

**A/S TASSO STANDARDS  
CONTINUOUS CAST IRON  
CONTENTS LIST**

**1) GEOMETRIC TOLERANCES**

- Flake iron bars
- Nodular iron bars

**2) CONTINUOUS CAST FLAKE IRON BARS**

<i>Grade:</i>	<i>Colour code:</i>
• GG-F-BLACK (GJL-150)	black dot
• GG-FFP-GREEN (GJL-200)	green dot
• GG-FP-RED (GJL-250)	red dot
• GG-P-YELLOW (GJL-300)	yellow dot

**3) CONTINUOUS CAST NODULAR IRON BARS**

<i>Grade:</i>	<i>Colour code:</i>
• GJS-400-15	yellow and red dot
• GJS-400-18-LT	one red and two yellow dots
• GJS-500-7	yellow and blue dot
• GJS-600-3	yellow and white dot
• GJS-700-2	yellow and black dot

May, 2005

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**A/S TASSO**

FREDERIKSGADE 37  
DK-5000 ODENSE C  
TEL.: +45 99 10 30 50  
FAX: +45 65 91 40 22

**TASSO STANDARD FOR GEOMETRIC TOLERANCES**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the geometric tolerances, which applies to continuous cast flake iron bars, grade EN-GJL according to EN 1561, produced by A/S Tasso.

**Diameter, side length and ovality tolerances**

Diameter/Side length (nominal measure)	Tolerance	Maximum ovality
30-100 mm	-0/+2.0 mm	1.0 mm
101-150 mm	-0/+3.0 mm	2.5 mm
151-200 mm	-0/+4.0 mm	4.0 mm
201-350 mm	-0/+5.0 mm	5.0 mm
351-440 mm	-0/+6.0 mm	6.0 mm

**Radii** Side length < 150 mm : R = 5.0 mm

Side length > 150 mm : R = 8.0 mm

**Description of deviation**

**Negative deviation** of the material is not allowed to **exceed** the following values (compared to **nominal** measure):

Diameter/Side length (nominal measure)	Round bars	Square and rectangular
30-100 mm	1.0 mm	1.5 mm
101-200 mm	2.0 mm	2.5 mm
201-440 mm	3.0 mm	3.5 mm

**Positive deviation** of the material is not allowed to **exceed** the following values (compared to **nominal** measure):

Diameter/Side length (nominal measure)	Round bars	Square and rectangular
30- 70 mm	1.5 mm	1.5 mm
71-120 mm	2.0 mm	2.0 mm
121-200 mm	2.5 mm	2.5 mm
201-350 mm	3.0 mm	3.0 mm
351-440 mm	4.0 mm	4.0 mm

**TASSO STANDARD FOR GEOMETRIC TOLERANCES**

Approved by: H. Elmkvist

Page 2 of 2

**General specification** for straightness:

Length of bar	Maximum deviation from straight line
1 metre	2 mm
2 metres	5 mm
3 metres	9 mm

Specification for **square and rectangular** bars with a side length < 75 mm:

Length of bar	Maximum deviation from straight line
1 metre	5 mm
2 metres	10 mm
3 metres	15 mm

**Rim**

Maximum thickness of rim:

Diameter/Side	Rim (% of radius)
30- 50 mm	Approx. 25
51-200 mm	Approx. 15
201-440 mm	Approx. 10

**Description of allowed bulb**

The maximum bulbiness of the material is not allowed to exceed the following values (compared to nominal measure):

Side length (nominal measure)	Maximum bulb
30- 50 mm	5 mm
51-100 mm	7 mm
101-200 mm	10 mm
201-300 mm	12 mm
301-440 mm	15 mm

**TASSO STANDARD FOR GEOMETRIC TOLERANCES**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the geometric tolerances, which apply to continuous cast nodular iron bars, grade EN-GJS according to EN 1563, produced by A/S Tasso.

