



THERMIT WELDING (GB) LTD

PROCESS MANUALS



SECTION THREE EQUIPMENT



SECTION 3 – EQUIPMENT

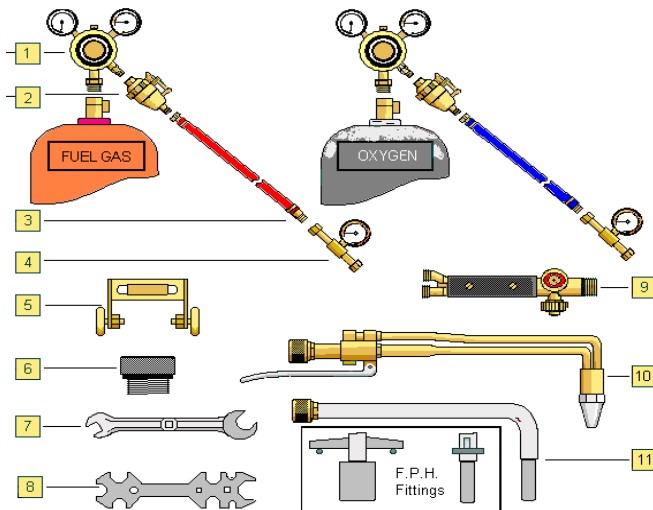
Section 3 provides a list of all the recommended items of equipment to be use with the SkV-E process, with guidelines for operation and regular maintenance.

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3.1 BASIC SET OF EQUIPMENT

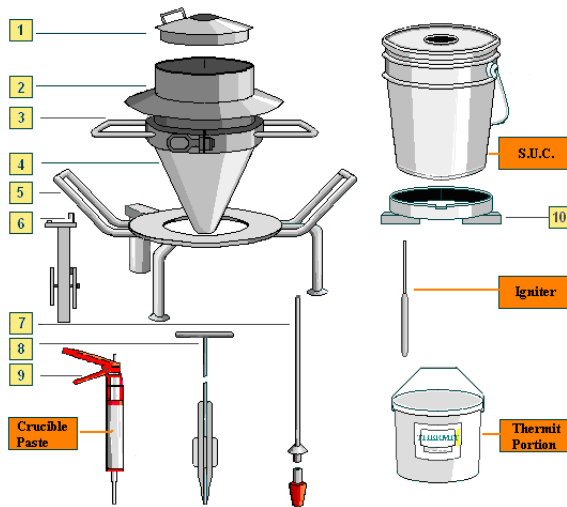
3.1.1 Oxy Fuel Gas Equipment - Preheating & Cutting



ITEM	DESCRIPTION	TW PART NUMBER			
		COMMON	OXYGEN	PROPANE	ACETYLENE
1	Regulator		107900	108100	107700
2	Flash Back arrestor		107500	107300	107300
3	Hose including fittings		106700	106900	107100
4	Pressure check Gauge		109100	109150	109160
5	Standard guide roller	111500			
	Wide gap guide roller	111501			
6	Mark II guide attachment	110701			
7	Cylinder spanner	109300			
8	Regulator multi-spanner	108300			
		PROCESS			
9	Mixer stem	ALL		102900	102900
10	Cutting torch	ALL		105500	105600
11	Pre-heating burner	SKV-E		100701	100101
		SKV		100700	100100
		SRZ		100400	100100
		SmW		100500	100100
		SoWoS		100500	100100
NOTES					
	For spare parts, maintenance please call				



