

Unibar

Technical Documentation

Unibar. Continuous Cast Iron Bar produced by United Cast Bar Limited

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UNIBAR GRADES AND STRUCTURES

3.0

UNIBAR Grades and Structures

UNIBAR GRADES AND STRUCTURES

The typical structure of the Unibar flake iron material consists of a fine outer rim of undercooled graphite (predominantly ferrite matrix and random 'A' type graphite), and a predominantly pearlite matrix in the core of the bar. By introducing suitable inoculants and pearlite stabilizing elements, it is possible to produce an iron with a predominantly pearlitic rim and fully pearlitic core.

Components produced from Unibar have consistent tensile strengths and the designer can have confidence in the tensile test result, since this test has been taken from actual product and not a separately cast test bar (which is the case with static castings).

UNIBAR FLAKE GREY CAST IRON
PRINCIPAL CHARACTERISTICS

3.1

UNIBAR-200

FERRITIC FLAKE CAST IRON (ANNEALED) (GJL-200 EN-1561)

GENERAL DESCRIPTION

This is the least hard quality, (120-180 HB) and is therefore recommended if your requirements are for good machinability with low requirements of tensile strength and resistance to wear. In addition, because of its ferritic structure, it is recommended for applications requiring good thermal conductivity. The surface finish of UNIBAR-200 is, however, inferior to that of the other qualities, which are harder and therefore have better structural cohesion.

AVAILABILITY

Available subject to consultation. UNIBAR-200 quality is obtained by means of thermal / annealing treatment of UNIBAR-250. See the list of Standard Sizes on page 19.

UNIBAR-250

FERRITIC-PEARLITIC FLAKE CAST IRON (GJL-250 EN-1561)

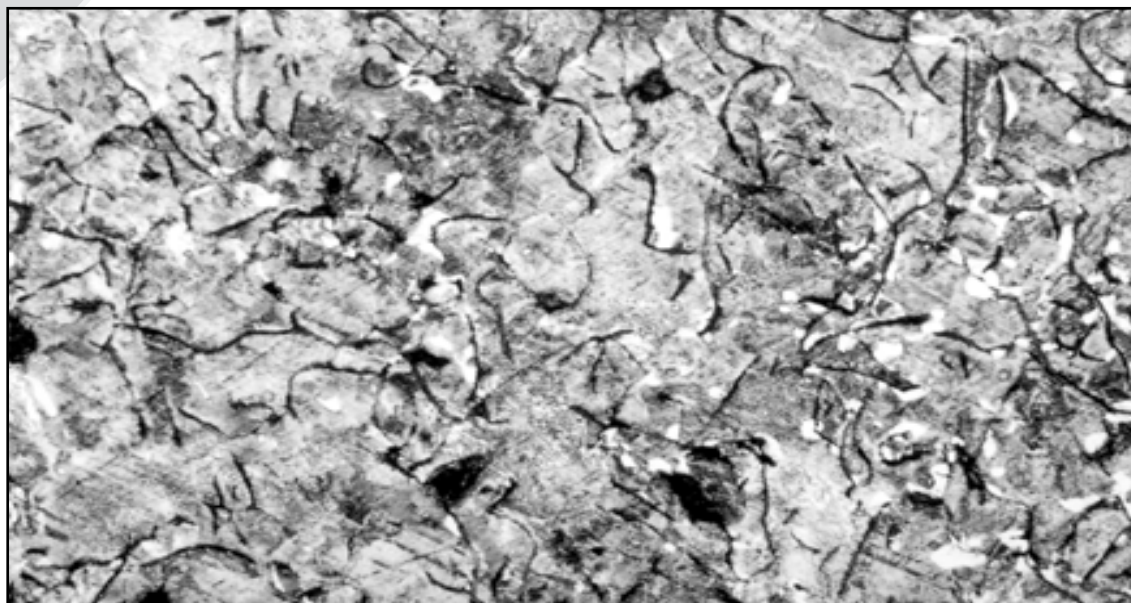
GENERAL DESCRIPTION

This is a quality of average hardness (180-220 HB) and is therefore recommended for uses where a balance is required between mechanical characteristics and machinability. It can be annealed in order to obtain the previous UNIBAR-200 quality. See table in page 25

