

## 26th International Forum for Materials Testing

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# Proficiency test for reinforcing steel testing Results of an EA highlighted ILC

**Ulm**

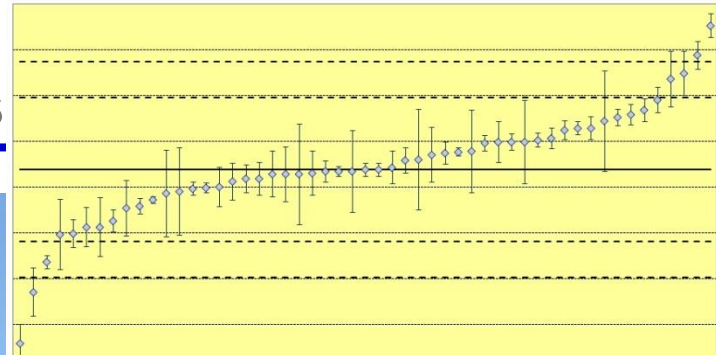
**Tuesday, 17. October 2017**

Dipl.-Ing. Christian Weißmüller

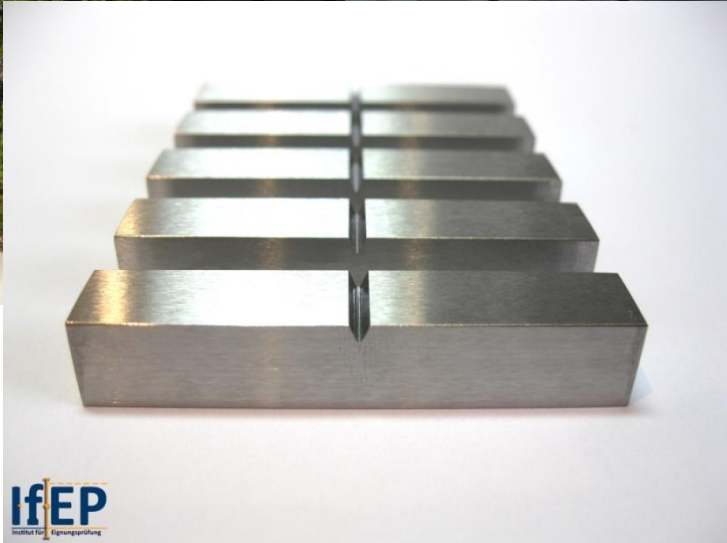


Since 2004

# Eignungs



Since 2000; accredited 2005



Since 2008; accredited 2009

# PT 1623: Tensile test reinforcement bars

- 6 x 1.000 mm BST 500, diameter 12 mm
- 76 labs
- 76 accredited
- Values:  $R_{eH} / R_m / A / A_{gt} / m_E$

Table 1: Participants' locations

Austria	22	Greece	1	Serbia	1
Belarus	1	Italy	4	Slovenia	3
Belgium	2	Jordan	1	Spain	6
Estonia	1	Lithuania	2	Sweden	5
Finland	1	Malaysia	1	Switzerland	4
France	2	Netherlands	2	Turkey	1
Germany	11	Portugal	5		

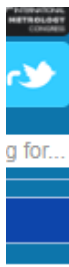
## Information sheet EA highlighted Proficiency tests metal 2016

These proficiency tests were selected by the EA working group ILCs in Testing to monitor the international multi-lateral agreements. A summary of the results will be evaluated without disclosing the individual confidentiality of the participants. The EA working group ILCs in Testing highlights this proficiency test to its ABs. It is expected that the ABs strongly encourage and support their applicant and accredited laboratories to participate in this proficiency test in order to maximise the quality of relevant data.

