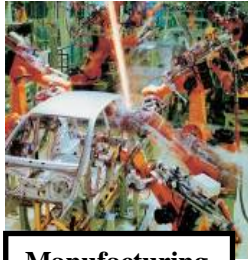


Industrial

Military



Effective



Manufacturing



Collaboration

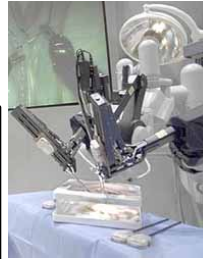


Service robots

Physical assistant



Surgery



Mobile servant



Person carrier



Rehabilitation

Personal care

Medical

Robot standardisation: Update



Professor Gurvinder Singh Virk

University of Gävle, KTH Royal Institute of Technology, Sweden
Trustee/ Deputy Chairman: CLAWAR Association Ltd, UK

Email: gurvinder.virk@hig.se

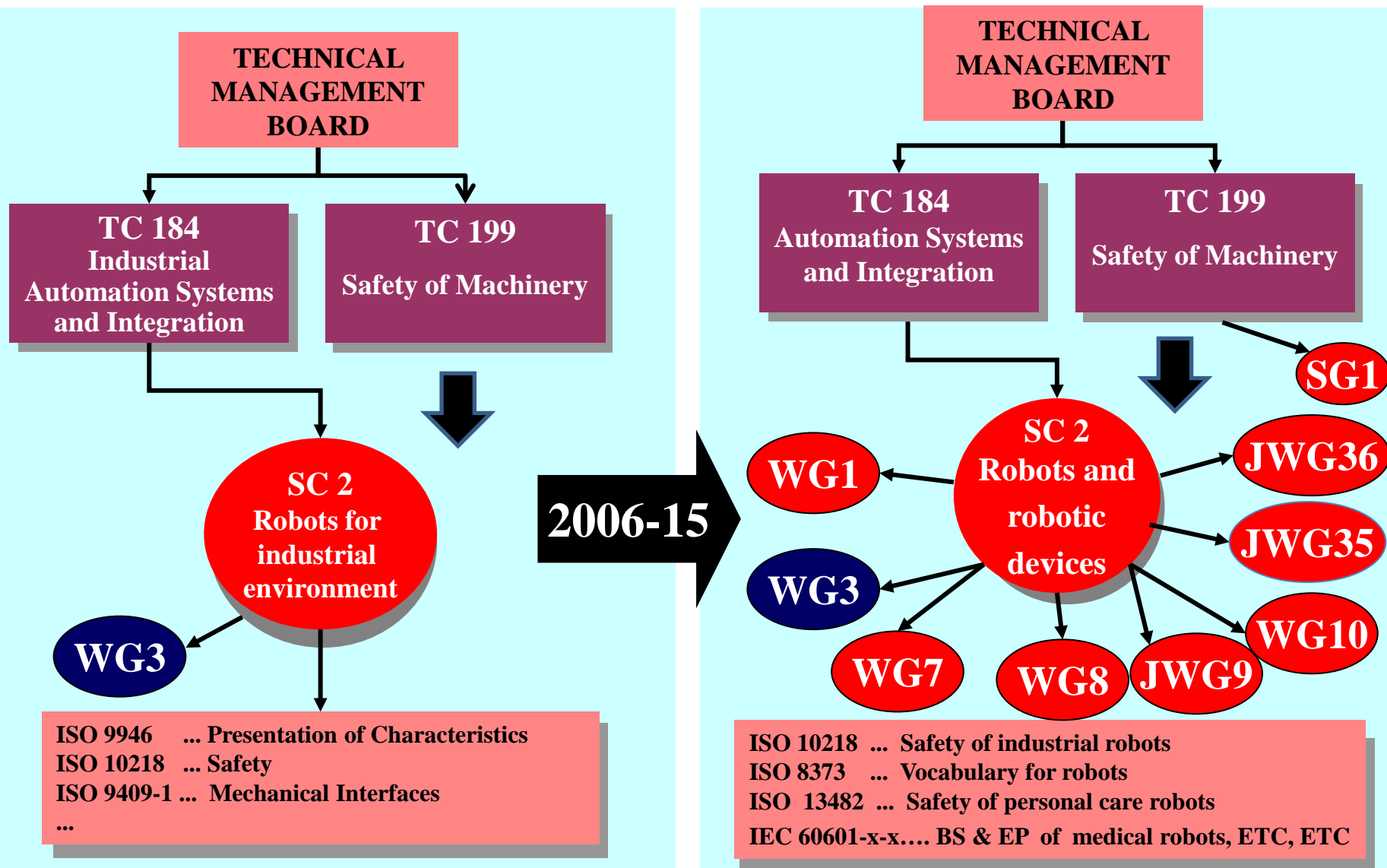


- 1) Convener: ISO TC 184/SC2/WG7: Personal care robot safety
- 2) Convener: IEC SC62A & ISO TC 184/SC2 JWG9: MEE & S using robotic technology
- 3) Convener: ISO TC 184/SC2/WG10: Modularity for service robots
- 4) Director: euRobotics Topic Group Standardisation for H2020

