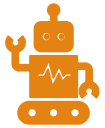
UNCUYO
UNIVERSIDAD NACIONAL DE CUYO

FACULTAD DE INGENIERÍA

ROBOTICA I



UNIDAD VII: **Aplicaciones Industriales y de Servicio**

Prof: Carolina Díaz **JTP: Eric Sanchez**

Aplicaciones

- Manipulación:
  - Pick and Place.
  - Paletizado.
  - Etc.
- Soldadura.
- Pintura.
- Corte.
- Tareas Cooperativas:
  - robot – robot.
  - humano – robot.
- Exploración:
  - espacial.
  - lugares peligrosos o inaccesibles.

IFR Class	Application area	Definitions
110	**Handling operations/ Machine tending**	**Assistant processes for the primary operation (the robot doesn't process the main operation directly)**
111	Handling operations for metal casting	including die-casting
112	Handling operations for plastic moulding	also inserting operations for injection moulding
113	Handling operations for stamping/forging/ bending	
114	Handling operations at machine tools	
115	Machine tending for other processes	e.g. handling during assembly, handling operations during glas or ceramics production or food production Robots that handle workpieces at an external welding TCP (i.e. MIG/MAG torch or spot gun) need to be reported in the appropriate welding classification (i.e. 161 for arc welding or 162 for spot welding) and shall not be counted to the classification of handling operations.
116	Handling operations for measurement, inspection, testing	triage, quality inspection, calibrating
117	Handling operations for palletizing	all sectors, all kinds and sizes of pallets
118	Handling operations for packaging, picking and placing	e.g. operations during primary and secondary packaging
119	Material Handling n.e.c.	e.g. transposing, handling during sandcasting
160	**Welding and soldering (all materials)**	
161	Arc welding	
162	Spot welding	
163	Laser welding	
164	other welding	e.g. ultrasonic welding, gas welding, plasma welding
165	Soldering	

Aplicaciones robots industriales

170	**Dispensing**	
171	Painting and enamelling	area-measured application of lacquer (surface coat)
172	Application of adhesive, sealing material or similar material	spot-wise and line-wise
179	Dispensing others/ Spraying others	e.g. powder coating, application of mould release agent, area-measured application of adhesive, spraying of wa to conserve)
190	**Processing**	**enduring changing, the robot leads the workpiece or the tool, material removal**
191	Laser cutting	
192	Water jet cutting	
193	Mechanical cutting/grinding/ deburring/ milling/polishing	
198	Other processing	e.g. gas/plasma cutting, drilling, bending, punching, shearing
200	**Assembling and disassembling**	**enduring positioning of elements**
201	Fixing, press-fitting	screw/nut-driving, clinching, reveting, bonding
202	Assembling/ mounting/ inserting	also temporarily positioning to facilitate the assembling process
203	Disassembling	recycling, removal of cover after processing
208	Other assembling	not mentioned before
900	**Others**	
901	Cleanroom for FPD	
902	Cleanroom for semiconductors	
903	Cleanroom for others	
905	Others	not mentioned before
999	**Unspecified**	**the application is unknown**

Sources: IFR

Aplicaciones robots industriales

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Sources: IFR

Types of robots	
I	Personal/Domestic Robots
1-7	Robots for domestic tasks
1	- Robot companions / assistants / humanoids
2	- Vacuuming, floor cleaning
3	- Lawn mowing
4	- Pool cleaning
5	- Window cleaning
6	- Home security & surveillance
7	- Others
8-11	Entertainment robots
8	Toy/hobby robots
9	Multimedia robots
10	Education and research
11	Others
12-14	Elderly and handicap assistance
12	- Robotized wheelchairs
13	- Personal aids and assistive devices
14	- Other assistance functions
15	Other personal/domestic robots

Source: IFR

Aplicaciones robots de servicio

II	Professional service robots
16-21	Field robotics
16	- Agriculture (broad acre, greenhouse, fruit-growing, vineyard)
17	- Milking robots
18	- other robots for livestock farming
19	- Mining robots
20	- Space robots
21	- Others
22-26	Professional cleaning
22	-Floor cleaning
23	-Window and wall cleaning (including wall climbing robots)
24	-Tank, tube and pipe cleaning
25	- Hull cleaning (aircraft, vehicles, etc.)
26	-other cleaning tasks
27-29	Inspection and maintenance systems
27	- Facilities, plants
28	- Tank, tubes, pipes and sewers
29	- Other inspection and maintenance systems
30-33	Construction and demolition
30	- Nuclear demolition & dismantling
31	- Building construction
32	- Robots for heavy/civil construction
33	- Other construction and demolition systems