### Applications for this test will be accepted until May, 31<sup>st</sup> 2016

<b>No. 1623 Tensile test Steel for the reinforcement</b>	Test Standard:	EN ISO 15630-1, EN ISO 6892-1
	Material:	6 reinforcing bars for machining in laboratory
	Production of specimen:	By the participants
	Results to be submitted:	according to the test standard, additionally Young's Module and the Measurement Uncertainty (not evaluated)
	Assigned Value:	Consensus values calculated from the results of the participants
	Additional information:	Influence of manufacturing the specimen, statements of measurement uncertainty of the test method
	Participation fee:	Germany 310 €; other countries: + Delivery costs * estimated start FW 28/2016

\* Costs exclusive of VAT; delivery costs, see [www.ifep.eu](http://www.ifep.eu)



## PT 1623: EA WG: ILC in testing

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- IfEP is active since 2004
- 1623:
- Proposal 2015 in Geneva
- Accepted 2016 in London
- Results discussed 2017 in Athens
  
- GOAL: Ensure the comparability between the MLA members

# PT 9 rein

## ILC in Testing report review form

Review performed by: Frenz/Weißmüller/Lehmann

ILC code	1102		
Part 1	General description of the scheme (What kind of ILC is it?)		
Title	Hardness Testing Rockwell HRC		
Purpose of the ILC	Assessment of the performance of laboratories in the determination of hardness on 3 different levels		
Test item	10 sets of 3 certified reference hardness blocks each (high, middle and low)		
Parameter tested	Hardness, error of testing machine and repeatability of testing machine		
Test procedure used	ISO 6508-1, assessed according to ISO 6508-2		
Name of organiser	IfEP GmbH		
Deadline for reporting the results and date of final report	Deadline: 15.02.2012 Final report: March 2012 (English version under review)		
Overall number of participating laboratories	101		
Number of participating laboratories per parameter	Parameter	Total number of labs	Number of Labs <u>accred.</u> by EA member
	Error low	101	79
	Repeatability low	101	79
	Error middle	101	79
	Repeatability middle	101	79
	Error high	101	79
	Repeatability high	101	79

Review performed by: Frenz/Weißmüller/Lehmann

ILC code	1102					
Part 1	General description of the scheme (What kind of ILC is it?)					
Title	Hardness Testing Rockwell HRC					
Purpose of the ILC	<b>Could the ILC be used for evaluating the effectiveness of the MLA?</b>	59 % MLA members, >50 % = can be used				
Test item						
Parameter tested	Performance of participants results	Satisfactory		Questionable		Not satisfactory
	Number	Total	EA	Total	EA	Total EA
		80	60	---	---	21 19
Test procedure used	<b>Expected performance level</b>	<i>An amount 24% of not satisfactory results (EA Group) is rated as not acceptable. Compared to other pts it should be less than 10%.</i>				
Name of organiser						
Deadline for reporting the results and date of final report	Deadline: 10.02.2012	Final report: March 2012 (English version under review)				
Overall number of participating laboratories	101					
Number of participating laboratories per parameter	Parameter	Total number of labs		Number of Labs <u>accred.</u> by EA member		
	Error low	101		79		
	Repeatability low	101		79		
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	Repeatability high	101		79		

## PT 1623: Tensile test reinforcement bars

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# PT 1623: Tensile test reinforcement bars: Homogeneity

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- 29 Specimens
- Goal: SD  $R_m$  under 1 %

	$R_{eH}$	$R_m$
Total mean $\bar{x}$	557 MPa	632 MPa
Relative standard deviation between the results $s_s$	1,2 %	0,6 %

# PT 1623: Tensile test reinforcement bars: Aquisition



## PT 1623: Tensile test reinforcement bars: assessment criteria

Specific values	$R_{eH}$ in MPa	$R_m$ in MPa	$A$ in %	$A_{gt}$ in %
$X$	546,8	633,7	23,9	11,3
$\hat{\sigma}$	13,6	9,9	0,9	1,3
$u_X, k = 1, p = 68 \%$	1,9	1,4	0,2	0,2
<b>Z = -3</b>	506,1	604,1	21,2	7,5
<b>Z = -2</b>	519,7	613,9	22,1	8,8
<b>Z = 2</b>	574,0	653,4	25,8	13,9
<b>Z = 3</b>	587,5	663,2	26,7	15,2

