Guidelines for the Construction of the National Intelligent Manufacturing Standards System

(2021 version)

(Draft for Comments)

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Contents

Intelligent manufacturing is based on the deep integration of advanced manufacturing technology and new generation information technology. It goes across the whole life cycle of products such as design, production, management and services. It is an advanced mode of production featured by self-sensing, self-decision making, self-execution, self-adaptation and self-learning, aimed at improving the quality, efficiency, effectiveness and flexibility of the manufacturing industry. Intelligent manufacturing is the main direction of strong manufacturing countries: it is of great significance for promoting the optimization and upgrading of manufacturing industry, enhancing the modernization of the industrial chain and supply chain, and building a new development pattern. "*Standards take the lead in intelligent manufacturing*". Thanks to its role in strengthening continuously the top-level design of intelligent manufacturing, standardization is conducive to leading and promoting the in-depth development of intelligent manufacturing.

Since 2015, the Ministry of Industry and Information Technology (MIIT) and the Standardization Administration of China (SAC) have jointly formulated the *Guidelines for the Construction of the National Intelligent Manufacturing Standards System (2015 version)* (No. 485 [2015], MIIT, version 1.0) and the *Guidelines for the Construction of the National Intelligent Manufacturing Standards System (2018 version)* (No. 154 [2018], MIIT version 2.0): both documents reflect the top-level design of national intelligent manufacturing standardization. MIIT and SAC have now jointly formulated the *Guidelines for the Construction of the National Intelligent Manufacturing Standards System (2021 version)* (version 3.0), with the objective to implement the requirement of "improving the intelligent manufacturing standards system" indicated by the Outline of *the 14th Five-Year Plan for National Economic and Social Development and the Long-range Objectives through the Year 2035*, and at the same time to meet the needs of technological progress and intelligent manufacturing development, and guide the construction of the intelligent manufacturing standards system for all relevant industries.

1. Intelligent manufacturing system architecture

The intelligent manufacturing system architecture describes the activities, equipment and characteristics involved in intelligent manufacturing. It does so from three perspectives, namely life cycle, system hierarchy and intelligent features, which are mainly used to define the standardization demands, objects and scope of intelligent manufacturing. The intelligent manufacturing system architecture is shown in Figure 1.

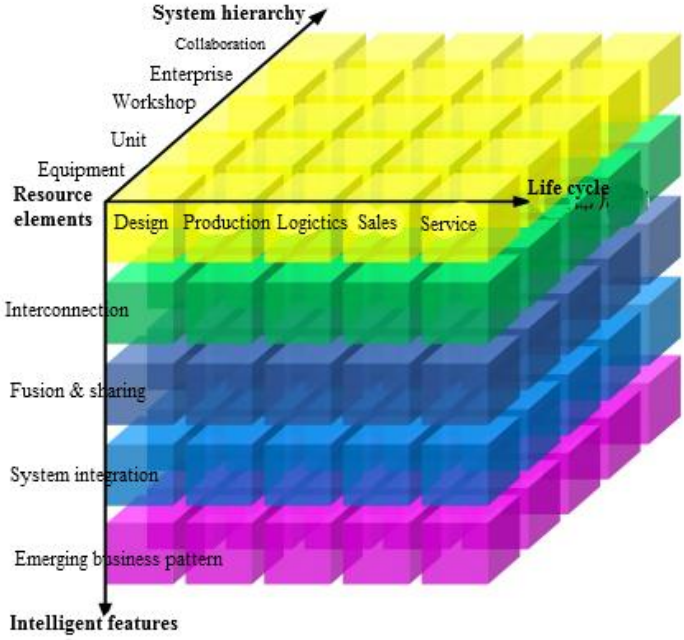

Figure 1. Intelligent manufacturing system architecture

1. Life cycle

Life cycle includes product, manufacturing system and supply chain life cycle. Product life cycle covers every stage, starting from R&D of product prototype, to product recycling and re-manufacturing, and including a series of interrelated value creation activities such as design, production, logistics, sales and services. The various activities throughout the life cycle can be optimized iteratively and in a sustainable way. Different industries tend to have varying life cycle composition and time sequence.

(1) Design refers to the process of realizing and optimizing the demands according to all the constraints of the enterprise and the selected technologies;

(1) Production refers to the process of processing, transporting, assembling and inspecting materials to create products;

(2) Logistics refer to the physical flow process of goods from the supplying place to the delivery place;

(3) Sales refer to the business activities of products or commodities transferred from enterprises to customers;

(4) Services refer to the processes and results of a series of activities generated throughout the interaction between the product provider and the customers.

2. System hierarchy

System hierarchy refers to the division into levels of the organizational structure related to enterprise production activities, including equipment level, unit level, workshop level, enterprise level and collaboration level.

(1) Equipment level refers to the level where the enterprise realizes the actual physical process, and perceives and controls the physical process by using sensors, instrumentation, machines, devices, etc.;

(2) Unit level refers to the level used to process information, and monitor and control physical processes in an enterprise;

(3) Workshop level is the level where the production management for the factory or workshop is realized;

(4) Enterprise level is the level of enterprise operation and management;

(5) Collaboration level is the level in which enterprises realize the interconnection and sharing of internal and external information, and realize the business collaboration between enterprises.

3. Intelligent features

(1) Intelligent features refer to the representation of self-sensing, self-decision making, self-execution, self-learning, self-adaptation and other functions of

manufacturing activities. It includes five levels of intelligent requirements, namely resource elements, interconnection, fusion and sharing, system integration, and emerging business patterns.Resource elements refer to the resources or tools that enterprises need to use when they are engaged in production and the level of their digital model;

(2) Interconnection refers to the level of data transfer and parameter semantic exchanges between resource elements, through wired or wireless networks, communication protocols and interfaces;

(3) Fusion and sharing refer to the level of information collaborative sharing based on interconnection, using new generation information communication technologies such as cloud computing and big data;

(4) System integration refers to the level of data exchange and functional interconnection among equipment, production units, production line, digital workshop and smart factory, as well as among intelligent manufacturing systems in the process of realizing intelligent manufacturing;

(5) Emerging business patterns refer to the level which covers the functions of cognition, diagnosis, prediction and decision-making, supporting the virtual-real iterative optimization on the basis of data, models and systems, integrated and fused by the resource elements of different levels in physical space and digital space.

2. General requirements

To implement the requirement of "improving the intelligent manufacturing standards system", indicated by the *Outline of the 14th Five-Year Plan for National Economic and Social Development and the Long-range Objectives through the Year 2035*, and the deployment of the *14th Five-Year Plan for High Quality Development of Manufacturing Industry* and of the *14th Five-Year Plan for the Development of Intelligent Manufacturing*. To gain a foothold in the new development stage, implement the new concepts of development, promote the construction of a new development pattern, carry out the requirements of key points of standardization of the MIIT and SAC, improve the national intelligent manufacturing standards system, guide the construction of the intelligent manufacturing standards system in various sub-fields and industries, and further give play to the guiding, regulating, leading and safeguarding role of standardization in promoting the healthy and orderly development of intelligent manufacturing.

(1) Basic principles

Departing from the principle of "overall planning, differential policies, cross-border integration, urgently-needed first, based on national conditions, opening up and cooperation" of both the 2015 and 2018 versions of the *Guidelines for the Construction of National Intelligent Manufacturing Standard System*, we should adhere to guiding the industrial needs, stick close to the demand of industrial chain and supply chain, accelerate the formulation of urgently needed standards of supply chain collaboration and integrated services. We should adhere to guiding technology integration, grasp the upgrading trend of intelligent manufacturing, and deploy a batch of forward-looking standards of new generation information and communication technology application, such as digital twin, artificial intelligence, and the 5th generation mobile communication technology (5G). We should adhere to the concept of systematic promotion, coordinate the formulation of national standards and sectoral standards, define the key points of sectoral standard formulation, and guide the construction of the intelligent manufacturing standards system and the development of key standards in sub-fields industries. We should adhere to the application demands and orientation, strengthen standard application pilot projects, and guide the formation of "standard clusters" for key scenarios.

(2) Construction objectives

To further improve the national intelligent manufacturing standards system; effectively guide the research and development of urgently-needed standards and new technology application standards; enhance the supply of basic common standards and key technology national standards; speed up the development of (i) intelligent equipment standards on human-machine collaboration system, technological equipment, inspection and testing equipment, (ii) smart factory standards such as smart factory design, integration and optimization, (iii) intelligent supply chain standards such as supply chain collaboration, and evaluation, (iv) intelligent service standards such as networked collaborative manufacturing, (v) intelligent enabling technology standards such as digital twin and artificial intelligence application, and (vi) industrial network standards such as industrial network integration; guide the construction and improvement of the intelligent manufacturing industry standards system, and the research and development of application standards for key industries; promote the

coordination, unification and complementarity of national and sectoral standards for intelligent manufacturing; guide and deepen the application of standards; continuously enhance the supporting ability of industrial foundation; promote and improve the modernization of industrial chain, and lead and boost the high-quality development of intelligent manufacturing.

By 2022, more than 50 national and sectoral standards will be developed and revised; the supply of basic common standards, key technology national standards and application standards for key industries will be further enhanced; and standardization will continue to play its role in guiding and supporting the development of intelligent manufacturing.

By 2023, more than 100 national and sectoral standards will be formulated and revised; a globally-leading intelligent manufacturing standards system will be established and improved; and a coordinated and complementary development pattern of national and sectoral standards for intelligent manufacturing will be formed to support and promote the development of intelligent manufacturing to a new level.

3. Construction train of thought

The construction of the national intelligent manufacturing standards system is based on the idea of "system architecture - system structure - system framework". The first step is to construct the "system architecture", defining the objects and boundaries of intelligent manufacturing, identifying the existing and missing standards of intelligent manufacturing, and recognizing the overlapping relationship between existing standards by extracting the common abstract features of intelligent manufacturing system. The second step is to straighten out the "system structure", accurately locating the position of the existing standardization foundations and demands in the intelligent manufacturing system architecture, integrating the logical relationship of each dimension of the system architecture, and identifying the intelligent manufacturing standards system structure composed of the existing standardization foundations and demands, and according to the three types of standards, namely basic common standards, key technology standards and industry application standards. The third step is to refine the "system framework", decomposing and detailing the intelligent manufacturing standards system structure, further defining the directions of key standards of intelligent manufacturing to guide the establishment of standardization projects.

(1) Intelligent manufacturing standards structure

The intelligent manufacturing standards structure includes three parts, namely “A - basic generality”, “B - key technology”, and “C - industry application”. These mainly reflect the composition relationship of each part of the standards system. The structure of intelligent manufacturing standards is shown in Figure 2.

A Basic generality	Generality	B Key Technology	BA Intellligent equipment	Sensor & instrumentation	C Industry application	Shipbuilding & ocean engineering
	Security			Auto identification equipment		Building material
	Reliability			Human-computer collabration system		Petrochemical
	Testing			Control system		Textile
	Evaluation			Additive manufacturing equipment		Steel
	People capability			Industrial robot		Rail transit
				Numerical machine tool		Aerospace
				Technological equipment		Automobile
				Test & inspection equipment		Nonferrous metal
			BB Smart Factory	Smart factory design		Others
				Smart factory delivery		
				Intelligent design		
				Intelligent production		
				Intelligent management		
				Intelligent logistics		
				Business integration & optimization		
			BC Intelligent supply chain	Supply chain data sharing		
				Supply chain collaboration		
				Supply chain risk management		
				Supply chain evaluation		
			BD Intelligent Service	Mass Customization		
				Operation & maintenance service		
				networked collaborative manufacturing		
			BE intelligent enabling technology	Artificial intelligence		
				Industrial big data		
				Industrial software		
				Industrial cloud		
				Edge computing		
				Digital twin		
				Blockchain		
			BF Industrial network	Industrial wireless network		
				Industrial wired network		
				Industrial convergence		
				Industrial network resource		

Figure 2 Intelligent manufacturing standard system structure

Specifically, A - basic general standards fall into six categories, namely generality, security, reliability, testing, evaluation, and people capability. These are located at the bottom of the intelligent manufacturing standards system structure, and support B - key technology standards and C - industry application standards.

B - key technology standards are the projection of the intelligent feature dimension of the intelligent manufacturing system architecture on the manufacturing plane, composed of life cycle dimension and system hierarchy dimension. BA - intelligent equipment standards, mainly focuses on the resource elements of the intelligent feature dimension; BB - smart factory standards, mainly focuses on the resource elements and system integration of the intelligent

feature dimension; BC - intelligent supply chain, corresponds to the system integration of the intelligent feature dimension; BD - intelligent service, corresponds to the emerging business patterns of the intelligent feature dimension; BE - intelligent enabling technology, corresponds to the integration and sharing of the intelligent feature dimension; BF - industrial network, corresponds to the interconnection of intelligent feature dimension.

C - industry application standards are located at the top of the intelligent manufacturing standards structure, addressing the specific needs of the industries, refining and implementing A - basic general standards and B - key technology standards, and guiding various industries to promote intelligent manufacturing.

(2) Intelligent manufacturing standard system framework

The intelligent manufacturing standards system framework is further refined from the intelligent manufacturing standards system structure. It includes several basic components of the intelligent manufacturing standards system, and covers three parts, namely A - basic generality, B - key technology, and C - industry application, as well as the further decomposition of each part, as shown in Figure 3.

Intelligent Manufacturing Standard System Frame	A Basic Generality	AA Generality	AAA Terms & definition
			AAB Reference model
			AAC Metadata & data dictionary
			AAD Identification
		AB Security	ABA Functional safety
			ABB Information security
		AC Reliability	ACA Engineering management
			ACB Technicai method
		AD Testing	ADA Test requirement
			ADB Test method
			ADC Test technology
		AE Evaluation	AEA Indicator system
			AEB Capability maturity
			AEC Evaluation method
			AED Implementation guide
		AF People capability	AFA Capability requirement
			AFB Capability evaluation
	B Key Technology	BA Intellligent equipment	BAASensor & instrumentation
			BAB Auto identification equipment
			BAC Human-computer collabration system
			BAD Control system
			BAEAdditive manufacturing equipment
			BAF Industrial robot
			BAG Numerical machine tool
			BAH Technological equipment
			BAI Test & inspection equipment
		BB Smart Factory	BBA Smart factory design
			BBB Smart factory delivery
			BBC Intelligent design
			BBD Intelligent production
			BBE Intelligent management
			BBF Intelligent logistics
			BBGBusiness integration & optimization
		BC Intelligent supply chain	BCA Supply chain data sharing
			BCB Supply chain collaboration
			BCC Supply chain risk management
			BCD Supply chain evaluation
		BD Intelligent Service	BDA Mass Customization
			BDB Operation & maintenance service
			BDC Networked collaborative manufacturing
		BE intelligent enabling technology	BEA Artificial intelligence
			BEB Industrial big data
			BEC Industrial software
			BEDIndustrial cloud
			BEE Edge computing
			BEF Digital twin
			BEG Blockchain
		BF Industrial network	BFA Industrial wireless network
			BFB Industrial wired network
			BFC Industrial convergence
			BFD Industrial network resource
	C Industry application	CA Shipbuilding & ocean engineering	
		CB Building material	
		CC Petrochemical	
		CD Textile	
		CE Steel	
		CF Rail transit	
		CG Aerospace	
		CH Automobile	
		CI Nonferrous metal	
		CJ Others	

Figure 3 Intelligent manufacturing standard system framework

4. Construction contents

(1) Basic general standards

Basic general standards mainly include six parts, namely generality, security, reliability, testing, evaluation, and people capability, as shown in Figure 4. These are mainly used to unify the related concepts of intelligent manufacturing,

and to solve the common key problems of intelligent manufacturing.

Figure 4 Basic general standards subsystem

1. General standards

General standards mainly include four parts, namely terms and definitions,

A Basic Generality	AA Generality	AAA Terms & definition
		AAB Reference model
		AAC Metadata & data dictionary
		AAD Identification
	AB Security	ABA Functional safety
		ABB Information security
	AC Reliability	ACA Engineering management
		ACB Technicai method
	AD Testing	ADA Test requirement
		ADB Test method
		ADC Test technology
	AE Evaluation	AEA Indicator system
		AEB Capability maturity
		AEC Evaluation method
		AED Implementation guide
	AF People capability	AFA Capability requirement
		AFB Capability evaluation

reference model, metadata and data dictionary, and identification. Standards on terms and definitions are used to unify the related concepts of intelligent manufacturing, and to support the formulation of other standards, including terms, vocabulary, symbols, codes and other standards. Standards on reference model are used to help all parties understand the objects, boundaries, hierarchical relationship, and internal relationship of the various parts of intelligent manufacturing standardization, including reference models, system architecture and other standards. Standards on metadata and data dictionary are used to specify the classification, naming rules, description and representation, registration, management and maintenance requirements of industrial data, such as industrial products and manufacturing processes during the design, production and circulation of intelligent manufacturing products, as well as the establishment method of data dictionary, including metadata and data dictionary standards. Identification standards are used for the identification and resolution of all kinds of objects in intelligent manufacturing, including identification coding, coding transmission rules, object metadata, resolution system and other standards.

2. Security standards

Security standards mainly include functional safety and information security. Functional safety standards are used to ensure that the control system can correctly and reliably perform its safety functions in case of danger, so as to avoid production accidents caused by system failure or conflict of safety facilities, including safety collaboration requirements for intelligent manufacturing, design and implementation of functional safety system, functional safety test and evaluation, functional safety management, functional safety operation and maintenance standards. Information security standards are used to ensure the availability, confidentiality and integrity of relevant information systems in the field of intelligent manufacturing, so as to ensure the safe and reliable operations of the systems, including equipment information security, system information security, network information security, data security, information security protection, security facilities construction, information security products evaluation, information security system evaluation, application guide for native cipher algorithm, and other standards.

3. Reliability standards

Reliability standards mainly cover engineering management and technical methods. Engineering management standards mainly plan, organize, coordinate and supervise the reliability activities of the intelligent manufacturing system, including standards on reliability requirements, reliability management, comprehensive support management, life cycle cost management of the intelligent manufacturing system and its various system hierarchical objects. Technical method standards are mainly used to guide the specific reliability assurance and verification of the intelligent manufacturing system and its various system levels, including standards on reliability design, reliability prediction, reliability test, reliability analysis, reliability growth and reliability evaluation.

4. Test standards

Test standards mainly include three parts, namely test requirements, test

methods, and test technology. Test requirement standards are used to guide the scientific sorting and effective management of intelligent equipment and systems during testing processes, including the standards on indicators or requirements of test items, such as consistency and interoperability, integration and interconnection, system energy efficiency, and electromagnetic compatibility of different types of intelligent equipment and systems. Test method standards are used for testing different types of intelligent equipment and systems, including standards on test contents, methods, steps, processes, calculation and analysis, as well as performance, environmental adaptability and parameter calibration. Test technology standards are used to regulate the testing technology for intelligent manufacturing, including standards on judgment test, information test, and causation test. The testing means are not limited to software and hardware testing, online monitoring, simulation testing, etc.

5. Evaluation standards

Evaluation standards mainly consist of four parts, namely indicator system, capability maturity, evaluation methods, and implementation guidance. Indicator system standards are used to evaluate the performance and results of intelligent manufacturing implementation, and to promote enterprises to continuously improve the level of intelligent manufacturing. Capability maturity standards are used to provide process methodology for enterprises to identify the status quo of intelligent manufacturing, plan the intelligent manufacturing framework, improve the capability of intelligent manufacturing, and provide reference for enterprises to identify gaps, establish goals and implement improvements. Evaluation method standards are used to provide consistent methods and basis for stakeholders, to regulate the evaluation process and to guide stakeholders to conduct the evaluation of intelligent manufacturing. Implementation guidance standards are used to guide enterprises to improve manufacturing capacities, and provide reference for enterprises to carry out intelligent construction and improve productivity.