**Diameter, side length and ovality tolerances**

Diameter/Side length (nominal measure)	Tolerance	Maximum ovality
30-100 mm	-0/+3.0 mm	2.0 mm
101-150 mm	-0/+4.0 mm	3.0 mm
151-200 mm	-0/+4.5 mm	4.0 mm
201-350 mm	-0/+5.0 mm	5.0 mm
351-440 mm	-0/+7.0 mm	6.0 mm

**Radii** Side length < 150 mm : R = 5.0 mm

Side length > 150 mm : R = 8.0 mm

**Description of deviation**

**Negative deviation** of the material is not allowed to **exceed** the following values (compared to **nominal** measure):

Diameter/Side length (nominal measure)	Round bars	Square and rectangular
30-100 mm	2.0 mm	4.0 mm
101-200 mm	3.0 mm	5.0 mm
201-440 mm	4.0 mm	6.0 mm

**Positive deviation** of the material is not allowed to **exceed** the following values (compared to **nominal** measure):

Diameter/Side length (nominal measure)	Round bars	Square and rectangular
30- 70 mm	1.5 mm	1.5 mm
71-120 mm	2.0 mm	2.0 mm
121-200 mm	2.5 mm	2.5 mm
201-350 mm	3.0 mm	3.0 mm
351-440 mm	4.0 mm	4.0 mm

**TASSO STANDARD FOR GEOMETRIC TOLERANCES**

Approved by: H. Elmkvist

Page 2 of 2

**General specification** for straightness:

Length of bar	Maximum deviation from straight line
1 metre	2 mm
2 metres	5 mm
3 metres	9 mm

Specification for **square and rectangular** bars with a side length < 75 mm:

Length of bar	Maximum deviation from straight line
1 metre	5 mm
2 metres	10 mm
3 metres	15 mm

**Description of allowed bulb**

The maximum bulbiness of the material is not allowed to exceed the following values (compared to nominal measure):

Side length (nominal measure)	Maximum bulb
30- 50 mm	5 mm
51-100 mm	7 mm
101-200 mm	10 mm
201-300 mm	12 mm
301-440 mm	15 mm

**TASSO STANDARD FOR GG-FFP-GREEN (GJL-200)**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast flake iron bars grade GG-FFP-GREEN produced by A/S TASSO.

**Applicable standards**

Cast iron with flake graphite	: EN 1561 (1997).
Structure	: ASTM A 247 - plate II. Type A graphite in core. Type D, E graphite in rim.
Tensile tests	: DIN 50109.
Hardness tests	: DIN 50351.
Documentation	: EN 10204 2.2 and 3.1.

**Structure**

Rim	: Up to 90% D-graphite in ferritic matrix.
Core	: > 40% pearlite in A-graphite.
Cementite	: Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast flake iron grade GG-FFP-GREEN.

**Identification**

Continuous cast flake iron grade GG-FFP-GREEN is marked with a green dot on the terminal surfaces.

**TASSO STANDARD FOR GG-FFP-GREEN (GJL-200)**

Approved by: H. Elmkvist

Page 2 of 2

**Mechanical properties****Tensile strength**Tensile strength Rm : Minimum 130 N/mm<sup>2</sup>.

Tensile strength is measured on a tensile test bar according to DIN 50109 cut out at half radius of a bar from the production concerned.

**Hardness**

Hardness measured on the cross section : 140-210 HBS 5/750/30.  
Hardness measured on the surface : Not specified, for guidance only

Continuously during production slices are cut for hardness measuring and structure analysis. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.

**Rim**

Maximum thickness of rim:

Diameter/Side (mm)	Rim (% of radius)
30-50	Approx. 25
55-200	Approx. 15
210-440	Approx. 10

**Geometric tolerances**

See A/S TASSO standard for geometric tolerances for continuous cast flake iron bars.

**TASSO STANDARD FOR GG-P-YELLOW (GJL-300)**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast flake iron bars, grade GG-P-YELLOW, produced by A/S TASSO.

**Applicable standards**

Cast iron with flake graphite	: EN 1561 (1997).
Structure	: ASTM A 247 - plate II. Type A graphite in core. Type D, E graphite in rim.
Tensile tests	: DIN 50109.
Hardness tests	: DIN 50351.
Documentation	: EN 10204 2.2 and 3.1.

**Structure**

Rim	: Up to 90% D-graphite in ferritic matrix.
Core	: > 80% pearlite in A-graphite.
Cementite	: Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast flake iron grade GG-P-YELLOW.

**Identification**

Continuous cast flake iron grade GG-P-YELLOW is marked with a yellow dot on the terminal surfaces.

