

Twelve cuneiform *tenû* numerals

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1 Summary

This document proposes filling the Cuneiform Numbers and Punctuation block with twelve cuneiform numerals used in the third millennium.

Three of those are additional numerals in the AŠ (or DIŠ) *tenû* series, 7↖–9↖, where 1↖ = ↖ through 6↖ = ↷ are already encoded. Their glyptic range and usage, as well as possible reasons for their absence in the current version of the Standard, are discussed in §3. The other proposed characters constitute a new series of numerals, formed by ↖ numerals crossing an ← wedge. They are discussed in §4.

These characters are extensively used in Early Dynastic administrative corpus, which is published online¹ using Unicode cuneiform as part of the [ePSD2] project.

2 Proposed changes to the Standard

2.1 Core specification text

No change is needed in the core specification.

2.2 Code charts

The code charts for the affected block, including the character names list with proposed informative aliases, cross references, and informative notes, are shown on the following pages. A plain text file containing the `NamesList.txt` lines is attached to this document.

2.3 Properties

Add to the respective UCD files the lines given in this section. These are available as plain text files attached to this document. Changes to derived files are not listed.

2.3.1 Name, General_Category, Numeric_Value, etc.

2.3.2 Line_Break

2.3.3 Script

2.3.4 Script_Extensions

2.3.5 Block

3 DIŠ *tenû* numerals

This section discusses the following proposed characters:

- U+1246F ↷ CUNEIFORM NUMERIC SIGN SEVEN ASH TENU
- U+12475 ↷ CUNEIFORM NUMERIC SIGN EIGHT ASH TENU
- U+12476 ↷ CUNEIFORM NUMERIC SIGN NINE ASH TENU

¹See, e.g., the transcription of [P220703] in <http://oracc.org/epsd2/P220703/cuneified>. Note that the proposed characters, as well as the provisionally assigned ones proposed in [L2/24-210R], are missing from that text; cf. <http://oracc.org/epsd2/P131747/cuneified> for the Ur III [P131747], which does not have this issue.

3.1 Name

The existing numerals in the \nwarrow series are named U+12039 \nwarrow CUNEIFORM SIGN ASH ZIDA TENU for the first one and U+1244A-U+1244E $\nwarrow\cdots\swarrow$ CUNEIFORM NUMERIC SIGN n ASH TENU for the others.

Some² technical terms used in cuneiform character names are derived originate from the structural descriptions of cuneiform signs by Akkadian-speaking scribes in late second and first millennium lexical texts. [TODO(egg): Cite Yushu Gong on tenu itself] In particular, the word *tenû* is used to describe slanted signs or parts of signs: thus \nwarrow is described as $\underline{\nwarrow}$ *tenû* in [P365233]³, \swarrow as $\overline{\swarrow}$ *tenû* in [P391514; P467315], $\nwarrow\cdots\swarrow$ as $\overline{\nwarrow\cdots\swarrow}$ *tenû* in [P391514], \square as \square (containing) \leftarrow *tenû* in [P365267]⁴. In most cases, the direction of the slant not explicitly specified. The terms *kaba tenû* and *zida tenû*, from Sumerian 𒂗 *gab₂* “left” and 𒂘 *zid* “right” respectively, are used in [P345960], which contrasts \nwarrow described as *kaba tenû* and \nwarrow described as *zida tenû*.

In modern transliteration, \nwarrow numerals are described as \leftarrow *tenû* (ATF: *asz@t*) or \nwarrow *tenû* (ATF: *disz@t*), the latter being more common⁵. Informative aliases using *diš tenû* have been recommended for the existing characters in [L2/24-239]. The proposed names use ASH TENU for consistency with the already-encoded characters, and the proposed annotations include informative aliases with *diš tenû*.

3.2 Ur III usage

As described in [Sch35, p. 135] (see Figure 1), slanted signs are used in Ur III economic texts primarily in subtractive notation with Γ^6 *lal*⁷, as well as for ordinals⁸ and for ages of animals in years⁹.

