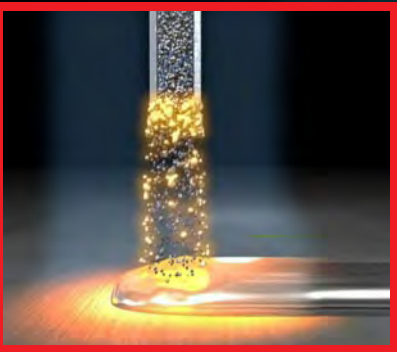
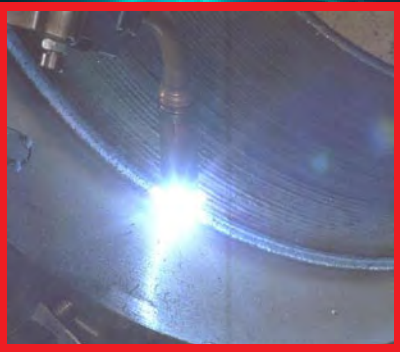
EnDOtec®

Welding Cored Wire Technology for Protection, Repair & Joining Solutions.





Complete range of small diameter cored wires for unique alloy wearfacing, repair & joining solutions

Peripheric arc principle ensures:

- *Cooler arc-welding process*
- *Faster welding speeds*
- *Increased safety & service life*
- *Greater cost savings & productivity*

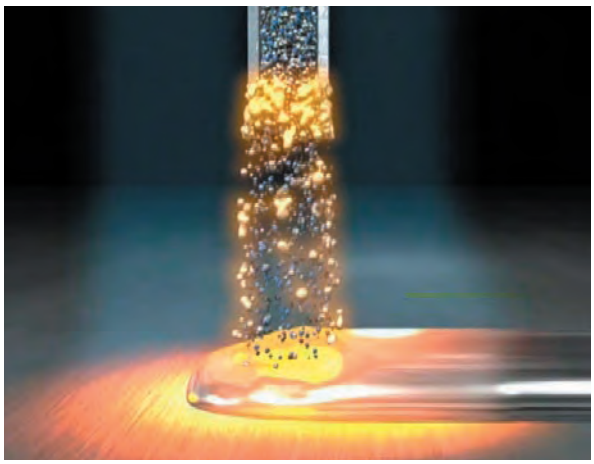
Castolin Eutectic®
Eutectic Castolin

EnDOtec® Cored Welding Wires

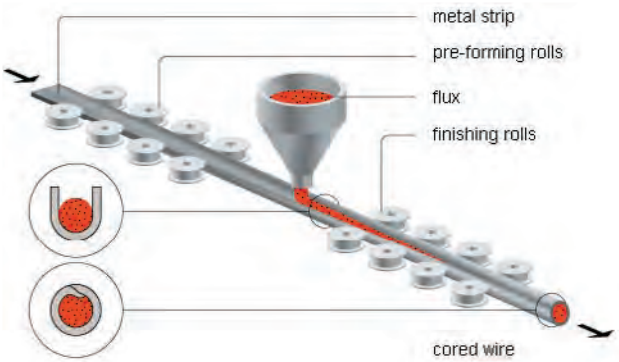
EnDOtec® is a gas shielded metal arc welding process (GMAW) using specially formulated cored wires which provide industry with wear protection, repair and joining solutions.

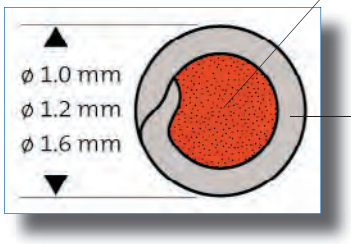
Primary **EnDOtec®** advantages & benefits are:

- Higher weld deposition rates
- Peripheric cool-arc concept
- Unique anti-wear alloys
- Easier weldability
- Increased cost savings



Custom made, welding alloy formulations are feasible with cored wires to optimise performance for wear protection, repair & joining applications.





