
PRIME CHOICE
FOR INDUSTRIAL
ALUMINUM
WELDING
SQUARE WAVE®
400 ADV
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LINCOLN ELECTRIC
www.lincolnelectric.eu
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PRIME CHOICE FOR INDUSTRIAL ALUMINUM WELDING

SQUARE WAVE® 400 ADV

SQUARE WAVE® 400 ADV is the ultimate solution for industrial TIG AC welding applications. It is combining power and precision welding offering excellent processes and high performance, to increase productivity. The new SQUARE WAVE is designed with the latest energy-saving technology and is ready to work in the most difficult environments, due to its unique design. To achieve excellent welding results, SQUARE WAVE® 400 ADV , utilises both digital and built-in communication systems and devices such as the USB port, making it easy to monitor and track welding operations. Simple automation interface (A1) make it a complete product for most demanding applications.

A modular system offering superior mobility to facilitate the most demanding welding applications, within a variety of industry segments.

- Power Sources with a 60% high duty cycle
- New compact, light **COOL ARC® 60** offering greater cooling efficiency
- Solid, 4-wheeled or 2-wheeled carts

Processes
- TIG (GTAW)
- Pulsed TIG (GTAW-P)
- Stick (SMAW)
- Air carbon arc (CAC-A)

Materials
- Aluminum,
- Magnesium,
- Copper alloys
- Steel
- Stainless steel
- Low alloy steel

Applications
- General fabrication
- Heavy fabrication
- Structural
- Transportation
- Chemical processing
- Maintenance and repair
- Shipbuilding
- Offshore
- Pipeline
- Aerospace
- Aluminum ship repair
- Anodized aluminum fabrication

SQUARE WAVE® 400 ADV

NEW MEMBER IN TIG FAMILY

What is AC GTAW welding used for?

Having both positive and negative cycles, an alternating current (AC) GTAW is ideal for high-quality aluminum welds. The positive cycle has a scrubbing effect on the metal surface, removing oxides that negatively impact weld quality, whereas the negative cycle allows a deeper weld penetration.

AC GTAW aluminum and magnesium welding is widely used within shipyards, cryogenics and aerospace applications for seam welding in shipbuilding, aluminum pipe GTAW welding and automotive work.

Why is an AC current the preferred process to use in GTAW aluminum welding?

The unique properties of an AC current provide better arc stability and oxide layer management, along with control over heat input, when compared to using a DC current. **This results in a significantly higher quality, consistent weld and makes it the preferred choice for aluminum welding applications.**

