

# Standard data for arc welding

## Volume 2

Tables of synthetic times and consumable usage for the manual TIG welding of stainless steel sheet, and for the manual TIG and semi-automatic CO<sub>2</sub> welding of mild steel sheet

**There is also Volume 1 which provides tables of synthetic times and consumable usage for arc welding fillet welds (5-25mm leg length) and butt welds (3-25mm plate thickness) in carbon steels using either manual metal arc welding or semi-automatic CO<sub>2</sub> welding with a solid or flux-cored continuous electrode**

***Please note***

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# STANDARD DATA FOR ARC WELDING

## Volume 2 – Steel sheet

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### INTRODUCTION

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These data for welding steel sheet, prepared in The Welding Institute's laboratories, are recommended as a basis for production welding and as data for estimating.

As a basis for welding procedures the recommended settings are presented as being usable by a competent welder within the stated tolerance ranges on current and gap. More highly skilled welders may achieve better performances.

As data for estimating, a mean value and range are specified for each procedure and sheet thickness. The actual values obtained will depend on the gap and current setting used as well as the welder's skill.

The tolerances chosen to generate the data are believed to be typical of those found in fabrication. Where a Research Member believes that the tolerances achieved in his own practice are different from these, the optimum procedure and output data can readily be recalculated at The Welding Institute.

Standard data for welding steel plate by manual metal-arc and CO<sub>2</sub> welding are to be found in Volume 1.

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### NOTES ON THE USE OF WELDING INSTITUTE DATA FOR STEEL SHEET

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This set of data, covering the welding of mild and stainless steel sheet by TIG-welding and mild steel sheet by CO<sub>2</sub> welding, is the first product of The Welding Institute's work on procedure optimisation. For the first time tolerance ranges are given which will enable users to assess the benefits of control over production tolerances, or the penalties for ignoring them.

For each sheet thickness one set of input factors is given which can be taken as the target settings. On the same line are given those outputs which correspond to reasonably tight control of tolerances on gap and current. The line above is where the tolerances are not so strictly maintained, and the line below is for zero tolerance.

In use the aim would always be to achieve the zero tolerance condition, though the economies so obtained should always be balanced against the cost of obtaining them. In all other respects the data may be used in the same manner as described in Volume 1 of *Standard data for arc welding*, previously published by the Institute.

All filler rods quoted in the data Tables refer to BS 2901 : 1970.

It is essential to note that times are given in Basic Minutes. **Basic Minutes are minutes at standard rate of working (as defined in BS 3138 : 1969) with no allowances included of any sort.**

**This publication should be used in conjunction with Volume 1 of *Standard data for arc welding* which contains information about the use of Welding Institute data.**

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## NOTES ON THE MANUAL TIG-WELDING OF MILD AND STAINLESS STEEL SHEET

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TIG-welding is basically a two-handed process where the filler rod is fed into the weld pool and the arc is independent of the filler rod. The welding procedures given in these data have all been established with the use of a filler rod and the leftwards method of welding.

To obtain good weld quality the following operating variables must be closely controlled:

- 1 TIG torch and filler rod angles
- 2 welding speed and filler rod feed technique
- 3 arc length
- 4 gas shielding and back purging

### TIG torch and filler rod angles

The correct TIG torch and filler rod angles must be maintained throughout the length of the weld run if good welds are to be produced. Ideally the TIG torch should be held with a lead angle of 70°–80° with the filler rod held at 10°–20° from the surface of the sheet. These angles will be common to all four positions encountered, i.e. flat, horizontal/vertical (H/V), vertical up, and overhead.

### Welding speed and filler rod feed technique

Correct speed and manipulation of the filler rod is necessary to produce smooth and even top bead and underbead profiles. The higher range of speeds quoted in the procedures may require the 'laid on' feed technique, but with the middle and lower range of speeds the conventional dip feed technique will suffice.

### Arc length

The shortest practical electrode-to-work distance, termed arc length, compatible with ease of feeding the filler rod into the weld pool must be maintained at all times.

Arc lengths of less than 3mm are recommended to achieve the best results when closed butt joints are welded.

Where root gaps are present it is usually better to increase the arc length slightly and to play the arc on to the filler rod tip when the laid on feed technique is used. This will prevent burnthrough.

