ELEKTRA BECKUM®

Ein Unternehmen der Metabo-Gruppe

(D) Betriebsanleitung
Schweißgeräte mit stufenloser Regelung

(ENG) Operating Instructions
Welding Transformers and Rectifiers
with Stepless Current Control

English only

(F) Instructions d'utilisation
Appareil de soudure avec réglage en continu

(NL) Handleiding
Lasapparaten met traploze instelling

SB 160 C / SB 200 CT

115 117 9491 / 2402 - 3.2 / de, en, fr, nl

(D)	**Achtung!**	Lesen Sie diese Anleitung vor der Installation und Inbetriebnahme aufmerksam durch.
(ENG)	**Attention!**	Carefully read through these instructions prior to installation and commissioning.
(F)	**Attention !**	Prière de lire attentivement la présente notice avant l'installation et la mise en service.
(NL)	**Oppassen!**	Lees deze instructies voor de installatie en ingebruikname aandachtig door.

D DEUTSCH

KONFORMITÄTSERKLÄRUNG

Wir erklären in alleiniger Verantwortlichkeit, daß dieses Produkt mit den folgenden Normen übereinstimmt* gemäß den Bestimmungen der Richtlinien**.

ENG ENGLISH

DECLARATION OF CONFORMITY

We herewith declare in our sole responsibility that this product complies with the following standards*
in accordance with the regulations of the undermentioned Directives**

F FRANÇAIS

DECLARATION DE CONFORMITE

Nous déclarons, sous notre seule responsabilité, que ce produit est en conformité avec les normes ou documents normatifs suivants* en vertu des dispositions des directives **

NL NEDERLANDS

CONFORMITEITSVERKLARING

Wij verklaren als enige verantwoordelijke, dat dit product in overeenstemming is met de volgende normen*
conform de bepalingen van de richtlijnen**

IT ITALIANO

DICHIARAZIONE DI CONFORMITÀ

Noi dichiariamo sotto la nostra esclusiva responsabilità che il presente prodotto è conforme alle seguenti norme*. in conformità con le disposizioni delle normative **

ES ESPAÑOL

DECLARACION DE CONFORMIDAD

Declaramos bajo nuestra exclusiva responsabilidad, que el presente producto cumple con las siguientes normas*.de acuerdo a lo dispuesto en las directrices**

PT PORTUGUÊS

DECLARAÇÃO DE CONFORMIDADE

Declaramos sob nossa responsabilidade que este produto está de acordo com as seguintes normas*.de acordo com as directrizes dos regulamentos **

SV SVENSKA

FÖRSÄKRAN OM ÖVERENSSTÄMMELSE

Vi försäkrar på eget ansvar att denna produkt överensstämmer med följande standarder*. Enligt bestämmelserna i direktiven**

FIN SUOMI

VAATIMUKSENMUKAISUUSVAKUUTUS

Vakuutamme, että tämä tuote vastaa seuraavia normeja*.on direktiivien määräysten mukainen**

NO NORGE

SAMSVARSERKLÆRING

Vi erklærer under eget ansvar at dette produkt samsvarer med følgende normer*. henhold til bestemmelsene i direktiv**

DA DANSK

OVERENSSTEMMELSESATTEST

Hermed erklærer vi på eget ansvar, at dette produkt stemmer overens ed følgende standarder*. iht. bestemmelserne i direktiverne**

POL POLSKI

OŚWIADCZENIE O ZGODNOŚCI

Oświadczamy z pełną odpowiedzialnością, że niniejszy produkt odpowiada wymogom następujących norm*.według ustaleń wytycznych **

EL ΕΛΛΗΝΙΚΑ

ΔΗΛΩΣΗ ΑΝΤΙΣΤΟΙΧΕΙΑΣ

Δηλώνουμε με ιδία ευθύνη ότι το προϊόν αυτό αντιστοιχεί στις ακόλουθες προδιαγραφές*
σύμφωνα με τις διατάξεις των οδηγιών**

HU MAGYAR

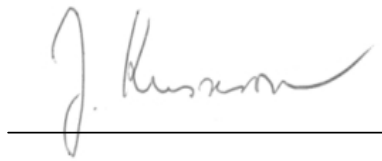
MEGEGYEZŐSÉGI NYILATKOZAT

Kizárólagos felelősségünk tudatában ezennel igazoljuk, hogy ez a termék kielégíti az alábbi szabványokban lefektetett követelményeket*.megfelel az alábbi irányelvek előírásainak**

SB 160 C - SB 200 CT

* EN 50060; EN 55014 (1993); DIN EN 61000-4-1 (1993), EN 60974-1

** 89/336/EWG, 73/23/EWG



Dipl. Ing. Jürgen Kusserow

Vorstand

CE

ELEKTRA BECKUM AG – Daimlerstraße 1 – 49716 Meppen

Tel.: +49 59 33 80 20

1000965/ 00

Contents

You have bought a high-quality electric arc welding machine, designed and built by specialists with many years of experience. A machine built to last, giving a long service life.
All models have the correct size power supply cable fitted, the transformer‘s core is made from top-quality insulated sheet steel, to keep eddy currents and cyclic magnetization losses to an absolute minimum.

Please read the instructions given in the manual in order to fully utilize the potential of your machine.
Know and adhere to all local safety codes and regulations governing the operation of electric arc welding machines.