6. People capability standards

People capability standards mainly cover two parts, namely capability requirements and capability evaluation. Capability requirements standards for intelligent manufacturing practitioners are used to regulate the capability management of practitioners, and to define the requirements of occupation classification, capability level, knowledge reserve, technical capability and practical experience, including standards on capability requirements and capability training. Evaluation standards for intelligent manufacturing capability are used to regulate the capability level of different occupational categories, and to guide the evaluation of the capability level of intelligent manufacturing practitioners, including practitioner evaluation, appraiser evaluation, and other standards.

(2) Key technology standards

Key technology standards mainly consist of six parts, namely intelligent equipment, smart factory, intelligent supply chain, intelligent service, intelligent enabling technology, and industrial network.

1. Intelligent equipment standards

Intelligent equipment standards cover ten main parts, namely sensors and instrumentation, automatic identification equipment, human-machine collaboration system, control system, additive manufacturing equipment, industrial robots, numerical control machine tools, technological equipment, testing and inspection equipment, and others – as shown in Figure 5.

BA Intelligent equipment	BAA Sensor & instrumentation	BAAA General technology
		BAAB Interface & communication
	BAB Auto identification equipment	BABA Geberal technlogy
		BABB Interface & communication
	BAC Human-computer collabration system	BACA Text, graphics & images
		BACB Interaction collaboration
	BAD Control system	BADA General technology
		BADB Interface & communication
		BADC Programming
	BAE Additive manufacturing equipment	BAEA General technology
		BAEB Interface & communication
		BAEC Test & Evaluation
	BAF Industrial robot	BAFA General technology
		BAFB Interface & communication
		BAFC Collaboration
		BAFD Test & Evaluation
	BAG Numerical machine tool	BAGA General technology
		BAGB Interface & collaboration
		BAGC Test monitoring
	BAH Technological equipment	BAHA General technology
		BAHB Interface & monitoring
	BAI Test & inspection equipment	BAIA General technology
		BAIB Integration
		BAIC Equipment management
	BAJ Others	BAJA General technology
		BAJB Interface & communication

Figure 5 Intelligent equipment standard subsystem

The standards mainly specify the requirements of information model, data dictionary, communication protocol and interface, integration and interconnection, operation and maintenance services, performance evaluation, and test methods for intelligent equipment.

(1) Sensors and instrumentation standards mainly include characteristics and classification, reliability design, life prediction, system and component life cycle management, performance evaluation, and other general technical standards; as well as information model, data interface, field device integration, semantic interoperability, communication protocol, protocol consistency, and other interfaces and communication standards.

(2) Automatic identification equipment standards mainly consist of data coding, performance evaluation, equipment management, and other general technical standards; as well as interface specification, communication protocol, information integration, fusion perception and collaborative information processing, and other interface and communication standards.

(3) Human-machine collaboration system standards mainly include the classification and definition of graphic symbols, acquisition and recognition of

visual images, display of virtual-reality fusion information, and other text graphics and image standards, such as virtual reality/augmented reality (VR/AR); as well as interactive collaboration standards on cooperation mode requirements, task assignment requirements, and human-computer interface in the process of human-computer collaboration.

(4) Control system standards mainly include control methods, data acquisition and storage, human-machine interface and visualization, testing and other general technical standards; in addition to control equipment information model, clock synchronization, interface, system interconnection, protocol consistency, and other interface and communication standards; as well as engineering data exchange, control logic program, control program architecture, control tag and data flow, function block, and other programming standards.

(5) Additive manufacturing equipment standards mainly include model data quality and processing requirements, establishment and classification of technological knowledge base, data dictionary and coding requirements, and the general technical standards on multi-material and array additive manufacturing, composite and micro-nano structure additive manufacturing; in addition to system and equipment information model, communication protocol, and other interfaces and communication standards; as well as test methods, performance evaluation, and other test and evaluation standards.

(6) Industrial robot standards mainly cover data format, object dictionary and other general technical standards; interface and communication standards among information model, programming system, user and industrial robots; collaboration standards between industrial robots and humans, environment, system, and other equipment; as well as performance, site adaptability, and other testing and evaluation standards.

(7) Numerical control machine tool standards mainly include language and format of machine tools and functional components, fault information dictionary, classification, control requirements, and other general technical standards; programming interface, physical mapping model, interconnection and other interfaces and collaborative standards; as well as test based on the industrial cloud manufacturing, status monitoring and optimization, and other testing and monitoring standards.

(8) Technological equipment standards mainly cover general technical standards on casting, forging, welding, heat treatment and special processing,

which are applied to the technical requirements of process and discrete manufacturing technological equipment; as well as data interface, status monitoring, and other interfaces and monitoring standards.

(9) Testing and inspection equipment standards mainly consist of general technical standards on data format, performance and environmental requirements of on-line detection system; integration standards on interconnection and interfaces between testing and inspection equipment and other production equipment and systems; as well as equipment management standards on effectiveness status detection and calibration, fault diagnosis, etc.

(10) Other standards mainly consist of general technical standards on data coding, data format, performance and environmental requirements for intelligent equipment, such as warehousing, logistics, packaging and printing; as well as interface and communication standards on information model, interconnection, interface specification, communication protocol and protocol consistency.

Key points of intelligent equipment standard construction
Sensors and instrumentation standards: general technical standards on reliability design and performance evaluation; interface and communication standards on information model, data interface and protocol consistency. **Automatic identification equipment standards**: general technical standards on data coding and performance evaluation; interface and communication standards on interface specification, fusion perception, and collaborative information processing. **Human-machine collaboration system standards:** text graphics and images standards on visual image acquisition and recognition; interactive collaboration standards on cooperation mode requirements, task assignment requirements, and human-computer interface. **Control system standards:** interface and communication standards on control equipment information model, system interconnection and protocol consistency; programming standards on engineering data exchange, control tag and data flow, and function block.

Additive manufacturing equipment standards: general technical standards on model data quality and processing requirements, data dictionary and coding requirements; interface standards on system and equipment information model, and communication protocol.

Industrial robot standards: general technical standards on data format and object dictionary; interface and communication standards among programming systems, users and industrial robots; collaboration standards between industrial robots and humans, environment, systems, and other equipment.

Numerical machine tool standards: general technical standards on language and format of machine tools and functional components and fault information dictionary; interfaces and collaborative standards on programming interface, physical mapping model and interconnection; as well as testing and monitoring standards on status monitoring and optimization.

Technological equipment standards: general technical standards, interface and monitoring standards on data interface, status monitoring, etc.

Testing and inspection equipment standards: general technical standards on data format, performance and environmental requirements of online detection system; integration standards on interconnection and interface; as well as equipment management standards on effectiveness status detection and calibration, fault diagnosis, etc.

Other standards: general technical standards on data coding, data format, performance and environmental requirements; interface and communication standards on information model, interconnection, interface specification, and protocol consistency.

2. Smart factory standards

Smart factory standards mainly consist of seven parts, namely smart factory design, smart factory delivery, intelligent design, intelligent production, intelligent management, intelligent logistics, and integration and optimization – as shown in Figure 6. The standards mainly specify the design and delivery processes of smart factory, as well as the design, production, management,

logistics and system integration in the factory.

BB Smart Factory	BBA Smart factory design	BBAA Overall planning
		BBAB Physical Virtual factory design
	BBB Smart factory delivery	BBBA Digital delivery
		BBBB Acceptance requirement
	BBC Intelligent design	BBCA Product design & simulation
		BBCB Technological design &simulation
		BBCC Test design & simulation
	BBD Intelligent production	BBDA Planning & scheduling
		BBDB Production execution
		BBDC Quality control
		BBDD Equipment operation and maintenance
	BBE Intelligent management	BBEA Procurement management
		BBEB Sales management
		BBEC Asset management
		BBED Energy management
		BBEE Safety management
		BBEF Environmental protection management
	BBF Intelligent logistics	BBFA Intelligent warehousing
		BBFB Intelligent distribution
	BBG Business integration & optimization	BBGA Integration requirement
		BBGB Optimization requirement

Figure 6 Smart factory standard subsystem

(1) Smart factory design standards mainly include the overall planning standards on the design requirements, design model, design verification, depth requirements of design files and collaborative design; as well as physical/virtual factory design standards on physical factory data acquisition, factory layout, virtual factory reference architecture, process flow and layout model, production process model and organization model, simulation analysis, and information interaction between physical factory and virtual factory.

(2) Smart factory delivery standards mainly include digital delivery standards on general requirements, content requirements and quality requirements of digital delivery in the design and implementation stages, as well as completion acceptance requirements of smart factory projects.

(3) Intelligent design standards mainly include product design and simulation standards on data-driven parametric modular design, model-based system engineering (MBSE) design, collaborative design and simulation, multi-field coupling simulation and optimization, and digital design of formula products; technological design and simulation standards based on manufacturing resource digital model; as well as test design and simulation standards on test methods, test data, and process management.

(4) Intelligent production standards mainly include the planning and dispatching standards on plan modeling and simulation, multi-level plan collaboration,

visual production scheduling, dynamic optimization and dispatching; production execution standards on automatic distribution and execution of operation files, design and manufacturing collaboration, dynamic organization of manufacturing resources, process simulation, production process control and optimization, exception management and error prevention mechanism, etc; quality control standards on intelligent online quality monitoring, early warning and optimization control, quality archives, and quality traceability; as well as standards on knowledge-based equipment operation status monitoring and optimization, maintenance, fault management, etc.

(5) Intelligent management standards mainly cover the procurement management standards on quality inspection and analysis of raw materials and accessories; sales management standards on sales forecast and customer service management; asset management standards on equipment health, reliability management and knowledge management; energy management standards on energy flow management and energy efficiency assessment; safety management standards on operation process control, emergency management and hazardous chemicals management; as well as environmental protection management standards on real-time monitoring, prediction, and early warning.

(6) Factory intelligent logistics standards mainly include intelligent warehousing standards on material status identification and information tracking, task assignment, dispatching and optimization, and functional requirements of warehousing system; intelligent distribution standards on material sorting, distribution path planning and management.

(7) Integration and optimization standards mainly include standards on software and hardware integration and on system solution integration services, to meet the needs of business activities in the factory; as well as standards on operation and control optimization, and data-driven whole life cycle business optimization.

Key points of smart factory standard construction
Smart factory design standards: overall planning standards on functional requirements

and collaborative design requirements of smart factory; standards on information interaction between physical factory and virtual factory.

Smart factory delivery standards: delivery standards on general requirements, content requirements and quality requirements for digital delivery in design and implementation stages, as well as completion acceptance standards for smart factory projects.

Intelligent design standards: product design and simulation standards based on data-driven parametric modular design, MBSE design, collaborative design and simulation, etc; technological design and simulation standards based on manufacturing resource digital model.

Intelligent production standards: planning and dispatching standards on plan modeling and simulation, multi-level planning collaboration, etc; production execution standards on design and manufacturing collaboration, dynamic organization of manufacturing resources, and production process control and optimization; quality control standards on online quality monitoring and early warning, quality archives, and quality traceability; as well as standards on knowledge-based equipment status monitoring and optimization, maintenance and fault management.

Integration and optimization standards: standards on software and hardware integration and on system solution integration services, to meet the needs of business activities in the factory; standards on operation and control optimization, and data-driven whole life cycle business optimization.

3. Intelligent supply chain standards

Intelligent supply chain standards mainly include four parts, namely supply chain data sharing, supply chain collaboration, supply chain risk management, and supply chain evaluation – as shown in Figure 7. These mainly specify the technical and management requirements for data, process and evaluation in the process of cooperation between upstream and downstream enterprises in the supply chain, guiding the design and development of the supply chain

management system and platform, and ensuring the horizontal integration and efficient collaboration of the supply chain.

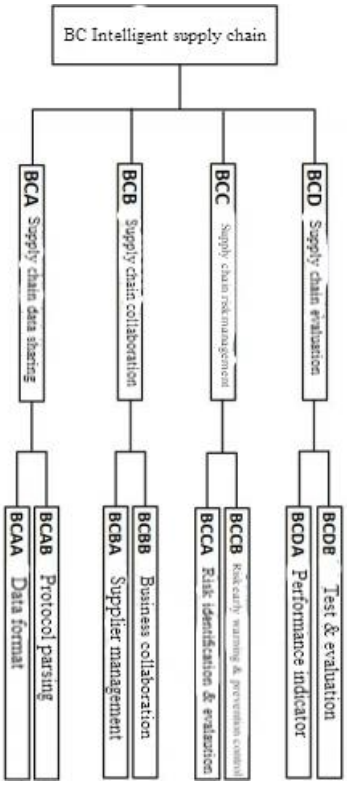

Figure 7 Intelligent supply chain standard subsystem

Supply chain data sharing standards mainly include standards on data format and protocol parsing of the upstream and downstream of the supply chain. Supply chain collaboration standards mainly include supplier management standards on supplier classification and performance evaluation, as well as business collaboration standards on design collaboration, production collaboration, logistics collaboration, sales collaboration and service collaboration of the upstream and downstream of the supply chain. Supply chain risk management standards mainly include standards on supply chain risk identification and evaluation, risk early warning and prevention control. Supply chain evaluation standards mainly include standards on supply chain performance indicator systems, and testing and evaluation methods.

Key points of intelligent supply chain standard construction

Supply chain data sharing standards: standards on data format, protocol parsing of the upstream and downstream of the supply chain.

Supply chain collaboration standards: standards on supplier classification, performance evaluation, design collaboration, production collaboration, logistics collaboration, sales

collaboration, service collaboration of the upstream and downstream of the supply chain.

Supply chain risk management standards: standards on risk identification and evaluation, risk early warning and prevention control of supply chain.

Supply chain evaluation standards: standards on supply chain performance indicator systems, and testing and evaluation methods.

4. Intelligent service standards

Intelligent service standards mainly include three parts, namely mass customization, operation and maintenance services, and networked collaborative manufacturing – as shown in Figure 8. These are mainly used to achieve the integration of products and services, the organic integration of decentralized manufacturing resources, as well as the high degree collaboration of their respective core competitiveness; they aim to solve the problem of comprehensive utilization of all kinds of internal and external resources of enterprises, providing all kinds of standardized and reliable new services.

BD Intelligent service	BDA Mass customization	BDAA General requirements
		BDAB Demand interaction requirement
		BDAC Design requirement
		BDAD Production requirement
	BDB Operation &maintenance service	BDBA General requirement
		BDBB Knowledge base
		BDBC Status monitoring
		BDBD Fault diagnosis
		BDBE Life prediction
		BDBF Operation & maintenance execution
	BDC Networked collaborative manufacturing	BDCA Overall architecture
		BDCB Platform techincal requirement
		BDCC Collaborative interaction procedure
		BDCD Resource model & Optimization Configuration
		BDCE Implementation guide

Figure 8 Intelligent service standard subsystem

Mass customization standards mainly include standards on general requirements, demand interaction requirements, design requirements, production requirements, evaluation and diagnosis. Operation and maintenance service standards mainly consist of standards on general requirements, knowledge base, status monitoring, fault diagnosis, life prediction, operation and maintenance execution. Networked collaborative manufacturing standards mainly include standards on the overall architecture, platform technical requirements, collaborative interaction process, resource model, and optimal

configuration and implementation guide.

Key points of intelligent service standard construction
Operation and maintenance service standards: standards on knowledge base, status monitoring, fault diagnosis, life prediction, and operation and maintenance execution. **Networked collaborative manufacturing standards**: standards on the overall architecture, platform technical requirements, collaborative interaction process, resource model, and optimal configuration and implementation guide.

5. Intelligent enabling technology standards

Intelligent enabling technology standards mainly include seven parts, namely artificial intelligence, industrial big data, industrial software, industrial cloud, edge computing, digital twin, and blockchain – as shown in Figure 9. These are mainly used to guide the integration and application of new technologies within the manufacturing industry, thus improving the intelligent level of the manufacturing industry.

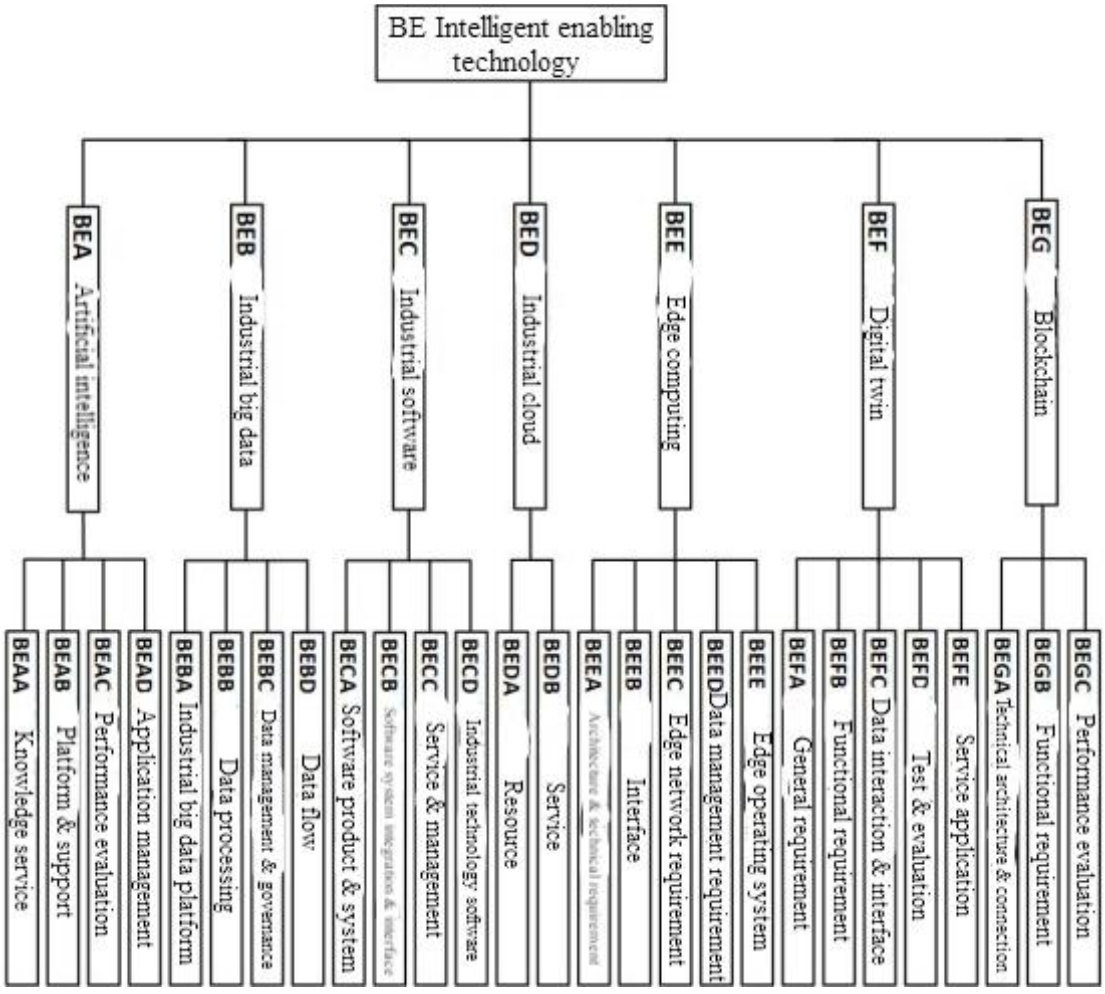

Figure 9 Intelligent enabling technology standard subsystem

(1) Artificial intelligence standards mainly include knowledge service standards on knowledge representation, knowledge modeling, knowledge fusion, and knowledge computing; platform and supporting standards on application platform architecture and integration requirements; performance evaluation standards on training data requirements, test guidelines and evaluation principles; as well as application management standards for whole life cycle of products for intelligent online detection and operation management and optimization.

