ROBOTICS

Product specification

IRB 1200 Gen2

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Product specification

IRB 1200-7/0.7 Gen2
IRB 1200-9/0.7 Gen2
IRB 1200-5/0.9 Gen2
IRB 1200-8/0.9 Gen2

OmniCore

Document ID: 3HAC074710-001

Revision: D

Original instructions.

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Overview of this specification

About this product specification

This product specification describes the performance of the manipulator or a complete family of manipulators in terms of:

- The structure and dimensional prints
- The fulfilment of standards, safety, and operating equipment
- The load diagrams, mounting or extra equipment, the motion, and the robot reach
- The specification of available variants and options

The specification covers the manipulator using the OmniCore controller.

Usage

Product specifications are used to find data and performance about the product, for example to decide which product to buy. How to handle the product is described in the product manual.

The specification is intended for:

- Product managers and product personnel
- Sales and marketing personnel
- Order and customer service personnel
- Integrators and customers

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References

Documentation referred to in the manual, is listed in the table below.

Product manual - IRB 1200 Gen2	*3HAC074708-001*
Product specification - OmniCore E line RW 7 (RobotWare 7)	*3HAC079823-001*
Product specification - OmniCore E line RobotWare 8 (RobotWare 8)	*3HAC098716-001*
Product specification - OmniCore C line RW 7 (RobotWare 7)	*3HAC065034-001*
Product specification - OmniCore C line RobotWare 8 (RobotWare 8)	*3HAC098715-001*
Product specification - OmniCore V line RW 7 (RobotWare 7)	*3HAC074671-001*
Product specification - OmniCore V line RW 8 (RobotWare 8)	*3HAC098717-001*

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Product manual - OmniCore E10 Type A	*3HAC095278-001*
Product manual - OmniCore C30 Type B	*3HAC097281-001*
Product manual - OmniCore C90XT Type A	*3HAC089065-001*
Product manual - OmniCore V250XT Type B	*3HAC087112-001*

Tip

All documents can be found via ABB Robotics One, *https://one.robotics.abb.com/en/knowledge-hub*.

Revisions

Revision	Description
A	First edition.
B	Published in release 25.3. The following updates are done in this revision: • Company name updated to reflect current legal entities. • Protection class IP67 (option 3350-670), protection types Clean Room (option 3351-4) and Foundry Plus 2 (option 3352-10) added. • Updated the loads on foundation. • Updated top view of working range. • Updated portal name from myABB to ABB Robotics One.
C	Published in release 26.1. The following updates are made in this revision: • Company name updated to reflect current legal entities. • Reorganized the document layout to improve readability. • Updated robot introduction and added information of intended use. • Added the section *Impacting robot lifetime on page 14*. • Updated the information on using 22 m and 30 m cables with OmniCore V controllers. • Updated calibration information. • Added support for RobotWare 8. • Added support for OmniCore C30 Type B controller and removed information for C30 Type A.
D	Published in release 26B. The following updates are made in this revision: • Minor changes.

1 Description of IRB 1200 Gen2

1.1 About the IRB 1200 Gen2

General introduction

The IRB 1200 Gen2 is one of ABB Robotics latest generation of 6-axis industrial robot, providing four high-performance variants covering payloads of 5 kg, 7 kg, 8 kg and 9 kg and in reaches of 0.7 m and 0.9 m.

Powered by OmniCore, the IRB 1200 Gen2 features class-leading motion control and path accuracy. With a compact design and slim upper arm that minimizes the risk of collisions with workpieces, the IRB 1200 Gen2 robots offer new opportunities for smaller, more efficient production cells.

Intended use

IRB 1200 Gen2 is designed specifically for manufacturing industries that use flexible robot-based automation, e.g. 3C industry. It targets the high-accuracy process applications and also applications that have demands on high-speed assembly and precise movements. IRB 1200 Gen2 is ideal for general industries, consumer electronics, automotive electronics and so on.

See *Impacting robot lifetime on page 14*.

Available variants

The IRB 1200 Gen2 is available in the following variant(s).

Robot variant	Handling capacity (kg)	Reach (m)
IRB 1200-7/0.7 Gen2	7	0.7
IRB 1200-9/0.7 Gen2	9	0.7
IRB 1200-5/0.9 Gen2	5	0.9
IRB 1200-8/0.9 Gen2	8	0.9

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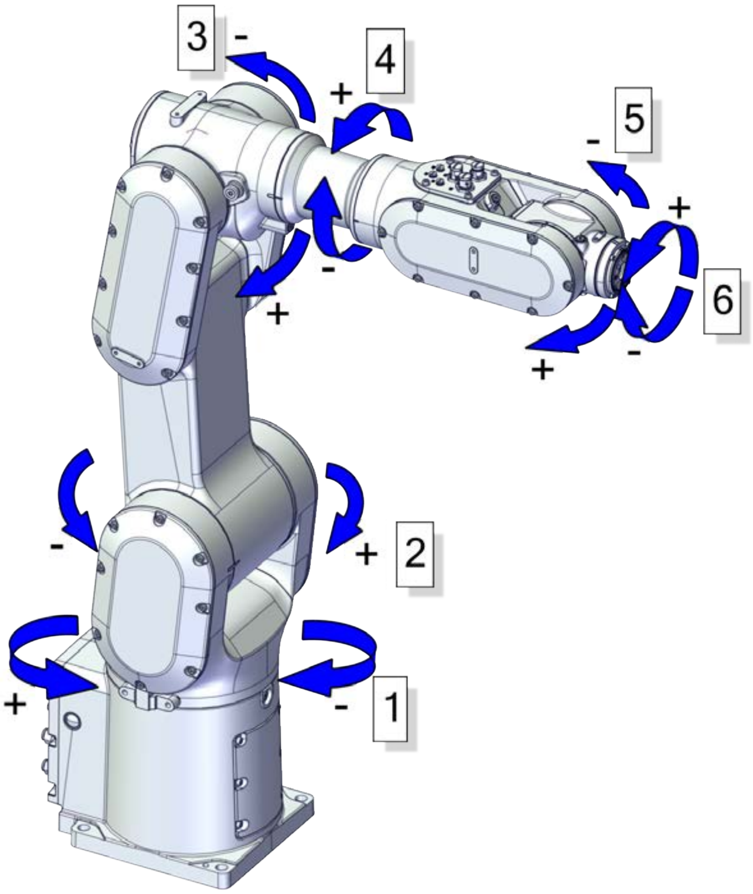
Robot axes



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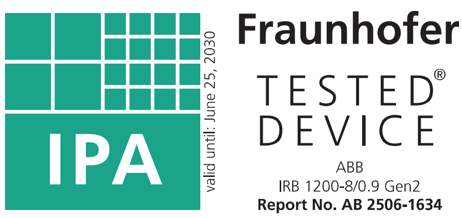
Protection type Clean Room

Robots with protection type Clean Room are specially designed to work in a clean room environment. Clean Room robots are designed to prevent from particle emission from the robot. For example, the maintenance work possible to perform without cracking the paint.



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According to IPA test result, the robot IRB 1200 Gen2 is suitable for use in clean room environments. Particle emission from the robot IRB 1200 Gen2 fulfill Clean room class 4 standard according to DIN EN ISO 14644-1, -14.

Test result/Classification:

Continues on next page

When operated under the specified test conditions, the IRB 1200 Gen2 is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1.

Test parameter(s)	Air Cleanliness Class
50% of maximum velocity	4
100% of maximum velocity	4
Overall result	4

Classification results in accordance with ISO 14644-8 at test temperature 23℃ is Class -6.8 (total organic compounds *TOC*) and at test temperature 90℃ is Class -3.8 (total organic compounds *TOC*).

Protection type Foundry Plus 2

Robots with the option Foundry Plus 2 are designed for harsh environments where the robot is exposed to sprays of coolants, lubricants and metal spits that are typical for die casting applications or other similar applications.

Typical applications are spraying insertion and part extraction of die-casting machines, handling in sand casting and gravity casting, etc. (Please refer to Foundry Prime robots for washing applications or other similar applications). Special care must be taken in regard to operational and maintenance requirements for applications in foundry are as well as in other applications areas. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility for the Foundry Plus 2 protected robot.

The robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may cause rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned.

The entire robot is IP67 compliant according to IEC 60529 - from base to wrist, which means that the electrical compartments are sealed against water and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Selected Foundry Plus 2 features:

- Improved sealing to prevent penetration into cavities to secure IP67
- Additional protection of cabling and electronics
- Special covers that protect cavities
- Well-proven connectors
- Nickel coated tool flange
- Rust preventives on screws, washers and unpainted/machined surfaces
- Extended service and maintenance program

The Foundry Plus 2 robot can be cleaned with appropriate washing equipment according to the robot product manual. Appropriate cleaning and maintenance is

Continues on next page

required to maintain the protection, for example can rust preventive be washed off with wrong cleaning method.

Available robot variants

The option Foundry Plus 2 might not be available for all robot variants.

See *Specification of variants and options on page 109* for robot versions and other options not selectable together with Foundry Plus 2.

Protection class IP67

The entire robot is IP67 compliant according to IEC 60529, which means that the electrical compartments are sealed against water and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Control system

The robot is equipped with the OmniCore controller and robot control software, RobotWare. RobotWare supports every aspect of the robot system, such as motion control, development and execution of application programs, communication etc. See *Operating manual - OmniCore*.

We have added a range of software products - all falling under the umbrella designation of Active Safety - to protect not only personnel in the unlikely event of an accident, but also robot tools, peripheral equipment and the robot itself.

The IRB 1200 Gen2 manipulator can be connected to the following robot controllers:

- OmniCore C30
- OmniCore C90XT
- OmniCore E10
- OmniCore V250XT

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support - for example communication features - network communication - and advanced functions such as multitasking, sensor control etc. For a complete description on optional software, see the product specification for the robot controller.

1.2 Standards

1.2.1 Applicable standards

General

This product is designed according to the global product standard ISO 10218-1:2025, *Robots for industrial environments - Safety requirements - Part 1 Robots*, In case of deviation from ISO 10218-1:2025, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

Standard	Description
ISO 9283	Manipulating industrial robots - Performance criteria and related test methods
ISO 9787	Robots and robotic devices -- Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots - Presentation of characteristics
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
IEC 61326-3-1	Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena - General requirements
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

Region specific standards

Standard	Description
UL 1740 (option) CSA Z434 (option)	Standards For Safety - Robots and Robotic Equipment Industrial robots and robot Systems - General safety requirements Valid for USA and Canada.

1.3 Impacting robot lifetime

Introduction

The expected lifetime of a robot is an important factor when planning an installation. This information is aiming to help you to maximize the lifetime of your robot and avoid unnecessary downtime or repair.

The lifetime of a robot is influenced by the following, but not limited to, factors:

- *Robot type selection on page 14*
- *Duty factor on page 14*
- *Environmental conditions on page 15*
- *Application and usage on page 15*
- *Design limitations on page 16*
- *Maintenance on page 17*
- *Individual lifetime variability on page 17*
- *Extreme usage on page 17*

Robot type selection

Selecting the right robot for the application is generally done based on payload and reach criteria, but other factors can influence the selection, such as the duty factor. Selecting the most suitable variant is crucial to achieve the expected high performance, uptime, and lifetime. Always select a robot in accordance with the intended use, see *Intended use on page 9*.

ABB robots are capable of high accelerations and speeds. It is generally recommended to use RobotStudio to find out if a robot model is suitable for a specific application and duty factor. RobotStudio is an excellent tool to help with the assessment of the duty factor and the selection of the most suitable robot variant.

This robot is not specifically designed for use in demanding applications with a very high duty factor. If used in such conditions, a significant reduction in lifetime is possible for all axes, depending on the cycle. See *Extreme usage on page 17*.

When selecting the robot variant, consider using application-specific robot, and suitable protection type.

Note

Use the Mechanical Analysis add-in in RobotStudio (see details below) for help with the assessment, or get technical support from ABB.

Duty factor

Duty factor is the percentage of time the robot is moving divided by the total time, including movement and wait time during the complete robot work cycle. It is a measurement of how much the robot is being used. Gearbox lifetime is reduced more rapidly by a higher duty cycle than by a lower one. See *Extreme usage on page 17*.

Continues on next page

> **Note**
>
> The duty factor impact on lifetime can be analyzed in the add-in *Mechanical Analysis* in RobotStudio (see details below) and *Service Information System* (SIS) data in the controller. Contact ABB to analyze the SIS data.

Environmental conditions

Following factors within environmental conditions of the robot has an impact on the robot lifetime:

- Temperature:

  The robot usage at high temperatures or extreme usage can lead to gearbox and motor cooling problems. Observe operating temperature limits stated in manipulator product manual. Extreme usage normally requires means of reduction of motor and gearbox oil heat.

  > **Note**
  >
  > The add-in Mechanical Analysis in RobotStudio (see details below) or technical support from ABB can provide recommendation whether means of reduction of motor and gearbox oil heat is required.

- Exposure to chemicals might impact sealings, which can cause oil leakage.
- Vibrations caused by not following the foundation requirements might cause reduction of lifetime, for example for bearings. See *Requirements, foundation on page 23*.
- Cleaning. Wrong cleaning can cause particles entering the sealings which can cause oil leakage. Proper cleaning is described in *Product manual - IRB 1200 Gen2*.

Application and usage

Following factors within robot application and usage has an impact on the robot lifetime:

- Payload definition and overload:

  It is important to define the payload within specification and correctly defined tool data. See section *Load diagrams on page 48*, and *Technical reference manual - RAPID Overview*.

  The service routine for load identification, *LoadIdentify*, is available to support tool data definition. See *Operating manual - OmniCore*.

- Acceleration/deceleration:

  The gearbox lifetime is reduced more rapidly by high accelerations/decelerations than by lower ones.

  > **Note**
  >
  > Smoother movements bring reduced energy consumption.

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Note

Acceleration/deceleration can be modified with the instruction `AccSet`. See *Technical reference manual - RAPID Overview*.

Acceleration/deceleration is optimized by using automatic path planning functionality, either offline, or in RobotStudio, or using the online software.

- Limited movements:

  If the range or the rotation angle for an axis is 10° or less, the expected life of the reduction gears may be reduced due to poor lubrication of internal parts or the internal parts being subject to a concentrated load. Add extra lubrication motion to the robot program or to maintenance schedule.

Note

Use RobotStudio *Signal Analyzer* or get technical support from ABB.

- High forces applied externally to the manipulator:

  Some applications or not correctly programmed paths apply external forces to the manipulator, which might reduce its lifetime. Example of external force: gripper under constraint when gripping a part or load sharing between multiple robots.

- Number of collisions:

  Collisions, especially at high speed and/or with high loads reduce the lifetime of the gearboxes. Avoid collisions and set collision detection sensitivity to the appropriate level.

Note

See the application manual for the controller software, section *Collision detection*, listed in *References on page 7*.

- Number of emergency stops:

  Emergency stops, especially at high speed and/or high loads reduce the lifetime of the gearboxes. Whenever permitted by risk assessment, set the robot stopping functions to stop category 1.

Note

See the product manual for the robot controller, listed in *References on page 7*.

Design limitations

See the section *Expected component life* in *Product manual - IRB 1200 Gen2*.

Continues on next page

Maintenance

The maintenance and use of the robot will affect the performance and lifetime. For example:

- Preventive maintenance will optimize the lifetime of the robot. The recommended maintenance activities and intervals are described in *Product manual - IRB 1200 Gen2*.
- Observance of lubricant types and maintenance periods recommended by ABB.
- Possible pollution of the lubricant by an external cause, for example, water in the oil caused by high humidity.
- Extreme usage, for example high duty factor or environmental factors, will affect the maintenance schedule, for example, shorter intervals for oil change.

Contact your local ABB office to get technical support from ABB.

Individual lifetime variability

The lifetime varies with individual robots. For example, a cycle with a lower duty factor may fail earlier than one with a higher duty factor. But a cycle with a higher duty factor is more likely to fail earlier than a cycle with lower duty factor.

Extreme usage

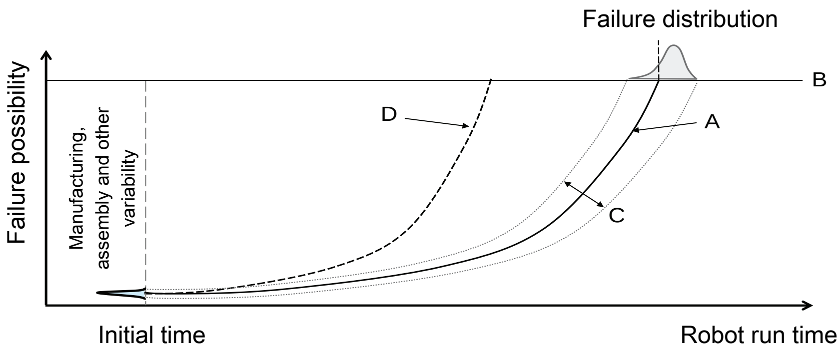
Examples of extreme usage in regard to movement: a stress index range that shows up as red (51) in the RobotStudio add-in *Mechanical Analysis*, press tending application, very severe palletizing applications, major use of axis 1, 2, or 3 movement.

The controller can issue a duty factor warning on the FlexPendant, if applicable. See the chapter *Troubleshooting* in *Product manual - IRB 1200 Gen2*.

Extreme usage requires specific maintenance, for example, shorter interval for oil change. See *Maintenance schedule* in *Product manual - IRB 1200 Gen2*.

Summary

The diagram illustrates the relationship between robot run time and failure possibility.



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A	Design lifetime

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B	Failure threshold
C	Individual variability
D	Negatively affected lifetime

The curve (A) represents the design lifetime, showing how failure probability increases over time following a normal distribution pattern. The failure threshold (B) indicates the point at which component failure becomes likely.

Individual variability between robots is shown by the dotted lines (C), representing the natural variation in component life due to manufacturing, assembly, and other factors. This variability means that while most robots will follow the design lifetime curve, some individual units may experience earlier or later failures within the normal distribution.

As highlighted with the curve (D) in the diagram, robot lifetime can be negatively affected by not following best practices in the key areas discussed in this chapter:

- *Robot type selection on page 14*
- *Duty factor on page 14*
- *Environmental conditions on page 15*
- *Application and usage on page 15*
- *Maintenance on page 17*

By adhering to the recommendations outlined in each of these sections, users can maximize their robot's operational lifetime and ensure performance stays within the design lifetime curve, avoiding premature failure and unnecessary downtime.

Available tools

There are several tools available throughout the lifecycle of an ABB robot, from support with selecting the most suitable manipulator and optimizing its lifetime, to operation, maintenance, and repair:

ABB toolbox	Type	Product lifecycle		
		Sales, pre-study	Installation, commissioning	Operation, maintenance, repair
Product specification	Document	x	x	
Product manual	Document		x	x
Mechanical Analysis add-in	Add-in in RobotStudio	x	x	x
Service Information System (SIS) / Condition Based Maintenance (CBM)	RobotWare functionality / Customer service analysis		x	x
Connected Services	Hardware and Software		x	x
Automatic Path Planning	RobotStudio functionality and online software	x	x	(x)

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ABB toolbox	Type	Product lifecycle		
		Sales, pre-study	Installation, commissioning	Operation, maintenance, repair
Signal Analyzer / TuneMaster	RobotStudio functionality / Software	x	x	x
ABB support	Customer support	x	x	x

1.4 Maintenance and troubleshooting

General

The robot requires only minimum maintenance during operation. It has been designed to make it as easy to service as possible:

- Maintenance-free AC motors are used.
- Grease is used for the gearboxes.
- The cabling is routed for longevity, and in the unlikely event of a failure, its modular design makes it easy to change.

Maintenance

The maintenance intervals depend on the use of the robot. The required maintenance activities also depend on the selected options. For detailed information on maintenance procedures, see the maintenance section in *Product manual - IRB 1200 Gen2*.

Troubleshooting

The robot has built-in communication that shows information on the FlexPendant. These messages facilitates troubleshooting and are an integral part of the control system. Troubleshooting procedures are describes in the product manual for the manipulator and the controller respectively.

2 Technical data for IRB 1200 Gen2

2.1 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight
IRB 1200 Gen2	IRB 1200-7/0.7 Gen2 and IRB 1200-9/0.7 Gen2: 42 kg IRB 1200-5/0.9 Gen2 and IRB 1200-8/0.9 Gen2: 44 kg

Note

The weight does not include additional options, tools and other equipment fitted on the robot.

Mounting positions

The table shows valid mounting positions and the installation (mounting) angle for the manipulator.

Mounting position	Installation angle
Floor mounted	Any angle
Wall mounted	Any angle
Suspended	Any angle

Note

The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See the product manual for details.

On robots running RobotWare 8, it is also possible to configure the mounting position on the FlexPendant, see the integrator's guide for the controller.

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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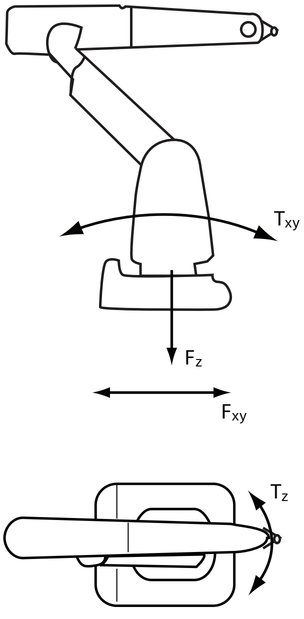
The directions are valid for all floor mounted, suspended and inverted robots.



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F_{xy}	Force in any direction in the XY plane
F_z	Force in the Z plane
T_{xy}	Bending torque in any direction in the XY plane
T_z	Bending torque in the Z plane

The table shows the various forces and torques working on the robot during different kinds of operation.

Note

These forces and torques are extreme values that are rarely encountered during operation. The values also never reach their maximum at the same time!

WARNING

The robot installation is restricted to the mounting options given in following load table(s).

