TSÚS, Building Testing and Research Institute, Notified body 1301
967/3 Studená Str., Bratislava 821 04, Slovak Republic

A) Summary statistics for a sample :

2D Flexural strength

		X1, X2, ... X(p-1), Xp	X2, X3, ... X(p-1), Xp	X3, X4... X(p-1), Xp	X1, X2, ... X(p-2), X(p-1)	X1, X2, ... X(p-3), X(p-2)	Sample without outliers
Count (Sample size)	n	17	16	15	16	15	17
Minimum value	$x_{min} = x_1$	3,7	3,87	3,88	3,70	3,70	3,70
Maximum value	$x_{max} = x_p$	4,57	4,57	4,57	4,49	4,43	4,57
Range of sample R =	$x_{max} - x_{min}$	0,87	0,70	0,69	0,79	0,73	0,87
difference $L_{m95\%} - L_{M95\%}$	$\Delta L_{95\%}$	1,01					1,01
Lower confidence limitsafterelimination of outliers (for P=98%)	$L_{m98\%}$	3,476					3,476
Lower confidence limitsafterelimination of outliers (for P=95%)	$L_{m95\%}$	3,586					3,586
Lower Irwin confidence limit (for P=95%)	$x_{minIw1-5\%}$	3,566					
Lower Grubbs confidence limit (for P=99%)	$x_{minG1-1\%}$	3,402	3,481				
Lower Grubbs confidence limit (for P=95%)	$x_{minG1-5\%}$	3,467	3,54				
Average (arithmetic mean) $\bar{x}$ =	$1/p\sum(x_i)$ =	4,091	4,116	4,132	4,061	4,033	4,091
Precision of a measure of the mean (for P=95%)	$\pm \varepsilon$	0,126	0,131	0,136	0,131	0,136	0,126
Upper Grubbs confidence limit (for P=99%)	$x_{maxGp-5\%}$	4,715			4,604		
Upper Grubbs confidence limit (for P=95%)	$x_{maxGp-1\%}$	4,78			4,66		
Upper Irwin confidence limit (for P=99%)	$x_{maxIw1-5\%}$	4,794					
Upper confidence limitsafterelimination of outliers (for P=95%)	$L_{M95\%}$	4,596					4,596
Upper confidence limitsafterelimination of outliers (for P=98%)	$L_{M98\%}$	4,706					4,706
Standard deviation of a sample	$s_{x,n-1}$	0,2380	0,2227	0,2203	0,2102	0,1826	0,2380
Standard deviation	$s_{x,0}$	0,2309	0,2156	0,2129	0,2036	0,1764	0,2309
Coefficient of variation	v	5,8%	5,4%	5,3%	5,2%	4,5%	5,8%
Standard skewness	Sk_{est}	0,641	0,877	0,836	0,593	0,458	0,641
Standard kurtosis (exces)	γ_2	-0,151	-0,263	-0,354	0,173	0,568	-0,151
t-value of the Student's distribution for P=95%	$t_{(n-1),\alpha=2,5\%}$	2,120	2,132	2,145	2,132	2,145	2,120
t-value of the Student's distribution for P=98%	$t_{(n-1),\alpha=1,0\%}$	2,584	2,603	2,625	2,603	2,625	2,584

B1) Tests by Irwin for an afterelimination of outliers

Tests by Irwin for an afterelimination of outliers based on a level of significance of 5%

Irwin critical value (for P=95%)	$\lambda_{\alpha(n)}$	1,318	1,338	1,359	1,338	1,359
	$\lambda_{calc,1,2}$	0,736	0,046	0,000	0,835	0,964
	$\lambda_{calc,n,n-1}$	0,346	0,371	0,376	0,295	0,907
Value x1 is not outlier		**1** ...	**1**	**1**	**1**	**1**
Value xp is not outlier		**1** ...	**1**	**1**	**1**	**1**

