

EutecTrode®

High performance Manual Metal Arc electrodes for repair, joining, rebuilding and wearfacing applications



*Stronger, with
Castolin Eutectic*



- Low-heat input welding for safe, reliable repairs
- Anti-wear protective coatings, for longer-lasting parts
- Ease of use, even in difficult positions
- For cost-saving, industrial maintenance solutions

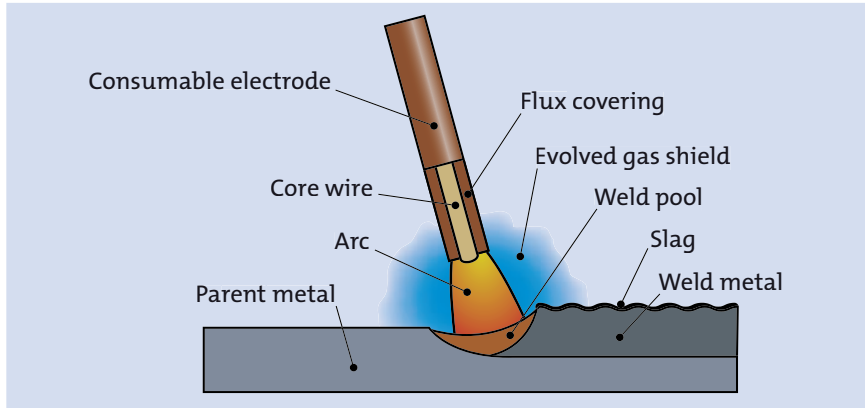
Castolin Eutectic®
Eutectic Castolin

Manual Metal Arc Process

When an electric arc is struck between a flux coated electrode and a workpiece, the core wire tip and the workpiece surface melt to form a liquid weld pool.

Simultaneously the flux coating decomposes into a gas shield and slag to protect the solidifying weld pool from the surrounding atmosphere. After cooling, the

slag cover must be chipped off the weld bead and wire brushed before welding the next electrode.

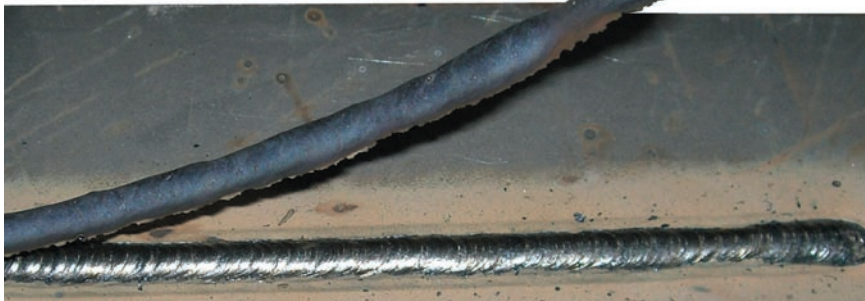


- Equipment is simple, inexpensive & often portable
- No extra shielding gases or fluxes required
- Process consumables tolerate air currents even on-site
- Suitable for areas with limited access
- Practical solutions for most industrial metals & alloys

Safety & Ease of Use

Because EutecTrodes are used every day by our 50,000 customers, we know the importance to develop safe, easy-to-use welding electrodes, especially for repairs in

awkward positions, on contaminated base metals or difficult on-site conditions.