### Tungsten electrode type and diameter

Either 1.5 or 2.4mm diameter 2% thoriated tungsten electrodes may be used with these recommended procedures, but the final choice will depend primarily on the sheet thickness being joined. On sheet thinner than 1mm the 1.5mm diameter tungsten with a 60° conical tip vertex angle may be used. For sheet thicker than 1mm the 2.4mm diameter tungsten with a 30°–60° conical tip vertex angle is recommended.

### Gas shielding and back purging

Adequate gas shielding of both the top surface and underside of the joint is important for the production of sound welds. It is not possible to stipulate specific gas flow rates for the procedures given since much will depend on the equipment used and the position and fitup of the joints in a production situation. Nevertheless, gas flows with the range of 5 to 10 litre/min issuing from a 12mm gas nozzle orifice have been found most satisfactory.

Although the argon gas flow from the TIG torch will ensure adequate protection to the top surface of the weld, the underside of the joint will be exposed to the surrounding atmosphere. It is recommended that the underside of the welds should be protected by an independent supply of argon for carbon steel and argon- or oxygen-free nitrogen for the stainless steels. These back purge flow rates may vary from 2.4 to 5 litre/min depending on the length and fitup of the joint to be welded.

### TIG-welding equipment (power source)

To weld carbon and stainless steel sheet a conventional DC drooping characteristic transformer/rectifier power source is recommended. High frequency spark discharge initiation to strike the arc is also essential to avoid contamination of the tungsten electrode and to assist in the production of high quality weld deposits.

TIG torches may be employed which are air-cooled up to 150A max. or water-cooled for greater current values.

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## ANCILLARY ELEMENTS FOR TIG-WELDING

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Element	Basic Minutes
1 Obtain welding gloves (450mm) and fit to both hands	0.085
2 Remove gloves from both hands and place aside (450mm)	0.062
3 Pick up TIG torch, filler rod, and position to workpiece	0.088
4 Aside TIG torch and filler rod	0.031
5 Pick up head shield (600mm) and fit to head	0.045
6 Remove head shield from head and place aside (600mm)	0.035
7 Raise or lower head shield	0.012

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## NOTES ON THE SEMI-AUTOMATIC CO<sub>2</sub> WELDING OF MILD STEEL SHEET

To join steel sheet (in this instance up to 3mm thick) full use has been made of the short circuiting (dip transfer) technique.

Short circuiting (dip transfer) welding is obtained with low currents, low arc voltage, and small diameter wires; in the following procedures with 0.8mm diameter wire only.

To obtain the best results when using the CO<sub>2</sub> dip transfer technique, the following operating variables need to be closely controlled by the operators:

- 1 gun angle
- 2 contact tip-to-work distance
- 3 arc voltage — inductance setting
- 4 direction of travel
- 5 gas flow

### Gun angle

The gun should be held at a lead angle of 70°–80° to the sheet surface when welding in the flat, H/V, and overhead positions. For vertical down welding the angle of the gun may be increased to reduce the underbead protrusion or decreased to increase underbead protrusion.

### Contact tip-to-work distance

It is most important to maintain a constant contact tip-to-work surface distance to avoid a variation in the current/voltage relationship and irregular burnoff of the wire.

### Arc voltage — inductance setting

The arc voltage settings for any welding condition

will be governed by the current (wfs), sheet thickness, and joint fitup. Voltages quoted in the procedures may be varied by one or two volts if necessary. The inductance should be tuned in accordingly.

### Direction of travel

With the exception of the vertical joints, where the backhand technique is recommended (welding vertically down), all other positions should be made with the forehand technique.

### Gas flow

This variable depends primarily on the nozzle and design to be used, but in practice the gas flows are usually between 10 and 30 litre/min.

### CO<sub>2</sub> welding equipment (power source)

The following conventional semi-automatic units are recommended comprising a DC power source with auxiliaries such as wire feed unit and, where necessary, a gas heater:

- 1 transformer/rectifier with constant voltage output
- 2 transformer/rectifier with slope-controlled output
- 3 DC generator with constant voltage

Either swan neck or pistol grip MIG guns may be used depending on the operator's preference.

## ANCILLARY ELEMENTS FOR CO<sub>2</sub> WELDING

Times for ancillary elements for CO<sub>2</sub> welding will be found in Volume 1 of *Standard data for arc welding*, page xiii, Table E.

