

ISO 23704-2:2022-06 (E)

General requirements for cyber-physically controlled smart machine tool systems (CPSMT) - Part 2: Reference architecture of CPSMT for subtractive manufacturing

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms, definitions and abbreviated terms	1
3.1	Terms and definitions	2
3.2	Abbreviated terms	4
4	Conformance with the CPSMT reference architecture for subtractive manufacturing	4
5	Goals and objectives of the CPSMT reference architecture for subtractive manufacturing	4
6	Reference architecture of a CPSMT for subtractive manufacturing	6
7	Functional view of a CPCM for subtractive manufacturing	8
7.1	General	8
7.2	Machine tool unit (MTU)	8
7.2.1	Function of the MTU	8
7.2.2	Abnormalities of the MTU	9
7.3	Cyber-physical system (CPS) unit	9
7.3.1	General	9
7.3.2	Inner-loop element	9
7.3.3	Intra-loop element	10
7.3.4	Inter-loop element	11
8	Functional view of a CSSM for subtractive manufacturing	12
8.1	General	12
8.2	Data processing unit (DPU)	12
8.2.1	General	12
8.2.2	A CPCM interface element	13
8.2.3	UIS interface element	13
8.2.4	Data fusion element	13
8.2.5	Data storage element	13
8.2.6	Data transformer for external entities element	14
8.3	Digital twin unit	14
8.3.1	General	14
8.3.2	Machine tool unit context data model	14
8.3.3	Machine tool unit state data model	15
8.3.4	Machine tool unit state management element	17
8.3.5	Machine tool unit behaviour model	17
8.3.6	Machine tool unit behaviour model engine	17
8.4	MAPE unit	18
8.4.1	General	18
8.4.2	Monitoring element	18
8.4.3	Analysis element	18
8.4.4	Planning element	19

8.4.5	Execution element	19
8.5	External interface unit	20
8.5.1	General	20
8.5.2	Interface schema element	20
8.5.3	Interface manager element	20
9	Interface view of a CPSMT for subtractive manufacturing	21
9.1	General	21
9.2	Interfaces for the capability of autonomous handling of machine tool abnormalities	21
9.2.1	General	21
9.2.2	Data from a CPCM to a CSSM	21
9.2.3	Data from a CSSM to a CPCM	21
9.3	Interfaces for the capability of autonomous coordination with various shop floor devices	21
9.4	Interfaces for the capability of autonomous collaboration with the SFCS	22
9.4.1	General	22
9.4.2	Interface between a CSSM and an SFCS	22
9.4.3	The interface between an SFCS and a CPCM	22
9.5	Interfaces for the capability of exchange with the life cycle aspects, hierarchy level, and humans through a UIS	23
9.5.1	General	23
9.5.2	Interface between a CPCM and a UIS	23
9.5.3	Interface between a CSSM and a UIS	23
Annex A (informative)	Concept model of shop floor system	25
Annex B (informative)	Concept of unified interfaces system (UIS)	28
Annex C (informative)	Example use cases of a CPSMT reference architecture for subtractive manufacturing	30
Bibliography	37