(2) Industrial big data standards mainly include standards on the requirements, operation, maintenance, testing and evaluation of industrial big data platforms; data processing standards on industrial big data acquisition, pre-processing, analysis, visualization and access; data management and governance standards on data management systems, data resource management, data quality management, master data management, data management capability maturity, etc; as well as data traffic standards on data sharing inside the factory and data exchange outside the factory.

(3) Industrial software standards mainly consist of standards on the definition of functions, business models, quality requirements and maturity requirements of software products, tools, embedded software, systems and platforms; software integration and interface standards on industrial software interface specifications, integration procedures and product line engineering; service and management standards on life cycle management, quality management, asset management, configuration management and reliability requirements; as well as industrial technology software standards on industrial technology software reference architecture and industrial application software packaging.

(4) Industrial cloud standards mainly include standards on platform construction, application, access, configuration and management of industrial cloud resources and service capabilities; as well as service standards on implementation guide, capability evaluation, and effect evaluation.

(5) Edge computing standards mainly include standards on architecture and technical requirements, interface, edge network requirements, data

management requirements and edge operating systems.

(6) Digital twin standards mainly include general requirement standards on reference architecture and information models; functional requirement standards for different system levels; data interaction and interface standards for integration and collaboration between digital twin systems; test and evaluation standards on performance evaluation and conformance test; as well as digital twin service application standards for different manufacturing scenarios.

(7) Blockchain standards mainly include standards on architecture and technical requirements, interface standards, and trusted data connection; functional requirement standards on trusted digital identity, trusted edge computing, industrial distributed ledger, trusted event extraction, and smart contract; as well as performance evaluation standards.

Key points of intelligent enabling technology standard construction
Artificial intelligence standards: knowledge service standards for whole life cycle of products for intelligent online detection and operation management and optimization, performance evaluation standards, platform and supporting standards. **Edge computing standards**: standards on architecture and technical requirements, interfaces, edge network requirements, data management requirements, and edge operating systems. **Digital twin standards**: standards on general requirements, reference architecture, data interaction and interface, and service application. **Blockchain standards**: standards on trusted digital identity, trusted data connection, trusted edge computing, industrial distributed ledger, trusted event extraction, smart contract, architecture and technical requirements, interfaces, performance evaluation, etc.

6. Industrial network standards

Industrial network standards mainly include four parts, namely industrial wireless network, industrial wired network, industrial network convergence, and industrial network resource management – as shown in Figure 10. These are mainly used to meet the needs of low latency and high reliability within and between different system levels of the factory, to realize the networking between different levels and heterogeneous networks under the industrial network architecture, and to regulate the use of network address, service quality, wireless spectrum and network operation management.

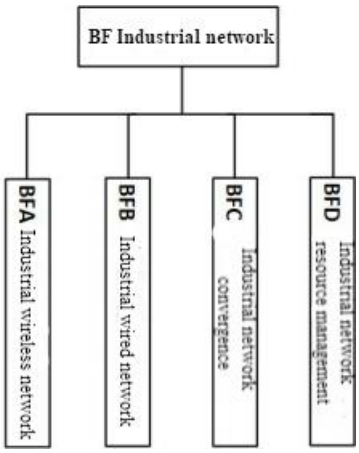

Figure 10 Industrial network standard subsystem

Industrial wireless network standards mainly include standards on industrial wireless fidelity (WiFi), wireless highway addressable remote transducer (WirelessHART), wireless network for industrial factory automation/industrial automation process automation (WIA-FA/PA), narrow-band Internet of things (NB-IoT), 5G application, etc. Industrial wired network standards mainly include standards on fieldbus, industrial Ethernet, industrial passive optical network (PON), and industrial generic cabling. Industrial network convergence standards mainly include standards on deterministic networking (DetNet), information technology/operational technology (IT/OT) convergence, and interconnection between heterogeneous networks. Industrial network resource management standards mainly include standards on network management, network address management, network spectrum management, and software defined network (SDN).

Key points of industrial network standard construction
Industrial wireless network standards: 5G application and other standards. **Industrial network convergence standards**: standards on IT/OT convergence, interconnection between heterogeneous networks. **Industrial network resource management standards**: standards on network management, network address management, network spectrum management, and SDN.

(3) Industry application standards

The objectives of industry application standards are to: give full play to the guiding and supporting role of basic general standards and key technology standards in the formulation of industry application standards; pay attention to the coordination between sectoral standards and national standards; to prioritize the promotion of the intelligent manufacturing standards system within relevant industries which possess good foundations for intelligent manufacturing standardization – such as shipbuilding and ocean engineering, building materials, petrochemicals, textile, steel, rail transit, aerospace, automobile, nonferrous metal, electronic information, power equipment and others; and to analyze the key directions of intelligent manufacturing standardization in the light industry, food industry, electronics, agricultural machinery, engineering machinery, nuclear energy, civil explosives, etc. The industry application standard subsystem is shown in Figure 11.

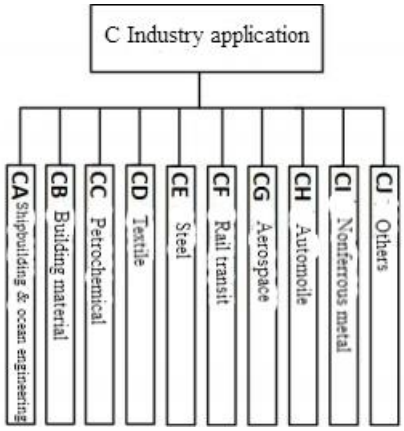

Figure 11 Industry application standard subsystem

1. Shipbuilding and ocean engineering industry

Technical requirements for 5G application shall be formulated with a focus on ship assembly and construction, and according to the characteristics of multi-variety, small batch and customization of shipbuilding and ocean engineering equipment manufacturing, also considering the application requirements of 5G and other digital new infrastructure, standards on coding, and data dictionary. The specifications or standards on information system interface, overall planning of production line and product collaborative design, shall be formulated with the focus on the construction of intelligent shipyards.

2. Building material industry

In view of the characteristics of multiple subdivided segments and obvious technological differences in building material industry, smart factory specifications or procedures shall be formulated on factory design, technological simulation, quality control and warehousing management, with particular focus on the fields of cement, glass, ceramics, glass fiber, concrete, bricks and tiles, wall materials and mines. Guiding standards shall be formulated on 5G-based equipment inspection, artificial intelligence-based defect detection, industrial cloud-based supply chain collaboration, and remote equipment operation and maintenance.

3. Petrochemical Industry

Smart factory design specifications on smart factory information model shall be formulated, in light of the high safety risks, high actual control requirements, high energy consumption and high requirements for environmental protection in petrochemical industry. New technology application specifications or procedures shall be formulated on technological pre-warning, site personnel positioning, equipment health, operation alarm. Standards of application guidelines on equipment remote operation and maintenance shall also be formulated.

4. Textile industry

In view of the characteristics of overall discrete and partial process manufacturing of the textile industry, specifications or guidelines for interconnection, information model, remote operation and maintenance technical requirements of special equipment shall be formulated, with a focus on the fields of spinning, chemical fiber, weaving, non-woven, printing and dyeing, clothing and home textile. Specifications or procedures on data, logistics storage and system integration in the process of digital workshop or smart factory construction shall also be formulated, together with new model application specifications or guidelines such as mass customization.

5. Steel industry

Due to the characteristics of continuous process, complex technological systems and diversified intermediate state of products involved in steel production, the specifications on 5G application, unmanned driving and special robot application shall be formulated, with a focus on the application of intelligent technology in production scenario. The standards on factory design, digital delivery and digital twin model shall be formulated, with a focus on construction of smart factory. Specifications on quality, logistics, energy, environmental protection, equipment and global optimization of supply chain shall be formulated, with a focus on production intelligent management.

6. Rail transit industry

In view of the characteristics of multi-variety, small batch, laying equal stress on manufacturing, operation, maintenance and customization of the rail transit industry, the key technology standards shall be formulated on intelligent equipment inspection and certification, three-dimensional model application specification, industrial robot interface and technological requirements, with a focus on typical business scenarios in smart factory construction of welding, grinding, assembly and debugging and logistics. The application standards on intelligent manufacturing project implementation guide and remote operation and maintenance for G-series high-speed trains shall also be formulated.

7. Aerospace

In light of the characteristics of multi-variety, small batch, model-based development mode and multi-party collaboration of design and manufacturing of the aerospace industry, the standards on model-based digital design, cloud based collaborative design platform, virtual simulation of production line and environmental monitoring for complex technology shall be formulated, with a focus on the construction or upgrading of smart factory and digital workshop. The application standards on production process status prediction and optimization based on industrial big data shall also be formulated.

8. Automobile industry

In view of the characteristics of strong technology intensity, numerous components and parts, long industrial chain, multiple subdivided models and complex production process of the automobile industry, standards on R&D of automobile products, test verification, production line manufacturing and integration based on digital twin shall be formulated, with a focus on the application of intelligent enabling technologies within new energy vehicles, traditional fuel vehicles painting, welding and final assembly. Application guides on R&D, production and marketing for automobile mass customization shall also be formulated.

9. Nonferrous metal industry

In view of the characteristics of high safety requirements, huge difference in raw material quality, complex technology, multi-variety and small batch and frequent logistics scheduling in nonferrous metal industry, standards on information coding, information interaction and operation status management shall be formulated, with a focus on special intelligent equipment, smelting and production processes. Application guides on smart factory design, construction and production process monitoring shall also be formulated.

10. Eletronic information industry

In view of the characteristic of high technical complexity, rapid product iteration, multi-species and small batch, product personalization and customization needs growth, standards on electronic information materials, components, information and communication products and systems and other areas of production and processing shall be formulated, with a focus on dedicated intelligent equipment and systems of information models, interconnection requirements and other standard specifications. Guidelines standards and system integration specifications on flexible production lines, digital workshops, intelligent factory construction shall be formulated. Guidelines standards on personalized customization and other new modes of application shall also be formulated.

11. Power equipment

In view of the characteristic of product variety, personalized customization and operation and maintenance needs, smart factory construction guidelines standards and system integration specifications shall be formulated, with a focus on smart grid customer side and electric motors and other areas. Implementation guidelines standards on digital simulation of the manufacturing process (processing process, production planning and layout, logistics simulation), digital processing of resources, digital process control, digital collaborative manufacturing, remote operation and maintenance of equipment, customization, smart manufacturing capability assessment shall also be formulated.

12. Others

Standards on the interconnection and online detection for special technological equipment shall be formulated for the light industry, with a focus on leather, primary battery and washing products. Mass customization guides for home appliances and furniture shall also be developed. Standards on smart factory design, brewing and filling, technological decision-making, remote operation and maintenance, and identification resolution, shall be formulated for the food industry, with a focus on dairy beverage, wine making, frozen food, and canned food. Design requirements based on digital twin, and implementation guides for mass customization, shall be formulated for the electronic industry. Standards on mass customization design, intelligent operation and maintenance services and monitoring, shall be developed for agricultural machinery and engineering machinery. Standards on flexible printing technological design and information exchange between systems shall be developed for the printing industry. Data-driven intelligent production standards shall be formulated for the nuclear energy industry. Finaly, standards on key technological equipment status monitoring, operation and maintenance requirements shall be formulated for the civil explosive industry.

5. Organization and Implementation

To strengthen overall planning and coordination. To give full play to the role of the National Intelligent Manufacturing Standardization Coordination and Promotion Group, General Group and Expert Group, and carry out the construction and planning of the intelligent manufacturing standards system under the joint guidance of the Ministry of Industry and Information Technology and the Standardization Administration of China. To make full use of the inter-ministerial and inter-committee cooperation mechanisms, gather together all kinds of standardization resources, and solidly build an advanced and applicable intelligent manufacturing standards system, in order to meet the needs of industrial development.

To speed up standard research and development. To improve the green channel of intelligent manufacturing standards, and accelerate the formulation

of national and sectoral standards on the basis of the principle of "generality and urgency first". To promote the establishment of standard test verification platforms and public service platforms, and provide technical support and safeguard to the formulation and implementation of standards.

To strengthen dissemination and training on implementation. To give full play to the role of local authorities, industry associations and societies, further strengthen the training, dissemination and implementation of standards, promote the dissemination and implementation of standards through online and offline means such as training and consultation, and guide the industry to realize intelligent transformation with standards.

To conduct dynamic adjustment. To revise the *Guidelines for the Construction of the National Intelligent Manufacturing Standards System* every two years, in order to continuously improve the national intelligent manufacturing standards system, strengthen the coordination and convergence of standards at all levels, and continuously promote the formulation and revision of standards. These efforts must keep pace with the continuous improvement of the overall level of development of intelligent manufacturing, and with the level of awareness of the industry, and must take into account the different stages of the development of intelligent manufacturing,

To strengthen international exchanges and cooperation. To strengthen exchanges and cooperation with international standardization organizations, regularly hold international fora on intelligent manufacturing standardization, and organize exchanges and cooperation between Chinese enterprises, their foreign counterparts, and foreign standardization organizations. To actively promote the research results of China's intelligent manufacturing standardization to the international standardization organizations, through participation in the standardization activities of ISO, IEC and other relevant international standardization organizations.

Appendix 1: Terms and abbreviations related to intelligent manufacturing

5G: the 5th Generation mobile communication technology

AR: Augmented Reality

DetNet: Deterministic Networking

IEC: International Electrotechnical Committee

ISO: International Organization for Standardization

IT: Information Technology

NB-IoT: Narrow Band Internet of Things

OPC UA: OPC Unified Architecture

OT: Operational Technology

PON: Passive Optical Network

SDN: Software Defined Network

VR: Virtual Reality

WIFI: Wireless Fidelity

WirelessHART: Wireless Highway Addressable Remote Transducer

WIA-FA: Wireless Network for Industrial Factory Automation

WIA-PA: Wireless Networks for Industrial Automation Process Automation

Appendix 2: Intelligent Manufacturing System Architecture Mapping

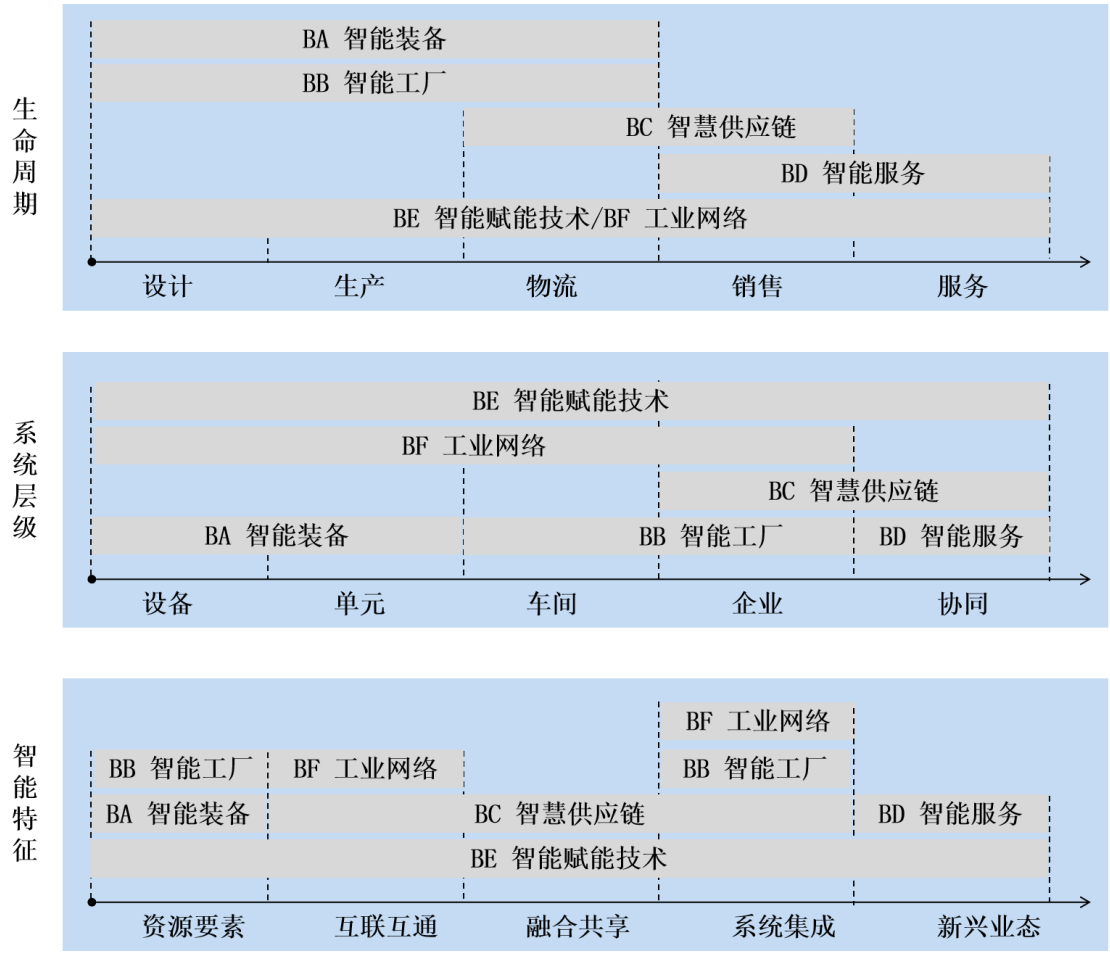

Figure 12 Intelligent manufacturing system architecture dimensions and intelligent manufacturing standard architecture mapping

Figure 12 shows the mapping relationship between the three dimensions of the intelligent manufacturing system architecture and the intelligent manufacturing standard system through a specific mapping diagram. As the A basic commonality and C industry application in the intelligent manufacturing standard system structure involve the whole intelligent manufacturing system architecture, the mapping diagram has mapped the B key technologies separately.

The B key technologies include BA smart equipment, BB smart factory, BC

smart supply chain, BD smart service, BE smart enabling technology, BF industrial network six categories of standards. BA intelligent equipment mainly corresponds to the design, production and logistics of life cycle dimension, equipment and units of system level dimension, and resource elements of intelligent feature dimension; BB intelligent factory mainly corresponds to the design, production and logistics of life cycle dimension, workshop and enterprise of system level dimension, and resource elements and system integration of intelligent feature dimension; BC intelligent supply chain mainly corresponds to the life cycle dimension of materials and sales, enterprise and collaboration of the system level dimension, and interconnection, integration and system integration of the intelligent characteristics dimension; BD intelligent services mainly corresponds to sales and services of the life cycle dimension, collaboration of the system level dimension, and emerging business of the intelligent characteristics dimension; BE intelligent enabling technology mainly corresponds to the whole process of the life cycle dimension, enterprise and collaboration of the system level dimension, and all links of the intelligent characteristics dimension. BF industrial network mainly corresponds to the whole process of life cycle dimension, equipment, unit, workshop and enterprise of system level dimension, and interconnection and system integration of intelligent characteristic dimension.