## INDEX TO TABLES

Material	Position	Process	Filler rod/wire	Shielding gas	Table	Page
Stainless steel	Flat	Manual TIG-welding	347S96	Argon	1	1
	H/V				2	1
	Vertical up				3	2
	Overhead				4	2
Mild steel	Flat	Semi-automatic	A18	CO <sub>2</sub>	5	3
	H/V				6	3
	Vertical up				7	4
	Overhead				8	4
	Flat				9	5
	H/V				10	5
	Vertical down				11	6
	Overhead				12	6

**Stainless steel**  
**Butt weld**  
**Flat position**  
**Manual TIG-welding**  
**Filler rod: 347S96**  
**Shielding gas: argon**  
**Current: DC negative**  
**Procedure: single-sided unbacked**

**1**

**Preparation: square edge**  
**Tolerances: current +5 to -5A**  
**gap +1 to 0mm**

Sheet thickness	Gap	Filler rod diameter	Current	Voltage	Filler rod consumed per metre of weld		Weight of weld metal deposited per metre of weld		Arc time per metre of weld	
					m		g		min	
					mean	range	mean	range	mean	range
0.7	0.0	1.6	55	9	0.83	1.12 0.55	8.3	13.4 3.1	2.91	3.47 2.53
0.9	0.0	1.6	95	10	1.08	1.36 0.79	9.1	14.2 3.9	1.82	2.07 1.65
1.0	0.0	1.6	105	10	1.14	1.43 0.86	9.5	14.6 4.3	1.83	2.06 1.68
1.2	0.0	1.6	135	10	1.33	1.61 1.04	10.3	15.5 5.1	1.62	1.79 1.50
1.6	0.0	2.4	175	10	1.02	1.21 0.83	29.9	35.1 24.7	1.70	1.83 1.61
2.0	0.0	2.4	185	11	1.06	1.25 0.87	31.5	36.7 26.4	2.26	2.40 2.16
2.5	0.0	2.4	195	11	1.10	1.29 0.91	33.6	38.8 28.4	2.92	3.07 2.81
3.0	0.0	2.4	195	11	1.10	1.29 0.91	35.6	40.8 30.4	3.78	3.95 3.64

**Stainless steel**  
**Butt weld**  
**H/V position**  
**Manual TIG-welding**  
**Filler rod: 347S96**  
**Shielding gas: argon**  
**Current: DC negative**  
**Procedure: single-sided unbacked**

**2**

**Preparation: square edge**  
**Tolerances: current +5 to -5A**  
**gap +1 to 0mm**

mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					0.7	0.0	1.6	65	9	0.67
0.9	0.0	1.6	105	10	0.74	1.00 0.48	10.8	15.5 6.0	1.62	1.82 1.47
1.0	0.0	1.6	115	10	0.76	1.02 0.49	10.9	15.7 6.2	1.66	1.85 1.53
1.2	0.0	1.6	135	11	0.79	1.06 0.53	11.2	15.9 6.5	1.74	1.90 1.61
1.6	0.0	2.4	185	11	0.63	0.80 0.45	24.6	29.3 19.8	1.65	1.76 1.56
2.0	0.0	2.4	195	11	0.64	0.82 0.46	25.1	29.9 20.4	2.24	2.36 2.14
2.5	1.0	2.4	185	11	0.99	1.17 0.82	35.3	40.1 30.6	3.52	3.79 3.33
3.0	1.0	2.4	215	12	1.03	1.20 0.85	36.1	40.8 31.3	3.67	3.91 3.50

