

YASKAWA

teqnow
TOP TECHNOLOGIE MKB METAAL

Industriële robots

Stand van zaken en ontwikkelingen

Eddie Mennen, YASKAWA Benelux, namens

ROBONED 

1. **Introductie YASKAWA**

2. Cijfers Internationale Federatie Robotics (IFR)
3. Enkele interessante voorbeelden in Nederland
4. Ontwikkelingen / toekomst
5. Vragen

- Founded in 1915
- Head office in Kitakyushu City, Japan
- 15,000 employees worldwide
- 3 Billion Euro p. a. business volume



1.900.000 per year
More than 22 Mio in the field



INVERTER

1.000.000 per year
More than 12 Mio in the field



SERVO

25.000 per year
over 330.000 in the field



INDUSTRIAL ROBOTS

Subsidiaries:

- Torsas, Sweden
- Moscow, Russia
- Turku, Finland
- Schwechat, Austria
- Waszwa, Poland
- Istanbul, Turkey
- Rudná u Prahy, Czech Republic
- Banbury, United Kingdom
- Son, Netherlands
- Saint-Aignan-de-Grand-Lieu, France
- Sant Boi de Llobregat, Spain
- Modena, Italy
- Ribnica, Slovenia
- Rosh Ha'ayin, Israel
- Johannesburg, South Africa



European Headquarters in Germany:

- YASKAWA Europe, Drives + Motion Division, Eschborn, **Germany**
- YASKAWA Europe Headquarters, Robotics Division, Allershausen, **Germany**
- VIPA GmbH, Herzogenaurach, **Germany**
(Since November 2012)

Total System Solution



Drives

Inverter Medium Voltage



Motion

Servo / Controller



Total System Solution

Control

PLC / HMI / I/O



Robotics

Robots / System / TCS



Robot Product Range

Scara-Robots



4-Axis-Robot for Pick-and-Place applications

Delta-Robots



4-Axis-High-Speed-Robots with parallel kinematics

4-Axis-Robots



5-Axis-Robots



6-Axis-Robots



7-Axis-Robots



Dual-Arm-Robots



15 Axes



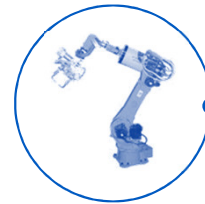
Arc Welding



• MA series



• VA1400



Spot Welding



• VS50



• MS80



Laser Welding



• MC2000



• HP20D



Picking, Packaging, Palletizing



• MPP3



• MPK2



• MPK50



• MPL80



• MPL160

3 Business segments

700+ Employees

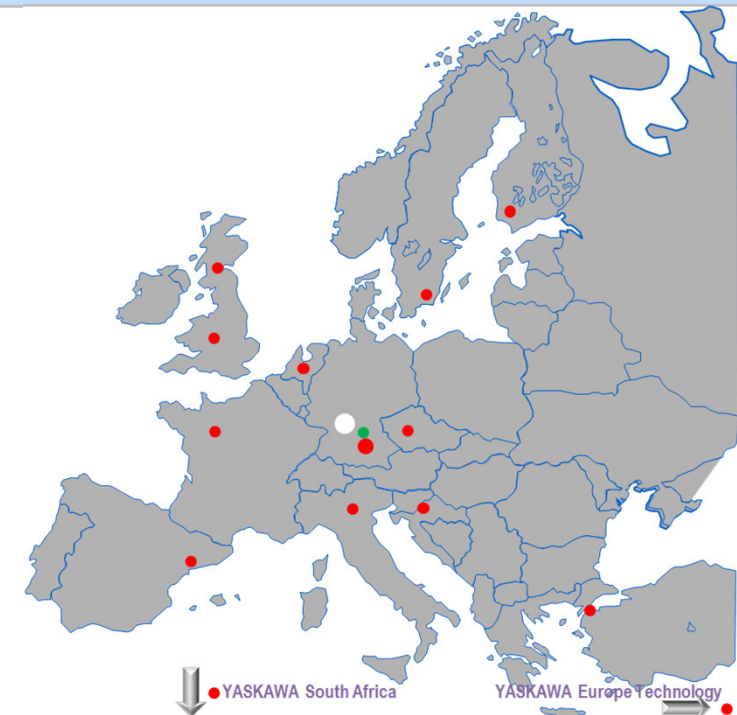
210M€+ Sales revenue

Robots

Systems

TCS

- **Robots, Positioners, Tracks, Software**
 - for Arc, Spot and Laser Welding
 - for Handling, Picking-Packing-Palletizing
 - for Assembling, Painting and all other applications
- **Experienced System builder**
 - in Welding Systems
 - in various other applications
- **Local Production**
 - Factories in Germany, Slovenia and Sweden
 - High degree of vertical manufacturing



European engineering & manufacturing



Plant construction and robot systems in Ristro, Slovenia



Assembly of controller in Torsas, Sweden



Plant construction and robot systems in Allershausen

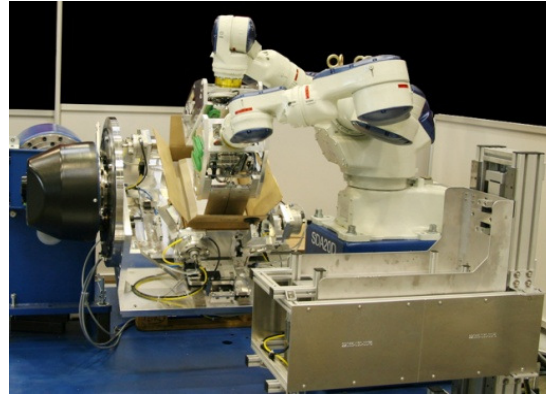


Positioner and portal construction in Torsas, Sweden

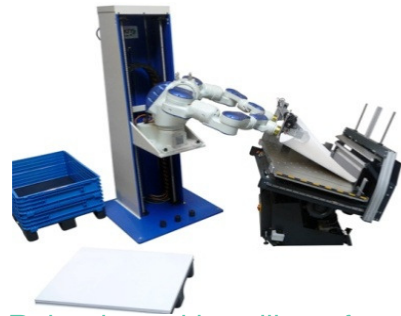
Development of dual-arm & mobile robots



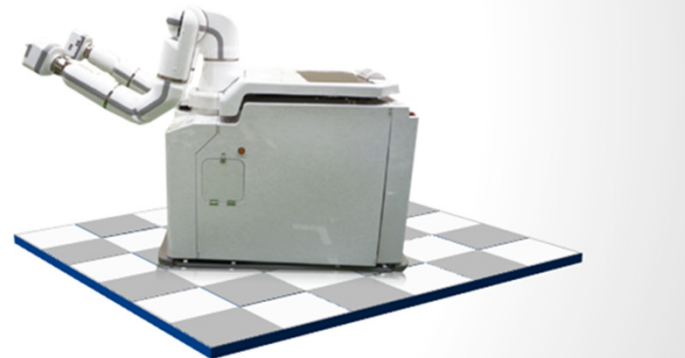
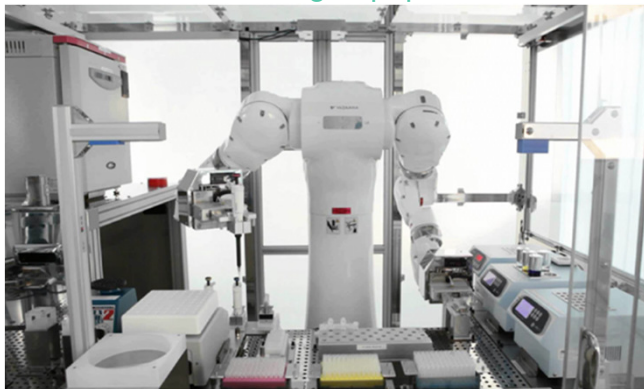
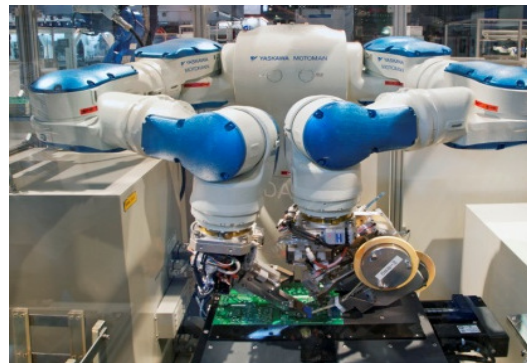
SDA20D in combination with adaptive grippers and 3D image processing software



Fully automated unloading system for folding boxes

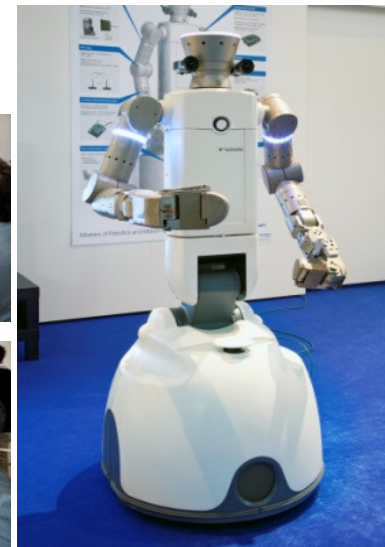


Robot based handling of paper sheets



SmartPal VII - development in service robotics

- Designed to act and interact with humans in their living environment
- Target is “care” application
- The robot can be operated, for example, by remote control by means of non-contact gestures and motions
- The technology of the Microsoft “Xbox 360” games console is used for this purpose
- Remote access is possible from any location via the Internet



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Industrial robot as defined by ISO 8373:2012:

An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications

Classification by mechanical structure

- Linear robots (including cartesian and gantry robots)
- SCARA robots
- Articulated robots
- Parallel robots (delta)

www.ifr.org

World
Robotics
Industrial Robots
2015

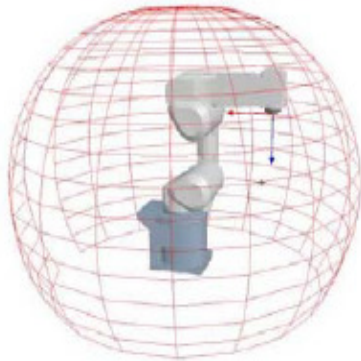
Hoofdbouwwormen industriële robots

Principle

Kinematic Structure

Photo

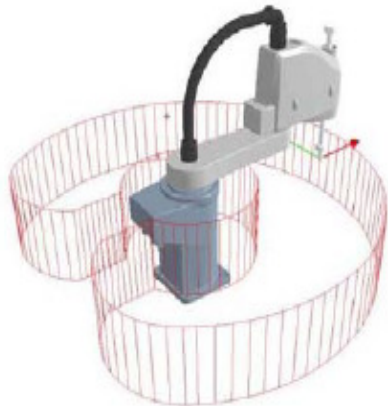
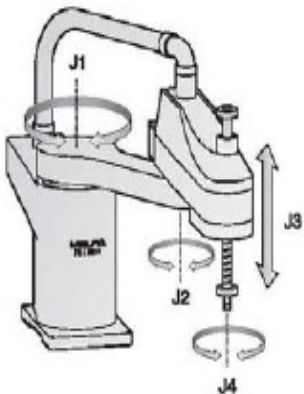
Articulated Robot



