IS 2314 (1986): Steel Sheet Piling Sections [CED 7: Structural Engineering and structural sections]

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Indian Standard

SPECIFICATION FOR STEEL SHEET PILING SECTIONS

(First Revision)

UDC 669·14-42: 624·155

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR STEEL SHEET PILING SECTIONS

(First Revision)

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Indian Standard

SPECIFICATION FOR STEEL SHEET PILING SECTIONS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 27 May 1986, after the draft finalized by the Structural Sections Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard is one of a series of Indian Standards being published under the Steel Economy Programme. The object of this programme is to achieve economy in the use of steel by establishing rational, efficient and optimum standards for structural sections; formulation of standard codes of practice for design and fabrication of steel structures; popularization of welding in steel construction and co-ordination; and sponsoring of experimental research relating to production and use of structural steel which would enable formulation and revision of specifications and codes of practice.

0.3 Piling sections are required in large quantities for coastal protection, hydroelectric, irrigation, power, dock and underground railway projects, etc. Necessity was, therefore, felt to standardize piling sections for manufacturing these in the country.

0.4 This standard was first published in 1963 when only three types of sections for piling were covered. In the present revision, four Z-type, four U-type and one flat-type piling sections have been covered. The suggestion from Ministry of Defence for the inclusion of heavier Z-type piling section has been kept in view.

0.5 Sneet piles are used for various purposes. Some of the important aspects in the use of sheet piles are:

a) their resistance to bending forces which depends on shape and section moduli of the sections;

b) ease with which piling sections can be driven and reclaimed for re-use, if required, even after a few years of service;

c) efficiency and water-tightness of the interlocking arrangement at the joints; and

d) feasibility of economical rolling in the country.

These aspects have also been kept in view while preparing this standard.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard stipulates dimensions and dimensional tolerances for Z-type, U-type and flat-type profile of hot rolled steel sheet piling sections.

1.1.1 Sectional properties of these sections as calculated with the nominal dimensions are also included.

2. MATERIAL

2.1 Piling sections shall be made from steel of any one grade conforming to IS: 226-1975*, IS : 961-1975†, IS : 2062-1984‡ or IS : 8500-1977§.

2.2 Where steel is required in copper bearing quality, the copper content shall be between 0·20 and 0·35 percent.

*Specification for structural steel (standard quality) (*fifth revision*).

†Specification for structural steel (high tensile) (*second revision*).

‡Specification for weldable structural steel (*third revision*).

§Specification for weldable structural steel (medium and high strength qualities).

3. TYPES

3.1 Steel sheet piles shall be classified as follows in accordance with the cross-sectional shapes of the sections.

3.1.1 *Z-Type* — Roughly Z-shape with joints of piles when driven located alternately at inner and outer sides of the piling wall.

3.1.2 *U-Type* — Roughly U-shape with joints of piles when driven located on the neutral axis of the piling wall.

3.1.3 *Flat-Type* — Having flat shape with high resistance to tensile forces.

4. DESIGNATION

4.1 Steel sheet piling sections conforming to this specification shall be designated with the letters ISPS followed by the section modulus per metre of wall in cm^3 and letter symbols Z, U and F which denote Z-type, U-Type and flat-type sections respectively.

5. DIMENSIONS

5.1 Profile and nominal dimensions of Z-type piling sections shall be as per Fig. 1 and Table 1 respectively.

5.2 Profile and nominal dimensions of U-Type piling sections shall be as per Fig. 2 and Table 2 respectively.

5.3 Profile and nominal dimensions of flat-type piling sections shall be as per Fig. 3 and Table 3 respectively.

5.4 The approximate calculated sectional properties, based on the nominal dimensions, for the three types of sheet piling sections are given in Table 4.

6. TOLERANCES

6.1 Dimensional Tolerances — Tolerances for widths (W), heights (H), and thicknesses (t) of Z-type, U-type and flat-type steel sheet piling sections shall be as given in Table 5.