**3**

Stainless steel

Butt weld

Vertical up position

Manual TIG-welding

Filler rod : 347S96

Shielding gas: argon

Current: DC negative

Procedure: single-sided  
unbacked

Preparation: square edge

Tolerances: current +5  
to -5A

gap +1 to 0mm

Sheet thickness	Gap	Filler rod diameter	Current	Voltage	Filler rod consumed per metre of weld		Weight of weld metal deposited per metre of weld		Arc time per metre of weld	
					m		g		min	
					mean	range	mean	range	mean	range
0.7	0.0	1.6	45	8	0.82	1.12 0.52	13.9	18.0 9.9	4.26	5.04 3.69
0.9	0.0	1.6	95	9	1.09	1.39 0.79	14.0	18.1 10.0	2.07	2.30 1.90
1.0	0.0	1.6	105	9	1.14	1.44 0.85	14.1	18.1 10.1	2.09	2.29 1.93
1.2	0.0	1.6	115	9	1.20	1.49 0.90	14.2	18.3 10.2	2.42	2.62 2.26
1.6	0.0	1.6	125	10	1.25	1.55 0.96	14.5	18.5 10.4	3.27	3.49 3.09
2.0	0.0	1.6	125	10	1.25	1.55 0.96	14.7	18.7 10.6	4.42	4.68 4.19
2.5	1.0	1.6	135	10	1.95	2.25 1.66	23.1	27.1 19.0	5.41	5.79 5.11
3.0	1.0	2.4	165	10	1.56	1.76 1.37	53.7	57.7 49.6	5.27	5.58 5.03

**4**

Stainless steel

Butt weld

Overhead position

Manual TIG-welding

Filler rod : 347S96

Shielding gas: argon

Current: DC negative

Procedure: single/sided  
unbacked

Preparation: square edge

Tolerances: current +5  
to -5A

gap +1 to 0mm

mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					0.7	0.0	1.6	55	9	0.70
0.9	0.0	1.6	105	10	0.73	0.96 0.50	8.5	14.9 2.2	1.05	1.29 0.90
1.0	0.0	1.6	115	10	0.73	0.96 0.50	8.8	15.2 2.5	1.09	1.32 0.95
1.2	0.0	2.4	135	10	0.61	0.77 0.46	19.1	25.4 12.7	1.16	1.35 1.04
1.6	0.0	2.4	175	11	0.63	0.78 0.48	20.3	26.6 13.9	1.25	1.40 1.15
2.0	0.0	2.4	175	11	0.63	0.78 0.48	21.5	27.8 15.1	2.07	2.24 1.94
2.5	0.0	1.6	175	11	0.77	0.99 0.54	13.3	19.7 7.0	3.09	3.29 2.94
3.0	0.0	1.6	175	11	0.77	0.99 0.54	14.8	21.2 8.5	4.11	4.34 3.93

Mild steel  
Butt weld  
Flat position  
Manual TIG-welding  
Filler rod: A18  
Shielding gas: argon  
Current: DC negative  
Procedure: single-sided  
unbacked

**5**

Preparation: square edge  
Tolerances: current +5  
to -5A  
gap +1 to 0mm

Sheet thickness mm	Gap mm	Filler rod diameter mm	Current A	Voltage V	Filler rod consumed per metre of weld		Weight of weld metal deposited per metre of weld		Arc time per metre of weld	
					m		g		min	
					mean	range	mean	range	mean	range
0.7	0.0	1.6	45	8	0.79	1.12 0.46	8.2	14.1 2.4	3.87	4.74 3.35
0.9	0.0	1.6	65	9	0.99	1.33 0.66	9.7	15.6 3.8	3.33	3.86 3.00
1.0	0.0	1.6	70	9	1.05	1.38 0.71	10.4	16.3 4.5	3.46	3.97 3.15
1.2	0.0	1.6	85	9	1.20	1.53 0.86	11.8	17.7 5.9	3.41	3.81 3.15
1.6	0.0	1.6	105	9	1.40	1.74 1.07	14.7	20.6 8.8	3.75	4.09 3.52
2.0	0.0	1.6	125	10	1.61	1.94 1.27	17.6	23.5 11.7	3.98	4.28 3.78
2.5	1.0	2.4	155	10	1.54	1.77 1.32	44.0	49.9 38.1	4.27	4.82 3.93
3.0	1.0	2.4	155	10	1.54	1.77 1.32	47.6	53.5 41.7	5.27	5.85 4.90

Mild steel  
Butt weld  
H/V position  
Manual TIG-welding  
Filler rod: A18  
Shielding gas: argon  
Current: DC negative  
Procedure: single-sided  
unbacked  
Preparation: square edge  
Tolerances: current +5  
to -5A  
gap +1 to 0mm

