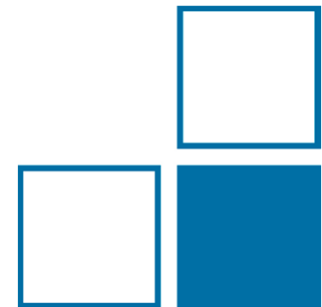# Digital SI

Machine-interpretable, unambiguous <u>digital</u> representation of metrological information and factual data

Analogue world

SI brochure, Section 5:
Writing unit symbols and names, and expressing the values of quantities

- "As a consequence, there now exists a general consensus […]"

- "Compliance with these rules and style conventions […] supports the readability of scientific and technical papers."

Analogue world

SI brochure, Section 5:

<u>Writing</u> unit symbols and names, and expressing the values of quantities

- <u>upright type</u> regardless of the type used in the surrounding text
- <u>printed</u> in lower-case letters unless they are derived from a proper name
- multiplication must be indicated by a space or a half-high (centred) dot (·)
- avoid ambiguities, for example by using brackets or negative exponents

"The use of the correct symbols for SI units, and for units in general, as listed in earlier chapters of this brochure, is **<u>mandatory</u>**. In this way ambiguities and misunderstandings in the values of quantities are avoided."

Digital world

M. P. Foster

From a computer science point of view, the SI system is not sufficiently systematic and consistent to be transferred directly to a form suitable for machines.

➔ Proposes fundamental changes in the SI

D. Pražák

Sees major weaknesses in Foster's proposals : partly contradictory in themselves, fundamental change of SI unrealistic, no future change and further development of SI taken into account.

Both are overlooking an important fact:
There is no need to change the human-readable part to achieve unambiguous machine-readability in digital data formats.

Digital world

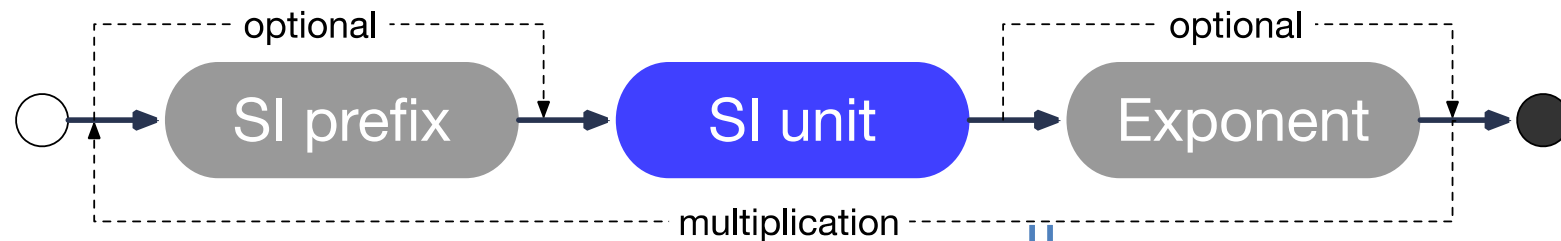**Microsoft Word documents:**   XML-based

PDF documents: machine language

Websites: HTML-based

➔ Human-readable <u>digital</u> content is generated by translating machine-readable information and data.

Machine-interpretable, unambiguous <u>digital</u> representation of metrological information and factual data

Digital, machine-readable units

Decimal numbers <u>only</u> with dot as separator

Integer exponent in scientific format allowed

Nationales Metrologieinstitut

Standardised digital data format

real quantity type extended	components (of the real quantity type)					
	label	value	unit	dateTime	expandedUnc (S)	coverageInterval (S)
Basic real with expanded measurement uncertainty	optional	mandatory	mandatory	optional	mandatory	
Basic real with coverage interval (probabilistic-symmetric)	optional	mandatory	mandatory	optional		mandatory

(S) sub type — mandatory — optional

GUM

SI unit format

VIM

ISO 80000

CODATA

IEEE 754

RFC 362 (UTF-8)

ISO 8601

Example use case

- Digital certificates (calibration, conformity assessment, etc.) based on XML format

- Standards based on XML format (ISO, IEC already started)

- Metadata in research data management

- Communication in the internet of things

- Scientific publications based on XML format