User Responsibility

The operation of the welding divice in the data processing system environment is not allowed!

This product shall only be used as specified. Any other use requires the written consent of Elektra Beckum AG, P.O.Box 1352, D-49703 Meppen, Germany
Please contact your dealer for any warranty claims.
Warranty work will essentially be carried out by service centres authorised by us. Repairs beyond the warranty period may be carried out only by our authorised service centres.
Please preserve all repair invoices! We reserve the right to make technical changes!
We recommend attending a welding course at a recognised technical institute.

1 Specifications

Model	**SB 160 C**	**SB 200 CT**	**SB 200 CT**
Main voltage	230/400 V	240 V	230/400 V
Mains frequency	50/60 Hz	50 Hz	50/60 Hz
Welding steps	stepless	stepless	stepless
Stepless at 230 V	32 - 38 V	47 - 55 V	31 - 39 V
Stepless at 400 V	38 - 46 V		41 - 50 V
Max. OCV at 230 V	16 A time-lag	32 A time-lag	16 A time-lag
Max. OCV at 400 V	16 A time-lag		20 A time-lag
Insulation class	H	H	H
Protection class	IP 21	IP 21	IP 21
Setting range, stepless 230 V	30 - 110 A	70 - 180 A	20 - 110 A
Setting range, stepless 400 V	65 - 155 A		60 - 180 A
Cooling	self	fan	fan
Weldable electrodes at 230 V	Ø 1.6 - 2.5 mm	Ø 2,0 - 4,0 mm	Ø 1.6 - 2.5 mm
Weldable electrodes at 400 V	Ø 2.0 - 3.25 mm		Ø 2.0 - 4.0 mm

2 Taking a Single-Phase Machine into Operation

This machine is to be connected to the power mains via a Earth Fault Circuit Interrupter of 30 mA capacity. Worn or damaged power cables should be replaced immediately by a qualified electrician.
Do not operate this machine with a damaged power cable, danger of personal injury by electric shock.
Children are not permitted to operate this machine.
Connect to an earthed single-phase 230/240 V outlet, protected by a 16 A time-lag fuse. Operating other electric machines or appliances on the same circuit while welding is only possible to a very limited extent and not recommended.
Earth and welding cable are firmly attached to the machine.
Polarity does not matter with AC welding current.

Attach earth clamp to the workpiece, close to the weld seam and on bare metal for good conduction.
Place stick electrode into the electrode holder.
With the handwheel select the desired welding current.
If there is not power outlet near the work area an extension cable is required. The cable's lead cross section must be at least 2.5 mm^2. Uncoil extension cable fully to prevent heatbuild-up by inductance. Inductance also conside-rably reduces the welding current. Extension of the welding cables is also possible, but the cross section of the extension cables must be larger than that of the cables supplied with the machine.
Every machine is protected against overloads by a thermo switch, which switches the power to the transformer off if it becomes too hot. After a short cooling-down period the machine will switch back on automatically. Model SB 200 CT is equipped with a fan for forced cooling, given better performance with a higher duty-cycle.

3 General Information for Welding Transformer/Rectifier Operators

Dust, dirt and metal chips will harm any welding machine. It is of particular importance that the air ventilation for cooling is not obstructed.
A weld should join two work pieces as if they were made from a single piece. Prior to the welding the joints must be cleaned and dirt, rust, grease and paint removed. Also slag from previous welds must be completely removed. Attach earth clamp firmly to work piece, assuring good metal to metal contact. Check that all cables and connectors are in proper operating condition to ensure proper current conduction.
Place electrode with the uncoated end into one of the electrode holder's notches. Each welding machine is supplied complete with an accessory kit, comprising the welding cables, a welding visor and a slag hammer. When removing slag it is recommended to protect the eyes by suitable means (goggles) from injury by sharp and hot slag. The welding visor's dark glass plate protects the eye against ultra-violet and infrared rays. The clear glass plate protects the dark plate against spatters and damage. The dark protective glass is available in different shades for different types of electrodes and to suit different eye sensivity. Normally for electrodes from 1.5 mm to 4 mm Ø protective glasses of shade DIN 9 are used, for electrode over 4 mm Ø shade DIN 10.
Select the correct welding current as shown below:

Current (A)	Electrode Ø	Material Thickness
25 - 50	1.0 - 2.0 mm	1.0 - 2.0 mm
50 - 100	2.0 - 2.5 mm	2.0 - 4.0 mm
100 - 140	2.5 - 3.25 mm	4.0 - 8.0 mm
140 - 220	3.25 - 5.0 mm	8.0 - 12.0 mm
220 - 300	5.0 - 6.0 mm	12.0 - 20.0 mm