**TASSO STANDARD FOR GG-P-YELLOW (GJL-300)**

Approved by: H. Elmkvist

Page 2 of 2

**Mechanical properties****Tensile strength**

Tensile strength is measured on a tensile test bar according to DIN 50109 cut out at half radius of a bar from the production concerned.

Profile description	Profile dimension (mm)	Controlling wall thickness (mm)	Min. tensile strength (N/mm <sup>2</sup> )
Small	40→80	20→40	Approx. 215
Medium	>80→160	40→80	Approx. 190
Large	>160→300	80→150	Approx. 175
Very large	>300→	150→	Approx. 160

The exact mechanical properties are dependent on where the test piece was placed in the actual bar profile.

As regards further particulars we refer to the "Continuous cast iron for innovative parts manufacture" (special edition from konstruieren + giessen 30 (2005) H.3) which is available on request.

**Hardness**

Hardness measured on the cross section : 220-290 HBS 5/750/30.  
 Hardness measured on the surface : Not specified, for guidance only

Continuously during production slices are cut for hardness measuring and structure analysis. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.

**Rim**

Maximum thickness of rim:

Diameter/Side (mm)	Rim (% of radius)
30-50	Approx. 25
55-200	Approx. 15
210-440	Approx. 10

**Geometric tolerances**

See A/S TASSO standard for geometric tolerances for continuous cast flake iron bars.

**TASSO STANDARD FOR GG-FP-RED (GJL-250)**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast flake iron bars grade GG-FP-RED produced by A/S TASSO.

**Applicable standards**

Cast iron with flake graphite	: EN 1561 (1997).
Structure	: ASTM A 247 - plate II. Type A graphite in core. Type D, E graphite in rim.
Tensile tests	: DIN 50109.
Hardness tests	: DIN 50351.
Documentation	: EN 10204 2.2 and 3.1.

**Structure**

Rim	: Up to 90% D-graphite in ferritic matrix.
Core	: > 60% pearlite in A-graphite.
Cementite	: Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast flake iron grade GG-FP-RED.

**Identification**

Continuous cast flake iron grade GG-FP-RED is marked with a red dot on the terminal surfaces.

**TASSO STANDARD FOR GG-FP-RED (GJL-250)**

Approved by: H. Elmkvist

Page 2 of 2

**Mechanical properties****Tensile strength**

Tensile strength is measured on a tensile test bar according to DIN 50109 cut out at half radius of a bar from the production concerned.

Profile description	Profile dimension (mm)	Controlling wall thickness (mm)	Min. tensile strength (N/mm <sup>2</sup> )
Small	40→80	20→40	Approx. 195
Medium	>80→160	40→80	Approx. 170
Large	>160→300	80→150	Approx. 155
Very large	>300→	150→	Approx. 140

The exact mechanical properties are dependent on where the test piece was placed in the actual bar profile.

As regards further particulars we refer to the "Continuous cast iron for innovative parts manufacture" (special edition from konstruieren + giessen 30 (2005) H.3) which is available on request.

**Hardness**

Hardness measured on the cross section : 170-240 HBS 5/750/30.  
Hardness measured on the surface : Not specified, for guidance only

Continuously during production slices are cut for hardness measuring and structure analysis. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.

**Rim**

Maximum thickness of rim:

Diameter/Side (mm)	Rim (% of radius)
30-50	Approx. 25
55-200	Approx. 15
210-440	Approx. 10

**Geometric tolerances**

See A/S TASSO standard for geometric tolerances for continuous cast flake iron bars.

**TASSO STANDARD FOR GG-F-BLACK (GJL-150)**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast flake iron bars grade GG-F-BLACK produced by A/S TASSO.

**Applicable standards**

Cast iron with flake graphite	: EN 1561 (1997).
Structure	: ASTM A 247 - plate II. Type A graphite in core. Type D, E graphite in rim.
Tensile tests	: DIN 50109.
Hardness tests	: DIN 50351.
Documentation	: EN 10204 2.2 and 3.1.

**Structure**

Rim	: Up to 90% D-graphite in ferritic matrix.
Core	: < 20% pearlite in A-graphite.
Cementite	: None.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast flake iron grade GG-F-BLACK.

**Identification**

Continuous cast flake iron grade GG-F-BLACK is marked with a black dot on the terminal surfaces.