Appendix 3: Basic general standards and key technical standards of intelligent manufacturing

Total No.	Sub No.	Standard Name	Standard Number/Plan Number	Corresponding International Standard Number	International Standard Organization	Status
A Basic general standards						
AA Generality						
1	1	Information technology - Vocabulary	GB/T 5271	ISO/IEC 2382		Published
2	2	Information technology -Terminology for embedded systems	GB/T 22033-2008			Published
3	3	Information technology - Cloud computing - Overview and vocabulary	GB/T 32400-2015	ISO/IEC 17789:2014		Published
4	4	Internet of things - Terminology	GB/T 33745-2017			Published
5	5	Information technology - Sensor networks - Part 2: Terminology	GB/T 30269.2-2013			Published
6	6	Intelligent sensor - Part 3: Terminology	GB/T 33905.3-		IEC TC65	Published
7	7	Digital factory - Terms and definitions	GB/T 37413-2019			Published
8	8	Industrial-process measurement and control - Terms and definitions	GB/T 17212-1998			Published
9	9	Process detection and control flow chart - Symbols and letter codes	GB/T 2625-1981			Published
10	10	Technical product documentation - Requirements for computer aided design and drafting - Vocabulary	GB/T 15751-1995	ISO/TR 10623-1992	ISO	Published
11	11	Manufacturing information - Technical terminology	GB/T 18725-2008			Published
12	12	Networked manufacturing - Technical terminology	GB/T 25486-2010			Published
13	13	Robots and robotic devices - Vocabulary	GBT 12643-2013			Published

14	14	Automation systems and integration - Key performance indicators (KPIs) for manufacturing operations management - Part 1: Overview, concepts and terminology	GB/T 34044.1-2019			Published

15	15	Industrial automation systems and integration - Integration of advanced process control and optimization software for manufacturing systems - Part 1: Overview, concepts and terminologies	GB/T 32854.1-2016			Published
16	16	Additive manufacturing - Terminology	GB/T 35351-2017	ISO 17296-1:2014	ASTM	Published
17	17	Internet of things - Collaborative information processing reference model	GB/T 37684-2019			Published
18	18	Information technology - Open systems interconnection - Basic reference model (All parts)	GB/T 9387	ISO/IEC 7498		Published
19	19	Information technology - Cloud computing - Reference architecture	GB/T 32399-2015	ISO/IEC 17788:2014		Published
20	20	Industrial-process measurement, control and automation - Reference model for representation of production facilities (digital factory)	GB/Z 32235-2015	IEC/TR 62794:2012	IEC TC65	Published
21	21	Batch control Part 1: Models and Terminology	GB/T 19892.1-2005	IEC 61512-1:1997	IEC SC65A	Published
22	22	Batch Control Part 2: Data Structures and Language Guide	GB/T 19892.2-2007	IEC 61512-2:2001	IEC SC65A	Published
23	23	Enterprise-control system integration - Part 1: Models and terminology	GB/T 20720.1-2019	IEC 62264-1:2013		Published
24	24	Integrated model for networked manufacturing system	GB/T 25488-2010			Published
25	25	Supply chain management business reference model	GB/T 25103-2010			Published
26	26	Reference model for business group operations management	GB/T 35133-2017			Published
27	27	Information technology - Metadata registries (MDR)	GB/T 18391.1~18391.6	ISO/IEC 11179	ISO/IEC JTC1 SC32	Published
28	28	Information technology - Procedures for achieving metadata registry content consistency	GB/T 23824	ISO/IEC TR 20943	ISO/IEC JTC1 SC32	Published

29	29	Industrial-process measurement and control - Data structures and elements in process equipment catalogues (All parts)	GB/T 20818	IEC 61987	IEC SC65E	Published
30	30	Principles and methods for data dictionary technology of supporting modularity design	GB/T 30438-2013			Published
31	31	The rules of constitute hierarchy for product data dictionary of general mechanical parts and	GB/T 24467-2009			Published
32	32	Maintenance specification for product data dictionary	GB/T 28040-2011			Published
33	33	Intelligent manufacturing - Object identification requirements	GB/T 37695-2019			Published
34	34	Intelligent manufacturing - Radio frequency identification system - General technical requirements	GB/T 38668-2020			Published
35	35	Intelligent manufacturing - Radio frequency identification system - Tag data format	GB/T 38670-2020			Published
36	36	Information technology - Open systems interconnection - Procedures for the operation of OSI registration authorities - Part 1: General procedures and top arcs of the international object identifier tree	GB/T 17969.1-2015	ISO/IEC 9834-1:2008		Published
37	37	Information technology - Open systems interconnection - National numbering system and operation code for object identifier(OID)	GB/T 26231-2017			Published
38	38	Information technology - Open systems interconnection - Procedures for the object identifier resolution system operational agency	GB/T 35300-2017			Published
39	39	Information technology - Open systems interconnection - Object identifier resolution system	GB/T 35299-2017	ISO/IEC 29168-1:2011		Published
40	40	Identifier protocol for instrument of industrial internet of things	GB/T 33901-2017			Published

41	41	Information Technology -Artificial intelligence - Terminology	20190851-T-469			Under development
42	42	Industrial communication networks - Network and system security - Terminology, concepts and models	GB/T 40211-2021	IEC 62443-1-1	IEC TC65	Published
43	43	Intelligent manufacturing - System architecture	20173704-T-604			Under development
44	44	General metadata for fundamental part and component	20194013-T-604			Under development
45	45	General metadata for fundamental manufacturing process	20194012-T-604			Under development
46	46	Intelligent manufacturing - Application guideline for identification resolution system of manufacturing	20173805-T-339			Under development
47	47	Intelligent manufacturing - Interoperability function requirements of heterogeneous system based on OID	20182051-T-339			Under development
48	48	Intelligent manufacturing - Identification and resolution system requirements	20170054-T-339			Under development
49	49	Intelligent manufacturing - Object identifier resolution system - Specification for matching test				To be established
AB Safety						
50	1	Safety requirements for industrial automation products (All parts)	GB 30439			Published
51	2	Robots for industrial environments - Safety requirements - Part 1: Robot	GB 11291.1-2011			Published
52	3	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and	GB 11291.2-2013			Published
53	4	Smart factory - Safety and security control	GB/T 38129-2019			Published
54	5	Functional safety of electrical/electronic/programmable electronic safety-	GB/T 20438			Published

55	6	Evaluation specification for security in industrial control network	GB/T 26333-2010			Published
56	7	Functional safety - Safety instrumented systems for the process industry sector	GB/T 21109.1~21109.3	IEC 61511	IEC SC65A	Published
57	8	Control and communication network CIP Safety specification	GB/Z 34066-2017	IEC 61784-3	IEC SC65C	Published
58	9	Control and communication network - Safety-over-EtherCAT specification	GB/T 36006-2018	IEC 61784-3	IEC SC65C	Published
59	10	Industrial control system security	GB/T 30976.1~30976.2			Published
60	11	Industrial communication networks - Network and system security - Establishing an industrial automation and control system security program	GB/T 33007-2016	IEC 62443-2-1:2010	IEC TC65	Published
61	12	Industrial automation and control system security - Distributed control system (DCS) (All parts)	GB/T 33009			Published
62	13	Industrial automation and control system security - Programmable logic controller (PLC) - Part 1: System requirements	GB/T 33008.1-2016			Published
63	14	Information security technology - Implementation guide to risk assessment of industrial control systems	GB/T 36466-2018			Published
64	15	Information security technology - Security management fundamental requirements for industrial	GB/T 36323-2018			Published
65	16	Information security technology - Information security classification specifications of industrial control	GB/T 36324-2018			Published
66	17	Information security technology - Common security functional requirements for data acquisition and control field devices of industrial control systems	GB/T 36470-2018			Published
67	18	Information security technology - Security requirements and evaluation approaches for industrial control network monitor	GB/T 37953-2019			Published

68	19	Information security technology - Common criteria for industrial control system products security	GB/T 37962-2019			Published
69	20	Information security technology - Technique requirements and testing and evaluation approaches for industrial control system vulnerability detection products	GB/T 37954-2019			Published
70	21	Information security technology - Guide for security inspection of industrial control systems	GB/T 37980-2019			Published
71	22	Information security technology - Security technical requirements of industrial control system network audit	GB/T 37941-2019			Published
72	23	Information security technology - Security technical requirements of industrial control system security	GB/T 37934-2019			Published
73	24	Information security technology - Technical	GB/T 37933-2019			Published
74	25	Information security technology - Application guide to	GB/T 32919-2016			Published
75	26	Information security technology - Security technique	GB/T 37955-2019			Published
76	27	Smart factory - The effectiveness assessment methods	20173706-T-604			Under
77	28	Functional safety requirement of digital workshop	20184669-T-604			Under
78	29	Security requirement of digital workshop	20184671-T-604			Under
79	30	Security for industrial automation and control system - Security program requirements for IACS service	20173709-T-604			Under development
80	31	Endogenous safety architecture of programmable	20194002-T-604			Under

81	32	Information security general requirement for control	20184686-T-604			Under
82	33	Industrial control system dynamic reconfiguration	20190644-T-604			Under
83	34	Information security technology - Guidelines of cyber	20121629-T-524			Under
84	35	Information security technology - Information system classified protection - Technical requirements of	20171111-T-469			Under development
85	36	Information security technology - Security protection technical requirements and testing evaluation methods	20171744-T-469			Under development
86	37	Information security technology - Implementation guide for the construction of information security protection in	20173583-T-469			Under development
87	38	Security requirements for industrial control system products Part 2: Security functional requirements	20171279-T-469			Under development
88	39	Security requirements for industrial control system products Part 3: Security Assurance requirements	20171280-T-469			Under development
89	40	Smart factory security integration - Part 1: General requirements				To be established
90	41	Smart factory security integration - Part 2: Risk assessment requirements				To be established
91	42	Smart factory security integration - Part 3: System collaborative design requirements				To be established

92	43	Smart factory security integration - Part 4: System evaluation requirements				To be established
93	44	Security integrity assessment specification for collaborative manufacturing platform				To be established
94	45	Intelligent manufacturing - Process industry information security protection requirements				To be established
AC Reliability						
95	1	Handbook of reliability prediction model and data for electronic equipment Intelligent Manufacturing Basic Common Criteria and Key Technology Standards	GB/T 37963-2019			Published
96	2	Guidance on system dependability specifications	GB/T 37079-2018	IEC 62308:2006	IEC/TC56	Published
97	3	Equipment reliability -Reliability assessment methods	GB/T 37079-2018	IEC 62308:2006	IEC/TC56	Published
98	4	Analysis techniques for system reliability - Procedure for failure mode and effects analysis(FMEA)	GB/T 7826	IEC 60812:2018	IEC/TC56	Published
99	5	Electrical equipment for measurement, control and laboratory use - EMC requirements	GB/T 18268	IEC 61326	IEC SC65A	Published
100	6	General technology for internet of things - Reliability design method and review for intelligent sensor	GB/T 34071-2017			Published
101	7	General requirement for the reliability of digital workshop	20184406-T-604			Under development
AD Testing						
102	1	Intelligent manufacturing - Online detection system based on machine vision - General requirements	20182048-T-339			Under development
103	2	Information technology - Open systems interconnection - Methods for testing and specification(MTS) - The testing and test control notation - Version 3 - Part 4: TTCN-3 operational semantics	GB/T 26857.4-2018			Published

104	3	Modbus test specification	GB/T 25919.1~.2-2010			Published
105	4	Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)	GB/T 25928-2010	IEC 62381	IEC SC65E	Published
106	5	Information technology - Open systems interconnection - Conformance testing methodology and framework	GB/T 17178.1~17178.7	ISO/IEC 9646		Published

107	6	General methods for testing the performance of industrial process measurement and control	GB/T 29247-2012			Published
108	7	Process measurement and control devices - General methods and procedures for evaluating performance	GB/T 18271.1~18271.4	IEC 61298	IEC SC65B	Published
109	8	Intelligent sensor - Part 4: Methods of performance evaluation	GB/T 33905.4-2017			Published
110	9	Evaluating method of programmable controllers' performance	GB/T 36009-2018			Published
AE Evaluation						
111	1	Maturity model of intelligent manufacturing capability	GB/T 39116-2020			Published
112	2	Maturity assessment method of intelligent manufacturing capability	GB/T 39117-2020			Published
113	3	Industrial-process measurement and control - Evaluation of system properties for the purpose of	GB/T 18272.1~18272.8	IEC 61069	IEC SC65A	Published
114	4	Information technology -Evaluation indicators for data quality	GB/T 36344-2018			Published
115	5	Evaluation system for manufacturing informatization	GB/T 31131-2014			Published
116	6	Industrial robot life cycle risk assessment methods	GB/T 38642-2020			Published
117	7	Industrial robot - Life cycle impact on environment evaluation method	GB/T 38835-2020			Published
118	8	Applying guidance on intelligent manufacturing capability for discrete industry	20182050-T-339			Under development
119	9	Applying guidance on intelligent manufacturing capability for process industry	20182049-T-339			Under development
120	10	The evaluation method of energy efficiency on discrete manufacturing	20181940-T-604			Under development

121	11	The code of effectiveness evaluation and functional safety assessment to fire, combustible gas, and toxic gas system in process industry	20184400-T-604			Under development
122	12	Smart Manufacturing Evaluation Index	20202787-T-469			Under development
123	13	Intelligent manufacturing - Specification for information security protection evaluation in process				To be established
124	14	General Rules for Smart Factory Evaluation				To be established
AF People capability						
125	1	Intelligent manufacturing - Capability requirements for practitioners				To be established
126	2	Intelligent manufacturing - Requirements for capability evaluation of practitioners				To be established
B Key technology						
BA Intelligent equipment						
127	1	Specification of programming interface for Chinese speech recognition internet service	GB/T 34083-2017			Published
128	2	Specification of programming interface for Chinese speech synthesis internet service	GB/T 34145-2017			Published
129	3	Specification of programming interface for Chinese speech recognition terminal service	GB/T 35312-2017			Published
130	4	Interface specification for sensor-based product monitoring software integration	GB/T 33137-2016			Published
131	5	Information technology - Radio frequency identification - Air interface protocol at 800/900 MHz	GB/T 29768-2013			Published

132	6	Information technology - Radio frequency identification - Air interface protocol at 2.45 GHz	GB/T 28925-2012			Published
133	7	Information technology - Radio frequency identification - Conformance test methods for air	GB/T 28926-2012			Published
134	8	Intelligent sensor - Part 1: General rules	GB/T 33905.1-2017			Published
135	9	Intelligent sensor - Part 5: Methods for inspection and routine testing	GB/T 33905.5-2017			Published
136	10	General technology of internet of things - Specification of intelligent sensor interface	GB/T 34068-2017			Published
137	11	General technology of internet of things - Characteristic and classification of intelligent sensor	GB/T 34069-2017			Published
138	12	Field device tool (FDT) interface specification (All	GB/T 29618	IEC 62453	IEC SC65E	Published
139	13	Interoperation guide for field device tool (FDT)/device type manager (DTM) and electronic device description language (EDDL)	GB/T 34076-2017			Published
140	14	Industrial-process measurement and control - Data structures and elements in process equipment catalogues (All parts)	GB/T 20818	IEC 61987	IEC SC65E	Published
141	15	Interface specification between automatic frequency identification technology and ERP, MES, CRM system	GB/T 35123-2017			Published
142	16	Intelligent manufacturing - Human-computer interaction system - Technological requirements of	GB/Z 38623-2020			Published
143	17	Programmable controllers (All parts)	GB/T 15969	IEC 61131	IEC SC65B	Published
144	18	Higher performance protocol for the standard digital interface for programmable instrumentation	GB/T 15946-2008	IEC 60488	IEC SC65C	Published
145	19	Sampling check and routine test method for programmable controller	GB/T 36011-2018			Published

146	20	Intelligent measuring and control device in full-distributed industrial control system - Part 1: General technical requirements	GB/T 36211.1-2018			Published
147	21	Intelligent measuring and control device in full-distributed industrial control system - Part 2: Communication interoperability test specification	GB/T 36211.2-2018			Published
148	22	Technical specification for remote terminal unit (RTU)	GB/T 34039-2017			Published
149	23	Interoperating protocol for instrument of industrial internet of things	GB/T 33899-2017			Published
150	24	Application attribute protocol for instrument of industrial internet of things	GB/T 33900-2017			Published
151	25	Service protocol for instrument of industrial internet of things	GB/T 33904-2017			Published
152	26	Data description of smart instrumentation - Positioners	GB/T 38845-2020			Published
153	27	Data description of smart instrumentation - Actuators	GB/T 38843-2020			Published
154	28	Additive manufacturing - File format	GB/T 35352-2017	ISO/ASTM 52915:2013	ISO&ASTM	Published
155	29	Additive manufacturing - Design - Requirements, guidelines and recommendations	GB/T 37698-2019	ISO/ASTM DIS 20195	ISO&ASTM	Published
156	30	Additive manufacturing - Specification for cloud service platform mode	GB/T 37461-2019			Published
157	31	The interface of robot simulation environment	GB/T 33267-2016			Published

158	32	Framework of real-time robot operating system on multi-core processor	GB/T 33264-2016			Published
159	33	Robot general bus communication protocol	GB/T 29825-2013			Published
160	34	Robot controller open communication interface profile	GB/T 32197-2015			Published
161	35	General high-speed communication bus performance for modular robot	GB/T 33266-2016			Published
162	36	Interface of universal driver module for industrial	GB/T 38560-2020			Published
163	37	General technical requirements of flexible control for industrial robots	GB/T 38839-2020			Published
164	38	Evaluation and testing of performance of industrial robot control system	GB/T 39360-2020			Published
165	39	Mechanical environment reliability requirements and test methods for industrial robots	GB/T 39266-2020			Published
166	40	The data exchange of cloud service platform for industrial robot	GB/T 39401-2020			Published
167	41	General technical requirements of vision integrated system for industrial robots	GB/T 39005-2020			Published
168	42	Industrial robot electromagnetic compatibility design specification	GB/T 39004-2020			Published
169	43	Specification of XML exchange of PLC-based software development platform for industrial robots	GB/T 39406-2020			Published
170	44	Design specification of collaborative industrial robot	GB/T 39402-2020			Published
171	45	General specifications of automatic guided vehicles	GB/T 20721-2006			Published
172	46	Data interface for software of rapid prototyping	GB/T 25632-2010			Published
173	47	Interconnection and interoperation of numerical control equipment (All parts)	GB/T 39561			Published
174	48	Specification for internet of things for analytical instruments	GB/T 38113-2019			Published

175	49	Industrial robot and production environment communication architecture	GB/T 38872-2020			Published
176	50	Data description of intelligent instruments - General requirements of properties database	GB/T 40216-2021			Published
177	51	Reference system of cloud service platform for additive manufacturing technology	GB/T 40210-2021			Published
178	52	The classification and reference architecture of cloud service platform for industrial robot	GB/T 40212-2021			Published
179	53	Intelligent manufacturing-Radio frequency identification system-Performance test specification for UHF RFID systems	20202904-T-469			Under development
180	54	Intelligent manufacturing - Radio frequency identification system-Application programming interface(API) for UHF readers	20202791-T-469			Under development
181	55	Field device integration - EDD and OPC UA integration technology specification	20192998-T-604			Under development
182	56	Industrial-process measurement and control - Data structures and elements in process equipment catalogues - Part 13: Lists of properties (LOP) for pressure measuring equipment for electronic data exchange	20204687-T-604	IEC 61987	IEC SC65E	Under development
183	57	Industrial-process measurement and control - Data structures and elements in process equipment catalogues - Part 14: Lists of properties (LOP) for temperature measuring equipment for electronic data exchange	20204686-T-604	IEC 61987	IEC SC65E	Under development
184	58	Field device integration - General requirement	20184172-T-604			Under development
185	59	Field device integration - Client	20184171-T-604			Under development
186	60	Field device integration - Server	20184170-T-604			Under development

187	61	Service for intelligent manufacturing system integration - General requirements	20202872-T-339			Under development
188	62	Programmable controllers - Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)	20171654-T-604			Under development
189	63	Additive manufacturing - Overview of data processing	20180182-T-604	ISO 17296-4:2014	ISO	Under development
190	64	Test methods of guided motion performance for wheeled mobile robot	20184682-T-604			Under development
191	65	Communication architecture of industrial robot and production environment	20184685-T-604			Under development
192	66	Logistics robot -Interface technical specification	20202627-T-604			Under development
193	67	Remote operation and maintenance of CNC Machine Tools - Part 1: General Requirements	20203870-T-604			Under development
194	68	Field device integration -Part 5： Information model				To be established
195	69	AR-based human-robot collaboration system - General requirements				To be established
196	70	Additive manufacturing - Specification for process parameter database construction				To be established
197	71	Field Device Integration (FDI) - Part 6: FDI Technology Mapping				To be established
198	72	Field Device Integration(FDI) - Part 7: Profiles - FDI Communication Devices				To be established
199	73	Field Device Integration(FDI) - Part 8: Profiles - FDI Communication Devices H1				To be established
200	74	Field Device Integration(FDI) - Part 9: Profiles - Foundation Fieldbus HSE				To be established

