



Committed To Satisfy Customers



MAINTENANCE HANDBOOK



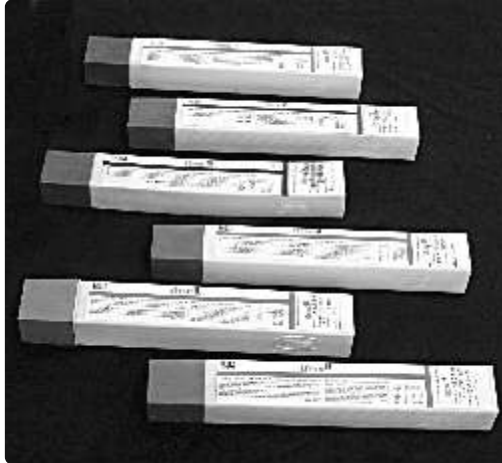
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**LOTHERME - COMPLETE SOLUTIONS  
FOR WEAR, CORROSION & HEAT**

**Low Heat Input SMAW  
Welding Electrodes**

**LOTHERME  
WELDING**

# LOTHERME



*LoTherme Electrodes in Temper-Proof Packs*

## MAINTENANCE WELDING

Effective maintenance and repair are essential for efficient running of industries. Welding, as a tool of maintenance and repair, plays a vitally important role in the functioning of all major industries. In general it may be said that practically any metal part which has broken or worn-out in service can be reclaimed by welding. In fact, one of the first uses of welding was to repair broken machinery and parts. What started out, as a process for making an emergency repair until a replacement could be obtained, has today become an economic necessity to conserve expensive materials and to reduce inventories.

The need for maintenance welding arises mainly because of:

- a) Wear and
- b) Failure

Wear is caused by mechanical means like friction, abrasion and impact in case of, relative movement between the parts in contact with each other. Wear is also caused by corrosive action of the medium being handled by the particular equipment. It is observed that the magnitude of wear, may it be due to mechanical or chemical reasons, is greater at higher temperatures. Complete failure of the equipment is the next stage if wear exceeds permissible levels. Failure can also take place due to defective material or accidental overloads.

In addition to the application of welding process to salvage broken parts, resurfacing by welding has become an economical solution to various problems. A majority of maintenance welding is carried out by the shielded manual metal arc process.

To obtain longer service life in many cases, it is even economical to surface new parts before putting them to use.

This handbook is designed to guide you in the selection of suitable electrodes for shielded manual arc welding for various maintenance applications.

#### SPECIAL FEATURES OF MAINTENANCE WELDING

In maintenance welding, the weld metal is deposited on the worn-out component or is used to join fractured component. Therefore, it is essential that the weld metal possesses the properties, which will meet the service requirements of the component and enhance its service life. Most of the times the component calls for welding only in certain areas and therefore in maintenance welding it is essential to see that the component does not lose its original properties in the areas where welding has not been done. These special features associated with maintenance welding impose restrictions on selection of welding consumables and also call for reduction of heat input during welding.

#### LoTherme low heat input welding

LoTherme electrodes are specially designed for low heat input welding. These electrodes are the result of extensive development, testing and analysis in our well-equipped modern laboratories.

The advantages of welding, particularly for maintenance and repair applications, with low heat input LoTherme electrodes needs no emphasis. It is well known that the composition and

metallurgical state of the base material affects the properties of the deposited weld metal since the first layer will always be diluted with base material.

The carbon content and other alloying elements can have a pronounced effect on the first layer of weld deposit. There is also a risk of damage to the desirable structure in the heat-affected zone of the base material. It is in this context that the introduction of LoTherme low heat input electrodes can be fully appreciated.

You derive the following benefits when you use LoTherme electrodes:

- Reduced pick-up of carbon and other detrimental elements from the base material;
- Minimal effect on the surface of the base material adjacent to the fusion zone, known as heat-affected zone:
- Reduced propensity for grain coarsening in weld metal and HAZ, thereby resulting in better toughness of weld and HAZ;
- Reduced width of the HAZ;
- Reduction in the cracking tendency of the highly brittle materials due to reduced 'thermal shock';
- Less distortion of the weldment;
- Lower consumption of electrodes, especially in hardfacing applications due to lower dilution with the parent material.

Through developments in the design of flux coating, it has been ensured that each LoTherme electrode performs at low welding currents, low arc voltage and short arc length. These factors are

strictly controlled to ensure that you get the maximum advantage of low heat input welding with LoTherme electrode.

#### SELECTION OF ELECTRODE FOR MAINTENANCE WELDING

Selection of electrode in maintenance welding is a very important step for achieving the desired results. The two major factors, which basically control the selection of electrodes, are:

- 1) Types of base material.
- 2) Service condition.

Though there are other factors, which can influence the choice on welding electrodes, the above two factors primarily decide the welding electrodes.

#### TYPES OF MATERIAL

The different types of base materials that are normally encountered in any industry are:

- 1) Carbon and low alloy steels
- 2) Stainless steels
- 3) Austenitic Mn steels and
- 4) Cast iron.

The salient features of welding these materials are listed in appropriate sections in this handbook together with the electrodes that are suitable for these materials. These guidelines should help the maintenance welding personnel to select the electrode for their applications.

#### WELDING TECHNIQUE

The welding technique for each type of LoTherme electrode is highlighted in the individual product literature. It is, however, necessary to observe certain general procedures and precautions in order to obtain best results.

Electrodes should be kept dry. Moisture pick-up affects the performance of the electrodes as also the soundness of the weld deposits. It is advisable to dry the electrodes before use as suggested in the individual product literature.

- Clean the weld groove and the adjacent area thoroughly free of rust, scale, paint, oil, grease or any other surface contamination. For removal of paint, oil or grease from the surface, it is advisable to use acetone or any other solvent.
- Use lowest possible current and short arc. As far as possible do not weave the electrode. Use stringer bead technique. If weaving becomes necessary due to position of welding, the width of weaving should not exceed two to three times the core wire diameter of the electrode.
- While welding on austenitic manganese steel, cast irons and thin sheets especially stainless steel, the length of each weld bead should be limited and the welds staggered over the surface to be welded. In case of austenitic manganese steel and cast irons, short and staggered weld beads help avoid cracks whereas in case of thin sheets, this technique helps control distortion. Please refer to individual LoTherme product literature for further details on control of heat input.

- While welding hard and brittle materials, especially cast irons, it is necessary to peen the weld beads. Peening helps in reduction of residual stresses by 'stretching' the weld metal. Peening should be done immediately after the weld metal has solidified and the slag is removed.
- Appropriate pre-heat and post-weld heat treatment may have to be adopted depending upon the physical as well as the metallurgical conditions from which the parts may have to be reclaimed. Please consult our Engineer for further details.

#### Packing and storage of electrodes

All LoTherme electrodes are supplied in moisture-proof and shock-proof high density polythene containers. For further protection, the electrodes are first packed in moisture-proof, low-density polythene bags.

LoTherme electrodes are supplied in 1 kg. and 2 kg. packing. Small quantities in each packet will help you control your inventory costs as well as avoid wastage of electrodes.

Rectangular containers facilitate storing. No special storage conditions are necessary for LoTherme electrodes. The storage area, however, should not be exposed to moisture conditions.

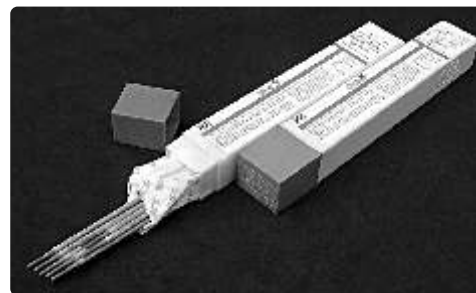
Each LoTherme electrode is printed along the length near the holder-end with the brand name for easy and positive identification.

#### Save Time and Money with LoTherme

Due to its economic advantages, welding naturally plays a very important role in maintenance work, particularly for emergency repairs or building-up worn out parts. There is no need to treat such work as a temporary job to keep the plant going till a replacement part is procured. LoTherme-low heat input electrodes are specially designed to ensure that the parts reclaimed by welding, in many cases, perform better than the originals.

Each LoTherme electrode is developed after a thorough study of the application requirements.

Save time and money by adopting LoTherme electrodes and technique.



LOTHERME

## Electrodes for Carbon & Low Alloy Steels

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### CARBON AND LOW ALLOY STEELS

The carbon steels are the most common materials used for various applications. The percentage of carbon is a major criterion in deciding its properties and also its weldability. Increasing amounts of carbon results in loss of ductility of the material and renders the material difficult to weld. Therefore, the percentage of carbon will have to be determined before deciding on the welding techniques and consumables. The susceptibility of the material to form hard structures like martensite increases with the higher percentage of carbon. With higher percentage of carbon, additional precautions like pre-heat, post-heat may be required to achieve the desired properties.

The alloy steels in addition to carbon have additions of alloying elements like Mn, Ni, Cr, Mo, V, etc., which increase the susceptibility of the material to form hard structures like martensite. These low alloy steels also, therefore, require special consideration while designing the welding procedures. In general, these low alloy steels are welded with a suitable pre-heat depending on the composition of the base material and the section thickness involved.

Our LoTherme electrodes in the 200 and 300 series are suitable for this group of materials: the 200 series suitable for sheet metal welding and the 300 series suitable for carbon and low alloy steels. Apart from joining applications LoTherme-352 is also suitable for buffer layers on a variety of carbon and low alloy steels and cast iron. These buffer layers are:

- a) Useful for providing a ductile layer over the hard material before hardfacing.
- b) For sealing off the impurity elements particularly in cast iron.

Depending on the composition of the material, suitable pre-heat for the base material will have to be selected.

## LoTherme - 200

A special low heat input electrode for welding mild steel.

### Characteristics :

LoTherme-200 is a specially formulated low heat input electrode for welding mild steel sheets, structural, etc. It can be used on AC/DC (-) and can be operated with ease in all welding positions including vertical down. The beads are finely rippled and arc is smooth.

### Applications :

LoTherme-200 is ideally suited for sheet metal welding, structural welding using low heat input welding technique. Ideal for welding mild steels in maintenance work.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 47 Kgf/mm<sup>2</sup>  
 ELONGATION (L=4d) : 28 %

### Welding Technique :

- \* Clean the weld area free of all contaminants.
- \* Use low current, short arc technique.

### Current Conditions : AC/DC (-)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	130-170	100-120	70-110	45-70

## LoTherme - 210

Exclusive electrode for low heat input welding of mild steel with minimal distortion.

### Characteristics :

LoTherme-210 flux formulation is so chosen that the electrode produces excellent weld finish at extremely low current. It can be used on AC/DC (±) in all conventional positions.

Finely rippled weld beads, soft and steady arc which is easy to strike and restrike and self-detachable slag are a few among many pleasant features associated with LoTherme-210.

### Applications :

LoTherme-210 has been specially designed for welding sheet metal with low heat input technique in order to prevent distortion. However, it can also be used for welding mild steel of higher thickness.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 48 Kgf/mm<sup>2</sup>  
 ELONGATION (L=4d) : 28 %

### Welding Technique :

Keep the electrode dry. Clean the weld area free of any surface contamination. Use low current and short arc technique. While welding sheet metal, it will be of greater advantage if the job can be placed in an inclined position and welded downhill. This will also help in increasing welding output.

### Current Conditions : AC/DC (±)

Size (mm)	5x350	4x350	3.15x350	2.5x350	2x300
Dia x Length					
Current Range (Amps)	140-200	110-160	80-120	50-80	40-60

## LoTherme - 210R

A medium coated electrode for low heat input welding of mild steel with minimal distortion.

### Characteristics:

LoTherme-210R produces excellent weld finish at extremely low current. It can be used on AC / DC (+) in all conventional positions. Finely rippled weld beads, soft and steady arc radiographic quality weld and self-detachable slag are a few among many pleasant features associated with LoTherme-210R.

### Applications:

LoTherme-210R has been designed for welding sheet metal in low heat input technique. It can also be used for welding mild steel of higher thicknesses depending on the applications. This electrode can be used for fabrication and repairing of Buckles, Gear cases, Protector tubs, Door patches, Side panels, End wall patches etc. of rolling stocks and locomotives.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 48 Kg/mm<sup>2</sup>  
 ELONGATION (L=4d) : 27 %

### Welding Technique :

Keep the electrode dry. Clean the weld area free of any surface contamination. Use low current and short arc technique. While welding sheet metal, it will be of greater advantage if the job can be placed in an inclined position and welded down hill. This will also help increase welding output.

### Current Conditions : AC/DC (-)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range	140-200	110-160	80-120	50-80
(Amps)				

## LoTherme - 351

Low heat input basic coated type high-yield hydrogen controlled electrode.

### Characteristics :

Low heat input, low hydrogen type electrode.  
 Steady, smooth arc, which is easy to strike and restrike.  
 Easy to operate in all conventional welding positions.  
 Extremely low spatter, excellent slag detachability and finely rippled weld beads.  
 Radiographic quality welds having excellent cracking resistance.  
 Weld metal of excellent toughness to withstand heavy dynamic loading and impact.

### Applications :

LoTherme 351 is ideally suited for welding carbon steels used in the construction of machinery and equipment subjected to heavy dynamic load, impact and severe service conditions. Some of the typical applications include: Heavy structures subjected to dynamic loading and impact, Highly restrained joints, Rail coaches, Wagons, Ships, Girders for columns, bridges, Blast furnace shells, Rotary kiln shells, building machinery, Earth moving machinery, Boilers, Pressure vessels.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 53 Kg/mm<sup>2</sup>  
 ELONGATION (L=4d) : 28 %

### Welding Technique :

Redry the electrodes at 250°C for one hour before use. Clean the weld area completely free of oil, grease, paint, rust or any other foreign matter. For welding heavy sections in cast steel, preheating of the part may prove beneficial. Use short arc.

### Current Conditions : AC/DC (±)

Size (mm)	5x450	4x450	3.15x450	2.5x350
Dia x Length				
Current Range	170-220	120-160	90-120	60-90
(Amps)				



## LoTherme - 352

Hydrogen controlled electrode for mild medium carbon, high strength steels, cast steels "problem steels" and for cushion layer under hard deposits.

