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Multiple-Octet Coded Character Set

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Title Electro-Technical Symbols -- Mapping Between IEC 617/P1289 and ISO 10646
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IEC Publication 1289 specifies a Technical Character Set No 1 comprising the graphic characters used in electrical technology for general-purpose language-independent applications in, for example, engineering and design offices. It includes the graphical symbols specified in IEC 617 for use on diagrams.

ISO 10646, Universal Character Set (UCS), specifies the characters for writing the major languages of the world together with a very large number of associated symbols. A recent Amendment No 18 has ensured that all the foregoing electro-technical symbols are included in ISO 10646. It is anticipated that UCS will become very widely used within computers, and is therefore like to be available in engineering and design offices.

However, whereas the IEC Publication 1289 provides its characters as a coherent set, often grouped together like-with-like, the equivalent characters are scattered widely amongst the very large repertoire of UCS. It will be quite difficult for users to identify these.

This paper therefore provides the necessary guidance to identify them in UCS. It takes the form of a 'mapping table', or table of preferred equivalences. Although this paper has been considered in the ISO committee responsible for UCS, who requested it be forwarded to the relevant IEC committee, it is primarily for information. In fact, ISO does not specify any mapping tables between UCS and other coded character sets; however the Unicode Consortium have issued some of those.

The ISO committee hopes that in some future revision of Publication 1289, or otherwise, the cross-references to the UCS characters may be included.

Like very many of the symbol characters in UCS, that standard does not specify how they shall be used nor what is their precise significance, which may vary from one application to another. This flexibility contrasts with the more specific usages in the IEC publications, and is sufficient to accommodate those.













The following table provides the suggested mappings between the characters of the IEC publications, as coded in Registered Set #181, and the UCS coded characters.

For the IEC characters, their coding is shown in column/row decimal notation. For the UCS characters, their coding is shown in hexadecimal notation.

Where the IEC names for the characters and the UCS names are identical, the latter are noted as Ditto. This highlights the other names where they are different; otherwise, such differences would be likely to be a source of confusion to users.

Because UCS has very many symbols, some differ only slightly from each other in appearance, or even have to be distinguished only by their names. Therefore to assist the user to avoid ambiguous mapping the alternative characters that should NOT be used are noted here.

The Table of Equivalences

NBSP	2/0	NO-BREAK SPACE	=	00A0	Ditto
	2/1	POSTPONED OUTPUT SYMBOL	=	2510	BOX DRAWINGS LIGHT DOWN AND LEFT NOT 00AC. NOT 2309. NOT 230D. NOT FE41.
	2/2	MONOSTABLE SYMBOL	=	238D	Ditto
	2/3	HYSTERESIS SYMBOL	=	238E	Ditto
	2/4	OPEN-CIRCUIT-OUTPUT SYMBOL	=	25C7	WHITE DIAMOND NOT 22C4. NOT 25CA. NOT 2662.
	2/5	OPEN-CIRCUIT-OUTPUT H-TYPE SYMBOL	=	238F	Ditto
	2/6	OPEN-CIRCUIT-OUTPUT L-TYPE SYMBOL	=	2390	Ditto NOT 235A.
	2/7	PASSIVE-PULL-DOWN OUTPUT SYMBOL	=	2391	Ditto
	2/8	PASSIVE-PULL-UP OUTPUT SYMBOL	=	2392	Ditto
	2/9	COPYRIGHT SYMBOL	=	00A9	Ditto NOT 24B8
	2/10	LESS-THAN OR EQUAL TO	=	2264	Ditto Note for 2/10. Registered Set #181 adds a note emphasising that the glyph shall be as drawn here and 'not with an alternative shape. For font design see ISO 3098'. It has always been an understanding in WG2 that the forms \leq and \lesseqgtr should be regarded as equivalent in UCS.
	2/11	MUCH LESS-THAN	=	226A	Ditto
	2/12	NOT SYMBOL	=	00AC	Ditto NOT 231D. NOT FE41.