Floor mounted

Force	Endurance load (in operation)	Maximum load (emergency stop)
Force xy	±720 N	±1665 N
Force z	+443±850 N	+443±1640 N
Torque xy	±465 Nm	±1560 Nm
Torque z	±190 Nm	±715 Nm

Continues on next page

Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	+443±890 N	+443±1900 N
Force z	±490 N	±1220 N
Torque xy	±535 Nm	±1610 Nm
Torque z	±190 Nm	±705 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±720 N	±1665 N
Force z	-443±850 N	-443±1640 N
Torque xy	±465 Nm	±1560 Nm
Torque z	±190 Nm	±715 Nm

Requirements, foundation

The table shows the requirements for the foundation where the weight of the installed robot is included:

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy
Minimum resonance frequency	22 Hz **Note** It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment.[i] For information about compensating for foundation flexibility, see the description of *Motion Process Mode* in the manual that describes the controller software option, see *References on page 7*.
Minimum foundation material yield strength	150 MPa	

i The minimum resonance frequency given should be interpreted as the frequency of the robot mass/inertia, robot assumed stiff, when a foundation translational/torsional elasticity is added, i.e., the stiffness of the pedestal where the robot is mounted. The minimum resonance frequency should not be interpreted as the resonance frequency of the building, floor etc. For example, if the equivalent mass of the floor is very high, it will not affect robot movement, even if the frequency is well below the stated frequency. The robot should be mounted as rigid as possibly to the floor.

Disturbances from other machinery will affect the robot and the tool accuracy. The robot has resonance frequencies in the region 10 – 20 Hz and disturbances in this region will be amplified, although somewhat damped by the servo control. This might be a problem, depending on the requirements from the applications. If this is a problem, the robot needs to be isolated from the environment.

Continues on next page

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25°C (-13°F)
Maximum ambient temperature	+55°C (+131°F)
Maximum ambient temperature (less than 24 hrs)	+70°C (+158°F)
Maximum ambient humidity	95%, non-condensing, at constant temperature

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5°C[i] (41°F)
Maximum ambient temperature	+45°C (113°F)
Maximum ambient humidity	95%, non-condensing, at constant temperature

i At low environmental temperature (below 10° C) a warm-up phase is recommended to be run with the robot. Otherwise there is a risk that the robot stops or runs with lower performance due to temperature dependent oil and grease viscosity.

Protection classes, robot

The table shows the available protection types of the robot, with the corresponding protection class.

Protection type	Protection class [i] / Suitability class [ii]
Manipulator, protection type Standard	IP40 IP67 (option 3350-670)
Manipulator, protection type Foundry Plus 2	IP67
Manipulator, protection type Clean Room	ISO Class 4

i According to IEC 60529.

ii Air Cleanliness Class for Clean Room robots was accessed in compliance with DIN EN ISO 14644-1, -14.

Environmental information

The product complies with IEC 63000. *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*.

2.2 Other technical data

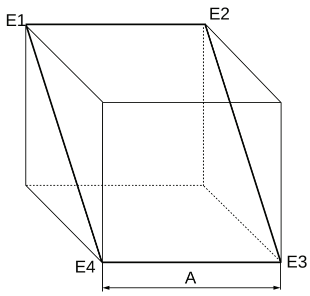
Airborne noise level

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 70 dB(A) Leq (acc. to machinery directive 2006/42/EC)

Power consumption at max load

Type of movement	IRB 1200 Gen2 (all variants)
ISO Cube Max. velocity	0.44 kW

Robot in calibration position	IRB 1200 Gen2 (all variants)
Brakes engaged	0.06 kW
Brakes disengaged	0.17 kW



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Pos	Description
A	400 mm

2.3 Mechanical data for installation

2.3.1 Introduction to installation

General

IRB 1200 Gen2 is available in four variants and all variants can be floor mounted, table mounted, inverted/suspended, wall mounted, or tilted mounted (any angle). Depending on the robot variant, an end effector with max. weight of 5 kg, 7 kg, 8 kg and 9 kg including payload, can be mounted on the tool flange (axis 6). See *Load diagrams on page 48*.

Extra loads

The upper arm can handle an additional load of 1 kg.

See *Fitting equipment on the robot on page 30*.

Attachment screws

The table below specifies the type of securing screws and washers to be used for securing the robot to the base plate/foundation.

Suitable screws	M12x35 (robot installation directly on foundation)
Quantity	4 pcs
Quality	8.8
Suitable washer	13 x 20 x 2, steel hardness class 300HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	50 Nm±5 Nm
Level surface requirements	0.1/500 mm

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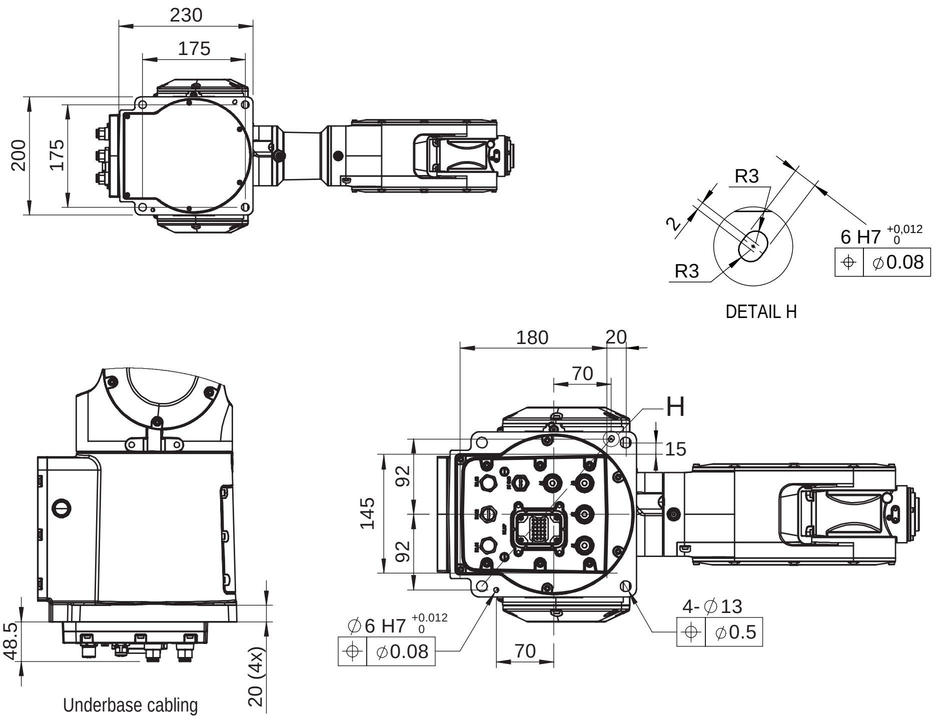
Hole configuration, base

This illustration shows the hole configuration used when securing the robot.



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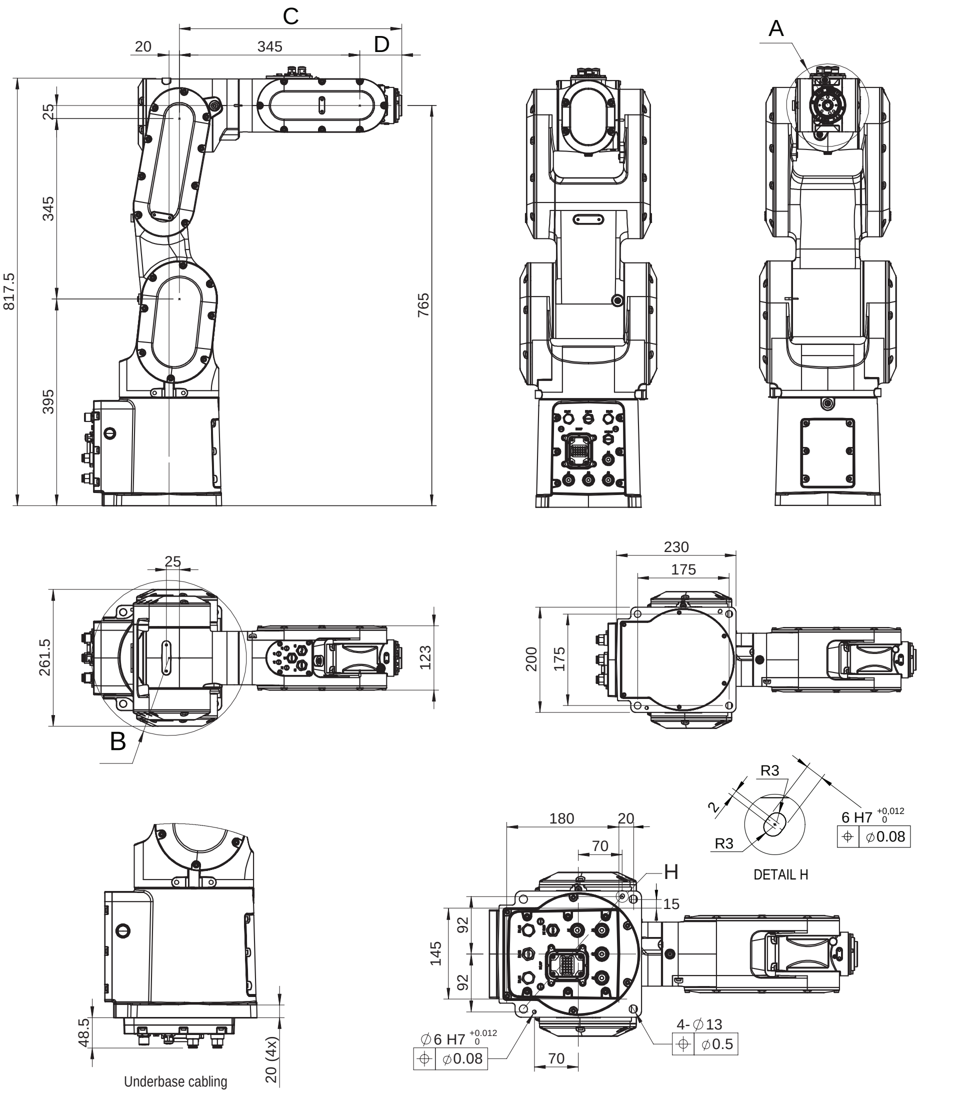
Working range limitation

The working range can be limited by mechanical stops. See *Working range on page 64*.

2.3.2 Dimensions

Main dimensions of IRB 1200-7/0.7 Gen2 and IRB 1200-9/0.7 Gen2



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Pos	Description
A	Turning radius: R79
B	Turning radius: R148
C	**Not with protection type Foundry Plus 2**: 425 mm **With protection type Foundry Plus 2**: 427 mm
D	**Not with protection type Foundry Plus 2**: 80 mm **With protection type Foundry Plus 2**: 82 mm

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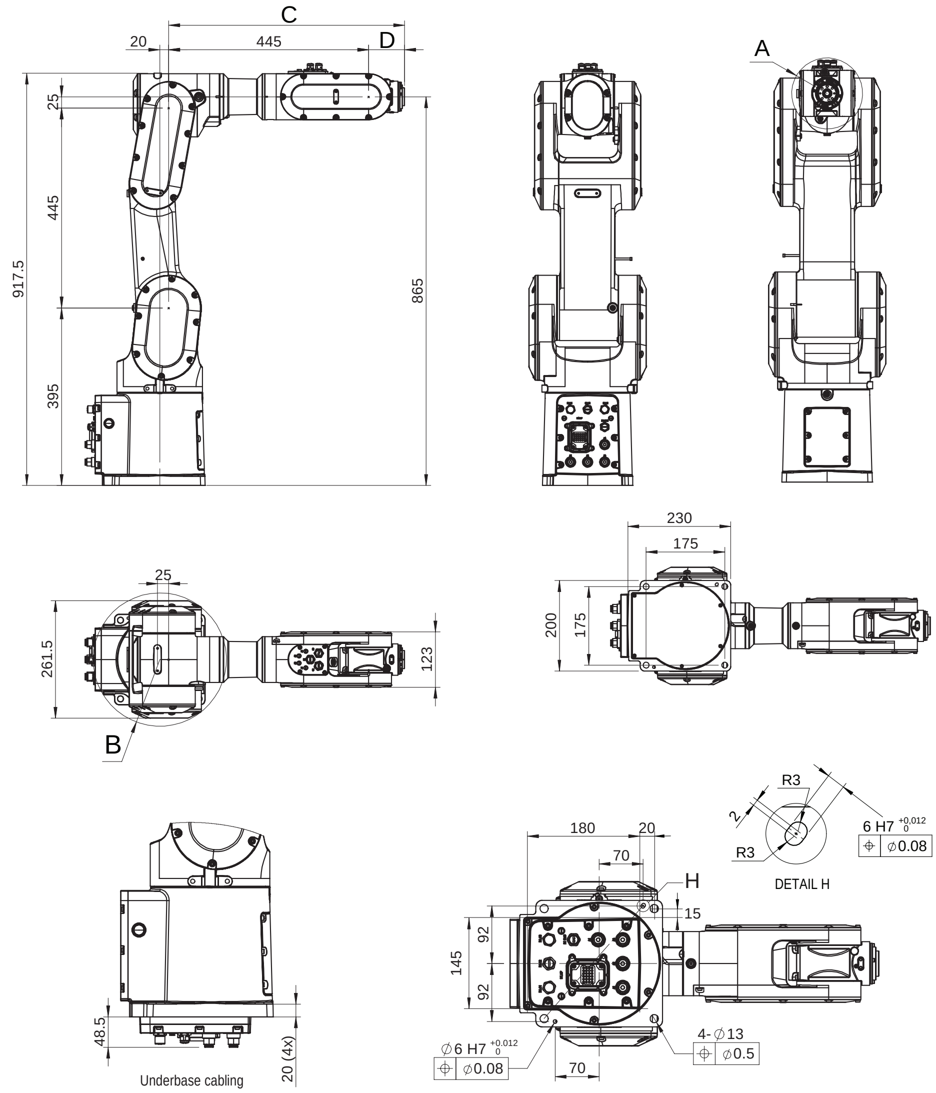
Main dimensions of IRB 1200-5/0.9 Gen2 and IRB 1200-8/0.9 Gen2



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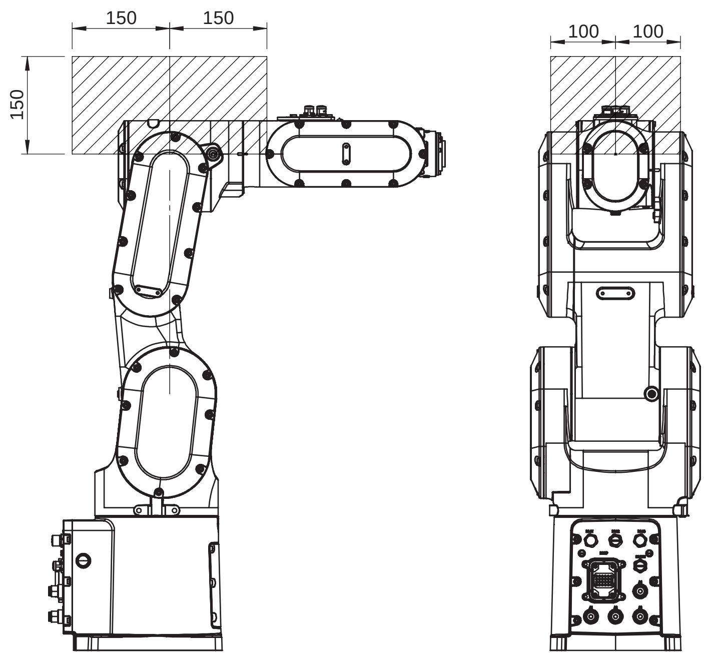
Pos	Description
A	Turning radius: R79
B	Turning radius: R148
C	**Not with protection type Foundry Plus 2**: 525 mm **With protection type Foundry Plus 2**: 527 mm
D	**Not with protection type Foundry Plus 2**: 80 mm **With protection type Foundry Plus 2**: 82 mm

2.3.3 Fitting equipment on the robot

Attachment holes and dimensions

Extra loads can be mounted on robot. Definitions of dimensions and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment.

Maximum allowed arm load depends on center of gravity of arm load and robot payload.



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Variant	Max. armload (kg)
All variants	1 kg

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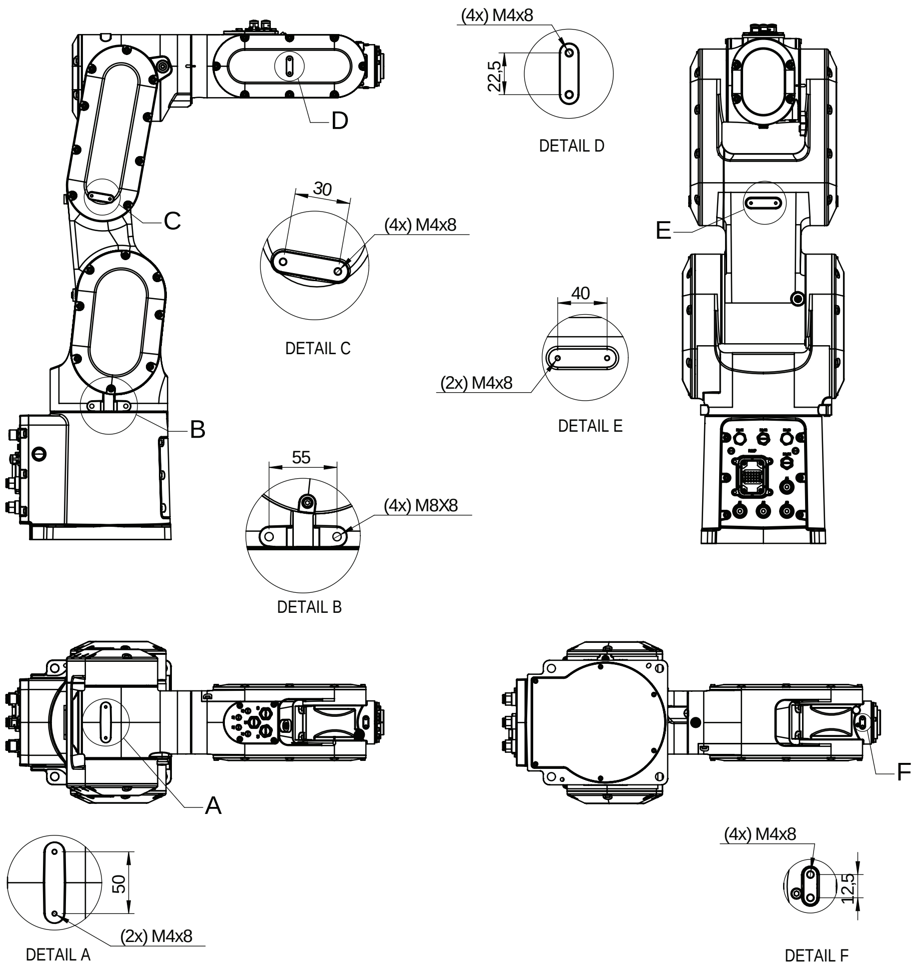
Holes for fitting extra equipment

The robot is supplied with holes for fitting extra equipment, as shown in the following figures



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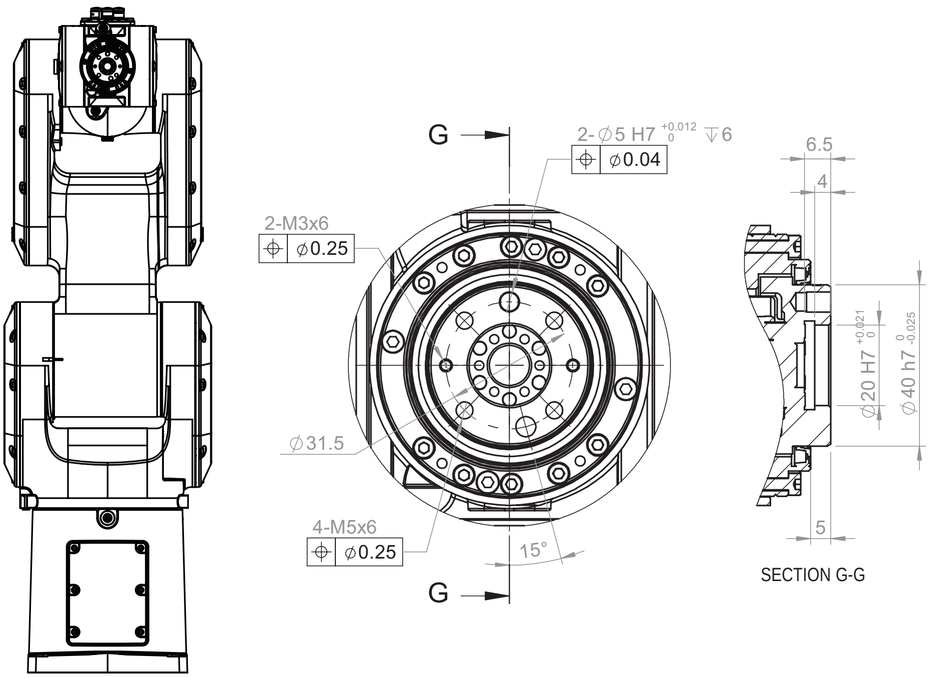
Tool flange standard

For robots with protection classes IP40 and IP67, and with protection type Clean Room



