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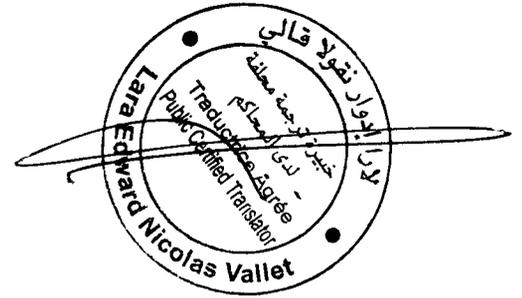
ES: 262 – 2 / 2009
ISO: 6935 – 2 / 2007

Steel for the reinforcement of concrete Part 2 Ribbed bars (rebars)

Stamped by the Egyptian committee for specifications and quality

**Egyptian Organization for standardization and quality
Airport branch**

Arab republic of Egypt



Adopted on : 16 /6/2009

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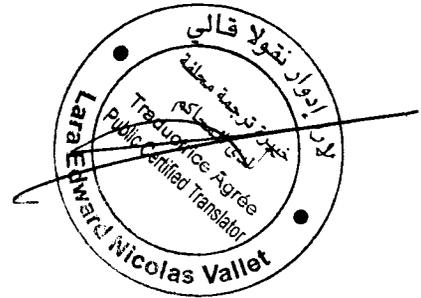
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Es: 262-2 / 2009
ISO 6935 – 2 / 2007

Introduction

The Egyptian standard number 262 – 2 / 2009, steel for the reinforcement of concrete

Part 2 : ribbed bars (rebars) technically covered by the international standard ISO 6935 – 2 / 2007

This standard is issued in 3 units :

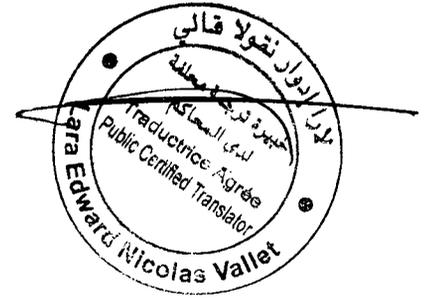
Part 1 : wire rods

Part 2: ribbed bars(rebars)

Part 3 : welded wires

It supersedes and annuls the ES 262 / 2000

This standard was prepared by the technical committee number 1 / 23 relating to iron / steel products



Steel for the reinforcement of concrete Part 2: ribbed bars(rebar's)

1- The scope

This part of the standard relates to the technical specifications of the ribbed bars for the reinforcement of concrete.

This part of the standard covers ten categories / grades of steel not undergoing welding operations / non weldable steel i.e.:

B300 A - R, B300 B - R, B300 C – R , B300 D - R, B400 A - R, B400 B -R, B400 C - R, B400 A - R, B500 B - R, B500 C - R

And 11 categories undergoing welding operations / weldable steel i.e. B300 DWR , B350 DWR, B400 AWR, B400 BWR, B400 CWR, B400 DWR, B420 DWR, B500 AWR, B500 BWR, B500 CWR, B500 DWR

The categories / grades of steel are characterized by the steel names mentioned in the international standards ISO / TS 4949

Note:

The first letter symbol "B" refers to the steel for the reinforcement of concrete. The three following letter symbols refer to the special characteristic defined for the maximal yield strength. The fifth letter symbol refers to the ductility degree (article 5/4). The sixth symbol relates to welding whereas the symbol " – " means that the steel does not undergo a welding process and the symbol W means that the steel undergoes a welding process, the last letter R means the ribbed bars. This section of the specification covers the product supplied in regular length. The manufacturer shall be free to select the manufacturing process

The ribbed bars produced shall be set apart from other finished product such as boards and railways wires

2- Complementary references

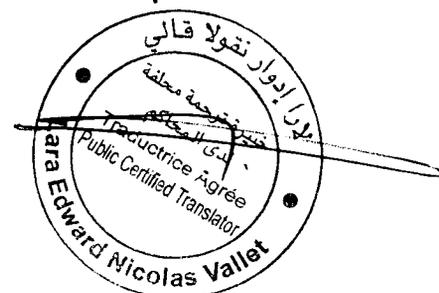
ISO 404, steel and steel products – general technical delivery requirements

ISO / Ts 4949, steel names based on letter symbols

ISO / TR 9769, steel and iron – review of available methods of analysis

ISO 10144, certification scheme for steel bars and wires for the reinforcement of concrete structures

ISO 14284, steel and iron – sampling and preparation of samples for determination of chemical composition



ISO 15630 – 1, steel for the reinforcement of concrete and prestressing of concrete – test methods – part 1: reinforcing bars, wire rod and wire

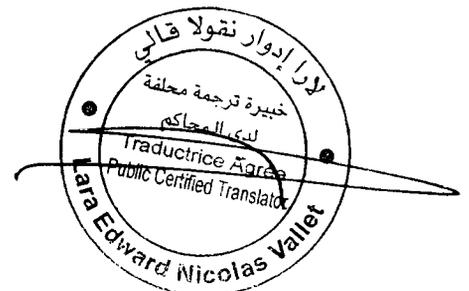
3- the symbols

Table 1 shows the symbols used in this section of the specification

Symbol	Unit	Description	article
A	Mm	Height of the rib	10/4, 6
A_5	%	Percentage of the elongation after breaking	1/8, 1/9
A_{gt}	%	Percentage of total elongation at the maximal load	1/8, 1/9
A_n	Mm ²	The nominal surface of the transversal cut	5, 1/9
C	Mm	Distance between ribs	6, 11/4
D	Mm	Nominal diameter of the bar	5,6, 1/9, 2/9, 3/9, 10, 2/11
Σf_i	Mm	Ribs free surface	6, 12/4
f_x	-	Required characteristic value	12/3/2/3
f_R	-	Relative surface of the rib	9/4, 6
K_1k	-	Indexes	12/3/2/3/1
m_g	-	Average value of n number in individual values	12/3/2/3/1
n	-	Number of individual values	12/3/2/3/1
R_{eH}	N/mm ²	Maximal yield strength	1/8
R_m	N/mm ²	Tensile strength	1/8
$R^{p0.2}$	N/mm ²	0.2 % proof strength, non homogeneous ductility	1/8
S_n	-	The standardized deviation for n number individual values	12/3/2/3/1
X_1	-	Individual value	12/3/2/3/1
α	Degree	Inclination of the transversal rib side	4/14, 6
β	Degree	The inclination between the axis of the transversal rib and the axis of the bar	4/15, 6