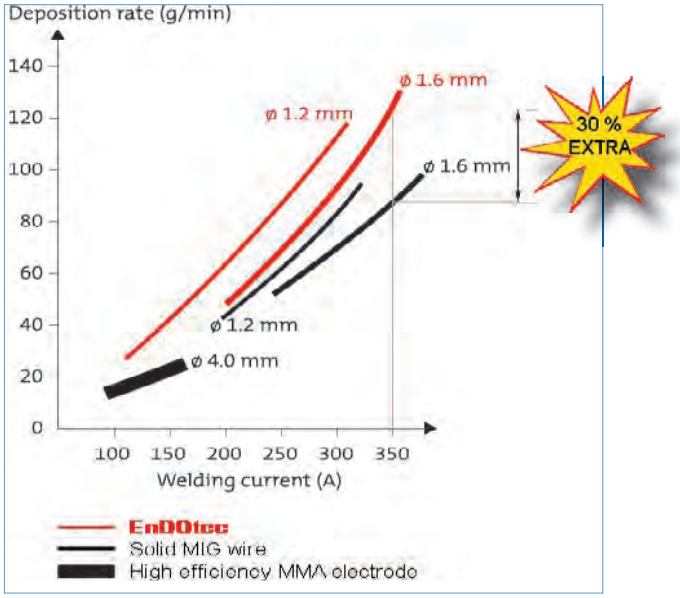
Flux ingredients:
Arc ionising stabilisers, fine grain inoculants, powerful deoxidisers, metallurgical refining agents, selected alloying elements, carbide compounds, etc.

Metallic strip:
Selected ferrous or non-ferrous based alloys (steels, nickel alloys, cobalt alloys etc)

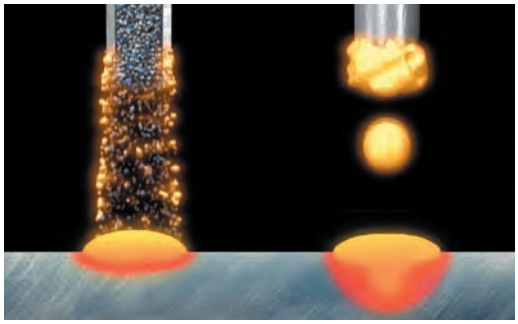
Higher Weld Deposition Rates

EnDOtec®'s composite cross sectional design, automatically produces a higher current density in the electrode's metallic periphery over solid MIG/MAG wires of the same diameter using the same welding amperage.

This ensures over 30% faster electrode fusion without sacrificing weld quality giving record weld deposition rates over MIG/MAG and Manual Metal Arc processes.



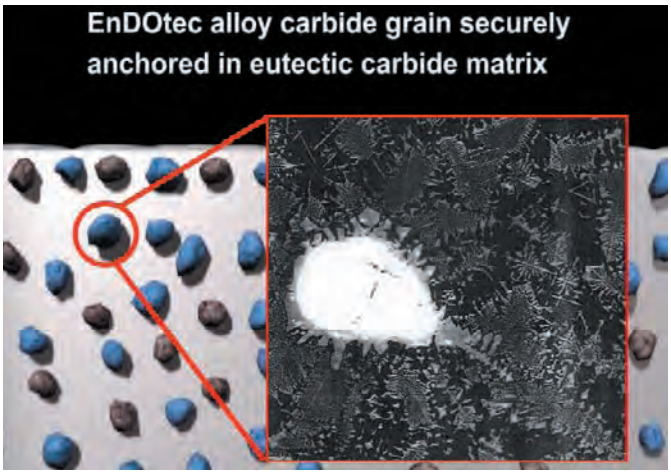
Peripheric Cool Arc Concept



Thanks to **EnDOtec®**'s intrinsic higher current density, a cored wire can always be welded at lower amperages than a solid wire whilst keeping a stable metal transfer across the arc due to ionising elements in the core. Lower heat input means that **EnDOtec®** welds have better bonding, lower dilution, superior microstructure properties and minimal heat affected zones for maximum service performance.

Unique Anti-Wear Alloys

Solid MIG/MAG wires can only be manufactured in metallurgical alloys which can be cast and easily drawn down to final diameters. The **EnDOtec®** cored wire concept completely overcomes such limitations and unique metallurgical alloys are formulated with high density, ultra-hard micro constituants in Fe, Ni, Co based matrices. Thus **EnDOtec®**'s wide alloy range provides cost effective solutions for most wear problems found in industry.