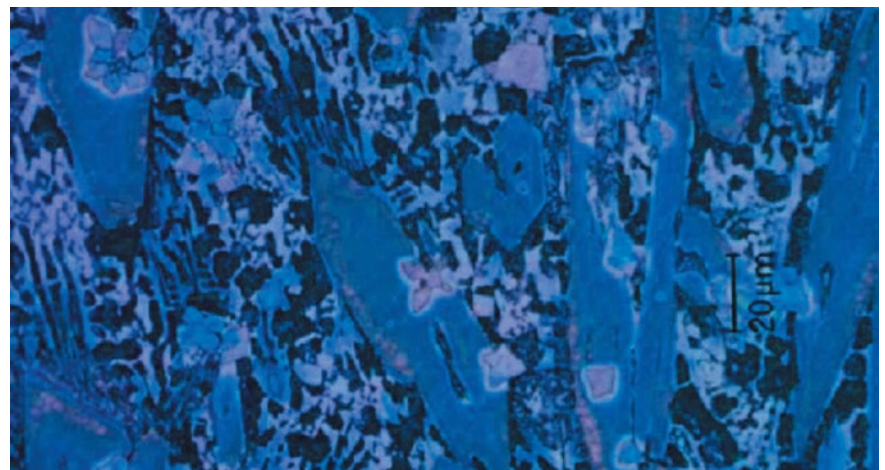
Example self lifting slag



Positional weldability

Unique Wearfacing Alloys

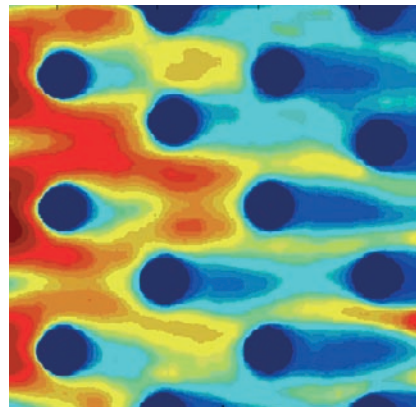
Solid MIG / MAG / TIG wires are only manufactured in standard metallurgical alloys which can be cast and easily drawn down to final diameters. The EutecTrode® electrode concept completely overcomes such limitations and unique wearfacing alloys have been formulated with high density, ultra-hard micro constituents in ferrous or non-ferrous matrices. Thus the wide EutecTrode® alloy range provides cost effective solutions for most wear problems found in industry.



Complex carbide microstructure

Wear Analysis

The latest state-of-the-art testing machines and facilities are essential to accurately monitor wear phenomena and understand the complex relationship between chemistry, process and application. We work with world experts in Technical Universities for testing and modelling in addition to having fully equipped laboratories with electron microscopes and wear test facilities.



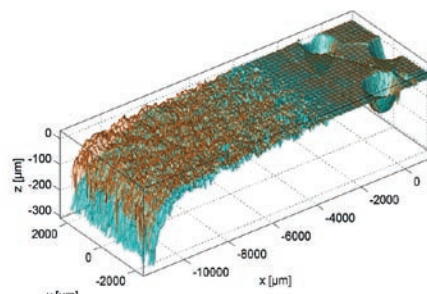
Modeling of wear surface



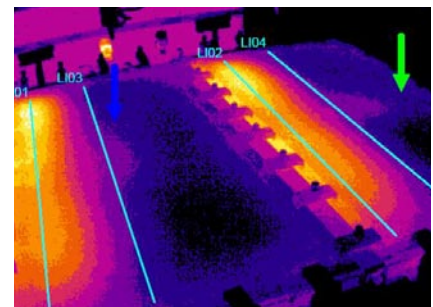
Unique wear test machine



Scanning Electron Microscope



Worn structure



Thermovision

EutecTrode® Manufacturing Facilities

The EutecTrode® range of high performance electrode formulations are developed and manufactured in Castolin Eutectic's own modern plants using specially designed production equipment and procedures in accordance with ISO 9001 and EN 29001 quality assurance standards.

Each EutecTrode® batch after precision extrusion and baking, is weld tested for consistent chemistry, properties & usability before marking and protective packaging for stock.



