



INSTYTUT TECHNIKI BUDOWLANEJ

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## NATIONAL TECHNICAL ASSESSMENT ITB-KOT-2019/0794 1<sup>st</sup> Edition

This National Technical Assessment has been issued in accordance with the Regulation of the Minister of Infrastructure and Construction of November 17, 2016 on national technical assessments (Official Journal of the Republic of Poland (Dz. U.) of 2016, item 1968) by Instytut Techniki Budowlanej (the Building Research Institute (ITB)) in Warsaw, upon a request of

**pgb-Polska Sp. z o.o.**  
**ul. Fryderyka Wilhelma Redena 3, 41-807 Zabrze**

National Technical Assessment ITB-KOT-2019/0794 1<sup>st</sup> Edition is a favourable assessment of the performance properties of the following construction products for their intended use:

**Self-drilling/tapping screws  
7504P, VTEKS, ZBBKR and 7504N for fixing  
steel metal sheets to steel substrate**

Date of validity of the National Technical Assessment:

**March 28, 2024.**



DIRECTOR  
pp. Deputy Director for  
Technical Assessment and  
European Harmonisation Affairs

Anna Panek, MSc (Eng)

Warsaw, March 28, 2019.

The Document of National Technical Assessment ITB-KOT-2019/0794, first edition, contains 18 pages, including 2 Annexes. The text of this document may only be copied in its entirety. Any publication or dissemination in any other form of excerpts from the text of the National Technical Assessment shall require written agreement with Instytut Techniki Budowlanej. The National Technical Assessment ITB-KOT-2019/0794, first edition, concerns products covered by the Technical Approval ITB AT-15-7436/2013.

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## 1. TECHNICAL DESCRIPTION OF THE PRODUCT

The subject of this National Technical Assessment are the self-drilling/tapping screws 7504P, VTEKS, ZBBKR and 7504N for fixing steel metal sheets to steel substrate produced by pgb-Polska Sp. z o.o., ul. F. W. Redena 3, 41-807 Zabrze, in a manufacturing plant in Vietnam.

The National Technical Assessment covers types of the products provided in Table A1, in Annex A.

The screws 7504P, VTEKS, ZBBKR and 7504N have the form of a screw ended with a drill. The screws are presented in drawings in the tables B1 ÷ B9. Dimensions of the screws are provided in the referred drawings. Tolerances of the dimensions correspond to *m* tolerance class according to the standard PN-EN 22768-1:1999.

The screws 7504P, VTEKS, ZBBKR and 7504N are made of carbon steel, grade SAE 1022 according to the American standard AMS 5070:1994/RG and coated with a zinc layer of thickness not less than 5 µm according to the standard PN-EN ISO 4042:2001/Ap1:2004.

## 2. SPECIFICATION OF THE INTENDED USE OF THE PRODUCT

The screws 7504P, VTEKS, ZBBKR and 7504N are intended to fix steel metal sheets to steel substrate. The data referring to the substrates are given in Annex B.

Characteristic resistance of fixings with the screws covered by this National Technical Assessment is given in Annex B.

In order to determine the design characteristic resistance, the characteristic resistance value shall be divided by the safety factor  $\gamma_m = 1,33$ .

Due to the corrosion aggressiveness of the environment, the screws 7504P, VTEKS, ZBBKR and 7504N shall be used in accordance with the requirements provided for in the standards: PN-EN ISO 12944-2:2001, PN-EN ISO 9223:2012 and PN-EN ISO 2081:2018.

The screws 7504P, VTEKS, ZBBKR and 7504N are classified as not-flammable and which meet the requirements of Class A1 reaction to fire in accordance with the standard PN-EN 13501-1+A1:2010 and the European Commission Decision 96/603/EC (as later amended).

Installation parameters of the screws covered by this National Technical Assessment are given in Annex B. Minimum spacing of the screws shall be 30 mm, and minimum distance between the screw and substrate edge shall amount to 10 mm.

Screwdrivers with adjustable tightening torque to drive the screws shall be necessarily used.

The screws covered by this National Technical Assessment shall be used in accordance with the technical design, drawn up taking into account Polish construction standards and regulations, the findings of this National Technical Assessment and in accordance with the manufacturer's instructions concerning the conditions for providing the fixings using the above mentioned screws.

## 3. PERFORMANCE PROPERTIES OF THE PRODUCT AND METHODS APPLIED TO ASSESS THE PROPERTIES

### 3.1 Performance of the product

**3.1.1. Destructive tightening torques.** Destructive tightening torques are given in Annex B.

**3.1.2. Characteristic resistance of fixings.** Characteristic resistance of fixings with the screws are provided in Annex B.

**3.1.3. Working life of the screws.** Zinc coating with a thickness not less than 5 µm ensures the working life of the screws to the extent resulting from article 2.

### **3.2. Methods used to assess performance properties**

**3.2.1. Destructive tightening torques.** Testing of destructive tightening torques shall be carried out according to the standard: PN-EN ISO 10666:2002.

**3.2.2. Characteristic resistance of fixings.** Characteristic resistance of fixings with the screws shall be tested on the screws seated in the substrates according to Annex B. The force shall be measured by means of a device with a range chosen to match the expected value of the destructive force, enabling a constant and gradual increase in force until the destruction occurs.