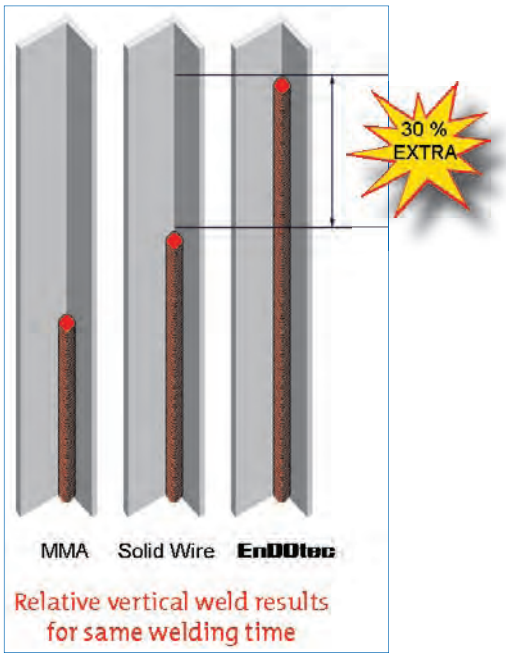


Easier Weldability

EnDOtec® cored wires are easy to use in most positions for repair or joining either in semi-automatic or robotic modes especially with new Dual Pulse systems. Three standard shielding gases cover all application needs. Precision welds at low currents or rapid weld coatings are significantly facilitated for semi-skilled operators.

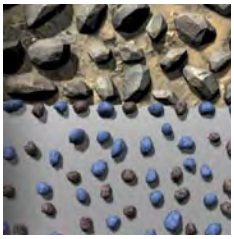
Increased Cost Savings

Numerous industry studies show that labour is the biggest single cost in welding. As skilled welder rates continue to rise inexorably, CUT your welding costs back to size with **EnDOtec®** systems.

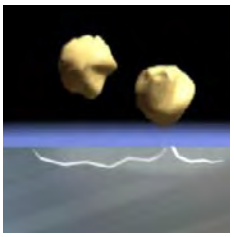


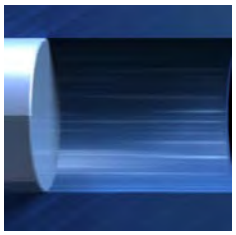
EnDOtec® systems significantly increase cost savings and productivity over both MIG/MAG & MMA processes due to faster welding speeds, superior performance and longer service life.

Wear Protective Coatings To Prolong Service Life

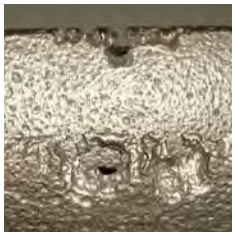

Abrasion


Erosion


Impact


Friction


Heat & Corrosion


Cavitation

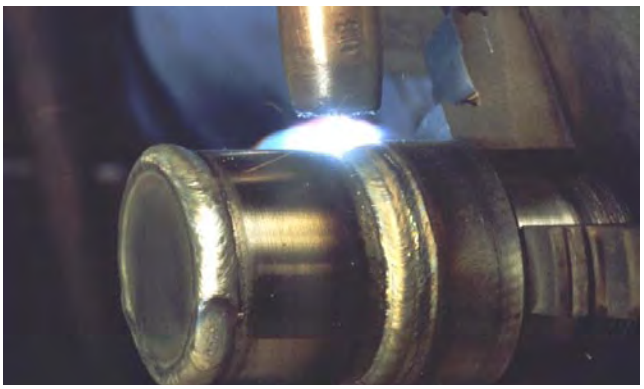
Classic wear types that occur in industry are:

- Abrasion
- Erosion
- Impact
- Friction
- Heat
- Corrosion
- Cavitation

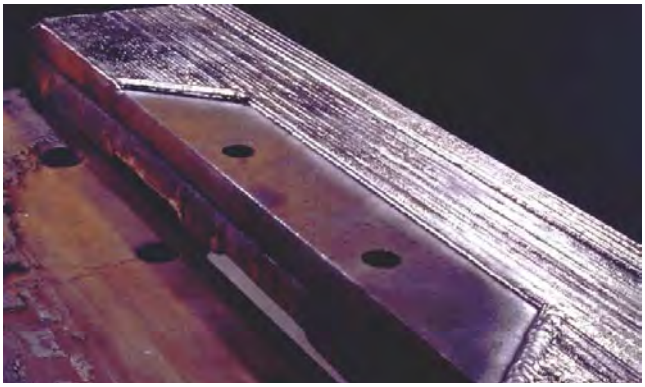
At Castolin Eutectic we take the time to study industry specific types of wear because until the nature of the wear is fully understood, the correct solution cannot be identified.
Damage caused by these wear groups costs money, especially in downtime and lost production, replacement parts, repair and ongoing maintenance.

