Stud welding unit N800i™

For Control Board Software Version 1.03 Only

Version 1.00

Operation and Service Manual
For Europe (CE)

Nelson Bolzenschweiß-Technik GmbH & Co. KG, Flurstraße 7-19, 58285 Gevelsberg

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1. Introduction

1.1 General

The operating and service instructions to hand refer to the Nelweld N800i welding unit. They are intended for operating and service personnel.

Trouble-free operation of the Nelweld N800i welding unit can only be guaranteed with knowledge of the contents of these operating and service instructions.

In case of difficulty or ambiguity please contact the customer service of Nelson, which will be very glad to help you.

The illustrations, specifications and technical data in these operating and service instructions are in accordance with the status of 05.01.2009.

Nelson reserves the right to make any technical modifications, which contribute to an improvement in the Nelweld N800i.

1.2 Unit Description

The Nelweld N800i is a mobile welding unit, which in connection with a manual-loading gun serves to weld metallic studs onto workpiece surfaces that are suited for welding.

Commercially available studs can be welded both according to the drawn-arc and the short-cycle welding method with the Nelweld N800i. The variation in method must be selected with the function code.

The Nelweld N800i works on the basis of a compact inverter power source and with extremely short weld times supplies constant weld currents up to 800A.

In this connection, the rectified input power voltage is transformed into high-frequency voltage by means of an inverter. The inverted voltage is transmitted by a high-frequency transformer and rectified on the output side.

As a consequence of the high control rate of the Nelweld N800i the reproducibility of the welds is increased and the quality of the welds clearly improved.

In contrast to welding units with a thyristor control of the same capacity it was possible to considerably reduce the dimensions and the weight of the Nelweld N800i.

The weld currents and weld times required for stud welding can be set step-lessly on the appropriately display function keys.

The entire weld cycle is coordinated by the control unit of the Nelweld N800i and can be visually traced by means of the LED display elements. Fault messages are issued, and numerically coded, on the error display.

In order to keep the temperature level of the Nelweld N800i as low as possible the N800i has two thermostats to monitor internal temperature level. One thermostat is used to turn on the fan automatically when the internal temperature reaches a level. Another thermostat checks if a higher unsafe level is reached and stops the inverter and displays an error message.

If the temperature is exceeded, the welding unit prevents welding temporarily. Thermal overload is indicated by means of a flashing warning triangle and E011 displayed if function key pressed.

In the Europe version the Nelweld N800i has a 4-pole control cable socket to transmit the controls signals to the configured weld gun.

The gun configuration always follows from the variation in method used. Thus the drawn-arc method requires the connection of a gun of type NS 40-B. Short-cycle welding must be performed with an NS 40 SL gun.

See the pertinent gun operating instructions for knowledge on handling weld guns in a professional and safe manner.

The bright dot matrix display shows the function codes in plain text and can typically be read in sunlight.

1.3 Welding Method

Commercially available studs with a diameter of up to 12mm can be welded with the Nelweld N800i welding unit both in keeping with the short-cycle method (7mm) and the drawn-arc method (12mm).

The drawn-arc method serves to full-surface weld studs of specific geometric dimensions to metallic workpieces, which should have a wall thickness of at least ¼ of the stud diameter.

In order to guarantee deoxidization of the weld pool and to better ignite the arc, the foreparts of the studs to be welded mostly have an ignition peak of aluminum.

It is preferable to use ceramic ferrules to protect the weld pool against atmospheric oxidization and contain the molten liquid metal in order to center the arc. In addition to this, the molten metal is prevented from cooling too quickly.

When welding overhead or in a horizontal position the ceramic ferrule ensures that the weld flash always has a constant shape and provides the user with protection against spatter.

The short-cycle method is a variation of the drawn-arc method, which in extremely short weld times makes no special demands of the type of stud tip.

With the exception of the shorter weld times, the operational sequence is identical with that of normal arc welding.

In keeping with the short-cycle method welding studs can also be welded on coated with oil contamination workpiece surfaces, the minimum plate thickness of which should not exceed 0.6mm.

On account of the extremely short weld times the studs can also be welded without ceramic ferrule. To protect the weld pool, particularly with aluminum welds, it is advisable to use inert gas.

The introduced inert gas displaces the air from the welding zone. If welds are to be carried out under inert gas, it is preferable to use studs with a tapered welding tip.

1.4 Operational Sequence

When welding in keeping with the drawn-arc method the gun must be loaded with a stud and a ceramic ferrule. When welding in keeping with the short-cycle method the ceramic ferrule is usually not used.

The loaded gun is pressed onto the workpiece at a right angle until the supporting tube touches the workpiece. The stud projecting from the supporting tube is pushed back at the same time compressing the pressure spring of the gun.

When the weld command is given, a pilot arc flows along the short-circuit distance between the stud and the workpiece. The gun coil lifts the stud from the workpiece against the force of the compressed spring.

When the welding stud is lifted from the workpiece, a pilot arc is drawn to begin with and then the main arc is ignited.

During the travel motion the arc melts the end of the stud and an approximately equally sized area on the workpiece so that a pool of liquid metal is formed under the arc and the stud.

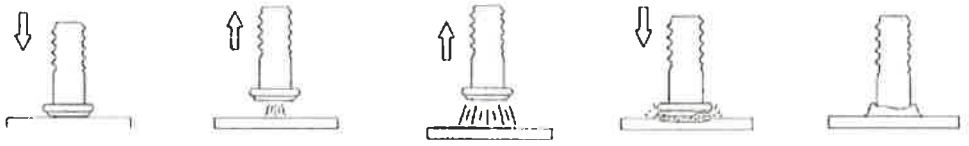
As soon as the gun coil is switched off-circuit the stud accelerates back onto the workpiece as a result of the force of the pressure spring.

Once the stud plunges into the weld pool, the main arc extinguishes and the weld current is switched off. The stud is pressed into the still liquid molten mass before the weld pool solidifies.

The gun is removed from the stud. When welding with ceramic ferrules the latter must be knocked off the cooled stud.

Welding sequence diagram:

1. Placing the welding stud
2. Drawing the auxiliary arc
3. Igniting the main arc
4. Immersing the welding stud
5. End of welding



The weld time as per per drawn-arc method is approx. 100ms - 1000ms.

For the short-cycle method the weld time is approx. 10ms - 100ms.

1.5 Welding Elements

According to the short-cycle method threaded studs (SC-B; SC-Z), internal inserts (SC-1) and pin studs (SC-S) of various dimensions and materials can be welded.

In keeping with the drawn-arc method threaded studs, headed studs and cylinder pins and other welding elements (according to EN ISO 13918) can be welded.

The following conditions must be observed:

- The weld gun has been set to the studs to be welded in the factory
- The stud type is noted on the type plate of the gun
- The studs to be welded are specified in chapter **6.3.7**

1.6 Ceramic Ferrules

Ceramic ferrules (according to EN ISO 13918) are used when welding in keeping with the drawn-arc method. They form a combustion chamber around the weld, which centers the arc and protects the user against welding spatter.

In addition to this, the cooling down rate of the weld is reduced and an even shape of the weld flash is achieved.

The following conditions have to be observed:

- An appropriate ceramic ferrule is required for every stud diameter
- For differing ceramic ferrules, corresponding ceramic ferrule holders are needed

The LFH 000 catalogue offers an overview of the Nelson ceramic ferrule product range.

1.7 Material Combinations

The welding suitability of the different metals and the combinations of stud material and base material depend on the welding process.

The material combinations listed in the following table have been tried and tested and comply with ISO/TR 15608[1].

Explanation of the superscript letters:

= For example for power transmission

= Restrictions for power transmission

= Only for momentary drawn-arc procedure

= Restrictions for the heat transfer

= Up to 12 mm diameter and inert gas

Stud material	Basic material			
	ISO/TR 15608 Groups 1 and 2.1	ISO/TR 15608 Groups 2.2, 3 ... 6	ISO/TR 15608 Groups 8 and 10	ISO/TR 15608 Groups 21 and 22
S235 4.6 16 Mo3	Well suitable for any application [a]	Suitable with restrictions [b]	Suitable with restrictions [b c]	Not suitable for welding
1.4742 1.4762	Suitable with restrictions [b]	Suitable with restrictions [b]	Suitable with restrictions [b]	Suitable with restrictions [b]
1.4828 1.4841	Suitable with restrictions [b]	Suitable with restrictions [b]	Suitable with restrictions [b]	Not suitable for welding
1.4301 1.4303 1.4401 1.4529 1.4541 1.4571	Suitable with restriction[b] Well suitable for any application [a e]	Suitable with restrictions[b]	Well suitable for any application[a]	Not suitable for welding
EN AW-AlMg3 EN AW-AlMg5	Not suitable for welding	Not suitable for welding	Not suitable for welding	Suitable with restrictions [b]

Group 1: Steel with a specified minimum yielding point ReH ≤ 460 N/mm²

Group 2.1 Thermo-mechanically rolled fine-grain structural steel and steel casting of a specified minimum yielding point of 360 N/mm² < ReH ≤ 460 N/mm²

Group 2.2: Thermo-mechanically rolled fine-grain structural steel and steel casting of a specified minimum yielding point ReH > 460 N/mm²

Group 3: Hardened and tempered and precipitation-hardened steel, but no rustproof steel, of a specified minimum yielding point ReH > 360 N/mm²

1. ISO/TR 15608: Welding - Guidance on Grouping Metallic Materials (2000-06)

Group 4:	Low vanadium-alloyed Cr-Mo-(Ni) steel with Mo ≤ 0.7% and V ≤ 0,1%
Group 5:	Vanadium-free Cr-Mo steel with C ≤ 0,35%
Group 6:	Highly vanadium-alloyed Cr-Mo-(Ni) steel
Group 8:	Austenitic steel
Group 10:	Austenitic ferritic rustproof steel (duplex)
Group 21:	Pure aluminium ≤ 1% impurities or alloy contents
Group 22:	Not heatproof alloys

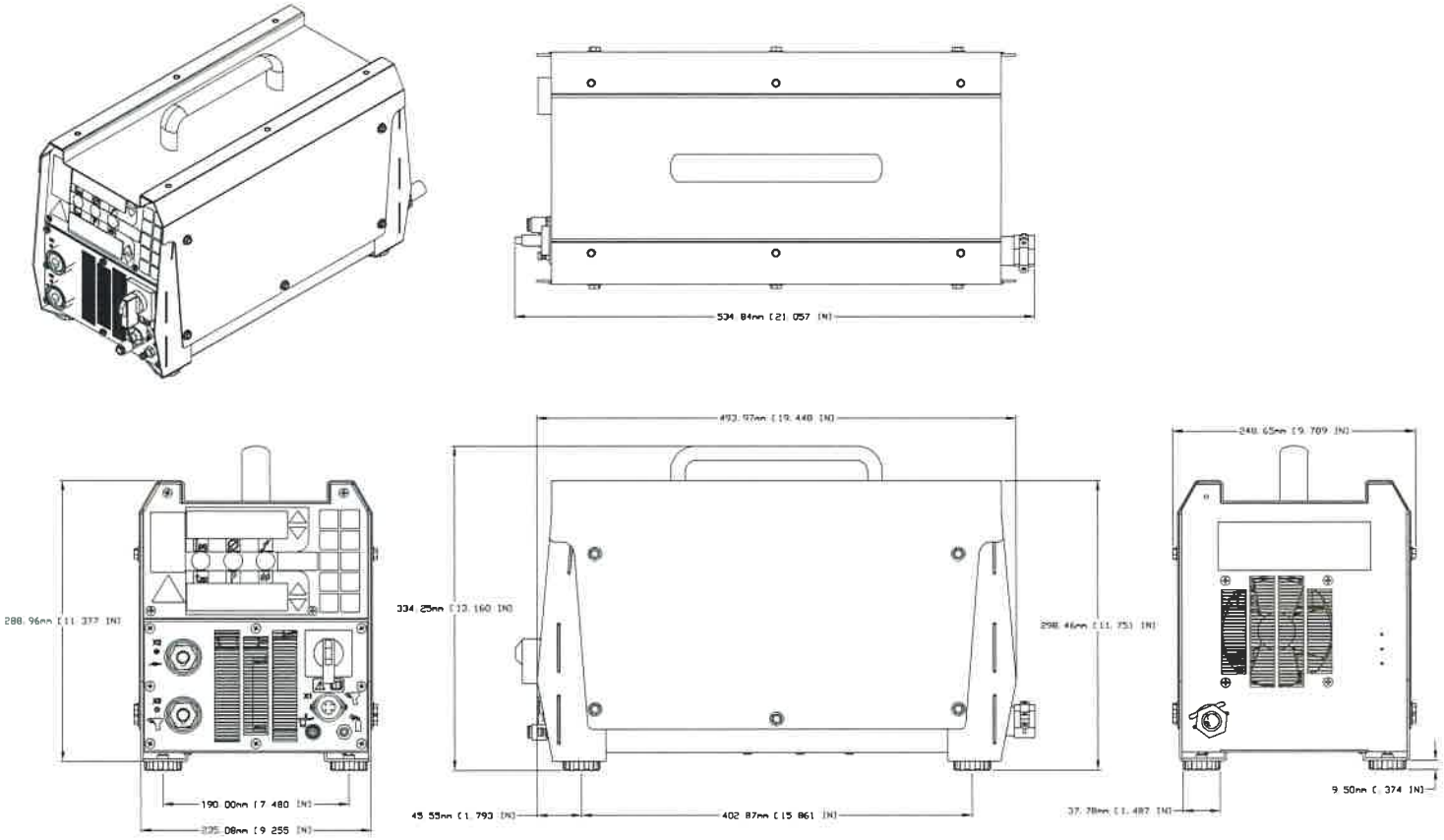
Note!

Please consult a Nelson expert for material combinations that are not listed in the table and applications where aluminium studs should be welded.

1.8 Technical Data

Unit designation/Type:	Stud welding unit / N800i
Version:	400V CE
Welding method:	Drawn-arc, short-cycle and gas-arc
Input voltage:	3~400VAC (+/- 10%)
System frequency:	50/60Hz
System fusing:	32A (slow-blow)
Output:	32kVA
No-load voltage:	75V
ON period:	3%
Weld sequences for	at biggest diameter
• Drawn-arc method:	max. 3 weld/min
• Short-cycle method:	max. 60 weld/min
Weld current range:	50-800A
Weld time range for	
• Drawn-arc method:	100ms-1000ms
• Short-cycle method:	5ms-100ms
Unit fuses F1, F2:	1,5A, 600V, Electronic fusing
Protection type due to casing:	IP23S
Protection class:	1 (one)
Operating Temperature:	-20 to +40 Degrees C
Storage Temperature:	-40 to +60 Degrees C
Type of cooling:	AF (thermostatically controlled)
Relative air humidity:	0% to 50% at 40 Degrees C 0% to 90% at 20 Degrees C
Dimensions:	B x H x T (250mm x 340mm x 535mm)
Weight:	21Kg
input power plug:	CEE (5 pole); 32A at 400V
input power cable:	H07RN-F 4G 6 (4x6mm^2)
Length:	2m

1.8.1 Dimensions



1.8.2 Accessories (optional)

Weld guns for manual stud loading:

Weld gun:	Type NS 40 SL
complete with accessories:	see NS 40 SL operating instructions
Shielding gas device:	order no. 67-03-04

Weld gun:	Type NS 40 (B-1, B-2, B-3, B-4)
complete with accessories:	see NS 40 B operating instructions
Shielding gas device:	order no. 67-03-04

Gas hose pipe:

10 m shielding gas hose pipe system (Nelweld N800i-gun): order no. 67-07-50

Connecting cable (standard):

Nelweld N800i - Workpiece:

earth ground cable H01N2-D (with 2 earth ground holders):

Cable cross-section:	2 x 35 mm^2
Minimum bending radius:	130 mm
Length 5.0m:	order no. 68-01-92 (others on request)

1.8.3 Option Kits / Accessories

Quantity	Part Number	Description
1	512-387-005[a]	Mobility Kit (General Stud Welding)
1	512-387-006[a]	Mobility Kit Automotive
1	512-387-041	Automatic Stud Feeder Interface Kit
1	512-387-052	NELWARE Software Package
1	512-387-053	Hardware and Fastener Kit
1	751-585-703[a]	Composite Gun, NS 40, FL 67mm²
1	751-585-801[a]	Composite Gun, NS 20, FL 107mm²
1	751-650-453	Light Duty Gun

a. Contact Nelson Stud Welding sales representative for availability

1.8.4 Guns cable extension incl. control cable

Length (m)	Cross section (mm²)	
	Part Number / Socket inclusive control cable with BIN 4	
	50	**70**
7,5	67-01-16 / 50	67-02-08 / 70
10	67-03-29 / 50	67-03-30 / 70
12,5	67-03-41 / 50	-
15	67-03-38 / 50	67-02-58 / 70
20	67-01-51 / 50	67-03-32 / 70
25	67-03-37 / 50	67-04-62 / 70
30	67-01-71 / 50	-
	Composite Cable inclusive control cable with BIN 4	
	67	**107**
7,5	722-000-165[a]	722-000-167[a]
15	722-000-164[a]	722-000-166[a]

1.8.5 Mass cable extension

Length (m)	Cross section (mm^2)	
	Part Number / Socket	
	50	**70**
5	68-03-61 / 50 BK[a] 68-03-63 / 50 BK/SK[b]	68-04-39 / 70
10	652-23-41 / 50	67-02-09 / 70/95
15	67-03-78 / 50	-

a. BK: Socket contact
b. BK/SK: Plug contact

1.9 Declaration of Conformity

Manufacturer and technical documentation holder:	Nelson Stud Welding, Inc 7900 West Ridge Road Eyria, Ohio 44036-2019 USA
European Representative:	Nelson Bolzenschweiß-Technik GmbH & Co. KG 58285 Gevelsberg, Germany

Hereby declare, that the welding unit of type Nelweld N800i for the welding of studs in keeping with the drawn-arc and short-cycle welding method was developed, constructed and manufactured in accordance with the following EC guidelines:

- Low voltage 2006/95/EEC
- EMC 2004/108/EEC

The following harmonised European standards have been applied:

- EN 60974-1 "Arc welding equipment – Part 1: Welding power sources" (2005)
- EN 60974-12 "Arc welding equipment – Part 12 Coupling devices for welding cables" (2005)
- EN 60529 "Degrees of protection provided by enclosures (IP-Code)" (2000)
- EN 60974-10 "Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements" (2003)

The following national standards and specifications have been applied:

- Accident preventation regulation BGV A3 "Electrical installations and operating materials" (1997)
- Operating working material BGR 500 (2007)

Technical documentation are on hand.

The operating and service instructions pertinent to the Nelweld N800i are available,

- in the original version
- in the operator's language

Manufacturer:	**European Representative:**
----------	----------
Ken Caratelli	Detlev Vierschilling
Managing Director	Managing Director

2. Safety at work

2.1 Safety Symbols

Safety notices and warnings are made on the one hand for your personal safety and on the other hand for product safety. In these operating instructions they are made to stand out by means of the following safety symbol.

The applied symbol has the following meaning:

	The caution sign draws your attention to potentially dangerous situations. It is always used in connection with one of the supplementary terms which are defined as follows.

The used supplementary terms have the following meaning:

Danger The addendum means that death, grievous bodily harm or considerable damage to property will occur if the corresponding preventive measures are not taken.

Warning The addendum means that death, grievous bodily harm or considerable damage to property can occur if the corresponding preventive measures are not taken.

Caution The addendum means that slight bodily harm or damage to property can occur if the corresponding preventive measures are not taken.

This sign contains important information about the correct method of handling the product or special advice, to which particular reference is to be made.

	**Warning!** The system operator is obliged only to allow persons to work with the unit, who are acquainted with the safety at work and accident prevention regulations and have a training authorizing them to perform stud welding! All persons who work with the unit are obliged to read and observe all the operating and service instructions of the welding unit prior to commencing work! In addition, the operating instructions of the weld gun connected in each case must be read and observed!

2.2 Safety notices

Safety should be one of the utmost concerns for each user of a Nelweld unit. Knowledge of and careful attention to all safety advice granted in this manual is highly advised by Nelson Stud Welding, Inc.

Observing all safety warnings and advice is a prerequisite for safe and correct handling and trouble-free operation of the Nelweld series of stud welding power supplies.

Users should observe all safety standards, including accident prevention regulations: „Welding, Cutting and Allied Processes" BGV D1 (2001).

Operating instructions must be kept where the Nelweld unit is used. The ability to quickly consult the manual is highly recommended to all Nelweld users.

Safety signs, stickers, etc. must remain attached to the Nelweld unit at all times. They should remain free from dirt and be kept in legible condition

Knowledge of the following safety notices is a prerequisite for safe and correct handling and trouble-free operation of the Nelweld N800i.

The operating instructions must always be kept at the place that the power unit is used.

Safety signs and the type plate must be kept in a legible condition.

In addition, the technical regulations for safe and professional working as well as the generally valid accident prevention regulations have to be observed.

Personnel training

Warning!
Only a qualified electrician should perform any work inside the unit's casing. Any work done should be made in accordance with all local and national electrical codes. Failure to do so may result in bodily injury or death.

The operating personnel of the welding unit must:

- be instructed in handling welding appliances
- have had training, which permits stud welding
- know the contents of these operating and service instructions

The maintenance and the electrical specialists must:

- have had training, which qualifies to carry out repairs
- be entitled to operate electrical circuits and appliances in accordance with safety engineering standards

Apprentices or personnel receiving on the job training may:

- only work with the welding head under supervision of an experienced person

Personal protection equipment (PSA):

Welding spatter, arcs and a noise level of 75dB. Consequently, the wearing of the following personal protection equipment is a mandatory stipulation:

	Hardly inflammable protective clothing covering the whole body as per EN 470
	Welder's protective filter with safety plates according to DIN EN 169
	Protective gloves as per DIN 4841 Part 4
	Helmet as per EN 397 (in case of overhead welding)
	Ear protection (plugs; muffs) as per DIN EN 352 is recommended
	In order to prevent back injury, do not attempt to lift the Nelweld unit alone. Seek the assistance of at least one other person when moving/lifting the unit.

During welding, exposed parts of the welding head are current-carrying. For this reason wear no electrically conductive jewelery (wristwatch or chain).