Accounts of animals giving their ages in years rarely go beyond three-year old animals. Subtractive notation, which appears in the ED IIIa period [Robo8, p. 77], is used to compactly express numbers close to a larger round number, e.g., \nwarrow 10 – 1 instead of ||||| for 9, $\nwarrow\cdots\swarrow$ 30 – 2 instead of $\nwarrow\text{|||||}$ for 28, or \nwarrow 60 – 1 instead of $\nwarrow\text{|||||}$ for 59; cf. IX instead of VIII in Roman numerals. It is therefore usually limited to small subtrahends¹⁰. Larger subtrahends do occur for quantities close to a much larger unit; however in Ur III, they are often written \nwarrow numerals, as in [P109346] $\text{||||}\Gamma\text{||}\nwarrow\cdots\swarrow$ “4 shekels minus 7 grains of gold”, a weight

²TODO also note *gunû* but contrast CROSSING rather than *gi-li-mu-u*, SQUARED rather than *li-mu-bu-i-gi-gu-ub-bu-u2*

³Note that while the third millennium \nwarrow and $\underline{\nwarrow}$ are related by a 45° rotation, in the Neo-Assyrian style used by this list, these signs look like \nwarrow and $\underline{\nwarrow}$, so that only one wedge is slanted, as noted in [Gong2000].

⁴TODO something on spelling out names ga-na te-nu-u_2 and še te-nu-u ; *ku te-nu-u*, etc.

⁵For an example of a transliteration using *aš tenû*, see [Greco2021]; note that only the HTML version uses *aš tenû*, the PDF uses *diš*.

⁶As noted in [L2/24-210R, p. 25 n. 40], the sign Γ (*lal*, “minus”) is often ligated with the following numerals, with the subtrahend placed under a sometimes considerably enlarged Γ , similar to the layout of the radical in modern mathematical notation, see, e.g., [Po20092, rev. 3 1, 2]. The font used in this document ligates or kerns \nwarrow subtrahends, but does not enlarge the Γ .

⁷Also transliterated *la₂*, as in [CDLI]. In the transliterated Ur III corpus on [CDLI], out of 3304 occurrences of (*disz@t*), 1971 are in $\Gamma n \nwarrow 1a_2 n(\text{disz@t})$.

⁸1583 out of 3304 occurrences are $n \nwarrow n(\text{disz@t})\text{-kam}$, including 647 after Γ

⁹203 occurrences of *gu4*, *ab2*, *ansze*, or *dur3* $n(\text{disz@t})$

¹⁰Of the 1971 Ur III occurrences of *lal n(disz@t)*, 1930 are with $n \leq 2$, of which 1823 with $n = 1$.

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b) DIE SCHIEFEN KEILE UND DIE WINKELHAKEN (für die Einheiten von 1-9, neben den senkrechten keilförmigen Zahlenzeichen).

a) bei I^{I} : RTC. 276:

Bart. III 118, 249: 3 gín igi-4-gál še.

Legr. TRU. 310: ud- kam.

Gen. TD. 5487: áb.

b) vor kam und àm:

Bart. III 152, 398: dub--àm

Legr. TRU. 42: a-du--kam

a-du

a-du

a-du

Legr. TRU. 346: 1 māš-qal-še -kam-uš

1 udu-še -kam-uš

Siehe: itu-šu--sa; itu šu--sa; itu šu--sa.

c) nach gud, áb, anše, zur Bezeichnung des Alters.

ITT. III, II 4956: 20 áb--še 3 qa-ta

ITT. III, II 6090: 3 anše-sal- I ; 1 anše-nita I ;

Pinch. AT. I. 53: 3 gud I ; 1 áb I ;

Bart. III 106, 191: 3 anše-nita

ITT. II, I. 6965: 20 zu-gud- 15 zu-gud

Figure 1: [Sch35, p. 135]

b) GEBRAUCH VON I^{I} .

ITT. IV. 7164 *: $= 20 \text{ minus } 3 = 17$.

CT. 10, 24964: $= 40 \text{ minus } 4 = 36$.

Gen. TD. 5670: $= 240 \text{ minus } 2 = 238$.

