine is equipped with two roll wire feeder move the lever **E1**

to the right (2 roll feeder)/ forward (4 roll feeder). The pressure arm shall pop up.

3. Unscrew the plastic fixing cup **E5** and take off the roll.
4. In case there is suitable groove on the roll, turn it around and fix it back to the feeder.

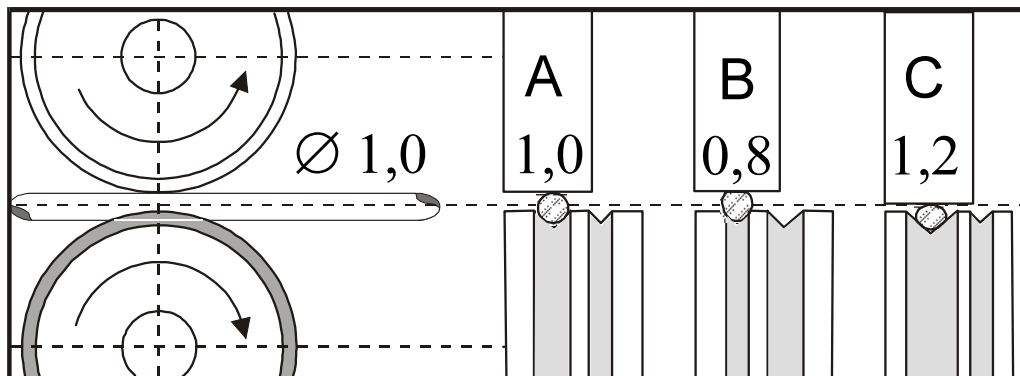


Fig. 6- The influence of the roll groove on the wire

A	Correct
B	Wrong
C	Wrong

ADJUSTING THE MACHINE FOR WELDING OF ALUMINIUM

1. For feeding the AL wire it is necessary to use roll with the “U” profile of the groove. To prevent problems with feeding use wires with diameter 1,0 or more mm of AlMg3 or AlMg5. The torch must be equipped with Teflon liner and special tip. As shielding atmosphere use Argon.

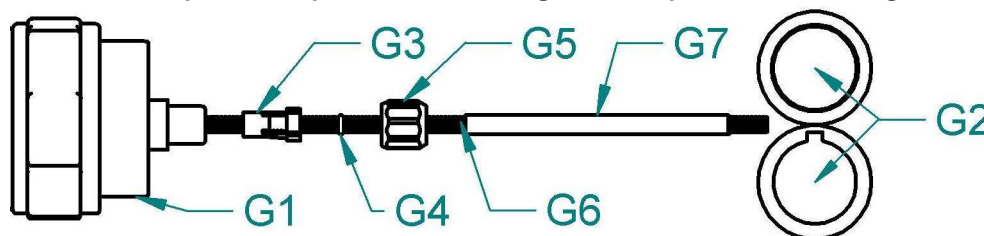


Fig 7 – Set for welding aluminium

G1	EURO connector
G2	Rolls
G3	Liner terminal for 4,0mm, 4,7mm outer diameter
G4	O – ring 3,5x1,5mm
G5	Nut
G6	Teflon Liner
G7	Sustain pipe for teflon and plastic liner

GAS FLOW SETTING

The electric arc and the weld must be perfectly shielded by gas. Too small amount of gas does not perform the protective atmosphere and on the other hand to big amount of the gas brings air into the electric arc.

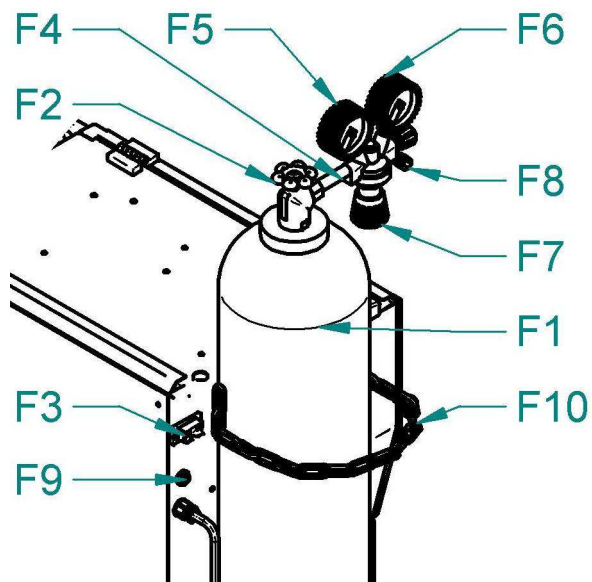


Fig. 8 – Gas fitting

F1	Gas Cylinder
F2	Cylinder Valve
F3	Gas heater connector
F4	Pressure Reducer
F5	High Pressure Manometer
F6	Low Pressure Manometer
F7	Adjusting Screw
F8	Gas outlet
F9	Solenoid Valve
F10	Chain