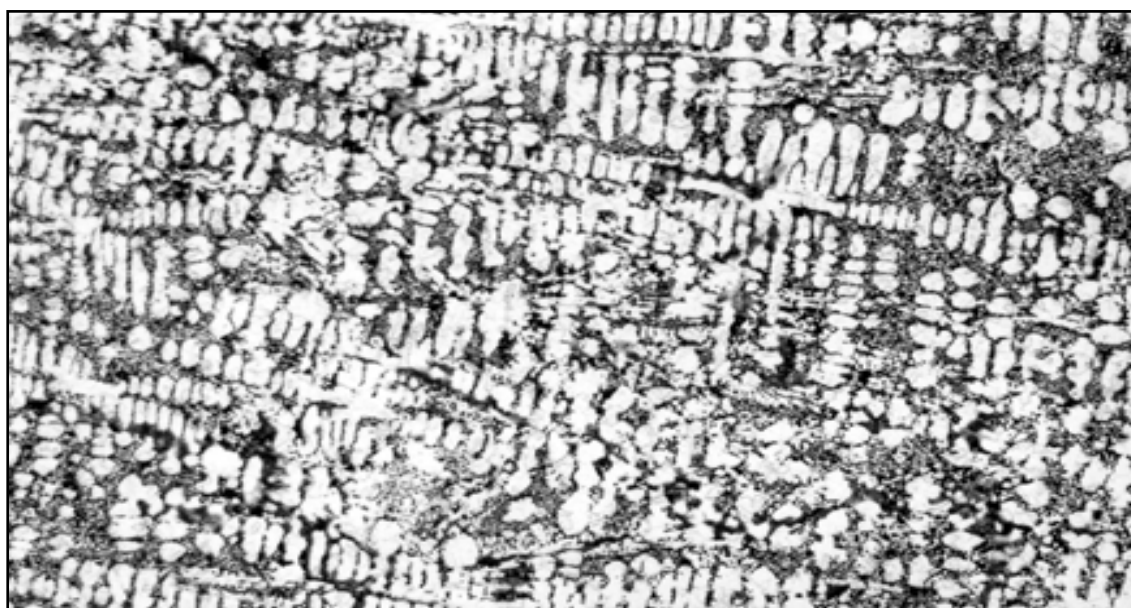
AVAILABILITY

Available from stock. See the list of Standard Sizes on page 19.

However, any other size not included in the list can be produced according to minimum tonnage and after consultation.



UNIBAR 250 Core



UNIBAR 250 Periphery

UNIBAR-300

PEARLITIC FLAKE CAST IRON (GJL-300 EN-1561)

GENERAL DESCRIPTION

This is one of the hardest qualities, (200-250 HB,) and is therefore used when high tensile strength and/or resistance to wear is required, because of its pearlitic structure. Its surface finish is better than that of other softer qualities because of its better structural cohesion, which allows surface hardening.

AVAILABILITY

Available subject to consultation, taking the UNIBAR-250 sizes as a basis (see the list of Standard Sizes on page 19). Subject to minimum order.

UNIBAR-GF

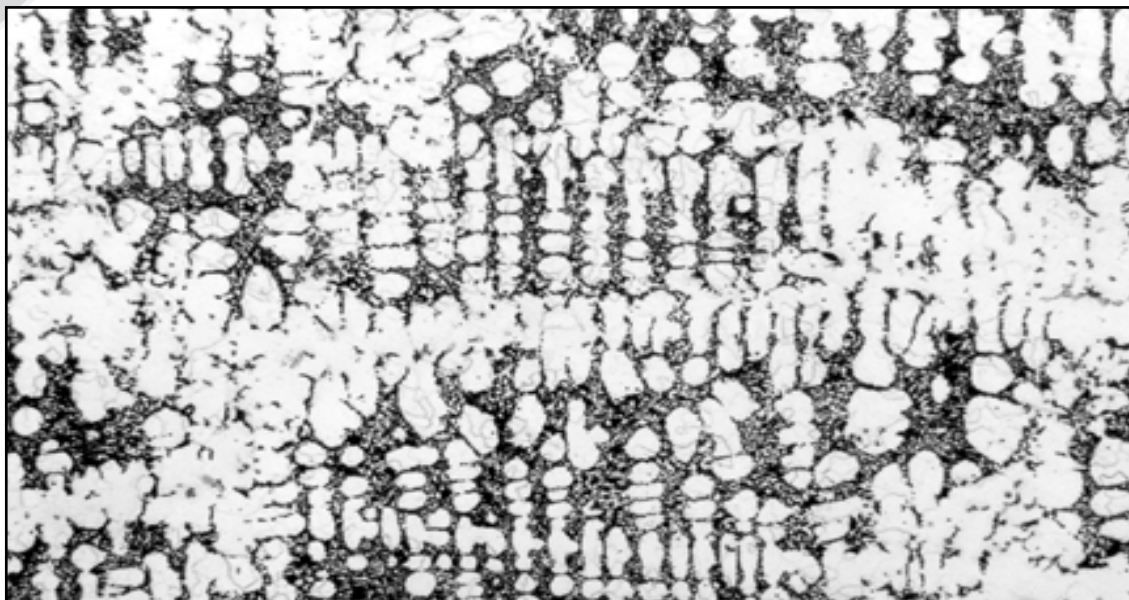
INTERDENDRITIC FERRITIC CAST IRON (SPECIAL)