Protective measures at the work place:

The workplace must be such that people in the vicinity are adaquately protected against the harmful effects of optical radiation.

Space limiters and protective screens must be placed in such a way that the reflection and permeability of any radiation are for the most part avoided.

Combustible and inflammable materials must be removed from the welding zone. A guarantee must be given that a fire extinguisher is to hand at the workplace.

Ensure that the workplace is sufficiently ventilated and adequately lit.

	Only weld in rooms/areas, in which no additional hazards due to fire, explosion or moisture can occur.

During welding strong electromagnetic fields come into being. These can:

	• Interfere with or damage both electrical and electronical appliances • Irrevocably erase magnetic data carriers (memories • Magnetize and damage watches
	• Potentially fatal for people with cardiac pacemakers

Attention must be paid to the fact that the welding and earth ground cable are laid as close together as possible, near to the floor and with sufficient clearance to external electrical equipment.

This is particularly applicable when welding in residential and commercial area as well as on building sites and on special installations. If in doubt, the user must convince himself of the immunity to interference of the external equipment.

Ensure that the workplace is adequately ventilated and illuminated

	Make sure that fire fighting equipment as per DIN EN 3 is on hand. In the event of uncertainty, the employee responsible for fire protection should be consulted!

Warning!

- In keeping with standard EN 60974-10 the welding unit N800i is suited for use in an industrial environment (limit class A).
- We expressely point out that units of limit class A can cause radio interference in residential and commercial areas!

Safety measures prior to commencing work:

Each time, prior to commencing work (shift change), check:

- The welding unit for perceptible outer damage
- The correct application of all protective devices
- All connecting cables for mechanical damage
- Wear no electrically conductive jewelry such as ferrule rings, or chains
- The measures required to reduce emitted interference
- For a secure fit of the supply tube system on the screwed-in connection

Safety measures during normal operation:

- Only use the welding unit when in a technically perfect condition
- Refrain from any manner of working, which is hazardous to safety

Safety measures after work completion:

- Switch the welding unit off and disconnect the main plugs
- Secure and label the welding unit against unauthorised use
- Ensure that the stipulated maintenance intervals are observed

Safety measures in case of malfunctions:

- Switch the welding unit off and disconnect the main plugs
- Inform the plant/system personnel about the duration of the malfunction
- Secure and label the welding unit against unintentional restart-up

Warning!

- Opening the welding unit as well as a work inside the casing may only be carried out by authorized electrical specialists.
- Prior to closing the welding unit the connection of the protective conductor to the unit casing must be re-established!
- If the plastic protection must be removed for repairing the unit, always be sure to replace it prior to applying power to the unit.

Safety measures in case of increased electrical danger:

Increased electrical danger is to hand particularly when working:

- In confined spaces with electrically conductive walls
- In wet, damp, extremely dry and hot rooms
- With restricted freedom of movement on electrically conductive parts (metallic ladders, scaffolding, mounting rails, floor plates, etc)
- In confined conditions between or on electrically conductive parts

Under these working conditions, the following protective measures must be taken:

- The welder must be adequately protected against electrical dangers by using insulating underlay or intermediary layers
- The insulating materials must be applied in such a way that touching conductive parts, damp walls and damp flooring can be ruled out

For the use of insulating materials is not possible due to additional dangers (risk of falling, special room conditions, etc), work may at least only be done in dry, undamaged working clothes.

Safety features of the welding unit

The Nelweld welding unit bears the S sign and is suited for welding under increased electrical danger.

- The peak value of the no-load voltage lies below 113V.

In order to be able to ensure the dafety of the user in the event of an error, the power unit has a limiting device, which shuts itself down if the output voltage of 75V is exceeded.

To protect against direct and indirect contact the welding unit is equipped with the following protective measures:

Protection type IP 23S: Protection against penetration by foreign bodies (Ø ≥ 12mm). Protection against splashwater, inclined up to 60° to the perpendicular.

Protection class I: Unit with basic insulation and connection of all exposed conductive parts to the protective conductor.

WARNING!

- During wet weather (e.g. rain), with the N800i should not be welded outdoors!
- Wet equipment must dry out before use. Operators must always use dry insulation between themselves and the welding equipment.

2.3 Intended use

During the design and manufacture of the Nelweld N800i the relevant guidelines and standards were observed. The welding head was built according to state of the art technology and is operationally reliable.

Nevertheless, dangers can originate from the Nelweld N800i welding head if it is operated by untrained people or is not used as intended.

Observation of the following points falls under intended use:

- The N800i is designed for welding studs according to the drawn-arc and the short-cycle welding methods.
- The specifications in these operating instructions with regard to material combinations and the particularities of studs and ceramic ferrules have to be observed.
- The Nelweld N800i is not suited for use in residential and business areas because electromagnetic disturbance must be expected in external electrical equipment as a condition of its process.
- The operating location of the Nelweld N800i is limited to areas of an industrial and trading nature. When used in residential and commercial areas the user of the system must ensure that the electromagnetic fields that occur during welding do not cause any dangers to persons and property.
- The Nelweld N800i is only permitted to be used with the cited accessories. Alterations to the Nelweld N800i not authorised by the manufacturer are forbidden.
- The Nelweld N800i is only to be operated with the plant components listed in. It is not permitted to configure the equipment with that of other manufacturers.
- Furthermore, the observance of the general and particular safety advice in these operating and service instructions as well as relevant accident prevention regulations UVV (BGV A3[1]; BGR 500[2]) falls under indented use.

Operation in accordance with regulations also includes observing the general and special safety instructions contained in this documentation as well as the local regulations on accident prevention.

Warning!
Contravention of intended use or usage exceeding this, is inadmissible and possibly dangerous.
The manufacturer is not liable for damage resulting hereof; the operator alone bears the risk!

1. BGV A3: UVV „Electrical installation and operating materials" (1977)
2. BGR 500: Operating working material (2007)

2.4 Guarantee and liability

Guarantee and liability claims in case of physical injury and damage to property are excluded if they are due to one or several of the following causes:

- Non-intended use of the Nelwled N800i welding unit
- Non-compliance with the operating instructions of the Nelweld unit and associated options
- Non-compliance with the operating instructions for the system components
- Use in moist, inflammable and potentially explosive surroundings
- Use in residential and commercial areas as well as in business establishments
- Improper start-up, maintenance and conversion of the welding head
- Start-up in case of improperly mounted supply tube system
- Non-observance of the working and safety notices in the operating instructions
- Improper handling of the shielding gas supply devices
- Improperly implemented repair work
- Repair by unqualified personnel
- Arbitrary structural alterations to the system
- Non-observance of the stipulated maintenance intervals

The Nelwled N800i welding unit is only designed for the range of applications, which is specified in on "Intended use".

Note!

Before the Nelwled N800i welding unit is used outside the contractual operative range, the customer service of Nelson Bolzenschweiß - Technik GmbH & Co. KG has to be consulted, as otherwise the guarantee is not applicable.

2.5 Copyright

NELSON BOLZENSCHWEIß-TECHNIK GMBH & CO. KG
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58285 Gevelsberg, Germany
Telephone: +49 (0) 2332 661-0
Telefax: +49 (0) 2332 661-121

3. Delivery and Transport

3.1 Extent of delivery

Included in the extent of delivery of the Nelweld N800i welding unit are the following unit components and accessories:

- 1 Nelweld N800i welding unit
- 1 set of operating and service instructions for the Nelweld N800i

3.2 Packing and dispatch

Unless otherwise agreed, the type of packing complies with HPE regulations, which were laid down by the Federal Association for Wooden Materials, Pallets and Export Packing.

3.3 Inspection of incoming materials

The operability of the welding unit was tested prior to dispatch.

On arrival the welding unit has to be checked for damage as well as for the completeness of the parts within the extent of delivery.

Any possible transport damage and/or missing parts have to be immediately made known to the manufacturer or the authorized forwarding company.

3.4 Intermediate range

If the Nelson N800i welding unit is not operated immediately after delivery, it must be put into intermediate storage in a secure place.

The welding unit must be sufficiently protected against dust and moisture.

3.5 Storage

If the welding unit is not operated immediately after delivery, it must be put into intermediate storage in a secure place. To this end the Nelweld N800i has to be sufficiently protected against impurity and moisture.

3.6 Transport

In order to avoid damage to the welding unit, the N800i may only be transported by the foreseen handles or by means of suitable lifting gear.

The input power cable may not be misused as a handle.

	In order to prevent back injury, do not attempt to lift the Nelweld unit alone. Seek the assistance of at least one other person when moving/lifting the unit.

3.7 Operating Location

The operating location of the N800i welding unit is restricted to areas of industrial and trading nature. Welding can cause radio interference in residential and commercial areas.

- Welds that are performed at temperatures below 5°C (41° Fahrenheit) may have a negative influence upon the welding result.
- To protect people not involved, the operating location must be amply cordoned off and clearly marked with warning and informatory signs.
- Inflammable and explosive materials must be removed from the danger zone.

Note!

We expressly point out that welding in commercial areas, in the open or in open halls is as a general principle forbidden

	**Danger!** Wearers of cardiac pacemakers are as a general principle forbidden to stay in the vicinity of stud welding facilities.
	Electrical external appliances can be disturbed or damaged by the electromagnetic fields, which occur when welding. Therefore, a minimum clearance of 10m has to be guaranteed between the welding apparatus and the external appliances.

	It is forbidden to operate the equipment in an environment where there is a risk of fire, explosion or dampness beyond the power units IP rating.
	**Warning!** In keeping with standard EN 60974-10 the welding unit N800i is suited for use in an industrial environment (limit class A). We expressely point out that units of limit class A can cause radio interference in residential and commercial areas!

4 Connection and Installation

4.1 Installation Precautions

Attention must be paid to the fact that the welding unit is installed on horizontal, vibration-free and non-slip floor space The load-carrying capacity of the floor space should be at least double the weight of the welding unit.

When working in high-lying locations, such as bridges, ladders or platforms the N800i must be secured against the risk of falling.

The Nelweld N800i must be adequately protected against the intrusion of liquids. It may not be installed on liquid-bearing pipelines.

In order to guarantee unimpeded temperature exchange with the environment, a minimum clearance of 1 m (39.4 inch) to existing heat sources must be observed.

Attention must be paid to the fact that the ventilation slits on the unit casing are kept free.

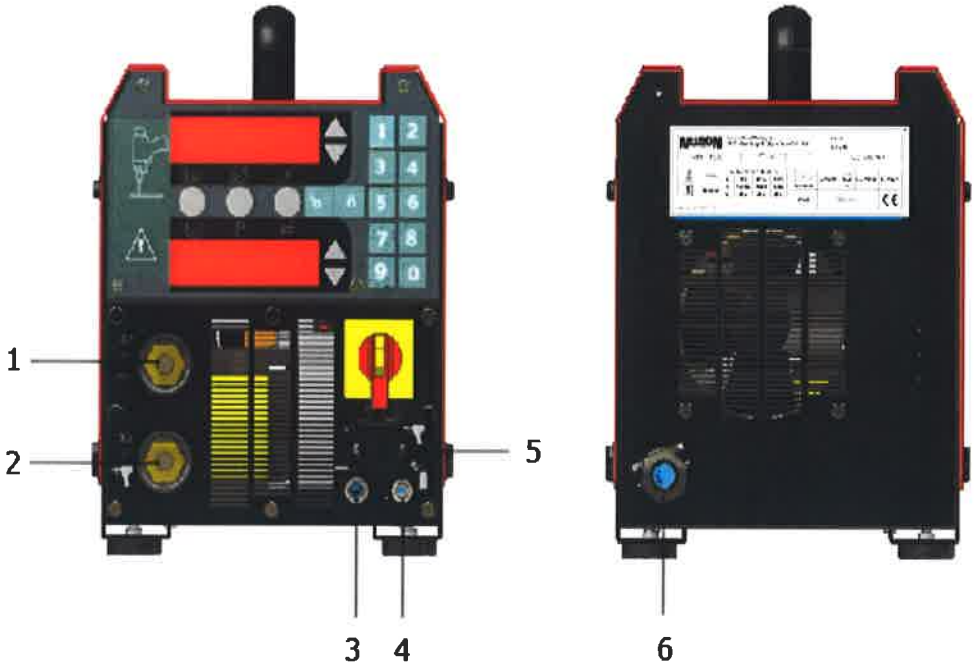
4.2 Connection

With the exception of the input power cable all the connecting elements are arranged in a functional manner on the front plate of the N800i.

The input power cable with CEE plug is to be found at the rear of the unit

Warning!

Prior to connecting the N800i to the input power voltage supply, the safety advice and information in chapter **5.1** must be observed!



1 Welding cable connection (+) X3	4 Gas connection input (bottle)
2.Welding cable connection (-) X2	5 Control cable connection (X1)
3 Gas connection output (gun)	6 input power cable connection

Warning!
Prior to any connection work the Nelweld N800i welding unit must be switched off. The input power switch of the unit must be in the >>0<< position!

4.2.1 Input Connection

Before the Nelweld N800i welding unit is connected to the supply voltage the following connecting criteria must be observed.

- The CEE plug of the input power cable may only be connected to appropriately designed input power socket outlets
- Only tested input power socket outlets with a tested protective conductor function may be used.
- In order to electrically protect the welding system against short circuits a 32Atime - delay fuse is required per phase.

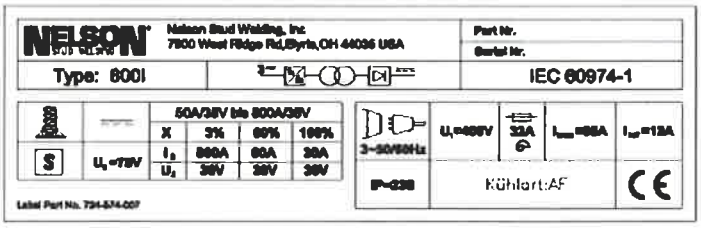
Once these criteria have been met, the switched-off welding unit can be connected to the supply voltage with due regard to the safety advice.

Warning!

Connection to the input power may only be carried out by a qualified electrition in accordance with all local and national electrical codes!

Before connecting ensure that the welder grounding conductor is connected to a proper safety (earth) ground!

The Nelweld N800i may only be operated with a input power voltage of 400-460VAC/50/60Hz. The input power connection values are marked on the type plate.



Definition of "Kühlart: AF": Air cooling by external ventilation (fan)

Definition of this symbol: Fusing with slow response characteristics

4.2.2 Connection of the Welding Cable

Connection of the welding cable of the gun is effected by means of the welding cable socket of the N800i which is marked with the gun symbol.

It must be noted that procedurally safe operation of the system can only be guaranteed when NS 40-B or NS 40 SL guns are connected.

Welding Cable Connection (X2)

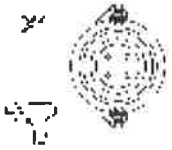
Connect the welding cable plug of the gun to the welding cable socket of the N800i.

The connection must be secured by a full "turn to the right" of the welding cable plug!

4.2.3 Connection of the Control Cable

The control cable socket serves to take the control cable plug of the gun. The signals to control the gun are transmitted via the control cable.

In keeping with the weld gun to be connected (type NS 40-B or NS 40 SL), the control cable socket of the welding unit is 4-pole in design.



Control Cable Connection (X1)

Pin 1: Gun coil (-)

Pin 2: Gun coil (+)

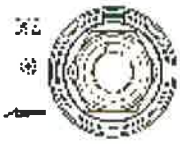
Pin 3: Start button of the gun (+)

Pin 4: Start button of the gun (-)

The connection must be secured by "screwing on" the control cable plug!

4.2.4 Connection of the Ground Cable

The welding current return takes place via the earth ground cable, which must be connected as follows to the earth ground cable socket of the Nelweld N800i.



Earth ground Cable Connection (X3)

Connect the earth ground cable plug into the proper socket of the Nelweld N800i.

The connection must be secured by a full "turn to the right" of the earth ground cable plug!

Warning!

The welding cable connection cannot be locked. Tight connection must be checked regularly (2 -3 times per shift)!

4.2.5 Connection of the shielding gas

Prerequisites:

The Nelweld N800i has already been equipped with a shielding gas valve combination.

The connected weld gun has already been equipped with the optional special equipment for shielding gas.

Standard Mode:

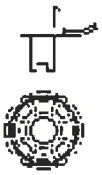
When the gun with manual stud-loading is connected, the tubes from the gas source and the gun must be directly connected to the Nelweld N800i.

Connection of the shielding gas source:

Supply of the shielding gas is ensured by means of the marked coupler plug.

The tubing system with coupler socket (optional) must be pushed into the coupler plug to lock it into place.

Connection of the gun:



The tubing system to the weld gun or to the feeder must be connected to the coupler socket.

The tubing system with coupler plug (optional) must be pushed into the coupler socket to lock it into place.

Should the gas tubes be removed by pressing/pulling the release ring, the self-sealing coupler sockets prevent any shielding gas from escaping.

Warning!

Prior to commencing work the shielding gas tubes must be checked for leaks!

4.2.6 Connection of the workpiece

As standard, the earth ground cable is equipped with two earth ground terminals which have to be connected to the workpiece.

When connecting the earth ground terminals attention must be paid to the following:

1. The earth ground terminals must be connected directly to the workpiece or to the workpiece fixture (welding bench, welding grid).

Steel constructions, tracks, pipelines, etc. may not be used as current conductors, unless they are themselves the workpiece to be welded.

2. The welding current circuit may not be earth grounded.

Exception: The workpiece itself or the workpiece fixture are earth grounded compulsorily (pipelines, shipbuilding, etc.).

3. Place the earth ground terminals if possible at the same distance from the point of welding when two ground clamps are used.

Note!

Prior to connecting the earth ground terminals the following advice on avoiding any arc blowing must be observed!

4.3 Arc Blowing Effect

Blowing effect is the designation for the lateral deviation of the arc from a central position. Depending on the cause, a distinction is made between the following blowing effects.

Thermal blowing effect:

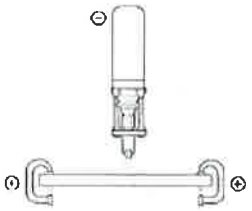
- Deviation of the arc as a result of the expansion and turbulence of heated gases in the combustion area of the arc.

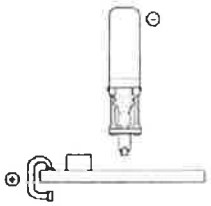
Magnetic blowing effect:

- Deviation of the arc as a result of the influence of magnetic or electromagnetic fields.

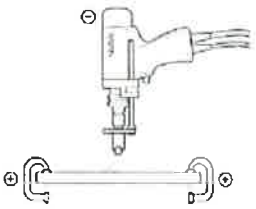
The possibilities of reducing the thermal blowing effect are limited. They are restricted to precise centering of the stud and chuck.

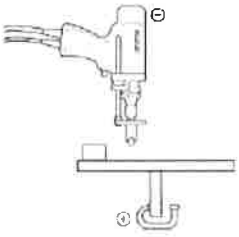
Several remedial measures are available to reduce the consequences of the magnetic blowing effect-some of which are indicated below.





In order to favorably influence the arc, the earth ground terminals must be placed as symmetrically as possible to the point of welding.	*In the event of a one-sided earth ground terminal the arc blows away from the terminal. The condition can be eliminated by additional metal plates.*

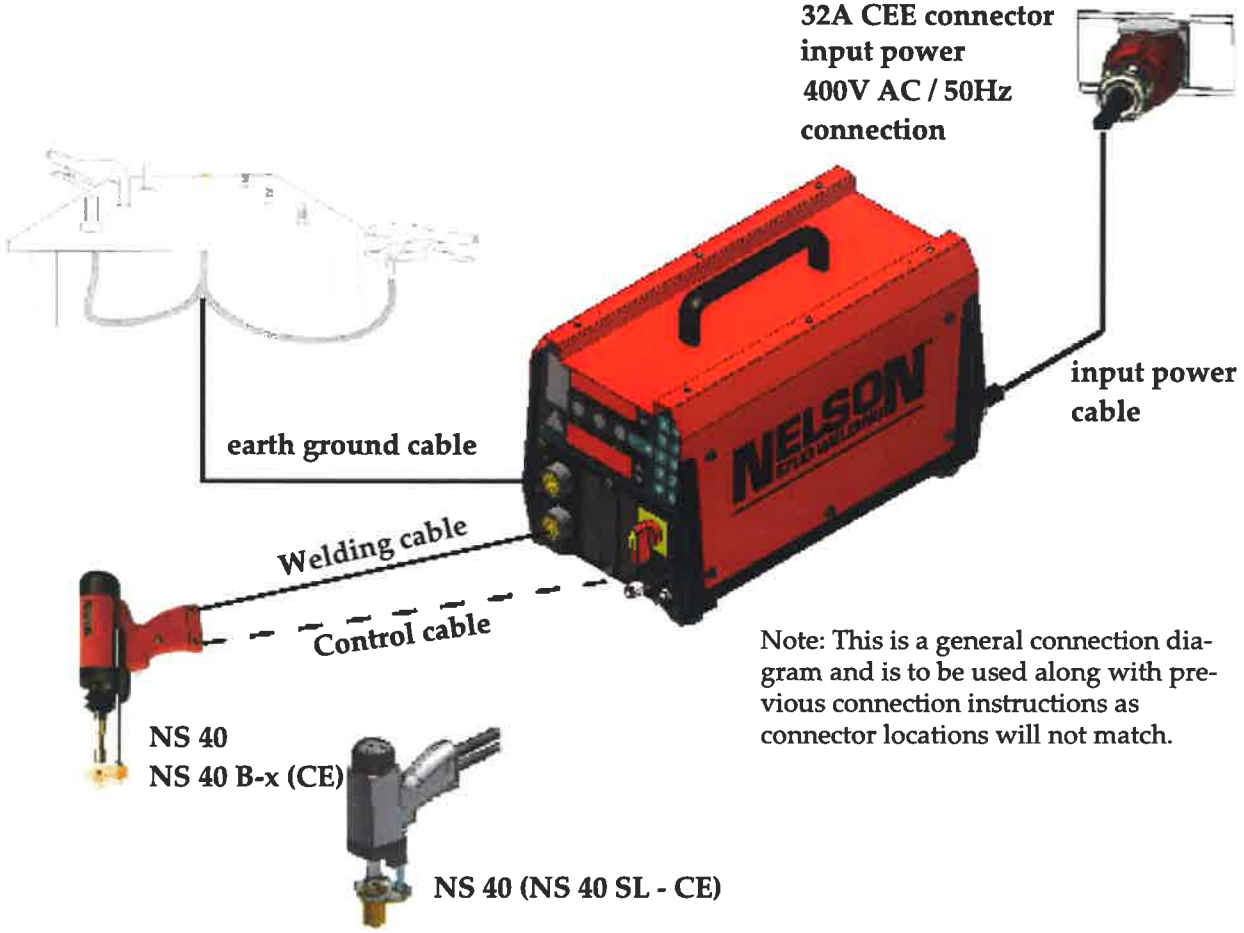




Influences upon the arc as a result of welding cable itself can largely be avoided by turning the weld gun through 90°.	*When welding sections, arc blowing can be reduced by repositioning the earth ground terminal and additional metal plates.*

The polarity in the illustration refers to ferromagnetic materials. when welding aluminium attention must be paid to reverse polarity.