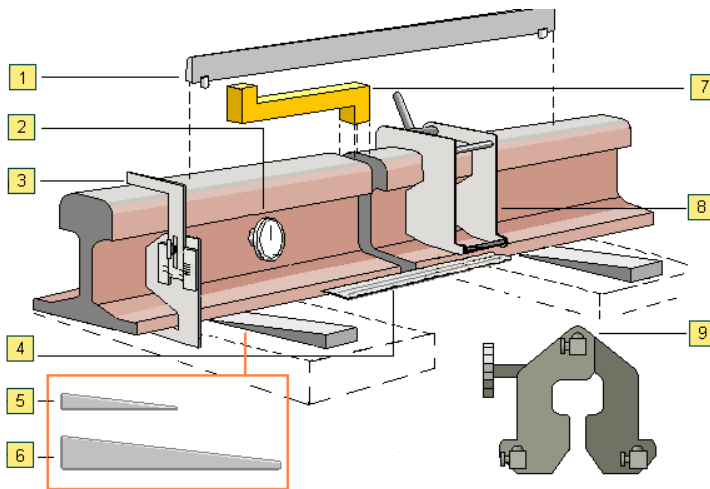
3.1.2 Crucibles and Fittings



ITEM	DESCRIPTION	TW PART NUMBER
1	Crucible cap – standard	112300
2	Crucible extension ring	113500
3	Crucible clamping ring	114100
4	Crucible lining	301802
5	Crucible tripod stand	114300
6	Crucible drying clamp	112000
7	Thimble applicator	137100
8	Thimble drift	137300
9	Paste Applicator	301801
10	SUC Locating ring	114400



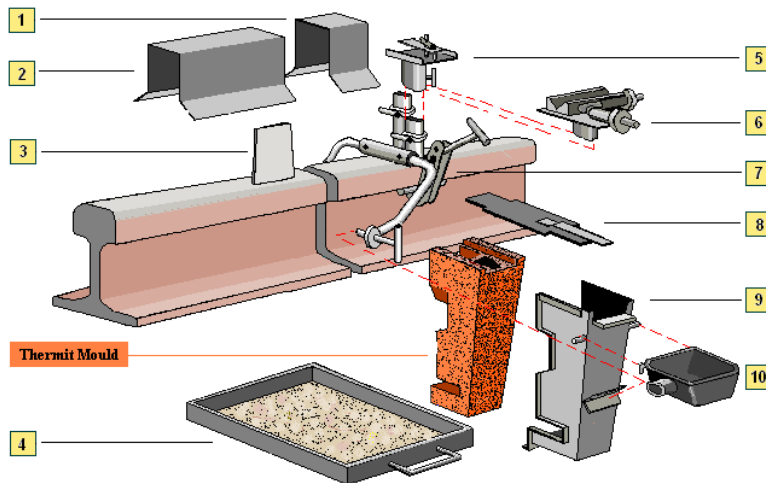
3.1.3. Rail Preparation



ITEM	DESCRIPTION	TW PART NUMBER		
		COMMON		
1	1 Metre Straight edge	139200		
2	Rail thermometer	137700		
3	TW Rail wear gauge	144500		
4	300mm Steel rule	145030		
5	Rail wedge - large	137810		
6	Rail wedge - small	137800		
		PROCESS	OXY/PROPANE	OXY/ACETYLENE
7	Distance gauge	SkV-E		
8	Cutting guide	Vignole rail	Standard	110900
			60E1	111300
			BS80A	110900
9	Mk II Cutting guide	Vignole rail	Standard	110700
			60E1	110780
NOTES				
	For other applications please call			



3.1.4. Welding Attachments



ITEM	DESCRIPTION	TW PART NUMBER			
		COMMON	SPECIAL		
					BS80A
1	Rail cover - small	129500			
2	Rail cover - large	129700			
3	Mould alignment gauge	144700			
4	Sand tray	136310			
5	FPH Preheater holder	118520			
6	Standard Preheater holder	118500			
7	Universal Mounting	116300			116900
8	Mould cover	127300			
9	Mould shoes	See Below			
10	Slag Bowl	131900			
			95R BH	54E1 56E1	60E1
MOULD SHOES					
	SkV-SUC Straight		126120	126140	126160
	SkV-SUC 7-9 step		126123	126143	
	SkV-SUC 3 piece				
	SkV – Composite 110A/80A	123000			
NOTES					
	For other applications please call				



3.1.5. Miscellaneous hand tools



ITEM	DESCRIPTION	TW PART NUMBER
1	Ramming tool	136300
2	Luting tool – standard	135900
3	Slag bowl lifting tool	135700
4	Tongs	136900
5	3lb Hammer	134500
6	Chipping Hammer	134100
7	File	139900
8	Wire Brush	139700
9	Welders Mittens	137500
10	Flip Front Goggles	137400
11	Spark Lighter	110300
12	Digital Stop Watch	141900
13	Nozzle cleaners	110100



3.1.6 Weld Finishing

Items required for weld finishing and cleaning include:

Item	Example (for information only)
Approved Hydraulic Weld Trimmer	TW UL
Grinding equipment and stones	Geismar MP 12
Needle Gun	110v Bosch Hammer GPH 4DSC
Wire brush	TW Part no 139700
Chipping hammer	TW Part no 134100
Straightedge	TW part no 139200

Thermit Weld Trimmer

The Thermit weld trimmer is equipped with two replaceable blades.

