

Standard data for arc welding

Volume 1

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 CO₂ welding with a solid or flux-cored continuous electrode

There is also Volume 2 which provides tables of synthetic times and consumable usage for the manual TIG welding of stainless steel sheet, and for the manual TIG and semi-automatic CO₂ welding of mild steel sheet

Please note

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STANDARD DATA FOR ARC WELDING

INTRODUCTION

Standard data for arc welding is a form of synthetic data, such as may be widely used to build up Standard Times (users who find any terms unfamiliar are referred to BS 3138 : 1969, or to BS 499 : Pt 1 : 1965 for welding terms). Broadly speaking there are two categories of synthetic data, the 'microscopic', where the motions are as basic as possible, and the 'macroscopic', where the times may refer to a whole group of motions or even to a complete job. In the first category are the various predetermined motion time systems (Work Factor and Methods-Time Measurement are only two of such systems) with elements such as 'reach' or 'grasp', and a time scale per element not exceeding 0.05min; most other forms of synthetic data, including *Standard data for arc welding*, come in the second category.

Synthetic data may be elemental, as in the ancillary elements given on page xiii, or it may be a formula or formulae, or it may be in tabular form, as is the bulk of the Standard Data in the book. The example of the use of Standard Data has been laid out to show the derivation of a time for a welding task, but Standard Data may be used for other forms of estimation, such as the quantities of consumables required, or the weight of the completed weld.

NOTES ON THE USE OF STANDARD DATA

Where a choice of procedures is given the technical requirements of the weld should be considered, and also the limitations of the available power sources. Where there are no sound reasons for not doing so, the fastest welding procedure should normally be selected.

With the electrode class or wire size and the procedure selected, the time for the weld is a straightforward calculation from the appropriate Table and the known length of weld. If times for ancillaries are required, these may be found by applying a frequency to the figures for the required elements given on page xiii; it should be noted that these figures are for bench work and are intended mainly as an illustration. Where the greatest accuracy is required, and certainly for work away from a bench, these ancillaries should have their times established by direct observation.

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 of any sort included.**

THE DERIVATION OF STANDARD DATA

The standard data for arc welding have been calculated from laboratory-tested procedures. These procedures and the deposition data which have been derived from them form the basis of this book (see Figs 1 and 2).

TYPICAL DEPOSITION CURVES

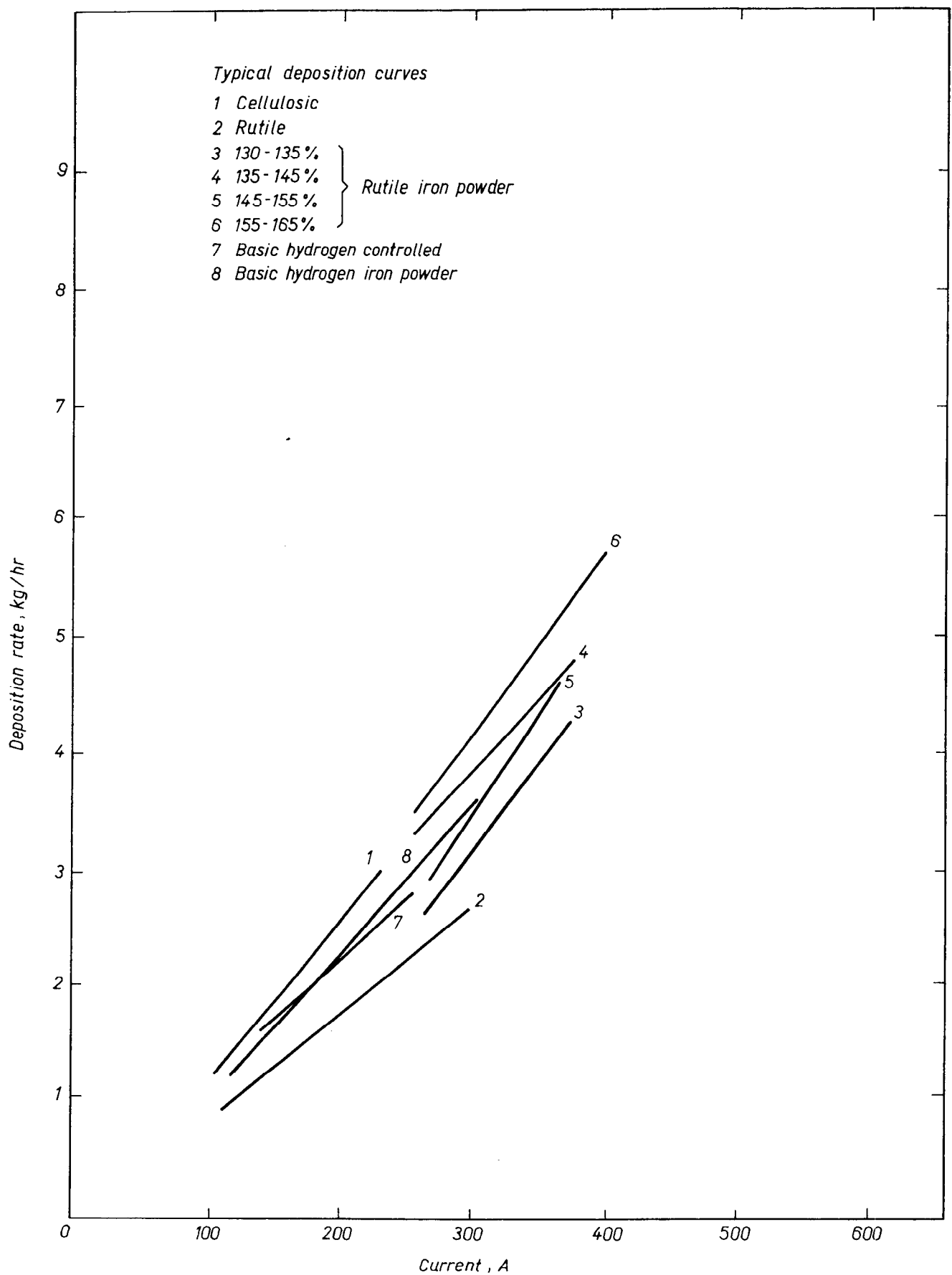


Fig. 1. Comparison of typical welding times for fillet weld made by manual metal-arc welding

TYPICAL DEPOSITION CURVES

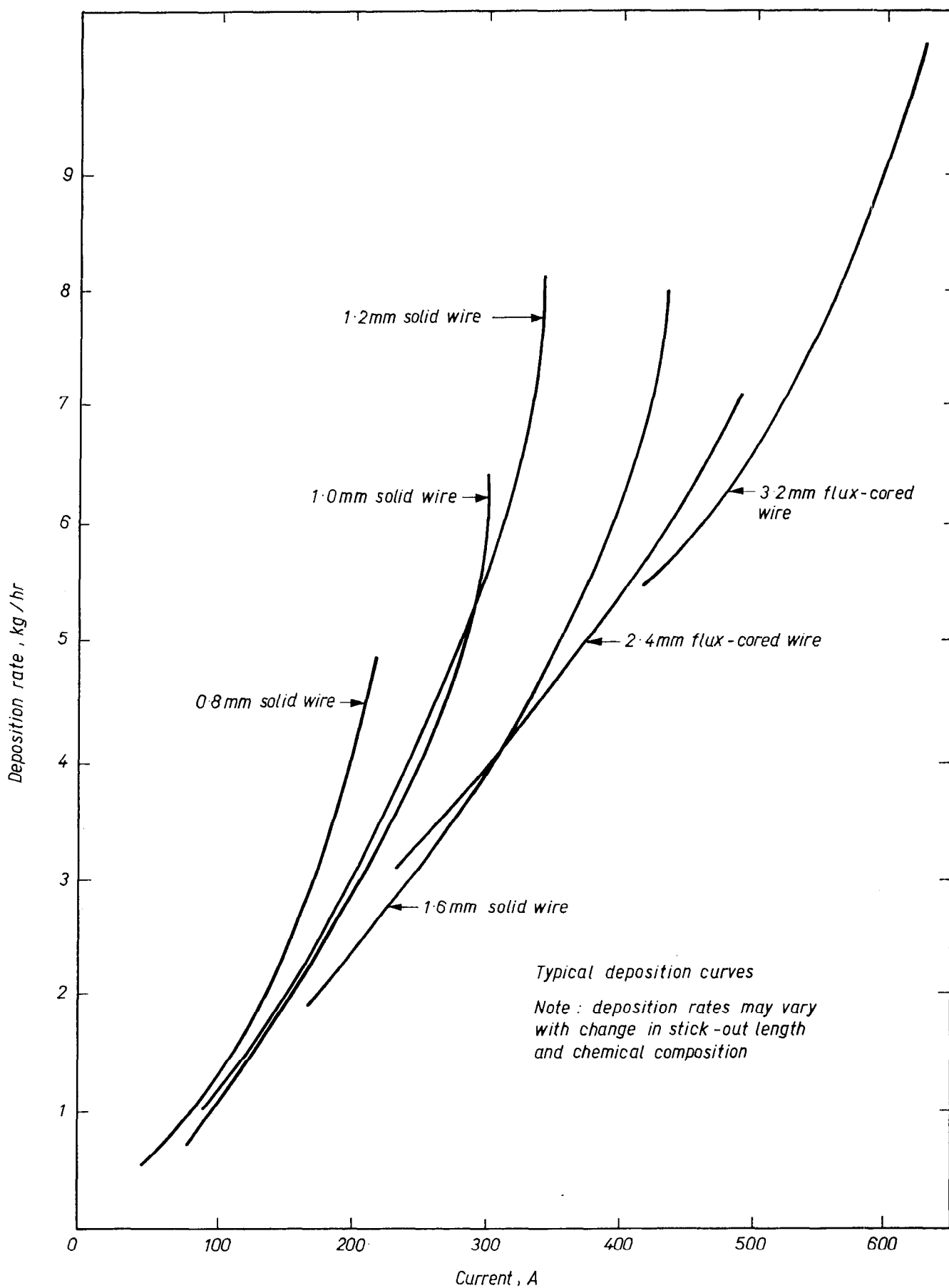


Fig. 2. Comparison of typical welding times for fillet weld made by CO₂ welding using solid and flux-cored wires

WELDING CURRENT

The data in this book have been obtained using alternating current (AC) for manual metal-arc welding and direct current (DC) for CO₂ welding.

EXAMPLE OF THE USE OF STANDARD DATA

The example chosen to illustrate the use of filler and butt weld Standard Data is a stiffened panel 4.0 × 5.25m, and the calculations compare the use of manual metal-arc (MMA) welding using rutile electrodes, and CO₂ welding using 1.6mm solid wire electrodes. This panel is fabricated from three standard size sheets of 12.5mm plate, each 4000 × 1750mm, stiffened by five stiffeners of 10 × 150 × 5250mm rectangular sections attached by twin fillet welds, as shown in Fig. 3.

Number of welds required to fabricate panel:

Fillet welds two welds on each of five sections 5.25m long = ten welds × 5.25m of 10mm leg length fillet

Butt welds two welds each 4.0m long = two welds × 4.0m of 12.5mm sealed.

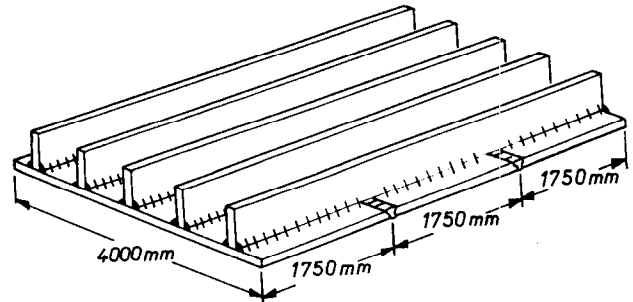


Fig. 3. Stiffened panel assembly used as example for the calculation of Standard Data. Stiffened plate 12.5mm thick; stiffeners 10 × 150mm

Calculation of welding and metal removal ancillary elements (from Tables E and F)

Welding elements	MMA, min Per joint	Per electrode	CO ₂ , min Per joint	Per 8m wire
1 Pick up and put on gloves etc.	0.085	—	0.085	—
4 Pick up electrode and holder, etc.	0.056	—	—	—
7 Pick up hand shield etc.	0.077	—	—	—
8 Aside hand shield	—	0.025	—	—
15 Change electrode	—	0.062	—	—
7 Pick up hand shield etc.	—	0.077	—	—
8 Aside hand shield	0.025	—	—	—
6 Aside stub end etc.	0.031	—	—	—
9 Pick up head shield etc.	—	—	0.045	—
13 Pick up MIG gun and position etc.	—	—	0.057	—
11 Raise head shield	—	—	—	0.012
16 Pick up cutters, trim wire, etc.	—	—	—	0.077
17 Ream nozzle etc.	—	—	—	0.085
13 Pick up MIG gun and position etc.	—	—	—	0.057
11 Lower head shield	—	—	—	0.012
11 Raise head shield	—	—	0.012	—
10 Remove head shield etc.	—	—	0.035	—
18 Pick up anti-spatter can etc.	—	—	0.081	—
2 Remove gloves etc.	0.062	—	0.062	—
	0.0336	0.164	0.377	0.243

Metal removal elements	Per joint, min
8 Pick up face mask etc.	0.045
11 Pick up grinder etc.	0.058
10 Lower face mask	0.012
12 Aside grinder	0.026
9 Remove and aside face mask	0.035
	0.176

Calculation A — Manual metal-arc welding

The rutile electrode used is of 93·5% efficiency. The fillet welds were made in the horizontal position and the butt welds in the flat position. The deposition data are therefore taken from Table 2 for the fillet welds and Table 24 for the butt welds.

Deposition data

	Fillet welds		Butt welds	
Electrode size (m)	5·0	3·15	4·0	5·0
Current (A)	220	110	180	210
Arc time/m (min)	14·36	35·26 (total)		
Weight of weld/m (kg)	0·44	0·88 (total)		
Length of electrode consumed/m of weld (m)	3·08	3·94	1·03	0·85
Number of electrodes/m of weld (assuming 50mm stub)	7·7	9·9	2·6	2·1
Number of electrode changes per joint, i.e. length of joint × number of electrodes/m – 1	40	39	10	8
				19

Synthesis of times/joint, min

	Fillet welds	Butt welds
Ancillaries, welding (see page iv)		
Per joint	0·34	0·34
Metal removal	—	0·18
Per electrode change	40 × 0·164 = 6·56	76 × 0·164 = 12·46
Arc time	5·25 × 14·36 = 75·39	4·0 × 35·26 = 141·04
Deslag time	5·25 × 3·35 = 17·59	4·0 × 3·88 = 15·52
Sealing run preparation time	—	4·0 × 11·28 = 45·12
Total	99·88	214·66

Total weld time for structure

Ten welds × 99·88min + two welds × 214·66min
 = 1428·12min
 23hr 48·12min

Calculation B — CO₂ welding

The fillet welds were made in the horizontal position and the butt welds in the flat position. The deposition data are therefore taken from Table 114 for the fillet welds and Table 157 for the butt welds.

Deposition data

	Fillet welds	Butt welds
Current (A)	400	300
Wire feed speed (m/hr)	430	265
Arc time/m (including butt weld sealing run (min)	4·50	9·80
Weight of weld/m (kg)	0·474	0·636
Length of electrode wire consumed/m or weld (m)	32·3	43·28
Number of stops/m of weld (once for every 8m of wire consumed)	$\frac{32·3}{8} = 4·00$	$\frac{43·28}{8} = 5·4$

Synthesis of times/joint, min

	Fillet welds	Butt welds
Ancillaries, welding	0.38	0.38
Ancillaries, metal removal	—	0.18
Ancillaries/stop	$5.25 \times 4.0 \times 0.243 = 5.10$	$4.0 \times 5.4 \times 0.243 = 5.25$
Arc time	$5.25 \times 4.50 = 23.63$	$4.0 \times 9.80 = 39.30$
Sealing run preparation time	—	$4.0 \times 7.44 = 29.76$
Total, min	29.11	74.77

Total weld time for structures

Ten welds $\times$ 29.11min + two welds $\times$ 74.77min
= 440.64min
= 7hr 20.64min

Note: A decision to adopt one welding process in preference to another should not be made solely on a comparison of weld times; the costs involved must also be considered, and it is possible for these to reverse the balance of advantage between one process and another.

WELDING POSITIONS

For precise definitions of welding positions, reference should be made to BS 499:1965. The abbreviations used in this book are:

- F — flat
- H — horizontal
- H/V — horizontal/vertical
- V — vertical up
- D — vertical down
- O — overhead

ELECTRODE COVERINGS

The system of manual metal-arc electrode classification used in this volume of Standard Data conforms with ISO Standard 2560 and the revised BSI standard BS 639; these should be consulted for a full explanation of the symbols used.

For simplicity, the coding used has been confined to those symbols defining covering type, percentage metal recovery, and an indication that the electrode is hydrogen controlled, where this is relevant.

Although there is no direct relationship between the AWS and the previous BSI 1719:1963 coding systems, an approximate comparison between these and the new ISO system has been included.

NOTES ON THE USE OF ELECTRODES TO ISO STANDARD 2560 AND THE BRITISH STANDARD BS 639:1975 FOR WELDING MILD AND LOW ALLOY STEELS

Electrode classification

Covering type	ISO 2560	BS 1719: 1969	AWS
Cellulosic	E---C--	E1--	E---0 E---1

This class of electrode has at least 15% of cellulosic material in its covering, with up to 30% titanium dioxide in rutile form. It has a deeply penetrating arc and a rapid burnoff rate; the weld surface produced is coarser than other classes of electrode and spatter loss is somewhat higher.

Because of the low solid content of the covering the weld deposit is covered by a fairly thin layer of slag which is very easy to remove.

The voluminous gas shield produced by the decomposition of the cellulose in the covering gives rise to a highly penetrating arc, and the electrode is noted for its ease of welding in any position, i.e. in 'stovepipe' welding and for welding storage tanks etc.

Generally, this class of electrode is suitable for AC or DC supply; for AC the covering has stabilising elements added.

Covering type	ISO 2560	BS 1719: 1969	AWS
Rutile	E---R--	E2-- E3--	E---2

Electrodes with rutile-based coverings may conform to one or other of two types previously categorised in BS 1719 as Class 2 and Class 3. Class 2 electrodes contain in the covering a higher proportion of ioniser and titanium dioxide than Class 3 electrodes; this provides for good welding properties. They can be used in all positions, but are noted for the ease of welding fillets in the horizontal/vertical (H/V) position.

The fillet is slightly convex in appearance and the spatter loss is low. The slag coverage is dense, completely covering the deposited weld, but it has excellent detachability in the first run of a V butt joint.

These electrodes are suitable for AC and DC supplies and give welds with medium root penetration.

Class 3 electrodes have a covering containing appreciable amounts of titanium dioxide, but with certain basic additions which produce a much more fluid slag than that of Class 2 electrodes. These electrodes can be used in all positions, especially vertical and overhead. They have a smooth arc characteristic giving medium penetration and are suitable for either AC or DC supplies. The slag is readily detachable, even from the first run in deep V joints.

Covering type	ISO 2560	BS 1719: 1969	AWS
Heavy rutile covering	E--R120-- to E--RR180--	E2--K	E--24

Rutile iron powder electrodes are characterised by a high metal deposition rate and electrode efficiency. They have a heavier covering than other rutile types, this being associated with the addition of metal powder to the flux.

The electrode efficiency is directly related to the amount of metal powder added to the covering; in ISO 2560 this is expressed directly as a percentage of the core wire weight for electrodes with electrode efficiency greater than 110%.

Some electrodes with electrode efficiencies of up to 135% may be used in all positions; however, when welding in positions other than flat or H/V, the metal deposition rate will be considerably reduced since, for optimum welding conditions, the current and size of electrode used will be reduced and the full benefit of the iron powder additions will not be realised. Electrodes with efficiencies above 135% are recommended for use in the flat and H/V positions only.

These electrodes can be used on AC or DC supply; when using AC the open circuit voltage (OCV) should be that recommended by the manufacturers of the electrode. The use of DC calls for correct polarity which should be as recommended by the manufacturer.

The arc is easily controlled and very smooth, giving very little spatter; slag is self-releasing and the weld is of regular profile without evidence of undercut.

Covering type	ISO 2560	BS 1719: 1969	AWS
Basic	E---B---H	E6---H	E---6 to E---8
Basic with iron powder	E---B120---H	E6---HJ	

This class of electrode is generally suitable for welding in all positions. The coverings are based on a mixture of calcium carbonate and fluoride and the electrodes are, therefore, known as basic covered. The majority of these electrodes have iron powder additions to the flux covering, giving an electrode efficiency of between 98 and 130% of the core wire weight. The slag is fairly fluid and the deposit is usually convex in profile.

These electrodes are used for welding heavy section mild steel or medium and high tensile steels, where the higher mechanical properties and resistance to cracking are required.

They can be used with AC or DC supply, with reference to OCV and polarity as indicated by the manufacturer.

Storage of electrodes

Most electrode types deteriorate with age and under adverse conditions of storage, which can promote dampness and damage to the covering.

Mechanical damage in storage can result in chipped coatings; this leads to uneven 'burnoff' of the covering, which may cause defects such as porosity etc. Care should be taken, therefore, to ensure that adequate facilities are provided for handling.

For cellulosic, rutilic, and rutilic iron powder covered electrodes it is generally sufficient to specify that electrodes should be stored under conditions which ensure a dry atmosphere. One important factor is the change of relative humidity in the store which can affect the amount of moisture absorbed by the covering. The higher the air temperature the greater the amount of moisture which it can hold. Therefore, if the air temperature falls while a fairly high moisture content is present, the covering will absorb quantities of moisture which in time will impair the efficiency of the electrode. It is recommended that these electrodes should be stored at a constant temperature of 15°–21°C. For basic

covered electrodes other storage and drying conditions apply; these will be considered in the next paragraph.

Basic covered electrodes. These are dried in a special manner by the manufacturer and contain practically no moisture. Correct storage of these electrodes must be carried out to avoid deterioration.

To minimise moisture absorption, electrodes should always be stored in a dry atmosphere of 15°–28°C and dried at 130°–200°C immediately before use.

Small storage ovens are adequate for this purpose and should be used both in the shop or at site. All electrodes to be used should be dried at the manufacturer's recommended temperature prior to the start of the shift, and kept in heated containers close to the work until ready for use. All electrodes not used at the end of the shift must be returned to the heating ovens. Only sufficient supplies for each shift should be stored in the ovens to ensure an adequate flow.

Where electrodes of this type require baking to lower the hydrogen potential of the weld metal, it should be carried out at the temperatures recommended by the manufacturer.

Damage to electrodes through bad handling and storage facilities will cause uneven burnoff of the covering and produce defective welds.

Deterioration through age will be noticed by the presence on the electrode of 'fur' caused by the extrusion through the covering of one of its constituents. Electrodes in this condition can still be used but, it is suggested, not for work of high quality.

Hints on welding

To produce a sound weld, control of certain operating conditions is required. These are:

- 1 Starting technique
- 2 Current and OCV
- 3 Arc length
- 4 Electrode angle
- 5 Welding speed
- 6 Joint preparation for welding.

With this correct control of the conditions, welds will have a satisfactory profile and a regular surface with adequate fusion and penetration, and there will be an absence of cracks, porosity, undercut, slag inclusions, and spatter.

Starting technique. There are two permissible ways of striking the arc:

- 1 In the stub technique the electrode is stubbed on to the plate and withdrawn to give the correct arc length.
- 2 With the scratch method the electrode is drawn along the joint until the arc is struck and established at the correct length.

On restriking the arc with a new electrode the slag should be removed from the end of the previous run. The arc should be struck slightly ahead of the crater previously formed and established over this short length, the crater being filled by a fully established arc. This minimises the chance of a defect at that point.

Optimum current and OCV. The recommended OCV should be checked to ensure that this is adequate for the electrode, according to the

manufacturer's specifications. The current setting for any given size of electrode provides the current burnoff or fusion rate and hence the penetration required. It is essential that the electrode size and current give the operator full control of the arc.

It should be pointed out that true current readings must be taken by instrument measurement and not by the power source settings which are given only as a guide.

Arc length control: cellulosic, rutile, and rutile iron powder covered electrodes. A long arc exposes the metal from the electrode to the atmosphere; the transfer is of large globular form and tends to produce heavy spatter. A long arc lacks the penetration power of the correct arc. The correct arc length gives uniform transfer of metal, even burnoff of covering, and adequate penetration and fusion of the joint. Iron powder electrodes can be used with either the 'touch' or 'contact' technique where the electrode is placed lightly on the joint and drawn along it, or alternatively, with the short arc technique as used with basic covered electrodes.

When using the touch method care should be taken to ensure that the travel speed is such that the weld pool does not run ahead and partially extinguish the arc. The technique is used on the flat or H/V positions only.

The short arc method is for use when welding in the vertical and overhead positions. The iron powder in these electrodes makes the covering substantially thicker than those without iron powder, therefore the gauge of electrode used in these positions must be small enough to give complete and adequate fusion.

Basic covered electrodes. The majority of electrodes of this class burn off with the shortest possible arc

length, the covering forming a cap around the arc. It is essential to keep the arc as short as possible, otherwise the shielding will break down, causing porosity.

Weaving. Because of the necessity to observe the correct arc length, weaving should be kept to a minimum. Where possible, all runs should be deposited by the 'stringer' technique, but where it is necessary to weave, this should be slow, controlled, and confined to a horizontal movement across the weld, the width of the weave being approximately twice the diameter of the electrode. Weaving is not recommended for electrodes of more than 4mm diameter (8swg).

Welding speeds. Correct speed and manipulation of the electrode gives a bead width of adequate proportion. Too high a speed tends to lead to undercut, narrow beads, and irregular contours. Too low a speed of travel produces a very wide bead, pile up of weld metal, and cold lapping.

Electrode angle. It is extremely important that the correct electrode-to-workpiece angle be maintained: failure to do this will result in uneven burnoff of the covering which may cause defects. Table A gives recommended angles in the direction of travel, also the angle of inclination of the electrode to the plate for the flat, H/V, vertical, and overhead positions.

Defects

Listed in Table B are some defects which may occur through incorrect use of the electrode or incorrect conditions, together with the possible cause. These are given only as a guide to good welding practice and should be used accordingly.

Table A Typical electrode angles
Butt joints

Electrode covering type	Angle of electrode in direction of travel, °				Angle of inclination to joint, °			
	Position				Position			
	F	H/V	V	O	F	H/V	V	O
Cellulosic	70–80	70–80	90–110	70–80	90	60–110	90	90
Rutile	70–80	70–80	90–110	70–80	90	60–110	90	90
Rutile iron powder	60–70	60–70	60–80	60–70	90	70–110	90	90
Basic	70–80	70–80	70–80	70–80	90	60–110	90	90

Fillet joints

Electrode covering type	Angle of electrode in direction of travel, °				Angle of inclination to joint, °			
	Position				Position			
	F	H/V	V	O	F	H/V	V	O
Cellulosic	70–80	70–80	90–110	70–80	90	50–70	90	30–40
Rutile	70–80	70–80	90–110	70–80	90	50–70	90	30–40
Rutile iron powder	60–70	60–70	60–80	60–70	90	34–45	90	45–50
Basic	70–80	70–80	70–80	70–80	90	90	50–60	30–40

Table B Typical MMA weld defects and their causes

Defect	Possible cause
Lack of penetration or fusion	Too large an electrode for joint preparation
	Incorrect angle of electrode for joint configuration
	Too low a current with too high a speed of travel
	Wrong polarity
	Poor incorporation of tack welds
	Incorrect joint preparation
Porosity	Arc too long
	Conditions of electrode, e.g. excessive moisture content damage to covering
	Incorrect electrode for parent metal
	Welding current too low
	Welding current too high
	Arc too long
	Ineffective filling of weld craters
Slag inclusion	Incorrect weaving techniques
	Conditions of material and surface, e.g. scale, moisture, rust, paint, etc.
	Current speed of travel too low
	Electrode too large
	Inadequate cleaning between runs
	Welding over irregular profile
Undercut	Arc too long
	Variation in welding speed
	Wrong joint configuration
	Excessive welding current
	Excessive weaving of electrode
Spatter	Incorrect angle of electrode
	Excessive travel speed
	Electrode too large
	Current too high
	Arc too long
	Incorrect angle of electrode

NOTES ON THE USE OF CO₂ SEMI-AUTOMATIC WELDING FOR MILD STEEL

The theory and practice of the process are dealt with in detail in The Welding Institute's handbook 'CO₂ welding' by A. A. Smith, and it is suggested that this should be consulted for general reference. The following brief notes are meant to serve only as a guide to the use of the process.

Equipment

Conventional semi-automatic welding equipment consists of three main parts: the power source, the wire feed unit, and the welding gun.

The power source. This supplies the DC required for welding and also the power for auxiliaries such as the wire feed unit and gas heater. There are three main types:

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

The wire drive unit. This feeds the wire by means of a variable speed motor and driven pinch rolls at speeds between 75 and 1500m/hr and usually incorporates controls for wire feed speed and gas flow.

The welding gun. Wire, power, and the shielding gas are fed to the gun which may be air- or water-cooled, depending on the size and current capacity. Guns are available with a pistol grip or 'goose neck' shape to facilitate handling.

Welding with solid wire

Wire selection. Wires for CO₂ welding are produced under close control of composition, diameter, and surface quality. Normally these are specified in national standards, for example BS 2901.

Operating conditions. Three main ranges of welding parameter are used for CO₂ welding with solid wire according to the arc voltage and current settings chosen, as follows:

- 1 Short circuiting (dip transfer) is obtained when a low voltage and current are selected and metal transfer occurs by frequent short circuiting of the electrode wire to the weld pool. This technique gives the low heat input and small controllable weld pool essential for welding sheet metal in all positions and thicker sections in the vertical and overhead positions.
- 2 Semi-shortening (globular dip transfer) obtained when higher currents and voltages are used giving longer periods of arcing but with metal transfer by short circuiting. This condition gives a larger weld pool and medium penetration suitable for H/V fillet welds and flat position welds in medium and heavy sections.
- 3 Spray arc (free flight transfer) is obtained at the highest usable voltages and currents, giving deep penetration and a high metal deposition rate suitable for H/V fillet welds and flat position welds in medium and heavy sections.

Wire diameter. The selection of wire diameter for any particular application will depend on the type of joint, equipment, and consumables available.

Typical welding parameter ranges for the different wire diameters available are given in Table C. In general, the following broad guidelines are followed:

0.8mm diameter — most widely used for welding thin sheet because of the low currents and small weld pools which can be used. This wire is not widely used at higher current levels because of the higher cost and wire feed speeds compared with larger wires.

1.0mm diameter — widely used for sheet and tin plate welding. Although not as easy to use on thin sheet steel as 0.8mm wire, its usability at currents up to 300A improves its versatility.

Table C Typical operating ranges for CO₂ welding with solid wires

Wire diameter, mm	Short circuiting,		Semi-shorting,		Spray arc,	
	A	V	A	V	A	V
0.8	45–150	16–22	150–200	24–26	150–250	26–35
1.0	75–175	16–22	175–230	23–26	230–300	26–35
1.2	100–200	16–22	200–280	24–28	250–400	30–35
1.6	120–200	16–22	200–280	24–30	250–450	30–45

1.2mm diameter — the most widely used size of solid wire since it can be used at currents from 100 to 400A.

1.6mm diameter — although this wire may be used in the short circuiting and semi-shorting modes, it is being replaced in many applications by the more versatile 1.2mm wire. The main application of 1.6mm wire now is for spray-type arcs where greater penetration and high metal deposition rates can be used.

Welding with flux-cored wires

Wire selection. Flux-cored wires vary considerably in their composition and characteristics according to the manufacturer involved, and no overall standards are currently available to define these characteristics.

The majority of wires are available in 2.4 and 3.2mm diameters and are suitable for high current, high deposition rate welding of H/V fillets and flat position joints in medium to heavy sections.

According to wire type, diameter, and application, welding currents of 300 to 650A may be used.

General comments

Voltage. The arc voltage set for any welding condition will depend on the current, joint type, and equipment. The voltage indicated by the power source meters will generally be greater than the true mean arc voltage by an amount determined by the position of the meter in the circuit and the voltage drop in the leads. For this reason ranges of voltage have been given and the indicated value used should be chosen from experience with the equipment.

Wire feed/current relationship. Small differences in wire diameter and chemical composition and resistance heating in the stickout can cause wide variations in this relationship. If this is found to differ in practice from the conditions given it is the wire feed speed which should be regarded as significant in controlling welding speed, since this variable is directly related to metal deposition rate.

Setting the controls. Every commercial CO₂ welding set is supplied with a handbook which should be studied before the set is used. When setting up the procedures for CO₂ welding, four controls are available to the operator:

- 1 Wire feed speed — controlling current
- 2 Open circuit voltage — controlling arc voltage
- 3 Choke (inductance) — controlling spatter
- 4 CO₂ gas flow — controlling shielding.

With a constant potential power source the wire feed rate directly controls the current, and the setting of the OCV governs the arc voltage. The choke, usually available for low current ranges only, adjusts the response of the power source to the current surges when using short circuiting con-

ditions; this controls spatter and weld fusion into the plate. Gas flow depends on the nozzle design, but in practice this will usually be found to be between 10 and 30 litre/min.

From the above, it can be seen that basic essentials for setting the unit, depending on the mode of transfer required, are:

- 1 Set OCV to a little above that of the arc volts (constant potential power source)
- 2 Set wire feed speed to give burnoff value to suit current required
- 3 Set choke, if used, to give stable arc conditions.

If using a slope-controlled unit, the slope control can be used together with or instead of the choke.

Equipment maintenance

Unlike MMA welding plant, CO₂ welding equipment requires regular routine maintenance to ensure that a good performance is obtained. The frequency of this maintenance will depend on the duty cycle, the welding conditions, and make of equipment, but the following general comments can be made.

Wire feed. It is essential that the wire feeds smoothly. Regular checks should be made on feed roll size, pressure and alignment, wire guide wear, and alignment and wear or kinking of wire feed linears, which should be blown out with compressed gas to clear swarf or foreign matter which may collect.

Contact tip. Because of the heavy current passing between the tip and the wire, the hole through the tip becomes enlarged with time, giving poor contact, intermittent arcing, and unstable conditions. Before this stage is reached the tip should be changed.

Gas-shielding nozzle. Spatter from the arc can rapidly clog the nozzle, causing inefficient gas shielding. This spatter should be removed frequently; an anti-spatter compound may be useful. Checks should be made regularly that the gas entry ports are clear.

Gas and water lines. All fittings and hoses should be checked regularly for leaks. This is particularly important on gas lines since air can be entrained, causing weld porosity.

Electrical connections. Loose or poor connections can cause a heavy voltage drop in the welding circuit, and erratic arcing. All connections, particularly earthing to the work, should be checked regularly. Meters should also be calibrated whenever possible.

When hard wires are used, fitting a pair of wire straighteners may be found to improve the wire feed by straightening out the natural curvature of a reeled wire.

Defects

As in other welding processes, the CO₂ semi-automatic process can give rise to weld defects if good welding practice is neglected. Table D lists the typical defects found in CO₂ welding and the possible causes. Detailed discussions of defects and their causes are to be found in the Institute's 'CO₂ welding' book.

Table F Typical CO₂ weld defects and their causes

Defect	Common causes
Porosity	Gas flow too low or too high
	Blocked nozzle
	Leaking gas lines
	Draughty conditions
	Nozzle/work distance too long
	Painted, primed, wet, or oily work
	Wet or rusty wire
Centre-line cracking	Spray transfer welding with current too high
	Deep narrow preparation
Crater cracking	Poor finishing technique
Lack of penetration	Current too low
	Preparation too narrow
	Root face too thick
	Root gap too small
	Worn contact tip, causing irregular arcing
	Irregular wire feed
	Poor technique
Undercut	Mismatched joint
	Speed too high
	Current too high
	Poor technique
Lack of fusion	Voltage too low
	Current too low or too high
	Irregular surface
	Wrong torch angle
Spatter	Inadequate choke
	Voltage too low
	Rusty or primed plate

Table E Ancillary elements

Elements	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 electrode and electrode holder (600mm) and fit electrode to holder (twist grip)	0·071
4 Pick up electrode and electrode holder (600mm) and fit electrode to holder (spring grip)	0·056
5 Remove electrode stub and aside holder (600mm) (twist grip)	0·055
6 Remove electrode stub and aside holder (600mm) (spring grip)	0·031
7 Pick up hand face shield (600mm) and position with electrode to workpiece	0·077
8 Aside hand face shield (600mm)	0·025
9 Pick up head shield (600mm) and fit to head	0·045
10 Remove head shield from head and place aside (600mm)	0·035
11 Raise or lower head shield	0·012
12 Position electrode to workpiece (350mm) and lower head shield	0·057
13 Pick up MIG gun (450mm), position to workpiece, and lower head shield	0·057
14 Remove electrode stub, pick up electrode, and fit electrode to holder (600mm) (twist grip)	0·102
15 Remove electrode stub, pick up electrode, and fit electrode to holder (600mm) (spring grip)	0·062
16 Pick up side cutters (600mm), position to wire, cut off end, and aside cutters	0·077
17 Pick up hand reamer (600mm), clean nozzle to remove spatter, and aside reamer	0·085
18 Pick up can containing anti-spatter fluid (600mm), spray nozzle, and aside can	0·081

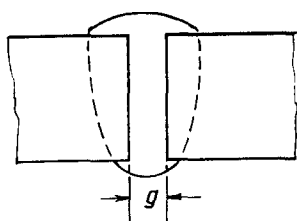
Table F Butt weld manual metal-arc and CO₂ semi-automatic welding sealing run preparation metal removal ancillaries

Element	Appliance used	Basic Minutes
1 Obtain welding gloves and fit to hands	Air-arc cutter	0·085
2 Remove welding gloves and place aside	Air-arc cutter	0·062
3 Pick up carbon electrode and holder and fit carbon to holder	Air-arc cutter	0·056
4 Remove carbon stub, pick up new carbon, and fit to holder	Air-arc cutter	0·062
5 Remove carbon stud and aside holder	Air-arc cutter	0·031
6 Pick up face shield and position carbon to work	Air-arc cutter	0·077
7 Aside face shield	Air-arc cutter	0·025
8 Pick up face mask and fit to head	Grinder and hammer	0·045
9 Remove face mask from head and place aside	Grinder and hammer	0·035
10 Raise or lower face mask	Grinder and hammer	0·012
11 Pick up grinder and position to work	Grinder	0·058
12 Aside grinder	Grinder	0·026
13 Pick up chipping hammer and position to work	Hammer	0·062
14 Aside chipping hammer	Hammer	0·026

All values expressed in Basic Minutes, i.e. minutes at Standard Rate of working without allowances

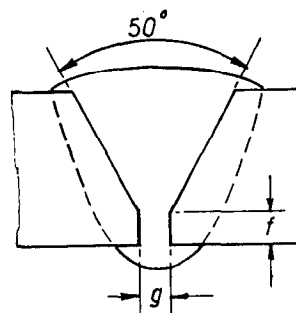
BUTT WELD PREPARATIONS

A



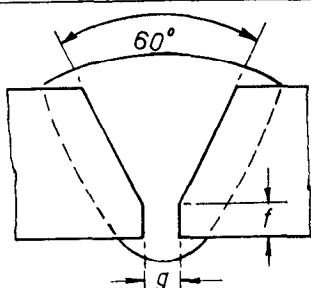
	g
	mm
Aa:	0
Ab:	1
Ac:	1.5

B



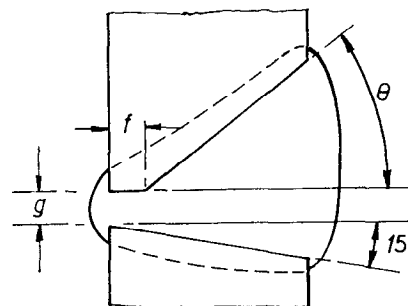
	g	f
	mm	mm
Ba:	1.5	1.5

C



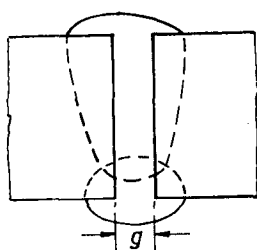
	g	f
	mm	mm
Ca:	0	1.5
Cb:	1	0
Cc:	1	1
Cd:	1	1.5
Ce:	1.5	1
Cf:	1.5	1.5
Cg:	2	1.5

D



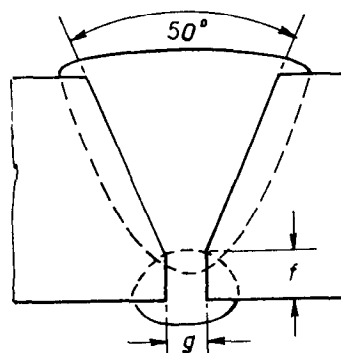
	g	f	θ
	mm	mm	°
Da:	1.5	1.5	25
Db:	1.5	1.5	30
Dc:	1.5	1	45
Dd:	1.5	1.5	45

E



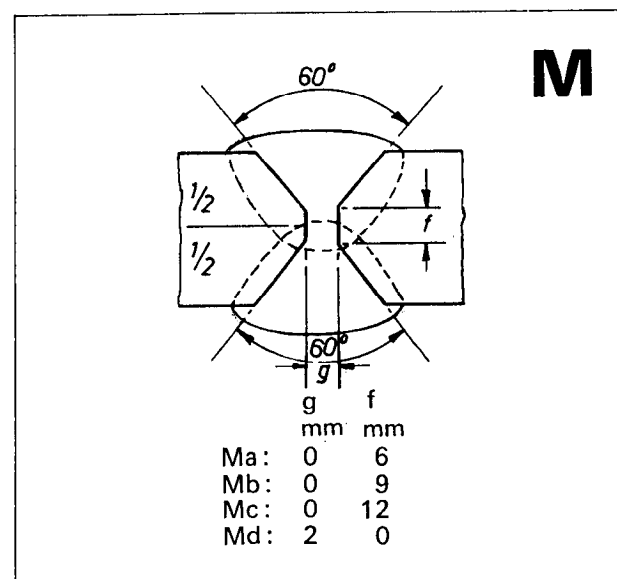
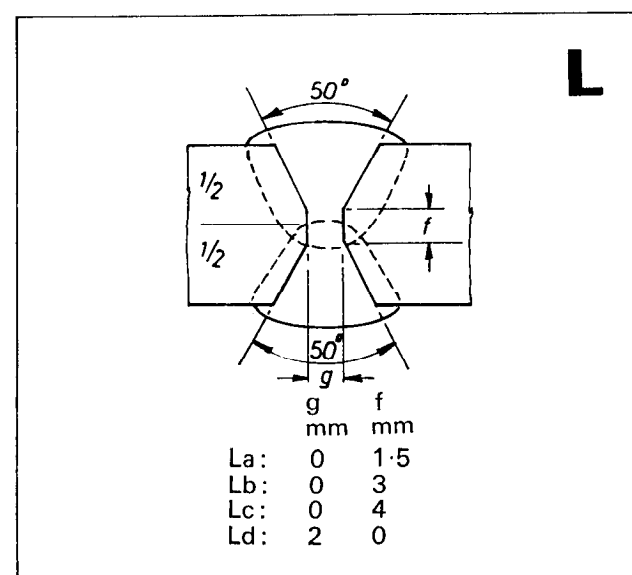
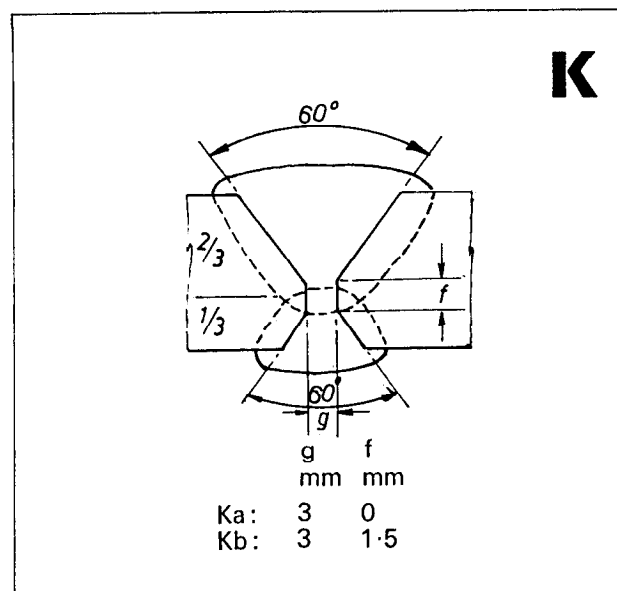
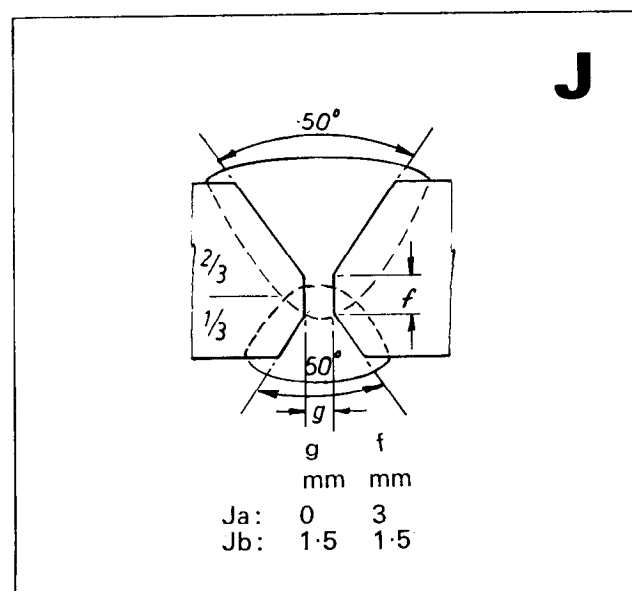
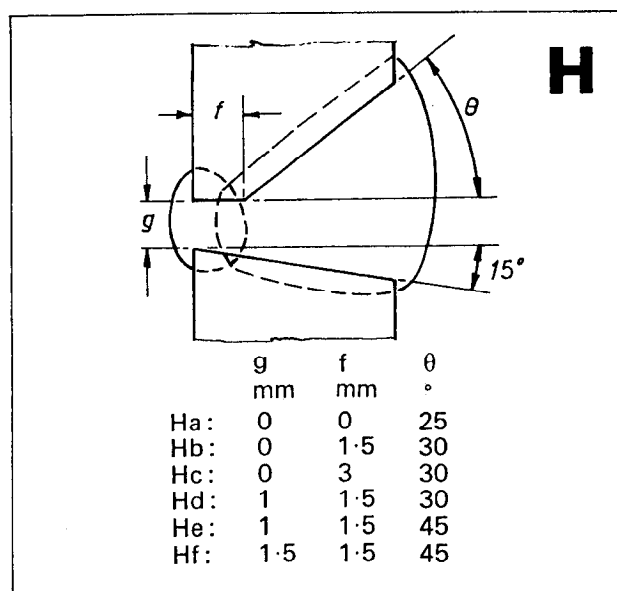
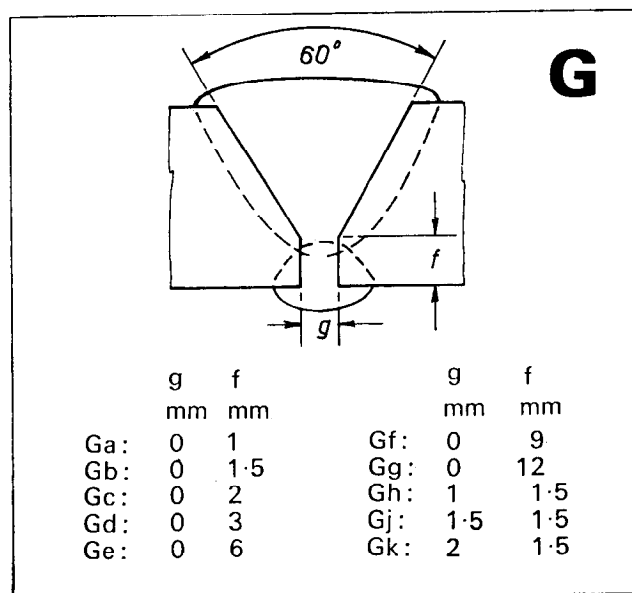
	g
	mm
Ea:	0
Eb:	1
Ec:	1.5