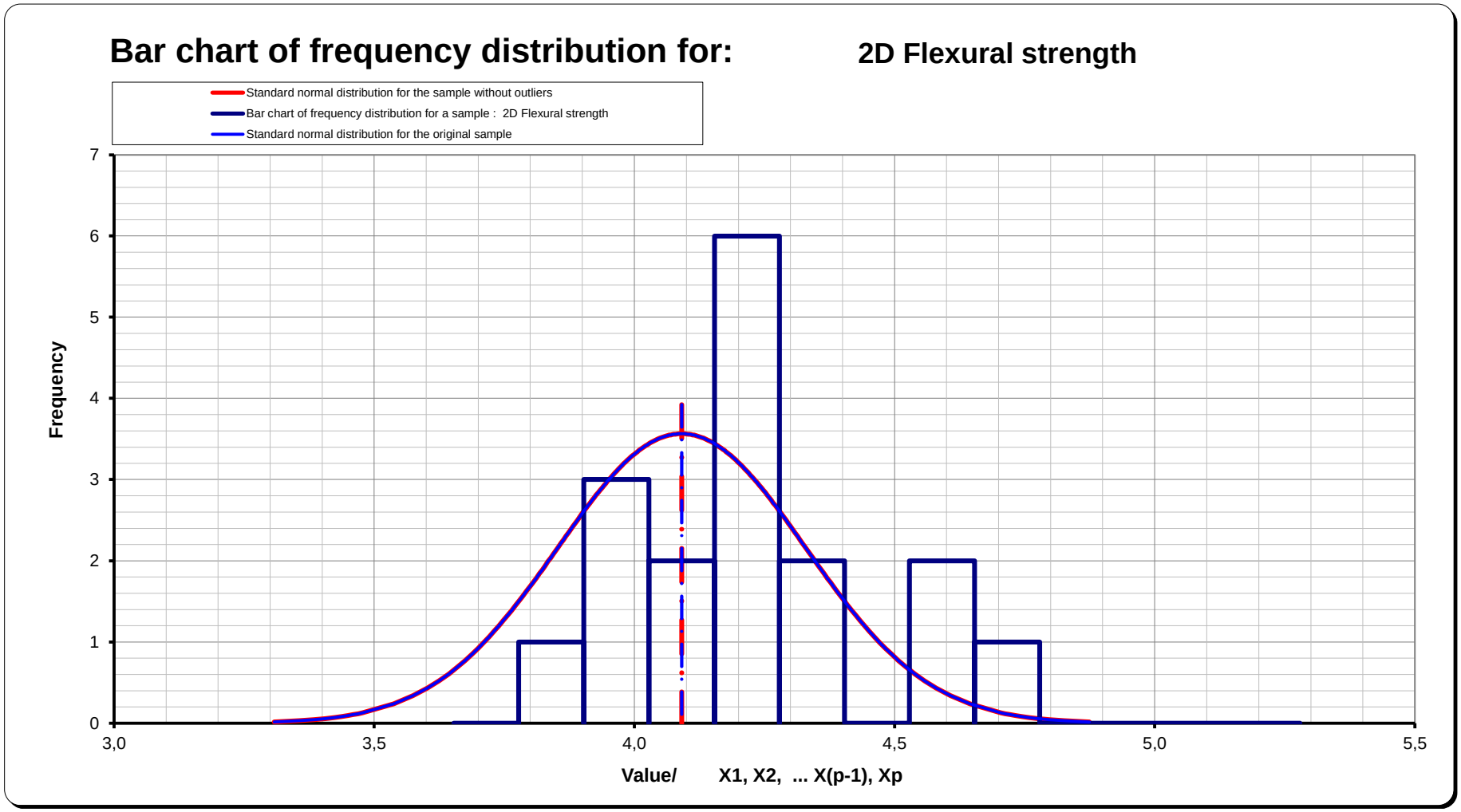
B2) Tests by Grubb for an afterelimination of outliers or biased values

Grubb_i=1	G_1	1,643	1,868	
Grubb_i=p	G_p	2,013	2,422	
Upper critical values	$G_{h,1\%}$	2,894	2,852	**Test for an afterelimination of one outlier based on a level of significance of 1%**
for the Grubb-test		**1** ...	**1**	Value x1 is not outlier
according to ISO 5725-2,		**1** ...	**1**	Value xp is not outlier
clause 7.3.4.1	$G_{h,5\%}$	2,620	2,585	**Test for an afterelimination of one biased value based on a level of significance of 5%**
		1 ...	**1**	Value x1 is not biased
		1 ...	**1**	Value xp is not biased
Grubb_i=1,2	$G_{1,2}$	0,850	0,850	
Grubb_i=p,p-1	$G_{p,p-1}$	0,584	0,584	
Lower critical values	$G_{d,1\%}$	0,299	0,277	**Test for an afterelimination of two outliers based on a level of significance of 5%**
for the Grubb-test		**1** ...	**1**	Values x1, x2 are not outliers
according to ISO 5725-2,		**1** ...	**1**	Values xp, xp-1 are not biased values
clause 7.3.4.2	$G_{d,5\%}$	0,382	0,360	**Test for an afterelimination of two biased values based on a level of significance of 5%**
		1 ...	**1**	Values x1, x2 are not outliers
		1 ...	**1**	Values xp, xp-1 are not biased values

B3) Tests by Dixon for an afterelimination of outliers or biased values

Test for an afterelimination of one biased value based on a level of significance of 5%

Dixon_i=1, ... (x_2-x_1)	Q_1	0,195	0,014	0,000	0,215	0,233
Dixon_i=p, ...$(x_p-x_{(p-1)})$	Q_p	0,092	0,114	0,116	0,076	0,219
Upper critical values	$Q_{v,\alpha,5\%}$	0,320	0,329	0,338	0,329	0,338
Value x1 is not biased		**1** ...	**1**	**1**	**1**	**1**
Value xp is not biased		**1** ...	**1**	**1**	**1**	**1**


Bar chart of frequency distribution for: 2D Flexural strength
Standard normal distribution for the sample without outliers
Bar chart of frequency distribution for a sample : 2D Flexural strength
Standard normal distribution for the original sample
Frequency
0
1
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7
3,0
3,5
4,0
4,5
5,0
5,5
Value/ X1, X2, ... X(p-1), Xp