Aplicaciones

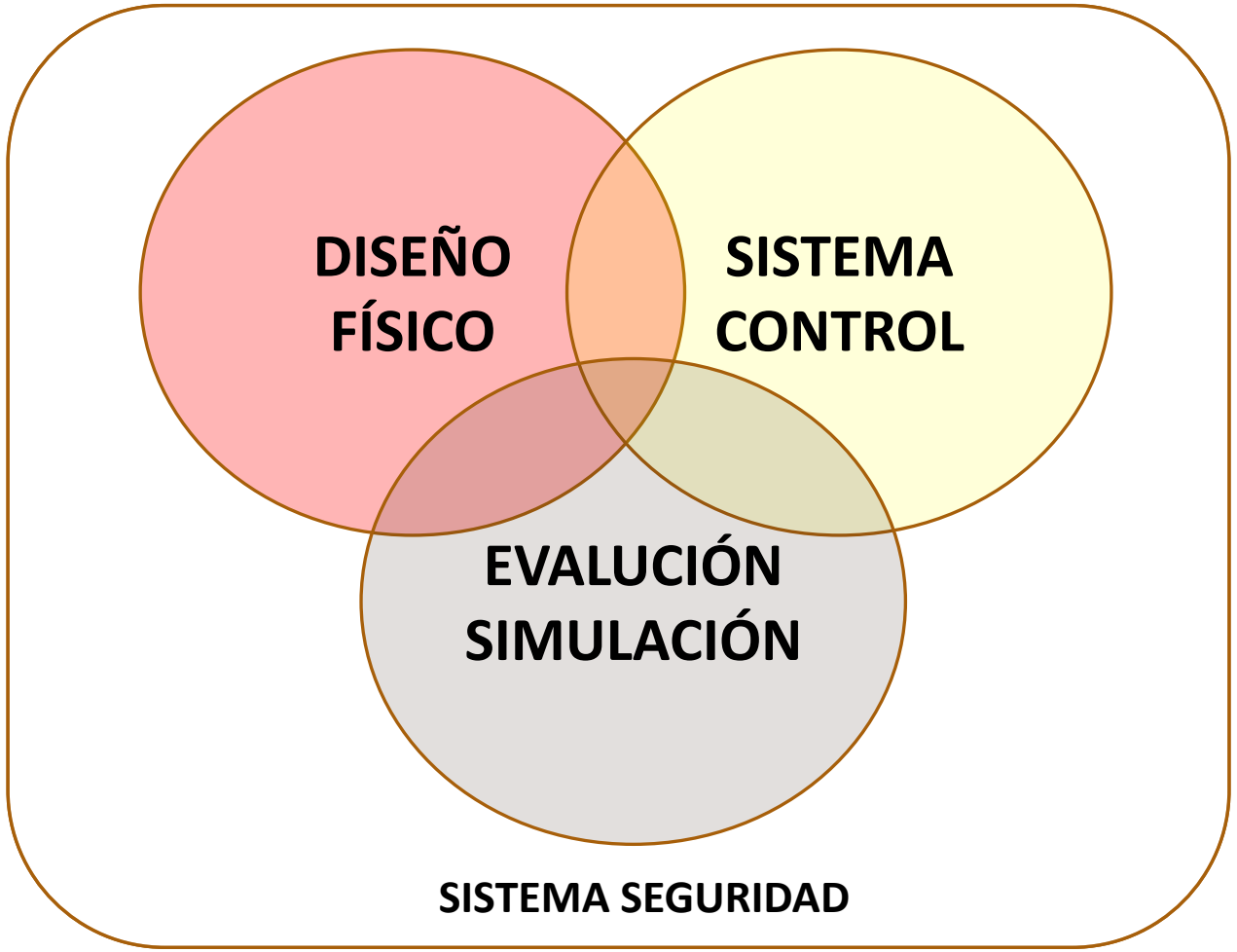
34-38	Logistic systems
34	- Autonomous guided (AGV) vehicles in manufacturing environments
35	- AGVs in non-manufacturing environments (indoor)
36	- Cargo handling, outdoor logistics
37	- Personal transportation (AGV for persons)
38	- Other logistics
39-42	Medical robotics
39	- Diagnostic systems
40	- Robot assisted surgery or therapy
41	- Rehabilitation systems
42	- Other medical robots
43-45	Rescue und security applications
43	- Fire and disaster fighting robots
44	- Surveillance/security robots without UAV
45	- Other rescue and security robots

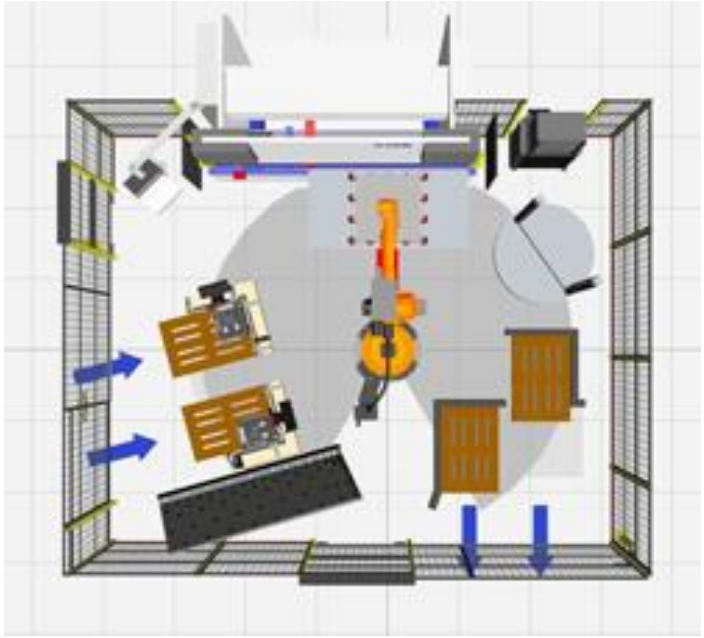
Aplicaciones

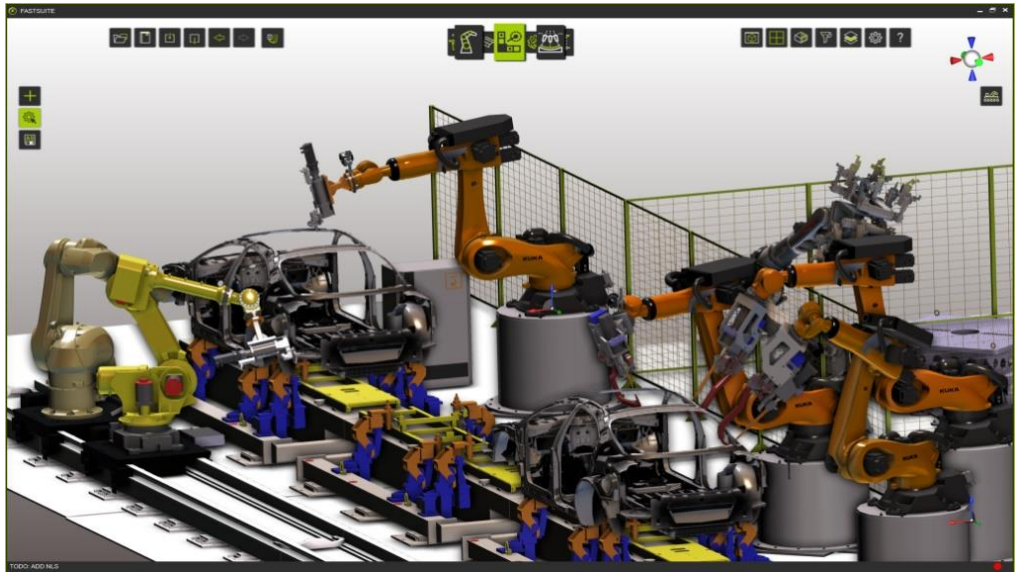
46-50	Defense applications
46	- Demining robots
47	- Unmanned aerial vehicles
48	- Unmanned ground based vehicles (e.g. bomb fighting)
49	- Unmanned underwater vehicles
50	- Other defense applications
51	Underwater systems (civil/general use)
52	Powered Human Exoskeletons*
53	Unmanned aerial vehicles (general use)
54	Mobile Platforms (general use)
55-59	Public relation robots and joy rides
55	Hotel and restaurant robots
56	Mobile guidance, information, telepresence robots
57	Robots in marketing
58	Robot joy rides
59	other public relation
60	Other professional service robots not specified above