201	75	Field Device Integration（FDI）– Part 10: Profiles – PROFIBUS				To be established
202	76	Fieid Device Integration(FDI) - Part 11： Profiles - PROFINET				To be established
203	77	Field Device Integration（FDI）- Part 12: Profiles- HART and Wireless HART				To be established
BB Smart factory						
204	1	Digital factory - General technical requirements	GB/T 37393-2019			Published
205	2	Digital workshop - Machine tools manufacturing - Information model	GB/T 37928-2019			Published
206	3	Technical product documentation--Life cycle model and allocation of documents	GB/T 19097-2003	ISO 15226:1999	ISO	Published
207	4	Technical product documentation - Handling of computer-based technical information	GB/T 16722.1~16722.4	ISO 11442	ISO	Published
208	5	Technical product documentation - Digital product definition data practices	GB/T 24734-2009	ISO 16792:2006	ISO	Published
209	6	Technical product documentation - Lettering - CAD lettering of the Latin alphabet numerals and marks	GB/T 18594-2001	ISO 3098-5:1997		Published
210	7	Technical product documentation - Organization and naming of layers for CAD - Part 1:Overview and	GB/T 18617.1~18617.11	ISO 13567	ISO	Published
211	8	Rule of CAD engineering drawing	GB/T 18229-2000			Published
212	9	Management of CAD documents	GB/T 17825.1~17825.10			Published
213	10	Quality of CAD/CAM data	GB/T 18784-2002			Published
214	11	Assurance method of CAD/CAM data quality	GB/T 18784.2-2005			Published
215	12	Technical drawings preparation of lines by CAD systems	GB/T 18686-2002			Published
216	13	Specification for function of computer aided process planning system	GB/T 28282-2012			Published

217	14	Industrial automation systems and integration - Product data representation and exchange (All parts)	GB/T 16656	ISO 10303	ISO TC184	Published
218	15	Industrial automation systems and integration - Process specification language (All parts)	GB/T 20719	ISO 18629	ISO TC184	Published
219	16	Industrial automation systems and integration - Service interface for testing applications (All parts)	GB/T 22270.1~22270.2	ISO 20242	ISO TC184	Published
220	17	Industrial automation systems and integration - Functional architecture of manufacturing execution	GB/T 25485-2010			Published
221	18	Industrial automation systems and integration--Parts library (All parts)	GB/T 17645	ISO 13584	ISO TC184	Published
222	19	Quality control of production process - Condition monitoring of equipment	GB/T 37942-2019			Published
223	20	Smart factory - Transfer protocol of production process control data	GB/T 38854-2020			Published
224	21	Industrial automation systems - Manufacturing message specification (All parts)	GB/T 16720.1~16720.4	ISO 9506	ISO TC184	Published
225	22	Industrial automation - Shop floor production	GB/T 16980.1~16980.2	ISO/TR 10314,IDT	ISO TC184	Published
226	23	Condition monitoring and diagnostics of machines - Data processing, communication and presentation (All parts)	GB/T 22281	ISO 13374	ISO TC184	Published
227	24	Enterprise application PDM implementing	GB/Z 18727-2002			Published
228	25	Enterprise resource planning (All parts)	GB/T 25109			Published
229	26	Automation systems and integration - Evaluating energy efficiency and other factors of manufacturing systems that influence the environment - Part 1:Overview and general principles	GB/T 35132.1-2017	ISO 20140-1:2013	ISO TC184	Published
230	27	Energy efficiency through automation systems	GB/T 35115-2017	IEC/TR 62837:2013	IEC TC65	Published
231	28	Intelligent factory - Technical requirements of process industry energy management system	GB/T 38848-2020			Published

232	29	Warehouse logistics equipment monitor & control system functions	GB/T 32827-2016			Published
233	30	Function blocks(FB) for process control (All parts)	GB/T 21099	IEC/TS 61804	IEC SC66E	Published
234	31	Function blocks for industrial-process measurement and control system (All parts)	GB/T 19769	IEC 61499	IEC SC65B	Published
235	32	Industrial automation systems - Concepts and rules for enterprise models	GB/T 18999-2003	ISO 14258:1998, IDT	ISO TC184	Published
236	33	Industrial automation systems - Requirements for enterprise-reference architectures and methodology	GB/T 18757-2008	ISO 15704:2000, IDT	ISO TC184	Published
237	34	Advanced automation technologies and their applications - Requirements for establishing manufacturing enterprise process interoperability	GB/T 32855	ISO 11354-1:2011,IDT	ISO TC184	Published
238	35	Specification of industry enterprise informatization integration system	GB/T 26335-2010			Published
239	36	Functional architecture of ASP platform for networked manufacturing	GB/T 25460-2010			Published
240	37	Core components for group enterprise operating management information system	GB/T 35128-2017			Published
241	38	OPC unified architecture (All parts)	GB/T 33863	IEC/TR 62541		Published
242	39	Intelligent factory - Technical requirements for industrial control abnormal monitoring instrument	GB/T 38847-2020			Published
243	40	Smart factory - Industrial automation systems engineering role class libraries	GB/T 38846-2020			Published
244	41	OPC UA-based interconnected network architecture in digital plant	GB/T 38869-2020			Published

245	42	ERP, MES and control system interconnection and intercommunication interface (All parts)	GB/T 39466			Published
246	43	Industrial automation systems and integration-Open systems application integration framework (All parts)	GB/T 19659	ISO 15745	ISO TC184	Published
247	44	Industrial automation systems and integration-Manufacturing software capability profiling for interoperability (All parts)	GB/T 19902	ISO 16100	ISO TC184	Published
248	45	Industrial automation systems and integration - Diagnostics, capability assessment and maintenance applications integration (All parts)	GB/T 27758	ISO 18435	ISO TC184	Published
249	46	Implementation guide for enterprise informatization system integration	GB/T 26327-2010			Published
250	47	Enterprise integration - Framework for enterprise modelling	GB/T 16642-2008	ISO 19439-2006, IDT	ISO TC184	Published
251	48	Enterprise integration - Constructs for enterprise modeling	GB/T 22454-2008	ISO 19440-2007, IDT	ISO TC184	Published
252	49	Specification of enterprise information integration in network environment	GB/T 18729-2011			Published
253	50	Enterprise-control system integration (All parts excluding part 1)	GB/T 20720	IEC 62264-2016	ISO TC184	Published
254	51	Automation systems and integration - Integration of advanced process control and optimization software for manufacturing systems (All parts excluding part 1)	GB/T 32854			Published
255	52	Automation systems and integration - Object-process methodology	GB/T 39470-2020			Published
256	53	Automation systems and integration - Key performance indicators (KPIs) for manufacturing operations management (All parts excluding part 1)	GB/Z 34044.10-2020	ISO/TR 22400-10: 2018		Published

257	54	Systems and software engineering - Interface and data exchange - Part 1:Interface specification for enterprise resource planning system and manufacturing execution system	GB/T 38557.1-2020			Published
258	55	Smart factory - General specification for time synchronization, time management and test in industry automation system	GB/T 38844-2020			Published
259	56	General modeling rules for manufacturing equipment integrated information model	GB/T 40209-2021			Published
260	57	Enterprise-control system integration - Part 4: Object model attributes for manufacturing operations management integration	GB/T 20720.4-2021	IEC 62264-4:2015	ISO TC184	Published
261	58	Smart factory - General technical requirements	20184401-T-604			Under development
262	59	Construction Guidelines of Intelligent Plants - Part 1: Intelligent Systems of Plants	20173804-T-339			Under development
263	60	Intelligent plant construction guidelines - Part 2: Virtual plant construction requirements	20182045-T-339			Under development
264	61	Intelligent plant construction guidelines - Part 4: Design file depth requirements of intelligent plants	20182044-T-339			Under development
265	62	Intelligent manufacturing - Virtual factory information model	20182047-T-339			Under development
266	63	Intelligent manufacturing - Virtual factory reference architecture	20182046-T-339			Under development

267	64	Batch control - Part 3: General and site recipe models and representation	20173705-T-604			Under development
268	65	Batch Control - Part 4: Batch Production Records	20173707-T-604			Under development
269	66	Production process quality control - Life cycle management of production equipment	20181939-T-604			Under development
270	67	Production process quality control - System model and architecture - machining	20193000-T-604			Under development
271	68	Production process quality control - Fault prognostics and diagnostics	20192996-T-604			Under development
272	69	The production process quality control - Communication conformance test	20192997-T-604			Under development
273	70	The production process quality control - General interface for quality data	20192999-T-604			Under development
274	71	Intelligent production order management system - Technical requirements	20182043-T-339			Under development
275	72	The diagnosis method of energy efficiency in industry automation	20184402-T-604			Under development
276	73	The data model of energy efficiency on discrete manufacturing	20184668-T-604			Under development
277	74	The technical specification for energy efficiency measurement in process production	20184667-T-604			Under development
278	75	Automation systems and integration - Evaluating energy efficiency and other factors of manufacturing systems that influence the environment - Part 2: Environmental performance evaluation process	20191930-T-604	ISO 20140-2:2018		Under development

279	76	Automation systems and integration - Evaluating energy efficiency and other factors of manufacturing systems that influence the environment - Part 3: Environmental performance evaluation data aggregation process	20192970-T-604			Under development
280	77	Evaluating energy efficiency and other factors of manufacturing systems that influence the environment - Part 5: Environmental performance evaluation data	20191928-T-604	ISO 20140-5:2017		Under development
281	78	Numerical Control Machine Workshop Bus Protocol of Intelligent Factory	20181954-T-604			Under development
282	79	Interconnection and interoperation specification for equipment of robot manufacturing digital workshop	20184403-T-604			Under development
283	80	Automation systems and integration - Interoperability of capability units for manufacturing application solutions - Part 3: Verification and validation of interoperability among capability units	20191929-T-604			Under development
284	81	Advanced automation technologies and their applications - Requirements for establishing manufacturing enterprise process interoperability - Part 2: Maturity model for assessing enterprise interoperability	20191927-T-604	ISO 11354-2:2015		Under development
285	82	Automation systems and integration - Applications integration approach using information exchange requirements modelling and software capability	20192973-Z-604	ISO/TR 18161:2013	ISO TC184	Under development
286	83	Automation systems and integration - Technical requirements for data governance of intelligent production line				To be established
287	84	Enterprise Control System Integration Part 3: Activity Model for Manufacturing Operations Management	20192972-T-604			Under development

288	85	Smart Factory Delivery Part 1: General Requirements	20202868-T-339			Under development
289	86	Smart Manufacturing Network Collaborative Design Part 4: Full Life Cycle Design Requirements	20202933-T-604			Under development
290	87	Smart Manufacturing Networked Collaborative Design Part 5: Multidisciplinary Collaborative Simulation	20202931-T-604			Under development
291	88	Digital collaborative engineering Off-site collaborative design requirements	20202660-T-469			Under development
292	89	Smart Manufacturing Application Interconnection Part 1: Integration Technology Requirements	20202625-T-604			Under development

293	90	Automation systems and integration - Technical requirements for virtual reconfiguration of intelligent production line				To be established
294	91	Automation systems and integration - Data space integration model of manufacturing enterprise				To be established
BC Intelligent supply chain						
295	1	Intelligent manufacturing - Intelligent supply chain - Data classification and format requirements				To be established
296	2	Intelligent manufacturing - Intelligent supply chain - Protocol resolution requirements				To be established

297	3	Intelligent manufacturing - System solution supplier - Classification code				To be established
298	4	Intelligent manufacturing - System solution supplier - Classification evaluation method				To be established
299	5	Intelligent manufacturing - Intelligent supply chain - General requirement for business collaboration				To be established
300	6	Intelligent manufacturing - Intelligent supply chain - Identification and evaluation requirements				To be established
301	7	Intelligent manufacturing - Intelligent supply chain - Implementation guide of risk early warning and prevention control				To be established
302	8	Intelligent manufacturing - Intelligent supply chain - Performance indicator system				To be established
303	9	Intelligent manufacturing - Intelligent supply chain - Test and evaluation specifications				To be established
BD Intelligent services						
304	1	Workflow and service interface for ASP in networked manufacturing	GB/T 25484-2010			Published
305	2	Networked manufacturing system implementing specification	GB/T 25487-2010			Published
306	3	Technical specification for the functional planning of networked manufacturing system	GB/T 25489-2010			Published
307	4	Networked manufacturing environment - Manufacturing resource class	GB/T 25111-2010			Published
308	5	Networked manufacturing environment - Business interoperability protocol and model	GB/T 30095-2013			Published
309	6	Cloud manufacturing service platform application implementation specification	GB/T 37960-2019			Published
310	7	General requirements for simulation service used in cloud manufacturing	GB/T 38554-2020			Published

311	8	Personalization Category Guide	GB/T 40012-2021			Published
312	9	Intelligent manufacturing - Mass customization - General requirement	GB/T 39837-2021			Published
313	10	Intelligent manufacturing - Mass customization- Demand interaction requirement	GB/T 39474-2020			Published
314	11	Intelligent manufacturing - Mass customization - Terminology	GB/T 39471-2020			Published
315	12	Intelligent manufacturing - Mass customization - Design requirement	GB/T 39403-2020			Published
316	13	Intelligent manufacturing - Mass customization - Production requirement	20182042-T-339			Under development
317	14	Customization - Taxonomy guideline	20182035-T-339			Under development
318	15	Customization - Maturity model	20182036-T-339			Under development
319	16	Intelligent manufacturing - Remote operation system general requirements	20182037-T-339			Under development
320	17	Information technology -Remote operation and maintenance - Technical reference model	20182038-T-339			Under development
321	18	Intelligent service - Predictive maintenance - General requirements	20173835-T-469			Under development
322	19	Intelligent Manufacturing - Network Cooperative Design - Part 1: General Requirements	20182039-T-339			Under development
323	20	Intelligent Manufacturing - Network Cooperative Design - Part 2: Software Interface and Data	20192995-T-604			Under development
324	21	Requirements of intelligent plant architecture	20192993-T-604			Under development
325	22	Specification of manufacturing resource import to cloud manufacturing service platform	20192994-T-604			Under development

326	23	Security protection management requirements of cloud manufacturing service platform	20202867-T-339			Under development
327	24	Intelligent manufacturing - Remote operation system - Resource management				To be established
328	25	Intelligent manufacturing - mass customization - Guidelines for assessment and diagnosis				To be established
BE Intelligent enabling technology						
329	1	Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - Part 51: Requirements for quality of Ready to Use Software Product (RUSP) and instructions for testing	GB/T 25000.51-2016	ISO/IEC 25051:2014	ISO/IEC JTC1/SC7	Published
330	2	Embedded software quality assurance requirement	GB/T 28172-2011			Published
331	3	Embedded software quality metric	GB/T 30961-2014			Published
332	4	Functionality of system and software	GB/T 29831.1~29831.3			Published
333	5	Reliability of system and software	GB/T 29832.1~29832.3			Published
334	6	Portability of system and software	GB/T 29833.1~29833.3			Published
335	7	Maintainability of system and software	GB/T 29834.1~29834.3			Published
336	8	Efficiency of system and software	GB/T 29835.1~29835.3			Published
337	9	Usability of system and software	GB/T 29836.1~29836.3			Published
338	10	Information technology - Guide for software life cycle processes	GB/Z 18493-2001	ISO/IEC TR15271:1998	ISO/IEC JTC1/SC7	Published
339	11	Systems engineering - A guide for the application of GB/T 22032 (System life cycle processes)	GB/Z 31103-2014	ISO/IEC TR 19760: 2003	ISO/IEC JTC1/SC7	Published
340	12	Information technology - Big data - Core metadata for industrial product	GB/T 38555-2020			Published

341	13	Information technology - Data provenance descriptive model	GB/T 34945-2017			Published
342	14	Elastic computing application interface	GB/T 31915-2015			Published
343	15	Information technology - General data import interface	GB/T 36345-2018			Published
344	16	Information technology - Cloud data storage and management - Part 2 : Object-based cloud storage application interface	GB/T 31916.2-2015			Published
345	17	Information technology - Cloud computing - Basic requirements of cloud service level agreement(CSLA)	GB/T 36325-2018			Published
346	18	Information technology - Industrial cloud - Reference model	GB/T 37700-2019			Published
347	19	Information technology - Industrial cloud service - Capabilities general requirements	GB/T 37724-2019			Published
348	20	Intelligent manufacturing - Technical requirements for multi-modal data fusion systems	20182040-T-339			Under development
349	21	Intelligent manufacturing - Industry big data platform general requirement	20182053-T-339			Under development
350	22	Intelligent manufacturing - Industrial data space model	20182054-T-339			Under development
351	23	Intelligent manufacturing - Time series data storage and query framework for big industrial data	20182052-T-339			Under development
352	24	Intelligent Manufacturing - Industrial Data Collection Specification	20181941-T-604			Under development
353	25	Intelligent Manufacturing -Industry data - Classification principle	20181942-T-604			Under development
354	26	Intelligent Manufacturing - Industry Data Cloud Adaptation Specification	20184404-T-604			Under development
355	27	Industrial automation systems and integration - Industrial manufacturing management data	GB/T 19114	ISO 15531	ISO TC184	Published

356	28	Industrial automation systems and integration - Integration of life-cycle data for process plants including oil and gas production facilities	GB/T 18975	ISO 15926	ISO TC184	Published
357	29	Systems and software engineering - System life cycle processes	GB/T 22032 20190850-T-469	ISO/IEC 15288:2015	ISO/IEC JTC1/SC7	Under development
358	30	Intelligent manufacturing - Software for industrial technology - General requirements of industrial APP groupware encapsulation	20193192-T-469			Under development
359	31	Intelligent manufacturing-Software for industrial technology - Reference architecture	20193194-T-469			Under development
360	32	Intelligent manufacturing - Software for industrial technology - General requirements of middleware	20193193-T-469			Under development
361	33	Intelligent manufacturing - Software for industrial technology-Industrial APP quality requirements	20193195-T-469			Under development
362	34	Information technology - Industrial cloud service - Service agreement guide	20173827-T-469			Under development
363	35	Information technology - Industrial cloud service - Metering indicators	20173828-T-469			Under development
364	36	Smart manufacturing -Industrial cloud service - Capabilities evaluation specification	20193191-T-469			Under development
365	37	Smart manufacturing - Industrial cloud service - Data management general requirements	20193190-T-469			Under development
366	38	The specification for the implementation of personalized customization based on industrial cloud	20193187-T-469			Under development
367	39	Intelligent Manufacturing Machine Vision In-Line Inspection Testing Methods	20202866-T-339			Under development
368	40	Industrial software Industrial APP classification and evaluation	20202626-T-469			Under development
369	41	Automated Systems and Integration Complex Product Digital Twin Architecture	20203707-T-604			Under development