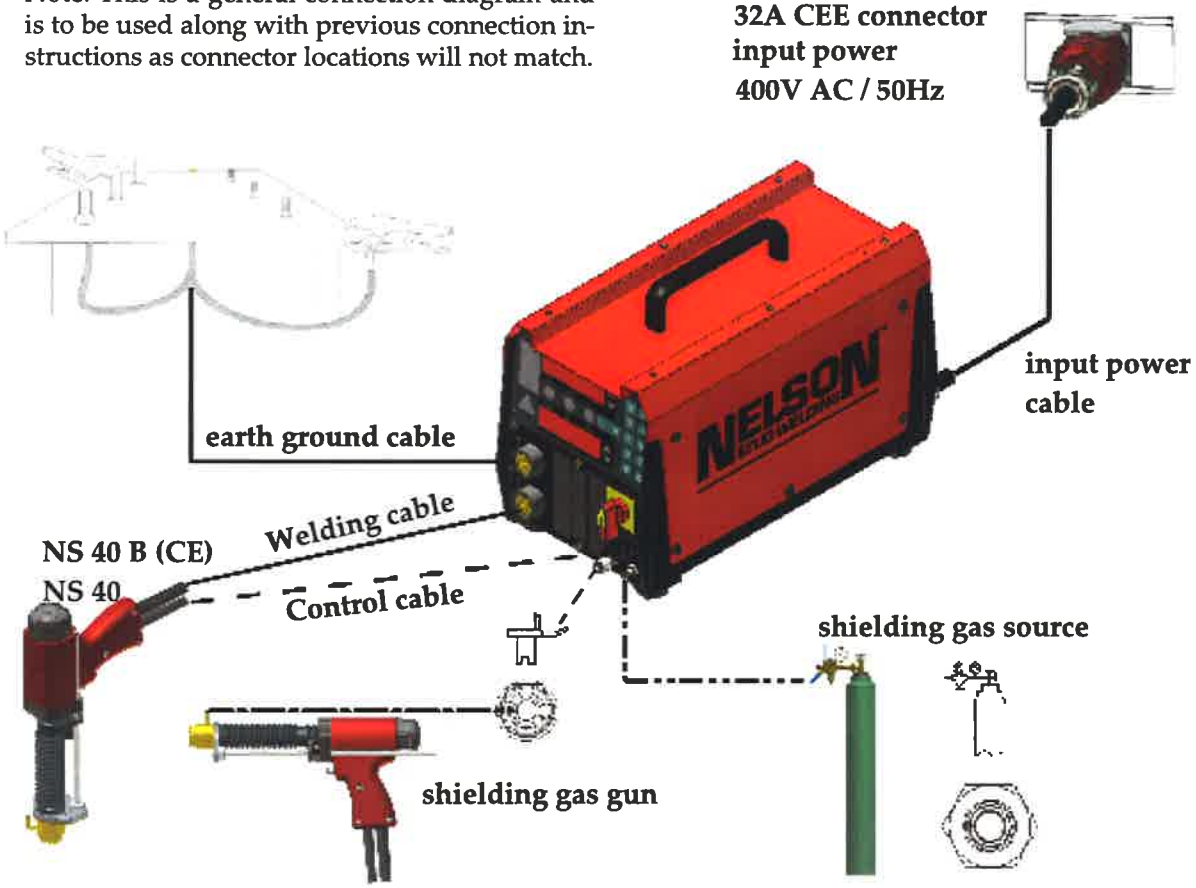
4.4 Connection Diagram Short-Cycle and Drawn Arc Welding



Note: This is a general connection diagram and is to be used along with previous connection instructions as connector locations will not match.

4.5 Connection Diagram Shielding Gas

Note: This is a general connection diagram and is to be used along with previous connection instructions as connector locations will not match.



4.6 Additional Cautions

SELECT SUITABLE LOCATION

The N800i will operate in harsh environments. Even so, it is important that simple preventative measures are followed in order to assure long life and reliable operation.

The machine must be located where there is free circulation of clean air such that air movement in the back, out the sides and bottom will not be restricted.

Dirt and dust that can be drawn into the machine should be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown.

Keep machine dry. Shelter from rain and snow. Do not place on wet ground or in puddles.

Caution!

DO NOT MOUNT OVER COMBUSTUBLE SURFACES. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least 1.6mm (.063 inches) thick, which shall extend not less than 150mm (5.9 inches) beyond the equipment on all sides.

STACKING

- N800i cannot be stacked.

TILTING

- Place the machine directly on a secure, level surface or on a recommended undercarriage. The machine may topple over if this procedure is not followed.

INPUT AND GROUNDING CONNECTIONS

- Only a qualified electrician should connect the N800i. Installation should be made in accordance with the appropriate National Electrical Code, all local codes and the information detailed below.
- When received directly from the factory, machines are internally connected for 460VAC.
- Open the access panel on the rear of the machine.

POWER CORD CONNECTION

- A power cord is provided and wired into the machine. Follow the power cord connection instructions.

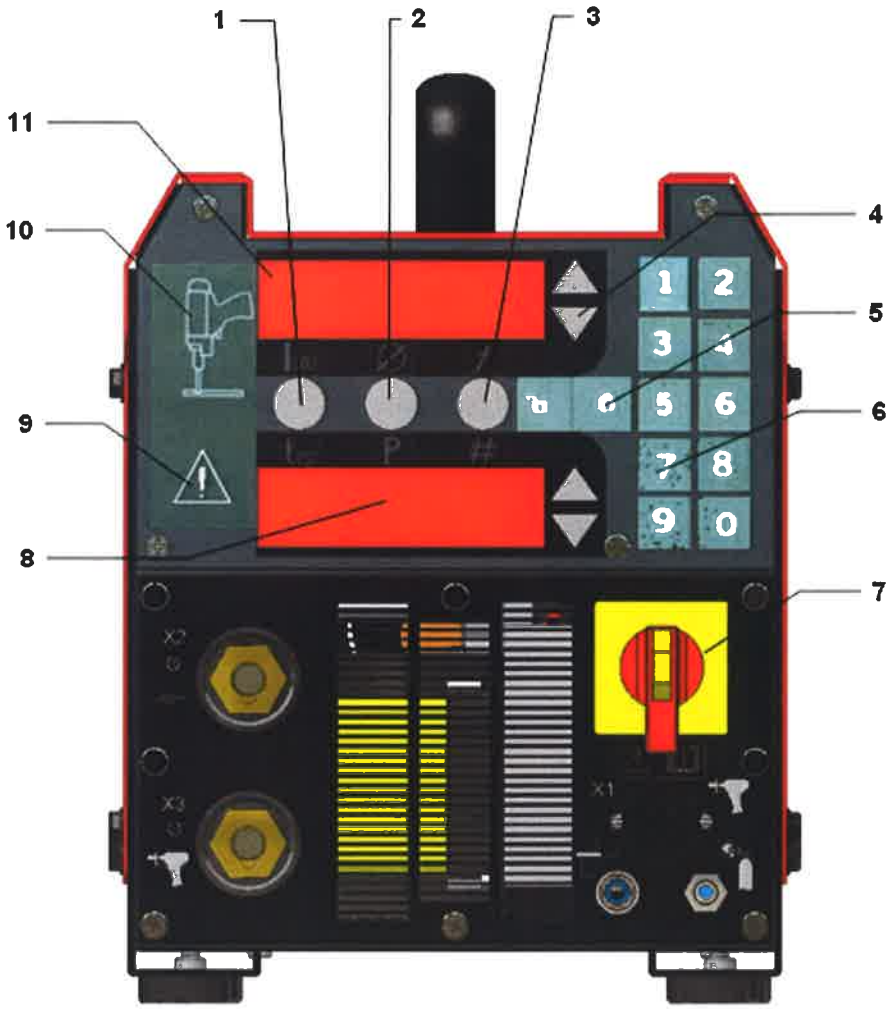
TROUBLESHOOTING WITH COVER OFF

- Do not remove plexiglass. Unlike other welders, N800i heatsinks have HIGH VOLTAGE.

Caution!

Incorrect connection may result in equipment damage!

5. Control and Display Elements

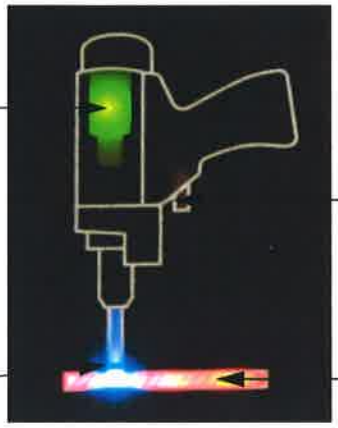


5.1 Front Panel Controls and Displays

1	Time/Current Mode	Enables Time/Current weld parameter selection
2	Stud Expert Mode	Setup selection by stud diameter and other process parameter such as weld position
3	Function Mode	Configuration Change or Troubleshooting
4	Up/Down Arrow Keys	Add or subtract numeric values in time or current function
5	Lock/Unlock Keys	The unit has a lockout feature that prevents any changes from being made to the front panel settings. See F19
6	Preset Values	Factory presets or storage of custom values
7	On/Off Power Switch	The main switch controls the input power to the machine. Upon powering up, the internal control software performs a series of diagnostic tests to ensure correct connection and operation of the power source.
8	Weld Time/Stud Expert Display/Material Display	The TIME setting is displayed on the front panel LOWER display. It can be changed using the Up/Down arrow keys to the right of the current display in one (1) amp increments.
9	Warning alert	This indicator turns ON when a fault condition occurs. Please refer to F1 in the troubleshooting section of this guide for fault condition descriptions and resolution.
10	Weld Tool Icon[1]	Graphical representation of gun operation and welding process.
11	Weld Current/Stud Diameter Display	The CURRENT setting is displayed on the front panel UPPER display. It can be changed using the + and – arrow keys to the right of the current display in one (1) amp increments.

1. Explanations see next page

Weld Tool Icon



Gun Coil
Green = Energized
Red (Flashing) = Undetected

No Light = Detected but not energized

Blue - Welding in progress

Trigger Indicator

Contact Detect (Green)

Good/Bad Weld Indicator (Green/Red)

6. Operation

6.1 Advice on Stud Welding

The advice on stud welding must be observed prior to commencing to weld. It contains information important to achieving good welds.

1. Welding elements and workpieces have to be suitable for welding. Only use material combinations, which are specified in the operating and service instructions.
2. The welding zone should be even and have a metallic bright finish. Care must be taken not to exceed a welding zone coarseness of 80µm.
3. Impurities in the welding zone such as rust, forging scales, coloring as well as moisture, fatty matters and oils have to be carefully removed prior to commencing welding. Anodised workpiece surfaces must be ground.
4. Workpieces made of aluminum or workpieces with aluminum coating may only be cleaned with a stainless wire brush or scraper.
5. Take care that the workpiece is stored free from vibrations (particularly important in case of large and thin-walled workpieces).
6. Chlorous solvents must by all means be removed from the welding zone. They may not be exposed to the arc radiation.
7. Poor welding quality as a result of arc blow can be avoided by careful grounding techniques such as using multiple grounding clamps and symmetrically positioning the grounding clamps.
8. Ensure that there is good current transfer (low-resistance) in all contact points in the welding circuit (welding cable connections – chuck – grounding clamps).
9. Always lay out the welding and earth ground cable without any snarls. Electromagnetic influences can thus be largely avoided.
10. Check the settings of the N800i welding unit and of the connected gun that you require for the welding task.
11. The position of the weld gun and the workpiece may not be altered during the welding process.
12. Welding on one workpiece with several welding units must be avoided (electrical danger as a result of higher no-load voltages and possible EMI interference).

If welding on one workpiece with several welding units cannot be avoided, it is not recommended to weld simultaneously.

6.2 Basic Procedure

The process to begin welding using a Nelweld unit is very easy, once the proper electrical connections and gun connections are established:

- Turn the main power switch on the front of the unit to the "on" position. Wait for the unit to complete its startup sequence.
- Set the desired current and time settings using one of the following 3 methods:

1. Push Time/Current Mode button (3 in the Front Panel section), and up/down buttons (8) to adjust time and current discretely.
2. Push Stud Expert (TM) Mode button (9 in the Front Panel section), and up/down buttons (8) to adjust stud diameter and weld position (or another process condition) and the welder automatically sets the weld current and time using a database.
3. Push one of the 10 preset buttons (11 in the Front Panel section) to choose one of the factory presets (see next section factory preset table).
    - Save any set points, if desired.
    - Adjust other settings by accessing the proper function.
    - Perform a lift check to verify proper gun lift.
    - Lock the unit, if desired.
    - Perform test welds to verify the correct welding settings.
    - After establishing proper setup, production welding may begin.

6.3 Weld Parameters

You can program this unit in 2 ways: directly setting the current and time values; or use the Stud Expert (tm) mode based on stud diameter.

6.3.1 Setting Current and Reading the Current Display

The current setting is the current setting during a weld, and can be viewed in the front panel's upper display. It can be changed using Up/Down arrow keys to the right of the current display in one (1) amp increments. As each of these keys reinput power pressed, the current setting will increase or decrease at a faster rate.

After each weld, actual current and time will be displayed briefly before the set values are displayed again.

If the display shows an actual weld time of the sum of the front panel time and F2 (short circuit on-time), a cold plunge may have occurred that can result in bad weld quality. If this condition persists, it is recommended to do a gun calibration to set the F31 value, and check the physical condition of the gun for any causes of preventing a normal drop. If the actual weld time is less than the front panel time, it means the arc shorted early, indicating a potential improper gun lift setup.

When the display shows WAIT when the trigger is pulled, it means the rated duty cycle is exceeded during operation. It is advised to check the value of F2 and possibly reduce the value of F2 to reduce the on-time and increase the studs per minute without cold plunge.

In normal operating modes, the desired setting and the actual current will be the same. In this situation the display does not change during or after a weld. However, in conditions where it is not possible for the power source to deliver the desired current, a warning light will light on the front panel display. This typically occurs when using high currents with small or excessively long weld cables.

6.3.2 Setting the Time and Reading the Time Display

The time setting is displayed on the front panel lower display. It can be changed using Up/Down arrow keys to the right of the time display in one (1) millisecond (0.001 second) increments. As each of these keys reinput power pressed, the time setting will increase or decrease at a faster rate. The time display is used to display both the desired time setting and the actual weld time.

In normal operating modes, the desired setting and the actual weld time will be the same. When this is the case, the display does not change during or after a weld. However, if an error condition occurs, the proper error code will be displayed on the front panel display. This will typically happen if a weld is aborted early.

6.3.3 Lift distance and plunge distance parameters:

- The mechanical parameters must be set on the respectively connected weld gun NS 40-B or NS 40 SL.
- See the operating instructions of the corresponding weld gun for the settings.
- See the gun operating instructions and diagrams below respectively for the guide values for the welding method.

6.3.4 Calibrate the gun drop time F31

It is recommended to calibrate the gun so that the welder understands the gun drop time and delivers the precise main arc time programmed. The calibration is a good practice when you exchange the gun, especially when you change process between short cycle mode (maximum main arc time is 100 ms) and drawn arc (mininum main arc time is 100 ms), or change gun type or plunge dampener (shock absorber). Simply go to F31, and shoot a stud. The actual gun speed is measured and the actual drop time is saved in F31.

6.3.5 Weld Parameter Presets

The power source has ten available preset configurations. Each of these is assigned a time and current setting for commonly welded stud sizes. To select a preset, simply press key 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. When a preset is selected, the time and current are displayed on the front panel, and the LED on the selected preset key lights.

Nelweld users are not restricted to pre-programmed presets, but may save more usable weld settings. To do so, first select the desired time and current settings using the corresponding Up/Down arrow. Then press and hold the desired preset key for 4 seconds. The preset values will be replaced by the desired custom values. When the orange LED of the preset button being pressed turns ON, the selected preset has been successfully programmed.

Note!

The weld parameter presets depends on to choosen weld method (short cycle, drawn arc).

6.3.6 Recommended Weld Parameters

The values specified in the tables and diagrams respectively must be seen merely as guide values, which were achieved under optimized welding conditions.

The best possible weld parameters must always be determined with proper attention to factors such as the material and surface quality of the workpiece, plate thickness, welding position, stud type, stud dimensions, etc. in trial welds.

Attention must be paid to the fact that the trial welds are for the most part equivalent to the real conditions in the current production process.

In obtaining the best welding result, the electrical and mechanical weld parameters must be preceisely adjusted to the respective welding task.

Upon suspicion of faulty welds the settings on the welding unit and the weld gun must be optimized.

The results of the trial welds must be tested in keeping with DIN EN ISO 14555[1].

Note!

The weld parameters in the tables and in Stud Expert are provided as is, without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular application. Performance suitability for any specific application should be determined by the user. The user assumes all liability of the use or the results of the use of the recommended weld parameters.

Nelson can not assume any responsibility for updating or correcting the welding advice or guide values once they have been given, nor does the provision of information create, expand or alter any warranty with respect to the sale of our products.

1. Arc stud welding of metallic materials (2006)

6.3.7 Weld Parameters and Settings

Note!

Weld parameters and settings below are developed using Nelson equipment and Nelson studs. It is recommended to use fasteners from one manufacturer (Nelson studs) to ensure weld consistency and compatibility.

Factory Preset Weld Settings (Short Cycle)

	Preset	Nelson Stud Type	Stud Size Ø	Current (Amps)	Time (ms)
Preset Bank 2 *	1	SC-Studs [3.0 M3]	4 mm	400	15
	2	SC-Studs [4.0 M4]	5 mm	500	15
	3	SC-Studs [5.0 M5]	6 mm	600	20
	4	SC-Studs [6.0 M6]	7 mm	700	25

The duty cycle limits for the Nelweld N800i can be seen in the Stud Weld Rate table below. If the duty cycle is exceeded, and a weld is attempted, a "Wait" prompt will be displayed. "Wait" will disappear when the unit is ready for another weld. If the unit reaches an abnormally high temperature, a failsafe thermal sensor will protect the unit and display E011. The unit will resume operation once the temperature has returned to safe operating range.

Factory Preset Weld Settings (Drawn Arc)

	Preset	Nelson Stud Type	Stud Size Ø	Current (Amps)	Time (ms)
Preset Bank 1**	1	IS-Studs	3 mm	200	150
	2	IS-Studs	4 mm	280	200
	3	IS-Studs	5 mm	350	230
	4	SD6, MR M8, S6	6 mm	410	250
	5	MP (F) M8	7 mm	470	300
	6	MR M10, S8	8 mm	550	300
	7	MP (F) M10	9 mm	650	300
	8	SD10, MR M12, S10	10 mm	750	350

	Preset	Nelson Stud Type	Stud Size Ø	Current (Amps)	Time (ms)
Preset Bank 0**	1	Drawn arc stud	3/16"	300	150
	2	Drawn arc stud	1/4"	450	170
	3	Drawn arc stud	5/16"	500	250
	4	Drawn arc stud	3/8"	550	330
	5	Drawn arc stud	7/16"	675	420
	6	Drawn arc stud	1/2"	800	550

* Preset bank 2 is loaded (such that presets 0-9 are as described above) when in short cycle mode.

** Prest bank 0 or 1 are loaded (such that presets 0-9 are as described above) when in drawn arc mode.

Bank 0 is loaded when a 2 - wire gun interface is used.

Bank 1 is loaded when a 4 - wire gun interface is used.

Note: The preset bank may be selected manually using Function Code F44.

6.3.8 Parameters for short - cycle procedure

Note!

The following parameters are only starting points (***guide values***) which must be adjusted to specific application conditions (base material, workpiece surface condition, weld position, gun type, weld circuit inductance and grounding etc.). It is recommended to perform robustness weld test (current-time tolerance graph) using the values below as center points to determine optimum welding parameters for the application.

Stud Type	Stud Size Ø	Current (Amps)	Time (msec)	Lift (mm)	Plunge (mm)
SC-S 3, SC-BM 3	4 mm	400	15	1,0	2,0
SC-S 4, SC-BM 4	5 mm	500	15	1,0	2,0
SC-S 5, SC-BM 5	6 mm	650	20	1,5	2,0
SC-S 6, SC-BM 6	7 mm	800	20	1,5	2,0

Rule of thumb for the parameters for the Short - Cycle - Procedure

- $I\,[A] \cong 100^* \phi$
- $t\,[ms] \cong 4^* \phi$

ϕ is in mm units.

6.3.9 Parameter for drawn - arc procedure

Drawn Arc Welding

Stud Type	Diameter ∅	Current (A)	Time (msec)	Lift (mm)	Plunge (mm)	Lift (mm)	Plunge (mm)	Welds/min
Stud Form				tapered abutting face		plane abutting face		
IS3	3	200	150	1,5	8,0	1,5	8,0	52
IS4	4	280	200	1,5	4,0	1,5	4,0	43
IS5	5	350	200	2,0	4,0	2,0	4,0	43
SD, MR, M8, SR	6	400	250	1,0	1,5	2,0	2,5	36
MP(F) M10, S8	7	450	300	1,0	1,5	2,0	2,5	32
MR M10, S8	8	550	300	1,0	1,5	2,0	2,5	32
MP(F) M10	9	700	350	1,0	2,0	2,5	3,0	28
SD10, MR M12, S10	10	750	400	1,5	2,0	2,5	3,0	25

Rule of thumb for the parameters for the Drawn-Arc-Procedure:

- I[A] ≅ 80 * ∅ = t[ms]*2
- t[ms] ≅ 40 * ∅ = I[A]/2

The weld rates assume an additional 0.08 sec power on time beyond the weld time during stud plunge. Stud loading and unloading time are not taken into consideration which may restrict actual stud weld rate.