6.2 Tolerances on Design Dimensions

6.2.1 Interlock shall meet the following essential requirements:

a) The interlocks shall fit with adequate free play so that the piles can easily be fitted into each other, and

b) The interlocks shall be so designed that the piles are firmly engaged despite the free play.

6.2.2 The tolerances as given in Table 6 for the three types of piling sections over the design dimensions at interlocks, as shown in Fig. 4, shall be followed to ensure the requirements specified in **6.2.1.**

6.2.3 To ensure proper coupling between the interlocking members, the difference between the actual values of a and b shall be 4 mm, minimum for Z- and U-types, and 7 mm for flat-type.

6.3 Tolerance on Mass — The tolerance on mass shall be + 4 percent and — 2·5 percent.

6.4 Tolerance on Length — The sections shall be supplied in lengths between 9 m and 13·4 m subject to a tolerance of +75 mm and — 50 mm. Any specific length may be ordered subject to mutual agreement between the purchaser and the manufacturer.

6.5 Camber Tolerance — The camber tolerance shall be 0·2 percent of length.

7. SURFACE DEFECTS

7.1 Steel sheet piles shall not show defects under use. Surface defects may be repaired either by grinding or welding as specified in **8.**

7.2 Steel sheet piles shall be straight and the cut and surface shall be flat.

8. SURFACE REPAIRS

8.1 Repair of surface defects shall be done either by grinding or by welding as specified in **8.1.1** and **8.1.2.**

8.1.1 *Repair by Grinding* — Repair of surface defects by grinding shall comply with the following conditions:

a) The depth of ground portions shall be within the minus range of thickness tolerance, and

b) The ground portions shall be finished neat.