**3.2.3. Working life of the screws.** Thickness of the zinc coating shall be tested according to the standard: PN-EN ISO 2178:2016 or PN-EN ISO 3497:2004.

## **4. PACKAGING, TRANSPORT AND STORAGE AND THE WAY OF PRODUCT MARKING**

The screws 7504P, VTEKS, ZBBKR and 7504N shall be delivered in original manufacturer's packaging and stored and transported in such a way as to ensure that their technical properties remain unchanged.

The manner of marking the products with the construction mark shall be in accordance with the Regulation of the Minister of Infrastructure and Construction of November 17, 2016 on the way of declaring the performance properties of construction products and the manner of marking them with the construction mark (Journal of Laws of the Republic of Poland (Dz. U.) of 2016, item 1966, as later amended).

Product marking with a construction mark shall be accompanied by the following information:

- the last two digits of the year in which the construction mark was first placed on the construction product;
- the name and address of the manufacturer's registered office or the identification mark allowing explicit identification of the name and address of the manufacturer's registered office;
- the name and type designation of the construction product;
- the number and year of issue of the National Technical Assessment, which served as the basis for the declaration of performance properties; (ITB-KOT-2019/0794 1<sup>st</sup> edition);
- the number of the national declaration of performance properties;
- the level or class of the declared performance properties;
- the name of the certification body which participated in the assessment and verification of the constancy of performance properties of the construction product;
- the address of the manufacturer's website, if the national declaration of performance properties is made available on that website.

A safety data sheet and/or information on hazardous substances contained in a construction product referred to in the Article 31 or 33 of the Regulation (EC) No. 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and establishing the European Chemicals Agency shall be provided or made available together with the national declaration of performance properties, as appropriate.

Moreover, the marking of a construction product, being a hazardous mixture according to the REACH regulation, shall comply with the requirements of the Regulation (EC) No. 1272/2008 of the European Parliament and of the Council on Classification, Labelling and Packaging of Substances and Mixtures (CLP), amending and repealing the Directives 67/548/EEC and 1999/45/EC, and amending the Regulation (EC) No. 1907/2006.

## **5. ASSESSMENT AND VERIFICATION OF THE CONSTANCY OF PERFORMANCE (AVCP)**

### **5.1. National system for the assessment and verification of the constancy of performance**

In accordance with the Regulation of the Minister of Infrastructure and Construction of November 17, 2016 on the manner of declaring the performance properties of construction products and the manner of marking them with construction mark (Official Journal of the Republic of Poland (Dz. U.) of 2016, item 1966, as later amended), the system for the assessment and verification of the constancy of performance: 2+ shall be applicable.

### **5.2. Type testing**

The performance properties assessed in article 3 shall constitute the product type testing unless the changes in raw materials, components, production line or manufacturing plant have been introduced.

### **5.3. Factory production control**

At the manufacturing plant the manufacturer shall have implemented a factory production control system. All the elements, requirements and provisions adopted by the manufacturer for the system shall be documented in a systematic manner in the form of written policies and procedures, including test records. The factory production control shall be adapted to the manufacturing processes and ensure the achievement of the declared performance properties of the product in serial production.

The factory production control includes the specification and verification of raw materials and components, inspections and tests to be carried out during manufacture process and control tests (according to article 5.4), conducted by the manufacturer in accordance with the established test plan and according to the principles and procedures specified in the documentation of the factory production control.

The results of production control shall be recorded on a regular basis. The records of the register shall confirm whether the products have satisfied the criteria of the assessment and verification of the constancy of performance properties. Individual products or batches of products and related manufacturing details shall be fully identifiable and traceable.

## 5.4. Control tests

**5.4.1. Test plan.** The test plan shall include:

- a) ongoing tests,
- b) periodic tests.

**5.4.2. Ongoing tests.** The ongoing tests shall include verification of:

- a) the shape and dimensions,
- b) the thickness of zinc coating.

**5.4.3. Periodic tests.** The periodic tests shall include verification of :

- a) destructive tightening torque,
- b) characteristic resistance of fixings with the screws.

## 5.5. Frequency of tests

The ongoing tests shall be conducted in accordance with the prescribed test plan, but not less frequently than for each batch of the products. The size of a batch of products shall be specified in the documentation of factory production control.

The periodic tests shall be performed at least once every 3 years.

## 6. INSTRUCTIONS

**6.1.** The National Technical Assessment ITB-KOT-2019/0794 1<sup>st</sup> edition is a favourable assessment of the performance properties of those essential characteristics of the self-drilling/tapping screws 7504P, VTEKS, ZBBKR and 7504N which, in accordance with the intended use, resulting from the provisions of the Assessment, influence the fulfilment of basic requirements by the construction objects in which the product will be applied.

**6.2.** The National Technical Assessment ITB-KOT-2019/0794 1<sup>st</sup> edition is not a document authorizing to mark a construction product with a construction mark.

Pursuant to the Act on Construction Products of April 16, 2004 (Journal of Laws: Dz. U. of 2016, item 1570, as later amended), the products to which this National Technical Assessment applies may be marketed or made available on the domestic market, if the manufacturer has assessed and verified the constancy of performance properties, drawn up a national declaration of performance properties in accordance with the National Technical Assessment ITB-KOT-2019/0794 1<sup>st</sup> edition and marked the products with a construction mark in compliance with the applicable regulations.

