NW650
NW650 – N2

Installation, Operation and Maintenance Manual

Original Language EN

Retain this user guide for future reference.

CONTENTS

NITROHEAT
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1 Safety Information

Important: Do not operate this equipment until the safety information and instructions in this user guide have been read and understood by all personnel concerned. Use of the equipment in a manner not specified within this user guide may impair the protection provided by the generator and could result in an unplanned release of pressure, which may cause serious personal injury or damage.

Only competent personnel trained, qualified, and approved by NITROHEAT should perform commissioning, service and repair procedures.

When handling, installing or operating this equipment, personnel must employ safe engineering practices and observe all related local regulations, health & safety procedures, and legal requirements for safety.

Ensure that the equipment is depressurized and electrically isolated, prior to carrying out any of the scheduled maintenance instructions specified within this user guide.

Most accidents that occur during the operation and maintenance of machinery are the result of failure to observe basic safety rules and procedures. Accidents can be avoided by recognizing that any machinery is potentially hazardous.

NITROHEAT cannot anticipate every possible circumstance, which may represent a potential hazard. The warnings in this manual cover the most known potential hazards, but by definition cannot be all-inclusive. If the user employs an operating procedure, item of equipment or a method of working which is not specifically recommended by **NITROHEAT** the user must ensure that the equipment will not be damaged or become hazardous to persons or property.

Nitrogen is not a poisonous gas but, in a concentrated form, there is a risk of asphyxiation. The generator produces a flow of nitrogen and air, which quickly disperses in the atmosphere. However, do not directly inhale the output gas from the outlet pipe.

The generator is classified as non-hazardous for transportation purposes and as non-flammable for fire regulations. Any fire should be fought by means appropriate to the material causing the fire with the exception being the use of water.

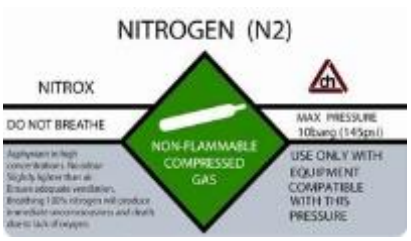
Note: Any interference with the warning labels will invalidate the generator's warranty.

This equipment is for indoor use only. Do not operate outdoors.

1.1 Markings and symbols

The following markings and international symbols are used on the equipment and within this user guide:

	Caution, Read the User Guide.		Highlights actions or procedures which, if not performed correctly, could lead to electric shock.
	Highlights actions or procedures which, if not performed correctly, may lead to personal injury or death.		When disposing of old parts always follow local waste disposal regulations.
	Highlights actions or procedures which, if not performed correctly, may lead to damage to this product.		Highlights information relevant to an operating procedure or process.

	DANGER Disconnect the mains supply before removing this cover.
	**NITROGEN (N_2)** NITROX DO NOT BREATHE Asphyxiant in high concentrations. No odor. Slightly lighter than air. Ensure adequate ventilation. Breathing 100% nitrogen will produce immediate unconsciousness and death due to lack of oxygen. NON-FLAMMABLE COMPRESSED GAS MAX PRESSURE 10barg (145 psi) Use only with equipment compatible with this pressure.

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2 Description

The NW650 manufactured by NITROHEAT is a turnkey solution for plastic welding and includes both an airless and nitrogen welding solutions. The advanced temperature controlled system is ready to “use out the box” and operates on a standard 110V power supply.

The NW650-N2 is a nitrogen generator designed to provide a constant supply of nitrogen gas to the plastic welder. The system uses proven membrane technology with polymer fibers to separate N2 from the compressed air and supply it on demand as determined by the flow and pressure requirements.

This user guide contains all of the information necessary for the correct use of the NITROHEAT NW650 product range.

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2.1 Technical Specification

This specification is valid when the equipment is located, installed, operated, and maintained as specified within this user guide.