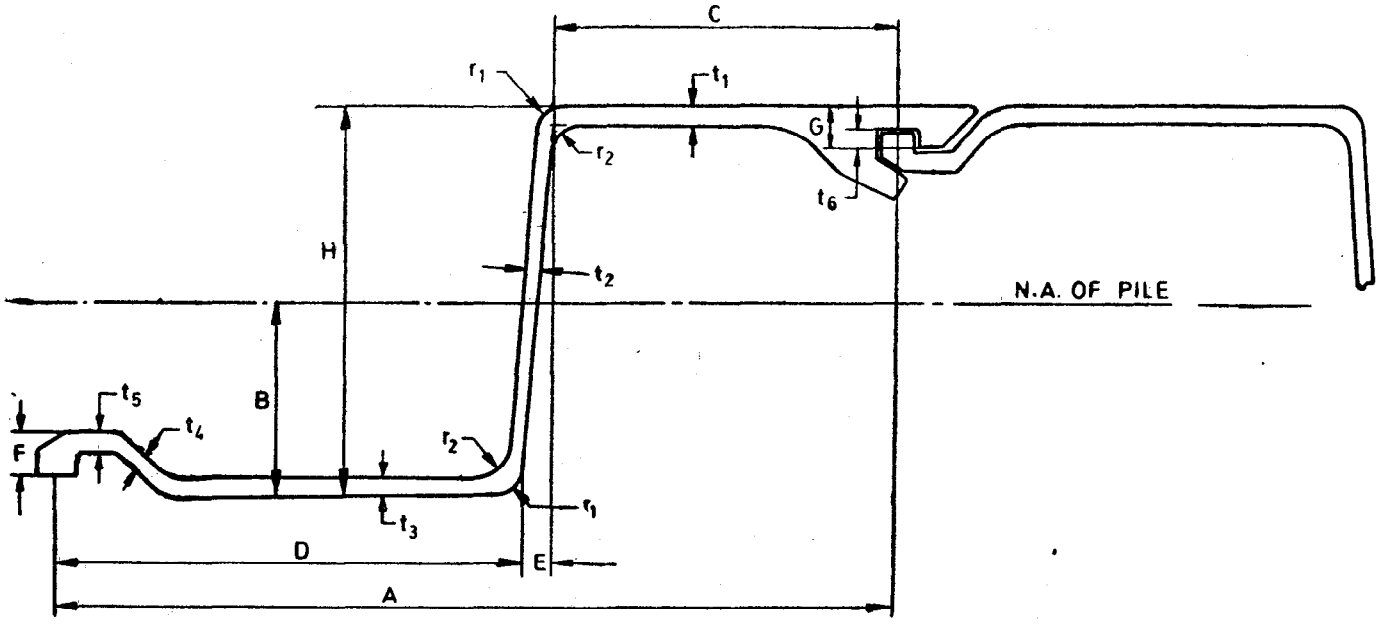


FIG. 1 Z-TYPE PILING SECTION

TABLE 1 NOMINAL DIMENSIONS OF Z-TYPE PILING SECTIONS

(*Clause* 5.1)

All dimensions in millimetres.

DESIGNATION	H	A	B	C	D	E	F	G	t_1	t_2	t_3	t_4	t_5	t_6	r_1	r_2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
ISPS 1021 Z	185·0	400	92·5	165·0	221·0	14·0	20·0	20·0	8·5	7·5	8·5	9·5	9·5	9·5	12·0	16·0
ISPS 1481 Z	210·0	400	105·0	165·0	220·0	15·0	23·0	23·0	11·5	8·5	11·5	12·5	12·5	12·5	14·0	18·0
ISPS 1888 Z	235·0	400	117.5	165·0	218·0	17·0	24·5	24·5	13·0	9·5	13·0	14·0	14·0	14·0	15·0	20·0
ISPS 2322 Z	260·0	400	130·0	165·0	217·0	18·0	25·5	25·5	14·0	10·5	14·0	15·0	15·0	15·0	16·0	20·0

NOTE — Clutch dimension has not been specified and is left to the discretion of the manufacturer.

