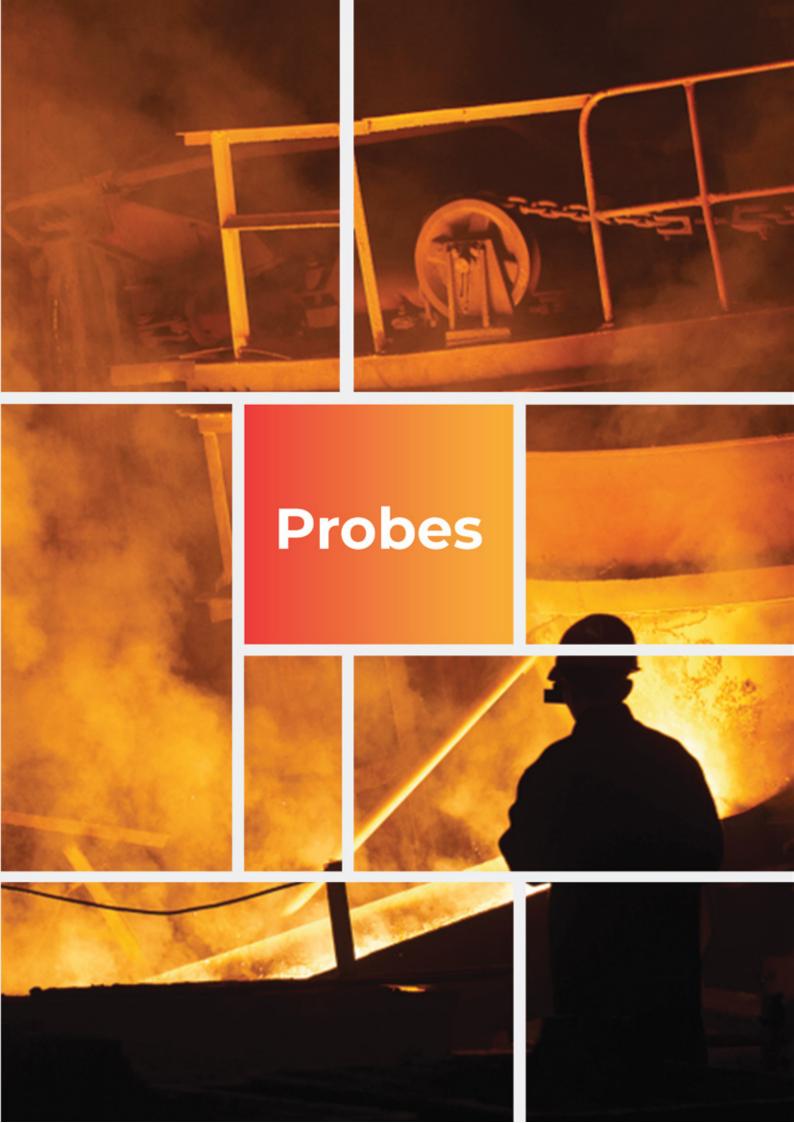
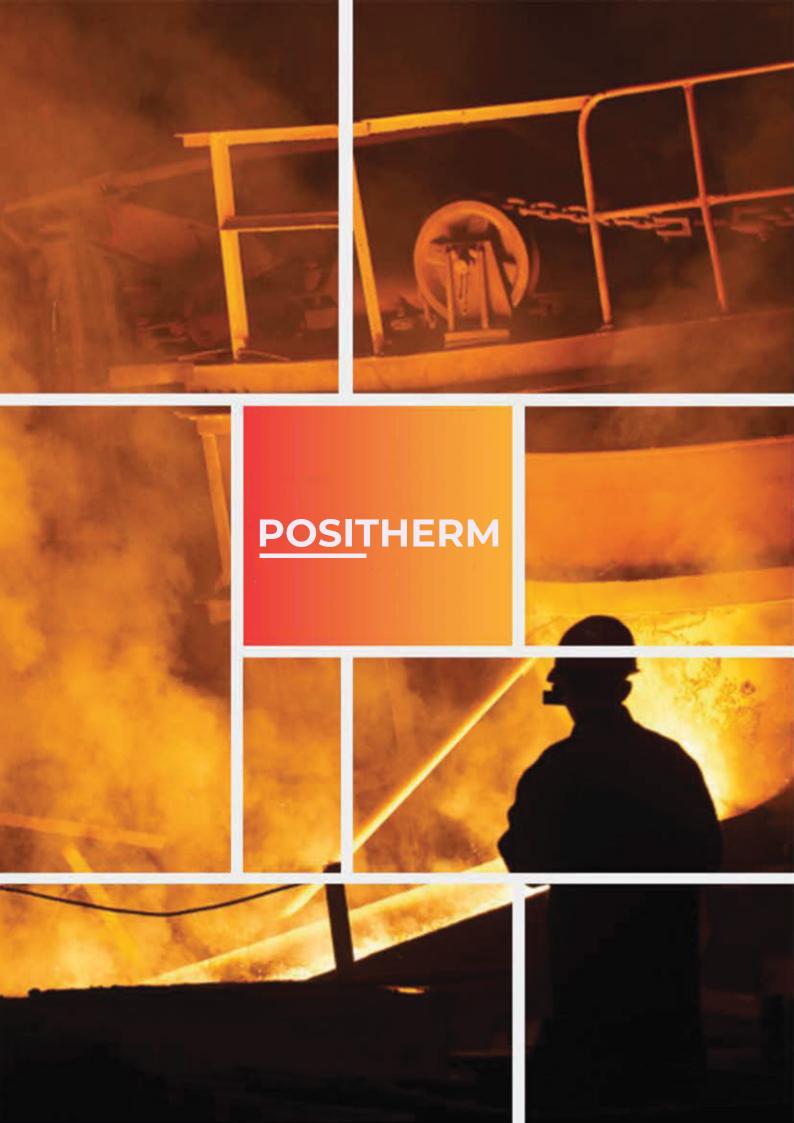




PRODUCT CATALOUGE





The knowledge of liquid metal temperature is essential for the production and quality control of steel, cast iron and non-ferrous metals. The molten metal temperature must be within strict limits to achieve the optimum quality before the heat or melt can be tapped or cast.

Thermoelectric temperature measurements with noble metal thermocouples immersed in the molten metal bath provide the best solution to meet the user's requirements.

Positherm disposable immersion thermocouple

Dedication to the highest standards of accuracy and reliability has made Heraeus Electro·Nite the world's largest producer of immersion thermocouples.

Designed and manufactured for total customer satisfaction. **MMC** Positherm immersion thermocouples most economical are the effective way to measure liquid metal with highest temperature the reproducibility accuracy, and reliability.

Supplied as ready-to-use units, Positherm expendable thermocouples are easy to use and require no special skill from the operator.

They are available in various types to meet the specific requirements of different applications.



Positherm Non-Splash

Working conditions in iron and steel works have been drastically improved over the last years.

As a contribution to operator safety, MMC has developed a Positherm Non-Splash thermocouple.

The new splash-free material was selected based on its non-splash characteristics, but also on its ecological properties. Major components are refractory cement, expanded glass particles, glass fibres and a binder.

In particular for applications where the operator stands near to the liquid metal, such as small furnaces, ladles, runners, tundishes and moulds, it is recommended to use the Positherm"



Non-Splash. Calibration, accuracy, performance and other features are the same as for the standard Positherm" thermocouple. Under favourable conditions, Positherm" Non-Splash thermocouples may even be used for multiple immersion although they are not designed for this.

Positherm' Non-Splash thermocouples are available in various standard non-splash lengths and cardboard tubes.

Packing: 40 units per box

Positherm FOR CLOSE-UP MEASUREMENT

For repeated measurements in small, slag free melts where only the quartz tube is immersed, Heraeus Electro-Nite designed its Positherm' for close-up applications. It consists of a PtRh/Pt·thermocouple in an extra long quartz protection tube,

cemented in a ceramic housing, and fitted with a special high temperature connector assuring complete contact even after a number of dips. Depending on the intervals between successive immersions and the metal temperature, the number of measurements may vary.

The use of a small cardboard tube for thermal protection of contact block and probe holder is recommended.

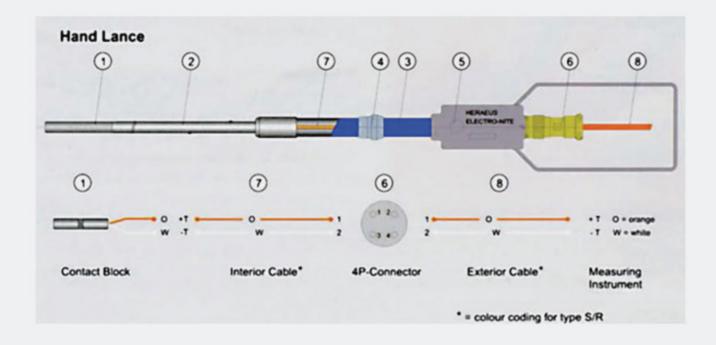


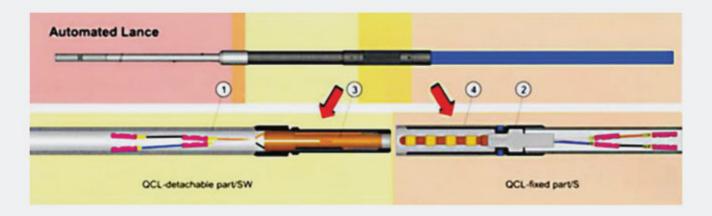
Immersion Lances

Positherm" thermocouples may be dipped either by means of an appropriate hand lance (Fig. 1) or an automated lance. For quick and easy change of the lower part of automated lances including contact block and probe holder,

Heraeus Electro·Nite developed the Quick Connecting Lance system (Fig. 2). A large range of ready-to-use manual immersion lances, straight or bent, can be supplied to suit customer's needs.