RUGGED RELIABILITY

60% High duty cycle at 40°C

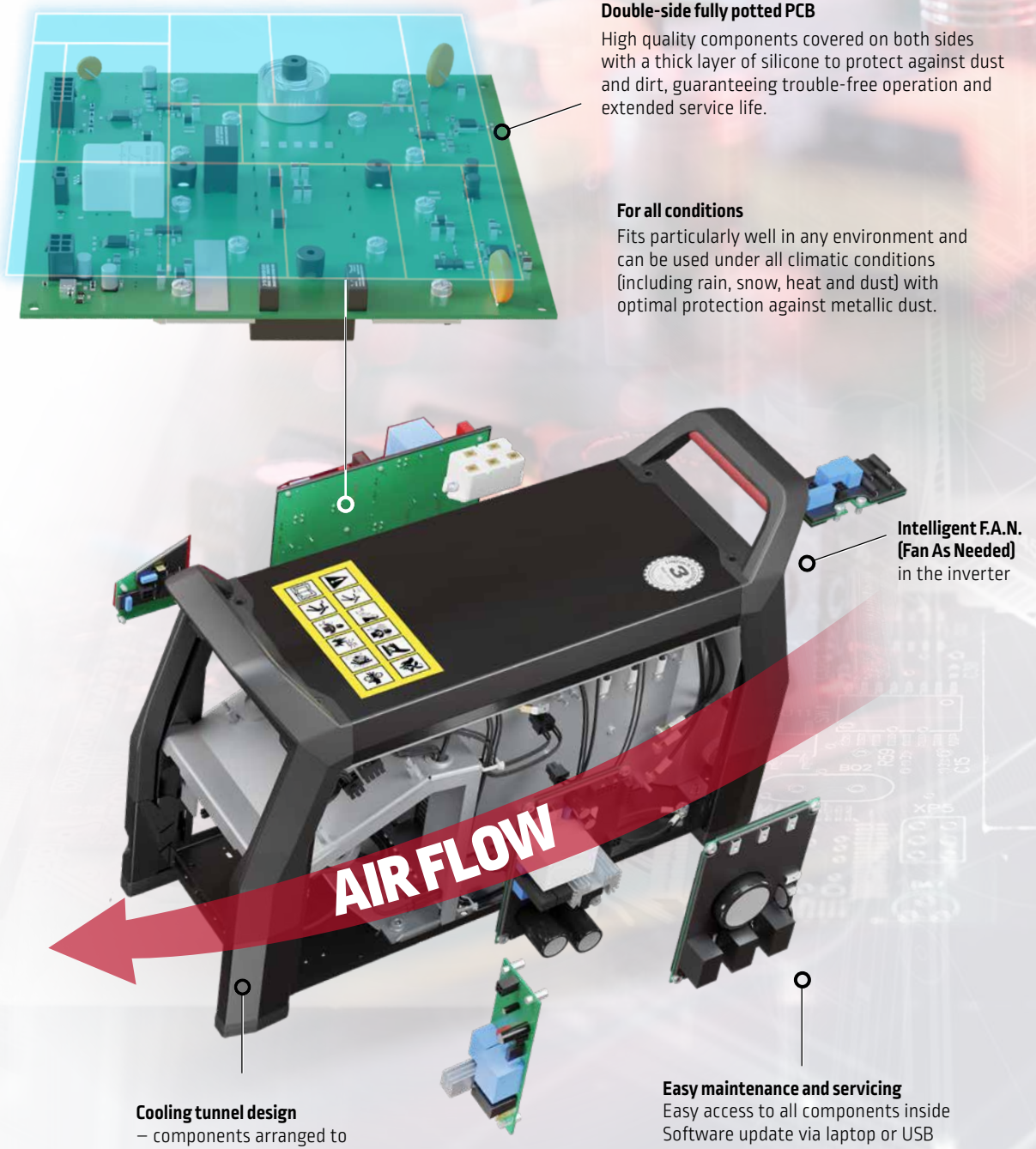
- High production efficiency
- Digital welding current control
- True HD tested – made for harsh environmental conditions

Inverter engine technology – ECO Friendly

- Lower power consumption due to high efficiency – energy cost saving
- Automatic power-saving modes (standby/shut-down function)
- Generator ready (for correct use, for welding suggested minimum 36KVA and for Gouging 50KVA)

Lincoln Electric Industrial design – ready to use anywhere

- **Double-sided fully potted PCB**
- Metal construction
- Protection class IP23
- **3 Years full parts and labour warranty**



Double-side fully potted PCB
High quality components covered on both sides with a thick layer of silicone to protect against dust and dirt, guaranteeing trouble-free operation and extended service life.

For all conditions
Fits particularly well in any environment and can be used under all climatic conditions (including rain, snow, heat and dust) with optimal protection against metallic dust.

Intelligent F.A.N. (Fan As Needed)
in the inverter

Cooling tunnel design
– components arranged to protect against dust and dirt

Easy maintenance and servicing
Easy access to all components inside
Software update via laptop or USB

SQUARE WAVE 400 ADV

Key technical data

INPUT
- 400V ±15%, 3-Ph 50/60Hz, generator ready

OUTPUT
- 400A@60% / 300A@100%
- ECO friendly: Idle power 23W and efficiency 85%

PROCESSES
- TIG, TIG Puls, MMA & CAG (Gouging)
- TIG manual & Synergic
- MMA manual & Synergic Pulse
- Premium Cellulosic 6010 Stick capability

