



**® TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.**  
**Technical and Test Institute for Construction Prague, SOE**

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**Notified Body 1020**  
**Branch 0100 – Praha**

# REPORT

**on the assessment of performance**

according to the Regulation (EU) 305/2011 of the European Parliament and of the Council of 9 March 2011  
(the Construction Products Regulation or CPR), Art. 1.4 of the Annex V (system 3)

**No. 1020-CPR-010-035571**

Trade name:

**HS easy chipboard screws;**  
type / variation:  $\Phi$ 3,0; 3,5; 4,0; 4,5; 5,0; 6,0

Manufacturer:

**Hermann Schwerter Iserlohn, DE.**

INo: 4001221000004  
Address: Langer Brauck 11, Iserlohn DE  
Plant: Taipei 10467  
Address: TAIWAN  
Order: Z010150210

Number of report pages including title page: 11

Number of Annexes: 0

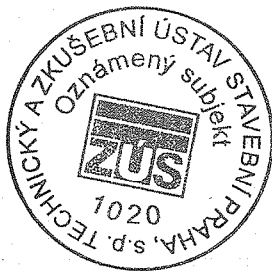
The person taking responsibility for the content of this report:

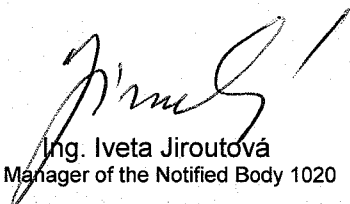
  
Ing. Václav Kučera  
Head Assessor

The person taking responsibility for the correctness of this report:

Stamp of the Notified Body 1020

Prague, November 14<sup>th</sup>, 2015



  
Ing. Iveta Jiroutová  
Deputy Manager of the Notified Body 1020

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Bank Name: KB Praha 1 Czech Republic, Account No.: 1501-931/0100, ID: 000 15679, VAT: CZ00015679

## 1. Specification of tested subject

Description and intended use of the product:

The self-tapping screws are used for connections in timber constructions e.g. timber/timber, chipboard, wood panel.

Technical specification: EN 14592

Manufacturer: Hermann Schwerter Iserlohn

Plant: Taipei 10467, Taiwan

Material: hardened steel

Surface treatment: CR6+YZ 3U SST 48H

Dimensions are given in Table 1

Table 1:

| No. | Mark   | $\Phi$<br>[mm] | Length<br>[mm] | Head diameter<br>[mm] |
|-----|--------|----------------|----------------|-----------------------|
| 1   | 6x90   | 6,0            | 90,0           | 11,30 - 12,0          |
| 2   | 5x70   | 5,0            | 70,0           | 9,40 - 10,0           |
| 3   | 4,5x45 | 4,5            | 45             | 8,40 - 9,0            |
| 4   | 4x70   | 4,0            | 70,0           | 4,40 - 8,0            |
| 5   | 3,5x50 | 3,5            | 50,0           | 6,40 - 7,0            |
| 6   | 3x45   | 3,0            | 45,0           | 5,50 - 6,0            |

## 2. Sampling

Date of sampling: ---

Place of sampling: deposit of manufacturer

Sampler: manufacturer

Sampling method: ISO 3534-1

Transport mode: by the manufacturer

Date of the taking over: 18.9.2015

Sample Registration number: VZ10150267

### 3. Test results

#### 3.1 Geometrical parameter

Determination according to the test method: EN 14592  
 Test was carried out by: Ing. Václav Kučera  
 Date of the test ending: 8. 10. 2015  
 Test result: Table 2