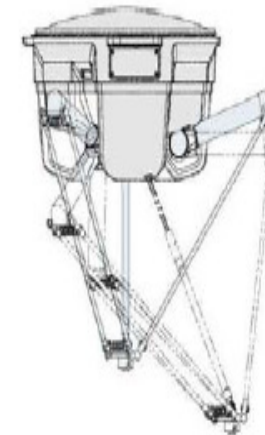
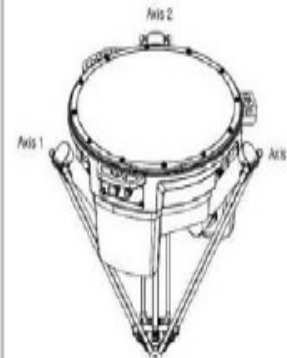
Cartesian Robot

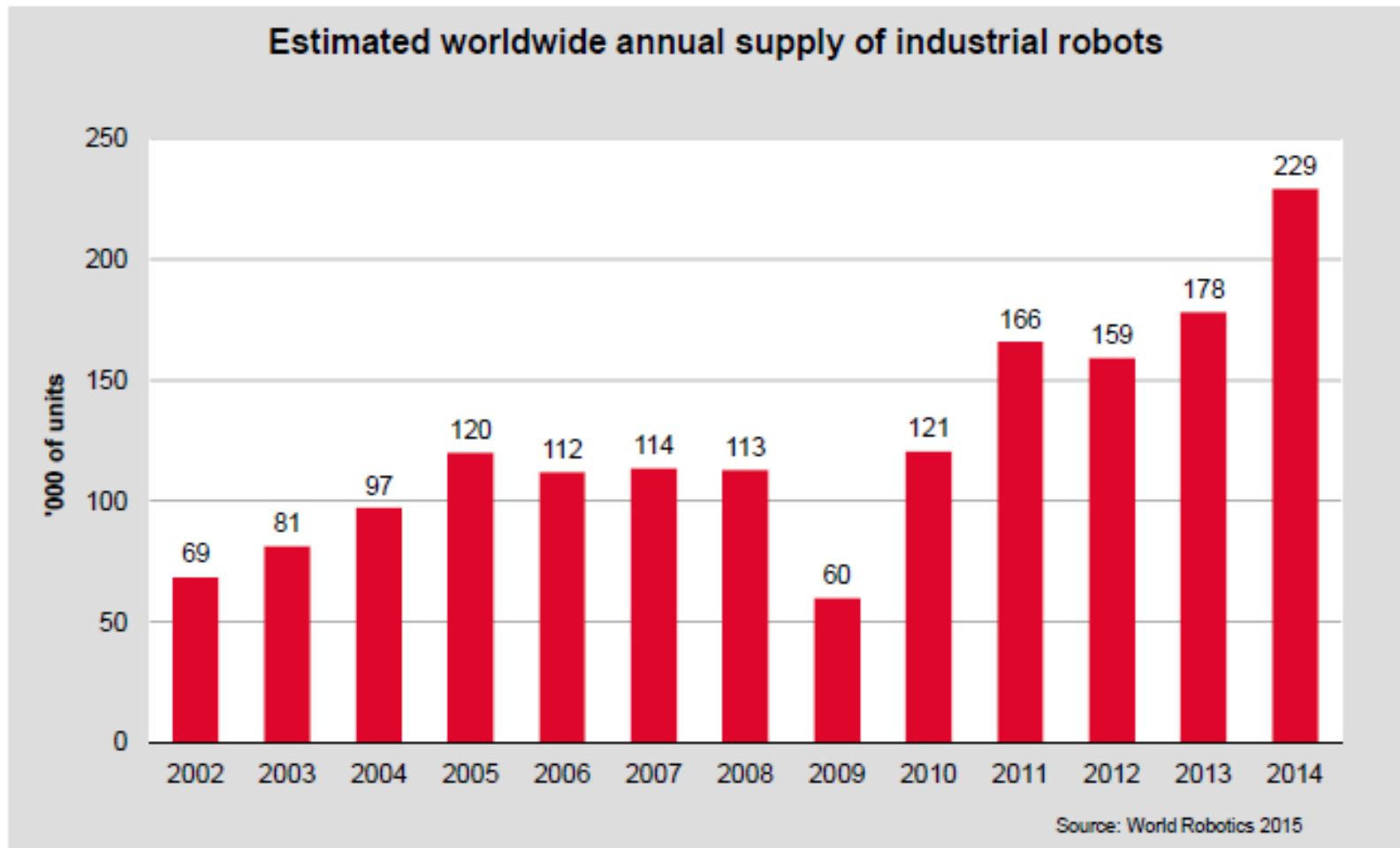


SCARA Robot



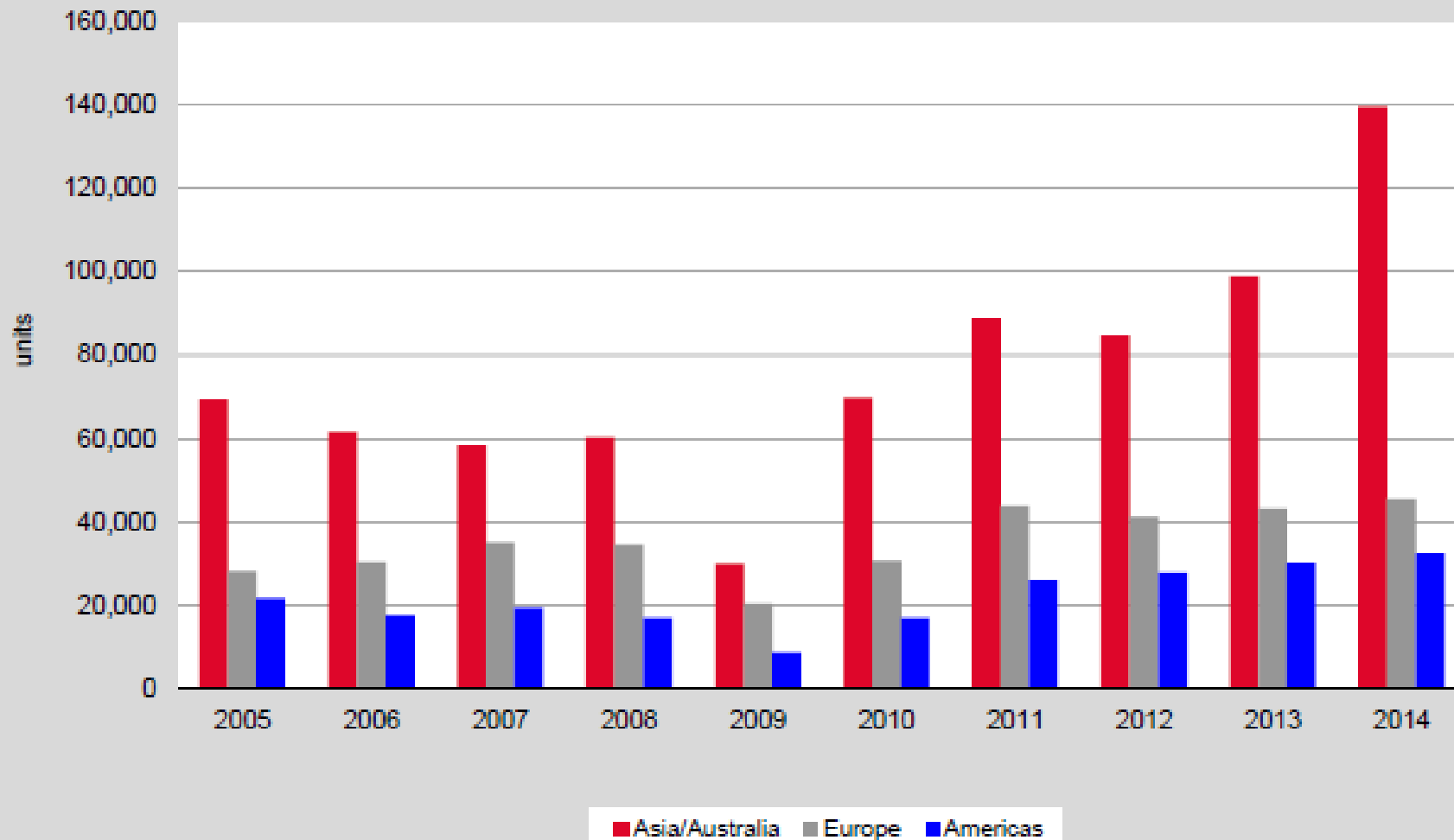
Parallel Robot





- 2014 recordjaar
- 17% groei per jaar gemiddeld over laatste 5 jaar
- Grootste groei in Azië
- China is nu al grootste markt! (ruim 57.000 robots in 2014)

