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**Agrément
Certificate
No 01/3780**

Designated by Government
to issue
European Technical
Approvals

MARUTEX STAINLESS STEEL ONE-PIECE SELF-DRILLING SCREWS

Vis
Schraube

Product




• THIS CERTIFICATE RELATES TO MARUTEX STAINLESS STEEL ONE-PIECE SELF-DRILLING SCREWS.

• The products are for use in PVC-U window, door and similar applications for securing hardware (eg, handles, hinges) through PVC-U into steel or aluminium reinforcing. They meet the requirements of BS 7412 : 1991, and exceed the Grade 4 requirement of BS EN 1670 : 1998.

• The products are also used for installing metal roofing and cladding in accordance with BS 5427-1 : 1996, for fastening metal sheets to substructure purlins and for fastening single skin or built-up systems.

Regulations

1 The Building Regulations 2000 (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which screws can contribute in achieving compliance. In the opinion of the BBA, Marutex Stainless Steel One-Piece Self-drilling Screws, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: A1	Loading
Comment:	The products have sufficient strength and stiffness to sustain and transmit the design loads in accordance with sections 8.1 to 8.3 of this Certificate.
Requirement: C4	Resistance to weather and ground moisture
Comment:	The products incorporating washers, when subjected to the maximum design load, will resist the passage of moisture to the inside of the building. See sections 10.1 and 10.2 of this Certificate.
Requirement: Regulation 7	Materials and workmanship
Comment:	The products are acceptable. See sections 12.1 and 12.2 of this Certificate.

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2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, Marutex Stainless Steel One-Piece Self-drilling Screws, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		The products comply with the requirements of this Standard. See sections 12.1 and 12.2 of this Certificate.
Regulation:	11	Structure
Standard:	C2.1	Construction
Comment:		The products have sufficient strength and stiffness to sustain and transmit the design loads in accordance with sections 8.1 to 8.3 of this Certificate.
Regulation:	17	Resistance to moisture
Standard:	G3.1	Resistance to precipitation
Comment:		The products incorporating washers, when subjected to the maximum design load, will resist the passage of moisture to the inside of the building. See sections 10.1 and 10.2 of this Certificate.

3 The Building Regulations (Northern Ireland) 1994 (as amended)



In the opinion of the BBA, Marutex Stainless Steel One-Piece Self-drilling Screws, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The products are acceptable. See sections 12.1 and 12.2 of this Certificate.
Regulation:	D1	Stability
Comment:		The products have sufficient strength and stiffness to sustain and transmit the design loads in accordance with sections 8.1 to 8.3 of this Certificate.
Regulation:	C5	Resistance to ground moisture and weather
Comment:		The products incorporating washers, when subjected to the maximum design load, will resist the passage of moisture to the inside of the building. See sections 10.1 and 10.2 of this Certificate.

4 Construction (Design and Management) Regulations 1994

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section: *6 Delivery and site storage.*

Technical Specification

5 Description

5.1 Marutex Stainless Steel One-Piece Self-drilling Screws are fasteners manufactured from heat-treated chrome molybdenum modified martensitic stainless steel containing 0.5% nickel.

5.2 The types and dimensions of the products are given in Table 1 and typical characteristics are shown in Figure 1.

5.3 The Marutex screws have a hardness of 48–51 HRC (Hardness Rockwell C) and, being

modified martensitic, are magnetic. The typical tensile strength of similarly heat-treated parent wire is 640 Nmm^{-2} (maximum 670 Nmm^{-2}).

5.4 The steel wire is obtained from quality assured suppliers. Quality control is exercised during manufacture and includes checks on:

dimensional accuracy

hardness

exposure to salt spray — JIS Z2371 : 2000

exposure to sulphur dioxide fog (Kesternich) —
BS EN ISO 6988 : 1995

rate of drilling into defined metal sheets

clamp test.