NW650 / - N2	Units
Volume output (cfm)	1
Maximum outlet pressure (psi)	15
Purity (%)	98
Nitrogen Outlet	¼"
Connection Type	IEC320
Supply Voltage Range	110 VAC
Max Current Draw	8.5A
Fuse	10A

Environmental data	
Temperature °F (°C)	36 – 122 (2 50)
Humidity	50% @ 40°C (80% MAX ≤ 31°C)
Pollution Degree	2
Noise dB(A)	<65

2.2 Dimensions

Product	Width (")	Length (")	Height (")	Weight (lbs)
NW650	**10**	**12**	**13.5**	**18**
NW650-N2 	**9**	**9**	**26**	

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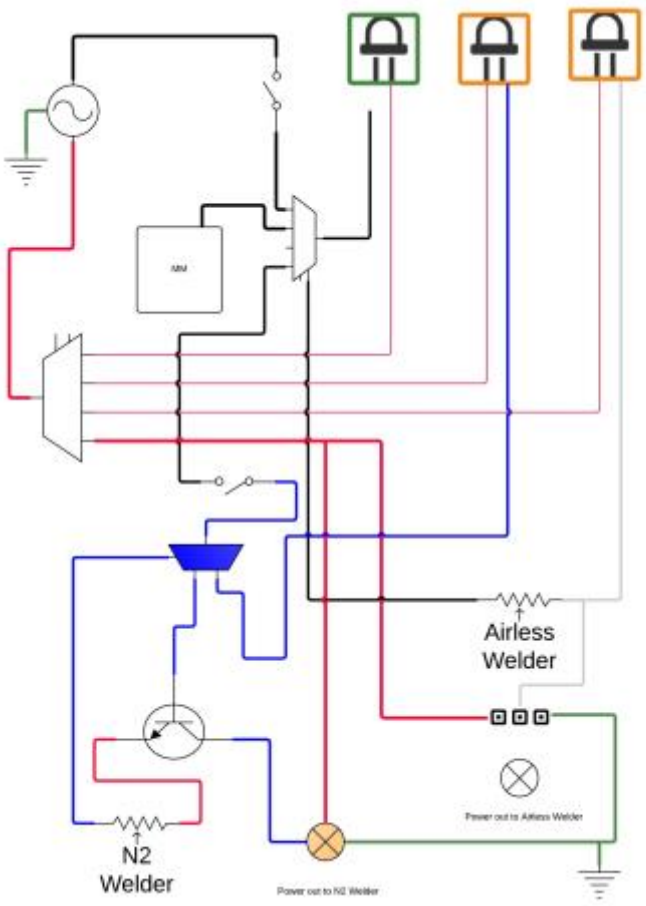
2.3 Unpacking the equipment

Remove the equipment from its packaging, check that it has not been damaged in transit and verify that the following items have been included with your equipment:

NW650-N2		NW650	
Description	**Qty**	**Description**	**Qty**
N2 Generator	1	Plastic Welder Control Unit	1
N2 outlet tubing	1	Airless Welder	1
		Hot Air Welding torch	1
		Power cable	1
		Welding Rods	1
		Wire Brush	1
		N2 Tank tube	1
		N2 Tank fitting	1

IF ANY ITEMS ARE MISSING OR DAMAGED PLEASE CONTACT YOUR NITROHEAT REPRESENTATIVE.

2.4 Schematic Overview of the Equipment



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3 Installation & Commissioning

Do not install this equipment until the following instructions have been read and understood by all personnel concerned.

Before continuing with the installation and commissioning of this equipment ensure that it is correctly sized for the inlet pressure and application and that the electrical supply voltage and frequency meet the requirements detailed within this specification and on the equipment rating plate.

3.1 Locating the equipment

The generator should be located on the welding cart and attached to the welder. Always ensure the welding cart is operated on aflat surface and be protected from direct sunlight, moisture, and dust (Refer to section 2.1 of this user guide for the generator's environmental specification).

DO NOT

Position the equipment so that it is difficult to operate or disconnect from the electrical supply.

Due to the nature of operation there is a possibility of oxygen enrichment surrounding the generator. Ensure that the area is adequately ventilated. Where the risk of oxygen enrichment is high, such as a confined space or poorly ventilated room, the use of oxygen monitoring equipment is advisable.

3.3 Electrical Installation

Attach the mains supply cable provided to the IEC 320 sockets and connect to the electrical supply.

If a cord set, other than the one provided, is used to connect the equipment to the electrical supply ensure that it is suitably rated for the application and in accordance with local and national code regulations.