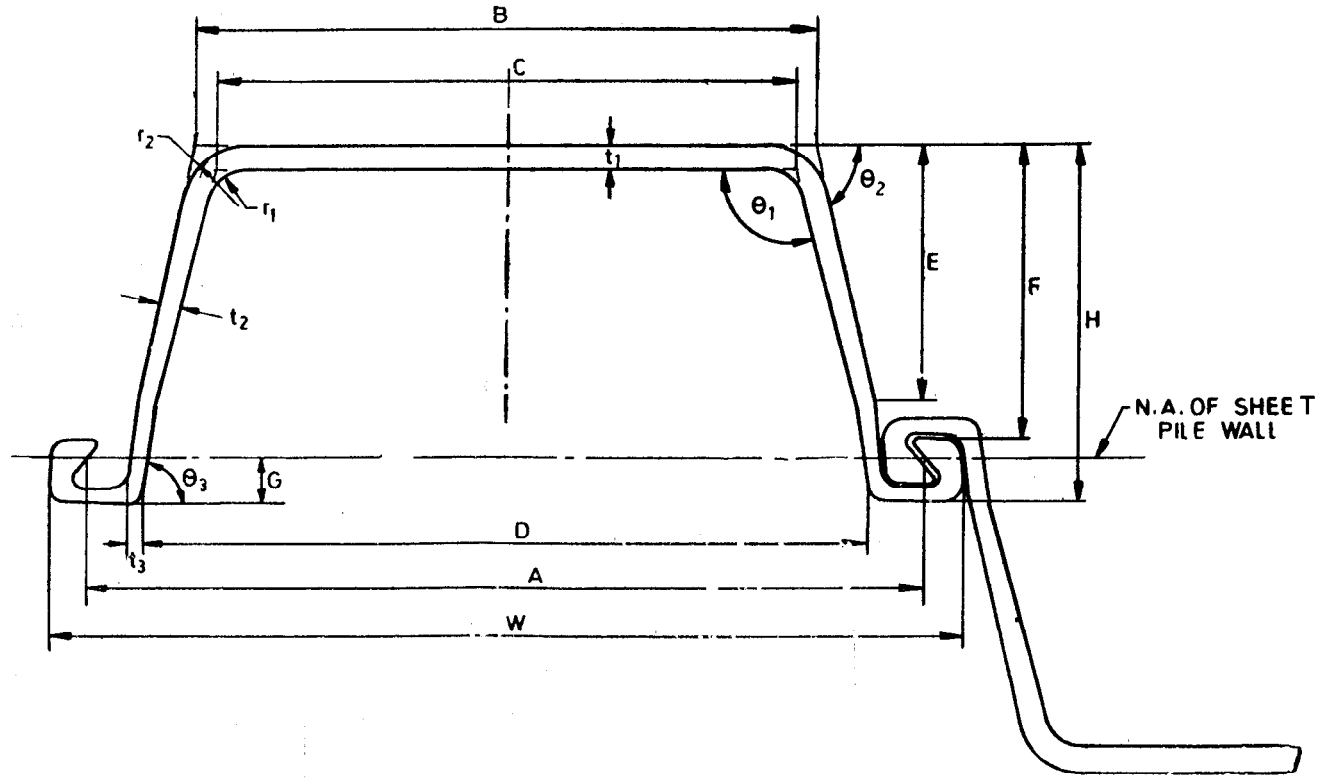


FIG. 2 U-TYPE PILING SECTION

TABLE 2 NOMINAL DIMENSIONS OF U-TYPE PILING SECTIONS

(*Clause* 5.2)

All dimensions in millimetres.

DESIGNATION	*W*	*H*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	t_1	t_2	t_3	θ_1	θ_2	θ_3	r_1	r_2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
ISPS 1625 U	437	172·0	402·5	295·7	275·8	347·5	124·5	139·2	20·9	13·0	9·0	8·2	105°	77°	82·5°	17·0	28·0
ISPS 2222 U	458	194·5	420·5	304·0	282·0	364·5	147·2	161·0	21·8	14·0	9·5	8·5	105°	77°	82·5°	28·0	35·0
ISPS 2770 U	458	193·0	420·0	304·0	284·5	364·0	147·2	159·5	22·5	22·0	10·0	10·5	105°	77°	82·5°	28·5	35·0

NOTE — Clutch dimension has not been specified and is left to the discretion of the manufacturer.

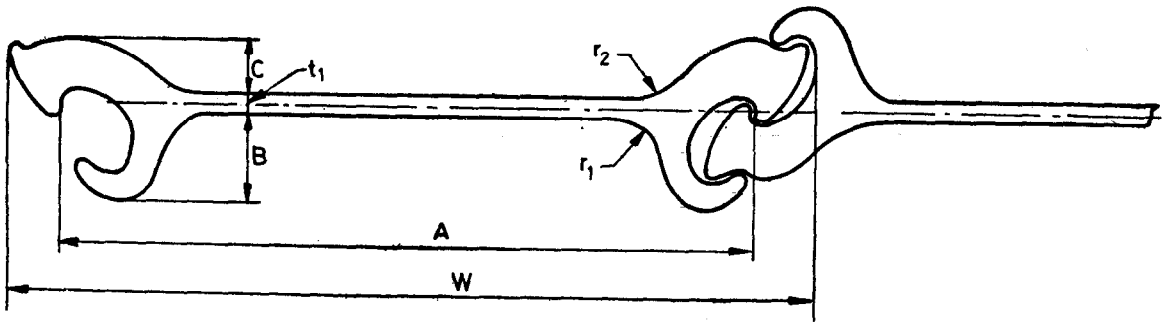


FIG. 3 FLAT-TYPE PILING SECTION

TABLE 3 NOMINAL DIMENSIONS OF FLAT-TYPE PILING SECTIONS

(*Clause* 5.3)

All dimensions in millimetres.

DESIGNATION	*W*	*A*	*B*	*C*	t_1	r_1	r_2
(1)	(2)	(3)	(3)	(4)	(5)	(6)	(7)
ISPS 100 F	445·0	400·0	40·0	25·0	9·0	13·0	18·0

NOTE — Clutch dimension has not been specified and is left to the discretion of the manufacturer.