FEATURES
- Light weight – 41 kg
- 7" TFT LCD color display
- Intelligent F.A.N. (Fan As Needed)
- Customer Support on User Interface
- USB Connectivity
- Voltage Reduction Device (VRD)
- Calibration procedure
- Industrial grade: IP23, 3 Years Warranty, no limitation
- AC Frequency – 40-400 Hz
- Soft/Medium/Hard/ pulse
- Simple automation interface (A1)

Included as standard
- Input cable 4 m (no plug)
- Gas hose 1.5 m
- Ground cable with clamp 5 m
- Metallic clips to fix the hose
- USB key with user manual
- Quick Start papers
- Front UI protection cover

THE LINCOLN ELECTRIC GREEN INITIATIVE
Inverter Technology
reduces energy demand
www.lincolnelectric.com/green

CART
Stable design with robust steel pipe construction

Repository for TIG torch

Storage for accessories and wear parts

Front UI protection cover
keep your UI safe

Practical handle for effortless grip, even with gloves, for safe movement of the machine

7" TFT LCD color display

USB connectivity

New encoder for more precise adjustment.

Simple navigation even when using welding gloves

COOL ARC® 60

HIGH PERFORMANCE

MODULAR DESIGN, FLEXIBLE CONFIGURATION

Square Wave®
400 ADV

3 PHASE | 50/60 Hz | CC | AC/DC | GENERATOR READY

Cellulosic

4.5l | 1100 W

COOL ARC® 60

CART 24 2x

CART 4-WHEELS 4x

PROTIG IIIS | PROTIG NGS | WTT2 4

TIG rods 5

	Item type	Item description	Item number
1	Power source	Square Wave® 400 ADV	K14412-1
2	Cooler	Cool Arc® 60	K14297-1
3	Cart	Cart 24	K14191-1
		Cart 4-wheels	K14298-1
4	TIG torches	WTT2	see accessories
		PROTIG IIIS	
		PROTIG NGS	
5	Welding consumables	TIG rods	see TIG ROD section
6	Welding cable	Ground cable 400A – 70 mm² – 5 m	GRD-400A-70-5M
7	Option	Foot Amptrol™	K870
8	Option	Remote control	K10095-1-15M

MODULAR CONCEPT MAKES EVERYDAY WELDERS WORK EASIER

Cart 24 – developed to store all accessories making everyday welding work easier

Practical storage

Helmet rack

Storage for electrodes

Torch holder

Cable Management System

For easy transportation of the whole welding system, even with a very long connection cable

Holder for foot control pedal

Low gas cylinder entry makes loading very easy

Cart 4-Wheels
New Heavy Duty undercarriage

4 lifting eyes for easy hook-in and safe transportation

Cable Management System

Rubber bumpers for feet protection

Low gas cylinder entry makes loading very easy

COOL ARC® 60

- High cooling power 1,1 kW@25°C
- Reservoir capacity 4,5 l
- Strong pump ensures proper cooling (max. pressure 0,47 MPa)
- Protection class IP23

Coolant filter
keeps coolant clean

LED lights inside reservoir for better visibility of the coolant level

Simple Connection and Easy Installation

Flow sensor inside
for gun protection

Additional water connections on the back
(when the intermediate hose package is connected)

Flow sensor ON-OFF switch handy during the filling procedure

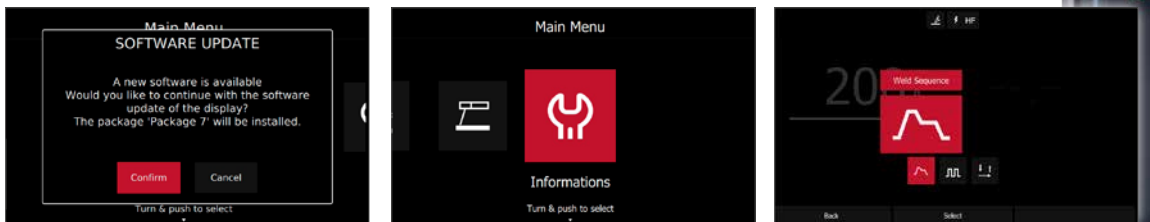
USB CONNECTIVITY

Analysis and quick decision making

- **Full system update & diagnostics**
- **Transfer settings between machines.**
- **Simple welding data collection on USB**
  (start time, average current, average voltage, arc time, welding mode/job number, job name).
- **Weld quality data monitoring**
  (data on TFT user interface screen or CSV file transfer)
- **Software updating**