4- Definitions

The following definitions and terms are used for the purpose of this standard :



4.1 Cast analysis

A chemical analysis of the cast analyses shall be performed by the manufacturer according to the procedures of the manufacturing factory (ISO 16020: 2005)

4.2 certification scheme

The Certification scheme for products or operations or services defined on which the same rules, procedures and standards apply

4.3 characteristic value

A value having a mandatory probability hard to achieve by performing a series of probability non limited analysis (ISO 16020: 2005)

Note:

The nominal value is used as characteristic value in some circumstances

4.4 the core

A part of the transversal cut of the bar not containing any ribs or indentations

4.5 ductility degree

The classification of the ductility specifications of the steel for reinforcement of concrete is based on the rate value between the tensile strength and the yield strength in addition to the elongation calculated either as a total elongation rate at the maximum load A_{gt} or elongation after breaking A_5

Note:

Refer to table 6

4.6 longitudinal rib

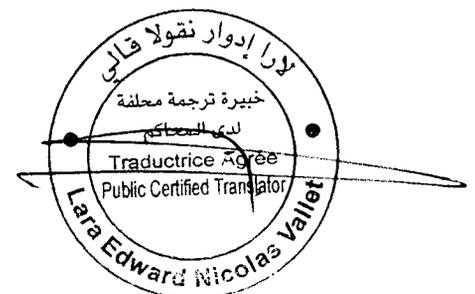
A regular and continuous rib equivalent to the axis of the bar

4.7 Nominal surface of the transverse cut

The surface of the transversal cut equivalent to the surface of rounded plain bars having the same nominal diameter

4.8 Analysis of the product

Chemical analysis carried out on the product (ISO 16020: 2005)



4.9 Surface of the relative rib f_R

The surface of all the transverse ribs inside a defined length on the vertical level of the longitudinal axis of the bar divided on this length and nominal surface

4.10 rib height a

The surface between one point on the rib and the surface of the bar's core ; it should be calculated vertically on the axis of the bar

Note:

Refer to figure 2

4.11 Distance between ribs c

The distance between 2 centers of transverse consecutive ribs calculated in parallel to the axis of the bar

Note:

See figure 1

4.12 Surface exempted from ribs Σ_{fi}

Total distances on the surface of the bar's core between the end of the transverse ribs of adjoining rows calculated as an elevation on the vertical level of the axis of the bar

4.13 transversal rib

A rib having an inclined or vertical angle on the longitudinal axis of the bar

4.14 inclination of the side of the transversal rib

A angle between the side of the transversal rib and the surface of the bar core calculated vertically on the longitudinal axis of the transversal rib

Note:

see figure 2

4.15 inclination of the transversal rib β

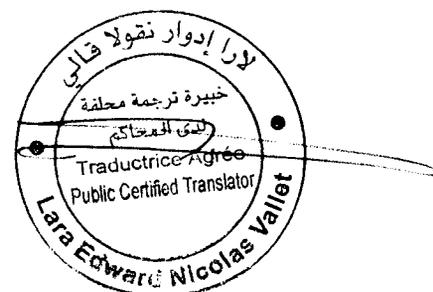
A angle between the rib and the longitudinal axis of the bar

Note:

See forms 1, 3 and 4

Note:

All these terms and definitions are taken from the international standards ISO 16020:2005



5- Dimensions, mass, length unit and tolerated deviation

Figure 2 shows the dimensions and mass for each length unit and tolerated deviation. The purchaser and the manufacturer may agree to use bars with ribs having nominal dimensions not showed in table 2

The supplying length shall be agreed upon between the purchaser and the manufacturer

Note :

The common supplying lengths of the straight bars are 6 meters, 9 meters and 18 meters

The allowed deviation in the supplying length from the rolling machine should be from 0 to +100 mm unless otherwise approved

6- Requirements of ribs

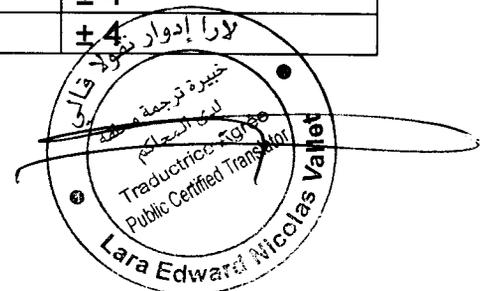
The ribbed bars should contain transversal ribs. They may have longitudinal ribs or not.

There should be at least two rows of transverse ribs distributed equally around the bar surface. The transverse ribs in each row should be distributed regularly on the bar length, exclusive the marks / indentation area

The ribs shall be in conformity with the requirements mentioned in table 3.