Source: IFR

Celda de Trabajo: *Layout*







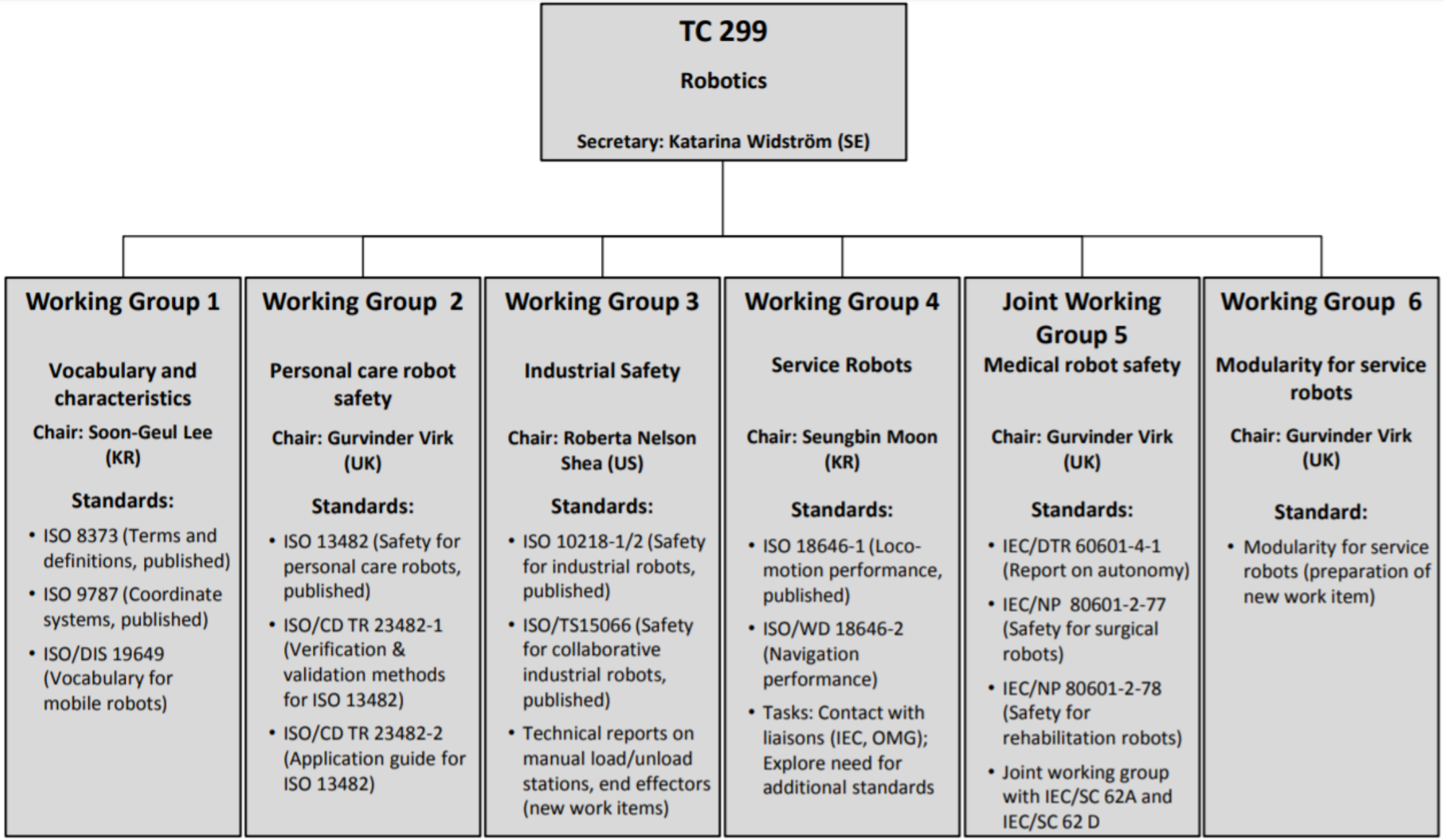

ABB

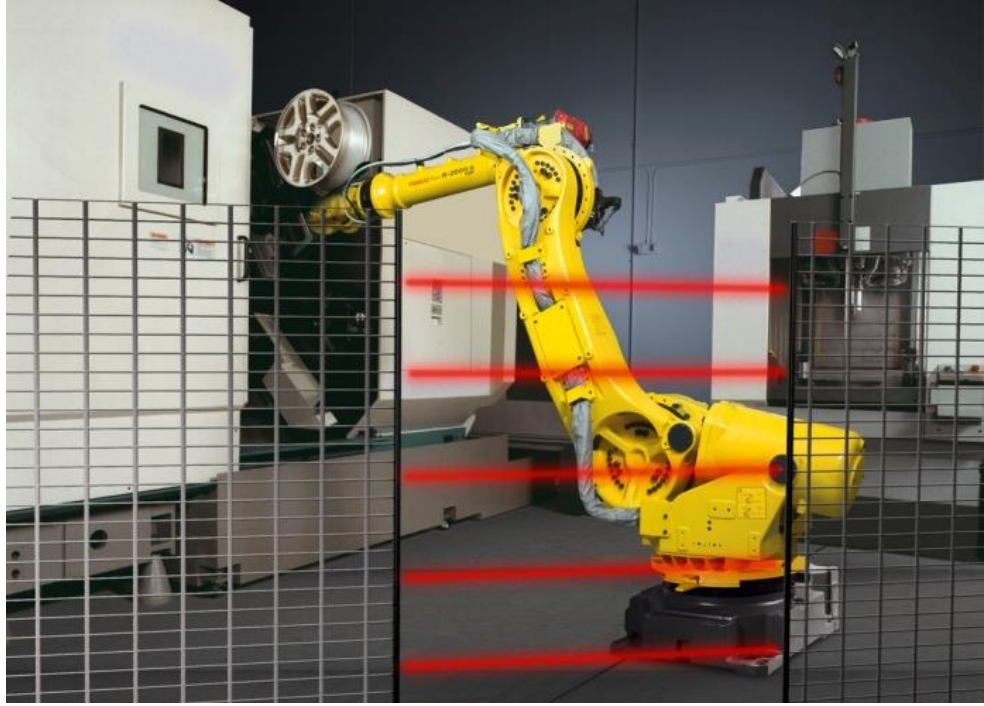
Normas

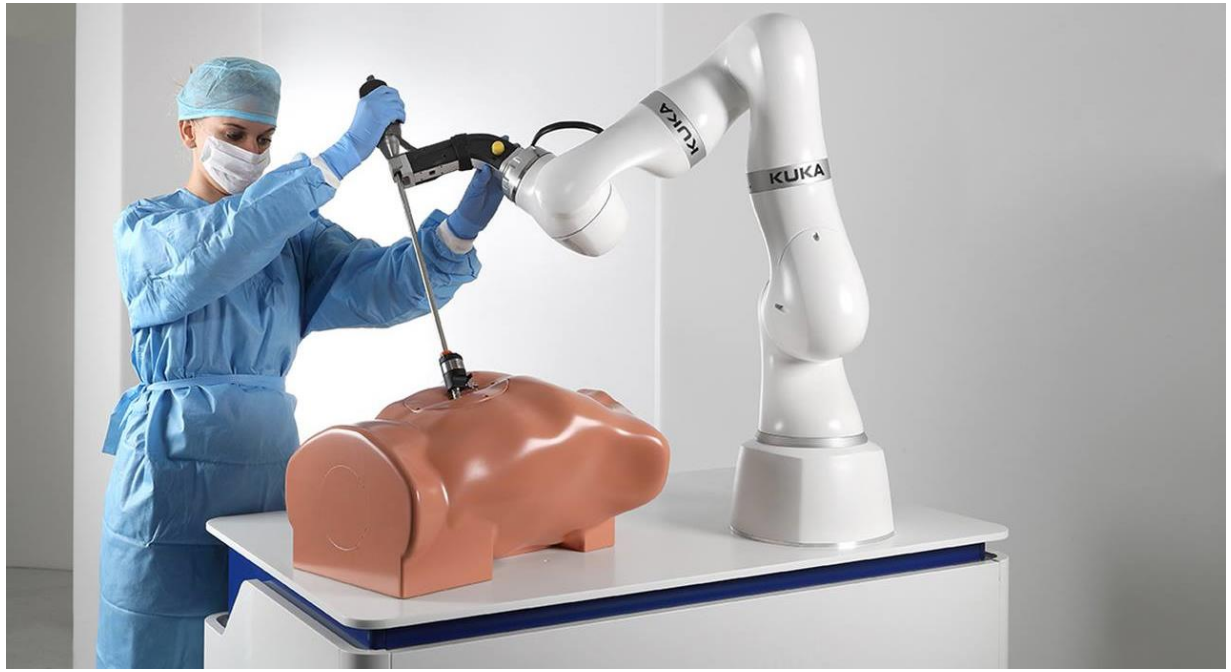
	Europe	North America
Robot safety standards	ISO 10218-1:2011 (robot) ISO 10218-2:2011 (robot systems)	ANSI/RIA R15.06-2009 CAN/CSA Z434-2008 (robots and robot systems)
Machinery safety standards	ISO 12100:2010 (risk assessment) ISO 13849-1:2006 (functional safety) IEC 62061:2005 (functional safety)	ANSI B11.0-2011
Machine safety legislation	European Machinery Directive	(no equivalent)
Workplace safety regulations	e.g. Berufsgenossenschaft directives (DE)	OSHA 1910 (US) Provincial regulations (CA)

--> ISO 8373: 2012
https://www.iso.org/standard/55890.html

Fuente: https://www.schmalz.com/es/tecnica-de-vacio-para-la-automatizacion/industria-4-0


TC 299
Robotics
Secretary: Katarina Widström (SE)
Working Group 1
Vocabulary and characteristics
Chair: Soon-Geul Lee (KR)
Standards:
• ISO 8373 (Terms and definitions, published)
• ISO 9787 (Coordinate systems, published)
• ISO/DIS 19649 (Vocabulary for mobile robots)
Working Group 2
Personal care robot safety