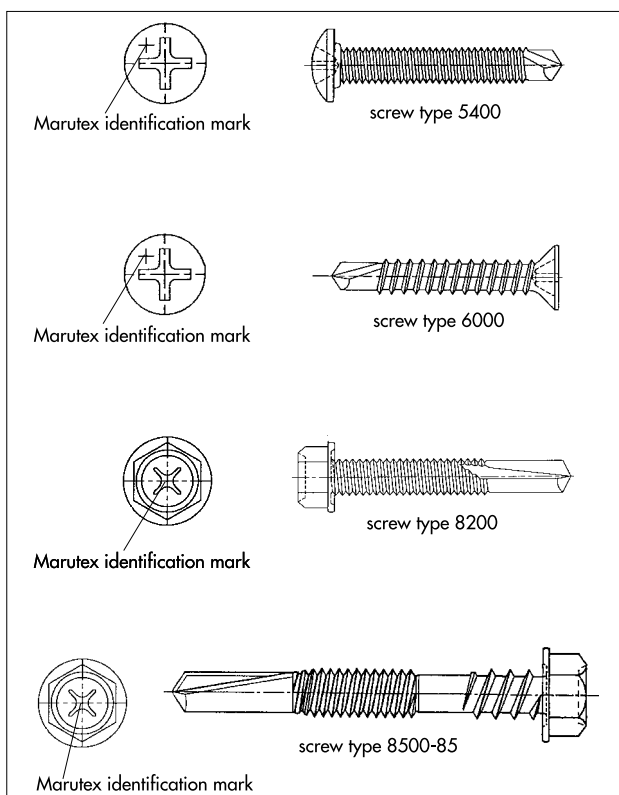
Table 1 Types and dimensions⁽¹⁾

Screw Series No	Head	Thread	Diameter (mm)	Lengths (mm)
5000	Shallow Flange, Phillips No 2	Self-tap	4.8	16, 25
5300	Shallow pan, Phillips No 2	Self-tap	4.2	13, 16, 25, 28
5400	Shallow pan, Phillips No 2	Metric M4	3.9	16, 25, 28
6000	Countersunk, Phillips No 2	Self-tap	3.9	13, 16, 19, 25, 32, 38
6200	Ribbed countersunk, Phillips No 2	Self-tap	3.9	13, 16
8000	Indented hexagonal 8 mm	Self-tap	4.8	19, 25
8100	Indented hexagonal 8 mm	Self-tap	5.5	25, 35
8200	Indented hexagonal 8 mm	12-24UNC	5.5	35, 45
8300	Indented hexagonal 8 mm	Self-tap/ Self-tap ⁽²⁾	5.5	50
8400	Indented hexagonal 8 mm	Self-tap/ Self-tap ⁽²⁾	5.5	65, 80, 100, 125, 150
8500	Indented hexagonal 8 mm	Self-tap/ 12-24UNC ⁽²⁾	6.3/ 5.5	85, 120, 150

(1) Other sizes may be available to order.

(2) Thread split into two clear sections, first reference is to the thread nearest the head.

Figure 1 Typical screw details



6 Delivery and site storage

6.1 The screws are normally supplied in packs of 1000 in boxes of 6 or 12 packs. Label information shows manufacturing traceability. They are packed uniformly to size with weight not exceeding 25 kg. Screws are also supplied to stockholders in larger pack sizes.

6.2 Screws should be stored in dry, secure conditions.

7 General

7.1 Marutex Stainless Steel One-Piece Self-drilling Screws can be used for:

securing hardware to steel or aluminium reinforcing in PVC-U window, door and similar applications meeting the requirements of BS 7412 : 1991 and exceeding the requirements of Grade 4 (very high corrosion resistance) of BS EN 1670 : 1998 fastening metal sheets or composite panels to substructure purlins in roofing or cladding in accordance with BS 5427-1 : 1996.

7.2 A summary of applications indicating the relevant substrates and recommended thicknesses of metal are given in Table 2.

Table 2 Summary of applications

Screw Series No	Use	Recommended metal sheet thicknesses (mm)
5000	Friction stay retention — Reinforced PVC-U profile	3.5 max
5300	Friction stay retention — Reinforced PVC-U profile	3.5 max
5400	Friction stay retention — Reinforced PVC-U profile	3.0 max
6000	Window furniture — Reinforced PVC-U profile	3.0 max
6200	Reinforcement retention	3.0 max
8000	Stitcher screws for sheet metal	2 x 0.4 — 3 x 0.7 sheets
8100	Sheeting and cladding	1.2–4
8200	Hot-rolled steel	4–12
8300*	Composite insulation panels — steel	1.2–4
8400*	Composite insulation panels — steel	1.2–4
8500*	Composite insulation panels — steel	4–12

*Thread split into two sections.

7.3 Due to the material strength and hardness, the threads of the Marutex screws do not deform significantly in use, enabling a greater holding capability and faster insertion.