Table 2 - dimensions, mass, length unit and tolerated deviation

Nominal diameter of the bar d mm (a)	Nominal surface of the transversal cut A_n mm^2 (b)	Mass of the length unit	
		Requirements (c) Kg/m	Tolerated deviation (d) %
6	28.3	0.222	± 8
8	50.3	0.395	± 8
10	78.5	0.617	± 6
12	113	0.888	± 6
14	154	1.21	± 5
16	201	1.58	± 5
20	314	2.47	± 5
25	491	3.85	± 4
28	616	4.84	± 4



32	804	6.31	± 4
40	1257	9.86	± 4
50	1964	15.42	± 4
a. The purchaser and the manufacturer should agree on diameters higher than 50 mm. The tolerated deviation should be ± 4 % b. $A_n = 0.7854 \times d^2$ c. Mass of the length unit $7.85 \times 10^{-3} \times A_n$ d. Tolerated deviation for each bar			

Table 3 – requirements of the ribs

	Nominal diameter d mm	Regular height ribs	Crescent shape ribs
Minimal rib height	Total	0.05 d	0.065 d
Distance between ribs	$6 \leq d \leq 10$	$0.5d \leq c \leq 0.7d$	$0.5d \leq c \leq 1.0d$
	$10 \leq d$	$0.5d \leq c \leq 0.7d$	$0.5d \leq c \leq 0.8d$
Deviation of the transversal rib	Total	$35^\circ \leq \beta \leq 90^\circ$	$35^\circ \leq \beta \leq 75^\circ$
Deviation of the angle of the transversal rib	Total	$A \geq 45^\circ$	$\alpha \geq 45^\circ$
Surface exempted from ribs maximal	Total		0.25 dπ

The purchaser and the manufacturer may define the requirements of the ribs variables according to the relative surface of the rib

The variable measures shall be carried out according to the ISO 15630 – 1 or ER 6828 – 1

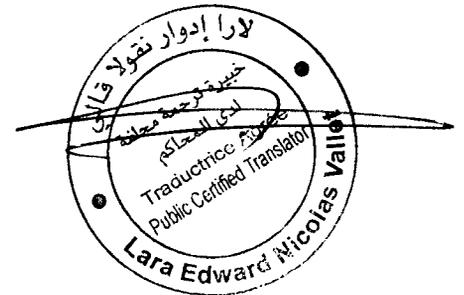
The figures from 1 to 4 show the architectural dimensions of the rib defined in table 3

The height of the longitudinal rib if present should not exceed 0.15 of the diameter

Figure

- 1- Longitudinal rib
- 2- Transverse rib

Figure 1 ribbed bar – engineering form



- 1) Rib
- 2) Round deviation

Figure 2 – transverse deviation of the rib α , Height of the rib a - Cut A - A of figure 1

Form 3 – example of ribbed bar with various deviations from the longitudinal axis

Form 4 – example of a ribbed bar with transverse ribs having a regular height ($\beta = 90^\circ$)

7- Chemical composition

The chemical composition of the steel should comply with the stipulations of the cast analysis and the analysis mentioned in table 4

The calculation of the carbon equivalent (CEV) should be as follows :
(1)

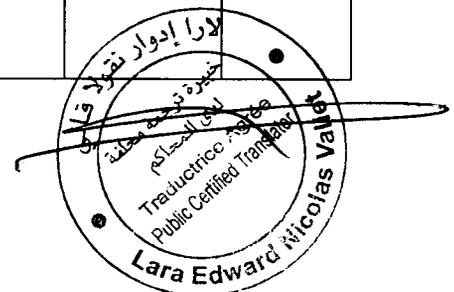
$$CEV = C + \frac{Mn}{6} + \frac{(Cr + V + Mo)}{5} + \frac{(Cu + Ni)}{15}$$

In which C, Mn, Cr, V, Mo, Cu, Ni are expressed as weight percentages of the chemicals elements present in the steel

Table 4 shows the tolerated deviations in the product analysis comparing to the cast analysis mentioned in table 5

Table 4 chemical composition based on the cast analysis – the maximal values of the weight percentages of elements

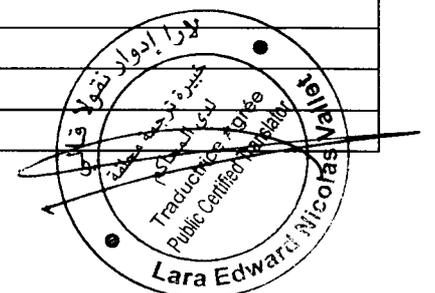
Steel category	C ²	Si	Mn	P	S	N ^b	CEV ^{a,c}
B300A-R	-	-	-	0.060	0.060	-	-
B300B-R							
B300C-R							
B400A-R							
B400B-R							
B400C-R							
B500A-R							
B500B-R							



B500C-R							
B400AWR ^d	0.22	0.60	1.60	0.050	0.050	0.012	0.50
B400BWR							
B400CWR							
B500AWR							
B500BWR							
B500CWR							
B300D-R	-	-	-	0.050	0.050	-	-
B300DWR	0.27	0.55	1.50	0.040	0.040	0.012	0.49
B350DWR	0.27	0.55	1.60	0.040	0.040	0.012	0.51
B400DWR	0.29	0.55	1.80	0.040	0.040	0.012	0.56
B420DWR ^d	0.30	0.55	1.50	0.040	0.040	0.012	0.56
B500DWR	0.32	0.55	1.80	0.040	0.040	0.012	0.61
<p>a- The categories B400 AWR , B400 BWR, B400 CWR , B500 AWR, B500 BWR, B500 CWR have a diameter higher than 32 meters which is the maximal for the carbon content 0.25 % and the maximal limit of the carbon equivalent 0.55 %</p> <p>b- The higher rate of nitrogen may be used in case there is a sufficient quantity of fixing elements</p> <p>c- The purchaser and the manufacturing entity may agreed to use rates or other values for the carbon equivalent</p> <p>d- The manufacturing entity and the purchaser may agreed to add alloying elements such as Cu, Ni, Cr, Mo, V, Nb, Ti, Zr</p>							

Table 5 : chemical composition on the basis of the product analysis – tolerated deviation in the analysis of the product as weight rate

Element	Maximal value defined in the cast analysis as in table 4	The tolerated deviation in the product analysis compared to the limits defined in the cast analysis as in table 4 %
C	≤0.25	+0.02
	>0.25	+0.03
Si	≤0.60	+0.05
Mn	≤1.65	+0.06
	>1.65	+0.08
P	≤0.05	+0.008
	>0.05	+0.010
S	≤0.05	+0.008
	>0.05	+0.010