The equipment must be bonded to earth (grounded) through the cord set.

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4.0 Operating the equipment

1.

Assemble welding cart as per the included instructions. Make sure all bolts and nuts are tightened correctly before placing any equipment on the assembled cart

2.

Place Nitrogen tank or N2 Generator into rear of welding cart.

Use safety chains to secure tank

3.

Remove NW650 plastic welder and place on work table

4.

Check all components are present as per inserted component checklist

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5.

Connect Hot Air / N2 welding torch to main control unit

6.

Connect airless welder to power plug

7.

Attach hot air and airless welder holster to right hand side of unit.

Place complete unit on welding cart

8.

Connect air supply to “Air IN” port

Add ¼” male quick disconnect to Air IN port

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9.

Connect Nitrogen to “Nitrogen IN” port

*Connect the supplied tube to your **PRESSURE REGULATOR** of the N2 tank*

10.

Ensure Airless Temp and N2 temp dials are set to “0”

When both temperature settings are at ‘0”, current is < 0.5A

11.

Connect 110/120V main power supply to unit.

12.

Switch ON main power switch

Green LED will illuminate on power switch

Check voltage – 110 – 120V

Check current <0.5A

Main green LED ON

This LED will remain ON until the main switch is powered OFF

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13.

Airless Welder Test

Turn ON airless welder

- RED LED will illuminate

Check current on multi-meter

DO NOT TOUCH WELDER

Current increases to between 0.6 and 1A

14.

Hot Air Welder Test

Set gas selector to “Air” (pull out knob)

If using N2 tank – use compressed air for pre-heating and cooling off

Open pressure regulator and set outlet pressure to between 5 – 10 psi

14A.

Amber LED will illuminate

Air will flow out of welding torch

Air / N2 will not heat up until the N2 Temperature is adjusted.

See next step for N2 temperature adjustment

NB: if using a N2 tank, always use compressed air for pre-heating and cooling the air welding torch

14B.

Adjust N2 temperature to “7”

- Check current on multi-meter
- **Adjust temperature for different material melting points**

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14C.

DO NOT TOUCH WELDER

CAUTION – Air from welding torch extremely HOT

14D.

COOL DOWN – SYSTEM SHUT OFF

Turn OFF airless welder

RED LED will switch OFF

14E.

Set N2 Temperature switch to “0”

- Check multi-meter current <1A
- Allow welding torch to cool down before shutting off air supply

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4 Identifying Plastics

Code	Plastic	Welding Temperature °C
ABS	Acrylonitrile Butadiene Styrene	350
ABS/PC	Polymer alloy of above	350
PA	Polyamide (Nylon)	400
PBT	Polybutylene Terephtalate (POCAN)	350
PC	Polycarbonate	350
PE	Polyethylene	300
PP	Polypropylene	300
PUR	Polyurethane (Not all PUR is weldable)	
PVC	Polyvinyl Chloride	300
GRP/SMC	Glass Fiber Reinforced Plastics isNot weldable	

Almost all thermoplastics can be welded. The quality or ability to be welded is governed by the extent of their melting range; those with the widest melting range are easiest to weld. The two most popular thermoplastics for fabrication are polyvinyl chloride (PVC) and polypropylene.

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5 WELDING

Surface Preparation

Simple preparation steps will insure successful repairs.

Plastic components can be repaired from the front or rear according to ease of access.

Reinforcement welds can be used across the rear of a front repair to restore strength to areas designed to withstand impact.

If the damage passes behind a decorative or protective trim, this must be removed from the damaged component to provide complete access to the repair area.

Trims are usually fixed with an adhesive that softens with heat treatment. Attempting to remove a trim that is cold can damage it beyond repair.

The NM650 hot air tool can supply 230 liters of air per minute at a precise temperature between 20°C and 700°C. For trim removal, the hot air tool is used at a temperature setting of 300°C. The temperature charts on the tool body show the rotary control setting to achieve the correct air temperature.

Whenever the hot air tool is in use, the end of the element housing becomes extremely hot.

Always rest the tool in its holster when not in use.

Moving the hot air tool over the trip surface aids even heat absorption to soften the adhesive.