Table 2: Geometry parameters

| screw 5x70   |       |       |       |       |       |       |            |       |       |      |
|--------------|-------|-------|-------|-------|-------|-------|------------|-------|-------|------|
| Sample No    | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 69,20 | 68,88 | 68,94 | 69,10 | 68,88 | 69,00 | 70,00      | 68,50 | 71,50 | TRUE |
| S mm         | 42    | 41,76 | 41,39 | 42,98 | 42,42 | 42,11 | 42,00      | 40,75 | 43,25 | TRUE |
| d mm         | 4,98  | 4,99  | 5,03  | 4,97  | 4,90  | 4,97  | 5,00       | 4,88  | 5,13  | TRUE |
| A mm         | 9,99  | 9,7   | 9,88  | 9,55  | 9,67  | 9,76  | 9,40-10,0  |       |       | TRUE |
| screw 6x90   |       |       |       |       |       |       |            |       |       |      |
| Sample No    | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 90,41 | 90,33 | 90,67 | 90,36 | 90,48 | 90,45 | 90,00      | 88,25 | 91,75 | TRUE |
| S mm         | 59,75 | 58,94 | 60,1  | 59,26 | 59,19 | 59,45 | 60,00      | 58,50 | 61,50 | TRUE |
| d mm         | 5,87  | 5,88  | 5,87  | 5,84  | 5,93  | 5,88  | 6,00       | 5,85  | 6,15  | TRUE |
| A mm         | 11,86 | 11,41 | 11,47 | 11,44 | 11,94 | 11,62 | 11,30-12,0 |       |       | TRUE |
| screw 4x70   |       |       |       |       |       |       |            |       |       |      |
| č.vzorku     | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 69,40 | 69,83 | 69,45 | 68,76 | 69,18 | 69,32 | 70,00      | 68,50 | 71,50 | TRUE |
| S mm         | 42,12 | 42,05 | 42,11 | 41,60 | 41,84 | 41,94 | 42,00      | 40,75 | 43,25 | TRUE |
| d mm         | 3,95  | 3,99  | 3,96  | 3,96  | 3,97  | 3,97  | 4,00       | 3,90  | 4,10  | TRUE |
| A mm         | 7,79  | 7,71  | 7,74  | 7,79  | 7,74  | 7,75  | 8,00       | 7,80  | 8,20  | TRUE |
| screw 4,5x45 |       |       |       |       |       |       |            |       |       |      |
| Sample No    | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 44,52 | 44,54 | 45,06 | 44,84 | 44,56 | 44,70 | 45,00      | 58,01 | 60,99 | TRUE |
| S mm         | 30    | 29,27 | 29,96 | 29,26 | 30    | 29,70 | 30,00      | 45,83 | 48,18 | TRUE |
| d mm         | 4,37  | 4,34  | 4,34  | 4,31  | 4,32  | 4,34  | 4,50       | 4,20  | 4,50  | TRUE |
| A mm         | 8,86  | 8,85  | 8,81  | 8,78  | 8,86  | 8,83  | 8,4 - 9,0  | 8,78  | 9,23  | TRUE |
| screw 3,5x50 |       |       |       |       |       |       |            |       |       |      |
| Sample No    | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 50,65 | 50,30 | 50,56 | 49,86 | 49,49 | 50,17 | 50,00      | 48,75 | 51,25 | TRUE |
| S mm         | 29,00 | 30,72 | 29,37 | 29,73 | 29,60 | 29,68 | 30,00      | 28,95 | 31,05 | TRUE |
| d mm         | 3,32  | 3,32  | 3,44  | 3,44  | 3,39  | 3,38  | 3,50       | 3,20  | 3,50  | TRUE |
| A mm         | 6,73  | 6,79  | 6,68  | 6,74  | 6,84  | 6,76  | 6,4 - 7,0  | 6,83  | 7,18  | TRUE |
| screw 3x45   |       |       |       |       |       |       |            |       |       |      |
| Sample No    | 1     | 2     | 3     | 4     | 5     | mean  |            |       |       |      |
| l mm         | 43,93 | 44,34 | 43,81 | 44,16 | 44,09 | 44,07 | 44,00      | 42,90 | 45,10 | TRUE |
| S mm         | 35,80 | 36,37 | 33,93 | 35,34 | 36,31 | 35,55 | 36,50      | 35,59 | 37,41 | TRUE |
| d mm         | 2,86  | 2,87  | 2,91  | 2,81  | 2,88  | 2,87  | 3,00       | 2,93  | 3,08  | TRUE |
| A mm         | 5,84  | 5,85  | 5,80  | 5,77  | 5,72  | 5,80  | 6,00       | 5,85  | 6,15  | TRUE |

### 3.2 Characteristic yield moment

Determination according to the test method:

EN 14592

Test was carried out by:

Ing. Václav Kučera

Date of the test ending:

13. 10. 2015

Test result:

Table 3

Table 3: Characteristic yield moment

| screw 6,0x90  |              | angle    |
|---------------|--------------|----------|
| č.            | Nm           | 12,83827 |
|               |              | 30       |
| 1             | 11,11        |          |
| 2             | 11,69        |          |
| 3             | 10,39        |          |
| 4             | 11,31        |          |
| 5             | 11,14        |          |
| 6             | 10,43        |          |
| 7             | 11,06        |          |
| 8             | 11,52        |          |
| 9             | 12,19        |          |
| 10            | 11,67        |          |
| nean          | 11,25        |          |
| stdev         | 0,56         |          |
| var1          | 0,05         |          |
| var2          | 0,05         |          |
| stdev2        | 0,31         |          |
| <b>My,k =</b> | <b>10,08</b> |          |

| screw5,0x70   |             | angle    |
|---------------|-------------|----------|
| č.            | Nm          | 14,58591 |
|               |             | 20       |
| 1             | 6,69        |          |
| 2             | 5,78        |          |
| 3             | 6,76        |          |
| 4             | 6,71        |          |
| 5             | 6,92        |          |
| 6             | 6,55        |          |
| 7             | 6,01        |          |
| 8             | 5,96        |          |
| 9             | 6,83        |          |
| 10            | 7,01        |          |
| nean          | 6,52        |          |
| stdev         | 0,44        |          |
| var1          | 0,07        |          |
| var2          | 0,05        |          |
| stdev2        | 0,31        |          |
| <b>My,k =</b> | <b>5,60</b> |          |