### Characteristics :

LoTherme-352 ,a hydrogen controlled AC/DC (+) electrode, operates equally well in all conventional positions. High quality, high strength, crack-free RADIOGRAPHIC welds are the special features of LoTherme-352. Welds display good ductility and impact resistance at ambient and sub-zero temperatures.

### Applications :

LoTherme-352 is ideally suited for welding mild, medium carbon, high tensile steels, difficult steels, steels high in sulphur and phosphorus, heavy structures, plant and equipment subjected to dynamic loading and impact. It is equally good for depositing buffer layer before hard surfacing.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	56 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	28 %

### Welding Technique :

For best results, dry the electrode at 250°C for two hours before use. Clean the weld area completely free of oil, grease, paint, rust or any other foreign matter. For welding heavy sections in cast steel, pre-heating of the part may prove beneficial. Use short arc.

### Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
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Dia x Length

Current Range (Amps)	150-200	120-160	90-120	60-90
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## LoTherme - 352R

A low heat input electrodes for mild, medium carbon steels, cast steels and for buffer layers.

### Characteristics :

LoTherme-352R is a low heat input AC/DC electrode, operates equally well in all conventional positions. High quality, high strength, crack free radiographic welds are the special features of LoTherme-352 R. Welds display excellent ductility and toughness.

### Applications :

LoTherme-352R is suitable for repair of bogies, both cast and fabricated. Also suitable for welding mild, medium carbon steels, difficult steels, steels heavy structures, repair of Co-Co bogies, plant and equipment subject to dynamic loading and impact. It is also suitable for depositing buffer layers before hard surfacing.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	57 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	26 %

### Welding Technique :

Redry the electrodes at 250oC for one hour before use. Clean the weld area completely free of oil, grease, paint, rust or any other foreign matter. For welding heavy sections in cast steel, preheating of the part may prove beneficial. Use short arc.

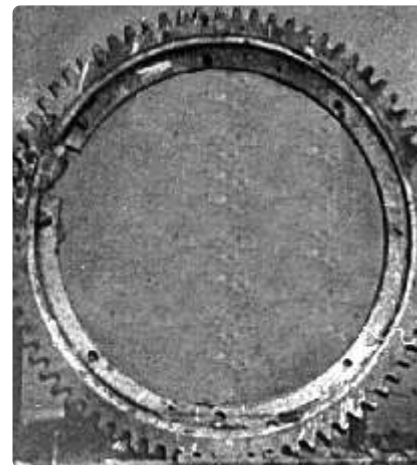
### Current Conditions : AC/DC (+)

Size (mm)	6.3x350	5x350	4x350	3.15x350	2.5x350
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Dia x Length

Current Range (Amps)	250-300	150-200	120-150	90-120	60-90
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# LOTHERME



*Welding Cast Steel Gear Using  
LoTherme-352 & LoTherme-601*

### LoTherme - 353

A low heat input electrode for welding carbon steel.

#### Characteristics :

LoTherme-353 is a AC/DC (±) electrode operating in all conventional positions depositing a high strength weld metal. The deposits are of radiographic quality and display excellent ductility and toughness.

#### Applications :

LoTherme-353 is ideally suited for welding mild, medium carbon steels of medium tensile strength. Ideal electrode having excellent operational characteristics for welding carbon steels where a high joint strength is required. The electrode has a high metal recovery and is ideal for achieving faster welding speed and welding output.

#### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	54 kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	28 %

#### Welding Technique :

Keep the electrodes dry. Clean the weld area free of all contamination. Use low current and short arc technique.

#### Current Conditions : AC/DC (±)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	150-200	120-160	90-120	60-90

### LoTherme - 355

An extra low hydrogen low heat input electrode depositing a low alloy steel weld metal.

#### Characteristics :

LoTherme-355 is an extra low hydrogen low heat input electrode depositing a low alloy steel, high strength weld metal ideal for maintenance and repair welding of Cr- Ni -Mo high strength low alloy steels, case hardened steels, heat-treated steels, etc. The extra low hydrogen helps in preventing cold cracks.

#### Applications :

Ideal for maintenance and repair welding of high strength steels, case hardened steels, heat-treated steels, etc. Typical applications include welding of rolls, shafts, gear wheels, etc.

#### Typical Mechanical Properties :

ULTIMATE TENSILE STRENGTH	:	78 Kgf/mm <sup>2</sup>
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#### Welding Technique :

Redry the electrodes at 350°C for 2 hours. Clean the weld area free of all contaminants. In case of the case hardened materials, the case should be removed before welding. Depending on the base material, a suitable welding procedure should be evolved for reclamation.

#### Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	140-160	100-120	70-100	50-70

## LoTherme - 356

Low Heat input electrode for hardfacing of ladle car wheels.

### Characteristics :

LoTherme-356, is a hydrogen controlled, AC/DC (+) electrode, operates equally well in all conventional positions. High quality, crack free welds are the special features of LoTherme-356

### Applications :

LoTherme-356 is a versatile low heat input electrode, depositing a tough air-hardening alloy, which gives a moderate abrasion and impact. It can be used on mild steel, carbon steel, low alloy steel, etc., where hardness of 320-350 BHN is required. Some of the typical applications include :

Ladle car wheels, tractor idler wheels, brake shoes, ropeway, tramcar rails and wheels, gear teeth, etc.

Hardness : 320-350 BHN

### Welding Technique :

For best results dry the electrodes at 250°C for 2 hours before use. Clean the weld area completely free of oil, grease, paints, rust or any other foreign matter. For welding heavy sections in cast steel, preheating of the part may prove beneficial. Use short arc.

Current Conditions : AC / DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	140-185	110-170	75-120	50-70

## LoTherme - 357

Low heat input electrode for withstanding thermal shocks.

### Characteristics :

LoTherme-357, is a special type electrode, operates equally well in all conventional positions. Smooth and soft arc, which is easy to strike and restrike. Finely rippled smooth weld beads. Crack free RADIOGRAPHIC welds are the special features of LoTherme-357.

### Applications :

LoTherme-357 is a versatile low heat input electrode. Ideally suited for welding 0.5Cr - 0.5Mo, 1Cr - 0.5Mo and 1.25Cr - 0.5Mo steels. The weld deposit gives excellent tensile strength and creep resistance at elevated temperatures.

### Typical Mechanical Properties :

ULTIMATE TENSILE STRENGTH	:	60 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	25 %

### Welding Technique :

For best results dry the electrodes at 250°C for 2 hours before use. Clean the weld area completely free of oil, grease, paints, rust or any other foreign matter. For welding heavy sections in cast steel and low alloy steel, preheating of the part may prove beneficial. Use short arc and stringer beads.

Current Conditions : DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-110	60-80

# LOTHERME



## Electrodes for Stainless Steels, Dissimilar Metals, etc.



# LOTHERME

## STAINLESS STEELS

Stainless steels are normally alloyed with considerable amounts of alloying elements like Cr, Ni. The most commonly used austenitic stainless steels contain 18Cr-8 Ni, 25Cr-12 Ni, 25Cr-20 Ni and several modified versions are also available to suit the service conditions. The welding of austenitic stainless steels rarely poses any problem.

The 400 series of LoTherme electrodes represent the electrodes depositing stainless steels weld metals. This range consists of electrodes, which are suited not only for welding similar materials but also for dissimilar materials.

Electrodes like LoTherme-452, LoTherme-453 and LoTherme-455 are suited for welding stainless steels of similar composition, Electrodes like LoTherme-456, LoTherme-457, LoTherme-458, LoTherme-464, LoTherme-467 and LoTherme-468 are suited not only for welding stainless steels but also are suited for welding a number of dissimilar material combinations. The various materials that can be welded with these electrodes are indicated in the individual technical data of each electrode.

## LoTherme-430

Low heat input electrodes for welding of AISI 430 and equivalent 17% chromium steels.

### Characteristics :

LoTherme-430 is a low heat input electrode depositing a weld metal containing 17% chromium. The weld deposit displays good resistance to corrosion and heat.

### Applications :

LoTherme-430 is ideally suited for : Welding of stainless steel AISI 430 and equivalent 17% chromium steels. For overlay carbon steel, low alloy steels, and chromium steels.

It is appropriate electrode, where the service conditions require good resistance to corrosion and heat up to 550oC. Typical applications include surfacing of valves, impellers, turbine blades, and valve seats.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 54 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d) : 22 %

### Welding Technique :

Keep the electrodes dry. For best results, redry the electrodes at 250-300oC for one hour before use. Clean the weld area thoroughly free of any foreign matter. Use low current, short arc and stringer beads.

### Current Conditions : DC(+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				

Current Range (Amps)	130-170	100-130	80-110	70-90
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## LoTherme-444 L

Electrode with 13% Cr, 4% Ni

### Characteristics :

LoTherme-444L especially designed for the fabrication and repair welding of hydro turbine components made of soft martensitic SS 13%Cr - 4%Ni alloyed steels and cast steel. Suitable for reclamations of ASTM CA6NM casting, continuous casting rolls, etc.

### Applications :

LoTherme-444L is a well suited welding electrode for joining and building up on corrosion resistant martensitic Cr - Ni steels and the corresponding cast steels. The electrode is being used in armatures and power station construction. The welding deposit has an increased resistance against cavitations and erosion also at working temperatures up to 350°C.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 93 Kg/mm<sup>2</sup>

ELONGATION (L = 4d) : 17 %

### CVN IMPACT STRENGTH

AT ROOM TEMPERATURE : 60 Joules

### Welding Technique :

Weld the electrode slightly inclined with a short arc. Re-drying 2-3 hours at 250-300°C. For wall thickness more than 10mm, preheating 150°C is recommended.

### Current Conditions : DC(+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150-180	110-150	80-110	60-90

## LoTherme-451

Stabilized Low Carbon Electrode for Cr Ni Mo Steel

### Characteristics :

LoTherme-451 produces deposits of extra low carbon with balanced Cr - Ni ratio and controlled ferrite. Furthermore, stabilisation with columbium ensures excellent resistance to corrosion. The presence of molybdenum improves the corrosion resistance in reducing media. Easy arc striking and restriking, excellent weld finish and good slag detachability are some of the many pleasant features associated.

### Applications :

LoTherme-451 is well suited for welding AISI 316, 316L, 316Ti, 317, 318, 318Ti, and other molybdenum bearing stainless steels, which find extensive applications in paper, fertilizer, oil refining and chemical industries. The extra low carbon coupled with columbium in the weld deposit ensures excellent resistance to carbide precipitation and the resultant intergranular corrosion.

### Typical Mechanical Properties Of All Weld Metal:

ULTIMATE TENSILE STRENGTH : 61 Kg/mm<sup>2</sup>

ELONGATION (L = 4d) : 35 %

### Welding Technique :

For best results, dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

### Current Conditions : AC / DC(+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150-180	110-150	80-110	60-90

## LoTherme - 452

Low heat input AC-DC, all position, extra low carbon Cr-Ni stainless steel electrode.

### Characteristics :

LoTherme-452 produces weld deposits of extra low carbon with balanced Cr-Ni ratio and controlled ferrite for outstanding resistance to hazards of cracking, weld decay, corrosion and pitting.

Excellent weld finish, easy striking and restriking, stable arc and good slag detachability are a few among many pleasant features associated with LoTherme-452.

### Applications :

LoTherme-452 is ideally suited for welding AISI stainless steels types 201, 301, 302, 304, 304L, 308, 308L and their equivalents. The extra low carbon in the weld deposit ensures freedom from carbide precipitation and resultant intergranular corrosion.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	53 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	35 %

### Welding Technique :

For best results, dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

### Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
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Dia x Length

Current Range (Amps)	120-150	85-120	70-90	50-70
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## LoTherme - 453

Low heat input AC-DC, ALL POSITION Cr-Ni-Cb stabilized stainless steel electrode

### Characteristics :

LoTherme-453 produces Cr-Ni-Cb stabilized weld deposits with balanced Cr-Ni ratio and controlled ferrite for excellent resistance to corrosion.

The electrode is characterised by soft and stable arc, which is easy to strike and restrike, finely rippled weld beads of radiographic quality and easily detachable slag.

### Applications :

LoTherme-453 is ideally suited for low heat welding on AISI 301, 302, 304, 304L, 308, 308L, 321 and 347 stainless steel which are used in oil refining, chemical, paper pigments and paints, brewery, dairy and food processing industries. The welds have excellent resistance to carbide precipitation and the resultant intergranular corrosion.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	54 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	:	30 %

### Welding Technique :

For best results, dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

### Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
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Dia x Length

Current Range (Amps)	130-160	90-130	70-90	50-70
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## LoTherme - 455

Low heat input AC-DC, all position extra low carbon Cr-Ni-Mo stabilized stainless steel electrode.

Characteristics :

LoTherme-455 produces deposits of extra low carbon with balanced Cr-Ni ratio and controlled ferrite. Furthermore, stabilisation with columbium ensures excellent resistance to corrosion. The presence of molybdenum improves the corrosion resistance in reducing media.

Easy arc striking and restriking, excellent weld finish and good slag detachability are some of the many pleasant features associated with LoTherme-455.

Applications :

LoTherme-455 is well suited for welding AISI 316, 316L, 316Ti, 317, 318, 318Ti, and other molybdenum bearing stainless steels, which find extensive applications in paper, fertilizer, oil refining and chemical industries.

The extra low carbon coupled with columbium in the weld deposit ensures excellent resistance to carbide precipitation and the resultant intergranular corrosion.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 54 Kg/mm<sup>2</sup>

ELONGATION (L=4d) : 25 %

Welding Technique :

For best results, dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
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Dia x Length				
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Current Range (Amps)	130-160	90-130	70-90	50-70
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## LoTherme - 456

Low heat input AC/DC, all position versatile stainless steel electrode for welding stainless and dissimilar steels.

Characteristics :

LoTherme-456 is characterized by excellent operational features on DC as well as AC power sources, a quiet, soft and stable arc, which is easy to strike and restrike, good slag detachability and evenly rippled beads. The weld metal is strong, tough and ductile.