Automated manufacturing



Quality certification



Double sealed packaging

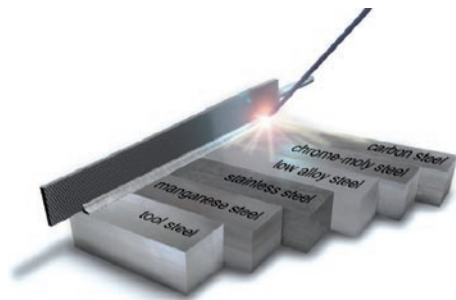
Crack repairs and joining with Maximum Safety Margin

Low heat input for safer welds

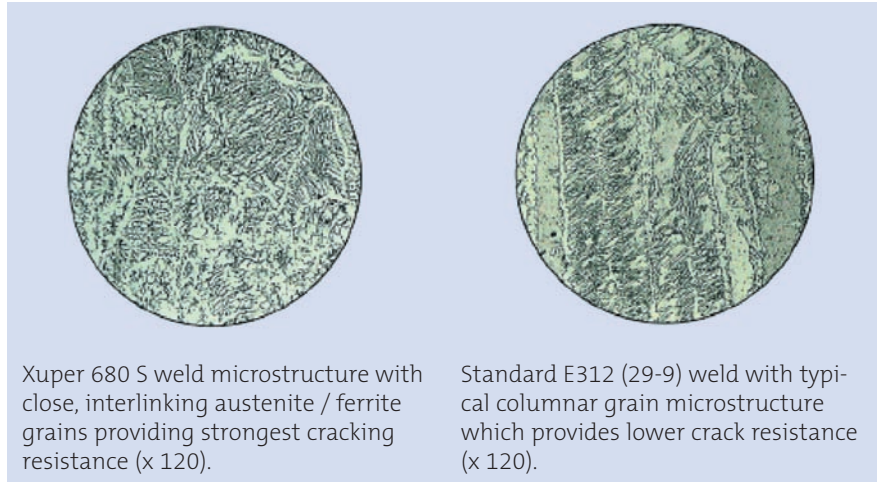
Our EutecTrode® flux coatings are specially formulated to ensure that the workpiece is heated as little as possible during welding. This reduces many risks such as : weld metal dilution, grain growth, formation of brittle phases, hot

cracking of the weld, residual stresses, deformation, distortion, undercutting, burn-through and electrode overheating, which can

cause breakdown of the flux coating leading to costly stub end losses.



Extremely versatile electrode range

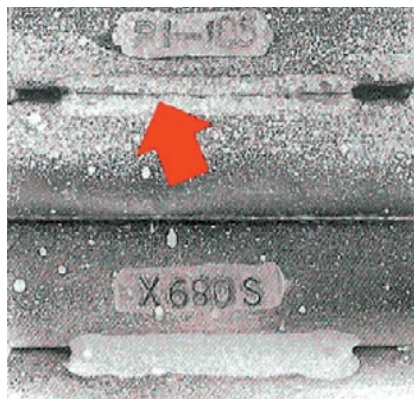


Xuper 680 S weld microstructure with close, interlinking austenite / ferrite grains providing strongest cracking resistance (x 120).

Standard E312 (29-9) weld with typical columnar grain microstructure which provides lower crack resistance (x 120).

Welding unknown or dissimilar steels

It's a common problem: a broken machine needs mending quickly, but it's often not clear which metal is involved. You rarely have time to find out and yet a safe reliable repair is needed. Special low heat input EutecTrodes such as Xuper 680 S are the answer. This tried and tested all-round electrode ensures the strongest welds even if the steel is unknown or when dissimilar steels with very different properties require joining.



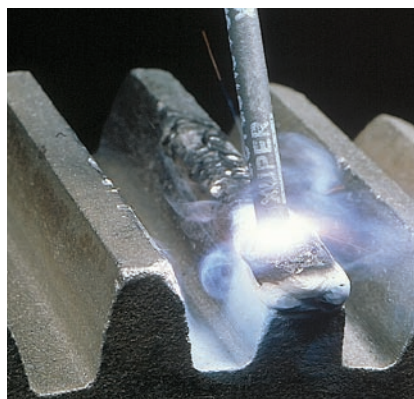
The value of low heat input: dye-penetrant testing on two highly stressed welds show a crack-free Xuper 680 S (lower photo), while the standard 29-9 weld (upper photo) has failed by hot cracking.



Low heat input and Xuper NucleoTec 2222 minimise residual stresses when performing massive repair welds on cracked cement kiln tyres.