| screw 4,5x45  |             | angle    |
|---------------|-------------|----------|
| č.            | Nm          | 15,70232 |
|               |             | 20       |
| 1             | 4,10        |          |
| 2             | 4,36        |          |
| 3             | 4,15        |          |
| 4             | 3,75        |          |
| 5             | 4,24        |          |
| 6             | 3,89        |          |
| 7             | 4,57        |          |
| 8             | 4,69        |          |
| 9             | 4,69        |          |
| 10            | 4,33        |          |
| nean          | 4,28        |          |
| stdev         | 0,32        |          |
| var1          | 0,07        |          |
| var2          | 0,05        |          |
| stdev2        | 0,31        |          |
| <b>My,k =</b> | <b>3,61</b> |          |

| screw 4,5x70  |             | angle    |
|---------------|-------------|----------|
| č.            | Nm          | 15,70232 |
|               |             | 20       |
| 1             | 4,28        |          |
| 2             | 4,46        |          |
| 3             | 4,36        |          |
| 4             | 4,43        |          |
| 5             | 4,09        |          |
| 6             | 4,39        |          |
| 7             | 4,26        |          |
| 8             | 3,85        |          |
| 9             | 4,08        |          |
| 10            | 4,67        |          |
| nean          | 4,29        |          |
| stdev         | 0,23        |          |
| var1          | 0,05        |          |
| var2          | 0,05        |          |
| stdev2        | 0,31        |          |
| <b>My,k =</b> | <b>3,80</b> |          |

Table 3 continue

| screw 3,0x45  |             | angle    |
|---------------|-------------|----------|
| č.            | Nm          | 20,85584 |
|               |             | 20       |
| 1             | 1,83        |          |
| 2             | 2,03        |          |
| 3             | 1,96        |          |
| 4             | 1,69        |          |
| 5             | 1,94        |          |
| 6             | 1,96        |          |
| 7             | 2,02        |          |
| 8             | 1,87        |          |
| 9             | 1,91        |          |
| 10            | 2,07        |          |
| nean          | 1,93        |          |
| stdev         | 0,11        |          |
| var1          | 0,06        |          |
| var2          | 0,05        |          |
| stdev2        | 0,11        |          |
| <b>My,k =</b> | <b>1,69</b> |          |

| screw 3,5x50  |             | angle    |
|---------------|-------------|----------|
| č.            | Nm          | 18,72254 |
|               |             | 20       |
| 1             | 3,03        |          |
| 2             | 3,18        |          |
| 3             | 3,27        |          |
| 4             | 2,92        |          |
| 5             | 2,84        |          |
| 6             | 3,01        |          |
| 7             | 2,98        |          |
| 8             | 3,03        |          |
| 9             | 2,79        |          |
| 10            | 2,97        |          |
| nean          | 3,00        |          |
| stdev         | 0,14        |          |
| var1          | 0,05        |          |
| var2          | 0,05        |          |
| stdev2        | 0,14        |          |
| <b>My,k =</b> | <b>2,70</b> |          |

### 3.3 Characteristic withdrawal parameter

Determination according to the test method:  
 Test was carried out by:  
 Date of the test ending  
 Test result:

EN 13822  
 Vlastimil Valeš  
 15.10.2015  
 Table 4

Table 4: Characteristic withdrawal parameter

| vrut 3,0/45 |        |          |              |              | vrut 3,5_50 |      |          |              |              |
|-------------|--------|----------|--------------|--------------|-------------|------|----------|--------------|--------------|
| č.          | N      |          |              | Mpa          | č.          | N    |          |              | Mpa          |
| 1           | 2107,2 | 7,653096 | mean         | 7,6290224    | 1           | 2769 | 7,926162 | mean         | 7,952086     |
| 2           | 1777,1 | 7,482744 | var          | 0,0750366    | 2           | 2930 | 7,982645 | var          | 0,067085     |
| 3           | 1999,1 | 7,600437 |              |              | 3           | 2764 | 7,924554 |              |              |
| 4           | 2120,4 | 7,659346 | ln5%         | 7,4714456    | 4           | 2839 | 7,951063 | ln5%         | 7,811207     |
| 5           | 1969,2 | 7,585372 | 5%           | 1757,1451    | 5           | 2859 | 7,958329 | 5%           | 2468,107     |
| 6           | 2031,4 | 7,616466 |              |              | 6           | 2681 | 7,893897 |              |              |
| 7           | 1985   | 7,593349 | d=           | 3,00         | 7           | 3138 | 8,051392 | d=           | 3,50         |
| 8           | 2208,3 | 7,699978 | l=           | 21,00        | 8           | 3176 | 8,063349 | l=           | 25,00        |
| 9           | 2357,3 | 7,765272 |              |              | 9           | 2768 | 7,925963 |              |              |
| 10          | 2067,6 | 7,634163 | $f_{ax,k} =$ | <b>27,89</b> | 10          | 2549 | 7,843503 | $f_{ax,k} =$ | <b>28,21</b> |
| vrut 4,5/45 |        |          |              |              | vrut 4_70   |      |          |              |              |
| č.          | N      |          |              | Mpa          | č.          | N    |          |              | Mpa          |
| 1           | 2677,2 | 7,892527 | mean         | 7,9487222    | 1           | 3700 | 8,216185 | mean         | 7,981088     |
| 2           | 2929,7 | 7,982645 | var          | 0,0693348    | 2           | 2930 | 7,982645 | var          | 0,106024     |
| 3           | 2764,3 | 7,924554 |              |              | 3           | 2764 | 7,924554 |              |              |
| 4           | 2838,6 | 7,951063 | ln5%         | 7,8031191    | 4           | 2839 | 7,951063 | ln5%         | 7,758439     |
| 5           | 2859,3 | 7,958329 | 5%           | 2448,2263    | 5           | 2859 | 7,958329 | 5%           | 2341,246     |
| 6           | 2680,9 | 7,893897 |              |              | 6           | 2681 | 7,893897 |              |              |
| 7           | 3138,2 | 8,051392 | d=           | 4,50         | 7           | 3138 | 8,051392 | d=           | 4,00         |
| 8           | 3175,9 | 8,063349 | l=           | 31,00        | 8           | 3176 | 8,063349 | l=           | 49,00        |
| 9           | 2768,2 | 7,925963 |              |              | 9           | 2768 | 7,925963 |              |              |
| 10          | 2549,1 | 7,843503 | $f_{ax,k} =$ | <b>17,55</b> | 10          | 2549 | 7,843503 | $f_{ax,k} =$ | <b>11,95</b> |
| vrut 5_70   |        |          |              |              | vrut 6_90   |      |          |              |              |
| č.          | N      |          |              | Mpa          | č.          | N    |          |              | Mpa          |
| 1           | 3700,4 | 8,216185 | mean         | 8,1591572    | 1           | 7406 | 8,910046 | mean         | 8,886208     |
| 2           | 3564,7 | 8,178846 | var          | 0,0602636    | 2           | 7345 | 8,901775 | var          | 0,019599     |
| 3           | 3479,3 | 8,154586 |              |              | 3           | 7275 | 8,892199 |              |              |
| 4           | 3135,3 | 8,050483 | ln5%         | 8,0326035    | 4           | 7150 | 8,874868 | ln5%         | 8,84505      |
| 5           | 3280,6 | 8,095779 | 5%           | 3079,7494    | 5           | 7050 | 8,860783 | 5%           | 6939,954     |
| 6           | 3270,1 | 8,092573 |              |              | 6           | 7456 | 8,916774 |              |              |
| 7           | 3594   | 8,187018 | d=           | 5,00         | 7           | 7130 | 8,872067 | d=           | 6,00         |
| 8           | 3593,4 | 8,186851 | l=           | 35,00        | 8           | 7061 | 8,862342 | l=           | 42,00        |
| 9           | 3781   | 8,237731 |              |              | 9           | 7286 | 8,89371  |              |              |
| 10          | 3610,2 | 8,191518 | $f_{ax,k} =$ | <b>17,60</b> | 10          | 7169 | 8,877521 | $f_{ax,k} =$ | <b>27,54</b> |

### 3.4 Characteristic head pull through parameter

Determination according to the test method: EN 13822  
 Test was carried out by: Ing. Václav Kučera  
 Date of the test ending: 23. 10. 2015  
 Test result: Table 5

Table 5: Characteristic head pull through parameter

| screw   | 3,5x50 | A <sub>h</sub> | 6,76              | mm         |
|---------|--------|----------------|-------------------|------------|
| tension | N      |                |                   | N          |
| 1       | 1827,4 | 7,510655       | mean              | 7,504628   |
| 2       | 1882,3 | 7,540223       | var               | 0,050897   |
| 3       | 1923,5 | 7,561902       |                   |            |
| 4       | 1907,5 | 7,553549       | ln5%              | 7,397745   |
| 5       | 1830,8 | 7,51253        | 5%                | 1632,299   |
| 6       | 1661,4 | 7,41541        |                   |            |
| 7       | 1915,8 | 7,55787        | f <sub>head</sub> | <b>36</b>  |
| 8       | 1719,2 | 7,449626       |                   | <b>Mpa</b> |
| 9       | 1782,3 | 7,485666       |                   |            |
| 10      | 1735,2 | 7,458849       |                   |            |

| screw   | 4,5x45 | A <sub>h</sub> | 8,79              | mm         |
|---------|--------|----------------|-------------------|------------|
| tension | N      |                |                   | N          |
| 1       | 2254,5 | 7,720661       | mean              | 7,628266   |
| 2       | 2009,9 | 7,605845       | var               | 0,089878   |
| 3       | 1960,8 | 7,581123       |                   |            |
| 4       | 1932,6 | 7,566606       | ln5%              | 7,439521   |
| 5       | 2364,3 | 7,768233       | 5%                | 1701,936   |
| 6       | 2093,6 | 7,646631       |                   |            |
| 7       | 2249,9 | 7,718654       | f <sub>head</sub> | <b>22</b>  |
| 8       | 2106,7 | 7,652869       |                   | <b>Mpa</b> |
| 9       | 1779,7 | 7,484178       |                   |            |
| 10      | 1877,8 | 7,537856       |                   |            |