**6.3.** The National Technical Assessment ITB-KOT-2019/0794 1<sup>st</sup> edition does not infringe the rights resulting from the provisions on industrial property protection, and in particular the Act of June 30, 2000 – Industrial Property Law (consolidated text: Journal of Laws of the Republic of Poland (Dz. U.) of 2017, item 776). Ensuring these rights shall be the responsibility of the users of this ITB National Technical Assessment.

**6.4.** When issuing the National Technical Assessment, ITB shall not be held responsible for any possible infringement of exclusive and acquired rights.

**6.5.** The National Technical Assessment shall not release the manufacturer of products from responsibility for their proper quality, while the contractors of construction works from responsibility for their proper use.

**6.6.** The validity of this National Technical Assessment may be extended for further periods not exceeding 5 years.

## **7. LIST OF DOCUMENTS USED IN THE PROCEEDINGS**

### **7.1. Reports, test reports, evaluations, classifications**

- 1) LOK-761/A/07. Test report and technical assessment concerning farmer screws 4,8 x L. Department of Building Construction Elements of the Silesian Branch of the Building Research Institute (ITB), Katowice, 2007.
- 2) LOK04-6026/11/R01OSK. Test report concerning the self-drilling/tapping screws MCF (so called farmer screws). Department of Building Construction Elements of the Silesian Branch of the Building Research Institute (ITB), Katowice, 2011.
- 3) LOK00-6026/13/R12OSK. Test report concerning the self-drilling/tapping screws MCF (so called farmer screws). Department of Elements for Building Constructions and Structures Sited in Mining Areas, Katowice, 2013.
- 4) LZK00-06026/17/R40NZK. Test report and specification of test results concerning the self-drilling/tapping screws MCF, FHD, FHDS, WHD, PHD and HWH. Department of Building Constructions, Geotechnical Engineering and Concrete of the Building Research Institute (ITB), Katowice, 2017.
- 5) LZK00-06026/17/R35NZK. Test report concerning the screws:
  1. pgb plastic-metal screws for multi-point mountings (AT-15-8671/2011, ETA-12/0572, ETA, 10/0392 – the system for assessment and verification of the constancy of performance: 2+).
  2. Screws for fixing window and door frames (AT-15/7572/2014 – the system for assessment and verification of the constancy of performance: 2+).
  3. Self-drilling/tapping screws for joining steel sheet metals AT-15-7378/2013, AT-15-7436/2013, AT-15-7435/2013Department of Building Constructions, Geotechnical Engineering and Concrete of the Building Research Institute (ITB), Katowice, 2017.

### **7.2. Related standards and documents**

PN-EN 22768-1:1999	<i>Tolerancje ogólne. Tolerancje wymiarów liniowych i kątowych bez indywidualnych oznaczeń tolerancji</i> (General tolerances. Tolerances for linear and angular dimensions without individual tolerance indications)
PN-EN ISO 4042:2001 /Ap1:2004	<i>Części złączne. Powłoki elektrolityczne</i> (Fasteners. Electroplated coatings)
PN-EN ISO 12944-2:2001	<i>Farby i lakiery. Ochrona przed korozją konstrukcji stalowych za pomocą ochronnych systemów malarskich. Część 2: Klasyfikacja środowisk</i> (Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments)

PN-EN ISO 9223:2012	<i>Korozja metali i stopów. Korozyjność atmosfer. Klasyfikacja, określenie i ocena (Corrosion of metals and alloys. Corrosivity of atmospheres. Classification, determination and estimation)</i>
PN-EN ISO 2081:2018	<i>Powłoki metalowe i inne nieorganiczne. Elektrolityczne powłoki cynkowe z obróbką dodatkową na żelazie lub stali (Metallic and other inorganic coatings - Electroplated coatings of zinc with supplementary treatments on iron or steel)</i>
PN-EN 13501-1+A1:2010	<i>Klasyfikacja ogniowa wyrobów budowlanych i elementów budynków. Część 1: Klasyfikacja na podstawie wyników badań reakcji na ogień (Fire classification of construction products and building elements. Part 1: Classification using data from reaction to fire tests)</i>
PN-EN ISO 10666:2002	<i>Wkręty wierzące samogwintujące. Własności mechaniczne i funkcjonalne (Drilling screws with tapping thread. Mechanical and functional properties)</i>
PN-EN ISO 2178:2016	<i>Powłoki niemagnetyczne na podłożu magnetycznym. Pomiar grubości powłok. Metoda magnetyczna (Non-magnetic coatings on magnetic substrates. Measurement of coating thickness. Magnetic method)</i>
PN-EN ISO 3497:2004	<i>Powłoki metalowe. Pomiary grubości powłok. Metody spektrometrii rentgenowskiej (Metallic coatings. Measurement of coating thickness. X-ray spectrometric methods)</i>
AT-15-7436/2013	<i>Łączniki wierzące, samogwintujące FHD, FHDS, WHD and PHD (Self-drilling/tapping screws FHD, FHDS, WHD and PHD)</i>