Components may be ordered separately (see hardware list).





Calibration

Positherm" thermocouples are available in following calibrations according to IEC 584-1 and J IS C 1602/1981 standards based on the IPTS 68 temperature scale:

Pt 10 $^{\circ}$ /o Rh I Pt (type S), temperature range: - 50 to 1767 $^{\circ}$ C

Pt 13 °/o Rh I Pt (type R), temperature range: - 50 to 1767 °C

Pt 30 °lo Rh I Pt 6 °lo Rh (type B), temperature range: O to 1820 °C

The thermocouple wires are rigorously selected in order to guarantee an accuracy of O to + 3 °C at 1554 °C (Pd melting point).

Cardboard tube lengths

To suit different applications, Positherm" thermocouples are available in several nominal lengths ranging from 150 to 1700 mm. For application in big vessels, the use of telescopic oversleeves is recommended to provide an additional thermal protection of the immersion lance.

Metal Caps

A metal cap protects the thermocouple assembly during transport and immersion through the slag.

It is made of steel for application in steel melts. For application in low temperature steel, cast iron and aluminium alloys, an aluminium protection cap is used. A copper cap is used for measurements in copper alloys.

Common Features

- · Measuring time: 3 to 6 s.
- Maximum immersion time: 7 s at 1650 °C
- · Diameter of protective cardboard tube: inner: 17.9 mm outer: 29.5 mm
- Packing: 50 units per box, check packing quantity with production, as I think that 100 pcs/box are for 300 mm and 400 mm long

Method of use

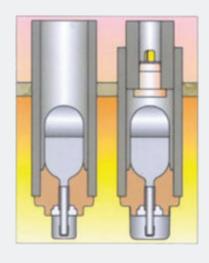
The Positherm" thermocouple is pushed upon the probe holder of a suitable immersion lance until electrical contact is achieved with a built in contact block. An inner and outer extension cable related to the thermocouple type connects the immersion lance to the measuring instrument (e.g. Digitemp, Digitemp-E and Digilance IV). Details about temperature measuring instruments can be found in the relative brochures. Next, the thermocouple is dipped into the molten metal until the end of measurement signal is given by the instrumentation.

APPLICATION FIELD

Molten metal temperature measurement in the blast furnace runner, torpedo car, converter, electric furnace, ladle,tundish, mould, foundry, copper melts and different alloys.



IMMERSION SAMPLERS

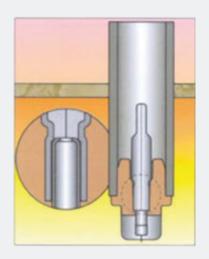


Classics

Samp-O-Line® offers standard and customised samplers for all types of steel whenever a homogeneous and representative sample from molten steel is needed.

Non-splash samplers are available for improved safety and accuracy.

Sufficient immersion depth is required for proper functioning. Capping configuration can be adapted to suit low steel temperatures. A deoxidant e.g. Al, Zr or Ti is available for unkilled steel conditions.

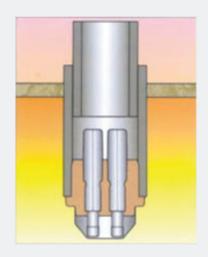


Pin Break off Sampler

The removal of a sampler pin can in certain circumstances be problematic.

The Pin Break Off sampler offers the customer a sample that allows an easy removal of the pin: at high carbon grades, the pin drops off automatically, for low carbon grades, the pin drops off easily by a small hit on the pin. This characteristic is specially useful for steel plants with a steel product mix covering as well low carbon grades

The use of the pin break off characteristic also improves in certain circumstances the quality of the sample



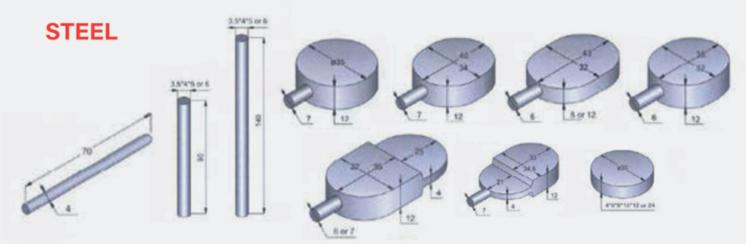
Double Sampler

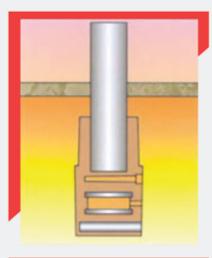
and high carbon grades.

The Double Sampler offers the steel plants the possibility to speed up time for analysis.

Two samples are yet immediately available and can be used for different purposes.

The design of the sampler allows the customer to choose all possible mould shapes that are available in the classic Samp-O-Line product range.



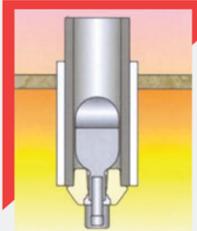


SA-E

This steel sampler is available in a reusable tube configuration. The re-usable cardboard tube from a previous temperature measurement can be fixed to the insert.

The SA-E sampler is an economic solution for all carbon grades with carbon values of 0.05 % minimum.

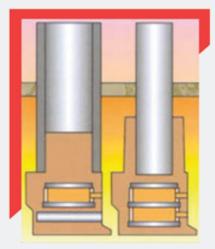
OPTIONS: Sample shapes: Round 35 x 12 - Round 35 \emptyset x 10 Round 35 x 8 Possibility of an additional pin Deoxidant AL, Zr or Ti SA-E: insert only Tube length on choice.



Ultra Low Carbon

Carbon determination in these steel grades demands the utmost care regarding sample preparation, analysis and sample taking techniques. MMC can offer a wide variety of sampling systems with controlled low carbon components in order to meet specific requirement.

OPTIONS: Available as well for immersion samplers and vacuum samplers.



Stainless Steel

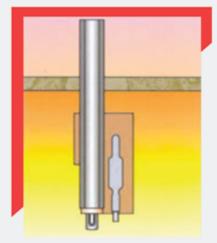
Designed to minimize contamination effects and to withstand high temperatures. The Squaf-design offer the customer the possibility of a single sample with pin or even a double sample. The Squaf can be assembled on thermocouple tube and sampling tube.

OPTIONS: Round 35 Ø x 12 - Round 35 x 12, with separate pin

2 samples, round 35 x 12 - Round 35 x 24

Deoxidant: Al, Zr Ti Capping: on choice

Tube length: on choice, as well TC or Sampler tube.



Piggy Back Steel

Angle immersion with the Piggy Back Steel gives both temperature and sample saving time and handling. The Piggy Back Steel is compatible with our standard hardware. Automatic immersion systems take full profit from this combination. As with traditional sampling a wide choice of sample shapes, deoxidant types and tube configurations are available.

OPTIONS: Sample shapes: Round 35 Ø x 12 - Oval 34 x 40 x12

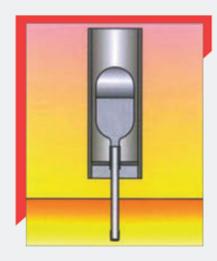
Oval 32 x 36 x 12

Dual thickness: 32 x 60 12/4 - 34 x 55 x 4//12

Deoxidant: Al, Zr or Ti

Thermocouple: Type S. R and B - Tube length: on choice

VACUUM SAMPLERS



Vaccum / Stream Sampling

Vacuum samplers are used for sampling from the mould of the continuous caster. Stream samplers are used for sampling from any open stream of liquid metal.

OPTIONS:

Sample shape:

Round 35 Ø x 12 - Oval 34 x 40 x 12 Oval 32 x 36 x 12 - Oval 32 x 43 x 8

Oval 32 x 43 x 12

Dual thickness: 32 x 60 x 12/4 - 34 x 55 x 4/12

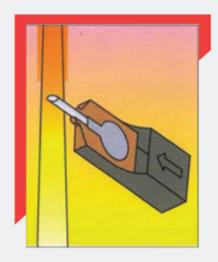
Deoxidant: Al, Zr or Ti Tube length: 145 - 430mm

Cap: On choice Quartz length: 70. 100 or 150 mm Cap: On choice Quartz length: 70, 100 or 150 mm

SAMPLING PROCEDURE

The sampler is tightly fixed to a conical probe holder.

With vacuum sampling the quartz tube is dipped into the liquid metal, while with stream sampling the quartz tube is kept at an angle of 45° to the stream.



Stream Sampling

Steam sampling is a safe way to take samples from any open stream of liquid metal. Deoxidants are available for use in unkilled steel. Samples taken by means of this system will give accurate analytical results in close relation with the end product.