Chair: Gurvinder Virk (UK)
Standards:
• ISO 13482 (Safety for personal care robots, published)
• ISO/CD TR 23482-1 (Verification & validation methods for ISO 13482)
• ISO/CD TR 23482-2 (Application guide for ISO 13482)
Working Group 3
Industrial Safety
Chair: Roberta Nelson Shea (US)
Standards:
• ISO 10218-1/2 (Safety for industrial robots, published)
• ISO/TS15066 (Safety for collaborative industrial robots, published)
• Technical reports on manual load/unload stations, end effectors (new work items)
Working Group 4
Service Robots
Chair: Seungbin Moon (KR)
Standards:
• ISO 18646-1 (Loco-motion performance, published)
• ISO/WD 18646-2 (Navigation performance)
• Tasks: Contact with liaisons (IEC, OMG); Explore need for additional standards
Joint Working Group 5
Medical robot safety
Chair: Gurvinder Virk (UK)
Standards:
• IEC/DTR 60601-4-1 (Report on autonomy)
• IEC/NP 80601-2-77 (Safety for surgical robots)
• IEC/NP 80601-2-78 (Safety for rehabilitation robots)
• Joint working group with IEC/SC 62A and IEC/SC 62 D
Working Group 6
Modularity for service robots
Chair: Gurvinder Virk (UK)
Standard:
• Modularity for service robots (preparation of new work item)