F

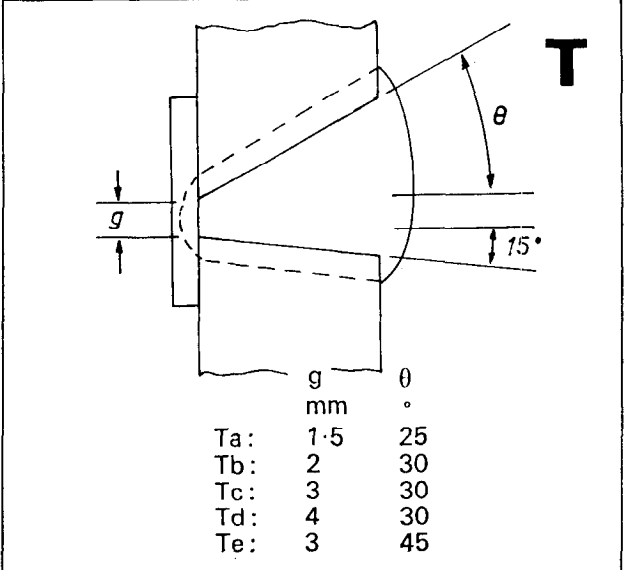
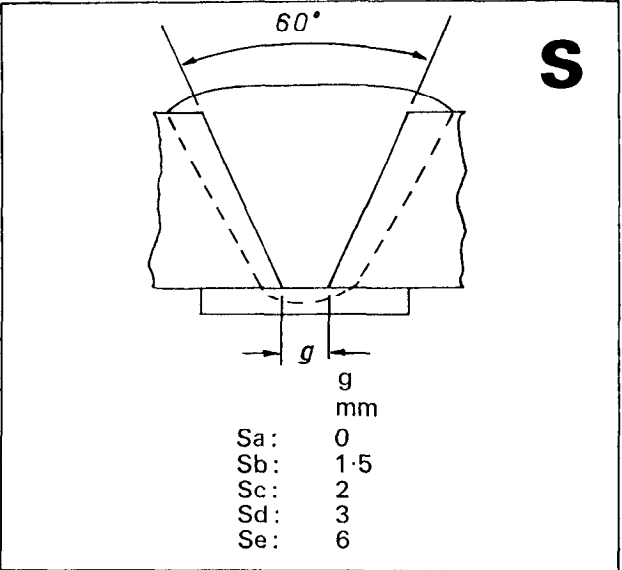
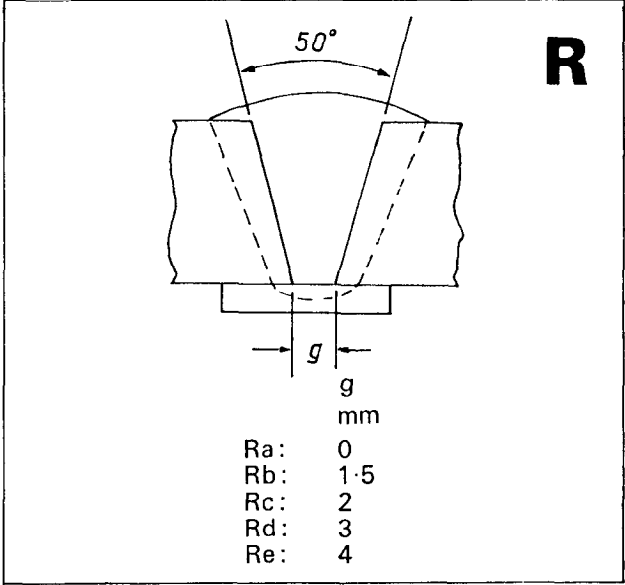
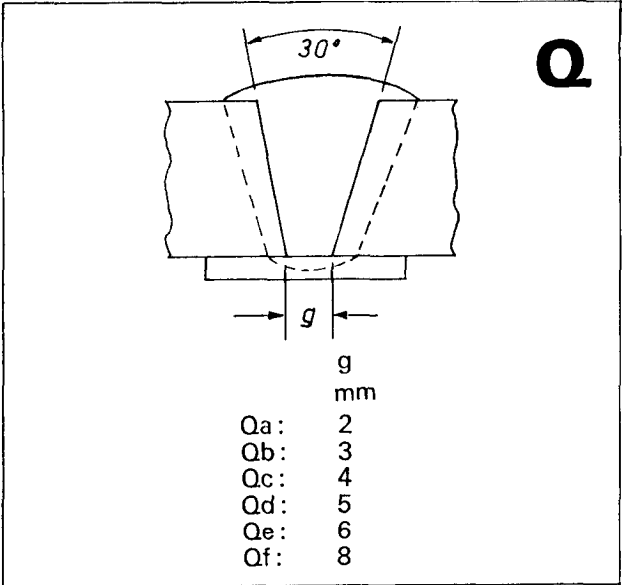
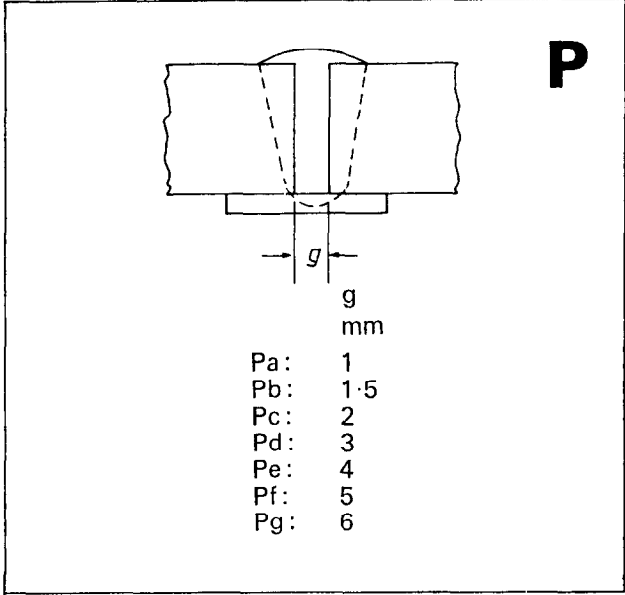
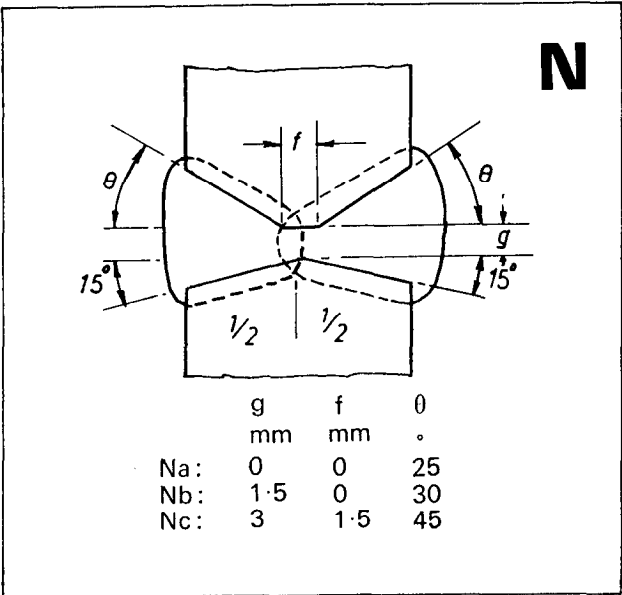


	g	f
	mm	mm
Fa:	0	1.5
Fb:	0	3
Fc:	0	6
Fd:	1.5	1.5

BUTT WELD PREPARATIONS



BUTT WELD PREPARATIONS



INDEX TO TABLES

Weld type	Process	Electrode	Position	Procedure	Table no.	Page nos
Fillet	MMA	Cellulose	All	—	1	1
		Rutile 93·5%	All	—	2	2-3
		Rutile iron powder 130%	All	—	3	3-4
		Rutile iron powder 140%	F and H/V	—	4	5
		Rutile iron powder 150%	F and H/V	—	5	6
		Rutile iron powder 160%	F and H/V	—	6	7
		Basic, hydrogen controlled	All	—	7	8-9
		Basic, hydrogen controlled	D	—	8	9
	CO ₂	Basic, hydrogen controlled 120%	All	—	9	10-11
		Solid wire, 0·8mm	All	—	111	69
		Solid wire, 1·0mm	All	—	112	70-71
		Solid wire, 1·2mm	All	—	113	71-72
		Solid wire, 1·6mm	All	—	114	73-74
		Flux-cored wire, 2·4mm	F and H/V	—	115	74-75
		Flux-cored wire, 3·2mm	F and H/V	—	116	75
Butt	MMA	Cellulose	F	Single-sided, unbacked	10	12
		Cellulose	F	Sealed	11	12-13
		Cellulose	F	Backed	12	13
		Cellulose	H/V	Single-sided, unbacked	13	14
		Cellulose	H/V	Sealed	14	14
		Cellulose	H/V	Backed	15	15
		Cellulose	V	Single-sided, unbacked	16	15
		Cellulose	V	Sealed	17	16
		Cellulose	V	Backed	18	16-17
		Cellulose	O	Single-sided, unbacked	19	17
		Cellulose	O	Backed	20	18
		Cellulose	All	Sealing run ; supplement : air-arc gouging	21	18
		Cellulose	All	Sealing run ; supplement : chipping	22	19
		Rutile 93·5%	F	Single-sided, unbacked	23	19
		Rutile 93·5%	F	Sealed	24	20
		Rutile 93·5%	F	Sealed	25	21
		Rutile 93·5%	F	Backed	26	21-22
		Rutile 93·5%	F	Backed	27	22
		Rutile 93·5%	H/V	Single-sided, unbacked	28	23
		Rutile 93·5%	H/V	Sealed	29	23
		Rutile 93·5%	H/V	Sealed	30	24
		Rutile 93·5%	H/V	Backed	31	24
		Rutile 93·5%	H/V	Backed	32	25
		Rutile 93·5%	V	Single-sided, unbacked	33	25
		Rutile 93·5%	V	Sealed	34	26
		Rutile 93·5%	V	Sealed	35	26
		Rutile 93·5%	V	Backed	36	27
		Rutile 93·5%	V	Backed	37	27
		Rutile 93·5%	O	Single-sided, unbacked	38	28
		Rutile 93·5%	O	Backed	39	28
		Rutile 93·5%	All	Sealing run ; supplement : air-arc gouging	40	29
		Rutile 93·5%	All	Sealing run ; supplement : chipping	41	29
		Rutile iron powder 130%	F	Single-sided, unbacked	42	30

Weld type	Process	Electrode	Position	Procedure	Table no.	Page nos
Butt	MMA	Rutile iron powder 130%	F	Sealed	43	30–31
		Rutile iron powder 130%	F	Sealed	44	31
		Rutile iron powder 130%	F	Backed	45	32
		Rutile iron powder 130%	H/V	Single-sided, unbacked	46	33
		Rutile iron powder 130%	H/V	Sealed	47	33–34
		Rutile iron powder 130%	H/V	Backed	48	34
		Rutile iron powder 130%	V	Single-sided, unbacked	49	35
		Rutile iron powder 130%	V	Sealed	50	35
		Rutile iron powder 130%	V	Backed	51	36
		Rutile iron powder 130%	O	Single-sided, unbacked	52	36
		Rutile iron powder 130%	O	Backed	53	37
		Rutile iron powder 130%	All	Sealing run ; supplement : air-arc gouging	54	37
				Sealing run ; supplement : chipping	55	38
		Rutile iron powder 130%	F	Single-sided, unbacked	56	38
		Rutile iron powder 140%	F	Sealed	57	39
		Rutile iron powder 140%	F	Sealed	58	40
		Rutile iron powder 140%	F	Backed	59	40
		Rutile iron powder 140%	F	Sealed	60	41
		Rutile iron powder 150%	F	Single-sided, unbacked	61	41
		Rutile iron powder 150%	F	Sealed	62	42
		Rutile iron powder 150%	F	Sealed	63	43
		Rutile iron powder 150%	F	Backed	64	43
		Rutile iron powder 150%	F	Sealed	65	44
		Rutile iron powder 160%	F	Single-sided, unbacked	66	44
		Rutile iron powder 160%	F	Sealed	67	45
		Rutile iron powder 160%	F	Sealed	68	46
		Rutile iron powder 160%	F	Backed	69	46
		Rutile iron powder 160%	F	Sealed	70	47
		Basic, hydrogen controlled	F	Single-sided, unbacked	71	47
		Basic, hydrogen controlled	F	Sealed	72	48
		Basic, hydrogen controlled	F	Sealed	73	49
		Basic, hydrogen controlled	F	Backed	74	50
		Basic, hydrogen controlled	F	Backed	75	50
		Basic, hydrogen controlled	H/V	Single-sided, unbacked	76	51
		Basic, hydrogen controlled	H/V	Sealed	77	51
		Basic, hydrogen controlled	H/V	Sealed	78	52
		Basic, hydrogen controlled	H/V	Backed	79	52
		Basic, hydrogen controlled	V	Single-sided, unbacked	80	53
		Basic, hydrogen controlled	V	Sealed	81	53
		Basic, hydrogen controlled	V	Sealed	82	54
		Basic, hydrogen controlled	V	Backed	83	54
		Basic, hydrogen controlled	O	Single-sided, unbacked	84	55
		Basic, hydrogen controlled	O	Backed	85	55
		Basic, hydrogen controlled	All	Sealing run ; supplement : air-arc gouging	86	56
		Basic, hydrogen controlled	All	Sealing run ; supplement : chipping	87	56
		Basic, hydrogen controlled	D	Single-sided, unbacked	88	57
		Basic, hydrogen controlled	D	Sealed	89	57
		Basic, hydrogen controlled	D	Sealed	90	58
		Basic, hydrogen controlled	D	Backed	91	58
		Basic, hydrogen controlled	D	Backed	92	59
		Basic, hydrogen controlled	D	Sealed	93	59
		Basic, hydrogen controlled 120%	F	Single-sided, unbacked	94	60

Weld type	Process	Electrode	Position	Procedure	Table no.	Page nos
Butt	MMA	Basic, hydrogen controlled 120%	F	Sealed	95	60-61
		Basic, hydrogen controlled 120%	F	Sealed	96	61
		Basic, hydrogen controlled 120%	F	Backed	97	62
		Basic, hydrogen controlled 120%	F	Backed	98	62
		Basic, hydrogen controlled 120%	H/V	Single-sided, unbacked	99	63
		Basic, hydrogen controlled 120%	H/V	Sealed	100	63
		Basic, hydrogen controlled 120%	H/V	Sealed	101	64
		Basic, hydrogen controlled 120%	H/V	Backed	102	64
		Basic, hydrogen controlled 120%	V	Single-sided, unbacked	103	65
		Basic, hydrogen controlled 120%	V	Sealed	104	65
		Basic, hydrogen controlled 120%	V	Sealed	105	66
		Basic, hydrogen controlled 120%	V	Backed	106	66
		Basic, hydrogen controlled 120%	O	Single-sided, unbacked	107	67
		Basic, hydrogen controlled 120%	O	Backed	108	67
		Basic, hydrogen controlled 120%	All	Sealing run ; supplement : air-arc gouging	109	68
		Basic, hydrogen controlled 120%	All	Sealing run ; supplement : chipping	110	68
Butt	CO ₂	Solid wire, 0.8mm	F	Single-sided, unbacked	117	76
		Solid wire, 0.8mm	F	Sealed	118	76
		Solid wire, 0.8mm	F	Backed	119	77
		Solid wire, 0.8mm	H/V	Single-sided, unbacked	120	77
		Solid wire, 0.8mm	H/V	Sealed	121	78
		Solid wire, 0.8mm	H/V	Backed	122	78
		Solid wire, 0.8mm	V	Single-sided, unbacked	123	79
		Solid wire, 0.8mm	V	Sealed	124	79
		Solid wire, 0.8mm	V	Backed	125	80
		Solid wire, 0.8mm	O	Single-sided, unbacked	126	80
		Solid wire, 0.8mm	O	Backed	127	81
		Solid wire, 0.8mm	All	Sealing run : supplement : air-arc gouging	128	81
		Solid wire, 0.8mm	All	Sealing run ; supplement : chipping	129	82
		Solid wire, 1mm	F	Single-sided, unbacked	130	82
		Solid wire, 1mm	F	Sealed	131	83
		Solid wire, 1mm	F	Backed	132	84
		Solid wire, 1mm	H/V	Single-sided, unbacked	133	84
		Solid wire, 1mm	H/V	Sealed	134	85
		Solid wire, 1mm	H/V	Backed	135	85
		Solid wire, 1mm	V	Single-sided, unbacked	136	86
		Solid wire, 1mm	V	Sealed	137	86
		Solid wire, 1mm	V	Backed	138	87
		Solid wire, 1mm	O	Single-sided, unbacked	139	87
		Solid wire, 1mm	O	Backed	140	88
		Solid wire, 1mm	All	Sealing run ; supplement : air-arc gouging	141	88
		Solid wire, 1mm	All	Sealing run ; supplement : chipping	142	89
		Solid wire, 1.2mm	F	Single-sided, unbacked	143	89
		Solid wire, 1.2mm	F	Sealed	144	90
		Solid wire, 1.2mm	F	Backed	145	91
		Solid wire, 1.2mm	H/V	Single-sided, unbacked	146	91
		Solid wire, 1.2mm	H/V	Sealed	147	92
		Solid wire, 1.2mm	H/V	Backed	148	92
		Solid wire, 1.2mm	V	Single-sided, unbacked	149	93

Weld type	Process	Electrode	Position	Procedure	Table no.	Page nos
Butt	CO ₂	Solid wire, 1·2mm	V	Sealed	150	93
		Solid wire, 1·2mm	V	Backed	151	94
		Solid wire, 1·2mm	O	Single-sided, unbacked	152	94
		Solid wire, 1·2mm	O	Backed	153	95
		Solid wire, 1·2mm	All	Sealing run ; supplement : air-arc gouging	154	95
		Solid wire, 1·2mm	All	Sealing run ; supplement : chipping	155	96
		Solid wire, 1·6mm	F	Single-sided, unbacked	156	96
		Solid wire, 1·6mm	F	Sealed	157	97
		Solid wire, 1·6mm	F	Backed	158	97
		Solid wire, 1·6mm	H/V	Single-sided, unbacked	159	98
		Solid wire, 1·6mm	H/V	Sealed	160	98
		Solid wire, 1·6mm	H/V	Backed	161	99
		Solid wire, 1·6mm	V	Single-sided, unbacked	162	99
		Solid wire, 1·6mm	V	Sealed	163	100
		Solid wire, 1·6mm	V	Backed	164	100
		Solid wire, 1·6mm	O	Single-sided, unbacked	165	101
		Solid wire, 1·6mm	O	Backed	166	101
		Solid wire, 1·6mm	All	Sealing run ; supplement : air-arc gouging	167	102
		Solid wire, 1·6mm	All	Sealing run ; supplement : chipping	168	102
		Flux-cored wire, 2·4mm	F	Sealed	169	103
		Flux-cored wire, 2·4mm	F	Backed	170	103
		Flux-cored wire, 2·4mm	F	Sealed	171	104
		Flux-cored wire, 3·2mm	F	Sealed	172	104
		Flux-cored wire, 3·2mm	F	Backed	173	104

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5-0	F F	1	4-00	120	1-69	57	0-153	4-2	1-61	6-70
		1	5-00	160	1-08	57	0-153	2-7	0-85	4-81
5-0	H H	1	4-00	110	1-69	57	0-153	4-2	1-61	7-43
		1	5-00	160	1-08	57	0-153	2-7	0-85	4-81
5-0	V V	1	3-25	85	3-06	89	0-185	7-6	3-33	12-26
		1	4-00	110	2-03	89	0-185	5-1	2-04	8-93
5-0	D D	1	4-00	160	1-36	26	0-123	3-4	1-20	3-86
		1	5-00	190	0-87	26	0-123	2-2	0-59	3-19
6-0	F F	1	5-00	160	1-47	48	0-208	3-7	1-34	6-54
		1	6-30	230	0-93	48	0-208	2-3	0-66	4-38
6-0	H H	1	5-00	160	1-47	48	0-208	3-7	1-34	6-54
		1	6-30	220	0-93	48	0-208	2-3	0-66	4-60
6-0	V V	1	3-25	85	3-93	68	0-237	9-8	4-42	15-75
		1	4-00	110	2-61	68	0-237	6-5	2-77	11-48
6-0	D D	1	5-00	190	1-20	20	0-170	3-0	1-00	4-39
		1	6-30	255	0-75	20	0-170	1-9	0-44	3-19
8-0	F F	1	5-00	160	2-41	37	0-342	6-0	2-52	10-73
		1	6-30	230	1-52	37	0-342	3-8	1-40	7-19
8-0	H H	1&2	4-00	110	3-77	37	0-342	9-4	4-22	16-56
		1&2	5-00	160	2-41	37	0-342	6-0	2-52	10-73
8-0	V V	1	3-25	85	6-04	45	0-364	15-1	7-05	24-18
		1	4-00	110	4-01	45	0-364	10-0	4-52	17-61
10-0	F F	1	5-00	160	3-58	30	0-508	8-9	3-98	15-92
		1	6-30	230	2-26	30	0-508	5-6	2-32	10-67
10-0	H H	1-3	4-00	110	5-60	30	0-508	14-0	6-50	24-57
		1-3	5-00	160	3-58	30	0-508	8-9	3-98	15-92
10-0	V V	1&2	3-25	85	8-63	33	0-520	21-6	10-29	34-56
		1&2	4-00	110	5-73	33	0-520	14-3	6-67	25-18
12-0	F	1&2	6-30	230	3-13	25	0-705	7-8	3-41	14-81
12-0	H	1-3	6-30	220	3-13	25	0-705	7-8	3-41	15-54
12-0	V	1-4	4-00	110	7-79	25	0-706	19-5	9-23	34-19

Fillet weld

All positions

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

1

Fillet weld

2

All positions

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5.0	F	1	4.00	180	1.26	18	0.116	3.1	1.07	4.66
		1	5.00	220	0.81	18	0.116	2.0	0.51	3.75
5.0	H	1	4.00	180	1.26	18	0.116	3.1	1.07	4.66
		1	5.00	220	0.81	18	0.116	2.0	0.51	3.75
5.0	V	1	3.25	115	2.49	52	0.148	6.2	2.61	9.86
		1	4.00	145	1.62	52	0.148	4.0	1.52	7.59
5.0	O	1	4.00	170	1.62	52	0.148	4.0	1.52	6.36
		1	5.00	200	1.03	52	0.148	2.6	0.79	5.33
6.0	F	1	5.00	220	1.14	17	0.164	2.9	0.93	5.33
		1	6.30	300	0.72	17	0.164	1.8	0.40	3.84
6.0	H	1	4.00	180	1.79	17	0.164	4.5	1.74	6.63
		1	5.00	220	1.14	17	0.164	2.9	0.93	5.33
6.0	V	1	3.25	115	3.39	44	0.202	8.5	3.74	13.46
		1	4.00	145	2.21	44	0.202	5.5	2.26	10.35
6.0	O	1&2	4.00	170	2.21	44	0.202	5.5	2.26	8.68
		1&2	5.00	200	1.41	44	0.202	3.5	1.26	7.28
8.0	F	1	5.00	220	2.00	15	0.287	5.0	2.00	9.31
		1	6.30	300	1.26	15	0.287	3.2	1.08	6.70
8.0	H	1-3	4.00	180	3.13	15	0.287	7.8	3.41	11.57
		1&2	5.00	220	2.00	15	0.287	5.0	2.00	9.31
8.0	V	1&2	3.25	115	5.61	34	0.334	14.0	6.51	22.24
		1&2	4.00	145	3.65	34	0.334	9.1	4.06	17.11
8.0	O	1-3	4.00	170	3.65	34	0.334	9.1	4.06	14.35
		1&2	5.00	200	2.33	34	0.334	5.8	2.41	12.02
10.0	F	1	5.00	220	3.08	13	0.443	7.7	3.35	14.36
		1	6.30	300	1.95	13	0.443	4.9	1.94	10.33
10.0	H	1-4	4.00	180	4.83	13	0.443	12.1	5.53	17.84
		1-3	5.00	220	3.08	13	0.443	7.7	3.35	14.36
10.0	V	1-3	3.25	115	8.35	28	0.498	20.9	9.94	33.14
		1&2	4.00	145	5.43	28	0.498	13.6	6.29	25.49
10.0	O	1-4	4.00	170	5.43	28	0.498	13.6	6.29	21.38
		1-3	5.00	200	3.47	28	0.498	8.7	3.84	17.91
12.0	F	1&2	6.30	300	2.78	12	0.631	6.9	2.97	14.74
12.0	H	1-3	5.30	275	2.78	12	0.631	6.9	2.97	16.15
12.0	V	1	4.00	145	2.30	23	0.211	5.8	0.95	10.81
		2	5.00	170	3.36		0.482	8.4	1.48	20.70
12.0	O	1-6	5.00	200	4.83	23	0.694	12.1	5.54	24.94
15.0	F	1&2	6.30	300	4.29	11	0.976	10.7	4.87	22.78
15.0	H	1-5	6.30	275	4.29	11	0.976	10.7	4.87	24.97
15.0	V	1	4.00	145	2.30	19	0.211	5.8	0.95	10.81
		2&3	5.00	170	5.81		0.835	14.5	2.71	35.82
15.0	O	1-9	5.00	200	7.29	19	1.046	18.2	8.61	37.61
18.0	F	1-4	6.30	300	6.13	10	1.394	15.3	7.17	32.54
18.0	H	1-8	6.30	275	6.13	10	1.394	15.3	7.17	35.67
18.0	V	1	4.00	145	2.30	16	0.211	5.8	0.95	10.81
		2-4	5.00	170	8.76		1.258	21.9	4.18	53.99
18.0	O	1-12	5.00	200	10.24	16	1.469	25.6	12.29	52.83

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
20-0	F	1-6	6-30	300	7-54	10	1-713	18-9	8-93	39-99
20-0	H	1-10	6-30	275	7-54	10	1-713	18-9	8-93	43-84
20-0	V	1 2-5	4-00 5-00	145 170	2-30 11-00	15	0-211 1-580	5-8 27-5	0-95 5-30	10-81 67-79
20-0	O	1-15	5-00	200	12-48	15	1-791	31-2	15-09	64-39
22-0	F	1-8	6-30	300	9-09	9	2-065	22-7	10-86	48-21
22-0	H	1-12	6-30	275	9-09	9	2-065	22-7	10-86	52-84
22-0	V	1 2-6	4-00 5-00	145 170	2-30 13-46	13	0-211 1-933	5-8 33-7	0-95 6-53	10-81 82-94
22-0	O	1-20	5-00	200	14-93	13	2-144	37-3	18-17	77-09
25-0	F	1-10	6-30	300	11-68	9	2-654	29-2	14-10	61-95
25-0	H	1-15	6-30	275	11-68	9	2-654	29-2	14-10	67-90
25-0	V	1 2-8	4-00 5-00	145 170	2-30 17-56	12	0-211 2-521	5-8 43-9	0-95 8-58	10-81 108-19
25-0	O	1-27	5-00	200	19-03	12	2-732	47-6	23-29	98-24

5-0	F	1	4-00	255	0-87	17	0-114	2-2	0-58	2-80
	F	1	5-00	300	0-55	17	0-114	1-4	0-19	2-20
5-0	H	1	4-00	245	0-87	17	0-114	2-2	0-58	2-98
	H	1	5-00	270	0-55	17	0-114	1-4	0-19	2-57
5-0	V	1	4-00	150	1-32	78	0-173	3-3	1-14	11-65
5-0	O	1	4-00	150	1-24	67	0-163	3-1	1-05	10-98
	O	1	5-00	200	0-79	67	0-163	2-0	0-48	6-01
6-0	F	1	4-00	255	1-24	16	0-163	3-1	1-04	4-00
	F	1	5-00	300	0-78	16	0-163	2-0	0-48	3-14
6-0	H	1	4-00	245	1-24	16	0-163	3-1	1-04	4-26
	H	1	5-00	270	0-78	16	0-163	2-0	0-48	3-67
6-0	V	1&2	4-00	150	1-68	58	0-222	4-2	1-60	14-89
6-0	O	1	4-00	150	1-72	62	0-227	4-3	1-65	15-26
	O	1	5-00	200	1-09	62	0-227	2-7	0-87	8-35
8-0	F	1	5-00	300	1-37	14	0-285	3-4	1-22	5-51
	F	1	6-30	370	0-87	14	0-285	2-2	0-59	4-14
8-0	H	1	5-00	270	1-37	14	0-285	3-4	1-22	6-43
	H	1	6-30	305	0-87	14	0-285	2-2	0-59	5-38
8-0	V	1&2	4-00	150	2-58	36	0-340	6-5	2-73	22-85
8-0	O	1-3	4-00	150	2-91	53	0-383	7-3	3-13	25-74
	O	1&2	5-00	200	1-85	53	0-383	4-6	1-81	14-09

Fillet weld

All positions

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
10-0	F	1	5-00	300	2-13	13	0-441	5-3	2-16	8-53
	F	1	6-30	370	1-34	13	0-441	3-4	1-18	6-40
10-0	H	1	5-00	270	2-13	13	0-441	5-3	2-16	9-94
	H	1	6-30	305	1-34	13	0-441	3-4	1-18	8-33
10-0	V	1&2	4-00	150	3-71	25	0-488	9-3	4-13	32-82
10-0	O	1-4	4-00	150	4-38	48	0-576	10-9	4-97	38-75
	O	1-3	5-00	200	2-78	48	0-576	6-9	2-97	21-21
12-0	F	1&2	6-30	370	1-92	12	0-631	4-8	1-90	9-15
12-0	H	1-3	6-30	305	1-92	12	0-631	4-8	1-90	11-90
12-0	V	1-3	4-00	150	5-06	19	0-677	12-7	5-83	44-83
12-0	O	1-6	5-00	200	3-89	44	0-806	9-7	4-36	29-69
15-0	F	1-3	6-30	370	2-98	11	0-977	7-4	3-22	14-17
15-0	H	1-4	6-30	305	2-98	11	0-977	7-4	3-22	18-44
15-0	V	1-3	4-00	150	7-53	13	0-992	18-8	8-91	66-69
15-0	O	1-8	5-00	200	5-83	39	1-220	14-7	6-85	44-91
18-0	F	1-4	6-30	370	4-26	11	1-397	10-6	4-82	20-27
18-0	H	1-6	6-30	305	4-26	11	1-397	10-6	4-82	26-38
18-0	V	1-4	4-00	150	10-53	10	1-386	26-3	12-66	93-20
18-0	O	1-11	5-00	200	8-26	36	1-714	20-6	9-82	63-09
20-0	F	1-5	6-30	370	5-24	10	1-719	13-1	6-05	24-93
20-0	H	1-8	6-30	305	5-24	10	1-719	13-1	6-05	32-45
20-0	V	1-4	4-00	150	12-81	8	1-688	32-0	15-52	113-47
20-0	O	1-14	5-00	200	10-06	34	2-087	25-1	12-07	76-84
22-0	F	1-6	6-30	370	6-32	10	2-073	15-8	7-40	30-07
22-0	H	1-10	6-30	305	6-32	10	2-073	15-8	7-40	39-14
22-0	V	1-5	4-00	150	15-34	7	2-020	38-3	18-67	135-81
22-0	O	1-17	5-00	200	12-03	32	2-496	30-1	14-54	91-88
25-0	F	1-7	6-30	370	8-12	9	2-666	20-3	9-65	38-67
25-0	H	1-13	6-30	305	8-12	9	2-666	20-3	9-65	50-33
25-0	V	1-6	4-00	150	19-56	6	2-577	48-9	23-96	173-24
25-0	O	1-19	5-00	200	15-30	30	3-174	38-2	18-62	116-86

Fillet weld

Flat and H/V positions

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 140%

Efficiency — 135-145%

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5-0	F	1	4-00	255	0-85	17	0-114	2-1	0-56	2-17
	F	1	5-00	300	0-54	17	0-114	1-3	0-17	1-83
5-0	H	1	4-00	245	0-85	17	0-114	2-1	0-56	2-26
	H	1	5-00	270	0-54	17	0-114	1-3	0-17	2-04
6-0	F	1	4-00	255	1-21	16	0-163	3-0	1-02	3-09
	F	1	5-00	300	0-77	16	0-163	1-9	0-46	2-62
6-0	H	1	4-00	245	1-21	16	0-163	3-0	1-02	3-22
	H	1	5-00	270	0-77	16	0-163	1-9	0-46	2-92
8-0	F	1	5-00	300	1-35	14	0-285	3-4	1-19	4-59
	F	1	6-30	370	0-85	14	0-285	2-1	0-57	3-70
8-0	H	1-3	5-00	260	1-35	14	0-285	3-4	1-19	5-32
	H	1&2	6-30	330	0-85	14	0-285	2-1	0-57	4-16
10-0	F	1	5-00	300	2-09	13	0-441	5-2	2-11	7-10
	F	1	6-30	370	1-32	13	0-441	3-3	1-15	5-72
10-0	H	1-4	4-00	245	3-29	13	0-441	8-2	3-62	8-75
	H	1-3	5-00	260	2-09	13	0-441	5-2	2-11	8-22
12-0	F	1&2	6-30	370	1-89	12	0-631	4-7	1-86	8-18
12-0	H	1-3	5-00	260	2-98	12	0-631	7-5	3-23	11-75
15-0	F	1-3	6-30	370	2-93	11	0-977	7-3	3-16	12-67
15-0	H	1-5	5-00	260	4-62	11	0-977	11-6	5-28	18-21
18-0	F	1-4	6-30	370	4-19	11	1-397	10-5	4-73	18-12
18-0	H	1-7	5-00	260	6-61	11	1-397	16-5	7-76	26-05
20-0	F	1-5	6-30	370	5-15	10	1-719	12-9	5-94	22-29
20-0	H	1-9	5-00	260	8-13	10	1-719	20-3	9-67	32-04
22-0	F	1-6	6-30	370	6-21	10	2-073	15-5	7-26	26-88
22-0	H	1-11	5-00	260	9-81	10	2-073	24-5	11-76	38-64
25-0	F	1-7	6-30	370	7-99	9	2-666	20-0	9-48	34-57
25-0	H	1-14	5-00	260	12-61	9	2-666	31-5	15-27	49-70

Fillet weld

Flat and H/V positions

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 150%

Efficiency — 145–155%

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5.0	F	1	4.00	245	0.77	17	0.114	1.9	0.46	2.82
	F	1	5.00	280	0.50	17	0.114	1.3	0.13	2.27
5.0	H	1	4.00	235	0.77	17	0.114	1.9	0.46	3.03
	H	1	5.00	270	0.50	17	0.114	1.3	0.13	2.41
6.0	F	1	4.00	245	1.10	16	0.163	2.7	0.87	4.02
	F	1	5.00	280	0.72	16	0.163	1.8	0.40	3.24
6.0	H	1&2	4.00	235	1.10	16	0.163	2.7	0.87	4.32
	H	1	5.00	270	0.72	16	0.163	1.8	0.40	3.43
8.0	F	1	5.00	280	1.26	14	0.285	3.1	1.07	5.69
	F	1	6.30	360	0.78	14	0.285	2.0	0.48	3.94
8.0	H	1&2	5.00	260	1.26	14	0.285	3.1	1.07	6.39
	H	1&2	6.30	330	0.78	14	0.285	2.0	0.48	4.45
10.0	F	1	5.00	280	1.95	13	0.441	4.9	1.94	8.80
	F	1	6.30	360	1.21	13	0.441	3.0	1.02	6.10
10.0	H	1-4	4.00	235	2.98	13	0.441	7.4	3.22	11.72
	H	1-3	5.00	260	1.95	13	0.441	4.9	1.94	9.89
12.0	F	1&2	6.30	360	1.73	12	0.631	4.3	1.67	8.71
12.0	H	1-3	5.00	260	2.78	12	0.631	7.0	2.98	14.14
15.0	F	1-3	6.30	360	2.69	11	0.977	6.7	2.86	13.50
15.0	H	1-5	5.00	260	4.31	11	0.977	10.8	4.89	21.90
18.0	F	1-4	6.30	360	3.84	11	1.397	9.6	4.30	19.31
18.0	H	1-7	5.00	260	6.17	11	1.397	15.4	7.21	31.33
20.0	F	1-5	6.30	360	4.73	10	1.719	11.8	5.41	23.75
20.0	H	1-9	5.00	260	7.59	10	1.719	19.0	8.99	38.54
22.0	F	1-6	6.30	360	5.70	10	2.073	14.2	6.62	28.65
22.0	H	1-11	5.00	260	9.15	10	2.073	22.9	10.94	46.49
25.0	F	1-7	6.30	360	7.33	9	2.666	18.3	8.66	36.85
25.0	H	1-14	5.00	260	11.77	9	2.666	29.4	14.22	59.78

Fillet weld

Flat and H/V positions

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 160%

Efficiency — 155-165%

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5-0	F	1	4-00	245	0-73	17	0-114	1-8	0-42	2-14
		1	5-00	280	0-48	17	0-114	1-2	0-10	1-83
5-0	H	1	4-00	235	0-73	17	0-114	1-8	0-42	2-24
		1	5-00	270	0-48	17	0-114	1-2	0-10	1-91
6-0	F	1	4-00	245	1-05	16	0-163	2-6	0-81	3-05
		1	5-00	280	0-68	16	0-163	1-7	0-35	2-61
6-0	H	1&2	4-00	235	1-05	16	0-163	2-6	0-81	3-20
		1	5-00	270	0-68	16	0-163	1-7	0-35	2-72
8-0	F	1	5-00	280	1-19	14	0-285	3-0	0-99	4-58
		1	6-30	390	0-74	14	0-285	1-9	0-43	3-15
8-0	H	1-3	5-00	260	1-19	14	0-285	3-0	0-99	4-99
		1&2	6-30	320	0-74	14	0-285	1-9	0-43	3-93
10-0	F	1	5-00	280	1-85	13	0-441	4-6	1-81	7-08
		1	6-30	390	1-15	13	0-441	2-9	0-94	4-87
10-0	H	1-4	4-00	235	2-84	13	0-441	7-1	3-04	8-69
		1-3	5-00	260	1-85	13	0-441	4-6	1-81	7-71
12-0	F	1&2	6-30	390	1-64	12	0-631	4-1	1-55	6-97
12-0	H	1-3	5-00	260	2-64	12	0-631	6-6	2-80	11-02
15-0	F	1-3	6-30	390	2-54	11	0-977	6-4	2-68	10-79
15-0	H	1-5	5-00	260	4-09	11	0-977	10-2	4-61	17-07
18-0	F	1-4	6-30	390	3-64	11	1-397	9-1	4-04	15-44
18-0	H	1-7	5-00	260	5-85	11	1-397	14-6	6-81	24-43
20-0	F	1-5	6-30	390	4-47	10	1-719	11-2	5-09	18-99
20-0	H	1-9	5-00	260	7-19	10	1-719	18-0	8-49	30-04
22-0	F	1-6	6-30	390	5-39	10	2-073	13-5	6-24	22-90
22-0	H	1-11	5-00	260	8-67	10	2-073	21-7	10-34	36-24
25-0	F	1-7	6-30	390	6-94	9	2-666	17-3	8-17	29-45
25-0	H	1-14	5-00	260	11-15	9	2-666	27-9	13-44	46-60

Fillet weld

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

7

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5.0	F F	1 1	4.00	150	1.45	50	0.146	3.6	1.31	5.26
			5.00	190	0.93	50	0.146	2.3	0.66	4.23
5.0	H H	1 1	4.00	150	1.45	50	0.146	3.6	1.31	5.26
			5.00	190	0.93	50	0.146	2.3	0.66	4.23
5.0	V V	1 1	3.25	100	2.75	88	0.183	6.9	2.93	9.49
			4.00	130	1.82	88	0.183	4.5	1.77	7.51
5.0	O O	1&2 1	3.25	120	2.47	69	0.165	6.2	2.59	7.27
			4.00	150	1.64	69	0.165	4.1	1.54	5.94
6.0	F F	1 1	5.00	190	1.27	42	0.200	3.2	1.09	5.78
			6.30	260	0.80	42	0.200	2.0	0.50	4.30
6.0	H H	1&2 1	4.00	150	1.98	42	0.200	4.9	1.97	7.19
			5.00	190	1.27	42	0.200	3.2	1.09	5.78
6.0	V V	1 1	3.25	100	3.56	69	0.238	8.9	3.95	12.31
			4.00	130	2.36	69	0.238	5.9	2.44	9.74
6.0	O O	1&2 1 2	3.25	120	3.31	57	0.221	8.3	3.64	9.74
			5.00	180	0.94	57	0.148	2.3	0.67	4.49
			4.00	130	0.73		0.074	1.8	0.41	3.01
8.0	F F	1 1	5.00	190	2.11	33	0.331	5.3	2.13	9.58
			6.30	260	1.33	33	0.331	3.3	1.16	7.13
8.0	H H	1-3 1&2	4.00	150	3.28	33	0.331	8.2	3.60	11.91
			5.00	190	2.11	33	0.331	5.3	2.13	9.58
8.0	V V	1&2 1&2	3.25	100	5.52	48	0.368	13.8	6.40	19.07
			4.00	130	3.65	48	0.368	9.1	4.06	15.10
8.0	O O	1-4 1-3	3.25	120	5.34	43	0.356	13.3	6.17	15.69
			5.00	170	2.27	43	0.356	5.7	2.33	11.43
10.0	F F	1 1	5.00	190	3.14	27	0.494	7.9	3.43	14.30
			6.30	260	1.99	27	0.494	5.0	1.98	10.64
10.0	H H	1-4 1-3	4.00	150	4.90	27	0.494	12.2	5.62	17.78
			5.00	190	3.14	27	0.494	7.9	3.43	14.30
10.0	V V	1-3 1&2	3.25	100	7.92	35	0.529	19.8	9.40	27.36
			4.00	130	5.24	35	0.529	13.1	6.05	21.66
10.0	O O	1-5 1-3	3.25	120	7.83	34	0.523	19.6	9.29	23.01
			5.00	170	3.32	34	0.523	8.3	3.65	16.76
12.0	F	1&2	6.30	260	2.77	23	0.689	6.9	2.96	14.84
12.0	H	1-3	6.30	260	2.77	23	0.689	6.9	2.96	14.84
12.0	V	1-3	4.00	130	7.12	28	0.719	17.8	8.40	29.46
12.0	O	1-6	5.00	170	4.58	28	0.720	11.4	5.22	23.08
15.0	F	1-3	6.30	260	4.18	19	1.041	10.5	4.73	22.41
15.0	H	1-5	6.30	260	4.18	19	1.041	10.5	4.73	22.41
15.0	V	1-3	4.00	130	10.51	21	1.061	26.3	12.64	43.48
15.0	O	1-8	5.00	170	6.83	22	1.074	17.1	8.04	34.44
18.0	F	1-5	6.30	260	5.88	16	1.463	14.7	6.85	31.50
18.0	H	1-7	6.30	260	5.88	16	1.463	14.7	6.85	31.50
18.0	V	1-3 4	4.00	130	9.41	16	0.950	23.5	11.26	38.92
			5.00	160	3.32		0.522	8.3	3.65	17.71
18.0	O	1-11	5.00	170	9.53	19	1.499	23.8	11.41	48.05

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
20-0	F	1-6	6-30	260	7-17	14	1-784	17-9	8-47	38-41
20-0	H	1-9	6-30	260	7-17	14	1-784	17-9	8-47	38-41
20-0	V	1-3 4&5	4-00 5-00	130 160	9-41 5-31	14	0-950 0-834	23-5 13-3	11-26 6-13	38-92 28-29
20-0	O	1-15	5-00	170	11-57	17	1-826	28-9	13-97	58-37
22-0	F	1-8	6-30	260	8-59	13	2-137	21-5	10-24	46-00
22-0	H	1-11	6-30	260	8-59	13	2-137	21-5	10-24	46-00
22-0	V	1-3 4-6	4-00 5-00	130 160	9-41 7-49	13	0-950 1-177	23-5 18-7	11-26 8-86	38-92 39-93
22-0	O	1-19	5-00	170	13-82	15	2-173	34-5	16-77	69-68
25-0	F	1-9	6-30	260	10-96	12	2-724	27-4	13-19	58-66
25-0	H	1-13	6-30	260	10-96	12	2-724	27-4	13-19	58-66
25-0	V	1-3 4-8	4-00 5-00	130 160	9-41 11-12	11	0-950 1-750	23-5 27-8	11-26 13-41	38-92 59-33
25-0	O	1-24	5-00	170	17-55	13	2-761	43-9	21-44	88-53

4-0	D	1	3-25	130	1-18	21	0-074	3-0	0-33	3-28
4-7	D	1	3-25	130	1-57	19	0-106	3-9	0-33	4-92
	D	1	4-00	180	1-05	19	0-106	2-6	0-33	3-61
5-1	D	1	4-00	180	1-18	18	0-122	3-0	0-33	4-27
	D	1	5-00	245	0-79	18	0-122	2-0	0-33	2-95
6-3	D	1	4-00	170	1-84	16	0-183	4-6	0-33	6-56
7-1	D	1-3	3-25	140	3-54	15	0-231	8-9	0-98	9-84
8-0	D	1-3	4-00	180	2-74	15	0-283	6-9	0-98	9-51
8-7	D	1-3	4-00	180	3-41	15	0-342	8-5	0-98	11-48
	D	1-3	5-00	240	2-36	15	0-342	5-9	0-98	8-86
9-5	D	1-4	4-00	180	4-07	15	0-408	10-2	1-31	13-78
11-1	D	1-6	4-00	180	5-51	15	0-372	13-8	1-97	18-70

Fillet weld

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 101%

Fillet weld

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

9

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
5-0	F	1	4-00	180	1-37	56	0-152	3-4	1-21	4-63
	F	1	5-00	230	0-88	56	0-152	2-2	0-60	3-51
5-0	H	1	4-00	170	1-37	56	0-152	3-4	1-21	4-95
	H	1	5-00	220	0-88	56	0-152	2-2	0-60	3-69
5-0	V	1	3-25	110	2-23	74	0-170	5-8	2-41	9-36
	V	1	4-00	140	1-52	74	0-170	3-8	1-40	6-94
5-0	O	1	4-00	150	1-46	67	0-163	3-7	1-33	6-14
	O	1	5-00	190	0-94	67	0-163	2-4	0-68	4-66
6-0	F	1	5-00	230	1-19	47	0-206	3-0	0-99	4-75
	F	1	6-30	300	0-73	47	0-206	1-8	0-42	3-55
6-0	H	1	5-00	220	1-19	47	0-206	3-0	0-99	4-99
	H	1	6-30	260	0-73	47	0-206	1-8	0-42	4-15
6-0	V	1	3-25	110	3-08	60	0-224	7-7	3-35	12-37
	V	1	4-00	140	2-01	60	0-224	5-0	2-02	9-18
6-0	O	1&2	4-00	150	1-97	57	0-220	4-9	1-97	8-29
		1	5-00	190	0-84	57	0-145	2-1	0-55	4-15
		2	4-00	150	0-67		0-075	1-7	0-34	2-83
8-0	F	1	5-00	230	1-95	35	0-337	4-9	1-94	7-78
	F	1	6-30	300	1-20	35	0-337	3-0	1-00	5-81
8-0	H	1-3	4-00	170	3-03	35	0-337	7-6	3-28	10-97
	H	1&2	5-00	220	1-95	35	0-337	4-9	1-94	8-17
8-0	V	1&2	3-25	110	4-90	43	0-356	12-2	5-62	19-65
	V	1&2	4-00	140	3-20	43	0-356	8-0	3-50	14-58
8-0	O	1-3	4-00	150	3-22	43	0-358	8-0	3-52	13-50
	O	1&2	5-00	190	2-07	43	0-358	5-2	2-09	10-25
10-0	F	1	5-00	230	2-89	28	0-500	7-2	3-12	11-52
	F	1	6-30	300	1-78	28	0-500	4-4	1-72	8-60
10-0	H	1-4	4-00	170	4-48	28	0-500	11-2	5-10	16-25
	H	1-3	5-00	220	2-89	28	0-500	7-2	3-12	12-11
10-0	V	1-3	3-25	110	7-13	33	0-518	17-8	8-41	28-59
	V	1&2	4-00	140	4-65	33	0-518	11-6	5-31	21-21
10-0	O	1-5	4-00	150	4-74	35	0-528	11-9	5-43	19-91
	O	1-3	5-00	190	3-06	35	0-528	7-6	3-32	15-12
12-0	F	1&2	6-30	300	2-46	23	0-693	6-2	2-58	11-93
12-0	H	1-3	6-30	270	2-46	23	0-693	6-2	2-58	13-39
12-0	V	1-3	4-00	140	6-38	27	0-711	15-9	7-47	29-10
12-0	O	1-6	5-00	190	4-23	30	0-730	10-6	4-79	20-89
15-0	F	1-3	6-30	300	3-70	19	1-042	9-3	4-13	17-94
15-0	H	1-5	6-30	270	3-70	19	1-042	9-3	4-13	20-13
15-0	V	1-3	4-00	140	9-49	20	1-057	23-7	11-36	43-27
15-0	O	1-8	5-00	190	6-32	24	1-092	15-8	7-40	31-25
18-0	F	1-5	6-30	300	5-20	16	1-461	13-0	5-99	25-16
18-0	H	1-7	6-30	270	5-20	16	1-461	13-0	5-99	28-22
18-0	V	1-4	4-00	140	13-22	17	1-473	33-0	16-02	60-28
18-0	O	1-11	5-00	190	8-83	21	1-525	22-1	10-54	43-64

Leg length	Position symbol	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Excess weld metal	Weight of weld metal per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m	%	kg		min	min
20-0	F	1-6	6-30	300	6-33	14	1-780	15-8	7-41	30-64
20-0	H	1-9	6-30	270	6-33	14	1-780	15-8	7-41	34-37
20-0	V	1-5	4-00	140	16-05	15	1-789	40-1	19-56	73-20
20-0	O	1-15	5-00	190	10-73	19	1-853	26-8	12-91	53-02
22-0	F	1-8	6-30	300	7-57	13	2-129	18-9	8-96	36-66
22-0	H	1-11	6-30	270	7-57	13	2-129	18-9	8-96	41-13
22-0	V	1-7	4-00	140	19-16	13	2-135	47-9	23-45	87-38
22-0	O	1-19	5-00	190	12-81	17	2-213	32-0	15-51	63-31
25-0	F	1-9	6-30	300	9-64	11	2-712	24-1	11-55	46-70
25-0	H	1-13	6-30	270	9-64	11	2-712	24-1	11-55	52-39
25-0	V	1-8	4-00	140	24-35	11	2-713	60-9	29-93	111-03
25-0	O	1-24	5-00	190	16-28	15	2-811	40-7	19-84	80-42

Butt weld

10

Flat position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	80	1-35	3-4	0-08		0-58	1-69	5-02	1-69	5-02
4-0	Cf	1	3-15	80	2-05	5-1	0-12		0-88	2-56	7-60	2-56	7-60
5-0	Cf	1	3-15	80	2-92	7-3	0-16		1-26	3-65	10-82	3-65	10-82
6-0	Cf	1 2	3-15 4-00	80 145	2-34 0-87	5-3 2-2	0-13 0-08		1-26	2-92 1-09	8-68 3-03	4-01	11-71
8-0	Cf	1 2 3	3-15 4-00 5-00	80 145 200	2-34 1-04 0-85	5-8 2-6 2-1	0-13 0-09 0-12		1-26	2-92 1-30 1-07	8-68 3-63 3-43	5-30	15-75
10-0	Cf	1 2 3 4	3-15 4-00 5-00 6-30	80 145 200 275	2-34 1-04 0-86 0-77	5-8 2-6 2-1 1-9	0-13 0-09 0-12 0-17		1-26	2-92 1-30 1-07 0-96	8-68 3-63 3-45 3-60	6-26	19-37
12-5	Cf	1 2 3 4	3-15 4-00 5-00 6-30	80 145 200 275	2-34 1-04 0-86 1-96	5-8 2-6 2-1 4-9	0-13 0-09 0-12 0-14		1-26	2-92 1-30 1-07 2-45	8-68 3-63 3-45 9-19	7-75	24-96
15-0	Cf	1 2 3 4&5	3-15 4-00 5-00 6-30	80 145 200 275	2-34 1-04 0-86 3-40	5-8 2-6 2-1 8-5	0-13 0-09 0-12 0-76		1-26	2-92 1-30 1-07 4-25	8-68 3-63 3-45 15-95	9-55	31-72
20-0	Cf	1 2 3 4-7	3-15 4-00 5-00 6-30	80 145 200 275	2-34 1-04 0-86 7-03	5-8 2-6 2-1 17-6	0-13 0-09 0-12 1-58		1-26	2-92 1-30 1-07 8-79	8-68 3-63 3-45 33-01	14-09	48-78
25-0	Cf	1 2 3 4-11	3-15 4-00 5-00 6-30	80 145 200 275	2-34 1-04 0-86 11-67	5-8 2-6 2-1 29-2	0-13 0-09 0-12 2-62		1-26	2-92 1-20 1-07 14-59	8-68 3-63 3-45 54-78	19-89	70-55