Figure 2.2 Estimated annual shipments of industrial robots by regions

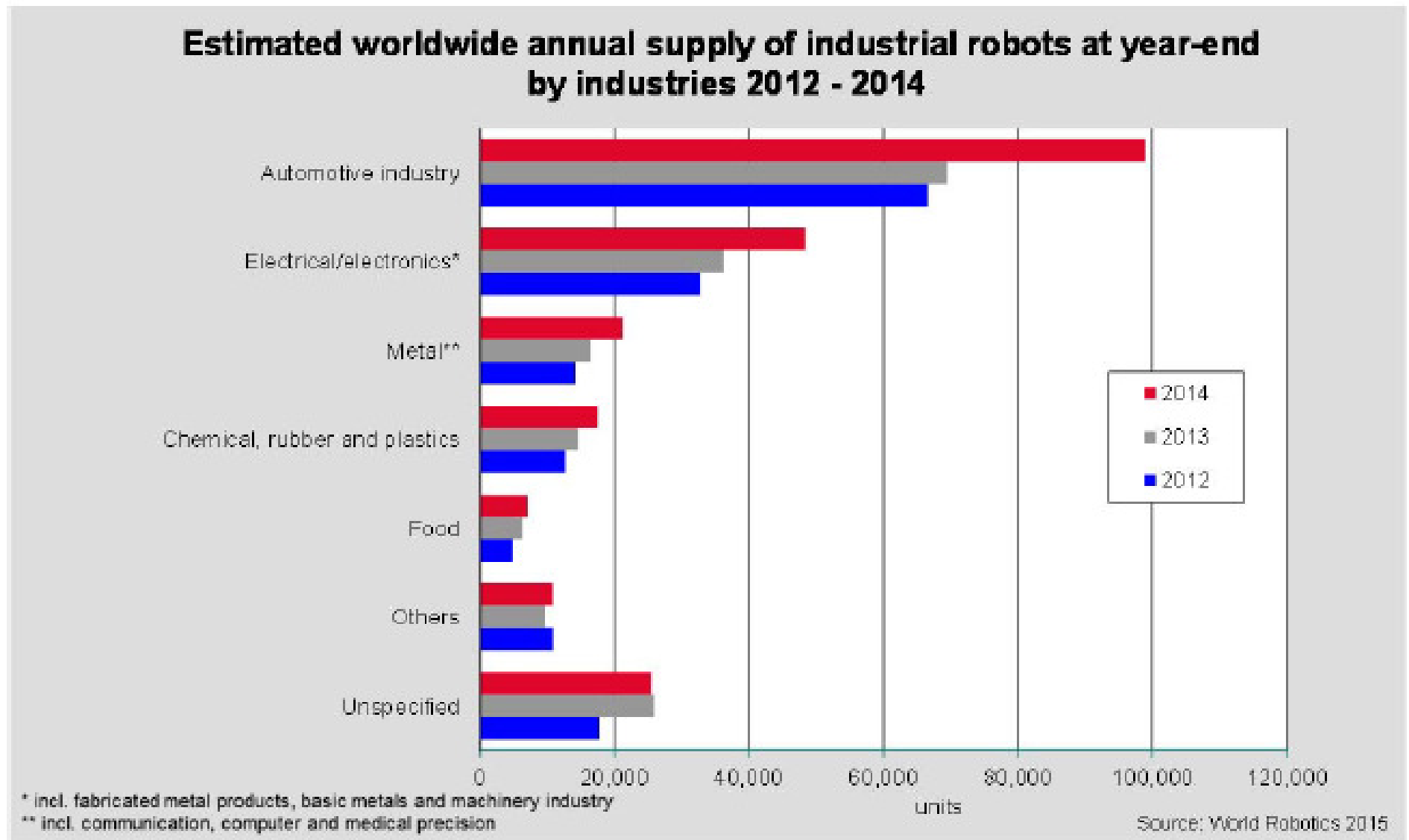


Verdeling 2014:

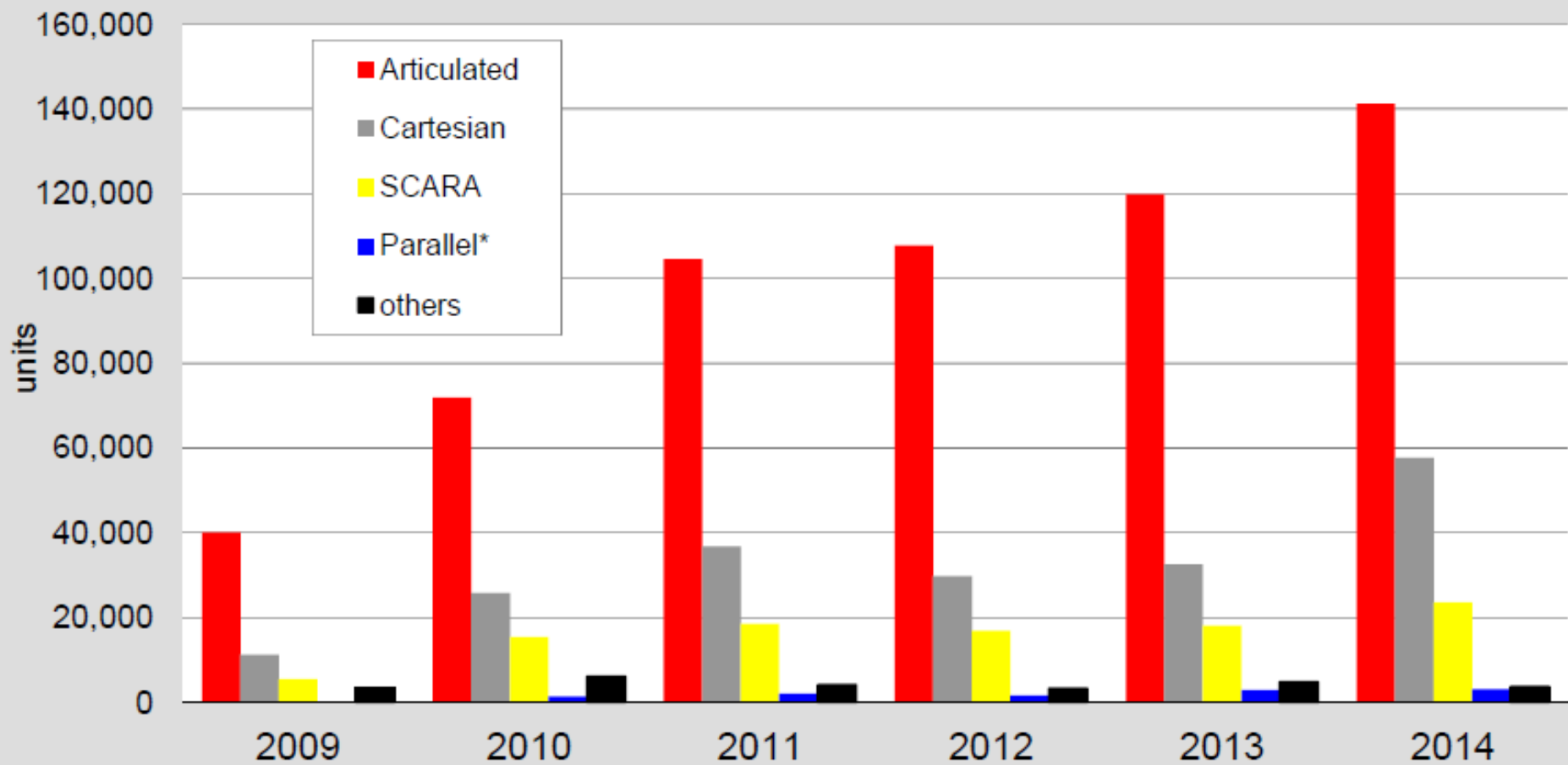
Azië: 139.300 (+41%)

Europa: 45.600 (+5%)

Americas: 32.600 (+8%)



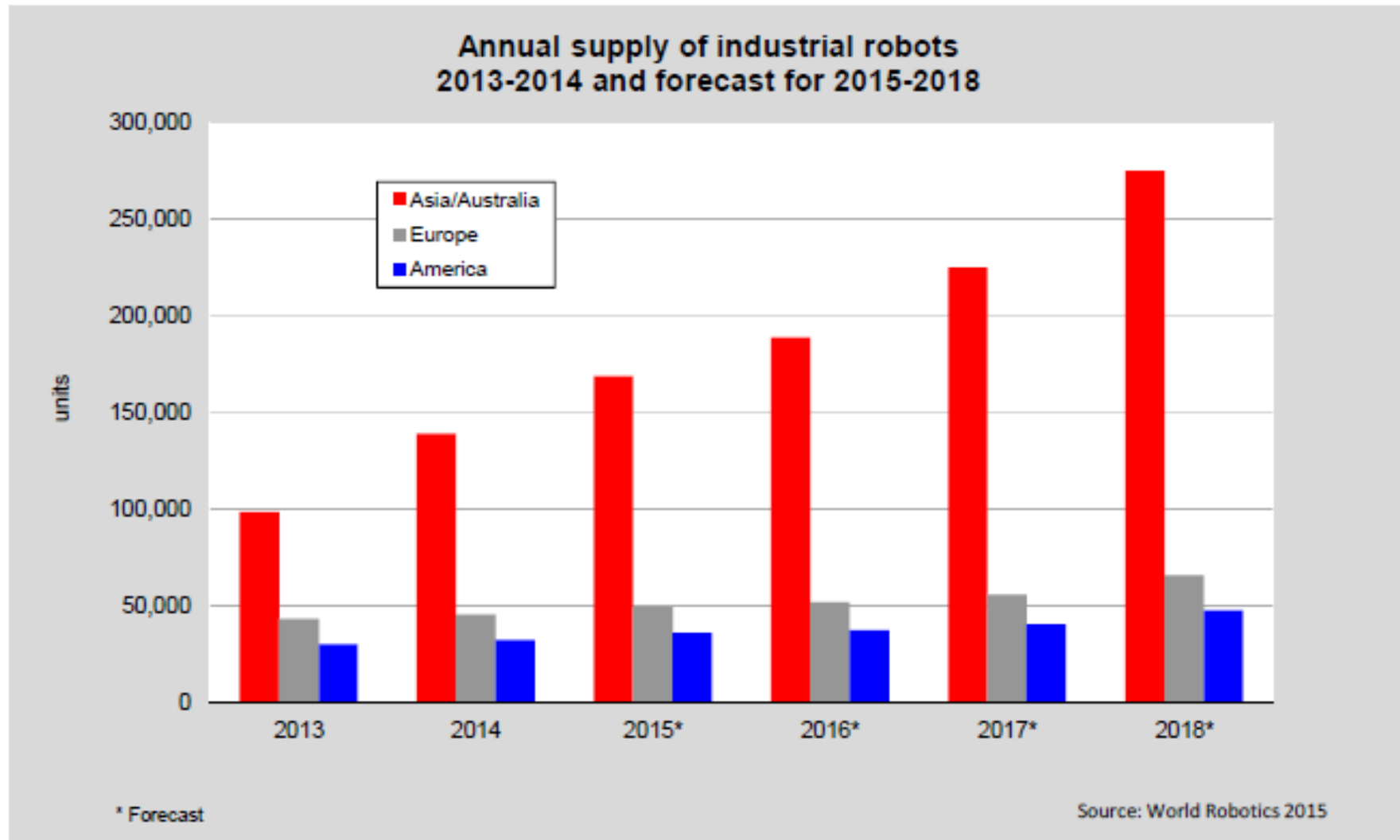
Annual supply of industrial robots by mechanical type