Castolin Eutectic has proved for more than a century that a preventive maintenance welding program can extend the life of critical machine parts by as much as 500%. Castolin Eutectic has the «know-how» to identify the most serious wear problems and «show how» to avoid them. Castolin Eutectic can greatly increase your plant efficiency and profits.

Proven Wearfacing Applications


Wearfacing a plunger component


Petrochemical OEM weld protected gate valve for corrosion resistance


Wearfacing for hot abrasion in coke ovens


Frictional wear of wagon wheel flanges in railways

Wearfacing Applications

	Abrasion	Erosion	Impact	Friction	Heat	Corrosion	Cavitation	Rebuild	Basis		Technical Data
DO*02			■	■	■	■		■	Fe	Buffer layers & build-ups subject to heavy impact, pressure, metal/metal wear, oxidation up to 600°C	Hardness as welded 190HV30 Hardness work hardened 320HV30
DO*04			■	■	■	■			Fe	Wearfacing resistant to metal/metal friction, corrosion and scaling at high temperature	Hardness as welded 50HRC
DO*05			■	■		■	■	■	Fe	Rebuilding and wearfacing of rolling parts subject to pressure, metal/metal friction & severe impact	Hardness as welded 250HV30 Hardness work hardened 380HV30
DO*06			■	■	■				Fe	High Speed Steel type alloy, retaining high cutting edge hardness & scaling resistance to red heat	Hardness as welded 63HRC
DO*11	■	■			■	■			Ni	Tungsten carbides in nickel based matrix for maximum abrasion resistance in corrosive media	Matrix hardness 52HRC Carbide hardness 2400HV
DO*13	■		■	■					Fe	Good all round resistance to combined wear by moderate impact, pressure, abrasion, friction	Hardness as welded 58HRC
DO*15			■	■	■				Fe	Wearfacing resistant to tempering, abrasion under low pressure and impact. Fully heat treatable.	Hardness as welded 58HRC Annealed 230HV30
DO*16	■		■	■	■	■			Fe	Wearfacing of hot working tools and die parts subject to high pressure. Suitable for nitriding	Hardness as welded 48HRC Annealed 240HV30
DO*26			■	■				■	Fe	Machinable build-ups, buttering layers, casting defects on cast iron stamping / forming tools.	Hardness as welded (3rd layer on cast iron) 180HV30
DO*30	■	■							Fe	Wearfacing resistant to fine particle abrasion & erosion. Ferrous matrix with embedded borides.	Hardness as welded 68HRC
DO*31	■	■	■		■	■			Fe	High resistance to abrasion combined with moderate impact, corrosion and heat.	Hardness as welded 55HRC
DO*322	■	■	■						Fe	Deposit resistant to low stress abrasion & erosion with moderate impact at ambient temperatures.	Hardness as welded 65HRC
DO*325				■				■	Fe	Rebuilding and buttering cast iron tools or casting defects. Crack free deposit.	Hardness as welded (3rd layer on cast iron) 33HRC
DO*326	■		■					■	Fe	Cold multipass deposits on cast iron for crack resistant cutting edges without any buffer layer.	Hardness as welded 51HRC
DO*327	■	■	■					■	Fe	Deposit resistant to combined heavy impact with abrasion, erosion and high pressure.	Hardness as welded 58HRC
DO*329			■	■	■			■	Fe	Good resistance to tempering, thermal and mechanical fatigue (up to 500°C)	Hardness as welded 54HRC
DO*33	■	■			■				Fe	High resistance to severe abrasion, corrosion, oxidation at high temperatures up to 650°C.	Hardness as welded 68HRC (2nd layer)
DO*332	■	■	■		■	■		■	Fe	Multipass deposits resistant to pressure, abrasion with moderate impact, corrosion & scaling.	Hardness as welded 60HRC
DO*390N (patented)	■	■			■				Fe	Latest Nano technology, mesomorphous alloy for maximum abrasion resistance up to 750°C.	Hardness as welded 71HRC
DO*411 (patented)	■	■			■	■			Co	Tungsten carbides in cobalt based matrix for maximum abrasion & oxidation resistance to 850°C	Matrix hardness 52HRC Carbide hardness 2400HV
DO*48	■	■							Fe	Tungsten carbides in ferrous based matrix for maximum abrasion & erosion resistance in service	Matrix hardness 55HRC Carbide hardness 2400HV
DO*53 S	■	■	■			■	■	■	Fe	Multipass, heat treatable deposits resistant to cavitation, erosion and corrosion.	Hardness as welded 420HV30 Hardness (annealed) 280HV30
DO*55			■	■				■	Fe	Age hardening alloy for tools and dies. Excellent results on plastic & aluminium injection moulds.	Hardness as welded 35HRC Hardness (aged) 58HRC
DO*60		■	■	■	■	■	■	■	Co	Co based alloy resistant to tempering, corrosion, cavitation and erosion at high temperatures	Hardness as welded 41HRC
DO*70	■			■	■	■		■	Co	Co based alloy resistant to tempering, abrasion, friction and corrosion at high temperatures	Hardness as welded 48HRC
DO*80			■	■	■	■	■	■	Co	Machinable Co based alloy resistant to tempering, corrosion and scaling at high temperatures	Hardness as welded 340HV30 Hardness work hardened 450HV30
DO*84			■		■	■		■	Ni	High resistance to corrosion, scaling, thermal cycles up to 1200°C. Hot working tools.	Hardness as welded 230HV30 Hardness work hardened 390HV30
DO*85			■	■	■			■	Co	Machinable Co based alloy resistant to pressure, impact, corrosion & thermal fatigue up to 950°C	Hardness as welded 250HV30 Hardness work hardened 380HV30
CaviTec GMA			■	■		■	■	■	Fe	Patented alloy for highest cavitation resistance on stainless steel, carbon steel hydro-turbines, pumps.	Hardness as welded 280HV30 Hardness work hardened 390HV30