Butt weld

11

Flat position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: sealed

3-0	Eb	1 1R	3-15 3-15	80 95	0-66 1-69	1-6 4-2	0-04 0-10	8-20		0-82 2-11	2-44 5-38	2-94	7-83
4-0	Gh	1 1R	4-00 3-15	145 95	1-00 1-69	2-5 4-2	0-09 0-10	8-20		1-25 2-11	3-49 5-38	3-37	8-38
5-0	Gh	1 1R	4-00 3-15	145 95	1-47 1-69	3-7 4-2	0-13 0-10	8-20		1-83 2-11	5-10 5-38	3-95	10-49
6-0	Gh	1&2 1R	4-00 3-15	145 95	2-03 1-69	5-1 4-2	0-18 0-10	8-20		2-53 2-11	7-06 5-38	4-65	12-45
8-0	Gh	1&2 3 1R	4-00 5-00 3-15	145 200 95	2-48 0-62 1-69	6-2 1-6 4-2	0-22 0-09 0-10	8-20		3-10 0-78 2-11	8-63 2-51 5-38	5-99	16-52
10-0	Gh	1&2 3 4 1R	4-00 5-00 6-30 3-15	145 200 275 95	2-48 0-86 0-59 1-69	6-2 2-1 1-5 4-2	0-22 0-12 0-13 0-10	8-20		3-10 1-07 0-73 2-11	8-63 3-45 2-76 5-38	7-01	20-22
12-5	Gh	1&2 3 4 1R	4-00 5-00 6-30 3-15	145 200 275 95	2-48 0-86 1-73 1-69	6-2 2-1 4-3 4-2	0-22 0-12 0-39 0-10	8-20		3-10 1-07 2-16 2-11	8-63 3-45 8-14 5-38	8-44	25-60
15-0	Gh	1&2 3 4&5 1R	4-00 5-00 6-30 3-15	145 200 275 95	2-48 0-86 3-12 1-69	6-2 2-1 7-8 4-2	0-22 0-12 0-70 0-10	8-20		3-10 1-07 3-90 2-11	8-63 3-45 14-69 5-38	10-18	32-16

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20-0 DV	Ka	1&2	4-00	145	2-05	5-1	0-19	5-64		2-56	7-14	14-68	46-85
		3	5-00	200	0-86	2-1	0-12			1-07	3-45		
		4&5	6-30	275	4-12	10-3	0-93			5-15	19-40		
		1R	3-15	95	2-26	5-7	0-13			2-83	7-21		
		2R	4-00	145	1-04	2-6	0-09			1-30	3-63		
		3R	5-00	200	0-86	2-1	0-12			1-07	3-45		
		4R	6-30	275	0-54	1-4	0-12			0-68	2-56		
		25-0 DV	Ka	1&2	4-00	145	2-05			5-1	0-19		
3	5-00			200	0-86	2-1	0-12	1-07	3-45				
4-7	6-30			275	6-58	16-4	1-48	8-22	30-96				
1R	3-15			95	2-26	5-7	0-13	2-83	7-21				
2R	4-00			145	1-04	2-6	0-09	1-30	3-63				
3R	5-00			200	0-86	2-1	0-12	1-07	3-45				
4R	6-30			275	1-27	3-2	0-29	1-59	5-99				
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	80	1-69	4-2	0-10	8-20		2-11	6-20		
20-0 DV		1R&2R	3-15	80	3-95	9-9	0-22	5-64		4-93	14-47		
		3R	4-00	110	2-69	6-7	0-24			3-37	12-69		
25-0 DV		1R&2R	3-15	80	3-95	9-9	0-22	5-64		4-93	14-47		
		3R&4R	4-00	110	4-50	11-2	0-41			5-62	21-19		

3-0	Qb	1	4-00	145	1-38	3-4	0-13			1-72	4-80	1-72	4-80
4-0	Qb	1	4-00	145	1-83	4-6	0-17			2-29	6-39	2-29	6-39
5-0	Qb	1&2	4-00	145	2-34	5-8	0-21			2-92	8-14	2-92	8-14
6-0	Qb	1&2	4-00	145	2-89	7-2	0-26			3-61	10-05	3-61	10-05
8-0	Qb	1&2	4-00	145	4-12	10-3	0-37			5-15	14-35	5-15	14-35
10-0	Qb	1&2	4-00	145	4-42	11-0	0-40			5-52	15-38	6-42	18-28
		3	5-00	200	0-72	1-8	0-10			0-90	2-89		
12-5	Qb	1&2	4-00	145	4-42	11-0	0-40			5-52	15-38	8-05	23-51
		3	5-00	200	2-02	5-1	0-29			2-53	8-13		
15-0	Qb	1&2	4-00	145	4-42	11-0	0-40			5-52	15-38	9-14	27-74
		3	5-00	200	1-85	4-6	0-26			2-31	7-44		
		4	6-30	275	1-04	2-6	0-23			1-31	4-92		
20-0	Qb	1&2	4-00	145	4-42	11-0	0-40			5-52	15-38	11-91	38-19
		3	5-00	200	1-85	4-6	0-26			2-31	7-44		
		4&5	6-30	275	3-26	8-2	0-73			4-08	15-37		
25-0	Qb	1&2	4-00	145	4-42	11-0	0-40			5-52	15-38	15-27	50-83
		3	5-00	200	1-85	4-6	0-26			2-31	7-44		
		4-7	6-30	275	5-95	14-9	1-34			7-44	28-01		

Butt weld

Flat position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: backed

Butt weld

H/V position

Manual metal-arc

Electrode:

Type cellulose

Efficiency — 93%

Procedure: single-sided,
unbacked

13

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	80	1-35	3-4	0-08		0-58	1-69	4-35	1-69	4-35
4-0	Cf	1	3-15	80	2-05	5-1	0-12		0-83	2-56	6-59	2-56	6-59
5-0	Cf	1	3-15	80	2-92	7-3	0-16		1-26	3-65	9-38	3-65	9-38
6-0	Cf	1 2	3-15 4-00	80 120	2-34 0-87	5-8 2-2	0-13 0-08		1-26	2-92 1-09	7-53 3-36	4-01	10-89
8-0	Dd	1 2&3	3-15 4-00	80 120	2-16 2-75	5-4 6-9	0-12 0-25		1-26	2-70 3-43	6-95 10-63	6-13	17-58
10-0	Dd	1 2-4	3-15 4-00	80 120	2-16 4-81	5-4 12-0	0-12 0-44		1-26	2-70 6-02	6-95 18-63	8-72	25-58
12-5	Dd	1 2-4 5&6	3-15 4-00 5-00	80 120 150	2-16 4-51 2-24	5-4 11-3 5-6	0-12 0-41 0-32		1-26	2-70 5-64 2-80	6-95 17-47 11-38	11-14	35-79
15-0	Dd	1 2-4 5-8	3-15 4-00 5-00	80 120 150	2-16 4-51 4-72	5-4 11-3 11-8	0-12 0-41 0-67		1-26	2-70 5-64 5-90	6-95 17-47 24-00	14-24	48-41
20-0	Dd	1 2-4 5-11	3-15 4-00 5-00	80 120 150	2-16 4-51 11-00	5-4 11-3 27-5	0-12 0-41 1-56		1-26	2-70 5-64 13-75	6-95 17-47 55-88	22-09	80-30
25-0	Dd	1 2-4 5-18	3-15 4-00 5-00	80 120 150	2-16 4-51 19-02	5-4 11-3 47-6	0-12 0-41 2-70		1-26	2-70 5-64 23-78	6-95 17-47 96-64	32-12	121-05

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: sealed

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3-0	Gh	1 1R	4-00 3-15	120 80	0-64 1-87	1-6 4-7	0-06 0-10	9-74		0-80 2-33	2-47 6-00	3-13	8-48
4-0	Gh	1 1R	4-00 3-15	120 80	1-00 1-87	2-5 4-7	0-09 0-10	9-74		1-25 2-33	3-88 6-00	3-59	9-88
5-0	Gh	1 1R	4-00 3-15	120 80	1-47 1-87	3-7 4-7	0-13 0-10	9-74		1-83 2-33	5-67 6-00	4-16	11-68
6-0	Gh	1 1R	4-00 3-15	120 80	2-03 1-87	5-1 4-7	0-12 0-10	9-74		2-53 2-33	7-85 6-00	4-87	13-85
8-0	He	1&2 1R	4-00 3-15	120 80	3-71 1-87	9-3 4-7	0-34 0-10	9-74		4-63 2-33	14-35 6-00	6-97	20-35
10-0	He	1-3 1R	4-00 3-15	120 80	5-69 1-87	14-2 4-7	0-52 0-10	9-74		7-11 2-33	22-02 6-00	9-44	28-02
12-5	He	1-3 4&5 1R	4-00 5-00 3-15	120 150 80	5-83 1-89 1-87	14-6 4-7 4-7	0-53 0-27 0-10	9-74		7-29 2-36 2-33	22-56 9-59 6-00	11-92	38-16
15-0	He	1-3 4-6 1R	4-00 5-00 3-15	120 150 80	5-83 4-30 1-87	14-6 10-8 4-7	0-53 0-61 0-10	9-74		7-29 5-38 2-33	22-56 21-86 6-00	15-00	50-43
20-0 DV	Ka	1-3 4-7 1R 2R&3R	4-00 5-00 3-15 4-00	120 150 80 120	5-96 4-90 2-58 3-74	14-9 12-2 6-5 9-3	0-54 0-69 0-15 0-34	8-46		7-45 6-12 3-23 4-67	23-07 24-83 8-32 14-46	21-47	70-73
25-0 DV	Ka	1-3 4-10 1R 2R-4R	4-00 5-00 3-15 4-00	120 150 80 120	5-96 8-80 2-58 5-54	14-9 22-0 6-5 13-8	0-54 1-25 0-15 0-50	8-46		7-45 10-99 3-23 6-92	23-07 44-68 8-32 21-44	28-61	97-52

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Sd	1	4-00	120	1.75	4.4	0.16			2.18	6.75	2.18	6.75
4-0	Sd	1	4-00	120	2.43	6.1	0.22			3.04	9.41	3.04	9.41
5-0	Sd	1&2	4-00	120	3.21	8.0	0.29			4.02	12.44	4.02	12.44
6-0	Sd	1-3	4-00	120	4.10	10.2	0.37			5.12	15.86	5.12	15.86
8-0	Te	1-3 4	4-00 5-00	120 150	5.43 0.71	13.6 1.8	0.49 0.10			6.79 0.89	21.01 3.60	7.67	24.61
10-0	Te	1-3 4&5	4-00 5-00	120 150	5.43 2.41	13.6 6.0	0.49 0.34			6.79 3.01	21.01 12.23	9.80	33.24
12.5	Te	1-3 4-8	4-00 5-00	120 150	5.43 4.92	13.6 12.3	0.49 0.70			6.79 6.15	21.01 25.01	12.94	46.02
15-0	Te	1-3 4-11	4-00 5-00	120 150	5.43 7.87	13.6 19.7	0.49 1.12			6.79 9.84	21.01 40.00	16.63	61.02
20-0	Te	1-3 4-16	4-00 5-00	120 150	5.43 15.09	13.6 37.7	0.49 2.14			6.79 18.86	21.01 76.65	25.65	97.66
25-0	Te	1-3 4-26	4-00 5-00	120 150	5.43 24.05	13.6 60.1	0.49 3.41			6.79 30.06	21.01 122.16	36.84	143.17

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: backed

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3-0	Cf	1	3-15	100	1.35	3.4	0.08		0.58	1.69	3.72	1.69	3.72
4-0	Cf	1&2	3-15	100	2.05	5.1	0.12		0.88	2.56	5.63	2.56	5.63
5-0	Cf	1&2	3-15	100	2.92	7.3	0.16		1.26	3.65	8.02	3.65	8.02
6-0	Cf	1-3	3-15	100	3.96	9.9	0.22		1.71	4.95	10.88	4.95	10.88
8-0	Cf	1 2&3	3-15 3-15	100 80	0.91 5.26	2.3 13.2	0.05 0.30		1.71	1.14 6.58	2.51 16.93	7.72	19.44
10-0	Cf	1 2&3	3-15 3-15	100 80	0.91 8.33	2.3 20.8	0.05 0.47		1.71	1.14 10.42	2.51 26.82	11.56	29.33
12.5	Cf	1 2&3 4	3-15 3-15 4-00	100 80 120	0.91 9.42 2.27	2.3 23.5 5.7	0.05 0.53 0.21		1.71	1.14 11.77 2.84	2.51 30.30 8.79	15.75	41.60
15-0	Cf	1 2&3 4&5	3-15 3-15 4-00	100 80 120	0.91 9.42 5.83	2.3 23.5 14.6	0.05 0.53 0.53		1.71	1.14 11.77 7.29	2.51 30.30 22.58	20.20	55.39
20-0	Cf	1 2&3 4&5 6	3-15 3-15 4-00 5-00	100 80 120 140	0.91 9.42 7.15 4.91	2.3 23.5 17.9 12.3	0.05 0.53 0.65 0.70		1.71	1.14 11.77 8.94 6.13	2.51 30.30 27.69 26.34	27.99	86.84
25-0	Cf	1 2&3 4&5 6&7	3-15 3-15 4-00 5-00	100 80 120 140	0.91 3.42 7.15 12.25	2.3 23.5 17.9 30.6	0.05 0.53 0.65 1.74		1.71	1.14 11.77 8.94 15.31	2.51 30.30 27.69 65.74	37.17	126.24

Butt weld

Vertical position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: single-sided
unbacked

16

Butt weld

17

Vertical position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Gh	1 1R	3-15 3-15	100 80	1-03 1-81	2-6 4-5	0-06 0-10	9-23		1-29 2-26	2-83 5-82	3-55	8-65
4-0	Gh	1 1R	3-15 3-15	100 80	1-62 1-81	4-0 4-5	0-09 0-10	9-23		2-02 2-26	4-44 5-82	4-28	10-26
5-0	Gh	1 1R	3-15 3-15	100 80	2-36 1-81	5-9 4-5	0-13 0-10	9-23		2-95 2-26	6-50 5-82	5-21	12-31
6-0	Gh	1&2 1R	3-15 3-15	100 80	3-27 1-81	8-2 4-5	0-18 0-10	9-23		4-09 2-26	8-99 5-82	6-35	14-81
8-0	Gh	1 2 1R	3-15 3-15 3-15	100 80 100	0-69 4-88 1-81	1-7 12-2 4-5	0-04 0-27 0-10	9-23		0-86 6-09 2-26	1-89 15-69 4-97	9-21	22-55
10-0	Gh	1 2&3 1R	3-15 3-15 3-15	100 80 100	0-69 7-81 1-81	1-7 19-5 4-5	0-04 0-44 0-10	9-23		0-86 9-76 2-26	1-89 25-13 4-97	12-88	31-99
12-5	Gh	1 2&3 4 1R	3-15 3-15 4-00 3-15	100 80 120 100	0-69 9-61 1-72 1-81	1-7 24-0 4-3 4-5	0-04 0-54 0-16 0-10	9-23		0-86 12-02 2-15 2-26	1-89 30-93 6-64 4-97	17-28	44-44
15-0	Gh	1 2&3 4&5 1R	3-15 3-15 4-00 3-15	100 80 120 100	0-69 9-61 5-17 1-81	1-7 24-0 12-9 4-5	0-04 0-54 0-47 0-10	9-23		0-86 12-02 6-46 2-26	1-89 30-93 20-02 4-97	21-60	57-81
20-0 DV	Ka	1-3 4&5 1R&2R	3-15 4-00 3-15	80 120 80	9-61 7-65 8-35	24-0 19-1 20-9	0-54 0-69 0-47	6-15		12-02 9-56 10-43	30-93 29-62 26-85	32-01	87-40
25-0 DV	Ka	1-3 4&5 6&7 1R-3R	3-15 4-00 5-00 3-15	80 120 140 80	9-61 7-15 4-22 11-25	24-0 17-9 10-5 28-1	0-54 0-65 0-60 0-63	6-15		12-02 8-94 5-27 14-07	30-93 27-69 22-63 36-21	40-30	117-46

Butt weld

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Vertical position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: backed

3-0	Sd	1 2	3-15 3-15	100 80	0-62 2-19	1-6 5-5	0-04 0-12			0-78 2-74	1-71 7-05	3-52	8-76
4-0	Sd	1 2	3-15 3-15	100 80	0-62 3-30	1-6 8-2	0-04 0-19			0-78 4-12	1-71 10-60	4-90	12-32
5-0	Sd	1 2	3-15 3-15	100 80	0-62 4-56	1-6 11-4	0-04 0-26			0-78 5-70	1-71 14-67	6-48	16-38
6-0	Sd	1 2	3-15 3-15	100 80	0-62 5-99	1-6 15-0	0-04 0-34			0-78 7-48	1-71 19-26	8-26	20-97
8-0	Sd	1 2&3	3-15 3-15	100 80	0-62 9-32	1-6 23-3	0-04 0-52			0-78 11-64	1-71 29-97	12-42	31-68
10-0	Sd	1 2&3 4	3-15 3-15 4-00	100 80 120	0-62 8-99 2-66	1-6 22-5 6-7	0-04 0-51 0-24			0-78 11-24 3-33	1-71 28-93 10-31	15-35	40-95
12-5	Sd	1 2&3 4&5	3-15 3-15 4-00	100 80 120	0-62 8-99 6-30	1-6 22-5 15-8	0-04 0-51 0-57			0-73 11-24 7-88	1-71 28-93 24-39	19-89	55-03
15-0	Sd	1 2&3 4&5 6	3-15 3-15 4-00 5-00	100 80 120 140	0-62 8-99 7-15 2-18	1-6 22-5 17-9 5-4	0-04 0-51 0-65 0-31			0-78 11-24 8-94 2-72	1-71 28-93 27-69 11-70	23-68	70-02

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20-0	Sd	1	3-15	100	0-62	1-6	0-04			0-78	1-71	31-99	105-67
		2&3	3-15	80	8-99	22-5	0-51			11-24	28-93		
		4&5	4-00	120	7-15	17-9	0-65			8-94	27-69		
		6&7	5-00	140	8-82	22-1	1-25			11-03	47-34		
25-0	Sd	1	3-15	100	0-62	1-6	0-04			0-78	1-71	42-28	149-85
		2&3	3-15	80	8-99	22-5	0-51			11-24	28-93		
		4&5	4-00	120	7-15	17-9	0-65			8-94	27-69		
		6-9	5-00	140	17-05	42-6	2-42			21-32	91-52		

Continued

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3-0	Cf	1	3-15	80	1-35	3-4	0-08		0-58	1-69	4-96	1-69	4-96
4-0	Cf	1	3-15	80	2-05	5-1	0-12		0-88	2-56	7-51	2-56	7-51
5-0	Cf	1	3-15	80	2-92	7-3	0-16		1-26	3-65	10-69	3-65	10-69
6-0	Cf	1&2	3-15	80	3-96	9-9	0-22		1-71	4-95	14-50	4-95	14-50
8-0	Cf	1&2 3	3-15 4-00	80 110	4-02 1-33	10-1 3-3	0-23 0-12		1-71	5-03 1-67	14-75 6-29	6-70	21-03
10-0	Cf	1&2 3&4	3-15 4-00	80 110	4-02 3-24	10-1 8-1	0-23 0-29		1-71	5-03 4-05	14-75 15-27	9-08	30-02
12-5	Cf	1&2 3-7	3-15 4-00	80 110	4-02 6-18	10-1 15-5	0-23 0-56		1-71	5-03 7-73	14-75 29-13	12-76	43-88
15-0	Cf	1&2 3-9	3-15 4-00	80 110	4-02 9-75	10-1 24-4	0-23 0-88		1-71	5-03 12-18	14-75 45-92	17-21	60-67
20-0	Cf	1&2 3-15	3-15 4-00	80 110	4-02 18-73	10-1 46-8	0-23 1-70		1-71	5-03 23-42	14-75 88-28	28-45	103-02
25-0	Cf	1&2 3-26	3-15 4-00	80 110	4-02 30-21	10-1 75-5	0-23 2-74		1-71	5-03 37-76	14-75 142-34	42-79	157-08

Butt weld

Overhead position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: single-sided,
unbacked

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Butt weld

20

Overhead position

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure: backed

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Sd	1&2	3-15	80	2-81	7-0	0-16			3-52	10-32	3-52	10-32
4-0	Sd	1-3	3-15	80	3-92	9-8	0-22			4-90	14-36	4-90	14-36
5-0	Sd	1&2 3	3-15 4-00	80 110	3-30 1-16	8-3 2-9	0-19 0-11			4-13 1-46	12-11 5-49	5-59	17-60
6-0	Sd	1&2 3&4	3-15 4-00	80 110	3-30 2-05	8-3 5-1	0-19 0-19			4-13 2-56	12-11 9-65	6-69	21-77
8-0	Qe	1&2	3-15	80	6-64	16-6	0-37			8-31	24-36	8-31	24-36
10-0	Qe	1-3 4	3-15 4-00	80 110	7-12 1-12	17-8 2-8	0-40 0-10			8-90 1-41	26-10 5-30	10-31	31-40
12-5	Qe	1-3 4&5	3-15 4-00	80 110	7-12 3-16	17-8 7-9	0-40 0-29			8-90 3-95	26-10 14-88	12-85	40-99
15-0	Qe	1-3 4-8	3-15 4-00	80 110	7-12 5-48	17-8 13-7	0-40 0-50			8-90 6-85	26-10 25-82	15-75	51-93
20-0	Qe	1-3 4-11	3-15 4-00	80 110	7-12 10-99	17-8 27-5	0-40 1-00			8-90 13-74	26-10 51-78	22-64	77-88
25-0	Qe	1-3 4-16	3-15 4-00	80 110	7-12 17-65	17-8 44-1	0-40 1-60			8-90 22-06	26-10 83-17	30-96	109-27

Butt weld

21

All positions

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— sealing run
preparation by air-arc
gouging

<i>Flat</i>													
3-0-15-0		1R	4-00	150	2-47	6-2	0-22	2-24		3-09	8-34		
20-0 DV		1R 2R	4-00 5-00	150 200	3-91 1-72	9-8 4-3	0-35 0-24	2-24		4-88 2-15	13-19 6-93		
25-0 DV		1R 2R	4-00 5-00	150 200	3-91 2-88	9-8 7-2	0-35 0-41	2-24		4-88 3-60	13-19 11-57		
<i>Horizontal/vertical</i>													
3-0-15-0		1R	4-00	120	2-47	6-2	0-22	2-24		3-09	9-57		
20-0 DV		1R&2R	4-00	120	6-60	16-5	0-60	2-24		8-25	25-54		
25-0 DV		1R-3R	4-00	120	8-40	21-0	0-76	2-24		10-50	32-53		
<i>Vertical</i>													
3-0-15-0		1R	3-15	80	3-99	10-0	0-22	2-24		4-98	12-83		
20-0 DV		1R&2R	3-15	80	10-64	26-6	0-60	2-24		13-30	34-24		
25-0 DV		1R&2R	3-15	80	13-55	33-9	0-76	2-24		16-94	43-60		
<i>Overhead</i>													
3-0-15-0		1R	4-00	110	2-47	6-2	0-22	2-24		3-09	11-65		
20-0 DV		1R&2R	4-00	110	6-60	16-5	0-60	2-24		8-25	31-10		
25-0 DV		1R&2R	4-00	110	8-40	21-0	0-76	2-24		10-50	39-60		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Flat													
3-0-15-0		1R	4-00	150	1-46	3-6	0-13	5-32		1-82	4-92		
20-0 DV		1R	4-00	150	2-34	5-9	0-21	8-69		2-93	7-90		
		2R	5-00	200	0-50	1-2	0-07			0-62	1-99		
		3R&4R	6-30	275	1-93	4-8	0-43			2-41	9-08		
25-0 DV		1R	4-00	150	2-34	5-9	0-21	8-69		2-93	7-90		
		2R	5-00	200	0-50	1-2	0-07			0-62	1-99		
		3R&4R	6-30	275	3-06	7-7	0-69			3-83	14-41		
Horizontal/vertical													
3-0-15-0		1R	4-00	120	1-46	3-6	0-13	5-32		1-82	5-65		
20-0 DV		1R&2R	4-00	120	4-60	11-5	0-42	8-69		5-75	17-80		
		3R&4R	5-00	150	2-11	5-3	0-30			2-64	10-73		
25-0 DV		1R&2R	4-00	120	4-60	11-5	0-42	8-69		5-75	17-80		
		3R-7R	5-00	150	3-91	9-8	0-55			4-89	19-87		
Vertical													
3-0-15-0		1R	3-15	80	2-35	5-9	0-13	5-32		2-94	7-57		
20-0 DV		1R&2R	3-15	80	7-42	18-5	0-42	8-69		9-27	23-86		
		3R	4-00	115	3-30	8-3	0-30			4-13	13-20		
25-0 DV		1R&2R	3-15	80	7-42	18-5	0-42	8-69		9-27	23-86		
		3R&4R	4-00	115	6-11	15-3	0-55			7-64	24-43		
Overhead													
3-0-15-0		1R	4-00	110	1-46	3-6	0-13	5-32		1-82	6-87		
20-0 DV		1R-5R	4-00	110	7-90	19-8	0-72	8-69		9-88	37-23		
25-0 DV		1R-7R	4-00	110	10-71	26-8	0-97	8-69		13-39	50-47		

Butt weld

22

All positions

Manual metal-arc

Electrode:

Type — cellulose

Efficiency — 93%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times— sealing run
preparation by chipping

3-0	Ce	1	3-15	110	1-49	3-7	0-09		1-09	0-74	6-12	0-74	6-12
4-0	Ce	1&2	3-15	110	2-23	5-6	0-13		1-64	1-12	9-17	1-12	9-17
5-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	1-34	10-79
		2	4-00	180	0-55	1-4	0-05				2-06		
6-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	1-66	13-23
		2	4-00	180	1-20	3-0	0-11				4-49		
8-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	2-14	18-22
		2	4-00	180	1-03	2-6	0-09				3-88		
		3	5-00	210	1-12	2-8	0-16				5-61		
10-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	2-49	22-36
		2	4-00	180	1-03	2-6	0-09				3-88		
		3	5-00	210	0-85	2-1	0-12				4-24		
		4	6-30	290	0-97	2-4	0-22				5-51		
12-5	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	3-10	29-30
		2	4-00	180	1-03	2-6	0-09				3-88		
		3	5-00	210	0-85	2-1	0-12				4-24		
		4-6	6-30	290	2-20	5-5	0-50				12-45		
15-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	3-84	37-63
		2	4-00	180	1-08	2-6	0-09				3-88		
		3	5-00	210	0-85	2-1	0-12				4-24		
		4-7	6-30	290	3-67	9-2	0-83				20-78		
20-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	5-68	58-52
		2	4-00	180	1-03	2-6	0-09				3-88		
		3	5-00	210	0-85	2-1	0-12				4-24		
		4-9	6-30	290	7-36	18-4	1-67				41-67		
25-0	Ce	1	3-15	110	2-12	5-3	0-13		1-64	1-06	8-73	8-02	85-02
		2	4-00	180	1-03	2-6	0-09				3-88		
		3	5-00	210	0-85	2-1	0-12				4-24		
		4-12	6-30	290	12-04	30-1	2-73				68-17		

Butt weld

23

Flat position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: single-sided,
unbacked

Butt weld

24

Flat position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed
(3.15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Gj	1 1R	3.15 3.15	110 110	1.23 1.72	3.1 4.3	0.07 0.10	11.28		0.61 0.86	5.05 7.06	1.47	12.11
4.0	Gj	1 1R	3.15 3.15	110 110	1.85 1.72	4.6 4.3	0.11 0.10	11.28		0.93 0.86	7.61 7.06	1.79	14.67
5.0	Gj	1 1R	3.15 3.15	110 110	2.63 1.72	6.6 4.3	0.16 0.10	11.28		1.31 0.86	10.80 7.06	2.17	17.86
6.0	Gj	1 2 1R	3.15 4.00 3.15	110 180 110	2.22 0.86 1.72	5.6 2.1 4.3	0.13 0.08 0.10	11.28		1.11 0.43 0.86	9.14 3.23 7.06	2.40	19.43
8.0	Gj	1 2 3 1R	3.15 4.00 5.00 3.15	110 180 210 110	2.22 1.03 0.84 1.72	5.6 2.6 2.1 4.3	0.13 0.09 0.12 0.10	11.28		1.11 0.52 0.42 0.86	9.14 3.88 4.22 7.06	2.91	24.30
10.0	Gj	1 2 3 4 1R	3.15 4.00 5.00 6.30 3.15	110 180 210 290 110	2.22 1.03 0.85 0.76 1.72	5.6 2.6 2.1 1.9 4.3	0.13 0.09 0.12 0.17 0.10	11.28		1.11 0.52 0.42 0.38 0.86	9.14 3.88 4.24 4.29 7.06	3.29	28.61
12.5	Gj	1 2 3 4&5 1R	3.15 4.00 5.00 6.30 3.15	110 180 210 290 110	2.22 1.03 0.85 1.93 1.72	5.6 2.6 2.1 4.8 4.3	0.13 0.09 0.12 0.44 0.10	11.28		1.11 0.52 0.42 0.97 0.86	9.14 3.88 4.24 10.95 7.06	3.88	35.26
15.0	Gj	1 2 3 4-6 1R	3.15 4.00 5.00 6.30 3.15	110 180 210 290 110	2.22 1.03 0.85 3.36 1.72	5.6 2.6 2.1 8.4 4.3	0.13 0.09 0.12 0.76 0.10	11.28		1.11 0.52 0.42 1.68 0.86	9.14 3.88 4.24 19.00 7.06	4.59	43.32
20.0 DV	Ka	1 2 3 4-7 1R 2R 3R 4R	3.15 4.00 5.00 6.30 3.15 4.00 5.00 6.30	110 180 210 290 110 180 210 290	1.54 1.03 0.85 4.08 2.65 1.03 0.85 0.54	0.9 2.6 2.1 10.2 6.6 2.6 2.1 1.3	0.09 0.09 0.12 0.93 0.16 0.09 0.12 0.12	10.25		0.77 0.52 0.42 2.04 1.33 0.52 0.42 0.27	6.34 3.88 4.24 23.11 10.89 3.88 4.24 3.06	6.28	59.64
25.0 DV	Ka	1 2 3 4-9 1R 2R 3R 4R&5R	3.15 4.00 5.00 6.30 3.15 4.00 5.00 6.30	110 180 210 290 110 180 210 290	1.54 1.03 0.85 6.51 2.65 1.03 0.85 1.26	3.9 2.6 2.1 16.3 6.6 2.6 2.1 3.1	0.09 0.09 0.12 1.48 0.16 0.09 0.12 0.29	10.25		0.77 0.52 0.42 3.26 1.33 0.52 0.42 0.63	6.34 3.88 4.24 36.89 10.89 3.88 4.24 7.13	7.86	77.48
For welds with sealing runs welded in the overhead position, substitute the following values:													
3.0-15.0		1R	3.15	115	2.11	5.3	0.12			1.58	8.25		
20.0 DV		1R&2R 3R	3.15 4.00	115 150	4.25 2.66	10.6 6.7	0.25 0.24	10.25		3.19 2.00	16.64 12.14		
25.0 DV		1R&2R 3R&4R	3.15 4.00	115 150	4.25 4.45	10.6 11.1	0.25 0.41	10.25		3.19 3.33	16.64 20.27		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
6.0	Gh	1 1R	5.00 3.15	210 110	1.28 2.55	3.2 6.4	0.18 0.15	18.97		0.64 1.27	6.41 10.48	1.92	16.89
8.0	Gh	1&2 1R	5.00 3.15	210 110	2.18 2.55	5.5 6.4	0.31 0.15	18.97		1.09 1.27	10.91 10.48	2.36	21.39
10.0	Gh	1&2 3 1R	5.00 6.30 3.15	210 290 110	2.41 0.58 2.55	6.0 1.5 6.4	0.35 0.13 0.15	18.97		1.21 0.29 1.27	12.07 3.29 10.48	2.77	25.83
12.5	Gh	1&2 3&4 1R	5.00 6.30 3.15	210 290 110	2.41 1.71 2.55	6.0 4.3 6.4	0.35 0.39 0.15	18.97		1.21 0.86 1.27	12.07 9.69 10.48	3.34	32.24
15.0	Gh	1&2 3-6 1R	5.00 6.30 3.15	210 290 110	2.41 3.09 2.55	6.0 7.7 6.4	0.35 0.70 0.15	18.97		1.21 1.55 1.27	12.07 17.51 10.48	4.03	40.05
20.0 DV	Ka	1&2 3-7 1R 2R 3R 4R	5.00 6.30 3.15 4.00 5.00 6.30	210 290 110 180 210 290	2.14 4.08 4.33 0.55 0.85 0.54	5.4 10.2 10.8 1.4 2.1 1.3	0.31 0.93 0.26 0.05 0.12 0.12	18.97		1.07 2.04 2.17 0.28 0.42 0.27	10.72 23.11 17.81 2.08 4.24 3.06	6.25	61.02
25.0 DV	Ka	1&2 3-13 1R 2R 3R 4R	5.00 6.30 3.15 4.00 5.00 6.30	210 290 110 180 210 290	2.14 6.51 4.33 0.55 0.85 1.26	5.4 16.3 10.8 1.4 2.1 3.1	0.31 1.48 0.26 0.05 0.12 0.29	18.97		1.07 3.26 2.17 0.28 0.42 0.63	10.72 36.89 17.81 2.08 4.24 7.13	7.83	78.87
For welds with sealing runs welded in the overhead position, substitute the following values:													
6.0-15.0		1R	3.15	115	2.94	7.3	0.17			2.20	11.50		
20.0 DV		1R&2R 3R	3.15 4.00	115 150	5.19 2.66	13.0 6.7	0.31 0.24	18.97		3.89 2.00	20.33 12.14		
25.0 DV		1R&2R 3R&4R	3.15 4.00	115 150	5.19 4.45	13.0 11.1	0.31 0.41	18.97		3.89 3.33	20.33 20.27		

3.0	Qe	1&2	4.00	180	2.33	5.8	0.21			1.17	8.77	1.17	8.77
4.0	Qe	1&2 3	4.00 5.00	180 210	2.22 0.52	5.6 1.3	0.20 0.07			1.11 0.26	8.36 2.61	1.37	10.96
5.0	Qe	1&2 3	4.00 5.00	180 210	2.22 1.00	5.6 2.5	0.20 0.14			1.11 0.50	8.36 5.01	1.61	13.37
6.0	Qe	1&2 3	4.00 5.00	180 210	2.22 1.51	5.6 3.8	0.20 0.22			1.11 0.76	8.36 7.56	1.87	15.92
8.0	Qe	1&2 3 4	4.00 5.00 6.30	180 210 290	2.22 1.83 0.50	5.6 4.6 1.3	0.20 0.26 0.11			1.11 0.91 0.25	8.36 9.14 2.83	2.27	20.33
10.0	Qe	1&2 3 4	4.00 5.00 6.30	180 210 290	2.22 1.83 1.27	5.6 4.6 3.2	0.20 0.26 0.29			1.11 0.91 0.64	8.36 9.14 7.21	2.66	24.70
12.5	Qe	1&2 3 4&5	4.00 5.00 6.30	180 210 290	2.22 1.83 2.34	5.6 4.6 5.9	0.20 0.26 0.53			1.11 0.91 1.17	8.36 9.14 13.27	3.20	30.76
15.0	Qe	1&2 3 4-7	4.00 5.00 6.30	180 210 290	2.22 1.83 3.53	5.6 4.6 8.8	0.20 0.26 0.80			1.11 0.91 1.76	8.36 9.14 19.98	3.79	37.47

25

Butt weld

Flat position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed

(5mm electrode root run)

26

Butt weld

Flat position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed

(3.15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20-0	Qe	1&2 3 4-9	4-00 5-00 6-30	180 210 290	2-22 1-83 6-24	5-6 4-6 15-6	0-20 0-26 1-42			1-11 0-91 3-12	8-36 9-14 35-35	5-15	52-84
25-0	Qe	1&2 3 4-12	4-00 5-00 6-30	180 210 290	2-22 1-83 9-42	5-6 4-6 23-5	0-20 0-26 2-14			1-11 0-91 4-71	8-36 9-14 53-33	6-73	70-82

Butt weld

27

Flat position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed
(5mm electrode root run)

6-0	Qe	1&2	5-00	210	2-93	7-3	0-42			1-47	14-67	1-47	14-67
8-0	Qe	1&2 3	5-00 6-30	210 290	3-25 0-50	8-1 1-3	0-47 0-11			1-62 0-25	16-25 2-83	1-87	19-08
10-0	Qe	1&2 3	5-00 6-30	210 290	3-25 1-27	8-1 3-2	0-47 0-29			1-62 0-64	16-25 7-21	2-26	23-45
12-5	Qe	1&2 3&4	5-00 6-30	210 290	3-25 2-34	8-1 5-9	0-47 0-53			1-62 1-17	16-25 13-27	2-79	29-51
15-0	Qe	1&2 3-6	5-00 6-30	210 290	3-25 3-53	8-1 8-8	0-47 0-80			1-62 1-76	16-25 19-98	3-39	36-22
20-0	Qe	1&2 3-8	5-00 6-30	210 290	3-25 6-24	8-1 15-6	0-47 1-42			1-62 3-12	16-25 35-35	4-74	51-59
25-0	Qe	1&2 3-11	5-00 6-30	210 290	3-25 9-42	8-1 23-5	0-47 2-14			1-62 4-71	16-25 53-33	6-33	69-57

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Ce	1	3-15	120	1.49	3.7	0.09		1.09	1.12	5.57	1.12	5.57
4-0	Ce	1	3-15	120	2.23	5.6	0.13		1.64	1.67	8.35	1.67	8.35
5-0	Ce	1	3-15	120	3.14	7.8	0.19		2.30	2.35	11.74	2.35	11.74
6-0	Ce	1&2	3-15	120	4.21	10.5	0.25		3.08	3.16	15.74	3.16	15.74
8-0	Dc	1-3 4	3-15 4-00	120 170	5.28 1.04	13.2 2.6	0.31 0.10		3.08	3.96 0.78	19.74 4.15	4.74	23.89
10-0	Dc	1-3 4&5	3-15 4-00	120 170	5.28 3.19	13.2 8.0	0.31 0.29		3.08	3.96 2.39	19.74 12.74	6.35	32.49
12.5	Dc	1-3 4&5 6-8	3-15 4-00 5-00	120 170 190	5.28 2.32 2.67	13.2 5.8 6.7	0.31 0.21 0.38		3.08	3.96 1.74 2.00	19.74 9.24 14.82	7.70	43.81
15-0	Dc	1-3 4&5 6-11	3-15 4-00 5-00	120 170 190	5.28 2.32 5.21	13.2 5.8 13.0	0.31 0.21 0.75		3.08	3.96 1.74 3.90	19.74 9.24 28.93	9.60	57.92
20-0	Dc	1-3 4&5 6-15	3-15 4-00 5-00	120 170 190	5.28 2.32 11.58	13.2 5.8 28.9	0.31 0.21 1.66		3.08	3.96 1.74 8.68	19.74 9.24 64.32	14.38	93.31
25-0	Dc	1-3 4&5 6-25	3-15 4-00 5-00	120 170 190	5.28 2.32 19.67	13.2 5.8 49.2	0.31 0.21 2.82		3.08	3.96 1.74 14.75	19.74 9.24 109.29	20.45	138.28

3-0	Gj	1 1R	3-15 3-15	120 120	1.23 1.83	3.1 4.6	0.07 0.11	8.71		0.92 1.37	4.59 6.84	2.29	11.43
4-0	Gj	1 1R	3-15 3-15	120 120	1.85 1.83	4.6 4.6	0.11 0.11	8.71		1.39 1.37	6.92 6.84	2.76	13.76
5-0	Gj	1 1R	3-15 3-15	120 120	2.63 1.83	6.6 4.6	0.16 0.11	8.71		1.97 1.37	9.82 6.84	3.34	16.66
6-0	Gj	1&2 1R	3-15 3-15	120 120	3.56 1.83	8.9 4.6	0.21 0.11	8.71		2.67 1.37	13.29 6.84	4.04	20.13
8-0	Hf	1-3 1R	3-15 3-15	120 120	6.26 1.83	15.7 4.6	0.37 0.11	8.71		4.70 1.37	23.40 6.84	6.07	30.24
10-0	Hf	1-3 4&5 1R	3-15 4-00 3-15	120 170 120	5.38 2.61 1.83	13.4 6.5 4.6	0.32 0.24 0.11	8.71		4.03 1.96 1.37	20.11 10.43 6.84	7.37	37.38
12.5	Hf	1-3 4&5 6-8 1R	3-15 4-00 5-00 3-15	120 170 190 120	5.38 2.32 2.21 1.83	13.4 5.8 5.5 4.6	0.32 0.21 0.32 0.11	8.71		4.03 1.74 1.66 1.37	20.11 9.24 12.29 6.84	8.80	48.18
15-0	Hf	1-3 4&5 6-11 1R	3-15 4-00 5-00 3-15	120 170 190 120	5.38 2.32 4.66 1.83	13.4 5.8 11.7 4.6	0.32 0.21 0.67 0.11	8.71		4.03 1.74 3.50 1.37	20.11 9.24 25.92 6.84	10.64	62.11
20-0 DV	Ka	1-3 4&5 6-11 1R-3R 4R	3-15 4-00 5-00 3-15 4-00	120 170 190 120 170	5.20 2.54 4.83 6.30 1.34	13.0 6.4 12.1 15.8 3.3	0.31 0.23 0.69 0.37 0.12	10.25		3.90 1.91 3.63 4.73 1.00	19.43 10.15 26.87 23.57 5.33	15.16	85.35
25-0 DV	Ka	1-3 4&5 6-15 1R-3R 4R-6R	3-15 4-00 5-00 3-15 4-00	120 170 190 120 170	5.20 2.54 8.68 6.30 3.12	13.0 6.4 21.7 15.8 7.8	0.31 0.23 1.25 0.37 0.29	10.25		3.90 1.91 6.51 4.73 2.34	19.43 10.15 48.26 23.57 12.46	19.39	113.86

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed
(3.15mm electrode root run)

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed

(4mm electrode root run)

30

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
10-0	He	1-4 1R	4.00 3.15	170 120	5.63 1.94	14.1 4.8	0.52 0.11	9-74		4-22 1-45	22-46 7-25	5-67	29-71
12-5	He	1-4 5-7 1R	4.00 5.00 3.15	170 190 120	5.76 1.86 1.94	14.4 4.7 4.8	0.53 0.27 0.11	9-74		4-32 1-40 1-45	23-02 10-36 7-25	7-18	40-63
15-0	He	1-4 5-10 1R	4.00 5.00 3.15	170 190 120	5.76 4.25 1.94	14.4 10.6 4.8	0.53 0.61 0.11	9-74		4-32 3-19 1-45	23-02 23-61 7-25	8-96	53-88
20-0 DV	Ka	1-4 5-11 1R-3R 4R-6R	4.00 5.00 3.15 4.00	170 190 120 170	5.89 4.83 6.86 1.34	14.7 12.1 17.1 3.3	0.54 0.69 0.41 0.12	15-38		4-42 3-63 5-14 1-00	23-54 26-87 25-64 5-33	14-19	81-30
25-0 DV	Ka	1-4 5-15 1R-3R 4R-8R	4.00 5.00 3.15 4.00	170 190 120 170	5.89 8.68 6.86 3.12	14.7 21.7 17.1 7.8	0.54 1.25 0.41 0.29	15-38		4-42 6-51 5-14 2-34	23-54 48-26 25-64 12-46	18-41	109-90

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed

(3.15mm electrode root run)

31

3-0	Qc	1	3.15	110	2.61	6.5	0.15			1-96	10-74	1-96	10-74
4-0	Qc	1&2	3.15	110	3.44	8.6	0.20			2-58	14-15	2-58	14-15
5-0	Qc	1&2	3.15	110	4.35	10.9	0.26			3-26	17-86	3-26	17-86
6-0	Qc	1-3	3.15	110	5.32	13.3	0.31			3-99	21-85	3-99	21-85
8-0	Te	1-4	3.15	110	7.47	18.7	0.44			5-61	30-72	5-61	30-72
10-0	Te	1-3 4&5 6-8	3.15 4.00 5.00	110 170 190	4.73 2.32 2.38	11.8 5.8 5.9	0.28 0.21 0.34			3-55 1-74 1-78	19-45 9-24 13-21	7-07	41-90
12.5	Te	1-3 4&5 6-10	3.15 4.00 5.00	110 170 190	4.73 2.32 4.86	11.8 5.8 12.2	0.28 0.21 0.70			3-55 1-74 3-65	19-45 9-24 27-01	8-93	55-70
15-0	Te	1-3 4&5 6-15	3.15 4.00 5.00	110 170 190	4.73 2.32 7.77	11.8 5.8 19.4	0.28 0.21 1.12			3-55 1-74 5-83	19-45 9-24 43-20	11-12	71-89
20-0	Te	1-3 4&5 6-20	3.15 4.00 5.00	110 170 190	4.73 2.32 14.90	11.8 5.8 37.2	0.28 0.21 2.14			3-55 1-74 11-17	19-45 9-24 82-78	16-46	111-47
25-0	Te	1-3 4&5 6-30	3.15 4.00 5.00	110 170 190	4.73 2.32 23.74	11.8 5.8 59.4	0.28 0.21 3.41			3-55 1-74 17-81	19-45 9-24 131-93	23-09	160-62

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
10-0	Te	1-4 5-7	4-00 5-00	170 190	5-37 2-38	13-4 5-9	0-49 0-34			4-03 1-78	21-43 13-21	5-81	34-64
12-5	Te	1-4 5-11	4-00 5-00	170 190	5-37 4-86	13-4 12-2	0-49 0-70			4-03 3-65	21-43 27-01	7-67	48-44
15-0	Te	1-4 5-14	4-00 5-00	170 190	5-37 7-77	13-4 19-4	0-49 1-12			4-03 5-83	21-43 43-20	9-86	64-64
20-0	Te	1-4 5-21	4-00 5-00	170 190	5-37 14-90	13-4 37-2	0-49 2-14			4-03 11-17	21-43 82-78	15-20	104-21
25-0	Te	1-4 5-34	4-00 5-00	170 190	5-37 23-74	13-4 69-4	0-49 3-41			4-03 17-81	21-43 131-93	21-83	153-37

3-0	Cf	1	3-15	110	1-29	3-2	0-08		0-94	0-64	5-28	0-64	5-28
4-0	Cf	1	3-15	110	1-95	4-9	0-12		1-43	0-97	8-00	0-97	8-00
5-0	Cf	1	3-15	110	2-77	6-9	0-16		2-03	1-39	11-39	1-39	11-39
6-0	Cf	1	3-15	110	3-76	9-4	0-22		2-75	1-88	15-45	1-88	15-45
8-0	Cf	1&2	3-15	110	6-23	15-6	0-37		4-56	3-11	25-59	3-11	25-59
10-0	Cf	1&2 3	3-15 4-00	110 140	5-88 1-88	14-7 4-7	0-35 0-17		4-56	2-94 0-94	24-16 9-22	3-88	33-38
12-5	Cf	1&2 3	3-15 4-00	110 140	5-88 4-79	14-7 12-0	0-35 0-44		4-56	2-94 2-39	24-16 23-50	5-33	47-65
15-0	Cf	1&2 3&4 5	3-15 4-00 5-00	110 140 170	5-88 3-75 1-64	14-7 14-4 4-1	0-35 0-53 0-24		4-56	2-94 2-87 0-82	24-16 28-21 10-23	6-63	62-60
20-0	Cf	1&2 3&4 5-7	3-15 4-00 5-00	110 140 170	5-88 5-75 7-32	14-7 14-4 18-3	0-35 0-53 1-05		4-56	2-94 2-87 3-66	24-16 28-21 45-72	9-47	98-09
25-0	Cf	1&2 3&4 5-9	3-15 4-00 5-00	110 140 170	5-88 5-75 14-57	14-7 14-4 36-4	0-35 0-53 2-09		4-56	2-94 2-87 7-28	24-16 28-21 91-02	13-10	143-38

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed
(4mm electrode root run)

32

Butt weld

Vertical position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: single-sided,
unbacked

33

Butt weld

34

Vertical position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed

(3.15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Gj	1 1R	3.15 3.15	110 110	1.23 1.97	3.1 4.9	0.07 0.12	11.28		0.61 0.98	5.05 8.09	1.60	13.13
4.0	Gj	1 1R	3.15 3.15	110 110	1.85 1.97	4.6 4.9	0.11 0.12	11.28		0.93 0.98	7.61 8.09	1.91	15.70
5.0	Gj	1 1R	3.15 3.15	110 110	2.63 1.97	6.6 4.9	0.16 0.12	11.28		1.31 0.98	10.80 8.09	2.30	18.88
6.0	Gj	1 1R	3.15 3.15	110 110	3.56 1.97	8.9 4.9	0.21 0.12	11.28		1.78 0.98	14.61 8.09	2.76	22.70
8.0	Gj	1&2 1R	3.15 3.15	110 110	5.87 1.97	14.7 4.9	0.35 0.12	11.28		2.93 0.98	24.11 8.09	3.92	32.20
10.0	Gj	1&2 3 1R	3.15 4.00 3.15	110 140 110	5.88 1.88 1.97	14.7 4.7 4.9	0.35 0.17 0.12	11.28		2.94 0.94 0.98	24.16 9.22 8.09	4.86	41.46
12.5	Gj	1&2 3 1R	3.15 4.00 3.15	110 140 110	5.88 4.79 1.97	14.7 12.0 4.9	0.35 0.44 0.12	11.28		2.94 2.39 0.98	24.16 23.50 8.09	6.32	55.74
15.0	Gj	1&2 3&4 5 1R	3.15 4.00 5.00 3.15	110 140 170 110	5.88 5.75 1.64 1.97	14.7 14.4 4.1 4.9	0.35 0.53 0.24 0.12	11.28		2.94 2.87 0.82 0.98	24.16 28.21 10.23 8.09	7.62	70.68
20.0 DV	Ka	1&2 3&4 5 1R&2R 3R	3.15 4.00 5.00 3.15 4.00	110 140 170 110 140	5.20 5.75 2.79 6.97 1.34	13.0 14.4 7.0 17.4 3.3	0.31 0.53 0.40 0.41 0.12	16.40		2.60 2.87 1.39 3.48 0.67	21.35 28.21 17.41 28.64 6.56	11.02	102.17
25.0 DV	Ka	1&2 3&4 5&6 1R&2R 3R	3.15 4.00 5.00 3.15 4.00	110 140 170 110 140	5.20 5.75 6.64 6.97 3.12	13.0 14.4 16.6 17.4 7.8	0.31 0.53 0.95 0.41 0.29	16.40		2.60 2.87 3.32 3.48 1.56	21.35 28.21 41.46 28.64 15.31	13.83	134.97