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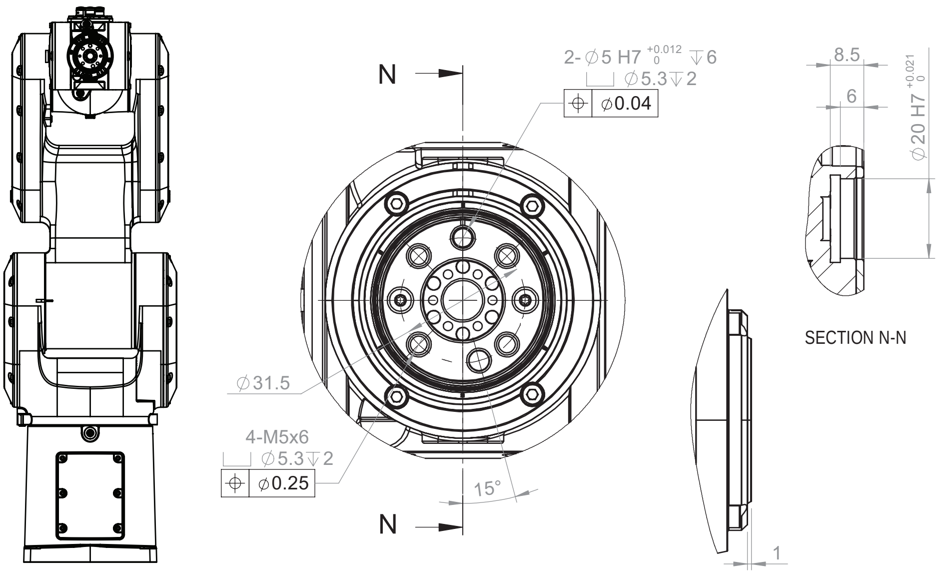
For robots with protection type Foundry Plus 2



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Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

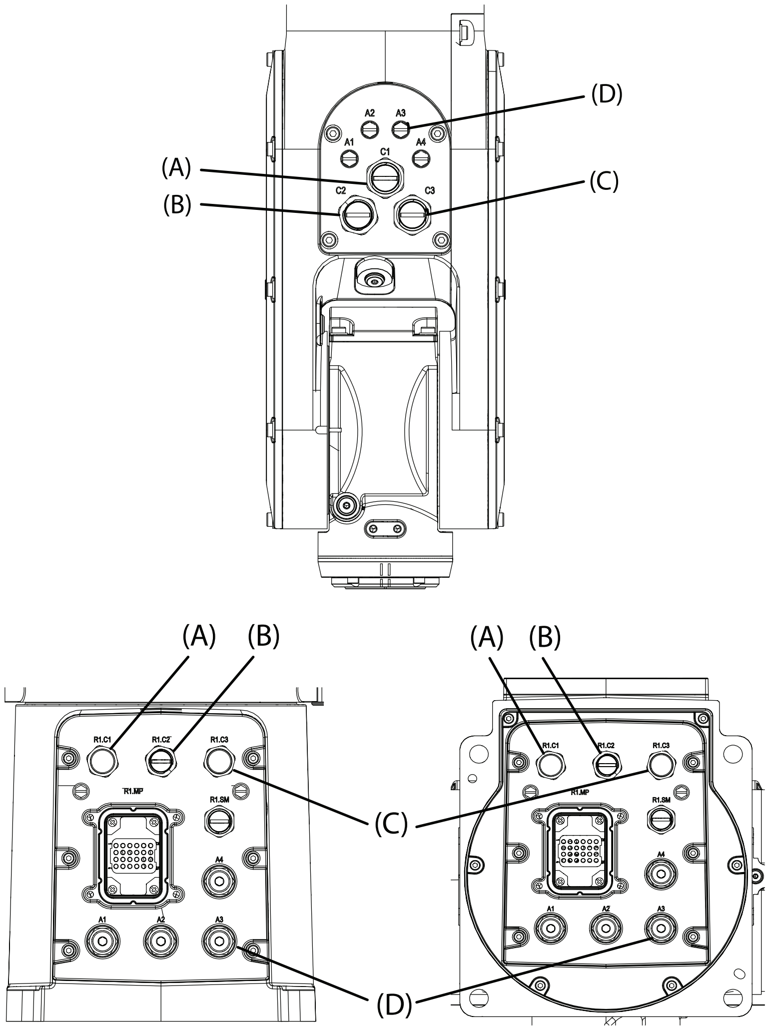
2.3.4 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular and at the base. There are two connectors R2.C1 and R2.C3 at the tubular. Corresponding connectors R1.C1 and R1.C3 are located at the base.

There is also connections for Ethernet, one connector R2.C2 at the tubular and the corresponding connector R1.C2 located at the base.

Hose for compressed air is also integrated into the manipulator. There are 4 inlets at the base (R1/8”) and 4 outlets (M5) on the tubular.



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Position	Connection	Description	Number	Value
A	(R1)R2.C1	Customer power/signal	12 wires	30 V, 1.5 A
B	(R1)R2.C2	Customer power/signal or Ethernet	8 wires	30 V, 1 A or 1 Gbits/s

Continues on next page

Position	Connection	Description	Number	Value
C	(R1)R2.C3	Customer power/signal	4 wires	42 V DC or 25 V AC, 4 A[i]
D	Air	Max. 6 bar	4	Outer diameter of air hose: 6 mm

i Contact ABB for more information if to use the (R1)R2.C3 connection for an application with a higher voltage.

Connector kits (optional)

Connector kits, base

R1.C1 and R1.C2 connectors on the base are parts of the CP/CS cable and Ethernet floor cable, respectively. For details about the robot cabling, see "Robot cabling and connection points" in product manual of the manipulator.

Customers need to do wiring when using the R1.C3 connector on the base. Make sure to use the R1.C3 connector in M12 A-code 4p female type.

Connector kits, tubular

The table describes the CP/CS and Ethernet (if any) connector kits for tubular.

Position	Description			Art. no.
Connector kits	CP/CS	R2.C1	M12 CPCS Male straight connector kits	3HAC066098-001
			M12 CPCS Male angled connector kits	3HAC066099-001
		R2.C3	M12 CPCS Male straight connector kits	3HAC068412-001
			M12 CPCS Male angled connector kits	3HAC068413-001
	Ethernet	R2.C2	M12 Ethernet CAT6a Male straight connector kits	3HAC067413-001
			M12 Ethernet CAT6a Male angled connector kits	3HAC067414-001

Protection covers

Protection covers for water and dust proofing

Protection covers are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

Always remember to refit the protection covers after removing them.

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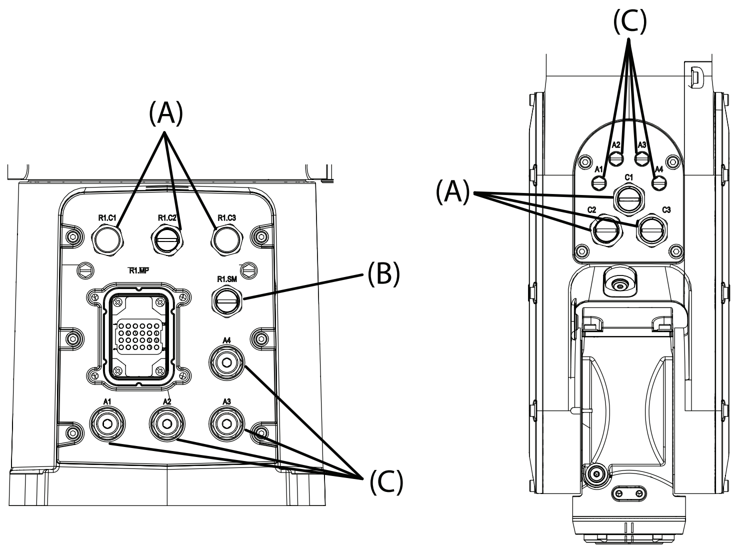

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A	CP/CS or Ethernet connector protection covers
B	SMB connector protection cover
C	Air hose connector protection covers

2.3.5 Setting the system parameters for an inverted or a tilted robot

General

The robot is configured for mounting parallel to the floor, without tilting, on delivery. If the robot is mounted in any other angle than 0°, then the system parameters that describe the mounting angle (how the robot is oriented relative to the gravity) must be re-defined.

Note

With inverted installation, make sure that the gantry or corresponding structure is rigid enough to prevent unacceptable vibrations and deflections, so that optimum performance can be achieved.

Note

The mounting positions are described in *Mounting positions on page 21*, and the requirements on the foundation are described in *Requirements, foundation on page 23*.

System parameters

Note

The mounting angle must be configured correctly in the system parameters so that the robot system can control the movements in the best possible way. An incorrect definition of the mounting angle will result in:

- Overloading the mechanical structure.
- Lower path performance and path accuracy.
- Some functions will not work properly, for example *Load Identification* and *Collision detection*.

Gravity Beta

When the robot is mounted other than floor-standing (rotated around the y-axis), the robot base frame and the system parameter *Gravity Beta* must be redefined.

If the robot is mounted upside down (inverted), then *Gravity Beta* should be π (+3.141593).

If the robot is mounted on a wall, then *Gravity Beta* should be ±π/2 (±1.570796).

The *Gravity Beta* is a positive rotation direction around the y-axis in the base coordinate system. The value is set in radians.

Gravity Alpha

If the robot is mounted on a wall (rotated around the x-axis), then the robot base frame and the system parameter *Gravity Alpha* must be redefined. The value of *Gravity Alpha* should then be ±π/2 (±1.570796).

The *Gravity Alpha* is a positive rotation direction around the x-axis in the base coordinate system. The value is set in radians.

Continues on next page

Note

The system parameter *Gravity Alpha* is not supported for all robot types.

If the robot does not support *Gravity Alpha*, then use *Gravity Beta* along with the re-calibration of axis 1 to define the rotation of the robot around the x-axis.

Note

The parameter is supported for all robots on track when the system parameter *7 axes high performance motion* is set, see *Technical reference manual - System parameters*.

Gamma Rotation

Gamma Rotation defines the orientation of the robot foot on the travel carriage (track motion).

Mounting angles and values

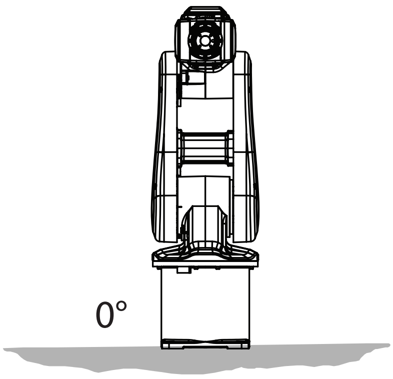
The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

`Gravity Beta = A° x 3.141593/180 = B radians`, where `A` is the mounting angle in degrees and `B` is the mounting angle in radians.

Example of position	Mounting angle (A°)	Gravity Beta
Floor mounted	0°	0.000000 (Default)
Wall mounted	90°	1.570796
Inverted mounting	180°	3.141593

Examples of mounting angles tilted around the X axis (*Gravity Alpha*)

The following illustration shows the IRB 120, but the same principle applies for all robots.



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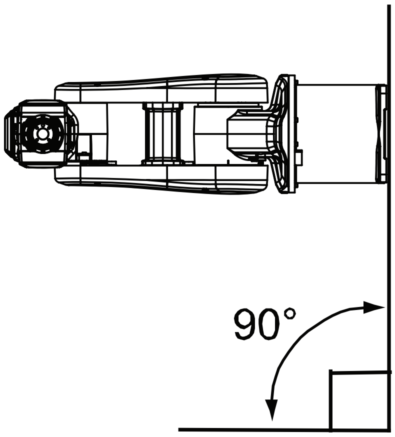

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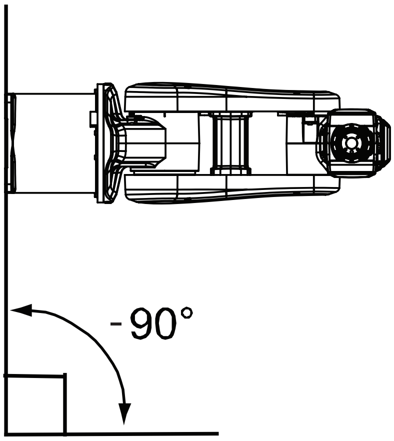

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Mounting angle	Gravity Alpha
0° (Floor mounted)	0
90° (Wall)	1.570796
-90° (Wall)	-1.570796

Note

For suspended robots (180°), it is recommended to use *Gravity Beta* instead of *Gravity Alpha*.

Limitations in working area

If mounting the robot on a wall, the working range of axis 1 is limited. These limitations are specified in the table *Working range on page 64*.

Defining the system parameters in RobotWare

The value of the system parameters that define the mounting angle must be redefined when changing the mounting angle of the robot. The parameters belong to the type *Robot*, in the topic *Motion*.

The system parameters are described in *Technical reference manual - System parameters*.

The system parameters are configured in RobotStudio or on the FlexPendant.

2.4 Calibration and references

2.4.1 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

More information is available in the product manual.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory. A robot calibrated with Absolute accuracy has the option information printed on its name plate (OmniCore). To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.	CalibWare
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4 and 5. **Note** For advanced users, it is also possible to do the wrist optimization using the RAPID instruction `WristOpt`, see *Technical reference manual - RAPID Instructions, Functions and Data types*. This instruction is only available for OmniCore robots.	Wrist Optimization

Continues on next page

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1200 Gen2. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

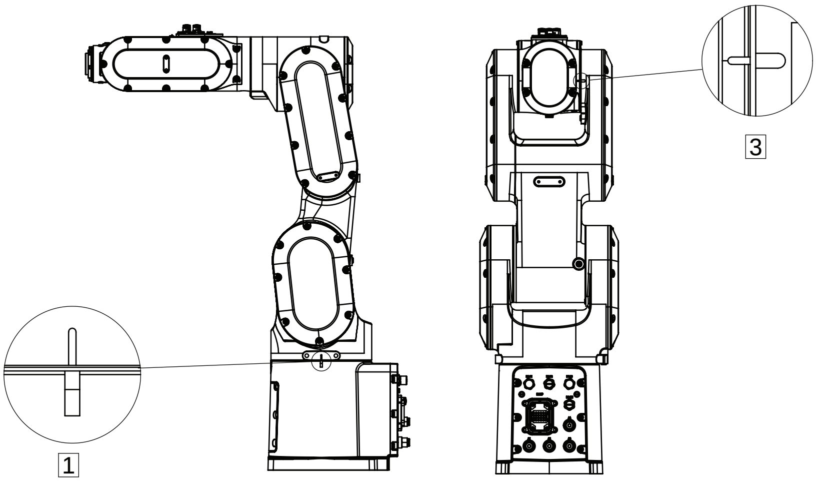
The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

2.4.2 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

Synchronization marks, IRB 1200 Gen2



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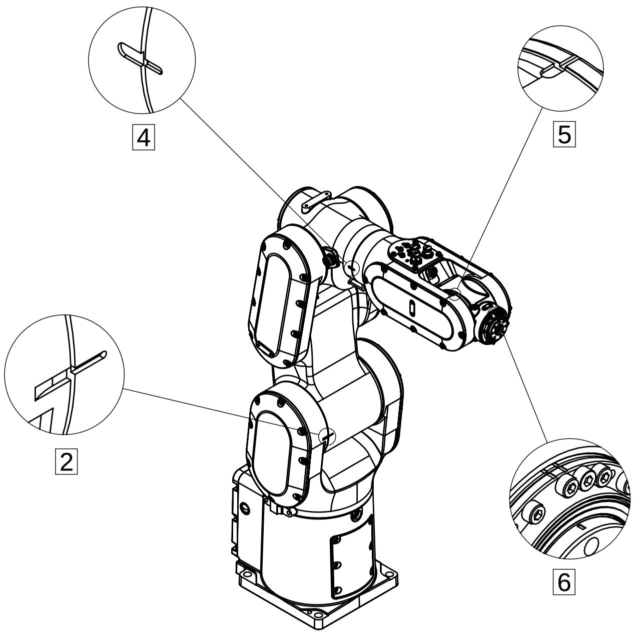

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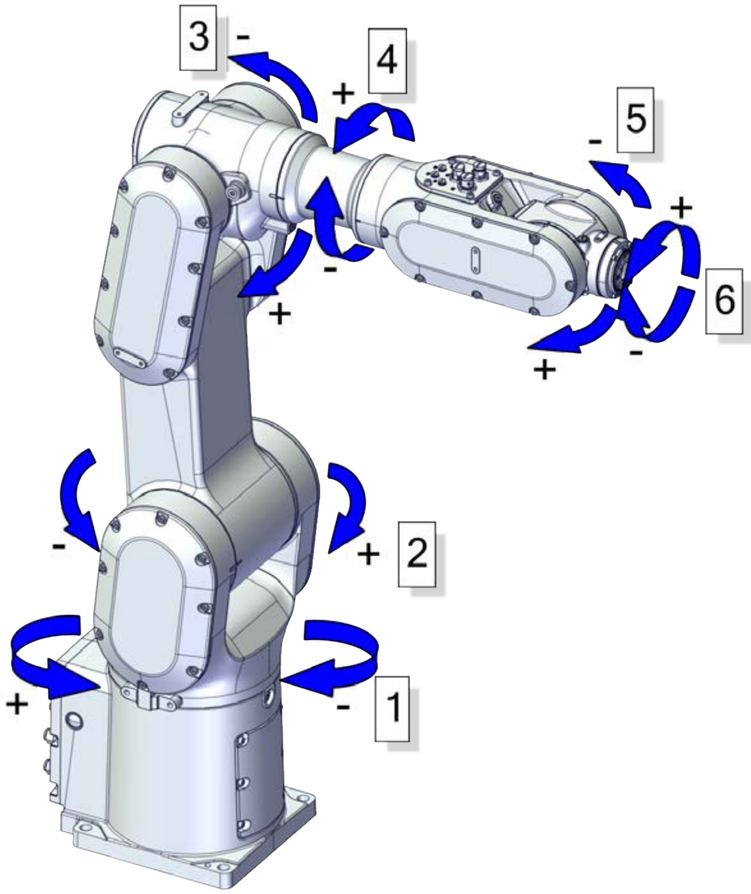
2.4.3 Calibration movement directions for all axes

Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

Manual movement directions



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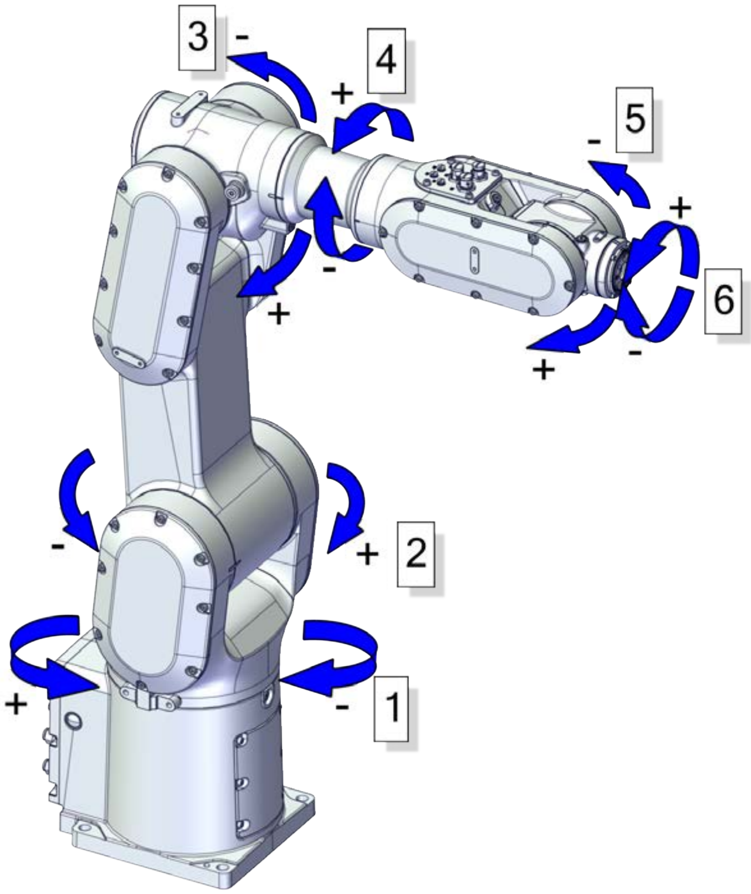
2.4.4 Fine calibration

General

The fine calibration is done with the Axis calibration method.



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Calibration tools for Axis Calibration

Check prior to usage

Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.

WARNING

If any part is missing or damaged, the tool must be replaced immediately.

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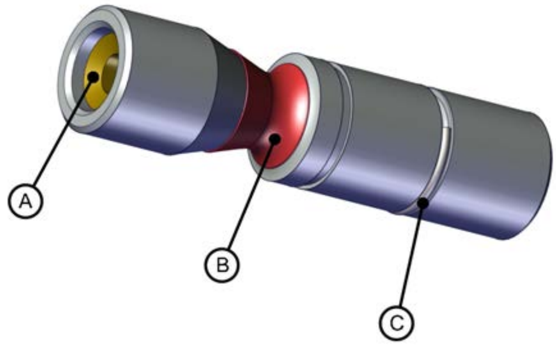

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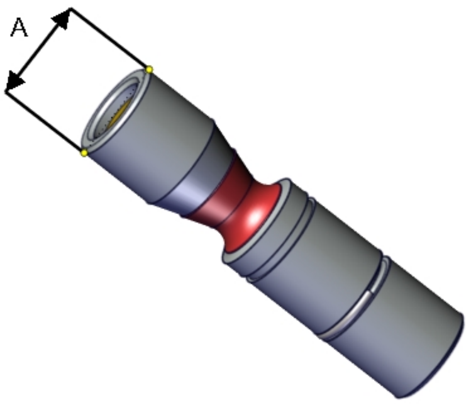
A	Tube insert
B	Plastic protection
C	Steel spring ring

Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø12g4 mm, Ø8g4 mm or Ø6g5 mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx1500000951

A	Outer diameter

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø5g5 mm.
- Straightness within 0.005 mm.

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xx1600001142

A	Outer diameter

2.4.5 Absolute Accuracy calibration

Purpose

Absolute Accuracy is a calibration concept that improves TCP accuracy. The difference between an ideal robot and a real robot can be several millimeters, resulting from mechanical tolerances and deflection in the robot structure. *Absolute Accuracy* compensates for these differences.

Here are some examples of when this accuracy is important:

- Exchangeability of robots
- Offline programming with no or minimum touch-up
- Online programming with accurate movement and reorientation of tool
- Programming with accurate offset movement in relation to, for example, vision systems or offset programming
- Re-use of programs between applications

The option *Absolute Accuracy* is integrated in the controller algorithms and does not need external equipment or calculation.

