

Introduction

Roberta Nelson Shea

Global Technical Compliance Officer

RNS@Universal-Robots.com
+1 (844) 462-6268

Universal Robots A/S

*a manufacturer of "collaborative robots"
really they are PFL (Power & Force Limited) robots*

*Also: Convenor of ISO TC299 SG1 & WG3
RIA Standards – Chair Emeritus*



ISO & RIA Robot Standardization...

Historically

- ISO TC299 was mostly industrial (now called WG3) with some other efforts for performance and interfaces and primarily safety
- RIA (Robotic Industries Association) is 90% industrial and only now expanding to other sectors
- Membership and participation in standardization in RIA and TC299 WG3 are primarily from industry (robot manufacturers, robot integrators, users of robot systems) with representation by government, researchers and consultants.
- Some but few from academia.

WG3 and RIA observation of other TC299 WGs

- Participation seems to be mostly academia and research



ISO/TC 299

Robotics

About

Secretariat: SIS

Secretary: [Ms Katarina Widström](#)

Chairperson (until end 2021): [Mr Staffan Elfving](#)

ISO Technical Programme Manager: [Mr Andrew Dryden](#)

ISO Editorial Programme Manager: [Mr Brian Stanton](#)

Creation date: 2015

Scope

Standardization in the field of robotics, excluding toys and military applications

Quick links

[Work programme](#)
Drafts and new work items

[Business plans](#)
TC Business plans for public review

[ISO Electronic applications](#)
IT Tools that help support the standards development process



ISO/TC 299

Visit the Technical Committee's own website

Majority of TC299 WG2 and WG3 standards are EU harmonized standards (in the Official Journal for the Machinery Directive)


WG3 safety standards have been adopted in Canada, USA, South Korea and Japan.

Some adoption in Singapore and others...



ISO/TC 299

Robotics

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<https://committee.iso.org/home/tc299>

About ISO/TC 299 Robotics

Robotics has been a core pillar in the manufacturing industry for several decades and is a multi-million Euro industry today. As statistics reveal, growth in the robotics industry continues to be explosive. Since the installation of the first industrial robot in the 1970s, the sector has continuously expanded into new markets and developed new applications. Today robotics is no longer a technology for only manufacturing but has evolved to also address much wider range of applications and domains where a variety of services are provided to different end users.

ISO/TC 299 has the goal to develop high quality standards for the safety of industrial robots and service robots to enable innovative robotic product to be brought onto the market. In addition, ISO/TC 299 has the goal to foster the growth of the robotic market by introducing standards in fields like terminology, performance measurement and modularity. The scope of ISO/TC 299 reads “Standardization in the field of robotics, excluding toys and military applications.”

The standards provide global organizations and individuals with guidance on how to implement robots in best possible way. Value is added to the robot investments by providing clear best practices on how to ensure proper safe installations, as well as providing standardized interfaces and performance criteria.

History of ISO/TC 299

Related ISO pages

[Our page on iso.org](#)

[Who develops ISO standards?](#)

[Map of participating countries in ISO/TC 299](#)

Want to get involved?

Standards are developed by the people who need them – that could mean you. Technical committees include experts from both standards and industry and these experts are put forward by ISO’s national members. If you want to help shape future standards in your field, contact your [national member](#)

TC299 Robotics – *officially...*

SG1 Gaps & overlaps – determine new organization under TC299 of WGs and their scopes (conclusion: May 2020)

WG1 Vocabulary and characteristics

WG2 Personal care robot safety

WG3 Industrial safety

WG4 Service robots

JWG5 Medical (under IEC lead, convenor: Michel Brossoit)

(JGW 5 convenor is Gurvinder Virk, but NO ISO JWF5 activity)

WG6 Modularity for service robots

Excludes Toys and military

Above structure is from ISO (<https://www.iso.org/committee/5915511.html>)

TC299 Robotics – trends...

- WG1 Vocabulary and characteristics → COMMON terms and not a dictionary
- WG2 Personal care robot safety → Service robot safety (scope is uncertain as desire is to cover EVERYTHING)
- WG3 Industrial safety → Workplace safety of robots/robot systems
already includes topic of “collaborative”, reference ISO/TS 15066
- WG4 Service robots → Service robot performance
- JWG5 Medical (under IEC lead) → no change (chugging along)
- WG6 Modularity for service robots → uncertain, differing perspectives
Example, ISO is NOT supposed to handle electro-technical (this is IEC’s turf)

Excludes | Toys → Uncertain who / what organization will lead
| Military → Uncertain who / what organization will lead

Not
excluded

/ Household appliance → but looks like IEC is leading, just by default (got there first)
/ Airborne → not aware of activity (WG3 does NOT address – not a “workplace”)
/ Waterborne → not aware of activity (WG3 does NOT address – not “workplace”)

TC299 Robotics – activities...