Butt weld

35

Vertical position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: sealed

(4mm electrode root run)

12.5	Gh	1-3 1R	4.00 3.15	140 110	8.01 2.36	20.0 5.9	0.74 0.14	14.87		4.01 1.18	39.34 9.68	5.19	49.02
15.0	Gh	1-3 4 1R	4.00 5.00 3.15	140 170 110	9.52 1.22 2.36	23.8 3.0 5.9	0.87 0.18 0.14	14.87		4.76 0.61 1.18	46.74 7.62 9.68	6.55	64.04
20.0 DV	Ka	1-3 4 1R&2R 3R	4.00 5.00 3.15 4.00	140 170 110 140	9.10 2.79 7.69 1.34	22.8 7.0 19.2 3.3	0.83 0.40 0.46 0.12	23.07		4.55 1.39 3.85 0.67	44.67 17.41 31.61 6.56	10.45	100.24
25.0 DV	Ka	1-3 4&5 1R&2R 3R	4.00 5.00 3.15 4.00	140 170 110 140	9.10 6.64 7.69 3.12	22.8 16.6 19.2 7.8	0.33 0.95 0.46 0.29	23.07		4.55 3.32 3.85 1.56	44.67 41.46 31.61 15.31	13.28	133.05

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Sd	1	3-15	110	2-67	6-7	0-16			1-34	10-99	1-34	10-99
4-0	Sd	1	3-15	110	3-72	9-3	0-22			1-86	15-30	1-86	15-30
5-0	Sd	1&2	3-15	110	4-93	12-3	0-29			2-46	20-24	2-46	20-24
6-0	Sd	1&2	3-15	110	6-28	15-7	0-37			3-14	25-81	3-14	25-81
8-0	Sd	1&2 3	3-15 4-00	110 140	5-20 2-74	13-0 6-9	0-31 0-25			2-60 1-37	21-35 13-45	3-97	34-81
10-0	Sd	1&2 3	3-15 4-00	110 140	5-20 5-18	13-0 12-9	0-31 0-47			2-60 2-59	21-35 25-41	5-19	46-76
12-5	Sd	1&2 3 4	3-15 4-00 5-00	110 140 170	5-20 5-75 1-93	13-0 14-4 4-8	0-31 0-53 0-28			2-60 2-87 0-97	21-35 28-21 12-08	6-44	61-64
15-0	Sd	1&2 3 4&5	3-15 4-00 5-00	110 140 170	5-20 5-75 4-62	13-0 14-4 11-6	0-31 0-53 0-66			2-60 2-87 2-31	21-35 28-21 28-89	7-78	78-45
20-0	Sd	1&2 3 4-6	3-15 4-00 5-00	110 140 170	5-20 5-75 11-18	13-0 14-4 28-0	0-31 0-53 1-61			2-60 2-87 5-59	21-35 28-21 69-87	11-06	119-43
25-0	Sd	1&2 3 4-8	3-15 4-00 5-00	110 140 170	5-20 5-75 19-31	13-0 14-4 48-3	0-31 0-53 2-77			2-60 2-87 9-66	21-35 28-21 120-65	15-13	170-22

6-0	Sd	1	4-00	140	4-05	10-1	0-37			2-03	19-89	2-03	19-89
8-0	Sd	1	4-00	140	6-09	15-2	0-56			3-05	29-91	3-05	29-91
10-0	Sd	1&2	4-00	140	8-53	21-3	0-78			4-26	41-86	4-26	41-86
12-5	Sd	1-3 4	4-00 5-00	140 170	9-10 1-93	22-8 4-8	0-83 0-28			4-55 0-97	44-67 12-08	5-52	56-75
15-0	Sd	1-3 4&5	4-00 5-00	140 170	9-10 4-62	22-8 11-6	0-83 0-66			4-55 2-31	44-67 28-89	6-86	73-56
20-0	Sd	1-3 4-6	4-00 5-00	140 170	9-10 11-18	22-8 28-0	0-83 1-61			4-55 5-59	44-67 69-87	10-14	114-54
25-0	Sd	1-3 4-8	4-00 5-00	140 170	9-10 19-31	22-8 48-3	0-83 2-77			4-55 9-66	44-67 120-65	14-21	165-32

Butt weld

Vertical position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed
(3.15mm electrode root run)

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Butt weld

Vertical position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed
(4mm electrode root run)

37

Butt weld

Overhead position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: single-sided,
unbacked

38

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Cf	1	3-15	110	1.29	3.2	0.08		0.94	0.96	5.28	0.96	5.28
4.0	Cf	1	3-15	110	1.95	4.9	0.12		1.43	1.46	8.00	1.46	8.00
5.0	Cf	1&2	3-15	110	2.77	6.9	0.16		2.03	2.08	11.39	2.08	11.39
6.0	Cf	1&2	3-15	110	0.76	9.4	0.22		2.75	2.82	15.45	2.82	15.45
8.0	Cf	1&2 3	3-15 4-00	110 150	3.82 1.32	9.6 3.3	0.23 0.12		2.75	2.87 0.99	15.71 6.02	3.86	21.73
10.0	Cf	1&2 3	3-15 4-00	110 150	3.82 3.20	9.6 8.0	0.23 0.29		2.75	2.87 2.40	15.71 14.61	5.27	30.32
12.5	Cf	1&2 3&4 5&6	3-15 4-00 5-00	110 150 170	3.82 3.87 1.43	9.6 9.7 3.6	0.23 0.35 0.21		2.75	2.87 2.90 1.08	15.71 17.64 8.96	6.84	42.31
15.0	Cf	1&2 3&4 5-7	3-15 4-00 5-00	110 150 170	3.82 3.87 3.69	9.6 9.7 9.2	0.23 0.35 0.53		2.75	2.87 2.90 2.76	15.71 17.64 23.03	8.53	56.38
20.0	Cf	1&2 3&4 5-9	3-15 4-00 5-00	110 150 170	3.82 3.87 9.37	9.6 9.7 23.4	0.23 0.35 1.34		2.75	2.87 2.90 7.02	15.71 17.64 58.52	12.79	91.87
25.0	Cf	1&2 3&4 5-14	3-15 4-00 5-00	110 150 170	3.82 3.87 16.62	9.6 9.7 41.5	0.23 0.35 2.39		2.75	2.87 2.90 12.46	15.71 17.64 103.81	18.23	137.16

Butt weld

Overhead position

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure: backed

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3.0	Rd	1&2	3-15	110	2.67	6.7	0.16			2.01	10.99	2.01	10.99
4.0	Rd	1&2	3-15	110	3.72	9.3	0.22			2.79	15.30	2.79	15.30
5.0	Rd	1&2 3	3-15 4-00	110 150	3.14 1.15	7.9 2.9	0.19 0.11			2.36 0.86	12.91 5.25	3.22	18.16
6.0	Rd	1&2 3	3-15 4-00	110 150	3.14 2.03	7.9 5.1	0.19 0.19			2.36 1.52	12.91 9.24	3.87	22.14
8.0	Qf	1&2 3&4	3-15 4-00	110 150	3.14 4.07	7.9 10.2	0.19 0.37			2.36 3.05	12.91 18.55	5.41	31.45
10.0	Qf	1&2 3&4 5	3-15 4-00 5-00	110 150 170	3.14 3.87 1.68	7.9 9.7 4.2	0.19 0.35 0.24			2.36 2.90 1.26	12.91 17.64 10.52	6.52	41.06
12.5	Qf	1&2 3&4 5&6	3-15 4-00 5-00	110 150 170	3.14 3.87 3.98	7.9 9.7 10.0	0.19 0.35 0.57			2.36 2.90 2.99	12.91 17.64 24.88	8.24	55.42
15.0	Qf	1&2 3&4 5-8	3-15 4-00 5-00	110 150 170	3.14 3.87 6.67	7.9 9.7 16.7	0.19 0.35 0.96			2.36 2.90 5.00	12.91 17.64 41.69	10.26	72.23
20.0	Qf	1&2 3&4 5-11	3-15 4-00 5-00	110 150 170	3.14 3.87 13.23	7.9 9.7 33.1	0.19 0.35 1.90			2.36 2.90 9.92	12.91 17.64 82.67	15.18	113.21
25.0	Qf	1&2 3&4 5-15	3-15 4-00 5-00	110 150 170	3.14 3.87 21.36	7.9 9.7 53.4	0.19 0.35 3.07			2.36 2.90 16.02	12.91 17.64 133.45	21.28	164.00

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Flat													
3-0-15-0		1R	4-00	180	2-44	6-1	0-22	2-24		1-22	9-19		
20-0 DV		1R&2R	4-00	180	3-86	9-7	0-35	2-24		1-93	14-52		
		3R	5-00	210	0-85	2-1	0-12			0-42	4-24		
		4R	6-30	290	0-54	1-3	0-12			0-27	3-06		
25-0 DV		1R&2R	4-00	180	3-86	9-7	0-35	2-24		1-93	14-52		
		3R	5-00	210	0-85	2-1	0-12			0-42	4-24		
		4R	6-30	290	1-26	3-1	0-29			0-63	7-13		
Horizontal/vertical													
3-0-15-0		1R	4-00	170	2-44	6-1	0-22	2-24		1-83	9-76		
20-0 DV		1R-5R	4-00	170	6-53	16-3	0-60	2-24		4-89	26-06		
25-0 DV		1R-5R	4-00	170	6-81	17-0	0-62	2-24		5-11	27-19		
		6R&7R	5-00	190	0-96	2-4	0-14			0-72	5-32		
Vertical													
3-0-15-0		1R	3-15	110	3-79	9-5	0-22	2-24		1-89	15-57		
20-0 DV		1R&2R	3-15	110	8-04	20-1	0-48	2-24		4-02	33-05		
		3R	4-00	140	1-34	3-3	0-12			0-67	6-56		
25-0 DV		1R&2R	3-15	110	8-04	20-1	0-48	2-24		4-02	33-05		
		3R	4-00	140	3-12	7-8	0-29			1-56	15-31		
Overhead													
3-0-15-0		1R	4-00	150	2-44	6-1	0-22	2-24		1-83	11-15		
20-0 DV		1R-3R	4-00	150	6-53	16-3	0-60	2-24		4-89	29-76		
25-0 DV		1R-4R	4-00	150	8-31	20-8	0-76	2-24		6-23	37-89		

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Butt weld

All positions

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure:

Sealed — supplement for sealing run preparation and welding times

— sealing run preparation by air-arc gouging

Flat													
3-0-15-0		1R	4-00	180	1-44	3-6	0-13	5-32		0-72	5-42		
20-0 DV		1R&2R	4-00	180	2-31	5-8	0-21	8-69		1-16	8-70		
		3R	5-00	210	0-49	1-2	0-07			0-24	2-45		
		4R&5R	6-30	290	1-91	4-8	0-43			0-96	10-82		
25-0 DV		1R&2R	4-00	180	2-31	5-8	0-21	8-69		1-16	8-70		
		3R	5-00	210	0-49	1-2	0-07			0-24	2-45		
		4R-6R	6-30	290	3-03	7-6	0-69			1-52	17-17		
Horizontal/vertical													
3-0-15-0		1R	4-00	180	1-44	3-6	0-13	5-32		1-08	5-42		
20-0 DV		1R-3R	4-00	180	4-55	11-4	0-42	8-69		3-41	17-10		
		4R-6R	5-00	210	2-09	5-2	0-30			1-56	10-44		
25-0 DV		1R-3R	4-00	180	4-55	11-4	0-42	8-69		3-41	17-10		
		4R-8R	5-00	210	3-86	9-7	0-55			2-90	19-32		
Vertical													
3-0-15-0		1R	3-15	110	2-24	5-6	0-13	5-32		1-12	9-19		
20-0 DV		1R&2R	3-15	110	4-77	11-9	0-28	8-69		2-39	19-62		
		3R	4-00	140	3-32	8-3	0-30			1-66	16-29		
		4R	5-00	170	0-90	2-3	0-13			0-45	5-65		
25-0 DV		1R&2R	3-15	110	4-77	11-9	0-28	8-69		2-39	19-62		
		3R	4-00	140	3-32	8-3	0-30			1-66	16-29		
		4R	5-00	170	2-68	6-7	0-38			1-34	16-74		
Overhead													
3-0-15-0		1R	4-00	150	1-44	3-6	0-13	5-32		1-08	6-58		
20-0 DV		1R-3R	4-00	150	4-55	11-4	0-42	8-69		3-41	20-74		
		4R&5R	5-00	170	2-09	5-2	0-30			1-56	13-03		
25-0 DV		1R-3R	4-00	150	4-55	11-4	0-42	8-69		3-41	20-74		
		4R-6R	5-00	170	3-86	9-7	0-55			2-90	24-13		

Double V preparation values are for reverse side only. Preparation for double V (reverse side only) for back-chipping: 45°-45°, 3-0 mm root gap, zero root face.

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Butt weld

All positions

Manual metal-arc

Electrode:

Type — rutile

Efficiency — 93.5%

Procedure:

Sealed — supplement for sealing run preparation and welding times

— sealing run preparation by chipping

Butt weld

42

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130–135%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Ce	1	3.15	130	1.11	2.8	0.09		0.61	0.67	3.56	0.67	3.56
4.0	Ce	1	3.15	130	1.67	4.2	0.13		0.91	1.00	5.33	1.00	5.33
5.0	Ce	1 2	3.15 4.00	130 220	1.59 0.39	4.0 1.0	0.13 0.05		0.87	0.95 0.23	5.07 0.96	1.19	6.04
6.0	Ce	1 2	3.15 4.00	130 220	1.59 0.85	4.0 2.1	0.13 0.11		0.87	0.95 0.51	5.07 2.10	1.46	7.17
8.0	Ce	1 2	3.15 4.00	130 220	1.59 1.98	4.0 4.9	0.13 0.26		0.87	0.95 1.19	5.07 4.89	2.14	9.96
10.0	Ce	1 2 3	3.15 4.00 5.00	130 220 285	1.59 1.67 1.09	4.0 4.2 2.7	0.13 0.22 0.22		0.87	0.95 1.00 0.65	5.07 4.14 3.07	2.61	12.28
12.5	Ce	1 2 3 4	3.15 4.00 5.00 6.30	130 220 285 460	1.59 1.67 1.15 0.83	4.0 4.2 2.9 2.1	0.13 0.22 0.23 0.27		0.87	0.95 1.00 0.69 0.50	5.07 4.14 3.23 2.12	3.14	14.56
15.0	Ce	1 2 3 4&5	3.15 4.00 5.00 6.30	130 220 285 460	1.59 1.67 1.15 1.86	4.0 4.2 2.9 4.7	0.13 0.22 0.23 0.60		0.87	0.95 1.00 0.69 1.12	5.07 4.14 3.23 4.78	3.76	17.23
20.0	Ce	1 2 3 4-7	3.15 4.00 5.00 6.30	130 220 285 460	1.59 1.67 1.15 4.47	4.0 4.2 2.9 11.2	0.13 0.22 0.23 1.44		0.87	0.95 1.00 0.69 2.68	5.07 4.14 3.23 11.45	5.33	23.90
25.0	Ce	1 2 3 4-10	3.15 4.00 5.00 6.30	130 220 285 460	1.59 1.67 1.15 7.77	4.0 4.2 2.9 19.4	0.13 0.22 0.23 2.50		0.87	0.95 1.00 0.69 4.66	5.07 4.14 3.23 19.92	7.31	32.36

Butt weld

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Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130–135%

Procedure: sealed
(3.15mm electrode root run)

3.0	Gj	1 1R	3.15 3.15	130 150	0.92 1.45	2.3 3.6	0.07 0.11	7.30		0.55 0.87	2.93 3.72	1.42	6.65
4.0	Gj	1 1R	3.15 3.15	130 150	1.39 1.45	3.5 3.6	0.11 0.11	7.30		0.83 0.87	4.42 3.72	1.70	8.14
5.0	Gj	1 1R	3.15 3.15	130 150	1.97 1.45	4.9 3.6	0.16 0.11	7.30		1.18 0.87	6.28 3.72	2.05	9.99
6.0	Gj	1 2 1R	3.15 4.00 3.15	130 220 150	1.66 0.61 1.45	4.2 1.5 3.6	0.13 0.08 0.11	7.30		1.00 0.37 0.87	5.31 1.51 3.72	2.23	10.54
8.0	Gj	1 2 1R	3.15 4.00 3.15	130 220 150	1.66 1.67 1.45	4.2 4.2 3.6	0.13 0.22 0.11	7.30		1.00 1.00 0.87	5.31 4.13 3.72	2.87	13.15
10.0	Gj	1 2 3 1R	3.15 4.00 5.00 3.15	130 220 285 150	1.66 1.67 0.85 1.45	4.2 4.2 2.1 3.6	0.13 0.22 0.17 0.11	7.30		1.00 1.00 0.51 0.87	5.31 4.14 2.39 3.72	3.38	15.55
12.5	Gj	1 2 3 4 1R	3.15 4.00 5.00 6.30 3.15	130 220 285 460 150	1.66 1.67 1.15 0.64 1.45	4.2 4.2 2.9 1.6 3.6	0.13 0.22 0.23 0.21 0.11	7.30		1.00 1.00 0.69 0.38 0.87	5.31 4.14 3.23 1.64 3.72	3.94	18.04
15.0	Gj	1 2 3 4&5 1R	3.15 4.00 5.00 6.30 3.15	130 220 285 460 150	1.66 1.67 1.15 1.64 1.45	4.2 4.2 2.9 4.1 3.6	0.13 0.22 0.23 0.53 0.11	7.30		1.00 1.00 0.69 0.99 0.87	5.31 4.14 3.23 4.21 3.72	4.55	20.61

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20-0 DV	Ka	1	3-15	130	1-15	2-9	0-09	5-51		0-69	3-68	6-01	26-51
		2	4-00	220	1-67	4-2	0-22			1-00	4-14		
		3	5-00	285	1-15	2-9	0-23			0-69	3-23		
		4&5	6-30	460	2-16	5-4	0-69			1-29	5-53		
		1R	3-15	150	1-60	4-0	0-13			0-96	4-10		
		2R	4-00	220	1-67	4-2	0-22			1-00	4-14		
		3R	5-00	285	0-60	1-5	0-12			0-36	1-70		
25-0 DV	Ka	1	3-15	130	1-15	2-9	0-09	5-51		0-69	3-68	7-52	33-18
		2	4-00	220	1-67	4-2	0-22			1-00	4-14		
		3	5-00	285	1-15	2-9	0-23			0-69	3-23		
		4-7	6-30	460	3-87	9-7	1-25			2-32	9-93		
		1R	3-15	150	1-60	4-0	0-13			0-96	4-10		
		2R	4-00	220	1-67	4-2	0-22			1-00	4-14		
		3R	5-00	285	1-41	3-5	0-29			0-84	3-97		
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	120	1-45	3-6	0-11	7-30		0-87	5-28		
20-0 DV		1R&2R	3-15	120	4-33	10-8	0-34	5-51		2-60	15-78		
		3R	4-00	150	0-95	2-4	0-12			0-57	3-97		
25-0 DV		1R&2R	3-15	120	4-33	10-8	0-34	5-51		2-60	15-78		
		3R	4-00	150	2-22	5-5	0-29			1-33	9-26		

3-0	Gj	1 1R	4-00 3-15	220 150	0-56 1-45	1-4 3-6	0-07 0-11	7-30		0-34 0-87	1-39 3-72	1-21	5-11
4-0	Gj	1 1R	4-00 3-15	220 150	0-85 1-45	2-1 3-6	0-11 0-11	7-30		0-51 0-87	2-10 3-72	1-38	5-81
5-0	Gj	1 1R	4-00 3-15	220 150	1-20 1-45	3-0 3-6	0-16 0-11	7-30		0-72 0-87	2-97 3-72	1-59	6-69
6-0	Gj	1 1R	4-00 3-15	220 150	1-63 1-45	4-1 3-6	0-21 0-11	7-30		0-98 0-87	4-03 3-72	1-85	7-74
8-0	Gj	1 1R	4-00 3-15	220 150	2-69 1-45	6-7 3-6	0-35 0-11	7-30		1-61 0-87	6-64 3-72	2-48	10-36
10-0	Gj	1 2 1R	4-00 5-00 3-15	220 285 150	2-69 0-85 1-45	6-7 2-1 3-6	0-35 0-17 0-11	7-30		1-62 0-51 0-87	6-66 2-39 3-72	2-99	12-76
12-5	Gj	1 2 3 1R	4-00 5-00 6-30 3-15	220 285 460 150	2-69 1-15 0-64 1-45	6-7 2-9 1-6 3-6	0-35 0-23 0-21 0-11	7-30		1-62 0-69 0-38 0-87	6-66 3-23 1-64 3-72	3-56	15-24
15-0	Gj	1 2 3&4 1R	4-00 5-00 6-30 3-15	220 285 460 150	2-69 1-15 1-64 1-45	6-7 2-9 4-1 3-6	0-35 0-23 0-53 0-11	7-30		1-62 0-69 0-99 0-87	6-66 3-23 4-21 3-72	4-16	17-82
20-0 DV	Ka	1	4-00	220	2-38	6-0	0-31	5-51		1-43	5-88	5-74	24-57
		2	5-00	285	1-15	2-9	0-23			0-69	3-23		
		3&4	6-30	460	2-16	5-4	0-69			1-29	5-53		
		1R	3-15	150	1-60	4-0	0-13			0-96	4-10		
		2R	4-00	220	1-67	4-2	0-22			1-00	4-14		
25-0 DV	Ka	3R	5-00	285	0-60	1-5	0-12			0-36	1-70		
		1	4-00	220	2-38	6-0	0-31	5-51		1-43	5-88	7-25	31-24
		2	5-00	285	1-15	2-9	0-23			0-69	3-23		
		3-5	6-30	460	3-87	9-7	1-25			2-32	9-93		
		1R	3-15	150	1-60	4-0	0-13			0-96	4-10		
		2R	4-00	220	1-67	4-2	0-22			1-00	4-14		
		3R	5-00	285	1-41	3-5	0-29			0-84	3-97		

Butt weld
Flat position
Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: sealed
(4mm electrode root run)

Butt weld

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130–135%

Procedure: backed

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Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Se	1	3-15	150	0-56	1-4	0-04			0-33	1-42	1-28	5-31
		2	4-00	220	1-57	3-9	0-20			0-94	3-89		
4-0	Se	1	3-15	150	0-56	1-4	0-04			0-33	1-42	1-48	6-33
		2	4-00	220	1-33	3-3	0-17			0-80	3-30		
		3	5-00	285	0-57	1-4	0-12			0-34	1-61		
5-0	Se	1	3-15	150	0-56	1-4	0-04			0-33	1-42	1-76	7-64
		2	4-00	220	1-33	3-3	0-17			0-80	3-30		
		3	5-00	285	1-04	2-6	0-21			0-62	2-92		
6-0	Se	1	3-15	150	0-56	1-4	0-04			0-33	1-42	2-06	9-08
		2	4-00	220	1-33	3-3	0-17			0-80	3-30		
		3	5-00	285	1-54	3-9	0-31			0-93	4-36		
8-0	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	2-78	11-74
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3	5-00	285	0-56	1-4	0-11			0-33	1-58		
10-0	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	3-30	14-18
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3	5-00	285	1-42	3-6	0-29			0-85	4-01		
12-5	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	4-01	17-55
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3&4	5-00	285	2-61	6-5	0-53			1-57	7-38		
15-0	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	4-48	19-51
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3&4	5-00	285	2-47	6-2	0-50			1-48	6-97		
		5	6-30	460	0-93	2-3	0-30			0-56	2-38		
20-0	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	5-63	24-43
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3&4	5-00	285	2-47	6-2	0-50			1-48	6-97		
		5&6	6-30	460	2-84	7-1	0-92			1-71	7-29		
25-0	Qe	1	3-15	150	1-20	3-0	0-09			0-72	3-06	6-97	30-17
		2	4-00	220	2-87	7-2	0-37			1-72	7-10		
		3&4	5-00	285	2-47	6-2	0-50			1-48	6-97		
		5-9	6-30	460	5-08	12-7	1-64			3-05	13-03		

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	120	0-96	2-4	0-08		0-53	0-58	3-50	0-58	3-50
4-0	Cf	1	3-15	120	1-46	3-6	0-12		0-80	0-87	5-30	0-87	5-30
5-0	Cf	1	3-15	120	2-07	5-2	0-16		1-13	1-24	7-55	1-24	7-55
6-0	Cf	1 2	3-15 4-00	120 190	1-66 0-61	4-2 1-5	0-13 0-08		1-13	1-00 0-37	6-06 1-83	1-36	7-89
8-0	Dd	1 2&3	3-15 4-00	120 190	1-53 1-93	3-8 4-8	0-12 0-25		1-13	0-92 1-16	5-59 5-78	2-08	11-37
10-0	Dd	1 2&3 4	3-15 4-00 3-15	120 190 120	1-53 2-69 1-12	3-8 6-7 2-8	0-12 0-35 0-09		1-13	0-92 1-61 0-67	5-59 8-06 4-10	3-21	17-75
12-5	Dd	1 2-4 5	3-15 4-00 3-15	120 190 120	1-53 4-94 1-12	3-8 12-3 2-8	0-12 0-64 0-09		1-13	0-92 2-96 0-67	5-59 14-79 4-10	4-56	24-48
15-0	Dd	1 2-4 5-7 8	3-15 4-00 5-00 3-15	120 190 220 120	1-53 5-24 1-54 1-12	3-8 13-1 3-8 2-8	0-12 0-68 0-31 0-09		1-13	0-92 3-14 0-92 0-67	5-59 15-71 5-98 4-10	5-66	31-37
20-0	Dd	1 2-4 5-10 11	3-15 4-00 5-00 3-15	120 190 220 120	1-53 5-24 5-91 1-12	3-8 13-1 14-8 2-8	0-12 0-68 1-20 0-09		1-13	0-92 3-14 3-54 0-67	5-59 15-71 23-00 4-10	8-28	48-39
25-0	Dd	1 2-4 5-15 16	3-15 4-00 5-00 3-15	120 190 220 120	1-53 5-24 11-49 1-12	3-8 13-1 28-7 2-8	0-12 0-68 2-34 0-09		1-13	0-92 3-14 6-89 0-67	5-59 15-71 44-75 4-10	11-63	70-14

3-0	Gh	1 1R	3-15 3-15	150 120	0-73 1-45	1-8 3-6	0-06 0-11	7-30		0-44 0-87	1-87 5-28	1-31	7-16
4-0	Gh	1 1R	3-15 3-15	150 120	1-15 1-45	2-9 3-6	0-09 0-11	7-30		0-69 0-87	2-94 5-28	1-56	8-23
5-0	Gh	1 1R	3-15 3-15	150 120	1-68 1-45	4-2 3-6	0-13 0-11	7-30		1-01 0-87	4-30 5-28	1-88	9-59
6-0	Gh	1 2 1R	3-15 4-00 3-15	150 190 120	1-64 0-42 1-45	4-1 1-0 3-6	0-13 0-05 0-11	7-30		0-99 0-25 0-87	4-21 1-25 5-28	2-11	10-74
8-0	He	1 2&3 1R	3-15 4-00 3-15	150 190 120	1-51 1-68 1-45	3-8 4-2 3-6	0-12 0-22 0-11	7-30		0-91 1-01 0-87	3-87 5-03 5-28	2-78	14-18
10-0	He	1 2&3 4 1R	3-15 4-00 3-15 3-15	150 190 120 120	1-51 2-38 1-12 1-45	3-8 6-0 2-8 3-6	0-12 0-31 0-09 0-11	7-30		0-91 1-43 0-67 0-87	3-87 7-13 4-10 5-28	3-88	20-38
12-5	He	1 2-4 5 1R	3-15 4-00 3-15 3-15	150 190 120 120	1-51 4-55 1-12 1-45	3-8 11-4 2-8 3-6	0-12 0-59 0-09 0-11	7-30		0-91 2-73 0-67 0-87	3-87 13-64 4-10 5-28	5-18	26-88
15-0	He	1 2-4 5&6 7 1R	3-15 4-00 5-00 3-15 3-15	150 190 220 120 120	1-51 5-24 1-24 1-12 1-45	3-8 13-1 3-1 2-8 3-6	0-12 0-68 0-25 0-09 0-11	7-30		0-91 3-14 0-75 0-67 0-87	3-87 15-71 4-84 4-10 5-28	6-34	33-79

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20.0 DV	Ka	1	3.15	120	1.15	2.9	0.09	5.51		0.69	4.20	8.53	47.20
		2-4	4.00	190	5.75	14.4	0.74			3.45	17.25		
		5&6	5.00	220	1.53	3.8	0.31			0.92	5.95		
		7	3.15	120	1.12	2.8	0.09			0.67	4.10		
		1R	3.15	120	1.60	4.0	0.13			0.96	5.82		
		2R&3R	4.00	190	1.93	4.8	0.25			1.16	5.80		
		4R	3.15	120	1.12	2.8	0.09			0.67	4.10		
25.0 DV	Ka	1	3.15	120	1.15	2.9	0.09	5.51		0.69	4.20	10.91	61.57
		2-4	4.00	190	5.75	14.4	0.74			3.45	17.25		
		5-9	5.00	220	4.24	10.6	0.86			2.55	16.52		
		10	3.15	120	1.12	2.8	0.09			0.67	4.10		
		1R	3.15	120	1.60	4.0	0.13			0.96	5.82		
		2R-4R	4.00	190	3.20	8.0	0.41			1.92	9.59		
		5R	3.15	120	1.12	2.8	0.09			0.67	4.10		

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: backed

3.0	Sd	1 2	3.15 4.00	150 190	1.15 0.52	2.9 1.3	0.09 0.07			0.69 0.31	2.95 1.56	1.00	4.51
4.0	Sd	1 2	3.15 4.00	150 190	1.15 1.00	2.9 2.5	0.09 0.13			0.69 0.60	2.95 3.00	1.29	5.95
5.0	Sd	1 2&3	3.15 4.00	150 190	1.15 1.55	2.9 3.9	0.09 0.20			0.69 0.93	2.95 4.65	1.62	7.60
6.0	Sd	1 2&3	3.15 4.00	150 190	1.15 2.17	2.9 5.4	0.09 0.28			0.69 1.30	2.95 6.50	1.99	9.46
8.0	Te	1 2&3 4	3.15 4.00 3.15	150 190 150	1.05 3.26 1.12	2.6 8.1 2.8	0.08 0.42 0.09			0.63 1.95 0.67	2.69 9.76 2.88	3.26	15.33
10.0	Te	1 2-4 5	3.15 4.00 3.15	150 190 150	1.05 5.12 1.12	2.6 12.8 2.8	0.08 0.66 0.09			0.63 3.07 0.67	2.69 15.34 2.88	4.38	20.91
12.5	Te	1 2-4 5&6 7	3.15 4.00 5.00 3.15	150 190 220 150	1.05 5.24 1.67 1.12	2.6 13.1 4.2 2.8	0.08 0.68 0.34 0.09			0.63 3.14 1.00 0.67	2.69 15.71 6.52 2.88	5.45	27.80
15.0	Te	1 2-4 5-8 9	3.15 4.00 5.00 3.15	150 190 220 150	1.05 5.24 3.73 1.12	2.6 13.1 9.3 2.8	0.08 0.68 0.76 0.09			0.63 3.14 2.24 0.67	2.69 15.71 14.52 2.88	6.69	35.80
20.0	Te	1 2-4 5-11 12	3.15 4.00 5.00 3.15	150 190 220 150	1.05 5.24 8.75 1.12	2.6 13.1 21.9 2.8	0.08 0.68 1.78 0.09			0.63 3.14 5.25 0.67	2.69 15.71 34.08 2.88	9.70	55.36
25.0	Te	1 2-4 5-18 19	3.15 4.00 5.00 3.15	150 190 220 150	1.05 5.24 14.99 1.12	2.6 13.1 37.5 2.8	0.08 0.68 3.05 0.09			0.63 3.14 8.99 0.67	2.69 15.71 58.37 2.88	13.44	79.65

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	120	0-96	2-4	0-08		0-53	0-58	3-50	0-58	3-50
4-0	Cf	1	3-15	120	1-46	3-6	0-12		0-80	0-87	5-30	0-87	5-30
5-0	Cf	1	3-15	120	2-07	5-2	0-16		1-13	1-24	7-55	1-24	7-55
6-0	Cf	1	3-15	120	2-81	7-0	0-22		1-54	1-69	10-24	1-69	10-24
8-0	Cf	1&2	3-15	120	4-66	11-6	0-37		1-54	2-80	16-96	2-80	16-96
10-0	Cf	1&2	3-15	120	6-99	17-5	0-55		1-54	4-20	25-47	4-20	25-47
12-5	Cf	1-3	3-15	120	10-60	26-5	0-84		1-54	6-36	38-61	6-36	38-61
15-0	Cf	1-3 4	3-15 4-00	120 150	11-06 1-82	27-7 4-5	0-88 0-24		1-54	6-64 1-09	40-28 7-61	7-73	47-89
20-0	Cf	1-3 4&5	3-15 4-00	120 150	11-06 8-13	27-7 20-3	0-88 1-05		1-54	6-64 4-88	40-28 34-00	11-51	74-28
25-0	Cf	1-3 4-8	3-15 4-00	120 150	11-06 16-18	27-7 40-5	0-88 2-09		1-54	6-64 9-71	40-23 67-69	16-35	107-97

Butt weld

49

Vertical position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130 135%

Procedure: single-sided,
unbacked

3-0	Gh	1 1R	3-15 3-15	120 120	0-73 1-45	1-8 3-6	0-06 0-11	7-30		0-44 0-87	2-67 5-28	1-31	7-95
4-0	Gh	1 1R	3-15 3-15	120 120	1-15 1-45	2-9 3-6	0-09 0-11	7-30		0-69 0-87	4-18 5-28	1-56	9-47
5-0	Gh	1 1R	3-15 3-15	120 120	1-68 1-45	4-2 3-6	0-13 0-11	7-30		1-01 0-87	6-12 5-28	1-88	11-40
6-0	Gh	1 1R	3-15 3-15	120 120	2-32 1-45	5-8 3-6	0-18 0-11	7-30		1-39 0-87	8-46 5-28	2-27	13-75
8-0	Gh	1&2 1R	3-15 3-15	120 120	3-96 1-45	9-9 3-6	0-31 0-11	7-30		2-37 0-87	14-40 5-28	3-24	19-69
10-0	Gh	1&2 1R	3-15 3-15	120 120	6-04 1-45	15-1 3-6	0-48 0-11	7-30		3-63 0-87	22-00 5-28	4-50	27-29
12-5	Gh	1-3 1R	3-15 3-15	120 120	9-29 1-45	23-2 3-6	0-74 0-11	7-30		5-57 0-87	33-84 5-28	6-45	39-12
15-0	Gh	1-3 4 1R	3-15 4-00 3-15	120 150 120	11-04 1-36 1-45	27-6 3-4 3-6	0-87 0-18 0-11	7-30		6-62 0-81 0-87	40-20 5-67 5-28	8-31	51-15
20-0 DV	Ka	1-3 4&5 1R&2R	3-15 4-00 3-15	120 150 120	10-55 3-10 5-88	26-4 7-7 14-7	0-83 0-40 0-47	5-51		6-33 1-86 3-53	38-42 12-95 21-42	11-72	72-72
25-0 DV	Ka	1-3 4&5 1R&2R	3-15 4-00 3-15	120 150 120	10-55 7-37 7-95	26-4 18-4 19-9	0-83 0-95 0-63	5-51		6-33 4-42 4-77	38-42 30-83 28-95	15-52	98-20

Butt weld

50

Vertical position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130 135%

Procedure: sealed

Butt weld

51

Vertical position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: backed

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Sd	1	3.15	120	2.00	5.0	0.16			1.20	7.29	1.20	7.29
4.0	Sd	1	3.15	120	2.79	7.0	0.22			1.67	10.14	1.67	10.14
5.0	Sd	1&2	3.15	120	3.68	9.2	0.29			2.21	13.42	2.21	13.42
6.0	Sd	1&2	3.15	120	4.70	11.7	0.37			2.82	17.11	2.82	17.11
8.0	Sd	1-3	3.15	120	7.06	17.7	0.56			4.24	25.73	4.24	25.73
10.0	Sd	1-3	3.15	120	9.89	24.7	0.78			5.93	36.01	5.93	36.01
12.5	Sd	1-3 4	3.15 4.00	120 150	10.55 2.15	26.4 5.4	0.83 0.28			6.33 1.29	38.42 8.98	7.62	47.40
15.0	Sd	1-3 4&5	3.15 4.00	120 150	10.55 5.14	26.4 12.8	0.83 0.66			6.33 3.08	38.42 21.49	9.41	59.90
20.0	Sd	1-3 4-6	3.15 4.00	120 150	10.55 12.42	26.4 31.1	0.83 1.61			6.33 7.45	38.42 51.96	13.78	90.38
25.0	Sd	1-3 4-9	3.15 4.00	120 150	10.55 21.45	26.4 53.6	0.83 2.77			6.33 12.87	38.42 89.73	19.20	128.15

Butt weld

52

Overhead position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: single-sided,
unbacked

3.0	Cf	1	3.15	120	0.96	2.4	0.08		0.53	0.58	3.50	0.58	3.50
4.0	Cf	1	3.15	120	1.46	3.6	0.12		0.53	0.87	5.30	0.87	5.30
5.0	Cf	1&2	3.15	120	2.07	5.2	0.16		0.53	1.24	7.55	1.24	7.55
6.0	Cf	1&2	3.15	120	2.81	7.0	0.22		0.53	1.69	10.24	1.69	10.24
8.0	Cf	1-3	3.15	120	4.66	11.6	0.37		0.53	2.80	16.96	2.80	16.96
10.0	Cf	1-3 4	3.15 4.00	120 150	4.40 1.33	11.0 3.3	0.35 0.17		0.53	2.64 0.80	16.01 5.58	3.44	21.59
12.5	Cf	1-3 4&5	3.15 4.00	120 150	4.40 3.40	11.0 8.5	0.35 0.44		0.53	2.64 2.04	16.01 14.21	4.68	30.23
15.0	Cf	1-3 4-7	3.15 4.00	120 150	4.40 5.90	11.0 14.8	0.35 0.76		0.53	2.64 3.54	16.01 24.68	6.18	40.69
20.0	Cf	1-3 4-9	3.15 4.00	120 150	4.40 12.21	11.0 30.5	0.35 1.58		0.53	2.64 7.33	16.01 51.07	9.96	67.08
25.0	Cf	1-3 4-13	3.15 4.00	120 150	4.40 20.27	11.0 50.7	0.35 2.62		0.53	2.64 12.16	16.01 84.75	14.80	100.77

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Sd	1	3-15	120	2-00	5-0	0-16			1-20	7-29	1-20	7-29
4-0	Sd	1&2	3-15	120	2-79	7-0	0-22			1-67	10-14	1-67	10-14
5-0	Sd	1&2	3-15	120	3-68	9-2	0-29			2-21	13-42	2-21	13-42
6-0	Sd	1&2	3-15	120	4-70	11-7	0-37			2-82	17-11	2-82	17-11
8-0	Qf	1 2&3	3-15 4-00	120 150	3-31 3-52	8-3 8-8	0-26 0-45			1-99 2-11	12-07 14-72	4-10	26-79
10-0	Qf	1 2-4	3-15 4-00	120 150	3-31 5-12	8-3 12-8	0-26 0-66			1-99 3-07	12-07 21-42	5-06	33-48
12-5	Qf	1 2-5	3-15 4-00	120 150	3-31 7-30	8-3 18-3	0-26 0-94			1-99 4-38	12-07 30-55	6-37	42-61
15-0	Qf	1 2-7	3-15 4-00	120 150	3-31 9-69	8-3 24-2	0-26 1-25			1-99 5-81	12-07 40-52	7-80	52-59
20-0	Qf	1 2-9	3-15 4-00	120 150	3-31 15-07	8-3 37-7	0-26 1-95			1-99 9-04	12-07 63-01	11-03	75-08
25-0	Qf	1 2-12	3-15 4-00	120 150	3-31 21-25	8-3 53-1	0-26 2-75			1-99 12-75	12-07 88-89	14-74	100-95

Butt weld

Overhead position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure: backed

53

Flat

3-0-15-0	1R	4-00	220	1-74	4-3	0-22	2-24	1-04	4-29		
20-0 DV	1R&2R 3R	4-00 5-00	220 285	3-68 0-60	9-2 1-5	0-48 0-12	2-24	2-21 0-36	9-11 1-70		
25-0 DV	1R&2R 3R	4-00 5-00	220 285	3-68 1-41	9-2 3-5	0-48 0-29	2-24	2-21 0-84	9-11 3-97		

Horizontal/vertical

3-0-15-0	1R	4-00	190	1-74	4-3	0-22	2-24	1-04	5-20		
20-0 DV	1R-3R	4-00	190	4-63	11-6	0-60	2-24	2-78	13-89		
25-0 DV	1R-4R	4-00	190	5-90	14-7	0-76	2-24	3-54	17-68		

Vertical

3-0-15-0	1R	3-15	120	2-83	7-1	0-22	2-24	1-70	10-32		
20-0 DV	1R&2R	3-15	120	7-57	18-9	0-60		4-54	27-55		
25-0 DV	1R-3R	3-15	120	9-63	24-1	0-76		5-78	35-08		

Overhead

3-0-15-0	1R	4-00	150	1-74	4-3	0-22	2-24	1-04	7-26		
20-0 DV	1R&2R	4-00	150	4-63	11-6	0-60	2-24	2-78	19-38		
25-0 DV	1R-3R	4-00	150	5-90	14-7	0-76	2-24	3-54	24-67		

Butt weld

All positions

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 130%

Efficiency — 130-135%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— sealing run
preparation by air-arc
gouging

54

Butt weld

55

All positions

Manual metal-arc

Electrode:

Type — rutile 130%

Efficiency — 130 135%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times--- sealing run
preparation by chipping

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Flat													
3-0-15-0		1R	4-00	220	1-02	2-6	0-13	5-32		0-61	2-53		
20-0 DV		1R 2R 3R	4-00 5-00 6-30	220 285 460	2-19 0-66 0-93	5-5 1-7 2-3	0-28 0-13 0-30	8-69		1-31 0-40 0-56	5-40 1-87 2-38		
25-0 DV		1R 2R 3R&4R	4-00 5-00 6-30	220 285 460	2-19 0-66 1-72	5-5 1-7 4-3	0-28 0-13 0-55	8-69		1-31 0-40 1-03	5-40 1-87 4-41		
Horizontal/vertical													
3-0-15-0		1R	4-00	190	1-02	2-6	0-13	5-32		0-61	3-07		
20-0 DV		1R&2R 3R&4R	4-00 5-00	190 220	1-22 2-75	3-1 6-9	0-16 0-56	8-69		0-73 1-65	3-66 10-69		
25-0 DV		1R&2R 3R-6R	4-00 5-00	190 220	1-22 4-00	3-1 10-0	0-16 0-81	8-69		0-73 2-40	3-66 15-57		
Vertical													
3-0-15-0		1R	3-15	120	1-67	4-2	0-13	5-32		1-00	6-09		
20-0 DV		1R&2R 3R	3-15 4-00	120 150	7-42 1-00	18-5 2-5	0-59 0-13	8-69		4-45 0-60	27-01 4-20		
25-0 DV		1R&2R 3R&4R	3-15 4-00	120 150	7-42 2-98	18-5 7-4	0-59 0-38	8-69		4-45 1-79	27-01 12-45		
Overhead													
3-0-15-0		1R	4-00	150	1-02	2-6	0-13	5-32		0-61	4-28		
20-0 DV		1R-3R	4-00	150	5-55	13-9	0-72	8-69		3-33	23-20		
25-0 DV		1R-4R	4-00	150	7-52	18-8	0-97	8-69		4-51	31-45		

Butt weld

56

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 140%

Efficiency — 135 145%

Procedure: single-sided,
unbacked

3-0	Ce	1	3-15	120	1-05	2-6	0-09		0-31	0-63	3-07	0-63	3-07
4-0	Ce	1	3-15	120	1-57	3-9	0-13		0-46	0-94	4-60	0-94	4-60
5-0	Ce	1 2	3-15 4-00	120 220	1-50 0-37	3-7 0-9	0-13 0-05		0-44	0-90 0-22	4-38 0-84	1-12	5-22
6-0	Ce	1 2	3-15 4-00	120 220	1-50 0-82	3-7 2-0	0-13 0-11		0-44	0-90 0-49	4-38 1-84	1-39	6-22
8-0	Ce	1 2	3-15 4-00	120 220	1-50 1-91	3-7 4-8	0-13 0-26		0-44	0-90 1-14	4-38 4-29	2-04	8-67
10-0	Ce	1 2 3	3-15 4-00 5-00	120 220 285	1-50 1-61 1-05	3-7 4-0 2-6	0-13 0-22 0-22		0-44	0-90 0-97 0-63	4-38 3-63 2-78	2-50	10-80
12-5	Ce	1 2 3 4	3-15 4-00 5-00 6-30	120 220 285 390	1-50 1-61 1-10 0-80	3-7 4-0 2-8 2-0	0-13 0-22 0-23 0-27		0-44	0-90 0-97 0-66 0-48	4-38 3-63 2-93 2-38	3-01	13-33
15-0	Ce	1 2 3 4&5	3-15 4-00 5-00 6-30	120 220 285 390	1-50 1-61 1-10 1-80	3-7 4-0 2-8 4-5	0-13 0-22 0-23 0-60		0-44	0-90 0-97 0-66 1-08	4-38 3-63 2-93 5-37	3-61	16-32
20-0	Ce	1 2 3 4-6	3-15 4-00 5-00 6-30	120 220 285 390	1-50 1-61 1-10 4-31	3-7 4-0 2-8 10-8	0-13 0-22 0-23 1-44		0-44	0-90 0-97 0-66 2-59	4-38 3-63 2-93 12-86	5-12	23-81
25-0	Ce	1 2 3 4-10	3-15 4-00 5-00 6-30	120 220 285 390	1-50 1-61 1-10 7-49	3-7 4-0 2-8 18-7	0-13 0-22 0-23 2-50		0-44	0-90 0-97 0-66 4-50	4-38 3-63 2-93 22-36	7-03	33-31

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Gj	1 1R	3-15 3-15	120 150	0-87 1-78	2-2 4-4	0-07 0-15	14-61		0-52 1-07	2-53 3-93	1-59	6-47
4-0	Gj	1 1R	3-15 3-15	120 150	1-31 1-78	3-3 4-4	0-11 0-15	14-61		0-78 1-07	3-82 3-93	1-85	7-75
5-0	Gj	1 1R	3-15 3-15	120 150	1-85 1-78	4-6 4-4	0-16 0-15	14-61		1-11 1-07	5-42 3-93	2-18	9-35
6-0	Gj	1 2 1R	3-15 4-00 3-15	120 220 150	1-57 0-59 1-78	3-9 1-5 4-4	0-13 0-08 0-15	14-61		0-94 0-35 1-07	4-58 1-32 3-93	2-36	9-84
3-0	Gj	1 2 1R	3-15 4-00 3-15	120 220 150	1-57 1-61 1-78	3-9 4-0 4-4	0-13 0-22 0-15	14-61		0-94 0-97 1-07	4-58 3-62 3-93	2-97	12-14
10-0	Gj	1 2 3 1R	3-15 4-00 5-00 3-15	120 220 285 150	1-57 1-61 0-82 1-78	3-9 4-0 2-0 4-4	0-13 0-22 0-17 0-15	14-61		0-94 0-97 0-49 1-07	4-58 3-63 2-17 3-93	3-47	14-32
12-5	Gj	1 2 3 4 1R	3-15 4-00 5-00 6-30 3-15	120 220 285 390 150	1-57 1-61 1-10 0-62 1-78	3-9 4-0 2-8 1-5 4-4	0-13 0-22 0-23 0-21 0-15	14-61		0-94 0-97 0-66 0-37 1-07	4-58 3-63 2-93 1-84 3-93	4-01	16-93
15-0	Gj	1 2 3 4&5 1R	3-15 4-00 5-00 6-30 3-15	120 220 285 390 150	1-57 1-61 1-10 1-59 1-78	3-9 4-0 2-8 4-0 4-4	0-13 0-22 0-23 0-53 0-15	14-61		0-94 0-97 0-66 0-95 1-07	4-58 3-63 2-93 4-73 3-93	4-59	19-81
20-0 DV	Ka	1 2 3 4&5 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	120 220 285 390 150 220 285	1-09 1-61 1-10 2-08 1-71 1-61 0-58	2-7 4-0 2-8 5-2 4-3 4-0 1-4	0-09 0-22 0-23 0-69 0-14 0-22 0-12	8-20		0-65 0-97 0-66 1-25 1-03 0-97 0-35	3-18 3-63 2-93 6-20 3-79 3-63 1-54	5-87	24-91
25-0 DV	Ka	1 2 3 4-7 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	120 220 285 390 150 220 285	1-09 1-61 1-10 3-73 1-71 1-61 1-35	2-7 4-0 2-8 9-3 4-3 4-0 3-4	0-09 0-22 0-23 1-25 0-14 0-22 0-29	8-20		0-65 0-97 0-66 2-24 1-03 0-97 0-81	3-18 3-63 2-93 11-14 3-79 3-63 3-60	7-33	31-91

Butt weld
Flat position
Manual metal-arc
Electrode:

Type — rutile,
heavy covering 140%
Efficiency — 135 145%

Procedure: sealed
(3 15mm electrode root run)

57

Butt weld

58

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 140%

Efficiency — 135-145%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
12.5	Gj	1	4.00	180	0.84	2.1	0.11	15-89		0.50	2.38	3.72	15.26
		2	4.00	220	1.76	4.4	0.24			1.06	3.96		
		3	5.00	285	1.10	2.8	0.23			0.66	2.93		
		4	6.30	390	0.62	1.5	0.21			0.37	1.84		
		1R	3.15	150	1.88	4.7	0.16			1.13	4.15		
15.0	Gj	1	4.00	180	0.84	2.1	0.11	15-89		0.50	2.38	4.30	18.15
		2	4.00	220	1.76	4.4	0.24			1.06	3.96		
		3	5.00	285	1.10	2.8	0.23			0.66	2.93		
		4&5	6.30	390	1.59	4.0	0.53			0.95	4.73		
		1R	3.15	150	1.88	4.7	0.16			1.13	4.15		
20.0 DV	Ka	1	4.00	180	0.54	1.3	0.07	16-66		0.32	1.52	5.01	21.76
		2	4.00	220	1.76	4.4	0.24			1.06	3.96		
		3	5.00	285	1.10	2.8	0.23			0.66	2.93		
		4&5	6.30	390	2.08	5.2	0.69			1.25	6.20		
		1R	4.00	220	1.48	3.7	0.20			0.89	3.33		
		2R	5.00	285	1.02	2.6	0.22			0.61	2.72		
		3R	6.30	390	0.37	0.9	0.12			0.22	1.10		
25.0 DV	Ka	1	4.00	180	0.54	1.3	0.07	16-66		0.32	1.52	6.29	28.16
		2	4.00	220	1.76	4.4	0.24			1.06	3.96		
		3	5.00	285	1.10	2.8	0.23			0.66	2.93		
		4-7	6.30	390	3.73	9.3	1.25			2.24	11.14		
		1R	4.00	220	1.48	3.7	0.20			0.89	3.33		
		2R	5.00	285	1.02	2.6	0.22			0.61	2.72		
		3R	6.30	390	0.86	2.1	0.29			0.51	2.56		