Nota: Pgl. im römischen Zahlen-
system: IX = X minus I; XIX =
XX minus I; ferner die la-
teinischen Ausdrücke:
undeviginti = 20 minus 1; duodeci-
ginta = 30 minus 2.

Figure 2: [Sch35, p. 132]

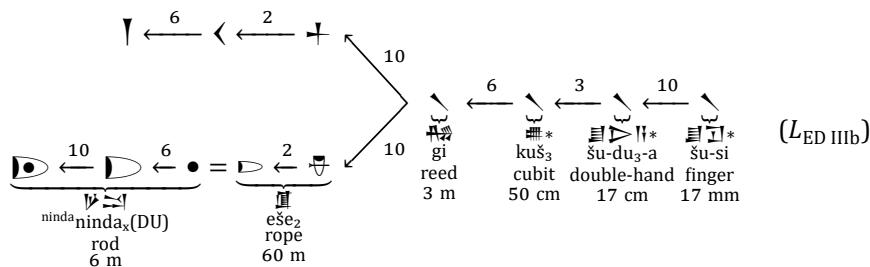
which would otherwise be written 三 𠂔 𠁻 𠂔 𠂔 “3 + $\frac{2}{3}$ shekels and 53 grains”, as 180𠂔 = 1𠁻.

Ordinals with 𠂔 numerals are also typically limited to small numbers or subtractive notation: many of the attestations of $n\text{ 𠂔 }$ “nth” are in year names¹¹, such as 𠂔 𠂔 𠂔 𠂔 𠂔 𠂔 mu kar₂-har^{ki} a-ra₂ 2𠂔-kam-aš ba-hul “year Karhar was destroyed for the second time” (31st year of Šulgi’s reign), 𠂔 𠂔 𠂔 𠂔 𠂔 𠂔 mu si-mu-ru-um^{ki} a-ra₂ 3𠂔-kam-aš ba-hul “year Simurrum was destroyed for the third time” (32nd year of Šulgi’s reign), or 𠂔 𠂔 𠂔 𠂔 𠂔 𠂔 mu si-mu-ru-um^{ki} u₃ lu-lu-bu-um^{ki} a-ra₂ 1𠂔 lal 1𠂔-kam-aš ba-hul “year Simurrum and Lullubum were destroyed for the ninth time” (44th year of Šulgi’s reign). Larger ordinals are frequent, in particular for the day of the month, but these are written with 𠂔 numerals, thus 𠂔 𠂔 𠂔 for “the 7th day” or 𠂔 𠂔 𠂔 𠂔 𠂔 for “the 28th day”.

The rarity of the higher 𠂔 numerals in the Ur III corpus likely explains the absence of 7𠂔-9𠂔 from the répertoire of Unicode Version 5.0, which was aiming to encode a répertoire appropriate for the Ur III period and later.

3.3 Early Dynastic usage

The situation is different in the Early Dynastic corpus. As described in [L2/24-210R], 𠂔 numerals are used in many Early Dynastic metrological systems, and in particular in the Early Dynastic IIIb length system



While this system has a unit 1 𠁻 = 2 𠁻, lengths above 1 𠁻 are only expressed in 𠁻, or equivalently in tens of 𠁻, and in half-𠁻 equal to 10 𠁻. We can therefore expect 7-9 𠁻 to occur, expressed using 𠂔 numerals. Indeed, 37 texts in the transliterated ED IIIb corpus on [CDLI] contain undamaged attestations of either 𠁻 or 𠁻¹²; some of these attestations are shown in Figures 3-6. However, 𠁻 is not attested, since instead subtractive notation is used, as in 𠁻 𠁻 𠁻 in [P020129, obv. 3 3], 𠁻 𠁻 𠁻 𠁻 𠁻 𠁻 in [P221272], or 𠁻 𠁻 in [P020304].

A similar situation occurs in some systems of capacity with 𠂔 numerals counting 𠁻 sila₃, so that 𠁻 𠁻 and 𠁻 𠁻 are attested, see Figures 7 and 8.

The use of 𠂔 numerals for ordinals, especially for days, is more prevalent in the Early Dynastic period than in the Ur III period, and the use of subtractive notation is less frequent¹³. In these numbers. We therefore find attestations of 𠁻-𠁻 in “nth day”, some of which are shown in Figures 9-13.