- **Pre-2004:** Most robot standardization activities focussed on industrial environments. ISO and IEC are main international organisations with well accepted responsibilities for standardization activities needed. EC funded Network of Excellence on Climbing and Walking Robots (CLAWAR: 1998-2005) \Rightarrow primary aim to widen the application base for robotics. Initiatives in robot modularity and robot standardisation
- **2004:** Formal contacts made to national standards bodies to activate work required
 - BSI (Univ Leeds, UK), AFNOR (Cybernetix, France), SIS (Orebro, Sweden), ONH (Univ Vienna, Austria), IBN, (RMA, Belgium), BIS (BAS, Bulgaria), FSA (HUT, Finland), DIN (F-IEF, Germany), MSZT (Univ Budapest, Hungary), ENIU (UNICT, Italy), NNI (TNO, The Netherlands), PKN (Poznan, Poland), IPQ (ISQ, Portugal), AENOR (CSIC, Spain)
- **2005:** New robot standardization work underway with SC2: Robots and robotic devices proposed. ISO Resolution to setup an ISO Advisory Group on “Standards for mobile service robots”, with GS Virk as Chairman.
 - Advisory Group setup in June 2005 with \approx 30 nominated experts + Observers for maximising input
 - Advisory Group reported results at ISO TC184/ SC2 Plenary meeting in Paris on 15-16 June 2006
- **2006:** Creation of WG1 on Robot Vocabulary (Soon-Geul Lee, Korea as chair)
- **2006:** Creation of WG7 on Personal care robot safety (GS Virk, UK as chair)
- **2006:** Creation of WG8 on Service robots (Seungbin Moon, Korea as chair)
- **2011:** Creation of IEC/ISO JWG9 on Medical electrical equipment and systems using robotic technology (GS Virk, UK as chair)
- **2014:** Creation of WG10 Modularity for service robots (GS Virk, UK, chair)
- **2014:** Creation of SG1 Safety data for human-machine interactions (BR Tranter, UK, chair)
- **2015:** Creation of JWG35 Medical robots for surgery (M Brossoit, Canada, chair; Project leader: Kiyo Chenzei, AIST, Japan)
- **2015:** Creation of JWG36 Medical robots for rehabilitation (M Brossoit, Canada, chair; Project leader: Burkhard Zimmerman, Hocoma, Switzerland)



Changing face for ISO robot standardization



WG1: Robot vocabulary and characteristics

- **Convenor:** Prof SoonGeul Lee, Kyung Hee University, Korea; Email: sglee@khu.ac.kr
- **WG of ISO TC184/SC2**
- **Scope:** Prepare consistent vocabulary and key robot characteristics for evolving robotics because these have been identified as critical issues to facilitate development of new robot applications
- **Key standard:**
 - ISO 8373:2012, Robots and robotic devices - Vocabulary
 - ISO 9787:2013, Robot coordinate systems and motion nomenclatures
- **Current work:** ISO/CD 19649, Vocabulary for mobile robots
- **Key definitions:**
 - **Old ISO 8373 definition:** industrial robot, robot; an automatically controlled, reprogrammable, multipurpose manipulator, programmable in three or more axes which may be either fixed in place or mobile for use in industrial automation applications
 - **Current ISO 8373 (2012) definition:** robot, actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks
 - **New ISO TC184/SC 2 definition:** robot; programmed actuated mechanism with a degree of autonomy, moving within its environment, to perform intended tasks

WG3: Industrial robot safety

- **Convenor: Pat Davison, RIA, USA; Email pdavison@robotics.org**
- **New convenor: Roberta Nelson, Rockwell, USA; Email: rnelsonshea@ra.rockwell.com**
- **WG of ISO TC184/SC2**
- **Scope: Industrial robot safety requirements**
- **Key standards:**
 - **EN ISO 10218-1,2011, Industrial robot safety requirements - Part 1: Robot**
 - **EN ISO 10218-2,2011, Industrial robot safety requirements - Part 2: Robot system and integration**
- **Current work: ISO/TS 15066, Collaborative industrial robots**
- **Future work:**
 - **Safety of industrial robot system end of arm tooling**
 - **Safety of industrial robot system manual load stations**