6.3.10 Stud Expert™ weld table

The following Stud Expert weld table is programmed into the inverter controls. It allows for automatic weld settings based on stud type and diameter.

Note!

There are conditions that will filter the table for selection, or reveal only a subset of the table to the user.

- Unit selection (F24) - If unit is set to metric, only metric diameters are available. If unit is set to English, only diameters in inches are available. If unit is set to both, then both will be available for selection.
- In the case of the N800i, studs requiring >800A will not appear in the list for selection.
- Input Power - If the maximum current on the N800i is limited to 800A due to single phase input power, studs requiring >800A will not display in the list.
- Short cycle mode (F30) - If configured for short cycle mode, studs requiring >=100ms will not display in the list. Conversely, in drawn-arc mode, studs requiring <100ms will not display in the list.

	$I_{standard}$	$t_{standard}$	$I_{aluminium}$	$t_{aluminium}$	Process
3mm Pitch Base	200,	100,	100,	160	Drawn Arc
3mm Full Base	220,	100,	110,	170,	Drawn Arc
3mm IS-Bolzen	200,	150,	200,	150,	Drawn Arc
3mm SC-Bolzen M3	400,	15,	400,	15,	Short Cycle
3/16" Pitch Base	280,	140,	150,	230,	Drawn Arc
3/16" Full Base	310,	150,	160,	250,	Drawn Arc
4mm Pitch Base	240,	120,	130,	200,	Drawn Arc
4mm Full Base	270,	130,	140,	220,	Drawn Arc
4mm IS-Bolzen	280,	200,	280,	200,	Drawn Arc
4mm SC-Bolzen M4	500,	15,	500,	15,	Short Cycle
5mm Pitch Base	290,	140,	150,	240,	Drawn Arc
5mm Full Base	320,	160,	170,	270,	Drawn Arc
5mm IS-Bolzen	350,	230,	350,	230,	Drawn Arc
5mm SC-Bolzen M5	600,	20,	600,	20,	Short Cycle
5mm ATC M5	600,	20,	600,	20,	Short Cycle
6mm Pitch Base	340,	170,	180,	280,	Drawn Arc
6mm Full Base	370,	190,	200,	320,	Drawn Arc
6mm SD6,MR M8,S6	410,	250,	410,	250,	Drawn Arc
6mm SC-Bolzen M6	700,	25,	700,	25,	Short Cycle

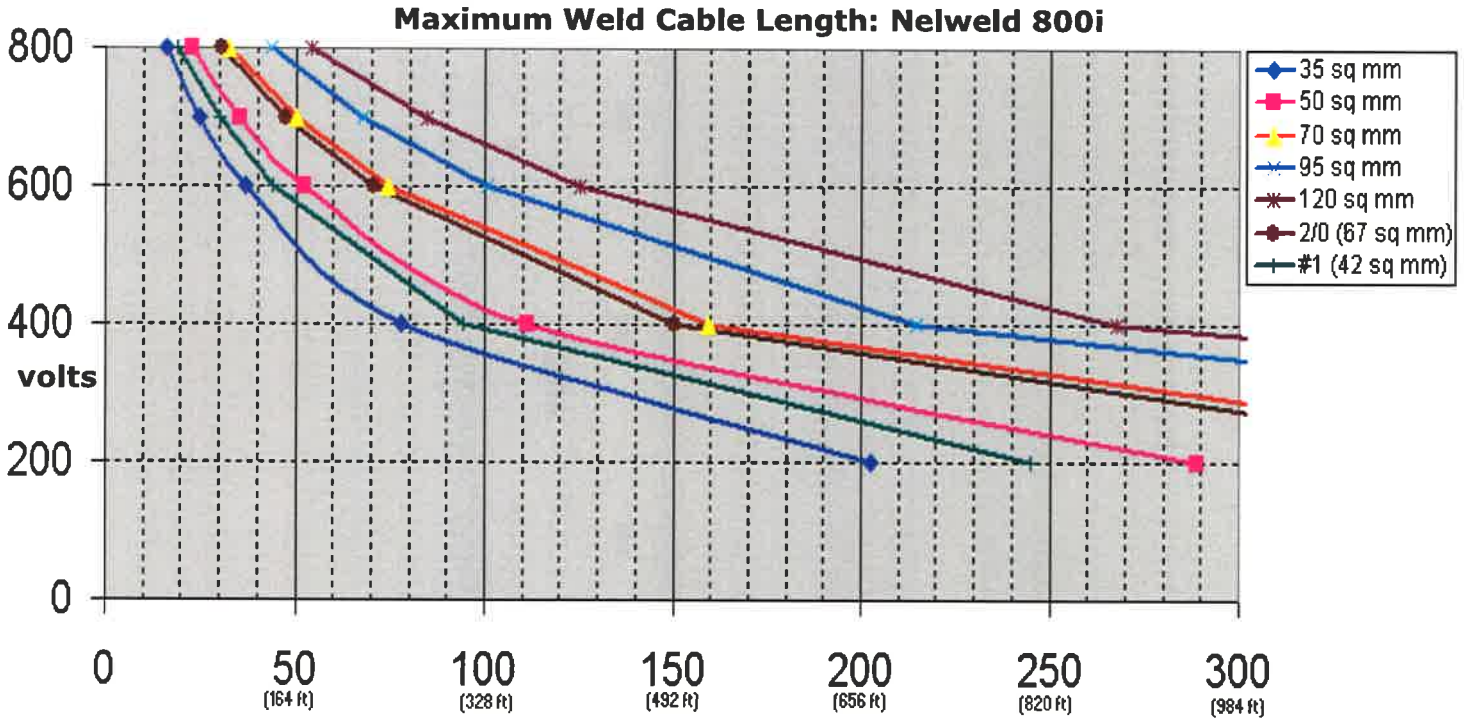
	$l_{standard}$	$t_{standard}$	$l_{aluminium}$	$t_{aluminium}$	Process
6mm WTOP M6	1150,	40,	1150,	40,	Short Cycle
6mm ATC M6	730,	30,	730,	30,	Short Cycle
1/4" Pitch Base	360,	180,	190,	300,	Drawn Arc
1/4" Full Base	400,	210,	210,	340,	Drawn Arc
7mm Pitch Base	390,	200,	210,	340,	Drawn Arc
7mm Full Base	430,	230,	230,	390,	Drawn Arc
7mm MP(F) M8	470,	300,	470,	300,	Drawn Arc
5/16" Pitch Base	440,	230,	240,	390,	Drawn Arc
5/16" Full Base	490,	260,	270,	450,	Drawn Arc
8mm Pitch Base	440,	230,	240,	400,	Drawn Arc
8mm Full Base	500,	270,	270,	460,	Drawn Arc
8mm MR M10,S8	550,	300,	550,	300,	Drawn Arc
8mm SC-Bolzen M8	700,	25,	700,	25,	Short Cycle
8mm WTOP M8	1250,	80,	1250,	80,	Short Cycle
8mm ATC M8	920,	80,	920,	80,	Short Cycle
3/8" Pitch Base	530,	290,	280,	500,	Drawn Arc
3/8" Full Base	600,	330,	320,	580,	Drawn Arc
9mm Pitch Base	500,	270,	270,	460,	Drawn Arc
9mm Full Base	560,	310,	300,	540,	Drawn Arc
9mm MP(F) M10	650,	300,	650,	300,	Drawn Arc
10mm Pitch Base	560,	300,	300,	530,	Drawn Arc
10mm Full Base	630,	350,	340,	620,	Drawn Arc
10mm SC-Bolzen M10	1100,	40,	1100,	40,	Short Cycle
10mm SD10,MR M12,S10	750	350,	750,	350,	Drawn Arc
11mm Pitch Base	620,	340,	330,	600,	Drawn Arc
11mm Full Base	710,	400,	380,	720,	Drawn Arc
7/16" Pitch Base	630,	350,	340,	610,	Drawn Arc
7/16" Full Base	720,	400,	380,	730,	Drawn Arc
12mm Pitch Base	680,	380,	370,	690,	Drawn Arc
12mm Full Base	780,	440,	420,	820,	Drawn Arc
12mm MM12, S12	950,	450,	950,	450,	Drawn Arc
12mm SC-Bolzen M12	1300,	50,	1300,	50,	Short Cycle
1/2" Pitch Base	730,	410,	390,	750,	Drawn Arc
1/2" Full Base	840,	480,	450,	890,	Drawn Arc
13mm Pitch Base	750,	420,	400,	770,	Drawn Arc
13mm Full Base	860,	500,	460,	920,	Drawn Arc
14mm Pitch Base	820,	470,	440,	860,	Drawn Arc
14mm Full Base	860,	500,	460,	920,	Drawn Arc
15mm Pitch Base	890,	510,	480,	960,	Drawn Arc
15mm Full Base	1030,	610,	550,	1160,	Drawn Arc
5/8" Pitch Base	960,	560,	510,	1050,	Drawn Arc
5/8" Full Base	1110,	660,	590,	1270,	Drawn Arc
16mm Pitch Base	970,	560,	520,	1060,	Drawn Arc
16mm Full Base	1120,	670,	600,	1280,	Drawn Arc
16mm S16, SD16	1400,	550,	1400,	550,	Drawn Arc

	$I_{standard}$	$t_{standard}$	$I_{aluminium}$	$t_{aluminium}$	Process
17mm Pitch Base	1050,	610,	560,	1170,	Drawn Arc
17mm Full Base	1220,	730,	650,	1420,	Drawn Arc
18mm Pitch Base	1130,	670,	600,	1290,	Drawn Arc
18mm Full Base	1310,	790,	700,	1560,	Drawn Arc
19mm Pitch Base	1210,	720,	640,	1410,	Drawn Arc
19mm Full Base	1420,	860,	750,	1710,	Drawn Arc
3/4" Pitch Base	1210,	730,	650,	1410,	Drawn Arc
3/4" Full Base	1420,	860,	750,	1720,	Drawn Arc

If the vertical position is selected, selection of some studs will provide a 10% increase in current and 15% reduction of weld time from what is shown here.

6.4 Rating Charts

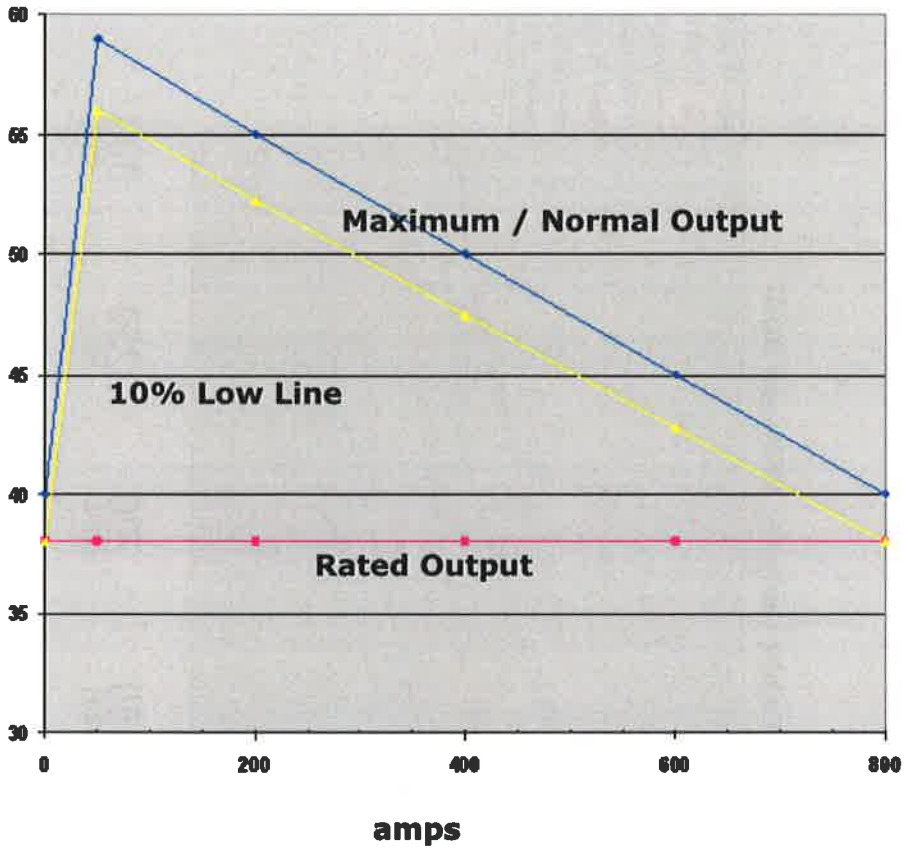
6.4.1 Maximum Weld Cable Length[1]



1. Check with Nelson representative for a Weld Cable Length calculator

6.4.2 Maximum Output & Rated Output

800i max. output & rated output, at 200/400 Vac & higher



- Energy Consumption (KWh)[1]

1. See Nelson Representative for a calculator to estimate your energy savings

6.4.3 Supply Cable Lengths

This includes facility wiring back to a high current buss/main supply.

208-230 Vac	
Up To X feet	AWG Cable, copper
20	10
30	8
50	6
75	4
110	2

400-460 Vac	
Up To X feet	AWG Cable, copper
75	10
120	8
200	6
300	4
500	2

400 Vac	
Up To X meters	mm² Cable, copper
19	4
28	6
46	10

- Based on 3% drop and max. 7% below nominal at input power connection during weld

The same guideline applies to power drops from the input power high current buss to disconnect boxes for machine connection. Even though fuse size may be smaller than nominal for the cable size, the high peak currents of stud welding necessitate appropriate cables. This table is based on a 800 amp output.

6.5 N800i Weld Cycle Timing

This part explains how the inverter series controls main current and the weld gun. It further explains what elements affect drop time. For short cycle welding, the gun drop time and plunge time are critical components in the weld timing, so they must be configured, understood, and used correctly to get the optimum results.

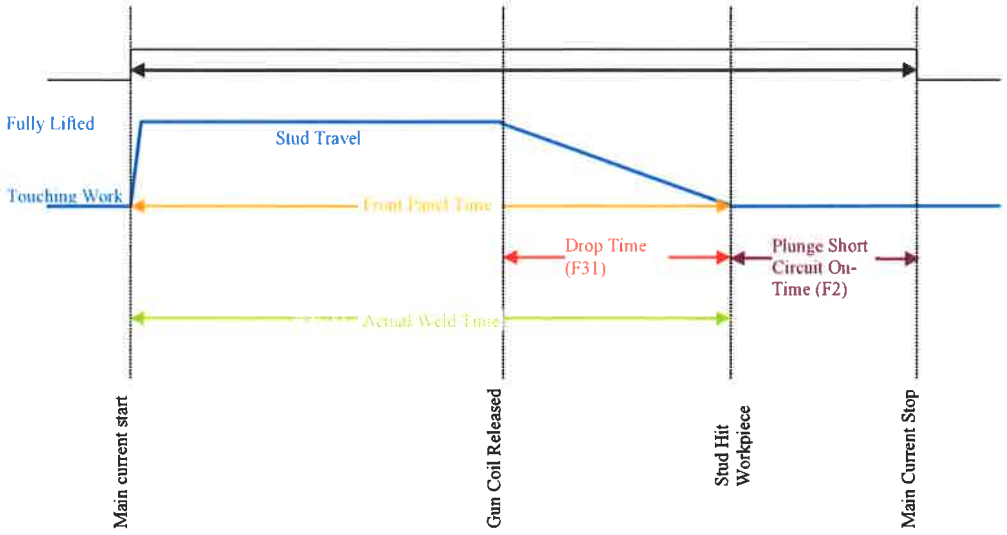
Here are the relevant settings for welding on the N800i:

- F31 – Drop time. Use this function to measure \ configure the drop time of the gun. While viewing this function (that is, with F31 on the display), attempt a weld. The gun will lift and drop, but no weld current will pass. The gun's drop time is measured, stored, displayed, and used in weld timing as will be described later in this document.
- F2 – Plunge short circuit on-time. This is the time that the weld current reinput power on after the stud is scheduled to have hit the workpiece.
- Front Panel Time – This is the (weld) time set on the front panel.

Here are some other definitions:

- Main current time = Front panel time + Plunge short circuit on-time (F2.) The main current time is the total time that weld current is delivered. See below.

Under normal conditions, critical times and events throughout the main current time can be described as:

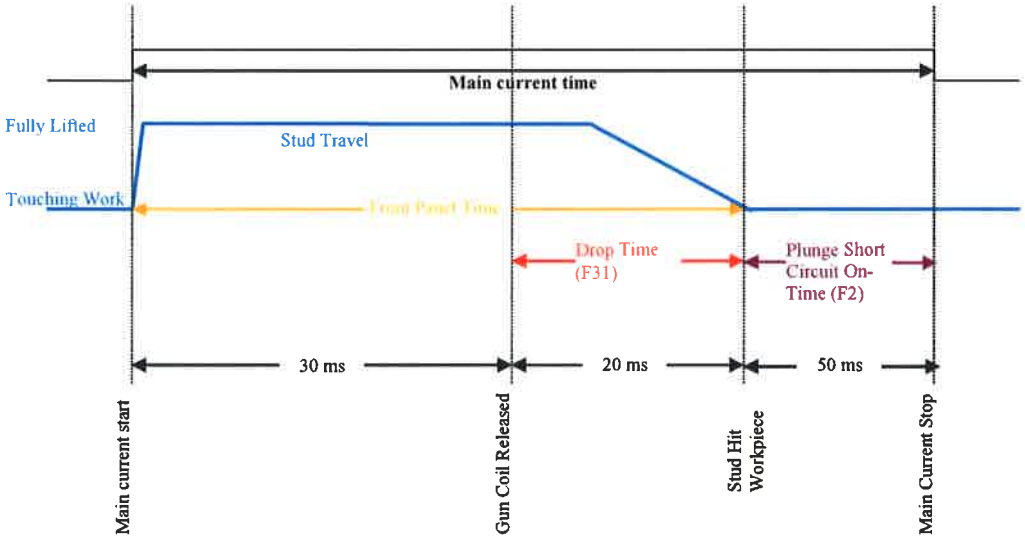


The Actual Weld Time is the time from the start of the main current to the time that the stud hits the workpiece. Under normal conditions, it will be equivalent to the Front Panel Time. This time measurement is reported after the weld is complete.

For example:

- Front Panel Time = 50ms
- Drop Time (F31) = 20ms
- Plunge short circuit on-time (F2) = 50ms

The weld profile would look like this:



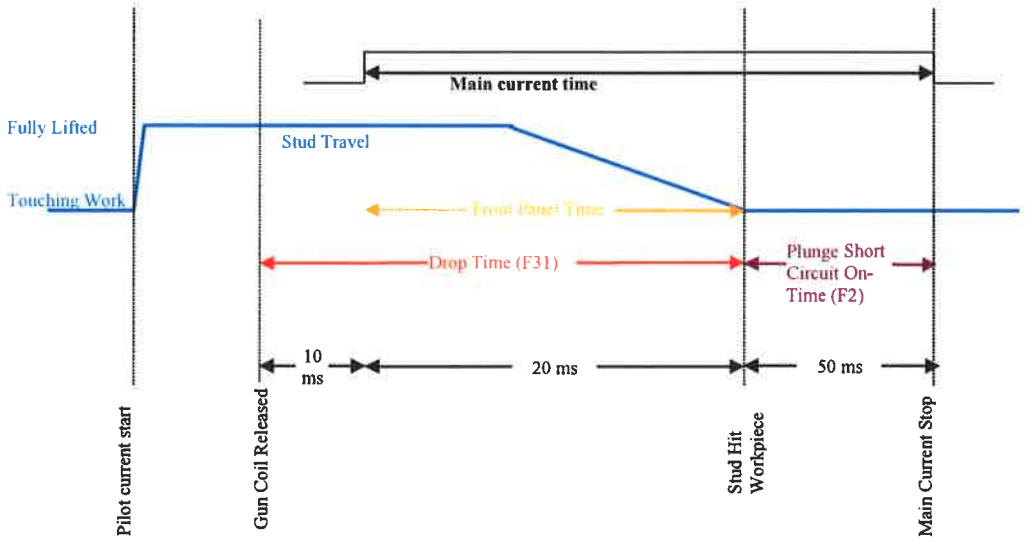
The resulting Actual Weld Time is 50 ms. The main current would be on for the Front Panel Time + Plunge short circuit on-time (F2) = 50ms+50ms=100ms, but the arc would exist only during the Actual Weld Time, or 50ms.

The important thing to note is that normally, the stud begins to drop at Front Panel Time – Drop Time. But if the Drop Time exceeds the Front Panel Time, the stud would need to begin to drop prior to the start of the weld in order to make the Actual Weld Time to be the same as the Front Panel Time. This is done by releasing the gun coil during the pilot arc stage.

For example:

- Front Panel Time = 20ms
- Drop Time (F31) = 30ms
- Plunge short circuit on-time (F2) = 50ms

Since [20ms – 30ms] < 0, the, the gun coil is released prior to starting the main current. So the weld profile would look like this:



The resulting Actual Weld Time is 20ms. The stud would still take 30ms to drop, but the main current and main arc would only be 20ms.

6.6 Drop Time Variables

This portion of the document describes several different conditions that affect drop time. This time duration will vary under many different conditions as outlined in the text below.

Power Source Gun Control and Trigger Switch Circuit:

The rate in which the gun coil energy is removed plays a large part in how fast the stud will drop. If the coil ***only*** has an anti-parallel diode (in either the gun itself or inside the power source), it will drop much later than a configuration with a diode/resistor since the energy is dissipated in the resistor after the coil is de-energized.

Plunge Dampener:

Tranquil arc dampeners are meant to slow the rate of stud travel speed (in the downward direction). Dampeners can adjust this rate for up to a few hundred milliseconds of travel time.

Temperature:

As temperatures rise, dampeners have less of an impact. They allow the stud to fall nearly 65% faster at 90 degrees F than at 0 degrees F.

Molten Stud Shape:

As the stud melts during the weld, it has the potential to change shape. It may elongate or even drip. The molten shape of the stud will vary as the weld heat varies. These factors can change the timing of the weld short circuit.