Butt weld

59

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 140%

Efficiency — 135-145%

Procedure: backed

3.0	Sd	1	3.15	150	1.89	4.7	0.16			1.13	4.17	1.13	4.17
4.0	Sd	1	3.15	150	2.63	6.6	0.22			1.58	5.81	1.58	5.81
5.0	Sd	1	3.15	150	2.22	5.5	0.19			1.33	4.90	1.80	6.67
		2	4.00	220	0.79	2.0	0.11			0.47	1.78		
6.0	Sd	1	3.15	150	2.22	5.5	0.19			1.33	4.90	2.16	8.02
		2	4.00	220	1.39	3.5	0.19			0.83	3.12		
8.0	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	2.95	11.21
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3	5.00	285	0.54	1.3	0.11			0.32	1.43		
10.0	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	3.45	13.41
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3	5.00	285	1.37	3.4	0.29			0.82	3.64		
12.5	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	4.14	16.47
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3&4	5.00	285	2.52	6.3	0.53			1.51	6.69		
15.0	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	4.60	18.77
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3&4	5.00	285	2.38	5.9	0.50			1.43	6.32		
		5	6.30	390	0.90	2.2	0.30			0.54	2.67		
20.0	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	5.70	24.28
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3&4	5.00	285	2.38	5.9	0.50			1.43	6.32		
		5&6	6.30	390	2.74	6.9	0.92			1.65	8.19		
25.0	Qe	1	3.15	150	2.43	6.1	0.20			1.46	5.37	7.00	30.73
		2	4.00	220	1.96	4.9	0.26			1.17	4.41		
		3&4	5.00	285	2.38	5.9	0.50			1.43	6.32		
		5-9	6.30	390	4.90	12.3	1.64			2.94	14.63		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
<i>Preparation by air-arc gouging</i>													
3.0-15.0		1R	4.00	220	1.67	4.2	0.22	2.24		1.00	3.77		
20.0 DV		1R&2R 3R	4.00 5.00	220 285	3.55 0.58	8.9 1.4	0.48 0.12	2.24		2.13 0.35	8.00 1.54		
25.0 DV		1R&2R 3R	4.00 5.00	220 285	3.55 1.35	8.9 3.4	0.48 0.29	2.24		2.13 0.81	8.00 3.60		
<i>Preparation by chipping</i>													
3.0-15.0		1R	4.00	220	0.99	2.5	0.13	5.32		0.59	2.22		
20.0 DV		1R 2R 3R	4.00 5.00 6.30	220 285 390	2.11 0.64 0.90	5.3 1.6 2.2	0.28 0.13 0.30	8.69		1.26 0.38 0.54	4.75 1.69 2.68		
25.0 DV		1R 2R 3R&4R	4.00 5.00 6.30	220 285 390	2.11 0.64 1.66	5.3 1.6 4.2	0.28 0.13 0.55	8.69		1.26 0.38 1.00	4.75 1.69 4.95		

Butt weld
Flat position
Manual metal-arc

60

Electrode:
Type — rutile,
heavy covering 140%
Efficiency — 135 145%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

3.0	Ce	1	3.15	125	0.97	2.4	0.09		0.28	0.58	2.89	0.58	2.89
4.0	Ce	1	3.15	125	1.45	3.6	0.13		0.42	0.87	4.32	0.87	4.32
5.0	Ce	1 2	3.15 4.00	125 200	1.38 0.34	3.4 0.8	0.13 0.05		0.40	0.83 0.20	4.12 0.93	1.03	5.05
6.0	Ce	1 2	3.15 4.00	125 200	1.38 0.74	3.4 1.9	0.13 0.11		0.40	0.83 0.44	4.12 2.04	1.27	6.15
8.0	Ce	1 2	3.15 4.00	125 200	1.38 1.72	3.4 4.3	0.13 0.26		0.40	0.83 1.03	4.12 4.75	1.86	8.86
10.0	Ce	1 2 3	3.15 4.00 5.00	125 200 275	1.38 1.46 0.98	3.4 3.6 2.4	0.13 0.22 0.22		0.40	0.83 0.88 0.59	4.12 4.02 2.87	2.29	11.00
12.5	Ce	1 2 3 4	3.15 4.00 5.00 6.30	125 200 275 390	1.38 1.46 1.03 0.73	3.4 3.6 2.6 1.8	0.13 0.22 0.23 0.27		0.40	0.83 0.88 0.62 0.44	4.12 4.02 3.02 2.36	2.76	13.51
15.0	Ce	1 2 3 4&5	3.15 4.00 5.00 6.30	125 200 275 390	1.38 1.46 1.03 1.65	3.4 3.6 2.6 4.1	0.13 0.22 0.23 0.60		0.40	0.83 0.88 0.62 0.99	4.12 4.02 3.02 5.32	3.31	16.48
20.0	Ce	1 2 3 4-7	3.15 4.00 5.00 6.30	125 200 275 390	1.38 1.46 1.03 3.95	3.4 3.6 2.6 9.9	0.13 0.22 0.23 1.44		0.40	0.83 0.88 0.62 2.37	4.12 4.02 3.02 12.75	4.69	23.90
25.0	Ce	1 2 3 4-11	3.15 4.00 5.00 6.30	125 200 275 390	1.38 1.46 1.03 6.88	3.4 3.6 2.6 17.2	0.13 0.22 0.23 2.50		0.40	0.83 0.88 0.62 4.13	4.12 4.02 3.02 22.17	6.45	33.32

Butt weld
Flat position
Manual metal-arc

61

Electrode:
Type — rutile,
heavy covering 150%
Efficiency 145 155%

Procedure: single-sided,
unbacked

Butt weld

62

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 150%

Efficiency — 145-155%

Procedure: sealed
(3 15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Gj	1 1R	3-15 3-15	125 150	0-80 1-63	2-0 4-1	0-07 0-15	14-61		0-48 0-98	2-38 3-89	1-46	6-27
4-0	Gj	1 1R	3-15 3-15	125 150	1-20 1-63	3-0 4-1	0-11 0-15	14-61		0-72 0-98	3-59 3-89	1-70	7-48
5-0	Gj	1 1R	3-15 3-15	125 150	1-70 1-63	4-3 4-1	0-16 0-15	14-61		1-02 0-98	5-09 3-89	2-00	8-98
6-0	Gj	1 2 1R	3-15 4-00 3-15	125 200 150	1-44 0-53 1-63	3-6 1-3 4-1	0-13 0-08 0-15	14-61		0-87 0-32 0-98	4-31 1-46 3-89	2-17	9-67
8-0	Gj	1 2 1R	3-15 4-00 3-15	125 200 150	1-44 1-46 1-63	3-6 3-6 4-1	0-13 0-22 0-15	14-61		0-87 0-87 0-98	4-31 4-01 3-89	2-72	12-21
10-0	Gj	1 2 3 1R	3-15 4-00 5-00 3-15	125 200 275 150	1-44 1-46 0-76 1-63	3-6 3-6 1-9 4-1	0-13 0-22 0-17 0-15	14-61		0-87 0-88 0-46 0-98	4-31 4-02 2-23 3-89	3-18	14-45
12-5	Gj	1 2 3 4 1R	3-15 4-00 5-00 6-30 3-15	125 200 275 390 150	1-44 1-46 1-03 0-57 1-63	3-6 3-6 2-6 1-4 4-1	0-13 0-22 0-23 0-21 0-15	14-61		0-87 0-88 0-62 0-34 0-98	4-31 4-02 3-02 1-83 3-89	3-68	17-07
15-0	Gj	1 2 3 4&5 1R	3-15 4-00 5-00 6-30 3-15	125 200 275 390 150	1-44 1-46 1-03 1-45 1-63	3-6 3-6 2-6 3-6 4-1	0-13 0-22 0-23 0-53 0-15	14-61		0-87 0-88 0-62 0-87 0-98	4-31 4-02 3-02 4-69 3-89	4-21	19-93
20-0 DV	Ka	1 2 3 4&5 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	125 200 275 390 150 200 275	1-00 1-46 1-03 1-91 1-57 1-46 0-54	2-5 3-6 2-6 4-8 3-9 3-6 1-4	0-09 0-22 0-23 0-69 0-14 0-22 0-12	8-20		0-60 0-88 0-62 1-14 0-94 0-88 0-32	2-99 4-02 3-02 6-15 3-75 4-02 1-59	5-39	25-54
25-0 DV	Ka	1 2 3 4-7 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	125 200 275 390 150 200 275	1-00 1-46 1-03 3-43 1-57 1-46 1-26	2-5 3-6 2-6 8-6 3-9 3-6 3-2	0-09 0-22 0-23 1-25 0-14 0-22 0-29	8-20		0-60 0-88 0-62 2-06 0-94 0-88 0-76	2-99 4-02 3-02 11-05 3-75 4-02 3-71	6-73	32-55

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
12.5	Gj	1	4.00	180	0.76	1.9	0.11	15.89		0.45	2.36	3.40	15.24
		2	4.00	220	1.59	4.0	0.24			0.95	3.93		
		3	5.00	275	1.03	2.6	0.23			0.62	3.02		
		4	6.30	390	0.57	1.4	0.21			0.34	1.83		
		1R	3.15	150	1.72	4.3	0.16			1.03	4.11		
15.0	Gj	1	4.00	180	0.76	1.9	0.11	15.89		0.45	2.36	3.93	18.10
		2	4.00	220	1.59	4.0	0.24			0.95	3.93		
		3	5.00	275	1.03	2.6	0.23			0.62	3.02		
		4&5	6.30	390	1.45	3.6	0.53			0.87	4.69		
		1R	3.15	150	1.72	4.3	0.16			1.03	4.11		
20.0 DV	Ka	1	4.00	180	0.48	1.2	0.07	16.66		0.29	1.51	4.59	21.80
		2	4.00	220	1.59	4.0	0.24			0.95	3.93		
		3	5.00	275	1.03	2.6	0.23			0.62	3.02		
		4&5	6.30	390	1.91	4.8	0.69			1.14	6.15		
		1R	4.00	220	1.34	3.3	0.20			0.80	3.29		
		2R	5.00	275	0.96	2.4	0.22			0.57	2.80		
		3R	6.30	390	0.34	0.8	0.12			0.20	1.09		
25.0 DV	Ka	1	4.00	180	0.48	1.2	0.07	16.66		0.29	1.51	5.77	28.14
		2	4.00	220	1.59	4.0	0.24			0.95	3.93		
		3	5.00	275	1.03	2.6	0.23			0.62	3.02		
		4-7	6.30	390	3.43	8.6	1.25			2.06	11.05		
		1R	4.00	220	1.34	3.3	0.20			0.80	3.29		
		2R	5.00	275	0.96	2.4	0.22			0.57	2.80		
		3R	6.30	390	0.79	2.0	0.29			0.47	2.54		

Butt weld
Flat position
Manual metal-arc
Electrode:

Type — rutile,
heavy covering 150%
Efficiency — 145 155%

Procedure: sealed
(4mm electrode root run)

63

3.0	Sd	1	3.15	150	1.73	4.3	0.16			1.04	4.13	1.04	4.13
4.0	Sd	1	3.15	150	2.41	6.0	0.22			1.45	5.75	1.45	5.75
5.0	Sd	1	3.15	150	2.04	5.1	0.19			1.22	4.85	1.65	6.81
		2	4.00	200	0.71	1.8	0.11			0.43	1.96		
6.0	Sd	1	3.15	150	2.04	5.1	0.19			1.22	4.85	1.97	8.30
		2	4.00	200	1.25	3.1	0.19			0.75	3.45		
8.0	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	2.70	11.66
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3	5.00	275	0.50	1.3	0.11			0.30	1.47		
10.0	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	3.17	13.94
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3	5.00	275	1.28	3.2	0.29			0.77	3.75		
12.5	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	3.81	17.09
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3&4	5.00	275	2.35	5.9	0.53			1.41	6.90		
15.0	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	4.23	19.35
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3&4	5.00	275	2.22	5.5	0.50			1.33	6.51		
		5	6.30	390	0.82	2.1	0.30			0.49	2.65		
20.0	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	5.24	24.82
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3&4	5.00	275	2.22	5.5	0.50			1.33	6.51		
		5&6	6.30	390	2.52	6.3	0.92			1.51	8.11		
25.0	Qe	1	3.15	150	2.23	5.6	0.20			1.34	5.32	6.43	31.21
		2	4.00	200	1.77	4.4	0.26			1.06	4.87		
		3&4	5.00	275	2.22	5.5	0.50			1.33	6.51		
		5-9	6.30	390	4.50	11.3	1.64			2.70	14.51		

Butt weld
Flat position
Manual metal-arc
Electrode:

Type — rutile,
heavy covering 150%
Efficiency — 145 155%

Procedure: backed

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Butt weld

65

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 150%

Efficiency — 145-155%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
<i>Preparation by air-arc gouging</i>													
3-0-15-0		1R	4-00	200	1-51	3-8	0-22	2-24		0-91	4-16		
20-0 DV		1R&2R 3R	4-00 5-00	200 275	3-21 0-54	8-0 1-4	0-48 0-12	2-24		1-33 0-32	8-84 1-59		
25-0 DV		1R&2R 3R	4-00 5-00	200 275	3-21 1-26	8-0 3-2	0-48 0-29	2-24		1-93 0-76	8-84 3-71		
<i>Preparation by chipping</i>													
3-0-15-0		1R	4-00	200	0-89	2-2	0-13	5-32		0-54	2-46		
20-0 DV		1R 2R 3R	4-00 5-00 6-30	200 275 390	1-91 0-59 0-82	4-8 1-5 2-1	0-28 0-13 0-30	8-69		1-14 0-36 0-49	5-25 1-75 2-65		
25-0 DV		1R 2R 3R&4R	4-00 5-00 6-30	200 275 390	1-91 0-59 1-52	4-8 1-5 3-8	0-28 0-13 0-55	8-69		1-14 0-36 0-91	5-25 1-75 4-91		

Butt weld

66

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 160%

Efficiency — 155-165%

Procedure: single-sided,
unbacked

3-0	Ce	1	3-15	120	0-93	2-3	0-09		0-27	0-56	1-73	0-56	1-73
4-0	Ce	1	3-15	120	1-39	3-5	0-13		0-41	0-83	2-60	0-83	2-60
5-0	Ce	1	3-15	120	1-95	4-9	0-19		0-57	1-17	3-65	1-17	3-65
6-0	Ce	1	3-15	120	2-62	6-5	0-25		0-57	1-57	4-89	1-57	4-89
8-0	Ce	1 2	3-15 4-00	120 220	2-32 1-03	5-8 2-6	0-22 0-16		0-57	1-39 0-62	4-33 1-90	2-01	6-23
10-0	Ce	1 2 3	3-15 4-00 5-00	120 220 290	2-32 1-24 0-63	5-8 3-1 1-6	0-22 0-19 0-15		0-57	1-39 0-74 0-38	4-33 2-28 1-39	2-51	8-00
12-5	Ce	1 2 3 4	3-15 4-00 5-00 6-30	120 220 290 450	2-32 1-24 1-06 0-45	5-8 3-1 2-7 1-1	0-22 0-19 0-25 0-17		0-57	1-39 0-74 0-64 0-27	4-33 2-28 2-34 1-08	3-04	10-03
15-0	Ce	1 2 3 4&5	3-15 4-00 5-00 6-30	120 220 290 450	2-32 1-24 1-06 1-33	5-8 3-1 2-7 3-3	0-22 0-19 0-25 0-51		0-57	1-39 0-74 0-64 0-80	4-33 2-28 2-34 3-14	3-56	12-09
20-0	Ce	1 2 3 4-6	3-15 4-00 5-00 6-30	120 220 290 450	2-32 1-24 1-06 3-51	5-8 3-1 2-7 8-8	0-22 0-19 0-25 1-35		0-57	1-39 0-74 0-64 2-10	4-33 2-28 2-34 8-31	4-87	17-26
25-0	Ce	1 2 3 4-8	3-15 4-00 5-00 6-30	120 220 290 450	2-32 1-24 1-06 6-27	5-8 3-1 2-7 15-7	0-22 0-19 0-25 2-41		0-57	1-39 0-74 0-64 3-76	4-33 2-28 2-34 14-87	6-53	23-83

Butt weld

Flat position

Manual metal-arc

Electrode:

Type -- rutile,
heavy covering 160%

Efficiency -- 155 165%

Procedure: sealed
(3 15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Gj	1 1R	3-15 3-15	125 150	0-76 1-57	1-9 3-9	0-07 0-15	14-61		0-46 0-94	1-38 2-45	1-40	3-83
4-0	Gj	1 1R	3-15 3-15	125 150	1-15 1-57	2-9 3-9	0-11 0-15	14-61		0-69 0-94	2-08 2-45	1-63	4-53
5-0	Gj	1 1R	3-15 3-15	125 150	1-63 1-57	4-1 3-9	0-16 0-15	14-61		0-98 0-94	2-96 2-45	1-92	5-40
6-0	Gj	1 1R	3-15 3-15	125 150	2-21 1-57	5-5 3-9	0-21 0-15	14-61		1-33 0-94	4-00 2-45	2-27	6-45
8-0	Gj	1 2 1R	3-15 4-00 3-15	125 220 150	2-38 0-78 1-57	5-9 1-9 3-9	0-23 0-12 0-15	14-61		1-43 0-47 0-94	4-30 1-43 2-45	2-84	8-18
10-0	Gj	1 2 3 1R	3-15 4-00 5-00 3-15	125 220 290 150	2-38 1-24 0-42 1-57	5-9 3-1 1-1 3-9	0-23 0-19 0-10 0-15	14-61		1-43 0-74 0-25 0-94	4-30 2-28 0-94 2-45	3-37	9-96
12-5	Gj	1 2 3 4 1R	3-15 4-00 5-00 6-30 3-15	125 220 290 450 150	2-38 1-24 1-06 0-30 1-57	5-9 3-1 2-7 0-7 3-9	0-23 0-19 0-25 0-11 0-15	14-61		1-43 0-74 0-64 0-18 0-94	4-30 2-28 2-34 0-71 2-45	3-93	12-08
15-0	Gj	1 2 3 4&5 1R	3-15 4-00 5-00 6-30 3-15	125 220 290 450 150	2-38 1-24 1-06 1-14 1-57	5-9 3-1 2-7 2-8 3-9	0-23 0-19 0-25 0-44 0-15	14-61		1-43 0-74 0-64 0-68 0-94	4-30 2-28 2-34 2-70 2-45	4-43	14-07
20-0 DV	Ka	1 2 3 4&5 1R 2R	3-15 4-00 5-00 6-30 3-15 4-00	125 220 290 450 150 220	1-95 1-24 1-06 1-57 2-51 1-57	4-9 3-1 2-7 3-9 6-3 3-9	0-19 0-19 0-25 0-60 0-24 0-24	8-20		1-17 0-74 0-64 0-94 1-50 0-94	3-53 2-28 2-34 3-72 3-91 2-89	5-94	18-67
25-0 DV	Ka	1 2 3 4-6 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	125 220 290 450 150 220 290	1-95 1-24 1-06 3-01 2-51 1-24 0-90	4-9 3-1 2-7 7-5 6-3 3-1 2-3	0-19 0-19 0-25 1-16 0-24 0-19 0-22	8-20		1-17 0-74 0-64 1-80 1-50 0-74 0-54	3-53 2-28 2-34 7-13 3-91 2-28 1-99	7-15	23-46

Butt weld

68

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 160%

Efficiency — 155 165%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
12.5	Gj	1	4.00	190	0.72	1.8	0.11	15.89		0.43	1.51	3.42	10.77
		2	4.00	220	1.97	4.9	0.31			1.18	3.63		
		3	5.00	290	1.06	2.7	0.25			0.64	2.34		
		4	6.30	450	0.30	0.7	0.11			0.18	0.71		
		1R	3.15	150	1.66	4.1	0.16			0.99	2.58		
15.0	Gj	1	4.00	190	0.72	1.8	0.11	15.89		0.43	1.51	3.93	12.76
		2	4.00	220	1.97	4.9	0.31			1.18	3.63		
		3	5.00	290	1.06	2.7	0.25			0.64	2.34		
		4&5	6.30	450	1.14	2.8	0.44			0.68	2.70		
		1R	3.15	150	1.66	4.1	0.16			0.99	2.58		
20.0 DV	Ka	1	4.00	190	0.46	1.2	0.07	16.66		0.28	0.96	4.78	16.37
		2	4.00	220	1.97	4.9	0.31			1.18	3.63		
		3	5.00	290	1.06	2.7	0.25			0.64	2.34		
		4-5	6.30	450	1.57	3.9	0.60			0.94	3.72		
		1R	4.00	220	1.88	4.7	0.29			1.13	3.46		
25.0 DV	Ka	2R	5.00	290	1.02	2.6	0.24	16.66		0.61	2.26	5.85	20.63
		1	4.00	190	0.46	1.2	0.07			0.28	0.96		
		2	4.00	220	1.97	4.9	0.31			1.18	3.63		
		3	5.00	290	1.06	2.7	0.25			0.64	2.34		
		4-6	6.30	450	3.01	7.5	1.16			1.80	7.13		

Butt weld

69

Flat position

Manual metal-arc

Electrode:

Type — rutile,
heavy covering 160%

Efficiency — 155-165%

Procedure: backed

3.0	Sd	1	3.15	150	1.66	4.2	0.16			1.00	2.65	1.00	2.65
4.0	Sd	1	3.15	150	2.32	5.8	0.22			1.39	3.69	1.39	3.69
5.0	Sd	1	3.15	150	1.95	4.9	0.19			1.17	3.11	1.58	4.39
		2	4.00	220	0.68	1.7	0.11			0.41	1.28		
6.0	Sd	1	3.15	150	1.95	4.9	0.19			1.17	3.11	1.89	5.36
		2	4.00	220	1.19	3.0	0.19			0.72	2.25		
8.0	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	2.73	7.96
		2	4.00	220	2.42	6.0	0.38			1.45	4.55		
10.0	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	3.23	9.73
		2&3	4.00	220	2.67	6.7	0.42			1.60	5.02		
		4	5.00	290	0.57	1.4	0.14			0.34	1.29		
12.5	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	3.84	12.03
		2&3	4.00	220	2.67	6.7	0.42			1.60	5.02		
		4	5.00	290	1.59	4.0	0.38			0.95	3.59		
15.0	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	4.42	14.26
		2&3	4.00	220	2.67	6.7	0.42			1.60	5.02		
		4&5	5.00	290	2.28	5.7	0.55			1.37	5.17		
		6	6.30	450	0.27	0.7	0.10			0.16	0.65		
20.0	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	5.38	18.16
		2&3	4.00	220	2.67	6.7	0.42			1.60	5.02		
		4&5	5.00	290	2.28	5.7	0.55			1.37	5.17		
		6&7	6.30	450	1.87	4.7	0.72			1.12	4.55		
25.0	Qe	1	3.15	150	2.14	5.4	0.20			1.29	3.42	6.51	22.72
		2&3	4.00	220	2.67	6.7	0.42			1.60	5.02		
		4&5	5.00	290	2.28	5.7	0.55			1.37	5.17		
		6-9	6.30	450	3.75	9.4	1.44			2.25	9.11		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Preparation by air-arc gouging													
3-0-15-0		1R	4-00	220	1-44	3-6	0-22	2-24		0-86	2-65		
20-0 DV		1R&2R	4-00	220	3-85	9-6	0-60	2-24		2-31	7-08		
25-0 DV		1R&2R 3R	4-00 5-00	220 290	3-52 0-90	8-8 2-3	0-55 0-22	2-24		2-11 0-54	6-47 1-99		
Preparation by chipping													
3-0-15-0		1R	4-00	220	0-85	2-1	0-13	5-32		0-51	1-56		
20-0 DV		1R 2R 3R	4-00 5-00 6-30	220 290 450	2-08 0-61 0-64	5-2 1-5 1-6	0-32 0-15 0-25	8-69		1-25 0-37 0-39	3-83 1-35 1-52		
25-0 DV		1R 2R 3R&4R	4-00 5-00 6-30	220 290 450	2-08 0-61 1-31	5-2 1-5 3-3	0-32 0-15 0-50	8-69		1-25 0-37 0-78	3-83 1-35 3-10		

Butt weld
Flat position
Manual metal-arc
Electrode:

Type — rutile,
heavy covering 160%
Efficiency — 155 165%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

70

3-0	Ce	1	3-15	110	1-41	3-5	0-09		0-72	1-76	5-35	1-76	5-35
4-0	Ce	1	3-15	110	2-11	5-3	0-13		1-08	2-63	8-02	2-63	8-02
5-0	Ce	1 2	3-15 4-00	110 175	2-01 0-50	5-0 1-2	0-13 0-05		1-03	2-51 0-62	7-63 1-68	3-13	9-31
6-0	Ce	1 2	3-15 4-00	110 175	2-01 1-09	5-0 2-7	0-13 0-11		1-03	2-51 1-36	7-63 3-67	3-87	11-30
8-0	Ce	1 2&3	3-15 4-00	110 175	2-01 2-53	5-0 6-3	0-13 0-26		1-03	2-51 3-16	7-63 8-56	5-67	16-19
10-0	Ce	1 2 3	3-15 4-00 5-00	110 175 215	2-01 2-14 1-41	5-0 5-4 3-5	0-13 0-22 0-22		1-03	2-51 2-68 1-76	7-63 7-24 5-80	6-94	20-68
12-5	Ce	1 2 3 4	3-15 4-00 5-00 6-30	110 175 215 330	2-01 2-14 1-48 0-11	5-0 5-4 3-7 0-3	0-13 0-22 0-23 0-27		1-03	2-51 2-68 1-85 0-13	7-63 7-24 6-12 4-31	7-17	25-30
15-0	Ce	1 2 3 4&5	3-15 4-00 5-00 6-30	110 175 215 330	2-01 2-14 1-48 0-24	5-0 5-4 3-7 0-6	0-13 0-22 0-23 0-60		1-03	2-51 2-68 1-85 0-30	7-63 7-24 6-12 9-72	7-34	30-71
20-0	Ce	1 2 3 4-7	3-15 4-00 5-00 6-30	110 175 215 330	2-01 2-14 1-48 0-58	5-0 5-4 3-7 1-4	0-13 0-22 0-23 1-44		1-03	2-51 2-68 1-85 0-72	7-63 7-24 6-12 23-28	7-76	44-27
25-0	Ce	1 2 3 4-11	3-15 4-00 5-00 6-30	110 175 215 330	2-01 2-14 1-48 1-01	5-0 5-4 3-7 2-5	0-13 0-22 0-23 2-50		1-03	2-51 2-68 1-85 1-26	7-63 7-24 6-12 40-48	8-30	61-47

Butt weld
Flat position
Manual metal-arc
Electrode:

Type basic,
hydrogen controlled
Efficiency — 103%

Procedure: single-sided,
unbacked

71

Butt weld

72

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: sealed
(3 15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Ec	1 1R	3-15 3-15	110 120	0-83 1-44	2-1 3-6	0-05 0-09	8-20		1-03 1-80	3-15 4-87	2-83	8-01
4-0	Gh	1 1R	3-15 3-15	110 120	1-01 1-44	2-5 3-6	0-06 0-09	8-20		1-27 1-80	3-86 4-87	3-07	8-72
5-0	Gj	1 1R	3-15 3-15	110 120	1-20 1-44	3-0 3-6	0-08 0-09	8-20		1-50 1-80	4-57 4-87	3-30	9-43
6-0	Gj	1 1R	3-15 3-15	110 120	1-39 1-44	3-5 3-6	0-09 0-09	8-20		1-73 1-80	5-28 4-87	3-53	10-14
8-0	Gj	1 2 1R	3-15 4-00 3-15	110 175 120	2-07 1-81 1-44	5-2 4-5 3-6	0-13 0-18 0-09	8-20		2-59 2-27 1-80	7-89 6-13 4-87	6-66	18-83
10-0	Gj	1 2 3 1R	3-15 4-00 5-00 3-15	110 175 215 120	2-10 2-14 1-10 1-44	5-2 5-4 2-7 3-6	0-13 0-22 0-17 0-09	8-20		2-62 2-68 1-37 1-80	7-99 7-24 4-52 4-87	8-47	24-62
12-5	Gj	1 2 3 4 1R	3-15 4-00 5-00 6-30 3-15	110 175 215 330 120	2-10 2-14 1-48 0-83 1-44	5-2 5-4 3-7 2-1 3-6	0-13 0-22 0-23 0-21 0-09	8-20		2-62 2-68 1-85 1-04 1-80	7-99 7-24 6-12 3-33 4-87	9-99	29-55
15-0	Gj	1 2 3 4&5 1R	3-15 4-00 5-00 6-30 3-15	110 175 215 330 120	2-10 2-14 1-48 2-13 1-44	5-2 5-4 3-7 5-3 3-6	0-13 0-22 0-23 0-53 0-09	8-20		2-62 2-68 1-85 2-66 1-80	7-99 7-24 6-12 8-56 4-87	11-61	34-78
20-0 DV	Ka	1 2 3 4&5 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	110 175 215 330 120 175 215	1-46 2-14 1-48 2-79 2-76 2-14 0-78	3-6 5-4 3-7 7-0 6-9 5-4 1-9	0-09 0-22 0-23 0-69 0-17 0-22 0-12	12-82		1-82 2-68 1-85 3-49 3-45 2-68 0-97	5-54 7-24 6-12 11-23 9-35 7-24 3-22	16-95	49-93
25-0 DV	Ka	1 2 3 4-7 1R 2R 3R	3-15 4-00 5-00 6-30 3-15 4-00 5-00	110 175 215 330 120 175 215	1-46 2-14 1-48 5-01 2-76 2-14 1-82	3-6 5-4 3-7 12-5 6-9 5-4 4-5	0-09 0-22 0-23 1-25 0-17 0-22 0-29	12-82		1-82 2-68 1-85 6-27 3-45 2-68 2-27	5-54 7-24 6-12 20-17 9-35 7-24 7-51	21-03	63-17
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	120	1-44	3-6	0-09	8-20		1-80	5-76		
20-0 DV		1R-4R	3-15	120	8-17	20-4	0-51	12-82		10-21	32-71		
25-0 DV		1R-4R 5R	3-15 4-00	120 150	7-35 2-13	18-4 5-3	0-46 0-22	12-82		9-18 2-66	29-42 9-72		

Butt weld

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: sealed
(5mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
5-0	Gh	1 1R	5-00 3-15	190 120	0-84 1-44	2-1 3-6	0-13 0-09	8-20		1-06 1-80	4-03 4-87	2-86	8-90
6-0	Gh	1 1R	5-00 3-15	190 120	1-17 1-44	2-9 3-6	0-18 0-09	8-20		1-46 1-80	5-58 4-87	3-26	10-45
8-0	Gh	1 1R	5-00 3-15	190 120	1-99 1-44	5-0 3-6	0-31 0-09	8-20		2-49 1-80	9-50 4-87	4-29	14-36
10-0	Gh	1 2 1R	5-00 5-00 3-15	190 215 120	2-20 0-84 1-44	5-5 2-1 3-6	0-35 0-13 0-09	8-20		2-75 1-05 1-80	10-51 3-46 4-87	5-60	13-83
12-5	Gh	1 2 3 1R	5-00 5-00 6-30 3-15	190 215 330 120	2-20 1-48 0-63 1-44	5-5 3-7 1-6 3-6	0-35 0-23 0-16 0-09	8-20		2-75 1-85 0-78 1-80	10-51 6-12 2-52 4-87	7-19	24-01
15-0	Gh	1 2 3&4 1R	5-00 5-00 6-30 3-15	190 215 330 120	2-20 1-48 1-89 1-44	5-5 3-7 4-7 3-6	0-35 0-23 0-47 0-09	8-20		2-75 1-85 2-36 1-80	10-51 6-12 7-59 4-87	8-76	29-08
20-0 DV	Kb	1 2 3&4 1R 2R 3R	5-00 5-00 6-30 3-15 4-00 5-00	190 215 330 120 175 190	2-07 1-48 2-35 3-04 0-44 1-46	5-2 3-7 5-9 7-6 1-1 3-6	0-33 0-23 0-58 0-19 0-04 0-23	12-82		2-58 1-85 2-93 3-80 0-54 1-82	9-86 6-12 9-44 10-29 1-47 6-96	13-54	44-16
25-0 DV	Kb	1 2 3-6 1R 2R 3R	5-00 5-00 6-30 3-15 4-00 5-00	190 215 330 120 175 190	2-01 1-48 4-74 2-90 0-44 2-67	5-0 3-7 11-9 7-3 1-1 6-6	0-32 0-23 1-18 0-18 0-04 0-42	12-82		2-51 1-85 5-93 3-63 0-54 3-33	9-60 6-12 19-09 9-82 1-47 11-72	17-81	57-81
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	120	1-44	3-6	0-09	8-20		1-80	5-76		
20-0 DV		1R	3-15	120	7-41	18-5	0-46	12-82		9-26	29-65		
25-0 DV		1R 2R&3R	3-15 4-00	120 150	7-63 1-37	19-1 3-4	0-48 0-14	12-82		9-53 1-71	30-54 6-25		

Butt weld

74

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: backed
(3 15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Sd	1 2	3.15 4.00	125 175	1.46 0.66	3.6 1.7	0.09 0.07			1.82 0.83	4.66 2.24	2.65	8.91
4.0	Sd	1 2	3.15 4.00	125 175	1.46 1.28	3.6 3.2	0.09 0.13			1.82 1.60	4.66 4.32	3.42	8.99
5.0	Sd	1 2	3.15 4.00	125 175	1.46 1.98	3.6 5.0	0.09 0.20			1.82 2.48	4.66 6.71	4.30	11.37
6.0	Sd	1 2&3	3.15 4.00	125 175	1.46 2.78	3.6 6.9	0.09 0.28			1.82 3.47	4.66 9.39	5.29	14.05
8.0	Qf	1&2 3&4	3.15 5.00	125 215	1.97 3.77	4.9 9.4	0.12 0.59			2.47 4.71	6.33 15.57	7.18	21.89
10.0	Qf	1&2 3&4 5	3.15 5.00 6.30	125 215 330	1.97 4.07 0.64	4.9 10.2 1.6	0.12 0.64 0.16			2.47 5.09 0.80	6.33 16.02 2.58	8.36	25.72
12.5	Qf	1&2 3&4 5	3.15 5.00 6.30	125 215 330	1.97 4.07 1.77	4.9 10.2 4.4	0.12 0.64 0.44			2.47 5.09 2.22	6.33 16.82 7.14	9.78	30.28
15.0	Qf	1&2 3&4 5&6	3.15 5.00 6.30	125 215 330	1.97 4.07 3.01	4.9 10.2 7.5	0.12 0.64 0.75			2.47 5.09 3.77	6.33 16.82 12.13	11.33	35.27
20.0	Qf	1&2 3&4 5-8	3.15 5.00 6.30	125 215 330	1.97 4.07 5.81	4.9 10.2 14.5	0.12 0.64 1.44			2.47 5.09 7.26	6.33 16.82 23.37	14.82	46.51
25.0	Qf	1&2 3&4 5-10	3.15 5.00 6.30	125 215 330	1.97 4.07 9.02	4.9 10.2 22.6	0.12 0.64 2.24			2.47 5.09 11.28	6.33 16.82 36.31	18.84	59.45

Butt weld

75

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Procedure: backed
(5mm electrode root run)

5.0	Qf	1	5.00	215	2.79	7.0	0.44			3.48	11.50	3.48	11.50
6.0	Qf	1&2	5.00	215	3.35	8.4	0.53			4.19	13.83	4.19	13.83
8.0	Qf	1&2	5.00	215	4.56	11.4	0.72			5.70	18.81	5.70	18.81
10.0	Qf	1&2 3	5.00 6.30	215 330	4.86 0.64	12.2 1.6	0.76 0.16			6.08 0.80	20.06 2.58	6.88	22.64
12.5	Qf	1&2 3	5.00 6.30	215 330	4.86 1.77	12.2 4.4	0.76 0.44			6.08 2.22	20.06 7.14	8.29	27.20
15.0	Qf	1&2 3&4	5.00 6.30	215 330	4.86 3.01	12.2 7.5	0.76 0.75			6.08 3.77	20.06 12.13	9.84	32.19
20.0	Qf	1&2 3-6	5.00 6.30	215 330	4.86 5.81	12.2 14.5	0.76 1.44			6.08 7.26	20.06 23.37	13.34	43.43
25.0	Qf	1&2 3-9	5.00 6.30	215 330	4.86 9.02	12.2 22.6	0.76 2.24			6.08 11.28	20.06 36.31	17.36	56.37

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	110	1-21	3-0	0-08		0-62	1-52	4-18	1-52	4-18
4-0	Cf	1	3-15	110	1-84	4-6	0-12		0-94	2-30	6-32	2-30	6-32
5-0	Cf	1	3-15	110	2-62	6-5	0-16		1-34	3-27	9-00	3-27	9-00
6-0	Cf	1 2	3-15 4-00	110 170	2-10 0-78	5-2 2-0	0-13 0-08		1-34	2-62 0-98	7-22 2-74	3-60	9-96
8-0	Dd	1 2&3	3-15 4-00	110 170	1-94 2-47	4-8 6-2	0-12 0-25		1-34	2-42 3-08	6-66 8-67	5-51	15-33
10-0	Dd	1 2-4	3-15 4-00	110 170	1-94 4-33	4-8 10-8	0-12 0-44		1-34	2-42 5-41	6-66 15-20	7-83	21-86
12-5	Dd	1 2-4 5-7	3-15 4-00 5-00	110 170 190	1-94 4-05 2-02	4-8 10-1 5-0	0-12 0-41 0-32		1-34	2-42 5-07 2-52	6-66 14-25 9-85	10-01	30-76
15-0	Dd	1 2-4 5-9	3-15 4-00 5-00	110 170 190	1-94 4-05 4-26	4-8 10-1 10-6	0-12 0-41 0-67		1-34	2-42 5-07 5-32	6-66 14-25 20-77	12-81	41-67
20-0	Dd	1 2-4 5-13	3-15 4-00 5-00	110 170 190	1-94 4-05 9-91	4-8 10-1 24-8	0-12 0-41 1-56		1-34	2-42 5-07 12-39	6-66 14-25 48-36	19-88	69-27
25-0	Dd	1 2-4 5-21	3-15 4-00 5-00	110 170 190	1-94 4-05 17-14	4-8 10-1 42-9	0-12 0-41 2-70		1-34	2-42 5-07 21-43	6-66 14-25 83-63	28-92	104-54

3-0	Gh	1 1R	3-15 3-15	110 110	0-92 1-39	2-3 3-5	0-06 0-09	8-71		1-15 1-73	3-18 4-77	2-89	7-95
4-0	Gh	1 1R	3-15 3-15	110 110	1-45 1-39	3-6 3-5	0-09 0-09	8-71		1-81 1-73	4-99 4-77	3-55	9-76
5-0	Gh	1 1R	3-15 3-15	110 110	2-12 1-39	5-3 3-5	0-13 0-09	8-71		2-65 1-73	7-29 4-77	4-38	12-06
6-0	Gh	1 2 1R	3-15 4-00 3-15	110 170 110	2-07 0-53 1-39	5-2 1-3 3-5	0-13 0-05 0-09	8-71		2-59 0-67 1-73	7-13 1-88 4-77	4-99	13-78
8-0	He	1 2&3 1R	3-15 4-00 3-15	110 170 110	1-91 2-15 1-39	4-8 5-4 3-5	0-12 0-22 0-09	8-71		2-38 2-68 1-73	6-55 7-54 4-77	6-80	18-86
10-0	He	1 2-4 1R	3-15 4-00 3-15	110 170 110	1-91 3-93 1-39	4-8 9-8 3-5	0-12 0-40 0-09	8-71		2-38 4-91 1-73	6-55 13-80 4-77	9-02	25-12
12-5	He	1 2-4 5&6 1R	3-15 4-00 5-00 3-15	110 170 190 110	1-91 4-05 1-70 1-39	4-8 10-1 4-3 3-5	0-12 0-41 0-27 0-09	8-71		2-38 5-07 2-13 1-73	6-55 14-25 8-30 4-77	11-31	33-87
15-0	He	1 2-4 5-8 1R	3-15 4-00 5-00 3-15	110 170 190 110	1-91 4-05 3-88 1-39	4-8 10-1 9-7 3-5	0-12 0-41 0-61 0-09	8-71		2-38 5-07 4-85 1-73	6-55 14-25 18-92 4-77	14-03	44-48
20-0 DV	Ka	1 2-4 5-9 1R 2R&3R	3-15 4-00 5-00 3-15 4-00	110 170 190 110 170	1-46 4-45 4-41 2-71 3-36	3-6 11-1 11-0 6-8 8-4	0-09 0-45 0-69 0-17 0-34	12-30		1-82 5-57 5-52 3-39 4-20	5-01 15-64 21-53 9-32 11-79	20-49	63-30
25-0 DV	Ka	1 2-4 5-12 1R 2R-4R	3-15 4-00 5-00 3-15 4-00	110 170 190 110 170	1-46 4-45 7-93 2-71 4-98	3-6 11-1 19-8 6-8 12-4	0-09 0-45 1-25 0-17 0-50	12-30		1-82 5-57 9-91 3-39 6-22	5-01 15-64 38-67 9-32 17-49	26-90	86-13

Butt weld

H V position

Manual metal-arc

Electrode:

Type – basic,
hydrogen controlled

Efficiency 103%

Procedure: single-sided,
unbacked

76

Butt weld

H/V position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency 103%

Procedure: sealed
(3 15mm electrode root run)

77

Butt weld

78

H/V position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
6-0	Gh	1 1R	4-00 3-15	170 110	1-82 1-39	4-6 3-5	0-18 0-09	8-71		2-28 1-73	6-40 4-77	4-01	11-17
8-0	He	1&2 1R	4-00 3-15	170 110	3-33 1-39	8-3 3-5	0-34 0-09	8-71		4-16 1-73	11-70 4-77	5-90	16-47
10-0	He	1-3 1R	4-00 3-15	170 110	5-11 1-39	12-8 3-5	0-52 0-09	8-71		6-39 1-73	17-96 4-77	8-12	22-73
12-5	He	1-4 5&6 1R	4-00 5-00 3-15	170 190 110	5-24 1-70 1-39	13-1 4-3 3-5	0-53 0-27 0-09	8-71		6-55 2-13 1-73	18-40 8-30 4-77	10-41	31-47
15-0	He	1-4 5-9 1R	4-00 5-00 3-15	170 190 110	5-24 3-88 1-39	13-1 9-7 3-5	0-53 0-61 0-09	8-71		6-55 4-85 1-73	18-40 18-92 4-77	13-13	42-09
20-0 DV	Ka	1-4 5-9 1R 2R&3R	4-00 5-00 3-15 4-00	170 190 110 170	5-36 4-41 2-71 3-36	13-4 11-0 6-8 8-4	0-54 0-69 0-17 0-34	12-30		6-70 5-52 3-39 4-20	18-82 21-53 9-32 11-79	19-80	61-47
25-0 DV	Ka	1-4 5-12 1R 2R-4R	4-00 5-00 3-15 4-00	170 190 110 170	5-36 7-93 2-71 4-98	13-4 19-8 6-3 12-4	0-54 1-25 0-17 0-50	12-30		6-70 9-91 3-39 6-22	18-82 38-67 9-32 17-49	26-21	84-30

Butt weld

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H/V position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: backed

3-0	Sd	1 2	3-15 4-00	110 170	1-46 0-66	3-6 1-7	0-09 0-07			1-82 0-83	5-01 2-33	2-65	7-34
4-0	Sd	1 2	3-15 4-00	110 170	1-46 1-28	3-6 3-2	0-09 0-13			1-82 1-60	5-01 4-49	3-42	9-50
5-0	Sd	1 2	3-15 4-00	110 170	1-46 1-98	3-6 5-0	0-09 0-20			1-82 2-48	5-01 6-97	4-30	11-98
6-0	Sd	1 2&3	3-15 4-00	110 170	1-46 2-78	3-6 6-9	0-09 0-28			1-82 3-47	5-01 9-76	5-29	14-76
8-0	Te	1 2-4 5	3-15 4-00 5-00	110 170 190	1-33 4-05 0-64	3-3 10-1 1-6	0-08 0-41 0-10			1-66 5-07 0-80	4-56 14-25 3-12	7-52	21-92
10-0	Te	1 2-4 5&6	3-15 4-00 5-00	110 170 190	1-33 4-05 2-17	3-3 10-1 5-4	0-08 0-41 0-34			1-66 5-07 2-71	4-56 14-25 10-58	9-44	29-39
12-5	Te	1 2-4 5-9	3-15 4-00 5-00	110 170 190	1-33 4-05 4-44	3-3 10-1 11-1	0-08 0-41 0-70			1-66 5-07 5-54	4-56 14-25 21-64	12-27	40-45
15-0	Te	1 2-4 5-12	3-15 4-00 5-00	110 170 190	1-33 4-05 7-10	3-3 10-1 17-7	0-08 0-41 1-12			1-66 5-07 8-87	4-56 14-25 34-62	15-60	53-42
20-0	Te	1 2-4 5-16	3-15 4-00 5-00	110 170 190	1-33 4-05 13-60	3-3 10-1 34-0	0-08 0-41 2-14			1-66 5-07 16-99	4-56 14-25 66-33	23-72	85-14
25-0	Te	1 2-4 5-26	3-15 4-00 5-00	110 170 190	1-33 4-05 21-67	3-3 10-1 54-2	0-08 0-41 3-41			1-66 5-07 27-09	4-56 14-25 105-72	33-81	124-52

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	110	1-21	3-0	0-08		0-62	1-52	3-70	1-52	3-70
4-0	Cf	1	3-15	110	1-84	4-6	0-12		0-94	2-30	5-59	2-30	5-59
5-0	Cf	1	3-15	110	2-62	6-5	0-16		1-34	3-27	7-96	3-27	7-96
6-0	Cf	1	3-15	110	3-55	8-9	0-22		1-82	4-44	10-80	4-44	10-80
8-0	Cf	1&2	3-15	110	5-88	14-7	0-37		1-82	7-35	17-89	7-35	17-89
10-0	Cf	1&2	3-15	110	8-83	22-1	0-55		1-82	11-03	26-87	11-03	26-87
12-5	Cf	1&2 3	3-15 4-00	110 140	9-27 2-04	23-2 5-1	0-58 0-21		1-82	11-59 2-55	28-21 7-60	14-14	35-81
15-0	Cf	1&2 3&4	3-15 4-00	110 140	9-27 5-24	23-2 13-1	0-58 0-53		1-82	11-59 6-55	28-21 19-53	18-14	47-75
20-0	Cf	1&2 3&4 5	3-15 4-00 5-00	110 140 170	9-27 10-55 1-78	23-2 26-4 4-4	0-58 1-06 0-28		1-82	11-59 13-18 2-22	28-21 39-30 8-33	26-99	75-85
25-0	Cf	1&2 3&4 5&6	3-15 4-00 5-00	110 140 170	9-27 10-55 8-40	23-2 26-4 21-0	0-58 1-06 1-32		1-82	11-59 13-18 10-49	28-21 39-30 39-33	35-26	106-84

Butt weld

80

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: single-sided,
unbacked

3-0	Ec	1 1R	3-15 3-15	110 110	0-83 1-83	2-1 4-6	0-05 0-11	6-92		1-03 2-29	2-52 5-57	3-32	8-09
4-0	Gh	1 1R	3-15 3-15	110 110	1-45 1-83	3-6 4-6	0-09 0-11	6-92		1-81 2-29	4-41 5-57	4-10	9-99
5-0	Gh	1 1R	3-15 3-15	110 110	2-12 1-83	5-3 4-6	0-13 0-11	6-92		2-65 2-29	6-45 5-57	4-94	12-03
6-0	Gh	1 1R	3-15 3-15	110 110	2-93 1-83	7-3 4-6	0-18 0-11	6-92		3-67 2-29	8-93 5-57	5-96	14-50
8-0	Gh	1&2 1R	3-15 3-15	110 110	4-99 1-83	12-5 4-6	0-31 0-11	6-92		6-24 2-29	15-19 5-57	8-53	20-77
10-0	Gh	1&2 1R	3-15 3-15	110 110	7-63 1-83	19-1 4-6	0-48 0-11	6-92		9-53 2-29	23-21 5-57	11-82	28-78
12-5	Gh	1&2 3 1R	3-15 4-00 3-15	110 140 110	9-24 1-54 1-83	23-1 3-9 4-6	0-58 0-16 0-11	6-92		11-55 1-93 2-29	28-13 5-75 5-57	15-77	39-45
15-0	Gh	1&2 3&4 1R	3-15 4-00 3-15	110 140 110	9-24 4-65 1-83	23-1 11-6 4-6	0-58 0-47 0-11	6-92		11-55 5-81 2-29	28-13 17-32 5-57	19-65	51-02
20-0 DV	Ka	1&2 3&4 1R	3-15 4-00 3-15	110 140 110	8-63 6-87 8-25	21-6 17-2 20-6	0-54 0-69 0-52	13-58		10-78 8-59 10-31	26-25 25-62 25-10	29-69	76-97
25-0 DV	Ka	1&2 3-5 6 1R	3-15 4-00 5-00 3-15	110 140 170 110	8-63 10-55 1-16 10-86	21-6 26-4 2-9 27-1	0-54 1-06 0-18 0-68	13-58		10-78 13-18 1-45 13-57	26-25 39-30 5-42 33-04	38-98	104-01

Butt weld

81

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: sealed
(3 15mm electrode root run)

Butt weld

82

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
12.5	Gh	1&2 1R	4.00 3.15	140 110	7.28 2.30	18.2 5.8	0.74 0.14	11.53		9.10 2.88	27.14 7.01	11.98	34.15
15.0	Gh	1-3 1R	4.00 3.15	140 110	10.39 2.30	26.0 5.8	1.05 0.14	11.53		12.98 2.88	38.71 7.01	15.86	45.72
20.0 DV	Ka	1-3 1R	4.00 3.15	140 110	12.23 9.16	30.6 22.9	1.23 0.57	22.56		15.29 11.45	45.58 27.89	26.74	73.47
25.0 DV	Ka	1-4 5 1R&2R	4.00 5.00 3.15	140 170 110	15.90 1.16 11.77	39.8 2.9 29.4	1.61 0.18 0.74	22.56		19.88 1.45 14.72	59.27 5.42 35.83	36.04	100.51