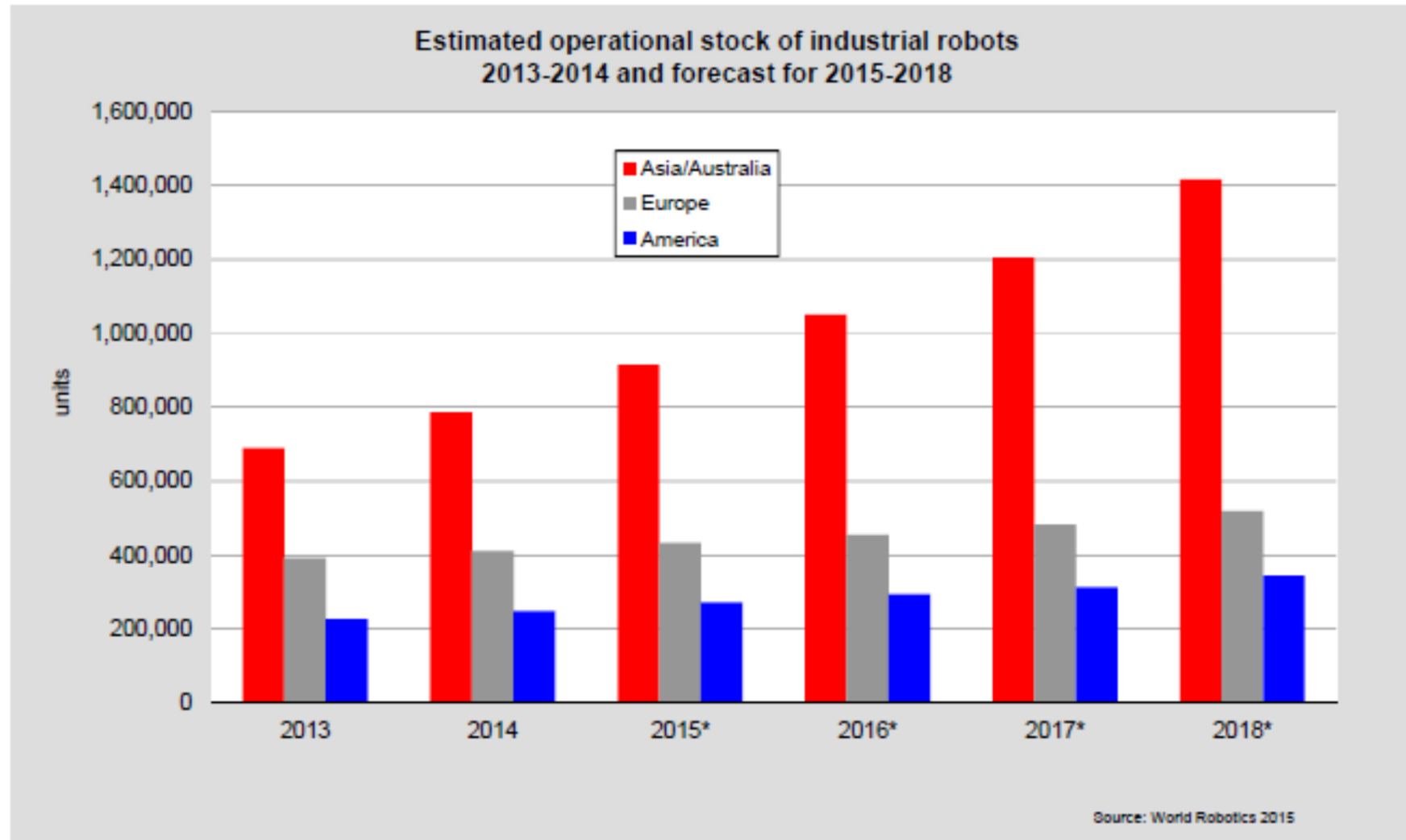


*in 2009 Parallel Robots included in Others

Figure 2.33

Verwachting 15% groei per jaar





Verdeling binnen Europa

Country	2009	2010	2011	2012	2013	2014	2014/2013 % change	CAGR 2010-2014
Western Europe	17,233	25,555	35,552	33,416	34,397	37,224	8%	10%
Austria	508	496	628	835	720	898	25%	16%
Belgium	672	451	737	1,077	1,518	484	-68%	2%
Switzerland	347	447	673	584	593	650	10%	10%
Germany	8,507	14,061	19,533	17,528	18,297	20,051	10%	9%
Spain	1,348	1,897	3,091	2,005	2,764	2,312	-16%	5%
France	1,450	2,049	3,058	2,956	2,161	2,944	36%	9%
Italy	2,883	4,517	5,091	4,402	4,701	6,215	32%	8%
Netherlands	614	508	1,015	810	895	1,234	38%	25%
Portugal	269	251	212	276	262	342	31%	8%
United Kingdom	635	878	1,514	2,943	2,486	2,094	-16%	24%
Nordic Countries	1,239	1,375	1,819	1,940	2,125	2,050	-4%	11%
Denmark	315	373	436	503	477	608	27%	13%
Sweden	587	682	1,016	1,016	1,199	1,073	-11%	12%
Other Nordic Countries	337	320	367	421	449	369	-18%	4%
- Finland*	276	270	297	330	365			
- Norway*	61	50	70	91	84			
Rest of Europe	563	1,300	1,721	1,893	1,695	1,642	-3%	6%
Turkey	210	338	864	995	1,136	1,246	10%	39%
All other European Countries	130	157	152	193	222	236	6%	11%
- Greece*	39	44	9	31	43			
- Iceland*					7			
- Ireland*	30	41	48	63	83			
- Israel*	61	72	95	94	88			
- Malta*				5	1			
Other Europe	223	805	705	705	337	160	-53%	-33%

Figure 2.14 Estimated annual shipments of industrial robots by applications worldwide 2012 - 2014