Troubleshooting Inconsistent Drop Times

1. Eliminate excessive lift. Too much lift increases the possibility of stud 'hang up'.
2. Be sure the weld energy is appropriate for the application.
3. Inspect foot alignment – Adjust if necessary. A misaligned foot will almost guarantee stud 'hang-up'. Make sure the stud is centered in the ferrule.
4. Inspect chuck – Replace if necessary. Check for a good grip of the stud in the chuck. A good grip is needed to eliminate stud slippage.
5. Tighten foot-retaining screws. These screws hold the foot in place during a weld while pressure is placed on the foot. Slippage of the foot will lead to a faster drop time.
6. Inspect and clean gun housing and related parts – replace parts as needed. Debris in this housing will resist travel.

6.7 Inspection and testing of the weld

To assure the quality of stud welds the following testing must be carried out before, during and after production:

- standard work testing
- simplified work testing
- continuous production monitoring

Standard work testing:

For welding according to the drawn-arc and short-cycle method ten studs must be welded and the following tests carried out on them:

- Visual inspection (all studs[1])
- Bending test (5 studs)
- Macro section (2 studs)

The test results must be documented and attached to the quality documentation.

Simplified work testing:

In order to check the setting and functionality of the unit three studs must be welded prior to beginning the shift and the following tests are to be carried out on them:

- Visual inspection (all studs)
- Bending test (all studs)

The test results must be documented and attached to the quality documentation.

Continuous production monitoring:

In continuous production monitoring visual inspection of all welded studs is in general sufficient. On suspicion of a faulty weld a bending test or a tension test must be carried out.

If the requirements are not met, a bending or tension test must be carried out on the three previous and on the three subsequent welds.

The test results must be recorded in the production log.

Warning!

It must be noted that the welding work may only be continued when the test results are satisfactory!

1. See the following pages for information on visual inspection

6.7.1 "Short-cycle-method" - Visual inspection

Inspection and testing of the weld is restricted in these operating and service instructions to the visual inspection of welds. A description of the mechanical and technological tests would go beyond the scope of these operating and service instructions.

+ *See EN ISO 14555[1] for detailed information in this regard.*

1. Perfect weld
   - Even bead, no perceptible errors. Corrective measures: Not necessary. No alteration to the electrical and mechanical parameters.

2. Faulty weld
   - Cross section not fully welded. Corrective measures: Increase weld current and/or weld time, possibly change polarity.

3. Faulty weld
   - Large, uneven bead. Corrective measures: Reduce weld time

4. Faulty weld
   - Pores in bead. Corrective measures: Reduce weld time or increase weld current, weld in shielding gas.

5. Faulty weld
   - Bead single-sided. Corrective measures: Eliminate blowing effect by applying compensation earth ground or correcting earth ground terminals.

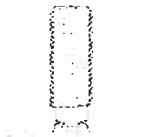
1. EN ISO 14555: „Welding Arc stud welding of metallic materials" (2006)

6.7.2 "Drawn-arc-method" - Visual inspection

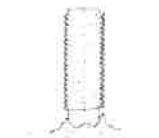
Inspection and testing of the weld is restricted in these operating and service instructions to the visual inspection of welds. A description of the mechanical and technological tests would go beyond the scope of these operating and service instructions.

+ *See EN ISO 14555[1] for detailed information in this regard.*

1. Perfect weld
   - Bead is even, glossy and closed. Stud length after welding within tolerance. Corrective measures: Not necessary. No alteration to the electrical and mechanical parameters.



2. Faulty weld
   - Constriction of the weld, stud too long. Corrective measures: Increase plunge distance, check lift, check centring of the ceramic ferrule. Decrease weld current and/or weld time.



3. Faulty weld
   - Feebly formed, uneven bead with a dull surface. Stud too long. Corrective measures: Increase weld time and weld current. Possibly dry ceramic ferrules in oven.

4. Faulty weld
   - Bead single-sided, undercutting. Corrective measures: Eliminate blowing effect, check centring.

5. Faulty weld
   - Bead low, surface glossy with intense spattering. Stud too short. Corrective measures: Decrease weld time and weld current, adjust plunge distance and/or damping.

1. EN ISO 14555: „Welding Arc stud welding of metallic materials" (2006)

6.8 Weld quality monitor

This inverter has a built-in weld quality monitor to identify suspect welds, also known as Not In Order (NIO) welds. This function works without the use of a Personal Computer (PC). It monitors actual weld process signals. When programmed as such, it will compare weld process parameters to target values and report bad weld when the actual signals deviates from the target values. The actual welding current and voltage are recorded at 1A and 0.1 ms resolution, and the arc energy and gun drop time are calculated for each weld.

6.8.1 Actual weld process signals

Actual process signals are recorded and displayed after each weld, shown in F32, weld results. Use the up / down button to scroll through current, voltage, main current time, energy, drop time, pilot time and pass/fail indicator. F32 is refreshed after each weld, and no weld history is recorded. To save actual signals for all welds in production permanently as record keeping, contact Nelson for Nelware™ PC software.

6.8.2 Set up weld monitor tolerance

Two tolerances must be configured: F34 gun drop time tolerance and F35 weld energy tolerance. F34 sets up a time tolerance in milliseconds. For example, if F34 is set to 10ms, it means the actual drop time can deviate from the target by ±10ms and the weld is still considered good weld. F35 is a percentage tolerance of arc energy. For example, if F35 is set to 10%, and a bad weld will be reported if the actual energy deviates from target by more than ±10% of the target. When either the drop time tolerance is exceeded, or the weld energy tolerance is exceeded, the weld will be marked as bad or NIO.

6.8.3 Set up a target of good weld

To save target without preset association (i.e. for welding without any preset), exit any presets by manually changing the time and/or current if necessary, so that no preset buttons are backlit. Make a good weld, go to F32, press and hold the "Lock" key until the display says the target is saved.

A target can be created for each preset. Choose a preset, make a good weld, and go to F32. While viewing F32, press and hold the "Lock" key until the display says the target is saved for the backlit preset.

To clear a target stored in a preset, exit F mode by selecting I\t mode, then press both the Lock button and the desired preset button simultaneously.

To clear a target that doesn't have a preset association, exit any preset by manually changing the time\current, exit F mode by selecting I\t mode, then press both the Lock button and the Time-down arrow simultaneously.

6.8.4 Notification options when bad weld occurs

When a bad weld is detected, the User Panel icon for the weld plate (below the gun icon) will turn red briefly after welding. It displays green after a good weld. To generate an error code after a bad weld, enable F36, which does not disable welding but will flash the red triangle icon and error message on the display. To disable the welder upon a bad weld, enable F33. The welder will flash "weld error" after seeing a NIO weld, and no more welding can be performed thereafter until the user enters a password. The password is the same as in Lock mode 2 or 3 (F19), and default password is 123456. Once entering the password, welding can resume even though the red triangle icon is still flashing. It is not necessary to try to clear the error E013 (Weld Out-of-Tolerance) before resuming welding.

Usage Example

The user would like the unit to be locked and for the internal process control to require a password when a failed weld is detected.

Setup:

1. Perform a successful weld.
2. View F32 (Weld Results). Press and hold the 'Lock' key to save the weld as a target. The word 'SAVED' will appear on the display.
3. Set the lock mode to 2 or 3 using F19 (Lock Mode). Set F35 (Weld Tolerance) as desired. Set F36 (Process Monitor Errorcode on Failed Weld) to ON. Set F33 (Disable Welding on Error) to ON.
4. From the Time\Current or Stud Expert mode, lock the unit by pressing the 'LOCK' key. Enter a password that will be used to both unlock the unit and also will allow welding to resume if a failed weld occurs. Press 'LOCK' again as the Enter key.

Use:

The unit is now locked and ready to weld. When a weld is out of tolerance, the unit will flash the red triangle icon and display 'WELD ERROR - ENTER PASSWORD'.

Enter the password to resume welding. Once the password is entered, the triangle will still be flashing, but the user can resume welding.

If any weld settings are to be changed or F code configurations are to be accessed, the unit must be unlocked before doing so.

6.8.5 Counters to keep track of good and bad welds

The good weld counter for the weld quality monitor is F41, and bad weld counts are tracked in F42. These counters can be reset by holding down the Time-Down button while viewing the counter F code.

6.8.6 Understanding Lock modes

The Lock Mode configuration (F19) determines how the unit responds to the LOCK key when in the Time\Current mode or Stud Expert mode. It lets the user configure the level of security as required for the circumstances.

Lock Mode 1: This is the minimal security mode, whereby the user may lock or unlock the panel by simply pressing the LOCK key in the Time\Current mode or Stud Expert mode. This is the default mode and is intended to prevent accidental weld setting changes due to inadvertent key presses (i.e. leaning on object or hand on the panel). **NO PASSWORDS** are used in this mode.

Lock Mode 2: This is the tightest security mode, whereby the user must select a password to lock the unit. **NO CHANGES** can be made to weld settings or function code settings while locked. The same password must be entered to unlock the unit.

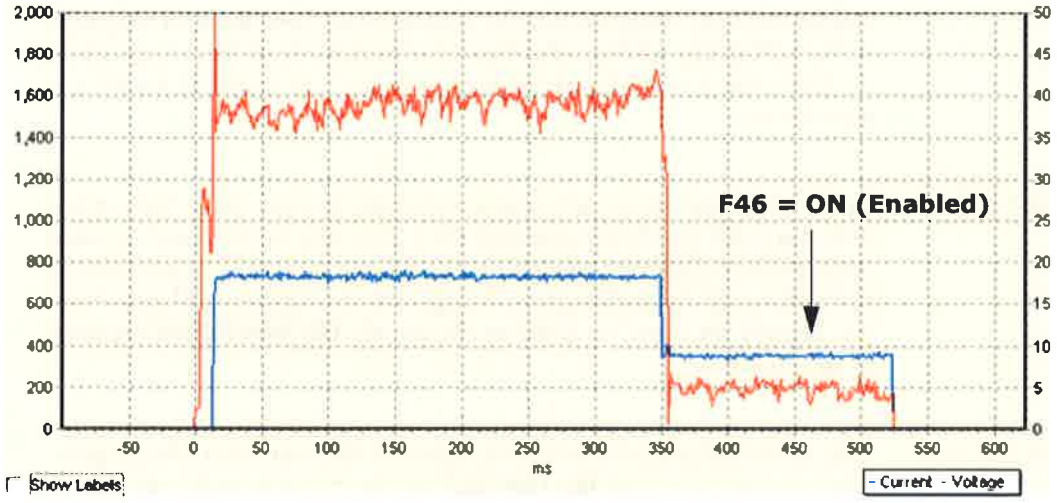
Lock Mode 3: This is the medium level security mode, whereby the user must select a password to lock the unit. Changes may be made to the weld settings only by use of the presets, but the value of the **PRESETS** may not be changed. The same password must be entered to unlock the unit.

6.9 Plunge Current

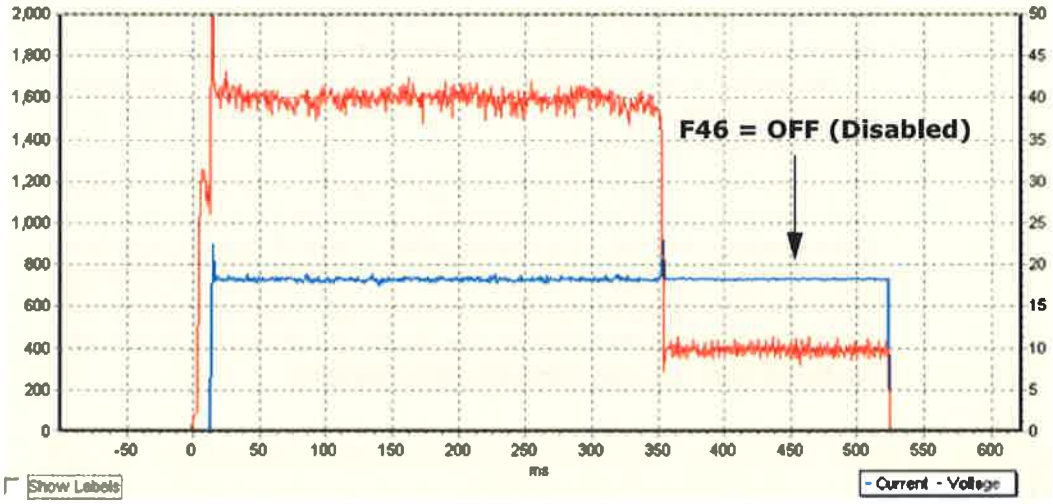
During the stud plunge, the welder normally outputs the main arc current to keep the arc burning until the stud is submerged into the weld pool, and continues to output the same main arc current for sometime after the short circuit. In some applications, it is desirable to set a current level different than the main arc current during plunge. For these applications, enable F46 to use a different current level. Then set the plunge current level using F47.

Potential benefits are reduced cable and connector heating which reduces down time for production, energy savings, and providing fine tuning for spatter / splatter reduction, non-ferrous metal welding, flash ring shape and uniformity in short cycle or trim stud applications. In mass production, a lower plunge current can be more tolerant to gun speed variation or drift during its service life, because the total arc energy variation as a result of gun speed variation is reduced.

The example below shows a 730A main current changing to 350A plunge current (green line) shortly before the short circuit represented by arc voltage collapse (red or darker line).



The same weld made with standard method (plunge current is the same as the main arc current) is shown below for comparison:

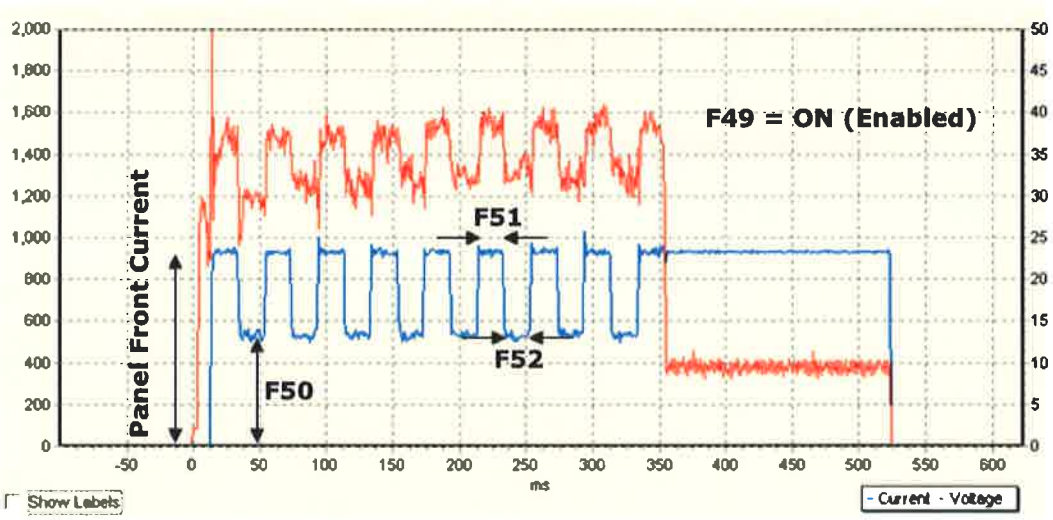


By default plunge current is disabled.

6.10 Pulse Welding (in main current)

The welder normally welds with a constant DC current during main arc. For some applications, it is desirable to pulse the main current. Potential benefits are the ability to cut through mill-scale, galvanized or contaminated workpiece surface, more arc stiffness and directional control in corner, angle iron or out of position, and reduced heat input with less backside marking.

Four parameters are needed to configure square wave pulse welding: peak current, peak time, background current and background time. Pulse welding is enabled by enabling F49. The peak current high level is set by the front panel current (same as constant current welding). Pulse low level is set in F50. Pulse current high time is set in F51, and low time in F52. Example below shows a pulse high level of 930A, low 530A and 20ms high and 20ms low pulse welding.



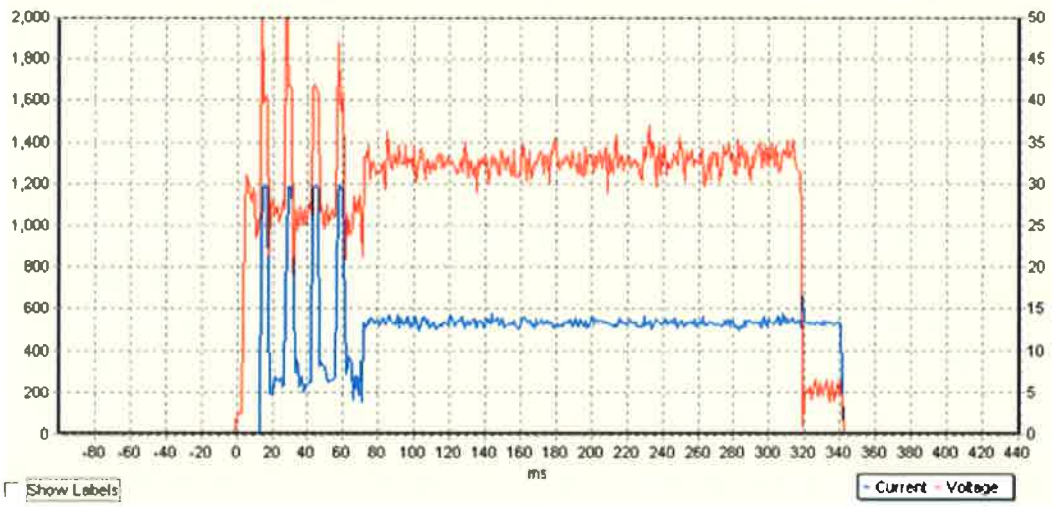
Due to low circuit inductance, it is possible to see current regulation errors when the pulse low current is too low, or the gap between high and low levels is too big. By default pulse main arc current is disabled.

6.11 Pulse Cleaning (during the beginning of main arc stage)

The welder normally outputs a constant low current in pilot arc to draw an arc before turning on the main arc for welding. In some applications, it is desirable to have very high and narrow pulses in the beginning of main arc stage before engaging full main arc. The potential benefits are the ability to pre-clean the workpiece from stamping oil contamination in sheet metal, or thick or varying galvanized surface, or mill-scaled plate in fabrication, or shipyard plates coated with weldable paint.

Pulse cleaning is enabled by enabling F37. For the peak pulse, it attempts to go the maximum rated current for 4ms, with a 10ms pause (or low pilot current) in between. Due to the inductance of the weld circuit, it is often below the set values. After each pulse, the arc voltage is measured and compared with F38 - pulse cleaning threshold voltage. When actual voltage is below F38, it proceeds to main current, otherwise another cleaning pulse will be sent. The maximum cleaning pulse count is set in F39. Since the cleaning pulse is adaptive and thus the number of pulses can vary, it has a small effect in increased total heat input. To make total energy consistent, F40 can be used to subtract a time in the main arc time.

The example below shows 4 cleaning pulses of 1200A prior to the main arc current of 570A. It is recommended to use Nelware PC software to configure the pulse cleaning feature properly.



By default pulse cleaning in pilot arc is disabled.

6.12 Password Reset

If the password is forgotten, it can be reset or removed. Turn the power off, press and hold the F key and the Time-Down key, and turn the power back on. Keep the keys pressed until the display reads 'OK'. Then release the keys. This will restore all factory defaults, even if the unit was previously locked.

6.13 Demo Mode

In demo mode, the welder will continuously flash all the lights in sequence on the front panel and key features of the welder will be scrolled in the 7-segment displays. To enter or exit the demo, press 1, 2 and 3 simultaneously. Prior to welding, it is recommended that the welder is turned off, then back on after using Demo mode.

7. Operational Function Codes & Error Code

Note: Contact the factory or Nelson representative if F25 shows a different version for F code info not in the table below.

The table below is for firmware version 1.03 only

F code	Description	Possible Values	Default	Unit	Notes
F0	Language	ENGLISH,GERMAN, ITALIAN, SPANISH, FRENCH	ENGLISH	x	
F1	Error Display	E--- to E014	E---	x	See below for error defines
F2	Plunge short circuit on-time	0 to 150	20	ms	When short cycle mode is enabled, this defaults to 20ms. When disabled, this defaults to 100ms.
F3	Stud Expert Mode easy access	POSTION, MATERIAL, PROCESS	POSITION	x	
F4	Stud Expert Mode position	DOWNHAND, VERTICAL, OVERHEAD	DOWN HAND		
F5	Stud Expert Mode material	MILD STEEL, STAINLESS, STEEL, ALUMINUM	MILD STEEL		
F6	Stud Expert Mode process	STUD WELD	STUD WELD	x	
F7	Calibration Values	700 to 850	750	Clock cycles	Used by manufacturing. Do not change
F8	Chuck Saver	OFF ON	ON	x	
F9	Gas Enable	OFF ON	OFF	x	
F10	Gas pre-flow time	10 to 2000	500	ms	
F11	Gas post flow time	10 to 2000	500	ms	
F12	Stud feed enable	OFF ON	OFF	x	This automatically turns on 'short cycle mode'. Disabling it does not disable 'short cycle mode'.