370	42	Intelligent manufacturing - Artificial intelligence application - Training data requirements				To be established
371	43	Intelligent manufacturing - Industrial knowledge graph - Knowledge service requirements				To be established
372	44	Intelligent manufacturing - Industrial knowledge graph - Test and evaluation specifications				To be established
373	45	Open interface requirements of cloud manufacturing service platform				To be established
374	46	Internet of things - Edge computing - Part 2: Service interface				To be established
375	47	Internet of things - Edge computing - Part 3: Requirements for edge computing nodes				To be established
376	48	Internet of things - Edge computing - Part 4: Data management requirement				To be established
377	49	Intelligent manufacturing - Digital twin - Reference architecture				To be established
378	50	Intelligent manufacturing - Digital twin - Data interaction and interface specification				To be established
379	51	Intelligent manufacturing - Digital twin - Maturity model and evaluation method				To be established
380	52	Intelligent manufacturing - Digital twin equipment - General requirement				To be established
381	53	Intelligent manufacturing - Digital twin equipment - Test specification				To be established
382	54	Intelligent manufacturing - Digital twin additive manufacturing - Implementation guide				To be established
BF Industrial network						
383	1	Information technology - Telecommunication and information exchange between systems - OSI routing framework	GB/Z 17977-2000			Published

384	2	Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3:Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specification	GB/T 15629.3-2014			Published
385	3	Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements	GB/T 15629			Published
386	4	Information technology - Telecommunications and information exchange between systems - Medium access control and physical layer specifications for middle-high throughput wireless local area network	GB/T 36454-2018			Published
387	5	Information technology - Telecommunications and information exchange between systems - Visible light communication - Part 1: General requirements of media access control and physical layer	GB/T 36628.1-2018			Published
388	6	Information technology - Telecommunications and information exchange between systems - Media access control and physical layer specifications for low power wide area network	GB/T 38641-2020			Published
389	7	Information technology - Enhanced communication transport protocol - Part 1: Specification of simplex multicast transport	GB/T 26241.1-2010			Published
390	8	Information technology - Relayed multicast control protocol (RMCP) - Part 1: Framework	GB/T 26243.1-2010			Published
391	9	Information technology - Sensor networks - Part 1: Reference architecture and general technical requirements	GB/T 30269.1-2015	ISO/IEC 29182-5:2013		Published

392	10	Information technology - Sensor networks - Part 301~304: Communication and information exchange (4 parts in total)	GB/T 30269.301~303			Published
393	11	Information technology - Sensor networks - Part 401: Collaborative information processing: Services and interfaces supporting collaborative information processing	GB/T 30269.401-2015	ISO/IEC 20005:2013		Published
394	12	Information technology - Sensor networks - Part 501~504: Identification (4 parts in total)	GB/T 30269.501~504			Published
395	13	Information technology - Sensor networks - Part 601~602: Information security (2 parts in total)	GB/T 30269.601~602			Published
396	14	Information technology - Sensor networks - Part 701~702: Sensor interface (2 parts in total)	GB/T 30269.701~702			Published
397	15	Information technology - Sensor networks - Part 801~809: Testing (9 parts in total)	GB/T 30269.801~809			Published
398	16	Information technology - Sensor networks - Part 901~902 :Gateway(3 parts in total)	GB/T 30269.901-2016			Published
399	17	Information technology - Sensor network -Part 1001: Middleware: Sensor networks node interfaces	GB/T 30269.1001-2017			Published
400	18	Information technology - General technical requirements of sensor networks system for demand	GB/T 37727-2019			Published
401	19	Information technology - Technical requirements of wireless sensor network system for gas meter remote management	GB/T 36330-2018			Published
402	20	Internet of things - Reference architecture	GB/T 33474-2016			Published
403	21	Internet of things - System interface requirements	GB/T 35319-2017			Published
404	22	Internet of things - Information sharing and exchanging - Part 1: General architecture	GB/T 36478.1-2018			Published

405	23	Internet of things - Sensing object information fusion model	GB/T 37686-2019			Published
406	24	Internet of things - Access of sensing and controlling device - Part 1: General requirements	GB/T 38637.1-2020			Published
407	25	Information technology - General architecture for industrial equipment inspection management system based on sensing device	GB/T 37693-2019			Published
408	26	Technical specification for industrial Ethernet switches	GB/T 30094-2013			Published
409	27	Industrial Ethernet fieldbus EtherCAT	GB/T 31230-2014	IEC 61158、IEC 61784	IEC SC65C	Published
410	28	Ethernet POWLINK communication profile specification	GB/T 27960-2011	IEC 61158	IEC SC65C	Published
411	29	Industrial wireless networks WIA specification	GB/T 26790.1~26790.2	IEC 62601		Published
412	30	EPA system architecture and communication specification for use in industrial control and	GB/T 20171-2006	IEC 61158, IEC 61784	IEC SC65C	Published
413	31	Modbus industrial automation network specification	GB/T 19582-2008	IEC 61158, IEC 61784	IEC SC65C	Published
414	32	CC-Link (Control & communication Link) specification	GB/T 19760-2008	IEC 61158, IEC 61784	IEC SC65C	Published
415	33	PROFIBUS&PROFINET technical profile PROFIdrive	GB/T 25740-2013			Published
416	34	Industrial control network general technical requirements - Wired networks	GB/T 38868-2020			Published
417	35	Digital data communication for measurement and control - Fieldbus for use in industrial control systems - Type 2: ControlNet and EtherNet/IP specification	GB/Z 26157-2010	IEC 61158, IEC 61784	IEC SC65C	Published
418	36	Digital data communication for measurement and control - Fieldbus for use in industrial systems Type 3: PROFIBUS specification	GB/T 20540-2006	IEC 61158, IEC 61784	IEC SC65C	Published

419	37	Digital data communication for measurement and control - Fieldbus for use in industrial control systems - Type 8: INTERBUS specification	GB/Z 29619-2013	IEC 61158, IEC 61784	IEC SC65C	Published
420	38	Industrial communication networks - Installation of communication networks in industrial premises	GB/T 26336-2010	IEC 61918		Published
421	39	Industrial communication networks - Fieldbus specifications - Type 10: PROFINET IO specifications (All parts)	GB/T 25105	IEC 61784	IEC SC65C	Published
422	40	Industrial communication networks - Fieldbus specifications - Type 20 HART specification (All parts)	GB/T 29910	IEC 61158, IEC 61784	IEC SC65C	Published
423	41	Industrial communication network - Profiles - Part 3-8: Functional safety communication profile of CC-Link family	GB/Z 37085-2018			Published
424	42	Control network LONWORKS technology specification (All parts)	GB/Z 20177	ANSI/CEA-709	ANSI	Published
425	43	Control network HBES technical specification - Home and building control system	GB/T 20965-2013			Published
426	44	Application and implementation specification of integrated platform for internet of things in	GB/T 35587-2017			Published
427	45	Reference architecture of information integration middleware platform for internet of things in manufacturing processes	GB/T 34047-2017			Published
428	46	Automation system and integration - Serial real time communication system for manufacturing integration - Part 1:General overview and architecture	GB/T 38002.1-2019			Published

429	47	Information technology -Telecommunications and information exchange between systems - Low voltage power line communication Part1: Physical layer specification	20141207-T-469			Under development
430	48	Internet of things-Data Quality	20150046-T-469			Under development
431	49	Industrial communication networks - Network and system security - Security technologies for industrial automation and control system	GB/T40218-202	IEC 62443-3-1	IEC TC65	Published
432	50	Industrial wireless networks WIA specification - Part 4: WIA-FA protocol conformance test specification	GB/T26790.4/2020			Published
433	51	Industrial Wireless Communication Based on Cellular Networks - Part 1: General Technical Requirements	20184670-T-604			Under development
434	52	Automation systems and integration - Serial real time communication system for manufacturing integration - Part 2: I/O Device Profile	20194014-T-604			Under development
435	53	Management requirements of IPv6 address in intelligent manufacturing environments	20193141-T-339			Under development
436	54	Industrial Communication Networks - Fieldbus Specifications Type 10: PROFINET IO Specification - Part 3: PROFINET IO Communication Line	20203702-T-604			Under development
437	55	Industrial Wireless Communication Based on Cellular Networks - Part 5: Application specification				To be established

* The list is subject to dynamic update according to the establishment and release of standards.

Appendix 4: Key development requirements of application standards in the intelligent manufacturing industry

No.	System location	Standard Name	Relevant national standards in place or not	Matching application relationship with national standard	Necessity of sectoral standards	Scope and main contents
CA Shipbuilding and ocean engineering equipment industry						
1	CA	Intelligent manufacturing - Application in Shipbuilding and ocean engineering equipment industry - Requirements for identification and coding of intermediate products in hull intelligent manufacturing	No	No	In the process of hull construction, parts and components and other intermediate products are mainly characterized by multi-variety and variable batch, which improves the difficulty of production and logistics in the workshop. The challenge of how to represent these complex production information in a digital way, and use the management system for unified storage and processing, are the basis of intelligent shipbuilding.	This standard specifies the principles and requirements of coding and identification of intermediate products in hull intelligent manufacturing, with a focus on the tools and carriers of information flow, such as the coding and identification of intermediate products to support shipbuilding.

2	CA	Intelligent manufacturing - Application in Shipbuilding and ocean engineering equipment industry - Requirements for planning, design and simulation of intelligent shipyard	Smart factory - General technical requirements (20184401-T-604)	This standard specifies the planning and design template and information model of intelligent shipyards. *Smart factory - General technical requirements* mainly specifies the overall technical requirements of smart factory, so they can be used as a set.	The shipbuilding industry has carried out research on the master planning and information model of the hull segmented intelligent welding workshop and production line, but there is still a gap in the field of intelligent shipyard planning and design. Therefore, it is urgent to formulate this standard in combination with the best practice of intelligent shipyard construction, so as to guide and regulate the construction of intelligent shipyard.	This standard is used to regulate the planning and design, information model and overall architecture of intelligent shipyards. It can reduce the exploration cost of enterprises in the planning of intelligent shipyards.

CB Building material industry						
3	CB	Intelligent manufacturing - Application in cement industry - Construction specifications for remote operation and maintenance system of equipment	Intelligent manufacturing - Remote operation system general requirements (20182039-T-339)	This standard is used to regulate the remote operation and maintenance requirements for all equipment in cement plants. It provides more details for the industry on Intelligent manufacturing - Remote operation system general requirements, and is consistent with it. Therefore, they can be used together.	So far, the intelligent sensing and control equipment has been widely applied in the cement industry, and most cement enterprises have applied distributed control systems. The application rate of sensor and intelligent instrument represented by temperature, level flow and mass has exceeded 80%. The operation and maintenance of production equipment and control systems has become the top priority of enterprises. The establishment of remote operation and maintenance systems will greatly improve the speed of status monitoring and fault handling, and further improve the efficiency and stability of cement enterprises.	This standard is used to describe the business process, equipment requirements, functional requirements and data acquisition requirements of remote operation and maintenance system management of equipment within cement industry. This standard is applicable to guide the design and development of remote operation and maintenance management systems of equipment within cement industry.

4	CB	Intelligent manufacturing - Application in glass industry application - Technical guide for defect detection based on artificial intelligence	No	/	So far, the online detection system of glass defects based on artificial intelligence deep learning technology, is gradually moving from laboratory to glass production workshop. Under the background of intelligent transformation of various production links in glass industry, the production speed of glass products is accelerated, and many quality problems are easily missed by manual detection and traditional detection machines. The establishment of technical guides for glass defect detection can regulate the requirements for detection of glass deformation defects, appearance defects, corner defects and light transmittance, so as to provide reference for the development and upgrading of glass defect detection systems. By now, there is no relevant standard for defect detection in glass industry both domestically and internationally.	This standard is used to regulate the application of machine vision technology in the quality control scenarios of building material industry, including ontology function, recognition scenario definition and comprehensive performance. It is applicable to guide the glass industry research institutes, enterprises and other related technical personnel to research and deploy the quality control process based on machine vision.

5	CB	Intelligent	Reference functional	This standard is	Supply chain collaboration is the	It is used to regulate the
6	CB	Intelligent manufacturing - Application in aggregate industry - Application guide of unmanned control technology of equipment	No	/	The production environment of aggregate industry is complicated, and there are many types and specifications of equipment. For example, the automation and intelligent degree of mining equipment, such as heavy machinery, is still low. It is urgent to realize production with less manpower, through the innovation of unmanned control technology for equipment, remote control and operation and maintenance. This will address future industrial development problems such as safety production and manpower shortage.	It is used to regulate the application of mining area UAV blasting inspection, VR remote equipment diagnosis, remote ship loader, remote water pump control and data acquisition, unmanned mining car and intelligent complete set of crushing and screening equipment based on 5G and artificial intelligence technology. It is applicable for aggregate enterprises and intelligent manufacturing system solution providers to carry out equipment transformation and upgrading.
CC Petrochemical industry						

7	CC	Intelligent manufacturing - Application in petrochemical industry - Smart factory information model	Digital factory - General technical requirements (GB/T 37393-2019), Intelligent manufacturing - Virtual factory information model (20182047-T-339), Integrated information model about intelligent manufacturing - Part 1: General modelling principle（20184665-T-604）	This standard mainly refines the data model according to the characteristics of the petrochemical industry. It is consistent with relevant national standards such as Digital factory - General technical requirement, Intelligent manufacturing - Virtual factory information model; and Integrated information model about intelligent manufacturing - Part 1: General modelling principle, and can be used together.	With the development of petrochemical industry informatization, enterprises have built a large number of information systems in various sectors. Although these systems can solve the corresponding business needs, in the absence of support of unified and normative standard systems, it is difficult to guarantee the consistency of integrated data and the maintainability of integrated interface; there are also difficulties in information data sharing, which lead to a fragmented information. Through years of standardization development in the petrochemical industry, the standardization framework and management specifications have been initially established, but there are still widespread problems such as inconsistency of model code, inconsistency of business definition, inconsistency of application rules and inconsistency of technical specifications within and between intelligent factory systems in petrochemical industry. Therefore, it is necessary to build the unified model in the business process of smart factory, extract unified data description models and object relational models in enterprises, achieve unified management and control of the	This standard describes the physical object model of petrochemical smart factories, and the relationship among them. It is used to solve the integration problems among different enterprises in the industrial chain collaboration. This standard has been verified for application in 11 enterprises, such as Sinopec Jiujiang Company, and can cover all the subdivided fields of petrochemical industry.

					business models among different subsystems, and integrate the standards, thus achieving information fusion among intelligent manufacturing systems, and accelerating the continuous change and rapid expansion of business on the basis of the principle of "seeking common ground while reserving differences".	

8	CC	Intelligent manufacturing - Application in petrochemical industry - Production control data dictionary	No	No	The petrochemical industry is characterized by diverse equipment, huge amount of data, diverse and scattered data, complex storage formats, etc. All these issues lead to poor data circulation among materials, intelligent equipment and systems, and to the lack of unified standards among various business systems. This is not conducive to the petrochemical industry to carry out big data analysis and centralized display.	This standard specifies the metadata classification and data attributes used for data integration in production control business of smart factories within the petrochemical industry. It gives the production control data entity, and specifies the production control data attribute name, data code, data format, description, etc. The standard is applicable to the provision of metadata specification and data entity for production control data integration of smart factories within the petrochemical industry.

9	CC	Intelligent manufacturing - Application in petrochemical industry - Technical specification for technological early warning and prediction	No	No	Safety production of petrochemical enterprises is an important concern of intelligent manufacturing, as safety involves many contents, influencing factors and uncertain conditions. The implementation of intelligent early warning and prediction technology of safety production is helpful to solve the problem of finding, analyzing and handling abnormal working conditions between normal operations and accident operations. At present, the technology has just started in China: the potential benefits of intelligent early warning and prediction technology of safety production are huge, so it is worth to be demonstrated and promoted.	This standard involves early warning and prediction of technological safety for typical devices in petrochemical enterprises, so as to guide the safe and stable production of equipment and reduce the occurrence of safety accidents. It includes technological status detection, technological abnormal evaluation, technological abnormal early warning, technological abnormal diagnosis, technological abnormal recovery, operation tracking, etc.

10	CC	Intelligent manufacturing - Application in petrochemical industry - General requirements for field personnel positioning system	No	No	The field personnel positioning system of smart factories in the petrochemical industry, is the Internet of Things information system used to manage the time-fixed, person-fixed and post-fixed performance of duties for petrochemical enterprise operators. It can effectively identify and track the location and behavior of operators through biometrics, intelligent access control, real-time positioning, and other technologies	The scope and main technical contents of this standard are as follows: basic requirements, hardware configuration integration requirements, etc. The basic requirements include infrastructure construction and basic information management.

CD Textile industry						
11	CD	Intelligent manufacturing - Application in textile industry - General technical requirements for remote operation and maintenance system of textile equipment	Intelligent manufacturing - Remote operation system general requirements (20182039-T-339)	Each part of GB/T 33863 *OPC unified architecture* is the basis of textile machinery information model; *Intelligent manufacturing - Remote operation system general requirements* is also referred to.	The remote operation and maintenance system is used in the construction of various textile equipment services and fault monitoring platform, which can reduce the failure rate of equipment, improve the stable operation time, and reduce the operation and maintenance cost. The system provides hardware remote diagnosis, remote monitoring, remote maintenance, health prediction, fault warning, software upgrade and other services.	This standard is applicable to regulate various services provided by textile equipment manufacturers to users, such as hardware remote diagnosis, remote monitoring, remote maintenance, health prediction and fault warning, and software upgrade. It can also be used for textile enterprises to independently establish equipment information collection systems. This standard specifies the system architecture, network requirements, wireless/wired communication requirements,

12	CD	Intelligent manufacturing - Application in textile industry application - General technical requirements for interconnection and interoperability of textile equipment	No	This standard refers to relevant chapters and articles in various parts of OPC unified architecture (GB/T 33863) as the basis for establishing textile machinery information model.	Due to the large number of textile equipment manufacturing enterprises and the complex data format, the equipment information is isolated and not shared, which leads to high fragmentation of information. The formulation of standards on information interconnection and interoperability covering the whole process of textile equipment, can unlock information channels and promote the intelligent manufacturing of textile enterprises.	The standard is applicable to the development and design of textile equipment, as well as the construction and transformation of digital workshop (factory) in textile enterprises. The series of standards are used for information interconnection among various textile equipment, among equipment and auxiliary systems, and among equipment and manufacturing systems. The main technical contents include: textile equipment interconnection system architecture, textile equipment interface specification, communication

13	CD	Intelligent manufacturing - Application in clothing industry - Technical specification for information system integration	Implementation guide for enterprise informatization system integration (GB/T 26327-2010), Specification of industry enterprise informatization integration system (GB/T 26335-2010)	This standard mainly regulates the basic technology used in the process of system integration and the functional requirements after system integration for clothing enterprises. It highlights the practicability and operability of the standard in the industry. It can be used in coordination with relevant national standards.	The purpose of this standard is to initially build a standards system for intelligent manufacturing in the field of clothing, and provide guidance and implementation recommendations for clothing enterprises to promote intelligent manufacturing. The aim is to contribute to the transformation, upgrading and high-quality development of the clothing industry.	According to the functional requirements and application characteristics of each information system of clothing enterprises, this standard focuses on typical technical issues in the process of information system integration, and proposes technical requirements for information system integration of clothing enterprises from four aspects, namely: system architecture, network integration, data integration and application integration. This standard also puts forward functional requirements for the integrated design, integrated production, integrated management, integrated office and integrated services of clothing enterprises, and is applicable to the planning,

14	CD	Intelligent manufacturing - Application in clothing industry - General functional requirements of customized electronic commerce platform	Specification of operations and technology for electronic commerce platform (GB/T 31524-2015)	This standard mainly identifies the functional points according to the characteristics of the clothing industry. It is consistent with the relevant national standard, so they can be used as a set.	E-commerce can improve the promptness of response, achieve remote transactions, save significant time and marketing costs, and achieve a win-win situation between customers and enterprises. With the development of the global economy, the application of Internet technology in international trade is bound to become increasingly important. The formulation of this standard will provide technical support for clothing enterprises to develop e-commerce platforms.	This standard specifies the demand interaction requirements in the clothing customization process, as well as the general functions of e-commerce platforms. This standard is applicable to related parties in the clothing customization process, including apparel customization manufacturing enterprises, apparel customization e-commerce, apparel offline physical stores, and other different business models and related activities. The main technical content is the basic architecture of the platform, which includes online interactive platform, offline interactive platform, network marketing platform, data analysis platform, etc.