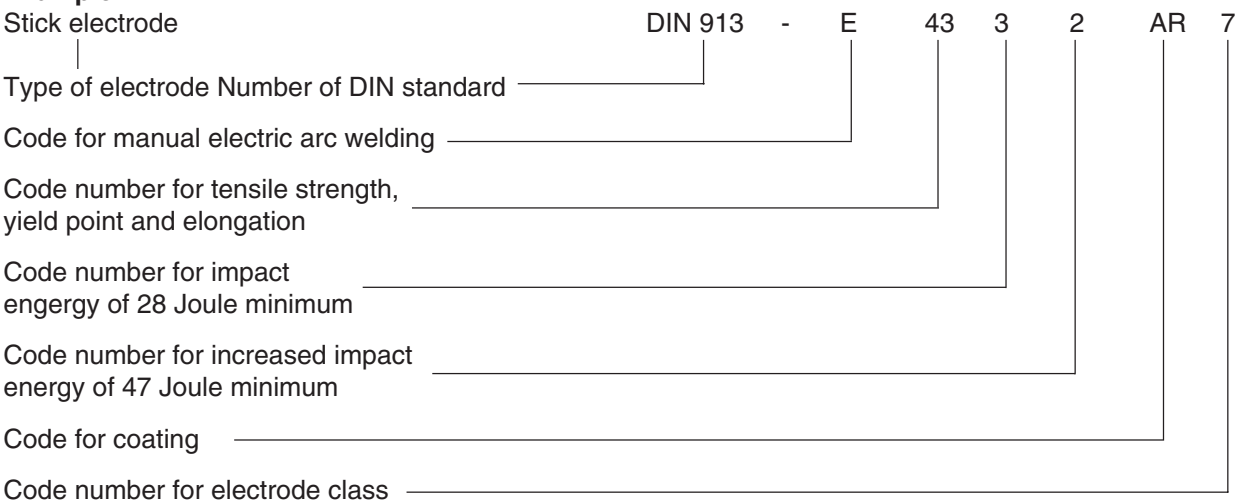
In principle do not use too thick an electrode. As a general rule calculate 40 amps welding current per 1 mm of electrode diameter. Depending on electrode type, material thickness and weld position this calculated value may have to be adjusted to plus or minus. All machines work well with thin plate from 1.0 mm thickness.

3.1 Care of Stick Electrodes and their correct Use

In order to achieve a good weld the electrode has to be dry, thus storing in a dry place is essential- Should electrodes have become moist, dry in an oven at between 200° C to 300° C for 30 minutes.
Basic coated low-hydrogen type electrodes always require pre-drying at 200° C to 300° C for 3 hours as atomic hydrogen causes weld flaws.
The designation of welding electrodes is standardized by DIN 1913. The designation is stipulated by the electrode manufacturers in accordance with the standard and checked by an inspection body. It is printed on the electrode packet.

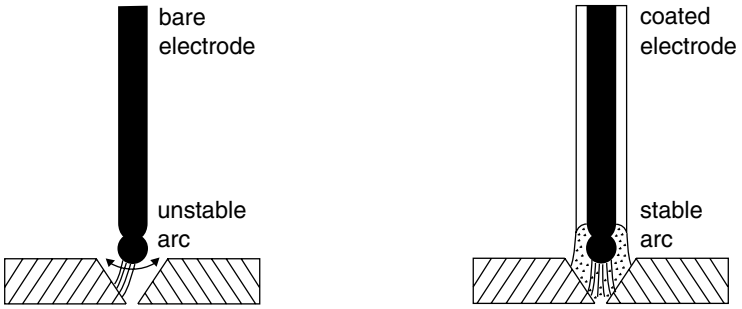
3.1.1 Coding of Stick Electrodes according to DIN 1913

Example:

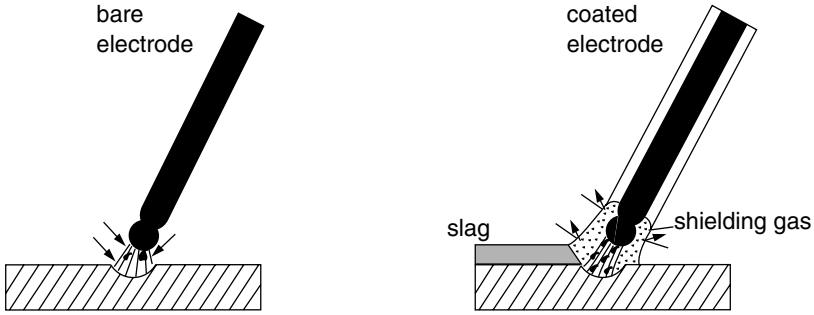


3.1.2 Function of the Stick Electrode Coating

Stabilization of the arc and Ionization of the arc space



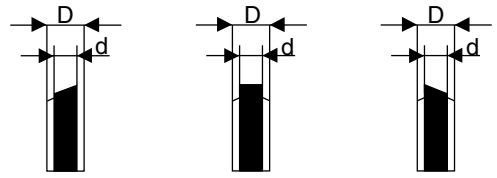
Protection of the weld metal from atmospheric oxygen and nitrogen



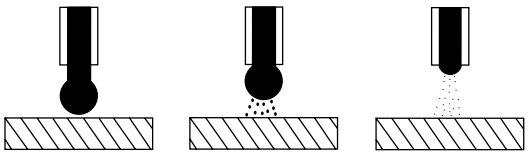
This protection is achieved by the generation of shielding gases and slag during the melting of the electrode.
Compensation of alloy burn-off.