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A) Summary statistics for a sample : 28D Flexural strength

		X1, X2, ... X(p-1), Xp	X2, X3, ... X(p-1), Xp	X3, X4... X(p-1), Xp	X1, X2, ... X(p-2), X(p-1)	X1, X2, ... X(p-3), X(p-2)	Sample without outliers
Count (Sample size)	n	17	16	15	16	15	16
Minimum value	$x_{min} = x_1$	6,37	7,28	7,52	6,37	6,37	7,28
Maximum value	$x_{max} = x_p$	9,04	9,04	9,04	8,71	8,48	9,04
Range of sample R =	$x_{max} - x_{min}$	2,67	1,76	1,52	2,34	2,11	1,76
difference $L_{m95\%} - L_{M95\%}$	$\Delta L_{95\%}$	2,592					1,916
Lower confidence limitsafterelimination of outliers (for P=98%)	$L_{m98\%}$	6,457					6,972
Lower confidence limitsafterelimination of outliers (for P=95%)	$L_{m95\%}$	6,740					7,183
Lower Irwin confidence limit (for P=95%)	XminIw1-5%	6,498					
Lower Grubbs confidence limit (for P=99%)	XminG1-1%	6,267	6,86				
Lower Grubbs confidence limit (for P=95%)	XminG1-5%	6,434	6,98				
Average (arithmetic mean) $\overline{x}$ =	$1/p\sum(x_i)$ =	8,036	8,141	8,198	7,974	7,925	8,141
Precision of a measure of the mean (for P=95%)	± ε	0,324	0,336	0,350	0,336	0,350	0,247
Upper Grubbs confidence limit (for P=99%)	XmaxGp-5%	9,638			9,453		
Upper Grubbs confidence limit (for P=95%)	XmaxGp-1%	9,805			9,605		
Upper Irwin confidence limit (for P=99%)	XmaxIw1-5%	9,492					
Upper confidence limitsafterelimination of outliers (for P=95%)	$L_{M95\%}$	9,332					9,099
Upper confidence limitsafterelimination of outliers (for P=98%)	$L_{M98\%}$	9,615					9,31
Standard deviation of a sample	$s_{x,n-1}$	0,6113	0,4493	0,3998	0,5720	0,5562	0,4493
Standard deviation	$s_{x,0}$	0,593	0,435	0,3863	0,5539	0,5373	0,435
Coefficient of variation	v	7,6%	5,5%	4,9%	7,2%	7,0%	5,5%
Standard skewness	Sk_{est}	-1,134	0,005	0,329	-1,523	-1,677	0,005
Standard kurtosis (exces)	γ_2	2,513	0,069	0,073	3,167	3,520	0,069
t-value of the Student's distribution for P=95%	$t_{(n-1),\alpha=2,5\%}$	2,120	2,132	2,145	2,132	2,145	2,132
t-value of the Student's distribution for P=98%	$t_{(n-1),\alpha=1,0\%}$	2,584	2,603	2,625	2,603	2,625	2,603