OPTIONS:

Sample shapes: Round 32 Ø x 15 - Oval 32 x 40 x 12

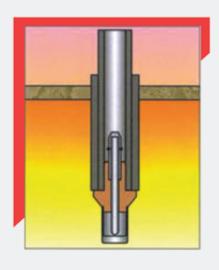
Dual thickness: 32 x 60 x 12/4

Quartz straight 60 mm - 45° cut, 60 mm Deoxidant: Al, Zr or Ti - Deoxidant: Al, Zr and Ti

SAMPLING PROCEDURE

The sampler has to be held versus the stream in a specific way to obtain a good quality sample.

The best surface for analysis is marked allowing less sample preparation cost and faster, more accurate analysis.



Stream Sampling

Total Oxygen Sampling offers superb pin sample quality and quick preparation for combustion analysis.

TOS is free from contamination, thus being a finger print of the steel cleanliness.

Best results are obtained in combination with the special pneumatic lance system in as well RH, ladle, tundish and moulds.

OPTIONS:

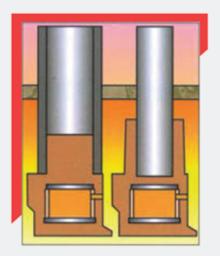
Tube: Different lengths with corresponding non-splash lengths are available Sample pin: 4 mm round

sample: 70 mm length



T.O.S Pneumatic Unit

TOS system uses argon flushing before sampling. When using the special pneumatic switch box, the sampling procedure is completely automated.



SQUAF 24mm

The Squaf technology has been modified to produce a 24 mm thick sample for specific applications, it is useful to have a thicker sample available.

OPTIONS:

Sample shapes: Round 35 Ø x 24

Tube length: on choice



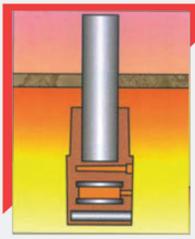
EVACUATED PIN TUBES

Evacuated Pin Tubes are used for sampling from spoon in ferrous and non-ferrous melts.

They feature a thin wall bulb section which melts in contact with molten metal.

The molten metal is sucked into the tube to form a solid slag free pin.

HOT METAL SAMPLERS



Low cost Hot metal Sampler For Spectrographic Analysis

SA-E

can be used in runners, torpedo and hot metal transfer ladle. They are designed with thick chill plates for 'white' solidification to meet all requirements for a reliable analysis with optical emission spectrometers.

OPTIONS:

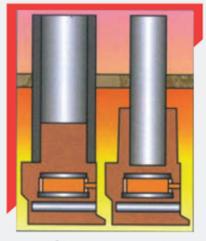
Sample shapes:

Round 35 x 6,10.8.12 and 4

SA-E: Insert only

SA-E on tube: 900,600,300 and 1200 mm

Cap: Mild steel and paper cap



One side Hot metal Sampler For Spectrographic and x-ray Analysis

SQUAF

This sampler provides the lab a hot metal sample, free of sand and a marked surface, that allows to select the best side of the sample and to improve analysis.

The horizontal sample chamber forces the gas bubbles and inclusions to rise to the top of the sample. The bottom side of the sample will be used for analysis.

This technique ensures that a good quality sample is obtained. The design also allows a very easy stripping technique.

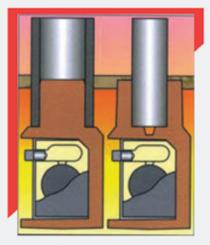
OPTIONS:

Sample shapes: Round 35 Ø x 10

Possibility of a separate pin 4 or 6mm for combustion analysis

Tube length: Available as well on thermocouple as on

sampling tube.



Dual side Hot metal Sampler For Spectrographic and x-ray Analysis

SAH

Some labs prefer to analyse a hot metal sample, free of sand and independent from the side of the sample.

The SAH sampler provides a sample, free of sand for analysis on its both sides.

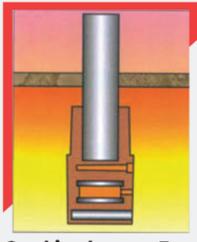
After immersion hot metal will enter a pre-chamber and then fill a vertical sample chamber. Thick metal plates will ensure a good cooling resulting in an excellent white structure.

During solidification, the gas bubbles and inclusions will be trapped in the pre-chamber.

This pre-chamber is easily removed when stripping the sample. The design also allows a very easy stripping technique

OPTIONS:

Round 35 x 10 additional pin or lugs on request Round 35 x 0 with lugs



Combined sensor For Temperature And the Dual side Hot metal Sampler

PIGGY BACK HOT METAL

The immersion of this combined sampler provides as well a temperature reading as a dual side hot metal sampler.

The filling properties are identical to the dual side sampler.

The Piggy Back is compatible with existing lance hardware and allows the use of existing automatic immersion systems.

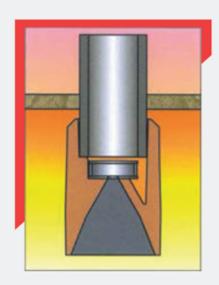
OPTIONS:

Sample shape:

Round 35 x 10. additional pin or lugs on request Round 35 x 8 with lugs

Thermocouple: Type S. R and B Tube length on choice

SLAG SAMPLERS



QUSAS IMMERSION SLAG SAMPLER

Completely new product line is yet available to sample the slag on top of the ladle or converter surface.

It provides a slag sample that can immediately be analysed by the XRF without any preparation.

The slag sample is obtained after immersion of the slag sampler in the ladle or converter.

OPTIONS:

Slag Sample shapes Round 38 x 10 Round 380x24 24 Tube lengths: on choic Cap: Mild steel and paper ca



QUSAS BLAST FURNACE SLAG SAMPLER

Cost of blast furnace slag sampling can be reduced considerably by using the blast furnace slag cup sampler. The blast furnace slag cup sampler provides a slag sample that can immediately be analysed in the lab.

It avoids expensive slag sample preparation and saves a lot of time.

The slag is collected by means of a special spoon.

This spoon ensures that iron droplets sink to the bottom.

The slag is cast into the cup.

After a few minutes the slag cup is crushed and the slag sample can be collected.

OPTIONS:

Slag Sample shape: 38 mm Ø , 10 mm thick

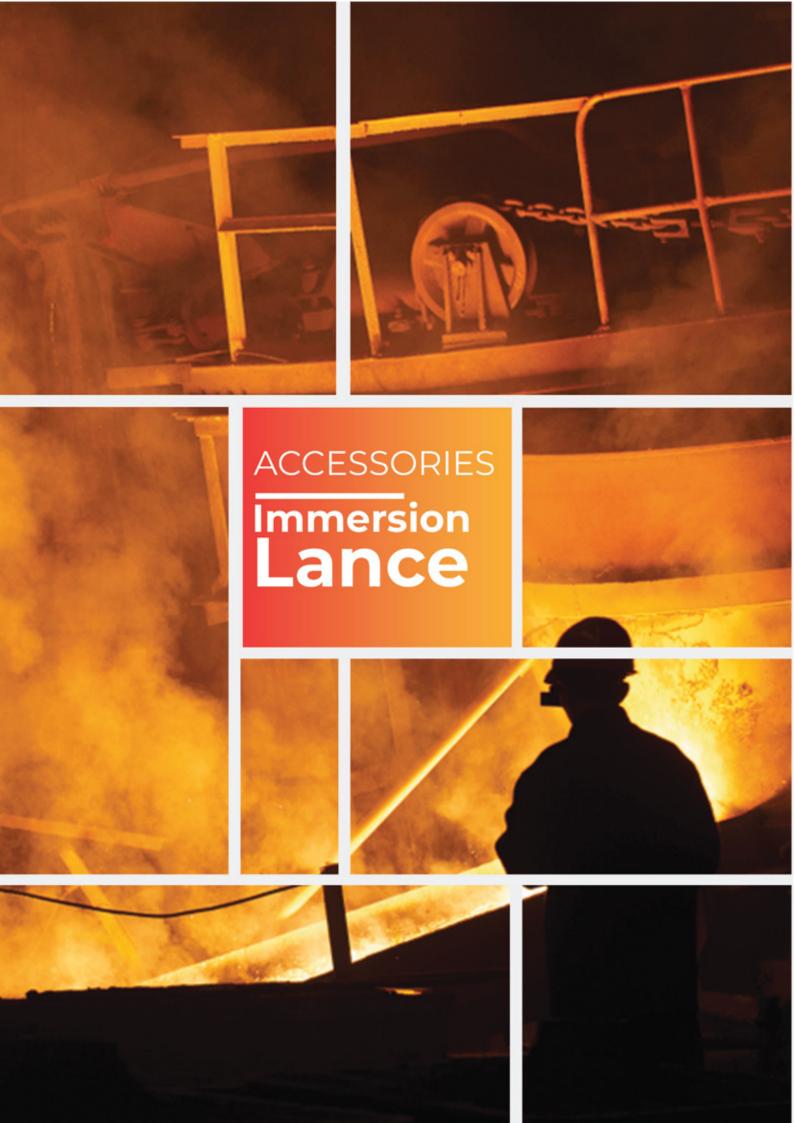


QUSAS SLAG CUP SAMPLER

An alternative for the slag immersion sampler is the use of the slag cup sampler, that can be placed in a holder and held in the slag stream when deslagging the FAF and the AOD.

OPTIONS:

Sample shape: Round 38 Ø x 10





The Immersion Lance has been designed for Positherm and Celox®.

The Celox" Lance features unique possibility of being applicable for Positherm® also.