# PT 1623: Tensile test reinforcement bars: nIQR

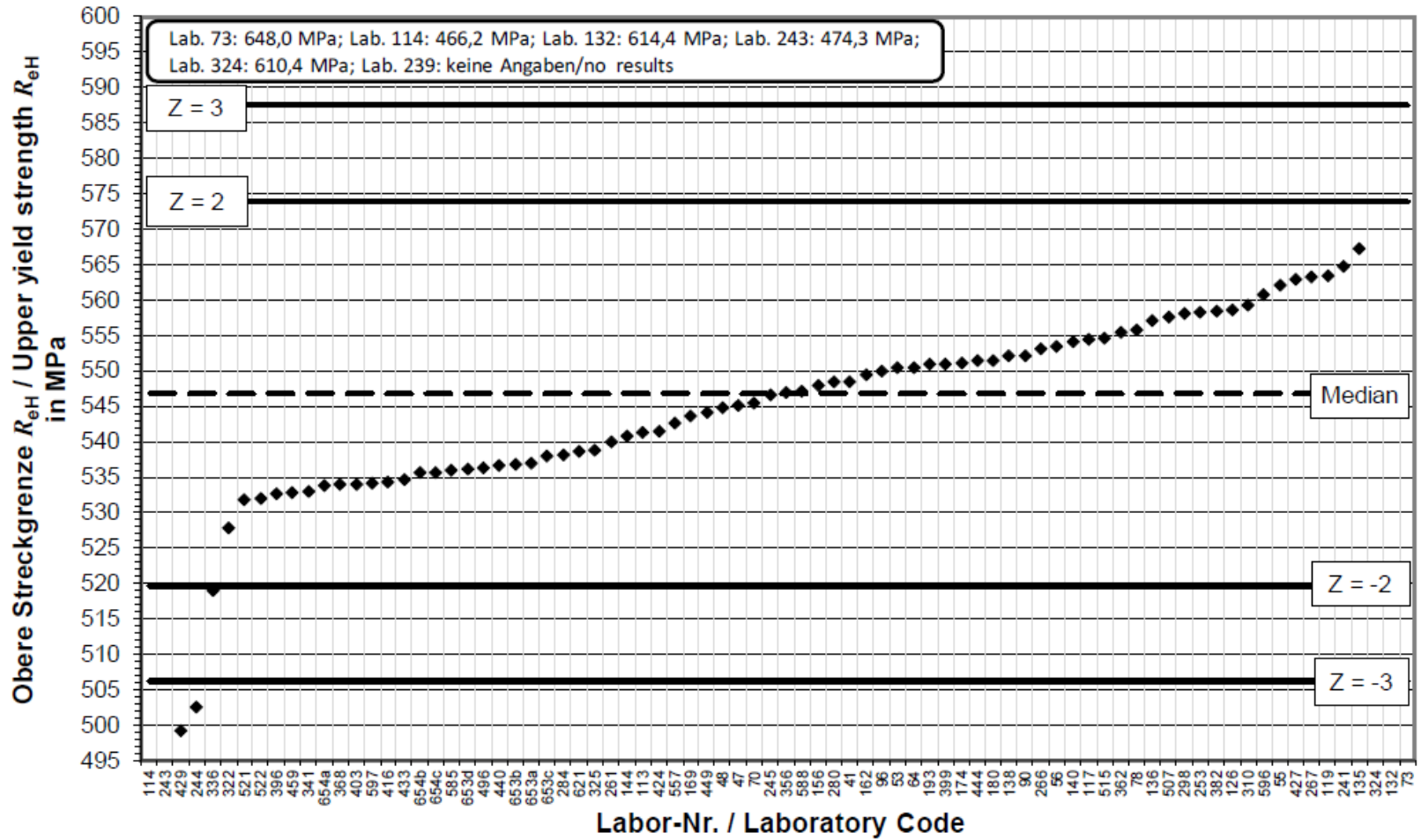


Bild A1: Obere Streckgrenze  $R_{eH}$ ; Mittelwerte aller Laboratorien  
Figure A1: Upper yield strength  $R_{eH}$ ; mean values of all laboratories