B1) Tests by Irwin for an afterelimination of outliers

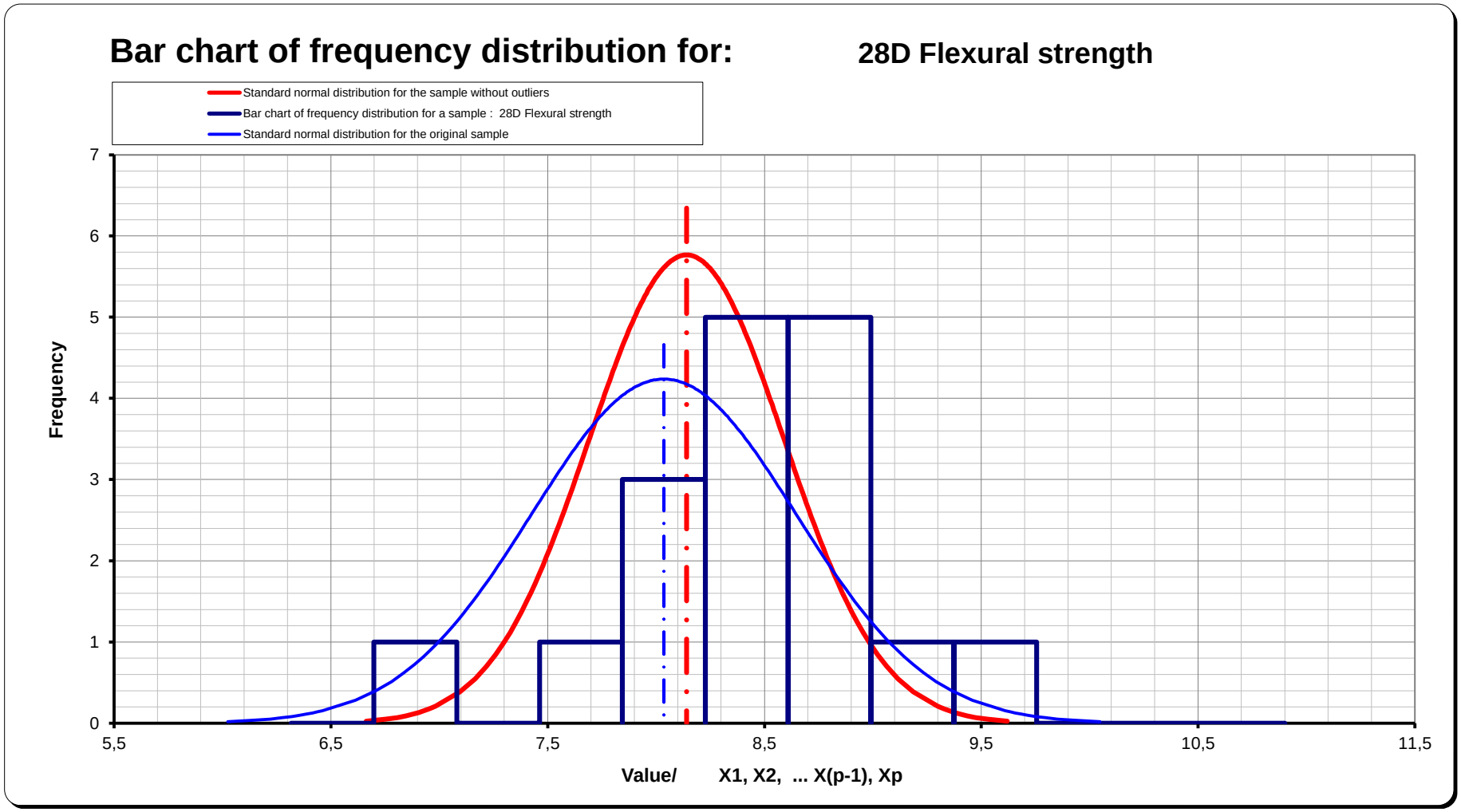
				Tests by Irwin for an afterelimination of outliers based on a level of significance of 5%			
Irwin critical value (for P=95%)	$\lambda_{\alpha(n)}$	1,318		1,338	1,359	1,338	1,359
	$\lambda_{calc,1,2}$	1,535		0,552	0,544	1,643	1,694
	$\lambda_{calc,n,n-1}$	0,556		0,759	0,854	0,415	0,000
	*x1 ** *	**0**	...	**1**	**1**	**0**	**0**
	Value xp is not outlier	**1**	...	**1**	**1**	**1**	**1**

B2) Tests by Grubb for an afterelimination of outliers or biased values

Grubb_i=1	G_1	2,725		3,942	
Grubb_i=p	G_p	1,642		1,864	
Upper critical values	$G_{h,1\%}$	2,894		2,852	**Test for an afterelimination of one outlier based on a level of significance of 1%**
for the Grubb-test		**1**	...	**0**	..... x1 ** is the outlier
according to ISO 5725-2,		**1**	...	**1**	..... Value xp is not outlier
clause 7.3.4.1	$G_{h,5\%}$	2,620		2,585	**Test for an afterelimination of one biased value based on a level of significance of 5%**
		0	...	**0**	..... x1 * is the biased value
		1	...	**1**	..... Value xp is not biased
Grubb_i=1,2	$G_{1,2}$	0,424		0,424	
Grubb_i=p,p-1	$G_{p,p-1}$	0,821		0,821	
Lower critical values	$G_{d,1\%}$	0,299		0,277	**Test for an afterelimination of two outliers based on a level of significance of 5%**
for the Grubb-test		**1**	...	**1**	..... Values x1, x2 are not outliers
according to ISO 5725-2,		**1**	...	**1**	..... Values xp, xp-1 are not biased values
clause 7.3.4.2	$G_{d,5\%}$	0,382		0,360	**Test for an afterelimination of two biased values based on a level of significance of 5%**
		1	...	**1**	..... Values x1, x2 are not outliers
		1	...	**1**	..... Values xp, xp-1 are not biased values

B3) Tests by Dixon for an afterelimination of outliers or biased values

				Test for an afterelimination of one biased value based on a level of significance of 5%				
Dixon_i=1, ... (x_2-x_1)	Q_1	0,341		0,136	0,138	0,389	0,431
Dixon_i=p, ...$(x_p-x_{(p-1)})$	Q_p	0,124		0,187	0,217	0,098	0,000
Upper critical values	$Q_{v,\alpha,5\%}$	**0,320**		**0,329**	**0,338**	**0,329**	**0,338**
*x1 * is the biased value*		**0**	...	**1**	**1**	**0**	**0**
Value xp is not biased		**1**	...	**1**	**1**	**1**	**1**


Bar chart of frequency distribution for: 28D Flexural strength
Standard normal distribution for the sample without outliers
Bar chart of frequency distribution for a sample : 28D Flexural strength
Standard normal distribution for the original sample
Frequency
0
1
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5
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5,5
6,5
7,5
8,5
9,5
10,5
11,5
Value/ X1, X2, ... X(p-1), Xp