Stick Electrodes According to DIN 1913

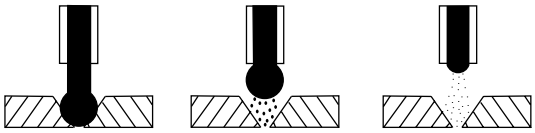
Coating thickness



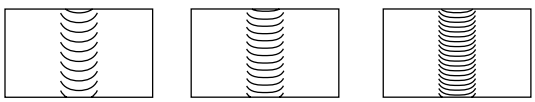
Material transfer



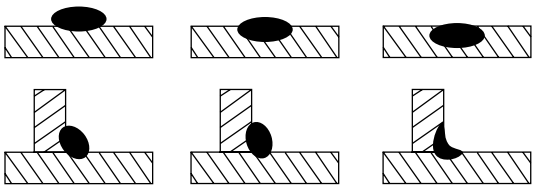
Gap bridging ability



Weld seam appearance



Penetration depth



Types of Coating

A	acid coated
R	rutile light and medium coating
RR	rutile heavy coating
AR	rutile acid coating
C	cellulose coating
R(C)	rutile cellulose medium coating
RR(C)	rutile cellulose heavy coating
B	basic coating
B(R)	basic coating with non-basic proportions
RR(B)	rutile basic heavy coating

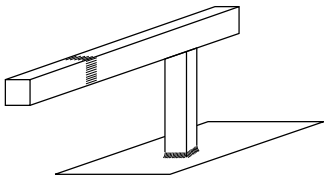
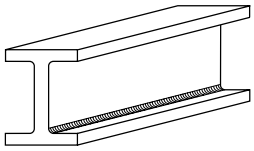
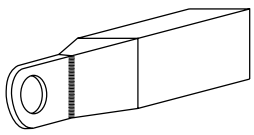
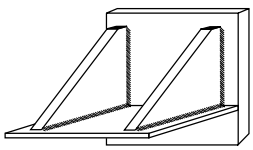
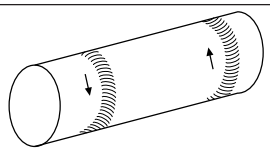
3.1.3 Classification of Stick Electrodes according to Table 3 of DIN 1913

Grade	Stick Electrode Type	Coating Thickness	Weld Position
2	A 2	light	1
	R 2		
3	R 3	medium	2 (1)
	R(C) 3		1
4	C 4		
5	RR 5	heavy	2
	RR(C) 5		1
6	RR 6		2
	RR(C) 6		1
7	A7		2
	AR 7		
	RR(B) 7		
8	RR 8		
	RR(B) 8		
9	B 9		1
	B(R) 9		
10	B 10		2
	R(R) 10		
11	RR 11	(high-performance electrodes)	4 (3)
	AR 11		
12	B 12		
	B(R) 12		

Code for Welding Position according to Table 4 of DIN 1913

Code	Weld Position	Code Letter For Welding Position
1	all	w, h, hü, s, f, q, ü
2	all except vertical-down	w, h, hü, s, q, ü
3	gravity position fillet weld gravity position horizontal	w w h
4	gravity position	w

3.1.4 Selecting suitable Electrodes for a Welding Task

Component	Welding Task	Stick Electrode Type
	out-of position welding of butt and fillet welds on thin-walled extrusion	RR 6 RR 8
	horizontal or gravity position fillet welds on long beams with "a" = 5 mm	RR 11 AR 11
	gravity position double-V welds on thick plate tow bars	B 10
	out-of-position fillet welds on bracket of 10 mm thick plate	RR(B) 7 RR(B) 8
	out-of-position butt welds on pipelines	weld 1: C 4

Stick electrodes can be classified according to their coating as under:

Type Code Type Coating Characteristics	Type of Slag - Slag Removal Ability	Penetration Depth - Gap Bridging Ability	Electrode Manipulation	Characteristics	Weld Appearance
O **Bare Electrode** finely distributed arc stabilizers in the electrode material	minimal slag	shallow - excellent	more difficult to weld than any other stick electrode	very high deposition rate, minimal heat stress, little heat distortion	convex, coarsely rippled
OO **Flux-Core Electrode** arc stabilizers rolled into the electrode's core	minimal slag	average to deep - excellent	slightly easier to weld than bare electrodes	good deposition rate, minimal heat stress, little weld distorition, especially for root welds	convex - coarsely rippled
N **Titania Oxide Type** high contens of titanium oxide	porous, even slag blanket - easily removed	average - good to excellent, depending on coating thickness	weldability of fillet welds improves with increasing coating thickness	general purpose electrodes, for steels sensitive to welding conditions, for thin plate	slightly convex to flat, finely to medium-coarsely rippled
Es **Acid-Coated Type** high contents of heavy metal oxides	porous, even slag blanket	deep - average	weldability of fillet welds improves with increasing coating thickness	for steels sensitive to welding conditions, requires good weld preparation	flat, finely rippled
Ox **Iron Oxide Type** high contents of iron oxides	tight slag blanket of evenly distributed thickness - very easily	shallow - very poor	good weldability, fillet welds in gravity position only	for unalloyed low-carbon steels, requires good weld preparation	concave, very finely rippled
Kb **Basic Low-Hydrogen Type** high contents of calcium or other alkaline carbonates	thick slag blanket - fair	medium - good	handling requires some practice, in particular when setting electrode to and removing from weld	particularly suitable for thick plate and rigid assemblies, for high-carbon steels, for thermo steels	slightly convex, medium-coarsely rippled
Ze **Cellulose Type** high contents of organic components	minimal, often quickly solidifying thin slag blanket - easy	deep - very good	good handling as only minimal slag, heavy fume generation	for out-of-position welding	slightly convex, rippled