CE Steel industry						
15	CE	Intelligent manufacturing - Application in steel industry - Data classification and coding	Data classification and coding for navigation electronic map (GB/T 28442-2012), Classification and coding of logistics documents (GB/T 29184-2012), Specifications of credit information classification and coding, (GB/T 37914-2019), Classification and code of emergency supplies (GB/T 38565-2020)	The framework and classification method of the existing national standards can be used as a reference for this standard.	The steel industry is an industry with complex technology and intensive equipment. The data volume is huge and complex, and data transmission among various systems is not smooth. It is therefore urgent to draw up unified data codes, realize system interconnection, so as to provide strong support to the construction of big data platforms, and conduct data-based analysis and decision-making.	This standard specifies the terms and definitions, classification and coding principles, coding method and classification code table of steel industrial data.

16	CE	Intelligent manufacturing - Application in steel industry - Technical requirements and specifications for digital twin system	Functional safety requirement of digital workshop (20184669-T-604), Intelligent manufacturing - Virtual factory information model (20182047-T-339) Intelligent manufacturing - Virtual factory reference architecture (20182046-T-339), Intelligent plant construction guidelines Part 2: Virtual plant construction requirements (20182045-T-339)	This standard proposes the technical requirements for the application of digital twin technology in the construction of steel smart factories. The existing digital workshop functions are part of the contents of digital twin construction, and can be used as a set. The architecture and requirements of virtual factory	The establishment of this standard is of great significance to the development of the steel industry, particularly because it (1) solves the key technical problems of intelligent construction, and promotes the continuous optimization and development of key technologies; (2) enhances the core competitiveness of China's steel manufacturing, and promotes the urgent need for industrial upgrading. The digital twin systems can perform the virtual simulation of products, manufacturing processes, and even of entire factories; they can also upgrade existing manufacturing models, create a flexible digital and intelligent production system, and improve the product R&D and production efficiency of enterprises; (3) forms industry and regional	This standard is applicable to the application of digital twin systems in intelligent workshops.

17	CE	Intelligent manufacturing - Application in steel industry - Technical requirements for full-process integrated collaborative management and control	No	No	With the continuous and in-depth application of new generation information technology and modern management science, the demand of steel enterprises for more efficient and flatter management and control is becoming increasingly stronger. Enterprise informatization needs to shift rapidly from single-point decentralized control, to the direction of continuous collaboration, flat and integrated management and control. There has always been a large degree of information fragmentation in the steel industry, while the phenomenon of offline business remains prominent. It is always difficult for various systems to support the needs of integrated and coordinated management and control of enterprises. It is necessary to target the production units and activities of steel enterprises, covering sales, procurement, finance, production, energy, quality, equipment, logistics, safety and environmental protection, and material measurement; on this basis, integrated collaborative design and modeling should be carried out, thus achieving integrated collaborative management and control of the whole process of steel enterprises.	The scope of production control data requirements of this standardization project proposal covers raw materials, sintering, coking, pelletizing, blast furnace, steelmaking, steel rolling and other production processes for the whole plant of steel enterprises; production management and control business scenarios include sales, procurement, finance, production, energy, quality, equipment, logistics, safety and environmental protection and material measurement.

18	CE	Intelligent manufacturing - Application in steel industry - Online detection and prediction of technological parameters	Specification for function of computer aided process planning system(GB/T 28282-2012), Intelligent manufacturing - Industrial data collection specification (20181941-T-604)	This standard serves as the implementation of Specification for function of computer aided process planning system in the industry. They are consistent with eachother	The steel industry has high requirements for product stability. The software system integration under traditional information technology cannot fundamentally solve technological quality problems, resulting in a generally lower quality stability of the domestic steel industry compared to the international level. So far, the application of real-time production process data in online	This standard is used in the production and manufacturing process of the steel industry, to formulate unified standards for online detection, interface, parameter prediction and real-time adjustment of process parameters.

CF Rail transit industry						
19	CF	Intelligent manufacturing - Application in rail transit industry - Implementation guide for intelligent manufacturing project	No	This standard targets the planning and implementation of intelligent manufacturing projects involving the manufacturing of rail transit equipment. The project management guide is applicable to any complex project of any organization, such as enterprises,	In recent years, D-series high-speed trains, urban rail transit and other rail transit equipment products have been developed rapidly, and intelligent manufacturing projects are being launched in many segments – such as product design and manufacturing services. However, enterprises do not have a clear top-level planning for intelligent manufacturing projects. The sources of funding and the organizational structure for the project have no methods for reference. Therefore, it is urgent to build on the mature project implementation methodology of the industry, to	This standard specifies the digital basic ability, support, project planning, implementation and operation, project evaluation and other requirements for enterprises to implement intelligent manufacturing projects. It can be used to guide the whole process of planning, implementation and evaluation of intelligent manufacturing projects in the rail transit industry. At present, it has been established in CRRC.
20	CF	Intelligent manufacturing - Application in rail transit industry - Data interface for intelligent manufacturing equipment	Serial standards on Field device tool (FDT) interface specification（GB/T 29618）	This standard investigates and identifies the common and special equipment (welding robot, grinding robot wheels press-fit machine, etc.) in rail transit manufacturing; it can guide and	In the rail vehicle manufacturing workshop, a large number of manufacturing equipment is deployed; but new and outdated equipment coexist, the data acquisition interface standards are not unified, and the transformation and upgrading of outdated equipment and the procurement of new equipment lack the technical requirements to support the equipment networking and data acquisition	This standard specifies the classification, data interface and requirements of intelligent manufacturing equipment data interface commonly used in the rail transit industry. It is applicable to the networking and data acquisition of intelligent manufacturing equipment. So far, it has been verified and released in CRRC.

21	CF	Intelligent manufacturing - Application in rail transit industry - General requirements for three-dimensional design	Serial standards on General principles of three-dimensional modeling for mechanical products (GB/T 26099-2010)	The formulation of this standard is largely aimed at the design software, vehicle product characteristics and industrial chain relations mainly applied by rail transit enterprises; it has strong applicability to the industry. It can support the use of General principles	The rail transit industry has a long industrial chain, with many affiliated enterprises involved. At present, most enterprises have applied 3D design, but they have not formed a unified 3D design specification, which leads to difficulties in collaboration among enterprises in the industrial chain and the integration of design, technology and manufacturing. Therefore, it is urgent to formulate 3D design standards for the rail transit industry, improve the quality of 3D modelling as a whole, and ensure the integrity of information, appropriate granularity of data and installation and promote the	This standard aims to regulate the general requirements, naming rules, model simplification and lightweight requirements, and model inspection quality requirements of rail transit manufacturing enterprises in the three-dimensional design process. It is applicable to enterprises manufacturing rail transit equipment, for promoting paperless processes, enterprise collaboration, improving design efficiency and reducing costs. At present, it has been established in CRRC.
CG Aerospace						
22	CG	Intelligent manufacturing - Application in aerospace industry - Construction requirements of cloud based collaborative design platform	No	No	The structure of aerospace products is complicated, generally requiring dozens – or even hundreds – of research units and sub-contractors to work together, even if they are often distributed in different regions and countries. The cloud based collaborative design platform can realize the exchange and sharing of aerospace product data among different units, the operation of design process, and the control of collaborative design of these processes in different places.	This standard mainly specifies the requirements of software platform of cloud collaborative design system for aerospace products.

23	CG	Intelligent manufacturing - Application in aerospace industry - Parts design process for manufacturing oriented digital design	No	No	The development of aerospace products involves the processing of a large number of metal parts. With the gradual application of the model-based development method, it is urgent to regulate the digital design process, input and output at different stages, as well as the tasks and participants of the metal parts of aerospace products, so as to promote the inter-departmental and cross-discipline collaboration of design and manufacturing.	This standard mainly specifies the general requirements and digital design processes of manufacturing oriented digital design of aerospace metal parts.

24	CG	Intelligent manufacturing - Application in aerospace industry - General principles of product inspection information model	No	No	With the gradual application of model-based development methods in the aerospace industry, the traditional two-dimensional engineering drawing used as the basis for inspection, has been unable to meet the current needs. The existing inspection information definition is relatively single, and the data management problem of quality inspection process is prominent. The formulation of this standard will provide support for the model-based inspection process.	This standard mainly specifies the basic architecture and data structure of information representation in the aerospace product inspection information models.

25	CG	Intelligent manufacturing - Application in aerospace industry - Virtual simulation of aircraft digital production line (4 parts in total, including general requirements, production line layout, material transfer path planning and production line structure optimization)	No	No	Before the design or reformation of the aerospace product production line, the structure and configuration scheme of the production line can be optimized through simulation, to ensure that the production line can not only meet the predetermined design requirements, but also obtain good flexibility, reliability and economy. Through the simulation of the production line layout, of the material transfer path and production line structure, and of the performance under different layout conditions, different scheduling situations and different production line structures can be analyzed to determine a reasonable and efficient operation plan, as well as to find out the bottlenecks of the production line, which will give full play to the production capacity and improve the economic effects. This standard will help to build digital manufacturing	The series of standards are divided into four parts: (i) Part 1 - General requirements is used to specify the principles, objectives, processes and requirements of virtual simulation for aircraft digital production line. (ii) Part 2 - Production line layout, is used to specify the purpose, content, process and requirements of the production line layout simulation. (iii) Part 3 - Material transfer path planning, is used to specify the purpose, content, process and requirements of material transfer path planning simulation. (iv) Part 4 - Production line structure optimization, is used to specify the purpose, content, process and requirements of production line structure optimization simulation
26	CG	Intelligent manufacturing - Application in aerospace industry - Requirements for three-dimensional digital model conversion	No	No	Unify three-dimensional digital model software and modeling processes of aerospace products, and accelerate the development of system data engineering technology in the aerospace industry.	This standard specifies data quality requirements, rights and responsibilities, general requirements, and specific steps involved in the conversion of three-dimensional digital model of aerospace products – from design to manufacturing process. These include the conversion of design models to workshop lightweight models, as well as the conversion of process accurate

27	CG	Intelligent manufacturing - Application in aerospace industry - Requirements for information interaction in manufacturing process of aerospace products	No	No	As limited by confidentiality requirements and multi-level management status, it is urgent to unify the efforts to unblock, collect and solve the data fragmentation issues throughout the manufacturing processes of aerospace products. Otherwise, the longer such problems last, the greater the difficulty and the higher the costs will be.	It specifies the technological process, manufacturing elements, Internet of things system architecture, information flow path, information security, production data and technological parameters of aerospace product manufacturing process. It is applicable to the information exchange of aerospace products in the whole life cycle.
28	CG	Intelligent manufacturing - Application in aerospace industry - Requirements for quality data package of aerospace product manufacturing process	No	No	Mass data and zeroing are the typical characteristics and the most important elements in the aerospace industry. It is necessary to unify the quality data types and processing methods.	It specifies the automatic construction methods of quality data package involved in aerospace product manufacturing processes. This is applicable to the automatic construction of quality data package in aerospace product manufacturing processes.

29	CG	Intelligent manufacturing - Application in aerospace industry - General requirements for predictive maintenance of aerospace products	No	No	The aerospace industry is different from other military industries, in the fact that it has a short service life and basically no back-end user data. Therefore, it is necessary to regulate the collection of back-end data, and finally achieve the predictive maintenance of aerospace products.	It specifies the fault types, diagnosis methods and maintenance recommendations of automatic fault diagnosis for aerospace products.
CH Automobile industry						
30	CH	Intelligent manufacturing - Application in automobile industry - Identification application guide	Intelligent manufacturing - Object identification requirements (20170057-T-469)	Pay attention to the characteristics of the automobile industry, and draw up the application requirements guidance of the identification in automobile industry.	Refine and define each application scenario of the application mode of identification in the automobile industry.	It describes and guides the application mode and scenario of identification in intelligent manufacturing of the automobile industry.

31	CH	Intelligent manufacturing - Application in automobile industry - Implementation guide for mass customization	Intelligent manufacturing - Mass customization - General requirement (20182042-T-339), Intelligent manufacturing - Mass customization- Design requirement (20182037-T-339), Intelligent manufacturing - Mass customization - Production requirement (20182038-T-339)	To focus on the characteristics of automobile mass customization, as an important support for the automobile industry	There are many types of car models in the automobile industry with different manufacturing characteristics, while the production process is complicated and the quality requirements are high. In the process of mass customization in the automobile industry, the production and manufacturing process and the requirements of each system are more complicated. It needs to be formulated on the basis of the general standards of mass customization in various industries, and of the characteristics of the automobile industry.	This standard includes four parts, namely general requirements, digital marketing system specification, flexible R&D and production specification, and customized operation service specification. It mainly includes standards on general requirements, demand interaction specification, modular development specification, flexible production specification, and data management specification. The standard mainly guides the enterprises to realize the customized production service mode with the customer's individual needs as the core; at the same time, it can reduce the
CI Nonferrous metal industry						

32	CI	Intelligent manufacturing - Application in nonferrous metal industry - General technical specification for unified coding of mine IoT information	Internet of things - Information exchanging and sharing (GB/T 36478)	China has implemented the national standard GB/T 36478 Internet of things - Information exchanging and sharing since January 1, 2019. This standard mainly specifies the information exchange and sharing of Internet of things. The general unified coding of all kinds of entities of “human-machine-environment” in the mining industry, will be a necessary and beneficial supplement to the information exchange and sharing of Internet of things.	Due to the different division of functions and different management data of various departments in mines, there are different data formats, different data classification methods, and different basic coordinate systems among multiple systems, resulting in difficulties in data sharing, waste of resources, and even repeated construction of some systems. This has also become the bottleneck of the unified management of modern mine information. In order to solve this problem and ensure the practicability, compatibility, scalability and operability of mine data, it is necessary to establish a unified coding for information of Internet of things in mines, realize the efficient use of data, facilitate data query and data sharing, provide data basis for mine actual production management and decision-making, and provide data support for information sharing and resource sharing of mining enterprises.	Scope: it specifies the information coding standards for all kinds of physical and logical entities and software in the Internet of things of nonferrous metal mines. Main contents: it specifies the unified description of mine "human-machine-environment" information in IoT business systems. It is applicable to the common use within the mine and manufacturers; it is used in business development and equipment development, and provides a unified coding specification for mine equipment interoperability, mine data sharing and mine application development.

33	CI	Intelligent manufacturing - Application in nonferrous metal industry - General requirements for intelligent mine	No	No	As different enterprises have different focuses in the understanding of intelligent mine construction, lack of uniformity and high diversification are widespread phenomena in the industry. Concrete examples include the frequent focus put on localization, as well as the efforts to solve one or several problems in production: these lead to no essential improvement for the overall intelligent production level. Another example is the phenomenon that system modules with similar functions cannot be directly used in another system and need to be rebuilt after being built in one system. The lack of control and integrated implementation plan for the overall construction objectives of intelligent mines consequentially leads to the lack of applicability of project construction to the industry, as well as to the failure to show the actual effect of intelligent production. It can be seen that the lack of relevant specifications for the construction of intelligent mines in the nonferrous metal industry has become a major bottleneck that hinders the intelligent development of the industry. In order to solve this problem and	Scope: business processes, system architecture and general requirements of intelligent mine construction; it is applicable to guiding the planning, design and construction of smart factories (mine) in the nonferrous metal industry. Main contents: it gives the principles, objectives, overall architecture, path and key elements of China's intelligent mine construction on the basis of existing automation and informatization for mine construction; it also specifies the interaction, scheduling and integration of mining, mineral processing and smelting.

34	CI	Intelligent manufacturing - Application in nonferrous metal industry - Technical specification for intelligent operation and maintenance system of production equipment	No	No	The safety level and operation efficiency of nonferrous metal production can be greatly improved, through (i) the integration of informatization and networking into the safety data collection, fault diagnosis and predictive maintenance of production equipment in the nonferrous metal industry, (ii) the implementation of risk hierarchical management and control, and (iii) the realization of remote operation and maintenance of production equipment. By now, production operation and maintenance systems have been widely used; however, due to the lack of unified normative guidance, the operation and maintenance system architecture and technical requirements are not unified and the operation and maintenance processes are not clear. Therefore, it is urgent to formulate relevant standards to guide and regulate the construction and use of operation and maintenance system in the production process of nonferrous metal industry.	This standard specifies the system composition, functional requirements, performance requirements, interface requirements and test methods of intelligent operation and maintenance system for nonferrous metal production equipment. It is applicable to the design, development and use of intelligent operation and maintenance systems for nonferrous metal production equipment. The main technical sections of this standard include: scope, normative references, interface requirements, system composition, interface requirements, functional requirements, performance requirements, test methods, etc.

	CJ	Intelligent Manufacturing Electronic Information Industry Applications Electrical Connector Intelligent Assembly Workshop Planning and Design Guide			Electrical connector assembly is a typical multi-variety, variable batch discrete production. The total market demand is large, the cycle time is short, and the production organization is under great pressure. The field of electrical connector intelligent assembly workshop planning and design is still blank. Therefore, there is an urgent need to combine the best practices of construction and develop standards to guide and standardize the construction of intelligent assembly workshops for electrical connectors.	This specification mainly specifies the planning and design process of the intelligent assembly workshop for electrical connectors, which mainly includes the following aspects: product scope selection principles, assembly process analysis, lean production planning based on a combination of manual and automated equipment, workshop process layout planning, automated storage and logistics planning, manufacturing execution software module implementation planning, production management mode improvement and related management system optimization planning in all phases of the project.

	CJ	Intelligent Manufacturing Electronic Information Industry Applications Smart Warehouse Planning and Design Guide for Electrical Connector Workshops			Electrical connector materials for the typical multi-variety small batch high frequency, strictly in accordance with batch management, parts storage management requirements are strict; out of storage frequency; high-density storage and high-frequency out of the combination of intelligent storage design urgently need to combine practice, the development of standards to guide and standardize the planning and construction of intelligent warehouses for electrical connectors intelligent workshop.	The standard is used to standardize the electronics industry multi-species small batch high-frequency intelligent storage methods, the frequency of entry and exit, the whole process design of goods-to-person picking, reduce the exploration of the electronics industry-related enterprises for intelligent storage planning.

	CJ	Intelligent manufacturing electronic information industry applications MES and intelligent storage and logistics system software interconnection interface specification	ERP, manufacturing execution system (MES) and control system software interconnection interface specification	This standard regulates the electronic information manufacturing industry MES and intelligent storage and logistics system software interconnection interface, "ERP, manufacturing execution system (MES) control system software interconnection interface specification" mainly specifies the ERP and	Electronic information manufacturing industry to carry out the MES (manufacturing execution system) construction, but in the MES and intelligent storage and logistics integration interface development is still blank. Therefore, there is an urgent need to combine the production mode of multi-species and small batch to develop this standard to guide the MES and intelligent storage and logistics software to complete the development of interconnection interface.	The standard is used to standardize the electronic information manufacturing industry MES and intelligent logistics system software interconnection interface specification, can reduce the cost of MES and intelligent storage and logistics system integration.

	CJ	Intelligent manufacturing Electronic information industry application Material picking system human-machine interface and visualization design specification			The human-machine interface of material picking system is a new form of human-machine interaction, which is an important system for modern electronic product manufacturing. This standard can provide necessary guidelines and reference basis for the development of human-machine collaboration system, and lay a solid foundation for the informationization and efficiency improvement of intelligent workshop in manufacturing industry.	The standard is used to standardize the goods-to-man picking system, operation mode setting and change; order information interaction, order status monitoring, goods position identification and printing, material status monitoring, and other functions to improve picking supporting operation efficiency by standardizing human-machine interaction.