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A) Summary statistics for a sample : 2D Compressive strength

		X1, X2, ... X(p-1), Xp	X2, X3, ... X(p-1), Xp	X3, X4... X(p-1), Xp	X1, X2, ... X(p-2), X(p-1)	X1, X2, ... X(p-3), X(p-2)	Sample without outliers
Count (Sample size)	n	17	16	15	16	15	16
Minimum value	$x_{min} = x_1$	18,3	18,72	18,86	18,30	18,30	18,30
Maximum value	$x_{max} = x_p$	23,07	23,07	23,07	21,95	21,50	21,95
Range of sample R =	$x_{max} - x_{min}$	4,77	4,35	4,21	3,65	3,20	3,65
difference $L_{m95\%} - L_{M95\%}$	$\Delta L_{95\%}$	5,104					4,112
Lower confidence limitsafterelimination of outliers (for P=98%)	$L_{m98\%}$	17,010					17,427
Lower confidence limitsafterelimination of outliers (for P=95%)	$L_{m95\%}$	17,569					17,881
Lower Irwin confidence limit (for P=95%)	xminIw1-5%	17,181					
Lower Grubbs confidence limit (for P=99%)	xminG1-1%	16,637	16,969				
Lower Grubbs confidence limit (for P=95%)	xminG1-5%	16,967	17,275				
Average (arithmetic mean) $\overline{x}$ =	$1/p\sum(x_i)$ =	20,121	20,235	20,336	19,937	19,803	19,937
Precision of a measure of the mean (for P=95%)	± ε	0,638	0,663	0,690	0,663	0,690	0,531
Upper Grubbs confidence limit (for P=99%)	xmaxGp-5%	23,275			22,43		
Upper Grubbs confidence limit (for P=95%)	xmaxGp-1%	23,605			22,688		
Upper Irwin confidence limit (for P=99%)	xmaxIw1-5%	23,489					
Upper confidence limitsafterelimination of outliers (for P=95%)	$L_{M95\%}$	22,673					21,993
Upper confidence limitsafterelimination of outliers (for P=98%)	$L_{M98\%}$	23,232					22,447
Standard deviation of a sample	$s_{x,n-1}$	1,2040	1,1451	1,1091	0,9645	0,8294	0,9645
Standard deviation	$s_{x,0}$	1,168	1,1087	1,0715	0,9339	0,8013	0,9339
Coefficient of variation	v	6,0%	5,7%	5,5%	4,8%	4,2%	4,8%
Standard skewness	Sk_{est}	0,891	1,079	1,178	0,351	-0,016	0,351
Standard kurtosis (exces)	γ_2	1,079	1,336	1,522	0,187	0,018	0,187
t-value of the Student's distribution for P=95%	$t_{(n-1),\alpha=2,5\%}$	2,120	2,132	2,145	2,132	2,145	2,132
t-value of the Student's distribution for P=98%	$t_{(n-1),\alpha=1,0\%}$	2,584	2,603	2,625	2,603	2,625	2,603