Applications :

LoTherme-456 is ideally suited for joining stainless steels to carbon steels, low alloy steels, cast steels and austenitic manganese steels for overlay welds. Typical applications include valve seats, pump impeller, shafts, etc. for chemical dairy, brewery and food industries.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 57 Kg/mm<sup>2</sup>

ELONGATION (L=4d) : 30 %

Welding Technique :

For best results, dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
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Dia x Length				
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Current Range (Amps)	130-160	100-130	80-110	60-90
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### LoTherme - 457

Special electrode for low heat input welding and surfacing of austenitic manganese steels and steels of widely varying composition.

#### Characteristics :

LoTherme-457 produces weld deposits, which display excellent resistance to impact in combination with corrosion. Resistance to scaling is retained up to 850°C. The special features include, soft and stable arc, which is easy to strike and restrike, well rippled smooth weld beads and good slag detachability.

#### Applications :

The balanced chemistry of LoTherme-457 results in high quality welds on a wide range of similar and dissimilar steels, such as joining of austenitic manganese steels to themselves, and to ferritic steels. Other applications include welding of austenitic stainless steel to itself, to other steels and also for welding of heat treatable alloy steels for fabrication welding, maintenance and reclamation of worn-out parts, both for buffer layer and hardfacing in mining, cement, steel, power plant, earth moving machinery, etc.

#### Typical Mechanical Properties Of All Weld Metal :

HARDNESS As Welded : 200 BHN  
Work hardens (under impact) to 500-550 BHN

#### Welding Technique :

Keep the electrodes dry. In case of moisture pick up, redry at 125°C for minimum one hour. Clean the weld area thoroughly free of any foreign matter. Use low current, short arc and stringer beads.

#### Current Conditions : AC/DC (+)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	140-180	120-160	80-110	55-80

## LOTHERME



*Welding heavy joints in Mn Steels : Recommended Electrode LoTherme-457*



*Welding Mn Steels buckets using LoTherme-457*

### LoTherme - 457IVR

Specially developed low heat input electrode for resurfacing rail points and crossings.

Characteristics :

LoTherme-457IVR has been formulated to produce extra tough and crack resistant weld metal. The weld metal exhibits excellent resistance to rolling and sliding friction, abrasion and impact. The weld metal work hardens under impact.

The electrode possesses pleasing operating characteristics and produces smooth, well-rippled weld beads.

Applications :

LoTherme-457IVR has been specially developed for resisting rolling and sliding friction, abrasion and impact service conditions as encountered by rail points and crossings. It is ideally suited for resurfacing rail points and crossings, worn-out rails, etc. in order to enhance the service life. LoTherme-457IVR is recommended for both buffer and surface layers.

Typical Mechanical Properties Of All Weld Metal :

HARDNESS As Welded : 220 BHN  
Work hardens (under impact) to 500-550 BHN

Welding Technique :

Keep the electrodes dry. In case of moisture pick-up, they should be redried at 125°C for minimum one hour. Clean the area thoroughly of all contaminants. Use low current, short arc and stringer beads.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	130-160	90-130	70-90	50-70

APPROVED BY RDSO UNDER H3 CLASS AS SINGLE ELECTRODE.

### LoTherme - 457 S

Special heavy coated electrode for welding and surfacing of austenitic manganese steels

Characteristics :

LoTherme-457S is easily weldable with stable arc, homogeneous, finely rippled bead appearance and gives good slag removal. The fully austenitic weld metal is resistant to rust and scale up to 850°C, work hardening.

Applications :

LoTherme-457S is suited for particularly tough, crack resistant joints and surfacing on steels of higher tensile strength, hard-manganese steel and mixed combinations including heterogeneous joints. Suitable for surfacing on parts subjected to impact, pressure and rolling wear, such as rails curved rails, switches, rolls, etc. an for tough buffer layers under hard alloys. A main application field is for repair and maintenance in the construction industry.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 66 Kgf/mm<sup>2</sup>

HARDNESS : As Welded : 200 BHN

Work Hardened : UP TO 350 BHN

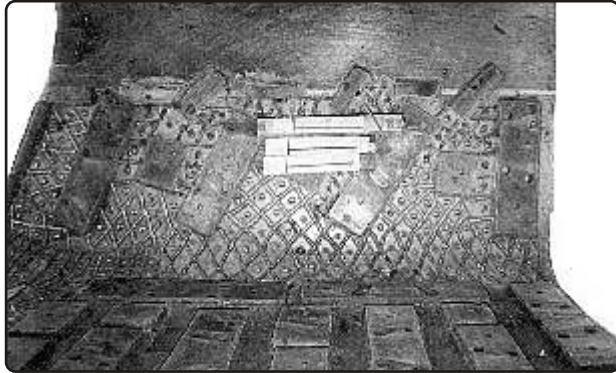
Welding Instructions :

Clean welding area thoroughly. Pre-heating of thick-walled ferritic part to 150-250°C. Hold electrode vertically with a short arc. Re-dry electrodes that have got damp at 250-300°C for 2 hours.

Current Conditions : AC / DC(+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	90-120	70-90

# LOTHERME



*Joining of Mild Steel with Austenitic Manganese Steel  
with our LoTherme-457*

## LoTherme - 458

A versatile electrode for low heat input welding dissimilar steels, and for overlays.

### Characteristics :

LoTherme-458 produces welds of RADIOGRAPHIC quality, resistant to corrosion and scaling at elevated temperatures up to 1050°C. Evenly rippled, extremely smooth weld beads. Soft and stable arc, which is easy to strike and restrike. Good slag detachability.

### Applications :

LoTherme-458 is ideally suited for :

- (1) Welding stainless steel AISI 309 and similar compositions in wrought or cast form ;
- (2) Joining 18/8 stainless steel to mild steel ;
- (3) Welding the clad side of 18/8 stainless steel;
- (4) Applying sheet linings of 12 % Cr or 17% Cr steel to mild steel Shells;
- (5) Overlays on carbon steels and low alloy steels for superior corrosion resistance.

Typical applications include furnace parts and a number of other machinery and equipment.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 57 Kgf/mm<sup>2</sup>  
ELONGATION (L=4d) : 30 %

### Welding Technique :

Keep the electrode dry. Redry moist electrodes at 125°C for one hour. Use low current, short arc length and stringer beads.

Current Conditions : AC/DC (+)

Size(mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range	120-150	90-120	70-90	50-70
(Amps)				

## LoTherme - 458S

All position anstenic stainless steel electrode for joining dissimilar and unknown stainless steel.

Characteristics :

LoTherme-458S is characterized steady & smooth arc, which is easy to strike and restrike. Excellent slag detachability and finely rippled welds beads of radiographic quality. Resistant to corrosion and scaling at elevated temperatures up to 1100°C.

Applications :

LoTherme-458S is ideally suited for : ★ Welding of stainless steel AISI 309 and similar compositions in wrought or cast form.

★ The alloy exhibits excellent resistance high oxidation at high temp. and maintain strength. ★ Overlays on carbon steels and low alloy steels for superior corrosion resistance. Typical applications include furnace parts heat treatment boxes, collar plate.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	: 58 Kgf/mm <sup>2</sup>
ELONGATION (L=4d)	: 30 %

Welding Technique :

Keep the electrodes dry. For best results, redry the electrodes at 150-200oC for one hour before use. Clean the weld area thoroughly free of any foreign matter. Use low current, short arc and stringer beads.

Current Conditions : AC/DC (+)

Size(mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length

Current Range	120-150	90-120	70-90	50-70
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(Amps)

## LoTherme - 464

Low heat input, special purpose stainless steel electrode for stainless steels and steels of dissimilar composition.

### Characteristics :

LoTherme-464 is characterised by a stable arc, which is easy to strike and restrike. Easily removable slag, smooth finely rippled welds of RADIOGRAPHIC quality. The weld metal is fully austenitic in structure and possesses high strength, high ductility, good toughness and creep strength. Resistance to scaling is retained upto 1100°C.

### Applications :

LoTherme-464 is ideally suited for welding of stainless steel AISI 310 to itself and to other steels, straight chromium stainless steels, dissimilar steels, including steels of relatively high hardenability, clad steels, carbon-molybdenum and chromium-molybdenum piping. Some of the typical applications include welding of heat exchangers, heat-treating pots and boxes, furnace parts, etc.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 56 Kgf/mm<sup>2</sup>

### Welding Technique :

Dry the electrode at 125°C for one hour before use. Keep the interpass temperature as low as possible by using low current and low heat input. Use short arc and stringer beads.

### Current Conditions : AC/DC (+)

Size (mm)            5 x 350    4 x 350    3.15 x 350    2.5 x 350

### Dia x Length

Current Range      130-160    90-120    70-100      50-70  
(Amps)

## LoTherme - 464S

Low heat input stainless steel electrode for joining and overlaying of stainless steels to itself and to other steels.

### Characteristics :

A new alloy low temp. stainless steel electrode with excellent slag detachability and finely rippled welds beads of RADIOGRAPHIC quality. The weld metal is fully austenitic in structure and possesses high strength, high ductility, good toughness and creep strength. Resistance to scaling is retained up to 1000°C.

### Applications :

Designed for applications requiring high degree of oxidation resistance. Some of the typical applications include: Furnace parts, anchors, heat exchangers, and parts exposed to high temperature with loading.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 57 Kgf/mm<sup>2</sup>

### Welding Technique :

Keep the electrodes dry. For best results, redry the electrodes at 150-200°C for one hour before use. Clean the weld area thoroughly free of any foreign matter. Keep interpass temperature as low as possible. Use low current, short arc and stringer beads.

### Current Conditions : AC/DC (+)

Size(mm)            5 x 350    4 x 350    3.15 x 350    2.5 x 350

### Dia x Length

Current Range      130-160    90-120    70-100      50-70  
(Amps)

## LoTherme - 467

A "universal" stainless steel electrode for low heat input welding and overlays on most types of stainless, mild, low-alloy and 'special' steels.

### Characteristics :

LoTherme-467 is characterised by quiet and stable arc, which is easy to strike and restrike, finely rippled, smooth weld beads and good slag detachability.

### Applications :

LoTherme-467 is a 'universal' electrode suited for welding all grades of steels where high strength and corrosion resistance in combination with heat resistance are important factors. For welding of straight chromium stainless steel such as AISI 410, and 430 Lotherme-467 is the appropriate electrode.

Typical applications of LoTherme-467 include salvaging pumps, valves and shafts operating at high temperatures. Also suitable for hot dies and overlays on cast iron.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 58 Kgf/mm<sup>2</sup>

ELONGATION (L=4d) : 30 %

### Welding Technique :

For best results dry the electrodes at about 125°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

### Current Conditions : AC/DC (+)

Size (mm) 5 x 350 4 x 350 3.15 x 350 2.5 x 350 2 x 300  
Dia x Length

Current Range 125 - 150 95 - 115 75 - 95 55 - 75 40 - 60  
(Amps)



### LoTherme - 468

A universal low heat input high strength, high alloy electrode for crack-free welds and overlays on steels of widely varying compositions.

#### Characteristics :

LoTherme-468 filler wire and flux material are so chosen that it is highly favourable for producing welds which have complete freedom from hazards of cracking on a wide variety of similar and dissimilar materials including "difficult" steels. It operates equally well on AC as well as on DC(+) in all conventional welding positions. Extremely low spatter. Easily detachable slag. Very smooth weld finish, which takes high polish.

#### Applications :

LoTherme-468 is ideally suited for high strength, crack-free welds and overlays subject to services under wear, friction, impact, heat and corrosion on mild carbon, low alloy, molybdenum-vanadium spring, tool and die, stainless "DIFFICULT" and dissimilar steels. Typical applications include welding on pressure vessels, salt water pipe lines, dies, tools, leaf and coil springs and similar parts and surfacing hot dies, points and crossing, gear teeth, forged shafts, earth moving equipment and machine parts. It is also ideal for use as a buffer layer prior to applying hardfacing alloys. It is suitable for rebuilding in construction and mining industries.

#### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 85 Kg/mm<sup>2</sup>  
 ELONGATION : 22%

#### Welding Technique :

Dry the electrode at about 125°C for one hour before use. Clean the weld area free from oil, grease, dirt or any other surface contamination. Hold a short arc. Do not weave the electrode. Weld with stringer beads. Intermittent welds may be necessary for welding high alloy and hardenable steels. Peening will relieve internal stresses. For certain high alloy tool steels preheating is recommended.

#### Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	125-145	95-115	75-95	55-75



### LoTherme - 468 (SPL)

A special purpose electrode for low heat input welding of austenitic manganese steel.

#### Characteristics :

LoTherme-468 (SPL) produces a weld deposit having excellent crack resistance on a variety of steels particularly austenitic Mn steels. The metal exhibits a pleasing operating characteristics with good slag detachability.

#### Applications :

LoTherme-468 (SPL) is ideally suited for welding of austenitic manganese steel components to themselves and to mild steel. It is also suited for buffer layers on these steels as well as carbon steels. Ideal for joining of manganese steel liners and other austenitic manganese steel components with steel casting to IS:1030 Gr. 230-450W /280-520W or to IS:2062.

#### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 190 BHN

Work hardens under impact upto : 475-525 BHN

#### Welding Technique :

Ensure the electrodes are dry and in case of moisture pick up, redry the electrodes at 250°C for one hour. Ensure cleanliness of the weld area and use short arc, lowest current possible and stringer beads.

#### Current Conditions : AC/DC (+)

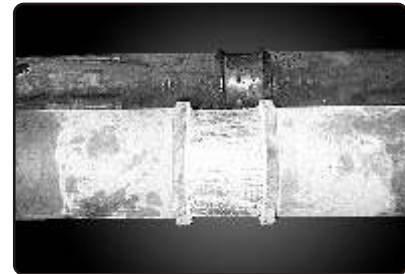
Size(mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150-200	120-150	90-120	60-90



# LOTHERME



*Broken gear being reclaimed with LoTherme-468*



*Broken Shaft Welded with LoTherme-468*

# LOTHERME



*Broken Shaft Welded with LoTherme-468*



*Demonstration in Progress with our LoTherme-468*

# LOTHERME

## LoTherme - 469

A low heat input electrode for crack free, high strength welds on all steels.

### Characteristics :

LoTherme-469 is an ideal low heat input electrode for high strength welds on steels. Pleasing operating characteristics, smooth weld beads, high strength crack resistant weld metal are features associated with this electrode.