# PT 1623: Tensile test reinforcement bars: results

Table 10: Results of the proficiency test

Specific value	Number of participants/ evaluated results	Results $ Z  < 3$
Determination of the upper yield strength $R_{eH}$	80	91 %
Determination of tensile strength $R_m$	81	90 %
Determination of percentage elongation after fracture $A$	30	93 %
Determination of percentage total extension at maximum force $A_{gt}$	77	92 %

# PT 1623: Tensile test reinforcement bars: results

## 4.3 Percentage elongation after fracture $A$

Data from laboratories using an original gauge length  $l_0 = 60$  mm were used only. 30 results were evaluated.

The laboratories listed in table 6 achieved an absolute Z-score of more than 2.

Table 6: Percentage elongation after fracture  $A$ : Deviation from assigned value; list of the laboratories with a questionable / unsatisfactory result

Lab.-Code	Deviation in %	Z-score	Assessment
70	-1,9	-2,1	O
96	3,0	3,2	X
245	9,3	10,1	X

O: questionable result  
X: unsatisfactory result

The results of this specific test value are presented in graph form in figure A3, appendix A.

# PT 1623: Tensile test reinforcement bars: results: A

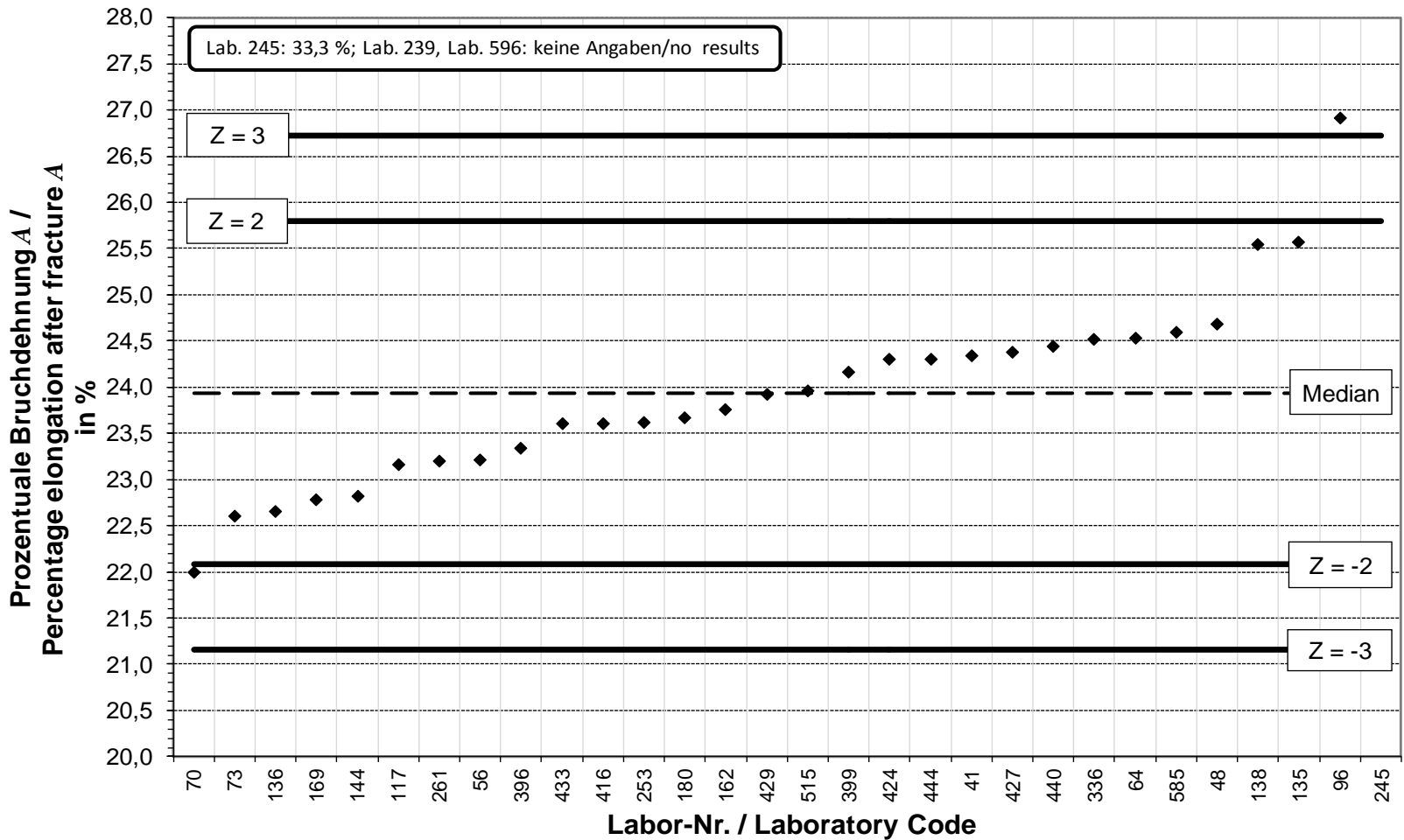