## ANNEXES

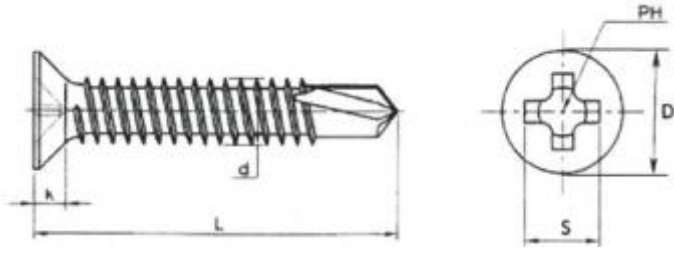
<b>Annex A.</b> Specification of the screws types.....	9
<b>Annex B.</b> Characteristic resistance of the fixings, materials, dimensions and parameters of screws installation .....	10



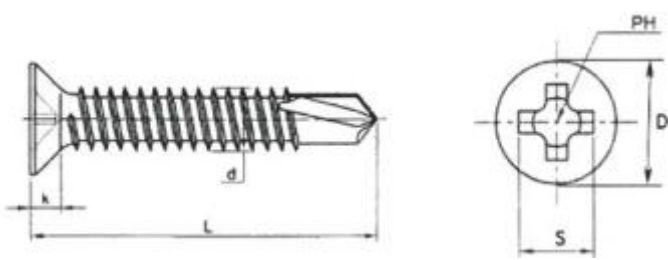
**Table A1.** Specification of the screws types: 7504P, VTEKS, ZBBKR and 7504N

<b>Item</b>	<b>Screw type</b>	<b>Material</b>	<b>Table</b>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1	7504P Ø 3,5	carbon steel, zinc-plated – thickness of zinc coating ≥ 5 µm	B1
2	7504P Ø 4,2		B2
3	VTEKS Ø 4,8		B3
4	VTEKS Ø 5,5		B4
5	VTEKS Ø 6,3		B5
6	ZBBKR Ø 4,2		B6
7	7504N Ø 3,5		B7
8	7504N Ø 4,2		B8
9	7504N Ø 4,8		B9

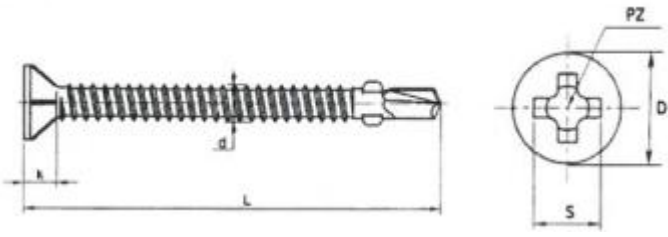
**Table B1.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws 7504P 3,5

<b>Material</b> Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating $\geq 5 \mu\text{m}$ in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004 Element I: — Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015																																																																																																				
Drilling capacity: $\sum t_i \leq 2,5 \text{ mm}$ Destructive tightening torque: $M_{t, \text{nom}} \geq 4,00 \text{ Nm}$		d = 3,5 mm L = 13, 16, 19, 25 and 32 mm k = 2,1 mm (2,35) S = 4,2 mm (4,4) D = 6,9 ÷ 7,3 mm																																																																																																		
<table border="1"> <thead> <tr> <th colspan="2"></th> <th colspan="6">Thickness of substrate <math>t_{N,II}</math> [mm]</th> </tr> <tr> <th colspan="2"></th> <th>1,00</th> <th>1,13</th> <th>1,25</th> <th>1,50</th> <th>2,00</th> <th>2,50</th> </tr> </thead> <tbody> <tr> <th rowspan="12">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</th> <th rowspan="6"><math>V_{R,k}</math> [kN]</th> <td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <th rowspan="6"><math>N_{R,k}</math> [kN]</th> <td>—</td><td>0,81</td><td>0,81</td><td>0,81</td><td>0,81</td><td>0,81</td><td>0,81</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> </tbody> </table>						Thickness of substrate $t_{N,II}$ [mm]								1,00	1,13	1,25	1,50	2,00	2,50	Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	$N_{R,k}$ [kN]	—	0,81	0,81	0,81	0,81	0,81	0,81	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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where: Element I - fastened steel sheet metal Element II - steel substrate $t_{N,I}$ - thickness of fastened steel sheet metal $t_{N,II}$ - thickness of steel substrate $M_{t, \text{nom}}$ - destructive tightening torque $V_{R,k}$ - characteristic shear resistance $N_{R,k}$ - characteristic tension resistance																																																																																																				

**Table B2.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws 7504P 4,2

<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: —</p> <p>Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p>	 <p style="text-align: center;"> <math>d = 4,2 \text{ mm}</math>  <math>L = 13, 16, 19, 25, 32 \text{ and } 38 \text{ mm}</math>  <math>k = 2,5 \text{ mm (2,6)}</math>  <math>S = 4,7 \text{ mm (4,6)}</math>  <math>D = 8,0 \div 8,4 \text{ mm}</math> </p>																																																																																																	
<p>Drilling capacity: <math>\sum t_i \leq 2,5 \text{ mm}</math></p> <p>Destructive tightening torque: <math>M_{t, \text{nom}} \geq 6,75 \text{ Nm}</math></p>																																																																																																		
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**Table B3.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws VTEKS 4,8