### Applications :

Ideally recommended for high strength joints in steels, dissimilar joints in carbon, low alloy steels, dissimilar joints in carbon steels to stainless steels, etc., buffer layers before hardfacing, etc. Typical applications include gears, dies, shafts, earth moving machinery, general machine parts, etc.

### Typical Ultimate Tensile Strength Of Weld Metal :

80 Kg/mm<sup>2</sup>

### Welding Technique :

The electrodes should be dry. Redry the moist electrodes at 125°C for one hour. Use short arc and stringer beads. Use Pre-heating wherever necessary.

### Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x350	2.5 x 350
Dia x Length				
Current Range	120-140	90-110	70-90	50-70
(Amps)				

## LoTherme - 470

A versatile low heat input electrode for crack free welds on a variety of steels

### Characteristics :

LoTherme -470 is a low heat input electrode ideally suited for producing crack free welds on a variety of steels. It operates equally well on AC as well as DC (+) in all conventional positions. Smooth weld beads, extremely low spatter are some of the features associated with this electrode.

### Applications :

Ideal for repair and maintenance welding on a variety of steels; dissimilar joints between carbon, low alloy steels to other steels, stainless steels, etc., surfacing applications; ideal for buffer layers before hardfacing. Ideal for joining and building up of a number of components in earthmoving and mining, thermal power, cement, sugar, general engineering industries.

### Typical Ultimate Tensile Strength Of Weld Metal :

65 Kgf/mm<sup>2</sup>

### Welding Technique :

The electrodes should be dry. Redry if necessary at 125°C for one hour. Clean the weld area of all contaminants. Use short arc stringer beads. Use preheat wherever necessary.

### Current Conditions : AC/DC (+)

Size (mm)      5 x350      4 x 350      3.15x350      2.5 x 350

Dia x Length

Current Range 125-145    95-115    75-95      55 - 75

(Amps)

## LoTherme-483

Low heat input electrode depositing low carbon high Cr - high Ni - Mo -Cu weld metal.

### Characteristics :

LoTherme-483 is a special AC / DC(+) electrode producing a low carbon Cr-Ni-Mo-Cu weld metal which resists Sulfuric acid, Phosphoric acid corrosion environment. It is characterized by quite and stable arc, which is easy to strike and restrike, finely rippled smooth weld beads and good slag detachability.

### Applications:

LoTherme-483 is ideally suited for welding similar composition materials to itself and to other grades of stainless steels.

### Typical Mechanical Properties Of All Weld Metal:

ULTIMATE TENSILE STRENGTH                    : 54 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d)                                : 34 %

### Welding Instructions:

Welding zone must be clean and free from residues, such as grease, paint or metal dust. Use stringer beads, short arc and smallest possible size, which helps in reducing the heat input. The electrodes should be kept dry. In case of moisture pick-up redry the electrodes at 200-250°C for one hour. Stringer beads are welded, weaving no more than twice the diameter of electrode core wire. Use thinnest possible electrode diameter.

### Current Conditions: AC/DC (+)

Size (mm)                    5 x 350    4 x 350    3.15x 350    2.5 x350

Dia x Length

Current Range    130-160    90-130    70-90      50-70

(Amps)

## LoTherme - 485

Low-carbon, fully austenitic electrode coated as mixed type. High corrosion resistance.

### Characteristics :

LoTherme-485 distinguishes itself particularly by resistance to tension cracks and pitting in media containing chloride ions. Like the base material 1.4539 this alloy has remarkably high corrosion resistance against phosphoric acid and exhibits very low excavation rates in sulphuric media. The electrode can be welded in all positions, except vertical down. It has a stable arc. Easy and thorough slag removal. The seam has a finely rippled, smooth and regular structure.

### Applications :

LoTherme-485 electrode for joining and surfacing of base materials of the same and of similar nature.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 54 Kgf/mm<sup>2</sup>  
 ELONGATION (L=4d) : 31 %

### Welding Instructions :

Welding zone must be clean and free from residues, such as grease, paint or metal dust. Stringer beads are welded, weaving no more than twice the diameter of electrode core wire. Use thinnest possible electrode diameter.

### Current Conditions : AC / DC(+)

Size (mm)    5 x 350    4 x 350    3.15 x 350    2.5 x 350

Dia x Length

Current Range    160-200    120-160    80-120    60-90

(Amps)

# LOTHERME



## Electrodes for Nickel, Nickel Alloys, Monel & Dissimilar Metals



# LOTHERME

## LoTherme - 510

Low heat input "universal" electrode for welding nickel base alloys and dissimilar metals.

Characteristics :

LoTherme-510 is a special purpose, specially formulated, hydrogen controlled electrode producing high quality nickel alloy deposits. The electrode is designed to operate on DC reverse polarity. Good weld finish. Steady arc, which is easy to strike and restrike. The weld metal displays good impact strength. Down to minimum 252°C.

Applications :

LoTherme-510 is a universal electrode designed for welding Ni-Cr-Fe alloy to itself, for welding clad side of Ni-Cr-Fe clad steel, and for surfacing steels with Ni-Cr-Fe alloy. It may be used for welding of dissimilar combination of high-nickel alloys. LoTherme -510 is also suitable for welding of heating elements like Nichrome, etc.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	58 Kg/mm <sup>2</sup>
ELONGATION (L=4d)	:	30 %

Welding Technique :

Ensure that the electrodes are dry. In the event of moisture pick-up, dry the electrodes at 250°C for one hour before use. Clean the weld area free of rust, oil, grease, paint, or any other surface contamination. Use short arc and stringer bead technique. Wherever possible, weld in flat position.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150 - 190	110-150	70-100	55-80

## LoTherme - 510 N

Electrodes for reactor grade materials

Characteristics :

LoTherme-510 N producing high quality Nickel alloy deposits. It operates in all conventional positions. Good weld finish, steady arc, and good slag remove-ability.

Applications :

LoTherme-510 N is designed for joining and surfacing of Nickel-base materials. It is recommended for welding different materials, such as austenitic to ferrite steels, as well as for cladding on unalloyed and low-alloyed steels.

Typical Mechanical Properties Of All Weld Metal:

ULTIMATE TENSILE STRENGTH : 65 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d) : 38 %

CVN IMPACT STRENGTH

AT ROOM TEMPERATURE : 90 Joules

AT (-) 196°C : 55 Joules

HARDNESS : 170 BHN

Welding Instructions :

Ensure that the electrodes are dry. In case of moisture pick-up, dry the electrodes at 250°C for 2 hours before use. Clean the weld area free of rust, oil, grease, paint, or any other surface contamination. To ensure minimal heat input, use short arc and stringer bead technique

Current Conditions : Dc (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	140-180	100-140	70-95	50-70

## LoTherme - 511

Low heat input electrode for welding Ni-Cr-Fe alloys and dissimilar metals.

Characteristics :

LoTherme -511 is a low heat input electrode yielding a high nickel-chromium-iron alloy deposit. The electrode is designed to operate on DC reverse polarity. It gives a steady and smooth arc, which is easy to strike and restrike. The beads display a good surface finish. The weld metal has exceptional impact strength.

Applications :

LoTherme-511 is used for the following applications :

- 1) For welding Ni- Cr- Fe alloys :
- 2) For welding dissimilar metal joints involving carbon steels, stainless steels, nickel- base alloys and pure nickel:
- 3) For surfacing steels with Ni-Cr-Fe alloys.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 58 Kgf/mm<sup>2</sup>

ELONGATION (L=4d) : 30 %

Welding Technique :

Ensure that the electrodes are dry. In the event of moisture pick-up, dry the electrodes at 250°C for one hour before use. Clean the weld area free of rust, oil, grease, paint or any other surface contamination. Use short arc and stringer bead technique. Wherever possible, weld in flat position.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150 -190	110-150	70-100	55-80

## LoTherme - 511 N

Electrodes for high temperature applications

Characteristics :

LoTherme-511N is operates in all conventional positions. Good weld finish, steady arc, and good slag remove-ability. The weld deposit is hot cracking resistant and does not tend to embrittlement. The weld metal working significantly after more than 10,000 hours at temperature up to 850°C

Applications :

LoTherme-511N is used for joining heat resistant Ni Cr Fe alloys, heat resistant austenitic steels, heat resistant austenitic ferrite materials, etc.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 67 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d) : 40 %

CVN IMPACT STRENGTH

AT ROOM TEMPERATURE : 92 Joules

AT (-) 196°C : 60 Joules

HARDNESS : 165 BHN

Welding Instructions :

Ensure that the electrodes are dry. In case of moisture pick-up, dry the electrodes at 250°C for 2 hours before use. Clean the weld area free of rust, oil, grease, paint, or any other surface contamination. To ensure minimal heat input, use short arc and stringer bead technique

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length				
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Current Range	140-180	100-140	70-95	50-70
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(Amps)				
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## LoTherme - 512

Low heat input electrode for high strength and corrosion resistant welds on monel and other Ni-Cu alloys.

Characteristics :

LoTherme -512 is a hydrogen controlled, direct current, reverse polarity, low heat input welding electrode. Soft and steady arc, which is easy to strike and restrike. Good weld finish. Good slag detachability. Versatile in applications for maintenance welding.

Applications :

LoTherme-512 electrode core wire and flux formulation are so balanced as to make it a versatile electrode for welding of monel to monel, to other Ni-Cu alloys; Ni-Cu alloys to themselves, Ni-Cu Alloys to steels, the clad side of Ni-Cu clad steel and for surfacing steel parts for service against corrosion by sea water, chlorinated solvents, sulphuric acid and alkalis. Ideal for power plants, chemical, food, dairy and oil refining industries.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 57 Kgf/mm<sup>2</sup>

ELONGATION (L=4d) : 30 %

Welding Technique :

The electrode should be stored dry. In case of moisture pick-up, redry them to 250°C for one hour before use. Clean the weld area free of surface contamination of any form. Use short arc and weld with stringer beads. Wherever possible weld in flat position.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350	2 x 300
-----------	---------	---------	------------	-----------	---------

Dia x Length					
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Current Range	140-170	105-135	70-100	50-70	35-50
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(Amps)					
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## LoTherme - 513

Low heat input electrode depositing practically pure nickel.

Characteristics :

LoTherme-513 is a special purpose electrode, versatile in applications in the field of fabrication and maintenance welding of machinery and equipment. It is meant for use with DC reverse polarity in all conventional positions. Finely rippled even weld beads. Stable arc, which is also easy to strike and restrike. Good slag detachability.

Applications :

LoTherme-513 is so designed as to deposit practically pure nickel. It is highly useful for welding nickel in wrought and cast forms, pure nickel to themselves and for joining nickel to steels, for surfacing carbon and low-alloy steels. It is an ideal electrode for building up worn out or missing sections, repairing defects and cladding mild steel for chemical, food, dairy and oil refining industries. It is also ideal for overlays on parts used for caustic soda service.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 43 Kgf/mm<sup>2</sup>  
 ELONGATION (L=4d) : 22 %

Welding Technique :

Dry the electrode at 250°C for one hour before use. Clean the weld area free of any surface contamination. Use DC reverse polarity, short arc, stringer beads. Control the heat input to as low a level as possible by allowing the weld to cool before depositing subsequent passes. Wherever possible, weld in flat position.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15x350	2.5 x 350
Dia x Length				
Current Range (Amps)	140-170	110-140	80-110	55-75

## LoTherme - 514

Outstanding low heat input electrode for welding Ni-Cr-Mo alloys and for surfacing applications.

Characteristics :

LoTherme-514 electrode is specially developed to produce high nickel deposit containing carefully controlled quantities of chromium, molybdenum and tungsten. The welds are

Characterised By :

1. Excellent heat resistance, strength and toughness upto about 1000°C
2. High resistance to corrosion by most types of acids or their Combinations.
3. Good thermal shock resistance.
4. Good machinability.

Applications :

LoTherme-514 is ideally suited for welding Ni-Cr-Mo alloys to themselves, to other metals and for surfacing steel with Ni-Cr-Mo deposit. Applications in this category include valves, pumps, etc. The weld deposit work hardens under impact to approx. 400 BHN. The weld metal retains hardness at elevated temperature and also possesses resistance to repeated thermal shocks. LoTherme-514 is thus highly suited for hot working tools, e.g. shear blades, forging dies, hot trimming dies, heating elements, etc.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 70 Kgf/mm<sup>2</sup>  
 ELONGATION (L=4d) : 28 %

WORK HARDENS UNDER IMPACT TO 400 BHN

Welding Technique :

Dry the electrode at 250°C for one hour before use. Use low current, short arc and stringer beads. Wherever possible weld in flat position.

Current Conditions : DC (+)

Size (mm)	5 x350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	170-210	130-170	90-130	70-100



## LoTherme - 515 N

Corrosion resistance electrode with high Nickel content

Characteristics :

LoTherme-515N electrode is weldable in all positions, except vertical down. Stable arc, good slag remove-ability. The seam is finely rippled and notch-free. It gives a fully austenitic weld metal without hot cracks, not prone to embrittlement either at high or low temperatures.

Applications :

LoTherme-515N is recommended for cold-tough steels up to 9% Ni and working temperatures down to minus 196°C, particularly where the welded joint has to undergo hot deformation or stress relieving. Cold tough austenitic Cr - Ni steels can also be welded with LoTherme-515N. This electrode is also suitable for joining different materials, such as austenitic to ferritic stainless steel, steels to Nickel alloys and steels to Copper alloys.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	: 63 Kgf/mm <sup>2</sup>
ELONGATION (L = 4d)	: 35 %
CVN IMPACT STRENGTH	
AT ROOM TEMPERATURE	: 80 Joules
AT (-) 196°C	: 65 Joules

Welding Instructions :

Ensure that the electrodes are dry. In case of moisture pick-up, dry the electrodes at 250°C for 2 hours before use. Clean the weld area free of rust, oil, grease, paint, or any other surface contamination. To ensure minimal heat input, use short arc and stringer bead technique.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

## LoTherme - 516 N

High scale resistant electrode with high Nickel content for high temperature applications

Characteristics :

LoTherme-516N has excellent welding properties, a regular and finely rippled bead appearance due to spray arc. Very easy slag removal. The weld deposit is highly corrosion resistant, scale resistant and work hardening. Machinable with cutting tools. Resistance to hot cracking for service temperature up to 1100°C.