1. Place the gas cylinder on the platform and fix it properly by the fixing chain. We recommend using bolts and nuts to fix it more safely.
2. Connect the pressure reduction valve on the gas cylinder.
3. Connect the gas hose to gas outlet **F8** on the valve and the gas inlet **F9** on the machine.
4. In case you use gas CO₂ it may be needed to use suitable gas heater (only above 6 l/min). Connect the heater to the **F3** heater connector (optional). Use type corresponding to voltage and current given on the shield.
5. Open the **F2** cylinder valve.
6. Press the torch trigger.
7. Adjust the amount of gas on the reduction gas valve (it is not a part of the welding machine) by the **F7** adjusting screw.
8. Release the torch trigger.

8. WELDING

For orientating adjusting of the welding current and voltage you can use empirical relation $U_2 = 14 + 0,05 I^2$. From that you can specify desired voltage.

SETTING WELDING CURRENT AND VOLTAGE

When the wire had been installed and gas had been set it is possible to start welding.

The appliance must be plugged into the mains, the ON/OFF switch **A1** on "I".

To select the voltage use step switch **A2**.

To select the current (that is linked to the wire speed) use the potentiometer **A6 (P1)**.

WELDING MODES

Machines works in four modes:

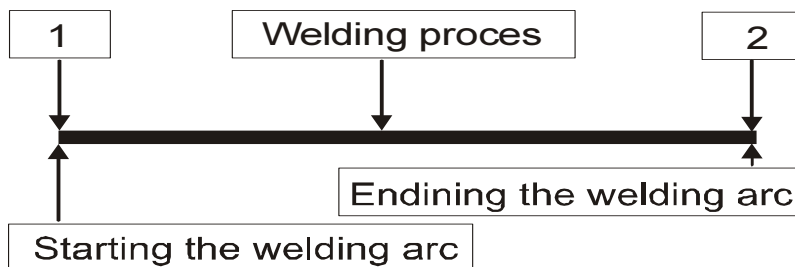
1. Continuous two stroke (2T)
2. Continuous four stroke (4T)
3. Spot welding
4. Interval welding

TWO STROKE

P2 P3



Both potentiometers **P2, P3** are in the OFF position. Welding procedure starts by pressing the button in the torch handle. It is necessary to keep the button pressed all the time during welding. The welding stops by releasing the torch button.



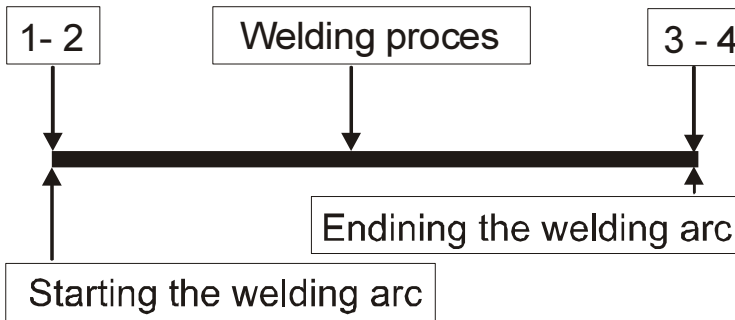
FOUR STROKE

P2 P3



The four stroke mode is being used mostly for long welds, when there is no need to hold the torch button pressed. The left potentiometer **P2** is in the OFF position, the right potentiometer **P3** is in the ON position. The welding procedure start by pressing the torch button; after releasing the torch

button the welding continues. The welding stops after the second pressing and releasing the torch button then.

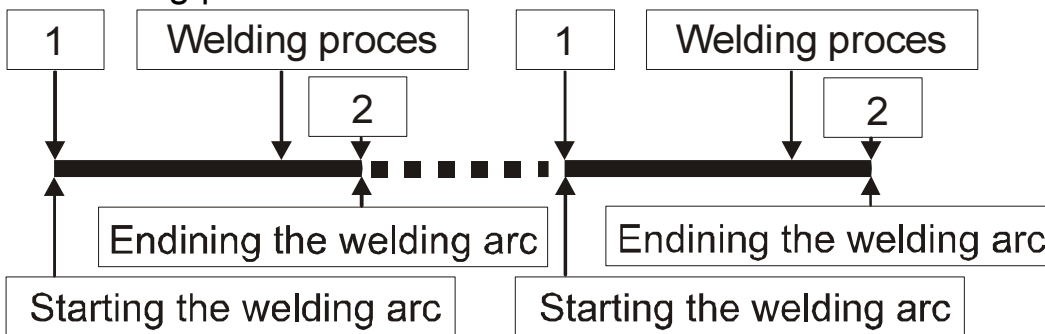


SPOT WELDING

P2 P3



The spot welding mode is being used for welding short welds of the same length. The length (welding time) can be set by the left potentiometer **P2**, the right potentiometer **P3** must be in the OFF position. The pressing the torch button activates the time circuit that starts and end the welding procedure.