N	≤0.012	+0.002
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8- Mechanical characteristics

8.1 tensile characteristics

The tensile test should be performed according to article 9.1

The steel type should comply with the requirements of the tensile characteristics mentioned in table 6

The characteristics value in this part of the standard (unless otherwise mentioned) is the lowest level or highest one of the statistical difference likely 90 % ($1 - \alpha = 0.90$) to become 95 % of the value at or higher than this minimum or at or lower than this maximal limit respectively. This definition refers to the quality level at the long term of production

The purchaser and the manufacturer may use the value mentioned in table 6 as minimal value and / or maximal value

If the yield does not exist than 0.2 % of the proof strength should be defined ($R_{p0.2}$)

8.2 bend characteristics

The bend test is carried out according to article 9/2 upon request of the purchaser, after performing the test the bars aspect should not show any sign of breaking or seen blooming / deformations for a person having a normal sight.

8.3 characteristics of the rebinding after heating

The rebinding test should be performed after heating if requested according to article 9.3 on the following fifteen categories B400 A- R , B 400 B – R , B 400 C – R , B 400 AWR, B 400 BWR, B 400 CWR, B 400 DWR, B 420 DWR, B 500 A – R , B 500 B – R , B 500 C – R , B 500 AWR, B 500 BWR, B 500 CWR, B 500 DWR

Note: the re-bend test is used to assess the heating characteristics of the bars after re-bend

After performing the test the bars aspect should not show any sign of breaking or seen blooming / deformations for a person having a normal sight.

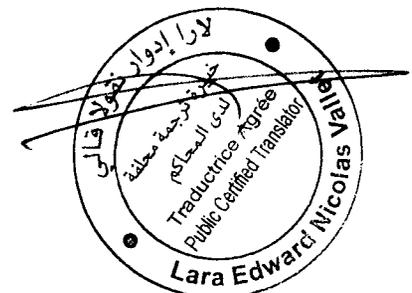
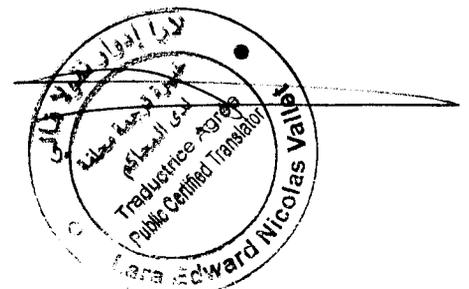


Table 6 : tensile characteristics

Ductility degree	Steel category	Characteristic value defined for the maximal level of the yield strength R_{eH} N.mm ²		Ductility characteristics		
		Minimal	Max	Defined Characteristic value R_m / R_{eH}	Characteristic value defined for the elongation (a)	
				Minimum	A_5	A_{gt}
					Minimum	Minimum
A	B300A – R	300	-	1.02	16	2
	B400A – R	400	-		14	
	B400 AWR					
	B500A – R	500	-			
B	B300B – R	300	-	1.08	16	5
	B400B – R	400	-		14	
	B400 BWR					
	B500B – R	500	-			
C	B300C – R	300	-	1.15	16	7
	B400C – R	400	-		14	
	B400 CWR					
	B500C – R	500	-			
D	B300D – R	300	-	1.25	17 _b	8
	B300 DWR		1.3 x			
	B350 DWR	350	R_{eH}			
	B400 DWR	400	(min)		16 _b	
	B420 DWR	420				
	B500DWR	500				

a) The elongation type should be selected between A_5 and A_{GT} by agreement between the manufacturer and the purchaser, if the elongation type is not defined by agreement the A_{gt} should be used



- b) In case of bars having a ductility degree D and a diameter of 32 mm or more the minimum for the characteristic value defined in the elongation A may be less by 2 % for each 3 mm increase in diameter. The maximal reduction value of the characteristic value fixed and mentioned in table 6 should be 4 %

8/4 the fatigue characteristics

The manufacturer should submit to the purchaser upon request the fatigue characteristics of the product based on the fatigue test with an axis power controlled having a tensile oscillation according to article 9/4

The manufacturer and the purchaser should agree upon signature of the contract on the number of fatigue cycles defined, the extend of fatigue $2 \delta_a$ and the maximal fatigue δ_{max}

9- The tests

9.1 tensile test

The tensile test should be carried out according to ISO 15630 – 1 or ES 6828 – 1 To fix the relative elongation after break A_5 the length of the original dimension should be five times nominal diameters

To define the total relative elongation at maximal load A_{gt} indentation/ marks should be put on equivalent distances from the free length of the tested part. The surface between each two indentation should be 20 mm or 10 mm or 5 mm according to the diameter of the bar

In order to define the tensile characteristic the surface of the transversal nominal cut of the bar should be used

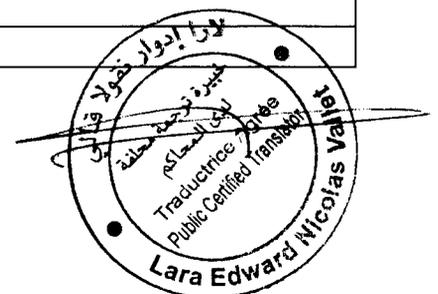
9.2 The bend test

The bend test should be performed according to the ISO 15630 – 1 or ES 6828 – 1 the tested part should be bended at a angle of 160° and 180° degree with a machine having the diameter defined in table 7

Table 7 – the diameter of the machine used in the bend test

Dimensions in millimeters

Nominal diameter d	Diameter of the machine (maximal) b a
≤ 16	3 d
$16 < d \leq 32$	6 d



$32 < d \leq 50$	$7 d$
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a) For the nominal diameters higher than 50 mm the purchaser and the manufacturer should agree on the diameter of the machine used in the bend tests

b) The purchaser and the manufacturer may agree on the use of a higher diameter machine