Applications :

LoTherme-516N electrode for joining and surfacing high-temperature alloys. Special applications are in oxidizing media at high temperatures, especially for the construction of gas turbines, combustion chambers and ethylene production plants.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	: 73 Kgf/mm <sup>2</sup>
ELONGATION (L = 4d)	: 32 %
CVN IMPACT STRENGTH	
AT ROOM TEMPERATURE	: 90 Joules

Welding Instructions :

Ensure that the electrodes are dry. In case of moisture pick-up, dry the electrodes at 250°C for 2 hours before use. Clean the weld area free of rust, oil, grease, paint, or any other surface contamination. To ensure minimal heat input, use short arc and stringer bead technique.

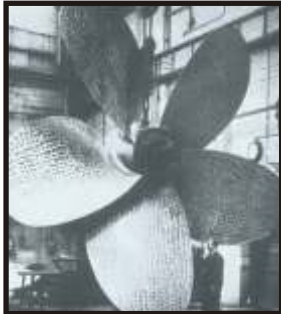
Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

# LOTHERME



## Electrodes for Copper & Copper Alloys



# LOTHERME

## LoTherme - 532

Tin-bronze electrodes with 7% tin

### Characteristics :

LoTherme-532 is distinguished by good welding properties. With steady arc and low spatter losses it gives dense, pore-less seams. The slag is easily removed.

### Applications :

LoTherme-532 for joining copper and copper alloys, phosphorus and tin-bronzes as well as copper-clad plates in mechanical and plant engineering and ship building. For surfacing on copper and copper alloys, phosphorus and tin-bronzes.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	: 32 Kgf/mm <sup>2</sup>
ELONGATION (L = 4d)	: 30 %

### Welding Instructions :

Seam preparation with large V angle (80-90°). Electrode guided vertical, arc 3-4 mm. Only work-pieces more than 5 mm need preheating up to 100-250°C. Bronze castings must be cooled slowly. Electrodes that have got damp must be dried 2 to 3 hours at 150°C.

### Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	130-160	100-130	80-100	60-90

## LoTherme - 533

Tin-bronze electrodes with 7% tin

### Characteristics :

LoTherme-533 is distinguished by good welding properties. With steady arc and low spatter losses it gives dense, pore-less seams. The slag is easily removed.

### Applications :

LoTherme-533 for joining copper and copper alloys, phosphorus and tin-bronzes as well as copper-clad plates in mechanical and plant engineering and ship building. For surfacing on copper and copper alloys, phosphorus and tin-bronzes.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 32 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d) : 30 %

### Welding Instructions :

Seam preparation with large V angle (80-90°). Electrode guided vertical, arc 3-4 mm. Only work-pieces more than 5 mm need preheating up to 100-250°C. Bronze castings must be cooled slowly. Electrodes that have got damp must be dried 2 to 3 hours at 150°C.

### Current Conditions : AC

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

## LoTherme - 534

Aluminium Bronze electrode for sea water corrosion

### Characteristics :

LoTherme-534 possesses outstanding welding properties and can be used in all positions, except vertical down. The weld metal displays high mechanical properties and is tough, pore-less and not prone to cracking.

### Applications :

LoTherme-534 is used for joining and surfacing on aluminium-bronzes (up to 10% Al), copper and copper alloys as well as surfacing on steel, cast steel and cast iron. It is also suitable for welding pipe cavities in new aluminium-bronze castings. Its corrosion resistance allows it to be used on marine propellers, acid pumps and fittings.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH : 46 Kgf/mm<sup>2</sup>

ELONGATION (L = 4d) : 20 %

### Welding Instructions :

Clean the weld zone thoroughly. Wall thickness in excess of 5 mm must be grooved out with a 90°V. Bigger work-pieces are preheated to about 150-250°C. To avoid overheating, guide the electrode vertically at high welding speed. Use only dry electrodes. Electrodes that have got damp must be dried 2 to 3 hours at 150°C.

### Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

### LoTherme - 535

Complex aluminium-bronze electrode with high mechanical properties and sea water resistant

Characteristics :

LoTherme-535 possesses outstanding welding properties and can be used in all positions, except vertical down. The weld metal displays high mechanical properties and is tough, pore-less and not prone to cracking.

Applications :

LoTherme-535 is used for joining and surfacing on complex aluminium-bronzes, especially those with high Mn, as well as steel and grey cast iron. It is also eminently suited for shipbuilding (marine propellers, pumps and fittings) and in the chemical industry (valves, pumps) where chemical attack is accompanied by erosion. Its favorable coefficient of friction makes it ideal for surfacing on shafts, sliding surfaces, bearings, punches and dies of all kinds.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	: 66 Kgf/mm <sup>2</sup>
ELONGATION (L = 4d)	: 25 %

Welding Instructions :

Clean the weld zone thoroughly. Wall thickness in excess of 5 mm must be grooved out with a 90°V. Bigger work-pieces are preheated to about 150-250°C. To avoid overheating, guide the electrode vertically at high welding speed. Use only dry electrodes. Electrodes that have got damp must be dried 2 to 3 hours at 150°C.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

## LOTHERME



## Electrodes for Surfacing, Overlay & Hardfacing Applications



### HARDFACING OF MATERIALS

The components in service are subjected to different types of wear namely friction, abrasion, impact, etc., which cause the material wear and render them unsuitable for service. The components are normally hardfaced by depositing a suitable weld metal, which will resist the type of wear encountered in service. It is needless to emphasize here that depending on the type of wear, the weld metal will have to be selected. Let us consider the hardfacing of various materials to resist different types of wear.

The frictional wear which is encountered in rollers, drives, bearings, gears, etc., is due to the movement of the metallic surface over the other. The resistance to this type of wear can be achieved by hardfacing the component with a weld metal with LoTherme-601. This weld metal will be an air hardening type and the hardness will be in the range of 250 to 350 VPN. This weld metal will have considerable toughness also and resist impact forces, which occur in service. The use of LoTherme-603 can be made for applications, which involve abrasion and heavy impact.

To resist heavy abrasion, the chromium carbide type weld metals are preferred. LoTherme-604, LoTherme-611 are ideal weld metals suited for resisting heavy abrasion. The weld metals of LoTherme-605 and LoTherme-613 are suited for resisting heavy abrasion in combination with high temperature. The typical service conditions in which these weld metals are suitable are indicated in the individual literature.

In hardfacing, it is necessary to understand the phenomena that occur during welding known as dilution.

#### DILUTION

Dilution is defined as the percentage of base material in the weld metal. When a weld metal is deposited on the base material, it

mingles with the base material and the resultant weld metal is of an intermediate composition. In all maintenance welding applications the dilution effect should be taken into consideration.

Normally in manual metal arc welding this dilution can be expected to be around 30 % which means, the deposited weld metal will have 70 % of weld metal and 30 % of base material.

FOR EXAMPLE IF WE CONSIDER THE FOLLOWING :

Base material : A1 + B1 + C1 + etc.

Weld metal : A2 + B2 + C2+ etc.

Where A, B, C are different elements

Resultant deposited weld metal :

For A : (0.7A2 + 0.3A1)

B : (0.7B2 + 0.3B1) and so on.

The practical consequence of this dilution effect can be observed as follows :

- 1) When a hardfacing deposit is made on mild steel, the first layer may get diluted with the base material and therefore may not give the required hardness in the first layer.
- 2) When depositing a hardfacing deposit (which is normally air hardening and has higher hardenability) on a high carbon material, the weld metal can pick up carbon from the base material, and on solidification the weld metal may crack because of the formation of brittle structures. In such cases, it is preferred to have a ductile weld metal deposition, which can, even with the carbon pickup from the base material, retain sufficient ductility to produce crack free weld metal. These are known as buffer layer or cushioning layers.

Hardfacing of austenitic manganese steel is one of the commonly practised maintenance welding jobs in industries like, cement plants, thermal power plants, mining and earthmoving industries.

### HARDFACING OF AUSTENITIC MANGANESE STEELS

These steels also known as 'Hadfield steels' find wide range of applications in cement units. These steels contain about 11-14 % Mn and because of the presence of this element, these steels are rendered austenitic in structure at room temperature. These steels have the property of work hardening and therefore are used for services where impact loads are involved. Some of the components of austenitic manganese steels are crusher jaws, crusher rolls, crusher hammers, etc.

When these austenitic manganese steels are heated, because of the precipitation of carbides on the grain boundaries, the steel gets embrittled. Therefore, it is essential that during welding, the heat input is restricted to the minimum. In general, it is not recommended to heat this material to above 310°C (and during welding the interpass temperature should never be more than 100°C). It is advisable to keep a portion of the casting immersed in water during welding so that the heat is dissipated fast and precipitation of brittle phases is avoided.

Since these types of steels will not be subjected to any further heat treatment after welding, care should be exercised to see that the properties of the base material are not hampered because of welding.

Reclamation of austenitic manganese steel component calls for detailed welding procedures and use of appropriate welding electrodes so that best service life can be obtained. Normally, the build-up can be done using LoTherme-607. However, on work hardened surfaces it is preferable to have a single layer deposition of LoTherme-610. After sufficient build-up using LoTherme-607 the top two layers should be made with LoTherme-603/604/605 depending on the type of wear to which this component will be subjected to in service.

The deposition of the air hardening deposit will help in reducing the initial wear of the components. By the time air hardened layers wear out, the austenitic manganese steel deposit below, would have work hardened and resist wear subsequently.

As detailed earlier, while hardfacing austenitic manganese steels, care should be taken to restrict the heat input to a minimum and overheating of the casting should be avoided by using:

- 1) The minimum possible current and the lowest possible size of the electrode.
- 2) Keeping the component immersed in water and maintaining a low interpass temperature in such a way that the component is warm to touch.
- 3) Using small stringer beads and adopting intermittent and sequential welding techniques.

Apart from this, a number of hardfacing applications are encountered in various industries. By analyzing the service and the hardness requirements of the actual job, one can select the appropriate electrode.

## LoTherme - 600

Co-Cr-W-alloy surfacing resisting heat and wear

Characteristics :

LoTherme-600 welds well in the horizontal position. Soft arc, smooth seam surface. It still retains great hardness at high temperatures, even at red heat, and recovers its original hardness after cooling.

Applications :

LoTherme-600 is the hardest of the cobalt-containing alloys and is used mainly for severe friction wear, erosion and corrosion. It is very resistant to sliding stressing metal-to-metal, and is therefore recommended for pump bushes, screw conveyors, wear rings, guide rails, cutters, rolls and wire guide pulleys.

Weld Metal Hardness :

AT ROOM TEMPERATURE	: 52-57 RC
AT 600°C	: 42 RC

Welding Instructions :

Clean the weld zone of rust, scale and grease. Bigger work pieces are preheated to about 300°C. Keep the amperage as low as possible, so as to fuse the parent metal as little as possible. Guide the electrode vertically, keeping the arc short. Weave only slightly. Cool slowly in an oven or under asbestos. Machinable only by grinding.

Current Conditions : AC / DC (+)

Size (mm)      5 x 350      4 x 350      3.15 x 350      2.5 x 350

Dia x Length

Current Range    160-200    120-160    80-120      60-90

(Amps)

Available in Filler Rod form also.

## LoTherme - 601

Low heat input electrode for machinable overlays on all ferrous metals

Characteristics :

LoTherme-601 is characterized by a soft and stable arc, which is easy to strike and restrike, smooth, crack free welds, good slag detachability.

The deposited weld metal has a high degree of toughness, excellent resistance to rolling and sliding friction and heavy impact loads.

Applications :

LoTherme-601 is a versatile electrode for hardfacing, overlay and inlay applications on all ferrous metals, components, machine parts requiring moderate hardness in combination with good machinability, such as tractor sprockets, gears, shafts, axles, pinion teeth, concrete and pan mixer blades, ropeway and tram car rails, and wheels, points and crossing, crane wheels, ropeway trolley wheels.

Weld Metal Hardness : 250-325 BHN

Welding Technique :

Clean the weld area. Use low current and a short arc length. Avoid weaving of the electrode. While surfacing on medium and high carbon steels, use LoTherme-352 for buffer layers in order to avoid chances of cracking. For surfacing on heavy sections and materials high in carbon, pre-heating of the part may be necessary.

Current Conditions : AC/DC(+)

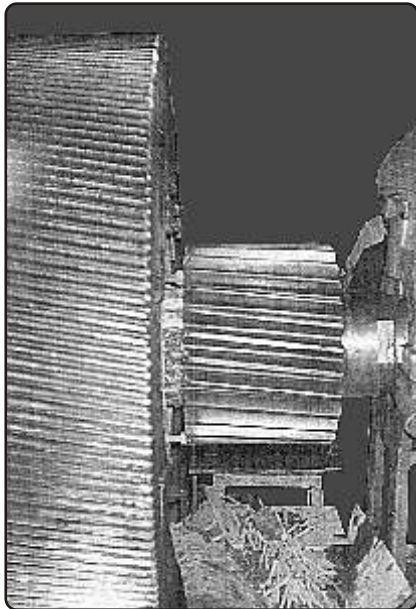
Size (mm)      5 x 350      4 x 350      3.15 x 350      2.5 x 350

Dia x Length

Current Range    150-250    120-160    95-120      60-90

(Amps)

# LOTHERME



***Gear Teeth built up with LoTherme-601***

## LoTherme - 602

AC-DC , Low heat input electrode for moderately hard deposit on ferrous metals

### Characteristics :

LoTherme-602 is characterised by a stable arc, which is easy to strike and restrike, good slag detachability and weld beads of fine appearance. It operates equally well on AC as well as DC in all conventional positions.

### Applications :

LoTherme-602 is ideally suited for a number of applications, which demand good abrasion resistance, combined with fairly high degree of toughness. It can be used on mild steel, carbon steel, low alloy steels, etc., where hardness of 350-400 BHN is required. Some of the typical applications include gears, shafts, crane wheels, brake shoes, forging dies, drive sprockets, conveyor parts, cold punching dies, rail ends, log wheels, ploughshares, wobblers, etc.