KUKA


We shape
your ideas
cama
GROUP

Aplicaciones en medicina

https://www.davincisurgery.com/da-vinci-systems/about-da-vinci-systems

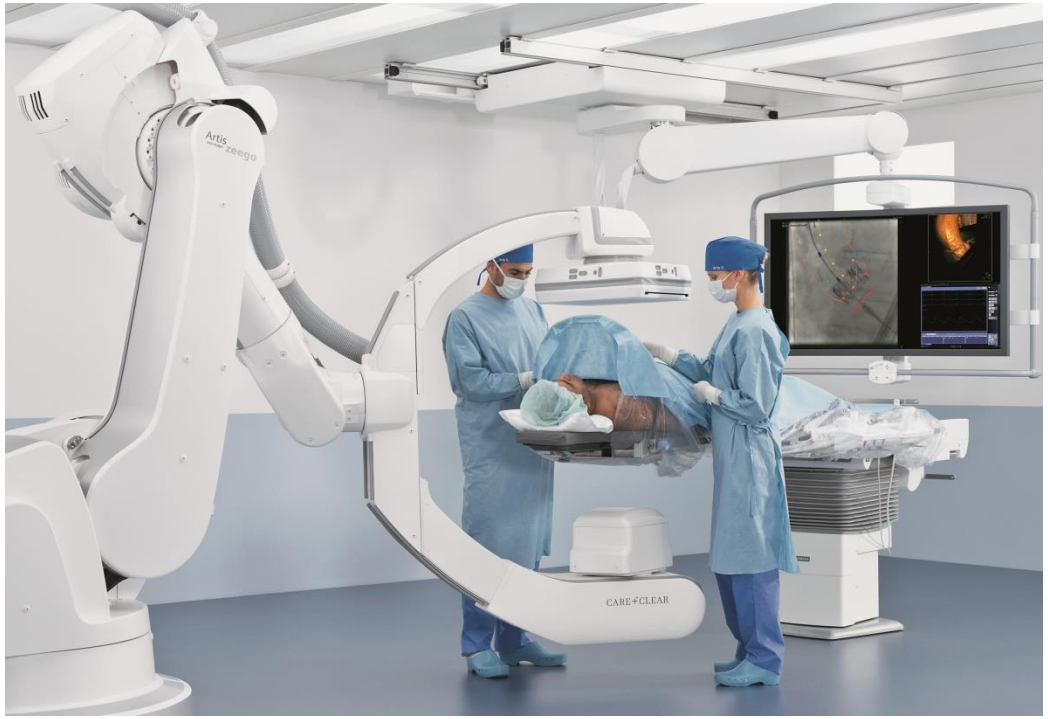
Sistema ROSA: **Robotic Stereotactic Assistance**

Neuronavegador
+ Brazo Robótico antropomórfico de 6GDL con un extremo operativo intercambiable, montado sobre una plataforma móvil

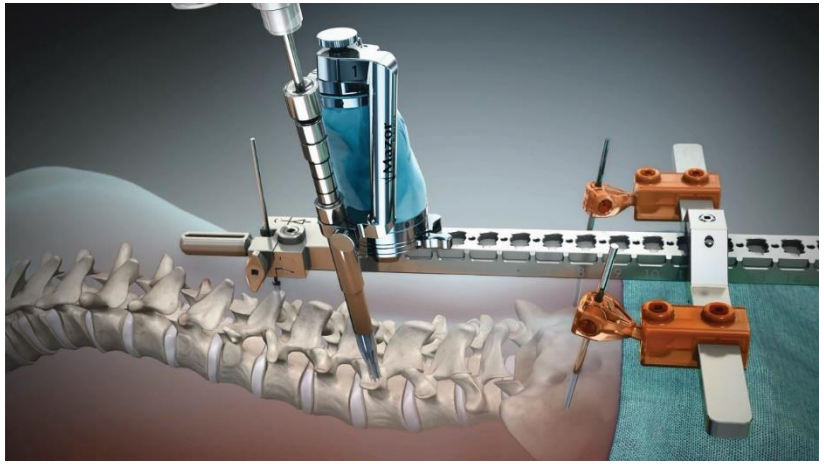
http://promedz.com/lebanon-medical-device/viewproduct/rosa-robot/