Butt weld

83

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: backed

3.0	Sd	1	3.15	110	2.53	6.3	0.16			3.16	7.68	3.16	7.68
4.0	Sd	1	3.15	110	3.52	8.8	0.22			4.39	10.70	4.39	10.70
5.0	Sd	1	3.15	110	4.65	11.6	0.29			5.81	14.15	5.81	14.15
6.0	Sd	1&2	3.15	110	5.93	14.8	0.37			7.41	18.04	7.41	18.04
8.0	Sd	1&2	3.15	110	8.92	22.3	0.56			11.15	27.14	11.15	27.14
10.0	Sd	1&2 3	3.15 4.00	110 140	8.63 2.39	21.6 6.0	0.54 0.24			10.78 2.99	26.25 8.92	13.77	35.17
12.5	Sd	1&2 3	3.15 4.00	110 140	8.63 5.66	21.6 14.2	0.54 0.57			10.78 7.08	26.25 21.10	17.86	47.35
15.0	Sd	1&2 3&4	3.15 4.00	110 140	8.63 9.49	21.6 23.7	0.54 0.96			10.78 11.86	26.25 35.36	22.64	61.61
20.0	Sd	1&2 3&4 5	3.15 4.00 5.00	110 140 170	8.63 10.55 5.31	21.6 26.4 13.9	0.54 1.06 0.83			10.78 13.18 6.63	26.25 39.30 24.86	30.60	90.41
25.0	Sd	1&2 3&4 5&6	3.15 4.00 5.00	110 140 170	8.63 10.55 12.73	21.6 26.4 31.8	0.54 1.06 2.00			10.78 13.18 15.91	26.25 39.30 59.61	39.87	125.16

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	120	1-21	3-0	0-08		0-62	1-52	4-86	1-52	4-86
4-0	Cf	1	3-15	120	1-84	4-6	0-12		0-62	2-30	7-36	2-30	7-36
5-0	Cf	1&2	3-15	120	2-62	6-5	0-16		0-62	3-27	10-48	3-27	10-48
6-0	Cf	1&2	3-15	120	3-55	8-9	0-22		0-62	4-44	14-22	4-44	14-22
8-0	Cf	1&2	3-15	120	5-88	14-7	0-37		0-62	7-35	23-55	7-35	23-55
10-0	Cf	1&2 3	3-15 4-00	120 150	6-68 1-00	16-7 2-5	0-42 0-10		0-62	8-35 1-25	26-76 4-58	9-61	31-33
12-5	Cf	1&2 3&4	3-15 4-00	120 150	6-68 3-65	16-7 9-1	0-42 0-37		0-62	8-35 4-56	26-76 16-63	12-91	43-38
15-0	Cf	1&2 3&4 5-7	3-15 4-00 5-00	120 150 170	6-68 4-52 1-49	16-7 11-3 3-7	0-42 0-46 0-24		0-62	8-35 5-65 1-87	26-76 20-60 8-88	15-87	56-24
20-0	Cf	1&2 3&4 5-11	3-15 4-00 5-00	120 150 170	6-68 4-52 6-68	16-7 11-3 16-7	0-42 0-46 1-05		0-62	8-35 5-65 8-35	26-76 20-60 39-68	22-35	87-05
25-0	Cf	1&2 3&4 5-18	3-15 4-00 5-00	120 150 170	6-68 4-52 13-30	16-7 11-3 33-2	0-42 0-46 2-09		0-62	8-35 5-65 16-62	26-76 20-60 79-00	30-62	126-36

Butt weld

84

Overhead position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: single-sided,
unbacked

3-0	Sd	1&2	3-15	120	2-53	6-3	0-16			3-16	10-11	3-16	10-11
4-0	Sd	1&2	3-15	120	3-52	8-8	0-22			4-39	14-08	4-39	14-08
5-0	Sd	1-3	3-15	120	4-65	11-6	0-29			5-81	18-62	5-81	18-62
6-0	Sd	1-4	3-15	120	5-93	14-8	0-37			7-41	23-74	7-41	23-74
8-0	Qf	1-3 4	3-15 4-00	120 150	6-62 2-99	16-6 7-5	0-42 0-30			8-28 3-74	26-51 13-63	12-01	40-15
10-0	Qf	1-3 4&5	3-15 4-00	120 150	6-62 5-04	16-6 12-6	0-42 0-51			8-28 6-30	26-51 22-97	14-57	49-49
12-5	Qf	1-3 4-6	3-15 4-00	120 150	6-62 7-83	16-6 19-6	0-42 0-79			8-28 9-79	26-51 35-71	18-07	62-22
15-0	Qf	1-3 4-7 8&9	3-15 4-00 5-00	120 150 170	6-62 9-74 0-74	16-6 24-3 1-8	0-42 0-98 0-12			8-28 12-17 0-92	26-51 44-40 4-33	21-37	75-29
20-0	Qf	1-3 4-7 8-11	3-15 4-00 5-00	120 150 170	6-62 9-74 5-15	16-6 24-3 12-9	0-42 0-98 0-81			8-28 12-17 6-44	26-51 44-40 30-63	26-89	101-54
25-0	Qf	1-3 4-7 8-19	3-15 4-00 5-00	120 150 170	6-62 9-74 10-24	16-6 24-3 25-6	0-42 0-98 1-61			8-28 12-17 12-80	26-51 44-40 60-82	33-24	131-74

Butt weld

85

Overhead position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure: backed

Butt weld

86

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— sealing run
preparation by air-arc
gouging

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Flat													
3-0-15-0		1R	4-00	175	2-22	5-6	0-22	2-24		2-78	7-51		
20-0 DV		1R&2R 3R	4-00 5-00	175 215	4-72 0-78	11-8 1-9	0-48 0-12	2-24		5-89 0-97	15-94 3-22		
25-0 DV		1R&2R 3R	4-00 5-00	175 215	4-72 1-82	11-8 4-5	0-48 0-29	2-24		5-89 2-27	15-94 7-51		
Horizontal/vertical													
3-0-15-0		1R	4-00	170	2-22	5-6	0-22	2-24		2-78	7-80		
20-0 DV		1R-3R	4-00	170	5-93	14-8	0-60	2-24		7-41	20-83		
25-0 DV		1R-4R	4-00	170	7-55	18-9	0-76	2-24		9-44	26-53		
Vertical													
3-0-15-0		1R	3-15	110	3-58	8-9	0-22	2-24		4-47	10-89		
20-0 DV		1R&2R	3-15	110	9-55	23-9	0-60	2-24		11-94	29-06		
25-0 DV		1R-3R	3-15	110	12-16	30-4	0-76	2-24		15-20	37-00		
Overhead													
3-0-15-0		1R	4-00	150	2-22	5-6	0-22	2-24		2-78	10-13		
20-0 DV		1R&2R	4-00	150	5-93	14-8	0-60	2-24		7-41	27-03		
25-0 DV		1R-3R	4-00	150	7-55	18-9	0-76	2-24		9-44	34-42		

Butt weld

87

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 103%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— sealing run
preparation by chipping

Flat													
3-0-15-0		1R	4-00	175	1-31	3-3	0-13	5-32		1-64	4-43		
20-0 DV		1R&2R 3R 4R	4-00 5-00 6-30	175 215 330	2-80 0-86 1-20	7-0 2-1 3-0	0-28 0-13 0-30	8-69		3-50 1-07 1-51	9-46 3-53 4-85		
25-0 DV		1R&2R 3R 4R&5R	4-00 5-00 6-30	175 215 330	2-80 0-86 2-23	7-0 2-1 5-6	0-28 0-13 0-55	8-69		3-50 1-07 2-79	9-46 3-53 8-97		
Horizontal/vertical													
3-0-15-0		1R	4-00	170	1-31	3-3	0-13	5-32		1-64	4-61		
20-0 DV		1R&2R 3R&4R	4-00 5-00	170 190	4-13 1-90	10-3 4-8	0-42 0-30	8-69		5-17 2-38	14-52 9-29		
25-0 DV		1R&2R 3R-7R	4-00 5-00	170 190	4-13 3-52	10-3 8-8	0-42 0-55	8-69		5-17 4-41	14-52 17-19		
Vertical													
3-0-15-0		1R	3-15	110	2-11	5-3	0-13	5-32		2-64	6-42		
20-0 DV		1R&2R 3R	3-15 4-00	110 140	6-65 2-97	16-6 7-4	0-42 0-30	8-69		8-32 3-71	20-25 11-06		
25-0 DV		1R&2R 3R&4R	3-15 4-00	110 140	6-65 5-49	16-6 13-7	0-42 0-55	8-69		8-32 6-86	20-25 20-46		
Overhead													
3-0-15-0		1R	4-00	150	1-31	3-3	0-13	5-32		1-64	5-98		
20-0 DV		1R 2R-4R	4-00 5-00	150 170	5-81 0-82	14-5 2-1	0-59 0-13	8-69		7-27 1-03	26-51 4-90		
25-0 DV		1R 2R-6R	4-00 5-00	150 170	5-81 2-44	14-5 6-1	0-59 0-38	8-69		7-27 3-06	26-51 14-53		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	140	1.26	3.1	0.08		0.61	0.31	3.12	0.31	3.12
4-0	Cf	1	3-15	140	1.90	4.8	0.12		0.93	0.48	4.72	0.48	4.72
5-0	Cf	1	3-15	140	2.71	6.8	0.16		1.32	0.68	6.72	0.68	6.72
6-0	Cf	1 2	3-15 4-00	140 170	2.17 0.82	5.4 2.0	0.13 0.08		1.06	0.54 0.20	5.39 2.60	0.75	7.99
8-0	Cf	1 2	3-15 4-00	140 170	2.17 2.24	5.4 5.6	0.13 0.22		1.06	0.54 0.56	5.39 7.11	1.10	12.50
10-0	Cf	1 2&3	3-15 4-00	140 170	2.17 4.03	5.4 10.1	0.13 0.39		1.06	0.54 1.01	5.39 12.81	1.55	18.20
12.5	Cf	1 2-6	3-15 4-00	140 170	2.17 6.80	5.4 17.0	0.13 0.66		1.06	0.54 1.70	5.39 21.61	2.24	27.00
15-0	Cf	1 2-9	3-15 4-00	140 170	2.17 10.16	5.4 25.4	0.13 0.98		1.06	0.54 2.54	5.39 32.27	3.08	37.66
20-0	Cf	1 2-12	3-15 4-00	140 170	2.17 18.62	5.4 46.6	0.13 1.79		1.06	0.54 4.66	5.39 59.15	5.20	64.54
25-0	Cf	1 2-20	3-15 4-00	140 170	2.17 29.42	5.4 73.6	0.13 2.83		1.06	0.54 7.36	5.39 93.46	7.90	98.85

Butt weld

88

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure: single-sided,
unbacked

3-0	Gj	1 1R	3-15 3-15	140 140	1.20 1.96	3.0 4.9	0.07 0.12	9.74		0.30 0.49	2.98 4.86	0.79	7.84
4-0	Gj	1 1R	3-15 3-15	140 140	1.81 1.96	4.5 4.9	0.11 0.12	9.74		0.45 0.49	4.49 4.86	0.94	9.35
5-0	Gj	1 1R	3-15 3-15	140 140	2.57 1.96	6.4 4.9	0.16 0.12	9.74		0.64 0.49	6.37 4.86	1.13	11.23
6-0	Gj	1 2 1R	3-15 4-00 3-15	140 170 140	2.17 0.82 1.96	5.4 2.0 4.9	0.13 0.08 0.12	9.74		0.54 0.20 0.49	5.39 2.60 4.86	1.24	12.85
8-0	Gj	1 2 1R	3-15 4-00 3-15	140 170 140	2.17 2.24 1.96	5.4 5.6 4.9	0.13 0.22 0.12	9.74		0.54 0.56 0.49	5.39 7.11 4.86	1.59	17.36
10-0	Gj	1 2&3 1R	3-15 4-00 3-15	140 170 140	2.17 4.03 1.96	5.4 10.1 4.9	0.13 0.39 0.12	9.74		0.54 1.01 0.49	5.39 12.81 4.86	2.04	23.06
12.5	Gj	1 2-6 1R	3-15 4-00 3-15	140 170 140	2.17 6.80 1.96	5.4 17.0 4.9	0.13 0.66 0.12	9.74		0.54 1.70 0.49	5.39 21.61 4.86	2.73	31.86
15-0	Gj	1 2-9 1R	3-15 4-00 3-15	140 170 140	2.17 10.16 1.96	5.4 25.4 4.9	0.13 0.98 0.12	9.74		0.54 2.54 0.49	5.39 32.27 4.86	3.57	42.52
20-0 DV	Ka	1 2-10 1R 2R&3R	3-15 4-00 3-15 4-00	140 170 140 170	1.51 11.87 2.13 3.52	3.8 29.7 5.3 8.8	0.09 1.14 0.13 0.34	5.90		0.38 2.97 0.53 0.88	3.74 37.70 5.28 11.17	4.75	57.89
25-0 DV	Ka	1 2-13 1R 2R-4R	3-15 4-00 3-15 4-00	140 170 140 170	1.51 17.61 2.13 5.22	3.8 44.0 5.3 13.0	0.09 1.70 0.13 0.50	5.90		0.38 4.40 0.53 1.30	3.74 55.92 5.28 16.57	6.62	81.51

Butt weld

89

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure: sealed
(3.15mm electrode root run)

Butt weld

90

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Gj	1 1R	4-00 4-00	170 170	0-75 1-23	1-9 3-1	0-07 0-12	9-74		0-19 0-31	2-40 3-91	0-50	6-31
4-0	Gj	1 1R	4-00 4-00	170 170	1-14 1-23	2-8 3-1	0-11 0-12	9-74		0-28 0-31	3-61 3-91	0-59	7-53
5-0	Gj	1 1R	4-00 4-00	170 170	1-61 1-23	4-0 3-1	0-16 0-12	9-74		0-40 0-31	5-13 3-91	0-71	9-04
6-0	Gj	1 1R	4-00 4-00	170 170	2-18 1-23	5-5 3-1	0-21 0-12	9-74		0-55 0-31	6-94 3-91	0-85	10-85
8-0	Gj	1&2 1R	4-00 4-00	170 170	3-61 1-23	9-0 3-1	0-35 0-12	9-74		0-90 0-31	11-45 3-91	1-21	15-36
10-0	Gj	1-3 1R	4-00 4-00	170 170	5-40 1-23	13-5 3-1	0-52 0-12	9-74		1-35 0-31	17-15 3-91	1-65	21-06
12-5	Gj	1-6 1R	4-00 4-00	170 170	8-17 1-23	20-4 3-1	0-79 0-12	9-74		2-04 0-31	25-95 3-91	2-35	29-86
15-0	Gj	1-9 1R	4-00 4-00	170 170	11-52 1-23	28-8 3-1	1-11 0-12	9-74		2-88 0-31	36-61 3-91	3-19	40-52
20-0 DV	Ka	1-10 1R&2R	4-00 4-00	170 170	12-82 4-86	32-0 12-1	1-23 0-47	5-90		3-20 1-21	40-71 15-43	4-41	56-14
25-0 DV	Ka	1-13 1R-4R	4-00 4-00	170 170	18-55 6-55	46-4 16-4	1-79 0-63	5-90		4-64 1-64	58-93 20-82	6-28	79-75

Butt weld

91

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure: backed
(3 15mm electrode root run)

3-0	Sd	1 2	3-15 4-00	140 170	1-51 0-70	3-8 1-7	0-09 0-07			0-38 0-17	3-74 2-21	0-55	5-95
4-0	Sd	1 2	3-15 4-00	140 170	1-51 1-34	3-8 3-4	0-09 0-13			0-38 0-34	3-74 4-26	0-71	8-00
5-0	Sd	1 2	3-15 4-00	140 170	1-51 2-08	3-8 5-2	0-09 0-20			0-38 0-52	3-74 6-60	0-90	10-34
6-0	Sd	1 2&3	3-15 4-00	140 170	1-51 2-91	3-8 7-3	0-09 0-28			0-38 0-73	3-74 9-25	1-10	12-98
8-0	Sd	1 2-4	3-15 4-00	140 170	1-51 4-86	3-8 12-1	0-09 0-47			0-38 1-21	3-74 15-42	1-59	19-16
10-0	Sd	1 2-5	3-15 4-00	140 170	1-51 7-17	3-8 17-9	0-09 0-69			0-38 1-79	3-74 22-79	2-17	26-52
12-5	Sd	1 2-9	3-15 4-00	140 170	1-51 10-60	3-8 26-5	0-09 1-02			0-38 2-65	3-74 33-67	3-03	37-40
15-0	Sd	1 2-13	3-15 4-00	140 170	1-51 14-61	3-8 36-5	0-09 1-41			0-38 3-65	3-74 46-40	4-03	50-14
20-0	Sd	1 2-16	3-15 4-00	140 170	1-51 24-38	3-8 61-0	0-09 2-35			0-38 6-10	3-74 77-44	6-47	81-18
25-0	Sd	1 2-25	3-15 4-00	140 170	1-51 36-49	3-8 91-2	0-09 3-52			0-38 9-12	3-74 115-91	9-50	119-65

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Sd	1	4-00	170	1-64	4-1	0-16			0-41	5-22	0-41	5-22
4-0	Sd	1	4-00	170	2-29	5-7	0-22			0-57	7-27	0-57	7-27
5-0	Sd	1&2	4-00	170	3-03	7-6	0-29			0-76	9-61	0-76	9-61
6-0	Sd	1-3	4-00	170	3-86	9-6	0-37			0-96	12-26	0-96	12-26
8-0	Sd	1-4	4-00	170	5-80	14-5	0-56			1-45	18-43	1-45	18-43
10-0	Sd	1-5	4-00	170	8-12	20-3	0-78			2-03	25-80	2-03	25-80
12-5	Sd	1-8	4-00	170	11-55	28-9	1-11			2-89	36-67	2-89	36-67
15-0	Sd	1-12	4-00	170	15-56	38-9	1-50			3-89	49-41	3-89	49-41
20-0	Sd	1-16	4-00	170	25-33	63-3	2-44			6-33	80-45	6-33	80-45
25-0	Sd	1-25	4-00	170	37-44	93-6	3-61			9-36	118-92	9-36	118-92

Preparation by air-arc gouging

3-0-15-0		1R	4-00	170	2-33	5-8	0-22	2-24		0-58	7-39		
20-0 DV		1R-3R	4-00	170	6-21	15-5	0-60	2-24		1-55	19-74		
25-0 DV		1R&4R	4-00	170	7-91	19-8	0-76	2-24		1-98	25-13		

Preparation by chipping

3-0-15-0		1R	4-00	170	1-37	3-4	0-13	5-32		0-34	4-36		
20-0 DV		1R-5R	4-00	170	7-44	18-6	0-72	8-69		1-86	23-63		
25-0 DV		1R-7R	4-00	170	10-08	25-2	0-97	8-69		2-52	32-03		

Butt weld

92

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure: backed
(4mm electrode root run)

Butt weld

93

Vertical down position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled

Efficiency — 95%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

Butt weld

94

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Ce	1	3.15	100	1.29	3.2	0.09		0.57	1.29	5.32	1.25	5.32
4.0	Ce	1	3.15	100	1.93	4.8	0.13		0.57	1.93	7.98	1.93	7.98
5.0	Ce	1 2	3.15 4.00	100 190	1.84 0.45	4.6 1.1	0.13 0.05		0.57	1.84 0.45	7.60 1.28	2.29	8.87
6.0	Ce	1 2	3.15 4.00	100 190	1.84 0.98	4.6 2.5	0.13 0.11		0.57	1.84 0.98	7.60 2.79	2.82	10.38
8.0	Ce	1 2	3.15 4.00	100 190	1.84 2.29	4.6 5.7	0.13 0.26		0.57	1.84 2.29	7.60 6.50	4.13	14.09
10.0	Ce	1 2 3	3.15 4.00 5.00	100 190 250	1.84 1.94 1.28	4.6 4.9 3.2	0.13 0.22 0.22		0.57	1.84 1.94 1.28	7.60 5.50 4.06	5.06	17.15
12.5	Ce	1 2 3 4	3.15 4.00 5.00 6.30	100 190 250 350	1.84 1.94 1.35 0.95	4.6 4.9 3.4 2.4	0.13 0.22 0.23 0.27		0.57	1.84 1.94 1.35 0.95	7.60 5.50 4.28 3.33	6.08	20.71
15.0	Ce	1 2 3 4-6	3.15 4.00 5.00 6.30	100 190 250 350	1.84 1.94 1.35 2.14	4.6 4.9 3.4 5.3	0.13 0.22 0.23 0.60		0.57	1.84 1.94 1.35 2.14	7.60 5.50 4.28 7.52	7.27	24.90
20.0	Ce	1 2 3 4-8	3.15 4.00 5.00 6.30	100 190 250 350	1.84 1.94 1.35 5.11	4.6 4.9 3.4 12.8	0.13 0.22 0.23 1.44		0.57	1.84 1.94 1.35 5.11	7.60 5.50 4.28 18.02	10.25	35.40
25.0	Ce	1 2 3 4-12	3.15 4.00 5.00 6.30	100 190 250 350	1.84 1.94 1.35 8.89	4.6 4.9 3.4 22.2	0.13 0.22 0.23 2.50		0.57	1.84 1.94 1.35 8.89	7.60 5.50 4.28 31.35	14.03	48.72

Butt weld

95

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(3.15mm electrode root run)

3.0	Ec	1 1R	3.15 3.15	115 130	0.76 1.30	1.9 3.2	0.05 0.09	8.20		0.76 1.30	2.55 3.67	2.05	6.21
4.0	Gh	1 1R	3.15 3.15	115 130	1.33 1.30	3.3 3.2	0.09 0.09	8.20		1.33 1.30	4.47 3.67	2.63	8.13
5.0	Gj	1 1R	3.15 3.15	115 130	2.28 1.30	5.7 3.2	0.16 0.09	8.20		2.28 1.30	7.64 3.67	3.57	11.31
6.0	Gj	1 2 1R	3.15 4.00 3.15	115 190 130	1.93 0.71 1.30	4.8 1.8 3.2	0.13 0.08 0.09	8.20		1.92 0.71 1.30	6.47 2.00 3.67	3.93	12.14
8.0	Gj	1 2 1R	3.15 4.00 3.15	115 190 130	1.93 1.94 1.30	4.8 4.8 3.2	0.13 0.22 0.09	8.20		1.93 1.94 1.30	6.47 5.48 3.67	5.16	15.62
10.0	Gj	1 2 3 1R	3.15 4.00 5.00 3.15	115 190 250 130	1.93 1.94 1.00 1.30	4.8 4.9 2.5 3.2	0.13 0.22 0.17 0.09	8.20		1.93 1.94 1.00 1.30	6.47 5.50 3.16 3.67	6.16	18.80
12.5	Gj	1 2 3 4 1R	3.15 4.00 5.00 6.30 3.15	115 190 250 350 130	1.93 1.94 1.35 0.73 1.30	4.8 4.9 3.4 1.8 3.2	0.13 0.22 0.23 0.21 0.09	8.20		1.93 1.94 1.35 0.73 1.30	6.47 5.50 4.28 2.58 3.67	7.25	22.49
15.0	Gj	1 2 3 4&5 1R	3.15 4.00 5.00 6.30 3.15	115 190 250 350 130	1.93 1.94 1.35 1.88 1.30	4.8 4.9 3.4 4.7 3.2	0.13 0.22 0.23 0.53 0.09	8.20		1.93 1.94 1.35 1.88 1.30	6.47 5.50 4.28 6.63 3.67	8.39	26.54

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
20-0 DV	Ka	1	3-15	115	1-34	3-3	0-09	12-82		1-34	4-48	12-28	37-88
		2	4-00	190	1-94	4-9	0-22			1-94	5-50		
		3	5-00	250	1-35	3-4	0-23			1-35	4-28		
		4&5	6-30	350	2-47	6-2	0-69			2-47	8-70		
		1R	3-15	130	2-54	6-3	0-17			2-54	7-18		
		2R	4-00	190	1-94	4-9	0-22			1-94	5-50		
		3R	5-00	250	0-71	1-8	0-12			0-71	2-25		
		25-0 DV	Ka	1	3-15	115	1-34			3-3	0-09		
2	4-00			190	1-94	4-9	0-22	1-94	5-50				
3	5-00			250	1-35	3-4	0-23	1-35	4-28				
4-7	6-30			350	4-43	11-1	1-25	4-43	15-62				
1R	3-15			130	2-54	6-3	0-17	2-54	7-18				
2R	4-00			190	1-94	4-9	0-22	1-94	5-50				
3R	5-00			250	1-66	4-1	0-29	1-66	5-25				
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	120	1-30	3-2	0-09	8-20		1-30	3-81		
20-0 DV		1R	3-15	120	2-54	6-3	0-17	12-82		2-54	7-46		
	2R&3R	4-00	150	3-04	7-6	0-34	3-04			11-25			
25-0 DV		1R	3-15	120	2-54	6-3	0-17	12-82		2-54	7-46		
	2R-5R	4-00	150	4-51	11-3	0-50	4-51			16-68			

4-0	Gh	1	5-00	190	0-53	1-3	0-09	8-20		0-53	2-31	1-82	5-98
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
5-0	Gh	1	5-00	190	0-77	1-9	0-13	8-20		0-77	3-38	2-07	7-05
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
6-0	Gh	1	5-00	190	1-06	2-7	0-18	8-20		1-06	4-68	2-36	8-34
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
8-0	Gh	1	5-00	190	1-81	4-5	0-31	8-20		1-81	7-96	3-11	11-63
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
10-0	Gh	1	5-00	190	2-01	5-0	0-35	8-20		2-01	8-81	4-06	14-89
		2	5-00	250	0-76	1-9	0-13			0-76	2-42		
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
12-5	Gh	1	5-00	190	2-01	5-0	0-35	8-20		2-01	8-81	5-21	18-70
		2	5-00	250	1-35	3-4	0-23			1-35	4-28		
		3	6-30	350	0-55	1-4	0-16			0-55	1-95		
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
15-0	Gh	1	5-00	190	2-01	5-0	0-35	8-20		2-01	8-81	6-32	22-63
		2	5-00	250	1-35	3-4	0-23			1-35	4-28		
		3&4	6-30	350	1-67	4-2	0-47			1-67	5-88		
		1R	3-15	130	1-30	3-2	0-09			1-30	3-67		
20-0 DV	Kb	1	5-00	190	1-88	4-7	0-33	12-82		1-88	8-27	9-90	34-71
		2	5-00	250	1-35	3-4	0-23			1-35	4-28		
		3&4	6-30	350	2-07	5-2	0-58			2-07	7-31		
		1R	3-15	130	2-79	7-0	0-19			2-79	7-90		
		2R	4-00	190	0-61	1-5	0-07			0-61	1-74		
		3R	5-00	190	1-19	3-0	0-20			1-19	5-21		
25-0 DV	Kb	1	5-00	190	1-83	4-6	0-32	12-82		1-83	8-04	12-95	44-67
		2	5-00	250	1-35	3-4	0-23			1-35	4-28		
		3-6	6-30	340	4-19	10-5	1-18			4-19	14-78		
		1R	3-15	130	2-66	6-7	0-18			2-66	7-54		
		2R	4-00	190	0-61	1-5	0-07			0-61	1-74		
		3R	5-00	190	2-29	5-7	0-40			2-29	8-29		
For welds with sealing runs welded in the overhead position, substitute the following values:													
3-0-15-0		1R	3-15	120	1-30	3-2	0-09	8-20		1-30	3-81		
20-0 DV		1R	3-15	120	2-79	7-0	0-19	12-82		2-79	8-22		
		2R&3R	4-00	150	2-45	6-1	0-27			2-45	9-07		
25-0 DV		1R	3-15	120	2-79	7-0	0-19	12-82		2-73	8-22		
		2R-4R	3-00	150	3-82	9-6	0-43			3-82	14-13		

Butt weld
Flat position
Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(5mm electrode root run)

Butt weld

97

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: backed
(3.15mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	1.94	5.48
		2	4.00	190	0.60	1.5	0.07			0.60	1.70		
4.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	2.49	7.06
		2	4.00	190	1.16	2.9	0.13			1.16	3.28		
5.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	3.13	8.87
		2	4.00	190	1.80	4.5	0.20			1.80	5.09		
6.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	3.85	10.91
		2&3	4.00	190	2.52	6.3	0.28			2.52	7.13		
8.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	5.53	15.67
		2&3	4.00	190	4.20	10.5	0.47			4.20	11.89		
10.0	Sd	1	3.15	130	1.34	3.3	0.09			1.34	3.78	7.54	21.35
		2-4	4.00	190	6.20	15.5	0.69			6.20	17.57		
12.5	Qf	1&2	3.15	130	1.81	4.5	0.12			1.81	5.13	7.09	22.41
		3&4	5.00	250	3.71	9.3	0.64			3.71	11.76		
		5&6	6.30	350	1.57	3.9	0.44			1.57	5.53		
15.0	Qf	1&2	3.15	130	1.81	4.5	0.12			1.81	5.13	8.19	26.27
		3&4	5.00	250	3.71	9.3	0.64			3.71	11.76		
		5-7	6.30	350	2.66	6.7	0.75			2.66	9.39		
20.0	Qf	1&2	3.15	130	1.81	4.5	0.12			1.81	5.13	10.66	34.98
		3&4	5.00	250	3.71	9.3	0.64			3.71	11.76		
		5-8	6.30	350	5.14	12.3	1.44			5.14	18.10		
25.0	Qf	1&2	31.5	130	1.81	4.5	0.12			1.81	5.13	13.50	45.00
		3&4	5.00	250	3.71	9.3	0.64			3.71	11.76		
		5-11	6.30	350	7.98	19.9	2.24			7.98	28.11		

Butt weld

98

Flat position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: backed
(5mm electrode root run)

5.0	Qf	1	5.00	250	2.54	6.3	0.44			2.54	8.04	2.54	8.04
6.0	Qf	1&2	5.00	250	3.05	7.6	0.53			3.05	9.67	3.05	9.67
8.0	Qf	1&2	5.00	250	4.15	10.4	0.72			4.15	13.15	4.15	13.15
10.0	Qf	1&2	5.00	250	4.43	11.1	0.76			4.43	14.03	4.99	16.02
		3	6.30	350	0.57	1.4	0.16			0.57	1.99		
12.5	Qf	1&2	5.00	250	4.43	11.1	0.76			4.43	14.03	6.00	19.56
		3-5	6.30	350	1.57	3.9	0.44			1.57	5.53		
15.0	Qf	1&2	5.00	250	4.43	11.1	0.76			4.43	14.03	7.09	23.42
		3-6	6.30	350	2.66	6.7	0.75			2.66	9.39		
20.0	Qf	1&2	5.00	250	4.43	11.1	0.76			4.43	14.03	9.56	32.12
		3-7	6.30	350	5.14	12.8	1.44			5.14	18.10		
25.0	Qf	1&2	5.00	250	4.43	11.1	0.76			4.43	14.03	12.40	42.14
		3-10	6.30	350	7.98	19.9	2.24			7.98	28.11		

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	105	1-11	2-8	0-08		0-49	1-11	3-68	1-11	3-68
4-0	Cf	1	3-15	105	1-69	4-2	0-12		0-74	1-69	5-57	1-69	5-57
5-0	Cf	1	3-15	105	2-40	6-0	0-16		1-05	2-40	7-93	2-40	7-93
6-0	Cf	1 2	3-15 4-00	105 180	1-93 0-71	4-8 1-8	0-13 0-08		1-05	1-93 0-71	6-36 2-08	2-63	8-44
8-0	Dd	1 2&3	3-15 4-00	105 180	1-78 2-24	4-4 5-6	0-12 0-25		1-05	1-78 2-24	5-87 6-56	4-01	12-43
10-0	Dd	1 2-4	3-15 4-00	105 180	1-78 3-92	4-4 9-8	0-12 0-44		1-05	1-78 3-92	5-87 11-51	5-70	17-37
12-5	Dd	1 2-4 5-7	3-15 4-00 5-00	105 180 210	1-78 3-67 1-84	4-4 9-2 4-6	0-12 0-41 0-32		1-05	1-78 3-67 1-84	5-87 10-79 7-08	7-29	23-73
15-0	Dd	1 2-4 5-10	2-15 4-00 5-00	105 180 210	1-78 3-67 3-88	4-4 9-2 9-7	0-12 0-41 0-67		1-05	1-78 3-67 3-88	5-87 10-79 14-93	9-33	31-58
20-0	Dd	1 2-4 5-13	3-15 4-00 5-00	105 180 210	1-78 3-67 9-03	4-4 9-2 22-6	0-12 0-41 1-56		1-05	1-78 3-67 9-03	5-87 10-79 34-76	14-48	51-42
25-0	Dd	1 2-4 5-21	3-15 4-00 5-00	105 180 210	1-78 3-67 15-61	4-4 9-2 39-0	0-12 0-41 2-70		1-05	1-78 3-67 15-61	5-87 10-79 60-11	21-06	76-77

3-0	Gh	1 1R	3-15 3-15	110 110	0-85 1-44	2-1 3-6	0-06 0-10	8-71		0-85 1-44	2-65 4-50	2-29	7-15
4-0	Gh	1 1R	3-15 3-15	110 110	1-33 1-44	3-3 3-6	0-09 0-10	8-71		1-33 1-44	4-16 4-50	2-77	8-66
5-0	Gh	1 1R	3-15 3-15	110 110	1-94 1-44	4-9 3-6	0-13 0-10	8-71		1-94 1-44	6-08 4-50	3-38	10-59
6-0	Gh	1 2 1R	3-15 4-00 3-15	110 180 110	1-90 0-48 1-44	4-8 1-2 3-6	0-13 0-05 0-10	8-71		1-90 0-48 1-44	5-95 1-42 4-50	3-83	11-88
8-0	He	1 2&3 1R	3-15 4-00 3-15	110 180 110	1-75 1-95 1-44	4-4 4-9 3-6	0-12 0-22 0-10	8-71		1-75 1-95 1-44	5-47 5-71 4-50	5-13	15-68
10-0	He	1 2-4 1R	3-15 4-00 3-15	110 180 110	1-75 3-56 1-44	4-4 8-9 3-6	0-12 0-40 0-10	8-71		1-75 3-56 1-44	5-47 10-45 4-50	6-75	20-42
12-5	He	1 2-4 5&6 1R	3-15 4-00 5-00 3-15	110 180 210 110	1-75 3-67 1-55 1-44	4-4 9-2 3-9 3-6	0-12 0-41 0-27 0-10	8-71		1-75 3-67 1-55 1-44	5-47 10-79 5-97 4-50	8-41	26-72
15-0	He	1 2-4 5-8 1R	3-15 4-00 5-00 3-15	110 180 210 110	1-75 3-67 3-53 1-44	4-4 9-2 8-8 3-6	0-12 0-41 0-61 0-10	8-71		1-75 3-67 3-53 1-44	5-47 10-79 13-60 4-50	10-39	34-36
20-0 DV	Ka	1 2-4 5-9 1R 2R&3R	3-15 4-00 5-00 3-15 4-00	110 180 210 110 180	1-34 4-03 4-02 2-49 3-04	3-3 10-1 10-0 6-2 7-6	0-09 0-45 0-69 0-17 0-34	12-30		1-34 4-03 4-02 2-49 3-04	4-18 11-85 15-48 7-78 8-93	14-92	48-21
25-0 DV	Ka	1 2-4 5-11 1R 2R-4R	3-15 4-00 5-00 3-15 4-00	110 180 210 110 180	1-34 4-03 7-22 2-49 4-51	3-3 10-1 18-0 6-2 11-3	0-09 0-45 1-25 0-17 0-50	12-30		1-34 4-03 7-22 2-49 4-51	4-18 11-85 27-80 7-78 13-24	19-59	64-84

Butt weld
H/V position
Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: single-sided,
unbacked

99

Butt weld
H/V position
Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(3.15mm electrode root run)

100

Butt weld

101

H/V position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
6-0	Gh	1	4-00	145	1-20	3-0	0-13	8-71		1-20	4-48	3-09	10-29
		2	4-00	180	0-45	1-1	0-05			0-45	1-31		
		1R	3-15	110	1-44	3-6	0-10			1-44	4-50		
8-0	He	1	4-00	145	1-11	2-8	0-12	8-71		1-11	4-12	4-46	14-23
		2	4-00	180	1-91	4-8	0-21			1-91	5-61		
		1R	3-15	110	1-44	3-6	0-10			1-44	4-50		
10-0	He	1	4-00	145	1-11	2-8	0-12	8-71		1-11	4-12	6-07	18-97
		2&3	4-00	180	3-53	8-8	0-39			3-52	10-35		
		1R	3-15	110	1-44	3-6	0-10			1-44	4-50		
12-5	He	1	4-00	145	1-11	2-8	0-12	8-71		1-11	4-12	7-74	25-28
		2&3	4-00	180	3-64	9-1	0-41			3-64	10-69		
		4&5	5-00	210	1-55	3-9	0-27			1-55	5-97		
15-0	He	1	4-00	145	1-11	2-8	0-12	8-71		1-11	4-12	9-72	32-91
		2&3	4-00	180	3-64	9-1	0-41			3-64	10-69		
		4-7	5-00	210	3-53	8-8	0-61			3-53	13-60		
20-0 DV	Ka	1	4-00	145	0-86	2-1	0-10	12-30		0-86	3-19	14-40	47-11
		2&3	4-00	180	4-00	10-0	0-45			4-00	11-74		
		4-7	5-00	210	4-02	10-0	0-69			4-02	15-48		
25-0 DV	Ka	1R	3-15	110	2-49	6-2	0-17	12-30		2-49	7-78	19-07	63-74
		2R&3R	4-00	180	3-04	7-6	0-34			3-04	8-93		
		1	4-00	145	0-86	2-1	0-10			0-86	3-19		
		2&3	4-00	180	4-00	10-0	0-45			4-00	11-74		
		4-10	5-00	210	7-22	18-0	1-25			7-22	27-80		
		1R	3-15	110	2-49	6-2	0-17			2-49	7-78		
		2R-4R	4-00	130	4-51	11-3	0-50			4-51	13-24		

Butt weld

102

H/V position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: backed

3-0	Sd	1 2	3-15 4-00	120 180	1-34 0-60	3-3 1-5	0-09 0-07			1-34 0-60	3-78 1-77	1-94	5-55
4-0	Sd	1 2	3-15 4-00	120 180	1-34 1-16	3-3 2-9	0-09 0-13			1-34 1-16	3-78 3-40	2-49	7-18
5-0	Sd	1 2&3	3-15 4-00	120 180	1-34 1-80	3-3 4-5	0-09 0-20			1-34 1-80	3-78 5-28	3-13	9-06
6-0	Sd	1 2&3	3-15 4-00	120 180	1-34 2-52	3-3 6-3	0-09 0-28			1-34 2-52	3-78 7-39	3-85	11-17
8-0	Te	1 2-4 5	3-15 4-00 5-00	120 180 210	1-22 3-67 0-58	3-0 9-2 1-5	0-08 0-41 0-10			1-22 3-67 0-58	3-44 10-79 2-24	5-47	16-47
10-0	Te	1 2-4 5&6	3-15 4-00 5-00	120 180 210	1-22 3-67 1-98	3-0 9-2 4-9	0-08 0-41 0-34			1-22 3-67 1-98	3-44 10-79 7-61	6-86	21-84
12-5	Te	1 2-4 5-8	3-15 4-00 5-00	120 180 210	1-22 3-67 4-04	3-0 9-2 10-1	0-08 0-41 0-70			1-22 3-67 4-04	3-44 10-79 15-56	8-93	29-79
15-0	Te	1 2-4 5-11	3-15 4-00 5-00	120 180 210	1-22 3-67 6-46	3-0 9-2 16-2	0-08 0-41 1-12			1-22 3-67 6-46	3-44 10-79 24-89	11-35	39-11
20-0	Te	1 2-4 5-14	3-15 4-00 5-00	120 180 210	1-22 3-67 12-38	3-0 9-2 31-0	0-08 0-41 2-14			1-22 3-67 12-38	3-44 10-79 47-68	17-27	61-91
25-0	Te	1 2-4 5-22	3-15 4-00 5-00	120 180 210	1-22 3-67 19-73	3-0 9-2 49-3	0-08 0-41 3-41			1-22 3-67 19-73	3-44 10-79 75-99	24-62	90-22

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3-0	Cf	1	3-15	110	1.11	2.8	0.08		0.49	1.11	3.48	1.11	3.48
4-0	Cf	1	3-15	110	1.69	4.2	0.12		0.74	1.69	5.27	1.69	5.27
5-0	Cf	1	3-15	110	2.40	6.0	0.16		1.05	2.40	7.51	2.40	7.51
6-0	Cf	1	3-15	110	3.26	8.1	0.22		1.43	3.26	10.19	3.26	10.19
8-0	Cf	1	3-15	110	5.39	13.5	0.37		1.43	5.39	16.87	5.39	16.87
10-0	Cf	1&2	3-15	110	8.10	20.2	0.55		1.43	8.10	25.33	8.10	25.33
12.5	Cf	1&2 3	3-15 4.00	110 140	8.50 1.85	21.3 4.6	0.58 0.21		1.43	8.50 1.85	26.60 7.16	10.35	33.76
15.0	Cf	1&2 3	3-15 4.00	110 140	8.50 4.75	21.3 11.9	0.58 0.53		1.43	8.50 4.75	26.60 18.41	13.25	45.00
20.0	Cf	1&2 3&4 5	3-15 4.00 5.00	110 140 185	8.50 9.55 1.62	21.3 23.9 4.1	0.58 1.06 0.28		1.43	8.50 9.55 1.62	26.60 37.03 7.16	19.68	70.79
25.0	Cf	1&2 3&4 5&6	3-15 4.00 5.00	110 140 185	8.50 9.55 7.65	21.3 23.9 19.1	0.58 1.06 1.32		1.43	8.50 9.55 7.65	26.60 37.03 33.77	25.70	97.40

Butt weld

103

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: single-sided,
unbacked

3-0	Ec	1 1R	3-15 3-15	110 110	0.76 1.90	1.9 4.7	0.05 0.13	6.92		0.76 1.90	2.37 5.93	2.65	8.30
4-0	Gh	1 1R	3-15 3-15	110 110	1.33 1.90	3.3 4.7	0.09 0.13	6.92		1.33 1.90	4.16 5.93	3.23	10.09
5-0	Gh	1 1R	3-15 3-15	110 110	1.94 1.90	4.9 4.7	0.13 0.13	6.92		1.94 1.90	6.08 5.93	3.84	12.01
6-0	Gh	1 1R	3-15 3-15	110 110	2.69 1.90	6.7 4.7	0.18 0.13	6.92		2.69 1.90	8.42 5.93	4.59	14.35
8-0	Gh	1&2 1R	3-15 3-15	110 110	4.58 1.90	11.4 4.7	0.31 0.13	6.92		4.58 1.90	14.32 5.93	6.48	20.26
10-0	Gh	1&2 1R	3-15 3-15	110 110	7.00 1.90	17.5 4.7	0.48 0.13	6.92		7.00 1.90	21.88 5.93	8.89	27.81
12.5	Gh	1&2 3 1R	3-15 4.00 3-15	110 140 110	8.48 1.40 1.90	21.2 3.5 4.7	0.58 0.16 0.13	6.92		8.48 1.40 1.90	26.52 5.42 5.93	11.77	37.87
15.0	Gh	1&2 3&4 1R	3-15 4.00 3-15	110 140 110	8.48 4.21 1.90	21.2 10.5 4.7	0.58 0.47 0.13	6.92		8.48 4.21 1.90	26.52 16.32 5.93	14.59	48.77
20.0 DV	Ka	1&2 3&4 1R&2R	3-15 4.00 3-15	110 140 110	7.91 6.23 7.57	19.8 15.6 18.9	0.54 0.69 0.52	13.58		7.91 6.23 7.57	24.75 24.14 23.67	21.71	72.56
25.0 DV	Ka	1&2 3&4 5 1R&2R	3-15 4.00 5.00 3-15	110 140 185 110	7.91 9.55 1.05 9.96	19.8 23.9 2.6 24.9	0.54 1.06 0.18 0.68	13.58		7.91 9.55 1.05 9.96	24.75 37.03 4.65 31.15	28.48	97.59

Butt weld

104

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(3.15mm electrode root) run

Butt weld

105

Vertical position

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: sealed
(4mm electrode root run)

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
12.5	Gh	1&2 1R	4.00 3.15	140 110	6.60 2.33	16.5 5.8	0.74 0.16	11.53		6.60 2.33	25.57 7.28	8.93	32.86
15.0	Gh	1-3 1R	4.00 3.15	140 110	9.41 2.33	23.5 5.8	1.05 0.16	11.53		9.41 2.33	36.48 7.28	11.74	43.76
20.0 DV	Ka	1-3 1R	4.00 3.15	140 110	11.08 8.41	27.7 21.0	1.23 0.57	22.56		11.08 8.41	42.95 26.29	19.49	69.24
25.0 DV	Ka	1-4 5 1R&2R	4.00 5.00 3.15	140 185 110	14.41 1.05 10.80	36.0 2.6 27.0	1.61 0.18 0.74	22.56		14.41 1.05 10.80	55.84 4.65 33.78	26.26	94.28

Butt weld

106

Vertical position

Manual metal-arc

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: backed

3.0	Sd	1	3.15	110	2.32	5.8	0.16			2.32	7.25	2.32	7.25
4.0	Sd	1	3.15	110	3.23	8.1	0.22			3.23	10.09	3.23	10.09
5.0	Sd	1	3.15	110	4.27	10.7	0.29			4.27	13.34	4.27	13.34
6.0	Sd	1&2	3.15	110	5.44	13.6	0.37			5.44	17.01	5.44	17.01
8.0	Sd	1&2	3.15	110	8.18	20.5	0.56			8.18	25.59	8.18	25.59
10.0	Sd	1&2 3	3.15 4.00	110 140	7.91 2.17	19.8 5.4	0.54 0.24			7.91 2.17	24.75 8.41	10.08	33.15
12.5	Sd	1&2 3	3.15 4.00	110 140	7.91 5.13	19.8 12.8	0.54 0.57			7.91 5.13	24.75 19.88	13.04	44.63
15.0	Sd	1&2 3&4	3.15 4.00	110 140	7.91 8.59	19.8 21.5	0.54 0.96			7.91 8.59	24.75 33.32	16.51	58.07
20.0	Sd	1&2 3&4 5&6	3.15 4.00 5.00	110 140 185	7.91 9.55 4.83	19.8 23.9 12.1	0.54 1.06 0.83			7.91 9.55 4.83	24.75 37.03 21.35	22.30	83.13
25.0	Sd	1&2 3&4 5-8	3.15 4.00 5.00	110 140 185	7.91 9.55 11.59	19.8 23.9 29.0	0.54 1.06 2.00			7.91 9.55 11.59	24.75 37.03 51.19	29.06	112.97

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
3.0	Cf	1	3.15	110	1.11	2.8	0.08		0.49	1.11	3.64	1.11	3.64
4.0	Cf	1	3.15	110	1.69	4.2	0.12		0.74	1.69	5.51	1.69	5.51
5.0	Cf	1&2	3.15	110	2.40	6.0	0.16		1.05	2.40	7.84	2.40	7.84
6.0	Cf	1&2 3	3.15 4.00	110 150	1.93 0.71	4.8 1.8	0.13 0.08		1.05	1.93 0.71	6.29 2.62	2.63	8.90
8.0	Dd	1&2 3&4	3.15 4.00	110 150	1.93 1.94	4.8 4.8	0.13 0.22		1.05	1.93 1.94	6.29 7.16	3.86	13.45
10.0	Dd	1&2 3-5	3.15 4.00	110 150	1.93 3.49	4.8 8.7	0.13 0.39		1.05	1.93 3.49	6.29 12.90	5.41	19.19
12.5	Dd	1&2 3-7	3.15 4.00	110 150	1.93 5.88	4.8 14.7	0.13 0.66		1.05	1.93 5.88	6.29 21.76	7.81	28.04
15.0	Dd	1&2 3-10	3.15 4.00	110 150	1.93 8.78	4.8 22.0	0.13 0.98		1.05	1.93 8.78	6.29 32.48	10.71	38.77
20.0	Dd	1&2 3-15	3.15 4.00	110 150	1.93 16.10	4.8 40.2	0.13 1.79		1.05	1.93 16.10	6.29 59.54	18.02	65.83
25.0	Dd	1&2 3-24	3.15 4.00	110 150	1.93 25.44	4.8 63.6	0.13 2.83		1.05	1.93 25.44	6.29 94.08	27.36	100.37

Butt weld
Overhead position
Manual metal-arc

107

Electrode:
Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: single-sided,
unbacked

3.0	Sd	1 2	3.15 4.00	110 150	1.34 0.60	3.3 1.5	0.09 0.07			1.34 0.60	4.36 2.23	1.94	6.59
4.0	Sd	1 2	3.15 4.00	110 150	1.34 1.16	3.3 2.9	0.09 0.13			1.34 1.16	4.36 4.29	2.49	8.65
5.0	Sd	1 2&3	3.15 4.00	110 150	1.34 1.80	3.3 4.5	0.09 0.20			1.34 1.80	4.36 6.65	3.13	11.01
6.0	Sd	1 2&3	3.15 4.00	110 150	1.34 2.52	3.3 6.3	0.09 0.28			1.34 2.52	4.36 9.31	3.85	13.67
8.0	Qf	1-3 4&5	3.15 4.00	110 150	6.07 2.71	15.2 6.8	0.42 0.30			6.07 2.71	19.83 10.02	8.78	29.85
10.0	Qf	1-3 4-6	3.15 4.00	110 150	6.07 4.56	15.2 11.4	0.42 0.51			6.07 4.56	19.83 16.88	10.64	36.72
12.5	Qf	1-3 4-8	3.15 4.00	110 150	6.07 7.10	15.2 17.7	0.42 0.79			6.07 7.10	19.83 26.25	13.17	46.08
15.0	Qf	1-3 4-10	3.15 4.00	110 150	6.07 9.86	15.2 24.7	0.42 1.10			6.07 9.86	19.83 36.47	15.93	56.31
20.0	Qf	1-3 4-14	3.15 4.00	110 150	6.07 16.10	15.2 40.2	0.42 1.79			6.07 16.10	19.83 59.54	22.17	79.37
25.0	Qf	1-3 4-21	3.15 4.00	110 150	6.07 23.27	15.2 58.2	0.42 2.59			6.07 23.27	19.83 86.07	29.34	105.90