8 Strength

8.1 Pull-out and shear test were carried out to a BBA specification generally in accordance with the recommendations of the European Convention for Constructional Steelwork (ECCS). The results were satisfactory, details are given in section 14.2.

8.2 The strength of a connection will depend on a number of factors:

- type of materials joined
- thicknesses of the joined materials
- strength and ductility of the joined materials
- strength and hardness of the screw
- diameter of the screw
- type of screw thread
- tightening torque on the screw
- type of loading applied.

8.3 If the loading is a critical factor, the designer must obtain data (either from the Certificate holder or by testing) for the ultimate load for a particular fixing and calculate the characteristic strength (F_c) and hence the safe working load (SWL) using the appropriate safety factors. Calculations can be made using the formulae:

$$F_c = F_m - ks$$

where:

F_m = mean ultimate load

k = a value dependant on the number of samples tested (2.0 for 8 samples). For other values see BS 5427-1 : 1996, Annex A7

s = standard deviation

then:

$$SWL = F_c / S_f$$

where:

S_f = appropriate partial safety factors taken from BS 5427-1 : 1996, Annex A7.

9 Corrosion resistance

9.1 Marutex screws subjected to neutral salt spray according to BS 7479 : 1991⁽¹⁾ for up to 1000 hours showed no signs of corrosion. They meet the 500 hours minimum required by the British Plastics Federation Guidelines⁽²⁾ and exceed Grade 4 (very high corrosion resistance) of BS EN 1670 : 1998.

(1) Equivalent to ISO 9227 : 1990.

(2) British Plastics Federation Guidelines 335/4 : March 2000, Section 4.

9.2 Immersion of the screws in 3.5% salt solution with exposed screw heads and threads in a crevice corrosion situation indicate that after 16 days the corrosion values (weight loss) are lower than those for the equivalent bi-metallic 304 stainless steel screws.

9.3 Accelerated corrosion tests in ferric chloride solution for 48 hours show results comparable with the equivalent austenitic screws.

9.4 For any stainless steel screw, including austenitic types, the presence of corrosion products from sources other than the screw, may lead to hydrogen being produced at the surface of the screw causing hydrogen embrittlement and eventual fracture. This type of failure is very rare but may occur if chlorides are present, eg coastal environments and if applied or residual stress is present. In an accelerated hydrogen embrittlement test (100 hours of cathodic polarisation in 20% ammonium thiocyanate with the Marutex screws under stress) evidence of cracking was not found when the screws were examined microscopically after the test. It is concluded that the Marutex screws will perform satisfactorily where this type of environment occurs.

10 Weathertightness



10.1 When installed correctly in accordance with section 13 and Table 2, the screws incorporating the correct washers will resist the passage of moisture.

10.2 The performance will be retained under normal service deflections.

11 Behaviour in relation to fire

Where the products are used in a structure subject to fire resistance requirements, an appropriate assessment must be carried out.

12 Durability



12.1 The corrosion resistance of Marutex screws enables them to be used as:

fasteners for PVC-U window, door and similar applications

internal or external fixings for the roof spaces of buildings having a Grade A (normal humidity) or Grade B (medium humidity)⁽³⁾ and designed in accordance with the Metal Cladding and Roofing Manufacturer's Association (MCRMA), Technical Paper No 10 : November 1995.

(3) For more aggressive environments consult the Certificate holder.

12.2 When used with EPDM⁽⁴⁾ sealing washers they are satisfactory for the external installation of metal roofing and cladding in accordance with BS 5427-1 : 1996, to buildings with an internal humidity of Grades A or B and will be effective for at least the life of the cladding or roofing installation.

(4) Ethylene propylene diene monomer.

Installation

13 Procedure

13.1 Roofing and cladding installation should be in accordance with the recommendations of BS 5427-1 : 1996 or MCRMA Technical Paper No 12 : May 2000.

13.2 The screw gun must be fitted with a nose-piece to suit the style of screw being installed. It must also be fitted with a pre-set depth gauge or torque setting device.

13.3 The screws should be installed at a speed of between 1600 rpm and 1800 rpm.

13.4 A hand-held tachometer can be used to give correct speed guidance.

13.5 Screws must not be drilled into material thicker than the maximum permitted for the screw type (see Table 2).

13.6 Marutex screws used externally must have EPDM sealing washers. This elastomer is resistant to ozone, UV and the weather.