WG7: Personal care robot safety

- **Convenor: Gurvinder S Virk, CLAWAR, UK; gsvirk@clawar.org**
- **WG of ISO TC184/SC2**
- **Scope: Safety requirements for personal care robots allowing close human-robot interactions. Three types of robots defined: mobile servant, physical assistant and person carrier robots**
- **Key standards: EN ISO 13482:2014, Safety**
- **requirements for personal care robots**
- **Current/ Future work:**
 - **NWP TR Application Guide to ISO 13482**
 - **NWP TR Safety-related V&V test methods ISO 13482**

WG8: Service robots

- **Convenor: Seungbin Moon, Sejong University, Korea, Email: sbmoon@sejong.ac.kr**
- **WG of ISO TC184/SC2**
- **Scope: Investigate standardisation needs for service robots and identify gaps**
- **Current work:**
 - **Liaise with IEC for robot standardisation issues**
 - **ISO/DIS 18646-1, Performance criteria and related test methods for service robot - Part 1: Locomotion for wheeled robots**
 - **ISO/PWD 18646-2, ISO 18646-2, Performance criteria and related test methods for service robot -Part 2: Navigation**

- **Convenor: Gurvinder S Virk, CLAWAR, UK;
Email: gsvirk@clawar.org**
- **JWG between IEC SC62A & ISO TC184/SC2**
- **Scope: Extending the IEC 60601 family of collateral and particular standards for medical electrical equipment to cover medical robots to be regulated as medical devices**
- **Current/ Future work: IEC/DTR 60601-4-1:
Medical electrical equipment - Part 4-1:
Guidance and interpretation – Medical electrical equipment and medical electrical systems employing a degree of autonomy**

WG10: Modularity for service robots

- **Convenor: Gurvinder S Virk, CLAWAR, UK;
gsvirk@clawar.org**
 - **Co-convenor 1: Shuping Yang, RIAMB, China;
Email: yangshp@riamb.ac.cn**
 - **Co-convenor 2: Prof Hongseong Park, Kangwon
National Univ, S. Korea; Email:
hspark@kangwon.ac.kr**
- **WG of ISO TC184/SC2**
- **Scope: Formulate robot modularity guidelines
from hardware and software perspectives**
- **Current work: NWP Modularity for service
robots – Part 1: General requirements**

JWG35: Medical robots for surgery

- **Convenor: Michel Brossoit, CSA International, Canada; Email: michel.brossoit@csagroup.org**
- **Project Leader: Kiyoyuki Chinzei, AIST, Japan; Email: k.chinzei@aist.go.jp**
- **JWG between IEC SC62D & ISO TC184/SC2**
- **Scope: Develop basic safety and essential performance requirements for medical robots for surgery**
- **Current work: IEC/CD 80601-2-77, Medical Electrical Equipment - Part 2-77: Particular requirements for the basic safety and essential performance of medical robots for surgery**

JWG36: Medical robots for rehabilitation

- **Convenor: Michel Brossoit, CSA International, Canada;
Email: michel.brossoit@csagroup.org**
- **Project Leader: Burkhard Zimmermann, Hocoma AG,
Switzerland; burkhard.zimmermann@hocoma.com**
- **JWG between IEC SC62D & ISO TC184/SC2**
- **Scope: Develop basic safety and essential performance requirements for medical robots for rehabilitation**
- **Current work: IEC/CD 80601-2-78, Medical Electrical Equipment - Part 2-78: Particular requirements for the basic safety and essential performance of medical robots for rehabilitation, compensation or alleviation of disease, injury or disability**

- **Co-convenor: Brian Tranter, CLAWAR, UK,
Email: btranter@btinternet.com**
- **Co-convenor; Yoji Yamada, Nagoya University,
Japan; Email: yamada-yoji@mech.nagoya-u.ac.jp**
- **WG of ISO TC199 (Safety of machinery)**
- **Scope: Identify requirements for development
of normative data relating to human-machine
interactions**
- **Current/ Future work: Normative safety data
for physical contacts between moving
machinery and people**

Latest developments within ISO/IEC

- **New Technical committee on Robotics set up to raise profile of robotics within ISO**
 - **Scope of new TC Robotics: Standardization in the field of robotics, except toys and military applications**
 - **Current WGs in SC will be transferred to the new TC Robotics**
- **IEC SMB to create a new Advisory Committee on Robotics to**
 - **Promote collaboration on robotics between IEC and ISO**
 - **Preparing a guidelines that outlines the critical aspects of preparing standards for products that incorporate robotic technology**