Note

The performance data is applicable to the corresponding RobotWare version of the individual robot.

Note

Singularities might appear in slightly different positions on a real robot compared to RobotStudio, where *Absolute Accuracy* is off compared to the real controller.

What is included

Every *Absolute Accuracy* robot is delivered with:

- compensation parameters saved in the robot memory
- a birth certificate representing the *Absolute Accuracy* measurement protocol for the calibration and verification sequence.

A robot with *Absolute Accuracy* calibration has a label with this information on the manipulator.

Absolute Accuracy supports floor mounted, wall mounted, and ceiling mounted installations. The compensation parameters that are saved in the robot memory differ depending on which Absolute Accuracy option is selected.

When is *Absolute Accuracy* being used

Absolute Accuracy works on a robot target in Cartesian coordinates, not on the individual joints. Therefore, joint based movements (e.g. `MoveAbsJ`) will not be affected.

If the robot is inverted, the Absolute Accuracy calibration must be performed when the robot is inverted.

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Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

- Any motion function based on robtargets (e.g. `MoveL`) and ModPos on robtargets
- Reorientation jogging
- Linear jogging
- Tool definition (4, 5, 6 point tool definition, room fixed TCP, stationary tool)
- Work object definition

Absolute Accuracy not active

The following are examples of when Absolute Accuracy is not active:

- Any motion function based on a jointtarget (`MoveAbsJ`)
- Independent joint
- Joint based jogging
- Additional axes
- Track motion

Note

In a robot system with, for example, an additional axis or track motion, the Absolute Accuracy is active for the manipulator but not for the additional axis or track motion.

RAPID instructions

There are no RAPID instructions included in this option.

2.5 Load diagrams

2.5.1 Introduction

WARNING

It is very important to always define correct actual load data and correct payload of the robot. Incorrect definitions of load data can result in overloading of the robot.

If incorrect load data is used, and/or if loads outside the load diagram are used, the following parts can be damaged due to overload:

- motors
- gearboxes
- mechanical structure

WARNING

In RobotWare, the service routine LoadIdentify can be used to determine correct load parameters. The routine automatically defines the tool and the load.

See *Operating manual - OmniCore*, for detailed information.

WARNING

Robots running with incorrect load data and/or with loads outside the load diagram, will not be covered by robot warranty.

General

The load diagrams include a nominal payload inertia, J_o of 0.015 kgm^2, and an extra load of 1 kg at the upper arm housing.

At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

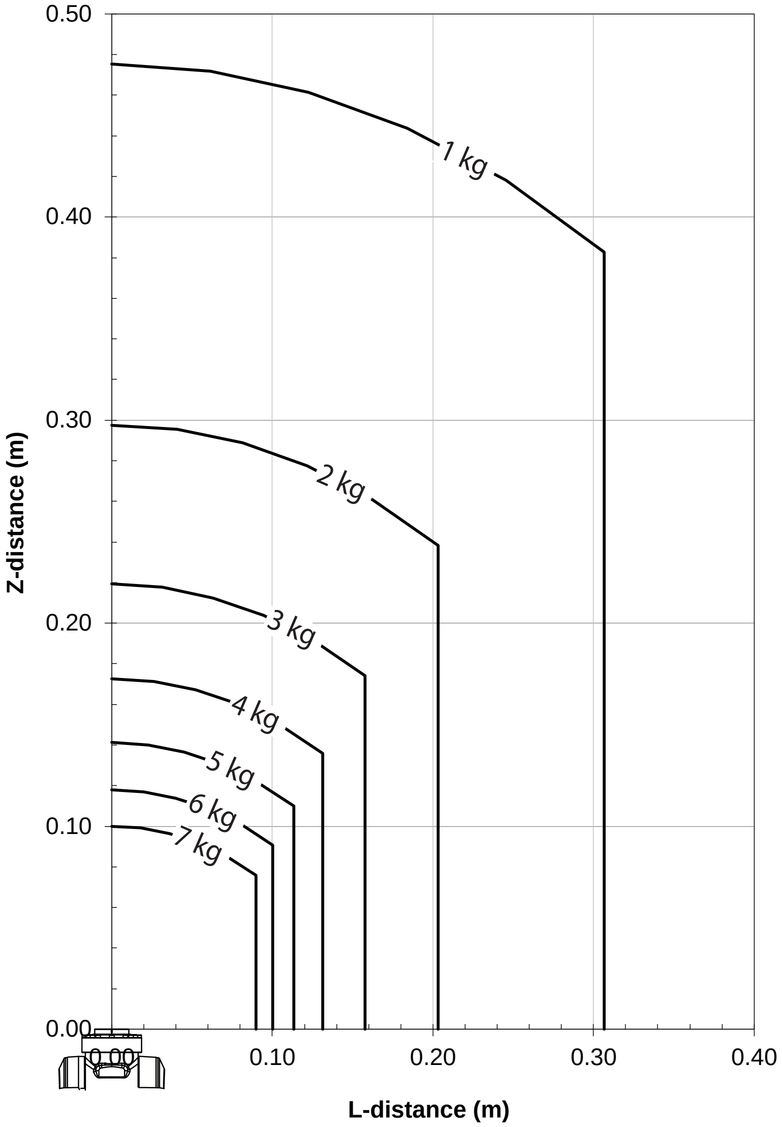
Control of load case with RobotLoad

To verify a specific load case, use the RobotStudio add-in RobotLoad.

The result from RobotLoad is only valid within the maximum loads and tilt angles. There is no warning if the maximum permitted arm load is exceeded. For over-load cases and special applications, contact ABB for further analysis.

2.5.2 Diagrams

IRB 1200-7/0.7 Gen2



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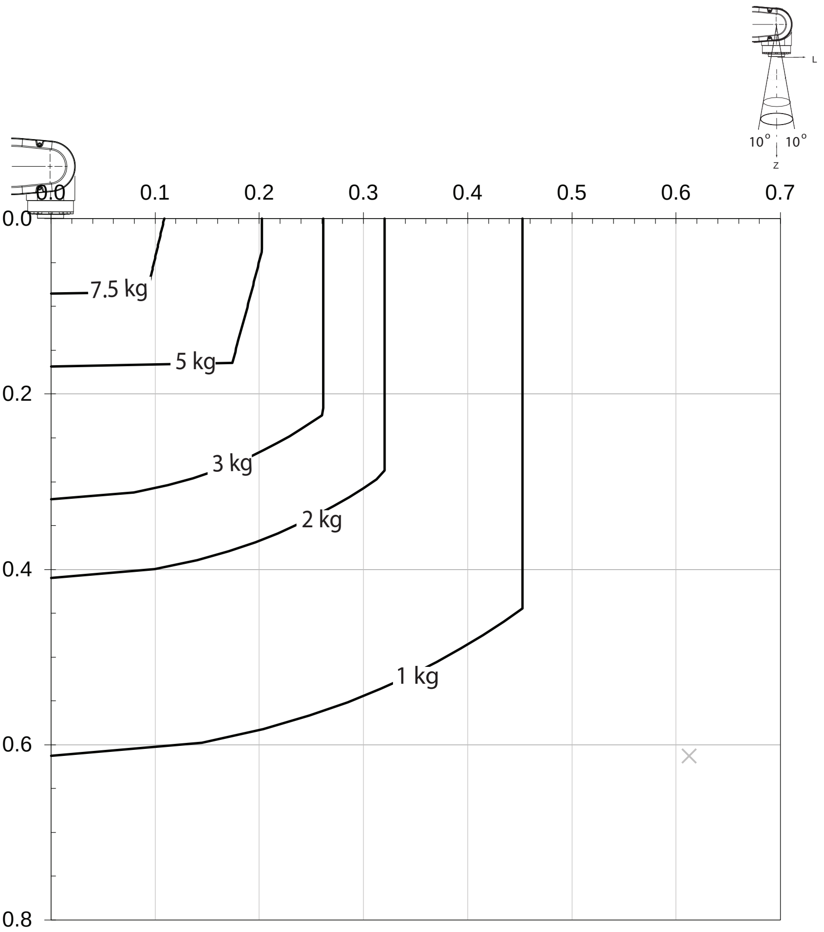
IRB 1200-7/0.7 Gen2 "Vertical Wrist" (±10°)



xx2500000141

For wrist down (0° deviation from the vertical line).

	Description
Max load	7.5 kg
Z_{max}	0.086 m
L_{max}	0.109 m

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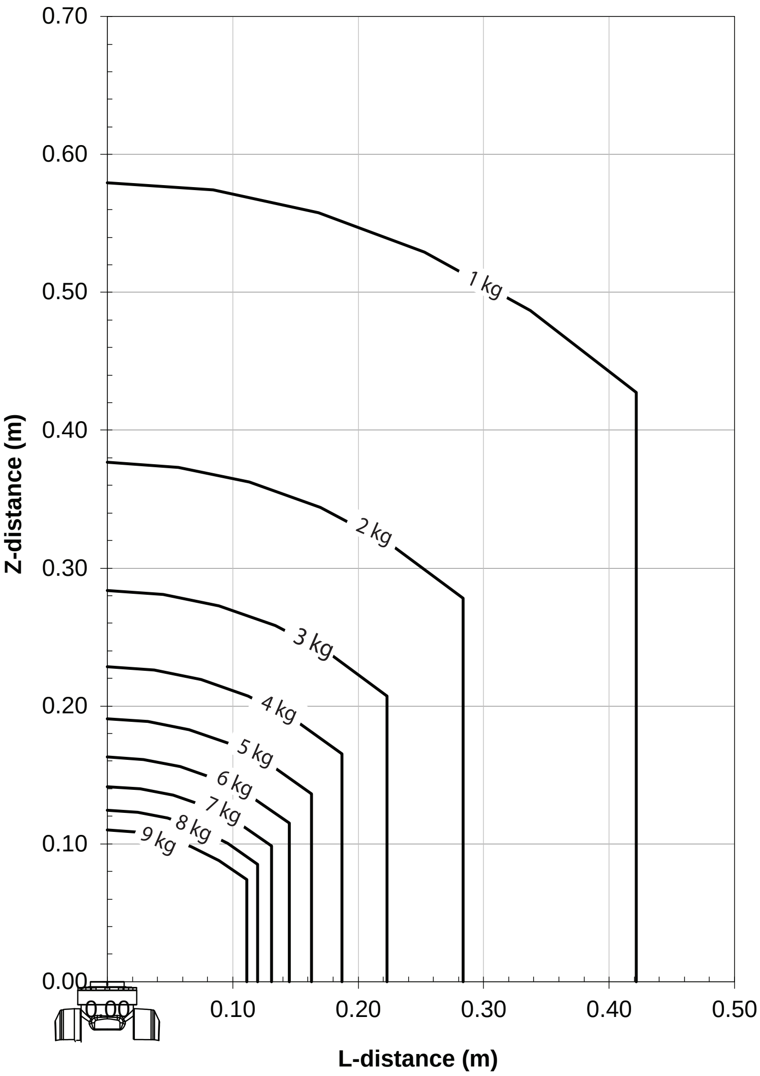
IRB 1200-9/0.7 Gen2



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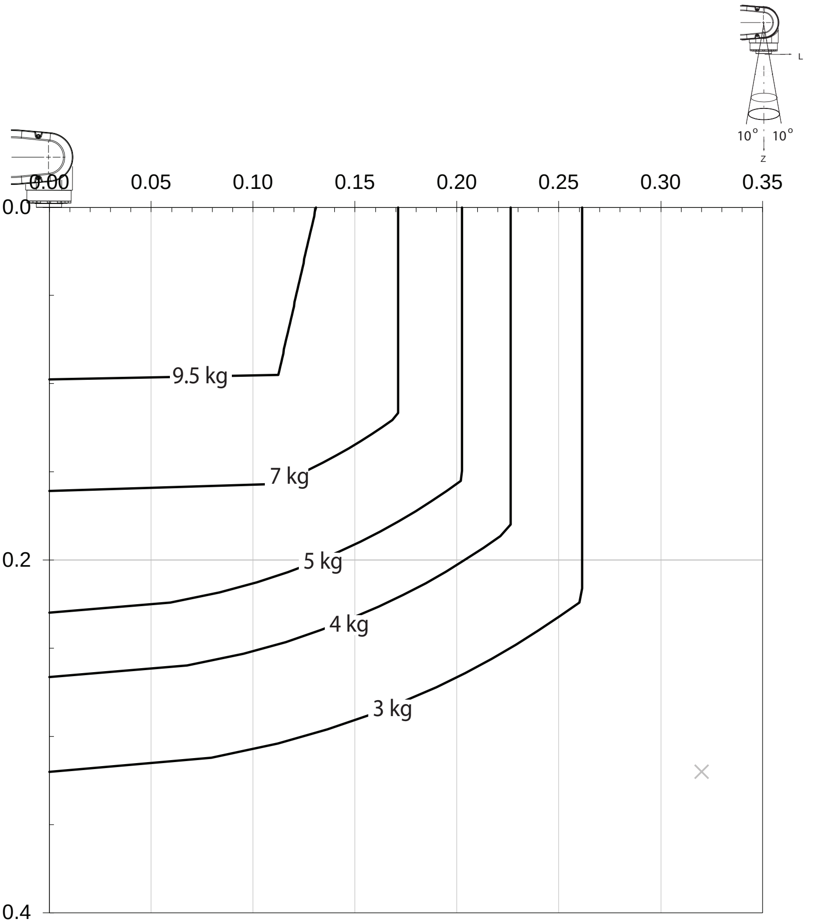
IRB 1200-9/0.7 Gen2 "Vertical Wrist" (±10°)



xx2500000143

For wrist down (0° deviation from the vertical line).

	Description
Max load	9.5 kg
Z_{max}	0.098 m
L_{max}	0.131 m

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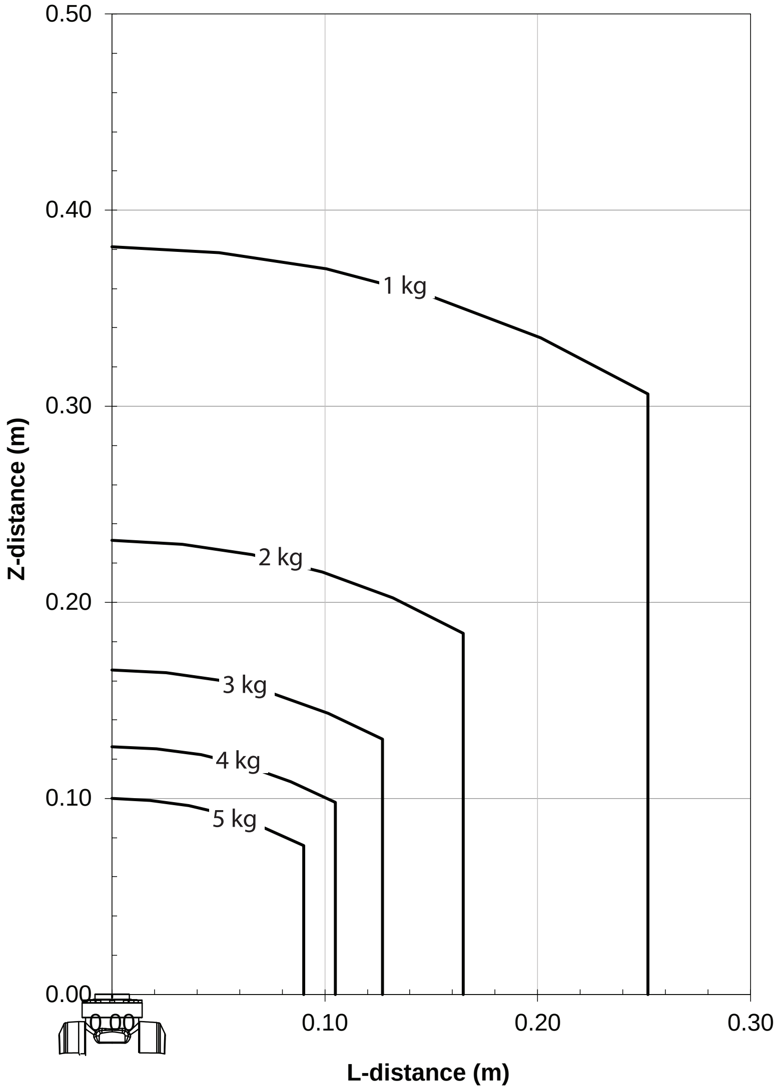
IRB 1200-5/0.9 Gen2



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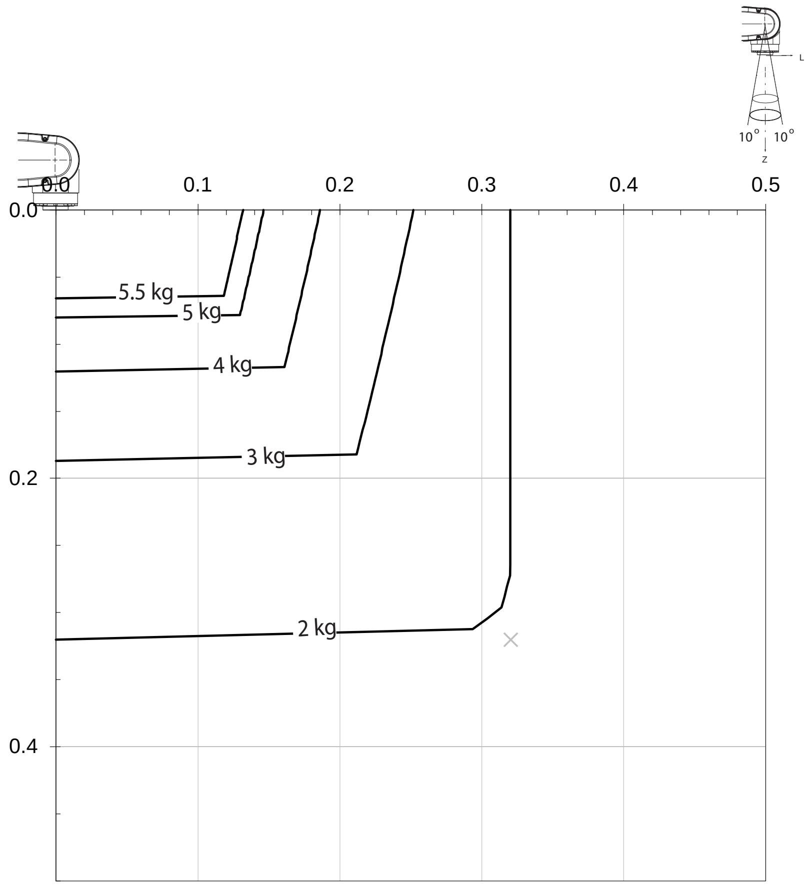
IRB 1200-5/0.9 Gen2 "Vertical Wrist" (±10°)



xx2500000145

For wrist down (0° deviation from the vertical line).

	Description
Max load	5.5 kg
Z_{max}	0.066 m
L_{max}	0.132 m

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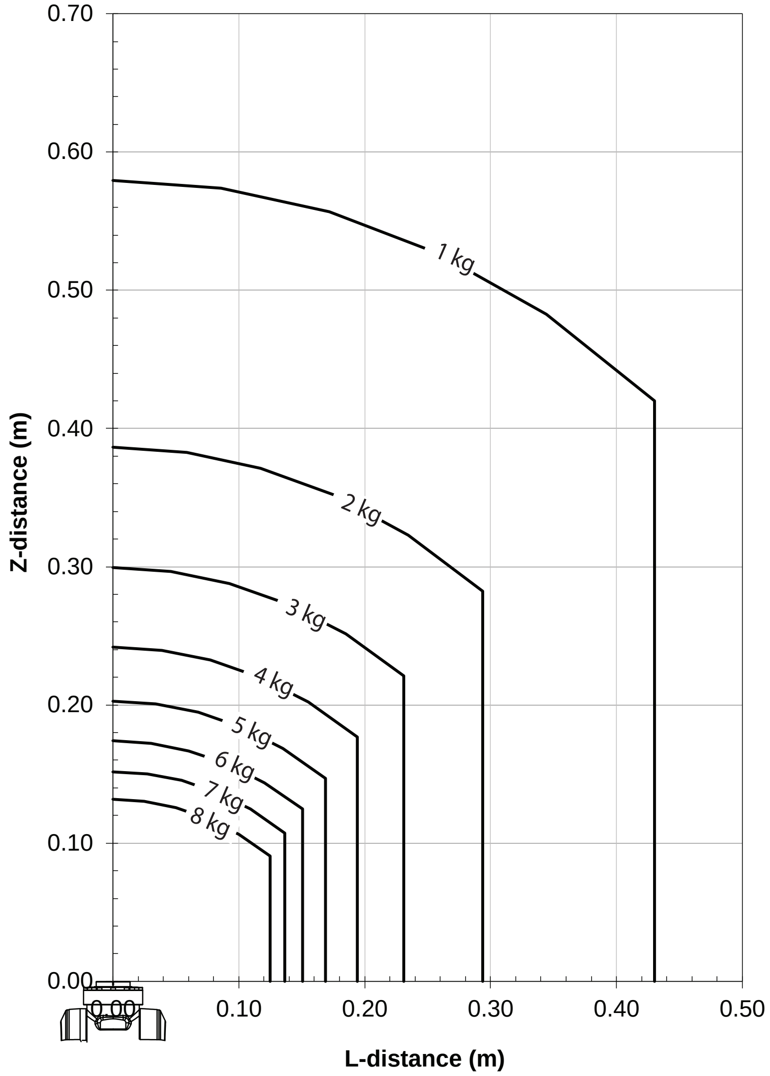
IRB 1200-8/0.9 Gen2



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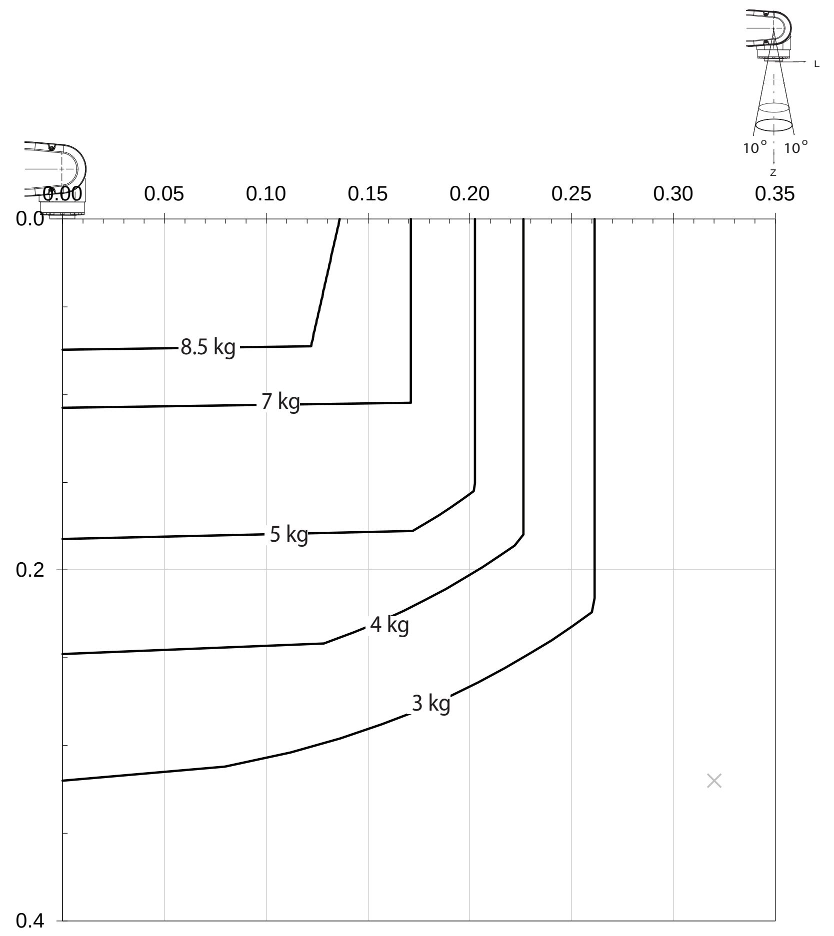
IRB 1200-8/0.9 Gen2 "Vertical Wrist" (±10°)



xx2500000147

For wrist down (0° deviation from the vertical line).