Technical Investigations

The following is a summary of the technical investigations carried out on Marutex Stainless Steel One-Piece Self-drilling Screws.

14 Tests

14.1 Tests were carried out to determine the corrosion behaviour of the product in contact with:
aluminium or galvanized steel under sulphur dioxide cycling
timber under salt spray conditions (untreated or treated with copper-chrome-arsenic preservative).

14.2 An assessment was made of test data⁽¹⁾ (see Table 3) for the product from an independent laboratory relating to:

tensile strength
shear strength
offset tensile strength.

(1) to a BBA specification based on ECCS recommendations.

Table 3 Strength values on test fixings

Test type	Screw Series No ⁽²⁾	Sheet thicknesses ⁽¹⁾ (mm)		Mean failure load (kN)
Tensile	5000 ⁽³⁾	1.6	3.0	2.07
	5300 ⁽³⁾	1.6	3.0	1.94
	5400 ⁽³⁾	1.6	3.0	1.68
	5400 ⁽³⁾	3.0	3.0	3.48
	6000 ⁽³⁾	1.2	3.0	1.46
	6000 ⁽³⁾	1.6	3.0	2.10
	8100	5.0	5.0	12.7
	8200	12.5	12.5	12.6
	8300	5.0	5.0	14.8
	8400	5.0	5.0	11.6
Shear	8500	12.5	12.5	17.8
	8000	0.7	0.7	7.2
	8200	12.5	12.5	26.4
	8300 ⁽⁴⁾	5.0	5.0	12.3
Offset tensile⁽⁵⁾	8100	5.0	5.0	11.1
	8200	5.0	12.5	5.5
	8200	9.0	12.5	11.9
	8200	12.5	12.5	9.1
	8300	5.0	5.0	12.1
	8400	5.0	5.0	9.6
	8500	12.5	12.5	23.3

(1) Steel 43B to BS 4360 : 1990.

(2) Most convenient screw length used for the test, this is only a critical parameter in one case (see footnote 5).

(3) In practice these screws would be used through PVC-U which would further contribute to the pull-out strength.

(4) Sheets separated by 25 mm wooden spacer — 50 mm screw used.

(5) Loading on one sheet offset by 35 mm from screw centre line.

14.3 An assessment was made of independent test data on the product relating to:

Mechanical behaviour

when used in window hinges for 30000 closures.

Corrosion resistance

under salt spray conditions to BS 7479 : 1991 of:

individual screws
screws in PVC-U window hinges and stays
casement screws in PVC-U windows

under sulphur dioxide cycling when used on aluminium or galvanized steel with or without aluminium or stainless steel washers

in 3.5% salt solution with:
screw heads exposed
crevice corrosion conditions

in ferric chloride solution:
under conditions for hydrogen induced stress corrosion.

15 Other investigations

15.1 The manufacturing process was inspected including the methods adopted for quality control, and details were obtained for the quality and composition of the material used.

15.2 An assessment was made of the product's:
range of use
durability
compatibility with other building materials.

Additional Information

The management systems of U.K. Fasteners Ltd have been assessed and registered as meeting the requirements of BS EN ISO 9002 : 1994 by BSI (Certificate No RS 22469).

Bibliography

BS 4360 : 1990 *Specification for weldable structural steels*

BS 5427 : 1996 *Code of practice for the use of profiled sheet for roof and wall cladding on buildings*
BS 5427-1 : 1996 *Design*

BS 7412 : 1991 *Specification for plastics windows made from PVC-U extruded hollow profiles*

BS 7479 : 1991 *Methods for salt and spray corrosion tests in artificial atmospheres*

BS EN 1670 : 1998 *Building hardware — Corrosion resistance — Requirements and test methods*

BS EN ISO 6988 : 1995 *Metallic and other non-organic coatings. Sulfur dioxide test with general condensation of moisture*

BS EN ISO 9002 : 1994 *Quality systems. Model for quality assurance in production, installation and servicing*

ISO 9227 : 1990 *Corrosion tests in artificial atmospheres — salt spray tests*

JIS Z2371 : 2000 *Methods of neutral salt spray testing*

Conditions of Certification

16 Conditions

16.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

16.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

16.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

16.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

16.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, Marutex Stainless Steel One-Piece Self-drilling Screws are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 01/3780 is accordingly awarded to U.K. Fasteners Ltd.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. C. Newson', is written over a light grey background.

Date of issue: 5th February 2001

Chief Executive