■ Main application ■ Secondary application

Repairs & Joining With Maximum Safety Margin

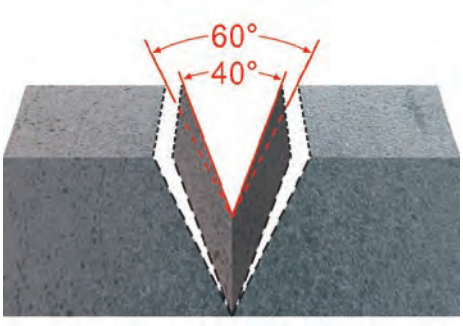
EnDOtec®with or without slag

The double protection by the shielding gas and light, self releasing slags produced by special fluxing ingredients within the cored wire, provide consistent premium quality welds combining higher mechanical properties and greater reliability over solid MIG/MAG wires:

- Refined weld structures
- Reduced oxide contents
- Improved degassing
- Superior wetting & bonding
- Less risk of cold lap defects
- Easier positional welding
- Slower even cooling rates
- Smooth flat fine rippled beads

Cleaner, purer welds = Increased safety & reliabilty

EnDOtec®33% less joint angle



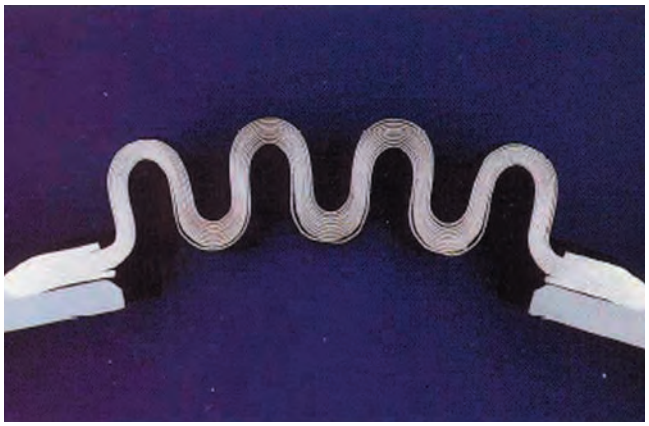
EnDOtec® metal cored wires reduce standard 60° joint angles to 40°.

Savings in preparation:

- less machining
- less filler metal
- less welding time
- less defects
- less distortion & stresses

= More cost savings!