**TASSO STANDARD FOR GG-F-BLACK (GJL-150)**

Approved by: H. Elmkvist

Page 2 of 2

**Mechanical properties****Tensile strength**

Tensile strength Rm : Not specified, for guidance only

**Hardness**Hardness measured on the cross section : 110-180 HBS 5/750/30.  
Hardness measured on the surface : Not specified, for guidance only

Continuously during production slices are cut for hardness measuring and structure analysis. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.

**Rim**

Maximum thickness of rim:

Diameter/Side (mm)	Rim (% of radius)
30-50	Approx. 25
55-200	Approx. 15
210-440	Approx. 10

**Geometric tolerances**

See A/S TASSO standard for geometric tolerances for continuous cast flake iron bars.

**TASSO STANDARD FOR GJS-400-15**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast nodular iron bars grade GJS-400-15 produced by A/S TASSO.

**Applicable standards**

Cast iron with nodular graphite	:	EN 1563 (2003).
Structure	:	ASTM A 247 - plate II Minimum 90% - types I & II Sizes not specified.
Tensile tests	:	DIN 50125.
Hardness tests	:	DIN 50351.
Documentation	:	EN 10204 2.2 and 3.1.

**Structure**

Ferrite	:	> 80%.
Pearlite	:	< 20%.
Cementite	:	Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast nodular iron GJS-400-15.

**Identification**

Continuous cast nodular iron grade GJS-400-15 is marked with a yellow and a red dot on the terminal surfaces.

**TASSO STANDARD FOR GJS-400-15**

Approved by: H. Elmkvist

Page 2 of 2

**Mechanical properties**

**Tensile strength**

Tensile strength	Rm	:	Minimum 400 N/mm <sup>2</sup> .
Yield stress	Rp	:	Minimum 250 N/mm <sup>2</sup> .
Elongation at rupture	A5	:	Minimum 15%.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 3.

After heat-treatment the tensile strength is measured on a tensile test bar cut out at half radius of a bar from the production concerned.

**Hardness**

Hardness measured on the cross section : 130-180 HBS 5/750/30.

After heat-treatment hardness is measured on a slice cut off at one end of a test bar. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurings.

**TASSO STANDARD FOR GJS-400-18-LT**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast nodular iron bars grade GJS-400-18-LT produced by A/S TASSO.

**Applicable standards**

Cast iron with nodular graphite	:	EN 1563 (2003).
Structure	:	ASTM A 247 - plate II. Minimum 90% - types I and II. Sizes not specified.
Tensile tests	:	DIN 50125.
Hardness tests	:	DIN 50351.
Documentation	:	EN 10204 2.2 and 3.1.

**Structure**

Ferrite	:	> 80%.
Pearlite	:	< 20%.
Cementite	:	Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast nodular iron GJS-400-18-LT (Low Temperature approved).

**Identification**

Continuous cast nodular iron grade GJS-400-18-LT is marked with a red and two yellow dots on the terminal surfaces.

**TASSO STANDARD FOR GJS-400-18-LT**

Approved by: H. Elmkvist

**Mechanical properties**

**Tensile strength**

Tensile strength	Rm	:	Minimum 400 N/mm <sup>2</sup> .
Yield stress	Rp	:	Minimum 240 N/mm <sup>2</sup> .
Elongation at rupture	A5	:	Minimum 18%.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 3.

After heat-treatment the tensile strength is measured on a tensile test bar cut out at half radius of a bar from the production concerned.

A Charpy-V impact test is carried out on an impact test bar cut out at half radius of a bar from the production concerned.

Temperature	:	- 20 +/- 2°C.
Average value	:	12 Joules.
Lowest value	:	9 Joules.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 4.

**Hardness**

Hardness measured on the cross section : 130-180 HBS 5/750/30.

After heat-treatment hardness is measured on a slice cut off at one end of a test bar. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.

**TASSO STANDARD FOR GJS-500-7**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast nodular iron bars grade GJS-500-7 produced by A/S TASSO.

**Applicable standards**

Cast iron with nodular graphite	:	EN 1563 (2003).
Structure	:	ASTM A 247 - plate II. Minimum 90% - types I and II. Sizes not specified.
Tensile tests	:	DIN 50125.
Hardness tests	:	DIN 50351.
Documentation	:	EN 10204 2.2 and 3.1.