The Immersion Lance connects the measuring probe with the instrument.

In both cases the contact block consists of a replaceable tip which can be changed in a few minutes.

Interior cable can be glass fiber insulated compensation wire but a better solution is mineral insulated copper sheathed wire which for Celox® measurement is obligatory.

For heavy duty conditions and also in locations where no telescopic oversleeves for lance protection can be used we recommend the use of an interior extension pipe. The small diameter of our disposable probe allows the complete unit to be constructed in 3/4" tube and to remain easy to handle.

Hardware and parts for the Immersion Lance can be ordered as separate items.

Detailed Description

1. Contact block:

Sealed contact block mounted in a steel tube with split pin for mounting in the lanceholder.

A. Positherm contact block

Cu-CuNi: for Pt10°/oRh/Pt and Pt13°/oRh/Pt

Cu-Cu: for Pt6%Rh/Pt30o/oRh

B. Celox contact block

4 contacts Cu-CuNi-Cu-CUNI: for Pt10%Rh/Pt and Pt13%Rh/Pt

4 contacts Cu-Cu-Cu-Cu: for Pt6%Rh/Pt30%Rh

2. Lance holder:

Steel lance holder provides maximum protection from heat. Lenghts available : 300 mm / 400 mm / 500 mm / 600 mm / 700mm / 900mm / 1200 mm / 1500 mm / 1700 mm

- 3. 3/4" dia pipe: Extension pipe available for any length desired
- 4. Arrest ring for protection sleeve
- 5. Handle: includes provision for making wiring connections
- **6. Connector:** A locking, plug-in connector, 4 pole to connect the Immersion Lance with the external compensation cable.

Interior compensating lead wire:

A. Two conductor: Cu-CuNi: mineral insulation and copper sheath

Cu-Cu: mineral insulation and copper sheat

Cu-CuNi: glass fiber insulation

Cu. (1 conductor only) glass fiber insulation

B. Four conductor:

Cu-CuNi-Cu-CuNi: with mineral insulation and copper sheath

External compensating lead wire :

A. Two conductor Cu-CuNi with copper braid and PVC-jacket Cu-Cu with copper braid and PVC-jacket.

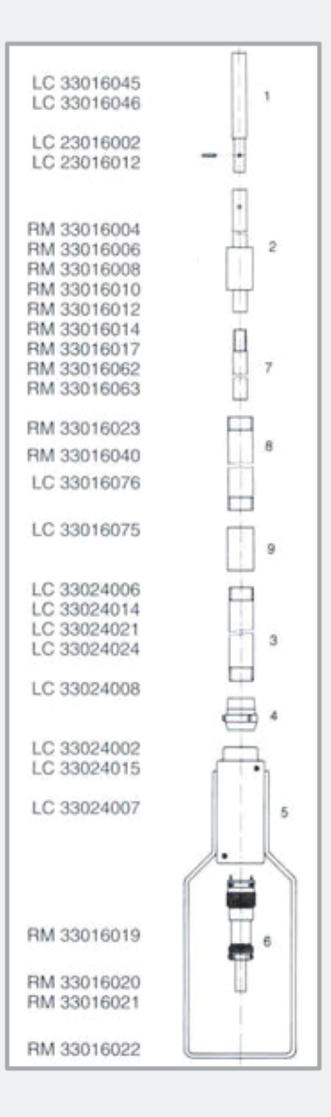
B. Four conductor Cu-CuNi-Cu-Cu with copper braid and PVC-jacket Other types of external compensation cable are available on request.

Option for Heavy Duty Lance:

7. Interior extension pipe, 1 meter long.

A Cr-Ni steel extension inside the main tube to provide additional protection for the compensating lead wire

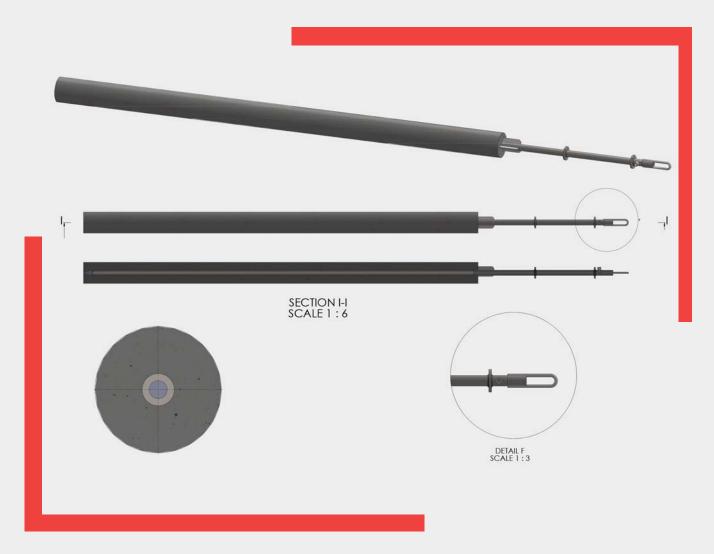
- 8. Cylindrical tube: 3/4" dia., 1 meter long.
- Standard stainless steel tube for extreme temperature conditions
- Special stainless steel tube for extreme temperature conditions.
- **9. Connecting piece:** Connection unit to connect tubes 8 and 3 and to position the interior extension pipe.

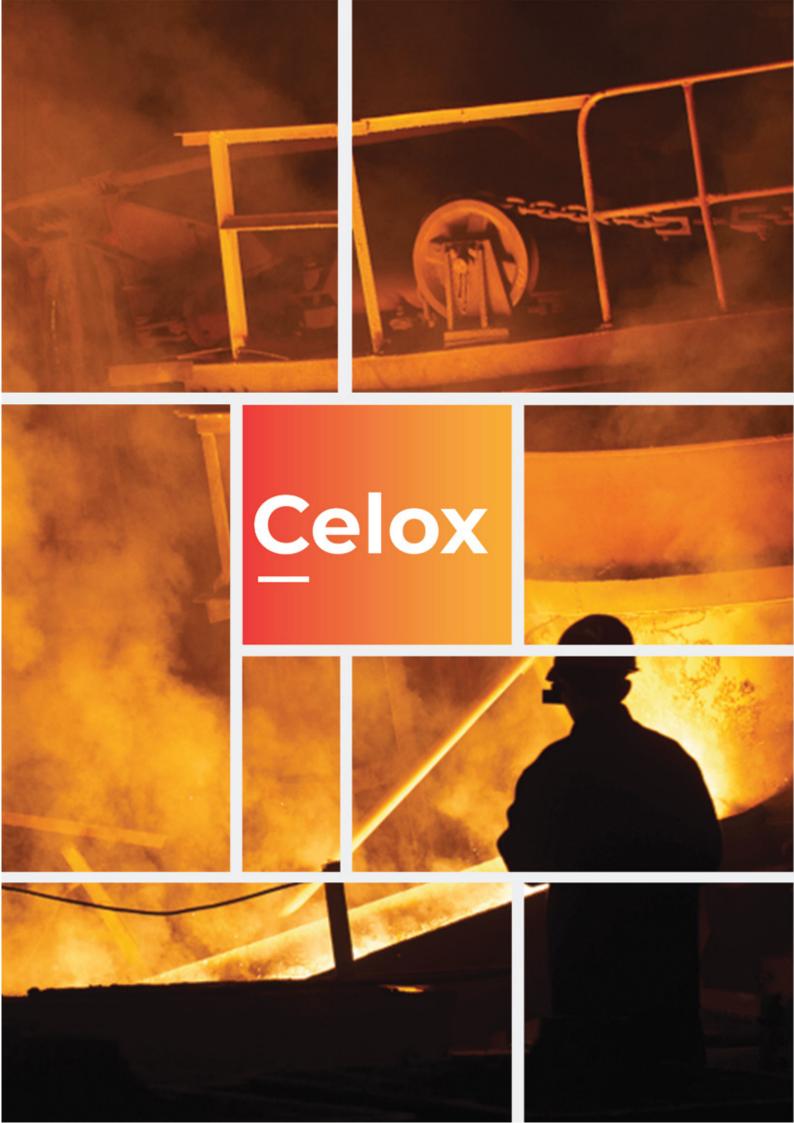


EMERGENCY LANCE

ITEM	UNIT	VALUE	
Al2O3+MgO (%)	(%)	≥ 97	
Bulk Density (@110 oC*24 h	Kg/Cm3	3.05:3.13	
Bending strength (@110 oC	Мра	≥ 10	
Compressive strength		Мра	≥ 45
Clod Crushing Strength	(@110 oC*24 hr)	Мра	50
Clod Crushing Strength	(@1550 oC*3 hr)	Мра	105
Clod Modulus Strength	(@110 oC*24 hr)	Мра	9
Clour Modulus Strength	(@1550 oC*3 hr)	Мра	25

Monolithic emergency lances for purging the molten metal with argon/Nitrogen. MMC commitments the manufacturing of these lances from high quality refractory castable having highest level of strength, resistance to temperature changes, anti-corrosion properties. This lance can be used alone or together with ladle bottom purging plugs. The use of lances can qualitatively improve the homogeneity and the steel quality



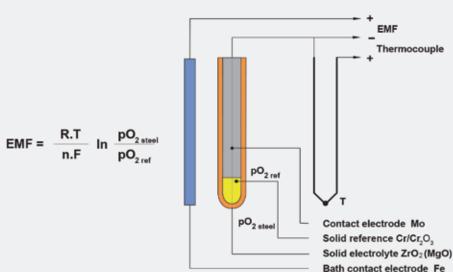


Steel making and steel refining are characterized through various oxidation and reduction processes coinciding with changes in liquid steel's oxygen activity.