Clamps are fitted to lock the unit to the rail to such that the weld is trimmed close to the rail profile. The basic machine is equipped with a manual pump with removable handle which operates from side to side. For Network Rail applications, the trimmer can be supplied with a longitudinal pump action.



Blades are available to fit a range of rail profiles.

DESCRIPTION	TW PART NUMBER			
	APPLICATION			
	COMMON	54E1 56E1 60E1	BS80A	
TW/UL Trimmer, standard lever action Vignole rails incl. 1 set blades		137901	137902	
TW/UL Trimmer, longitudinal pump action Vignole rails – incl. 1 set blades		137951		
REPLACEMENT ITEMS				
Blades (1 set)		138901	138902	
Pump unit complete	138010			
3 way valve	138330			
TW/UL Valve Handle	138541			
Hydraulic cylinder	138400			
FOR OTHER SPARES PLEASE CALL				

TECHNICAL DATA (TW/UL)	
Maximum trimming stroke	155mm
Maximum trimming force	200kN
Maximum working pressure	500 Bar
Weight (Standard Lever)	52kg including handle, oil and blades
Oil type	Tellus 32 or equivalent (ISO VG 22)
Capacity	0.6L



3.1.7 Electric Rail Profile Grinder

The Thermit Grinding Frame is designed for use with a standard Bosch 8" (200mm) disc grinder and allows the grinder to be used to profile finish a welded joint.



Item	Description	Comm on	TW Part No			
1	Grinding Frame – Type SVW	141700				
2	Bosch Angle Grinder – Model 23/180S	141703				
3	Cupped Wheel Guard	141704				
4	Spanner	141705				
5	Cupped Grinding Wheels	305200				
NOTES						
The Bosch Angle Grinder may be purchased locally if preferred.-type 180s or equivalent						
For replacement items, and rail guides/rollers –please call						

TECHNICAL DATA	
Length	840 mm
Height	470 mm
Width	800 mm
Distance between rollers	860 mm
Gross Weight	30kg including grinder
Electrical supply	110V (50Hz)



3.2 OPTIONAL ITEMS

Item	Example (for information only)
Rail Alignment Tools	SmartWeld Rail Setter TW part No 170100
Weather Protection	Lawton Tools Umbrella & support
	Sheerspeed welding tent
Fume extraction for Re-useable Crucible	TW part no. 150000
Enviro-cap for SUC	TW part no. 150010
Weld Identification stamps	



3.2.1 Fume Extraction Device for Thermit® Rail Welding



The Thermit Welding Fume Extractor is a wet scrubbing device available for use with THERMIT® rail welding processes to collect fume emission from the THERMIT® reaction when welding in confined areas e.g. underground or in tunnels.

Volatile products are emitted from the THERMIT® reaction for approximately 20 seconds. These consist of oxides of iron and aluminium - nuisance fume - together with toxic manganese oxide. The emission can easily be collected using the device, thereby minimising any risk to personnel operating in an enclosed environment, where the concentration of fume in the surrounding atmosphere may build up and exceed permitted threshold values.

Operating Principle

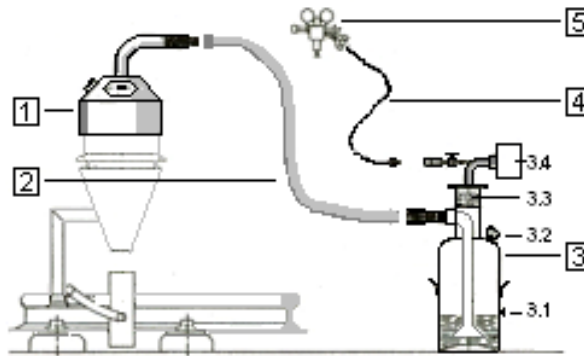
Dust and gases generated by the THERMIT® reaction are evacuated via a modified crucible cap and metallic hose into a filter unit. The fumes are scrubbed through a water bath and fibre glass filter so that dust particles are retained. The cleaned gases are then exhausted from the unit to atmosphere.