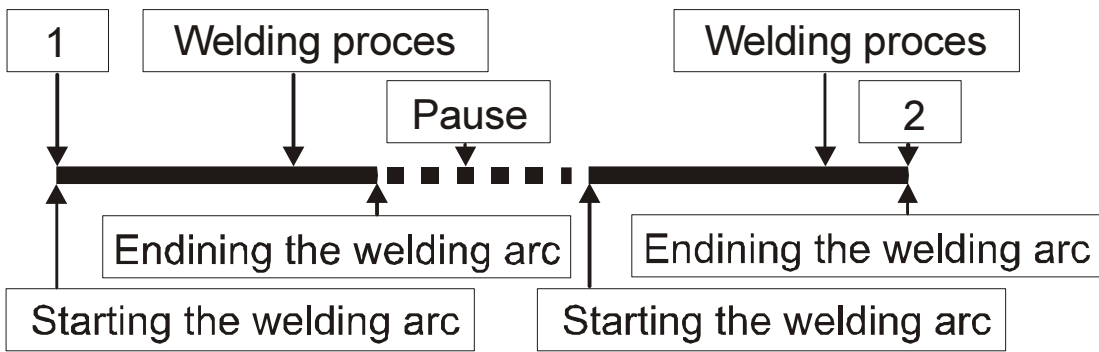


INTERVAL WELDING

P2 P3



The interval welding mode is being used for welding repeated short welds of the same length of welding time and the pause time. The length of welding time can be set by the left potentiometer **P2**, the pause by the right potentiometer **P3**. By pressing the torch button activate the time circuit that starts and end the welding procedure.



BURN BACK SETTING

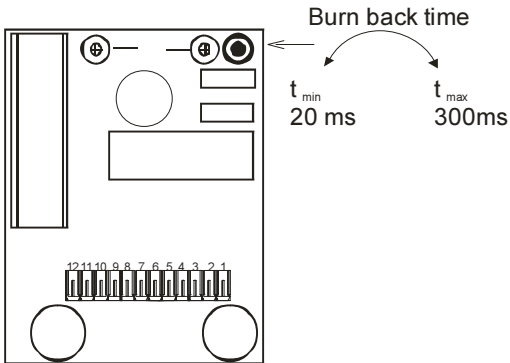










Fig. 9 – Burn back time trimmer

The burn back function if set suitably prevents sticking the welding wire into the welding tip. The default time is 50-80 ms. It is possible to change the burn back time by means of a trimmer placed on the rear side of the control board. It is necessary to take off the front panel. Only a qualified person may carry out this operation.

TABLE OF WELDING PARAMETERS

Recommended welding parameters - Ryval 181							
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 0,8 mm						
Gas	(EN ISO 14175) M21 - Ar 82%, CO2 18%						
	1	2	3	4	5	6	7
A	---	65	95	122	150	165	180
m/Min.	---	2,0	3,0	4,0	5,0	6,0	7,5
mm	---	0,8	1,5	2,0	3,0	4,0	5,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 1,0 mm						
Gas	(EN ISO 14175) M21 - Ar 82%, CO2 18%						
	1	2	3	4	5	6	7
A	---	80	130	155	180	200	215
m/Min.	---	1,5	2,3	3,0	3,5	4,0	4,5
mm	---	0,8	1,5	2,0	3,0	4,0	5,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 0,8 mm						
Gas	(EN ISO 14175) C1 - CO2 100%						
	1	2	3	4	5	6	7
A	---	50	80	108	125	140	157
m/Min.	---	1,8	2,5	3,5	4,0	5,0	6,0
mm	---	0,8	1,5	2,0	3,0	4,0	5,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 1,0 mm						
Gas	(EN ISO 14175) C1 - CO2 100%						
	1	2	3	4	5	6	7
A	---	65	100	130	150	170	180
m/Min.	---	1,2	1,8	2,3	2,8	3,2	3,5
mm	---	1,0	1,5	2,0	3,0	4,0	5,0