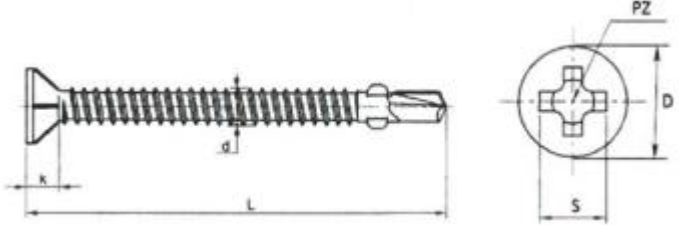
<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: —</p> <p>Element II: sheet metal of carbon steel, grade S235 in accordance with the standard: PN-EN 10025-1:2007</p>																																																																																										
<p>Drilling capacity: <math>\sum t_i \leq 2,5 \text{ mm}</math></p> <p>Destructive tightening torque: <math>M_{t, \text{nom}} \geq 9,50 \text{ Nm}</math></p>	<p><math>d = 4,8 \text{ mm}</math>  <math>L = 32, 38, 45 \text{ and } 50 \text{ mm}</math>  <math>k = 3,0 \text{ mm (3,17)}</math>  <math>S = 5,1 \text{ mm (5,2)}</math>  <math>D = 9,77 \text{ mm}</math></p>																																																																																									
<table border="1"> <thead> <tr> <th colspan="2"></th> <th colspan="6">Thickness of substrate <math>t_{N,II}</math> [mm]</th> </tr> <tr> <th colspan="2"></th> <th>3,00</th> <th>3,50</th> <th>4,00</th> <th>4,50</th> <th>—</th> <th>—</th> </tr> </thead> <tbody> <tr> <th rowspan="10">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</th> <th rowspan="6"><math>V_{R,k}</math> [kN]</th> <td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <th rowspan="4"><math>N_{R,k}</math> [kN]</th> <td>—</td><td>1,21</td><td>1,21</td><td>1,21</td><td>1,21</td><td>—</td><td>—</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> </tbody> </table>				Thickness of substrate $t_{N,II}$ [mm]								3,00	3,50	4,00	4,50	—	—	Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	$N_{R,k}$ [kN]	—	1,21	1,21	1,21	1,21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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<p><u>where:</u></p> <p>Element I - fastened steel sheet metal</p> <p>Element II - steel substrate</p> <p><math>t_{N,I}</math> - thickness of fastened steel sheet metal</p> <p><math>t_{N,II}</math> - thickness of steel substrate</p> <p><math>M_{t, \text{nom}}</math> - destructive tightening torque</p> <p><math>V_{R,k}</math> - characteristic shear resistance</p> <p><math>N_{R,k}</math> - characteristic tension resistance</p>																																																																																										

**Table B4.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws VTEKS 5,5

<b>Material</b> Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating $\geq 5 \mu\text{m}$ in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004 Element I: — Element II: sheet metal of carbon steel, grade S235 in accordance with the standard: PN-EN 10025-1:2007								
Drilling capacity: $\sum t_i \leq 4,5 \text{ mm}$ Destructive tightening torque: $M_{t, \text{nom}} \geq 15,30 \text{ Nm}$		d = 5,5 mm L = 38, 45 and 50 mm k = 3,4 mm S = 6,8 mm (6,6) D = 11,0 mm						
Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	—	3,00	3,50	4,00	4,50	—	—
		—	—	—	—	—	—	—
		—	—	—	—	—	—	—
		—	—	—	—	—	—	—
		—	—	—	—	—	—	—
		—	—	—	—	—	—	—
	$N_{R,k}$ [kN]	—	4,00	4,00	4,00	4,00	—	—
		—	—	—	—	—	—	—
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		—	—	—	—	—	—	—
		—	—	—	—	—	—	—

where:  
 Element I - fastened steel sheet metal  
 Element II - steel substrate  
 $t_{N,I}$  - thickness of fastened steel sheet metal  
 $t_{N,II}$  - thickness of steel substrate  
 $M_{t, \text{nom}}$  - destructive tightening torque  
 $V_{R,k}$  - characteristic shear resistance  
 $N_{R,k}$  - characteristic tension resistance

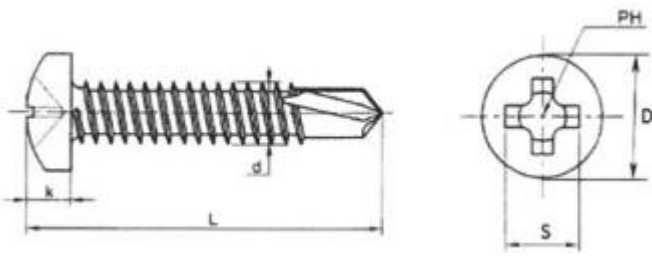
**Table B5.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws VTEKS 6,3