B1) Tests by Irwin for an afterelimination of outliers

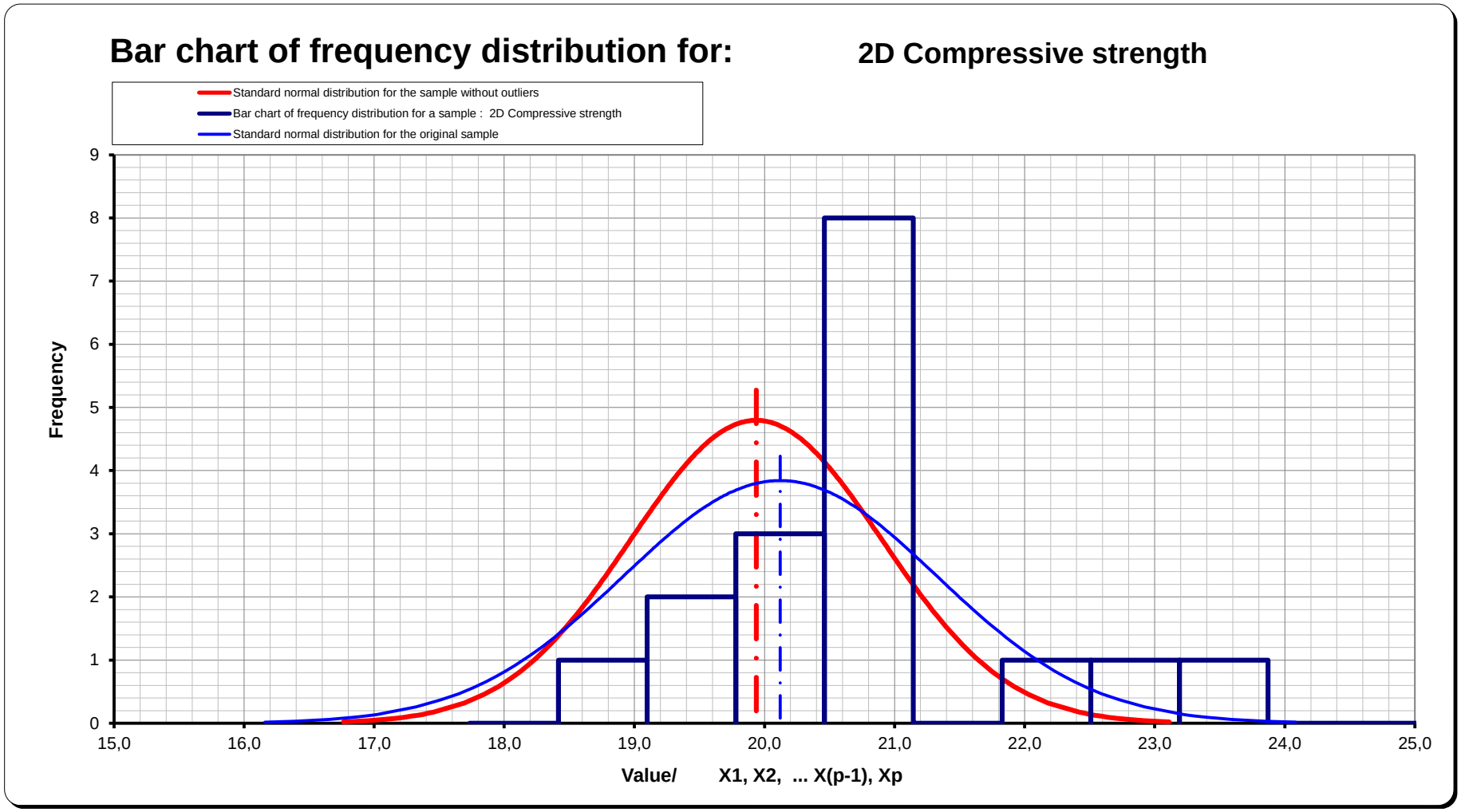
				Tests by Irwin for an afterelimination of outliers based on a level of signifiance of 5%			
Irwin critical value (for P=95%)	$\lambda_{\alpha(n)}$	1,318		1,338	1,359	1,338	1,359
	$\lambda_{calc,1,2}$	0,360		0,126	0,299	0,450	0,524
	$\lambda_{calc,n,n-1}$	0,959		1,010	1,045	0,482	1,310
Value x1 is not outlier		**1**	...	**1**	**1**	**1**	**1**
Value xp is not outlier		**1**	...	**1**	**1**	**1**	**1**

B2) Tests by Grubb for an afterelimination of outliers or biased values

Grubb_i=1	G_1	1,512		1,690	
Grubb_i=p	G_p	2,449		3,248	
Upper critical values	$G_{h,1\%}$	2,894		2,852	**Test for an afterelimination of one outlier based on a level of signifiance of 1%**
for the Grubb-test		**1**	...	**1**	..... Value x1 is not outlier
according to ISO 5725-2,		**1**	...	**0**	..... xp ** is the outlier
clause 7.3.4.1	$G_{h,5\%}$	2,620		2,585	**Test for an afterelimination of one biased value based on a level of signifiance of 5%**
		1	...	**1**	..... Value x1 is not biased
		1	...	**0**	..... xp * is the biased value
Grubb_i=1,2	$G_{1,2}$	0,842		0,842	
Grubb_i=p,p-1	$G_{p,p-1}$	0,471		0,471	
Lower critical values	$G_{d,1\%}$	0,299		0,277	**Test for an afterelimination of two outliers based on a level of signifiance of 5%**
for the Grubb-test		**1**	...	**1**	..... Values x1, x2 are not outliers
according to ISO 5725-2,		**1**	...	**1**	..... Values xp, xp-1 are not biased values
clause 7.3.4.2	$G_{d,5\%}$	0,382		0,360	**Test for an afterelimination of two biased values based on a level of signifiance of 5%**
		1	...	**1**	..... Values x1, x2 are not outliers
		1	...	**1**	..... Values xp, xp-1 are not biased values

B3) Tests by Dixon for an afterelimination of outliers or biased values

				Test for an afterelimination of one biased value based on a level of signifiance of 5%			
Dixon_i=1, ... (x_2-x_1)	Q_1	0,088		0,032	0,076	0,115	0,131
Dixon_i=p, ...$(x_p-x_{(p-1)})$	Q_p	0,235		0,257	0,266	0,123	0,328
Upper critical values	$Q_{v,\alpha,5\%}$	0,320		0,329	0,338	0,329	0,338
Value x1 is not biased		**1**	...	**1**	**1**	**1**	**1**
Value xp is not biased		**1**	...	**1**	**1**	**1**	**1**


Bar chart of frequency distribution for: 2D Compressive strength
Standard normal distribution for the sample without outliers
Bar chart of frequency distribution for a sample : 2D Compressive strength
Standard normal distribution for the original sample
Frequency
0
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16,0
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18,0
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20,0
21,0
22,0
23,0
24,0
25,0
Value/ X1, X2, ... X(p-1), Xp