Sistemas diagnóstico por imagen intervencionismo

Siemens Artis Zeego



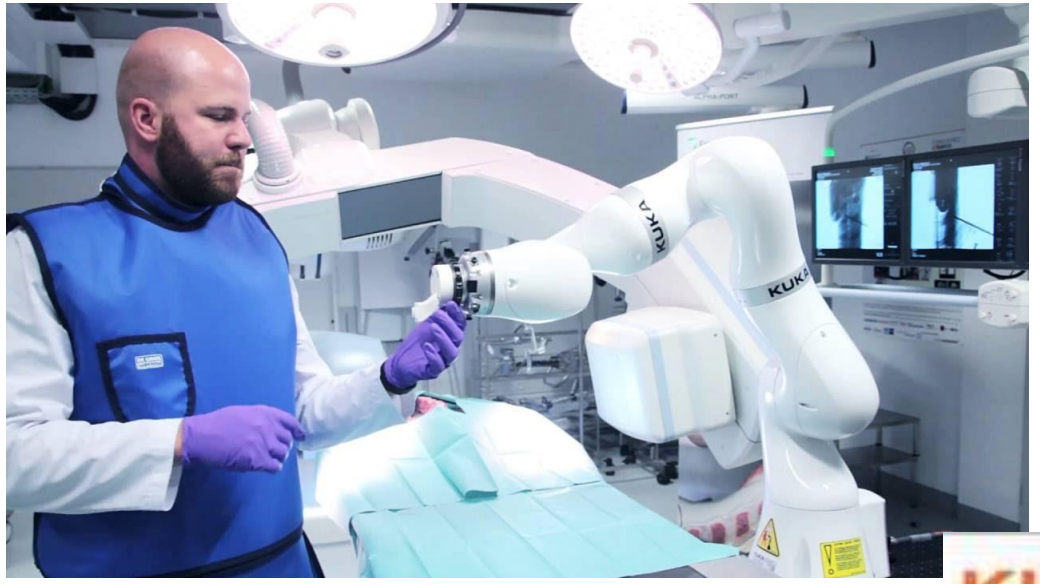
Mazor



https://www.siemens-healthineers.com/

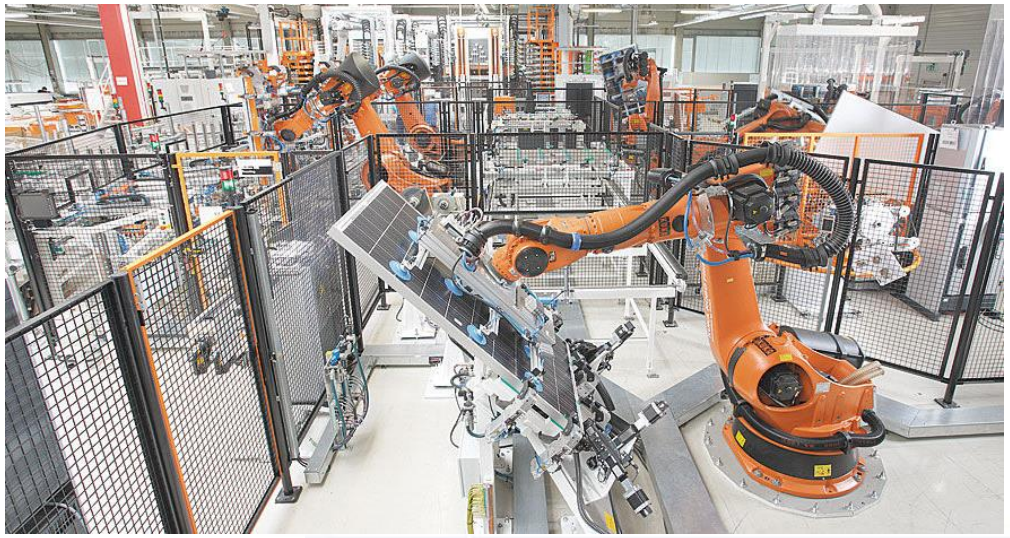
https://www.mazorrobotics.com/

Otras aplicaciones en medicina

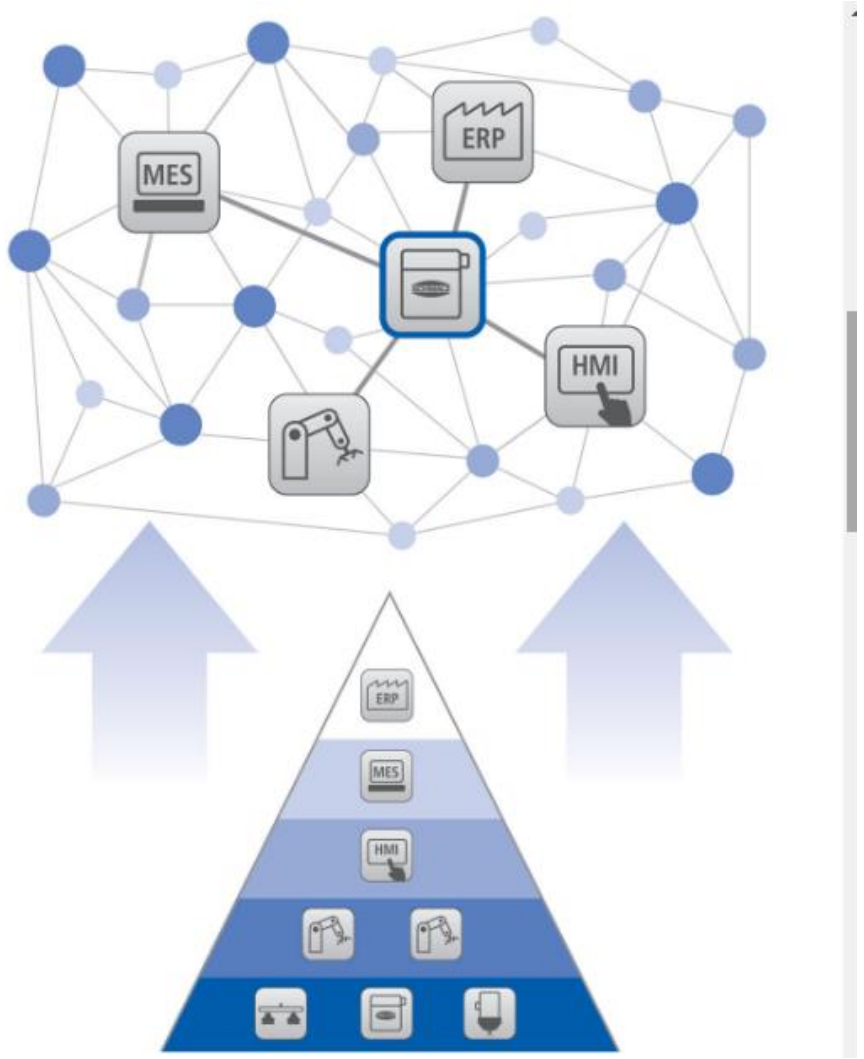


https://www.kuka.com/es-es/sectores/healthcare/kuka-medical-robotics

Industria 4.0

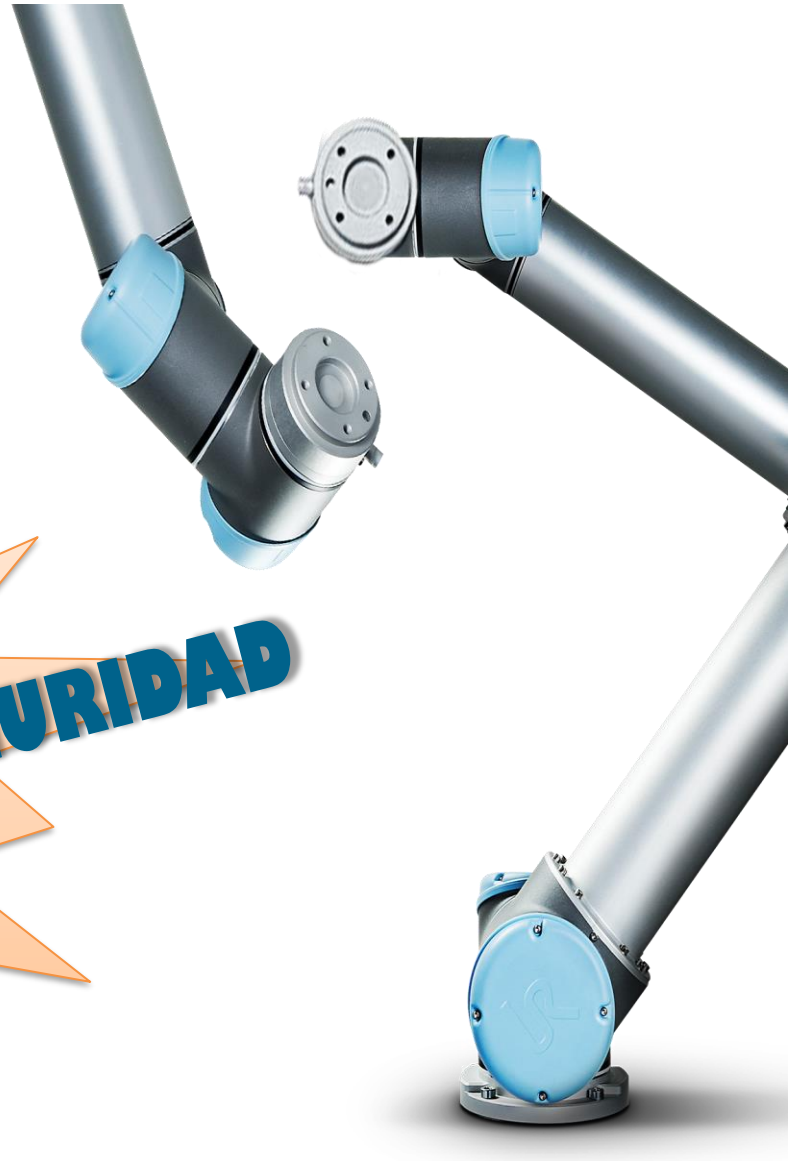


Nivel	Tipo de información
ERP	Capacidad básica y disponibilidad para la planificación de la producción
MES	Solicitud de mantenimiento, datos de productividad y calidad
HMI	Entrada de parámetros (p. ej., tiempo y velocidad) y salida de valor de medición (p. ej., consumo de energía)
	Informaciones de E/S, p. ej., valor de vacío alcanzado, pieza agarrada, tiempo de ciclo