Proven Repair & Joining Applications



Repair & Joining Applications

	Mild steel	Low alloy steel	Stainless steel	Cast steel	Nickel alloys	Dissimilar joining	Basis		Technical Data
DO*265S	■	■					Fe	Good weldability, premium quality for joining & fabrication of mild, low alloy & fine grain steels. Basic flux for impact strength down to –40°C	Tensile strength (Rm) >510 MPa Elongation (A5) >22% Impact value (Av) 80J
DO*266S	■	■					Fe	Good weldability, premium quality for joining & fabrication of mild, low alloy & fine grain steels. Rutile flux for all positional welds, easy deslagging	Tensile strength (Rm) >510 MPa Elongation (A5) >22%
DO*267	■	■					Fe	Good weldability, premium quality for joining & fabrication of mild, low alloy & fine grain steels. Metal cored type for slag-free, high welding speeds	Tensile strength (Rm) >510 MPa Elongation (A5) >22%
DO*02	■	■	■	■		■	Fe	Joining and crack repairs on high thickness parts, dissimilar steel combinations and buffer layer before wearfacing	Tensile strength (Rm) 650 MPa Elongation (A5) 35%
DO*09 S			■			■	Fe	Joining and crack repairs on Super Duplex stainless steels, austenitic stainless steels and excellent dissimilar steel welding capabilities	Tensile strength (Rm) 850 MPa Elongation (A5) 23% Pitting Resistance Equivalent >40
DO*22	■	■	■	■	■	■	Ni	Joining and crack repairs on difficult to weld steels in thick sections, dissimilar steel welding and nickel alloys. Low residual stresses avoid PWHT.	Tensile strength (Rm) 650 MPa Elongation (A5) 40%
DO*23	■			■	■	■	Ni	Joining and crack repairs on ductile and grey cast irons, dissimilar welding cast iron / steel. High crack resistance with good machinability.	Tensile strength (Rm) 470 MPa Elongation (A5) 15%
DO*24 S	■	■	■	■		■	Fe	Joining & crack repairs on alloy steels, difficult to weld steels, high carbon and manganese steels. Buffer layer before wearfacing	Tensile strength (Rm) 580 MPa Elongation (A5) 35%
DO*25 S		■	■			■	Fe	Joining and crack repairs on Duplex stainless steels, austenitic stainless steels and dissimilar steel welding capabilities	Tensile strength (Rm) 800 MPa Elongation (A5) 25%
DO*28 S		■	■				Fe	Joining, fabrication and crack repairs on low carbon or stabilised 18/8 & 18/8/3 austenitic stainless steels to combat intergranular & pitting corrosion.	Tensile strength (Rm) 570 MPa Elongation (A5) 40%
DO*53 S			■				Fe	Joining & fabrication of 13Cr 4Ni stainless steels used in hydro-turbine equipment where positional weldability and heat treatment are requirements.	Tensile strength (Rm) 870 MPa Elongation (A5) 18%
DO*66 S	■	■		■			Fe	Easy positional weldability, premium quality for joining & fabrication of low alloy, galvanised, free machining steels. Basic flux gives self lifting slag.	Tensile strength (Rm) 540 MPa Elongation (A5) 22% Impact value (Av) 80J
DO*69 S		■	■	■		■	Fe	Joining & crack repairs on alloy steels, difficult to weld steels, stainless steels, dissimilar steels. Buffer layer before wearfacing	Tensile strength (Rm) 760 MPa Elongation (A5) 32%
DO*636	■			■		■	Fe	Joining, rebuilding ductile and grey cast irons, dissimilar welding cast iron / steel. Low shrinkage stresses provide resistance to cracking.	Hardness as welded 140-160 HB

■ Main application ■ Secondary application

EnDOtec® Manufacturing Facilities

The **EnDOtec®** range of high performance cored wires are formulated, developed and manufactured in Castolin Eutectic's own plants using specially designed production equipment and procedures in accordance with ISO 9001 and EN 29001 quality assurance standards.

Each **EnDOtec®** batch is welded and fully tested for consistent chemistry, properties & operability before precision spiral spooling and protective packaging for stock.

EnDOtec® Welding Equipment Systems

- State of the art welding equipment
- Complete range of wear resistant alloys
- Superior welding performance
- Higher weld deposition rates
- Faster welding speeds
- Increased welding productivity

Wire Feeders

Wire feeders are specially designed with four precision profiled roll drives for smooth and trouble free use of the entire **EnDOtec®** cored wire range.

Dual Pulse Technology

Integrated Dual Pulse technology enables perfect positional welds even with more difficult alloy systems.

Torches

User friendly range of gas cooled or water cooled ergonomic torches for perfect results and increased savings.