Welding Contaminated Cast irons

The brittle contaminated nature of cast iron has given it a justifiable reputation for being difficult or impossible to weld. However, Castolin Eutectic's research and extensive practical experience has lead to the development of a range of EutecTrodes which facilitate "cold" welding of most cast iron grades, without preheating and yet resulting in crack free, easily machinable weld deposits.



Casting defect repair



The ability to "cold" weld cast iron "in-position" with Xuper 2240 facilitates repair of big, complex, costly castings.

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;"> Low alloy steels High alloy steels Stainless steels Cast irons Nickel alloys Copper alloys Aluminium alloys </div> <div style="text-align: center;"> <h2 style="margin: 0;">EutecTrode® range for crack repair and joining</h2> </div> <div style="text-align: right;"> <h3 style="margin: 0;">Technical Data</h3> </div> </div>								
2-44 2-44 NC							Cold welding of old, oily, contaminated grey cast irons. Non conductive version for limited accessibility. Deposits are machinable.	Tensile strength Rm: 250-300 N/mm2 Hardness: 100-130 HV30
285							Welding of tin or phosphor bronzes with low preheat e.g. pump rotors also for dissimilar joining of bronze to steel or cast iron.	Tensile strength Rm: 240-300 N/mm2 Hardness: 100-140 HB
Xuper 680 S							Highest strength, crack resistant repairs on wide range of difficult-to-weld steels of unknown composition or dissimilar joints e.g. tool and die work.	Tensile strength Rm: 770-850 N/mm2 Yield strength Rp 0.2: > 640 N/mm2 Hardness: 240-280 HV30
690							For repairing highly stressed steel components where a balance of both strength and ductility is needed for crack resistance and lower distortion.	Tensile strength Rm: 700-740 N/mm2 Elongation A5: 35%
XHD 1855							Welding of a wide range of bronzes alloyed with aluminium, manganese and nickel. Deposits are easily machinable and resist cavitation and salt water corrosion.	Tensile strength Rm: 630-770 N/mm2 Hardness: 150-230 HB
E2209-17							Low heat repairs of duplex stainless steels or joining them to alloy steels. Deposits are particularly resistant to stress corrosion. TÜV alloy approved.	Tensile strength Rm: 750 N/mm2 Elongation A5: 25%
XHD 2100							Repair of wrought aluminium alloy pipes, tubes sheets or plates. Deposits resist marine environments and may be electrolytically treated.	Tensile strength Rm: 100-120 N/mm2 Elongation A5~ 20%
2101 S							Repair of aluminium alloy castings e.g. engine housing cracks, machining errors, casting defects. Deposits have good colour match.	Tensile strength Rm: 160-200 N/mm2 Hardness: 50-60 HB5
Xuper 2222							Repair of massive sections or joining crack sensitive, unknown steels e.g. kiln rings. Deposits resist embrittlement from cryogenic to refractory temperatures.	Tensile strength Rm: 620-690 N/mm2 Elongation A5: 40% - 45% Impact KV: 120 J 20°C
XHD 2230							Cold welding of high strength, nodular cast irons and joining them to steel. Deposits are highly crack resistant.	Tensile strength Rm: 470-550 N/mm2 Hardness: 150-190 HV30
Xuper 2240							Cold welding of spheroidal graphite castings where positional ease of use and machinability are important. Joins cast iron to most ferrous, copper and nickel based alloys.	Tensile strength Rm: 370-440 N/mm2 Hardness: 130-170 HV30
6601							For easy to use joining in all position of common construction steels, steels and pipes where good gap building and vertical down capabilities are needed.	Hardness: ~ 480 N/mm2 Elongation A5: 25% - 28%
6666							Bipheric hydrogen controlled coating provides welder easy handling in all positions for general construction work even with rusty steels. Good impact properties. TÜV approved.	Tensile strength Rm: >500 N/mm2 Elongation A5: ~ 25% Impact KV: >140 J 20°C
6825							Welding of Inconel nickel alloys, duplex and super austenitic stainless steels, for high temperature, corrosion resistant joints. TÜV approved.	Tensile strength Rm: 650-800 N/mm2 Elongation A5: 40% Impact KV: 85 J 20°C
XHD-6868							High speed crack resistant joining of mechanical assemblies combining carbon, alloy or stainless steel parts. Easy contact weldability.	Tensile strength Rm: 740-820 N/mm2 Elongation A5: ~ 25%
33273							Low heat joining of super austenitic stainless steels of NiCrMoCu type where high pitting corrosion resistance is required.	Tensile strength Rm: 600 N/mm2 Elongation A5: 37%
33500							Low heat joining of acid resistant, molybdenum bearing stainless steels with extra low carbon content to resist intergranular corrosion.	Tensile strength Rm: >530 N/mm2 Elongation A5: > 35%
Castinox D							Repair or joining refractory stainless steels where oxidation resistance required up to 1100 °C e.g. furnace parts.	Tensile strength Rm: ~550 N/mm2 Elongation A5: ~ 40%