INNOVATIVE & INTUITIVE INTERFACE

- Two buttons, one control knob for easy navigation
- Icon language for key commands
- Easy process and settings selection
- All work parameters in 1 menu level
- Status bar: for immediate recognition of the set parameters
- Dynamic graphical weld-sequencer feedback when changing the setting of welding parameters
- Locking function / Limits / 50 Memories / Dual procedure
- Can easily be used when wearing gloves
- Interface available in languages: English, German, French, Polish, Finnish, Spanish, Italian, Russian, Dutch, Romanian, Norwegian, Swedish, Czech, Turkish, Portuguese



EASY COMMUNICATION

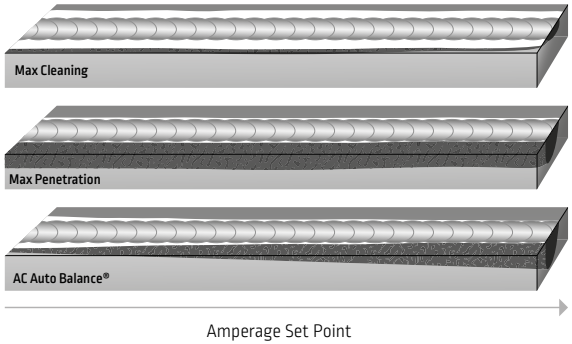
AUTO OR MANUAL: THE CHOICE IS YOURS

EFFORTLESS ARC CONTROL

Extremely fast arc response and stability for the smoothest and most efficient weld possible.

SIMPLICITY WHEN YOU WANT IT

AUTO setup technology to automatically provide for softer starts and minimal distortion on thinner materials and hotter starts required for thicker materials. The AC AUTO Balance® technology offers simplicity by automatically providing the optimal mix of cleaning and penetration when welding aluminum.

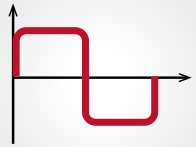


CUSTOMIZATION WHEN YOU NEED IT

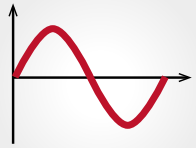
AC Wave Shape control enables you to customize the arc for critical aluminum welding requiring:

- A higher degree of penetration on thicker materials.
- Increased cleaning action in breaking through heavy oxide layers.
- Narrower arc profile enhancing control around corners and other tight configurations.

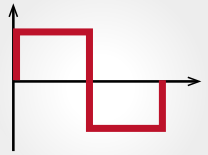
SQUARE WAVE® AC WAVEFORMS



SOFT SQUARE
for a soft arc with great puddle control and wetting action.