Butt weld
Overhead position
Manual metal-arc

108

Electrode:
Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure: backed

Butt weld

109

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— sealing run
preparation by air-arc
gouging

Plate thickness	Diagram reference	Run numbers	Electrode size	Current	Length of electrode consumed per metre of weld	Number of electrodes consumed per metre of weld (50mm stub)	Weight of weld metal per metre of weld	Sealing run preparation time per metre of weld	End tapering time (feathering) per metre of weld	Deslag and brush time per metre of weld (per electrode size)	Arc time per metre of weld (per electrode size)	Total deslag and brush time per metre of weld	Total arc time per metre of weld
mm			mm	A	m		kg	min	min	min	min	min	min
Flat													
3-0-15-0		1R	4-00	190	2-01	5-0	0-22	2-24		2-01	5-70		
20-0 DV		1R&2R 3R	4-00 5-00	190 250	4-27 0-71	10-7 1-8	0-48 0-12	2-24		4-27 0-71	12-10 2-25		
25-0 DV		1R&2R 3R	4-00 5-00	190 250	4-27 1-66	10-7 4-1	0-48 0-29	2-24		4-27 1-66	12-10 5-25		
Horizontal/vertical													
3-0-15-0		1R	4-00	180	2-01	5-0	0-22	2-24		2-01	5-91		
20-0 DV		1R-3R	4-00	180	5-37	13-4	0-60	2-24		5-37	15-77		
25-0 DV		1R-4R	4-00	180	6-84	17-1	0-76	2-24		6-84	20-09		
Vertical													
3-0-15-0		1R	3-15	110	3-28	8-2	0-22	2-24		3-28	10-26		
20-0 DV		1R&2R	3-15	110	8-76	21-9	0-60	2-24		8-76	27-40		
25-0 DV		1R-3R	3-15	110	11-15	27-9	0-76	2-24		11-15	34-89		
Overhead													
3-0-15-0		1R	4-00	150	2-01	5-0	0-22	2-24		2-01	7-44		
20-0 DV		1R&2R	4-00	150	5-37	13-4	0-60	2-24		5-37	19-87		
25-0 DV		1R-3R	4-00	150	6-84	17-1	0-76	2-24		6-84	25-30		

Butt weld

110

All positions

Manual metal-arc

Electrode:

Type — basic,
hydrogen controlled 120%

Efficiency — 115%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— sealing run
preparation by chipping

Flat													
3-0-15-0		1R	4-00	190	1-19	3-0	0-13	5-32		1-19	3-36		
20-0 DV		1R 2R 3R&4R	4-00 5-00 6-30	190 250 350	2-54 0-78 1-06	6-3 1-9 2-7	0-28 0-13 0-30	8-69		2-54 0-78 1-06	7-18 2-47 3-75		
25-0 DV		1R 2R 3R-5R	4-00 5-00 6-30	190 250 350	2-54 0-78 1-97	6-3 1-9 4-9	0-28 0-13 0-55	8-69		2-54 0-78 1-97	7-18 2-47 6-95		
Horizontal/vertical													
3-0-15-0		1R	4-00	180	1-19	3-0	0-13	5-32		1-19	3-49		
20-0 DV		1R&2R 3R&4R	4-00 5-00	180 210	3-74 1-73	9-4 4-3	0-42 0-30	8-69		3-74 1-73	10-99 6-68		
25-0 DV		1R&2R 3R-6R	4-00 5-00	180 210	3-74 3-21	9-4 8-0	0-42 0-55	8-69		3-74 3-21	10-99 12-36		
Vertical													
3-0-15-0		1R	3-15	110	1-94	4-8	0-13	5-32		1-94	6-06		
20-0 DV		1R&2R 3R	3-15 4-00	110 140	6-10 2-69	15-3 6-7	0-42 0-30	8-69		6-10 2-69	19-09 10-42		
25-0 DV		1R&2R 3R	3-15 4-00	110 140	6-10 4-97	15-3 12-4	0-42 0-55	8-69		6-10 4-97	19-09 19-28		
Overhead													
3-0-15-0		1R	4-00	150	1-19	3-0	0-13	5-32		1-19	4-39		
20-0 DV		1R-6R	4-00	150	6-43	16-1	0-72	8-69		6-43	23-79		
25-0 DV		1R-8R	4-00	150	8-72	21-8	0-97	8-69		8-72	32-24		

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
3-0	F F	1 1	150 230	19-23 26-30	600 1120	63 63	0.058 0.058	15.5 15.5	37.1 67.9	1.62 0.88
3-0	H H	1 1	145 205	19-22 24-28	575 950	37 37	0.048 0.048	13.0 13.0	42.5 69.0	1.41 0.87
3-0	D D	1 1	115 170	17-21 18-23	425 725	38 38	0.049 0.049	13.1 13.1	31.5 52.8	1.90 1.14
3-0	O O	1 1	155 195	19-22 23-27	640 900	63 63	0.058 0.058	15.5 15.5	39.5 55.0	1.52 1.09
4-0	F F	1 1	150 230	19-23 26-30	600 1120	43 43	0.091 0.091	24.2 24.2	23.7 43.3	2.53 1.38
4-0	H H	1 1	145 205	19-22 24-28	575 950	34 34	0.084 0.084	22.6 22.6	24.4 39.6	2.46 1.51
4-0	D D	1 1	115 170	17-22 18-23	425 725	27 27	0.080 0.080	21.5 21.5	19.2 32.1	3.13 1.87
4-0	O O	1 1	155 195	19-22 23-27	640 900	43 43	0.091 0.091	24.2 24.2	25.2 35.1	2.38 1.71
5-0	F F	1 1	150 230	19-23 26-30	600 1120	33 33	0.131 0.131	35.0 35.0	16.4 30.0	3.66 2.00
5-0	H H	1 1	145 205	19-22 24-28	575 950	32 32	0.130 0.130	34.7 34.7	15.9 25.8	3.78 2.33
5-0	D D	1 1	115 170	17-22 18-23	425 725	21 21	0.119 0.119	32.0 32.0	12.9 21.6	4.66 2.78
5-0	O O	1 1	155 195	19-22 23-27	640 900	33 33	0.131 0.131	35.0 35.0	17.5 24.3	3.44 2.47
6-0	F F	1&2 1	150 230	19-23 26-30	600 1120	26 26	0.179 0.179	47.8 47.8	12.0 21.9	5.00 2.73
6-0	H H	1&2 1	145 205	19-22 24-28	575 950	30 30	0.185 0.185	49.4 49.4	11.1 18.1	5.38 3.31
6-0	D D	1 1	115 170	17-22 18-23	425 725	17 17	0.167 0.167	44.5 44.5	9.2 15.5	6.50 3.88
6-0	O O	1&2 1&2	155 195	19-22 23-27	640 900	26 26	0.179 0.179	47.8 47.8	12.8 17.8	4.69 3.38
8-0	F F	1&2 1	150 230	19-23 26-30	600 1120	18 18	0.298 0.298	79.6 79.6	7.2 13.2	8.32 4.55
8-0	H H	1&2 1&2	145 205	19-22 24-28	575 950	28 28	0.323 0.323	86.3 86.3	6.4 10.4	9.40 5.79
8-0	D D	1&2 1&2	115 170	17-22 18-23	425 725	13 13	0.284 0.284	76.0 76.0	5.4 9.1	11.08 6.61
8-0	O O	1&2 1&2	155 195	19-22 23-27	640 900	18 18	0.298 0.298	79.6 79.6	7.7 10.7	7.82 5.62
10-0	F F	1&2 1	150 230	19-23 26-30	600 1120	13 13	0.447 0.447	119.7 119.7	4.8 8.8	12.51 6.85
10-0	H H	1-3 1&2	145 205	19-22 24-28	575 950	26 26	0.497 0.497	133.0 133.0	4.1 6.7	14.49 8.92
10-0	V V	1 2 1 2	80 70 180 145	17-20 18-21 18-23 19-24	250 200 790 575	13 13	0.065 0.382 0.144 0.303	17.4 102.3 38.5 81.2	1.9 1.9 7.3 6.8	32.39 30.90 8.20 8.84
10-0	O O	1-3 1-3	155 195	19-22 23-27	640 900	13 13	0.447 0.447	119.7 119.7	5.1 7.1	11.75 8.46

Fillet weld

111

All positions

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Fillet weld

112

All positions

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
3.0	F	1	180	22-26	430	24	0.044	7.7	54.4	1.10
	F	1	280	29-36	800	24	0.044	7.7	99.9	0.60
3.0	H	1	180	22-26	430	28	0.045	8.0	52.5	1.14
	H	1	270	28-35	770	28	0.045	8.0	92.9	0.65
3.0	D	1	140	20-24	300	33	0.047	8.4	35.4	1.70
	D	1	180	20-25	425	33	0.047	8.4	49.8	1.21
3.0	O	1	135	20-23	280	48	0.052	9.3	29.8	2.61
	O	1	200	22-26	500	48	0.052	9.3	52.7	1.14
4.0	F	1	180	22-26	430	16	0.073	12.9	32.5	1.85
	F	1	280	29-36	800	16	0.073	12.9	59.7	1.00
4.0	H	1	180	22-26	430	26	0.079	14.0	30.1	1.99
	H	1	270	28-35	770	26	0.079	14.0	53.3	1.13
4.0	D	1	140	20-24	300	20	0.076	13.4	22.1	2.71
	D	1	180	20-25	425	20	0.076	13.4	31.1	1.93
4.0	O	1	135	20-23	280	36	0.086	15.2	18.2	3.29
	O	1	200	22-26	500	36	0.086	15.2	32.2	1.86
5.0	F	1	180	22-26	430	12	0.111	19.5	21.5	2.79
	F	1	280	29-36	800	12	0.111	19.5	39.6	1.52
5.0	H	1	180	22-26	430	24	0.122	21.5	19.6	3.07
	H	1	270	28-35	770	24	0.122	21.5	34.6	1.73
5.0	D	1	140	20-24	300	14	0.112	19.8	13.0	4.01
	D	1	180	20-25	425	14	0.112	19.8	21.1	2.85
5.0	O	1	135	20-23	280	29	0.127	22.4	12.3	4.87
	O	1	200	22-26	500	29	0.127	22.4	21.7	2.76
6.0	F	1	180	22-26	430	10	0.156	27.5	15.3	3.92
	F	1	320	33-40	970	10	0.156	27.5	34.0	1.77
6.0	H	1	180	22-26	430	22	0.174	30.5	13.7	4.37
	H	1	300	32-39	900	22	0.174	30.5	28.3	2.12
6.0	V	1	125	20-22	250	24	0.176	31.1	7.9	7.55
	V	1	150	20-25	330	24	0.176	31.1	10.4	5.75
6.0	O	1	135	20-23	280	24	0.176	31.1	8.9	6.76
	O	1	200	22-26	500	24	0.176	31.1	15.7	3.83
8.0	F	1&2	180	22-26	430	7	0.269	47.5	8.9	6.78
	F	1	320	33-40	970	7	0.269	47.5	19.6	3.05
8.0	H	1	180	22-26	430	20	0.304	53.6	7.9	7.64
	H	1&2	300	32-39	900	20	0.304	53.6	16.2	3.70
8.0	V	1	125	20-22	259	18	0.299	52.7	4.7	12.79
	V	1	150	20-25	330	18	0.299	52.7	6.2	9.74
8.0	O	1&2	135	20-23	280	18	0.299	52.7	5.2	11.44
	O	1&2	200	22-26	500	18	0.299	52.7	9.3	6.48
10.0	F	1&2	180	22-26	430	5	0.414	73.1	5.8	10.43
	F	1&2	320	33-40	970	5	0.414	73.1	12.8	4.70
10.0	H	1-3	180	22-26	430	19	0.469	82.7	5.1	11.80
	H	1-3	300	32-39	900	19	0.469	82.7	10.5	5.72
10.0	V	1	125	20-22	250	15	0.452	79.8	3.1	19.37
	V	1	150	20-25	330	15	0.452	79.8	4.1	14.76
10.0	O	1-3	135	20-23	280	15	0.452	79.8	3.5	17.33
	O	1-3	200	22-26	500	15	0.452	79.8	6.1	9.82

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
12-0	F	1&2	320	33-40	970	4	0.591	104.2	9.0	6.70
12-0	H	1-3	300	32-39	900	12	0.669	118.0	7.4	8.16
12-0	V	1	171	21-26	400	12	0.638	112.5	3.5	17.23
12-0	O	1-3	200	22-26	500	12	0.638	112.5	4.3	13.84

3-0	F	1	150	20-23	190	32	0.047	5.6	33.9	1.77
	F	1	200	24-28	310	32	0.047	5.6	55.3	1.09
3-0	H	1	150	20-23	190	32	0.047	5.6	33.9	1.77
	H	1	200	24-28	310	32	0.047	5.6	55.3	1.09
3-0	D	1	115	17-20	120	32	0.047	5.6	21.4	2.80
	D	1	145	18-21	180	32	0.047	5.6	32.1	1.87
3-0	O	1	130	19-22	150	32	0.047	5.6	26.8	2.24
4-0	F	1	150	20-23	190	28	0.081	9.7	19.6	3.07
	F	1	200	24-28	310	28	0.081	9.7	31.9	1.88
4-0	H	1	150	20-23	190	28	0.081	9.7	19.6	3.07
	H	1	200	24-28	310	28	0.081	9.7	31.9	1.88
4-0	D	1	115	17-20	120	28	0.081	9.7	12.4	4.86
	D	1	145	19-22	180	28	0.081	9.7	18.5	3.24
4-0	O	1	130	19-22	150	28	0.081	9.7	15.4	3.89
5-0	F	1	200	24-28	310	26	0.124	14.9	20.8	2.88
	F	1	350	33-37	850	26	0.124	14.9	57.1	1.05
5-0	H	1	200	24-28	310	26	0.124	14.9	20.8	2.88
	H	1	300	30-34	610	26	0.124	14.9	40.9	1.47
5-0	D	1	115	17-20	120	26	0.124	14.9	8.1	7.45
	D	1	150	19-22	200	26	0.124	14.9	13.4	4.47
5-0	O	1	130	19-22	150	26	0.124	14.9	10.1	5.96
6-0	F	1	200	24-28	310	24	0.176	21.1	14.7	4.09
	F	1	350	33-37	850	24	0.176	21.1	40.2	1.49
6-0	H	1	200	24-28	310	24	0.176	21.1	14.7	4.09
	H	1	350	30-34	850	24	0.176	21.1	40.2	1.49
6-0	D	1	115	17-20	120	24	0.176	21.1	5.7	10.57
	D	1	165	20-23	230	24	0.176	21.1	10.9	5.52
6-0	O	1	130	19-22	150	24	0.176	21.1	7.1	8.46
	O	1	150	20-23	200	24	0.176	21.1	9.5	6.34
8-0	F	1	200	24-28	310	22	0.307	36.8	8.4	7.13
	F	1	350	33-37	850	22	0.307	36.8	23.1	2.60
8-0	H	1&2	200	24-28	310	22	0.307	36.8	8.4	7.13
	H	1&2	350	33-37	850	22	0.307	36.8	23.1	2.60
8-0	V	1	150	20-23	200	22	0.307	36.8	5.4	11.05
8-0	O	1	150	20-23	200	22	0.307	36.8	5.4	11.05

Fillet weld

All positions

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
10-0	F	1	200	24-28	310	20	0.473	56.7	5.5	10.97
	F	1	350	33-37	850	20	0.473	56.7	15.0	4.00
10-0	H	1&2	200	24-28	310	20	0.473	56.7	5.5	10.97
	H	1-3	350	33-37	850	20	0.473	56.7	15.0	4.00
10-0	V	1	150	20-23	200	20	0.473	56.7	3.5	17.00
10-0	O	1	150	20-23	200	20	0.473	56.7	3.5	17.00
12-0	F	1&2	200	24-28	310	18	0.673	80.7	3.8	15.62
	F	1	350	33-37	850	18	0.673	80.7	10.5	5.70
12-0	H	1-3	200	24-28	310	18	0.673	80.7	3.8	15.62
	H	1-3	350	33-37	850	18	0.673	80.7	10.5	5.70
12-0	V	1&2	150	20-23	200	18	0.673	80.7	2.5	24.20
12-0	O	1-3	150	20-23	200	18	0.673	80.7	2.5	24.20
15-0	F	1-3	200	24-28	310	17	1.038	124.4	2.5	24.08
	F	1&2	350	33-37	850	17	1.038	124.4	6.8	8.78
15-0	H	1-5	200	24-28	310	17	1.038	124.4	2.5	24.08
	H	1-5	350	33-37	850	17	1.038	124.4	6.8	8.78
15-0	V	1-3	150	20-23	200	17	1.038	124.4	1.6	37.33
15-0	O	1-6	150	20-23	200	17	1.038	124.4	1.6	37.33
18-0	F	1-4	200	24-28	310	16	1.480	177.4	1.7	34.33
	F	1-3	350	33-37	850	16	1.480	177.4	4.8	12.52
18-0	H	1-7	200	24-28	310	16	1.480	177.4	1.7	34.33
	H	1-7	350	33-37	850	16	1.480	177.4	4.8	12.52
18-0	V	1-4	150	20-23	200	16	1.480	177.4	1.1	53.22
18-0	O	1-9	150	20-23	200	16	1.480	177.4	1.1	53.22
20-0	F	1-5	200	24-28	310	15	1.817	217.8	1.4	42.16
	F	1-4	350	33-37	850	15	1.817	217.8	3.9	15.37
20-0	H	1-8	200	24-28	310	15	1.817	217.8	1.4	42.16
	H	1-9	350	33-37	850	15	1.817	217.8	3.9	15.37
20-0	V	1-4	150	20-23	200	15	1.817	217.8	0.9	65.34
20-0	O	1-11	150	20-23	200	15	1.817	217.8	0.9	65.34
22-0	F	1-7	200	24-28	310	15	2.188	262.3	1.2	50.76
	F	1-5	350	33-37	850	15	2.188	262.3	3.2	18.51
22-0	H	1-10	200	24-28	310	15	2.188	262.3	1.2	50.76
	H	1-12	350	33-37	850	15	2.188	262.3	3.2	18.51
22-0	V	1-5	150	20-23	200	15	2.188	262.3	0.8	78.68
22-0	O	1-13	150	20-23	200	15	2.188	262.3	0.8	78.68
25-0	F	1-9	200	24-28	310	14	2.808	336.6	0.9	65.15
	F	1-6	350	33-37	850	14	2.808	336.6	2.5	23.76
25-0	H	1-11	200	24-28	310	14	2.808	336.6	0.9	65.15
	H	1-15	350	33-37	850	14	2.808	336.6	2.5	23.76
25-0	V	1-6	150	20-23	200	14	2.808	336.6	0.6	100.98
25-0	O	1-16	150	20-23	200	14	2.808	336.6	0.6	100.98

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
6-0	F F	1 1	275 435	25-28 35-39	230 550	27 27	0.180 0.180	12.3 12.3	18.7 44.8	3.20 1.34
6-0	H H	1 1	265 400	22-26 34-37	220 430	27 27	0.180 0.180	12.3 12.3	17.9 35.0	3.35 1.71
6-0	D	1	210	19-22	160	27	0.180	12.3	13.0	4.60
6-0	O	1	195	20-23	145	27	0.180	12.3	11.8	5.08
8-0	F F	1 1	275 435	25-28 35-39	230 550	23 23	0.310 0.310	21.1 21.1	10.9 26.1	5.51 2.30
8-0	H H	1&2 1&2	265 400	22-26 34-37	220 430	23 23	0.310 0.310	21.1 21.1	10.4 20.4	5.76 2.95
8-0	D	1	210	19-22	160	23	0.310	21.1	7.6	7.92
8-0	O	1	195	20-23	145	23	0.310	21.1	6.9	8.73
10-0	F F	1 1	275 435	25-28 35-39	230 550	20 20	0.474 0.474	32.2 32.2	7.1 17.1	8.41 3.52
10-0	H H	1-3 1&2	265 400	22-26 34-37	220 430	20 20	0.474 0.474	32.2 32.2	6.8 13.3	8.79 4.50
10-0	V	1	190	19-22	140	20	0.474	32.2	4.3	13.82
10-0	O	1&2	195	20-33	145	20	0.474	32.2	4.5	13.34
12-0	F F	1&2 1	275 435	25-28 35-39	230 550	18 18	0.671 0.671	45.6 45.6	5.0 12.1	11.91 4.98
12-0	H H	1-3 1-3	265 400	22-26 34-37	220 430	18 18	0.671 0.671	45.6 45.6	4.8 9.4	12.45 6.37
12-0	V	1	190	19-22	140	18	0.671	45.6	3.1	19.56
12-0	O	1-3	195	20-23	145	18	0.671	45.6	3.2	18.89
15-0	F F	1-3 1&2	275 435	25-28 35-39	230 550	16 16	1.028 1.028	70.0 70.0	3.3 7.9	18.26 7.64
15-0	H H	1-5 1-5	265 400	22-26 34-37	220 430	16 16	1.028 1.028	70.0 70.0	3.1 6.1	19.09 9.77
15-0	V	1	190	19-22	140	16	1.028	70.0	2.0	30.00
15-0	O	1-6	195	20-23	145	16	1.028	70.0	2.1	28.96
18-0	F F	1-3 1&2	275 435	25-28 35-39	230 550	14 14	1.460 1.460	99.4 99.4	2.3 5.5	25.93 10.84
18-0	H H	1-8 1-7	265 400	22-26 34-37	220 430	14 14	1.460 1.460	99.4 99.4	2.2 4.3	27.11 13.87
18-0	V	1&2	190	19-22	140	14	1.460	99.4	1.4	42.60
18-0	O	1-9	195	20-23	145	14	1.460	99.4	1.5	41.13
20-0	F F	1-4 1&2	275 435	25-28 35-39	230 550	13 13	1.790 1.790	121.8 121.8	1.9 4.5	31.78 13.29
20-0	H H	1-10 1-8	265 400	22-26 34-37	220 430	13 13	1.790 1.790	121.8 121.8	1.8 3.5	33.22 17.00
20-0	V	1-3	190	19-22	140	13	1.790	121.8	1.1	52.21
20-0	O	1-12	195	20-23	145	13	1.790	121.8	1.2	50.40

Fillet weld

All positions

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

114

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min
22-0	F F	1-6 1-3	275 435	25-28 35-39	230 550	13 13	2.152 2.152	146.5 146.5	1.6 3.8	38.21 15.98
22-0	H H	1-12 1-9	265 400	22-26 34-37	220 430	13 13	2.152 2.152	146.5 146.5	1.5 2.9	39.94 20.44
22-0	V	1-3	190	19-22	140	13	2.152	146.5	1.0	62.77
22-0	O	1-15	195	20-23	145	13	2.152	146.5	1.0	60.60
25-0	F F	1-8 1-4	275 435	25-28 35-39	230 550	12 12	2.756 2.756	187.6 187.6	1.2 2.9	48.94 20.46
25-0	H H	1-14 1-11	265 400	22-26 34-37	220 430	12 12	2.756 2.756	187.6 187.6	1.2 2.3	51.16 26.18
25-0	V	1-4	190	19-22	140	12	2.756	187.6	0.7	80.40
25-0	O	1-18	195	20-23	145	12	2.756	187.6	0.8	77.63

Fillet weld

115

Flat and H/V positions

CO₂ flux-cored wire

Electrode:

Diameter — 2.4mm

Efficiency — 79%

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Deslag and brush time per metre of weld	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min	min
8-0	F F	1 1	295 500	25-29 33-38	180 340	13 13	0.285 0.285	15.3 15.3	11.7 22.2	2.65 2.65	5.12 2.71
8-0	H H	1&2 1&2	295 405	24-28 26-30	180 260	13 13	0.285 0.285	15.3 15.3	11.7 16.9	2.65 2.65	5.12 3.54
10-0	F F	1 1	295 500	25-29 33-38	180 340	11 11	0.439 0.439	23.6 23.6	7.6 14.4	4.08 4.08	7.87 4.16
10-0	H H	1-3 1-3	295 405	24-28 26-30	180 260	11 11	0.439 0.439	23.6 23.6	7.6 11.0	4.08 4.08	7.87 5.45
12-0	F F	1-3 1	295 500	25-29 33-38	180 340	10 10	0.624 0.624	33.6 33.6	5.4 10.1	5.81 5.81	11.20 5.93
12-0	H H	1-3 1-3	295 405	24-28 26-30	180 260	10 10	0.624 0.624	33.6 33.6	5.4 7.7	5.81 5.81	11.20 7.75
15-0	F F	1-4 1-3	295 500	25-29 33-38	180 340	9 9	0.964 0.964	51.8 51.8	3.5 6.6	8.97 8.97	17.28 9.15
15-0	H H	1-6 1-5	295 405	24-28 26-30	180 260	9 9	0.964 0.964	51.8 51.8	3.5 5.0	8.97 8.97	17.28 11.96

Leg length	Position symbol	Run numbers	Current	Voltage	Wire feed rate	Excess weld metal	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Welding speed per hour	Deslag and brush time per metre of weld	Arc time per metre of weld
mm			A	V	m/hr	%	kg	m	m	min	min
18-0	F F	1-6	295	25-29	180	8	1.375	74.0	2.4	12.80	24.66
		1-4	500	33-38	340	8	1.375	74.0	4.6	12.80	13.06
18-0	H H	1-8	295	24-28	180	8	1.375	74.0	2.4	12.80	24.66
		1-7	405	26-30	260	8	1.375	74.0	3.5	12.80	17.07
20-0	F F	1-7	285	25-29	180	7	1.690	90.9	2.0	15.73	30.30
		1-4	500	33-38	340	7	1.690	90.9	3.7	15.73	16.04
20-0	H H	1-10	295	24-28	180	7	1.690	90.9	2.0	15.73	30.30
		1-9	405	26-30	260	7	1.690	90.9	2.9	15.73	20.98
22-0	F F	1-9	295	25-29	180	7	2.036	109.6	1.6	18.95	36.52
		1-5	500	33-38	340	7	2.036	109.6	3.1	18.95	19.33
22-0	H H	1-12	295	24-28	180	7	2.036	109.6	1.6	18.95	36.52
		1-11	405	26-30	260	7	2.036	109.6	2.4	18.95	25.28
25-0	F F	1-10	295	25-29	180	6	2.616	140.8	1.3	24.35	46.92
		1-6	500	33-38	340	6	2.616	140.8	2.4	24.35	24.84
25-0	H H	1-15	295	24-28	180	6	2.616	140.8	1.3	24.35	46.92
		1-13	405	26-30	260	6	2.616	140.8	1.8	24.35	32.48

8-0	F F	1	450	26-30	130	14	0.287	7.4	17.6	0.78	3.40
		1	555	30-34	175	14	0.287	7.4	23.7	0.78	2.53
8-0	H H	1&2	450	25-29	130	14	0.287	7.4	17.6	0.78	3.40
		1&2	555	29-33	175	14	0.287	7.4	23.7	0.78	2.53
10-0	F F	1	490	27-31	145	12	0.442	11.4	12.8	1.21	4.71
		1	650	35-39	250	12	0.442	11.4	22.0	1.21	2.73
10-0	H H	1&2	450	25-29	130	12	0.442	11.4	11.4	1.21	5.25
		1-3	605	32-36	205	12	0.442	11.4	18.0	1.21	3.33
12-0	F F	1&2	490	27-31	145	11	0.631	16.2	8.9	1.73	6.71
		1	650	35-39	250	11	0.631	16.2	15.4	1.73	3.89
12-0	H H	1-3	450	25-29	130	11	0.631	16.2	8.0	1.73	7.49
		1-4	605	32-36	205	11	0.631	16.2	12.6	1.73	4.75
15-0	F F	1-3	490	27-31	145	10	0.976	25.1	5.8	2.67	10.38
		1&2	650	35-39	250	10	0.976	25.1	10.0	2.67	6.02
15-0	H H	1-4	450	25-29	130	10	0.976	25.1	5.2	2.67	11.58
		1-6	605	32-36	205	10	0.976	25.1	8.2	2.67	7.34
18-0	F F	1-4	490	27-31	145	9	1.394	35.8	4.0	3.82	14.83
		1-3	650	35-39	250	9	1.394	35.8	7.0	3.82	8.60
18-0	H H	1-5	450	25-29	130	9	1.394	35.8	3.6	3.82	16.55
		1-8	605	32-36	205	9	1.394	35.8	5.7	3.82	10.49
20-0	F F	1-4	490	27-31	145	9	1.714	44.1	3.3	4.69	18.24
		1-3	650	35-39	250	9	1.714	44.1	5.7	4.69	10.58
20-0	H H	1-7	450	25-29	130	9	1.714	44.1	2.9	4.69	20.34
		1-9	605	32-36	205	9	1.714	44.1	4.7	4.69	12.90
22-0	F F	1-5	490	27-31	145	8	2.067	53.1	2.7	5.66	21.99
		1-4	650	35-39	250	8	2.067	53.1	4.7	5.66	12.75
22-0	H H	1-9	450	25-29	130	8	2.067	53.1	2.4	5.66	24.52
		1-11	605	32-36	205	8	2.067	53.1	3.9	5.66	15.55
25-0	F F	1-6	490	27-31	145	8	2.656	68.3	2.1	7.27	28.26
		1-5	650	35-39	250	8	2.656	68.3	3.7	7.27	16.39
25-0	H H	1-11	450	25-29	130	8	2.656	68.3	1.9	7.27	31.52
		1-13	605	32-36	205	8	2.656	68.3	3.0	7.27	19.99

Fillet weld

116

Flat and H/V positions

CO₂ flux-cored wire

Electrode:

Diameter — 3.2mm

Efficiency — 76%

Butt weld

117

Flat position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1-6	Aa	1	95	16-20	275	0.046	12.29		22.37	2.68	2.68
3-0	Cb	1	95	16-20	275	0.128	34.25		8.03	7.47	7.47
5-0	Cc	1&2	120	17-21	405	0.187	50.11		8.03	7.42	7.42
6-0	Cf	1&2	175	20-24	705	0.249	66.65		10.53	5.67	5.67
8-0	Cf	1&2	175	20-24	705	0.397	106.11		6.54	9.03	9.03
10-0	Ba	1&2	200	21-25	855	0.497	132.76		6.44	9.32	9.32
12.5	Ba	1-3	200	21-25	855	0.729	194.76		4.39	13.67	13.67

Butt weld

118

Flat position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: sealed

3-0	Gb	1 1R	140 140	19-23 19-23	515 515	0.042 0.091	11.28 24.33	4.43	45.65 21.17	1.31 2.83	4.15
5-0	Gc	1 1R	185 185	22-26 22-26	780 780	0.081 0.091	21.65 24.33	4.43	36.03 32.06	1.67 1.87	3.54
6-0	Gd	1 1R	210 210	24-28 24-28	935 935	0.081 0.091	21.65 24.33	4.43	43.19 38.43	1.39 1.56	2.95
8-0	Gd	1 1R	210 210	24-28 24-28	935 935	0.178 0.091	47.51 24.33	4.43	19.68 38.43	3.05 1.56	4.61
10-0	Fb	1&2 1R	210 210	24-28 24-28	935 935	0.251 0.091	67.06 24.33	4.43	13.94 38.43	4.30 1.56	5.86
12.5	Fb	1&2 1R	210 210	24-28 24-28	935 935	0.426 0.091	113.89 24.33	4.43	8.21 38.43	7.31 1.56	8.87
For all welds sealed in the overhead position, substitute the following values											
		1R	165	19-23	640	0.091	24.33	4.43	26.31	2.28	2.28

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Pc	1	95	16-20	275	0.056	14.97		18.37	3.27	3.27
3.0	Sc	1&2	120	16-20	405	0.150	39.96		10.14	5.92	5.92
5.0	Sc	1&2	165	18-22	640	0.278	74.20		8.63	6.96	6.96
6.0	Qd	1&2	210	22-28	935	0.226	60.42		15.48	3.88	3.88
8.0	Qd	1-3	210	22-28	935	0.327	87.32		10.71	5.60	5.60
10.0	Qd	1-3	210	22-28	935	0.444	118.72		7.88	7.62	7.62
12.5	Qd	1-3	210	22-28	935	0.615	164.26		5.69	10.54	10.54

1.6	Aa	1	130	16-20	455	0.046	12.29		37.01	1.62	1.62
3.0	Ce	1	155	18-22	575	0.093	24.87		23.12	2.59	2.59
5.0	Cf	1&2	155	18-22	575	0.189	50.55		11.38	5.27	5.27
6.0	Db	1&2	170	19-23	670	0.209	55.87		11.99	5.00	5.00
8.0	Db	1-3	170	19-23	670	0.323	86.35		7.76	7.73	7.73
10.0	Db	1-3	200	21-25	855	0.464	123.91		6.90	8.70	8.70
12.5	Db	1-3	200	21-25	855	0.676	180.80		4.73	12.69	12.69

Butt weld

119

Flat position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: backed

Butt weld

120

H/V position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: single-sided,
unbacked

Butt weld

121

H/V position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Gb	1 1R	180 180	20-24 20-24	740 740	0.042 0.091	11.28 24.33	4.43	65.60 30.42	0.91 1.97	2.89
5.0	Gb	1 1R	205 205	22-28 22-28	895 895	0.102 0.091	27.20 24.33	4.43	32.90 36.79	1.82 1.63	3.45
6.0	Hb	1 1R	205 205	22-28 22-28	895 895	0.110 0.091	29.45 24.33	4.43	30.39 36.79	1.97 1.63	3.61
8.0	Hb	1&2 1R	205 205	22-28 22-28	895 895	0.201 0.091	53.61 24.33	4.43	16.69 36.79	3.59 1.63	5.23
10.0	Hb	1&2 1R	205 205	22-28 22-28	895 895	0.318 0.091	84.87 24.33	4.43	10.55 36.79	5.69 1.63	7.32
12.5	Hb	1-4 1R	205 205	22-28 22-28	895 895	0.501 0.091	133.91 24.33	4.43	6.68 36.79	8.98 1.63	10.61

Butt weld

122

H/V position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: backed

3.0	Sc	1&2	210	23-29	935	0.150	39.96		23.40	2.56	2.56
5.0	Sc	1&2	210	23-29	935	0.278	74.20		12.60	4.76	4.76
6.0	Tb	1-3	210	23-29	935	0.291	77.71		12.03	4.99	4.99
8.0	Tb	1-3	210	23-29	935	0.432	115.57		8.09	7.42	7.42
10.0	Tb	1-4	210	23-29	935	0.601	160.50		5.83	10.30	10.30
12.5	Tb	1-6	210	23-29	935	0.848	226.61		4.13	14.54	14.54

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Ab	1	115	17-21	380	0.046	12.29		30.91	1.94	1.94
3.0	Ce	1	180	20-24	740	0.093	24.37		29.76	2.02	2.02
5.0	Ce	1	180	20-24	740	0.212	56.76		13.04	4.60	4.60
6.0	Ce	1&2	180	20-24	740	0.277	74.07		9.99	6.01	6.01
8.0	Ce	1 2	180 140	20-24 18-22	740 515	0.168 0.266	44.91 71.03		16.48 7.25	3.64 8.27	11.92
10.0	Ce	1 2	180 140	20-24 18-22	740 515	0.169 0.458	45.05 122.43		16.42 4.21	3.65 14.26	17.92
12.5	Ce	1 2&3	180 140	20-24 18-22	740 515	0.169 0.750	45.16 200.36		16.39 2.57	3.66 23.34	27.00

3.0	Ga	1 1R	165 165	19-23 19-23	640 640	0.050 0.091	13.32 24.33	4.43	48.06 26.31	1.25 2.28	3.53
5.0	Ga	1 1R	185 185	20-24 20-24	780 780	0.125 0.091	33.37 24.33	4.43	23.38 32.06	2.57 1.87	4.44
6.0	Ga	1&2 1R	185 185	20-24 20-24	780 780	0.178 0.091	47.51 24.33	4.43	16.42 32.06	3.65 1.87	5.53
8.0	Gb	1 2 1R	185 140 185	20-24 19-24 20-24	780 515 780	0.163 0.111 0.091	43.62 29.66 24.33	4.43	17.88 17.36 32.06	3.36 3.46 1.87	8.68
10.0	Gb	1 2&3 1R	185 140 185	20-24 19-24 20-24	780 515 780	0.164 0.270 0.091	43.85 72.28 24.33	4.43	17.79 7.13 32.06	3.37 8.42 1.87	13.66
12.5	Gb	1 2&3 1R	185 140 185	20-24 19-24 20-24	780 515 780	0.165 0.521 0.091	44.00 139.28 24.33	4.43	17.73 3.70 32.06	3.38 16.23 1.87	21.48

Butt weld

123

Vertical position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: single-sided,
unbacked

Butt weld

124

Vertical position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: sealed

Butt weld

125

Vertical position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: backed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Pc	1	115	17-21	380	0.056	14.97		25.38	2.36	2.36
3.0	Sd	1&2	175	20-24	705	0.184	49.16		14.34	4.18	4.18
5.0	Sb	1	130	18-22	455	0.253	67.52		6.74	8.90	8.90
6.0	Sb	1&2	140	18-22	515	0.326	87.23		5.90	10.16	10.16
8.0	Sb	1&2	140	18-22	515	0.501	133.93		3.85	15.60	15.60
10.0	Sb	1&2	140	18-22	515	0.712	190.31		2.71	22.17	22.17
12.5	Sb	1&2	140	18-22	515	1.027	274.36		1.88	31.96	31.96

Butt weld

126

Overhead position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: single-sided,
unbacked

1.6	Aa	1	95	17-21	275	0.046	12.29		22.37	2.68	2.68
3.0	Cf	1	115	17-22	380	0.096	25.60		14.84	4.04	4.04
5.0	Cf	1	155	19-24	575	0.189	50.55		11.38	5.27	5.27
6.0	Cf	1	155	19-24	575	0.249	66.65		8.63	6.95	6.95
8.0	Cf	1&2	155	19-24	575	0.397	106.11		5.42	11.07	11.07
10.0	Cf	1&2	155	19-24	575	0.581	155.24		3.70	16.20	16.20
12.5	Cf	1-3	155	19-24	575	0.862	230.25		2.50	24.03	24.03

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Pa	1	165	19-23	640	0.043	11.60		55.18	1.09	1.09
3.0	Sc	1	165	19-23	640	0.150	39.96		16.02	3.75	3.75
5.0	Sc	1	165	19-23	640	0.278	74.20		8.63	6.96	6.96
6.0	Sc	1&2	165	19-23	640	0.355	94.96		6.74	8.90	8.90
8.0	Rc	1&2	165	19-23	640	0.462	123.53		5.18	11.58	11.58
10.0	Rc	1-3	165	19-23	640	0.645	172.28		3.71	16.15	16.15
12.5	Rc	1-3	165	19-23	640	0.914	244.19		2.62	22.89	22.89

<i>Flat</i>											
3.0		1R	140	19-23	515	0.231	61.78	2.24	8.34	7.20	
5.0		1R	185	21-26	780	0.231	61.78	2.24	12.63	4.75	
6.0-12.5		1R	210	24-28	935	0.231	61.78	2.24	15.13	3.96	
<i>Horizontal/vertical</i>											
3.0		1R	180	20-24	740	0.231	61.78	2.24	11.98	5.01	
5.0-12.5		1R	205	22-28	895	0.231	61.78	2.24	14.49	4.14	
<i>Vertical</i>											
3.0		1R	165	19-23	640	0.231	61.78	2.24	10.36	5.79	
5.0-12.5		1R	185	20-24	780	0.231	61.78	2.24	12.63	4.75	
<i>Overhead</i>											
3.0-12.5		1R	165	19-23	640	0.231	61.78	2.24	10.36	5.79	

127

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure: backed

128

Butt weld

All positions

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— preparation by
air-arc gouging

Butt weld

129

All positions

CO₂ solid wire

Electrode:

Diameter — 0.8mm

Efficiency — 96%

Procedure:

Sealed — supplement for
sealing run preparation
and welding times

— preparation
by chipping

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
<i>Flat</i>											
3-0		1R	140	19-23	515	0.148	39.54	4.89	13.02	4.61	
5-0		1R	185	22-26	780	0.148	39.54	4.89	19.73	3.04	
6-0-12.5		1R	210	24-28	935	0.148	39.54	4.89	23.64	2.54	
<i>Horizontal/vertical</i>											
3-0		1R	180	20-24	740	0.148	39.54	4.89	18.71	3.21	
5-0-12.5		1R	205	22-28	895	0.148	39.54	4.89	22.63	2.65	
<i>Vertical</i>											
3-0		1R	165	19-23	640	0.148	39.54	4.89	16.18	3.71	
5-0-12.5		1R	185	20-24	780	0.148	39.54	4.89	19.73	3.04	
<i>Overhead</i>											
3-0-12.5		1R	165	19-23	640	0.148	39.54	4.89	16.18	3.71	

Butt weld

130

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: single-sided,
unbacked

1.6	Aa	1	105	15-19	170	0.047	8.34		20.38	2.94	2.94
3.0	Cc	1&2	150	17-21	305	0.088	15.57		19.59	3.06	3.06
5.0	Cc	1&2	150	17-21	305	0.180	31.82		9.58	6.26	6.26
6.0	Cc	1&2	150	17-21	305	0.240	42.27		7.22	8.32	8.32
8.0	Cc	1-3	150	17-21	305	0.384	67.77		4.50	13.33	13.33
10.0	Ba	1-3	205	21-25	520	0.479	84.47		6.16	9.75	9.75
12.5	Ba	1 2-4	205 255	21-25 27-31	520 745	0.152 0.550	26.78 97.00		19.41 7.68	3.09 7.81	10.90
15.0	Ba	1 2-5	205 255	21-25 26-30	520 745	0.152 0.815	26.78 143.77		19.42 5.18	3.09 11.58	14.67
20.0	Ba	1 2 3-6	205 255 320	21-25 26-30 33-37	520 745 1100	0.151 0.112 1.359	26.66 19.67 239.60		19.51 37.87 4.59	3.08 1.58 13.07	17.73
25.0	Ba	1 2 3-8	205 255 320	21-25 26-30 33-37	520 745 1100	0.150 0.111 2.175	26.48 19.54 383.63		19.64 38.14 2.87	3.05 1.57 20.93	25.55

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Gb	1 1R	190 190	19-23 19-23	455 455	0.041 0.105	7.28 18.46	6.15	62.52 24.64	0.96 2.43	3.39
5.0	Gb	1 1R	190 190	19-23 19-23	455 455	0.095 0.105	16.82 18.46	6.15	27.06 24.64	2.22 2.43	4.65
6.0	Gb	1 1R	190 190	19-23 19-23	455 455	0.143 0.105	25.14 18.46	6.15	18.10 24.64	3.32 2.43	5.75
8.0	Gb	1 1R	190 190	19-23 19-23	455 455	0.263 0.105	46.44 18.46	6.15	9.80 24.64	6.12 2.43	8.56
10.0	Fa	1&2 1R	240 240	23-29 23-29	685 685	0.336 0.105	59.30 18.46	6.15	11.55 37.10	5.19 1.62	6.81
12.5	Fa	1-3 1R	240 240	23-29 23-29	685 685	0.532 0.105	93.77 18.46	6.15	7.30 37.10	8.21 1.62	9.83
15.0	Fa	1-4 1R	240 240	23-29 23-29	685 685	0.770 0.105	135.77 18.46	6.15	5.05 37.10	11.89 1.62	13.51
20.0	Fb	1&2 3-5 1R	290 320 320	25-31 32-38 32-38	945 1100 1100	0.256 0.918 0.105	45.12 161.86 18.46	6.15	20.95 6.80 59.58	2.86 8.83 1.01	12.70
25.0	Fb	1&2 3-6 1R	290 320 320	25-31 32-38 32-38	945 1100 1100	0.254 1.635 0.105	44.86 288.34 18.46	6.15	21.06 3.81 59.58	2.85 15.73 1.01	19.58
20.0 DV	Lb	1&2 1R&2R	290 290	26-32 26-32	945 945	0.336 0.336	59.30 59.30	6.15	15.93 15.93	3.77 3.77	7.54
25.0 DV	Lb	1&2 3 1R&2R 3R	290 320 290 320	26-32 32-38 26-32 32-38	945 1100 945 1100	0.324 0.274 0.364 0.274	57.18 48.41 64.12 48.41	6.15	16.53 22.72 14.74 22.72	3.63 2.64 4.07 2.64	12.98

For double V welds sealed in the overhead position, substitute the procedures below for those shown above.