Production cost, yield and steel purity widely depend on comprehensive and reliable oxygen control.

Continued improvement in product performance and unmatched quality monitoring has made the Heraeus Electro-Nite Ceíox' precision oxygen sensor the world industrial standard to monitor and control both, steel and slag oxygen activity in primary and secondary liquid steel production.

CELOX OXYGEN CONTROL IN LIQUID STEEL



PRINCIPLE

An integrated electrochemical cell provides a characteristic voltage dependent on the liquid steel's oxygen activity by referring it to an approved oxygen standard within the cell. The generated Electro-Motive Force (EMF or cell 2ref. voltage in mV) has a direct correlation to the liquid steel's oxygen partial pressure

(Nernst's law, R is the gas constant, n the number of transit electrons per standard reaction 02 = 20, and F the constant of Faraday).

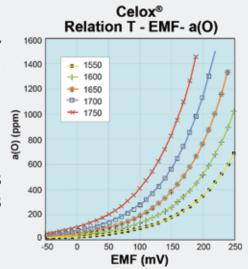
OXYGEN MEASUREMENT

At a given temperature (T in K), simultaneously measured by Celox", the oxygen activity in liquid steel can be taken from the generated EMF.

E=EMF (mV)+24.

log ao= ,,-,ù + 0.0059 · (E + 0.54 · (T · 1823) + 0.0002 · E · (T · 1823))

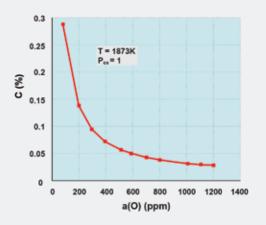
For unalloyed/low alloyed steel and thus Raoult's activity factor f(0)=1, the oxygen activity is practically same value as the dissolved oxygen content in ppm.



CARBON CALCULATION

In primary steelmaking, based on the reaction 2C+02= 2CO and assuming that CO pressure equals the atmospheric pressure, carbon calculates to:

 \log °/o C = f1 + f2/t + f3 · \log ao with t in °C and aO in ppm



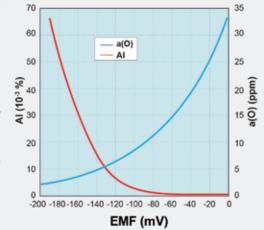
ALUMINIUM CALCULATION

In primary steelmaking, based on the reaction 2C+02= 2CO and assuming that CO pressure equals

the atmospheric pressure, carbon calculates to: log $^{\circ}$ /o C = f 1 + f2/t + f3 \cdot log $^{\circ\circ}$ with t in $^{\circ}$ C and $^{\circ}$ O in ppm

The sharp correlation of aluminium to oxygen may be used to:

- calculate deoxidizer additions during furnace tap based on the Celox" measurement during tapping
- calculate first aluminium addition in ladle metallurgy
- calculate trim aluminium addition to final pecification.



BENEFITS

Celox' is a sensor providing a measurement in few seconds. There is no other method to provide readings of oxygen activity /dissolved oxygen in liquid steel.

During secondary metallurgical refining of liquid steel in the ladle Celox allows for real aluminium readings rather than "fake results" through spectrometer measurement. Aluminium trim problems are thus avoided.

CELOX' VERSIONS

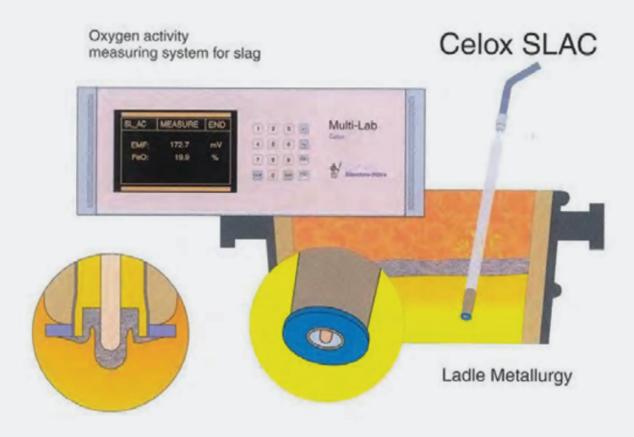
- Celox' standard for measurements over 10ppm dissolved/active oxygen.
- · Celox" Al for aluminium measurements in Al killed steels (incl. Celox standard range).
- · Celox" Ti for aluminium control in IF steels.
- Celox EAF for oxygen measurements with specific lance and hardware in EAF applications.

Celox versions come in thermocouple calibrations S, R, and B and various cardboard lengths.

STANDARD OPERATION PROCEDURES

- Store in a dry place.
- Preventive maintenance of cable and lance.
- Fix to contact and immerse 30 to 40 cm into steel avoiding damage on slag crusts.
- Stop electrode operation (EAF) and minimize gas stirring (ladle).
 Celox SLAC" controls ferrous ladle slag in terms of its FeO or FeO-MnO contents.

The cell is built like the Celox' sensor, but exposes an open zirconia thimble to pick-up slag during immersion. Celox SLAC" goes together with standard Celox" hardware and instrumentation. The sensor does not comprise a thermocouple, as not needed in slag chemistry.



BENEFITS

- Provides a FeO or a FeO-MnO reading within a few seconds.
- · Allows an instant decision to add slag modifiers.
- Predicts aluminium and sulfur fade; predicts reoxidation from slag and thus judges cleanliness.
- · Replaces expensive and sophisticated X-ray analysis.
- Plays its advantages not just in speed, but as well in accuracy, especially in the low FeO-range.
- Eliminates erratic results from poor magnetic metal separation in sample preparation.

APPLICATION

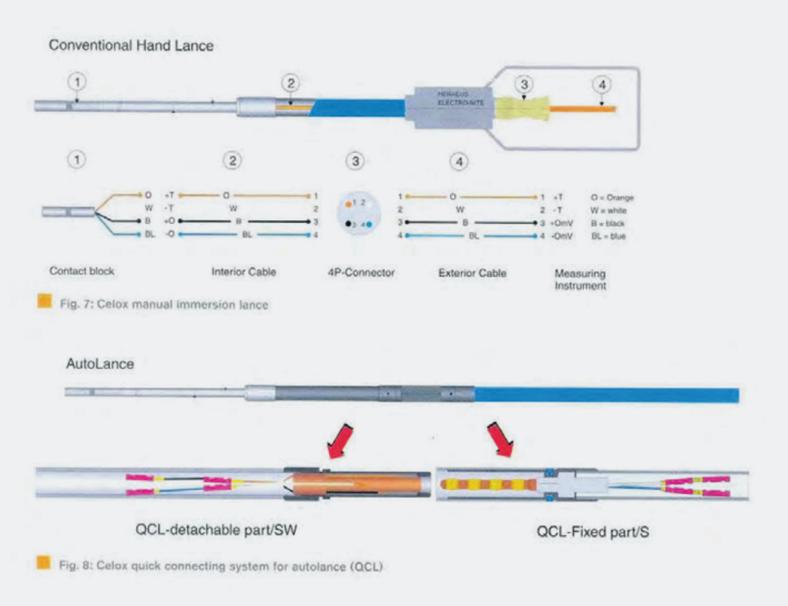
Celox SLAC~ is used like a common Celox" sensor, however has to be immersed through liquid slag into steel to get the reading.

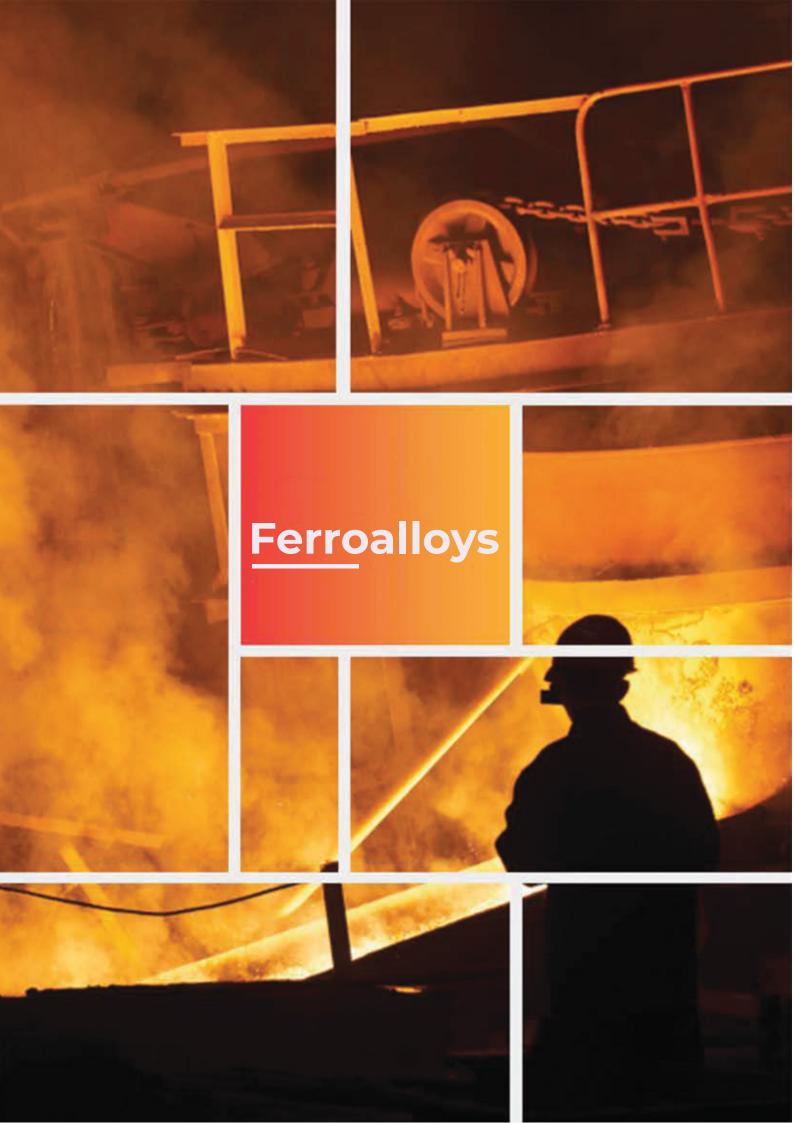
- · select an "eye" with liquid slag on the ladle slag surface.
- make sure there is not any turbulence around the Celox SLAC sensor head;
 it would wash away the slag film surrounding the sensor's zirconia thimble
 and result in an erratic reading.
- immerse in a similar way as a Celox' sensor through liquid slag at a depth of about 10 cm into steel.