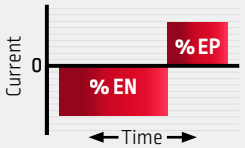
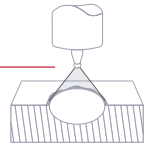
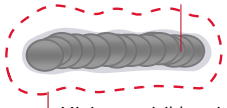
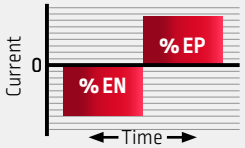
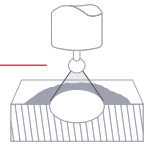
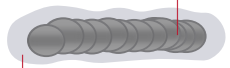
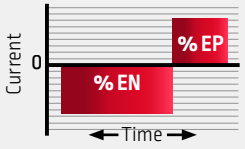
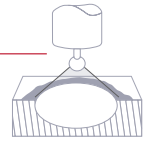
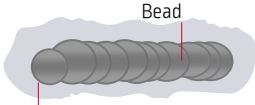
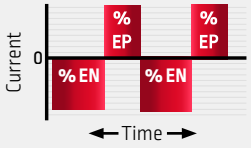
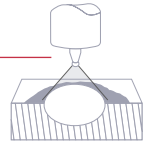
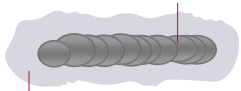
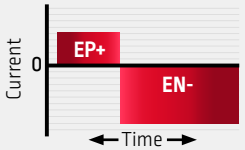
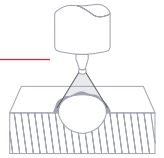
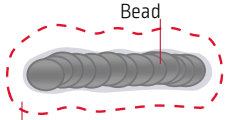
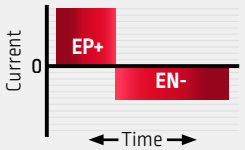
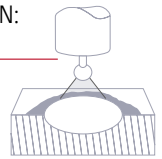
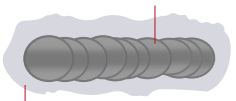
SINE
for welders who like the traditional arc welding, quiet with excellent wetting.



SQUARE
increased energy transfer allows for a deeper penetration and faster travel speed.

TRIANGULAR
ideal for very thin materials, as the minimal heat input helps to reduce chances of distortion.

AC WAVESHAPE CONTROLS

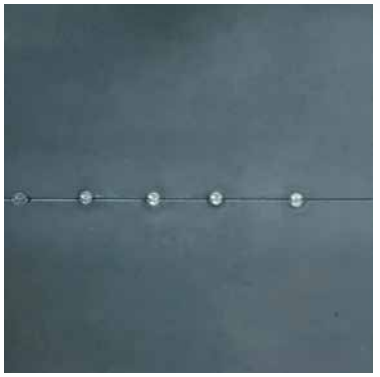
	Feature	Setting	Arc Effect	Weld Effect
AC Balance Control	**Controls the arc cleaning action. The %EN AC wave setting controls the width of the etch zone around the weld.** Note: Adjust the AC balance to achieve proper arc cleaning on the sides and front of the weld pool. The AC balance must be precisely adjusted to the intensity or thickness of the oxides. *35-95% (EN%)*	**75% EN** 	Reduces balling action and helps maintain point 	Bead  Minimum visible oxide removal (etching)
		50% EN 	Increases balling action of the electrode 	Bead  Visible oxide removal (etching)
AC Frequency Control	**Controls the width of the edge cone. Increasing the AC frequency produces a more focused arc with better directional control.** Note: Reducing the AC frequency softens the arc and widens the weld pool to create a wider weld. *40-400 Hz*	**60 Hz** 	Wider profile ideal for build-up work 	Bead  Visible oxide removal (etching)
		120 Hz 	Narrower profile for fillet welds and automated applications 	Bead  Visible oxide removal (etching)
Offset Control	**Adjust the ratio between EN current and EP current to precisely control the heat input into the welding material and electrode. The EN amperage controls melting, while the EP amperage has a significant effect on arc cleaning and also controls the AC balance.** *Offset positive: increase EN, decrease EP* *Offset negative: decrease EN, increase EP*	**100A EP** **200A EN** 	More current in EN than EP: Faster travel speeds and deeper penetration 	Bead  Minimum visible oxide removal (etching)
		200A EP **100A EN** 	More current in EP than EN: Shallow penetration, increased balling and etching 	Bead  Visible oxide removal (etching)