GENERAL DESCRIPTION

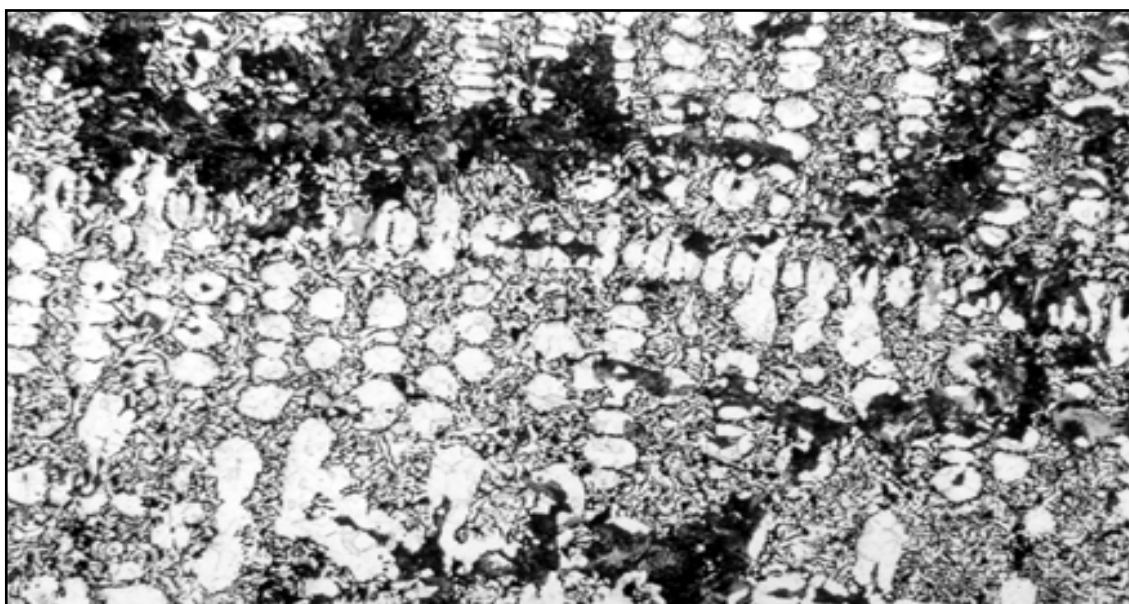
This quality is recommended for glass moulds because of its ferritic structure with fine graphite (ID/IE). The thin film of graphite improves the surface finish, while the ferritic matrix encourages the expulsion of heat from the mould due to its greater heat conductivity in comparison with pearlitic casting. This quality can be offered in the annealed condition UNIBAR-GF (100% ferritic-140/180 HB) or as- cast UNIBAR-GP (20/30 % ferrite-160/200 HB).

AVAILABILITY

Available subject to consultation, taking the UNIBAR-250 sizes as a basis (see the list of Standard Sizes on page 19). Subject to minimum order.



UNIBAR-G-F Mid Radius Zone



UNIBAR-G-P Mid Radius Zone

UNIBAR-350

HIGH CONTENT PEARLITIC CAST IRON (SPECIAL)