¹¹430 occurrences of $n(\text{disz@t})\text{-kam}$ are on lines starting with *mu*, of which 308 are in 𠁻.

¹²Of those, 34 have 𠁻 𠁻 and 9 have 𠁻 𠁻.

¹³Although also attested, see, e.g., [P221346] 𠁻 𠁻 𠁻 𠁻 𠁻 𠁻, [P221006] 𠁻 𠁻 𠁻 𠁻 𠁻 𠁻

In Ebla, the \nwarrow numerals are primarily used in subtractive notation, see [Gor24, p. 88 n. 298, p. 120 n. 465, p. 167 n. 739, p. 180 n. 801]. However, contrary to Ur III, \nwarrow numerals remain used for large subtrahends, thus [Gor24, p. 101 n. 355] cites occurrences of $\bullet\bullet\Gamma \nwarrow$ for 36 and $\square\Gamma \nwarrow \text{¹⁴}\text{¹⁵$ for 94. In particular, [Gor24, pp. 129 sq.] cites occurrences of $\Gamma 9 \nwarrow$ in Ebla, shown in Figure 14.

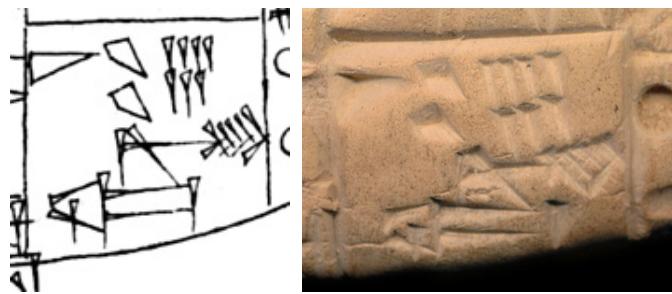


Figure 3: $\Gamma \ll \text{¹⁵}\text{¹⁴}\text{¹⁵$ “501 m (first) width” (of a field) in [P221254] from Nirsu, dated to the reign of $\square \text{¹⁴}\text{¹⁵}\text{¹⁵$. Left: Copy from [AllottededelaFuye1920]. Right: [CDLI] photograph.



Figure 4: $\text{¹⁴}\text{¹⁵}\text{¹⁵}\text{¹⁵$ “21 m of reed-bed dyke” (attributed to $\text{¹⁴}\text{¹⁵}\text{¹⁵$ the farmer) in [P221266, obv. 11] from Nirsu, dated to the reign of $\text{¹⁴}\text{¹⁵}\text{¹⁵}\text{¹⁵$. Left: Copy from [AllottededelaFuye1920]. Right: [LouvreCollections] photograph.

¹⁴Recall that $\text{¹⁴}\text{¹⁵}\text{¹⁵}$ *mi-at* is Eblaite for “hundred”, see [Arc15, p. 33; L2/24-210R, p. 27].

¹⁵TODO something about rhomboidal numerals, cite [Gor24].



Figure 5: “1344 m, its height 2 m” (dimensions of a dyke on the river) in [Po20303] from Nirsu, dated to the reign of . Left: Copy from [Marzahn1991]. Right: [CDLI] photograph.



Figure 6: “444 m equal widths” (of a field) in [P221254]. Left: Copy from [AllottededelaFuye1920]. Right: [CDLI] photograph.



Figure 7: “1 ninbanda 7 sila of butter, 1 sila of cream, 7 sila of dates” in [P020182, rev. 3 5-7] from Nirsu, dated to the reign of Ḫitt. Left: Copy from [För16]. Right: [CDLI] photograph.