MOVE TO THE NEXT LEVEL OF TIG WELDING

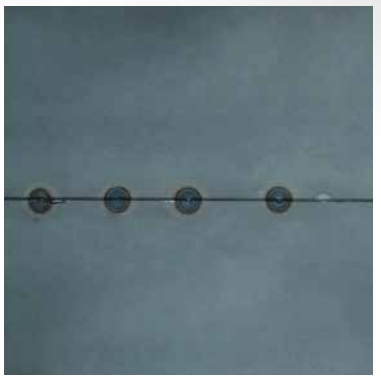
UNIFORM AND CONTROLLED LOOK

Tack for thin

- Fast and accurate tacking with minimal heat input avoiding any weld deformation
- **Ideal for spot welding activities, multiple and repetitive where a uniform, controlled look is essential**
- Uses heat to melt and fuse the surfaces of metal work pieces, which tends to make them more durable
- Greater corrosion resistance for materials



Tack for thin
Function



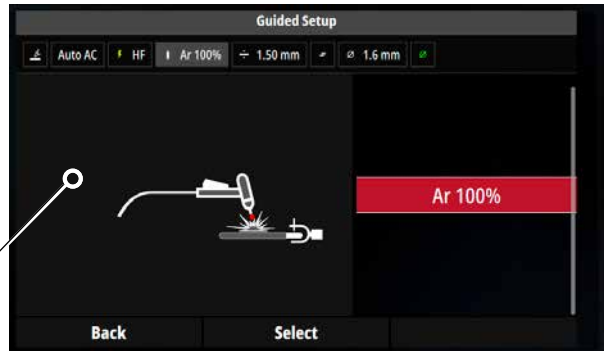
Standard
Function

EASY AND QUALITATIVE WELDING

GUIDED SETUP
helps non-expert TIG welders to:

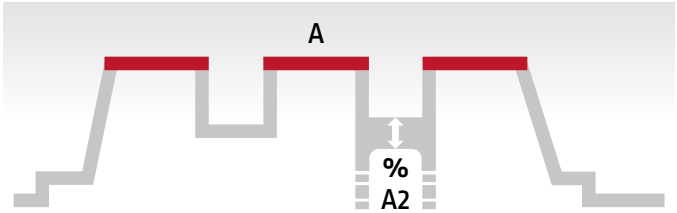
- Stabilise the arc
- Reduce the heat input
- Optimise the pulse
- Speed up the welding process
- Control the overall operation of the machine
- Save on current, filler material and gas
- Limit distortion on thin sheet metal

Following the indications on the screen, selecting the material type , thickness and type of joint, the Guide Setup will set all correct parameters for an easy and qualitative weld



BI-LEVEL TIG FUNCTION

The ability to use higher amps to add preheat and then weld with lower amps, moving between the two pre-set current values as many times as you like, by simply pressing the torch button trigger.



With this sequence the arc is started in the 4S sequence, this means that steps 1 and 2 are the same. Quickly press and release the TIG torch trigger.
The equipment will switch the electrical current from 'Set' to 'A2' (background current). Each time this trigger action is repeated, the current level will switch between the two settings. Pressing and holding the TIG torch trigger when the main part of the weld is complete will command the machine to decrease the output current at a controlled rate, or downslope time, until the Crater current is reached. This Crater current can be maintained as long as necessary.

Move quickly between 2 pre-set current values as many times as you like, simply by pressing the torch button trigger

TIG AND MMA

One machine, two processes

TIG torches

Series	Type	Rate	Application	110A	125A	135A	150A	180A	200A	220A	250A	350A	450A
WTT2	9	35%	Professional										
	17												
	26												
	18	100%											
	20												
PROTIG IIIS	10	60%	Industrial										
	20												
	30												
	40												
	35W	100%											
	40W												
PROTIG NGS	10	60%	Industrial										
	20												
	30												
	40												
	35W	100%											
	40W												

air cooled
water cooled

	Rated Output			Output Range
TIG	Duty Cycle 40°C (based on a 10 min. period)	Output Current I_2	Output Voltage	Peak Open Circuit Voltage U_0
	100%	300A	22.0V	90V
	60%	400A	26.0V	
MMA	100%	250A	32.0V	
	60%	300A	32.0V	
	40%	400A	36.0V	

OPTIONS ON PROTIG NGS

The choice of the most demanding customers

Adjustable heads

Optional, adjustable torch bodies are available. Designed to make welding in limited access locations easier and comes with small and large heads, mounted on air or water cooled bodies.