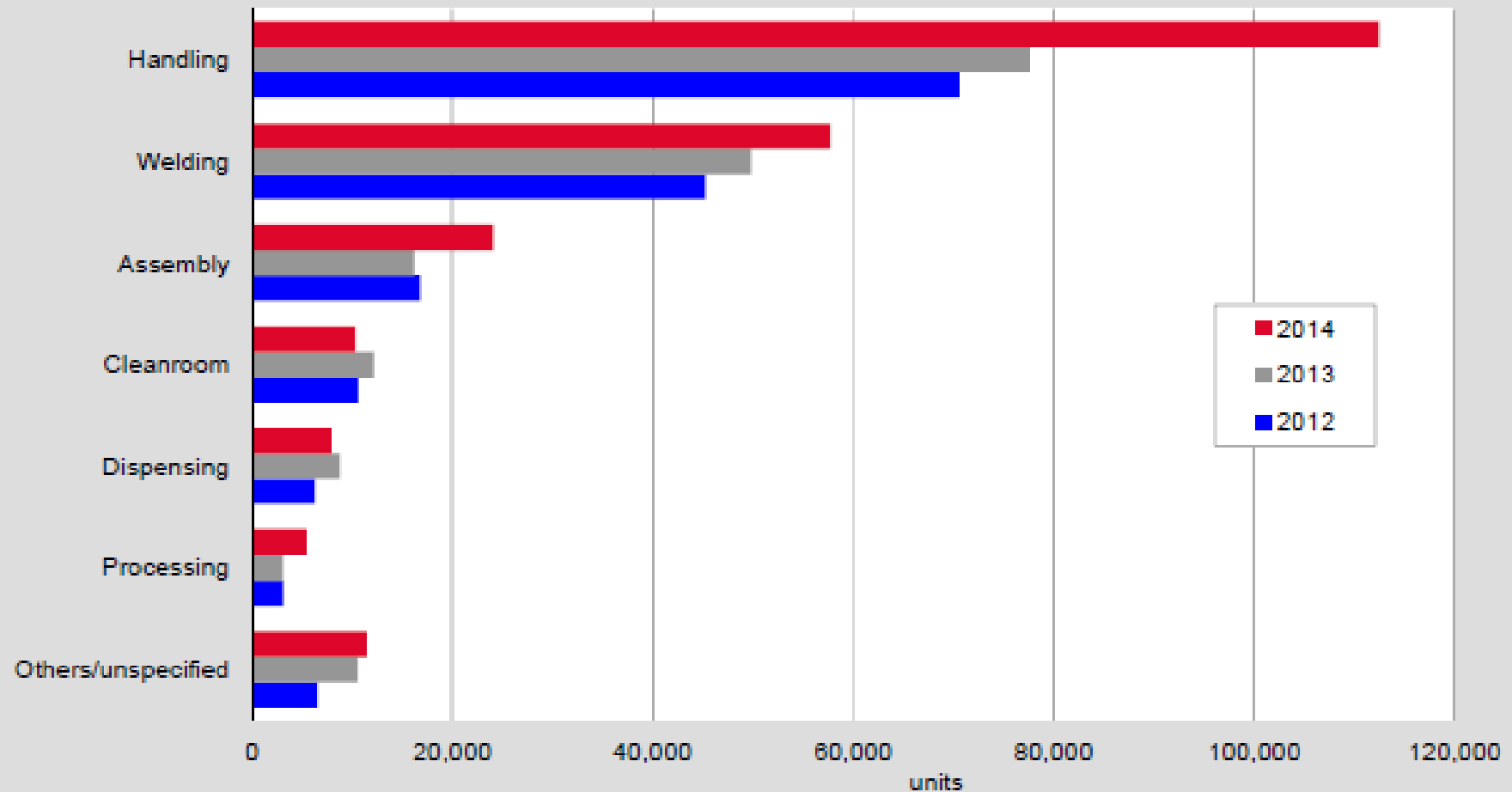


Figure 2.14

Verdeling naar applicatie per land

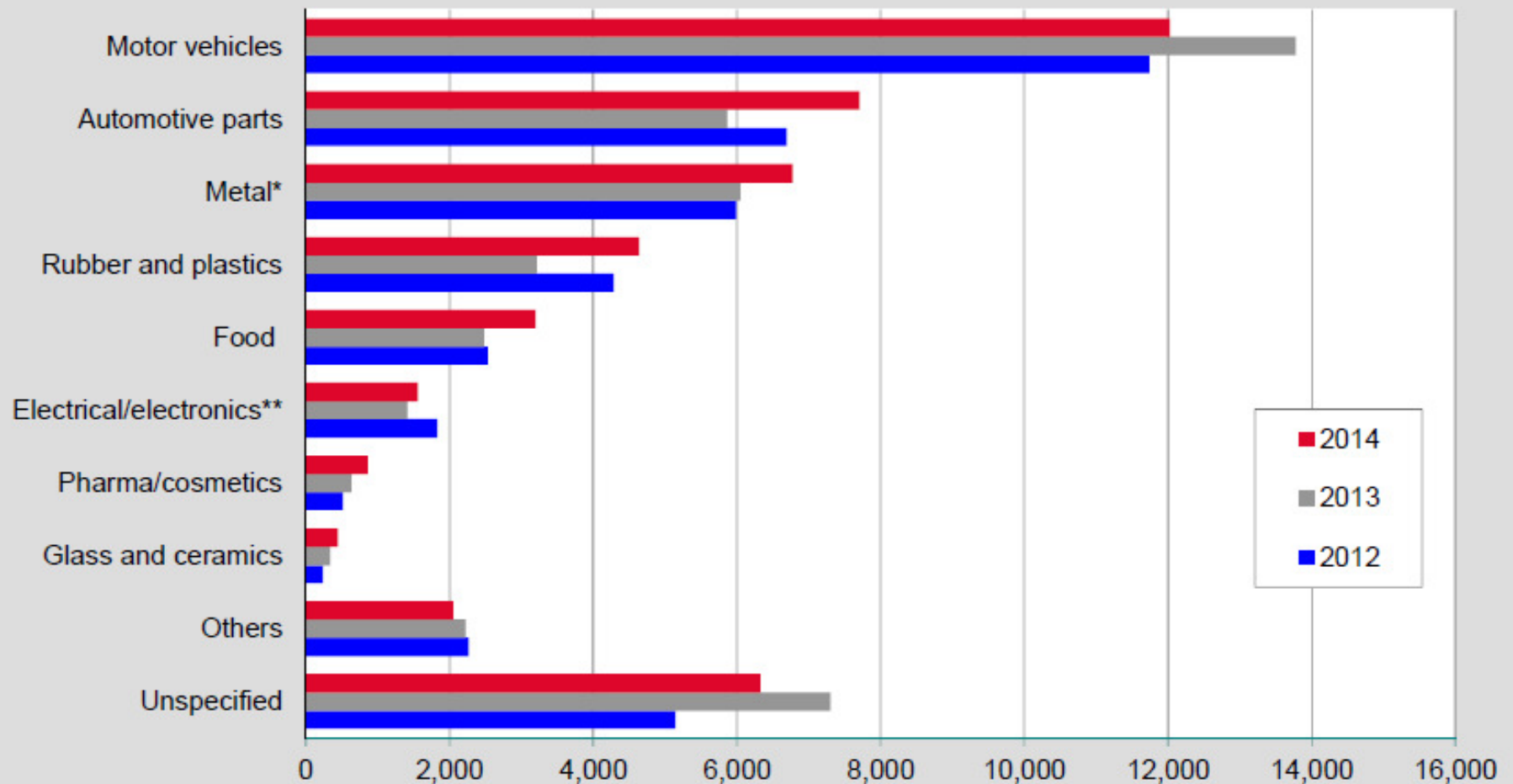
	Welding	Handling operations/machine tending	of which: material handling	of which: plastic moulding	of which palletizing	of which packaging, picking & placing	of which handling operations at machine tools	Dispensing	Processing	Assembly	Cleanroom	All others/non classified	Total
China	20,642	20,157	6,398	5,439	2,258	1,165	2,507	2,838	1,079	9,413	1,942	1,025	57,096
United States	8,330	11,538	4,662	1,551	598	2,407	1,004	934	250	1,891	2,322	937	26,202
Japan	7,004	11,404	5,058	2,224	1,426	164	1,783	500	336	5,973	3,462	618	29,297
Rep. of Korea	5,613	15,463	1,131	812	194	11,895	995	577	97	1,644	773	554	24,721
Thailand	1,993	1,325	453	668	47	3	143	82	39	135		83	3,657
Germany	1,907	12,408	7,624	1,534	438	1,208	607	751	714	959	87	3,225	20,051
India	1,320	501	308	115	13	2	47	145	51	45		64	2,126
Italy	1,263	3,710	1,132	588	624	405	489	244	129	475	2	392	6,215
Mexico	1,060	1,089	379	346	5	67	101	242	30	8		65	2,494
Canada	887	1,056	472	97	69	141	93	75	115	45		155	2,333
France	781	1,549	486	385	132	299	58	95	45	50		424	2,944
Indonesia	598	480	129	323	15	3	6	48	3	17		6	1,152
Taiwan	584	2,577	1,314	259	21	641	303	177	2,053	1,085	314	122	6,912
Czech Republic	543	692	185	323	9	24	109	54	33	36		175	1,533
Brazil	475	591	243	169	32	11	21	63	10	61		66	1,266
United Kingdom	471	1,263	595	254	44	105	73	72	67	45		176	2,094
Sweden	381	429	183	48	25	31	90	27	14	14		208	1,073
Spain	366	1,450	511	223	299	89	135	45	33	87		331	2,312
Turkey	360	603	280	246	38	29	2	52	33	2		196	1,246
Netherlands	284	746	286	53	33	219	119	19	13	10		162	1,234
South Africa	245	78	42	7	19		4	11	7	13		4	356
Poland	208	594	179	279	33	68	13	110	45	50		260	1,267
Rest of South America	174	104	45	34	24	1		3	4	4		28	317
Malaysia	170	375	138	187	39	5	1	61	5	52	171	18	852
Slovakia	89	187	95	53	2	9	24	19	8	12		28	343
Russian Federation	81	158	82	20	16		25	11	11			78	339
Portugal	63	245	73	107	25	10	20	11	3	11		9	342
Austria	58	562	331	140	30	21	20	26	23	8	89	132	896
Balkan countries	48	177	49	43	33	14	17	13	5	7		33	283
Hungary	47	308	76	168	6	7	6	8	19	47		105	534
Australia/New Zealand	42	257	133	28	31	38	24	2	5	6		114	426
Switzerland	33	421	177	110	37	20	37	8	13	25		150	650
Belgium	29	315	62	69	26	98	53	12	7	3		118	484
Denmark	28	373	60	124	64	96	3	1	17	2		187	606
Singapore	16	92	15	21	7	21	28	6	2	158	850	104	1,226
Vietnam	12	277	2	260	7		8	52	5	2			346
Other Asia	9	9,896	53	22	356	9,449	2	55	61	51		68	10,140
all other countries	103	866	165	393	123	77	67	63	22	1,204	12	302	2,572
Others, not specified	1,407	8,154	810	153	72	6,673	330	431	29	390	220	683	11,314
Total	57,724	112,470	34,416	17,875	7,270	35,515	9,367	7,943	5,435	24,040	10,244	11,405	229,261
% distribution	25.2%	49.1%	15.0%	7.8%	3.2%	15.5%	4.1%	3.5%	2.4%	10.5%	4.5%	5.0%	100.0%

Verdeling naar sector per land

	Automotive	Electrical/ electrical/ industries*	Chemical industries	Metal products, basic metals and machinery	Food and beverages	All others	not classified	Total
China*	21,106	16,726	3,511	6,878	1,371	1,616	5,888	57,096
Rep. of Korea	14,016	5,816	676	97	153	90	3,873	24,721
United States	13,611	4,270	2,065	2,384	1,043	1,944	885	26,202
Germany	10,875	739	1,848	2,218	702	827	2,842	20,051
Japan	10,517	8,369	2,735	3,112	706	3,858		29,297
Thailand*	2,001	97	657	288	18	15	581	3,657
Mexico	1,932	28	306	79	71	49	29	2,494
Italy	1,902	260	757	1,257	826	234	979	6,215
India	1,517	60	117	168	2	100	162	2,126
Canada	1,449	43	177	255	147	178	84	2,333
United Kingdom	1,159	51	316	206	134	137	91	2,094
France	1,121	101	377	463	304	255	323	2,944
Spain	940	43	252	412	321	106	238	2,312
Czech Republic	841	17	205	231	39	40	160	1,533
Brazil	816	3	105	106	39	108	89	1,266
Taiwan	669	5,146	267	657	8	64	101	6,912
Poland	563	8	280	114	59	46	197	1,267
Sweden	438	4	94	291	69	66	111	1,073
Turkey	393	42	229	237	44	87	214	1,246
Netherlands	319	27	111	332	237	45	163	1,234
Austria	234	105	188	199	20	62	90	898
Slovakia	220	5	30	51	6	10	21	343
South America (except Brazil)	175	5	33	32	18	28	26	317
Portugal	160	5	61	60	30	12	14	342
Russian Federation	147	3	26	46	15	48	54	339
Hungary	135	52	158	86	8	12	83	534
Balkan Countries	133	8	31	38	26	18	29	283
Belgium	53	9	74	105	97	32	114	484
Switzerland	52	37	155	196	55	37	118	650
Singapore	2	1,016	24	11	23	60	92	1,228
Other Asia	4,631	4,948	21	46	32	22	440	10,140
all other countries	377	261	1,391	391	320	250	3,326	6,316
Others not specified	6,439	77	187	130	113	329	4,039	11,314
Total	98,943	48,381	17,464	21,176	7,056	10,785	25,456	229,261
% distribution	43.2%	21.1%	7.6%	9.2%	3.1%	4.7%	11.1%	100.0%

Verdeling naar sector in Europa

Estimated annual supply of industrial robots at year-end in Europe by main industries 2012 - 2014

