

Contents

Foreword	3
Contents	5
Executive Summary World Robotics 2021 - Service Robots	7
1 Introduction into service robotics.....	10
1.1 Structure of the World Robotics 2021 - Service Robots.....	10
1.2 Definitions: robotics, Service Robotics, Industrial Robotics.....	11
1.2.1 ISO 8373:2012 Vocabulary definitions	11
1.2.2 Deviations of IFR definitions from ISO definitions and IFR refinements of ISO definitions – Service Robots	12
1.2.3 Scope of IFR Service robot statistics.....	13
1.2.4 Summary: IFR service robot definition	14
1.3 Compliance and privacy (service robot statistics)	15
1.4 Classification of service robots	16
2 Distribution of Service Robots	22
2.1 Service robots for professional use, sales 2019 and 2020, market potential 2021-2024	23
2.2 Service robots for consumer use, sales 2019 and 2020, Market potential 2021-2024	29
2.3 Service robots by region of origin	33
2.4 Service robots by type of movement	36
3 Major application areas	40
3.1 Introduction.....	40
3.2 AP: Professional Service Robots.....	44
3.2.1 AP1: Agricultural robots	45
3.2.1.1 AP11: Cultivation.....	45
3.2.1.2 AP12: Milking and AP13: Livestock Farming	57
3.2.2 AP2: Professional cleaning	64
3.2.2.1 AP21: Floor cleaning.....	65
3.2.2.2 AP22: Window and Wall cleaning.....	70
3.2.2.3 AP23: Professional Tank, tube, and pipe cleaning	74
3.2.2.4 AP24: Hull cleaning.....	80
3.2.2.5 AP25: Disinfection robots.....	83
3.2.2.6 AP29: Other professional cleaning	87
3.2.3 AP3: Inspection and maintenance robots.....	90
3.2.3.1 AP31 Buildings and other construction.....	90
3.2.3.2 AP32: INspection and Maintenance of Tank, tubes, pipes, and sewers ..	97

3.2.3.3	AP39: Other inspection and maintenance robots.....	105
3.2.4	AP4: Construction and demolition	108
3.2.4.1	AP41: Construction	109
3.2.4.2	AP42: Demolition	118
3.2.5	AP5: Transportation and logistics	126
3.2.5.1	AP51: Indoor environments without public traffic	128
3.2.5.2	AP52: Indoor environments with public traffic	138
3.2.5.3	AP53: Outdoor environments without public traffic	146
3.2.5.4	AP54: Outdoor environments with public traffic	149
3.2.5.5	AP55: Inventory.....	152
3.2.6	AP6: Medical robots	157
3.2.6.1	AP61: Diagnostics	158
3.2.6.2	AP62: Surgery	163
3.2.6.3	AP63: Rehabilitation and non-invasive therapy.....	170
3.2.6.4	AP69: Other medical robots.....	182
3.2.7	AP7: Search, Rescue and security applications.....	189
3.2.7.1	AP71: Firefighting and AP72: disaster Relief	189
3.2.7.2	AP73: Security services	197
3.2.8	AP8: Hospitality	207
3.2.8.1	AP81: Food and drink preparation.....	207
3.2.8.2	AP82: Mobile guidance, information, telepresence robots.....	212
3.2.9	AP99: Other professional service robots	220
3.3	Consumer Robots	225
3.3.1	AC1: Robots for domestic tasks	226
3.3.1.1	AC11: Domestic floor cleaning (indoor).....	226
3.3.1.2	AC12: Domestic Window cleaning.....	230
3.3.1.3	AC13: Gardening	233
3.3.1.4	AC14: Domestic cleaning (outdoor).....	237
3.3.1.5	AC19: Other domestic tasks	239
3.3.2	AC2: Social interaction, education.....	242
3.3.2.1	AC21: Social interaction, companions.....	242
3.3.2.2	AC22: Education	246
3.3.3	AC3: Care at home	253
4	Service robotics industry structure	266
4.1	Service robot suppliers by region of origin and company age	267
4.2	Service robot suppliers – top 10 countries	269
4.3	Service robot suppliers by business size.....	272
4.4	Service robot suppliers by application – consumer use.....	273
5	IERA Award.....	344
5.1	Introduction.....	344
5.2	Winner of the IERA Award 2020: Photoneo’s high resolution MotionCam-3DBy: Andrea Pufflerova, Photoneo s.r.o, Slovakia.....	345