<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p> <p>Element II: sheet metal of carbon steel, grade S235 in accordance with the standard: PN-EN 10025-1:2007</p>	 <p style="margin-top: 20px;"> <math>d = 6,3 \text{ mm}</math>  <math>L = 50, 60 \text{ and } 70 \text{ mm}</math>  <math>k = 3,8 \text{ mm}</math>  <math>S = 4,1 \text{ mm (6,8)}</math>  <math>D = 12,0 \text{ mm}</math> </p>																																																																																											
Drilling capacity: $\Sigma t_i \leq 6,0 \text{ mm}$ Destructive tightening torque: $M_{t,nom} \geq 21,30 \text{ Nm}$																																																																																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th colspan="6">Thickness of substrate <math>t_{N,II}</math> [mm]</th> </tr> <tr> <th colspan="2"></th> <th>3,00</th> <th>3,50</th> <th>4,00</th> <th>4,50</th> <th>5,00</th> <th>6,00</th> </tr> </thead> <tbody> <tr> <th rowspan="12" style="writing-mode: vertical-rl; transform: rotate(180deg);">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</th> <th rowspan="6" style="writing-mode: vertical-rl; transform: rotate(180deg);"> <math>V_{R,k}</math> [kN]                 </th> <td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr> <th rowspan="6" style="writing-mode: vertical-rl; transform: rotate(180deg);"> <math>N_{R,k}</math> [kN]                 </th> <td>—</td><td>5,58</td><td>5,58</td><td>5,58</td><td>5,58</td><td>5,58</td> </tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> <tr><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr> </tbody> </table>				Thickness of substrate $t_{N,II}$ [mm]								3,00	3,50	4,00	4,50	5,00	6,00	Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	$N_{R,k}$ [kN]	—	5,58	5,58	5,58	5,58	5,58	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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**Table B6.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws ZBBKR 4,2

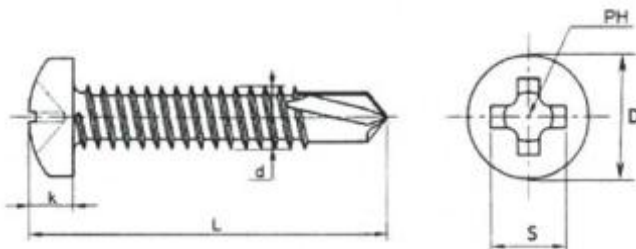
<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p> <p>Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p>																																																																																				
<p>Drilling capacity: <math>\sum t_i \leq 2,5 \text{ mm}</math></p> <p>Destructive tightening torque: <math>M_{t, \text{nom}} \geq 6,75 \text{ Nm}</math></p>	<p><math>d = 4,2 \text{ mm}</math>  <math>L = 13, 16, 19, 25, 32, 38, 50 \text{ and } 65 \text{ mm}</math>  <math>k = 3,0 \text{ mm (2,36)}</math>  <math>S = 4,4 \text{ mm (4,6)}</math>  <math>D = 9,75 \text{ mm}</math></p>																																																																																			
<table border="1"> <thead> <tr> <th colspan="2">Thickness of substrate <math>t_{N,II}</math> [mm]</th> <th>1,00</th> <th>1,13</th> <th>1,25</th> <th>1,50</th> <th>2,00</th> <th>—</th> </tr> </thead> <tbody> <tr> <td rowspan="10" style="writing-mode: vertical-rl; transform: rotate(180deg);">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</td> <td rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg);">V<sub>R,k</sub> [kN]</td> <td>0,50</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> </tr> <tr> <td>0,55</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>—</td> </tr> <tr> <td rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg);">N<sub>R,k</sub> [kN]</td> <td>1,00</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>1,26</td> <td>—</td> </tr> <tr> <td>0,50</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> </tr> <tr> <td>0,55</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>—</td> </tr> <tr> <td>1,00</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>1,06</td> <td>—</td> </tr> </tbody> </table>		Thickness of substrate $t_{N,II}$ [mm]		1,00	1,13	1,25	1,50	2,00	—	Thickness of fastened sheet metal $t_{N,I}$ [mm]	V <sub>R,k</sub> [kN]	0,50	1,26	1,26	1,26	1,26	1,26	0,55	1,26	1,26	1,26	1,26	—	0,63	1,26	1,26	1,26	1,26	—	0,75	1,26	1,26	1,26	1,26	—	0,88	1,26	1,26	1,26	1,26	—	N <sub>R,k</sub> [kN]	1,00	1,26	1,26	1,26	1,26	—	0,50	1,06	1,06	1,06	1,06	1,06	0,55	1,06	1,06	1,06	1,06	—	0,63	1,06	1,06	1,06	1,06	—	0,75	1,06	1,06	1,06	1,06	—	0,88	1,06	1,06	1,06	1,06	—	1,00	1,06	1,06	1,06	1,06	—
Thickness of substrate $t_{N,II}$ [mm]		1,00	1,13	1,25	1,50	2,00	—																																																																													
Thickness of fastened sheet metal $t_{N,I}$ [mm]	V <sub>R,k</sub> [kN]	0,50	1,26	1,26	1,26	1,26	1,26																																																																													
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		0,63	1,26	1,26	1,26	1,26	—																																																																													
		0,75	1,26	1,26	1,26	1,26	—																																																																													
		0,88	1,26	1,26	1,26	1,26	—																																																																													
	N <sub>R,k</sub> [kN]	1,00	1,26	1,26	1,26	1,26	—																																																																													
		0,50	1,06	1,06	1,06	1,06	1,06																																																																													
		0,55	1,06	1,06	1,06	1,06	—																																																																													
		0,63	1,06	1,06	1,06	1,06	—																																																																													
		0,75	1,06	1,06	1,06	1,06	—																																																																													
0,88	1,06	1,06	1,06	1,06	—																																																																															
1,00	1,06	1,06	1,06	1,06	—																																																																															
<p>where:</p> <p>Element I - fastened steel sheet metal</p> <p>Element II - steel substrate</p> <p><math>t_{N,I}</math> - thickness of fastened steel sheet metal</p> <p><math>t_{N,II}</math> - thickness of steel substrate</p> <p><math>M_{t, \text{nom}}</math> - destructive tightening torque</p> <p><math>V_{R,k}</math> - characteristic shear resistance</p> <p><math>N_{R,k}</math> - characteristic tension resistance</p>																																																																																				