F code	Description	Possible Values	Default	Unit	Notes
F13	Stud feed time	10 to 2000	50	ms	Pulse width of stud feed signal. This only applies when stud feed is enabled.
F14	Stud feed normal level	NORMAL CLOSED, NORMAL OPEN	NORMAL OPEN	x	This only applies when stud feed is enabled.
F15	Stud feed style	AFTER CONTACT BREAK, AFTER WELD	AFTER CONTACT BREAK	x	When to get the signal. This only applies when stud feed is enabled.
F16	Stud feed on air trigger	OFF ON	OFF	x	To feed a stud even when triggering the gun while not welding. This only applies when stud feed is enabled.
F17	Loadbank enable	OFF ON	OFF	x	For manufacturing. This is a read-only function used for burn-in testing.
F18	Capacitor v-f Readings	0-65535	NA	Hz	Time-up/down to see both sides
F19	Lock Mode	1 to 3	1	x	**Mode 1**: Use the lock key to toggle blocking on all keys - no password protection. **Mode 2**: Use the lock key to enter a password, lock key as 'enter'. From there, all keys are blocked until you press lock again. It will prompt for the same password entered when originally locked. Password can be up to 9 characters. **Mode 3**: Same as mode 2, except user can toggle between presets and cannot change the value of presets.
F20	Debug	ENTER DEBUG MODE	ENTER DEBUG MODE	x	Used by manufacturing and service.
F21	User Counter	0 to 4.3B	0	Welds	While in this F code, press and hold the time-down button to reset the counter
F22	Total Counter	0 to 4.3B	0	Welds	(Non-resettable)
F23	Chuck Stripper	OFF ON	OFF	x	
F24	Synergic - Unit Select	English, metric, or both	Both	x	Lets user select which units are displayed as stud sizes while in Stud Expert mode.
F25	Software Versions	A: DSP version B: Coldfire version	A: DSP version	x	Time-up/down to see both versions

F code	Description	Possible Values	Default	Unit	Notes
F26	Restore Factory Defaults	HOLD TIME DOWN BUTTON	HOLD TIME DOWN BUTTON	x	While in this F code, press and hold the time-down button to reset all F codes to default.
F27	Scroll Speed	100 to 500	150	ms	Controls text scrolling speed
F28	Pilot Arc Extension	0 to 10	0	ms	This is the time the control will wait to start the main arc after establishing a stable pilot arc.
F29	Chuck Change Counter	OFF to 1000000	OFF	Welds	Increments by 1000; Press down key until value equals OFF to disable. This function counts down and turns the chuck change indicator ON when it reaches zero.
F30	Short Cycle Mode	OFF ON	OFF	X	Turn this on to limit weld time to 100ms. This is automatically turned on when 'stud feed' is enabled, but not automatically turned off. Changing this mode affects other F codes. See section on 'which F codes change automatically'.
F31	Drop Time	0 to 100	12	ms	This is a drop time measurement function THAT DOES AN ACTUAL WELD. If F48 (Drop Time Configuration) is in either Manual or Auto mode, the measurement taken during the weld (while viewing this function) will be stored in this function and used in weld timing. The measured value may be overridden by using the arrow keys. This value changes to 7ms when short cycle mode is enabled, 12ms when disabled.
F32	Weld Results	I= Current (Amps) V= Voltage (Volts) tM= Main current time (ms) E= Energy (Joules) tD= Drop Time (ms) tP= Pilot Time (ms) Pass/Fail indicator	NA	x	This F code gives information about the last weld. To save these weld results as the target (for weld comparison), press and hold the 'Lock' key. To clear targets, exit to time\current mode and click the 'Lock' key + desired preset key at the same time. For the main preset (no preset), use the 'Lock' key + timedown key

F code	Description	Possible Values	Default	Unit	Notes
F33	Disable Welding on Weld Error	OFF ON	OFF	X	Turn this on to disable welding when a weld is out of specified weld energy/drop range. Flashes 'WELD ERROR!' and requires a password to continue. Password is 123456 by default, but can be changed to any number up to 9 digits. Use lock mode 2 or 3 to set this password.
F34	Drop Time Tolerance	0 to 1000	100	ms	This defines the tolerance allowed from target weld drop time for determining good/bad weld.
F35	Weld Energy Tolerance	1 to 20	10	%	This defines the tolerance allowed from target weld drop time for determining good/bad weld.
F36	Process Monitor Error code on failed weld	OFF ON	OFF	X	When enabled, an error code is given when the weld is out of tolerance.
F37	Pulse Cleaning Enable	OFF ON	OFF	X	When enabled, the weld current will pulse high current and low current before the weld.
F38	Pulse Cleaning Threshold Voltage	0.00 to 50.00	30.00	V	Threshold voltage to stop pulsing and begin the main weld. When voltage is less than this value, it terminates pulsing and starts the weld.
F39	Pulse Cleaning Maximum Pulses	1 to 10	4	X	Maximum number of pulses before starting main weld.
F40	Pulse Cleaning Time to Subtract for Each Pulse	0 to 500	10	ms	Time to remove from the main weld time per pulse done prior to the weld.
F41	Passing Weld Counter	0 to 4.3B	0	X	When process monitor is used, this holds a count of 'passing' welds. Hold the time down arrow to reset.
F42	Failed Weld Counter	0 to 4.3B	0	X	When process monitor is used, this holds a count of 'failed' welds. Hold the time down arrow to reset.
F43	Diagnostic Data	PWM AVG to ABORT CODE	PWM AVG	X	This gives extra diagnostic data after each weld. If the power unit is at the maximum output in voltage and current, PWM AVG will be 100%.

F code	Description	Possible Values	Default	Unit	Notes
F44	Preset Bank	0 to 3	1	X	This determines which preset the 0-9 buttons are accessing. By selecting the preset bank, up to 40 presets can be accessed. For example, if the preset bank is set to 0, preset button 5 will access preset 5. If preset bank is set to 1, preset button 5 will access preset 15.
F45	Calibration Offset Value	0 to 250	50	X	Used by manufacturing. Do not change
F46	Plunge Current Enable	OFF ON	OFF	X	When enabled, the current will change to the selected value while the stud is plunging.
F47	Plunge Current	50 to 800	200	Amps	When Plunge Current is enabled, this current will be used during the plunge state.
F48	Drop Time Configuration	Manual, Auto, or Average	Manual	X	In **Manual mode**, F31 (drop time function) is the only way to configure the drop time. In **Auto mode**, F31 automatically gets a new value taken from the first weld done after power-up and after the gun is unplugged. In **Average mode**, the average of the last 10 welds' drop times are used and displayed in F31.
F49	Pulse Weld Enable	OFF ON	OFF	Binary	Enable this to use pulse welding, where the main current pulses to a high and low current setting at variable time settings per F codes F50-F52.
F50	Pulse Weld Low Current	50 to 800	300	Amps	This is the current used for as the lower of the two currents during the weld. (The front panel current setting will be the high current).
F51	Pulse Weld High Time	5	1000	ms	This is the time the weld will deliver the front panel current.
F52	Pulse Weld Low Time	5	1000	ms	This is the time the weld will deliver the low current (F50 current).

Other features:

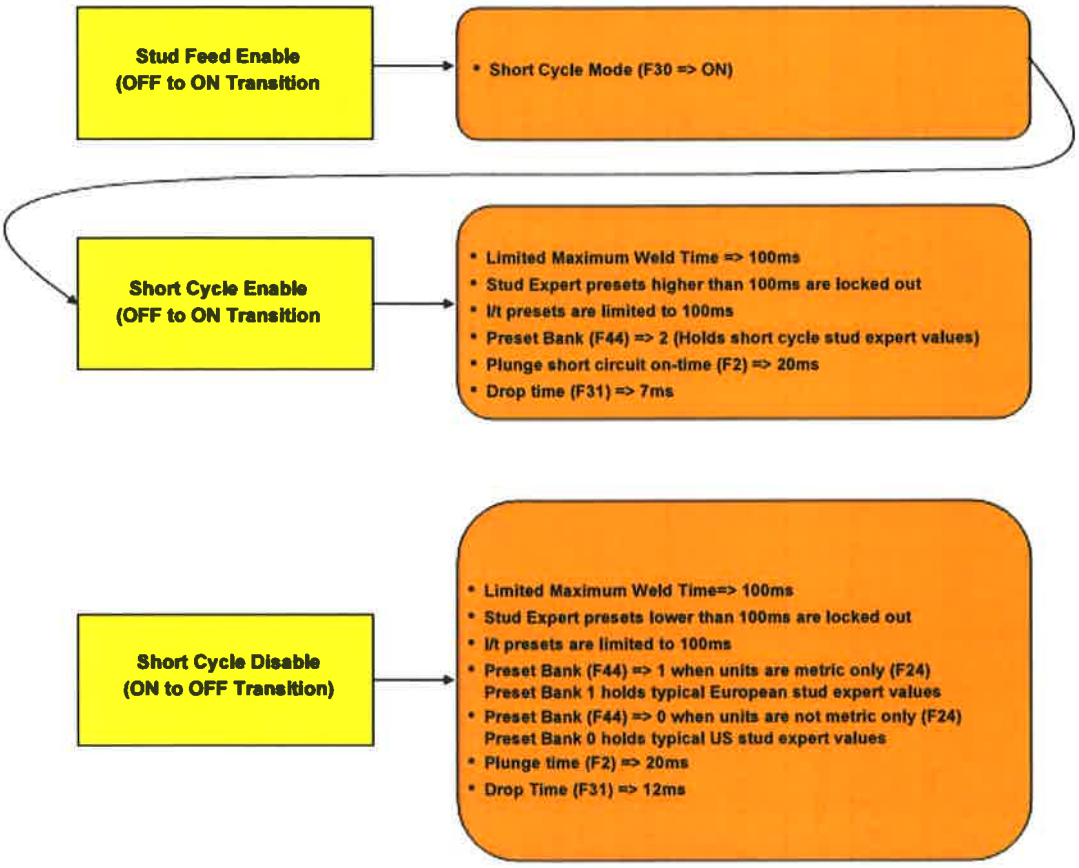
- To enter/exit demo mode, press 1,2, and 3 simultaneously. This will disable welding and flash LEDs.

7.1 Diagnostic Error Codes

Error Number	Error Display	What this really means	Fatal – meaning you have to power down to reset. Otherwise, you weld again to reset.	Likely problem
E - - -	E - - -: NO ERRORS	Really, no errors.		NA
E001	SHORTED CONTROL CABLE-FIX CONTROL CABLE AND/OR GUN	The gun control cables were shorted or the gun coil resistance is too low.		Shorted cable-external wiring problem in the gun circuit **-See troubleshooting-**
E002	BROWNOUT CONDITION - CHECK PRIMARY VOLTAGE	The input voltage dipped low enough to drop out auxiliary supplies. Welding is stopped until power is restored so as to prevent internal damage.		Brown out on input power line **-See troubleshooting-**
E003	CAPACITOR VOLTAGE IMBALANCE	The capacitors could not be balanced for some unknown reason. The difference between the caps is greater than 10% (usually around 30V).		Remove the upgrade to v1.02 software **-See troubleshooting-**
E004	REGULATION ERROR-ARC WENT OUT	The control sensed that the current was more than 50% low and the control is applying the maximum allowable pulse width for 10ms.		Current sensor wiring or extremely high load **-See troubleshooting-**
E005	REGULATION ERROR-SHORT CIRCUIT-COULDN'T CONTROL CURRENT	The control sensed that the current was more than 50% high and the control is applying the minimum allowable pulse width for 10ms.		Current sensor wiring or dead short circuit **-See troubleshooting-**
E006	INPUT VOLTAGE TOO HIGH	This happens if the capacitor voltage exceeds 400V due to capacitor imbalances. This also happens on boot-up if the voltage skyrockets after closing relays.	x	Input voltage is too high **-See troubleshooting-**

Error Number	Error Display	What this really means	Fatal – meaning you have to power down to reset. Otherwise, you weld again to reset.	Likely problem
E007	INPUT VOLTAGE TO LOW-FLIP SWITCH TO CORRECT VOLTAGE SETTING	On boot-up only, after closing the charge relay, the caps have 10 seconds to get the proper voltage.	x	Incorrect voltage setting or broken/bad V-F signal from one or more switch boards. **-See troubleshooting-**
E008	PRIMARY OVERCURRENT ERROR	A primary overcurrent occurred.	x	On-board control PCB failure **-See troubleshooting-**
E009	COULD NOT ESTABLISH PILOT ARC	The gun did not lift within the pilot arc period		Shorted gun control cable, mechanical binding of the gun, pilot arc pcb failure, or excessive contaminants on work surface. **-See troubleshooting-**
E010	CAPACITOR VOLTAGE COULD NOT BE READ	The sensed capacitor V-F signal is not within the acceptable bounds.		Check V-F signal from Switch Boards **-See troubleshooting-**
E011	UNIT TOO HOT PLEASE WAIT	The thermal sensor was tripped. This error will disappear when the sensor resets.		Thermal sensor on output PCB heatsink has been activated. Wait for it to cool down. **-See troubleshooting-**
E012	SHORT CIRCUIT- CHECK GUN LIFT SETTING	If a short circuit was detected for at least 100ms, the weld aborts to protect the power unit.		Check the gun lift setting. Under normal welding conditions, this should not happen. **-See troubleshooting-**
E013	WELD FAILED –OUT OF TOLERANCE	The last weld was out of tolerance from the target weld by weld energy or drop time.		Compare actual time, current, voltage, and drop time to find cause. A new target can also be set. **-See troubleshooting-**
E014	NO STUD HIT DETECTION	The stud is expected to hit the workpiece after the gun coil is de-energized, but before the main current is turned off. If it is not detected, this error will occur.		Incorrect weld parameter setup. Check drop time, weld time, and plunge time. Press LOCK button to clear error. **-See troubleshooting-**

7.1.1 Notes on which F codes change automatically



For firmaware version 1.03 only.

7.2 Weld Quality Problems

Problem	Possible Cause	Solution
Weld appears "hot"	Time setting or current setting is too high.	Check the stud burn-off. If the burn-off is much greater than what is typical for that diameter stud, the time and current settings may not be correct. Consult Section 2.6 to ensure proper current and time settings are being used. Reduce the current setting and perform weld inspections as described in Sections 2.7.4, and 2.7.5.
	Plunge is too short.	Plunge is measured by the amount of stud protruding beyond the bottom edge of the ferrule. Consult Section 2.6 to ensure proper plunge settings are being used, and correct, if necessary.
	Incorrect ferrule.	Ensure that the ferrule being used in the welding process is the proper ferrule for the stud size and application.
	Plunge dampening is too great.	If the gun is a Heavy Duty gun, it is equipped with Tranquil Arc®. Back out the clear plastic plunge dampener housing to decrease the free travel.
Weld appears "cold"	Time setting or current setting is too low.	Check the stud burn-off. If the burn-off is much less than what is typical for that diameter stud, the time and current settings may not be correct. Consult Section 2.6 to ensure proper current and time settings are being used.
	Incorrect ferrule.	Ensure that the ferrule being used in the welding process is the proper ferrule for the stud size and application.
	Inconsistent gun lift.	Perform a Lift Check, as specified in Section 4.5.14. Consult Section 2.6 to ensure proper lift settings are being used. Correct the lift to the proper setting if the lift is improperly set. Perform weld inspections as described in Sections 2.7.4 and 2.7.5.
	Inconsistent gun lift.	Perform a Lift Check, as specified in Section 4.5.14, several times. Consult Section 2.6 to ensure proper lift settings are being used. If lift results are inconsistent, disassemble and clean the gun.
	Too much plunge.	Plunge is measured by the amount of stud protruding beyond the bottom edge of the ferrule. Consult Section 2.6 to ensure proper plunge settings are being used, and correct, if necessary.

Problem	Possible Cause	Solution
Stud „hangs-up" during the weld	Plunge dampening is too little.	If the gun is a Heavy Duty gun, it is equipped with Tranquil Arc®. Screw in the clear plastic plunge dampener housing to decrease the free travel.
	Plunge is too short.	Plunge is measured by the amount of stud protruding beyond the bottom edge of the ferrule. Consult Section 2.6 to ensure proper plunge settings are being used, and correct, if necessary.
	Mechanical bind in accessories or ferrule.	Position the foot or ferrule grip of the gun so that the stud is centered in the ferrule opening. If the stud is off-center, it can restrict the plunging motion of the stud during welding.
	Time setting or current setting is too high.	Check the stud burn-off. If the burn-off is much greater than what is typical for that diameter stud, the time and current settings may not be correct. Consult Section 2.6 to ensure proper current and time settings are being used. Correct the settings and perform weld inspections as described in Sections 2.7.4 and 2.7.5.
	Plunge dampening is too great.	If the gun is a Heavy Duty gun, it is equipped with Tranquil Arc®. Back out the clear plastic plunge dampener housing to increase the free travel.
	Mechanical bind in gun.	Manually depress chuck adaptor and release. Chuck adaptor must return to the full out position rapidly without binding. If necessary, disassemble and clean the gun. On Heavy Duty guns, ensure that the weld cable is centered between the legs and does not rub on them.
	Base material contamination.	Contamination of the base plate or stud may cause the arc to become erratic. Ensure that there is no rust, scale, oil, water, residue, paint, galvanization, etc. present between the stud and the work piece. Welding to a clean plate can help diagnose if there is any foreign substance on the base material or studs.
	Incorrect ferrule.	Ensure that the ferrule being used is the proper ferrule for the stud size and application.

8. Maintenance

8.1 Care and cleaning

The stud welding system requires no special care.

See the operating instructions specific to the units for the necessary cleaning work to the gun and if need be to the feeder.

The cleaning work specified below is necessary for the Nelweld N800i unit. In this connection, pay attention to the following:

Warning!

Prior to commencing any cleaning work the welding unit must be switched off, disconnected from the input power and secured against restart!

Perform preventive maintenance procedures at least once every six months. It is good practice to keep a preventive maintenance record; a record tag attached to the machine works best.

- Neither aggressive or alcoholic agents nor combustible liquids may be used for the cleaning work.
- The unit casing of the Nelweld N800i must be wiped down with a dry cloth. Type plate and safety advice must be very legible.
- The front plate of the Nelweld N800i must be cleaned with a fat-dissolving cleansing agent. The LED display elements must be recognisable.
- The electrical connecting cables must be cleaned with a dry cloth. Scorching or mechanical faults can thus be easily detected.
- Cleaning inside the unit is required in keeping with the operating conditions and the degree of soiling.
- Impurities inside the welding unit, such as metallic dust or conductive swarf, must be wiped out or vacuumed off.

Warning!

Opening the welding unit as well cleaning inside the unit may only be carried out by an authorised electrical specialist!

Blowing down the welding unit with air pressure is expressly forbidden because of the risk of injury to organs of respiration and sight!

8.2 Routine Maintenance

Warning!

Prior to commencing any maintenance work the welding unit must be switched off, disconnected from the input power and secured against restart!

Only a qualified electrician should perform any work inside the unit's casing. Any work done should be made in accordance with all local and national electrical codes. Failure to do so may result in bodily injury or death.

1. Remove the machine wrap-around cover after disconnecting input connector.
2. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean the following areas with a low pressure air stream. See figure D.1 for component locations.
   - Power and control printed circuit boards
   - Power switch
   - Input rectifier
   - Heat sink fins

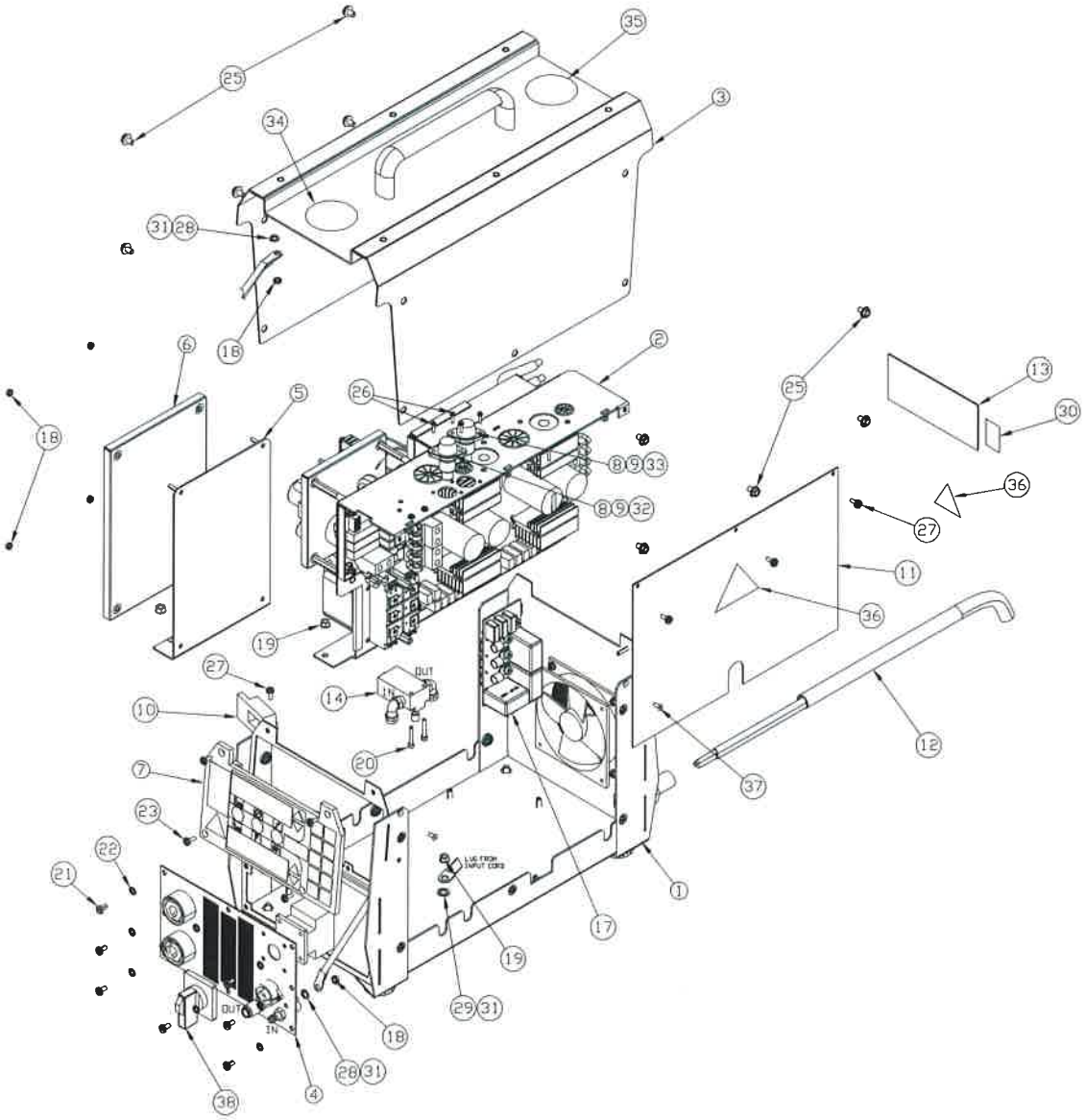
Warning!

Heatsinks can stand under tension and/or be hot!

   - Output terminals
3. Examine capacitors for leakage or oozing. Replace boards if needed.
4. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to ensure that high voltage parts are protected and correct spacing is maintained. All external sheet metal screws must be in place to assure case strength and electrical ground continuity.
5. Replace machine cover and screws.