Fuente: https://www.schmalz.com/es/tecnica-de-vacio-para-la-automatizacion/industria-4-0

Ejemplo Universal Robots



ESTÁNDARES DE SEGURIDAD

© UNIVERSAL ROBOTS

- Un sistema robótico colaborativo debe cumplir con los requerimientos descritos en los siguientes estándares internacionales

Estándar	Describe	Responsable
ISO 13849-1	Principios generales para el diseño de las partes de los sistemas de mando relativas a la seguridad	Fabricante
ISO 10218-1	Requisitos de seguridad para robots industriales	
ISO 10218-2	Seguridad en la integración de sistemas robóticos	Integrador
ISO TS 15066	Especificación técnica para robots colaborativos	
ISO 12100	Principios generales para el diseño. Evaluación del riesgo y reducción del riesgo.	

ISO 12100: Evaluación y reducción del riesgo

- OBLIGATORIO
  - **El integrador *DEBE* realizar una evaluación de riesgos**
- NO OBLIGATORIO
  - El cumplimiento con los estándares
  - *¡Se recomienda cumplir con los estándares!*
  - En caso de accidente:
    - Si el sistema cumple con los estándares » El fiscal debe probar la culpabilidad
    - Si el sistema *no* cumple con los estándares » El integrador debe probar su inocencia

Diferencias regionales

- Canadá
  - CAN/CSA-Z434-03: 2013
    - Armonizado con estándares internaciones ISO
    - Consiste en la ISO 10218-1 e ISO 10218-2 con diferencias regionales
- EEUU
  - ANSI/RIA R15.06: 2012
    - Armonizado con estándares internacionales ISO
    - ISO 10218-1 e ISO 10218-2 están unidos en un único documento
- Brasil
  - NR 12
    - Estándar no armonizado con estándares internacionales ISO

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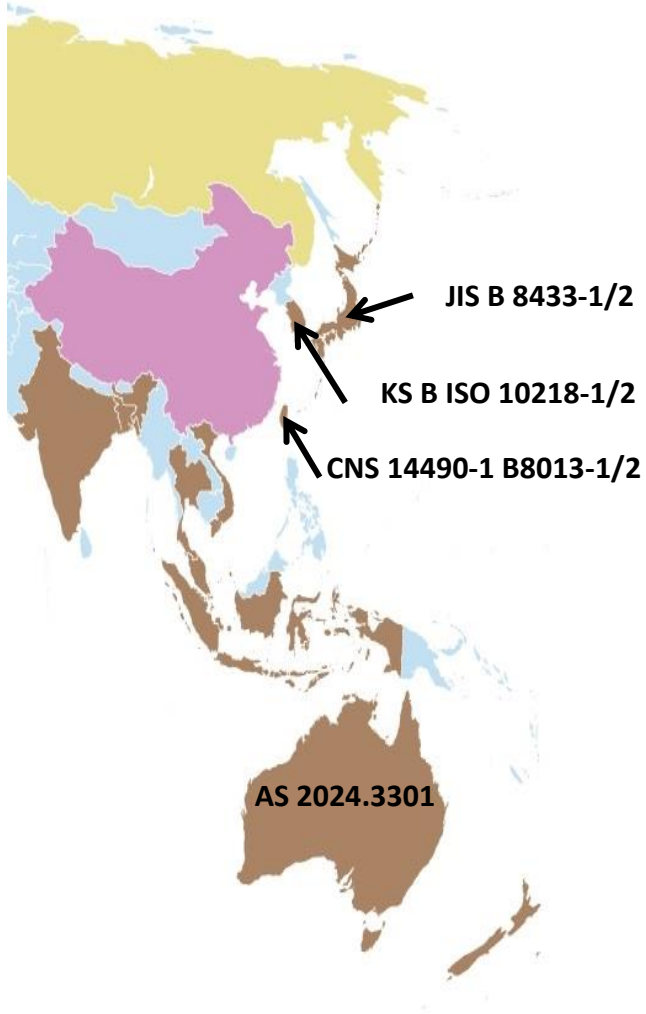
Diferencias regionales

- Japón
  - JIS B 8433-1:2015 and JIS B 8433-2:2015
    - Traducción directa de las ISO 10218-1 y ISO 10218-2
- Corea del Sur
  - KS B ISO 10218-1 and KS B ISO 10218-2
    - Traducción directa de las ISO 10218-1 y ISO 10218-2
- Taiwán
  - CNS 14490-1 B8013-1 and CNS 14490-1 B8013-2
    - Traducción directa de las ISO 10218-1 y ISO 10218-2
- Australia
  - AS 2024.3301-2009
    - 2024: Seguridad de maquinaria
    - Parte 3301: Requerimientos de seguridad para robots industriales

- Listado completo: Support site - Safety standards



UNIVERSAL ROBOTS

Services for all your Testing, Inspection, and Certification needs

Understanding local and global safety regulations is critical when setting up machinery production or implementing equipment. Any failure to follow such intricate, interconnected and constantly-changing protocols can disrupt your operations.

TÜV Rheinland's machinery services can help. Backed by a global network and in-depth technical expertise, we can deliver a customized review of your safety implementation, and help you manage strategies for every stage of the machinery lifecycle – from development to production and commissioning, modification, all the way through to recycling.