Weld Metal Hardness : 350-400 BHN.

### Welding Technique :

The electrode should be stored dry. In case of moisture pick-up, ready at 150°C for one hour before use. Use low current and short arc. Avoid excessive weaving. For base materials with carbon content of 0.3% and above, use buffer layers with LoTherme-352 before surfacing.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	150-180	120-150	95-120	55-75



## LoTherme - 603

AC-DC, Low heat input versatile electrode for hard surfacing of widely varying machine parts and components.

### Characteristics :

LoTherme-603 a hard surfacing electrode, operates well in all conventional positions. The deposited weld metal has exceptional abrasion and wear resistance in combination with resistance to heavy impact. Evenly rippled, porosity free weld deposits permit heavy build-up without danger of cracking. In most cases LoTherme-603 can be used direct on the job without the necessity of depositing buffer layers.

### Applications :

LoTherme-603 core wire and flux formulation are so chosen as to make the electrode versatile in terms of surfacing applications on a large variety of machine parts, equipment, etc. Typical applications include surfacing chipper knives, conveyor bucket lips, shear blades, shovels dredger and elevator bucket lips rock crushers, rock drills, tractor grousers and paddlers. In crushing applications, LoTherme-603 is recommended as the final layer on 14 % manganese weld deposit to reduce the initial wear.

### Weld Metal Hardness :

52-62 RC

### Welding Technique :

Ensure that the electrodes are perfectly dry before use. In case of moisture pick-up, redry the electrodes at 200°C for one hour before use. Clean the weld area free of any surface contamination. Use AC or DC(+). Hold a short arc length and weld with stringer beads.

### Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350
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Dia x Length

Current Range (Amps)	150-180	120-160	95-120
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# LOTHERME



*Hammer welding using LoTherme-607 & LoTherme-603*

## LoTherme - 603 R

Rutile coated electrode for wear resistant surfacing on cold and hot working tools

### Characteristics :

LoTherme-603R has excellent welding properties, a homogeneous, finely rippled bead appearance due to the spray arc and very easy slag removal. This electrode is weldable with very low amperage settings (advantage for edge buildup).

### Applications :

LoTherme-603R is used for wear resistant buildups on cold and hot working tools, particularly for cutting edges on hot cutting tools, hot-shear blades, trimming tools and cold cutting knives. The production of new cutting tools by welding on non-alloy or low-alloy base materials is also possible.

Weld Metal Hardness : 55 60 RC

### Welding Instructions :

Preheat high-alloy tool steels to 400-450°C and maintain this temperature during the whole welding process. Hold electrode vertically with a short arc and lowest possible amperage setting. Machining only by grinding. Re-dry electrodes that have got damp for 2 hours at 300°C.

Current Conditions : AC / DC (±)

Size (mm)	5 x 350	4 x 350	3.15 x350	2.5 x 350
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Dia x Length

Current Range	150-180	110-150	80-110	60-90
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(Amps)

## LoTherme - 604

Unique low heat electrode for overlays on machine parts and components subject to high abrasion and moderate impact.

### Characteristics :

LoTherme-604 yields hard and tough deposits, which have excellent resistance to abrasion in combination with high friction, moderate impact.

### Applications :

LoTherme-604 is ideally suited for surfacing machine parts subject to high stress grinding abrasion as also grouping abrasion on carbon steels, manganese steels, malleable iron and air hardenable alloy steels. Typical applications for abrasion resistance include excavator teeth, ploughshares, cultivators, impellers, excavator buckets, bucket teeth, cams, fan blades, exhaust blades, scraper bars, dredger buckets and oil expeller worms. LoTherme-604 is also well suited for coal crushing applications such as mill hammers, pulverizers and cement grinder rings.

Weld Metal Hardness :  
56-62 RC

### Welding Technique :

Redry the electrodes at 250°C for one hour before use. Clean the weld area. Use short arc and avoid weaving of the electrode. While surfacing medium and high carbon steels use LoTherme-352 for buffer layers to avoid chances of cracking. Do not use more than two layers of LoTherme-604 at a time. For a heavy build-up, deposit two layers of LoTherme-604, then a cushion layer of LoTherme-352 or LoTherme 607 followed by two layers of LoTherme-604 and so on.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15x350	2.5x350
-----------	---------	---------	----------	---------

Dia x Length

Current Range	165-190	120-160	90-120	70-90
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(Amps)

# LOTHERME



*Dozer Blade hardfacing with LoTherme-604*

## LoTherme - 605

Low heat input hard surfacing electrode producing weld with exceptionally high resistance to abrasion at room temperature as well as at elevated temperatures.

Characteristics :

LoTherme-605 is specially designed for hardfacing applications on machine parts subject to severe erosion, abrasion and moderate impact.

Applications :

LoTherme-605 is ideally suited for surfacing applications where resistance to erosion, heavy abrasion with moderate impact, specially at elevated temperatures are important factors. The weld metal retains hardness up to 550°C and resists scaling up to 1000°C. Typical applications include : press screws, conveyor screws, dredger, bucket teeth and lips, tube mill and rolling mill guides, wire straightening rolls, agricultural machinery, boring tools, pug mill knife.

Weld Metal Hardness : 58-62 HRC.

Welding Technique :

Redry the electrodes at 250°C for an hour before use. Clean the weld area. Allow each bead to cool down before depositing subsequent beads. While surfacing medium and high carbon steels use LoTherme-352 for buffer layers to avoid chances of cracking. Do not use more than two layers of LoTherme -605 at a time. For heavy build-up alternate LoTherme-352 or LoTherme-607 with two layer deposits of LoTherme-605.

Current Conditions : AC/DC(+)

Size (mm)            5 x 350    4 x 350    3.15 x 350    2.5 x 350

Dia x Length

Current Range    155-180    120-150    90-120            65 -85

(Amps)

## LoTherme- 606

Co-Cr-W-alloy hardfacing resisting impact and wear

Characteristics :

LoTherme-606 welds well in the horizontal position. Soft arc, smooth seam surface. High resistance to impact, corrosion and hardness at elevated temperature under alternating temperatures stressing.

Applications :

LoTherme-606 is used primarily on work-pieces exposed to high alternating temperatures and corrosion. Specific applications: valves and valve seats, sealing surfaces, hot shear blades, hot pressing tools, forging de-burrers, wire mill rolls and beaters for coke combustion.

Weld Metal Hardness :

AT ROOM TEMPERATURE	: 40 - 43 RC
AT 600°C	: 33 RC

Welding Instructions :

Clean the weld zone of rust, scale and grease. Bigger work pieces are preheated to about 300°C. Keep the amperage as low as possible, so as to fuse the parent metal as little as possible. Guide the electrode vertically, keeping the arc short. Weave only slightly. Cool slowly in an oven or under asbestos. Machinable with tungsten carbide tools.

Current Conditions : AC / DC (+)

Size (mm)	5 x 350	4 x 350	3.5 x 350	2.5 x 350
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Dia x Length

Current Range	160-200	120-160	80-120	60-90
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(Amps)

Filler Wire Available.

## LoTherme - 607

Versatile low heat input welding and surfacing electrode producing a weld metal highly resistant to cracking, heavy impact, metal-to metal wear and deformation.

Characteristics :

LoTherme-607 is characterised by excellent performance in all conventional positions, soft and stable arc which is easy to strike and restrike, good slag detachability and well rippled, uniform weld beads.

The electrode produces a unique weld metal chemistry and set of physical and mechanical properties which are highly favorable for obtaining crack free weld deposits having outstanding resistance to heavy impact, metal-to-metal wear and plastic deformation.

Applications :

LoTherme-607 is ideally suited for use on austenitic manganese steels. Typical applications include surfacing and building up of broken or worn out manganese steel parts such as jaw and roll crushers, crusher hammers, excavator bucket teeth and lips, dredger buckets, dipper teeth, rail road trucks, frogs and switches and similar machine parts and components subject to heavy impact and high stresses.

Weld Metal Hardness :

160-200	BHN (As welded)
49-53	HRC (Work hardens under impact )

Welding Technique :

Dry electrodes at 250°C for one hour. Clean the weld area. Use low current, short arc, short and stringer beads. For joining or resurfacing of austenitic manganese steel, ensure that the interpass temperature dose not exceed 100°C.

Current Conditions : AC / DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length

Current Range	150 -180	100-140	80-110	50-80
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(Amps)

# LOTHERME



*Hardfacing Mn steel tooth points with  
LoTherme-607 & LoTherme-604*



*Reclamation of Mn Steel tooth points with  
LoTherme-607 & LoTherme-604*

## LoTherme - 608

Versatile low heat input electrode for hardfacing and overlay applications on high speed steels and tool steels.

Characteristics :

LoTherme-608 is a versatile electrode for surfacing, inlay, overlay and hardfacing of a variety of machine tools and components for prolonged service life. The weld deposits are highly resistant to wear and retain hardness and toughness up to 600°C . This special feature enables the weld metal to retain its cutting edge and hardness even at elevated temperatures. Use of LoTherme-468 may be necessary as buffer layer on tool steels.

Applications :

LoTherme-608 has been specially designed for surfacing cutting tools, dies, punches, bamboo chipper knives, paper cutting knives, shearing blades, boring tools, and large number of other machine tools requiring high speed steel type deposit of appropriate hardness.

Weld Metal Hardness : 56-60 RC

Welding Technique :

Keep the electrodes dry. In case of moisture pick-up, redry at 250°C for one hour before use. Clean the weld area free of any surface-contamination.

Pre- heating of hardenable steels, complicated parts and heavy sections at 200-300°C may be necessary depending upon the size and type of the job.

Current Conditions : AC / DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160- 200	130-160	90-120	60- 90

## LoTherme - 610

An outstanding, low heat input electrode for hardfacing and applying buffer and cushion layers on a wide variety of austenitic manganese steel components.

### Characteristics :

LoTherme-610 yields a weld metal, which has high toughness and abrasion resistance in combination with excellent resistance to deformation and cracking. Ideally suited for depositing buffer layers on hard austenitic manganese steel surface.

### Applications :

LoTherme-610 is ideally suited for hardfacing, overlay, buffer, and cushion layer applications on a variety of components on mild steel, carbon steel, low alloy steel and austenitic manganese steel. Typical applications include surfacing mining machinery, dredging equipment, excavator parts, mill hammers, cement mill air rings, crusher hammers, roll crusher, muller tyres, shovel tracks, coal mining cutters, tractor grousers, dipper teeth, sand pump impellers, valve seats, etc.

Weld Metal Hardness : 185-240 BHN (As welded)

Work hardens under impact to : 500-550 BHN

### Welding Technique :

For best results, dry electrodes at 250°C for one hour before use. Clean weld surface thoroughly free of any surface contamination. Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				

Current Range (Amps)	150-180	100-130	80-100	50-70
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# LOTHERME



***Buffer layers on work hardened Manganese steels :  
Recommended electrode LoTherme-610***

## LoTherme - 611

Low heat input, versatile, hardfacing electrode having excellent resistance to abrasion accompanied by mild impact.

### Characteristics :

LoTherme-611 is a versatile low heat input electrode producing a weld metal having exceptional resistance to heavy abrasion and metal-to-metal wear in combination with high compressive load and moderate impact even at temperatures up to 500°C. Soft and stable arc, which is easy to strike and restrike, easily detachable slag and smooth, regular weld bead are some of the pleasant features associated with the electrode.

### Applications :

LoTherme-611 is ideally suited for hardfacing parts and components subject to heavy abrasion, erosion, metal-to-metal wear and moderately heavy impact. Typical applications include air rings, conveyor screws, dredger buckets, shovels, impellers, mill hammers, mixer blades, muller ploughs, dipper teeth, I.D. fans, etc. in steel mills, construction and earth moving machinery, power plants and cement industry.

Weld Metal Hardness : 58 - 63 RC

### Welding Technique :

Ready electrode at 250°C for one hour before use. Clean weld surface free of all surface contamination .Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)      5 x 350    4 x 350    3.15 x 350    2.5 x 350

Dia x Length

Current Range    150-180    120-150    90-120      60-80

(Amps)

## LoTherme - 612

Co-Cr-W alloy hardfacing resisting heat, corrosion and wear.

### Characteristics :

LoTherme-612 welds well in the horizontal position. Soft arc, smooth seam surface. Very high resistance to combined abrasion and impact stressing under high temperatures. Corrosion-resistant.

### Applications :

LoTherme-612 is given preference where corrosion, abrasion and impact stressing are imposed simultaneously. Typical specific applications are cutters and tools for processing plastics, wood and paper, as well as highly stressed sealing and sliding surfaces.

### Weld Metal Hardness :

AT ROOM TEMPERATURE : 50 - 53 RC

AT 600°C : 40 RC

### Welding Instructions :

Clean the weld zone of rust, scale and grease. Bigger work pieces are preheated to about 300°C. Keep the amperage as low as possible, so as to fuse the parent metal as little as possible. Guide the electrode vertically, keeping the arc short. Weave only slightly. Cool slowly in an oven or under asbestos. Machinable by grinding.

Current Conditions : AC / DC (+)

Size (mm)      5 x 350    4 x 350    3.15 x 350    2.5 x 350

Dia x Length

Current Range    160-200    120-160    80-120      60-90

(Amps)

## LoTherme - 613

An outstanding low heat input, hardfacing electrode having excellent resistance to abrasion, metal-to-metal wear at ambient as well as at high temperatures and good corrosion resistance.

### Characteristics :

LoTherme-613 yields weld deposits, which have excellent resistance to abrasion and metal-to-metal wear in combination with good resistance to corrosion. The weld deposits possess hardness of 48-56 RC. Hardness is retained up to 550°C. A soft and stable arc, which is easy to strike and restrike, good slag detachability and smooth weld profile are some of the many pleasing features associated with LoTherme-613.

### Applications :

Where conditions are highly abrasive and also corrosive e.g. flue gases, slurries, etc., LoTherme-613 is the most appropriate electrode.

The capacity to retain hardness at high temperatures, and excellent resistance to abrasion make LoTherme-613 ideally suited for surfacing blast furnace bells and hoppers, conveyor screws, coke, chutes, steel mill grinders, pump impellers, valves, etc.