It also prevents localized heat build-up. When the adhesive is soft, the strip should pull away neatly and allow for reuse after the repair.

Welding Groove

As in most welding, a 90° V-shaped groove is used. It must be prepared along the crack to accept the welding rod and form a strong repair.

Begin by removing any paint or other coating from the repair area with a body file or sander.

An area 10 to 15mm around the damage should be sufficient. If sections of the material have been impacted and become trapped, the application of heat up to 200°C will help to free them.

A screwdriver blade can also be used to free trapped sections.

The 'V' groove can be formed with careful use of a square-edged file, but the best tool is a rotary burring bit with a cutting edge on its circumference and end face. This creates the 90-degree groove in one operation even following the most erratic of crack courses.

Begin the groove up to 10mm beyond the start of the crack and increase the depth progressively to maximum by the time the start of the crack is reached. The depth of the groove should be no more than 2/3 of the thickness of the material.

Best results are obtained when a high speed drill is employed. A slow drill or the use of a single cutting face burring tool may lead to it jumping from the groove.

During the burring operations, always wear eye protectors and a dust mask to prevent irritation from fine particles of plastic.

When the groove is finished, the welding rod for the material should rest neatly in it, the upper curve face of the rod protruding 1 to 2 mm above the surface of the repair. This allows for weld dressing operations, eliminating the need for fillers and ensuring enough depth of penetration for the rod.

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This test relates to larger components, such as bumpers, where a 5mm profile welding rod should be used. If a 3mm welding rod is used, more than one run may be necessary. For small or thin-walled components, one run of 3mm rod may be sufficient.

Crack Prevention

After removing decorative trims and adhesive, the end of each crack or split should be drilled with a maximum 3mm diameter drill to prevent further lengthening of the crack. Remember, plastic swarf can be abrasive to the eyes. Wear eye protectors.

Missing Material

Where small sections of plastic are lost, a piece can be used from a spare, unsalvageable part of the same material. This can be shaped and inserted, though success will depend on the availability of spare plastic, the intricacy of the design, and the experience of the operator.

Tack Welding

Welding operations are completed in two stages. First, tack weld the base of the crack. The heat knits the sides of the crack together and holds both sections of the component in alignment.

The weld is best completed in one continuous run from end to end, drawing the welding nozzle tip along the base of each 'V' groove.

The sole of the nozzle should be inclined at an angle not exceeding 20° to the groove base. As the nozzle is drawn along, hot air softens the plastic below the heel of the nozzle and the toe draws the softened material together.

Avoid applying pressure to the weld via the tool, as the material at the base of the groove is thin and not strong. While tack welding, minor misalignment of the panel sides or newly inserted material can be corrected by holding the sections in position until the weld has knitted and cooled.

After each welding run, brush the nozzle clean with a brass brush. Remove any difficult residue by increasing the heat level to maximum to soften it.

Main Welding

The most important rule in plastic welding is that it is only possible to weld like with like. Hence the need to identify the plastic material and select a matching welding rod.

The main welding operation begins with preparation of the welding rod. Cut the end to a pencil point using a trimming knife or side cutters; this provides a progressive fill in the 'V' groove, particularly where it starts in the center of a panel, preventing the formation of bulbous protrusions of plastic.

Set the correct temperature for the material and allow the tool to warm up before starting.

The rod must be held beyond the start of the 'V' groove so that heat is directed onto the start point for welding.

When the surface plastic shows signs of slight "wetting", move the welding nozzle along the groove. The nozzle toe should rest on the rod in the groove while under the heel and there should be an air gap of 3mm. Feed the rod steadily with a downward hand pressure of about 2.5Kg, sufficient to push the softened rod into the groove. To judge what a pressure of 2.5Kg feels like, take a short piece of weld rod and use it to press down on a set of scales until 2.5Kg registers. (Do not apply downward force to the weld via the hot air tool itself). Wherever possible, the weld should be completed in one continuous run along the contour of the crack.

Correct mating between the welding rod and the material occurs when the rod is seen to soften and the new rod moves down the nozzle feed. As the rod melts into the groove, two smooth, continuous ridges will appear at the

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edges, accompanied by a slight wash at the sides of the weld. Do not move too quickly, failing to create a wash, nor too slowly, thereby overheating and even scorching or distorting the plastic.