9.3 Re-bend test

The re-bend test should be performed according to the ISO 15630 – 1 or ES6828 – 1

The tested part should be bended on a machine having the dimension defined in table 8

The bend angle before heating should not be less than 90 ° and the re-bend one than 20 ° both angles should be measured before raising the load

Table 8 – the diameter of the – used in the re-bend test

Dimensions in mm

Nominal diameter d	Diameter of the machine (maximal) b a
≤ 16	$5 d$
$16 < d \leq 32$	$8 d$
$32 < d \leq 50$	$10 d$

a) For the nominal diameters higher than 50 mm the purchaser and the manufacturer should agree on the diameter of the machine used in the re-bend tests

b) The purchaser and the manufacturer may agree on the use of a higher diameter machine

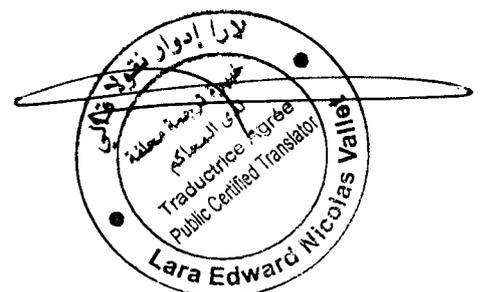
9.4 the fatigue test

The fatigue test should be carried out according to the ISO 15630 – 1 or ES 6828 – 1

9.5 chemical analysis

In general the chemical analysis is defined by the spectrum analysis way

In case of discrepancies on the analysis method the chemical composition should be defined in the appropriate reference mean mentioned in one of the international standards or Egyptian standards issued in this context



10- The denomination

The ribbed bars should be named according to this part of the specification as the following classification

- a- Reinforcement of concrete bars
- b- Number of this part in the standard
- c- Nominal diameter in mm according to table 2
- d- Category of steel

Example: steel of reinforcement of concrete ES 262 – 2 – 12 B 500 CWR

11- Putting indentation / marks

11.1 putting marks on the bar

All the bars should have marks stamped during rolling process indicating the following:

- a- style category
- b- Manufacturer

Annex 1 shows some examples of the international indentation systems

11.2 putting marks on the bars batches

Each batch of bars should have a label clarifying the name of the manufacturer and the number of this standard and the steel category and nominal diameter and cast number or reference relating to the test register and country of origin

12- Evaluation of the compliance

12.1 generalities

The inspection tests and certification should be performed on steel bars for the reinforcement of concrete

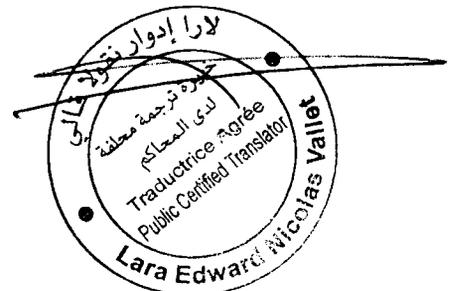
- a) According to the certification scheme under the supervision of a foreign control organism
- b) according to the acceptance test of supplying defined

12.2 certification scheme

In case of certification scheme, the inspection and certification should be performed according to ISO 10144 or Egyptian standard issued in this context

12.3 acceptance test of supplying defined

12.3.1 generalities



The conditions relating to the nature and scope and evaluation of the acceptance test on supplies for steel for the reinforcement of concrete not subject to the certification scheme mentioned in articles 12.3.2 and 12.3.3

The acceptance test on the concerned supplies should be carried according to the article 12.3.2

Article 12.3.3. may be used by agreement between the purchaser and the manufacturer

12.3.2 Evaluation of the characteristics values

12.3.2.1 Organization

The tests should be organized and executed according to the agreement between the buyer and the manufacturer taking into account the national rules of the importing country

12.3.2.2 Extend of taking samples and tests

In order to perform the tests, the consignment should be divided into testing units of 50 Tons maximum or in part. Each unit for testing of the products should be at the same category of cast and same nominal diameter for the same cast

The producer should confirm in the test report that all the samples for the tests were taken from the same cast. The chemical composition (cast analysis) should be mentioned in the test report

The test units should be taken from each testing unit as follows :

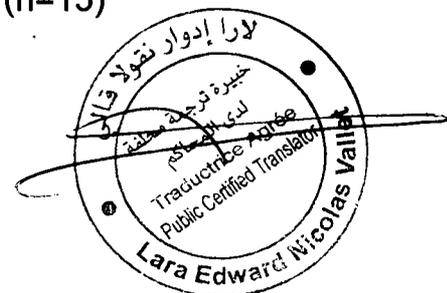
- 1- Two testing units from different bars to test the chemical composition (analysis of the final product
- 2- 15 testing part at least (if appropriate 60 testing part see article 12.3.2.1) of different bars to test all the other characteristics mentioned in this section of the standard

12.3.2.3 Assessment of result

12.3.2.3.1. Inspection by variables

For the characteristics defined as characteristic value the following should be defined:

- a- Each individual value x_i for a number of 15 testing part ($n=15$)
- b- The average value m_{15} ($n = 15$)
- c- The standard deviation s_{15} ($n = 15$)



The testing unit of the requirements correspondence, in case the following condition is fulfilled for all the characteristics :

$$(2) \quad f_k \leq m_{15} - 2.33 \times S_{15}$$

Whereas f_k is the required characteristic value stipulated
2.33 the value of the acceptance indicator k for a number of test units $n = 15$ for a failure average 5 % ($p = 0.95$) at 90 % probability i.e. ($1 - \alpha = 0.90$)

$$(3) \quad S_{15} = \sqrt{\sum (x_i - m_{15})^2 / 14}$$

In case this condition is not fulfilled in the equation 2 than the indicator

$$(4) \quad k_1 = \frac{m_{15} - f_k}{S_{15}}$$

Should be fixed from the available test results, if $2 \leq k'$ the test may continue, in this case 45 other test units from various bars of the test unit may be taken and tested therefore the results of 60 tests should be available.