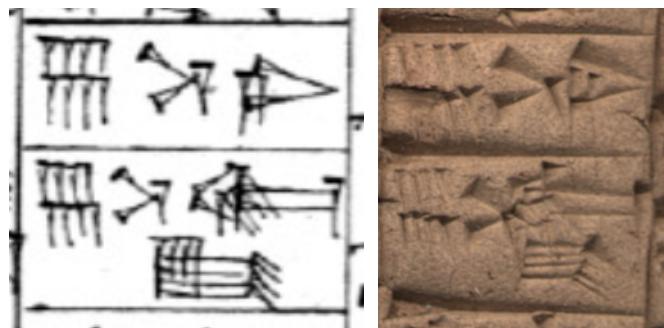


Figure 8: / “8 sila of butter, 8 sila of dates” in [P221730] from Nirsu, dated to the reign of . Left: Copy from [Никольский1908]. Right: [CDLI] photograph.



Figure 9: “seventh day” in [P220703] from Nirsu, dated to 3rd year of the reign of . Left: Copy from [AllottedelaFuye1918]. Right: [LouvreCollections] photograph.



Figure 10: “seventh day passed” in [P221590] from Nippur. Left: Copy from [Westenholz1975]. Right: [CDLI] photograph.



Figure 11: “eighth day” in [P220703]. Left: Copy from [AllottedelaFuye1918]. Right: [LouvreCollections] photograph.



Figure 12: “ninth day passed” in [P452986], dated to the ED IIIa period. [CDLI] photograph.

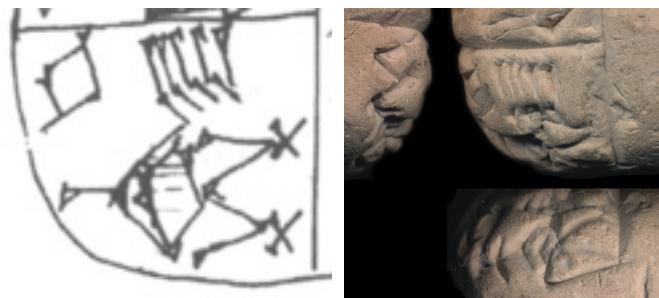


Figure 13: “ninth day” in [P222129] from Šuruppag, dated to the ED IIIa period. Left: Copy from [Martin2001]. Right: [CDLI] photograph.

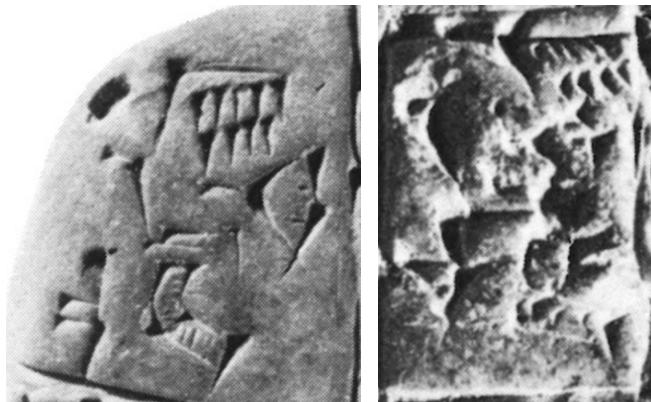


Figure 14: Left: • ≡ “9 minas and 51 shekels of silver” in [P241283]; right: $\text{≡}\text{≡}$ “1 mina and 51 shekels of silver” in [P241325], both from Ebla. Photographs from [EbDA].

3.4 Glyptic range

As illustrated in the above figures, the angle of the \nwarrow varies, and is not always faithfully reproduced in copies. The representative glyphs retain the same angle used for the already-encoded numerals.

The stacking patterns for the proposed characters do not vary among the attestations cited above. Note that stacking patterns are known to vary for other numerals in this series; for instance, \nwarrow and \swarrow sometimes appear with all wedges in a row in ED IIIa tablets, as in [Po10787; Po10896; Po10928]. As discussed in [L2/24-210R, pp. 45 sqq.], the disunification of variant stacking patterns poses problems when producing cuneiform text from transliterated corpora, as the stacking patterns are not normally indicated in transliteration, and the default stacking pattern varies over time: VV in Ur III, VV in Neo-Assyrian. While I and — numerals needed to have their stacking patterns disunified for compatibility with [Bor10], this practice should not be extended to \nwarrow numerals.