Cored Wire + Welding Program + Dedicated Equipment

=

Guarantee of professional results everytime...

....even with semi-professional welders!

Welding Programs

EnDOtec®		Gas	Program
DO*02	Ø 1.2	Ar + 2.5% CO2	37
	Ø 1.6		38
DO*11	Ø 1.6	Ar + 2.5% CO2	39
DO*15	Ø 1.2	Ar + 2.5% CO2	40
	Ø 1.6		41
DO*23	Ø 1.2	Ar + 18% CO2	42
DO*28	Ø 0.9	Ar + 18% CO2	43
	Ø 1.2		44
	Ø 1.6		45
DO*29	Ø 1.2	Ar + 2.5% CO2	46
	Ø 1.6		47
DO*30	Ø 1.2	Ar + 2.5% CO2	48
	Ø 1.6		49
DO*48	Ø 1.6	Ar + 2.5% CO2	56
DO*55	Ø 1.6	Ar + 2.5% CO2	50
DO*60	Ø 1.2	Ar 100%	51
	Ø 1.6		52
DO*65	Ø 1.2	Ar + 18% CO2	53
DO*66	Ø 1.2	Ar + 18% CO2	54
DO*80	Ø 1.2	Ar 100%	57
Cavitec	Ø 1.2	Ar 100%	58

Castolin Eutectic has developed a complete range of welding program parameters which are specifically optimised for each **EnDOtec®** cored wire alloy.
These digital synergic programs have been integrated into **EnDOtec®** high duty welding equipment systems so that superior performance, productivity and perfect results are assured everytime even when highly skilled welders are not available.

CastoLab

We believe in making our extensive know-how fully available to our customers, but for situations where technology transfer is complex or requires a rapid turn-around, we have our own maintenance service workshops; CastoLabs. These fully resourced skill centers develop advanced procedures for transfer to end users.

In Situ Maintenance

Castolin Eutectic CastoLabs are located in Germany, Belgium, Holland, Spain, Austria, Poland, Czech Republic and the United Kingdom, and are best contacted through Castolin Eutectic via our website (www.castolin.com). In countries without CastoLabs, Castolin Eutectic collaborates with approved workshops who are in close contact with Castolin Eutectic's specialists and technologies.

Workshop Maintenance

Fan Protected with Powder Coated Wear Plates

Fan built with wear resistant CDP

Thermal Spraying

Remachining

Arc Wire Spraying

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, ...

Castolin Eutectic

Castolin Eutectic Locations

The unique Terolink database of Castolin Eutectic contains almost 6,000 fully documented approved applications from around the globe. The case studies include photographs, technical data, detailed descriptions and cost-saving analyses.

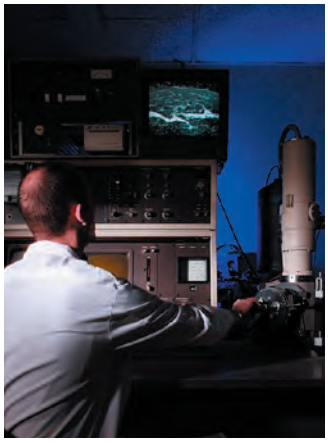
Training

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.

Manufacturing

Product Portfolio - Widest in the Industry

R&D-Wear Test Laboratory



Metallurgical Laboratory

Micrograph of Wear Phenomena

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

- Investing €420 million before 2008
- More than 6,000 motivated employees
- Over 100 factories to meet the needs of customers
- Technical sales support in over 120 countries
- 2,000 technical sales people in the field with our customers every day

Part of the **Messer** World

History of Castolin Eutectic

1906: Foundation of Castolin in Lausanne, Switzerland by Jean-Pierre Wasserman. His stroke of genius: to discover a way of welding cast iron at low temperature; in the following years, this innovation was further developed for all industrial metals including aluminium alloys.

1940: Foundation of Eutectic Welding Alloys Corporation in New York

1952: Foundation of Castolin France

1959: Foundation of Eutectic Japan Ltd

1962: Foundation of Eutectic India Ltd.

1960's: International consolidation under Castolin Eutectic

1970's: Creation of training centers for Maintenance & Repair technologies

1978: Establishment of World Head Quarters in St-Sulpice, Switzerland

2000: Merger with Messer Cutting & Welding and creation of the MEC Group - Messer Eutectic Castolin

2005: Part of the Messer World

2006: 100 years of innovation, service and quality.

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