The test unit should be considered as complying with the requirements if the following condition is fulfilled for all characteristics

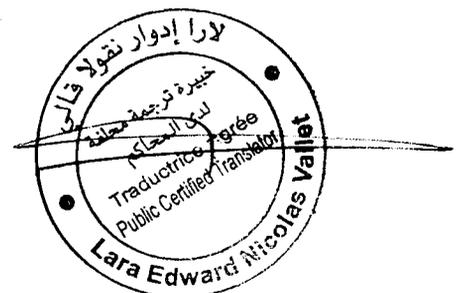
$$f_k < M_{60} - 1.93 \times S_{60}$$

Where 1.93 is the value of the acceptance index k for the number $n = 60$ of the failure average 5 % ($p = 0.95$) at the probability of 90 i.e. ($1 - \alpha = 0.90$)

12.3.2.3.2 Test of characteristic specification

When the stipulated characteristics are tested as maximum and minimum all the defined results fixed on 15 units tested should comply with the characteristics of the product requirement. In this case the test unit should comply with the requirements

The tests should continue after the occurrence of non compliance for the two results of the test at most e, in this case the test should be performed on 45 other part taken from various tested bars units therefore the result of 66 tests would be available . the test unit should comply with requirements if the number of results of non complying samples is more than 60 of the total of 60 result



12.3.2.3.3 Chemical composition

The two units tested should comply with the requirement mentioned in this section of the standard

12.3.3 Evaluation of the minimal and maximal values

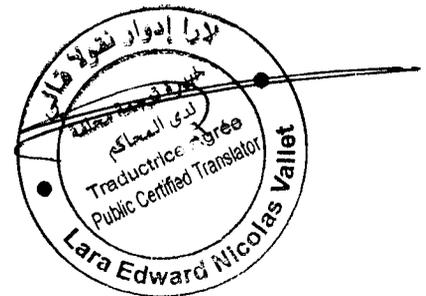
The test should be carried out according to the following

- a- The set should be composed of bars from the same cast. One tensile test should be performed on each 50 Ton or part thereof and one bend / re-bend test should be performed on each diameter
- b- The result of each test individually should achieve the values required in table 6 and the bend and re-bend characteristics mentioned in articles 8/2 and 3/8
- c- An analysis should be performed on each cast in order to confirm the chemical composition (article 7) and the samples should be taken according to the international standard ISO 14284 or the ES issued in this respect
- d- In case the result of any test is not complying with the requirements the test should be redone according to the international standard ISO 404 or the ES 1423
- e- The manufacturer should provide a test report showing that the supplied products are complying with the chemical and mechanical specifications and characteristics mentioned in articles 7 and 8 and confirm that the other requirements mentioned in this section of the standard are fulfilled

12.3.4 test report

The test report should contain the following information :

- 1) The denomination of the steel for the reinforcement of the concrete according to this section of the standard
- 2) Put the marks / indentations
- 3) Date of the test
- 4) Weight of the tested unit
- 5) Results of the test



**Annex a
(orientation)**

**For examples on the system of putting the marks / indentation on the
ribbed bars**

a.1 references

EN 10080 : 2005 Steel for the reinforcement of concrete – weldable reinforcing steel – general

ASTM A 615 / A 615 M – 06 a Standard specification for deformed and plain carbon steel bars for concrete reinforcement

ASTM A 706 / A 706 M – 06 a Standard specification for the low alloy steel deformed and plain bars for concrete reinforcement

CAN / CSA G 30 – 18 M 92 Billet steel bars for concrete reinforcement

JIS G 3112 : 2004 Steel bars for concrete reinforcement

GB 1499 – 1998 Hot rolled ribbed steel bars for the reinforcement of concrete

a.2. example number 1 : he system according to the EN 10080 : 2005

a.2.1. each bar should bear the indentation / mark of the manufacturer put in one row of the ribs and the indentation / mark should be repeated at a 1.5 distance at most

a.2.2 the indentation / mark should contain the following :

a) the symbol showing the start of each indentation

the digital system defining the manufacturer featuring the country of origin and the number of the factory

a.2.3. the digital system to define the country of origin and the number of the factory should be used in one of the following manners :

- a) The number of the normal ribs or the marks / indentation between the wide ribs or the indentations (for ex. See figure a.1)
- b) Number of the normal ribs or indentations between the lost ribs or the marks / indentation
- c) The numbers on the surface of the bar
- d) The indentations formed with the rolling with the number of the normal ribs or the marks / indentation between the same

Figure



Start country n. 4 Works n. 16

Figure a.1. example of the indentation showing the manufacturer (using the wide ribs)

a.2.4. the symbol showing the start of the indentation should be according to one of the following steps :

- a- when putting the mark . indentation using wide ribs or indentations the symbol showing the start of the indentation should be formed of two wide ribs consecutive or indentations (for ex. See the ex. Figure a-1)
- b- When an indentation is put using the lost ribs or the indentations, the symbol showing the start of the indentation should be constituted of two lost ribs or two consecutive indentations.
- c- When numbers composed by rolling are put on the surface of the bar the symbol showing the start of the indentation should be one of the two letters O and X
- d- When the indentations are composed by rolling on the surface the start of the indentation should contain two indentations between the couple of normal ribs or indentations / marks

a.2.5 the country of origin should be referred to by one of the numbers from 1 to 9 according to the table a.1 (for ex. See the figure a.1)

a.2.6. the number of the manufacturing factory should be one to two numbers from 1 to 99 at the exception of the number 10 (for ex. See figure a.1)