For all other welds sealed in the overhead position, substitute the sealing run data shown below:

3.0-25.0		1R	155	18-22	320	0.105	18.46	6.15	17.33	3.46	
20.0 DV	Ja	1 2&3 1R 2R	290 320 190 160	26-32 32-38 19-23 18-22	945 1100 455 335	0.324 0.282 0.118 0.064	57.18 49.76 20.86 11.36	6.15	16.53 22.14 21.82 29.50	3.63 2.71 2.75 2.03	11.12
25.0 DV	Ja	1 2-4 1R 2R&3R	290 320 190 160	26-32 32-38 19-23 18-22	945 1100 455 335	0.324 0.716 0.120 0.195	57.18 126.22 21.11 34.41	6.15	16.53 8.72 21.55 9.74	3.63 6.88 2.78 6.16	19.46

Butt weld

132

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: backed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Sd	1&2	180	18-24	410	0.176	31.06		13.20	4.55	4.55
5.0	Sd	1&2	240	22-28	685	0.316	55.72		12.29	4.88	4.88
6.0	Qb	1&2	240	22-28	685	0.270	47.64		14.33	4.17	4.17
8.0	Qb	1-3	240	22-28	685	0.381	67.24		10.19	5.89	5.89
10.0	Qb	1-3	275	25-31	870	0.508	89.58		9.71	6.18	6.18
12.5	Qb	1-4	300	26-32	1005	0.688	121.30		8.29	7.24	7.24
15.0	Qb	1-5	300	26-32	1005	0.891	157.16		6.39	9.38	9.38
20.0	Qb	1-3 4-6	300 320	26-32 32-38	1005 1100	0.322 1.044	56.86 184.14		17.67 5.97	3.39 10.04	13.44
25.0	Qb	1-3 4-7	300 320	26-32 32-38	1005 1100	0.373 1.558	65.72 274.80		15.29 4.00	3.92 14.99	18.91

Butt weld

133

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: single-sided, unbacked

1.6	Aa	1	130	14-19	245	0.047	8.34		29.37	2.04	2.04
3.0	Aa	1	180	18-23	425	0.047	8.34		50.95	1.18	1.18
5.0	Ca	1	180	18-23	425	0.110	19.34		21.98	2.73	2.73
6.0	Cd	1&2	190	19-24	455	0.213	37.49		12.14	4.94	4.94
8.0	Cd	1-3	190	19-24	455	0.349	61.47		7.40	8.11	8.11
10.0	Da	1&2 3&4	235 190	23-28 19-24	670 455	0.288 0.116	50.81 20.54		13.19 22.15	4.55 2.71	7.26
12.5	Da	1&2 3&4	235 190	23-28 19-24	670 455	0.414 0.171	73.00 30.21		9.18 15.06	6.54 3.98	10.52
15.0	Da	1-4 5-7	235 190	23-28 19-24	670 455	0.562 0.237	99.09 41.83		6.76 10.88	8.87 5.52	14.39
20.0	Da	1-6 7-9	235 190	23-28 19-24	670 455	0.992 0.332	174.88 58.61		3.83 7.76	15.66 7.73	23.39
25.0	Da	1-9 10-14	235 190	23-28 19-24	670 455	1.550 0.425	273.34 74.95		2.45 6.07	24.48 9.88	34.36

Butt weld

H V position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Ea	1 1R	165 165	15-21 15-21	365 365	0.033 0.105	5.82 18.46	6.15	62.71 19.77	0.96 3.04	3.99
5.0	Ea	1 1R	180 180	17-23 17-23	425 425	0.033 0.105	5.82 18.46	6.15	73.02 23.02	0.82 2.61	3.43
6.0	Eb	1 1R	180 180	17-23 17-23	425 425	0.064 0.105	11.21 18.46	6.15	37.91 23.02	1.58 2.61	4.19
8.0	Ha	1 2 1R	235 180 180	22-28 17-23 17-23	670 425 425	0.125 0.111 0.105	21.97 19.63 18.46	6.15	30.49 21.65 23.02	1.97 2.77 2.61	7.35
10.0	Ha	1&2 3 1R	235 180 180	22-28 17-23 17-23	670 425 425	0.181 0.169 0.105	31.89 29.89 18.46	6.15	21.01 14.22 23.02	2.86 4.22 2.61	9.68
12.5	Ha	1&2 3&4 1R	235 180 180	22-28 17-23 17-23	670 425 425	0.323 0.201 0.105	56.93 35.43 18.46	6.15	11.77 12.00 23.02	5.10 5.00 2.61	12.71
15.0	Ha	1-3 4&5 1R	235 180 180	22-28 17-23 17-23	670 425 425	0.409 0.321 0.105	72.13 56.68 18.46	6.15	9.29 7.50 23.02	6.46 8.00 2.61	17.07
20.0	Ha	1-4 5-7 1R	235 180 180	22-28 17-23 17-23	670 425 425	0.666 0.575 0.105	117.45 101.48 18.46	6.15	5.70 4.19 23.02	10.52 14.33 2.61	27.45
25.0	Ha	1-7 8-11 1R	235 180 180	22-28 17-23 17-23	670 425 425	1.126 0.753 0.105	198.64 132.73 18.46	6.15	3.37 3.20 23.02	17.79 18.74 2.61	39.13
20.0 DV	Na	1&2 3 1R&2R 3R	235 190 235 190	22-28 18-24 22-28 18-24	670 455 670 455	0.181 0.169 0.181 0.169	31.89 29.89 31.89 29.89	6.15	21.01 13.27 21.01 13.27	2.86 4.52 2.86 4.52	14.76
25.0 DV	Na	1&2 3&4 1R&2R 3R&4R	235 190 235 190	22-28 18-24 22-28 18-24	670 455 670 455	0.323 0.201 0.323 0.201	56.93 35.43 56.93 35.43	6.15	11.77 11.21 11.77 11.21	5.10 5.35 5.10 5.35	20.90

1.6	Pc	1	135	13-19	260	0.054	9.51		27.34	2.19	2.19
3.0	Pd	1&2	180	17-23	425	0.095	16.81		25.28	2.37	2.37
5.0	Pe	1 2	245 180	21-28 17-23	700 425	0.100 0.085	17.64 15.00		39.73 28.30	1.51 2.12	3.63
6.0	Sb	1 2&3	245 180	21-28 17-23	700 425	0.151 0.163	26.66 28.75		26.25 14.78	2.29 4.06	6.34
8.0	Sb	1 2-4	245 180	21-28 17-23	700 425	0.152 0.332	26.78 58.50		26.13 7.27	2.30 8.26	10.55
10.0	Ta	1 2&3	245 180	21-28 17-23	700 425	0.202 0.277	35.59 48.80		19.67 8.71	3.05 6.89	9.94
12.5	Ta	1&2 3-5	245 180	21-28 17-23	700 425	0.273 0.406	48.12 71.67		14.55 5.93	4.12 10.12	14.24
15.0	Ta	1-3 4-6	245 180	21-28 17-23	700 425	0.444 0.468	78.37 82.61		8.93 5.14	6.72 11.66	18.38
20.0	Ta	1-6 7-9	245 180	21-28 17-23	700 425	0.905 0.571	159.58 100.75		4.39 4.22	13.68 14.22	27.90
25.0	Ta	1-9 10-14	245 180	21-28 17-23	700 425	1.432 0.733	252.50 129.21		2.77 3.29	21.64 18.24	39.88

Butt weld

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: backed

Butt weld

136

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Ab	1	130	15-19	245	0.056	9.82		24.95	2.40	2.40
3.0	Cf	1	160	17-21	335	0.091	16.00		20.94	2.87	2.87
5.0	Cf	1&2	180	18-23	425	0.182	32.08		13.25	4.53	4.53
6.0	Ba	1 2	190 150	19-24 17-21	455 305	0.150 0.062	26.41 10.92		17.24 27.91	3.48 2.15	5.63
8.0	Ba	1 2	190 150	19-24 17-21	455 305	0.151 0.181	26.59 31.86		17.11 9.57	3.51 6.27	9.77
10.0	Ba	1 2	180 150	18-23 17-21	425 305	0.152 0.327	26.73 57.74		15.90 5.28	3.77 11.36	15.13
12.5	Ba	1 2	180 170	18-23 17-21	425 380	0.177 0.525	31.20 92.59		13.62 4.10	4.40 14.62	19.02
15.0	Ba	1 2-3	180 170	18-23 17-21	425 380	0.177 0.790	31.19 139.36		13.63 2.73	4.40 22.00	26.41
20.0	Ba	1-3	180	18-23	425	1.621	285.93		1.49	40.37	40.37
25.0	Ba	1-4	180	18-23	425	2.436	429.64		0.99	60.66	60.66

Butt weld

137

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: sealed

3.0	Ea	1 1R	180 180	19-24 19-24	425 425	0.033 0.105	5.82 18.46	6.15	73.02 23.02	0.32 2.61	3.43
5.0	Ga	1 1R	160 160	18-23 18-23	350 350	0.118 0.105	20.78 18.46	6.15	16.84 18.96	3.56 3.17	6.73
6.0	Ga	1 1R	160 160	18-23 18-23	350 350	0.169 0.105	29.89 18.46	6.15	11.71 18.96	5.12 3.17	8.29
8.0	Ga	1 1R	160 160	17-22 18-23	350 350	0.299 0.105	52.73 18.46	6.15	6.64 18.96	9.04 3.17	12.20
10.0	Fa	1 1R	160 160	17-22 18-23	350 350	0.336 0.105	59.30 18.46	6.15	5.90 18.96	10.17 3.17	13.33
12.5	Fa	1&2 1R	160 160	17-22 18-23	350 350	0.532 0.105	93.77 18.46	6.15	3.73 18.96	16.08 3.17	19.24
15.0	Fa	1&2 1R	160 160	17-22 18-23	350 350	0.770 0.105	135.77 18.46	6.15	2.58 18.96	23.27 3.17	26.44
20.0	Fa	1&2 1R	160 190	17-22 20-25	350 455	1.371 0.105	241.85 18.46	6.15	1.45 24.64	41.46 2.43	43.89
25.0	Fa	1-3 1R	160 190	17-22 20-25	350 455	2.135 0.105	376.57 18.46	6.15	0.93 24.64	64.56 2.43	66.99
20.0 DV	La	1 1R	160 160	18-23 18-23	350 350	0.390 0.390	68.85 68.85	6.15	5.08 5.08	11.80 11.80	23.60
25.0 DV	La	1&2 1R&2R	160 160	18-23 18-23	350 350	0.634 0.634	111.75 111.75	6.15	3.13 3.13	19.16 19.16	38.32

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Pd	1	185	19-23	440	0.067	11.75		37.45	1.60	1.60
3.0	Pe	1 2	185 170	19-23 18-22	440 380	0.107 0.036	18.81 4.04		23.35 69.77	2.57 0.86	3.43
5.0	Sc	1 2	185 155	19-23 17-21	440 320	0.145 0.122	25.62 21.46		17.18 14.91	3.49 4.02	7.52
6.0	Sb	1	160	17-21	350	0.314	55.41		6.32	9.50	9.50
8.0	Sb	1	160	17-21	350	0.484	85.28		4.10	14.62	14.62
10.0	Rb	1	185	18-22	440	0.577	101.76		4.32	13.88	13.88
12.5	Rb	1	185	18-22	440	0.825	145.58		3.02	19.85	19.85
15.0	Rb	1-3	185	18-22	440	1.116	196.77		2.24	26.83	26.83
20.0	Rb	1-3	185	18-22	440	1.819	320.80		1.37	43.75	43.75
25.0	Rb	1-3	185	18-22	440	2.681	472.87		0.93	64.48	64.48

138

Butt weld

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: backed

1.6	Aa	1	110	14-18	180	0.033	5.82		30.93	1.94	1.94
3.0	Ac	1	140	16-20	275	0.060	10.63		25.88	2.32	2.32
5.0	Cf	1	150	17-21	305	0.168	29.56		10.32	5.81	5.81
6.0	Cf	1 2	170 150	18-22 17-21	380 305	0.125 0.101	22.02 17.89		17.26 17.05	3.48 3.52	7.00
8.0	Cf	1 2&3	170 150	18-22 17-21	380 305	0.126 0.244	22.22 42.99		17.10 7.10	3.51 8.46	11.97
10.0	Ba	1 2&3	190 160	19-23 18-22	455 335	0.177 0.288	31.13 50.81		14.62 6.59	4.11 9.10	13.21
12.5	Ba	1 2&3	190 160	19-23 18-22	455 335	0.177 0.511	31.20 90.07		14.58 3.72	4.11 16.13	20.25
15.0	Ba	1 2-4	190 160	19-23 18-22	455 335	0.177 0.776	31.19 136.84		14.59 2.45	4.11 24.51	28.62
20.0	Ba	1 2-5	190 160	19-23 18-22	455 335	0.203 1.404	35.79 247.62		12.71 1.35	4.72 44.35	49.07
25.0	Ba	1 2-6	190 160	19-23 18-22	455 335	0.202 2.220	35.55 391.57		12.80 0.86	4.69 70.13	74.82

139

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: single-sided, unbacked

Butt weld

140

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure: backed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
1.6	Pc	1	125	14-19	230	0.054	5.51		24.19	2.48	2.48
3.0	Pd	1 2	140 125	15-20 14-19	275 230	0.067 0.028	11.86 4.95		23.17 46.51	2.59 1.29	3.88
5.0	Sb	1 2	160 125	17-22 14-19	350 230	0.044 0.198	7.81 34.96		44.83 6.58	1.34 9.12	10.46
6.0	Sb	1 2	160 150	17-22 15-20	350 305	0.091 0.224	15.97 39.44		21.92 7.73	2.74 7.76	10.50
8.0	Sb	1 2	160 150	17-22 15-20	350 305	0.152 0.332	26.78 58.50		13.07 5.21	4.59 11.51	16.10
10.0	Rb	1&2 3	175 155	17-22 16-21	395 320	0.280 0.297	49.43 52.33		7.99 6.11	7.51 9.81	17.32
12.5	Rb	1&2 3	175 155	17-22 16-21	395 320	0.352 0.473	62.16 83.42		6.35 3.84	9.44 15.64	25.08
15.0	Rb	1-3 4&5	175 155	17-22 16-21	395 320	0.475 0.641	83.77 113.01		4.72 2.83	12.72 21.19	33.91
20.0	Rb	1-3 4-6	175 160	17-22 16-21	395 350	0.663 1.156	116.98 203.82		3.38 1.72	17.77 34.94	52.71
25.0	Rb	1-4 5-7	175 160	17-22 16-21	395 350	1.342 1.339	236.75 236.12		1.67 1.48	35.96 40.48	76.44

Butt weld

141

All positions

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— preparation by
air-arc gouging

<i>Flat</i>											
3.0-6.0		1R	190	19-23	455	0.234	41.24	2.24	11.03	5.44	
8.0-12.5		1R	240	23-29	685	0.234	41.24	2.24	16.61	3.61	
15.0-25.0		1R	320	32-38	1100	0.234	41.24	2.24	26.67	2.25	
20.0 DV		1R	290	25-31	945	0.240	42.29	2.24	22.35	2.68	
25.0 DV		1R-4R	290	25-31	945	0.409	72.18	2.24	13.09	4.58	
<i>Horizontal/vertical</i>											
3.0		1R	165	15-21	365	0.234	41.24	2.24	8.85	6.78	
5.0-25.0		1R	180	17-23	425	0.234	41.24	2.24	10.31	5.82	
20.0 DV		1R-3R	235	22-28	670	0.350	61.78	2.24	10.84	5.53	
25.0 DV		1R-5R	235	22-28	670	0.524	92.36	2.24	7.25	8.27	
<i>Vertical</i>											
3.0		1R	180	19-24	425	0.234	41.24	2.24	10.31	5.82	
5.0-12.5		1R	160	18-23	350	0.234	41.24	2.24	8.49	7.07	
15.0-25.0		1R	190	20-25	455	0.234	41.24	2.24	11.03	5.44	
20.0 DV		1R&2R	190	20-25	455	0.336	59.30	2.24	7.67	7.82	
25.0 DV		1R-3R	190	20-25	455	0.532	93.77	2.24	4.85	12.37	
<i>Overhead</i>											
3.0-25.0		1R	155	18-22	320	0.234	41.24	2.24	7.76	7.73	
20.0 DV		1R	190	19-23	455	0.082	14.47	2.24	31.45	1.91	
25.0 DV		1R&2R 3R-5R	190 160	19-23 18-22	455 335	0.248 0.072	43.66 12.70	2.24	10.42 26.37	5.76 2.28	

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
Flat											
3-0-6-0		1R	190	19-23	455	0.151	26.56	5.32	17.13	3.50	
8-0-12.5		1R	240	23-29	685	0.151	26.56	5.32	25.79	2.33	
15-0-25.0		1R	320	32-38	1100	0.151	26.56	5.32	41.41	1.45	
20-0 DV		1R&2R 3R&4R	290 320	25-31 32-38	945 1100	0.259 0.370	45.63 65.34	8.69	20.71 16.84	2.90 3.56	
25-0 DV		1R&2R 3R-5R	290 320	25-31 32-38	945 1100	0.259 0.737	45.67 130.07	8.69	20.69 8.46	2.90 7.09	
Horizontal/vertical											
3-0		1R	165	15-21	365	0.151	26.56	5.32	13.74	4.37	
5-0-25.0		1R	180	17-23	425	0.151	26.56	5.32	16.00	3.75	
20-0 DV		1R&2R 3R&4R	235 180	22-28 17-23	670 425	0.426 0.203	75.09 35.88	8.69	8.92 11.84	6.72 5.07	
25-0 DV		1R-3R 4R-6R	235 180	22-28 17-23	670 425	0.654 0.342	115.38 60.35	8.69	5.81 7.04	10.33 8.52	
Vertical											
3-0		1R	180	19-24	425	0.151	26.56	5.32	16.00	3.75	
5-0-12.5		1R	160	18-23	350	0.151	26.56	5.32	13.18	4.55	
15-0-25.0		1R	190	20-25	455	0.151	26.56	5.32	17.13	3.50	
20-0 DV		1R&2R	190	20-25	455	0.733	129.34	8.69	3.52	17.06	
25-0 DV		1R-3R	190	20-25	455	1.156	203.91	8.69	2.23	26.89	
Overhead											
3-0-25.0		1R	155	18-22	320	0.151	26.56	5.32	12.05	4.98	
20-0 DV		1R&2R 3R&4R	190 160	19-23 18-22	455 335	0.143 0.143	25.19 25.24	8.69	18.06 13.27	3.32 4.52	
25-0 DV		1R&2R 3R-5R	190 160	19-23 18-22	455 335	0.143 0.293	25.27 51.71	8.69	18.01 6.48	3.33 9.26	

3-0	Ab	1	165	18-22	215	0.069	8.29		25.94	2.31	2.31
5-0	Cf	1&2	165	18-22	215	0.188	22.52		9.55	6.29	6.29
6-0	Cf	1&2	175	20-24	240	0.246	29.55		8.12	7.39	7.39
8-0	Cf	1&2	175	20-24	240	0.390	46.71		5.14	11.68	11.68
10-0	Ba	1&2	175	20-24	240	0.484	58.04		4.13	14.51	14.51
12.5	Ba	1-3	175	20-24	240	0.707	84.71		2.83	21.18	21.18
15-0	Ba	1-4	175	20-24	240	0.971	116.44		2.06	29.11	29.11
20-0	Ba	1-5	175	20-24	240	1.624	194.70		1.23	48.67	48.67
25-0	Ba	1-7	175	20-24	240	2.437	292.15		0.82	73.04	73.04

142

Butt weld

All positions

CO₂ solid wire

Electrode:

Diameter — 1.0mm

Efficiency — 95%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— preparation by
chipping

143

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: single-sided,
unbacked

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter - 1.2mm

Efficiency — 95%

Procedure: sealed

144

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Eb	1 1R	155 155	18-22 18-22	195 195	0.048 0.120	5.74 14.44	6.79	34.00 13.51	1.76 4.44	6.21
5-0	Ea	1 1R	205 205	22-26 22-26	305 305	0.033 0.120	3.96 14.44	6.79	77.09 21.13	0.78 2.84	3.62
6-0	Ec	1 1R	205 205	22-26 22-26	305 305	0.085 0.120	10.21 14.44	6.79	29.87 21.13	2.01 2.84	4.85
8-0	Fb	1 1R	205 205	22-26 22-26	305 305	0.135 0.120	16.15 14.44	6.79	18.88 21.13	3.18 2.84	6.02
10-0	Fb	1&2 1R	245 245	25-29 25-29	415 415	0.239 0.120	28.60 14.44	6.79	14.51 28.75	4.13 2.09	6.22
12.5	Fb	1-3 1R	245 245	25-29 25-29	415 415	0.408 0.120	48.87 14.44	6.79	8.49 28.75	7.07 2.09	9.15
15.0	Fb	1-4 1R	305 305	28-32 28-32	605 605	0.620 0.120	74.30 14.44	6.79	8.14 41.91	7.37 1.43	8.80
20-0	Fb	1-5 1R	305 305	28-32 28-32	605 605	1.170 0.120	140.30 14.44	6.79	4.31 41.91	13.91 1.43	15.35
25.0	Fb	1-5 1R	385 385	31-35 31-35	885 885	1.884 0.120	225.92 14.44	6.79	3.92 61.30	15.32 0.98	16.30
20-0 DV	Lc	1&2 1R&2R	305 305	28-32 28-32	605 605	0.301 0.301	36.08 36.08	6.79	16.77 16.77	3.58 3.58	7.16
25.0 DV	Lc	1&2 1R&2R	365 365	31-35 31-35	820 820	0.574 0.574	68.81 68.81	6.79	11.92 11.92	5.03 5.03	10.06
For double V welds sealed in the overhead position, substitute the procedures below for those given above.											
For all other welds sealed in the overhead position, substitute the sealing run values only.											
3-0-25.0		1R	150	17-21	180	0.120	14.44	6.79	12.47	4.81	
20-0 DV		1-3 1R&2R	305 155	28-32 18-22	605 200	0.840 0.300	100.70 35.98	6.79	6.01 5.56	9.99 10.79	20.78
25.0 DV		1-4 1R&2R	305 155	28-32 18-22	605 200	1.282 0.427	153.74 51.18	6.79	3.94 3.91	15.25 15.35	30.60

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Pc	1	175	19-23	240	0.071	8.54		28.11	2.13	2.13
5-0	Pf	1&2	205	22-26	305	0.219	26.28		11.61	5.17	5.17
6-0	Qb	1&2	205	22-26	305	0.269	32.21		9.47	6.34	6.34
8-0	Qb	1&2	205	22-26	305	0.379	45.48		6.71	8.95	8.95
10-0	Qb	1-3	245	25-29	415	0.506	60.62		6.85	8.76	8.76
12.5	Qb	1-4	245	25-29	415	0.685	82.12		5.05	11.87	11.87
15-0	Qb	1-4	305	28-32	605	0.888	106.42		5.68	10.55	10.55
20-0	Qb	1-4	305	28-32	605	1.362	163.24		3.71	16.19	16.19
25-0	Re	1-8	385	31-35	885	3.148	377.47		2.34	25.59	25.59

145

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter -- 1.2mm

Efficiency -- 95%

Procedure: backed

3-0	Ab	1	155	18-22	195	0.069	8.29		23.52	2.55	2.55
5-0	Cc	1	155	18-22	195	0.186	22.35		8.72	6.88	6.88
6-0	Cf	1&2	155	18-22	195	0.246	29.55		6.60	9.09	9.09
8-0	Cf	1-3	155	18-22	195	0.390	46.71		4.17	14.37	14.37
10-0	Db	1-3	160	18-22	210	0.451	54.12		3.88	15.46	15.46
12.5	Db	1-4	160	18-22	210	0.655	78.56		2.67	22.45	22.45
15-0	Db	1-6	160	18-22	210	0.897	107.58		1.95	30.74	30.74
20-0	Db	1-7	160	18-22	210	1.493	179.02		1.17	51.15	51.15
25-0	Db	1-12	160	18-22	210	2.234	267.83		0.78	76.52	76.52

146

Butt weld

H V position

CO₂ solid wire

Electrode:

Diameter -- 1.2mm

Efficiency -- 95%

Procedure: single-sided, unbacked

Butt weld

147

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Ea	1 1R	160 160	18-22 18-22	210 210	0.033 0.120	3.96 14.44	6.79	53.03 14.55	1.13 4.12	5.26
5.0	Gc	1 1R	195 195	22-26 22-26	280 280	0.074 0.120	8.92 14.44	6.79	31.40 19.39	1.91 3.09	5.00
6.0	Gd	1 1R	195 195	22-26 22-26	280 280	0.074 0.120	8.92 14.44	6.79	31.40 19.39	1.91 3.09	5.00
8.0	Gd	1 1R	195 195	22-26 22-26	280 280	0.168 0.120	20.20 14.44	6.79	13.86 19.39	4.33 3.09	7.42
10.0	Hc	1&2 1R	195 195	22-26 22-26	280 280	0.215 0.120	25.81 14.44	6.79	10.85 19.39	5.53 3.09	8.62
12.5	Hc	1-3 1R	245 245	25-29 25-29	415 415	0.368 0.120	44.14 14.44	6.79	9.40 28.75	6.38 2.09	8.47
15.0	Hc	1-5 1R	245 245	25-29 25-29	415 415	0.560 0.120	67.15 14.44	6.79	6.18 28.75	9.71 2.09	11.80
20.0	Hc	1-7 1R	245 245	25-29 25-29	415 415	1.058 0.120	126.89 14.44	6.79	3.27 28.75	18.35 2.09	20.43
25.0	Hc	1-11 1R	245 245	25-29 25-29	415 415	1.705 0.120	204.41 14.44	6.79	2.03 28.75	29.55 2.09	31.64
20.0 DV	Nc	1-6 1R-6R	215 215	23-27 23-27	330 330	0.791 0.791	94.83 94.83	6.79	3.43 3.43	17.24 17.24	34.48
25.0 DV	Nc	1-9 1R-10R	215 215	23-27 23-27	330 330	1.177 1.177	141.12 141.12	6.79	2.34 2.34	25.66 25.66	51.32

Butt weld

148

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: backed

3.0	Sc	1	160	18-22	210	0.141	16.95		12.39	4.84	4.84
5.0	Sd	1&2	215	22-26	330	0.315	37.73		8.75	6.86	6.86
6.0	Sd	1&2	215	22-26	330	0.397	47.65		6.93	8.66	8.66
8.0	Sd	1-4	215	22-26	330	0.589	70.59		4.68	12.83	12.83
10.0	Tc	1-4	215	22-26	330	0.660	79.15		4.17	14.39	14.39
12.5	Td	1-7	215	22-26	330	1.018	122.03		2.70	22.19	22.19
15.0	Td	1-10	215	22-26	330	1.327	159.09		2.07	28.92	28.92
20.0	Td	1-14	215	22-26	330	2.054	246.21		1.34	44.77	44.77
25.0	Td	1-18	215	22-26	330	2.921	350.17		0.94	63.67	63.67

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Ce	1&2	160	16-21	210	0.111	13.33		15.76	3.81	3.81
5-0	Ce	1&2	160	16-21	210	0.211	25.26		8.31	7.22	7.22
6-0	Cg	1&2	160	16-21	210	0.274	32.90		6.38	9.40	9.40
8-0	Cg	1&2	160	16-21	210	0.425	50.97		4.12	14.56	14.56
10-0	Cg	1-3	160	16-21	210	0.610	73.14		2.87	20.90	20.90
12.5	Cg	1-3	160	16-21	210	0.889	106.58		1.97	30.45	30.45
15.0	Cg	1-3	160	16-21	210	1.220	146.26		1.44	41.79	41.79
20.0	Cg	1-4	160	16-21	210	2.035	243.96		0.86	69.70	69.70
25.0	Cg	1-5	160	16-21	210	3.048	365.39		0.57	104.40	104.40

149

Butt weld

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: single-sided, unbacked

3-0	Ec	1 1R	160 160	17-21 17-21	210 210	0.060 0.120	7.14 14.44	6.79	29.42 14.55	2.04 4.12	6.16
5-0	Gk	1 1R	160 160	17-21 17-21	210 210	0.191 0.120	22.88 14.44	6.79	9.18 14.55	6.54 4.12	10.66
6-0	Gk	1&2 1R	160 160	17-21 17-21	210 210	0.253 0.120	30.35 14.44	6.79	6.92 14.55	8.67 4.12	12.80
8-0	Gk	1&2 1R	160 160	17-21 17-21	210 210	0.404 0.120	48.41 14.44	6.79	4.34 14.55	13.83 4.12	17.96
10-0	Gk	1&2 1R	160 160	17-21 17-21	210 210	0.589 0.120	70.59 14.44	6.79	2.97 14.55	20.17 4.12	24.29
12.5	Gk	1-3 1R	160 160	17-21 17-21	210 210	0.868 0.120	104.02 14.44	6.79	2.02 14.55	29.72 4.12	33.85
15.0	Gk	1-3 1R	160 160	17-21 17-21	210 210	1.199 0.120	143.71 14.44	6.79	1.46 14.55	41.06 4.12	45.18
20.0	Gk	1-3 1R	160 160	17-21 17-21	210 210	2.013 0.120	241.40 14.44	6.79	0.87 14.55	68.97 4.12	73.10
25.0	Gk	1-5 1R	160 160	17-21 17-21	210 210	3.026 0.120	362.84 14.44	6.79	0.58 14.55	103.67 4.12	107.79
20.0 DV	Md	1-3 1R&2R	155 155	16-21 16-21	195 195	0.728 0.728	87.29 87.29	6.79	2.23 2.23	26.86 26.86	53.72
25.0 DV	Md	1-3 1R&2R	155 155	16-21 16-21	195 195	1.038 1.038	124.50 124.50	6.79	1.57 1.57	38.31 38.31	76.62

150

Butt weld

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: sealed

Butt weld

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: backed

151

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Sd	1&2	155	17-21	195	0.175	21.01		9.28	6.46	6.46
5.0	Sd	1&2	155	17-21	195	0.315	37.73		5.17	11.61	11.61
6.0	Sd	1&2	155	17-21	195	0.397	47.65		4.09	14.66	14.66
8.0	Sd	1&2	155	17-21	195	0.589	70.59		2.76	21.72	21.72
10.0	Sd	1&2	155	17-21	195	0.814	97.59		2.00	30.03	30.03
12.5	Sd	1-3	155	17-21	195	1.142	136.97		1.42	42.14	42.14
15.0	Sc	1-3	155	17-21	195	1.400	167.90		1.16	51.66	51.66
20.0	Sc	1-4	155	17-21	195	2.276	272.85		0.71	83.95	83.95
25.0	Sc	1-5	155	17-21	195	3.347	401.30		0.49	123.48	123.48

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: single-sided,
unbacked

152

3.0	Ca	1	150	17-22	180	0.062	7.48		24.07	2.49	2.49
5.0	Cf	1	150	17-22	180	0.188	22.52		7.99	7.51	7.51
6.0	Ba	1&2	150	17-22	180	0.218	26.08		6.90	8.69	8.69
8.0	Ba	1&2	150	17-22	180	0.337	40.40		4.46	13.47	13.47
10.0	Ba	1&2	150	17-22	180	0.484	58.04		3.10	19.35	19.35
12.5	Ba	1-3	150	17-22	180	0.707	84.71		2.12	28.24	28.24
15.0	Ba	1-4	150	17-22	180	0.971	116.44		1.55	38.81	38.81
20.0	Ba	1-5	150	17-22	180	1.624	194.70		0.92	64.90	64.90
25.0	Ba	1-6	150	17-22	180	2.437	292.15		0.62	97.38	97.38

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Sc	1&2	150	17-22	180	0.141	16.95		10.62	5.65	5.65
5-0	Sc	1&2	150	17-22	180	0.266	31.86		5.65	10.62	10.62
6-0	Rc	1&2	150	17-22	180	0.295	35.38		5.09	11.79	11.79
8-0	Rc	1-3	150	17-22	180	0.443	53.08		3.39	17.69	17.69
10-0	Rc	1-3	150	17-22	180	0.618	74.07		2.43	24.69	24.69
12.5	Rc	1-3	150	17-22	180	0.875	104.88		1.72	34.96	34.96
15-0	Rc	1-4	150	17-22	180	1.173	140.67		1.28	46.89	46.89
20-0	Rc	1-5	150	17-22	180	1.892	226.88		0.79	75.63	75.63
25-0	Rc	1-6	150	17-22	180	2.769	332.00		0.54	110.67	110.67

153

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency — 95%

Procedure: backed

<i>Flat</i>											
3-0		1R	155	18-22	195	0.245	29.43	2.24	6.63	9.05	
5.0-8.0		1R	205	22-26	305	0.245	29.43	2.24	10.36	5.79	
10.0-12.5		1R	245	25-29	415	0.245	29.43	2.24	14.10	4.25	
15.0-20.0		1R	305	28-32	605	0.245	29.43	2.24	20.56	2.92	
25.0		1R	385	31-35	885	0.245	29.43	2.24	30.07	2.00	
20.0 DV		1R	305	28-32	605	0.183	21.95	2.24	27.56	2.18	
25.0 DV		1R&2R	365	31-35	820	0.335	40.14	2.24	20.43	2.94	
<i>Horizontal/vertical</i>											
3-0		1R	160	18-22	210	0.245	29.43	2.24	7.14	8.41	
5.0-10.0		1R	195	22-26	280	0.245	29.43	2.24	9.51	6.31	
12.5-25.0		1R	245	25-29	415	0.245	29.43	2.24	14.10	4.25	
20.0 DV		1R-7R	215	23-27	330	0.717	85.97	2.24	3.84	15.63	
25.0 DV		1R-10R	215	23-27	330	1.038	124.48	2.24	2.65	22.63	
<i>Vertical</i>											
3.0-25.0		1R	160	17-21	210	0.245	29.43	2.24	7.14	8.41	
20.0 DV		1R&2R	155	16-21	195	0.728	87.29	2.24	2.23	26.86	
25.0 DV		1R&2R	155	16-21	195	1.038	124.50	2.24	1.57	38.31	
<i>Overhead</i>											
3.0-25.0		1R	150	17-22	180	0.245	29.43	2.24	6.12	9.81	
20.0 DV		1R&2R	155	18-22	200	0.233	27.93	2.24	7.16	8.38	
25.0 DV		1R&2R	155	18-22	200	0.338	40.56	2.24	4.93	12.17	

154

Butt weld

All positions

CO₂ solid wire

Electrode:

Diameter — 1.2mm

Efficiency 95%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

preparation by
air-arc gouging

Butt weld

155

All positions

CO₂ solid wire

Electrode:

Diameter — 1.2 mm

Efficiency — 95%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times— preparation by
chipping

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
Flat											
3-0		1R	155	18-22	195	0.162	19.45	5.32	10.02	5.99	
5.0-8.0		1R	205	22-26	305	0.162	19.45	5.32	15.68	3.83	
10.0-12.5		1R	245	25-29	415	0.162	19.45	5.32	21.33	2.81	
15.0-20.0		1R	305	28-32	605	0.162	19.45	5.32	31.10	1.93	
25.0		1R	385	31-35	885	0.162	19.45	5.32	45.49	1.32	
20.0 DV		1R&2R	305	28-32	605	0.402	48.24	5.32	12.54	4.78	
25.0 DV		1R-3R	365	31-35	820	0.732	87.73	5.32	9.35	6.42	
Horizontal/vertical											
3-0		1R	160	18-22	210	0.162	19.45	5.32	10.80	5.56	
5.0-10.0		1R	195	22-26	280	0.162	19.45	5.32	14.39	4.17	
12.5-25.0		1R	245	25-29	415	0.162	19.45	5.32	21.33	2.81	
20.0 DV		1R-7R	215	23-27	330	0.991	118.77	5.32	2.78	21.59	
25.0 DV		1R-10R	215	23-27	330	1.468	175.97	5.32	1.88	31.99	
Vertical											
3.0-25.0		1R	160	17-21	210	0.162	19.45	5.32	10.80	5.56	
20.0 DV		1R&2R	155	16-21	195	1.147	137.47	5.32	1.42	42.30	
25.0 DV		1R-3R	155	16-21	195	1.660	199.05	5.32	0.98	61.25	
Overhead											
3.0-25.0		1R	150	17-22	180	0.162	19.45	5.32	9.25	6.48	
20.0 DV		1R&2R	155	18-22	200	0.406	48.62	5.32	4.11	14.59	
25.0 DV		1R-3R	155	18-22	200	0.613	73.45	5.32	2.72	22.03	

Butt weld

156

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.6 mm

Efficiency — 94%

Procedure: single-sided,
unbacked

3.0	Aa	1	180	18-22	135	0.057	3.88		34.80	1.72	1.72
5.0	Ab	1	180	18-22	135	0.080	5.47		24.67	2.43	2.43
6.0	Cd	1&2	180	18-22	135	0.220	14.99		9.00	6.66	6.66
8.0	Cd	1&2	180	18-22	135	0.356	24.20		5.58	10.76	10.76
10.0	Cf	1 2	180 260	18-22 22-26	135 220	0.075 0.493	5.09 33.57		26.50 6.55	2.26 9.16	11.42
12.5	Cf	1 2&3	180 300	18-22 25-29	135 265	0.075 0.762	5.10 51.88		26.46 5.11	2.27 11.75	14.01
15.0	Cf	1 2-4	180 300	18-22 25-29	135 265	0.075 1.083	5.10 73.74		26.48 3.59	2.27 16.69	18.96
20.0	Cf	1 2-5	180 300	18-22 25-29	135 265	0.075 1.878	5.07 127.85		26.62 2.07	2.25 28.95	31.20
25.0	Cf	1 2-7	180 300	18-22 25-29	135 265	0.074 2.871	5.03 195.41		26.83 1.36	2.24 44.24	46.48

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Eb	1 1R	190 190	19-23 19-23	145 145	0-047 0-130	3-22 8-83	7-44	45-09 16-41	1-33 3-66	4-99
5-0	Ec	1 1R	190 190	19-23 19-23	145 145	0-076 0-130	5-15 8-83	7-44	28-14 16-41	2-13 3-66	5-79
6-0	Ec	1&2 1R	210 210	20-24 20-24	165 165	0-084 0-130	5-71 8-83	7-44	28-88 18-68	2-08 3-21	5-29
8-0	Gd	1 1R	210 210	20-24 20-24	165 165	0-168 0-130	11-41 8-83	7-44	14-46 18-68	4-15 3-21	7-36
10-0	Gd	1&2 1R	260 260	22-26 22-26	220 220	0-297 0-130	20-18 8-83	7-44	10-90 24-90	5-50 2-41	7-91
12-5	Gd	1-3 1R	300 300	25-29 25-29	265 265	0-506 0-130	34-45 8-83	7-44	7-69 30-00	7-80 2-00	9-80
15-0	Gd	1-3 1R	300 300	25-29 25-29	265 265	0-769 0-130	52-34 8-83	7-44	5-06 30-00	11-85 2-00	13-85
20-0	Gd	1-4 1R	300 300	25-29 25-29	265 265	1-450 0-130	98-71 8-83	7-44	2-68 30-00	22-35 2-00	24-35
25-0	Gd	1-6 1R	300 300	25-29 25-29	265 265	2-333 0-130	158-78 8-83	7-44	1-67 30-00	35-95 2-00	37-95
For welds sealed in the overhead position, substitute the following sealing run values:											
3-0-25-0			160	17-21	115	0-130	8-83		13-02	4-61	

157

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: sealed

3-0	Pb	1	220	20-24	175	0-059	4-01		43-63	1-38	1-38
5-0	Pc	1&2	220	20-24	175	0-095	6-47		27-06	2-22	2-22
6-0	Pc	1&2	250	23-27	205	0-107	7-28		28-15	2-13	2-13
8-0	Qb	1-3	250	23-27	205	0-378	25-70		7-98	7-52	7-52
10-0	Qb	1-3	320	26-30	285	0-503	34-26		8-32	7-21	7-21
12-5	Qb	1-5	320	26-30	285	0-682	46-42		6-14	9-77	9-77
15-0	Qb	1-6	320	26-30	285	0-884	60-16		4-74	12-66	12-66
20-0	Qb	1-7	320	26-30	285	1-356	92-26		3-09	19-42	19-42
25-0	Qb	1-9	320	26-30	285	1-915	130-34		2-19	27-44	27-44

158

Butt weld

Flat position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: backed

159

Butt weld

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: single-sided,
unbacked

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Ab	1	190	18-22	145	0.071	4.85		29.90	2.01	2.01
5-0	Cd	1&2	190	18-22	145	0.166	11.27		12.86	4.67	4.67
6-0	Cf	1&2	200	19-23	155	0.248	16.89		9.18	6.54	6.54
8-0	Cf	1-3	200	19-23	155	0.391	26.61		5.82	10.30	10.30
10-0	Db	1-3	200	19-23	155	0.452	30.79		5.03	11.92	11.92
12.5	Db	1-5	200	19-23	155	0.656	44.62		3.47	17.27	17.27
15-0	Db	1-6	200	19-23	155	0.897	61.04		2.54	23.63	23.63
20-0	Db	1-8	200	19-23	155	1.491	101.45		1.53	39.27	39.27
25-0	Db	1-13	200	19-23	155	2.228	151.66		1.02	58.71	58.71

160

Butt weld

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: sealed

3-0	Ea	1 1R	190 190	18-22 18-22	145 145	0.033 0.130	2.25 8.83	7.44	64.56 16.41	0.93 3.66	4.59
5-0	Ec	1 1R	190 190	18-22 18-22	145 145	0.076 0.130	5.15 8.83	7.44	28.14 16.41	2.13 3.66	5.79
6-0	Gd	1&2 1R	200 200	19-23 19-23	155 155	0.074 0.130	5.02 8.83	7.44	30.86 17.54	1.94 3.42	5.36
8-0	Gd	1-3 1R	200 200	19-23 19-23	155 155	0.168 0.130	11.41 8.83	7.44	13.58 17.54	4.42 3.42	7.84
10-0	Hc	1-3 1R	210 210	19-23 19-23	165 165	0.214 0.130	14.58 8.83	7.44	11.32 18.63	5.30 3.21	8.51
12.5	Hc	1-4 1R	210 210	19-23 19-23	165 165	0.367 0.130	24.96 8.83	7.44	6.61 18.63	9.07 3.21	12.29
15-0	Hc	1-5 1R	210 210	19-23 19-23	165 165	0.558 0.130	37.98 8.83	7.44	4.34 18.63	13.81 3.21	17.02
20-0	Hc	1-6 1R	210 210	19-23 19-23	165 165	1.055 0.130	71.78 8.83	7.44	2.30 18.63	26.10 3.21	29.32
25-0	Hb	1-10 1R	210 210	19-23 19-23	165 165	1.920 0.130	130.68 8.83	7.44	1.26 18.63	47.52 3.21	50.73

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3.0	Sb	1	180	18-22	135	0.124	8.43		16.02	3.75	3.75
5.0	Sc	1&2	180	18-22	135	0.265	18.02		7.49	8.01	8.01
6.0	Tc	1-3	180	18-22	135	0.332	22.59		5.98	10.04	10.04
8.0	Tc	1-4	180	18-22	135	0.483	32.84		4.11	14.60	14.60
10.0	Tc	1-4	180	18-22	135	0.658	44.77		3.02	19.90	19.90
12.5	Tc	1-6	180	18-22	135	0.911	62.00		2.18	27.56	27.56
15.0	Tc	1-7	180	18-22	135	1.201	81.76		1.65	36.34	36.34
20.0	Tc	1-9	180	18-22	135	1.891	128.68		1.05	57.19	57.19
25.0	Tc	1-14	180	18-22	135	2.720	185.16		0.73	82.30	82.30

3.0	Ce	1	160	17-21	115	0.113	7.71		14.92	4.02	4.02
5.0	Ce	1	160	17-21	115	0.212	14.46		7.95	7.54	7.54
6.0	Cg	1	160	17-21	115	0.276	18.79		6.12	9.80	9.80
8.0	Cg	1&2	160	17-21	115	0.426	29.02		3.96	15.14	15.14
10.0	Cg	1&2	160	17-21	115	0.611	41.58		2.77	21.69	21.69
12.5	Cg	1-3	160	17-21	115	0.889	60.51		1.90	31.57	31.57
15.0	Cg	1-3	160	17-21	115	1.219	82.97		1.39	43.29	43.29
20.0	Cg	1-4	160	17-21	115	2.031	138.24		0.83	72.13	72.13
25.0	Cg	1-5	160	17-21	115	3.040	206.90		0.56	107.95	107.95

161

Butt weld

H/V position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: backed

162

Butt weld

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: single-sided, unbacked

Butt weld

163

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.6 mm

Efficiency — 94%

Procedure: sealed

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Ec	1 1R	180 180	19-23 19-23	135 135	0.059 0.130	4.01 8.83	7.44	33.66 15.23	1.78 3.93	5.71
5-0	Gb	1 1R	150 150	17-21 17-21	110 110	0.094 0.130	6.39 8.83	7.44	17.20 12.45	3.49 4.82	8.31
6-0	Gb	1 1R	150 150	17-21 17-21	110 110	0.141 0.130	9.59 8.83	7.44	11.47 12.45	5.23 4.82	10.05
8-0	Gb	1 1R	150 150	17-21 17-21	110 110	0.261 0.130	17.77 8.83	7.44	6.19 12.45	9.69 4.82	14.51
10-0	Gb	1&2 1R	150 150	17-21 17-21	110 110	0.416 0.130	28.31 8.83	7.44	3.89 12.45	15.44 4.82	20.26
12.5	Gb	1&2 1R	150 150	17-21 17-21	110 110	0.658 0.130	44.76 8.83	7.44	2.46 12.45	24.41 4.82	29.23
15-0	Gb	1-3 1R	150 150	17-21 17-21	110 110	0.952 0.130	64.78 8.83	7.44	1.70 12.45	35.34 4.82	40.15
20-0	Gb	1-3 1R	150 150	17-21 17-21	110 110	1.694 0.130	115.31 8.83	7.44	0.95 12.45	62.90 4.82	67.72
25-0	Gb	1-4 1R	150 150	17-21 17-21	110 110	2.636 0.130	179.40 8.83	7.44	0.61 12.45	97.86 4.82	102.67

Butt weld

164

Vertical position

CO₂ solid wire

Electrode:

Diameter — 1.6 mm

Efficiency — 94%

Procedure: backed

3-0	Sd	1&2	190	19-23	145	0.174	11.87		12.21	4.91	4.91
5-0	Sd	1 2	190 160	19-23 17-21	145 115	0.087 0.227	5.91 15.43		24.53 7.45	2.45 8.05	10.50
6-0	Sd	1&2	160	17-21	115	0.396	26.96		4.27	14.07	14.07
8-0	Sd	1&2	160	17-21	115	0.587	39.95		2.88	20.84	20.84
10-0	Sd	1&2	160	17-21	115	0.812	55.24		2.08	28.82	28.82
12.5	Sd	1-3	160	17-21	115	1.139	77.53		1.48	40.45	40.45
15-0	Sd	1-3	160	17-21	115	1.518	103.30		1.11	53.89	53.89
20-0	Sd	1-3	160	17-21	115	2.424	165.01		0.70	86.09	86.09
25-0	Sd	1-4	160	17-21	115	3.524	239.88		0.48	125.16	125.16

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
3-0	Ac	1	160	17-22	115	0-083	5-64		20-37	2-95	2-95
5-0	Cf	1	160	17-22	115	0-190	12-91		8-91	6-74	6-74
6-0	Cf	1&2	160	17-22	115	0-248	16-89		6-81	8-81	8-81
8-0	Cf	1&2	160	17-22	115	0-391	26-61		4-32	13-88	13-88
10-0	Ba	1&2	160	17-22	115	0-485	33-02		3-48	17-23	17-23
12-5	Ba	1-3	160	17-22	115	0-707	48-11		2-39	25-10	25-10
15-0	Ba	1-4	160	17-22	115	0-971	66-07		1-74	34-47	34-47
20-0	Ba	1-5	160	17-22	115	1-621	110-34		1-04	57-57	57-57
25-0	Ba	1-7	160	17-22	115	2-430	165-43		0-70	86-31	86-31

3-0	Sc	1	165	17-22	120	0-141	9-57		12-53	4-79	4-79
5-0	Sc	1&2	165	17-22	120	0-265	18-02		6-66	9-01	9-01
6-0	Rc	1&2	165	17-22	120	0-294	20-00		6-00	10-00	10-00
8-0	Rc	1-3	165	17-22	120	0-441	30-02		4-00	15-01	15-01
10-0	Rc	1-3	165	17-22	120	0-616	41-91		2-86	20-95	20-95
12-5	Rc	1-5	165	17-22	120	0-872	59-34		2-02	29-67	29-67
15-0	Rc	1 2-5	140 160	16-21 17-22	100 115	0-127 1-042	8-66 70-94		11-55 1-62	5-19 37-01	42-21
20-0	Rc	1 2-7	140 160	16-21 17-22	100 115	0-126 1-759	8-61 119-74		11-62 0-96	5-16 62-47	67-64
25-0	Rc	1 2-10	140 160	16-21 17-22	100 115	0-125 2-633	8-54 179-22		11-71 0-64	5-12 93-51	98-63

165

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: single-sided, unbacked

166

Butt weld

Overhead position

CO₂ solid wire

Electrode:

Diameter — 1.6mm

Efficiency — 94%

Procedure: backed

Butt weld

167

All positions

CO₂ solid wire

Electrode:

Diameter — 1.6 mm

Efficiency — 94%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— preparation by
air-arc gouging

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
<i>Flat</i>											
3-0-5-0		1R	190	19-23	145	0.251	17.06	2-24	8-50	7-06	
6-0-8-0		1R	210	20-24	165	0.251	17.06	2-24	9-67	6-20	
10-0		1R	260	22-26	220	0.251	17.06	2-24	12-89	4-65	
12-5-25-0		1R	330	25-29	265	0.251	17.06	2-24	15-53	3-86	
<i>Horizontal/vertical</i>											
3-0-5-0		1R	190	18-22	145	0.251	17.06	2-24	8-50	7-06	
6-0-8-0		1R	200	19-23	155	0.251	17.06	2-24	9-08	6-61	
10-0-25-0		1R	210	19-23	165	0.251	17.06	2-24	9-67	6-20	
<i>Vertical</i>											
3-0		1R	180	19-23	135	0.251	17.06	2-24	7-91	7-58	
5-0-25-0		1R	150	17-21	110	0.251	17.06	2-24	6-45	9-31	
<i>Overhead</i>											
3-0-25-0		1R	160	17-22	115	0.251	17.06	2-24	6-74	8-90	

Butt weld

168

All positions

CO₂ solid wire

Electrode:

Diameter — 1.6 mm

Efficiency — 94%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

— preparation by
chipping

<i>Flat</i>											
3-0-5-0		1R	190	19-23	145	0.167	11.40	5-32	12-72	4-72	
6-0-8-0		1R	210	20-24	165	0.167	11.40	5-32	14-47	4-15	
10-0		1R	260	22-26	220	0.167	11.40	5-32	19-30	3-11	
12-5-25-0		1R	330	25-29	265	0.167	11.40	5-32	23-24	2-58	
<i>Horizontal/vertical</i>											
3-0-5-0		1R	190	18-22	145	0.167	11.40	5-32	12-72	4-72	
6-0-8-0		1R	200	19-23	155	0.167	11.40	5-32	13-60	4-41	
10-0-25-0		1R	210	19-23	165	0.167	11.40	5-32	14-47	4-15	
<i>Vertical</i>											
3-0		1R	180	19-23	135	0.167	11.40	5-32	11-84	5-07	
5-0-25-0		1R	150	17-21	110	0.167	11.40	5-32	9-65	6-22	
<i>Overhead</i>											
3-0-25-0		1R	160	17-22	115	0.167	11.40	5-32	10-09	5-95	

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
6-0	Ea	1 1R	315 445	24-28 28-32	200 295	0-033 0-168	1-78 9-03	7-44	112-65 32-68	0-53 1-84	2-37
8-0	Ea	1 1R	315 445	24-28 28-32	200 295	0-065 0-168	3-51 9-03	7-44	57-69 32-68	1-04 1-84	2-88
10-0	Ea	1 1R	445 445	28-32 28-32	295 295	0-100 0-168	5-39 9-03	7-44	55-04 32-68	1-09 1-84	2-93
12-5	Ea	1 1R	445 445	28-32 28-32	295 295	0-155 0-168	8-36 9-03	7-44	35-50 32-68	1-69 1-84	3-53
15-0	Ge	1 1R	445 445	28-32 28-32	295 295	0-455 0-168	24-48 9-03	7-44	12-05 32-68	4-98 1-84	6-82
20-0	Ge	1&2 1R	445 445	28-32 28-32	295 295	1-006 0-168	54-14 9-03	7-44	5-45 32-68	11-01 1-84	12-85
25-0	Fc	1-3 1R	445 445	28-32 28-32	295 295	1-414 0-168	76-09 9-03	7-44	3-88 32-68	15-48 1-84	17-31

6-0	Pd	1	400	24-28	260	0-149	8-02		32-40	1-85	1-85
8-0	Pd	1	400	24-28	260	0-186	10-00		25-99	2-31	2-31
10-0	Sa	1&2	400	24-28	260	0-549	29-52		8-81	6-81	6-81
12-5	Ra	1&2	445	29-33	295	0-657	35-36		8-34	7-19	7-19
15-0	Sd	1-3	445	29-33	295	1-501	80-77		3-65	16-43	16-43
20-0	Sd	1-4	445	29-33	295	2-395	128-85		2-29	26-21	26-21
25-0	Rd	1-5	445	29-33	295	2-904	156-26		1-89	31-78	31-78

169

Butt weld

Flat position

CO₂ flux-cored wire

Electrode:

Diameter — 2.4mm

Efficiency — 79%

Procedure: sealed

170

Butt weld

Flat position

CO₂ flux-cored wire

Electrode:

Diameter — 2.4mm

Efficiency — 79%

Procedure: backed

Butt weld

171

Flat position

CO₂ flux-cored wire

Electrode:

Diameter — 2.4mm

Efficiency — 79%

Procedure:

Sealed — supplement for
sealing run preparation and
welding times

Plate thickness	Diagram reference	Run numbers	Current	Voltage	Wire feed rate	Weight of weld metal per metre of weld	Wire consumed per metre of weld	Sealing run preparation time per metre of weld	Welding speed per hour	Arc time per metre of weld	Total arc time per metre of weld
mm			A	V	m/hr	kg	m	min	m	min	min
<i>Preparation by air-arc gouging</i>											
6.0-25.0		1R	445	28-32	295	0.289	15.53	2.24	18.99	3.16	
<i>Preparation by chipping</i>											
6.0-25.0		1R	445	28-32	295	0.136	7.33	5.32	40.25	1.49	

Butt weld

172

Flat position

CO₂ flux-cored wire

Electrode:

Diameter — 3.2mm

Efficiency — 76%

Procedure: sealed

6.0	Ea	1 1R	505 505	28-33 28-33	155 155	0.033 0.173	0.89 4.64		174.82 33.42	0.34 1.80	2.14
8.0	Ea	1 1R	505 505	28-33 28-33	155 155	0.075 0.173	2.02 4.64		77.92 33.42	0.77 1.80	2.57
10.0	Ea	1 1R	505 505	28-33 28-33	155 155	0.128 0.173	3.45 4.64		45.45 33.42	1.32 1.80	3.12
12.5	Ge	1&2 1R	535 535	29-34 29-34	170 170	0.254 0.173	6.83 4.64		24.89 36.66	2.41 1.64	4.05
15.0	Ge	1&2 1R	565 565	30-35 30-35	190 190	0.450 0.173	12.08 4.64		15.73 40.97	3.82 1.46	5.28
20.0	Gf	1&2 1R	600 600	32-36 32-36	210 210	0.644 0.173	17.29 4.64		12.15 45.28	4.94 1.32	6.27
25.0	Gf	1-3 1R	600 600	32-36 32-36	210 210	1.269 0.173	34.11 4.64		6.16 45.28	9.74 1.32	11.07
25.0 DV	Mc	1&2 1R	600 600	32-36 32-36	210 210	0.254 0.254	6.83 6.83		30.74 30.74	1.95 1.95	3.90

Butt weld

173

Flat position

CO₂ flux-cored wire

Electrode:

Diameter — 3.2mm

Efficiency — 76%

Procedure: backed

6.0	Pg	1	565	32-36	190	0.311	8.34		22.77	2.64	2.64
8.0	Pg	1	565	32-36	190	0.388	10.43		18.21	3.29	3.29
10.0	Pf	1	565	32-36	190	0.379	10.19		18.65	3.22	3.22
12.5	Qd	1&2	600	35-40	210	0.863	23.18		9.06	6.62	6.62
15.0	Qd	1&2	600	35-40	210	1.092	29.33		7.16	8.38	8.38
20.0	Qd	1-3	600	35-40	210	1.610	43.26		4.85	12.36	12.36
25.0	Qd	1-4	600	35-40	210	2.207	59.29		3.54	16.94	16.94