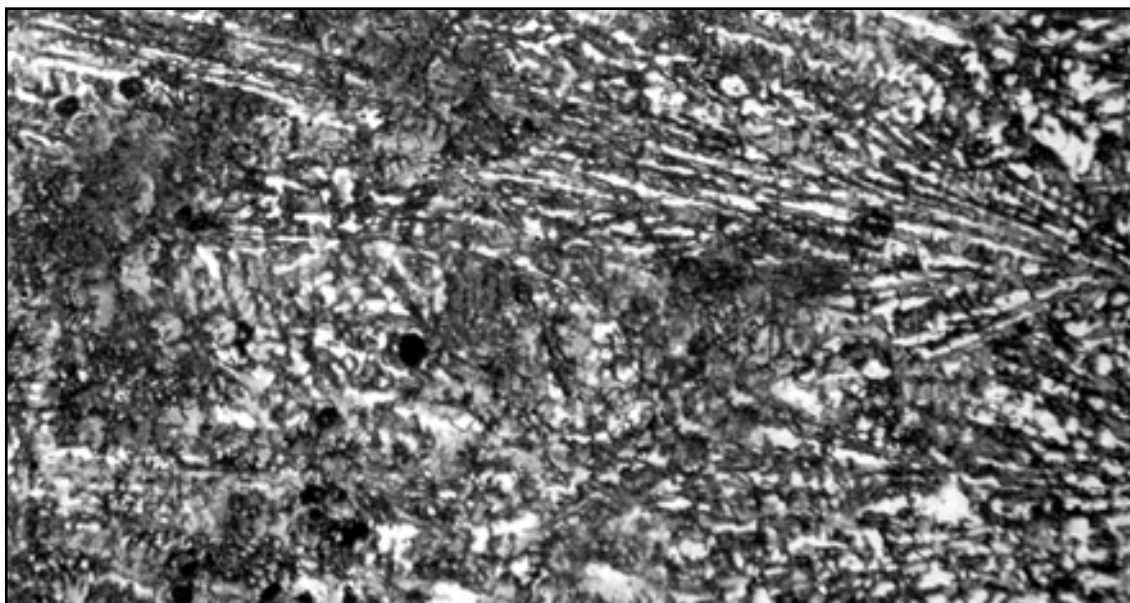
GENERAL DESCRIPTION

This is the hardest quality with the highest resistance (220-280 HB, depending on dimension). Its most important quality is the fact that the structure is also pearlitic on the outside rim (90% pearlite), and is therefore suitable for those applications in which high resistance to wear is required in the parts close to the outside of the bar. In addition, this quality allows surface hardening.

In particular, this quality with a high phosphorus content (0.3/0.6%) is recommended when a higher resistance to wear is required than that provided by a fully pearlitic structure, as is the case with valve guides, etc. In addition, the very hard UNIBAR-350 quality (HB-250/310), obtained using fine graphite (ID/IE) in the center of the bar as well, constitutes one of the highest values in terms of cohesion and resistance.

AVAILABILITY

Available subject to consultation, taking the UNIBAR-250 sizes as a basis (see the list of Standard Sizes on page 19). Subject to minimum order.



UNIBAR-350 Periphery


UNIBAR STANDARD SIZES UNIBAR 250

| UNIBAR 250 | | | | | | | | | | | |
|-------------------|----------|----------|--------|------------------|----------|----------|--------|---------------------|----------|----------|---------|
| Round ● | | | | Squares ■ | | | | Rectangles ▭ | | | |
| | Standard | Optional | Ingots | | Standard | Optional | Ingots | | Standard | Optional | Ingots |
| 25 mm. | x | | | 30 x 30 mm. | x | | | 40 x 20 mm. | x | | 600x500 |
| 30 mm. | x | | | 35 x 35 mm. | x | | | 40 x 25 mm. | x | | |
| 35 mm. | x | | | 40 x 40 mm. | x | | | 45 x 20 mm. | x | | |
| 40 mm. | x | | | 45 x 45 mm. | x | | | 45 x 35 mm. | x | | |
| 45 mm. | x | | | 50 x 50 mm. | x | | | 50 x 25 mm. | x | | |
| 50 mm. | x | | | 55 x 55 mm. | x | | | 50 x 30 mm. | x | | |
| 55 mm. | x | | | 60 x 60 mm. | x | | | 50 x 40 mm. | x | | |
| 60 mm. | x | | | 65 x 65 mm. | x | | | 50 x 45 mm. | x | | |
| 65 mm. | x | | | 70 x 70 mm. | x | | | 55 x 35 mm. | x | | |
| 70 mm. | x | | | 75 x 75 mm. | x | | | 60 x 30 mm. | x | | |
| 75 mm. | x | | | 80 x 80 mm. | x | | | 60 x 40 mm. | x | | |
| 80 mm. | x | | | 85 x 85 mm. | x | | | 60 x 45 mm. | x | | |
| 85 mm. | x | | | 90 x 90 mm. | x | | | 60 x 50 mm. | x | | |
| 90 mm. | x | | | 95 x 95 mm. | x | | | 70 x 30 mm. | x | | |
| 95 mm. | x | | | 100 x 100 mm. | x | | | 70 x 40 mm. | x | | |
| 100 mm. | x | | | 110 x 110 mm. | x | | | 70 x 50 mm. | x | | |
| 105 mm. | x | | | 120 x 120 mm. | x | | | 70 x 55 mm. | x | | |
| 110 mm. | x | | | 130 x 130 mm. | x | | | 70 x 60 mm. | x | | |
| 115 mm. | x | | | 140 x 140 mm. | x | | | 80 x 30 mm. | x | | |
| 120 mm. | x | | | 150 x 150 mm. | x | | | 80 x 40 mm. | x | | |
| 125 mm. | x | | | 160 x 160 mm. | x | | | 80 x 50 mm. | x | | |
| 130 mm. | x | | | 170 x 170 mm. | x | | | 80 x 60 mm. | x | | |
| 135 mm. | x | | | 180 x 180 mm. | x | | | 80 x 70 mm. | x | | |
| 140 mm. | x | | | 190 x 190 mm. | x | | | 85 x 40 mm. | x | | |
| 145 mm. | x | | | 200 x 200 mm. | x | | | 85 x 50 mm. | x | | |
| 150 mm. | x | | | 210 x 210 mm. | x | | | 90 x 40 mm. | x | | |
| 160 mm. | x | | | 220 x 220 mm. | x | | | 90 x 45 mm. | x | | |
| 170 mm. | x | | | 230 x 230 mm. | x | | | 90 x 50 mm. | x | | |
| 180 mm. | x | | | 250 x 250 mm. | x | | | 90 x 60 mm. | x | | |
| 190 mm. | x | | | 280 x 280 mm. | x | | | 90 x 70 mm. | x | | |
| 200 mm. | x | | | 300 x 300 mm. | x | | | 90 x 80 mm. | x | | |
| 210 mm. | x | | | 310 x 310 mm. | | | | 100 x 30 mm. | x | | |
| 220 mm. | x | | | 320 x 320 mm. | | x | | 100 x 40 mm. | x | | |
| 230 mm. | x | | | 330 x 330 mm. | x | | | 100 x 50 mm. | x | | |
| 240 mm. | x | | | 350 x 350 mm. | | x | | 100 x 60 mm. | x | | |
| 250 mm. | x | | | 360 x 360 mm. | x | | | 100 x 65 mm. | x | | |
| 260 mm. | x | | | 370 x 370 mm. | | | x | 100 x 70 mm. | x | | |
| 270 mm. | x | | | 380 x 380 mm. | x | | x | 100 x 80 mm. | x | | |
| 280 mm. | x | | | 390 x 390 mm. | | | x | 100 x 90 mm. | x | | |
| 290 mm. | x | | | 400 x 400 mm. | | | x | 105 x 30 mm. | x | | |
| 300 mm. | x | | | 410 x 410 mm. | x | | | 105 x 35 mm. | x | | |
| 310 mm. | x | | | 420 x 420 mm. | | | x | 105 x 40 mm. | x | | |