	Description
Max load	8.5 kg
Z_{max}	0.074 m
L_{max}	0.136 m

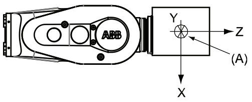
2.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

Note

Total load given as: mass in kg, center of gravity (Z and L) in meters and moment of inertia (J_{ox}, J_{oy}, J_{oz}) in kgm^2. L= sqr ($X^2 + Y^2$), see the following figure.

Full movement of axis 5 (±130°)

Axis	Robot type	Maximum moment of inertia
5	IRB 1200-7/0.7 Gen2 IRB 1200-9/0.7 Gen2 IRB 1200-5/0.9 Gen2 IRB 1200-8/0.9 Gen2	Ja_5 = Load x $((Z + 0.08)^2 + L^2)$ + max $(J_{ox}, J_{oy}) \leq 0.45$ kgm^2
6	IRB 1200-7/0.7 Gen2 IRB 1200-9/0.7 Gen2 IRB 1200-5/0.9 Gen2 IRB 1200-8/0.9 Gen2	Ja_6 = Load x L^2 + Joz ≤ 0.2 kgm^2



xx1400002028

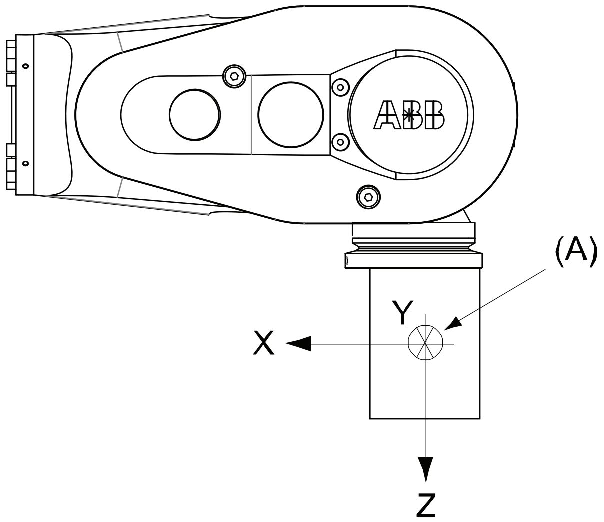
Pos	Description
A	Center of gravity

	Description
J_{ox}, J_{oy}, J_{oz}	Max. moment of inertia around the X, Y and Z axes at center of gravity.

Continues on next page

Limited axis 5, center line down

Axis	Robot type	Maximum moment of inertia
5	IRB 1200-7/0.7 Gen2 IRB 1200-9/0.7 Gen2 IRB 1200-5/0.9 Gen2 IRB 1200-8/0.9 Gen2	Ja_5 = Load x $((Z + 0.08)^2 + L^2)$ + max $(J_{ox}, J_{oy}) \leq 0.495$ kgm^2
6	IRB 1200-7/0.7 Gen2 IRB 1200-9/0.7 Gen2 IRB 1200-5/0.9 Gen2 IRB 1200-8/0.9 Gen2	Ja_6 = Load x $L^2 + J_{oz} \leq 0.22$ kgm^2



xx1400002029

Pos	Description
A	Center of gravity

	Description
J_{ox}, J_{oy}, J_{oz}	Max. moment of inertia around the X, Y and Z axes at center of gravity.

2.5.4 Wrist torque

Note

The wrist torque values are for reference only, and should not be used for calculating permitted load offset (position of center of gravity) within the load diagram, since those also are limited by main axes torques as well as dynamic loads. Furthermore, arm loads will influence the permitted load diagram. To find the absolute limits of the load diagram, use the RobotStudio add-in RobotLoad.

Torque

The table below shows the maximum permissible torque due to payload.

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 1200-7/0.7 Gen2	12.36 Nm	6.2 Nm	7 kg
IRB 1200-9/0.7 Gen2	16.78 Nm	9.8 Nm	9 kg
IRB 1200-5/0.9 Gen2	8.83 Nm	4.4 Nm	5 kg
IRB 1200-8/0.9 Gen2	16.78 Nm	9.8 Nm	8 kg

2.5.5 Maximum TCP acceleration

General

Higher values can be reached with lower loads than the nominal because of our dynamical motion control QuickMove2. For specific values in the unique customer cycle, or for robots not listed in the table below, we recommend to use RobotStudio.

Maximum Cartesian design acceleration for nominal loads

Robot type	E-stop Max acceleration at nominal load COG [m/s^2]	Controlled Motion Max acceleration at nominal load COG [m/s^2]
IRB 1200-7/0.7	84	55
IRB 1200-9/0.7	65	43
IRB 1200-5/0.9	99	71
IRB 1200-8/0.9	62	44

Note

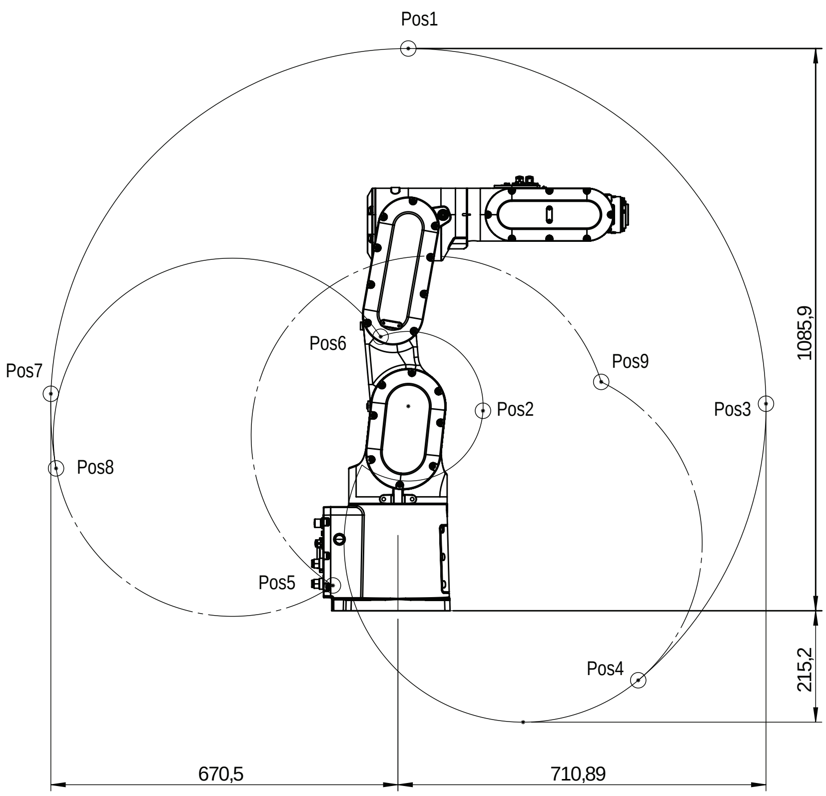
Acceleration levels for emergency stop and controlled motion includes acceleration due to gravitational forces. Nominal load is defined with nominal mass and cog with max offset in Z and L (see the load diagram).

2.6 Working range

2.6.1 Working range

Illustration, working range IRB 1200-7/0.7 Gen2 and IRB 1200-9/0.7 Gen2

This illustration shows the unrestricted working range of the robot.



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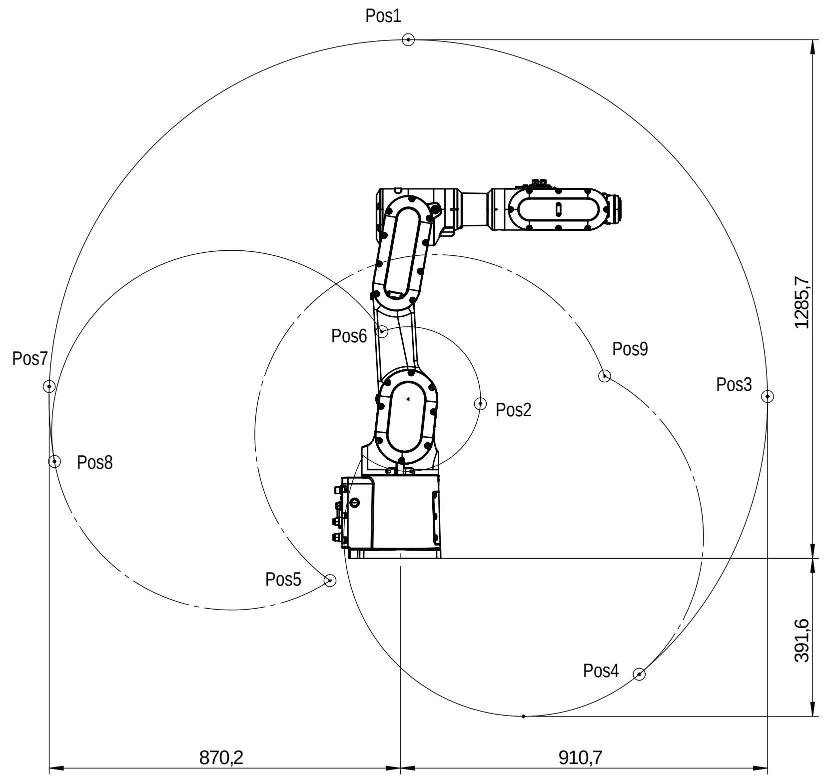
Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	365	765	0°	0°
pos1	20	1085.91	0°	-85.86°
pos2	164.21	386.23	15.20°	70.00°
pos3	710.89	399.82	89.6°	-85.86°
pos4	464.11	-134.26	140°	-85.85°
pos5	-125.56	48.82	-100°	-200°
pos6	-33.47	529.22	-100°	70°
pos7	-670.49	419.07	-88°	-85.86°
pos8	-660.4	274.98	-99.96°	-85.93°
pos9	392.59	442	25.62°	28.29°

Continues on next page

Illustration, working range IRB 1200-5/0.9 Gen2 and IRB 1200-8/0.9 Gen2

This illustration shows the unrestricted working range of the robot.



xx2500000188

Positions at wrist center and angle of axes 2 and 3

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	axis 2	axis 3
pos0	465	865	0°	0°
pos1	20	1285.7	0°	-86.56°
pos2	198.79	383.09	15.20°	70.00°
pos3	910.68	401.22	89.6°	-86.78°
pos4	592.53	-287.32	140°	-86.79°
pos5	-174.03	-55.15	-100°	-200°
pos6	-45.35	561.84	-100°	70°
pos7	-870.16	426.03	-87.92°	-86.96°
pos8	-857.16	240.27	-100°	-86.78°
pos9	506.86	452.01	26.64°	26.44°

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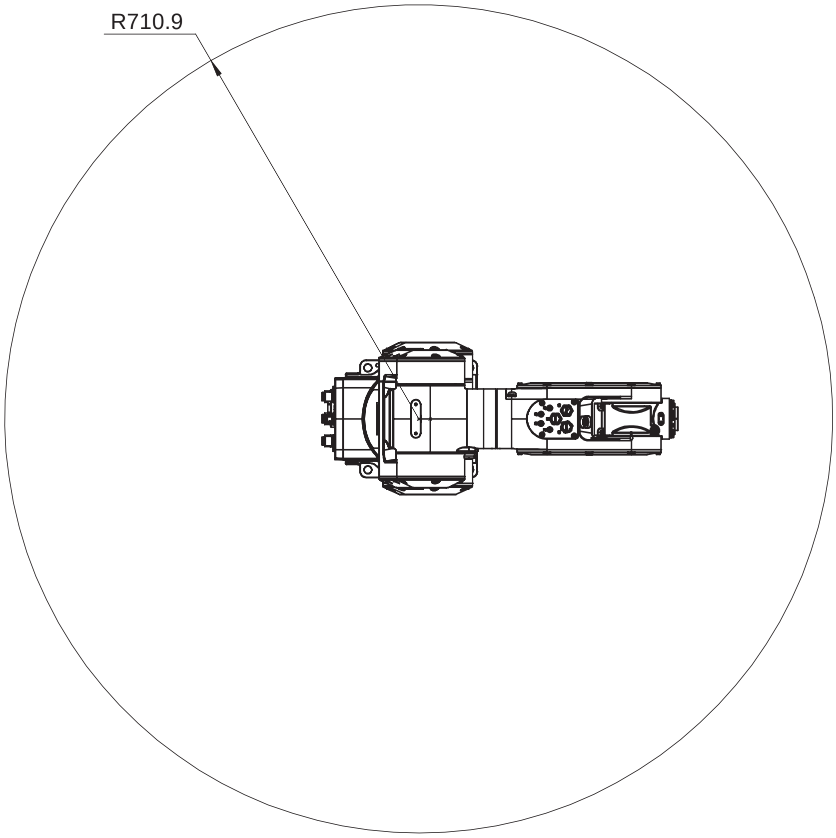
Top view of working range

IRB 1200-7/0.7 Gen2 and IRB 1200-9/0.7 Gen2



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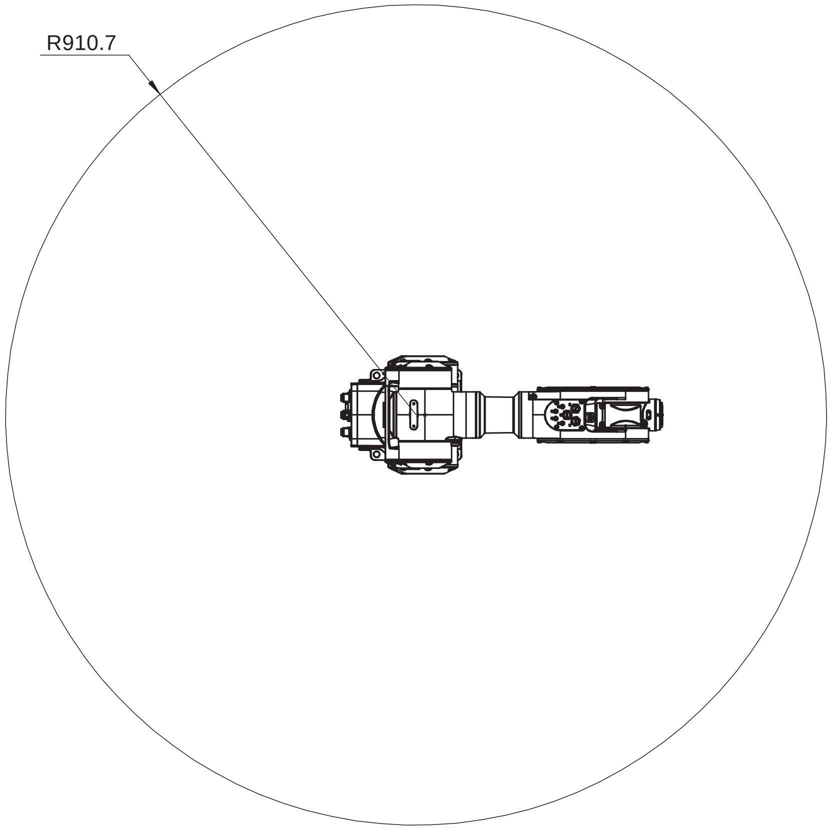
IRB 1200-5/0.9 Gen2 and IRB 1200-8/0.9 Gen2



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Working range

Axis	Working range	Note
Axis 1	±220°	Wall-mounted robot has a work area for axis 1 that depends on payload and the positions of other axes. Simulation in RobotStudio is recommended.
Axis 2	-100°/+140°	
Axis 3	-200°/+70°	
Axis 4	±230°	
Axis 5	±130°	
Axis 6	±400°	Default value.
	±242	Maximum revolution value. The default working range for axis 6 can be extended by changing parameter values in the software.

2.6.2 Adjusting the working range

Reasons for adjusting the manipulator working range

The working range of each manipulator axis is configured in the software. If there is a risk that the manipulator may collide with other objects at installation site, its working space should be limited. The manipulator must always be able to move freely within its entire working space.

Note

If safe supervision is used, then use the robot stopping distance and time data to determine the requirements on restricted space. See the product specification for the manipulator.

Working range configurations

The parameter values for the axes working range can be altered within the allowed working range and according to available options for the robot, either to limit or to extend a default working range. Allowed working ranges and available options for each manipulator axis are specified in *Working range on page 64*.

Mechanical stops on the manipulator

Mechanical stops are and can be installed on the manipulator as limiting devices to ensure that the manipulator axis does not exceed the working range values set in the software parameters.

Note

The mechanical stops are only installed as safety precaution to physically stop the robot from exceeding the working range set. A collision with a mechanical stop always requires actions for repair and troubleshooting.

Axis	Fixed mechanical stop [i]	Movable mechanical stop [ii]
Axis 1	yes [iii]	no
Axis 2	yes	no
Axis 3	yes	no
Axis 4	no	no
Axis 5	yes	no
Axis 6	no	no

i Part of the casting or fixed on the casting and can not /should not be removed.

ii Can be installed in one or more than one position, to ensure a reduced working range, or be removed to allow extended working range.

iii The optional mechanical stop on axis 1 is not available on IRB 1200 Gen2 with protection type Clean Room

Continues on next page

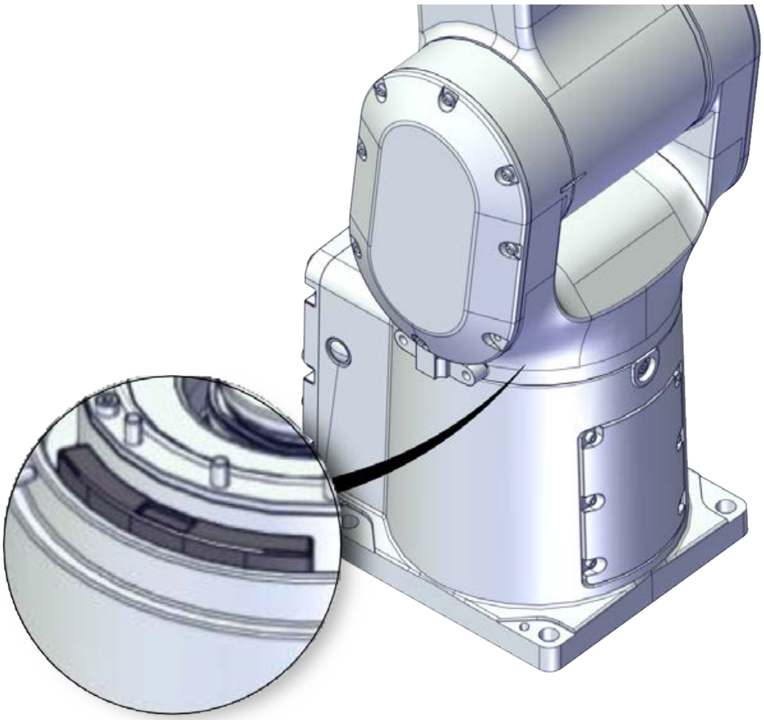
Note

The axis-1 mechanical stop of IRB 1200 Gen2 is optional and can be removed. However, the axis-1 working range is fixed regardless of whether this mechanical stop is installed. Without the mechanical stop installed, the working range can be defined in the system parameters and its limitation can be supervised by the default *SafeMove Standard* option. For more information about SafeMove functions, see *Application manual - Functional safety and SafeMove*。

2.6.3 Mechanically restricting the working range

Location of mechanical stops

Axis 1



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> **Note**
>
> IRB 1200 Gen2 with protection type Clean Room do not have the optional mechanical stop on axis 1.