Tabelle 7: Bruchdehnung  $A$ : Angaben der Laboratorien mit abweichender Anfangsmesslänge

Labor-Nr.	$A$ in %	Anfangs- messlänge in mm	Labor-Nr.	$A$ in %	Anfangs- messlänge in mm
47	24,7	50	325	23,8	100
53	24,1	100	341	23,7	220
55	18,4	100	356	12,8	100
78	17,9	120	362	19,1	100
90	18,8	kA	368	14,5	300
113	24,4	225	382	18,2	120
114	27,2	25	403	24,1	100
119	24,5	50	449	25,0	100
126	17,9	kA	459	12,6	400
132	19,5	50	496	24,0	100
140	20,0	80	507	17,5	100
156	25,3	500	521	25,7	6
174	9,5	100	522	18,4	120
193	14,2	500	557	23,7	50
241	22,9	100	588	14,4	100
243	22,5	155	597	13,2	100
244	26,8	40	621	18,8	120
266	24,9	100	653a	23,6	200
267	12,2	100	653b	23,3	200
280	24,2	100	653c	22,8	200
284	24,1	4	653d	24,5	200
298	9,8	100	654a	23,8	100
310	23,2	200	654b	22,6	100
322	25,9	50	654c	24,7	100
324	41,4	20			

## EP 1623: ZA

- ISO 1563

For the determination of the elongation at break, the nominal diameter ( $d$ ) shall be determined manually.

The measurement of the length of 100 mm, as is the greater) away from the grips and the measurement of the length of the test piece on a gauge shall be 5 times the nominal diameter ( $d$ ) or 20 mm or 2d (whichever is valid if the distance,  $r_1$ , is greater). See Figure 1.