9. Drawings and parts lists

9.1 Explosion drawing Final Assembly N800i



9.1.1 Parts List Final Assembly N800i

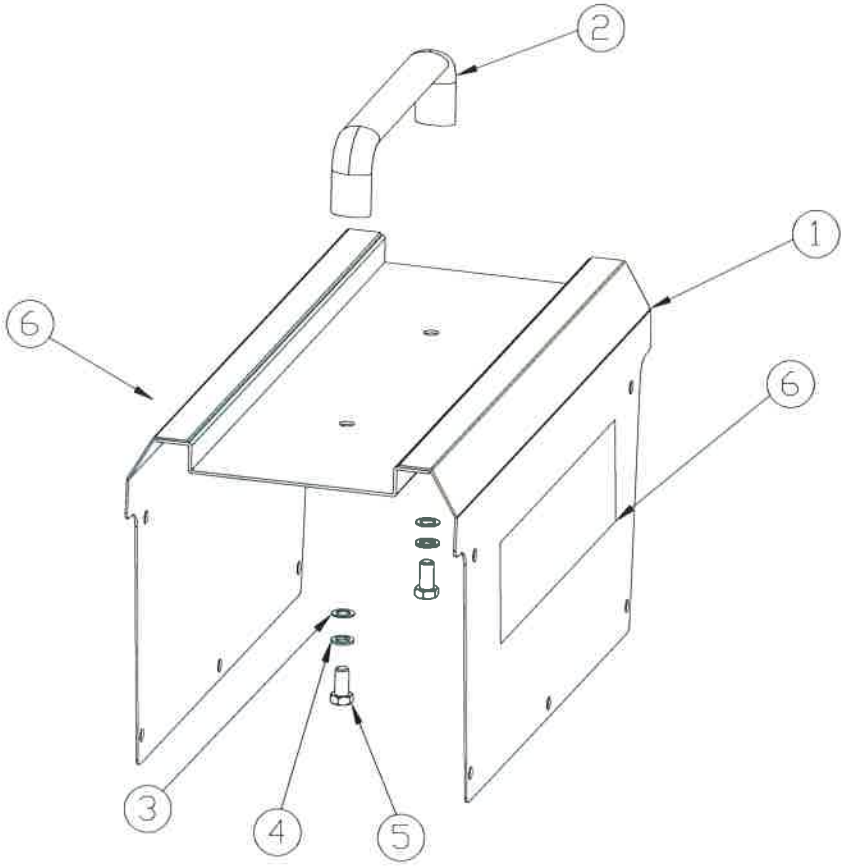
Item	QTY	Part Number	Comment	Description
1	1	750-611-404		CHASSIS SUBASSEMBLY
2	1	750-611-401		VERTICAL PANEL SUBASSEMBLY
3	1	750-611-405		COVER SUBASSEMBLY
4	1	750-611-403		FRONT PANEL SUBASSEMBLY
5	1	750-611-205		BRACKET, CONTROL BOARD MOUNTING
6	1	750-610-072		CONTROL BOARD ASSEMBLY
7	1	750-611-081		DISPLAY/USER INTERFACE PCB
8	2	708-143-003		FUSE HOLDER
9	2	715-039-001		FUSE, 1.5A, 600V
10	1	700-142-003		CURRENT TRANSFORMER (LEM)
11	1	750-611-225		INSULATOR PANEL, LEXAN
12	1	66-08-99		INPUT CABLE
13	1	724-574-007		RATINGS PLATE
14	1	723-242-031		GAS VALVE AND HARNESS ASSEMBLY
17	1	66-09-00		CE FILTER PCB ASSEMBLY
18	6	524-005-210		M4 KEPS NUT, SS (CONTROL PCB/COVER GROUND/FRONT PANEL GROUND MOUNTING)
19	5	524-005-273		M6 KEPS NUT, SS (VERTICAL PANEL/ CONTROL BD BRACKET/INPUT CABLE GROUND MOUNTING)
20	2	524-005-278		M4x25 SHCS, SS (VALVE MOUNTING)
21	8	524-005-124		M5x12 PHCRMS, SS (CONNECTOR PANEL MOUNTING)
22	8	524-005-256		M5 LOCK WASHER, SS (CONNECTOR PANEL MOUNTING)
23	4	524-005-283		M4x6 PHMS, SS (USER INTERFACE MOUNTING)
25	10	524-005-206		M6x16 HWHMS, SS (COVER MOUNTING
26	4	524-005-271		M3x12 PHCRMS, SS (FUSE HOLDER MOUNTING)
27	4	524-005-279		M4x16 PHMS, SS (LEM/INSULATOR PANEL MOUNTING)
28	2	524-005-010		M4 INTERNAL TOOTH WASHER (CHASSIS GROUND/COVER GROUND MOUNTING)
29	1	524-005-285		M6 INTERNAL TOOTH WASHER (INPUT CABLE GROUND MOUNTING)
30	1	724-569-013		LABEL, TRASH CAN, CE
31	4	724-485-010		LABEL, ELECTRICAL GROUND
32	1	724-485-013		LABEL, FUSE, "F1"
33	1	724-485-014		LABEL, FUSE, "F2"
34	1	87-09-35		LABEL, CARDIAC PACEMAKER

Item	QTY	Part Number	Comment	Description
35	1	87-05-19		LABEL, POWER PLUG
36	2	87-07-86		LABEL, HIGH VOLTAGE, YELLOW TRIANGLE
37	2	524-005-286		SCREW, M4x10 FHCS, SS
38	1	709-256-014		ROTARY SWITCH, POWER, 32A
NS	1	716-050-002		FERRITE CORE, TOROID
NS	24 in	103-450-156		TUBING
NS	1	723-245-004		HARNESS, CONTROL TO LEM TRANSDUCER
NS	1	716-050-102		FERRITE CORE, CLAMP ON
NS	1	723-245-042		HARNESS, MAIN SW, 3 PHASE BRIDGE, INPUT BOARD
NS	1	716-050-003		FERRITE CORE, TOROID, GROUND LEAD
NS	1	716-050-101		FERRITE CORE, CLAMP-ON, 9mm, CONTROL BD TO DISPLAY BD

Comment:

Sp = Spare part; **Stp** = Standard part; **W** = Wearing part;
Ssp = Stud-specific part; **NS** = Not shown

9.2 Cover Assembly



+ *TORQUE NUT TO 4 N-M (35-40 IN-Lbs)*

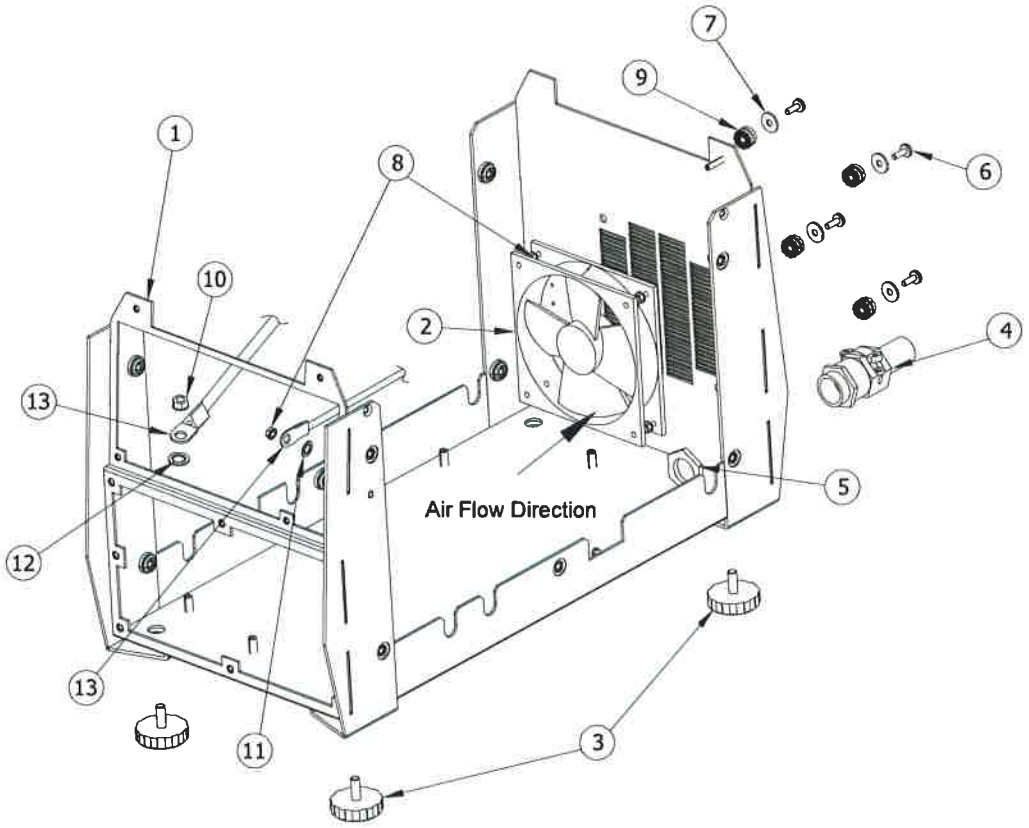
9.2.1 Parts list cover assembly

Item	QTY	Part Number	Comment	Description
1	1	750-611-204		COVER
2	1	729-114-200		HANDLE
3	2	524-001-310		WASHER, FLAT, 3/8", SS
4	2	524-001-323		WASHER, LOCK, 3/8", SS
5	2	524-001-322		3/8-24 x 3/4 HHCS, SS
6	2	724-569-004		DECAL, NELSON

Comment:

Sp = Spare part; **Stp** = Standard part; **W** = wearing part;
Ssp = Stud-specific part

9.3 Chassis Sub ASM



Note!

Rotate strain relief 30 degrees clockwise to have access to the screws.

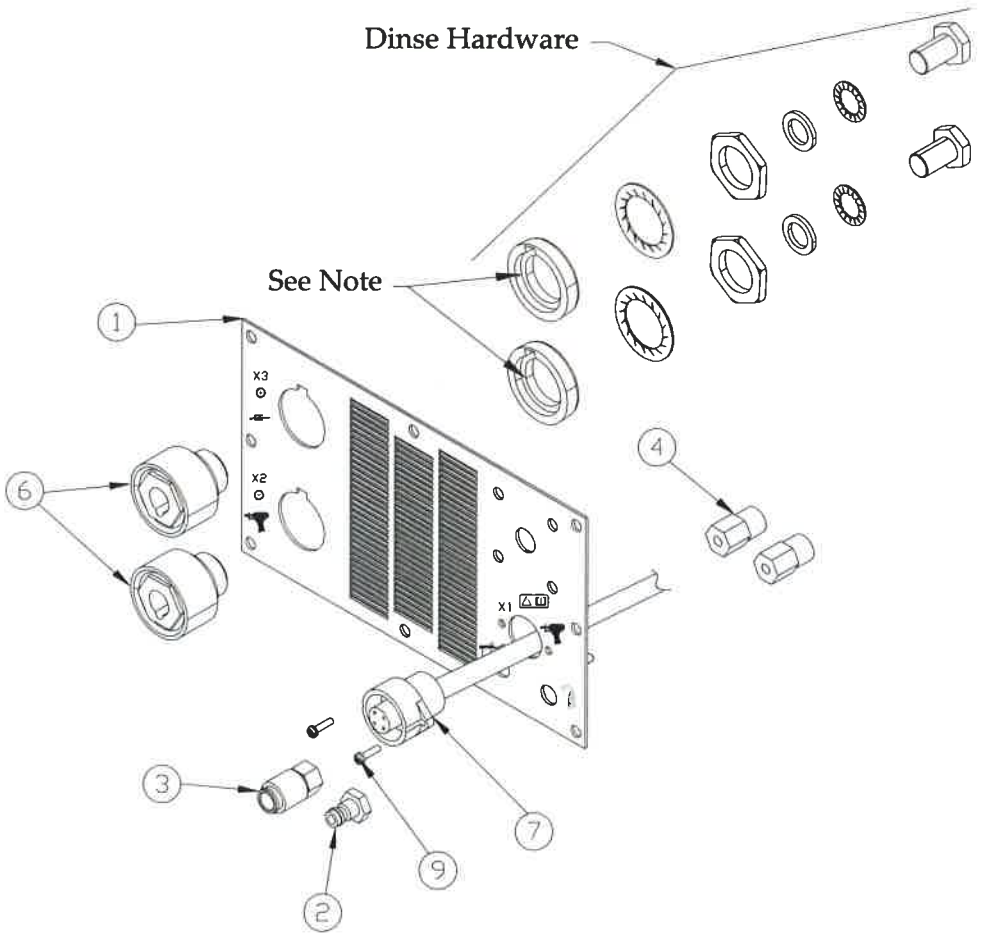
9.3.1 Parts list chassis sub ASM

Item	QTY	Part Number	Comment	Description
1	1	750-611-221		CHASSIS WELDMENT
2	1	750-611-407		FAN SUB ASSEMBLY
3	4	729-022-008		FOOT
4	1	714-074-010		CABLE GLAND
5	1	714-074-011		CABLE GLAND NUT
6	4	524-005-279		M4x16 PHMS, SS (FAN MOUNTING)
7	4	524-005-284		M4 FENDER WASHER, SS (FAN MOUNTING)
8	5	524-005-210		M4 KEPS NUT, SS (FAN/CHASSIS GROUND MOUNTING)
9	4	717-140-010		GROMMET, RUBBER (FAN MOUNTING)
10	1	524-005-273		M6 KEPS NUT (CHASSIS GROUND MOUNTING)
11	1	524-005-010		M4 INTERNAL TOOTH WASHER (CHASSIS GROUND MOUNTING)
12	1	524-005-285		M6 INTERNAL TOOTH WASHER (CHASSIS GROUND MOUNTING)
13	1	723-245-040		HARNESS, CHASSIS GROUND

Comment:

Sp = Spare part; **Stp** = Standard part; **W** = Wearing part;
Ssp = Stud-specific part; **NS** = Not shown

9.4 Front panel assembly



Note!

GREASE CONNECTORS BY FILLING GROOVE OF REAR CAP WITH NYOGEL 760G (OR EQUIVALENT), SILICONE FREE GREASE BEFORE ASSEMBLING.

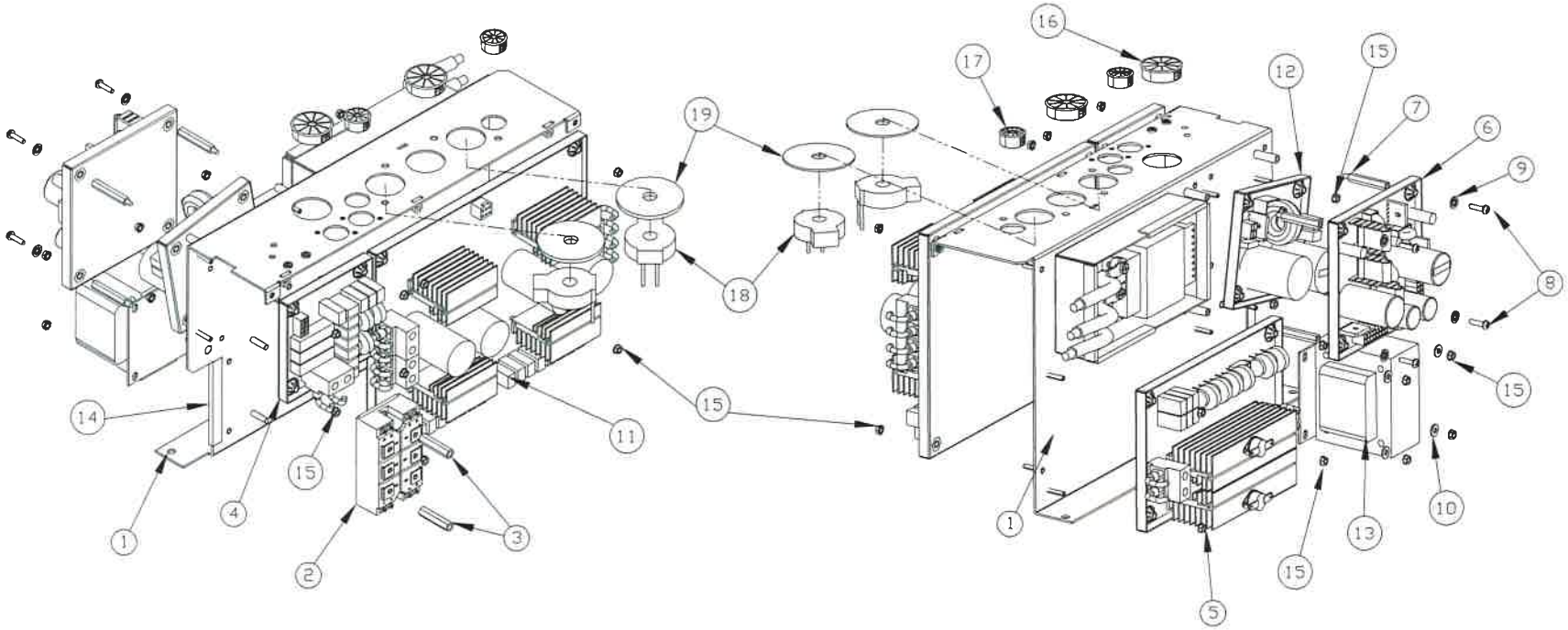
9.4.1 Parts list Front panel assembly

Item	QTY	Part Number	Comment	Description
1	1	750-611-243		FRONT CONNECTOR PANEL
2	1	520-001-251		COUPLING,QUICK PLUG
3	1	520-001-252		COUPLING,QUICK SOCKET
4	2	520-001-320		FITTING,FEMALE,M6 TUBING x G1/8
6	2	85-10-02		DINSE,FEMALE (M10 SCREW)
7	1	723-245-041		HRNS TRIGGER CONNECTOR (4 WIRE BINDER)
8	1	714-232-003		COVER,CONNNECTOR,BINDER
9	2	524-005-271		SCREW,M3x12 PHCRMS,SS (TRIGGER HARNESS MTG)
NS	1	723-242-015		HRNS OUTPUT BD TO WORK DINSE (+)
NS	1	723-242-039		HRNS OUTPUT FILTER CAPACITOR ASM

Comment:

Sp = Spare part; **Stp** = Standard part; **W** = Wearing part;
Ssp = Stud-specific part; **NS** = Not shown

9.5 Vertical panel assembly



Secondary Side

Primary Side

9.5.1 Parts list Vertical panel assembly

Item	QTY	Part Number	Comment	Description
1	1	750-611-402		VERTICAL/TRANSFORMER ASSEMBLY
2	1	701-175-000		3 PHASE BRIDGE RECT.
3	2	729-114-201		M5x35 HEX SPACER, FEMALE/FEMALE (BRIDGE MOUNTING)
4	1	750-611-021		INPUT PCB ASSEMBLY
5	1	750-611-031		OUTPUT PCB ASSEMBLY
7	4	729-114-202		M4x40 HEX SPACER, MALE/FEMALE (POWER BD MOUNTING)
8	4	524-005-279		M4x16 PHMS, SS (POWER BOARD MOUNTING)
9	4	524-005-010		M4 LOCK WASHER, SS (POWER BOARD MOUNTING)
10	4	524-005-120		M4 FLAT WASHER, SS (AUX TRANSFORMER MOUNTING)
11	1	750-611-051		SWITCHING PCB ASSEMBLY
12	1	750-610-062		PILOT ARC PCB ASSEMBLY
13	1	723-245-007		AUXILIARY TRANSFORMER ASSEMBLY
14	4 in	727-029-212		EDGE GUARD
15	20	524-005-210		M4 KEPS NUT, SS (PCB, AUX TRANSFORMER MOUNTING)
16	2	714-028-002		CABLE GROMMET, LARGE
17	2	714-028-001		CABLE GROMMET, SMALL
18	1	723-242-021		CURRENT TRANSFORMER SUB ASM
19	2	524-001-340		WASHER, RUBBER (CT MOUNTING)
NS	1	723-242-025		HARNESS, OUTPUT RECT TO CONTROL
NS	1	723-245-002		HARNESS, CONTROL TO INPUT, SWITCH, CTs, & PILOT
NS	1	723-245-003		HARNESS, CONTROL TO DISPLAY
NS	4	717-615-101		TY-WRAP (CT MOUNTING)
NS	1	723-245-009		HARNESS, 3 PHASE BRIDGE (+) TO INPUT (DC IN)
NS	1	723-245-011		HARNESS, 3 PHASE BRIDGE (-) TO SWITCH (B IN(-))
NS	1	723-245-037		HARNESS, INPUT (DC OUT) TO SW (A IN (+))
NS	1	723-245-038		HARNESS, SWITCH (A IN (-)) TO SWITCH (B IN (+))
NS	1	723-245-001		HARNESS, POWER SUPPLY CONTROL TO FAN
NS	12 in	727-029-214		SLEEVING, FIBERGLASS (MAIN XFMR, PRIMARY LEADS)

Sp = Spare part; **Stp** = Standard part; **W** = Wearing part;
Ssp = Stud-specific part; **NS** = Not shown

10.Troubleshooting

10.1 How to use Troubleshooting guide

Warning!

Service and Repair should only be performed by Nelson Factory Trained Personnel. Unauthorized repairs performed on this equipment my result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

Warning!

Heat sinks on the switch boards have HIGH VOLTAGE.

DO NOT remove plexiglass when the power is on.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the procedure listed below.

1. LOCATE PROBLEM (SYMPTOM)

- Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. If the problem is accompanied by a flashing warning symbol, see the error code section for more details.

Step 1.POSSIBLE CAUSE

- The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

Step 2.SOLUTION RECOMMENDED

- This column provides a course of action for the Possible Cause, generally it states to contact your local Nelson Authorized Field Service Facility.

Note!

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Nelson Authorized Field Service Facility. Replace plexiglass after service!

Note: Replace plexiglass after service!

10.2 Problems / Possible Cause / Solution

Problems	Possible Cause	Solution
Major physical or electrical damage is evident when the sheet metal covers are removed.	• Contact you local authorized Nelson Field Service Facility for technical assistance	If all recommended misadjustment have been checked and the problem persists, contact your local Nelson Authorized Field Service Facility.
Input fuses keep blowing, or input breaker keeps tripping.	• Make certain that the fuses or breakers are properly sized. See rating section of the manual for recommended fuse and breaker size. • Welding procedure is drawing too much output current, or duty cycle is too high. Reduce output current, duty cycle, or both. • There is internal damage to the power source. Contact an Authorized Nelson Field Service Facility	
Machine will not power up (no lights)	• Make certain that the power switch is in the "ON" position. • The 1.5 amp fuses may have opened. Check fuses. *Fuses are located inside the unit. 1.5A, 600V, Part-No. 715-039-001. Ses chapter* **9.1** *„Explosion drawing Final Assembly N800i".* **Warning!** + Opening the welding unit may only be carried out by an authorised electrical specialist!	
Machine wont weld, can't get any output	• If the displays are not lit refer to machine will not power up section. • If the thermal symbol is lit refer to the thermal section.	