Main application

Secondary application

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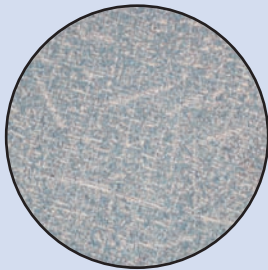
Wearfacing for longer service life

Application Engineered coatings

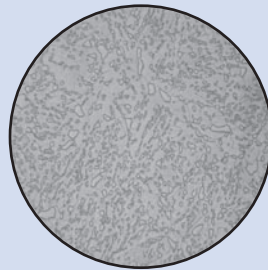
EutecTrodes are just one way of applying our renowned TeroCote® anti-wear protective coatings. TeroCote® alloys offer durable protection because each forms a deposit structure which provides

optimum resistance against a specific type of wear, or combination of wear phenomena. Extensive research helps us to identify the most appropriate alloy type, size and distribution of complex phases

developed for each application, while our manufacturing experience ensures that each electrode, when used with the appropriate welding procedure, will deliver the required service properties.



XHD 6395N microstructure with numerous complex hard phases evenly distributed within a NanoAlloy matrix. This gives optimum protection against severest wear by abrasion and erosion (x 300).



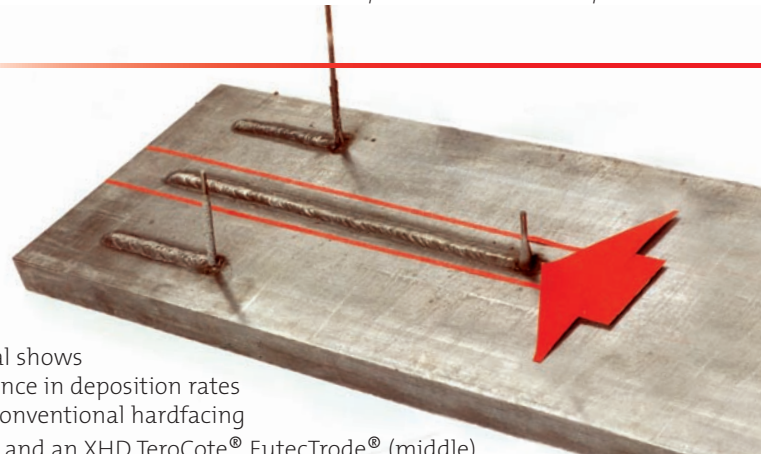
A standard hardfacing deposit with few hard phases (x 300). Lower prices / kg do not compensate for shorter service life, especially when additional downtime and labour are accounted for.



TeroCote® EutecTrodes provide industry with fast, effective, practical, wearfacing solutions to protect critical machine parts.

XHD - Xtra High Deposition Rate

Fast deposition rates allow a given job to be completed more quickly. This means the welder can maintain a higher level of concentration which in turn leads to better welds. Fast deposition rates also move the arc energy more quickly over the workpiece, which further reduces local heat input.



A time trial shows the difference in deposition rates between conventional hardfacing electrodes and an XHD TeroCote® EutecTrode® (middle).