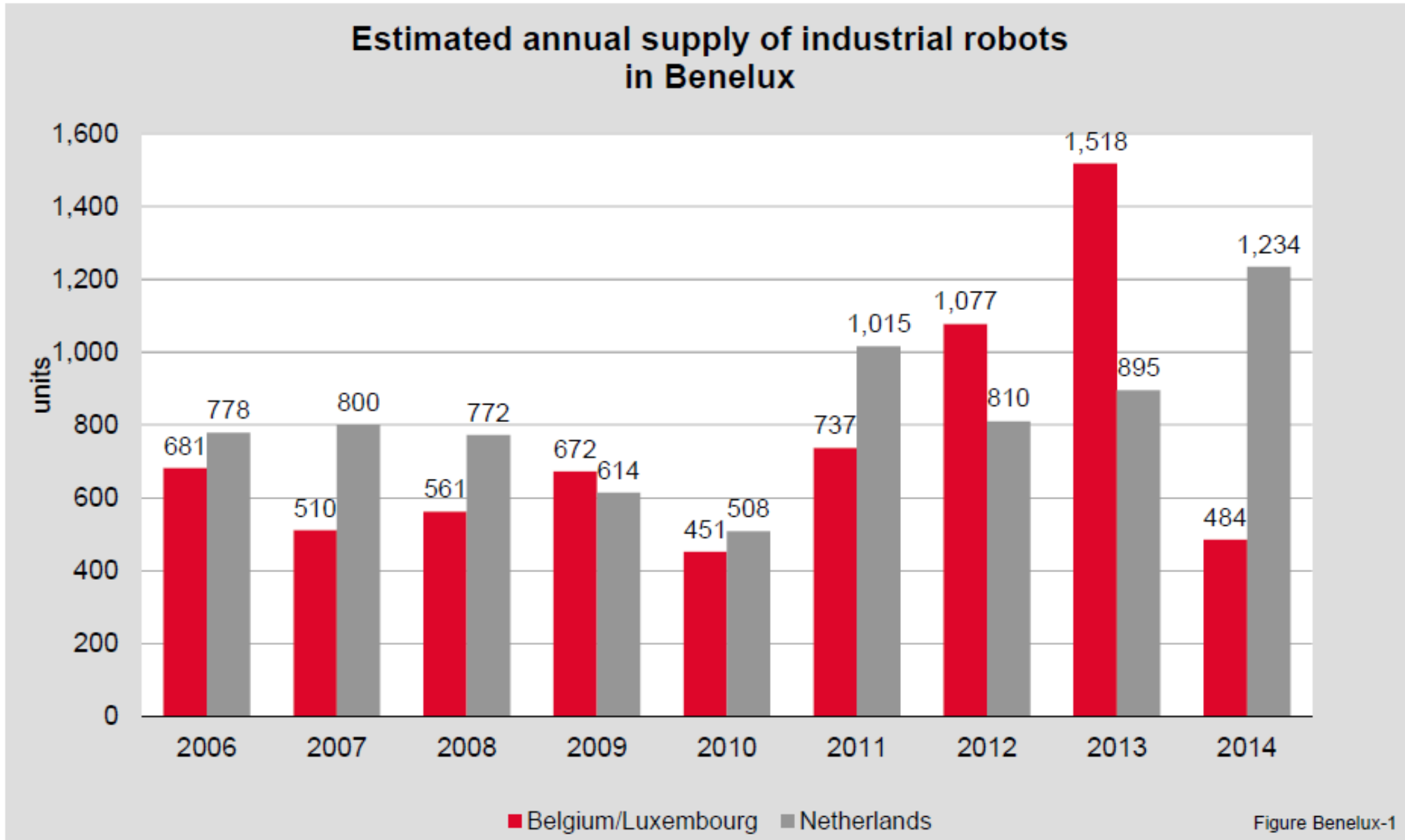


* incl. fabricated metal products, basic metals and machinery industry

** incl. communication, computer and medical precision

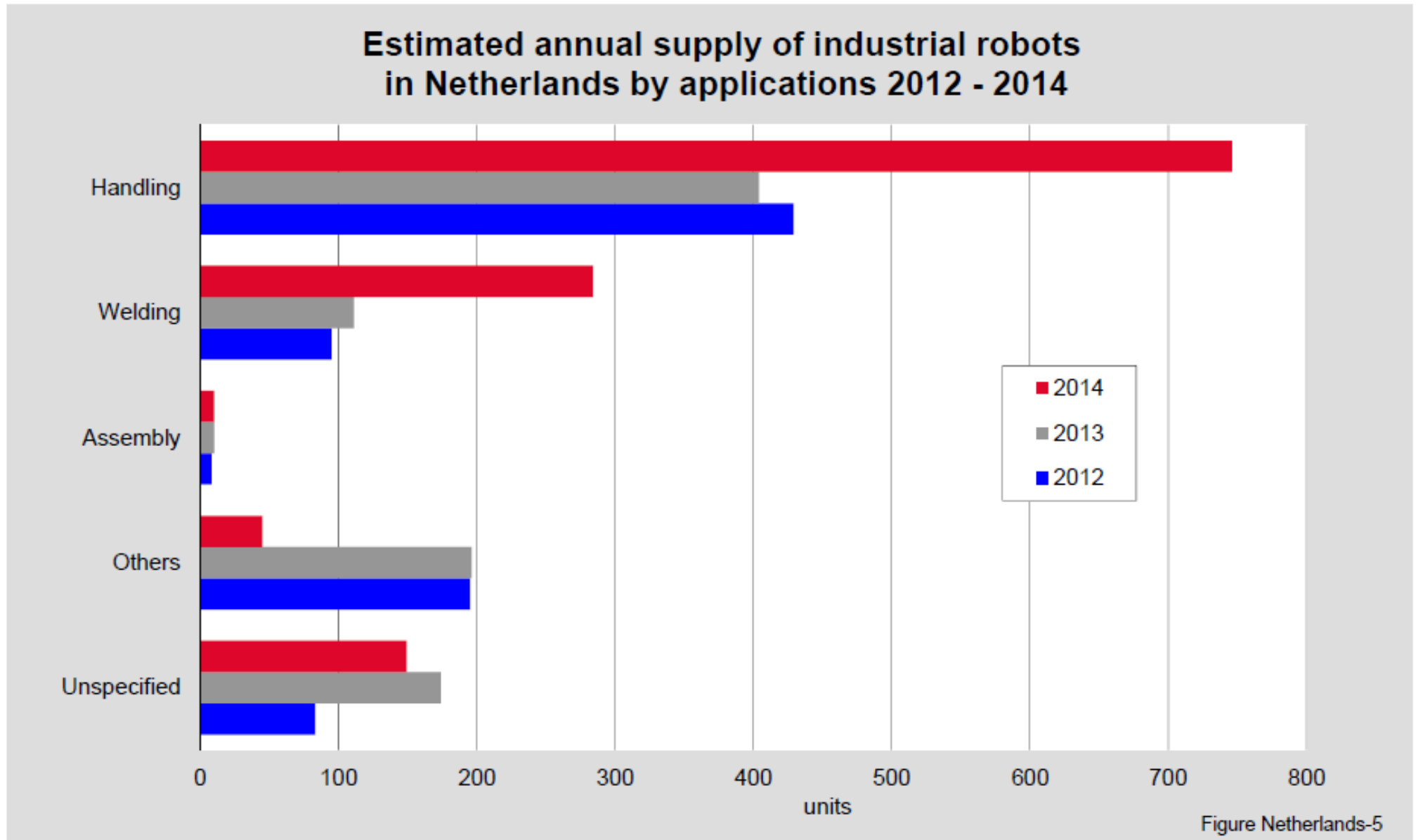
units

Figure Europe-7



Noot: In 2014 correctie foutieve verdeling België / NL

Verdeling naar applicatie Nederland



Verdeling naar sector Nederland

Estimated annual supply of industrial robots at year-end in Netherlands by main industries 2012 - 2014

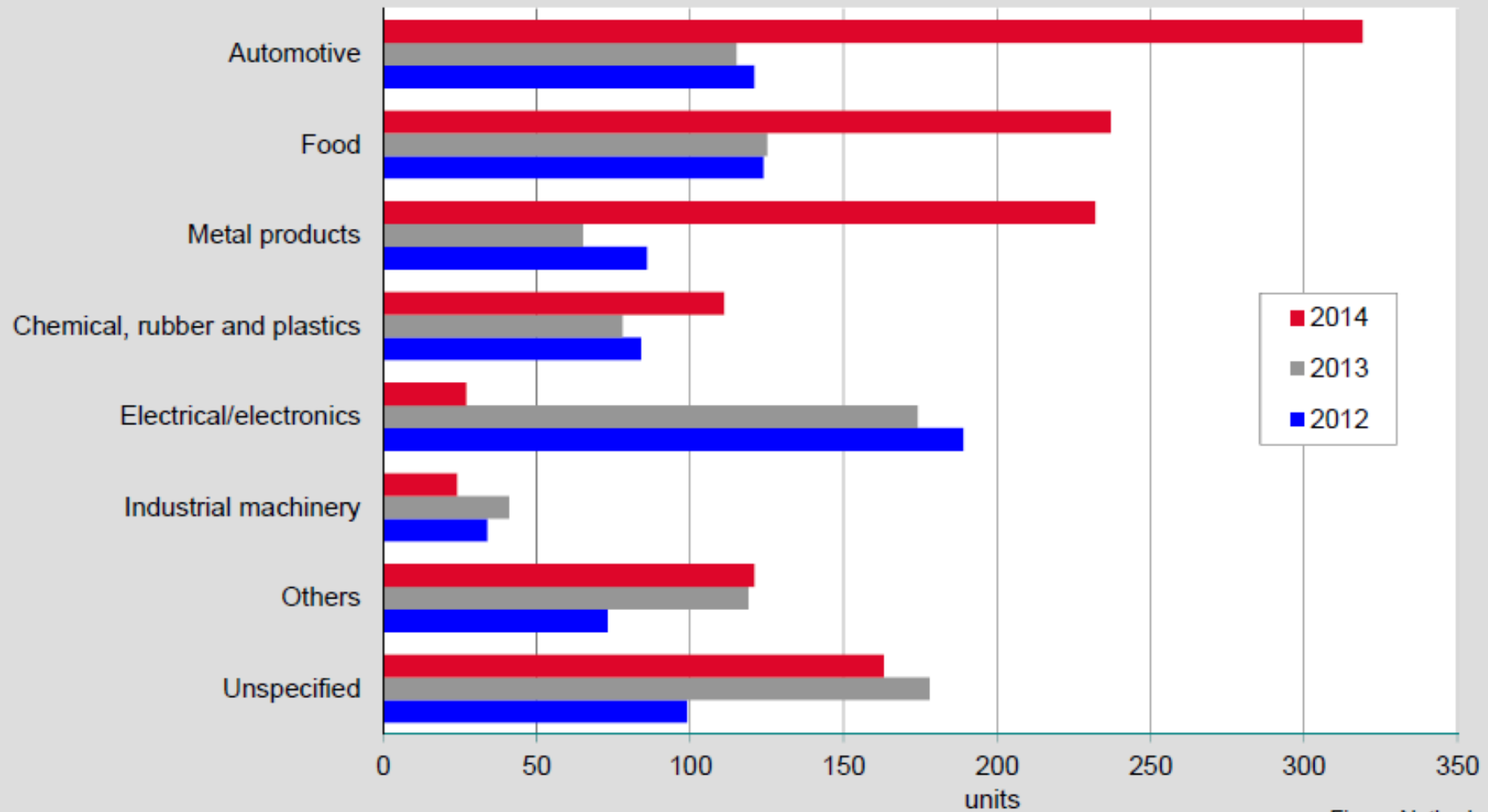


Figure Netherlands-7

Waarom worden er steeds meer robots ingezet?