Warning!

Defective fuses must always be replaced by fuses of the same model with identical nominal values.

\+ *If for any reason you do not understand the test procedures or are unable to person the tests/repairs safely, contact your Local Nelson Authorized Field Service Facility for technical troubleshooting assistance before you proceed.*

10.3 Welding Problems

Problems	Possible Cause	Solution
Poor welding, weld settings drift, or output power is low	• Make sure the machine settings are correct for the weld process being used. • Check for loose or faulty welding cables.	If all recommended misadjustment have been checked and the problem persists, contact your local Nelson Authorized Field Service Facility.
Poor welding performance	• Check for loose or faulty welding cables. • Make sure the machine settings are correct for the weld process being used. • Are input cables correct size? (See table 4.3.4)	
The thermal light and fan keep turning on and off	• Check the input voltage section • Check for blockage of vents, which restricts air flow into or out of the machine. • Blow air in the rear louvers to remove dirt from around fan.	

Observe all Safety Guidelines detailed throughout this manual

+ *If for any reason you do not understand the test procedures or are unable to person the tests/repairs safely, contact your Local Nelson Authorized Field Service Facility for technical troubleshooting assistance before you proceed.*

Warning!

Opening the welding unit as well as work inside the casing may only be carried out by authorised electrical specialists!

Prior to any work on the N800i the welding unit must be switched off. The master switch of the welding unit must be in the „0" position!

10.3.1 E001 Shorted Control Cable-Fix Control Cable and/or Gun

Shorted Control Cable	E001

u **Fatal, meaning you have to power down to continue welding**
7 **No**
u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
3 **Yes**

Description: The gun drive circuit sensed a current spike of 10A or greater for at least 10us. When this condition is sensed, the gun drive turns off and the user interface displays this error. The gun may be retriggered and the unit does not need to be powered down.

Likely problems or items to check - in order from most likely to least likely:

1. A cable short in the combo cable external to the unit
2. A wiring or switch short in the gun
3. Internal wiring from the control to the output board, output board to the front panel gun connector
4. Failure of the control board.

10.3.2 E002 Primary Voltage Dip too Low-Check Primary Voltage

Primary Voltage Dip Too Low	E002

u **Fatal, meaning you have to power down to continue welding**
7 **No**
u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
3 **Yes**

Description: The control board senses the +15VDC power supply provided to it. This supply is the one used to gate the primary IGBTs on, so it must be at 15VDC to turn the IGBTs on reliably so no damage occurs. When the 15VDC dips down below 14.3VDC (1ms during a weld, or 20ms while idle), this error will be displayed and if welding, the weld will stop immediately. +15VDC is located at pins 1(+) and 11(-) of JP11 on the control board.

Likely problems or items to check - in order from most likely to least likely:

1. Primary voltage is sagging during the weld enough for the +15VDC auxillary supply to dip.
2. Control board 15VDC sensor circuit failed.
3. Power supply board failed.
4. Aux transformer failed.

- Check that +15VDC exists at the control board while unit is not welding (idle). If it does not exist at idle, check primary power and replace power supply or aux transformer as necessary.
- Using a scope, determine what the voltage dips to during the weld. If the voltage did not dip lower than 14.3VDC, replace the control board.
- If the voltage is dipping, check the primary and secondary of the aux transformer while at idle and during weld. If the primary is dipping, move N800i to a stiffer supply. If the secondary is dipping but primary is not, replace aux transformer. If neither dips, replace power supply board.

10.3.3 E003 Capacitor Voltage Imbalance

Capacitor Voltage Imbalance	E003

- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: When (and only when) running the unit on the high range 400, the primary capacitor bank has the potential to go out of balance such that they are not the same voltage. When they are 20VDC out of balance for 10ms, the weld will be aborted to protect the power unit. When operating the unit with very low current and/or very little cable load, unit will have the most opportunity for this imbalance.

Likely problems or items to check - in order from most likely to least likely:

- Try reducing F2, which gives the most opportunity for delivering current through a minimal load.

10.3.4 E004 Regulation Error-Arc Went Out

Regulation Error- Arc Went Out	E004

- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: If the control board senses that the current was more than 50% low while the control to the power system was at the maximum for 15ms, it will abort the weld and display this error. This will happen if the current sensing failing for any reason (wiring, power supply, etc). This exists as a safety mechanism in case current sensing fails. This is most likely caused by the arc actually popping out.

Likely problems or items to check - in order from most likely to least likely:

1. Arc actually popped out. Check gun lift / Try again. If it is consistant, it is an internal failure.
2. Damaged/Broken connection from the current sensor (See picture below) to JP5 of control board.

3. Missing voltage supplies at current sensor. Check at JP5 of control board for +15VDC and -15VDC.
4. Broken connection in gate circuit to switch board. This would cause the power system to not turn on even though the control board is at max pulse width. Check control board JP1 pins Check that +15VDC exists at the control board while unit is not welding (idle). If it does not exist at idle, check primary power and replace power supply or aux transformer as necessary.

10.3.5 E005 Regulation Error - Short circuit

Regulation Error- Short	E005

u **Fatal, meaning you have to power down to continue welding**
7 **No**
u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
3 **Yes**

Description: If the control board senses that the current was 150% or higher of the setting while the control to the power system was at the minimum for 15ms, it will abort the weld and display this error. This will happen if the current sensing failing for any reason (wiring, power supply, etc). This exists as a safety mechanism in case current sensing fails.

Likely problems or items to check - in order from most likely to least likely:

1. Damaged connection from the current sensor (See picture below) to JP5 of control board.
2. Missing voltage supplies at current sensor. Check at JP5 of control board for +15VDC and -15VDC.

10.3.6 E006 Input Voltage Too High

Input Voltage Too High	E006

- u **Fatal, meaning you have to power down to continue welding**
- 3 **Yes**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: When power is initially applied to the system, it goes through a series of relay closures / opens and watches the primary voltage closely. If the voltage is sensed to be a damaging level (>400VDC on the capacitor banks - J1 on the switch board), the relays are turned off and this error is displayed. They system must be powered down and examined/ fixed prior to anything else.

Likely problems or items to check - in order from most likely to least likely:

1. Measure the primary voltage and make sure it is within the correct range.
2. Improper adjustment of voltage-to-frequency circuit to switch board. Each switch board has a pair of wires to provide an open-collector signal to the control board. These pairs carry a near 15V signal with a frequency in the 3000Hz range that represents the primary voltage. The signal is controlled by the switch board, which provides an opto-coupled linear voltage-to-frequency signal to the control board for sensing. If this frequency is below 1000Hz, it will be read by the control as zero (0Hz). Relationship is [y=0.0904x+0.28 where x= Vin/10 and y= freq in kHz]. Once this condition occurs, the control may not update the frequency on the display. The reading must be in the normal range for this adjustment to be made. As you turn the potentiometer on the switch board to adjust the V-F measurement, observe F18 on the user interface on both left and right sides to tune it in to the measured voltage on J1 of the switch board. Press the time up/ down arrows to switch from left/right measurements and to display. If this error occurs and you suspect an adjustment is needed, turn the potentiometer to half way of the full scale and tune from there. You'll have to get past this error to tune the voltage readings correctly, which will involve some power down/up cycles.

3. Broken connection from control board to the switch board in V-F circuit. Check control board JP1 pins 1,9 for one pair, 2, 10 for the other.
4. If the input voltage measures to be correct and the switch boards V-F signal can not be calibrated replace the switch board.
5. If the V-F signal is in a range of (2540Hz and 3896Hz) and when first powered up, you still get this error, replace the control board.

10.3.7 E007 Input Voltage Too Low

Input Voltage Too Low	E007

- u **Fatal, meaning you have to power down to continue welding**
- 3 **Yes**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: When power is initially applied to the system, it goes through a series of relay closures / opens and watches the primary voltage closely. If the voltage is sensed to be a damaging level (>400VDC on the capacitor banks - J1 on the switch board), the relays will de-energize and the unit will remain in this state. The system must be powered down and examined/fixed prior to anything else. That is, no welding can be done in this state.

Likely problems or items to check - in order from most likely to least likely:

1. Measure the primary voltage and make sure it is within the correct range as defined by the voltage setting on the back of the unit.
2. Improper adjustment of voltage-to-frequency circuit to switch board. Each switch board has a pair of wires to provide an open-collector signal to the control board. These pairs carry a near 15V signal with a frequency in the 3000Hz range that represents the primary voltage. The signal is controlled by the switch board, which provides an opto-coupled linear voltage-to-frequency signal to the control board for sensing. If this frequency is below 1000Hz, it will be read by the control as zero (0Hz). Relationship is [y=0.0904x+0.28 where x= Vin/10 and y= freq in KHz]. Once this condition occurs, the control may not update the frequency on the display. The reading must be in the normal range for this adjustment to be made. As you turn the potentiometer on the switch board to adjust the V-F measurement, observe F18 on the user interface on both left and right sides to tune it in to the measured voltage on J1 of the switch board. Press the time up/down arrows to switch from left/right measurements and to display. If this error occurs and you suspect an adjustment is needed, turn the potentiometer to half way of the full scale and tune from there. You'll have to get past this error to tune the voltage readings correctly, which will involve some power down/up cycles.
3. Broken connection from control board to the switch board in V-F circuit. Check control board JP1 pins 1,9 for one pair, 2, 10 for the other.

4. If the input voltage measures to be correct and the switch boards V-F signal can not be calibrated replace the switch board.
5. If the V-F signal is in a range of (2540Hz and 3896Hz) and when first powered up, you still get this error, replace the control board.

10.3.8 E008 Primary Overcurrent Error

Primary Overcurrent Error	E008

u **Fatal, meaning you have to power down to continue welding**
3 **Yes**
u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
7 **No**

Description: When a dangerous primary current is sensed (by means of the Current transformer sensors in the back of the unit near the fan plenum), the control will quickly disable the output of the power section to prevent damage. This should only happen due to internal failures.

Likely problems or items to check - in order from most likely to least likely:

1. Replace the output board.
2. Replace the switch boards (both).
3. Replace the control boards.

10.3.9 E009 Could Not Establish Pilot Arc

Could Not Establish Pilot Arc	E009

- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: At the beginning of the weld, the pilot arc supply is turned on and the gun is energized. The gun has 20ms to lift (usually lifts in 3ms) and to draw a pilot arc. If no stud voltage is sensed after 20ms, it is assumed that the gun didn't lift and the control throws this error. Note - If the gun lifts and no arc exists, it will try to turn the main current on (and will end up with an E004 because no arc exists).

10.3.10 E010 Capacitor Voltage Could Not Be Read

Capacitor Voltage Could Not Be Read	E010

- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: The voltage-to-frequency signal as provided by the switch boards to the control board are not within a 'window' defined by the control board (indicating that they are invalid, or caused by noise on the signal line).

Likely problems or items to check - in order from most likely to least likely:

1. Inspect V-F wiring from switch board to control board. Keep wiring away from high power wires.
2. Eliminate possible sources of external electrical noise on the same circuit as this welder.
3. Replace switch board.
4. Replace control board.

10.3.11 E011 Unit Too Hot-Please Wait

Unit Too Hot - Please Wait	E011

u **Fatal, meaning you have to power down to continue welding**
7 **No**
u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
7 **No**

Description: When the internal temperature sensor trips, the control board disables welding so as not to allow damage to the unit. This error is displayed while the unit is in the overtemperature condition and disappears when it is ready for more welding. The normally closed temperature sensor is located on the output board and connects to pins 1 and 6 of JP3 on the control board. The sensor closes when it reaches 80 deg C.

Likely problems or items to check - in order from most likely to least likely:

1. Fan is not functional or is blocked. Check that fan can physically turn and the wiring to the fan. Short the fan sensor to manually activate the fan. Make sure it works.
2. Inspect wiring from overtemp thermostat to the control board (JP1 on control board pins 1 and 6). Measure ~22VDC while open, near 0VDC while closed.
3. Scroll on user interface using time up\down arrows for other errors that may indicate another problem. Measure 24VDC supply on control (JP11 pins 7 and 17).
4. Replace sensor
5. Replace wiring

10.3.12 E012 Short Circuit-Check Gun Lift Setting

Short Circuit- Check Gun Lift Setting	E012

- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: If the stud voltage of the power unit is less than 20V while welding for over 100ms, the output is considered shorted. When the unit is shorted, it has the potential for the capacitor banks to go out of balance and damage the unit (if operated this way or with the voltage on one side above the rating of the switch board 400VDC). The unit aborts welds and displays this error if this condition occurs during the main arc time. If this occurs during the plunge time, the error is not displayed, but the weld is aborted - as this is expected to happen during plunge time.

Likely problems or items to check - in order from most likely to least likely:

1. Gun lift setting is causing too many or too large of material transfers, which are shorting the arc for over 100ms. If this happens, the lift should be adjusted to overcome the transfers. If the unit were to continue to deliver current through a shor
2. Determine if it is an internal problem by trying different types of studs and gun settings. If the unit consistantly reports this error, it is internal. Otherwise, an
3. Inspect wiring from control board JP2 pins 1 and 4 to the weld outputs. Make sure the control can sense the voltage appropriately.
4. Replace control board.

10.3.13 E013 Weld Failed - Out of Tolerance

Weld Failed - Out of Tolerance	E013

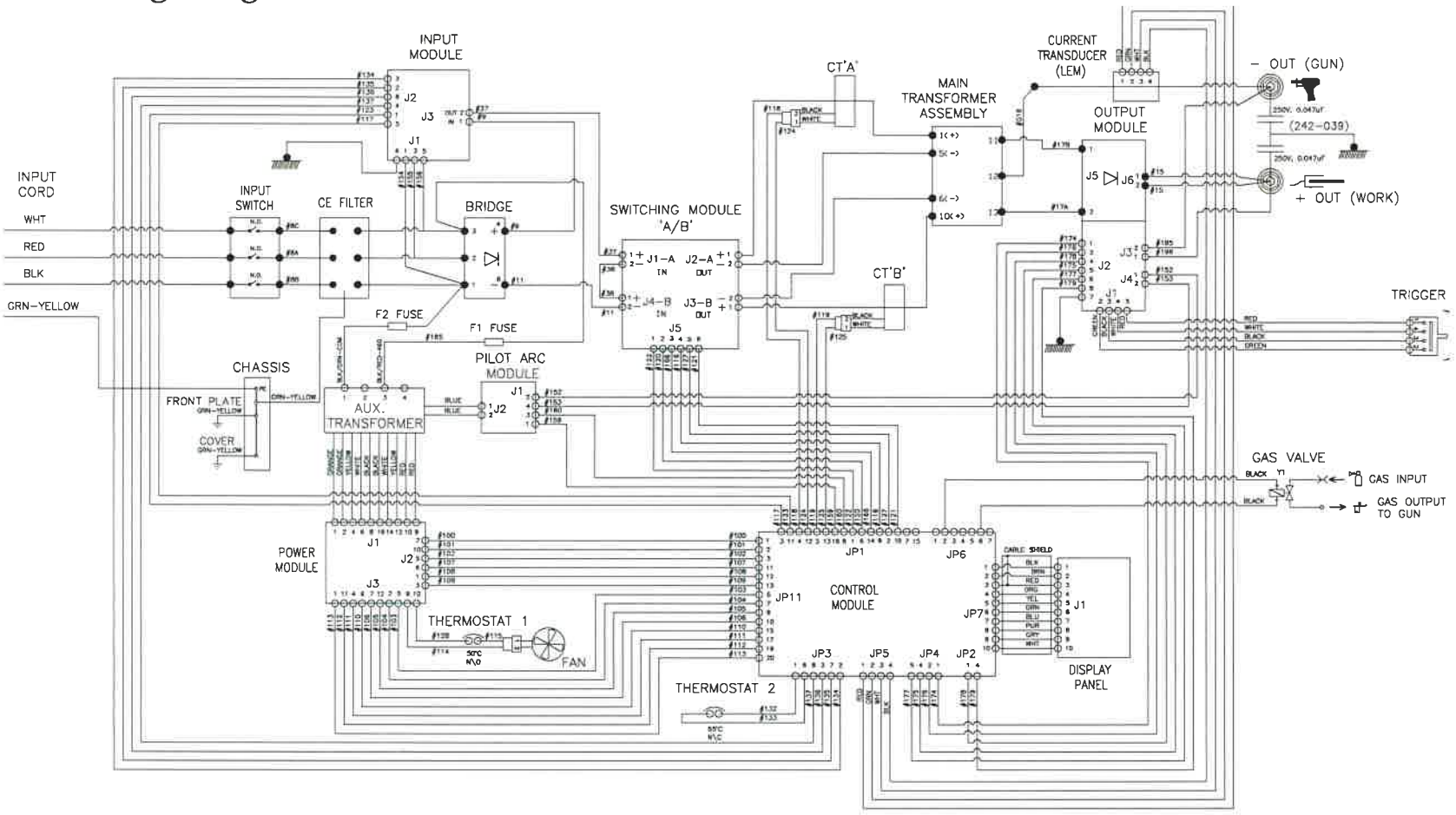
- u **Fatal, meaning you have to power down to continue welding**
- 7 **No**
- u **Acknowledge, meaning the error will exist as long as the unit is powered on. (Note, welding can continue while the error exists)**
- 7 **No**

Description: If the unit is configured to compare each weld results (Actual current, voltage, time, etc) to a given weld 'target', it will display this error when the last weld is out of the configured tolerance range. Change weld setup as appropriate, set a new target, or disable this error as necessary.

Likely problems or items to check - in order from most likely to least likely:

1. Change weld setup as appropriate.
2. Configure new target. To do this, select F32 and hold the lock button.
3. Adjust tolerance (weld energy F35 or drop time F34)
4. Disable this error using F36

10.4 Wiring Diagram Nelweld N800i



11. Annex

11.1 Disposal of the Nelweld N800i

Disposal of the Nelweld N800i in an orderly and as pollution-free as possible manner can be ensured by complying with the measures stated below. You are thus making an important contribution towards environmental protection and waste management.

Designation	Specification	Storage	Disposal
Ferrous metals and non-ferrous metals	Free of GB*	No requirements	VER*
Circuit boards	Free of GB	No requirements	VER
Plastics (pure grade)	Free of bromide compounds	No requirements	VER
Plastics (mixed)	None	No requirements	HM*, VER
Mercury-containing components	Undamaged	Closed plastic container, Hg absorber!	VER of the mercury
LEDs	Undamaged	Leakproof container	HM, VER
Cable, wiring	None	No requirements	VER
Gold-bearing components	None	No requirements	VER
Packing	Segregated collection	None	VER
Other materials	In accordance with requirements	In accordance with their composition	Decided in each given instance

- GB: Components containing hazardous materials (capacitors, LCDs, accumulators, batteries, etc)
- VER: Reprocessing (in accordance with the latest technological developments)
- HM: Disposal as household waste or commercial waste similar to household waste
- UTD: Underground tip
- SA: Disposal as waste requiring special supervision

+ *In accordance with the purpose of product responsibility, Nelson offers to take back and dispose of its unit and system components against the payment of respective fees.*

*)When the materials are stored, compliance with environmental regulations must be observed. Proof of expert and competent disposal must be furnished in accordance with KrW-/AbfG: Law Regarding Waste Recycling and Management (1994)!

11.2 Disposal in accordance with the European directive

Only for EU countries

Do not dispose of Nelson stud welding units and system components with household waste!

Nelson stud welding units and system components are B2B devices[1] and therefore exclusively designed for commercial use.

We expressly point out that Nelson stud welding units and system components must neither be disposed of with household waste nor at municipal collection points!

In accordance with the European 2002/96/EC directive on waste electrical and electronic equipment and within the scope of this directive's translation into national law, Nelson offers the collection and environmentally-compatible disposal of its units and system components against payment of a fee.
Please contact us!

1. Business-to-Business device, which is exclusively designed for commercial use

11.3 Abbreviations

The abbreviations used in this documentation in alphabetical order:

AlMg	Aluminum- Magnesium alloy
AF type of cooling	Fan (forced-air cooling)
CF	Ceramic ferrule
Cr	Chromium
DIN	German Standards Institute
DIN EN	European standard incorporated into German standards
DIN ISO	International standard incorporated into German standards
DS	Drawn-arc stud welding
EEC	European Economic Community
EMC	Electromagnetic compatibility
EN	European standard
ESF	Welding stud with an even fore-part
I[A]	Current in [amps]
IEC	International Electrotechnical Commision
IEC-Norm	International Standard
IP	Protection category code (International Protection)
ISO	International Organization for Standardization
KrW-/AbfG	Law regarding Waste Recycling and Management
KSF	Welding stud with tapered for-part
LED	Light-emitting diode
Mg	Magnesium
m[kg]	Mass in [kilograms]
Mo	Molybdenum
PA	Trough location
P[VA], [W]	Power in [volts x amps], in [watts]
ReH	Yield limit
T[oC]	Temperature in [degrees Celsius]
t[ms],[s]	Time in [milliseconds], in [seconds]
U[V]	Voltage in [volts]
VDE	Association of German Electrotechnical Engineers
W[Ws]	Energy in [wattseconds]

11.4 Literature

ISO/TR 15608:	Welding - Guidelines for a metallic material grouping system (2000)
EN 60529:	Degrees of protection provided by enclosures (IP-Code) (2000)
EN 60974-1:	Arc welding equipment Part 1 - Welding power sources (2005)
EN 60974-12:	Arc welding equipment Part 12 - Coupling devices for welding cable (2005)
EN ISO 13918:	Welding - Studs and ceramic ferrules for arc stud welding (1998)
EN ISO 14555:	Welding - Arc stud welding of metallic materials 2006)
BGV A3:	Accident prevention regulation of the administrative trade association "Electrical installations and operating materials" (1997)
BGR 500:	Operating working material (2007)