4 AŠ×(DIŠ *tenû*) numerals

This section discusses the following proposed characters:

- U+12477 \nwarrow CUNEIFORM NUMERIC SIGN ASH TIMES ONE DISH TENU
- U+12478 $\nwarrow\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES TWO DISH TENU
- U+12479 $\nwarrow\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES THREE DISH TENU
- U+1247A $\nwarrow\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES FOUR DISH TENU
- U+1247B $\nwarrow\text{≡}\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES FIVE DISH TENU
- U+1247C $\nwarrow\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES SIX DISH TENU
- U+1247D $\nwarrow\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES SEVEN DISH TENU
- U+1247E $\nwarrow\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES EIGHT DISH TENU
- U+1247F $\nwarrow\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}\text{≡}$ CUNEIFORM NUMERIC SIGN ASH TIMES NINE DISH TENU

4.1 Name

This section discusses the following characters:

<https://cdli.mpiwg-berlin.mpg.de/artifacts/452986/reader/209489> <https://cdli.mpiwg-berlin.mpg.de/artifacts/467743/reader/213564>

4.2 Glyptic range

The subsequent mu-it system, which saw limited use at the end of the presargonic and the beginning of the Old Akkadian periods, seems, on its surface, to be a rational development from the system it replaced; the *basis* of a 30-day month carries on (cf. for instance the texts B. Foster, Umma in the Sargonic Period [Hamden 1982] pl. 18, Nr. 37, discussed by J. Friberg, Scientific American 250/2 [Feb. 1984] 114 and Foster, ASJ 4 [1982] 43 obv iii9-11) and, for a period at least, a graphically comparable method of representing year dates, with now vertical strokes impressed on either side of the long horizontal, was used (the date of the text BIN 8, 117, + , which both Powell, HUCA 49, 9 and B. Foster, Or.NS 48 (1979) 156 and USP p. 7 read 7 (mu) 1 (iti) 7 (ud), should be registered with some scepticism). Only here is the refinement of day added, so that documents

Figure 15: TODO note that this should cite BIN 8, 116, not 117.

A connection of IM with the later usage of im(.ma) (presargonic Lagash and later; Akkadian šaddaqdi/a(m) with lexical equivalent MU.IM.MA [MSL 5, 65:195]), meaning “previous (year)” is not apparent. For the latter usage cf. particularly DP 280 (= 281), a presargonic temple document which “loads onto the backs” (gu₂.ne.ne.a.e.ne.gar) of the fisheries foremen Ne.sag and Lugal.ša₃.la₂.tuk the quota arrears of im.um.ma.kam , im.ma.kam and mu.a.kam , that is of the year before last = year one (of the king Urukagina [second regnal year]), of last year = year 2 and of this year = year 3. Also DP 243 goats of various colors / maš im.ma.kam / ditto / maš mu.a.kam and DP 94. maš im.ma as delivery arrears noted after grown nannies (ud₅) and before maš ša₃.hi (//mu.a.kam, “of the current year”), further maš im.ma = maš.gal.gal in the summation rev i2 (see footnote 17 to the notations of the type). A parallel usage is found in the Old Akkadian text ITT 2/1, 3078 obv 1-4. 3 1/2 ma.na.siki / [i]m.ma.kam / 1 gu₂ la₂.4 ma.na.siki / mu.a.kam. It would seem difficult to reconcile this clear usage im = “previous year” with the often translated im = “account tablet” (im = clay)

Figure 16: TODO

Acknowledgements

The *CuneiformComposite* font by Steve Tinney is used when referring to the reference glyphs for already-encoded cuneiform. *Noto Sans Cuneiform*, by Monotype Imaging, is used to for most of the cuneiform text in this document, with modifications (cuneiform glyph for ◇ ŠAR₂, corrected glyphs for UN and KALAM per [Uni16], alternate glyph for Ł). Arabic text is set in *Scheherazade New* by SIL International; Traditional Chinese text is set in *Noto Serif TC* by Ken Lunde et al.; monospace text is set in *Consolas* by Luc(as) de Groot; the remainder of the text is set in *Cambria* and *Cambria Math* by Monotype Imaging and Tiro Typeworks.

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ORACC: [epsd2/P020092](#).
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