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A) Summary statistics for a sample : 28D Compressive strength

		X1, X2, ... X(p-1), Xp	X2, X3, ... X(p-1), Xp	X3, X4... X(p-1), Xp	X1, X2, ... X(p-2), X(p-1)	X1, X2, ... X(p-3), X(p-2)	Sample without outliers
Count (Sample size)	n	17	16	15	16	15	17
Minimum value	$x_{min} = x_1$	47,46	48,00	48,16	47,46	47,46	47,46
Maximum value	$x_{max} = x_p$	53,38	53,38	53,38	52,95	52,34	53,38
Range of sample R =	$x_{max} - x_{min}$	5,92	5,38	5,22	5,49	4,88	5,92
difference $L_{m95\%} - L_{M95\%}$	$\Delta L_{95\%}$	7,236					7,236
Lower confidence limitsafterelimination of outliers (for P=98%)	$L_{m98\%}$	45,780					45,78
Lower confidence limitsafterelimination of outliers (for P=95%)	$L_{m95\%}$	46,571					46,571
Lower Irwin confidence limit (for P=95%)	$x_{minIw1-5\%}$	45,818					
Lower Grubbs confidence limit (for P=99%)	$x_{minG1-1\%}$	45,25	45,779				
Lower Grubbs confidence limit (for P=95%)	$x_{minG1-5\%}$	45,718	46,208				
Average (arithmetic mean) $\bar{x}$ =	$1/p\sum(x_i)$ =	50,189	50,359	50,517	49,989	49,792	50,189
Precision of a measure of the mean (for P=95%)	$\pm \varepsilon$	0,904	0,939	0,978	0,939	0,978	0,904
Upper Grubbs confidence limit (for P=99%)	$x_{maxGp-5\%}$	54,66			53,981		
Upper Grubbs confidence limit (for P=95%)	$x_{maxGp-1\%}$	55,128			54,393		
Upper Irwin confidence limit (for P=99%)	$x_{maxIw1-5\%}$	55,132					
Upper confidence limitsafterelimination of outliers (for P=95%)	$L_{M95\%}$	53,807					53,807
Upper confidence limitsafterelimination of outliers (for P=98%)	$L_{M98\%}$	54,598					54,598
Standard deviation of a sample	$s_{x,n-1}$	1,7065	1,6058	1,5293	1,5443	1,3738	1,7065
Standard deviation	$s_{x,0}$	1,6555	1,5549	1,4775	1,4953	1,3272	1,6555
Coefficient of variation	v	3,4%	3,2%	3,0%	3,1%	2,8%	3,4%
Standard skewness	Sk_{est}	0,327	0,430	0,483	0,247	0,056	0,327
Standard kurtosis (exces)	γ_2	-0,570	-0,573	-0,550	-0,473	-0,590	-0,570
t-value of the Student's distribution for P=95%	$t_{(n-1),\alpha=2,5\%}$	2,120	2,132	2,145	2,132	2,145	2,120
t-value of the Student's distribution for P=98%	$t_{(n-1),\alpha=1,0\%}$	2,584	2,603	2,625	2,603	2,625	2,584

B1) Tests by Irwin for an afterelimination of outliers

Tests by Irwin for an afterelimination of outliers based on a level of significance of 5%

Irwin critical value (for P=95%)	$\lambda_{\alpha(n)}$	1,318	1,338	1,359	1,338	1,359
	$\lambda_{calc,1,2}$	0,326	0,103	0,589	0,361	0,407
	$\lambda_{calc,n,n-1}$	0,260	0,277	0,291	0,408	0,618
Value x1 is not outlier		**1** ...	**1**	**1**	**1**	**1**
Value xp is not outlier		**1** ...	**1**	**1**	**1**	**1**