**Structure**

Ferrite	:	30-70%.
Pearlite	:	70-30%.
Cementite	:	Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast nodular iron GJS-500-7.

**Identification**

Continuous cast nodular iron grade GJS-500-7 is marked with a yellow and a blue dot on the the terminal surfaces.

**TASSO STANDARD FOR GJS-500-7**

Approved by: H. Elmkvist

**Mechanical properties**

**Tensile strength**

Tensile strength	Rm	:	Minimum 500 N/mm <sup>2</sup> .
Yield stress	Rp	:	Minimum 320 N/mm <sup>2</sup> .
Elongation at rupture	A5	:	Minimum 7%.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 3.

After heat-treatment the tensile strength is measured on a tensile test bar cut out at half radius of a bar from the production concerned.

**Hardness**

Hardness measured on the cross section : 170-240 HBS 5/750/30.

After heat-treatment hardness is measured on a slice cut off at one end of a test bar. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurings.

**TASSO STANDARD FOR GJS-600-3**

Approved by: H. Elmkvist

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast nodular iron bars grade GJS-600-3 produced by A/S TASSO.

**Applicable standards**

Cast iron with nodular graphite	:	EN 1563 (2003).
Structure	:	ASTM A 247 - plate II. Minimum 90% - types I and II. Sizes not specified.
Tensile tests	:	DIN 50125.
Hardness tests	:	DIN 50351.
Documentation	:	EN 10204 2.2 and 3.1.

**Structure**

Ferrite	:	< 30%.
Pearlite	:	> 70%.
Cementite	:	Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast nodular iron GJS-600-3.

**Identification**

Continuous cast nodular iron grade GJS-600-3 is marked with a yellow and a white dot on the terminal surfaces.

**TASSO STANDARD FOR GJS-600-3**

Approved by: H. Elmkvist

**Mechanical properties**

**Tensile strength**

Tensile strength	Rm	:	Minimum 600 N/mm <sup>2</sup> .
Yield stress	Rp	:	Minimum 360 N/mm <sup>2</sup> .
Elongation at rupture	A5	:	Minimum 3%.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 3.

After heat-treatment the tensile strength is measured on a tensile test bar cut out at half radius of a bar from the production concerned.

**Hardness**

Hardness measured on the cross section : 200-270 HBS 5/750/30.

After heat-treatment hardness is measured on a slice cut off at one end of a test bar. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurings.

**TASSO STANDARD FOR GJS-700-2**

Approved by: H. Elmkvist

Page 1 of 2

**Object and field of application**

This standard specifies the technical facts, which apply to continuous cast nodular iron bars grade GJS-700-2 produced by A/S TASSO.

**Applicable standards**

Cast iron with nodular graphite	:	EN 1563 (2003) .
Structure	:	ASTM A 247 - plate II. Minimum 90% - types I and II. Sizes not specified.
Tensile tests	:	DIN 50125.
Hardness tests	:	DIN 50351.
Documentation	:	EN 10204 2.2 and 3.1.

**Structure**

Ferrite	:	< 20 %.
Pearlite	:	> 80 %.
Cementite	:	Maximum 5% equally dispersed over the total cross section.

Structural analysis is carried out at half radius of a bar from the production concerned.

**Description of material**

Continuous cast nodular iron GJS-700-2.

**Identification**

Continuous cast nodular iron grade GJS-700-2 is marked with a yellow and a black dot on the terminal surfaces.

**TASSO STANDARD FOR GJS-700-2**

Approved by: H. Elmkvist

**Mechanical properties**

**Tensile strength**

Tensile strength	Rm	:	Minimum 700 N/mm <sup>2</sup> .
Yield stress	Rp	:	Minimum 400 N/mm <sup>2</sup> .
Elongation at rupture	A5	:	Minimum 2%.

The exact physical properties are dependent on the thickness of the cross section of the bar. For further information we refer to EN 1563 (1997) table 3.

After heat-treatment the tensile strength is measured on a tensile test bar cut out at half radius of a bar from the production concerned.

**Hardness**

Hardness measured on the cross section : 230-300 HBS 5/750/30.

After heat-treatment hardness is measured on a slice cut off at one end of a test bar. The hardness is measured 5 places on the total cross section and 4 places on the surface. The slice is also used for structural measurements.