Table a.1. numbers of the country of origin

Country of origin	Number of normal ribs inclined between two wide inclined ribs
Austria, Republic of Czech, Germany, Poland, Slovakia	1
Belgium, Netherland, Luxembourg, Switzerland	2
France, Hungary	3
Italy, Malta, Slovenia	4
UK, Ireland, Island	5
Danmark, Estonia, Finland, Latvia, Lithuania, Norway, Sweden	6
Portugal, Spain	7
Cyprus, Greece	8



Other countries	9
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a.3. Example number 2 system according to the US standards ASTM A615 / A 615 M – 06a, ASTM A706 / A706 M – 06 a

a.3.1 when the product is loaded for consignment the bars should be separated in an appropriate manner on which labels should be put to show the manufacturer and the test number

a.3.2. the manufacturing factory should put the labels used to the indentations / marks

a.3.3. all the bars should be defined in a characterized set of various indentations by rolling in a clear manner and put the same on one side of the bar as mentioned in order in the following articles from a.3.3.1 to a.3.3.4

a.3.3.1 start point

A letter of a symbol showing the characteristic indentation / mark of the product manufacturer

a.3.3.2 dimension denomination

In Arabic letters equivalent to the number of the bar denomination (nominal diameter)

a.3.3.3 type of steel

the letter S should be present in case the bars are manufactured according to the US standars ASTM A615 / A 615 M or the letter W in case the bars are manufactured according to the US standard ASTM A 706 A 706 M and no symbols should be added on the bars if the same are manufactured according to the standard CSA G 30 – 18 M 1992

a.3.3.4 marking the minimal yield

regarding the grades RB 420 being of number 4 (ASTM) or 400 (CSA) or the individual longitudinal continuous line during five lengths at least far from the middle line from the bar side (no marking symbol for the bars produced – category 280)

figure

- 1- Reading direction
- 2- Symbol of the factory
- 3- Dimension of the bar
- 4- According to the US ASTM



5- Cast grade

Figure a.2. putting the indentations according to the US standard ASTM A615 / A 615 M – 06 A, ASTM A 706 / A 706 M – 06 A

a.4 example number 3 : The system according to the Japanese Standard JIS G 3112 : 2004

a.4.1. the ribbed bars shall be marked according to the stipulations of the standard

a.4.1.1. putting characterizing marks on each bar

Marks are put on the ribbed bars to show the category of the steel according to the table a.2

Table a.2 method of putting marks showing the grade / category of the steel

Category of steel	Method of putting the symbols showing the category of steel	
	Put marks during rolling process	Putting the marks by coloring
B300 D – R	Without any mark composed by rolling	Not applied
B300 DWR	1 o l	White (on the side of one cut)
B350 DWR	Number or ribs one unit (*)	Yellow (on the side of one cut)
B400 DWR	Number or ribs two units (**)	Green (on the side of one cut)
B500DWR	Number or ribs three units (***)	Blue (on the side of one cut)

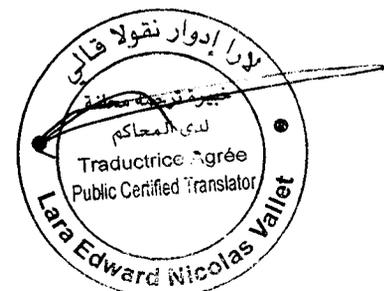
Note :

In the case of bars having an 8 diameter or less, indentations may be put by coloring method instead of those by rolling.

a.4.1.2 putting marks / indentations on each batch

The ribbed bars should bear the following data by the appropriate mean :

- The symbol of the steel category
- Number of the cast or number of test
- Diameter or characteristic indentation
- Name of the product's manufacturer or its abbreviation



a.5. example number 4 : system according to the standard GB 1499 – 1998

Each bar should be characterized as follows:

a.5.1 the category of the steel and the abbreviation of the name of the manufacturer of the steel product (or the trademark) and the diameter of the ribbed bars shall be put by rolling on the bars surface

the ribbed bars having a diameter of less than or equal to 10 millimeters, rolling marks may not be used. The labels shall only be put on the bars.

a.5.1.1. the category of steel should be referred to in an Arabic number or a number to which a spelling letter is added according to what is mentioned in table a.3

table a.3 method of putting a mark / indentation to show the category

Category of steel standard GB 1499 – 1998	Characterizing number
HRB 335	3
HRB 400	4
HRB 500	5
HRBF 335	C3
HRBF 400	C4
HRBF 500	C5

a.5.1.2. the indentation of the steel manufacturer should be an abbreviation of its name of two letters or its trademark

a.5.1.3 the diameter of ribbed bars should be characterized by an Arabic number in millimeters

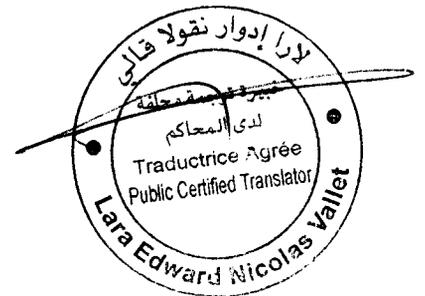
Example

The rolling indentation of the ribbed bars (category of steel HRB 335 and produced by a steel company Abc diameter 25 millimeter) "" 3 AS 25

Whereas

" 3 category of steel HRB 335

AS name of the steel manufacturer : steel company Abc
25 the diameter 25 millimeters

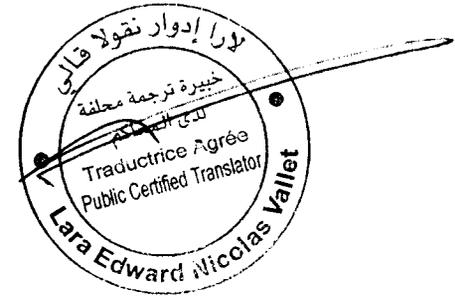


**Annex b
(orientation)**

Selections to be agreed upon between the purchaser and the manufacturer

For simplicity, the special conditions relating to this part of the standard referring to the additional requirements on which the purchaser and the manufacturer may agree upon are clarified in the list below. This list does not bind the special agreements by any other conditions.