UNIBAR 250

| Round ● | | | | Squares ■ | | | | Rectangles ▣ | | | |
|---------|----------|----------|--------|---------------|----------|----------|--------|---------------|----------|----------|--------|
| | Standard | Optional | Ingots | | Standard | Optional | Ingots | | Standard | Optional | Ingots |
| 320 mm. | x | | | 430 x 430 mm. | | | x | 105 x 90 mm. | x | | |
| 330 mm. | x | | | 440 x 440 mm. | | | x | 110 x 30 mm. | x | | |
| 340 mm. | x | | | 450 x 450 mm. | | | x | 110 x 35 mm. | x | | |
| 350 mm. | x | | | 460 x 460 mm. | | | x | 110 x 40 mm. | x | | |
| 360 mm. | x | | | 470 x 470 mm. | | | x | 110 x 50 mm. | x | | |
| 370 mm. | | x | | 480 x 480 mm. | | | x | 110 x 60 mm. | x | | |
| 380 mm. | x | | | 490 x 490 mm. | | | x | 110 x 70 mm. | x | | |
| 390 mm. | | x | | 500 x 500 mm. | | | x | 110 x 90 mm. | x | | |
| 400 mm. | x | | | 510 x 510 mm. | | | x | 110 x 80 mm. | x | | |
| 420 mm. | x | | | 520 x 520 mm. | | | x | 115 x 55 mm. | x | | |
| 430 mm. | | x | | 530 x 530 mm. | | | x | 120 x 40 mm. | x | | |
| 440 mm. | | x | | 540 x 540 mm. | | | x | 120 x 50 mm. | x | | |
| 450 mm. | x | | | 550 x 550 mm. | | | x | 120 x 60 mm. | x | | |
| 460 mm. | | | x | | | | | 120 x 70 mm. | x | | |
| 470 mm. | x | | x | | | | | 120 x 80 mm. | x | | |
| 480 mm. | | | x | | | | | 120 x 90 mm. | x | | |
| 490 mm. | | | x | | | | | 120 x 100 mm. | x | | |
| 500 mm. | x | | x | | | | | 125 x 85 mm. | x | | |
| 510 mm. | | | x | | | | | 130 x 40 mm. | x | | |
| 520 mm. | | | x | | | | | 130 x 50 mm. | x | | |
| 530 mm. | | | x | | | | | 130 x 55 mm. | x | | |
| 540 mm. | | | x | | | | | 130 x 60 mm. | x | | |
| 550 mm. | | | x | | | | | 130 x 70 mm. | x | | |
| 560 mm. | | | x | | | | | 130 x 80 mm. | x | | |
| 570 mm. | | | x | | | | | 130 x 90 mm. | x | | |
| 580 mm. | | | x | | | | | 130 x 100 mm. | x | | |
| 590 mm. | | | x | | | | | 130 x 110 mm. | x | | |
| 600 mm. | | | x | | | | | 140 x 70 mm. | x | | |
| 610 mm. | | | x | | | | | 140 x 80 mm. | x | | |
| 620 mm. | | | x | | | | | 140 x 90 mm. | x | | |
| 630 mm. | | | x | | | | | 145 x 75 mm. | x | | |
| 640 mm. | | | x | | | | | 150 x 90 mm. | x | | |
| 650 mm. | | | x | | | | | 150 x 100 mm. | x | | |
| | | | | | | | | 150 x 110 mm. | x | | |
| | | | | | | | | 160 x 40 mm. | x | | |
| | | | | | | | | 160 x 65 mm. | x | | |
| | | | | | | | | 160 x 80 mm. | x | | |
| | | | | | | | | 160 x 100 mm. | x | | |
| | | | | | | | | 165 x 135 mm. | x | | |
| | | | | | | | | 170 x 110 mm. | x | | |
| | | | | | | | | 170 x 120 mm. | x | | |
| | | | | | | | | 170 x 150 mm. | x | | |