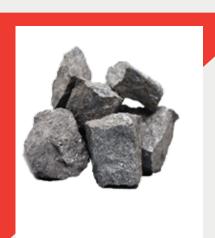
A PROPER CELOX" LANCE

Figs. 7 and 8 show the lance details of manual and autolance. All components may be ordered separately.

In autolance use of telescopic cardboard tubes help to keep long exchange intervals.







FERRO SILICON

	Si	Al	С	S	Р	Size
FeSi70	70	1.5	0.2	0.05	0.05	10-60 mm
FeSi72	72	2	0.2	0.03	0.04	10-60 mm
FeSi73	73	2	0.2	0.02	0.04	10-60 mm
FeSi75	75	1.5	0.2	0.03	0.03	10-60 mm

HIGH CARBON FERRO MANGANESE



	Mn	Si	С	S	Р	Size
HC FeMn 70	70	2	6-8%	0.03	0.3	10-60 mm
HC FeMn 73	73	2	6-8%	0.03	0.3	10-60 mm
HC FeMn 75	75	2	6-8%	0.03	0.3	10-60 mm
HC FeMn 78	78	1.2	6-8%	0.02	0.3	10-60 mm



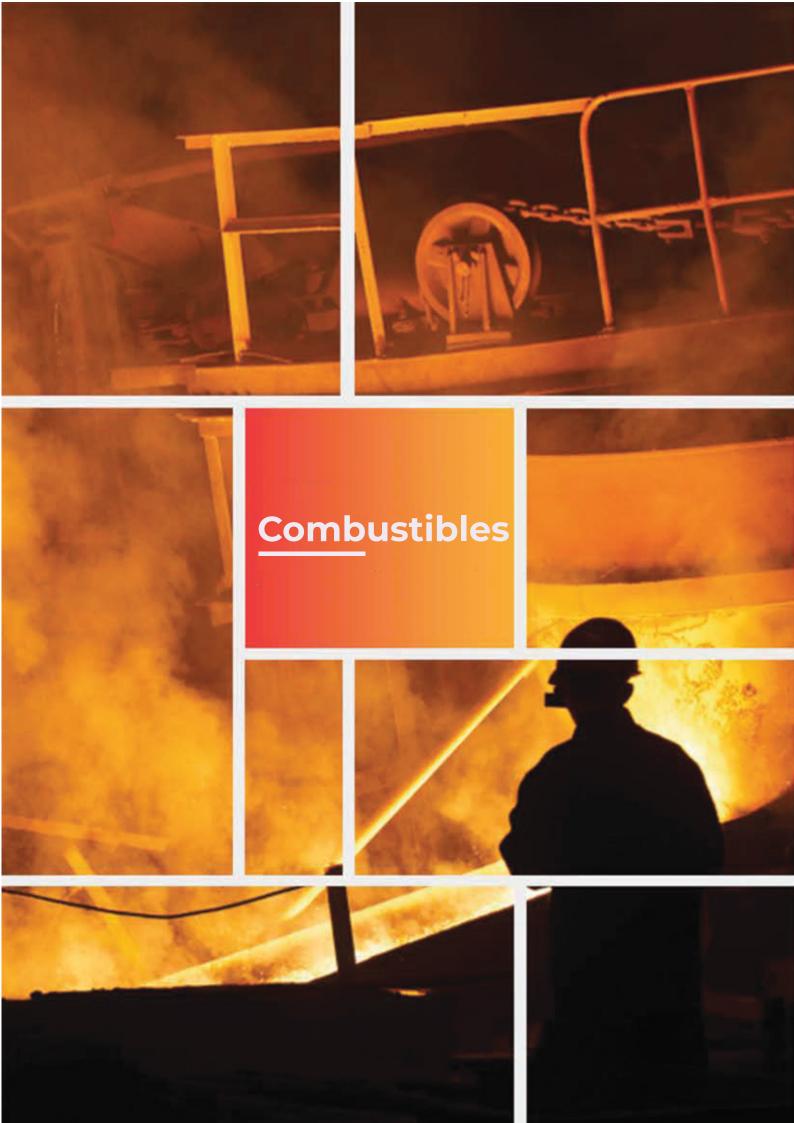
SILICON MANGANESE

	Mg	Si	С	Р	S	Size
SiMn 14/60	60	14	2.5	0.35	0.03	10-60 mm
SiMn 15/65	65	15	2.25	0.3	0.03	10-60 mm
LC SiMn	55% - 60%	25%-32%	0.1	0.1	0.03	10-60 mm



Ferro Silicon Magnesium

	Mg	Si	Ca	Tre	AI	Size
FeSiMg	10 -11 %	45-48 %	2-2.5 %	1.6-2.4 %	0.7	10-30



CHARCOAL

Fixed Carbon: 82 %Min (Dry Basis)

Ash Content: less than 5% (Dry Basis)

Wood Matter 2-4% Max

Moisture Content: 10% Max (Dry basis)

 General Size: 20mm to 150mm (Max 0.5% Fines Acceptable)

Volatile Material – 12 to 15% Max.



SEMI COKE

• F.C: 85% Min.

Moisture: 18% Max.

Ash: 9% Max.V.M.: 7% Max.

Sulphur: 0.6% Max.Phos: 0.015% Max

• Size: 06mm to 18mm - 90% minium



LOW ASH METALLURGICAL COKE

Fixed Carbon: 85% Min

Ash: 12.5% MaxV.M.: 1.5% Max

Phosphorus: 0.03% Max
Sulphur: 0.70% Max
Moisture: 8% Max

• Size: 10-30MM (90% Min)



CARBON FOR FOAMING (CALCINED ANTHRACITE)

Moisture: 0.7% max

Ash: 10% max (typically 6-7%)

Volatiles: 2.5% max

Sulphur: 1% max. (typical 0.7-0.8%)

Phosphorous: 1% max .,

• FC: 86-90% min, GCV, Kcal/kg-min: 7200

Size Distribution:

1 mm to 3mm – 70% min,

• 0.3mm to 1mm - 30% max., > 3mm - NIL

• 0.3mm to 3mm - 100%



CARBON FOR CARBURIZING (CALCINED PETROLEUM COKE)



Moisture: 0.7% max

Ash: 0.2% max

Volatiles: 0.8% maxSulphur: 1.0 % max

• FC: 98% min

Nitrogen: 1% max

Size Distribution:

3mm to 15mm - 95% max., <3mm - 5% max., > 15mm - NIL

RE-CARBURIZER (ANTHRACITE/RCB):

- Fixed Carbon 90% Min.
- Sulphur 0.80 % Max
- Ash 5.0 % Max
- Volatiles 5.0% Max
- Moisture 3.00 % Max.
- Hydrogen 0.10% Max.
- Bulk Density 0.9 Min. (gm/cm³)
- N & P Content is to be specified

Grain Size:

- 2.0 ~ 4.0 MM (85% Min.)
- \geq 4.0 MM to \leq 5.0 MM : 10% Max
- ≤ 2.0 MM : 5% Max



SILICA SAND GRADE-II

- SiO₂ 99,2% min
- Fe2O3 0.017 0.029 %

LIME STONE

- SiO₂: 0.38%
- TiO₂: 0.0%
- Al2O3:0,07%
- Fe2O3:0.05%
- MnO: 0.0%
- CaO: 55.4%
- Na₂O: 0.0%
- K₂O: 0.11%
- P2O5: 0.0%
- SO₃:0.0%
- CI:0.02%
- LOI:42.1%
- Purity: 98.93%
- Whiteness: 95.8%



GREEN PETROLEUM COKE (ANODE GRADE)