Rebuilding worn components

Severe wear in just one small area of a component can make it inoperable, despite the fact that the part may still be largely intact. However, worn parts can be easily rebuilt with EutecTrodes which provide a suitable match with the

base metal in terms of mechanical properties and appearance, while also creating a suitable substrate onto which TeroCote® wear-resistant coatings can be applied.



Rebuilding gear teeth

Welding aids

CutTrode 01 is recommended for cutting and piercing (left). ChamferTrode 03/04 gouging electrodes are ideal for weld preparation, particularly on old, oil contaminated base materials (right).



Hole cutting with CutTrode



Gouging with ChamferTrode

EutecTrode® range for anti-wear protective coating

							Technical Data		
	Abrasion	Erosion	Cavitation	Impact	Friction	Corrosion	Heat		
2 / 2R								Cold stamping tools, dies, punches, hammers. Deposits are heat treatable and nitridable.	Hardness: 56 - 61 HRC quenched from 950°C: 58-59 HRC
N 102								Crusher hammers, ripper teeth, grab buckets, drilling equipment where high impact is combined with medium abrasion.	Hardness : 55 HRC
XHD-646								Ideal for buttering layers and rebuilding hardenable alloy steel or 13% manganese steel. Deposits rapidly work harden.	Hardness: ~170HV after work hardening: ~430 HV30
Xuper Abratec 5006								For abrasion on low alloy and manganese steels. Ideal for: rolling mill entry and exit guides, bulldozer blades, crusher teeth, drag-line pumps, etc.	Hardness: 57 - 62 HRC
Xuper Abratec 5088								For low-alloy steels, tool steels and equivalent cast steel. Ideal for deep drilling tools, excavating machines, agricultural machinery, foundry machinery, milling machines, sludge pumps, mixers and screening plant.	Hardness: 58 HRC Tungsten carbide up to 2300 HV 1
N 6070								Screws, blades, mixers, scrapers, hoppers where extreme abrasion is experienced.	Hardness : 920 - 1110 HV30
XHD 6080								High speed steel tools and dies for cutting, trimming, drawing and pressing. Deposits retain high hot hardness	Hardness: 60-65 HRC annealed at 900°C: ~300HB
Xuper Abratec 6088								For low and high-alloy steels (rust-resistant steels), tool steels and cast steel nickel based alloys. Examples: press and conveyer worms, mixer parts, scraper edges parts used in the chemical and food industry.	Hardness: 56 HRC Tungsten carbide up to 2300 HV 1
35200								Rebuilding worn steel sections and buttering layers prior to anti wear coatings. Deposit are machinable.	Hardness: 320-360 HB30
XHD 6395N								Designed for protective coatings with extreme resistance to abrasion, erosion combined with moderate shock on carbon, alloy, stainless and cast steels.	Hardness: 68 - 70 HRC
6450								For Caterpillar tracks, drive sprocket wheels, conveyor rolls, hammers, cushion layers, crusher hammers, crossing points.	Hardness: 240 HV after work hardening: ~420 HV
XHD- 6710								Protection against combined abrasion, pressure and low impact such as conveyor components, scraper, dredge pump.	Hardness 63 - 69 HRC
XHD-6715								Protection against high temperature abrasion and erosion of sinter fan blades, sinter breaker screens, blast furnace cones.	Hardness : 65 - 70 HRC
XHD-6804								Single pass coating of hot working steel up to 650°C such as wire drawing dies, extrusion pistons, trimming dies.	Hardness: 420 - 520 HV30 after work hardening: 480 - 580 HV
XHD 6817								For protective overlays or repair of alloy steel components subject to oxidation, corrosion, high temperature use. For joining dissimilar metals: nickel alloys to carbon steel, alloy steels or stainless steels.	Hardness: 190 HV after work hardening: ~350 HV
XHD-6865								Special nickel alloy for severe corrosive environment at elevated temperatures like waste incinerators and hot forging equipment.	Hardness : 200-240 HV30 after work hardening: 360-380 HV30
XHD-6899								Special nickel alloy to resist thermal and mechanical shocks on high temperature parts like stripper points and shear blades.	Hardness : 270-320 HV30 after work hardening: 380-480 HV30
N 9060								Special cobalt alloy for steam and chemical valve seats where higher hot hardness and corrosion resistance are needed.	Hardness : 38 - 43 HRC
N 9080								Special crack resistant cobalt alloy for hot forging tools, trimming dies and cropping blades.	Hardness : 280 - 330 HV30 after work hardening: ~ 500 HV30
CaviTec SMA								For preventive maintenance and repair coatings on Francis, Kaplan and pump turbines as well as other hydraulic machine parts subject to wear by cavitation.	Hardness : 250-280 HV30 after work hardening: 400-450 HV30