The suction in the vessel is created by a venturi injector in the exhaust tube powered by compressed air or Nitrogen cylinder.



Description

The THERMIT® weld is made in the normal way using standard equipment. The suction hood (1) replaces the normal crucible cap. This hood is provided with a covered aperture to allow the THERMIT® charge to be ignited in the usual way. The suction hood is fabricated with an outlet pipe for connection to the filter unit via a flexible steel hose (2).



The scrubber unit (3) consists of a water tank containing 9 to 10 litres of water (filled via 3.2)

A level plug is fitted to the side of the tank (3.1).

On top of the scrubber is mounted a filter (3.3) containing fibre glass discs and to this is attached the venturi system with injector nozzle and inlet valve. The exhaust end of the venturi is fitted with a cartridge type filter (3.4). The airline (4) is connected to the inlet end of the venturi pipe with a quick release coupling. The unit can be operated with on line compressed air or a compressed air or nitrogen cylinder via a regulator (5).

Operation

The air / nitrogen supply should be regulated at **2.0 bar (29 psi)** before commencing welding operations and the unit coupled up to the crucible.

Before ignition of the THERMIT® charge the air / nitrogen supply must be turned on. As soon as the steel has been discharged from the crucible into the moulds and the pour is completed, the supply may be turned off.

Maintenance of Unit

The water in the scrubber must be changed after not more than 6 welds, and the tank washed out.

The fibre glass filters must be inspected at frequent intervals. If they are clogged they should be shaken or renewed. Replacement filters may be purchased from Thermit Welding (GB) Limited.

The cartridge filter should be replaced when clogged (- every 50 welds).



If inadequate suction is available with the unit operating at 2.0 bar (29 psi) the cause is almost certainly a clogged filter.

Dos and Do Not's:

- **DO** treat the flexible hose carefully or the ends will become damaged.
- **DO** change the water in the tank regularly for efficient cleaning of the gases.
- **DO** inspect the glass fibre filter regularly to check that it is not clogged.
- **DO NOT** overfill the tank or entrained water will be carried over and waterlog the fibre glass filter.
- **DO NOT** use air pressures above **2.0 bar (29 psi)** or water can be blown out of the exhaust.



3.2.2 Enviro-Cap for use with the Single Use Crucible

The Enviro-Cap is designed to be used with our Single Use Crucible when welding in confined spaces.

Volatile products are emitted from the THERMIT® reaction for approximately 20 seconds. These consist of oxides of iron and aluminium - nuisance fume - together with toxic manganese oxide. The emission can easily be collected using the device, thereby minimising any risk to personnel operating in an enclosed environment, where the concentration of fume in the surrounding atmosphere may build up and exceed permitted threshold values.



Operating Principle

Dust and gases generated by the THERMIT® reaction are collected by the Enviro-Cap which is fitted to our standard single use crucibles. The fume cap contains filters which remove fumes and dust particles.

ITEM	DESCRIPTION	TW NUMBER	PART NUMBER
	Enviro-cap - Complete	150010	
REPLACEMENT PARTS			
	Replacement filters	301900	
	Sealant	301801	

Operation

The THERMIT® weld is made in the normal way using standard equipment. The recess within the crucible lid is filled with a single bead of crucible sealant paste prior to use. To prevent the igniter being pushed too far into the Thermit portion the end of the igniter should be bent over, shortening the overall length by approximately 150mm.

Once the Thermit ® has started the Enviro-Cap is placed firmly into the recess in the crucible cap. The Enviro-Cap will not affect the reaction of the portion or the tap time.

The Enviro-Cap should remain in place for one minute following completion of the pour and then be removed independently of the empty SUC.

The Enviro-Cap contains a series of baffle plates and two replaceable filters

Trials have shown that the filters are effective for up to at least 10 welds, depending on the size of the portion being used. It is recommended that the filters are reversed after six welds.



To replace the filters first ensure that the Enviro-Cap is cold, remove the two wing nuts (or clips) and remove the lid. The two replaceable filters are located in the top of the Enviro-Cap. Take out the used filters and replace with new, ensuring that the new filters are pushed down to completely fill the void in the top of the Enviro-Cap, there should be no spaces around the edge of the filters.

The lid is then replaced and secured with the two wing nuts (or clips).