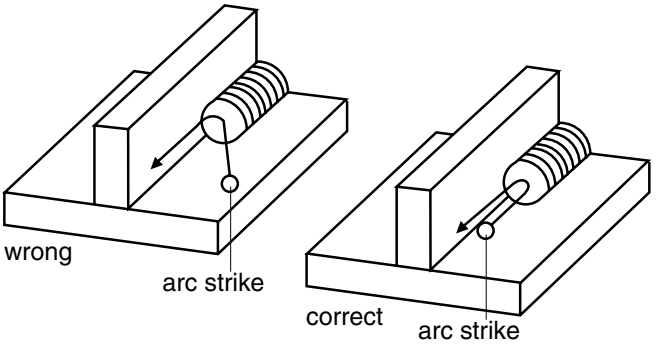
In addition to the electrodes types shown in the above table there are several special types available coded SO. Cast iron electrodes, for example, fall into this class.
When buying Kb and So type electrodes make sure they are suitable for AC current. As far as the quality grades are concerned, a higher number indicates a better grade quality. For common low-carbon steels grades 7 - 9 are best suitable.
The last letter of the code shown on the stick electrode indicates the coating thickness.

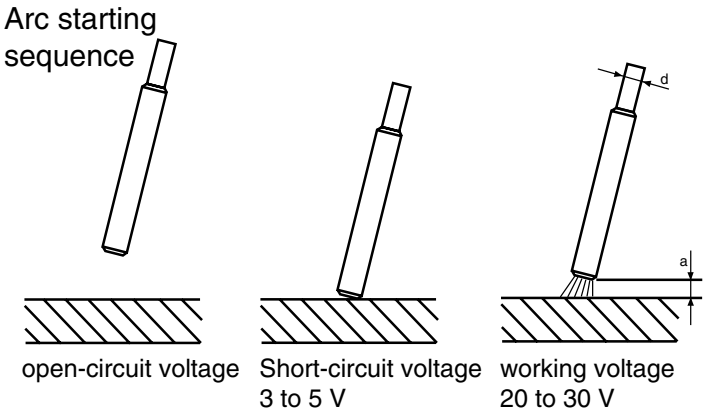
d = light coating
m = medium coating
s = heavy coating

3.1.5 Arc Starting and Arc Burning

Arc Strike

Always start the arc in the welding groove.
When the arc is stable weld over the arc strike and melt for good fusion, otherwise there is a risk of cracking.





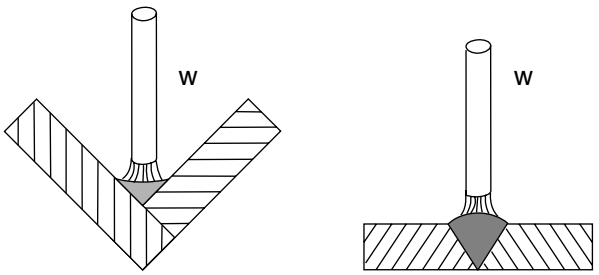
Arc Length

The arc length "a", that is the distance between the stick electrode and the work, should be:

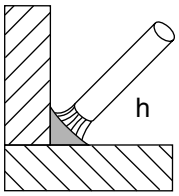
with stick electrodes of coating type R, RR, A, C = 1.0xd,
with stick electrodes of coating type B = 0.5xd,

Too long an arc reduces the penetration, increases the arc blow effect and, particularly with basic coated stick electrodes, causes a porous weld seam.

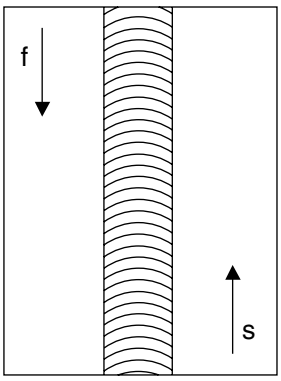
3.1.6 Welding Positions According to DIN 1921



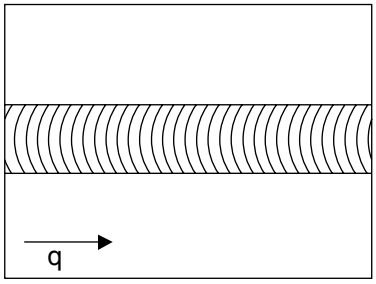
w = gravity position



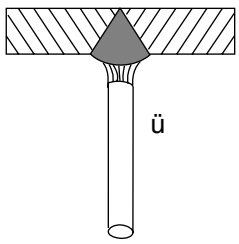
h = horizontal position



s = vertical-up position
f = vertical-down position



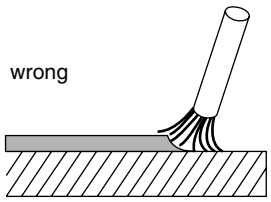
q = horizontal-vertical position



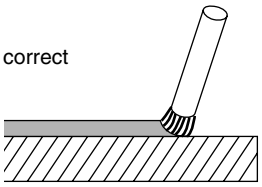
ü = overhead position

4 Welding Hints

Because of the multitude of and great differences in the important points for welding only the very basic operations for the most common electrodes for low-carbon steels, the Ti-type electrode, are introduced here. In the case that other electrodes have to be used, the electrode manufacturers supply upon request all relevant information for the type of special electrode to be used.
Always make some trial welds on scrap material. Select electrode diameter and welding current as per Table 1. Attach earth clamp to work piece and place electrode into electrode holder as described earlier. Now hold the electrode tip approx. 2 cm / 1 inch above the starting point of your welding seam. Hold the welding shield in front of your face and draw the electrode with a short stroke along the groove. Through the welding shield you watch the arc, keeping it to a length of 1 to 1.5 times the electrode diameter.