- **Steeds hogere eisen aan kwaliteit / reproduceerbaarheid processen (met manuele processen moeilijk haalbaar)**
- **Beschikbaarheid vakmensen (bv. lassers., plaatwerkers)**
- **Efficiency / kostenoptimalisatie / rendement machines**
- **Lean manufacturing + “high mix / low volume” productietrends**
- **Technologische ontwikkelingen (o.a. Industry 4.0 / Smart Industry)**

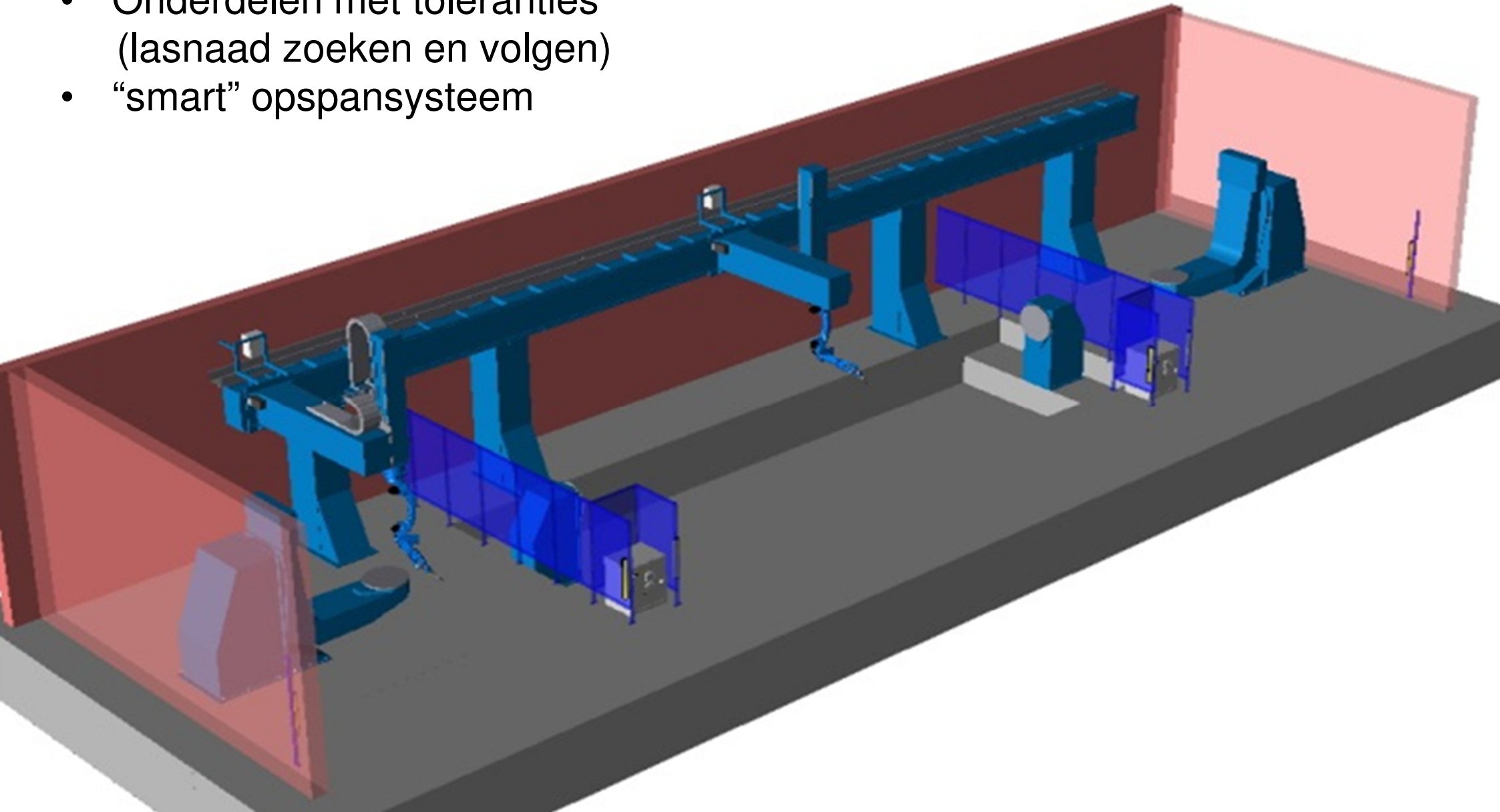


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teqnow
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Voorbeeld lassen (Schuitemaker, Rijssen)

- Off-line programmeersoftware (robotonafhankelijk)
- Onderdelen met toleranties (lasnaad zoeken en volgen)
- “smart” opspansysteem



Kantbankautomatisering (Peeters, Etten-Leur) **ROBONED**



Off- line genereren van programma's (zowel voor kantbank als robot)

Beladen CNC bewerkingsmachines (BMO)



Applicatiespecifieke gebruikersinterface (geen robotkennis nodig)

3D binpicking (Dyka, Arnhem)

- Video: <http://www.robomotive.nl/index.php?lang=351>
- Cycle time bin picking robots 7,5 sec.
- Standard containers kunnen worden gebruikt
- Besparing: 2 operators per shift
- System integrator: Robomotive (Roermond)





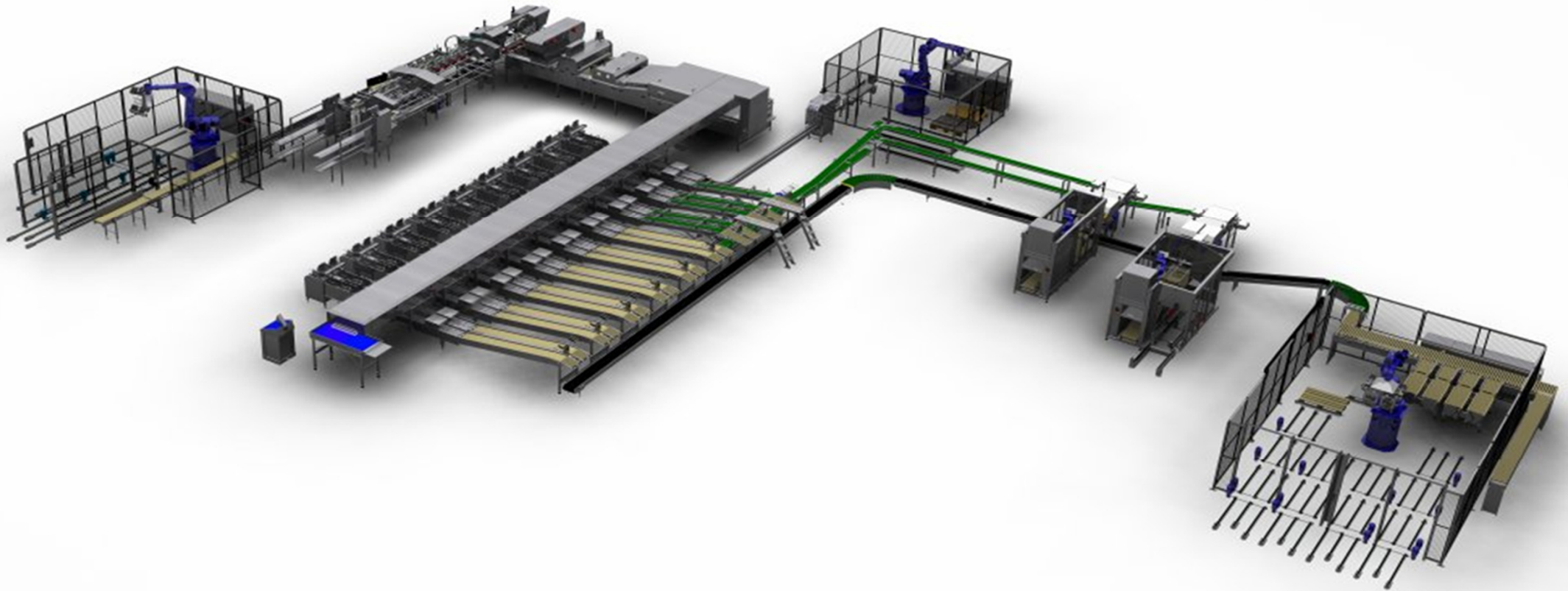
- Robot kann op 2 posities werken
- 3D Vision
- Speciale afscherming voor omgeving
- Data logging

[Video](#)

Voorbeeld robots in machinebouw in NL MOBA, Barneveld

Ontwikkeling gestart in 2010

Inmiddels +/- 200 robots geleverd wereldwijd voor verpakking & (de)palletizing



MOBA

[Video](#)

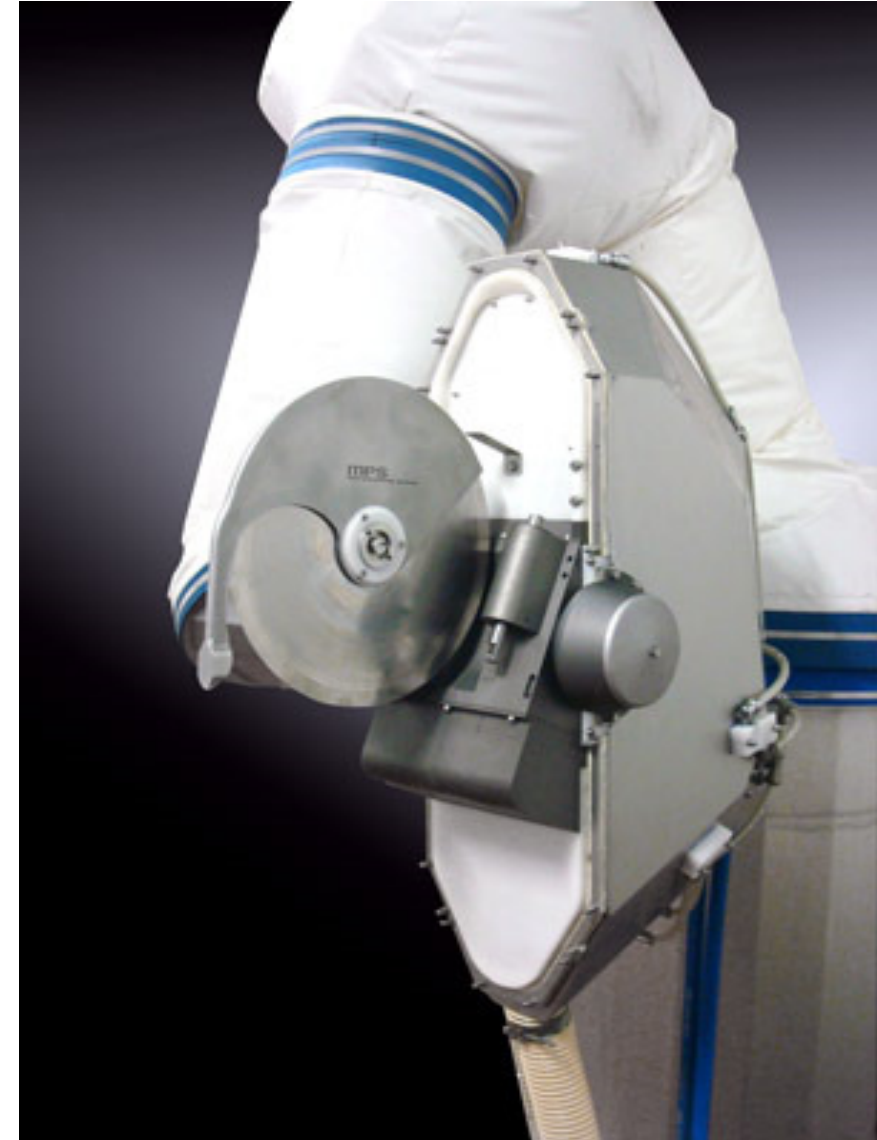
Voorbeeld robots in machinebouw NL

MPS, Lichtenvoorde

- 3D Vision scanning
- Berekening van robot pad vanuit PC applicatie
- MOTOPlus module voor automatic „float“ functie
- Inmiddels 4 verschillende applicaties met robots