| screw   | 4x70 | A <sub>h</sub> | 7,84              | mm         |
|---------|------|----------------|-------------------|------------|
| tension | N    |                |                   | N          |
| 1       | 2109 | 7,654121       | mean              | 7,690907   |
| 2       | 2184 | 7,689115       | var               | 0,062398   |
| 3       | 2167 | 7,681099       |                   |            |
| 4       | 2395 | 7,781293       | ln5%              | 7,559872   |
| 5       | 2163 | 7,67945        | 5%                | 1919,599   |
| 6       | 2308 | 7,743994       |                   |            |
| 7       | 2382 | 7,775498       | f <sub>head</sub> | <b>31</b>  |
| 8       | 1944 | 7,572518       |                   | <b>Mpa</b> |
| 9       | 2123 | 7,660684       |                   |            |
| 10      | 2146 | 7,671296       |                   |            |

| screw   | 5x70 | A <sub>h</sub> | 9,76              | mm         |
|---------|------|----------------|-------------------|------------|
| tension | N    |                |                   | N          |
| 1       | 2645 | 7,880536       | mean              | 7,867921   |
| 2       | 2615 | 7,868882       | var               | 0,045372   |
| 3       | 2770 | 7,926592       |                   |            |
| 4       | 2681 | 7,893885       | ln5%              | 7,77264    |
| 5       | 2775 | 7,928291       | 5%                | 2374,732   |
| 6       | 2536 | 7,838497       |                   |            |
| 7       | 2615 | 7,869061       | f <sub>head</sub> | <b>25</b>  |
| 8       | 2457 | 7,806871       |                   | <b>Mpa</b> |
| 9       | 2418 | 7,790783       |                   |            |
| 10      | 2633 | 7,875815       |                   |            |

| screw   | 6x90   | A <sub>h</sub> | 11,62             | mm         |
|---------|--------|----------------|-------------------|------------|
| tension | N      |                |                   | N          |
| 1       | 2945,4 | 7,98801        | mean              | 8,02049    |
| 2       | 3147,5 | 8,054364       | var               | 0,048973   |
| 3       | 3183,7 | 8,065799       |                   |            |
| 4       | 2937,1 | 7,985178       | ln5%              | 7,917646   |
| 5       | 3186   | 8,066525       | 5%                | 2745,302   |
| 6       | 2967   | 7,9953         |                   |            |
| 7       | 3306,1 | 8,103528       | f <sub>head</sub> | <b>20</b>  |
| 8       | 3026,8 | 8,015258       |                   | <b>Mpa</b> |
| 9       | 2841,8 | 7,952189       |                   |            |
| 10      | 2918,3 | 7,978753       |                   |            |

### 3.5 Characteristic tensile capacity

Determination according to the test method:

EN 13823

Test was carried out by:

Vlastimil Valeš

Date of the test ending:

3. 11. 2015

Test result:

Table 6

Table 6: Characteristic tensile capacity

| screw | 3,5x50 | $\Phi=$  | 2,5            | mm          |
|-------|--------|----------|----------------|-------------|
| 1     | 4667   | 8,448272 | mean           | 8,500943    |
| 2     | 5141   | 8,545003 | stdev          | 0,049417    |
| 3     | 4752   | 8,466321 |                |             |
| 4     | 4888   | 8,494539 | ln5%           | 8,397166    |
| 5     | 4986   | 8,514389 | 5%             | 4434,482    |
| 6     | 5105   | 8,537976 |                |             |
| 7     | 5269   | 8,569596 | $f_{tens,k} =$ | <b>4434</b> |
| 8     | 4727   | 8,461046 |                | <b>N</b>    |
| 9     | 5158   | 8,548304 | F              |             |
| 10    | 4555   | 8,423981 |                |             |

| screw | 4,0x70 | $\Phi=$  | 2,8            | mm          |
|-------|--------|----------|----------------|-------------|
| 1     | 5343   | 8,583543 | mean           | 8,616952    |
| 2     | 5057   | 8,528529 | stdev          | 0,047014    |
| 3     | 5292   | 8,573952 |                |             |
| 4     | 5450   | 8,603371 | ln5%           | 8,518223    |
| 5     | 5650   | 8,639411 | 5%             | 5005        |
| 6     | 5627   | 8,635332 |                |             |
| 7     | 5590   | 8,628735 | $f_{tens,k} =$ | <b>5005</b> |
| 8     | 5980   | 8,696176 |                | <b>N</b>    |
| 9     | 5559   | 8,623174 |                |             |
| 10    | 5752   | 8,657303 |                |             |

| screw | 4,5x45 | $\Phi=$  | 3              | mm          |
|-------|--------|----------|----------------|-------------|
| 1     | 6253   | 8,740817 | mean           | 8,802788    |
| 2     | 6399   | 8,763897 | stdev          | 0,068687    |
| 3     | 7945   | 8,980298 |                |             |
| 4     | 6905   | 8,840001 | ln5%           | 8,658546    |
| 5     | 6494   | 8,778634 | 5%             | 5759,155    |
| 6     | 6641   | 8,801018 |                |             |
| 7     | 6388   | 8,762177 | $f_{tens,k} =$ | <b>5759</b> |
| 8     | 6429   | 8,768574 |                | <b>N</b>    |
| 9     | 6485   | 8,777247 |                |             |
| 10    | 6736   | 8,815222 |                |             |