Customise your PROTIG NG torch with the following body bends and heads:	
Air cooled body bent (10/20)	W000279381
Water cooled body bent (10W)	W000279382
Head PROTIG NG 10/10W	W000279383
Head PROTIG NG 20	W000279384

Modular system

All EB (electron beam) torches come with a single button module as standard. Additional control modules can be ordered.

Single button

Other buttons

Horizontal potentiometer	Vertical potentiometer	3 buttons module	Blade
W000279370 (4.7 Kohm)	W000279246 (4.7 Kohm)	WP10529-2	W000279245
WP10529-3 (10 Kohm)	WP10529-4 (10 Kohm)		

TIG RODS

MILD STEEL TIG RODS

LNT 26

AWS A5.18: ER70S-6
ISO 636-A: W 42 5 W3Si1

Shielding gas
I1: Inert gas Ar (100%)

- Solid rod for welding general construction in mild steel.
- Smooth bead appearance.

Product Name	Ø (mm)	Length (mm)	Weight per tube (kg)	Item Number
LNT 26	1.6	1000	5	T16T005R6S00
	2.0			T20T005R6S00
	2.4			T24T005R6S00
	3.0			T32T005R6S00

STAINLESS STEEL TIG RODS

LNT 304LSI

AWS A5.9: ER308LSi
ISO 14343-A: W 19 9 LSi

Shielding gas
I1: Inert gas Ar (100%)

- Used for welding of 304 and 304L stainless steel grades. The weld metal provides good corrosion resistance to intergranular attack from a range of liquid media. It is used for a wide range of applications including pipework and plate fabrication, vessel production etc.

Product Name	Ø (mm)	Length (mm)	Weight per tube (kg)	Item Number
LNT 304LSi	1.2	1000	5	580198
	1.6			582512
	2.0			582796
	2.4			582802
	3.2			583045

LNT 316LSI

AWS A5.9: ER316LSi
ISO 14343-A: W 19 12 3 LSi

Shielding gas
I1: Inert gas Ar (100%)

- Used for welding 316 and 316L stainless steel grades, in a wide range of applications including pipe and plate fabrication. The increased silicon content results in increased weld pool fluidity to give a smooth deposit appearance. The low carbon content increases the resistance to intergranular corrosion.

Product Name	Ø (mm)	Length (mm)	Weight per tube (kg)	Item Number
LNT 316LSi	1.0	1000	5	580259
	1.2			580235
	1.6			583915
	2.0			583922
	2.4			582819
	3.2			583571

TUNGSTEN ELECTRODES

A complete range of tungsten electrodes:

- Pure tungsten
- Tungsten + cerium
- Tungsten + lanthanum

Product advantages:

- Very high life cycle
- Perfect arc ignition
- Very stable arc
- Tip longevity

Type	Metal		Arc stability	Striking	Lasting	Thermal resistance
	Aluminium	Steel & Stainless steel				
WP – pure tungsten	*		**	*	*	*
WC 20 – Cerium 2%		*	**	*	**	**
WL 15 – Lanthanum 1.5%	**	***	**	***	***	***
WL 20 – Lanthanum 2%	*	***	**	***	***	***