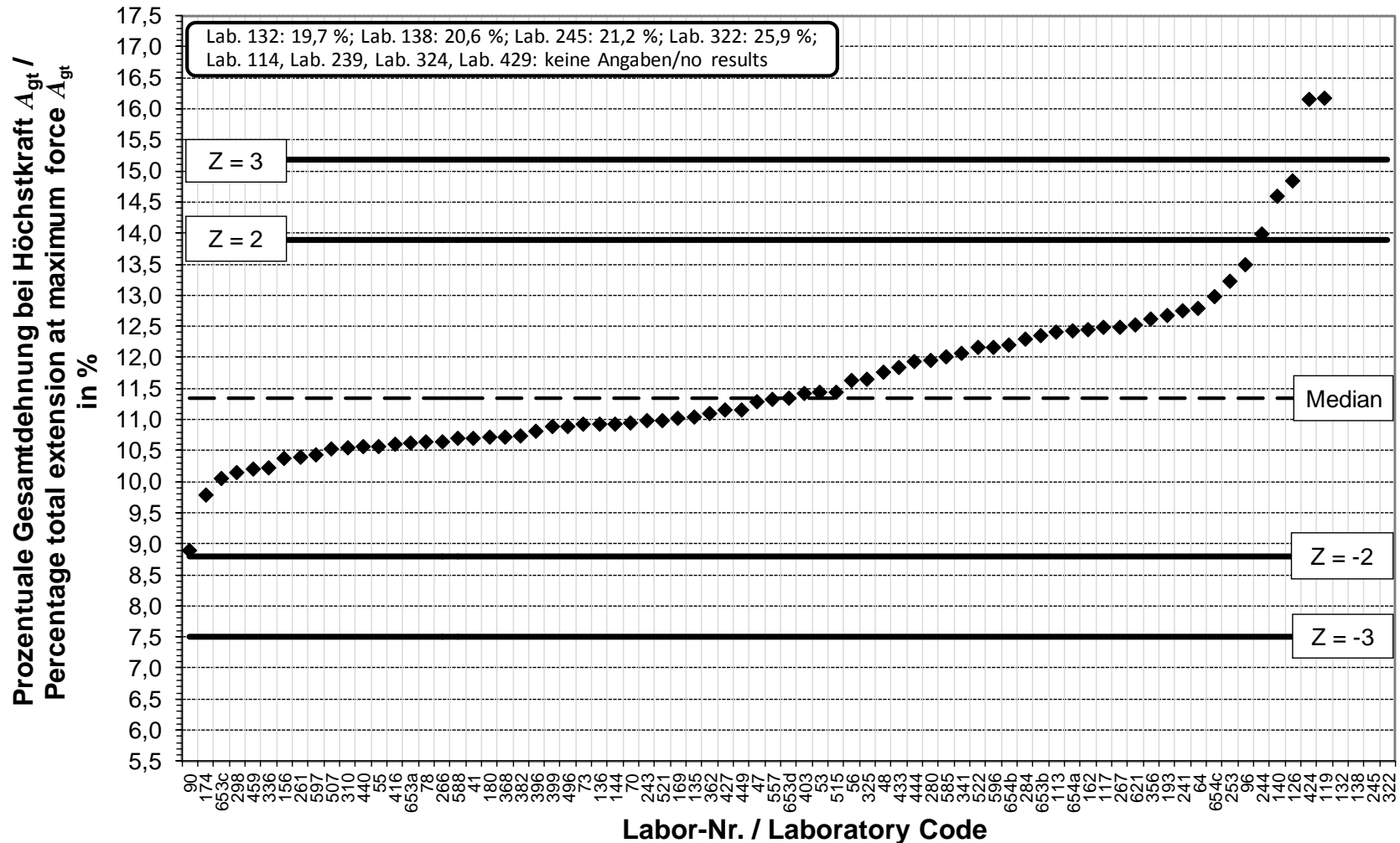
In case of dispute, the measurement of the length of the test piece on a gauge shall be 5 times the nominal diameter ( $d$ ) or 20 mm or 2d (whichever is valid if the distance,  $r_1$ , is greater). See Figure 1.

In case of dispute,  $A$  shall be determined on the test piece on a gauge with a length shall be 5 times the nominal diameter ( $d$ ) or 20 mm or 2d (whichever is valid if the distance,  $r_1$ , is greater). See Figure 1.