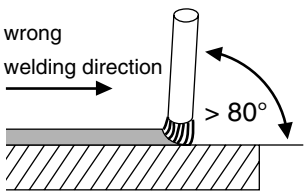


arc too long
(Pic. 3)

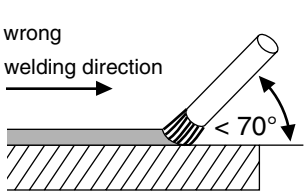


approx. 1 - 1.5 the electrode-Ø
(Pic. 4)

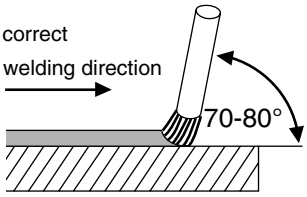
The correct arc length is important for a good weld, because with too short or too long an arc both welding current and working voltage change. A low working voltage causes insufficient penetration. Too high or too low welding current gives a poor welding seam. Too long an arc does not sufficiently melt the parent material, resulting in high spatter losses. Also the air, with its detrimental substances like hydrogen and nitrogen, may get access to the weld pool.
For a good weld the work angle of the electrode (or electrode inclination angle) is of substantial importance. The inclination should be 70° - 80° to the welding direction. With the work angle too steep slag will run under the weld pool, too flat an work angle causes the arc to spatter, in both cases the result is a porous, weak welding seam (see pictures 5 - 7).



(Pic. 5)

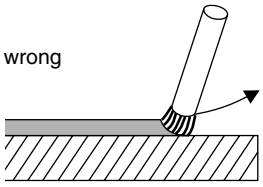


(Pic. 6)

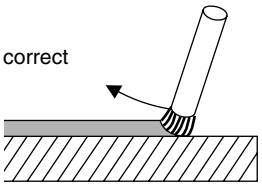


(Pic. 7)

The welder has to keep the arc at the same length, that is the electrode burn-off is compensated by feeding the electrode into the weld. At the same time the welder has to watch the weld pool for even penetration and width. Welding is always done from left to right (backhand welding).
At the end of the welding seam the electrode can not simply be lifted or pulled from the weld, this creates porous end craters, which weaken the weld. To correctly terminate a weld the electrode is held for a short moment at the end of the weld seam, then lifted in an arc over the just laid weld.



(Pic. 8)

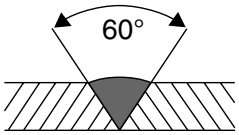


(Pic. 9)

Remove slag only after it has cooled down and is no longer glowing.
If an interrupted weld is to be continued, the slag at the end of the already finished weld must be removed. Then the arc can be started either in the groove or on the weld, as described earlier, and then moved to the end of the weld, which has to be thoroughly melted for good fusion. Welding is then continued normally.

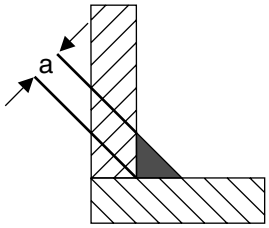
4.1 Weld Types

For **Butt Welds** the work piece edges should be bevelled to approx. 30°, which gives a groove angle of 60° (Pic. 10).
The root opening between the two work pieces should be 2 - 3 mm.



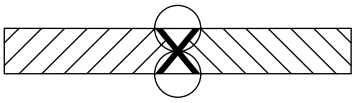
(Pic. 10)

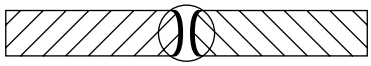
For **Fillet Welds** "a" is the throat width size. The throat width should be at least x 0.7 the plate thickness of the thinner plate.

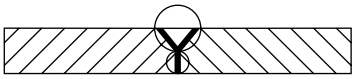


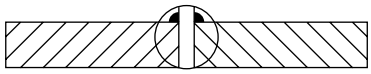
(Pic. 11)

Other weld types:

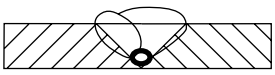
x-weld 

J-weld 

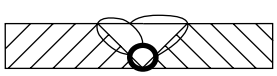
y-weld 

Flange weld 

A joint weld must always have a good fusion at the root.

wrong 

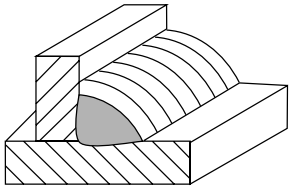
(Pic. 12)

correct 

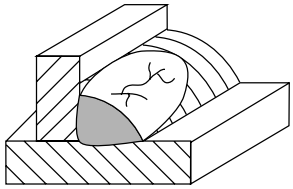
(Pic. 13)

Let weld cool down in the ambient air, do not quench.