**6**

mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					0.7	0.0	1.6	55	9	0.65
0.9	0.0	1.6	85	9	0.91	1.17 0.66	6.0	9.8 2.2	2.42	2.68 2.21
1.0	0.0	1.6	90	9	0.96	1.21 0.70	7.0	10.8 3.2	2.59	2.86 2.39
1.2	0.0	1.6	105	9	1.09	1.34 0.83	9.0	12.8 5.2	2.70	2.93 2.52
1.6	0.0	2.4	175	9	1.01	1.18 0.84	28.9	32.6 25.1	1.92	2.03 1.83
2.0	1.0	2.4	185	11	1.47	1.64 1.30	40.4	44.2 36.6	2.56	2.76 2.41
2.5	1.0	2.4	175	11	1.41	1.58 1.24	45.4	49.2 41.6	3.75	4.00 3.56
3.0	1.0	2.4	205	11	1.59	1.76 1.41	50.4	54.2 46.6	3.86	4.07 3.69

Sheet thickness	Gap	Filler rod diameter	Current	Voltage	Filler rod consumed per metre of weld		Weight of weld metal deposited per metre of weld		Arc time per metre of weld	
					m		g		min	
					mean	range	mean	range	mean	range
0.7	0.0	1.6	50	8	1.03	1.32 0.74	11.3	16.3 6.2	3.07	3.90 2.46
0.9	0.0	1.6	90	9	1.38	1.67 1.09	13.2	18.2 8.1	1.17	1.50 0.91
1.0	0.0	1.6	95	9	1.42	1.71 1.13	14.1	19.2 9.1	1.42	1.74 1.16
1.2	0.0	2.4	105	10	0.80	0.99 0.60	26.0	31.1 20.9	1.85	2.16 1.59
1.6	0.0	2.4	135	10	0.97	1.16 0.78	29.8	34.9 24.8	2.05	2.29 1.84
2.0	0.0	2.4	135	10	0.97	1.16 0.78	33.7	38.7 28.6	3.45	3.75 3.20
2.5	1.0	2.4	125	9	1.36	1.55 1.16	48.6	53.7 43.5	6.03	6.61 5.58
3.0	1.0	2.4	155	9	1.53	1.72 1.34	53.4	58.5 48.3	5.70	6.15 5.34

Mild steel

Butt weld

Vertical up position

Manual TIG-welding

Filler rod: A18

Shielding gas: argon

Current: DC negative

Procedure: single-sided unbacked

Preparation: square edge

Tolerances: current +5 to -5A

gap +1 to 0mm

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mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					0.7	0.0	1.6	65	8	0.79
0.9	0.0	1.6	105	9	1.04	1.25 0.82	13.2	18.2 8.2	1.78	1.96 1.63
1.0	0.0	1.6	110	9	1.07	1.28 0.85	14.2	19.2 9.2	1.97	2.15 1.82
1.2	0.0	2.4	125	9	0.68	0.82 0.54	25.9	30.8 20.9	2.16	2.32 2.02
1.6	0.0	2.4	155	9	0.80	0.94 0.66	29.7	34.7 24.7	2.42	2.56 2.30
2.0	1.0	2.4	165	10	1.16	1.31 1.02	43.5	48.4 38.5	3.13	3.35 2.97
2.5	1.0	2.4	165	10	1.16	1.31 1.02	48.2	53.2 43.2	4.25	4.50 4.05
3.0	1.0	2.4	175	10	1.20	1.35 1.06	53.0	58.0 48.0	4.98	5.23 4.77

Mild steel

Butt weld

Overhead position

Manual TIG-welding

Filler rod: A18

Filler rod: A18

Shielding gas: argon

Current: DC negative

Procedure: single-sided unbacked

Preparation: square edge

Tolerances: current +5 to -5A

gap +1 to 0mm

8

Mild steel  
Butt weld  
Flat position  
Semi-automatic CO<sub>2</sub>  
welding  
Filler wire: A18  
Shielding gas: CO<sub>2</sub>  
Current: DC positive  
Procedure: single-sided  
unbacked  
Preparation: square edge  
Tolerances: current +5  
to -5A  
gap +1 to 0mm