Weld Metal Hardness : 48-56 RC

### Welding Technique :

For best result, bake the electrodes at 200°C for one hour before use. Clean weld surface thoroughly free of all surface contamination. Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350
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Dia x Length			
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Current Range	180- 220	140-170	100-120
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(Amps)

## LoTherme - 617

Low heat input, hardfacing electrode having excellent resistance to abrasion.

### Characteristics :

- A versatile electrode producing a weld metal having exceptional resistance to wear from combined abrasion, erosion and moderate impact.
- Soft and stable arc which is easy to strike and restrike.
- Electrode deposits high rate of weld metal with little slag.
- Thick single pass deposits give high yield.

### Applications :

LoTherme-617 is ideally suited for hardfacing machine parts and components subject to combination of heavy abrasion, erosion, metal-to-metal wear and moderate impact. Typical applications include surfacing carbon steels, austenitic manganese steels like drag line buckets, scraper blades, crushing blades, crushing hammers, conveyor chains, etc.

Weld Metal Hardness : 61-65 RC

### Welding Technique :

Remove all damaged and fatigued metal before deposition. Use short arc and stringer bead technique. One pass overlay is normally recommended. If more build-up is required, use cushion layer of LoTherme-468 for steels, LoTherme-457 for 14% manganese steels.

Current Conditions : AC/DC (-)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length				
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Current Range	180-220	140-180	100-140	70-90
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(Amps)



## LoTherme - 618

Low heat input hardfacing electrode having outstanding abrasion resistance at high temperatures.

### Characteristics :

- Specially formulated to retain abrasion resistance upto 650°C.
- Excellent resistance to wear due to high temperature Abrasion.
- Soft and stable arc which is easy to strike and restrike.
- Easy handling with rapid deposition rate.
- Thick single pass deposits give extra high yield.

### Applications :

LoTherme-618 is a specially designed for hardfacing carbon steel and austenitic manganese steels for applications encountering abrasion and erosion at elevated temperatures. The typical applications include clinker conveyor chains, sinter handling equipment, coke pusher shoes, augers, slurry pumps, billet conveyor guide, hot slag conveyors, etc.

Weld Metal Hardness : 63-67 RC

### Welding Technique :

Remove all damaged and fatigued metal and clean weld area. Use short arc and stringer bead technique. For high carbon steels, hardfacing use preheat upto 275°C. Use LoTherme-468 as a buffer layer if more build-up is required. For austenitic manganese steels do not allow temperature of parts to rise more than 150°C and use LoTherme-457 as a cushion layer. Slow cool after welding.

Current Conditions : AC/DC (-)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				

Current Range (Amps)	180-220	140-160	120-140	70-90
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## LoTherme - 619

Low heat input hardfacing electrode for reconditioning of worn-out MM steel and gr.90A points and crossings for use in high traffic density routes.

### Characteristics :

LoTherme-619 has been formulated to produce strong, tough, easy work hardening and highly abrasion resistible austenitic 16Cr-16Mn-2Ni weld metal. The electrode possesses pleasing operating characteristics and produces smooth, well-rippled weld beads.

### Applications :

LoTherme-619 is ideally suited for welding high manganese steel such as rail crossings, Bulletproof steel plates, Crushing blades, Crushing hammers etc.

Weld Metal Hardness : 240-250 BHN (As welded)  
42-45 RC  
(After work hardened)

### Welding Instructions :

Keep the electrode dry. In case of moisture pick up, they should be rebaked at 250°C for min. one hour. Clean the weld area thoroughly free of any foreign matter, Use low current, short arc and stringer beads,

Current Conditions : AC/DC (+)

Size (mm)	5.3X350	4X350	3.15X350	2.5X350
Dia x Length				
Current Range (Amps)	160-200	140-180	100-140	70-90

## LoTherme - 618 S

“Spray” electrode for roughening the cast-iron press-rolls in the SUGAR industry.

### Characteristics :

LoTherme-618 S has an aggressive “spray” type arc with excellent penetration to allow application while the mill is in operation. By attaching the earth clamp to the gearbox housing, arcing in the bearing area is avoided. It has been developed to resist the extreme load produced during crushing. The deposit is highly abrasion-resistant and also corrosion-resistant.

### Applications :

The application of LoTherme-618 S electrode on sugar mill rollers improves the grip on the cane, increases the quantity of sugar cane crushed and, consequently, results in a higher sugar production.

### Weld Metal Hardness :

ON CARBON STEEL	:	60 RC
ON CAST IRON	:	64 RC

### Welding Instructions :

Hold electrode vertical to work piece. Keep stable arc on moving roll for full spraying effect.

### Current Conditions : AC / DC (±)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	170-200	140-170	100-140	70-100

## LoTherme - 621

Electrodes produces cobalt base weld metal

Characteristics :

LoTherme-621 has excellent welding properties and a homogeneous, finely rippled bead due to spray arc. Very easy slag removal.

Applications :

LoTherme-621 is used for crack resistant hardfacing on parts subject to a combination of impact, pressure, abrasion, corrosion and high temperatures up to 900°C, such as running and sealing faces on gas, water, steam and acid fittings and pumps, valve seats and cones for combustion engines, working parts in gas and power plants, hot working tools with changing thermal load. Excellent gliding characteristics, good polishability and toughness, highly work hardening nonmagnetic, machinable with cutting tools.

Weld Metal Hardness :

AT ROOM TEMPERATURE	:	30-32 RC
AT 600°C	:	240 BHN
WORK HARDENED	:	UP TO 45 RC

Welding Instructions :

Ensure that the electrodes are dry. In case of moisture pick-up, dry the electrodes at 300°C for 2 hours before use. Clean weld area and preheat the base material. Hold electrode vertically and with a short arc and lowest possible amperage. Ensure slow cooling.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	160-200	120-160	80-120	60-90

## LoTherme - 625

Low heat input hardfacing electrode for reconditioning of worn-out MM steel and gr.90A points and crossings for use in high traffic density 35 GMT routes electrode.

Characteristics :

LoTherme-625 is characterized by producing easy work hardening and highly wear resistible austenitic 18%Cr- 12%Mn-3% Ni weld metal. The electrode possesses pleasing operating characteristics and produces smooth, well-rippled weld beads.

Applications :

LoTherme-625 is ideally suited for welding high manganese steel such as rail crossings and points, jaw and roll crushers, crusher hammers, crushing blades, etc.

Weld Metal Hardness :	240-250 BHN (As welded)
	400-450 BHN
	(After work hardening)

Welding Technique :

Keep the electrode dry. In case of moisture pick up, they should be rebaked at 250°C for one hour. Clean the weld area thoroughly free of any foreign matter, Use low current, short arc and stringer beads,

Current Conditions : AC/DC (+)

Size (mm)	6.3X350	5X350	4X350	3.15X350
Dia x Length				
Current Range (Amps)	200-250	160-190	130-160	100-130

## LoTherme - 627

A special low heat input hardfacing electrode.

### Characteristics :

LoTherme-627 is a specially formulated low heat input hardfacing electrode for the reclamation of rolls, crane wheels, etc. The electrode has pleasing operating characteristics. The weld metal has excellent resistance to heat and rolling friction and resistance to wear at elevated temperatures. The weld deposit is machinable for smooth finish.

### Applications :

The weld metal is ideally suited for the reclamation of steel mill rolls and other similar applications involving roll friction and elevated temperature wear.

Weld Metal Hardness : 400 - 450 BHN

### Welding Technique :

Keep the electrode dry. In case of moisture pick-up, redry at 250°C for an hour before use. Clean the weld area free of any surface contamination. Use short arc and stringer bead technique.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length

Current Range	160-200	130-160	90-120	60-90
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(Amps)

## LoTherme - 628

Low heat input electrodes depositing air hardening weld metal for hardfacing.

### Characteristics :

LoTherme-628 is a low heat input electrode specially designed for hardfacing and build-up of worn out machine parts and components. Welds are highly resistance to abrasive wear and possesses moderate toughness. It can be used in all conventional positions. Soft and stable arc, which is easy to strike and restrike, well rippled smooth weld beads and good slag detachability are the special operating characteristics.

### Applications :

LoTherme-629 is versatility of applications in areas of building-up worn out parts and hardfacing. It can be use directly on the job without the necessity of putting a buffer layer. Some of the typical applications include surfacing / rebuilding of shafts, chain sheaves, dies, shares, sprockets, rail ends & crossings, pulleys, idler wheels.

Weld Metal Hardness : 350-400 BHN

### Welding Technique :

Keep the electrodes dry. For best results, redry the electrodes at 250-300oC for one hour before use. Clean the weld area thoroughly free of any foreign matter. Use low current, short arc and stringer beads.

Current Conditions : AC / DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length

Current Range	180-220	130-160	80-110	70-90
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(Amps)

## LoTherme - 629

Low heat input electrodes for versatile hardfacing applications.

### Characteristics :

LoTherme-629 is a low heat input electrode specially designed for hardfacing and build-up of worn out machine parts and components for maximum service life. Welds are highly resistance to abrasion, heavy impact, or a combination of both. It can be used in all conventional positions. Soft and stable arc, which is easy to strike and restrike, well rippled smooth weld beads and good slag detachability are the special operating characteristics.

### Applications :

LoTherme-629 is versatility of applications in areas of building-up worn out parts and hardfacing. It can be use directly on the job without the necessity of putting a buffer layer. Some of the typical applications include surfacing / rebuilding of cane cutting knives, crusher hammers, jaws, rollers, rock drill, tractor grousers, shear blades, clutch plates, dipper teeth, spindles.

Weld Metal Hardness : 50-60 RC

### Welding Technique :

Keep the electrodes dry. For best results, redry the electrodes at 250-300oC for one hour before use. Clean the weld area thoroughly free of any foreign matter. Use low current, short arc and stringer beads.

Current Conditions : AC / DC (+)

Size (mm) Dia x Length	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Current Range (Amps)	180-220	130-160	80-110	70-90

## LoTherme - 650 P

High Heat & Tempering Resistant Alloy for Surfacing

### Characteristics :

LoTherme-650P has excellent welding properties, a homogeneous, finely rippled seam and a self-lifting slag.

### Applications :

LoTherme-650P is suited for heat resistant buildups on hot working steels particularly exposed to metallic gliding wear and elevated shock stress, such as die cast molds for brass, aluminum and magnesium, hot piercing plugs, hot pressed mandrills, trimming tools, hot shear blades, extruding tools, forging dies and hot flow pressing tools for steel. Due to the excellent metal-to-metal gliding properties, also suitable for buildups on guiding and gliding surfaces. Tempering resistant up to 650°C, scale resisting up to 900°C.

### Weld Metal Hardness :

AS WELDED	:	48 - 52 RC
ANNEALED AT 850 - 900°C	:	35 RC
HARDENED AT 1100- 1150°C	:	48-52 RC
TEMPERED AT 700°C	:	40 RC

### Welding Instructions :

Clean welding area to metallic bright. Preheating temperature depends on the welding application (150-240°C). On low-alloy steels at least 3-4 layers should be applied.

Current Conditions : AC / DC (+)

Size (mm) Dia x Length	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Current Range (Amps)	160-200	120-160	80-120	60-90

## LoTherme - 660 G2

Electrode for high temperature resistant surfacing of hot work steels exposed to compression and abrasion

Characteristics :

LoTherme-660G2 electrode welds well in the horizontal and slightly rising positions. The weld pool is easy to control and the slag is easily removed.

Applications :

On the strength of its great hardness, toughness and high-temperature resistance, LoTherme-660G2 is employed for surfacing on machine components and tools exposed to abrasion and compression with moderate impact loads and operating temperatures up to 500°C. These include dead centers, tons, slide-and guide ways, hot and cold cut-off attachments, valves, slides, hot shear blades, extrusion press pistons, dies, strippers, deburrers, sheet punching tools. It is also used to good advantage for the economic manufacture of cold and hot working tools. In such cases steel with a tensile strength above 1100 N/mm<sup>2</sup> is used as parent metal for the tool.

Weld Metal Hardness : 55- 60 RC

Welding Instructions :

Preheat the work piece to 250-300°C. Guide the electrode as vertically as possible, with medium-long arc. Let the work piece cool slowly under asbestos. Finish by grinding.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length				
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Current Range	160-200	120-160	80-120	60-90
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(Amps)				
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## LoTherme - 660 G3

Electrode for high temperature resistant surfacing on hot work steels exposed to impact, compression and abrasion

Characteristics :

LoTherme-660G3 electrode welds well in the horizontal and slightly rising positions. The weld pool is easy to control and the slag is easily removed.

Applications :

On account of its high tensile strength, toughness and high-temperature resistance, LoTherme-660G3 is employed for surfacing on machine components and tools exposed to impact, compression and abrasion at operating temperatures up to 550°C, such as cutting edges for cold and hot shear blades, guillotine shears, dies, swages, hammers etc. It is also used to good advantage for the economic manufacture of cold and hot working tools. In such cases the carrier steel must have a tensile strength of more than 1000 N/mm<sup>2</sup>.

Weld Metal Hardness : 48 RC

Welding Instructions :

Preheat the work piece to 250-300°C. Guide the electrode as vertically as possible, with medium-long arc. Let the work piece cool slowly under asbestos. Finish by grinding.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
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Dia x Length				
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Current Range	160-200	120-160	80-102	60-90
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(Amps)				
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## LoTherme - 660 G4

Electrode for high temperature resistant surfacing exposed to compression and abrasion

Characteristics :

LoTherme-660G4 electrode welds well in the horizontal and slightly rising positions. The weld pool is easy to control and the slag is easily removed.

Applications :

On the strength of its toughness and high-temperature resistance, LoTherme-660G4 is employed for surfacing on machine components exposed to impact, compression and abrasion at operating temperatures up to 550°C. Accordingly LoTherme-660G4 is particularly suited for building-up dies. It can also be used to good effect for surfacing rollers, drive cloverleaves, hot shear blades, etc. It is also employed for the economic manufacture of these work pieces. As parent metal carrier steel with tensile strength in excess of 1000 N/mm<sup>2</sup> is recommended.

Weld Metal Hardness : 40 RC

Welding Instructions :

Preheat the work piece to 250-300°C. Guide the electrode as vertically as possible, with medium-long arc. Let the work piece cool slowly under asbestos. Subsequent machining with tungsten carbide or grinding.