| screw | 5,0x70 | $\Phi=$  | 3              | mm          |
|-------|--------|----------|----------------|-------------|
| 1     | 8547   | 9,053347 | mean           | 9,05958     |
| 2     | 9015   | 9,106689 | stdev          | 0,041541    |
| 3     | 9285   | 9,136181 |                |             |
| 4     | 8407   | 9,036832 | ln5%           | 8,972345    |
| 5     | 8224   | 9,014805 | 5%             | 7882,062    |
| 6     | 8856   | 9,088859 |                |             |
| 7     | 8656   | 9,066047 | $f_{tens,k} =$ | <b>7882</b> |
| 8     | 8301   | 9,024173 |                | <b>N</b>    |
| 9     | 8617   | 9,0615   |                |             |
| 10    | 8163   | 9,007368 |                |             |

| screw | 6,0x90 | $\Phi=$  | 3,7            | mm          |
|-------|--------|----------|----------------|-------------|
| 1     | 13731  | 9,527411 | mean           | 9,51225     |
| 2     | 14731  | 9,597709 | stdev          | 0,050522    |
| 3     | 12830  | 9,459541 |                |             |
| 4     | 12811  | 9,458059 | ln5%           | 9,406154    |
| 5     | 14009  | 9,547455 | 5%             | 12163       |
| 6     | 13317  | 9,496797 |                |             |
| 7     | 13013  | 9,473704 | $f_{tens,k} =$ | <b>1131</b> |
| 8     | 12800  | 9,4572   |                | <b>N</b>    |
| 9     | 14306  | 9,568434 |                |             |
| 10    | 13852  | 9,536185 |                |             |



### 3.6 Characteristic torsional resistance

Determination according to the test method:

Test was carried out by:

Date of the test ending:

Test result:

EN 15737

Vratislav Trávníček

4.11.2015

Table 7

Table 7: Characteristic torsional resistance

| screw 6x90 |      |          |                            |             |
|------------|------|----------|----------------------------|-------------|
| No         | Nm   | LN       |                            |             |
| 1          | 2,42 | 0,883768 | mean                       | 0,886425    |
| 2          | 2,56 | 0,940007 | stdev                      | 0,065461    |
| 3          | 2,4  | 0,875469 |                            |             |
| 4          | 2,43 | 0,887891 | In5%                       | 0,748956    |
| 5          | 2,47 | 0,904218 | <b>R<sub>tor,k</sub> =</b> | <b>2,11</b> |
| 6          | 2,07 | 0,727549 |                            | <b>Nm</b>   |
| 7          | 2,4  | 0,875469 |                            |             |
| 8          | 2,53 | 0,928219 |                            |             |
| 9          | 2,38 | 0,8671   |                            |             |
| 10         | 2,65 | 0,97456  |                            |             |

| screw 5x70 |      |          |                            |             |
|------------|------|----------|----------------------------|-------------|
| No         | Nm   | LN       |                            |             |
| 1          | 1,73 | 0,548121 | mean                       | 0,594312    |
| 2          | 1,9  | 0,641854 | stdev                      | 0,062571    |
| 3          | 2    | 0,693147 |                            |             |
| 4          | 1,76 | 0,565314 | In5%                       | 0,462912    |
| 5          | 1,72 | 0,542324 | <b>R<sub>tor,k</sub> =</b> | <b>1,59</b> |
| 6          | 1,9  | 0,641854 |                            | <b>Nm</b>   |
| 7          | 1,73 | 0,548121 |                            |             |
| 8          | 1,67 | 0,512824 |                            |             |
| 9          | 1,78 | 0,576613 |                            |             |
| 10         | 1,96 | 0,672944 |                            |             |

| screw 4,5x45 |      |          |                            |             |
|--------------|------|----------|----------------------------|-------------|
| No           | Nm   | LN       |                            |             |
| 1            | 0,96 | -0,04082 | mean                       | 0,104523    |
| 2            | 1,14 | 0,131028 | stdev                      | 0,075257    |
| 3            | 1,05 | 0,04879  |                            |             |
| 4            | 1,27 | 0,239017 | In5%                       | -0,05352    |
| 5            | 1,16 | 0,14842  | <b>R<sub>tor,k</sub> =</b> | <b>0,95</b> |
| 6            | 1,1  | 0,09531  |                            | <b>Nm</b>   |
| 7            | 1,12 | 0,113329 |                            |             |
| 8            | 1,17 | 0,157004 |                            |             |
| 9            | 1,05 | 0,04879  |                            |             |
| 10           | 1,11 | 0,10436  |                            |             |

| screw 4x70 |      |      |                            |             |
|------------|------|------|----------------------------|-------------|
| No         | Nm   | LN   |                            |             |
| 1          | 1,60 | 0,47 | mean                       | 0,45        |
| 2          | 1,38 | 0,32 | stdev                      | 0,07        |
| 3          | 1,53 | 0,43 |                            |             |
| 4          | 1,61 | 0,48 | In5%                       | 0,31        |
| 5          | 1,51 | 0,41 | <b>R<sub>tor,k</sub> =</b> | <b>1,36</b> |
| 6          | 1,55 | 0,44 |                            | <b>Nm</b>   |
| 7          | 1,52 | 0,42 |                            |             |
| 8          | 1,67 | 0,51 |                            |             |
| 9          | 1,78 | 0,58 |                            |             |
| 10         | 1,58 | 0,46 |                            |             |