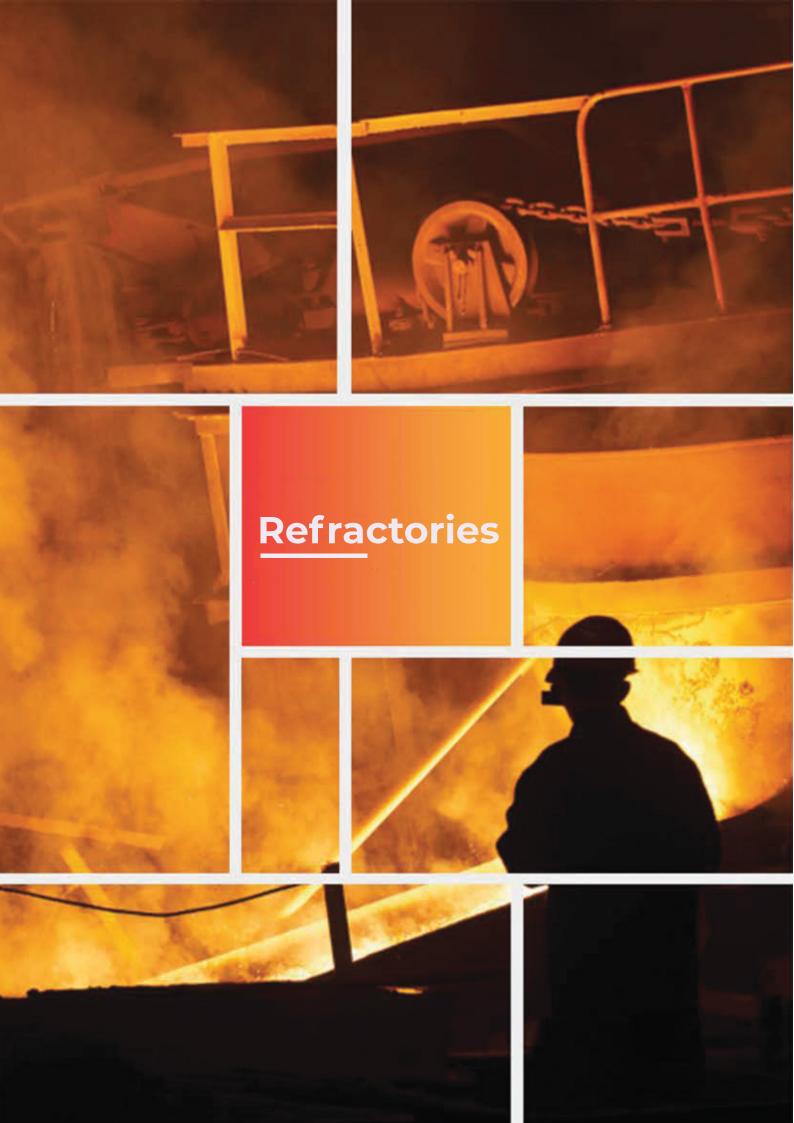
- Moisture % 8Max
- Volatiles % 9-12
- Sulfur % 3Max
- Ash % 0.5Max
- Nickel PPM 250 Max
- Vanadium PPM 300 Max
- Calcium PPM 250 Max
- Iron PPM 300 Max
- Silicon PPM 300 Max
- Chromium PPM 10 Max
- Magnesium PPM 20 Max
- Titanium PPM 10Max
- Na PPM 200 Max
- HGI / VCM ≥8

Vibrated Bulk Density:

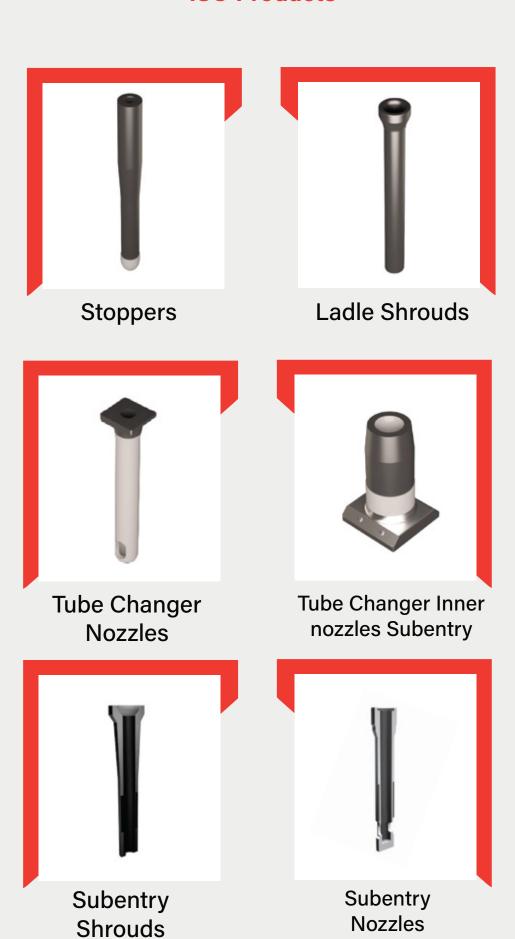
- 0.3 + 0.8mm gm/cc
- 0.72MIN
- 0.5+0.3mm gm/cc
- 0.72MIN
- Fixed Carbon % 85MIN
- Hardgrove Grinability
- Index (IIGI): 75-100

Size:

- 125+50mm % 0-100
- 50+10mm % 40-65
- 10+5mm % 15-25
- 5+0.3mm % 5-10
- CO2 Reactivity Loss At (1000C) % 3-15
- Air Reactivity At (525C) %MINUTE 0.05-0.3



ISO Products



SLIDE GATE Products



Ladle and Tundish slide gate plates

Molds ready to order

LADLE
Z21-Z21R
LV12
LG22
LG24
CS60
CS80
CS100
LS70
LS90

TUNDISH
13QC
C51R

Ladle slide gate quality plates

PLATES CHEMICAL ANALYSIS (%)							
COMPONENTS	EXPAL76Z6C9	EXPAL76Z5C11	EXPAL78Z5C8	EXPAL75Z5C9	insert ZNS	Insert MCP	
Al203	76,3	76,3	78,1	75,3	-	8,6	
ZrO2	6,2	5,3	5,2	4,9	95	-	
MgO	-	-	-	-	-	84,5	
с	9,5	11	832	8,8	-	5,1	
	PL	ATES PHYSICAL PROF	PERTIES				
Apparent porosity (%)	6	5,2	1	5	11	7	
Bulk density (g/cm³)	3,16	3,15	3,2	3,15	4,9	2,85	
Cold Crush Strenght (Mpa)	170	220	250	180	200	122	
Main Applications	General Steel [Ca]<15ppm 300T LD 4-6ch 300T LD 4-10ch				Special Steel Ca 15 45 ppm sleet 4ch		
Remark	Apalling Resistance		Attravion Resistance Corresion Resistan			Resistance	

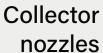
Tundish slide gate quality plates

CHEMICAL ANALYSIS					INSEI	DTC	
				Specia			owing
COMPONENTS	EXPAL95C3	EXPAL78Z5C8	EXPAL94C3	ZN5	МСР	AUN	ASP
AI2O3	95	78,1	94,1	-	8,6	90,7	91,5
ZrO2	-	5,2	-	95	-	-	-
NgO	-		-	-	84,5	-	-
С	2,8	8,5	3,5	-	5,1	4,2	-
	F	PLATES PHYSICAL PRO	OPERTIES				
Apparent porosity (%)	6	4	3,7	11	7	8,5	19,2
Bulk density (g/cm ³)	3,23	3,2	3,25	4,9	2,85	-	1,6
Cold Crush Strenght (Mpa)	170	250	270	200	122		
Main Applications	-	General Steel	Ca-treated steel: 7 ch Rail steel : 27ch	High Co treated Steel: 8ch		-	-
Remark		Apalling resistance	Abrasion resistance	Corresion	Resistance		