Current Conditions : DC (+)

Size (mm)	5 x 350	4 x 350	3.15x350	2.5 x 350
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Dia x Length

Current Range	160-200	120-160	80-120	60-90
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(Amps)

# LOTHERME



## Electrodes for Cast Irons to Themselves / Other Metals



### CAST IRONS

Next to carbon steels the cast irons form an important group of materials. Cast irons are iron carbon alloys, which have carbon more than 1.7%. The effect of higher carbon was detailed earlier. The cast irons are highly brittle and their ductility is very less. However, because of their shock resistance, heat resistance and corrosion resistance in certain media, they are used for many applications.

Cast irons have poor weldability . This is due to :

- 1) The formation of high carbon martensite in the HAZ during welding which embrittles the material and causes cracking.
- 2) Ductility of the material is so less that it is not able to withstand the shrinkage stresses that occur during welding because of which cracks appear.

However, many of the cast irons can be welded taking due precautions like pre-heating, post heating, slow cooling, etc.

For welding of cast irons, LoTherme range offers :

- |                                |   |                                    |
|--------------------------------|---|------------------------------------|
| LoTherme-701                   | : | Non- machinable deposit.           |
| LoTherme-702                   | : | Monel type, machinable weld metal. |
| LoTherme-703                   | : | Fe-Ni type, machinable type.       |
| LoTherme-704 &<br>LoTherme-705 | : | Ni type, machinable weld metal     |

Apart from the selection of electrode the most important aspect in producing sound welds in cast irons is the welding procedure that is to be adopted. The various steps in welding cast irons are given below :

1. Grind the area to be welded so that the casting skin is removed.
2. Clean the area free of all contaminants.
3. If a crack has to be repaired, drill crack arrestor holes at the end of the cracks
4. Deposit welds in small lengths of 50 mm at a time.
5. Peen the welds.
6. After welding allow the casting to cool slowly by covering with suitable insulating material.



### LoTherme - 701

Highly economical electrode for non-machinable welding on cast irons to carbon , low alloy steels.

**Characteristics :**

The special flux formulation of LoTherme-701 electrode produces a weld metal of high strength. It is ideally suited for welding, where machinability of the welds is not essential. LoTherme-701 is also suitable for welding difficult steels high in carbon and sulphur. The welds display good abrasion resistance.

**Applications :**

LoTherme-701 is highly suited repair & maintenance for welding of cast iron, cast steel machine parts, equipments, etc. For repair of defective castings in steel foundry. Where repair welding of rusty, dirty or greasy castings are involved, LoTherme-701 is the appropriate electrode.

**Welding Technique :**

Dry the electrode at 250°C for one hour before use. Use low current, short weld runs followed by peening.

**Current Conditions : AC /DC (+)**

Size (mm)     5 x 350     4 x 350     3.15 x 350     2.5 x 350

Dia x Length

Current Range    150-180    110-140    75-110     55-85

(Amps)

### LoTherme - 702

A low heat input, low cost, Ni-Cu alloy type electrode for machinable welding of cast iron.

**Characteristics :**

LoTherme-702 is a nickel-copper alloy electrode for low heat input welding of cast iron without preheating. The welds are sound, strong and easily machinable. The electrode displays a soft and steady arc, which is easy to strike and restrike and ability to operate on low currents.

**Applications :**

LoTherme-702 is suited for joining of broken cast iron parts, repairing defects in cast iron foundry and repairs of fractured iron parts in all welding positions. Typical applications include rebuilding of worn out surface, gear teeth, pump impellers, etc.

**Typical Mechanical Properties Of All Weld Metal :**

ULTIMATE TENSILE STRENGTH     :     34 Kgf/mm<sup>2</sup>  
 HARDNESS     :     160 BHN

**Welding Technique :**

Dry the electrode at 150°C for one hour before use. Clean the base material thoroughly free of any surface contamination. Use short weld runs followed by peening. In case of repair welding on castings, remove entire defective portion to sound metal prior to welding.

**Current Conditions : AC/DC (+)**

Size (mm)     5 x 350     4 x 350     3.15 x 350     2.5 x 350

Dia x Length

Current Range    140-170    100-130    80-100     50-70

(Amps)

## LoTherme - 703

Low heat input electrode for high strength machinable welding and overlays on grey and alloy cast iron

Characteristics :

LoTherme-703 produces high strength, machinable welds and overlays on grey and alloy cast irons. A stable arc and evenly rippled, smooth beads are some of the many pleasant features of the electrode.

Applications :

LoTherme-703 is used for :

1. Welding grey cast iron, malleable iron and S.G. iron ;
2. Welding cast iron to steel and to nickel alloys and ;
3. Repair welds and rectification of defects in castings.

Typical applications include engine heads, pump castings, impellers, rope drums, ingot moulds and a variety of cast iron machine parts. Due to the high strength and ductility, LoTherme-703 is ideal for welding heavy and highly stressed cast iron sections.

Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	43 Kgf/mm <sup>2</sup>
HARDNESS	:	190 BHN

Welding Technique :

For joining bevel the edges to 75-90° in single or double 'Vee' groove according to thickness of the parts. For repair of cracks, drill holes at the two ends of the crack to arrest its further propagation. Remove entire cracked material to sound metal by chipping, gouging or machining.

Clean the weld area free of grease, oil, paints, etc. prior to welding. Weld short beads not exceeding 50 mm at a time. Each bead should be peened when still hot. For large and heavy sections pre heating of the job may be necessary. After the welding is completed, the castings should be covered completely with a layer of asbestos or dry lime until it attains room temperature.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	130-170	100-130	85-120	50-70

## LoTherme - 703 (LN)

Universal Electrode for Welding of Cast Irons

Characteristics :

LoTherme-703(LN) is a special flux coated nickel - iron alloy electrode designed for repair welds as well as for joining components of various types of cast irons, including grey and nodular cast irons and for welding them to steel and some ferrous and non-ferrous materials.

Applications :

LoTherme-703(LN) is the right electrode for repair welds as well as for joining components and parts made out of various types of cast irons; rectification of defective casting in cast iron foundry; engine heads, pump casings, impellers, rope drums, ingot moulds and a variety of cast iron machine parts and equipments. It is also suitable for welding cast iron to steel and some ferrous and non-ferrous materials.

Due to higher tensile strength and good ductility of well-balanced nickel iron deposits, satisfactory welds on spheroidal cast iron can be obtained.

Welding Technique :

1. Moist electrodes should be redried at 120oC for one hour before use. 2. Clean the parent metal surfaces free of grease, oil, paint etc. prior to welding. 3. Ensure that the parts to be welded are not exposed to rain or high wind during welding. 4. Weld beads should be laid in short length, each bead not exceeding 50 mm at a time. Each length of weld bead should be peened when still hot, to minimize shrinkage stresses and prevent chances of cracking. 5. Over heating of castings should be avoided by putting intermittent weld beads and cooling in still air before laying subsequent beads. 6. Pre-heating of the job between 250-500oC may be necessary according to the amount of weld metal to be deposited and the size and the type of casting. 7. After welding is completed, the casting should be covered completely with a layer of asbestos powder or mattress or dry lime until it attains room temperature.

Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range (Amps)	170-200	130-170	90-130	60-90

# LOTHERME



*Cast iron gear repaired with LoTherme-703*

## LoTherme - 704

A low heat input, high nickel electrode for machinable welds on cast iron

### Characteristics :

LoTherme-704 is a low heat input electrode, which deposits a very high nickel alloy. The arc is stable even at low current ranges, and this minimises dilution of weld metal with harmful elements present in the parent metal. Slag coverage is complete and slag detachability is excellent. The deposit bonds soundly with the parent metal and the beads are smooth and dense. The welds are machinable.

### Applications :

LoTherme-704 is ideally suited for sound, crack-free welds on grey cast iron, S.G. iron, malleable iron and for joining cast irons to steels and to nickel-copper alloys. It is equally good for corrosion resistant overlays, filling and building up of worn out parts and joining broken sections. Typical applications are repair welding on machine bases, motor blocks, heavy castings, valve bodies, sprockets, pumps castings and gears.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	35 Kgf/mm <sup>2</sup>
HARDNESS	:	140 BHN

### Welding Technique :

Redry the electrode at 150°C for one hour before use. Clean weld area free from any surface contamination. Bevel broken parts or cracks to 70-80° Vee. Use a short arc and as low a current as possible. Deposit short weld beads not exceeding 50 mm. Peen the weld to relieve internal stresses and allow the workpiece to cool slowly to room temperature. Pre-heating of the part is generally not necessary.

### Current Conditions : AC/DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range	125-165	95-125	65-95	45-65
(Amps)				

## LoTherme - 704 N

Universally applicable electrode for repair and construction

### Characteristics :

The electrodes have a stable arc and produce a flat seam. Particularly for fillet welds an optimal seam structure is achieved. Due to the bimetallic core wire, the current carrying capacity and the deposition rate are excellent. The weld deposit is highly crack resistant and easily machinable.

### Applications :

LoTherme-704N is suitable for joining and surfacing of grey cast iron, nodular cast iron (spheroidal cast iron) and malleable cast iron as well as for joining these materials each other or with steel and cast steel.

### Typical Mechanical Properties Of All Weld Metal :

ULTIMATE TENSILE STRENGTH	:	40 Kgf/mm <sup>2</sup>
HARDNESS	:	220 BHN

### WELDING INSTRUCTIONS :

LoTherme-704N is preferably welded on DC (-) or on AC. When welding on DC (-) a deep penetration is reached in fillet welds. Position welding are easier with AC. Prior to welding, remove the casting skin. Hold electrode vertically and with short arc. When welding crack susceptible cast iron grades, the deposit may be peened.

### CURRENT CONDITIONS : DC (+)

Size (mm)	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Dia x Length				
Current Range	140-170	110-130	90-110	65-80
(Amps)				

## LoTherme - 705

Low heat input electrode producing outstanding quality machinable welds on cast iron.

### Characteristics :

LoTherme-705 flux formulation is so chosen that the electrode produce extremely soft arc which is essential for low heat input and avoiding dilution of weld metal with harmful elements present in the parent metal. The electrode produces crack free machinable welds.

### Applications :

LoTherme-705 is ideally suited for sound, crack free welds on grey cast iron, spheroidal iron, malleable cast iron to themselves, to each other, to steel, or to monel or copper alloys. Equally good for cladding, filling, surfacing and building up of worn-out parts or broken sections. Repair welding of valve bodies, sprockets, engine blocks, pump casings, gears, machine base and defective castings are some of the various applications of LoTherme-705

### Typical Mechanical Properties Of All Weld Metal :

TENSILE STRENGTH	:	35 Kgf/mm <sup>2</sup>
HARDNESS	:	150 BHN

### Welding Technique :

Dry the electrode at 150°C for one hour before use. Clean weld area free of all surface contamination. Bevel broken parts or crack areas to about 70° Vee. For cold welding, use as low a current as possible and deposit short weld beads not exceeding 50 mm. Peen the welds. Pre-heating of the part is not necessary.

### Current Conditions : AC/DC (+)

Size (mm) Dia x Length	5 x 350	4 x 350	3.15 x 350	2.5 x 350
Current Range (Amps)	125-165	95-125	65-105	45-65

# LOTHERME

Electrodes for Cutting,  
Gouging, Piercing,  
Chamfering, etc.

## LoTherme - 801

For cutting and piercing all ferrous and non-ferrous metals and alloys without the need for any auxiliary equipment.

Characteristics :

LoTherme-801 is designed to produce fairly smooth cuts and pierce metals in all positions. The special coating withstands high current without overheating. A forceful arc renders it possible to cut all metals and alloys without the necessity of supplementary gas, compressed air or oxygen or special torches.

Applications :

LoTherme-801 is meant for cutting and piercing carbon steels, low alloy steels, stainless steels, cast irons, nickel and nickel alloys, copper, brass, bronze, aluminium and other metals and alloys. Although the cut will not be as smooth as that produced by gas cutting of carbon steel, the application of LoTherme-801 extends to various ferrous and non-ferrous metals which cannot be cut by conventional gas cutting process. The electrode is also suitable for cutting and piercing out of position jobs, rivets, risers, etc., where gas cutting is not convenient.

Welding Technique :

Mark the area to be cut or pierced with chalk. Hold the electrode at an angle of 45° to the job and use a sawing motion to cut. Manoeuvre LoTherme-801 continuously in sawing motion, pressing it against the surface of the metal. The high arc-force produced by the electrode and the manual pressure ensures and rapid cutting.

For piercing, position the electrode perpendicular to the part. Strike the arc and apply push in and pull out motion till the part is pierced.

Current Conditions : AC/DC (-)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	280-320	200-240	150-180	120-150

## LoTherme - 802

AC-DC electrode for chamfering and grooving of various metals with electric arc.

Characteristics :

LoTherme-802 is designed to produce smooth grooves in all positions. The special coating of the electrode withstands high current without overheating. The forceful arc renders it possible to chamfer and gouge various metals without the need for supplementary gas, air, oxygen or special torches. The force of the arc blows away undesired materials from its path leaving a clean groove for subsequent operations such as welding, surfacing, re-building, etc.

Applications :

LoTherme-802 is meant for chamfering and gouging carbon steels, low alloy steels, stainless steel, cast irons, nickel alloys, etc., to bevel out cracks, remove defective weld metal and unwanted metal in castings. The special advantage of LoTherme-802 is the accessibility in locations where it is inconvenient to work with metal cutting tools or even gas cutting torch. LoTherme-802 comes in handy wherever repair or maintenance welding is envisaged such as in foundries, steel plants and fabrication industries.

Welding Technique :

Mark the area to be gouged with Chalk. Hold the electrode pointing towards the path of gouging at an angle not exceeding 25° to the job. Push the electrode along the line, maintaining contact with the base metal all the while. The strong arc-force produced by LoTherme-802 and the pushing action will blow the molten metal ahead and away from the groove. Avoid reverse motion.

Current Conditions : AC/DC(-)

Size (mm)	5x350	4x350	3.15x350	2.5x350
Dia x Length				
Current Range (Amps)	300-360	230-280	150-200	125-175