*** Excellent ** Good * Average

ACCESSORIES

OPTIONS		
Cool Arc® 60	K14297-1	
Freezcool (9.6 l cooling liquid)	W000010167	
Cart 24	K14191-1	
Cart 4-Wheels	K14298-1	
Ground Cable	GRD-400A-70-5M	
TIG PREMIUM TORCHES AIR	**5 m**	**8 m**
PROTIG IIIS 10 RL	W000382715-2	W000382716-2
PROTIG IIIS 20 RL	W000382717-2	–
PROTIG IIIS 30 RL	W000382719-2	W000382720-2
PROTIG IIIS 40 RL	W000382721-2	–
PROTIG NGS 10 EB	W000278394-2	W000278395-2
PROTIG NGS 20 EB	W000278396-2	W000278397-2
PROTIG NGS 30 EB	W000278398-2	W000278399-2
PROTIG NGS 40 EB	W000278400-2	W000278401-2
TIG PREMIUM TORCHES WATER	**5 m**	**8 m**
PROTIG IIIS 35W RL	W000382725-2	W000382726-2
PROTIG IIIS 40W RL	W000382727-2	–
PROTIG NGS 35W EB	W000278404-2	W000278405-2
PROTIG NGS 40W EB	W000278406-2	W000278407-2
TIG TORCHES AIR	**4 m**	**8 m**
WTT2 9 EB	W000278875	–
WTT2 17 RL	W000278884	W000278917
WTT2 17 EB	W000278882	W000278919
WTT2 26 RL	W000278890	W000278913
WTT2 26 EB	W000278887	W000278915
TIG TORCHES WATER	**4 m**	**8 m**
WTT2 18W RL	W000278898	W000278899
WTT2 18W EB	W000278896	W000278901
WTT2 20W RL	–	W000278905
WTT2 20W EB	W000278892	W000278909
TORCHES ACCESSORIES		
Horizontal potentiometer	WP10529-3	
Vertical potentiometer	WP10529-4	
3 buttons module	WP10529-2	
REMOTE CONTROLS		
Remote control	K10095-1-15M	
Foot Amptrol™	K870	
Extension Cord 15 m *	K14148-1	

* Only 2 Extension Cords for a maximum total length of 45 m can be used

CART 24
K14191-1

CART 4-WHEELS
K14298-1

FOOT AMPTROL™
K870

COOL ARC® 60
K14297-1

REMOTE CONTROL
K10095-1-15M

GROUND CABLE
GRD-400A-70-5M

FREEZCOOL
W000010167

TIG RODS

PROTIG IIIS PROTIG NGS WTT2

TECHNICAL SPECIFICATION

POWER SOURCE

Product	Item number	Primary voltage	Fuse size (A)	I 1 eff (A)	I 1 max (A)	Max. input power (kVA)	Rated output (A)		Welding current range (A)	Open Circuit Voltage (V)	Temperature range		EMC class	Weight (kg)	Dimensions H x W x D (mm)	Protection class
							TIG	MMA			Operating	Storage				
Square Wave® 400 ADV	K14412-1	400V ± 15% 3Ph	25	16.17	25.77	13.83 @60% (GTAW) 18.0 @40% (SMAW)	400A@60% 300a@100%	400A@40% 300A@60% 250A@100%	3-400A (GTAW) 5-400A (SMAW)	90	-10°C to +40°C	-25°C to +55°C	A	41.0	509 x 294 x 624	IP23

COOLER

Product	Item number	Cooling power @1l/min	Recommended coolant	Reservoir capacity (l)	Maximum pressure (MPa)	Temperature range		EMC class	Weight (kg)	Dimensions H x W x D (mm)	Protection class
						Operating	Storage				
Cool Arc® 60	K14297-1	1100W	FREEZCOOL	4.5	0.47	-10°C to +40°C	-25°C to +55°C	A	22	663 x 291 x 224	IP23

CART

Product	Item number	Max. gas cylinder diameter (mm)	Max. gas cylinder height (mm)	Wheels diameter (mm)	Weight (kg)	Dimensions H x W x D (mm)	Other features
Cart 24	K14191-1	240	1700	250	33.8	1180 x 540 x 600	Low gas cylinder entry Drawer for storage of consumables Integrated cable management allowing for a neat work area Remote control and TIG rod housings Vertical design to save space in shop environments
Cart 4 wheels	K14298-1			125 (front) 250 (rear)	36	534 x 905 x 999	Low gas cylinder entry Rubber bumpers for feet protection 4 lifting eyes for easy transportation

THE NEXT TIG GENERATION

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company® is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to enquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

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