When the weld has been completed, remove the hot air tool. Once cool, the unwelded rod end is cut off as close to the weld as possible.

The completed weld appears as a smooth, continuous line with the wash still visible alongside it, confirming that the rod has welded successfully with the component.

During the welding, previously unseen cracks may open up. These are not new but are impact cracks that have been present since the initial damage. These must be treated and welded as any other crack damage.

If the weld is successful, reinforcement welds can be added to the reverse of the material
across the axis of the repair. The same preparation and weld operations apply.

Pendulum Welding

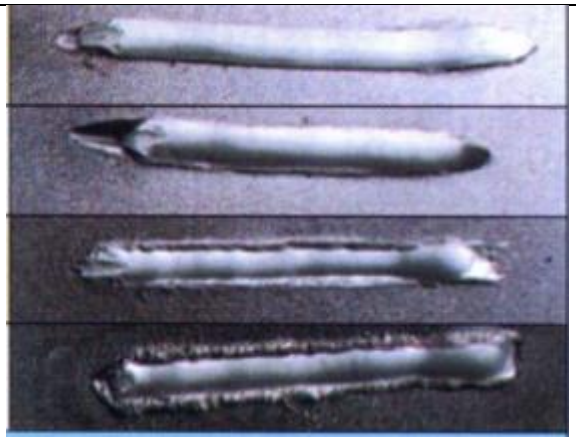
Where cracks or splits pass through tight corners, it may be difficult to use the normal speed welding. In such cases the technique of pendulum welding is effective.

Prepare the crack in the normal way, then feed the welding rod manually into the 'V' groove at an angle of between 80 and 90 degrees to the groove. Exert about 2.5 Kg downward force on the rod while playing the hot air tool, onto the base of the rod and into the 'V' groove in a constant pendulum action. The bias of the action is determined by the comparative thicknesses of the component material and the welding rod.

Both must be in the same molten state at the point of fusion.

Welding Defects

The table and pictures below detail common causes of weld defects.

The weld was started correctly but completed too quickly. No wash indicates haste or too low a temperature.	
The hot air tool was not allowed to attain the correct operating temperature and the weld was finished too soon, leaving a hole.	
Too much pressure has been applied to the rod, leaving a low and deformed bead. Filling may be necessary.	
The welding temperature was too high, blistering the sides of the weld. The repair area may be brittle.	

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Welding Defects and Causes

Poor weld penetration or poor bonding	--Incorrect weld site preparation --Weld speed too fast/temperature too low --Weld attempted with dissimilar materials --Poor technique
Uneven weld bead width Charred weld	--Welding rod stretched --Uneven pressure applied to welding rod --Welding speed too slow --Temperature too high
Warping	--Repair area overheated --Parts fixed under tension --Poor site preparation

Weld Dressing

A successful weld forms a slightly raised, smooth, even bead across the component surface. Welds must be flatted only when they are cold; warm welds clog the sanding disc. Remember that plastic is a soft material that yields easily to abrasives. For this reason, use a 120 grit disc first, then progress to 180 and finally 320 to produce a smooth finish. Always use new, clean, sharp papers. Allow a 7 to 10cm margin around the weld area for dressing to provide a key for painting.

Painting Plastics

There are many paint schemes that are suitable for use on plastic components. Check with the vehicle manufacturer for approved schemes.

Surface preparation prior to painting can be completed with fine grade abrasive paper, followed by a thorough cleaning which is essential for good paint adhesion. Cleaning agents should be compatible with the recommended paint scheme.

A repaired plastic component should be completely repainted to ensure invisibility of the repair.

The finished component should be as strong as the original and provide an unblemished cosmetic finish.

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WARRANTY

(for more information, contact your local distributor)

Nitroheat guarantees to the original purchaser of this product, that if the product fails or is defective within 12 months from the date of purchase, when this product is operated and maintained as per the manufacturer's instructions provided in this document, then Nitroheat guarantees, at Nitroheat's option, to either repair or replace the product. This warranty applies only to defects in material or workmanship and does not cover "wear and tear", routine maintenance or filter cartridges. Any modifications to the product without written approval from Nitroheat will result in voiding of this warranty.