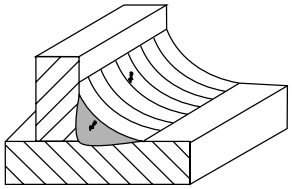
4.2 Weld Flaws and possible Causes - Shown on Fillet Welds



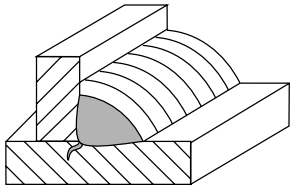
Weld Undercut
Welding current to high
Electrode work angle too steep
Arc too long



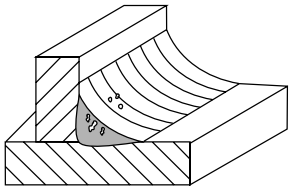
End Crater
Electrode removed too quickly from the weld pool, particularly with high welding currents risk of shrinkage cracking



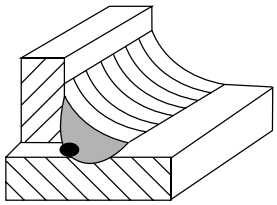
Slag Inclusion
Welding current too low
Welding speed to high
Welding over slag on multi-layer welds



Weld Toe Cracks
Material sensitive to welding conditions
Weld cooled down too fast after welding



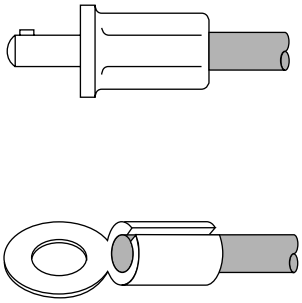
Gas Inclusion
Work surface not clean (rust, grease, paint)
Arc to long
Basic coated electrodes not sufficiently dried



Root Flaw
Slag entering root area because distance too great

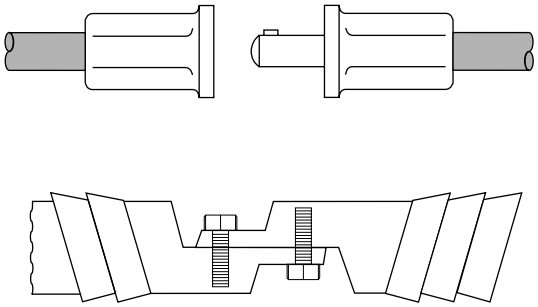
5 Accessories and Accessory Maintenance

Connecting Welding Cables to the Welding Power Source



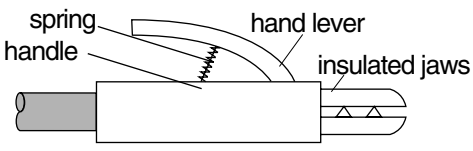
Ring tongue terminal soldered, crimped, clamped

Connecting (Extending) Welding Cables



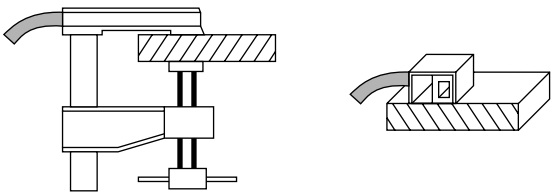
Insulate screw joint terminal with rubber bush or heat-shrinkable sleeve

Fully Insulated Electrode Holder



Replace broken insulating parts at once!

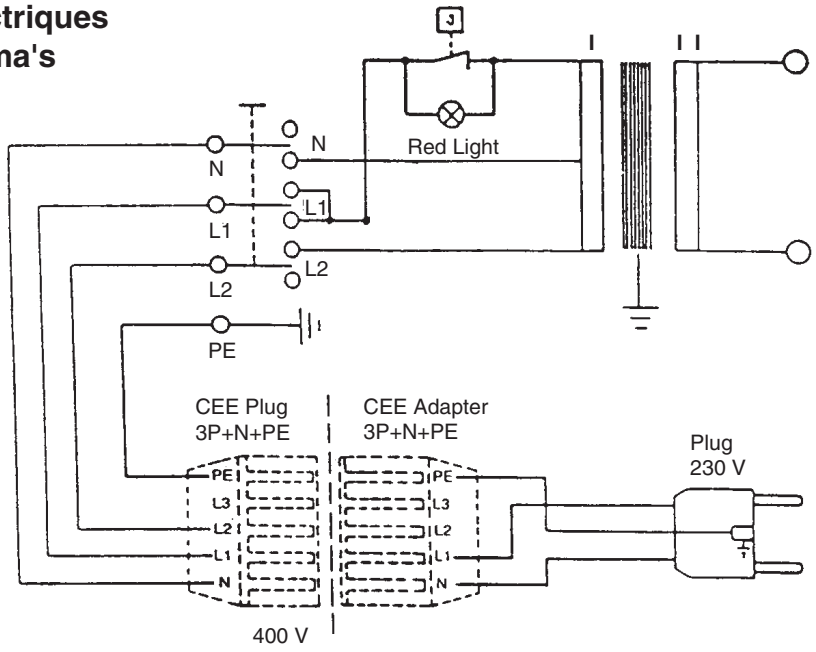
Connection of Welding Cables to the Work Piece

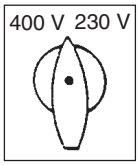


Clean work piece surface for good conduction

Attach earth clamp as close as possible to the weld. Structural components, beams, pipes or rails should not be used for earth conducting if they are not the actual work piece.