UNIBAR 250

| Rectangles  | | | | | | | |
|--|---------|----------|--------|---------------|---------|----------|--------|
| | Standar | Optional | Ingots | | Standar | Optional | Ingots |
| 180 x 100 mm. | x | | | 490 x 295 mm. | x | | |
| 180 x 120 mm. | x | | | 520 x 50 mm. | x | | |
| 185 x 165 mm. | x | | | 520 x 60 mm. | | x | |
| 180 x 170 mm. | x | | | 520 x 80 mm. | | x | |
| 190 x 145 mm. | x | | | 520 x 100 mm. | | x | |
| 200 x 80 mm. | x | | | 520 x 120 mm. | | | |
| 200 x 90 mm. | x | | | 520 x 135 mm. | x | | |
| 200 x 100 mm. | x | | | 520 x 330 mm. | x | | |
| 200 x 150 mm. | x | | | 620 x 60 mm. | | x | |
| 205 x 155 mm. | x | | | 620 x 80 mm. | | x | |
| 210 x 100 mm. | x | | | 620 x 100 mm. | | x | |
| 210 x 130 mm. | x | | | 620 x 120 mm. | | x | |
| 210 x 160 mm. | x | | | 620 x 270 mm. | x | | |
| 215 x 85 mm. | x | | | 620 x 330 mm. | x | | |
| 220 x 70 mm. | x | | | | | | |
| 220 x 150 mm. | x | | | | | | |
| 220 x 170 mm. | x | | | | | | |
| 230 x 180 mm. | x | | | | | | |
| 230 x 185 mm. | x | | | | | | |
| 245 x 165 mm. | x | | | | | | |
| 260 x 120 mm. | x | | | | | | |
| 290 x 200 mm. | x | | | | | | |
| 300 x 70 mm. | x | | | | | | |
| 300 x 150 mm. | x | | | | | | |
| 320 x 60 mm. | x | | | | | | |
| 320 x 80 mm. | x | | | | | | |
| 320 x 220 mm. | x | | | | | | |
| 350 x 100 mm. | x | | | | | | |
| 360 x 65 mm. | x | | | | | | |
| 380 x 90 mm. | x | | | | | | |
| 400 x 60 mm. | x | | | | | | |
| 400 x 80 mm. | x | | | | | | |
| 400 x 100 mm. | x | | | | | | |
| 400 x 120 mm. | | x | | | | | |
| 400 x 130 mm. | x | | | | | | |
| 400 x 180 mm. | x | | | | | | |
| 420 x 80 mm. | x | | | | | | |
| 420 x 120 mm. | | x | | | | | |
| 430 x 160 mm. | x | | | | | | |
| 430 x 330 mm. | x | | | | | | |
| 470 x 90 mm. | x | | | | | | |
| 490 x 245 mm. | x | | | | | | |

UNIBAR 250

Rectangles

| | Standard | Optional | Ingots | |
|--|----------|----------|--------|--|
| 720 x 60 mm. | | x | | |
| 720 x 80 mm. | | x | | |
| 720 x 100 mm. | | x | | |
| 720 x 120 mm. | | x | | |
| | | | | |
| Any other combination up to 750x330mm available depending on enquiry (in multiples of 10 mm) | | x | | |
| | | | | |
| Any other combination up to 600x500 mm available as INGOT (in multiples of 10 mm) | | | x | |
| | | | | |

Standard size means that it is a stockable product.
 This list is also valid for quality UNIBAR 200 (UNIBAR 250 Annealed)
 Other sizes, sections and specifications (UNIBAR 300 and UNIBAR 350) can be supplied on request.
 These sizes are suitable for being machined down.
 INGOTS are supplied PROOF MACHINED.
 Unibar is constantly expanding the range of sizes. Please, do not hesitate to ask for further information.