| screw 3,5x50 |      |          |                            |             |
|--------------|------|----------|----------------------------|-------------|
| No           | Nm   | LN       |                            |             |
| 1            | 0,66 | -0,41552 | mean                       | -0,43038    |
| 2            | 0,64 | -0,44629 | stdev                      | 0,050121    |
| 3            | 0,62 | -0,47804 |                            |             |
| 4            | 0,63 | -0,46204 | In5%                       | -0,53563    |
| 5            | 0,65 | -0,43078 | <b>R<sub>tor,k</sub> =</b> | <b>0,58</b> |
| 6            | 0,64 | -0,44629 |                            | <b>Nm</b>   |
| 7            | 0,67 | -0,40048 |                            |             |
| 8            | 0,6  | -0,51083 |                            |             |
| 9            | 0,69 | -0,37106 |                            |             |
| 10           | 0,71 | -0,34249 |                            |             |

| screw 3x45 |      |          |                            |             |
|------------|------|----------|----------------------------|-------------|
| č          | Nm   | LN       |                            |             |
| 1          | 0,49 | -0,71335 | mean                       | -0,68181    |
| 2          | 0,5  | -0,69315 | stdev                      | 0,036171    |
| 3          | 0,49 | -0,71335 |                            |             |
| 4          | 0,53 | -0,63488 | In5%                       | -0,75777    |
| 5          | 0,53 | -0,63488 | <b>R<sub>tor,k</sub> =</b> | <b>0,47</b> |
| 6          | 0,5  | -0,69315 |                            | <b>Nm</b>   |
| 7          | 0,5  | -0,69315 |                            |             |
| 8          | 0,48 | -0,73397 |                            |             |
| 9          | 0,53 | -0,63488 |                            |             |
| 10         | 0,51 | -0,67334 |                            |             |

### 3.7 Characteristic torsional capacity

Determination according to the test method:

Test was carried out by:

Date of the test ending:

Test result:

EN ISO 10666

Vratislav Trávníček

6. 11. 2015

Table 8

Table 8: Characteristic torsional capacity:

| screw |       | 6x90     |               |             |  |
|-------|-------|----------|---------------|-------------|--|
| No    | Nm    | LN       |               |             |  |
| 1     | 10,56 | 2,357073 | mean          | 2,223453    |  |
| 2     | 10,68 | 2,368373 | stdev         | 0,105816    |  |
| 3     | 9,61  | 2,262804 |               |             |  |
| 4     | 9,39  | 2,239645 | ln5%          | 2,001238    |  |
| 5     | 10,34 | 2,33602  | $f_{tor,k} =$ | <b>7,40</b> |  |
| 6     | 8,44  | 2,132982 |               | <b>Nm</b>   |  |
| 7     | 8,05  | 2,085672 |               |             |  |
| 8     | 8,8   | 2,174752 |               |             |  |
| 9     | 8,85  | 2,180417 |               |             |  |
| 10    | 8,14  | 2,09679  |               |             |  |

| screw |      | 5x70     |               |             |  |
|-------|------|----------|---------------|-------------|--|
| No    | Nm   | LN       |               |             |  |
| 1     | 4,86 | 1,581038 | mean          | 1,608538    |  |
| 2     | 5,1  | 1,629241 | stdev         | 0,044732    |  |
| 3     | 4,88 | 1,585145 |               |             |  |
| 4     | 5,3  | 1,667707 | ln5%          | 1,514601    |  |
| 5     | 4,9  | 1,589235 | $f_{tor,k} =$ | <b>4,55</b> |  |
| 6     | 5,02 | 1,61343  |               | <b>Nm</b>   |  |
| 7     | 5,05 | 1,619388 |               |             |  |
| 8     | 5,37 | 1,680828 |               |             |  |
| 9     | 4,6  | 1,526056 |               |             |  |
| 10    | 4,92 | 1,593309 |               |             |  |

| screw |      | 4,5x45   |               |             |  |
|-------|------|----------|---------------|-------------|--|
| No    | Nm   | LN       |               |             |  |
| 1     | 3,6  | 1,280934 | mean          | 1,199821    |  |
| 2     | 3,28 | 1,187843 | stdev         | 0,065946    |  |
| 3     | 3,45 | 1,238374 |               |             |  |
| 4     | 3,66 | 1,297463 | ln5%          | 1,061335    |  |
| 5     | 3,43 | 1,23256  | $f_{tor,k} =$ | <b>2,89</b> |  |
| 6     | 3,28 | 1,187843 |               | <b>Nm</b>   |  |
| 7     | 2,96 | 1,085189 |               |             |  |
| 8     | 3,07 | 1,121678 |               |             |  |
| 9     | 3,22 | 1,169381 |               |             |  |
| 10    | 3,31 | 1,196948 |               |             |  |