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Sheet thickness mm	Gap mm	Wire diameter mm	Current A	Voltage V	Wire consumed per metre of weld m		Weight of weld metal deposited per metre of weld g		Arc time per metre of weld min	
					mean	range	mean	range	mean	range
					0.9	0.0	0.8	65	18	6.18
1.0	0.0	0.8	80	18	6.11	6.35 5.94	23.0	23.8 22.4	1.12	1.34 0.94
1.2	0.0	0.8	105	18	6.43	8.41 5.04	24.1	30.7 19.4	0.93	1.27 0.65
1.6	0.0	0.8	150	18	10.05	14.87 5.81	36.1	52.2 22.0	0.66	1.19 0.19
2.0	0.0	0.8	155	18	15.50	20.82 10.76	54.3	72.1 38.5	1.23	1.74 0.78
2.5	1.0	0.8	145	18	12.94	17.34 9.13	45.8	60.5 33.1	1.34	1.68 1.05
3.0	1.0	0.8	155	18	19.29	24.52 14.63	67.0	84.5 51.4	1.98	2.32 1.70

Mild steel  
Butt weld  
H/V position  
Semi-automatic CO<sub>2</sub>  
welding  
Filler wire: A18  
Shielding gas: CO<sub>2</sub>  
Current: DC positive  
Procedure: single-sided  
unbacked  
Preparation: square edge  
Tolerances: current +5  
to -5A  
gap +1 to 0mm

10

mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					0.9	0.0	0.8	65	17	7.72
1.0	0.0	0.8	70	17	7.93	8.92 7.60	30.0	32.9 29.0	1.04	1.20 0.96
1.2	0.0	0.8	85	17	8.86	9.12 8.66	32.7	33.5 32.1	1.15	1.35 1.02
1.6	0.0	0.8	135	19	10.94	13.82 8.71	38.9	47.4 32.3	1.13	1.56 0.77
2.0	0.0	0.8	150	19	16.67	20.15 13.85	55.9	66.2 47.5	1.67	2.09 1.32
2.5	1.0	0.8	145	19	19.36	21.37 18.01	63.9	69.8 59.8	2.19	2.37 2.08
3.0	1.0	0.8	160	20	27.07	29.35 25.45	86.7	93.5 81.9	3.19	3.33 3.12

**11**

Mild steel  
Butt weld  
Vertical down position  
Semi-automatic CO<sub>2</sub> welding  
Filler wire: A18  
Shielding gas: CO<sub>2</sub>  
Current: DC positive  
Procedure: single-sided unbacked

Preparation: square edge  
Tolerances: current +5 to -5A  
gap +1 to 0mm

Sheet thickness	Gap	Wire diameter	Current	Voltage	Wire consumed per metre of weld		Weight of weld metal deposited per metre of weld		Arc time per metre of weld	
					m		g		min	
					mean	range	mean	range	mean	range
0.9	0.0	0.8	75	16	12.08	13.30 11.12	43.0	47.6 39.4	2.15	2.18 2.15
1.0	0.0	0.8	95	16	12.56	13.35 12.03	44.8	47.8 42.8	1.97	2.03 1.96
1.2	0.0	0.8	135	16	14.84	15.17 14.77	53.3	54.6 53.0	1.63	1.79 1.51
1.6	1.0	0.8	170	20	14.33	14.42 14.25	51.4	51.8 51.1	0.77	0.90 0.67
2.0	1.0	0.8	175	20	18.00	18.45 17.82	65.1	66.8 64.5	1.10	1.14 1.10
2.5	1.0	0.8	185	21	21.75	22.56 21.20	79.1	82.2 77.1	1.38	1.49 1.31
3.0	1.0	0.8	195	22	25.78	26.95 24.88	94.2	98.6 90.8	1.66	1.88 1.48

**12**

Mild steel  
Butt weld  
Overhead position  
Semi-automatic CO<sub>2</sub> welding  
Filler wire: A18  
Shielding gas CO<sub>2</sub>  
Current: DC positive  
Procedure: single-sided unbacked

Preparation: square edge  
Tolerances: current +5 to -5A  
gap +1 to 0mm

mm	mm	mm	A	V	m		g		min	
					mean	range	mean	range	mean	range
					1.2	0.0	0.8	85	17	8.95
1.6	0.0	0.8	115	17	11.10	13.58 9.30	40.1	48.2 34.2	1.18	1.53 0.89
2.0	0.0	0.8	155	19	12.42	16.78 8.73	44.4	58.8 32.3	0.97	1.49 0.51
2.5	1.0	0.8	125	18	16.58	18.03 15.80	58.1	62.9 55.6	1.76	1.96 1.63
3.0	1.0	0.8	155	19	23.13	25.93 21.00	79.7	88.9 72.7	1.80	2.09 1.57