STANDARD LENGTHS FOR UNIBAR SPHEROIDAL GRADES

| | AS-CAST | | | MACHINED | | | | | | |
|---------------------|---------|--------|-----------|----------|--------|------------------|-----------------|--------|--------|--------|
| | Round | Square | Rectangle | Ingots | | Tubes | | Peeled | Milled | Turned |
| | | | | Round | Square | Outside Machined | Outside As-cast | | | |
| 1000 mm -0/+50 mm | ○ | ○ | ○ | ■ | ■ | ■ | ■ | ○ | ○ | ○ |
| 2000 mm +50/+150 mm | ○ | ○ | ○ | | | ■ | ■ | ○ | ■ | ■ |
| 3000 mm +50/+150 mm | ■ | ■ | ■ | | | | | ■ | | ■ |
| Others | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

■ Standard Length
 ○ Possible as special if required both Length and Tolerance.

CHEMICAL COMPOSITION

Unibar guarantees the characteristics particular to its various grades, with chemical composition subject to the discretion of its Technical Department. Required variations in mechanical or compositional characteristics must be discussed in advance, and specified on the order.

The following table shows the chemical composition of the various Unibar flake grades for information purposes only. The percentages of C and Si vary according to the dimensions of the bar.

| ELEMENT | % |
|-------------------|------------|
| Carbon | 2.9 — 3.65 |
| Silicon | 1.8 — 2.9 |
| Manganese | 0.5 — 0.7 |
| Sulphur | 0.1 max |
| Phosphorus | 0.3 max. |

MECHANICAL-CHARACTERISTICS, HARDNESS AND STRUCTURE

The table below shows details of the expected values. It is important to note that, due to the effect of sensitivity to the thickness of the flake cast iron, the values of these properties reduce as the diameter or cooling modulus of the bar increases.

| UNIBAR Grade | Diameter or Module of Cooling | Hardness Range H.B. 2.5/187.5 | UTS (N/mm ²) or (Mpa) Min.- | Matrix Structure | Graphite Structure |
|--------------------------------|-------------------------------------|-------------------------------------|---|---|---|
| UNIBAR-200 | < 25 mm | 150-210 | 180 | Rim.- Ferritic | Rim.- Type ID/IE |
| | 25-50 mm | 140-200 | 155 | Core.- Ferritic | Core.- Type IA2/4 |
| | 50-100 mm | 130-190 | 130 | | With IB/ID/IE |
| | 100-200 mm | 120-190 | 115 | | (20% maximum) |
| | > 200 mm | 120-190 | | | |
| | | | | | |
| UNIBAR-250 | < 25 mm | 190-250 | 225 | Rim.- Ferritic | Rim.- Type ID/IE |
| | 25-50 mm | 180-230 | 195 | Core.- 70% Pearlite | Core.- Type IA3/5 |
| | 50-100 mm | 180-220 | 170 | | With IB/ID/IE |
| | 100-200 mm | 170-220 | 155 | | (10% maximum) |
| | > 200 mm | 160-220 | | | |
| | | | | | |
| UNIBAR-300 | < 25 mm | 210-260 | 250 | Rim.- Ferritic -Pearlite. | Rim.- Type ID/IE |
| | 25-50 mm | 200-240 | 235 | Core 90% Pearlite | Core.- Type IA3/5 |
| | 50-100 mm | 200-230 | 210 | | With IB/ID/IE |
| | 100-200 mm | 190-230 | 170 | | (10% maximum) |
| | > 200 mm | 190-230 | | | |
| | | | | | |
| UNIBAR GP (Special) | 40-200 mm | 160-200 | 170 | 30% Pearlite Max. Core (Without annealing) | Graphite.- Type ID/IE Rim and Core. |
| UNIBAR GF (Special) | 40-200 mm | 140-180 | 160 | Total Ferrite. (Annealed) | Graphite.- Type ID/IE Rim and Core. |
| UNIBAR 350 (Special) | 20-150 mm | 210-280 | 210 | 90% Pearlite. Rim 100% Pearlite Core. (Possible steadite network if % P>0.3 is desired). | Rim.- Type ID/IE Core.- Type IA3/5 With IB/ID/IE (10% maximum) |

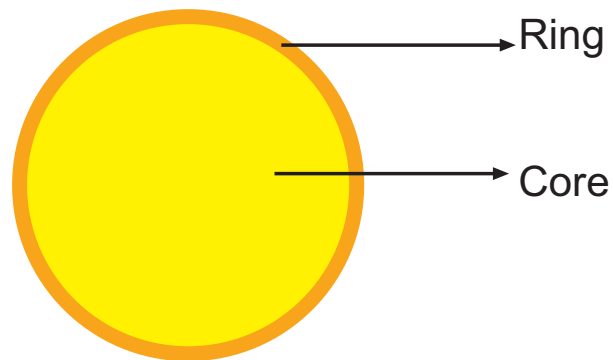
NOTES:

1. The test specimen for tensile strength is taken from mid-radius.
2. The cooling modulus for square and rectangular bars is obtained by applying the formula

$$Mod = \frac{2 \times C \times c}{(C+c)}$$

C=Width c=Height

3. The Unibar flake grades have a characteristic presence of a rim with interdendritic graphite (ID/IE) due to the subcooling inherent in the process. In general, a ferritic structure is obtained in this rim. Nevertheless, this structure can be pearlitic in special suitability alloyed qualities (see UNIBAR-350).