B2) Tests by Grubb for an afterelimination of outliers or biased values

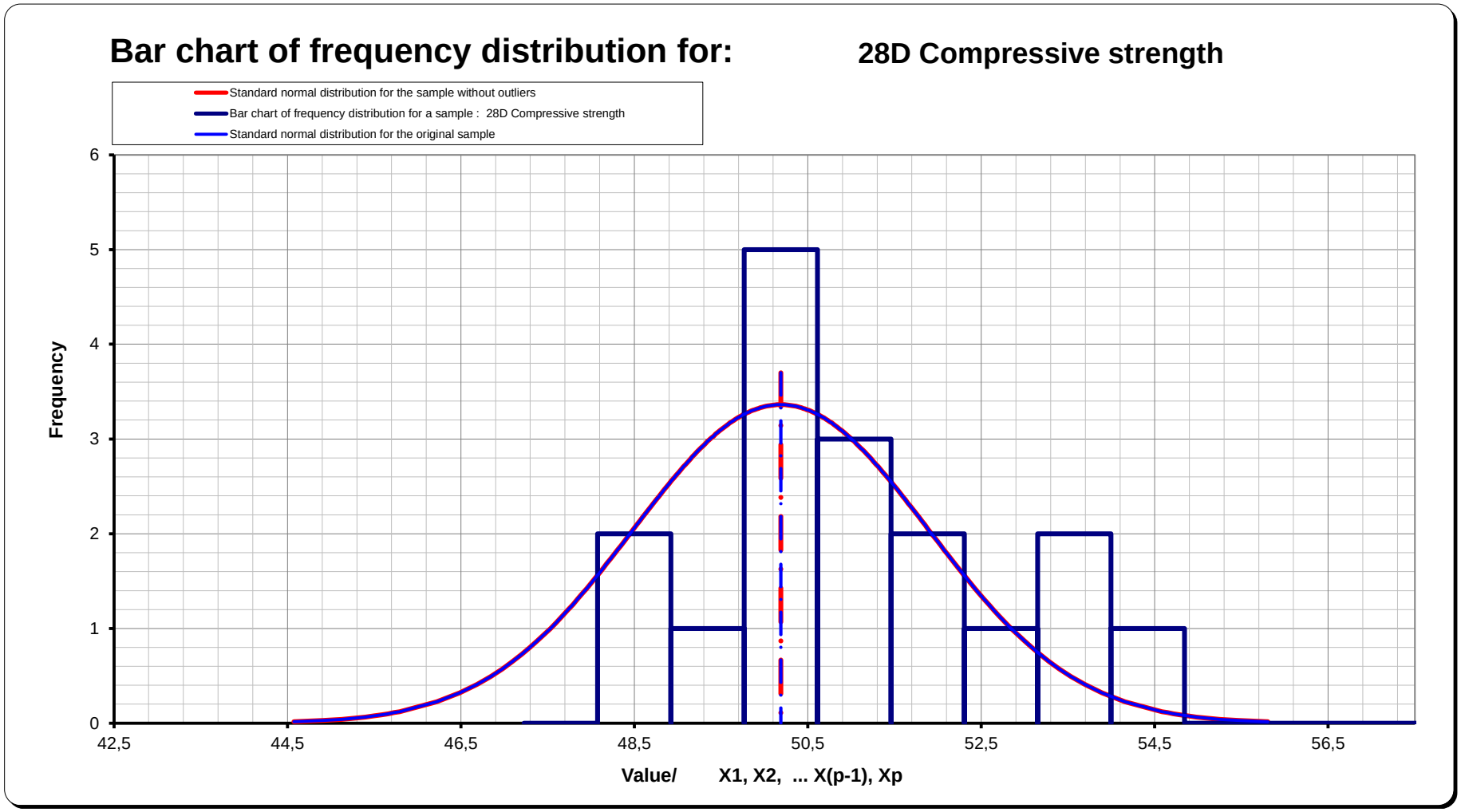
Grubb_i=1	G_1	1,599	1,805	
Grubb_i=p	G_p	1,870	2,196	
Upper critical values	$G_{h,1\%}$	2,894	2,852	**Test for an afterelimination of one outlier based on a level of significance of 1%**
for the Grubb-test		**1** ...	**1**	Value x1 is not outlier
according to ISO 5725-2,		**1** ...	**1**	Value xp is not outlier
clause 7.3.4.1	$G_{h,5\%}$	2,620	2,585	**Test for an afterelimination of one biased value based on a level of significance of 5%**
		1 ...	**1**	Value x1 is not biased
		1 ...	**1**	Value xp is not biased

Grubb_i=1,2	$G_{1,2}$	0,797	0,797	
Grubb_i=p,p-1	$G_{p,p-1}$	0,643	0,643	
Lower critical values	$G_{d,1\%}$	0,299	0,277	**Test for an afterelimination of two outliers based on a level of significance of 5%**
for the Grubb-test		**1** ...	**1**	Values x1, x2 are not outliers
according to ISO 5725-2,		**1** ...	**1**	Values xp, xp-1 are not biased values
clause 7.3.4.2	$G_{d,5\%}$	0,382	0,360	**Test for an afterelimination of two biased values based on a level of significance of 5%**
		1 ...	**1**	Values x1, x2 are not outliers
		1 ...	**1**	Values xp, xp-1 are not biased values

B3) Tests by Dixon for an afterelimination of outliers or biased values

Test for an afterelimination of one biased value based on a level of significance of 5%

Dixon_i=1, ... (x_2-x_1)	Q_1	0,091	0,030	0,167	0,098	0,111
Dixon_i=p, ...$(x_p-x_{(p-1)})$	Q_p	0,073	0,080	0,082	0,111	0,168
Upper critical values	$Q_{v,\alpha,5\%}$	0,320	0,329	0,338	0,329	0,338
Value x1 is not biased		**1** ...	**1**	**1**	**1**	**1**
Value xp is not biased		**1** ...	**1**	**1**	**1**	**1**


Bar chart of frequency distribution for: 28D Compressive strength
Standard normal distribution for the sample without outliers
Bar chart of frequency distribution for a sample : 28D Compressive strength
Standard normal distribution for the original sample
Frequency
0
1
2
3
4
5
6
42,5
44,5
46,5
48,5
50,5
52,5
54,5
56,5
Value/ X1, X2, ... X(p-1), Xp