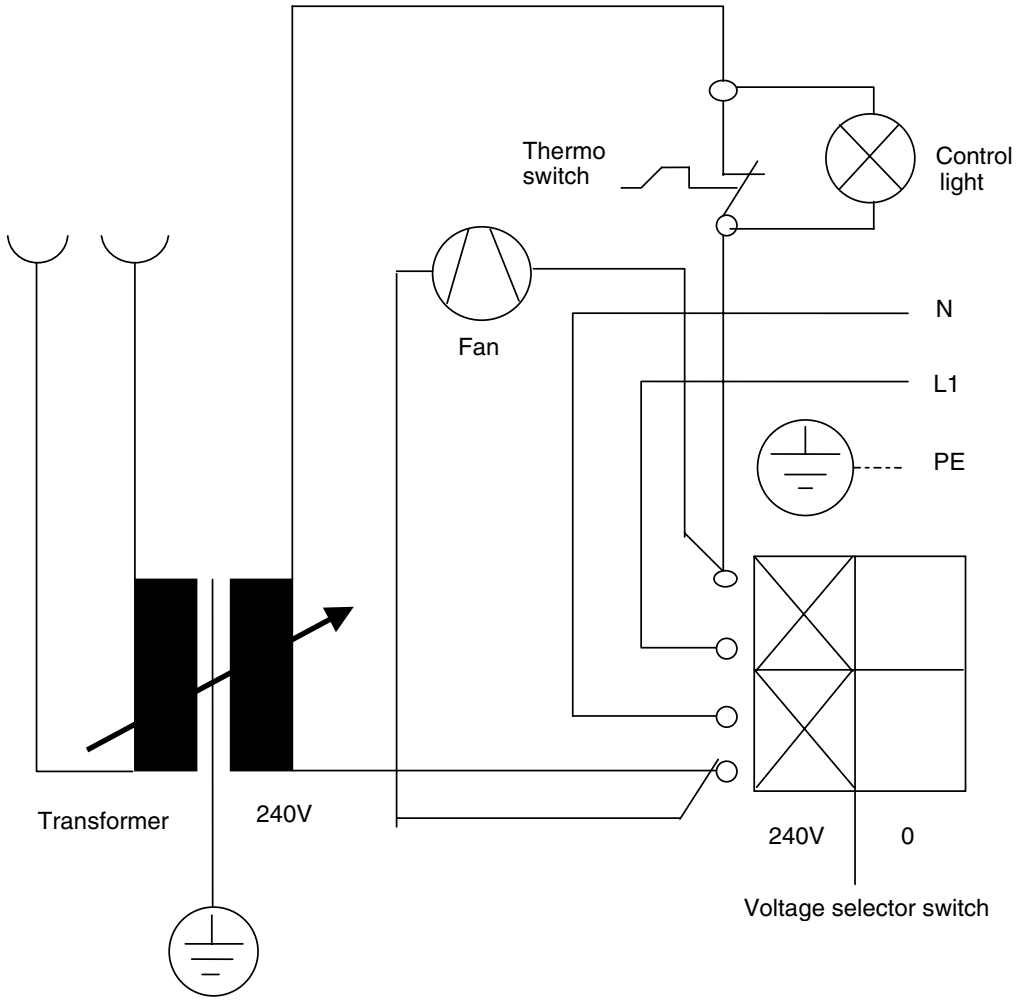
6 Wiring Diagrams
6 Schaltpläne
6 Schémas électriques
6 Schakelschema's



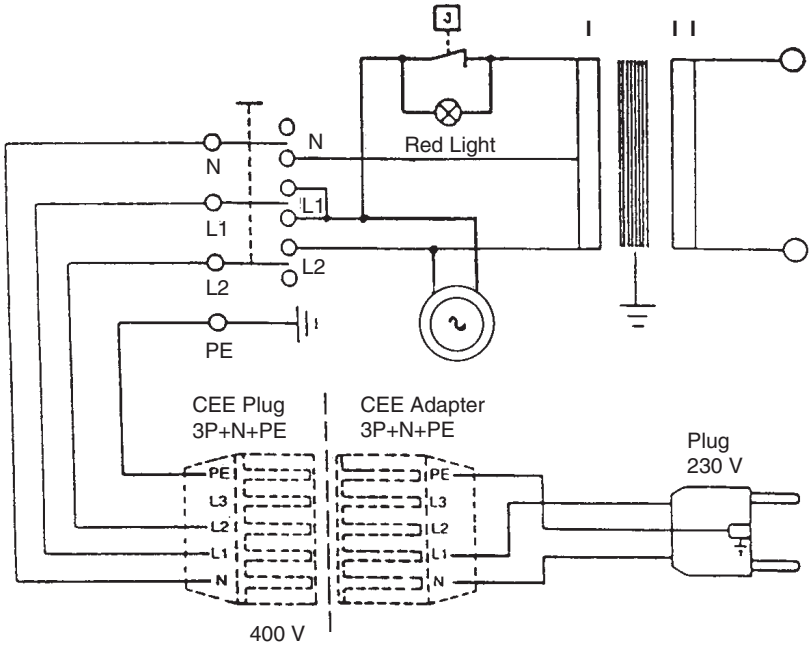


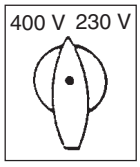
Contacts	Schwitch Positions 400 V	0	230 V
N - N	On	ON	OFF
L1 - L1	OFF	ON	OFF
L2 - L2	OFF	ON	ON

SB 160 C (230/400 V)



SB 200 CT (240 V)





	Schwitch Positions		
Contacts	400 V	0	230 V
N - N	On	ON	OFF
L1 - L1	OFF	ON	OFF
L2 - L2	OFF	ON	ON

SB 200 CT (230/400 V)

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