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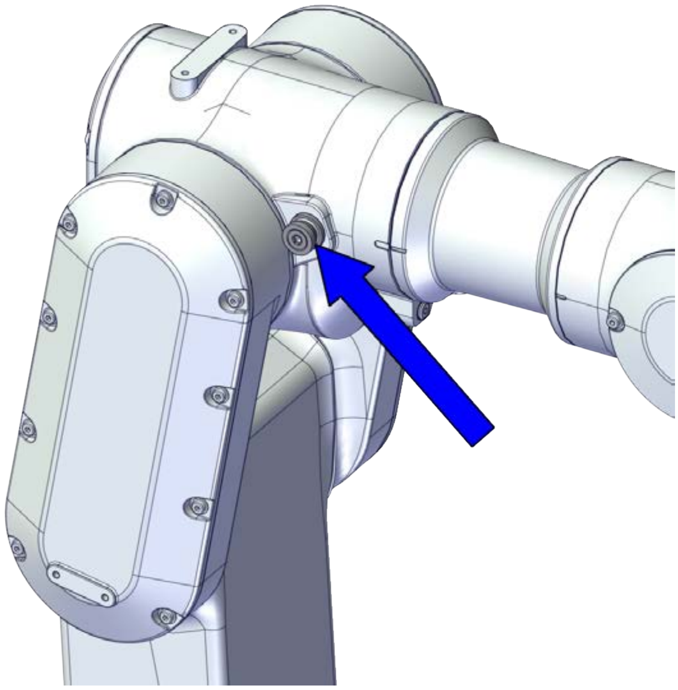
Axis 3



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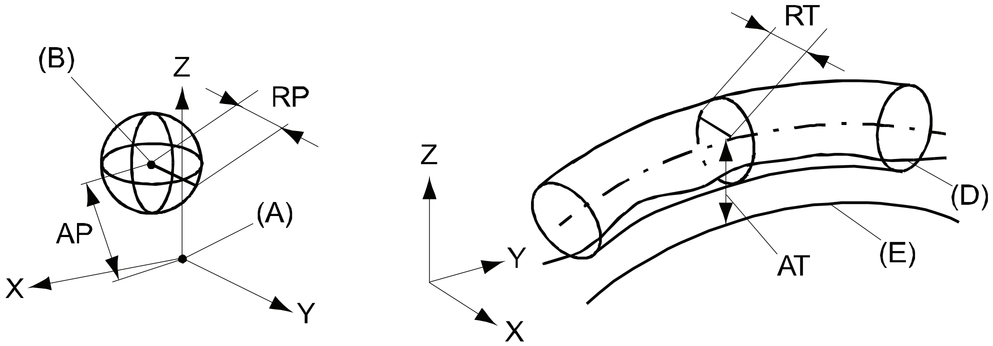
2.7 Performance according to ISO 9283

General

At rated maximum load, maximum offset and 1.6 m/s velocity on the inclined ISO test plane, with all six axes in motion. Values in the table below are the average result of measurements on a small number of robots. The result may differ depending on where in the working range the robot is positioning, velocity, arm configuration, from which direction the position is approached, the load direction of the arm system. Backlashes in gearboxes also affect the result.

The figures for AP, RP, AT and RT are measured according to figure below.



xx0800000424

Pos	Description	Pos	Description
A	Programmed position	E	Programmed path
B	Mean position at program execution	D	Actual path at program execution
AP	Mean distance from programmed position	AT	Max deviation from E to average path
RP	Tolerance of position B at repeated positioning	RT	Tolerance of the path at repeated program execution

IRB 1200 Gen2	7/0.7	9/0.7	5/0.9	8/0.9
Pose accuracy, AP[i] (mm)	0.01	0.007	0.007	0.009
Pose repeatability, RP (mm)	0.011	0.011	0.015	0.019
Pose stabilization time, PSt (s) within 0.1 mm of the position	0.09	0.153	0.355	0.162
Path accuracy, AT (mm)	0.798	1.054	0.899	0.623
Path repeatability, RT (mm)	0.057	0.032	0.04	0.034

i AP according to the ISO test above, is the difference between the teached position (position manually modified in the cell) and the average position obtained during program execution.

2.8 Velocity

Maximum axis speed (full performance)

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 1200-7/0.7 Gen2	360 °/s	300 °/s	360 °/s	500 °/s	470 °/s	840 °/s
IRB 1200-9/0.7 Gen2	360 °/s	300 °/s	360 °/s	500 °/s	470 °/s	840 °/s
IRB 1200-5/0.9 Gen2	360 °/s	300 °/s	360 °/s	500 °/s	470 °/s	840 °/s
IRB 1200-8/0.9 Gen2	360 °/s	300 °/s	360 °/s	500 °/s	470 °/s	840 °/s

There is a supervision function to prevent overheating in applications with intensive and frequent movements (high duty cycle).

2.9 Robot stopping distances and times

2.9.1 Robot stopping distances according to ISO 10218-1

About the data for robot stopping distances and times

All measurements and calculations of stopping distances and times are done according to ISO 10218-1, with single axis motion on axes 1, 2, and 3. If more than one axis is used for the movement, then the stopping distance and time can be longer or shorter. The movement of the axes does not necessarily represent the actual application. Therefore, the braking distance must be validated for each application.

Normal delays of the hardware and software are taken into account. See more about the delays and their impact on the results, *Reading the data on page 73*.

The stopping distances and times are presented using the tool data and extension zones presented for the respected robot variant. These variables are 100%, 66%, and 33% of the maximum values for the robot.

The stop categories 0 and 1 are according to IEC 60204-1.

Note

The category 0 stop is not necessarily the worst case (depending on load, speed, application, wear, etc.).

Note

The stop category 1 is a controlled stop and will therefore have less deviation from the programmed path compared with a stop category 0.

Loads

The tool data that is used is presented for the respective robot variant.

The used loads represent the rated load. No arm load is used. See the *Load diagrams on page 48*.

Continues on next page

Extension zones

The extension zone for the stop category 1 is based on the tool mounting interface (tool flange) with the axis angles according to the following illustrations. The zone data is presented for the respective robot variant.

The extension zone outer limits are defined by the TCP0 position for the stated angles.

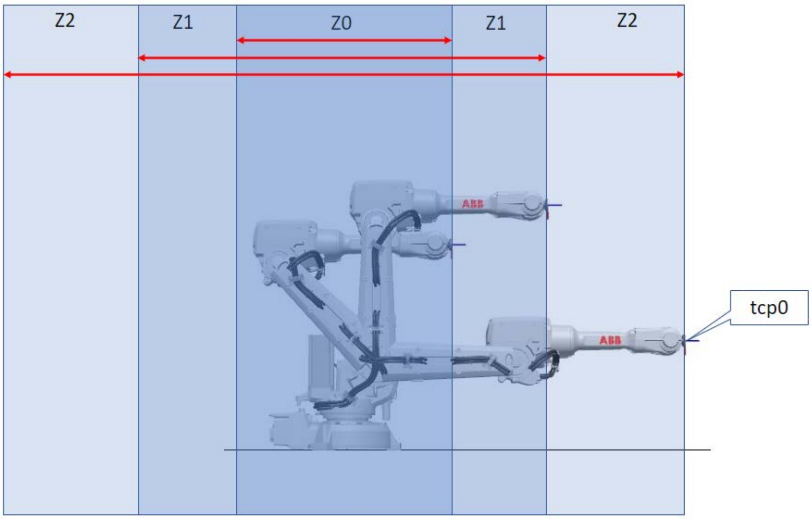
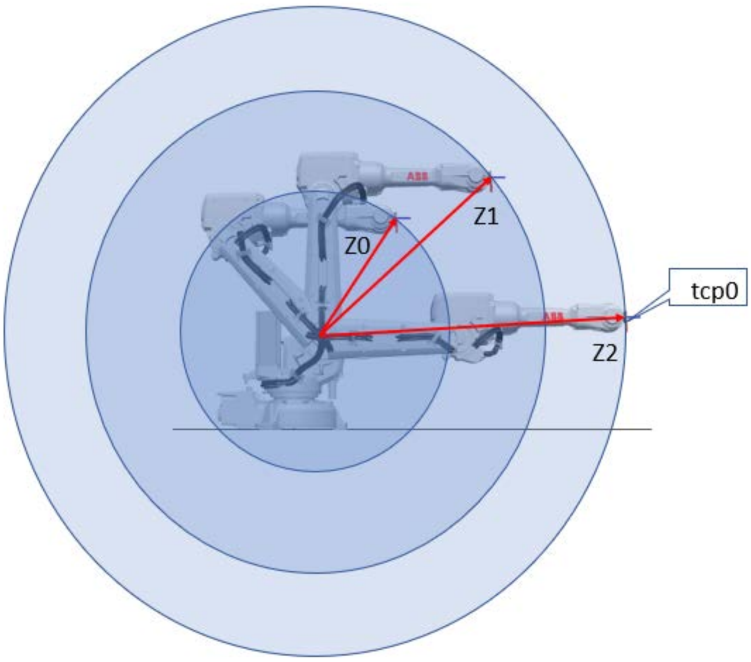
	Illustration
Axis 1	 xx2300000860
Axis 2	 xx2300000861

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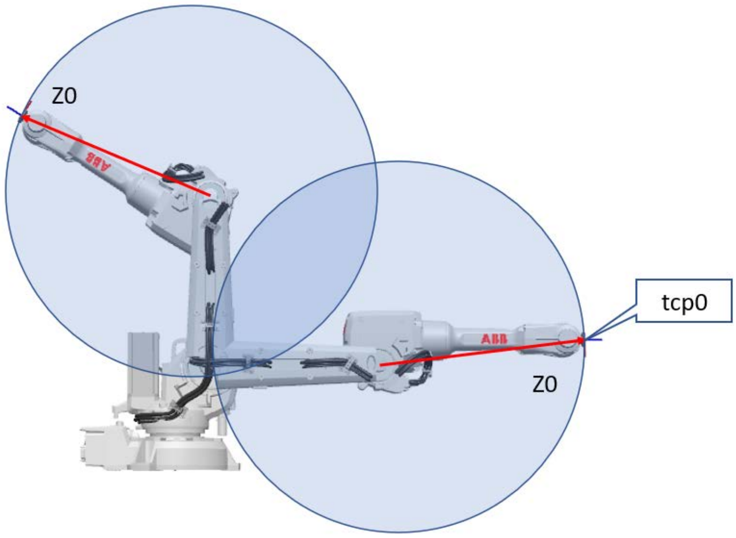
	Illustration
Axis 3	 xx2300000862

Speed

The speed in the simulations is based on TCP0.

The TCP0 speed is measured in meters per second when the stop is triggered.

Stopping distances

The stopping distance is measured in degrees.

Stopping times

The stopping time is measured in seconds.

Limitations

The stopping distance can vary depending on additional loads on the robot.

The stopping distance for category 0 stops can vary depending on the individual brakes and the joint friction.

Reading the data

The data for stop category 0 is presented in tables, with distance and time for each axis.

The data for stop category 1 is presented as graphs with curves representing the different loads.

There is a short delay in the stop, which means that if the axis is accelerating when the stop is initiated (C), it will continue to accelerate during this delay time. This can result in graphs where a higher load (A) gives shorter stopping distance than a smaller load (B).

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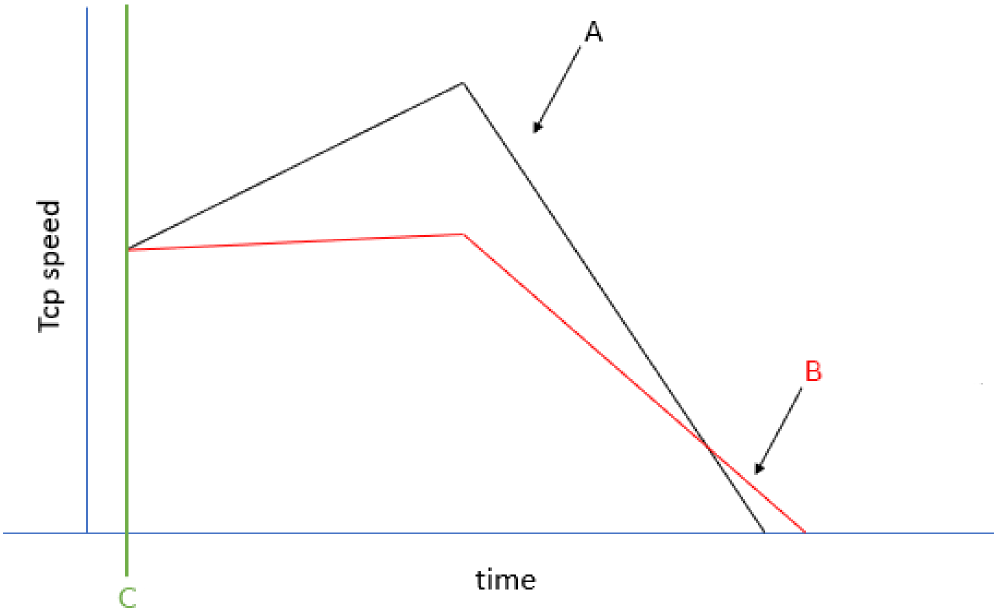

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The tcp speed is the actual speed when the stop is initiated, which is not necessarily the programmed speed.

2.9.2 Measuring stopping distance and time

Preparations before measuring

For measurement and calculation of overall system stopping performance, see ISO 13855:2010.

The measurement shall be done for the selected stop category. The emergency stop button on the robot controller is configured for stop category 0 on delivery. A risk assessment can conclude the need for another stop category. The stop category can be changed through the system parameter *Function* (topic *Controller*, type *Safety Run Chain*). In case of deviations of the default configuration of stop category 0, then this is detailed in the product specification for the respective manipulator.

CAUTION

The measurement and calculation of overall stopping performance for a robot must be tested with its correct load, speed, and tools, in its actual environment, before the robot is taken into production.

All load and tool data must be correctly defined (weight, CoG, moment of inertia). The load identification service routine can be used to identify the data.

The measurement and calculation can also be included in a yearly maintenance.

CAUTION

Follow the safety instructions in the respective product manual for the robot.

Measuring with TuneMaster

The software TuneMaster can be used to measure stopping distances and times for ABB robots. The TuneMaster software contains documentation on how to use it.

1. Download TuneMaster from *www.abb.com/robotics*, section **RobotStudio - Downloads - RobotWare Tools and Utilities**.
2. Install TuneMaster on a computer. Start the TuneMaster app and select **Log Signals**.
3. Connect to the robot controller.
4. Define the I/O stop signal to use for measurement, for example, ES1 for emergency stop.
5. Define the signal number to use for measurement, 1298 for axis position. The value is given in radians.
6. Start the logging in TuneMaster.
7. Start the test program on the controller.

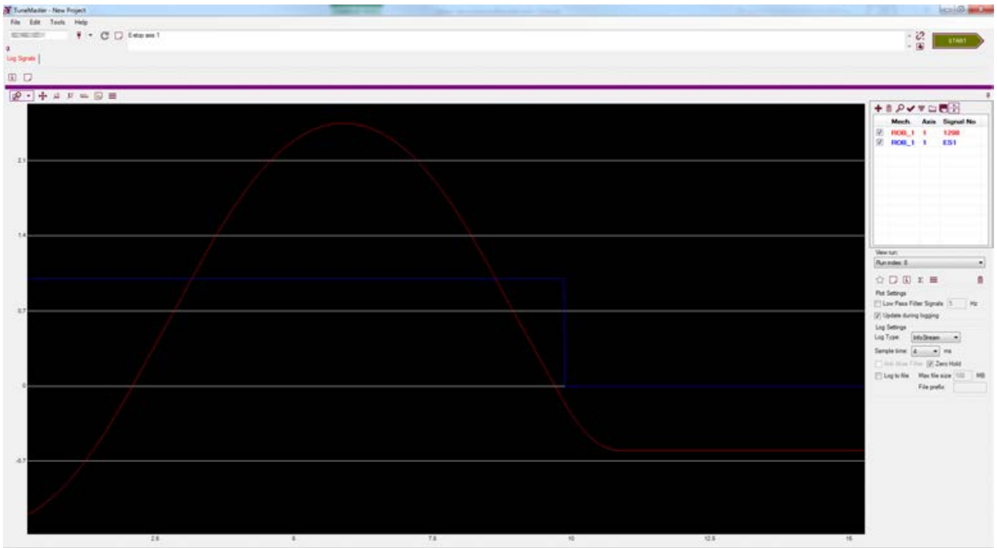
Tip

Use the tool and zone definitions for the respective variant in this document to get results that are comparable with this document.

Continues on next page

8. When the axis has reached maximum speed, press the emergency stop button.
9. In TuneMaster, measure the stopping distance and time.
10. Repeat for all installed emergency stop buttons until the identified hazards due to stopping distance and time for axes have been verified.

Example from TuneMaster



xx1600000386

2.9.3 IRB 1200-7/0.7 Gen2

Used tooldata

```
PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [7, [0, 0,
     76], [1, 0, 0, 0], 0.00673867, 0.0067, 0.0067]];
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [4.7, [0,
     0, 51], [1, 0, 0, 0], 0.00199664, 0.002, 0.002]];
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [2.3, [0,
     0, 25], [1, 0, 0, 0], 0.00024958, 0.00025, 0.00025]];
```

Category 0

The following table describes the stopping distance and time for category 0 stop.

Axis	Distance	Stop time
1	57.8°	0.27 s
2	48.0°	0.26 s
3	76.4°	0.37 s

Category 1, extension zones

For definitions of the zones, see *Extension zones on page 72*.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

Axis 2

Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

Axis 3

Only one zone exists.

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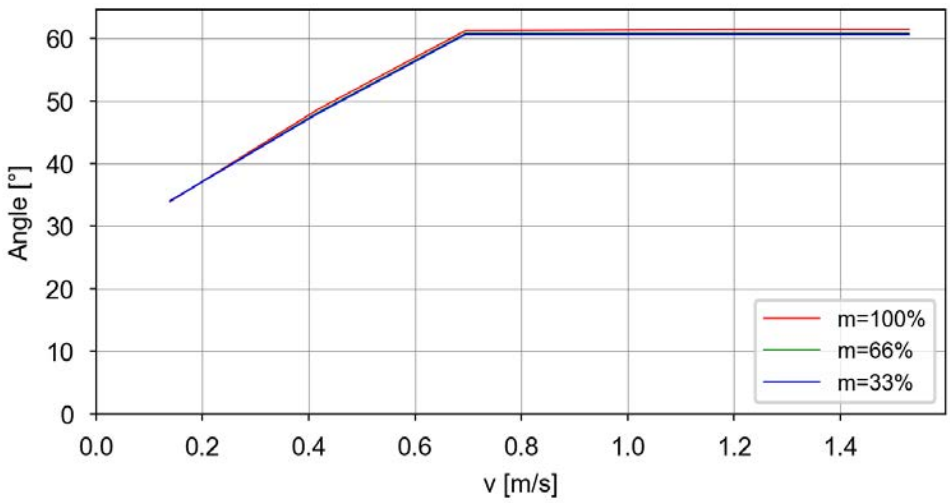
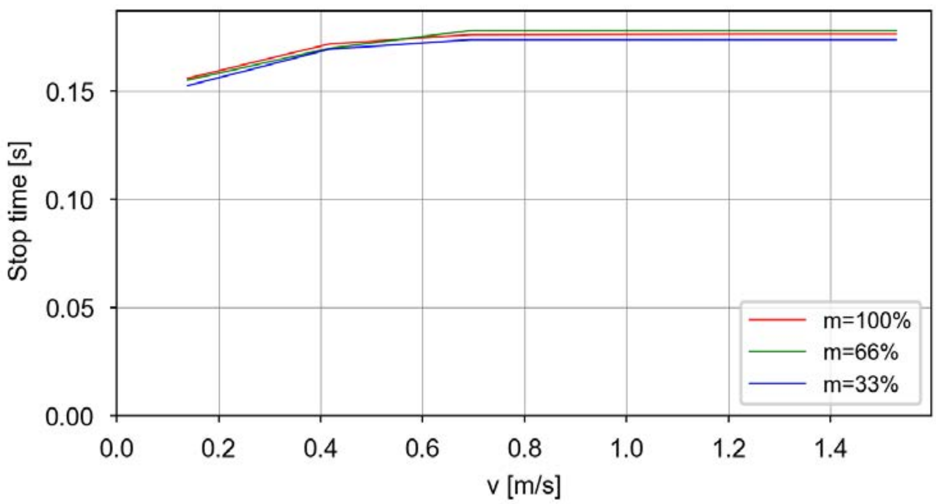
Category 1, Axis 1, Extension zone 0, stopping distance and stopping time





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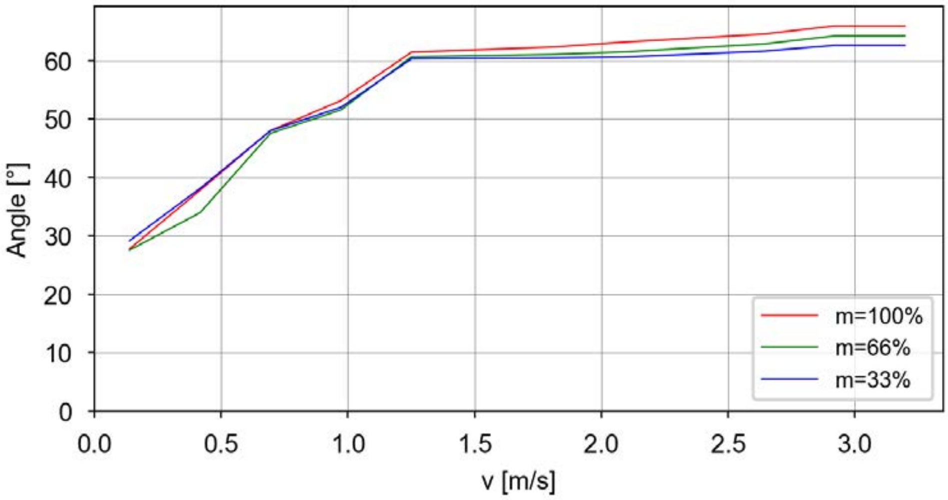
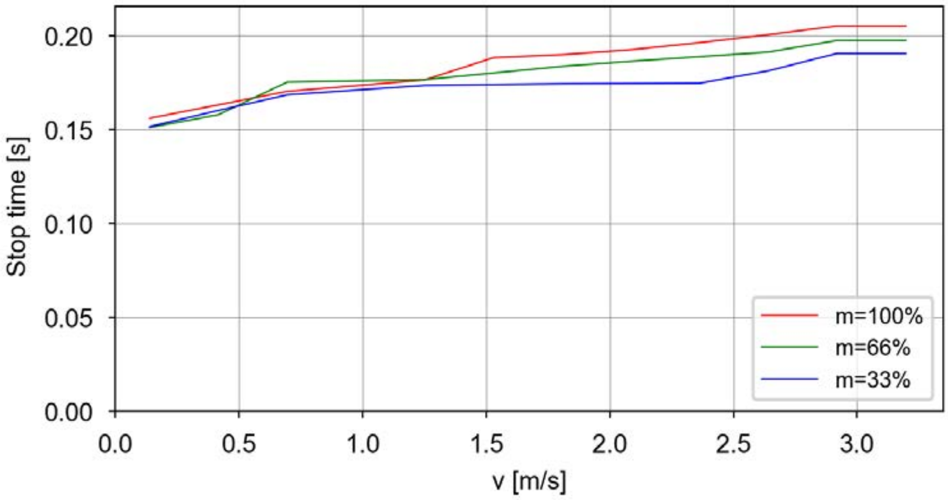
Category 1, Axis 1, Extension zone 1, stopping distance and stopping time