- WG1 ISO 8373:2012, *Robots and robotic devices – Vocabulary* (under revision)
ISO 19649:2017, *Mobile robots – Vocabulary*
ISO 9798:2013, *Robots and robotic devices – Coordinate systems & motion nomenclatures*
- WG2 ISO 13842: 2014, *Robots and robotic devices – Safety requirements for personal care robots*
ISO/CD TR 23482-1, *Robotics – Application of ISO 13482 – Part 1: Safety-related test methods*
ISO/CD TR 23482-2, *Robotics – Application of ISO 13842 – Part 2: Application guide*
- WG3 ISO 10218-1:2011, *Robotics – Safety requirements for industrial robots – Part 1: Robots* (under revision)
ISO 10218-2:2011, *Robotic – Safety requirements ...– Part 2: Robot systems & integration* (under revision)
ISO/TS 15066:2016, *Robots and robotic devices – Collaborative robots*
ISO/TR 20218-1:2018, *Robotics – Safety design for industrial robot systems – Part 1: End-effectors*
ISO/TR 20218-2:2017, *Robotics – Safety design for ind robot sys – Part 2: Manual load/ unload stations*
ISO 11593:1996, *Robotics – Automatic end-effector exchange systems – Vocabulary & presentation* (revising)
ISO 9283:1998, *Manipulating industrial robots – Performance criteria and related test methods*
ISO 9409-1:2004, *Manipulating industrial robots – Mechanical interfaces – Part 1: Plates*
ISO 9409-2:2002, *Manipulating industrial robots – Mechanical interfaces – Part 2: Shafts*
ISO 14539:2000, *Manipulating industrial robots – Object handling with grasp-type grippers – Vocabulary...*
ISO 9946:1998, *Manipulating industrial robots – Presentation of characteristics*

TC299 Robotics – activities...

- WG4 ISO 18646-1:2016, *Robotics — Performance criteria and related test methods for service robots — Part 1: Locomotion for wheeled robots*
ISO/DIS 18646-2, *Robotics — Performance criteria & related test methods ... — Part 2: Navigation*
ISO/AWI 18646-3 *Robotics — Performance criteria & related test methods ... — Part 3: Manipulation*
- JWG5 IEC/TR 60601-4-1:2017, *Medical electrical equipment – Part 4-1: Guidance and interpretation — Medical electrical equip & medical electrical systems employing a degree of autonomy*
IEC lead IEC/DIS 80601-2-77, *Medical electrical equipment – Part 2-77: Particular requirements for the basic safety and essential performance of robotically assisted surgical equipment*
as IEC/DIS 80601-2-78, *Medical electrical equipment – Part 2-78: Particular requirements for the basic safety and essential performance of medical robots for rehabilitation, assessment, compensation or alleviation*
JWG9,
JWG35,
JWG36
- WG6 ISO/CD 22166-1, *Robotics – Part 1: Modularity for service robots – Part 1: General requirements*

RIA Standardization...

ANSI/RIA R15.06 Industrial robots & robot systems

- R15.06 was first published in 1986, then 1992, 1999, then 2012
- R15.06 1999 edition was used as the basis for ISO TC299 WG3's ISO 10218-1 and ISO 10218-2, most recently published in 2011.
- Numerous Technical Report published (6) with 3 under development

ANSI/RIA R15.08 Mobile robots (with and without R15.06 robots)