MACHINERY SAFETY COMPLIANCE

TÜV Rheinland delivers a full-range of services to demonstrate machinery safety compliance with major global regulatory requirements. They include:

- EU Directives such as:
  - Machinery Directive 2006/42/EC
  - EMC Directive 2014/30/EU
- GS Mark and TUV Mark
- cTUVus Mark (ANSI/UL and CSA standards for US and Canada)
- Machinery Safety according to global and domestic standards (e.g. ISO 13849)
- Risk Assessment for Machinery: ISO 12100
- Laser Safety: IEC 60825, ISO 11553
- Compliance with local regulations on machinery, including:
  - Field Evaluation Services (FES) for US and Canada
  - PUWER for UK
  - NOM 004 for Mexico
  - NR 12 for Brazil
  - KOSHA for Korea, and others

PRODUCTION LINES

Workplace safety assurance covers a complete assessment of the machinery throughout the production line, including:

- Workplace Safety Assessment
- Inter-machinery Assessment
- Review of Risk Assessment and Safety Integrity Levels (SIL)

CYBERSECURITY

Protecting machines or production lines from cyber risks brings companies closer to the Smart Factory ideal. TÜV Rheinland services include:

- Interoperability Assessment
- Penetration Tests and IT Security Analysis
- CB Scheme certification to IEC 62443-4-1 product development requirements
- ISA Secure certification to ISA 62443-4-1 and ISA 62443-4-2
- UL 2900 Series

FUNCTIONAL SAFETY

- IEC 61508
- EN 62061 Safety of machinery

SEMICONDUCTOR MANUFACTURING EQUIPMENT

As the world goes digital, compliance with industry-specific requirements for semiconductor production machinery set by industry associations and other major stakeholders has never been more important. TÜV Rheinland's offering currently includes:

- SEMI S2: Environmental, Health, and Safety (EHS)
- SEMI S8: Ergonomics Engineering
- SEMI S23: Conservation of Energy, Utilities and Materials Used
- SOP 39: safety requirements for Seagate production equipment

ROBOTICS

As human involvement in manufacturing decreases, the evaluation of robotic systems is in high demand. TÜV Rheinland's comprehensive evaluation services cover everything from the integration/ installation of fixed, mobile and autonomous robots, to related controls and recharging stations:

- Safety requirements for robots and robotic devices:
  - ISO 10218-1 & ISO 10218-2
  - ANSI / RIA 15.06
- CAN / CSA Z434 for industrial robots
- ANSI / UL 1740 for robots and robotic equipment
- ISO / TS 15066 for collaborative robots
- ISO 13482 for personal care robots

ADDITIVE MANUFACTURING

Additive Manufacturing or 3D Printing offers incredible possibilities. TÜV Rheinland can test and certify 3D printers to a host of international standards, such as:

- Safety requirements for AM machines and 3D printers
- Risk Assessment and safety evaluation
- Factory and workplace safety
- REACH and RoHS chemical safety for materials

OTHER SERVICES

That is not the end of the TÜV Rheinland story. We offer a tremendous range of services – not only for machinery, but also for other industries – including:

Market Access Services

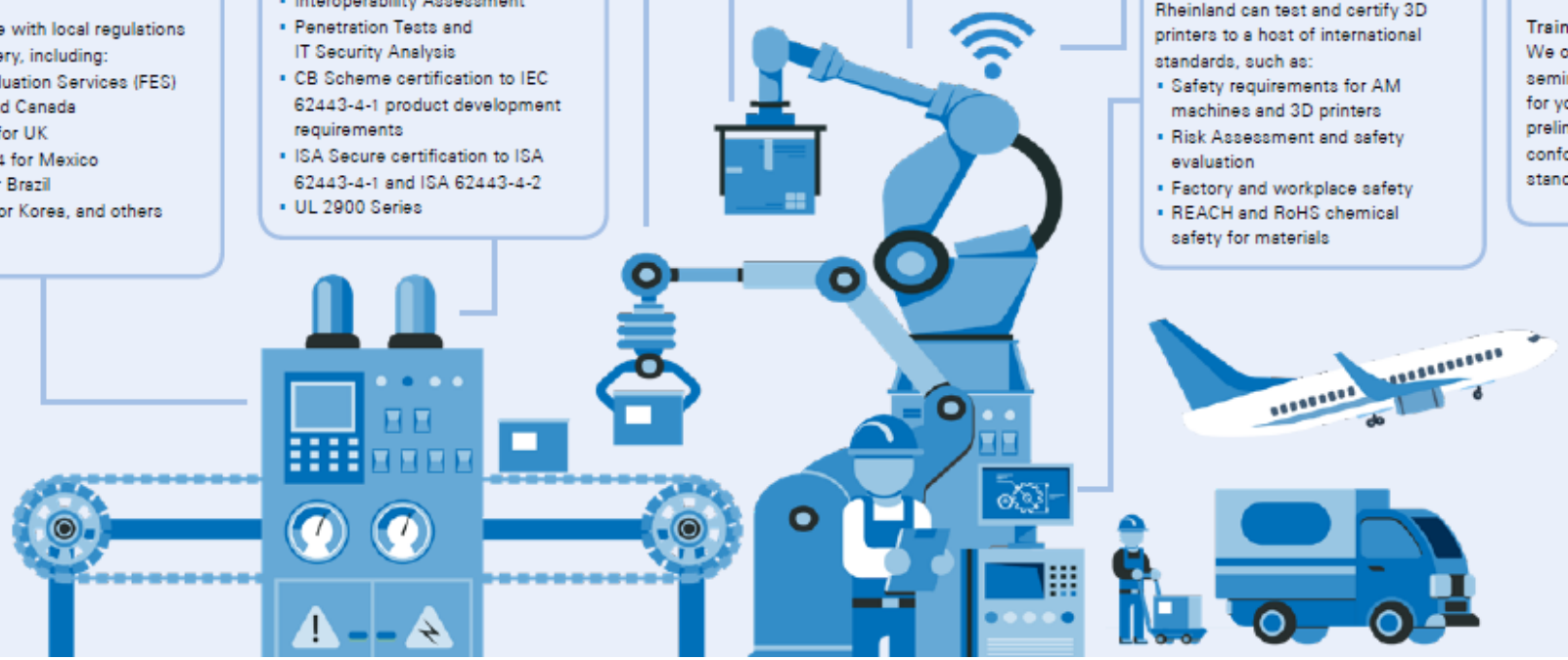
Facilitate the export of your products by complying with the local regulations in your target markets

Worldwide Regulatory Landscape Research and Information Service

Our global network enables us to capture the latest information on mandatory and voluntary certification procedures and export regulations. We can also support customers with insight into certification procedures, and act as their representative when they apply for certification

Training & Consulting

We offer customized in-house seminars on standards specifically for your products, as well as preliminary assessments for conformity with safety and quality standards



Seguridad lo primero

Teniendo en cuenta las tendencias actuales en robótica la seguridad es un factor muy importante a ser considerado, se debe SIEMPRE garantizar la seguridad del sistema en general, **de todos los operarios** y los requerimientos legales y estándares globales y locales deben ser cumplimentados.