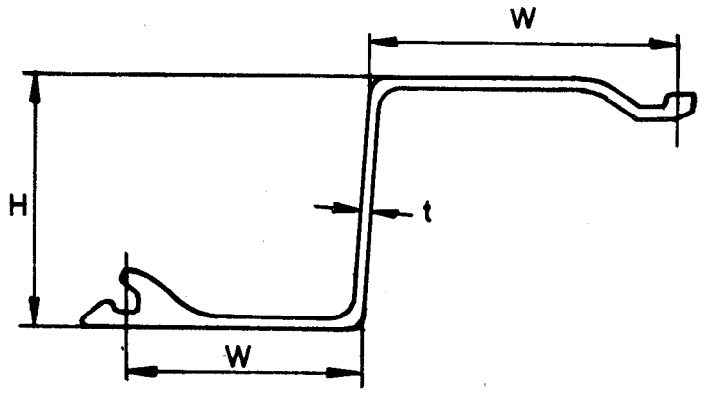
TABLE 4 MASS AND GEOMETRICAL PROPERTIES OF SHEET PILING SECTIONS

(*Clause* 5.4)

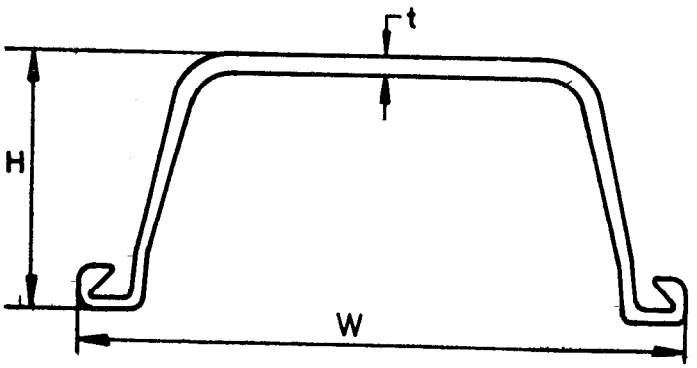
DESIGNATION	MASS PER METRE	MASS PER SQUARE METRE OF WALL	SECTIONAL MODULUS PER METRE OF WALL	MOMENT OF INERTIA PER METRE OF WALL	SECTIONAL AREA PER METRE OF WALL	PERIMETER PER METRE OF WALL
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	kg	kg	cm^3	cm^4	cm^2	cm
ISPS 1021 Z	49·2	123·1	1021	9448	157	283
ISPS 1481 Z	63·8	159·5	1481	15548	203	295
ISPS 1888 Z	73·2	183·1	1888	22184	233	307
ISPS 2322 Z	81·6	204·1	2322	30189	260	318
ISPS 1625 U	65·4	162·4	1625	24563	207	308
ISPS 2222 U	82·7	195·7	2222	38219	249	331
ISPS 2770 U	95·0	226·0	2770	47500	288	330
ISPS 100 F	55·2	138·0	100	428	176	104

TABLE 5 DIMENSIONAL TOLERANCES

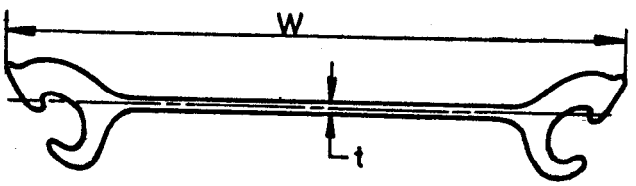
(*Clause* 6.1)