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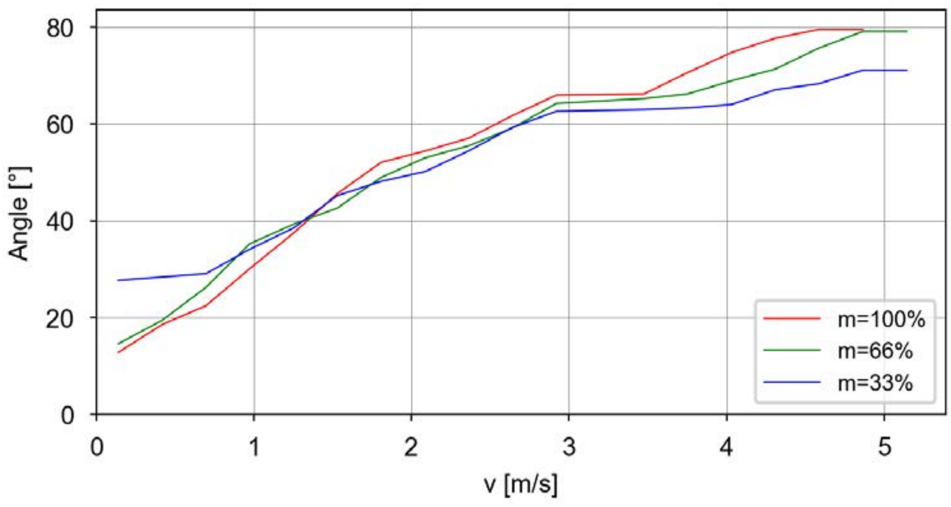
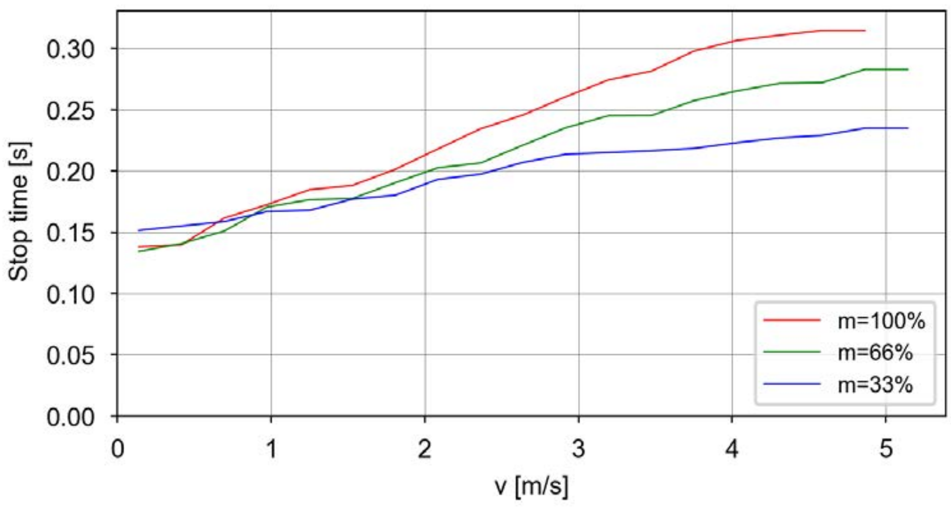
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time





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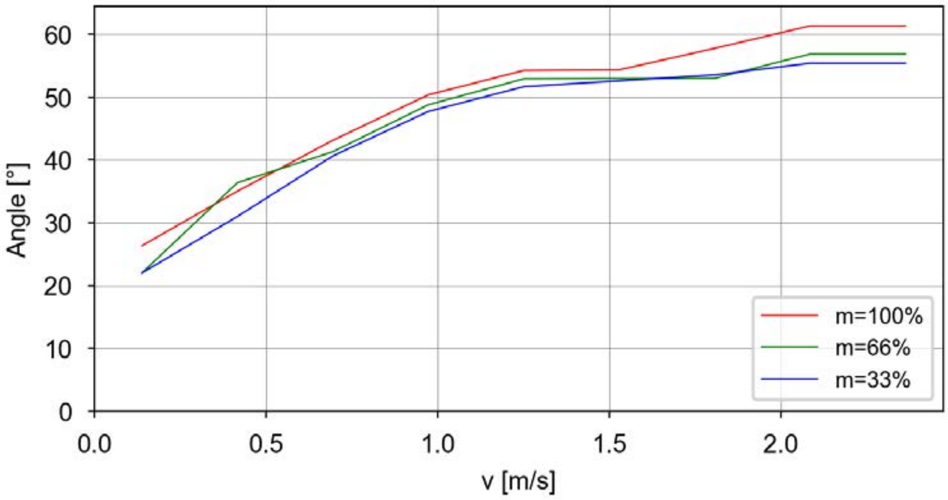
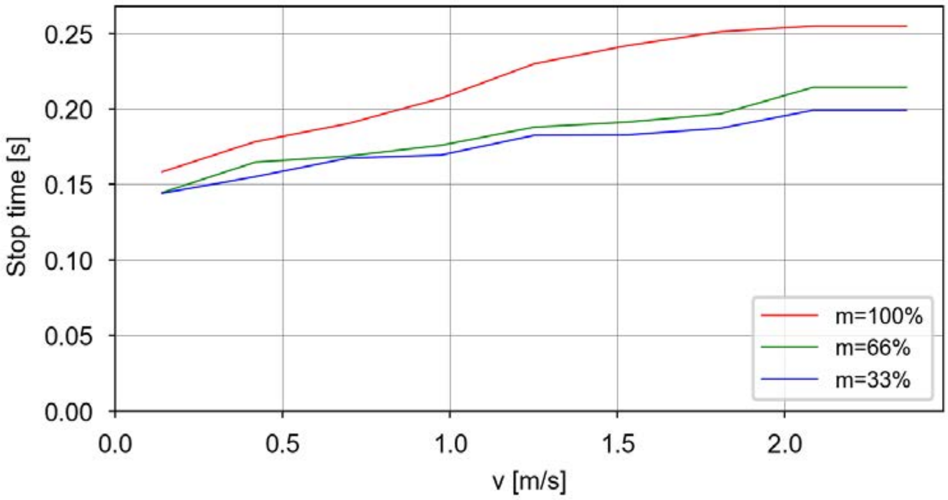
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time





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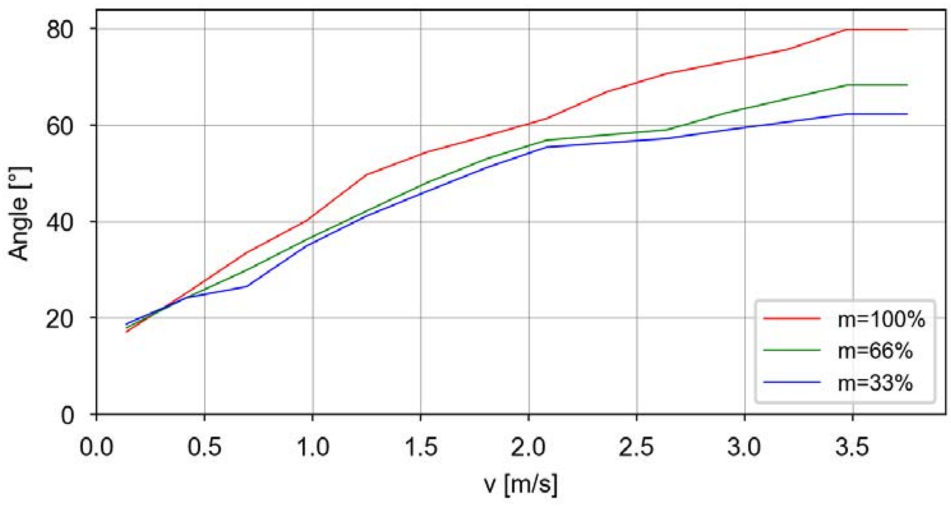
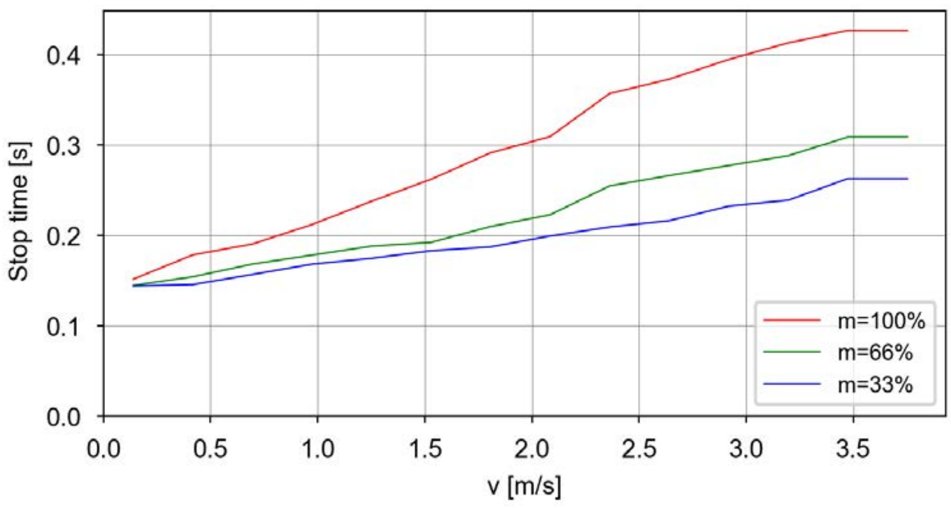
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time





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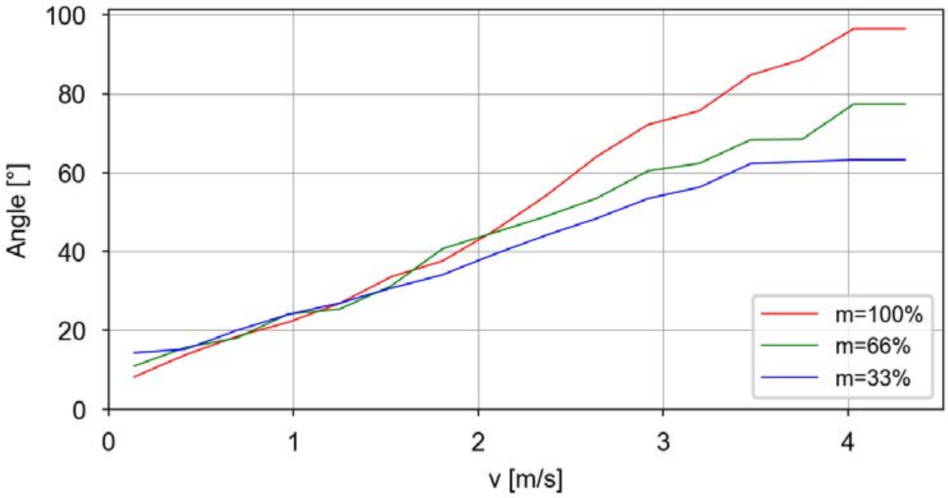
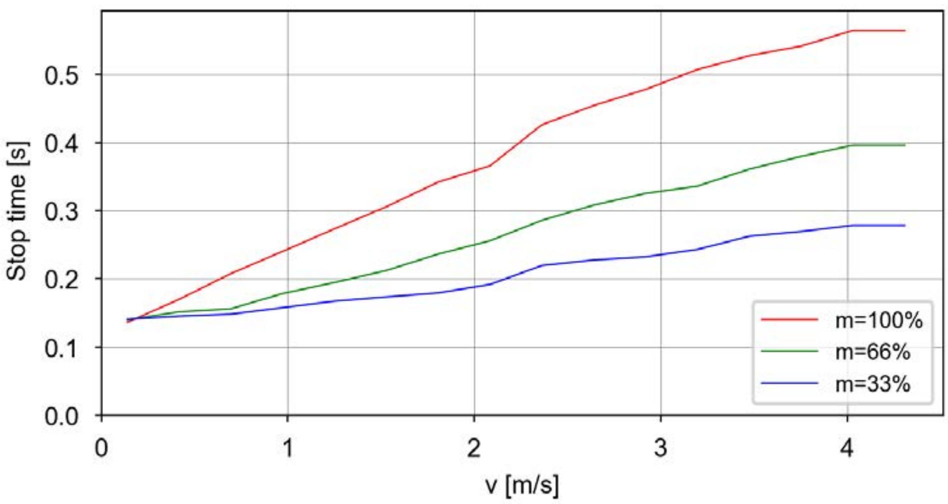
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time





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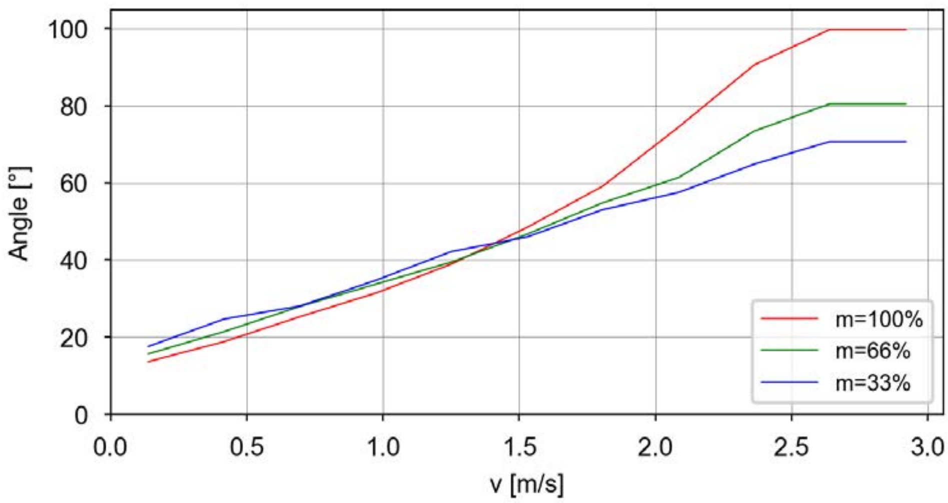
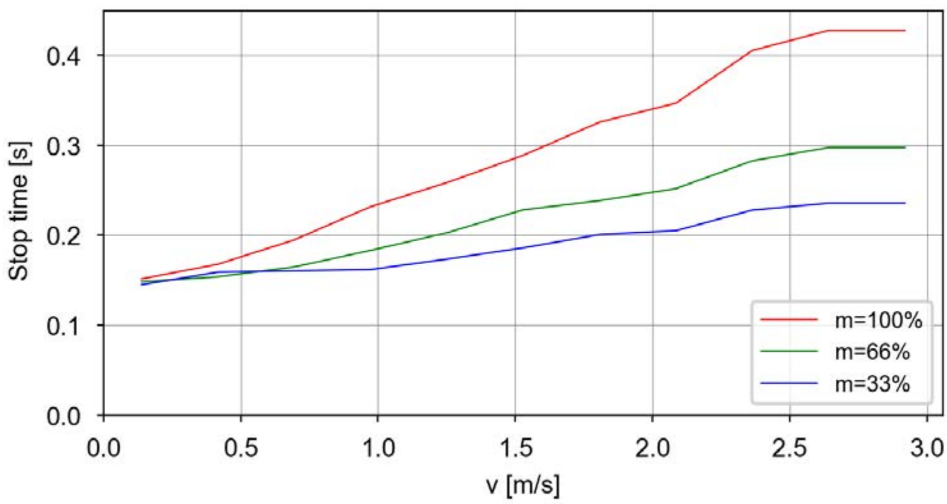
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





2.9.4 IRB 1200-9/0.7 Gen2

Used tooldata

```
PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [9, [0, 0,
     74], [1, 0, 0, 0], 0.008214, 0.0082, 0.0082]];
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [6, [0, 0,
     49], [1, 0, 0, 0], 0.00243378, 0.0024, 0.0024]];
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [3, [0, 0,
     25], [1, 0, 0, 0], 0.000304222, 0.0003, 0.0003]];
```

Category 0

The following table describes the stopping distance and time for category 0 stop.

Axis	Distance	Stop time
1	56.6°	0.28 s
2	47.9°	0.26 s
3	65.9°	0.37 s

Category 1, extension zones

For definitions of the zones, see *Extension zones on page 72*.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

Axis 2

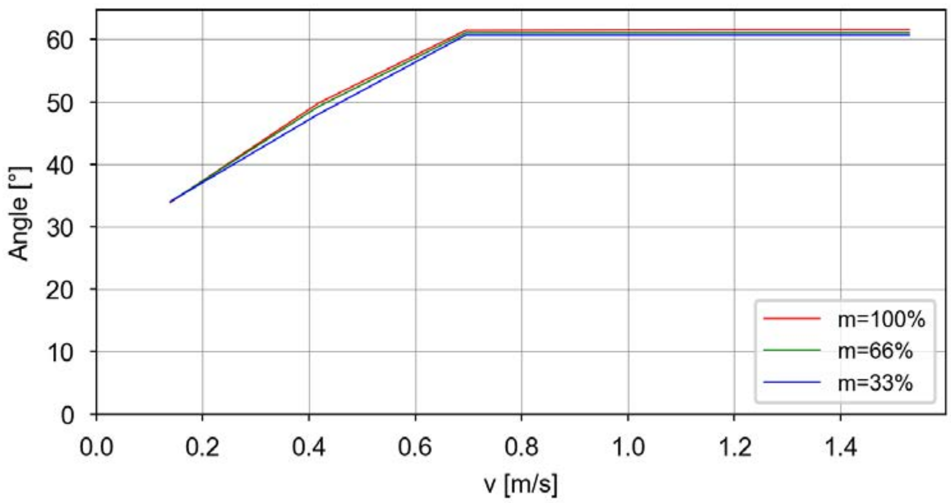
Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

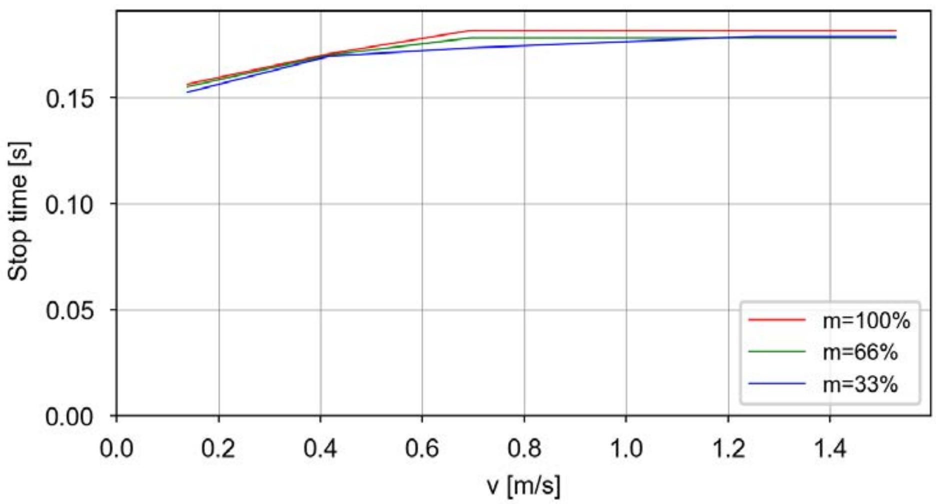
Axis 3

Only one zone exists.