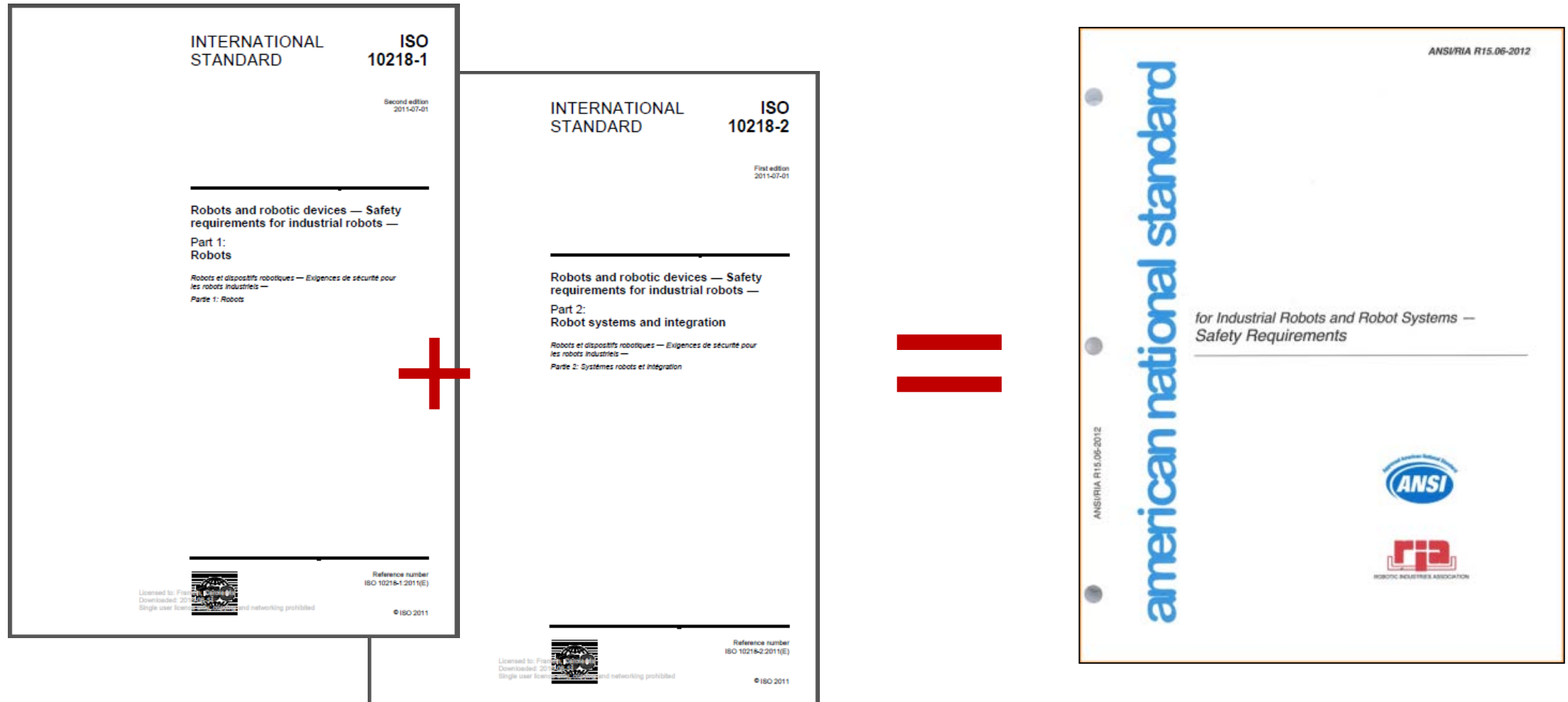
- Under development
- Not overlapping industrial truck & AGV standards

COMMON ASPECTS (also for TC299 WG3)

- Ground-based (not airborne or waterborne)
- Includes mobile manipulators & Autonomous Mobile Robots (AMRs)

About ISO 10218-1,2 relationship with R15.06

Like Europe, the USA (ANSI/RIA) and Canada (CSA) are developing in ISO for subsequent national adoption.



Supplemental Documents: TSs and TRs

ISO:

Technical Specification (TS) - Normative

Technical Report (TR) - Informative

ANSI:

Technical Report (TR) *ONLY* – Informative

Supplemental Documents through ANSI by RIA

Currently published and available: *(TR R15.106 & TR R15.206 withdrawn)*

- TR R15.306-2016 Task-based Risk Assessment Methodology
→ Key references ISO 12100, ISO 13849 and more...
- TR R15.406-2014 Safeguarding *(refers to ISO 11161, ISO 13855, ISO 13857...)*
- TR R15.506-2014 Existing Systems *(applicability guidance for USERS)*
- TR R15.606-2016 Collaborative "Robots" *(US adoption of ISO/TS 15066)*

Technical reports to aid USERS, under development:

- TR R15.706 Guidance for USERS *(ISO addresses SUPPLIERS of machinery)*
- TR R15.806 How to perform pressure & force measurements
(for Collaborative PFL (Power & Force Limited) applications under lead of J Falco of NIST)
- TR R15.906 Implementation of safety functions - validation

There is room for other standards...

Let's identify ...

- Common interests
- Minimize overlaps

AND Play to our own strengths!