**Table B7.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws 7504N 3,5

<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p> <p>Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p>																																																																																										
<p>Drilling capacity: <math>\sum t_i \leq 2,5 \text{ mm}</math></p> <p>Destructive tightening torque: <math>M_{t, \text{nom}} \geq 4,00 \text{ Nm}</math></p>	<p><math>d = 3,5 \text{ mm}</math>  <math>L = 9,5; 13, 16, 19, 25 \text{ and } 32 \text{ mm}</math>  <math>k = 2,6 \text{ mm}</math>  <math>S = 4,2 \text{ mm (3,9)}</math>  <math>D = 6,64 \div 7,00 \text{ mm}</math></p>																																																																																									
<table border="1"> <thead> <tr> <th colspan="2">Thickness of substrate <math>t_{N,II}</math> [mm]</th> <th>1,00</th> <th>1,13</th> <th>1,25</th> <th>1,50</th> <th>2,00</th> <th>—</th> </tr> </thead> <tbody> <tr> <td rowspan="10" style="writing-mode: vertical-rl; transform: rotate(180deg);">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</td> <td rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg);"> <math>V_{R,k}</math> [kN]                 </td> <td>0,50</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>—</td> </tr> <tr> <td>0,55</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>1,21</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg);"> <math>N_{R,k}</math> [kN]                 </td> <td>0,50</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> </tr> <tr> <td>0,55</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> <td>—</td> </tr> <tr> <td></td> <td>1,00</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>1,08</td> <td>—</td> <td>—</td> </tr> </tbody> </table>		Thickness of substrate $t_{N,II}$ [mm]		1,00	1,13	1,25	1,50	2,00	—	Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	0,50	1,21	1,21	1,21	1,21	1,21	—	0,55	1,21	1,21	1,21	1,21	—	—	0,63	1,21	1,21	1,21	1,21	—	—	0,75	1,21	1,21	1,21	1,21	—	—	0,88	1,21	1,21	1,21	1,21	—	—	$N_{R,k}$ [kN]	0,50	1,08	1,08	1,08	1,08	1,08	—	0,55	1,08	1,08	1,08	1,08	—	—	0,63	1,08	1,08	1,08	1,08	—	—	0,75	1,08	1,08	1,08	1,08	—	—	0,88	1,08	1,08	1,08	1,08	—	—		1,00	1,08	1,08	1,08	1,08	—	—
Thickness of substrate $t_{N,II}$ [mm]		1,00	1,13	1,25	1,50	2,00	—																																																																																			
Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	0,50	1,21	1,21	1,21	1,21	1,21	—																																																																																		
		0,55	1,21	1,21	1,21	1,21	—	—																																																																																		
		0,63	1,21	1,21	1,21	1,21	—	—																																																																																		
		0,75	1,21	1,21	1,21	1,21	—	—																																																																																		
		0,88	1,21	1,21	1,21	1,21	—	—																																																																																		
	$N_{R,k}$ [kN]	0,50	1,08	1,08	1,08	1,08	1,08	—																																																																																		
		0,55	1,08	1,08	1,08	1,08	—	—																																																																																		
		0,63	1,08	1,08	1,08	1,08	—	—																																																																																		
		0,75	1,08	1,08	1,08	1,08	—	—																																																																																		
		0,88	1,08	1,08	1,08	1,08	—	—																																																																																		
	1,00	1,08	1,08	1,08	1,08	—	—																																																																																			
<p>where:</p> <p>Element I - fastened steel sheet metal</p> <p>Element II - steel substrate</p> <p><math>t_{N,I}</math> - thickness of fastened steel sheet metal</p> <p><math>t_{N,II}</math> - thickness of steel substrate</p> <p><math>M_{t, \text{nom}}</math> - destructive tightening torque</p> <p><math>V_{R,k}</math> - characteristic shear resistance</p> <p><math>N_{R,k}</math> - characteristic tension resistance</p>																																																																																										



**Table B8.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws 7504N 4,2

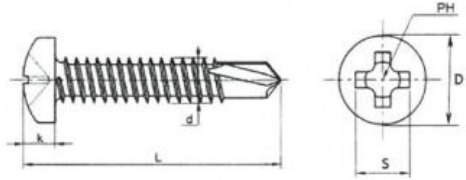
<p><b>Material</b></p> <p>Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating <math>\geq 5 \mu\text{m}</math> in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004</p> <p>Element I: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p> <p>Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015</p>	 <p style="margin-top: 20px;"> <math>d = 4,2 \text{ mm}</math>  <math>L = 13, 16, 19, 25 \text{ and } 32 \text{ mm}</math>  <math>k = 3,1 \text{ mm}</math>  <math>S = 4,6 \text{ mm (4,4)}</math>  <math>D = 7,64 \div 8,00 \text{ mm}</math> </p>
Drilling capacity: $\sum t_i \leq 2,5 \text{ mm}$ Destructive tightening torque: $M_{t, \text{nom}} \geq 6,75 \text{ Nm}$	