4. In specific cases the EN-1563 (Spheroidal) and EN-1561 (Flake) standards provide for casting requested in accordance with the desired HB hardness values. In this case, these values of hardness determine grade or quality, with the values of the mechanical characteristics (UTS, PS, EL) therefore being provided for information only.

SURFACE HARDENING

The UNIBAR-300 and UNIBAR-350 qualities are recommended for surface hardening (approx. 880°C.). Given its pearlitic structure in the as-cast condition, it is advisable to test the 1st samples in order to check the values reached (40/55 HRc).

UNIBAR-350 is specially recommended for parts where high values of hardness are required in areas close to the periphery, since this is mainly pearlitic.

The process of hardening UNIBAR-200 with a ferritic structure is not recommended.

The UNIBAR-250 pearlitic-ferritic quality allows hardening although the results will be inferior to those obtained with UNIBAR-300 and UNIBAR-350.

Generally, the through-hardening of Unibar is not to be recommended.

In the areas of the bar close to the core it is advisable to bear in mind (especially for large dimensions) that because of its thick graphite sheet structure, the values of hardness reached will be lower than those obtained in the areas close to the outside of the bar.

In general, other types of surface hardening (nitriding, sulphinizing, etc.) are perfectly applicable as with any type of traditional Flake Cast Iron. However, the treatment specialist will have to take into account the normal considerations, including the following:

1. Structure and hardness of the core-periphery of the bar in the as-cast condition;
2. Awareness of the different qualities as referred to in the case of hardening treatment;
3. Variation in casting characteristics depending on the dimensions of the bar;

See grading of suitability for hardening in Comparative Table Of Unibar Behaviour in page 68.

MACHINING ALLOWANCE ON BARS FOR FLAKE IRON BAR

| DIMENSION (mm) | ROUND | SQUARE AND RECTANGULAR |
|-------------------|--------------------------------|--------------------------------|
| | Minimum Machining Allowance | Minimum Machining Allowance |
| 25-50 | 2 mm | 2.5 mm |
| 55-75 | 2 mm | 3 mm |
| 80-100 | 2,5 mm | 4 mm |
| 105-150 | 3 mm | 4 mm |
| 155-200 | 4 mm | 5 mm |
| 210-280 | 5 mm | 5 mm |
| 290-350 | 7.5 mm | 7.5 mm |
| 360-430 | 10 mm | 10 mm |

NOTE:

This machining allowance refers to the radius of the round bar or to each face of the square or rectangular bar. For example, in order to obtain a \varnothing 40 mm as a final dimension, we must start with a \varnothing 44 mm as a minimum. In the case of square and rectangular sections, we have to machine a dimension 108x108 mm or over in order to obtain a final dimension of 100x100 mm.

DIMENSIONAL TOLERANCE FLAKE GREY CAST BAR

| DIAMETER (mm) | TOLERANCE in comparison with the nominal measurement | Maximum ovality $\emptyset-\emptyset$. |
|--------------------------|---|--|
| 20-100 | - 0 / + 2 mm | 1 mm |
| 105-200 | - 0 / + 3mm | 2 mm |
| > 200 | - 3 / + 3 mm | 4 mm |

| SHAPE | In comparison with the nominal measurement SQUARE C x C | TOLERANCE SQUARE C < 100 mm | TOLERANCE SQUARE 100 ≤ C-Width ≤ 200 | TOLERANCE SQUARE 200mm < C |
|------------------|---|---|---|---|
| SQUARE | C | C (0, +2) | C (0, +3) | C (-3, +3) |
| | In comparison with the nominal measurement RATIO C / c C-Width...c-Height | TOLERANCE RECTANGLE c-Height C-Width < 100 mm | TOLERANCE RECTANGLE c-Height 100 < = C-Width ≤ 200 | TOLERANCE RECTANGLE c-Height 200mm < C-Width |
| RECTANGLE | 1 < C/c < 1,5 | c(0, +2) C(0, +2) | c(0, +3) C(0, +3) | c(0, +4) C(-3, +3) |
| | 1,5 ≤ C/c < 2 | c(0, +3) C(0, +2) | c(0, +4) C(0, +3) | c(0, +5) C(-3, +3) |
| | 2 ≤ C/c < 3 | c(0, +4) C(0, +2) | c(0, +5) C(0, +3) | c(0, +6) C(-3, +3) |
| | 3 ≤ C/c < 4 | c(0, +5) C(0, +2) | c(0, +6) C(0, +3) | c(0, +7) C(-3, +3) |
| | 4 < C/c | c(0, +6) C(0, +2) | c(0, +7) C(0, +3) | c(0, +8) C(-3, +3) |