NanoAlloy®

Welding aids

CutTrode 01	High speed cutting or piercing of most ferrous or non ferrous metals in all positions
ChamferTrode 03/04	Rapid gouging or crack removal on most industrial alloys leaving metallurgically clean surfaces ready for welding 03=(+)/04~.
Eutest	Non Destructive Test using die penetrant sprays for easy detection of surface cracks or defects prior to welding repairs.

■ Main application
 ■ Secondary application

The above product technical properties are based on Castolin Eutectic quality assurance standards and procedures for use. Procedures and applications other than those specified may alter these properties.

MMA Equipment

To obtain perfect welds, you need not only an excellent electrode but also outstanding equipment quality. Castolin Eutectic has developed for you a complete range of MMA power sources starting from 140 Amps to 650 Amps. This wide range will give you the possibility to use welding for your small applications as well as really tough industrial ones.

UltraMax²



Technical data

Welding amperage range	5 A - 140 A
35% Duty cycle amperage	140 A
100% Duty cycle amperage	100 A (at 40 °C)
Open circuit voltage	54 V
Power supply	230 V 50/60 Hz
Power at primary (100%)	4.6 kVA
Fuse rating	16 A
Protection index	IP 23
Dimensions L x W x H (mm)	310 x 120 x 215
Weight	4.3 Kg

- For MMA and TIG welding with liftarc
- Hot start, arc force control and anti stick function for perfect MMA welding
- TIG welding with constant and pulsed current
- Light, compact and robust
- Voltage compensator
- Spike protector
- Fully portable

PowerMax



Technical data

Welding amperage range	10 A - 150 A
35% Duty cycle amperage	140 A
100% Duty cycle amperage	80 A (at 40 °C)
Open circuit voltage	92 V
Power supply	230 V 50/60 Hz
Power at primary (100%)	3.6 kVA
Fuse rating	16 A
Protection index	IP 23
Dimensions L x W x H (mm)	315 x 110 x 200
Weight	4.7 Kg

- Advanced inverter technology
- Possibility to weld cellulosic electrodes
- Power generator compatible
- TIG DC welding with liftarc
- Variable characteristics allow welding of every kind of electrodes
- Hot start, arc force control and anti stick function for perfect MMA welding
- Fully portable

XuperMax²



Technical data

Welding amperage range	10 A - 150 A
40% Duty cycle amperage	250 A
100% Duty cycle amperage	160 A (at 40°C)
Open circuit voltage	76 V
Power supply	3 x 400 V 50/60 Hz
Power at primary (100%)	12.1 kVA
Fuse rating	20 A
Protection index	IP 23
Dimensions L x W x H (mm)	460 x 230 x 325
Weight	4.7 Kg

- Suitable for 4mm electrodes
- Remote current control available
- TIG welding with liftarc ignition and constant or pulsed current
- Light, compact and robust design for industrial use
- Hot start, arc force control and anti stick function for perfect MMA welding