3.3 POST WELD HEAT TREATMENT

3.3.1 Thermit Weld Insulating Muffle

The Thermit Weld Insulated Muffle is designed to control the cooling of welds in rails sensitive to rapid cooling as may occur under adverse weather.

The muffle is required for use when welding 260Mn and 320Cr grades of rail.



On completion of weld trimming, and not later than the time specified in Section 2, the excess head riser and mould is removed and placed in a safe position.

The base of the muffle box is placed under the rail about the weld and clamped to the rail foot using the locating pegs.

The upper half of the box is positioned on top of the base.

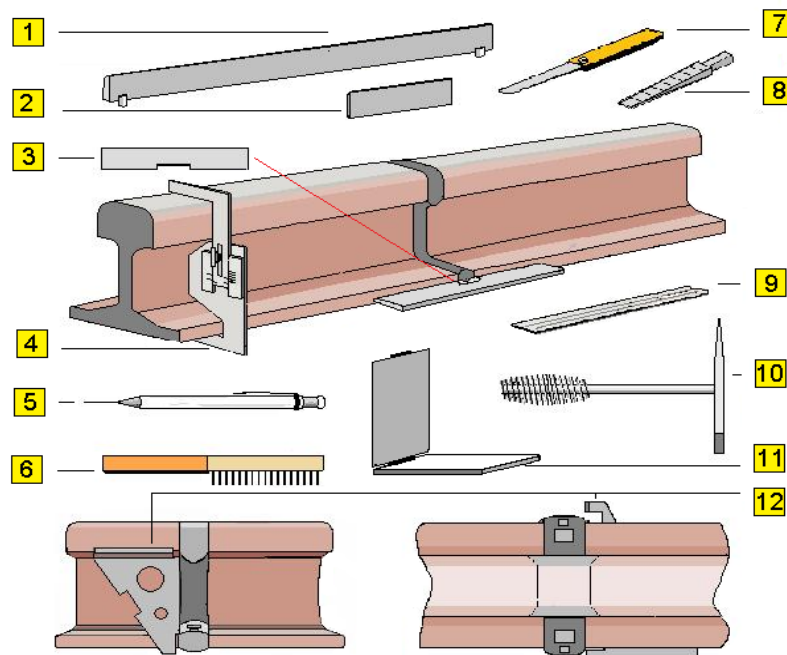
The box remains in place for a minimum of **1 hour**.



RAIL PROFILE	INSULATING MUFFLE PART NUMBER
BS113A	128700 NR Pads No 0057/050093
60E1	128900



3.4. WELD INSPECTION



ITEM	DESCRIPTION	TW PART NUMBER
1	1 Metre Straight edge	139200
2	200mm straight edge	145025
3	250mm straight edge	145020
4	Rail Wear Gauge	144500
5	Inspection probe	145060
6	Wire brush	139700
7	Feeler gauge	145050
8	Taper gauge	145100
9	300mm rule	145030
10	Chipping hammer	134100
11	Mirror	145080
12	Weld collar alignment gauges	144000
OTHER ITEMS NOT SHOWN		
	5M tape	145040
	Weld stamps	CALL
	Tool bag	CALL



3.5 MAINTENANCE OF EQUIPMENT.

The following guidelines are intended as additional checks which can be carried out by the welder to supplement the mandatory inspection and calibration processes for the equipment.

WHEN	WHAT	CHECK	ACTION
BEFORE EACH WELD	GAS FITTINGS	Check for leaks , damaged fittings	Replace
	PREHEATER	FPH wings and locating pins	Replace if out of alignment
	GAS CONNECTIONS	Check for leaks, thread damage	Tighten if loose
	GAUGES	Inspect for damage,	Replace
	CYLINDERS	Contents	Replace
	MOULD SHOES	Check for damage	Replace
		Fit of moulds	Adjust
	SLAG BOWLS	Slag or steel in bowl	Remove or replace
	CRUCIBLE	DAMPNESS	DRY AS SPECIFIED
		HOT SPOT ON SHELL	Replace lining
IN ADDITION TO ABOVE:			
BEFORE EACH SHIFT	PREHEATER	Nozzles	If blocked clear with nozzle cleaner
		Injector	Tighten if loose
	UNIVERSAL MOUNTING	Arms, rail clamp	Clean all threads
	MOULD SHOES	Damage or dross from the Thermit steel	Remove any dross, or replace
	PREHEATER HOLDER	Wing nut and clamp	Clear debris and replace nut if missing
IN ADDITION TO ABOVE			
EACH WEEK			
	TRIMMER	Blade condition	Replace if cracked or worn
		Trimming stroke	Check for full stroke
		Pump oil level	Fill to level