- a) A diameter higher than 50 millimeter (table 2 article 9)
- b) Length supplied (article 5)
- c) Longitudinal ribs (article 6)
- d) min / max values defined (articles 8 / 1 and 12/ 3 /3)
- e) characteristics of the re-bend (article 8 / 3)
- f) fatigue characteristics (article 8 / 4)
- g) party responsible for the supplying test (article 12 / 3 / 2 / 1)

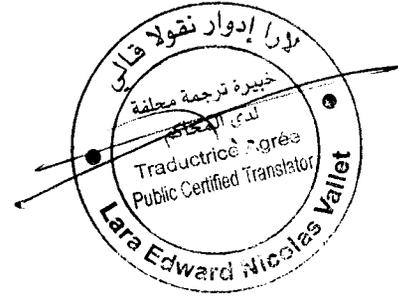


Related standards

ISO 3534 – 1 Statistics – vocabulary and symbols – part 1 general statistical terms and terms used in probability

ISO 16020 steel for the reinforcement and pre-stressing of concrete vocabulary

ISO / IEC guide 2 standardization and related activities general vocabulary



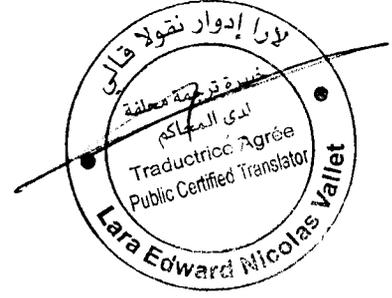
13- Technical terms

(Arabic and English equivalencies)

14- References

ISO 6935 – 2/ 2007

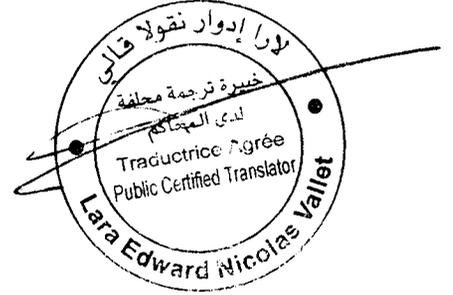
Steel for the reinforcement of concrete – Part 2 ribbed bars



The entities participating in issuing this standard

This standard was prepared by the technical committee number 1/23 relating to iron products composed by the following entities :

- Egyptian organization for the specifications and quality
- The Tebbin institute for metallurgic studies
- The Faculty of engineering – El Azhar University
- El nassr for forgery
- Factory of manufacturing and repairing the armored chars (2000 War)
- Ezz El Dakhilah for iron and steel
- Public Authority for the control of importations and exportations
- Center of researches and development of metals
- El nasr for the production of pipes
- The center of housing researches and construction
- The Egyptian American company for steel rolling (Bechay for steel)
- Steel National Egyptian company (Attaka)
- The international company for alloys (Enfet)



Egyptian Organization for standardization and quality

- 1- The Egyptian Authority for the standards unification was established in 1957 by virtue of the PD number 29 in 1957 which stipulated to consider it as the national reference adopted for the standards unification affairs and the text of the law number 2 for 1957. Therefore, standards are only adopted by the Authority
- 2- In 1979 the PD number 392 for 1979 decided to annex the center of quality control to the Authority
- 3- In 2005 the PD number 83 for 2005 renamed the Authority to become the Egyptian Organization for the specifications and the quality which undertakes the following :
 - a. Prepare and issue standards for raw materials, products, materials, equipments, administrative systems, documentation, information, requirements of security and safety, validity terms and measurements, standardization equipments
 - b. Technical inspection, test, control, taking samples, issuing certificates of compliance to the specifications adopted and the calibration certificates of the measurement equipments
 - c. License to grant a quality mark for the industrial products, the marks and the certificates of quality and compliance of the products to the standards
 - d. Provide technical advices and training services in the fields of specifications and quality of measurement and calibration and test and information for all concerned parties
 - e. Represent Egypt in the activities of the international and regional organizations working in the field of specialization, quality, test and calibration.

The Organization executes the requirements and conditions of the technical hinders towards the WTO since the Organization stands as an information Egyptian center to provide information and documents relating to the specifications and the evaluation of compliance.

- 4- the Organization shall be managed by a board presided by the first Secretary of the Ministry – head of the Organization and two representatives of all the entities concerned in the standards unification, production quality, tests, and calibration in Egypt in addition to a number of academics and Scientifics and experts and jurists and media experts.
- 5- The standards are prepared by a technical committee composed approximately of 100 commissions with the participation of experts according to the international standards and specialists from all the



concerned entities. The technical secretary is assumed by the employees in the Organization

- 6- The projects of specifications are distributed widely on the concerned entities and Arabic countries to provide remarks during a period of 60 days and on a drafting committee and revision committees before being submitted to the Board
- 7- The Organization provided licenses for the factories to use the quality marks on the goods and the products complying with the ES in order to protect the consumers and to serve the manufacturers in order to raise the quality of their products. Many modern factories to test the chemical products, construction materials, edifice and engineering products and foodstuff in addition to textile and yarns in addition to factories for mechanical, electrical and physical measurements and calibration are affiliated to the Organization
- 8- The Organization also has a unit for the protection of the consumer in order to receive the complaints and to try to solve the same. Its activities were significantly successful
- 9- The Organization has also the unique library in Egypt specialized in the standards containing more than 130 thousand international, regional, Arabic and Egyptian standard.



Egyptian standards
ES: 262 – 2 / 2009
ISO: 6935 – 2 / 2007

STEEL FOR THE REINFORCEMENT OF CONCRETE
Part 2
Ribbed bars (rebars)

Stamped by the Egyptian committee for specifications and quality

- Egyptian Organization for standardization and quality
airport branch
ICS77.140.15
Arab republic of Egypt