GatoMatec Range

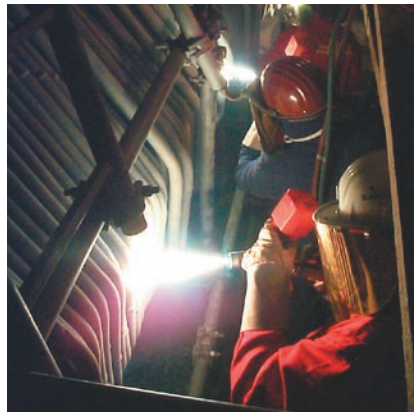


- 305 / 455/ 650 amps @ 35% duty cycle
- Thyristor controlled DC transformer rectifier unit
- Trolley mounted
- Robust design for heavy industrial use
- Remote control unit FR3-1 optional
- TIG welding with lift arc possible with the 305
- 455 and 655 are suitable for welding and gouging applications

Our mission is to develop applications and solve customer problems. Depending on the customer's wish, we can transfer this knowledge to him or perform the work for him in our approved CastoLab® Services workshops. CastoLab® Services can develop advanced procedures to allow transfer of complete solutions to end users. CastoLab® Services offer a complete and comprehensive service for the maintenance of machine parts and major components subject to extensive service wear or needing repair. Work can either be undertaken in the CastoLab® Services or alternatively on site. Often the parts being repaired or protected need to be produced on a regular basis, and here "specialist prepared parts" can be produced in unique manufacturing environment, from 10's of parts to 100,000 parts per year.



Large CastoLab® Services for major repairs On site Boiler Coating



On-site boiler coating



Precision working



Special Oil industry parts protected with GAP®



Repair in difficult conditions



Fan Protected with Powder Coated Wear Plates



TeroCote® wearfacing



Arc Wire Spraying

Your Industry Partner

A century at the forefront of protective materials technology has positioned Castolin Eutectic as the world's premier industrial partner. Our comprehensive know-how is unrivalled, and our industry partnerships continue to thrive. We provide solutions to all of the major companies operating in industry with global industrial programs for steel, cement, automotive, power, oil, waste & recycling, etc.



Castolin Eutectic



Training

To increase customer know-how in wear technology and repair techniques, we have developed a full line of seminars and training programs, teaching all relevant personnel from welders and engineers to sales teams and managing directors.

Together with our sister companies in the Messer World, we can offer our customers a very powerful range of products and services. Being Part of the Messer World means:

- Investment of over € 420 million
- More than 6,000 motivated employees
- Over 100 factories to meet customer needs
- Technical sales support in over 120 countries
- 2,000 technical sales people in the field with our customers every day



The unique TeroLink® database of Castolin Eutectic contains more than 8,000 fully documented approved applications from around the globe. The case studies include photographs, technical data, detailed descriptions and cost saving analyses.



Manufacturing



Quality laboratory



Product Portfolio - Widest in the Industry

History of Castolin Eutectic



- 1906** Foundation of Castolin in Lausanne, Switzerland by Jean-Pierre Wasserman. His stroke of genius: to discover way of welding cast iron at low temperature. In the following years, this innovation was further developed for all industrial metals including aluminium alloys
- 1938** First machinable cast iron electrode
- 1940** Electrode production in USA
- 1948** First arc electrodes for cutting & gouging
- 1956** Electrode production in Brazil
- 1960** First aluminium alloy electrode
- 1968** Nucleo-C for wearfacing electrodes
- 1960's** Xuper 680-S
- 1960's** International consolidation under Castolin Eutectic
- 1970's** Xuper 2222
- 1970's** Creation of training centers for Maintenance & Repair technologies
- 1978** Establishment of World Head Quarters in St-Sulpice, Switzerland
- 1980's** XHD electrode range
- 1985** RytmArc portable power source
- 1995** Global Stainless Steel electrode range
- 1996** First CaviTec alloy electrode
- 2000** Merger with Messer Cutting & Welding and creation of the MEC Group - Messer Eutectic Castolin.
- 2005** Part of the Messer World
- 2006** 100 years
- 2009** World's first NanoAlloy electrode

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Your resource for protection, repair and joining solutions

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Stronger with...

Castolin Eutectic

WEAR & FUSION TECHNOLOGY



*Ask for a demonstration
from our Application
Specialists.*

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