SHY	2/13	SOFT HYPHEN	= 00AD	Ditto
®	2/14	REGISTERED SIGN	= 00AE	Ditto NOT 24C7
°	3/0	DEGREE SIGN	= 00B0	Ditto NOT 02DA. NOT 030A. NOT 0652. NOT 309C.
±	3/1	PLUS-MINUS SIGN	= 00B1	Ditto
÷	3/2	DIVISION SIGN	= 00F7	Ditto
∞	3/3	INFINITY	= 221E	Ditto
∫	3/4	INTEGRAL	= 222B	Ditto
...	3/5	HORIZONTAL ELLIPSIS	= 2026	Ditto NOT 22EF.
≠	3/6	NOT EQUAL TO	= 2260	Ditto
•	3/7	MIDDLE DOT	= 2219	BULLET OPERATOR NOT 00B7. NOT 2022. NOT 22C5.
≈	3/8	APPROXIMATELY EQUAL TO	= 2248	ALMOST EQUAL TO
≡	3/9	IDENTICAL TO	= 2261	Ditto
≥	3/10	GREATER-THAN OR EQUAL TO	= 2265	Ditto Note for 3/10. Same as note for 2/10.
≫	3/11	MUCH GREATER-THAN	= 226B	Ditto
™	3/12	TRADE MARK SYMBOL	= 2122	TRADE MARK SIGN
Ⓒ	3/13	CENTRE LINE SYMBOL	= 2104	Ditto
—	3/14	DIRECT-CURRENT SYMBOL FORM ONE	= 2014	EM DASH NOT 2212.
≡	3/15	DIRECT-CURRENT SYMBOL FORM TWO	= 2393	Ditto
‰	4/0	PER MILLE SIGN	= 2030	Ditto
←	4/1	SHIFTING-INPUT SYMBOL RIGHT-TO-LEFT OR BOTTOM-TO-TOP	= 2190	LEFTWARDS ARROW
Γ	4/3	CAPITAL LETTER SYMBOL GAMMA	= 0393	GREEK CAPITAL LETTER GAMMA
Δ	4/4	CAPITAL LETTER SYMBOL DELTA	= 25B3	WHITE UP-POINTING TRIANGLE NOT 0394. NOT 2206. NOT 25B5.

◁	4/5	AMPLIFICATION SYMBOL RIGHT-TO-LEFT	= 25C1 WHITE LEFT-POINTING TRIANGLE NOT 25C3. NOT 25C5.
▽	4/6	THREE-STATE OUTPUT SYMBOL	= 25BD WHITE DOWN-POINTING TRIANGLE NOT 25BF.
▷	4/7	AMPLIFICATION SYMBOL LEFT-TO-RIGHT	= 25B7 WHITE RIGHT-POINTING TRIANGLE NOT 25B9. NOT 25BB.
⊖	4/8	CAPITAL LETTER SYMBOL THETA	= 0398 GREEK CAPITAL LETTER THETA
∩	4/9	ANALOGUE SYMBOL	= 2229 INTERSECTION NOT 22C2.
⊙	4/10	SOFTWARE FUNCTION SYMBOL	= 2394 Ditto
Λ	4/11	CAPITAL LETTER SYMBOL LAMBDA	= 039B GREEK CAPITAL LETTER LAMDA
Ξ	4/14	CAPITAL LETTER SYMBOL XI	= 039E GREEK CAPITAL LETTER XI
Π	5/0	CAPITAL LETTER SYMBOL PI	= 03A0 GREEK CAPITAL LETTER PI
→	5/1	SHIFTING INPUT SYMBOL LEFT-TO-RIGHT OR TOP-TO-BOTTOM	= 2192 RIGHTWARDS ARROW NOT 2799. NOT 279B. NOT 279D. NOT 279E.
Σ	5/3	CAPITAL LETTER SYMBOL SIGMA	= 03A3 GREEK CAPITAL LETTER SIGMA
Υ	5/5	CAPITAL LETTER SYMBOL UPSILON	= 03A5 GREEK CAPITAL LETTER UPSILON
Φ	5/6	CAPITAL LETTER SYMBOL PHI	= 03A6 GREEK CAPITAL LETTER PHI
×	5/7	MULTIPLICATION SIGN	= 00D7 Ditto
Ψ	5/8	CAPITAL LETTER SYMBOL PSI	= 03A8 GREEK CAPITAL LETTER PSI
Ω	5/9	CAPITAL LETTER SYMBOL OMEGA	= 03A9 GREEK CAPITAL LETTER OMEGA NOT 2126.
□	5/10	SQUARE SIGN	= 25A1 WHITE SQUARE NOT 2610.
∅	5/11	DIAMETER SIGN	= 2300 Ditto
∠	5/12	ANGLE	= 2220 Ditto