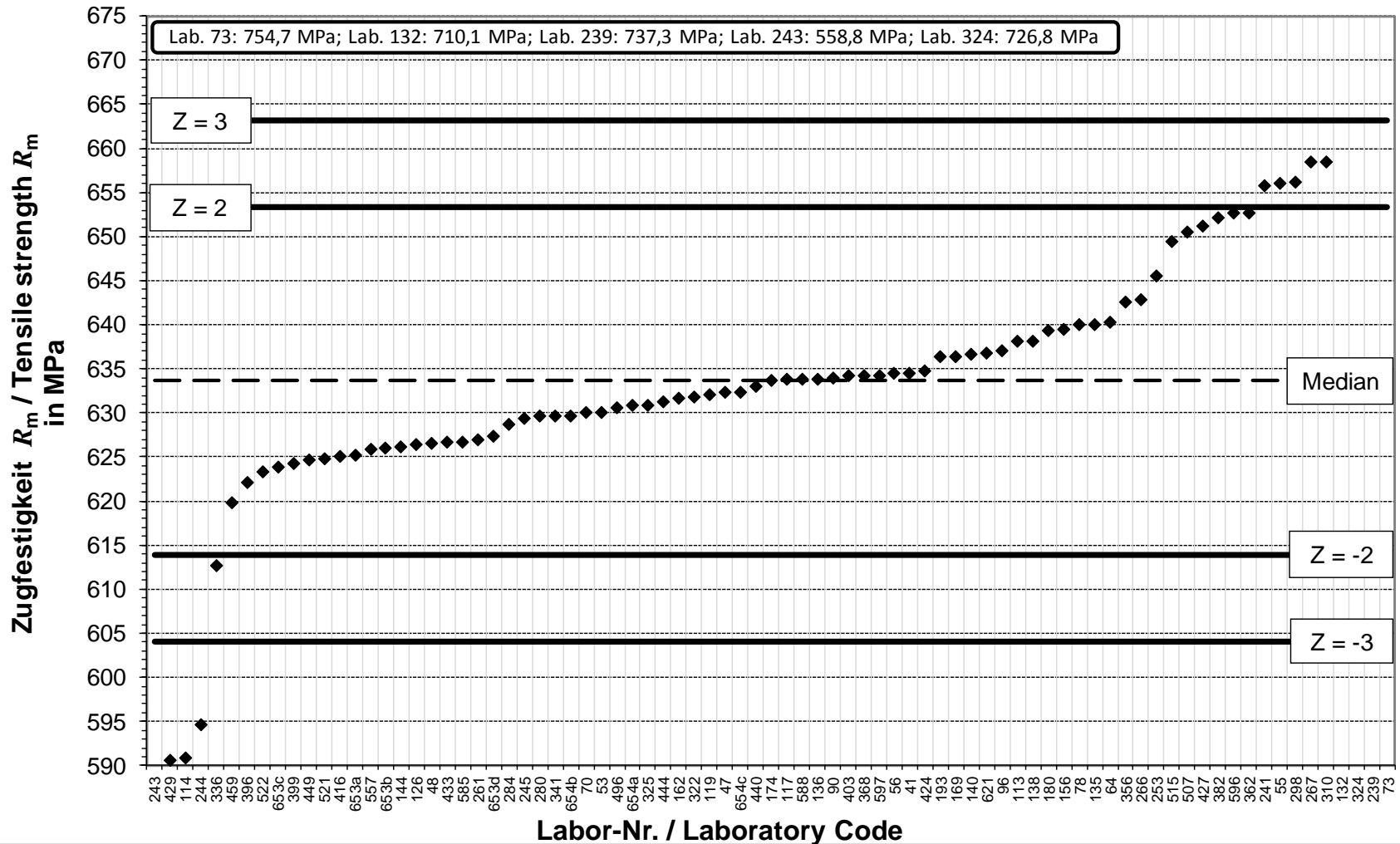
The measurement of the length of the test piece on a gauge shall be 5 times the nominal diameter ( $d$ ) or 20 mm or 2d (whichever is valid if the distance,  $r_1$ , is greater). See Figure 1.