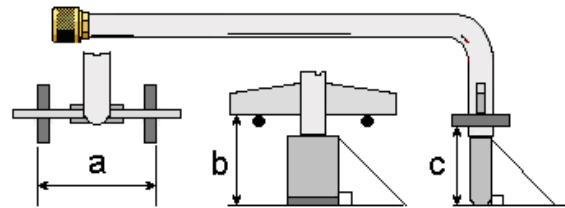
MOULD SHOES

Mould shoes may be adjusted to a snug fit around the mould by pressing the sides in a vice. Any weld spatter (dross) should be removed and the SUC crucible guides checked for alignment or damage.



PREHEATER.

The position of the locating wings and pins can be checked by reference to the drawing. If damaged the preheater must be replaced or repaired by an approved supplier.

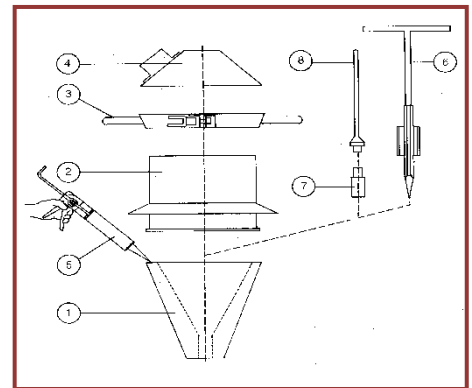


Preheater		A		B		C	
Fuel gas	Part No	max	min	max	min	max	min
Propane	100701	107	105	82	80	72	70
Acetylene	100101	107	105	67	65	57	55



RE- USABLE CRUCIBLE

When the crucible lining becomes damaged or too worn, or if hot spots show on the outer shell during a reaction, or if localised temper colours are visible on the outside of the shell when cold, the lining and its shell must be discarded and replaced.



Item	Description	TW Part No			
		Standar	application		
			SkV-L80		
1	Re Usable Crucible Lining	301802			
2	Extension Ring	113500	113700		
3	Clamping ring	114100			
4	Crucible cover	112300			
5	Sealing Paste	301800			
6	Thimble drift	137300			
7	Thimble –supplied with portion				
8	Thimble Applicator	137100			

Replacing the Crucible Lining

The refractory lining (1), must be stood upright on a level surface. The extension ring (2) is inspected to check that there are no signs of distortion or heavy build-up of slag/steel which would prevent the correct fitting to the lining.

The extension (2) and clamping ring (3) are placed in position on the shell and checked for correct fit. Should either not fit correctly they must be replaced.

The assembly is then dismantled.

Sealing paste (5) is applied, using a mastic gun, in an unbroken layer around the top of the lining. The extension ring is positioned carefully over the crucible shell and the two parts clamped together with the clamping ring, making sure that the screw is fastened tightly. Any excess paste, which squeezes out of the joint, is removed.

The crucible is now ready for drying.



THERMIT TW UL WELD TRIMMER

Refer to the handbook supplied with the trimmer for service and maintenance of the trimmer and the trimming blades.

Prior to use the trimmer must be inspected for damage to the blades or hydraulic hoses and pump. The control lever should be checked for correct operation and the anti-lift arms released.



Oil level

1. Check the oil level regularly. The filler cap is cleaned of debris and removed – the oil level should be to the bottom of the mesh filter – top up if necessary. Before replacing the cap check that the vent hole is not blocked.

Maintenance of blades

1. Any small burrs on the underside of the blades may be dressed with an appropriate grinder.
2. If the tips become badly worn, their profile may be restored with a hand grinder (refer to the service manual). After grinding the unit should be operated to check that the cutting edges meet around the railhead profile.
3. The hardened cutting tips may crack after a period of use. Provided that the tip does not start to break up the blades may continue to be used.
4. If the blades are severely worn, badly cracked or broken, they must be replaced. Reconditioned blades and re-tipping service is available from Themit Welding (GB) Ltd.