| screw |      | 4x70 |               |             |  |
|-------|------|------|---------------|-------------|--|
| No    | Nm   | LN   |               |             |  |
| 1     | 2,60 | 0,96 | mean          | 0,95        |  |
| 2     | 2,74 | 1,01 | stdev         | 0,05        |  |
| 3     | 2,55 | 0,94 |               |             |  |
| 4     | 2,49 | 0,91 | ln5%          | 0,85        |  |
| 5     | 2,54 | 0,93 | $f_{tor,k} =$ | <b>2,34</b> |  |
| 6     | 2,66 | 0,98 |               | <b>Nm</b>   |  |
| 7     | 2,74 | 1,01 |               |             |  |
| 8     | 2,54 | 0,93 |               |             |  |
| 9     | 2,34 | 0,85 |               |             |  |
| 10    | 2,68 | 0,99 |               |             |  |

| screw |      | 3,5x50   |               |             |  |
|-------|------|----------|---------------|-------------|--|
| No    | Nm   | LN       |               |             |  |
| 1     | 1,68 | 0,518794 | mean          | 0,483923    |  |
| 2     | 1,68 | 0,518794 | stdev         | 0,059638    |  |
| 3     | 1,48 | 0,392042 |               |             |  |
| 4     | 1,57 | 0,451076 | ln5%          | 0,358683    |  |
| 5     | 1,76 | 0,565314 | $f_{tor,k} =$ | <b>1,43</b> |  |
| 6     | 1,62 | 0,482426 |               | <b>Nm</b>   |  |
| 7     | 1,65 | 0,500775 |               |             |  |
| 8     | 1,47 | 0,385262 |               |             |  |
| 9     | 1,72 | 0,542324 |               |             |  |
| 10    | 1,62 | 0,482426 |               |             |  |

| screw |      | 3x45     |               |             |  |
|-------|------|----------|---------------|-------------|--|
| č     | Nm   | LN       |               |             |  |
| 1     | 1,31 | 0,270027 | mean          | 0,340649    |  |
| 2     | 1,44 | 0,364643 | stdev         | 0,105878    |  |
| 3     | 1,46 | 0,378436 |               |             |  |
| 4     | 1,28 | 0,24686  | ln5%          | 0,118306    |  |
| 5     | 1,29 | 0,254642 | $f_{tor,k} =$ | <b>1,13</b> |  |
| 6     | 1,58 | 0,457425 |               | <b>Nm</b>   |  |
| 7     | 1,33 | 0,285179 |               |             |  |
| 8     | 1,62 | 0,482426 |               |             |  |
| 9     | 1,21 | 0,19062  |               |             |  |
| 10    | 1,61 | 0,476234 |               |             |  |

### 3.8 Characteristic torsional ratio

Determination according to the test method: EN 13823

Test result: Table 9

Table 9: Characteristic torsional ratio

| screw  | R <sub>tor,k</sub><br>[Nm] | f <sub>tor,k</sub><br>[Nm] | f <sub>tor,k</sub> /R <sub>tor,k</sub><br>[Nm] |       |
|--------|----------------------------|----------------------------|--|-------|
| 3,0x45 | 0,47                       | 1,12                       | 2,38   | ≥ 1,5 |
| 3,5x50 | 0,58                       | 1,43                       | 2,47   | ≥ 1,5 |
| 4,0x70 | 1,36                       | 2,34                       | 1,72   | ≥ 1,5 |
| 4,5x45 | 0,95                       | 2,89                       | 3,04   | ≥ 1,5 |
| 5,0x70 | 1,59                       | 4,55                       | 2,86   | ≥ 1,5 |
| 6,0x90 | 2,11                       | 7,4                        | 3,51   | ≥ 1,5 |

### 3.9 Durability corrosion protection

Determination according EN 14592

CR6 + YZ 3U SST 48H. Class 1, EN 1995-1-1

### 3.10 Summary of results

| Characteristic / screw                     |       | 3,0x45 | 3,5x50 | 4,0x70 | 4,5x45 | 5,0x70 | 6,0x90 |
|--|-------|--------|--------|--------|--------|--------|--------|
| Geometry                                   |       | TRUE   | TRUE   | TRUE   | TRUE   | TRUE   | TRUE   |
| Characteristic yield moment                | [Nm]  | 1,69   | 2,70   | 3,80   | 3,61   | 5,60   | 10,08  |
| Characteristic withdrawal parameter        | [MPa] | 27,89  | 28,21  | 11,95  | 17,55  | 17,6   | 27,54  |
| Characteristic head pull through parameter | [MPa] |        | 36     | 31     | 9,80   | 25,0   | 20,0   |
| Characteristic tensile capacity            | [MPa] |        | 4,43   | 5,00   | 5,76   | 7,88   | 11,31  |
| Characteristic torsional resistance        | [Nm]  | 0,47   | 0,58   | 1,36   | 0,95   | 1,59   | 2,11   |
| Characteristic torsion capacity            | [Nm]  | 1,12   | 1,43   | 2,34   | 2,89   | 4,55   | 7,40   |
| Characteristic torsional ration            | [ - ] | 2,38   | 2,47   | 1,72   | 3,04   | 2,86   | 3,51   |
| Durability corrosion protection            |       | TRUE   | TRUE   | TRUE   | TRUE   | TRUE   | TRUE   |

The end of Report