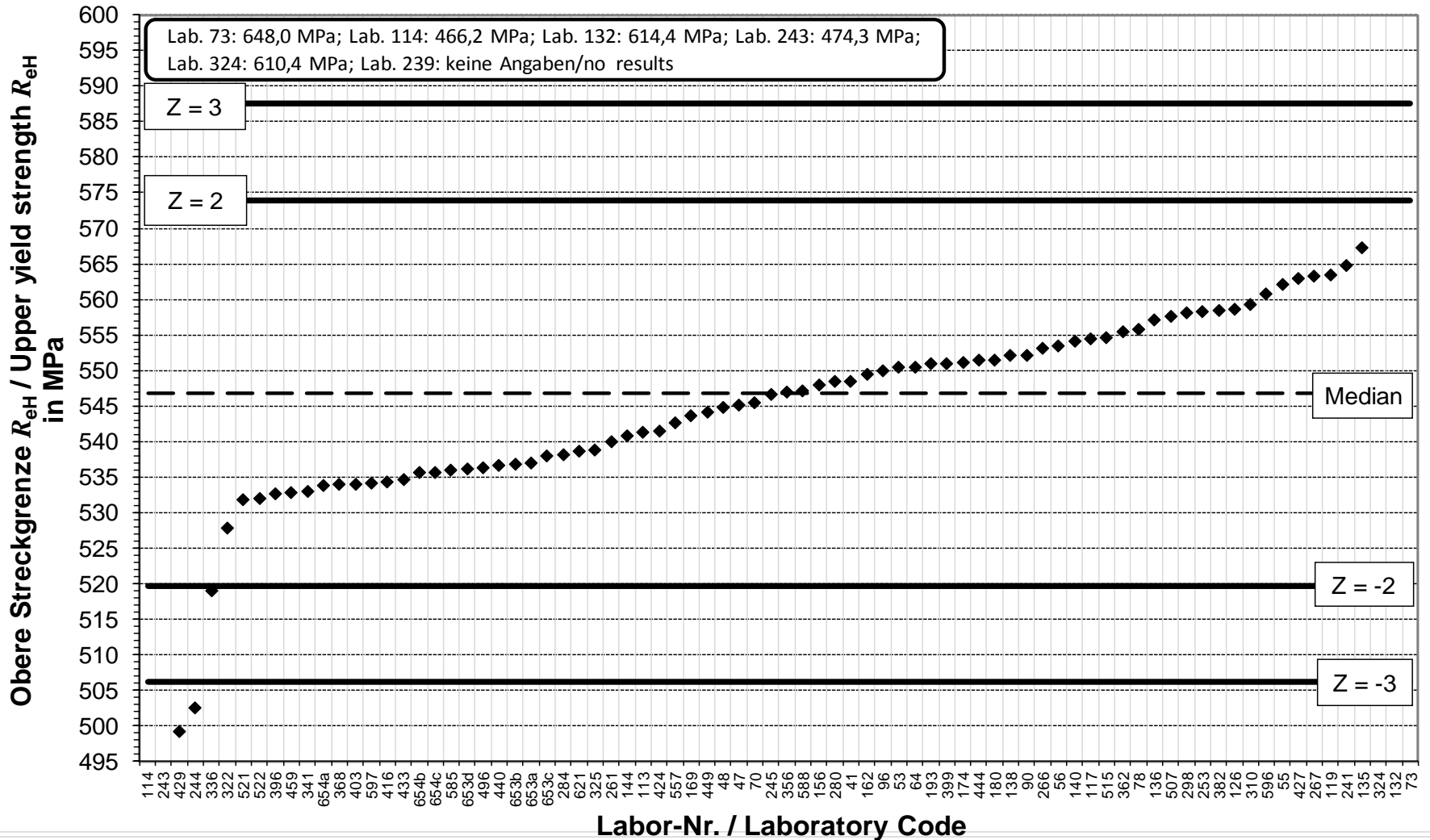
# EP 1623: ZV Betonstahl: Results: $A_{gt}$



# EP 1623: ZV Betonstahl: Results : $R_m$



# EP 1623: ZV Betonstahl: Results : $R_{eH}$



# Summary

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- It is possible, but laborious to produce homogeneous specimens out of reinforcement steel,
- The evaluation of the value „Elongation“ show room of improvement in relation to rules given by the standard,
- All the other values show comparable results, however they will not be able support or confirm the MLA.



IfEP GmbH  
Daimlerstraße 8  
45770 Marl  
Germany  
Tel. +49 209 00 09  
ifep@online.de



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certified reference materials