		Thickness of substrate $t_{N,II}$ [mm]		1,00	1,13	1,25	1,50	2,00	—
		Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	0,50	1,26	1,26	1,26	1,26	1,26
0,55	1,26			1,26	1,26	1,26	—	—	
0,63	1,26			1,26	1,26	1,26	—	—	
0,75	1,26			1,26	1,26	1,26	—	—	
0,88	1,26			1,26	1,26	1,26	—	—	
1,00	1,26			1,26	1,26	1,26	—	—	
$N_{R,k}$ [kN]	0,50		1,26	1,26	1,26	1,26	1,26	—	
	0,55		1,26	1,26	1,26	1,26	—	—	
	0,63		1,26	1,26	1,26	1,26	—	—	
	0,75		1,26	1,26	1,26	1,26	—	—	
	0,88		1,26	1,26	1,26	1,26	—	—	
	1,00		1,26	1,26	1,26	1,26	—	—	

where:

- Element I - fastened steel sheet metal
- Element II - steel substrate
- $t_{N,I}$  - thickness of fastened steel sheet metal
- $t_{N,II}$  - thickness of steel substrate
- $M_{t, \text{nom}}$  - destructive tightening torque
- $V_{R,k}$  - characteristic shear resistance
- $N_{R,k}$  - characteristic tension resistance

**Table B9.** Characteristic resistance of the fixings, materials, dimensions and parameters of installation of the screws 7504N 4,8

<b>Material</b> Screw: carbon steel, grade SAE 1022 according to the American standard: AMS 5070:1994/RG, thickness of zinc coating $\geq 5 \mu\text{m}$ in accordance with the standard: PN-EN ISO 4042:2001/Ap1:2004 Element I: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015 Element II: sheet metal of carbon steel, grade S280GD, S320GD or S350GD in accordance with the standard: PN-EN 10346:2015																																																																																						
Drilling capacity: $\sum t_i \leq 4,4 \text{ mm}$ Destructive tightening torque: $M_{t, \text{nom}} \geq 9,50 \text{ Nm}$		d = 4,8 mm L = 13, 16, 19, 25, 32 and 38 mm k = 3,6 mm S = 5,0 mm (4,9) D = 9,14 ÷ 9,50 mm																																																																																				
<table border="1"> <thead> <tr> <th colspan="2">Thickness of substrate <math>t_{N,II}</math> [mm]</th> <th>3,00</th> <th>3,50</th> <th>4,00</th> <th>—</th> <th>—</th> <th>—</th> </tr> </thead> <tbody> <tr> <td rowspan="12">Thickness of fastened sheet metal <math>t_{N,I}</math> [mm]</td> <td rowspan="6"><math>V_{R,k}</math> [kN]</td> <td>0,50</td> <td>1,41</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,55</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,00</td> <td>1,41</td> <td>1,41</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="6"><math>N_{R,k}</math> [kN]</td> <td>0,50</td> <td>0,96</td> <td>0,96</td> <td>0,96</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,55</td> <td>0,96</td> <td>0,96</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,63</td> <td>0,96</td> <td>0,96</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,75</td> <td>1,60</td> <td>1,60</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>0,88</td> <td>1,60</td> <td>1,60</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>1,00</td> <td>2,73</td> <td>2,73</td> <td>—</td> <td>—</td> <td>—</td> </tr> </tbody> </table>		Thickness of substrate $t_{N,II}$ [mm]		3,00	3,50	4,00	—	—	—	Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	0,50	1,41	1,41	1,41	—	—	0,55	1,41	1,41	—	—	—	0,63	1,41	1,41	—	—	—	0,75	1,41	1,41	—	—	—	0,88	1,41	1,41	—	—	—	1,00	1,41	1,41	—	—	—	$N_{R,k}$ [kN]	0,50	0,96	0,96	0,96	—	—	0,55	0,96	0,96	—	—	—	0,63	0,96	0,96	—	—	—	0,75	1,60	1,60	—	—	—	0,88	1,60	1,60	—	—	—	1,00	2,73	2,73	—	—	—	where: Element I - fastened steel sheet metal Element II - steel substrate $t_{N,I}$ - thickness of fastened steel sheet metal $t_{N,II}$ - thickness of steel substrate $M_{t, \text{nom}}$ - destructive tightening torque $V_{R,k}$ - characteristic shear resistance $N_{R,k}$ - characteristic tension resistance	
Thickness of substrate $t_{N,II}$ [mm]		3,00	3,50	4,00	—	—	—																																																																															
Thickness of fastened sheet metal $t_{N,I}$ [mm]	$V_{R,k}$ [kN]	0,50	1,41	1,41	1,41	—	—																																																																															
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		0,63	1,41	1,41	—	—	—																																																																															
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		0,88	1,41	1,41	—	—	—																																																																															
		1,00	1,41	1,41	—	—	—																																																																															
	$N_{R,k}$ [kN]	0,50	0,96	0,96	0,96	—	—																																																																															
		0,55	0,96	0,96	—	—	—																																																																															
		0,63	0,96	0,96	—	—	—																																																																															
		0,75	1,60	1,60	—	—	—																																																																															
		0,88	1,60	1,60	—	—	—																																																																															
		1,00	2,73	2,73	—	—	—																																																																															