Recommended welding parameters - Ryval 221							
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 0,8 mm						
Gas	(EN ISO 14175) M21 - Ar 82%, CO2 18%						
	1	2	3	4	5	6	7
A	45	85	118	160	182	194	227
m/Min.	1,0	2,0	3,0	4,2	5,5	7,0	9,0
mm	0,8	1,5	2,0	3,0	4,0	5,0	6,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 1,0 mm						
Gas	(EN ISO 14175) M21 - Ar 82%, CO2 18%						
	1	2	3	4	5	6	7
A	60	100	130	175	200	230	245
m/Min.	1,2	2,0	2,5	3,6	4,3	5,0	5,8
mm	1,0	1,5	2,0	3,0	4,0	5,0	6,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 0,8 mm						
Gas	(EN ISO 14175) C1 - CO2 100%						
	1	2	3	4	5	6	7
A	---	50	90	124	160	178	188
m/Min.	---	1,2	3,0	4,2	5,5	6,8	8,1
mm	---	0,8	2,0	3,0	4,0	5,0	6,0
Wire	(EN ISO 14341) G2Si1, G3Si1, G4Si1 - 1,0 mm						
Gas	(EN ISO 14175) C1 - CO2 100%						
	1	2	3	4	5	6	7
A	---	78	105	135	155	195	225
m/Min.	---	1,5	2,0	2,4	3,2	4,0	5,5
mm	---	1,0	1,5	2,0	3,0	4,0	5,0

9. ROUTINE MAINTENANCE & INSPECTION

1. The only routine maintenance required for the Ryval range of machines is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

 **WARNING** 

2. Disconnect the Ryval from the mains supply voltage before disassembling.
3. Special maintenance is not necessary for the control unit parts in the Welder. If these parts are damaged for any reason, replacement is recommended.

 CAUTION 

4. Do not blow air into the welder during cleaning. Blowing air into the welder can cause metal particles to interfere with sensitive electronic components and cause damage to the welder.
5. To clean the welder, disconnect it from the mains supply voltage then open the enclosure and use a vacuum cleaner to remove any accumulated dirt and dust. The welder should also be wiped clean. If necessary, solvents that are recommended for cleaning electrical apparatus may be used.
6. Troubleshooting and repairing of Ryval welding equipment should only be carried out only by suitably qualified or competent person.
7. A 'competent person' must be a person who has acquired through training, qualification or experience, or a combination of them, the knowledge and skills enabling that person to safely carry out a risk assessment and repairs to the electrical equipment in question.
8. The person carrying out the servicing needs and repairs must know what to look at, what to look for and what to do.

10. STATEMENT OF WARRANTY

1. In accordance with the warranty periods stated below, Linde AG, Linde Gas Deutschland guarantees the proposed product to be free from defects in material or workmanship when operated in accordance with the written instructions as defined in this operating manual.
2. Linde AG, Linde Gas Deutschland welding products are manufactured for use by commercial and industrial users and trained personnel with experience in the use and maintenance of electrical welding and cutting equipment.
3. Linde AG, Linde Gas Deutschland will repair or replace, at its discretion, any warranted parts or components that fail due to defects in material or workmanship within the warranty period. The warranty period begins on the date of sale to the end user.
4. If warranty is being sought, please contact your Linde AG, Linde Gas Deutschland product supplier for the warranty repair procedure.
5. Linde AG, Linde Gas Deutschland warranty will not apply to:
6. Equipment that has been modified by any other party other than Linde AG, Linde Gas Deutschland's own service personnel or with prior written consent obtained from Linde AG, Linde Gas Deutschland Service Department.
7. Equipment that has been used beyond the specifications established in the operating manual.
8. Installation not in accordance with the installation/operating manual.
9. Any product that has been subjected to abuse, misuse, negligence or accident.
10. Failure to clean and maintain (including lack of lubrication,

maintenance and protection), the machine as set forth in the operating, installation or service manual.

11. Within this operating manual are details regarding the maintenance necessary to ensure trouble free operation.



12. Warranty repairs must be performed by either an Linde AG, Linde Gas Deutschland Service Centre, an Linde AG, Linde Gas Deutschland distributor or an Authorised Service Agent approved by the company Linde AG, Linde Gas Deutschland.

11. DISPOSAL



Only for EU countries. Do not dispose of electric tools together with household waste material.

In accordance with European Council Directive 2002/96/EC on electrical and electronic equipment waste and its implementation in accordance with national law, electric tools that have reached the end of their service life must be collected separately and returned to an environmentally compatible recycling facility.