	CJ	Smart manufacturing Electronic information industry applications Smart factory design guidelines for optical fibers and prefabricated rods.	Smart factory construction guidelines	Will be guided by national standards, specific electronic industry segments of smart factory specific design guidelines, and supporting the use of national standards.	This document will solve the problem of a certain gap between national standards and industry-specific implementation in the process of designing and building smart factories for optical fiber and preform manufacturing. Through the development of this document, the design specifications and application guidelines for smart factories in the optical fiber industry will be proposed more closely in line with the national standard specifications to improve production efficiency and intelligence.	This document specifies the design framework, basic principles, physical plant design, and virtual plant design for optical fiber and preform smart plants. This document applies to optical fiber and preform smart manufacturing enterprises as well as the personnel and organizations that provide consulting services for smart factory planning and design.

	CJ	Intelligent Manufacturing Electronic Information Industry Application Implementation Specification for Smart Factory for Optical Fiber and Prefabricated Rods	Digital Workshop General Technical Requirements " "Smart Factory General Technical Requirements	Will be guided by national standards, specific electronic industry segments of smart factory implementation, and supporting the use of national standards.	For the fiber optic manufacturing presents industrial concentration, intelligent manufacturing level is not high, labor-intensive and other characteristics, through the development of this standard, will effectively guide the construction of China's optical fiber and prefabricated rod smart factory, to further improve production efficiency, reduce energy consumption, to achieve intelligent transformation and upgrading of fiber optic smart factory.	This document specifies the general technical requirements of fiber optic and preform smart factory (hereinafter referred to as smart factory), as well as the technical requirements and implementation guidelines for R&D intelligence, equipment and facilities intelligence, production process intelligence, safety production intelligence, management intelligence and integration intelligence. This document is applicable to guide the planning and design, new construction and reconstruction, and acceptance and operation of fiber optic and prefabricated rod smart factory.

	CJ	Intelligent manufacturing Electronic information industry applications Fiber optic and preformed rod intelligent equipment information model			In the production and manufacturing process of optical fiber and prefabricated rod, special equipment is a key link to limit production capacity and reduce costs, therefore, through the development of this standard, it will standardize the technical requirements of optical fiber and prefabricated rod intelligent equipment, help upgrade the optical fiber and prefabricated rod equipment industry, improve equipment intelligence, and ensure information exchange and control capabilities.	This document specifies the classification composition, information model and technical requirements of optical fiber and preform intelligent equipment. This document applies to optical fiber and prefabricated rod special intelligent equipment development, manufacturing and application.

	CJ	Smart Manufacturing Electronic Information Industry Applications Optical Fiber Smart Factory Design Guide		Will be guided by national standards, specific electronic industry segments of smart factory implementation, and supporting the use of national standards.	With the deepening of internationalization, the manufacturers are widely involved in international competition, the need for the domestic industry as a whole to continuously improve the level of intelligent manufacturing, and strive to maintain the leading level of production capacity and efficiency. Smart factory is the inevitable trend of high-quality development of the manufacturing industry, is the basis for the realization of intelligent, flexible and efficient manufacturing of fiber optic cable products. This standard will solve the problem of missing standards, inconsistent requirements and incomprehensive content in the design and implementation of smart factories for optical cable manufacturing, regulate the construction of smart factories in the optical cable industry, and improve their digital and intelligent management level.	The standard specifies the technical requirements of the structure, equipment layer, unit layer, workshop layer, enterprise layer, and collaboration layer of the smart factory for optical cable manufacturing, and is applicable to guide the design, implementation, and acceptance of the smart factory for optic al cable.

	CJ	Intelligent manufacturing electronic information industry applications fiber optic cable smart factory network technical specifications		Will be guided by national standards, specific electronic industry segments of smart factory implementation, and supporting the use of national standards.	Intelligent factory planning and construction needs the Internet of Things, Internet support, to achieve the interconnection of everything, the network is the foundation and an important part of the intelligent and digital construction of the factory. This standard will solve the problem of inconsistent and incomplete network technology requirements in the design and construction implementation of smart factories for fiber optic cable manufacturing, standardize the network technology requirements for smart factory construction in the fiber optic cable industry, and lay the foundation for intelligent construction.	The standard specifies the network design requirements, network implementation requirements and network security requirements in the construction of smart factories for optical cable enterprises. It is applicable to the network technology management in the construction of intelligent factory of fiber optic cable manufacturing enterprises.

	CJ	Intelligent manufacturing Electronic information industry applications Digital design and process simulation specifications for radar and similar electronic information equipment Part 1: General requirements			Radar and similar uses of electronic information equipment development is facing a complex electromagnetic environment, equipment multi-functional integration, equipment lightweight, miniaturization, increasing performance requirements, equipment upgrades and other new development characteristics, the urgent need to be guided by MBSE theory, from the top planning based on digital simulation design electronic information equipment R & D overall requirements, the formation of a series of simulation design specifications, the construction of a unified digital platform. Realize the new mode of electronic information equipment research and development, to enhance the competitive strength of China's electronic information equipment in the international arena. The development of this document can solve the problem of lack of systematic, standardized, digital R & D processes and specifications for guidance in the design and process simulation of electronic information equipment.	This document specifies the radar and similar uses of electronic information equipment (hereinafter referred to as electronic information equipment) digital design and process simulation of the basic content, the overall requirements, the specification of each component module requirements and data management requirements. This document applies to radar and similar uses of electronic information equipment digital design and process simulation, other electronic information equipment can also refer to use.

	CJ	Intelligent Manufacturing Electronic Information Industry Applications Specifications for Digital Design and Process Simulation of Radar and Similarly Used Electronic Information Equipment Part 2: Specifications for Telecommunications Modeling and Simulation			This document mainly studies the model composition, main functions, performance indicators, model parameters, input and output, modeling and simulation methods and other requirements for the digital design process of radar and similar electronic information equipment, to solve the traditional local calculation-based program design, physical test-based debugging means resulting in the development of electronic equipment technology risk, long development cycle, high development costs.	This document specifies the general requirements of radar and similar uses of electronic information equipment telecommunications model and simulation, detailed requirements, including model composition, main functions, performance indicators, model parameters, input and output, modeling and simulation methods. This document applies to radar and similar uses of electronic information equipment telecommunications modeling and simulation. Other electronic equipment can also be used with reference.

	CJ	Intelligent manufacturing Electronic information industry applications Digital design and process simulation specifications for radar and similar uses of electronic information equipment Part 3: Structural design and simulation specifications			This document realizes the digital prototype based on 3D model in the whole process of product design and simulation, forming an innovative R&D model characterized by virtual design and simulation verification, effectively improving the efficiency of product design and development and simulation confidence, breaking the bottleneck of the existing R&D model on the development of future equipment, meeting the demand for rapid renewal of core electronic equipment, and promoting the strategic transformation of China's radar and similar electronic information equipment The strategic transformation of the R&D mode.	This document specifies the general requirements for structural design and simulation, design model modeling requirements, analysis model modeling and simulation requirements for digital design and process simulation system of radar and similar electronic equipment. This document applies to the digital design and process simulation of electronic equipment for radar and similar purposes.

	CJ	Intelligent manufacturing Electronic information industry applications Digital design and process simulation specifications for radar and similar uses of electronic information equipment Part 4 3D assembly process planning and simulation specifications			This document mainly studies and develops standards for the requirements of 3D model input, process route planning, virtual assembly, and simulation result output in the process of assembly process design and simulation, solves the problems such as the difficulty of penetration between structure, process and production of civil radar 3D models, effectively standardizes the product development process and detailed requirements of enterprises in this industry, so as to realize the real 3D process technology in enterprises "on the ground", improve the efficiency of industry product development, reduce industry R&D costs, and bring effective results for enterprises.	This document specifies the general requirements, process and detailed requirements, data management requirements for the planning and simulation of three-dimensional assembly process of radar and similar electronic information equipment. This document applies to the radar and similar uses of electronic information equipment three-dimensional assembly process planning and simulation, other electronic equipment can be used with reference.
CK Power Equipment Industry						

	CK	Intelligent manufacturing Power equipment industry application Implementation specification of supply chain-based collaborative manufacturing system for small and medium-sized motors	GB/T38994-2020 General requirements for digital collaborative manufacturing technology for ships	Different industries, but still harmonizable with existing standards	At present, the motor industry suffers from imperfect supply chain, low bargaining power, long procurement cycle of some parts and unstable quality, etc., and the realization of supply chain collaborative manufacturing is the key for small and medium-sized motor manufacturing enterprises to enhance their core competitiveness and occupy the market. At the same time, the rapid development of intelligent manufacturing will inevitably lead to the acceleration of the motor manufacturing process, the bottleneck effect of the supply chain will immediately appear, and the current supply chain standards are all general standards, it is difficult to meet the current situation of the industry division of labor in small and medium-sized motors and the needs of multi-species, small batch production mode, so the standardization of supply chain collaborative manufacturing is urgent.	This standard specifies the general requirements and functional requirements of the supply chain collaborative manufacturing system for small and medium-sized motors in multi-species and small-lot manufacturing mode.

	CK	Intelligent manufacturing Power equipment industry applications Large-scale personalized customization of electric motors Production Implementation Guide	GB/T40012-2021 Personalized Customization Classification Guide	Synergistic with existing standards, can be used in conjunction	Large and medium-sized motor small batch, multi-species production mode of personalized customization needs, is now increasingly common, the need to regulate its production process, there is no relevant standards for the motor industry's large-scale personalized customization, so there is an urgent need to develop relevant standards to guide and regulate the production of industry enterprises.	This standard mainly describes to meet the needs of personalized customization of large and medium-sized motor small batch, multi-species production mode, including the motor customization process in the production chain of order processing, production scheduling, material control, production execution, quality control he, logistics and distribution and other activities requirements.

	CK	Intelligent manufacturing Electric power equipment industry applications Remote operation and maintenance platform equipment access specifications for electric motor systems	GB/T39837-2021 Information technology remote operation and maintenance technology reference model	Can be used in conjunction with GB/T39837-2021 "Information Technology Remote Operation and Maintenance Technical Reference Model	Motor application areas are extensive, the site use is complex, communication interfaces and installation methods vary widely, equipment access requirements have not formed a unified specification and labeling, with the enterprise intelligent development needs, the urgent need to establish relevant standards to enhance the reliability of the motor use process, safety, intelligence, and effectively play the standardization and quality work on the equipment manufacturing industry to lead and support the role.	Provisions motor system remote operation and maintenance platform equipment access requirements of the terminology and definitions, system architecture, hardware functional requirements, software functional requirements, data transmission requirements, information security requirements, operation and maintenance management and other general technical requirements. This standard applies to the construction of the industrial Internet platform for remote operation and maintenance of motors based on the industrial Internet.

	CK	Intelligent manufacturing Power equipment industry applications Edge processing technical specifications for remote operation and maintenance platform of electric motor system			The calculation of current, voltage, vibration and corresponding spectrum information during the operation of electric motors is huge, generating data overload growth and data delay. Edge computing mode provides important technical support to solve the above problems. Therefore, it is important to standardize relevant standards, solve the problem that the edge side can dynamically assume the computing power of the cloud, and expand the scope and depth of remote operation and maintenance applications of motor systems, etc.	Specify the edge measurement acquisition and transmission device of remote operation and maintenance platform of motor system for current, voltage, vibration and the corresponding spectrum information edge processing requirements, early warning of data, alarm mechanism and other requirements. This standard applies to the construction of the industrial Internet platform for remote operation and maintenance of motors based on the industrial Internet.

	CK	Intelligent Manufacturing Electric Power Equipment Industry Application Digital Design and Simulation Technical Specification for Customer-side Electrical Equipment			Due to the lack of systematic application standards, the management of design and simulation data is confusing and the knowledge base is lacking, and only partial qualitative analysis is conducted through the simulation system, but quantitative optimization has not been carried out by means of simulation. Therefore, there is an urgent need to establish standards related to digital design and simulation system and simulation database, so that digital design can be effectively integrated with digital manufacturing and design data can be directly applied to manufacturing.	This standard specifies the simulation and calculation process, simulation knowledge base requirements, simulation objects and simulation input and output requirements, simulation operation environment and simulation file management requirements for digital design and simulation of user-side electrical equipment. It is used to guide the construction and application of digital design and simulation system for user-side electrical equipment.

	CK	Intelligent Manufacturing Power Equipment Industry Application Digital Process Simulation Technical Specification for Customer-side Electrical Equipment			The process design of enterprises in the user-side electrical industry is mainly carried out by past experience, and the process design is influenced by the experience of process personnel, which often causes the process stage to fail to achieve the design objectives and require re-modification of the design. The backward means of process design makes it difficult to evaluate the manufacturability of products comprehensively and systematically, and to realize the whole process management of intelligent manufacturing. Therefore, there is an urgent need to establish digital process simulation system and simulation database related standards to effectively integrate digital process with digital manufacturing, so that process parameters and process documents can be directly applied to the manufacturing process.	This standard specifies the overall process design flow chart and input and output requirements, simulation and calculation process, simulation knowledge base requirements, simulation objects and simulation input and output requirements, simulation operation environment and simulation file management requirements for digital process simulation of user-side electrical equipment. It is used to guide the construction and application of digital process simulation system for user-side electrical equipment.

	CK	Intelligent Manufacturing Power Equipment Industry Application Specification for Digital Design Information and Process Information Integration of User-side Electrical Equipment			Most of the product design, design simulation, process design and process simulation in the customer-side electrical equipment industry are implemented based on independent software without effective information integration, resulting in low product design efficiency and production efficiency, backward product processes, lack of data accumulation, and a large distance from the international advanced level. Therefore, there is an urgent need to establish digital design, process simulation system and simulation database, and to integrate digital design and process effectively with digital manufacturing, so that design and process parameters and documents can be directly applied to the manufacturing process.	This standard specifies the overall information integration architecture and information integration requirements for the integration of digital design information and process information of user-side electrical equipment. It is used to guide the development and implementation of digital design information and process information integration of user-side electrical equipment.
CL Others						

35	CL	Intelligent manufacturing - Application in liquor making industry - Data specification for digital management and decision-making of intelligent liquor brewing	Digital factory - General technical requirements (GB/T 37393-2019)	This standard can be used in conjunction with GB/T 37393-2019 Digital factory - General technical requirements as the specific application specification for liquor industry	The data specification of digital intelligent decision-making systems for intelligent liquor brewing mainly elaborates different stages of digital intelligent decision-making systems, from the perspective of production data and analytical data, such as data collection, transmission, storage, processing, analysis and application. It provides data specifications for relevant system platforms, as well as guiding technical solutions for intelligent manufacturing enterprises in the digitalization of liquor brewing. At the same time, the standard can further promote the implementation of the system for hardware equipment design, software platform design, development, testing, operation and application, giving leading unified recommendations, guiding hardware enterprises and software enterprises to take this specification as the main line, contributing to the quick establishment of digital platforms, and defining open interfaces for third-party data application services. Therefore, it will enrich the liquor production and sales related ecological services.	This standard specifies the requirements for data classification, collection, processing, transmission, analysis and safety technology implementation of digital intelligent decision-making systems for the intelligent brewing of liquor. This standard is applicable to liquor brewing enterprises and intelligent manufacturing system solution suppliers in data acquisition equipment and system design, development, construction, testing, operation, etc.

36	CL	Intelligent manufacturing - Application in canned food industry - Implementation guide for intelligent monitoring system in key links of canned food production	No	This standard supports GB/T20938-2007 Good manufacturing practice for canned food, and provides guidance to intelligent monitoring of key links in canned food production and implementation of good practice for canned food enterprises.	Canned food processing is labor-intensive, involving a wide variety of raw materials, huge processing loss and seasonality. Different kinds of quality control indicators are involved in the production of canned food, which are closely related to raw materials. With growing consumers' understanding of the concept of safer and greener canned food, the domestic demand is increasing. Canned food production enterprises urgently need a set of systematic, intelligent and efficient means/systems to implement good manufacturing practices aimed at improving production efficiency and maintaining product quality stability;	This standard proposes the quality control indicator system of the key technology of canned food production, the general processes of systematic and intelligent monitoring. and reverse guidance of production decision-making; it also regulates the construction methods of intelligent quality control system solutions in canned food production.

37	CL	Intelligent manufacturing - Application in agricultural machinery - Technical requirements for remote operation and maintenance and fault diagnosis of combine harvesters	Combine harvesters monitoring system (GB/T 35488-2017)	This standard is a supplement to the published national standards; they can be used as a complete set.	To carry out research on remote fault pattern recognition of combine harvester. To build on data association feature extraction and clustering data mining technology, and study the relationship between complex working environment information, working condition information of combine harvester and typical fault information. To reveal the influence mechanism of working condition of key components on typical fault of combine harvesters, and establish the spatial-temporal distribution map of combine harvester fault. To study the multi-information collection and fusion technology of combine harvesters, realizing the efficient collection and processing of working condition information. To study the self-learning fault diagnosis and performance prediction technology of input-output observer-based agricultural machinery, on the basis of the mechanical principle of combine harvesters. To mine the historical data of single machine and the same type of machines, extract the associated features and analyze the fault model horizontally on the basis of the network data, so as to establish the fault pattern recognition model in the complex operation process of combine harvester and improve the accuracy of fault diagnosis	The technical requirements for remote operation and maintenance fault diagnosis of combine harvesters specify the technical contents of fault diagnosis scope, detection system requirements, detection points, data transmission, storage and processing, detailed requirements, evaluation and diagnosis of remote operation and maintenance management of combine harvesters. These are applicable to the remote operation and maintenance management system of combine harvesters. The standard can effectively solve the problems of fault diagnosis information collection, multi-information fusion extraction, fault pattern recognition, fault diagnosis and prediction program specification of combine harvesters remote operations and maintenance management, as well as the standardization of sensor, diagnosis system calibration, diagnosis point, diagnosis environment, diagnosis value, diagnosis time and other indicators of fault diagnosis, so as to improve the fault diagnosis level of combine harvester remote operation and maintenance management.

38	CL	Intelligent manufacturing - Application in printing industry - Specifications for data acquisition and communication of equipment	No	No	The intelligent construction of the printing industry is inseparable from the support to printing equipment. The informatization and digitization of printing equipment are the basic conditions to achieve the intelligent construction of the printing industry. Therefore, attention must be paid to the establishment of printing equipment standards, which requires support of printing equipment standards from basic general requirements, data acquisition to equipment operation	The standard is used to specify the data acquisition functions, processing and communication of each production equipment involved in the printing process.
39	CL	Intelligent manufacturing - Application in printing industry - Guide to supply chain management in printing industry	No	No	Printing supply chain management is indispensable for suppliers, warehouses and distribution centers to effectively organize production; it is also very important for product transshipment and sales. It is a necessary means to adjust the supply chain balance. The construction of smart printing factories is inseparable from the guidance of supply chain	Supply chain management standard is used to guide the effective organization of suppliers, printing enterprises, warehouses, distribution centers and channel providers for printing production, transshipment, distribution and sales. The aim is to minimize the cost of the whole supply chain system while

40	CL	Intelligent manufacturing - Application in nuclear energy industry - Production control data dictionary	No	No	The nuclear energy industry is characterized by a long industrial chain, diverse product forms, complex technological systems and production processes with both process-type and discrete features. These characteristics lead to poor data flows among materials, intelligent equipment and systems, and to the lack of unified standards among various business systems; these are not conducive to big data analysis and centralized display in the nuclear energy industry.	This standard specifies the metadata classification and data attributes used for data integration in the production control business of smart factories in the nuclear energy industry. It gives the production control data entity, and specifies the production control data attribute name, data code, data format, description, etc. It is applicable to the provisions of metadata specifications and data entity for production management and control data integration of smart factories in the nuclear energy industry.

* The list is subject to dynamic update according to the progress of standards formulation.