~	5/13	ALTERNATING-CURRENT SYMBOL LOW-FREQUENCY RANGE = 223C TILDE OPERATOR
~	5/14	ALTERNATING-CURRENT SYMBOL MEDIUM-FREQUENCY RANGE = 2248 ALMOST EQUAL TO
~	5/15	ALTERNATING-CURRENT SYMBOL HIGH-FREQUENCY RANGE = 224B TRIPLE TILDE
α	6/1	SMALL LETTER SYMBOL ALPHA = 03B1 GREEK SMALL LETTER ALPHA NOT 237A.
β	6/2	SMALL LETTER SYMBOL BETA = 03B2 GREEK SMALL LETTER BETA NOT 03D0.
γ	6/3	SMALL LETTER SYMBOL GAMMA = 03B3 GREEK SMALL LETTER GAMMA
δ	6/4	SMALL LETTER SYMBOL DELTA = 03B4 GREEK SMALL LETTER DELTA
ε	6/5	SMALL LETTER SYMBOL EPSILON FORM ONE = 220A SMALL ELEMENT OF
ζ	6/6	SMALL LETTER SYMBOL ZETA = 03B6 GREEK SMALL LETTER ZETA
η	6/7	SMALL LETTER SYMBOL ETA = 03B7 GREEK SMALL LETTER ETA
θ	6/8	SMALL LETTER SYMBOL THETA FORM TWO = 03B8 GREEK SMALL LETTER THETA NOT 03D1.
ι	6/9	SMALL LETTER SYMBOL IOTA = 03B9 GREEK SMALL LETTER IOTA
κ	6/10	SMALL LETTER SYMBOL KAPPA = 03F0 GREEK KAPPA SYMBOL NOT 03BA.
λ	6/11	SMALL LETTER SYMBOL LAMBDA = 03BB GREEK SMALL LETTER LAMDA
μ	6/12	SMALL LETTER SYMBOL MU = 03BC GREEK SMALL LETTER MU NOT 00B5.
ν	6/13	SMALL LETTER SYMBOL NU = 03BD GREEK SMALL LETTER NU
ξ	6/14	SMALL LETTER SYMBOL XI = 03BE GREEK SMALL LETTER XI
π	7/0	SMALL LETTER SYMBOL PI = 03C0 GREEK SMALL LETTER PI
ρ	7/1	SMALL LETTER SYMBOL RHO = 03F1 GREEK RHO SYMBOL NOT 03C1. NOT 2374.
σ	7/3	SMALL LETTER SYMBOL SIGMA = 03C3 GREEK SMALL LETTER SIGMA
τ	7/4	SMALL LETTER SYMBOL TAU = 03C4 GREEK SMALL LETTER TAU
υ	7/5	SMALL LETTER SYMBOL UPSILON = 03C5 GREEK SMALL LETTER UPSILON

ϕ 7/6 GREEK SMALL LETTER PHI FORM TWO = 03C6 GREEK SMALL LETTER PHI
 χ 7/7 SMALL LETTER SYMBOL CHI = 03C7 GREEK SMALL LETTER CHI
 ψ 7/8 SMALL LETTER SYMBOL PSI = 03C8 GREEK SMALL LETTER PSI
 ω 7/9 SMALL LETTER SYMBOL OMEGA = 03C9 GREEK SMALL LETTER OMEGA
 NOT 2375.
 θ 7/10 SMALL LETTER SYMBOL THETA FORM ONE = 03D1 GREEK THETA SYMBOL
 φ 7/11 SMALL LETTER SYMBOL PHI FORM ONE = 03D5 GREEK PHI SYMBOL
 ε 7/12 SMALL LETTER SYMBOL EPSILON FORM ONE = 03B5 GREEK SMALL LETTER EPSILON

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