CASTABLE Products



Well blocks & Inner nozzles



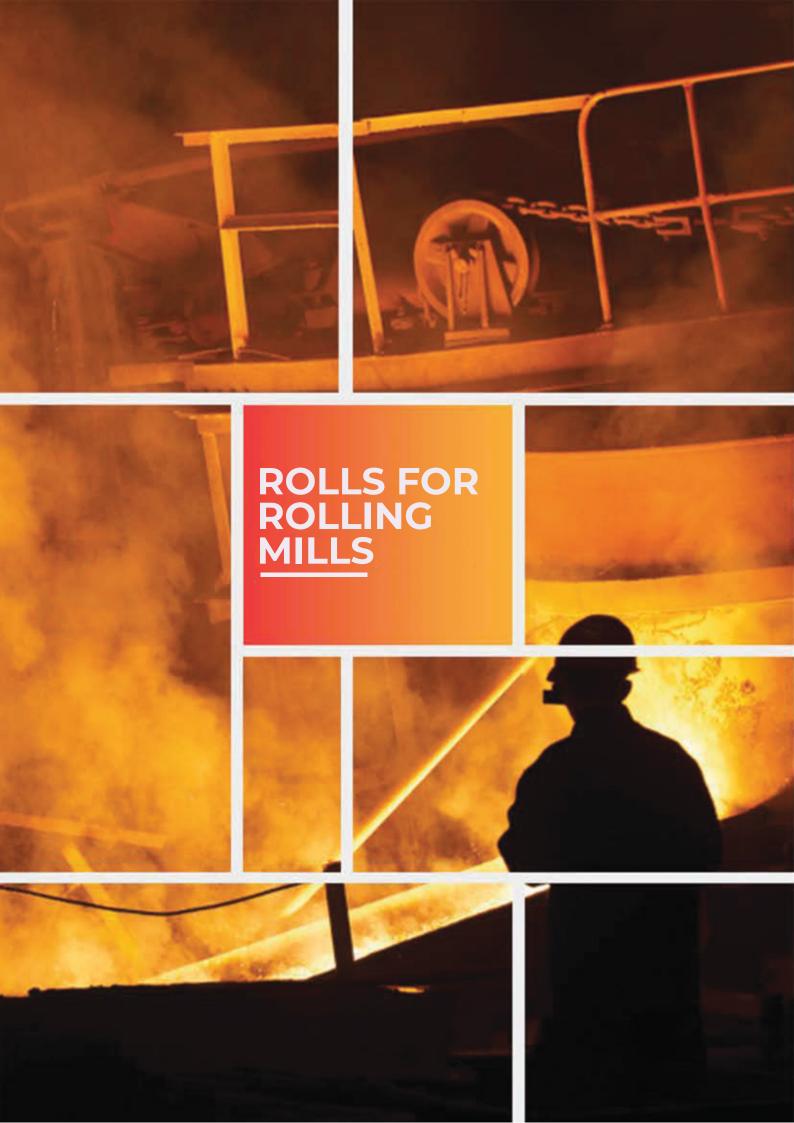




Housing blocks & porous plugs

Metering nozzles





S.G. Iron Rolls

MAIN FEATURES

Spheroidal Graphite Iron Rolls are structurally characterized as having graphite in nodular form instead of being in flakes as characterized in normal Cast Iron Rolls.

The matrix structure varies from Ferritic-Pearlitic and Pearlitic together with different carbide content and graphite in the form of spheroid / nodules. Special properties of

Application

These rolls are suitable for Roughing and Intermediate Mill stands of Blooming / Slabbing, TMT Bars Mills and Wire Rod mills. Rolls for Intermediate and Finishing Stands of Structure and Strip Mills.

SG Iron Rolls make it suitable for use in hot & cold steel relocating mills or by the manufacturers of all kinds of structural products such as squares, general angles, flat angles, bar and other such products.

HARDNESS. RANGE SHOR(C)		Min.	40	50	60
		Max.	50	60	65
	C 0/	Min.	3.1	3.1	3.1
	C%	Max.	3.4	3.4	3.5
	Mn%	Min.	0.7	0.7	0.7
	14111 70	Max.	0.7	0.7	0.7
	Si%	Min.	1.3	1.3	1.3
CHEMICAL	3170	Max.	1.6	1.6	1.6
COMPOSITION RANGE	P%	Min.	0	0	0
		Max.	0.01	0.01	0.01
	S %	Min.	0	0	0
		Max.	0.015	0.015	0.015
	Cr%	Min.	0.3	0.4	0.5
	0170	Max.	0.5	0.6	0.7
	Mo%	Min.	0.3	0.3	0.3
		Max.	0.4	0.4	0.4
	Ni%	Min.	1.5	1.5	1.5
	141.70	Max.	1.7	1.7	1.8



S.G. Accicular Rolls

MAIN FEATURES

S.G.I. Bainitic / Accicular Rolls are stronger and more wear resistant than S.G.I. Pearlitic Rolls and are capable of much higher hardness. Accicular rolls have a bainitic matrix with increased carbide. The name of this material is based on its constituents of nodular graphite and carbides in an accicular (needle-like) bainitic matrix, also called Lower Bainitic.

Application

These rolls are suitable for Intermediate and Finishing Mill stands for TMT Bar Mills, Rail and Structural mills. Rolls for Finishing Stands of Wire rod and Strip Mills.

These rolls are suitable for Roughing and Intermediate Mill stands of Blooming/Slabbing, TMT Bars Mills and Wire Rod mills. Rolls for Intermediate and Finishing Stands of Structure and Strip Mills.

HARDNESS. RANGE SHOR(C)		Min.	65	70
		Max.	70	75
	C%	Min.	3	3
	C %	Max.	3.5	3.5
	Mn%	Min.	0.5	0.5
	14111 70	Max.	0.7	0.7
	Si%	Min.	1.2	1.2
CHEMICAL	3170	Max.	1.6	1.6
COMPOSITION RANGE	P%	Min.	0	0
		Max.	0.01	0.01
	S %	Min.	0	0
		Max.	0.05	0.05
	Cr%	Min.	0.5	0.5
	0.70	Max.	0.7	0.7
	Mo%	Min.	0.7	0.7
	1010 70	Max.	0.9	0.9
	Ni%	Min.	2.8	2.8
	14170	Max.	3.1	3.1



Alloyed Steel Rolls / Adamite Rolls

MAIN FEATURES

Alloy Steel Base Adamite Rolls are Hyper-Eutectoid Steel alloyed with Nickel, Chromium and Molybdenum. It has higher mechanical strength and thermal / wear resistance. The rolls undergo a multi-stage, high temperature heat treatment cycle which consists of Normalizing / Hardening followed by a tempering cycle.

Application

These rolls are suitable for Roughing, Intermediate and Finishing stands for Section and Structural Mills, rolling medium and heavy Sections where resistance is very important along with considerable amount of strength and toughness. Applications include Heavy Section and Rail Mills, Universal Beam Mills, TMT Bar Mills, Medium Section Mills and Billet Mills.

HARDNESS.		Min.	45	45
RANGE SHOR(C)		Max.	50	55
	C%	Min.	1.4	1.5
	C%	Max.	1.6	1.7
	Mn%	Min.	0.55	0.6
	14111 70	Max.	0.7	0.75
	Si%	Min.	0.45	0.5
CHEMICAL	3170	Max.	0.6	0.65
COMPOSITION RANGE	Р%	Min.	0	0
		Max.	0.05	0.05
	S%	Min.	0	0
	370	Max.	0.05	0.05
	Cr%	Min.	0.75	0.25
	01 70	Max.	1.2	0.35
	Mo%	Min.	8.0	0.3
	100 70	Max.	1.4	0.4
	Ni%	Min.	0.7	1
	14170	Max.	1	1.25



Definite Chill Cast Iron Rolls

MAIN FEATURES

Definite Chill Cast Iron Rolls also known as Clear Chill Rolls.

Such rolls in general possess excellent wear resistance and when alloyed with proper alloying elements have adequate resistance to fracture, fire cracking and spalling. By controlled addition of various alloying elements, the surface hardness and wear properties of chilled zone can be improved upto an optimum limit.

Application

These rolls are suitable for Roughing and Intermediate Mill stands of Blooming/Slabbing, TMT Bars Mills and Wire Rod mills. Rolls for Intermediate and Finishing Stands of Structure and Strip Mills.

More alloyed grades used considering rolling mill operational conditions and especially wear resistance which is increasing with hardness drop if compared with standard grades.

HARDNESS. RANGE SHOR(C)		Min.	60	70
		Max.	70	75
CHEMICAL COMPOSITION RANGE	C%	Min.	3	3
		Max.	3.5	3.5
	Mn%	Min.	0.6	0.6
		Max.	0.8	0.9
	Si%	Min.	1	1
		Max.	1.1	1.3
	P%	Min.	0.11	0.11
		Max.	Max.	Max.
	S %	Min.	-	-
		Max.	-	-
	Cr%	Min.	1.205	1.5
		Max.	1.5	2
	Mo%	Min.	0.3	0.4
		Max.	0.4	0.5
	Ni%	Min.	0.75	1
		Max.	1	1.25



Indefinite Chill Cast Iron Rolls

MAIN FEATURES

Indefinite Chill Cast Iron Rolls have a matrix structure which varies from fine pearlitic to bainitic martensitic depending on the alloy addition. The material has very good thermal properties coupled with property of imparting good surface finish to the product.

The desired hardness is obtained by changing the carbide /graphite balance which is achieved by a close control of chemistry and process parameters.

Application

These Rolls are highly suitable for products where surface finish is very critical. Adequate water cooling of roll is required.

Intermediate/Finishing stand of Wire Rod Mills, TMT Mills, Merchant Mills and Structural Mills. Finishing stand of Strip, Sheet and Flat rolling mills.

The working surface is highly resistant to fire cracking, spalling and wear.

Customised to client's requirement assuring the best quality which is used in suitable rolling Mills.

HARDNESS. RANGE SHOR(C)		Min.	50	60
		Max.	60	70
CHEMICAL COMPOSITION RANGE	C%	Min.	3	3
		Max.	3.4	3.5
	Mn%	Min.	0.5	0.6
		Max.	8.0	0.9
	Si%	Min.	2	2.25
		Max.	2.25	2.5
	P%	Min.	0.1	0.1
		Max.	Max.	Max.
	S %	Min.	0.05	0.05
		Max.	Max.	Max.
	Cr%	Min.	1.25	0.2
		Max.	1.5	0.3
	Mo%	Min.	1.5	0.2
		Max.	2	0.3
	Ni%	Min.	1	1
		Max.	1.25	1.5



QUALITY CONTROL and Quality Policy

MAIN FEATURES

All the rolls are thoroughly inspected at various stages of production to ensure that the best quality product reaches our customers. Inspection is carried out by a team of dedicated Engineers using various metrological instruments.

We, at MMC are committed to increase satisfaction of our customers and employees through continual improvement of our Quality Management System.





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