Z-TYPE



U-TYPE

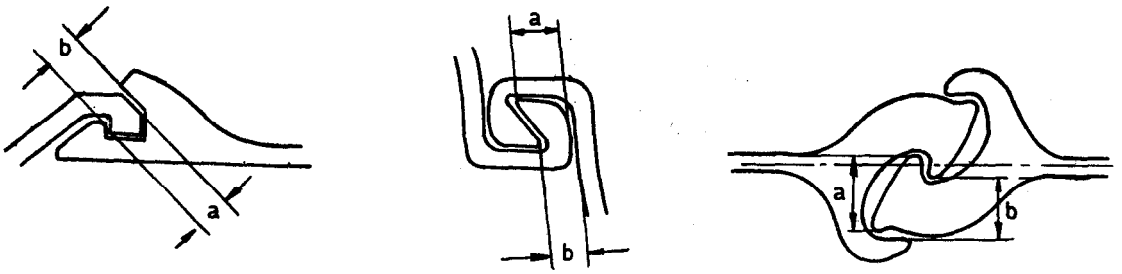


FLAT-TYPE

DESCRIPTION / TOLERANCES FOR (mm)	Z-TYPE	U-TYPE	FLAT-TYPE
Width, *W*	+ 4·0 — 5·0	+ 4·0 — 4·0	+ 4·0 — 4·0
Height, *H*	+ 4·0 — 4·0	+ 4·0 — 4·0	— —
Thickness, *t*			
$t < 10$	+ 1·0 — 1·0	+ 1·0 — 1·0	+ 1·5 — 1·0
$10 < t \leq 16$	+ 1·2 — 1·2	+ 1·2 — 1·2	+ 1·75 — 1·75

NOTE 1 — Width, *W* in case of Z-type section stands for the appropriate dimension of leg width, *C* or *D* given in Table 1.

NOTE 2 — Thickness, *t* stands for the various thicknesses given in Tables 1, 2 and 3.



a = Button width
b = Interlock opening, Z-type

a = Hook width
b = Interlock opening, U-type

a = Knuckle width
b = Interlock opening, flat-type

FIG. 4 INTERLOCK DIMENSIONS, a AND b

TABLE 6 TOLERANCES ON DESIGN DIMENSIONS

(*Clause* 6.2.2)

TYPE	DESIGN DIMENSION	TOLERANCE ON DESIGN DIMENSION	
		Plus	Minus
(1)	(2)	(3) mm	(4) mm
Z-type	Button width, a	1·0	3·0
	Interlock opening, b	3·0	1·0
U-type	Hook width, a	2·5	2·5
	Interlock opening, b	2·0	2·0
Flat-type	Knuckle width, a	2·0	3·0
	Interlock opening, b	3·0	2·0

8.1.2 *Repair by Welding* — Repair of surface defects by welding shall comply with the following conditions:

a) Prior to welding, defects shall be removed completely by chipping, grinding or other suitable methods and their depth shall not be more than 20 percent of thickness of the parent metal. The aggregate of the surface area repaired by welding shall not exceed 2 percent of the total surface area of the sheet piling section.

b) Portions repaired by welding shall be sound. Provisions of extra thickness shall not be less than 1·5 mm above the surface of the steel sheet pile and shall be removed by chipping or grinding to a clean finish flush with the height of the surface.

9. STRENGTH OF JOINT

9.1 Tensile strength of joints of flat-type sheet piles shall not be less than 400 t/m for steels conforming to IS : 226-1975*. Tensile strength of joints of other grades of steels and for flat-type sheet piling shall be as agreed upon between the purchaser and the manufacturer.

10. MARKING

10.1 Piling sections shall be marked with the following details:

a) Manufacturer's identification mark,

b) Designation, and

c) Colour code to identify grade of steel in accordance with IS : 2049-1978*.

10.1.1 The sections may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or processors may be obtained from the Bureau of Indian Standards.

*Specification for structural steel (standard quality) (*fifth revision*).

*Colour code for the indentification of wrought steels for general engineering purposes (*first revision*).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL		DEFINITION
Force	newton	N	1	$N = 1\ kg.m/s^2$
Energy	joule	J	1	$J = 1\ N.m$
Power	watt	W	1	$W = 1\ J/s$
Flux	weber	Wb	1	$Wb = 1\ V.s$
Flux density	tesla	T	1	$T = 1\ Wb/m^2$
Frequency	hertz	Hz	1	$Hz = 1\ c/s\ (s^{-1})$
Electric conductance	siemens	S	1	$S = 1\ A/V$
Electromotive force	volt	V	1	$V = 1\ W/A$
Pressure, stress	pascal	Pa	1	$Pa = 1\ N/m^2$