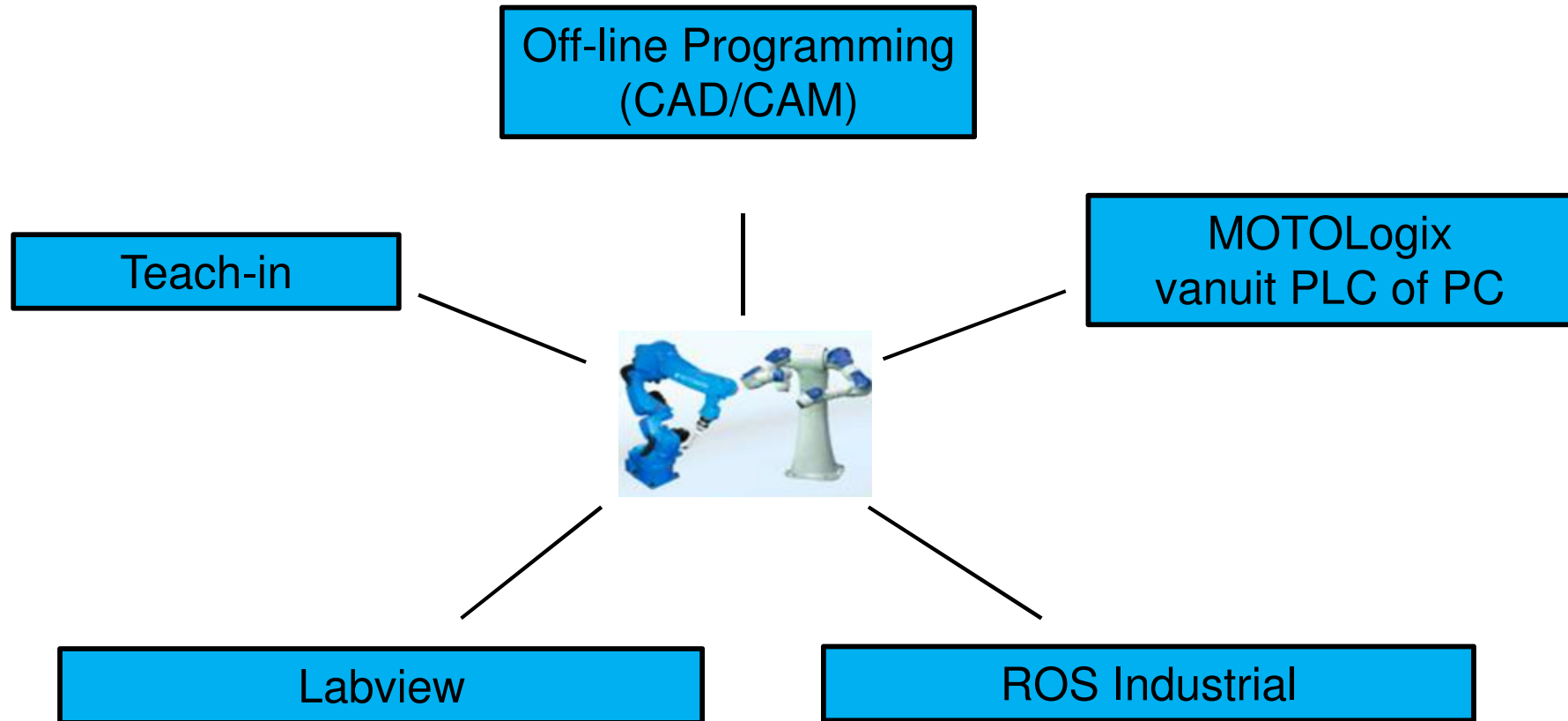
mps
meat processing systems



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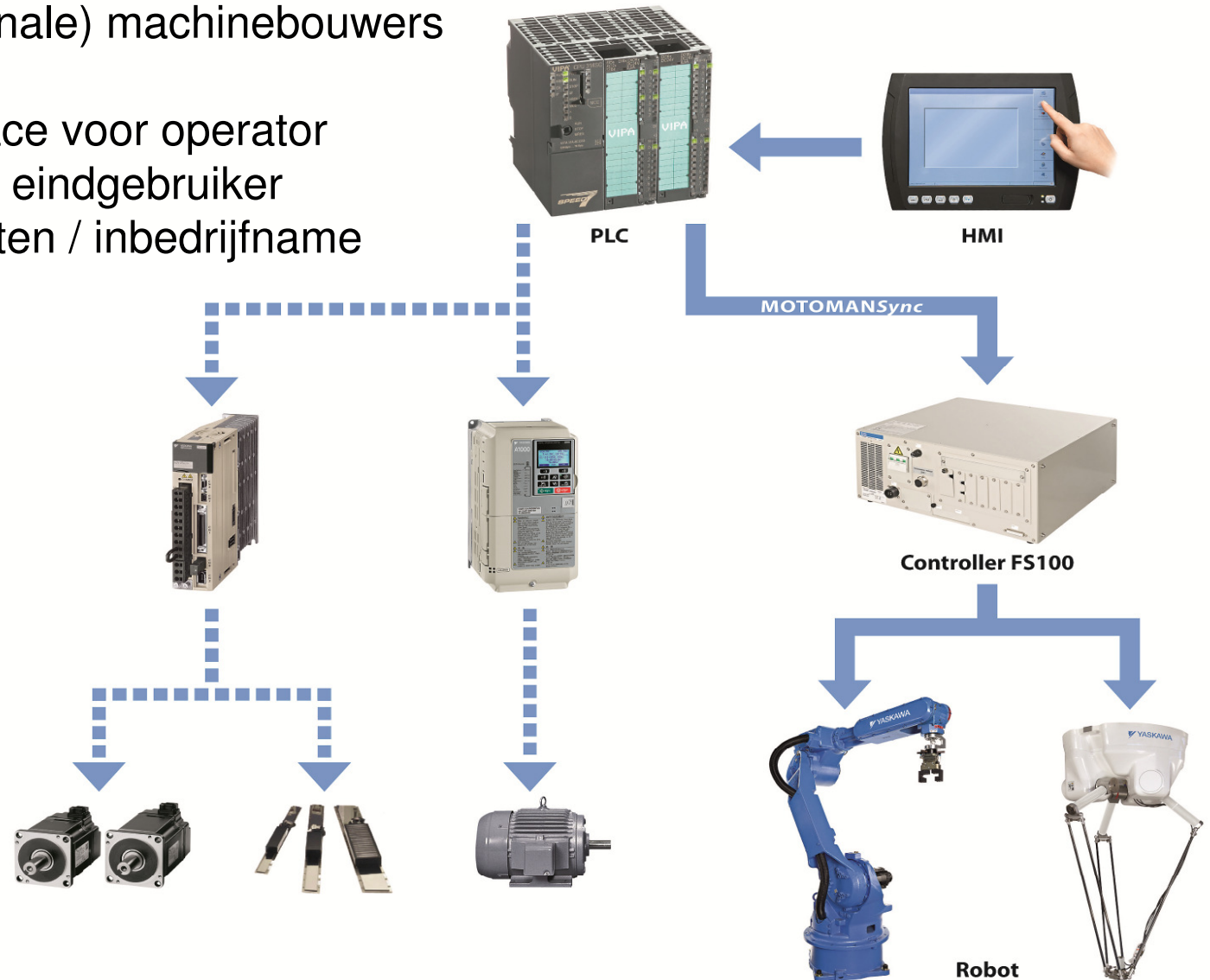
- **Robots moeten meer “flexibel” inzetbaar worden voor “high-mix / low-volume” toepassingen**
- **Robots moeten een eenvoudiger interface krijgen**
- **Robots moeten gemakkelijker geïntegreerd en gekoppeld kunnen worden met omgeving**
- **Robots moeten vanuit externe systemen kunnen worden geprogrammeerd / aangestuurd**
- **Geavanceerde software nodig voor (semi-)automatische aansturing vanuit productdata (CAD/CAM)**





Directe aansturing vanuit PLC

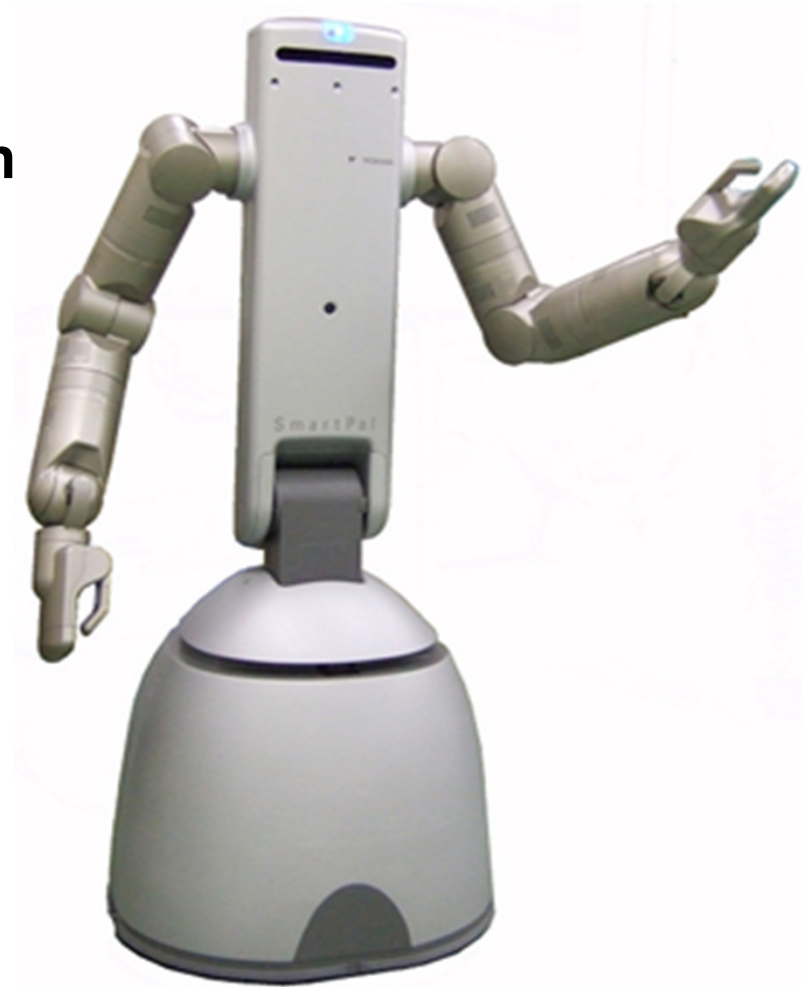
- Interessant voor (internationale) machinebouwers
- Geen „robot expert“ nodig
- Gebruiksvriendelijke interface voor operator
- Gemakkelijker voor service eindgebruiker
- Minder uren nodig voor testen / inbedrijfname



Nieuwe toepassingen “open controls” robotics:

- Integratie van intelligente sensor systemen
- Automatisch genereren van baan / pad
- Force feedback
- Veiligheid

[Video](#): YASKAWA “SmartPal”



Vragen?



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