Continues on next page

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time





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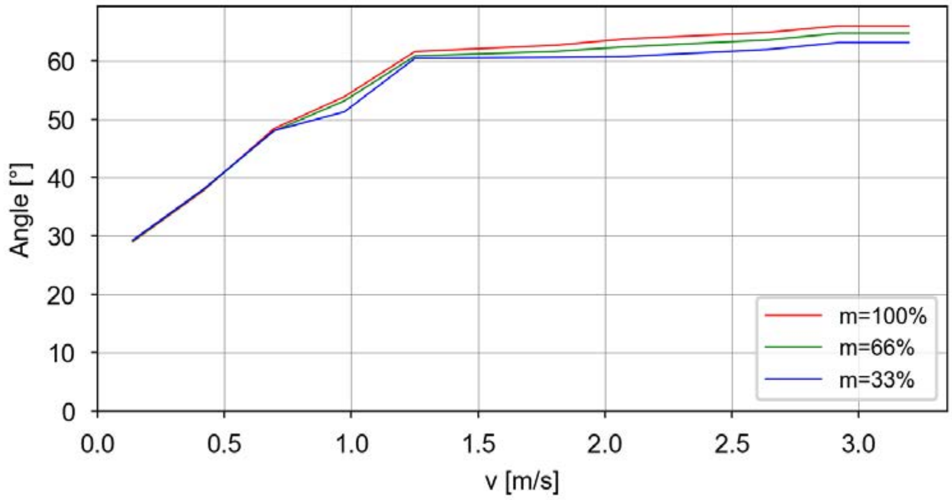
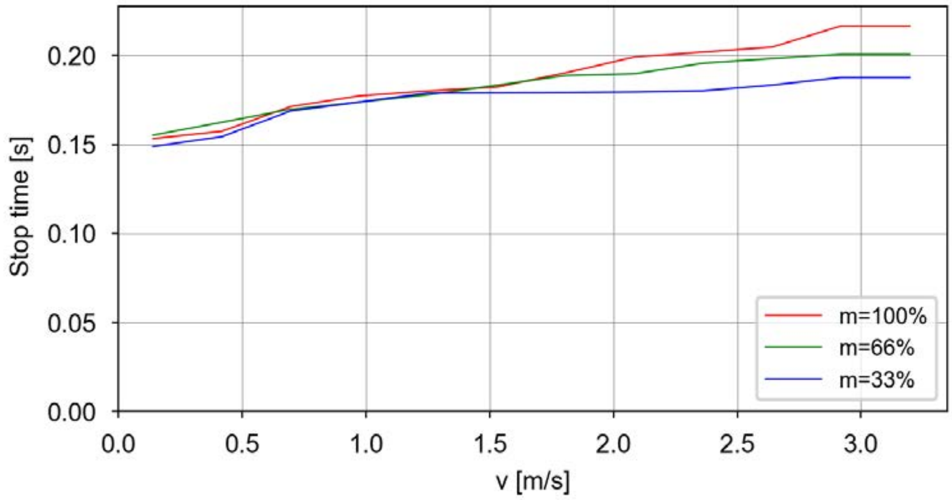
Category 1, Axis 1, Extension zone 1, stopping distance and stopping time





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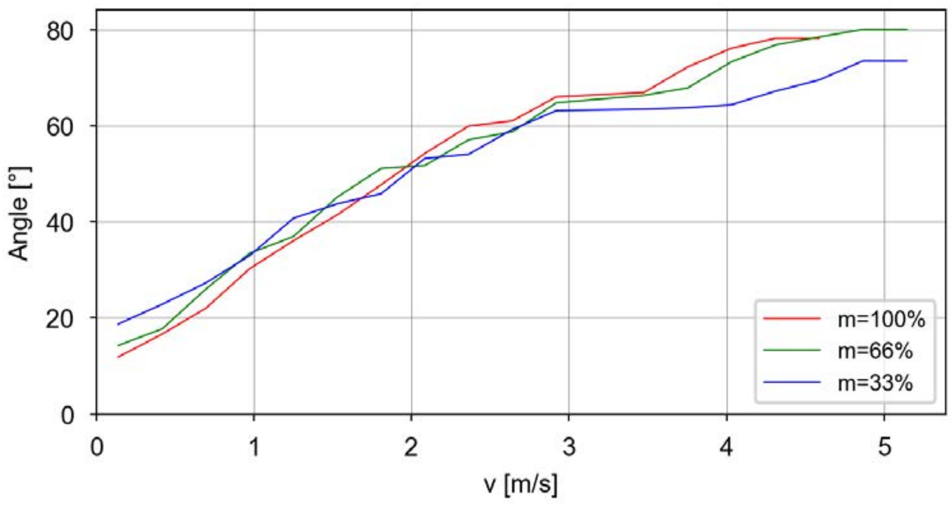
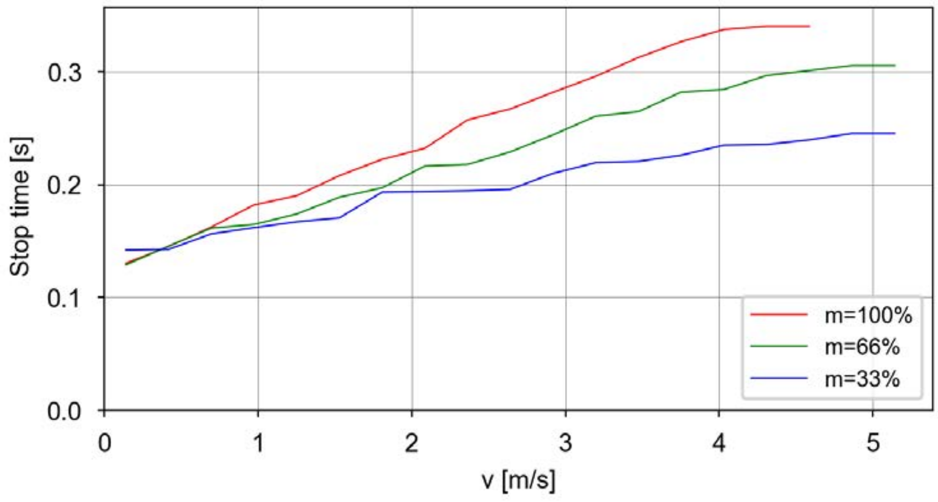
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time





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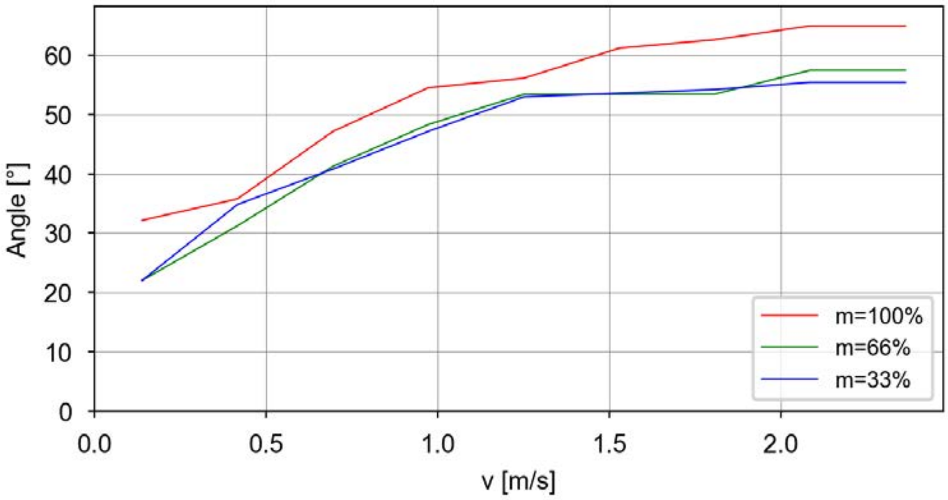
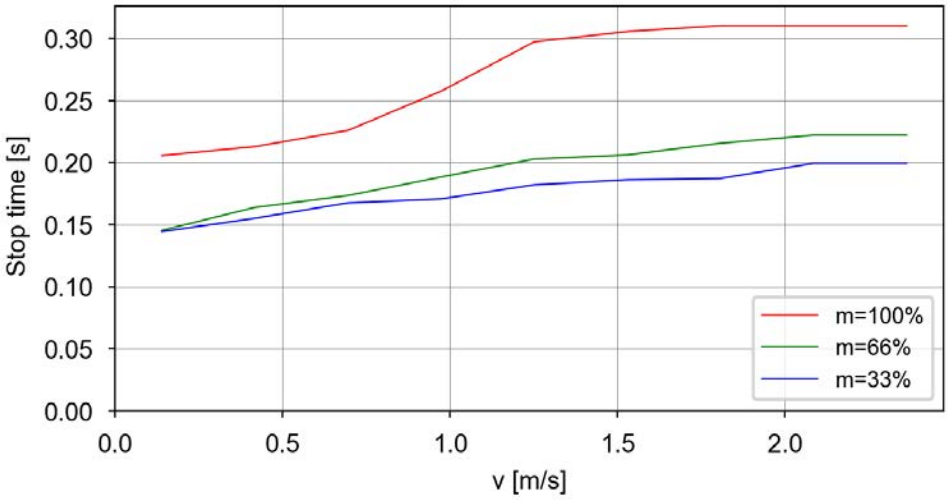
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time





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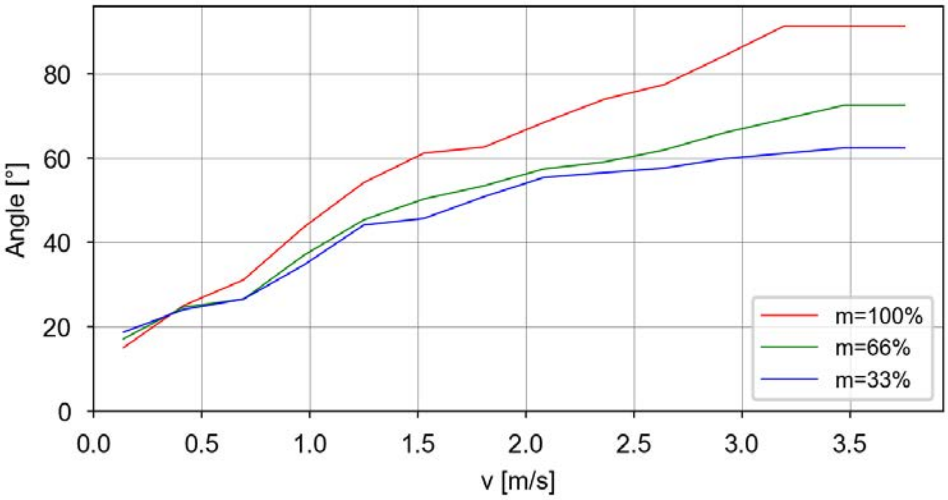
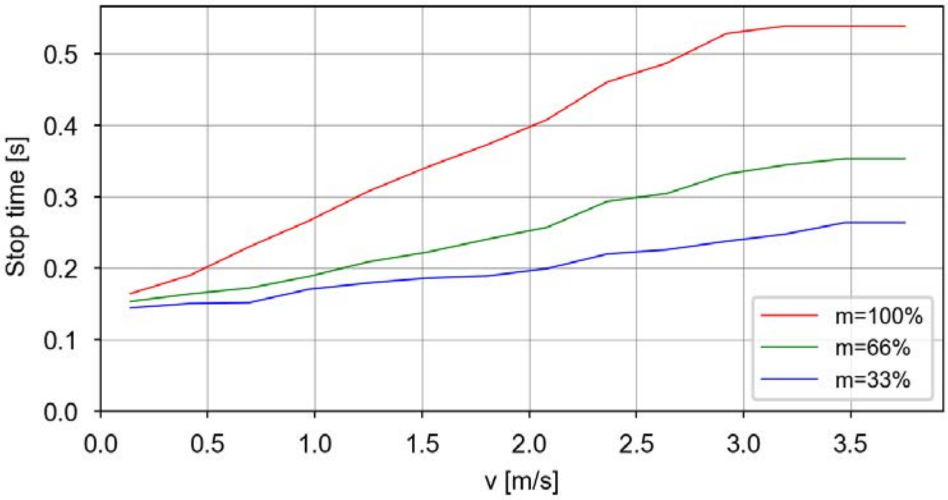
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time





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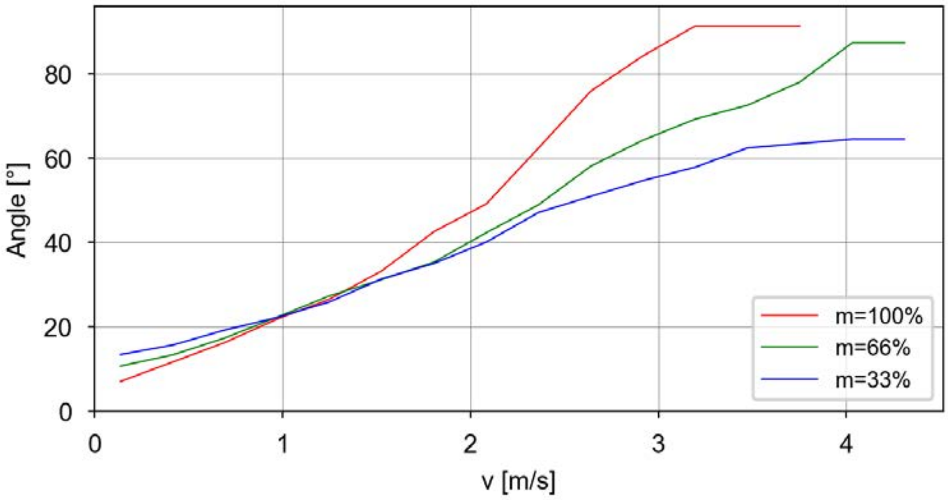
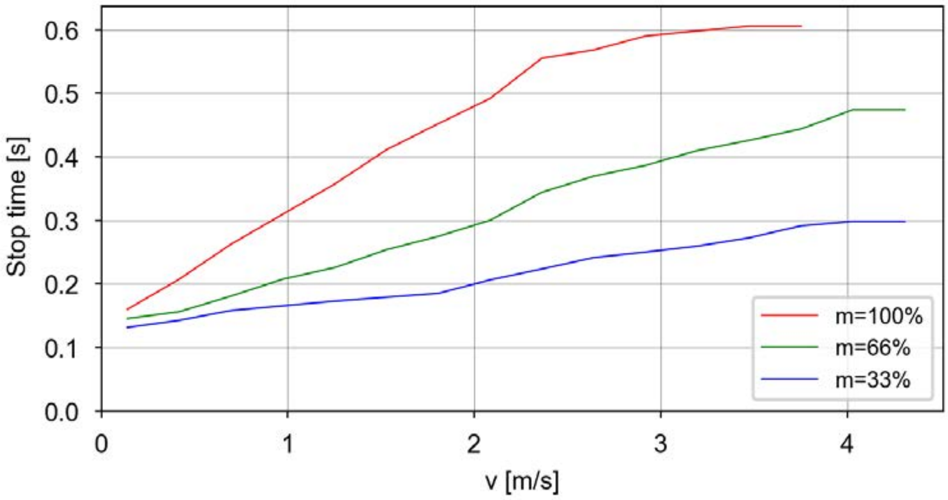
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time





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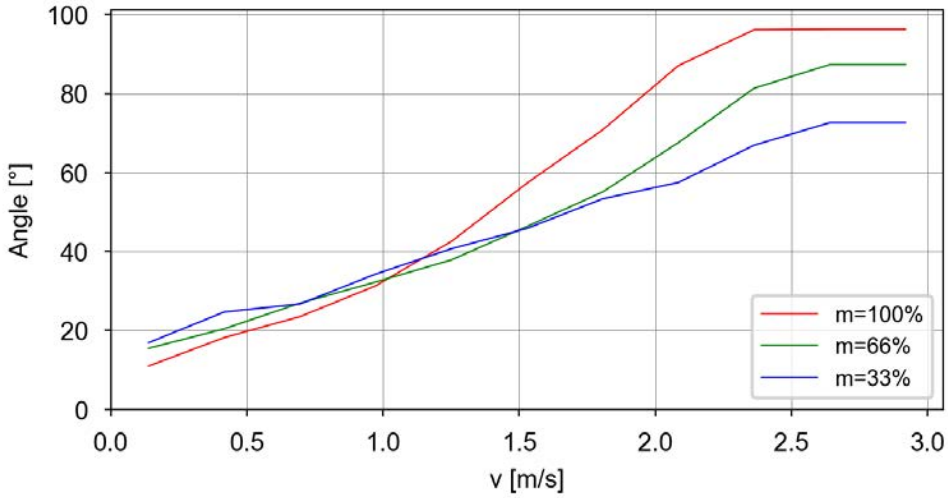
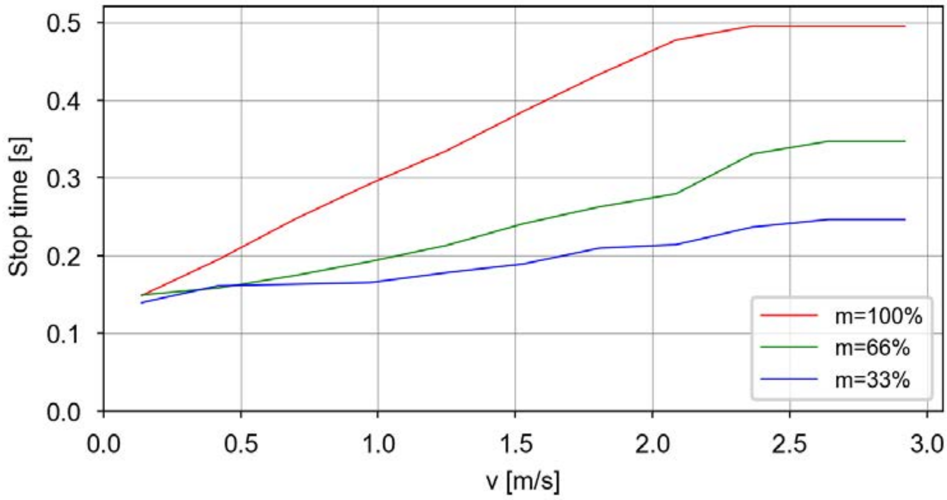
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





2.9.5 IRB 1200-5/0.9 Gen2

Used tooldata

```
PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [5, [0, 0,
     76], [1, 0, 0, 0], 0.00481333, 0.0048, 0.0048]];
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [3.3, [0,
     0, 51], [1, 0, 0, 0], 0.00142617, 0.0014, 0.0014]];
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [1.7, [0,
     0, 25], [1, 0, 0, 0], 0.000178272, 0.00018, 0.00018]];
```

Category 0

The following table describes the stopping distance and time for category 0 stop.

Axis	Distance	Stop time
1	65.3°	0.33 s
2	50.8°	0.28 s
3	79.6°	0.42 s

Category 1, extension zones

For definitions of the zones, see *Extension zones on page 72*.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

Axis 2

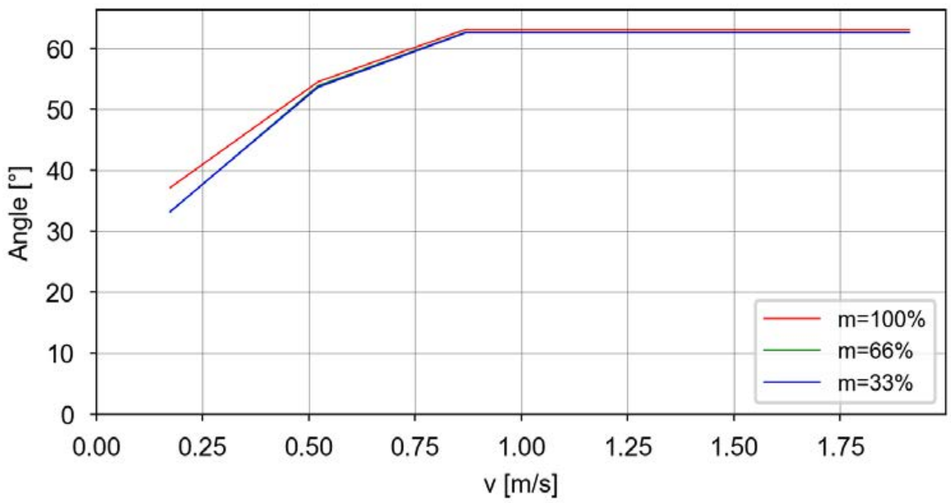
Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

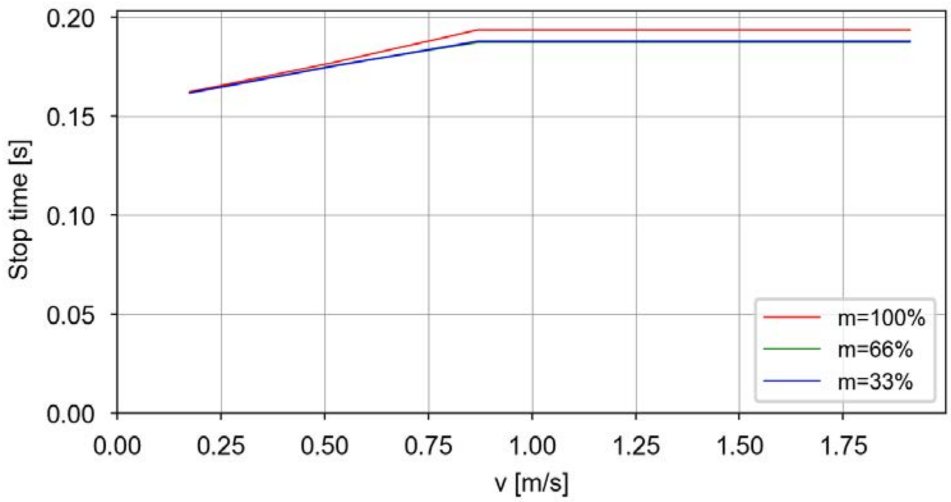
Axis 3

Only one zone exists.

Continues on next page

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time





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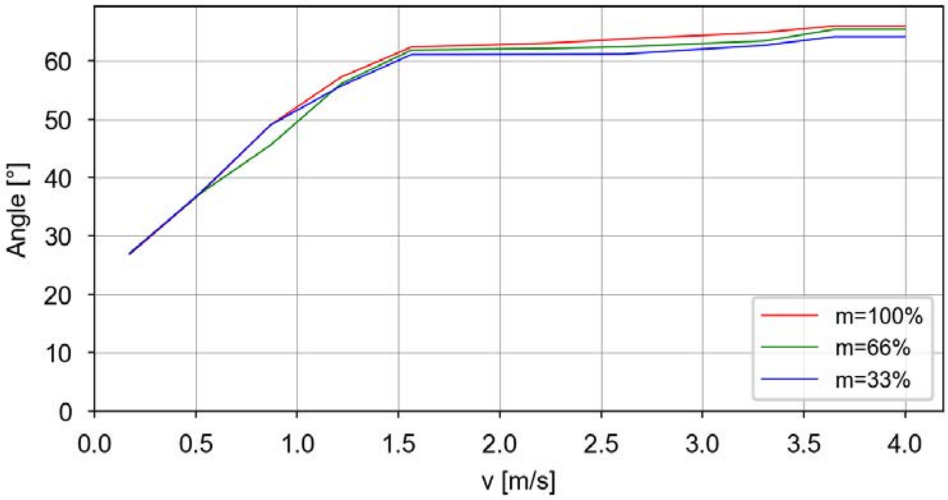
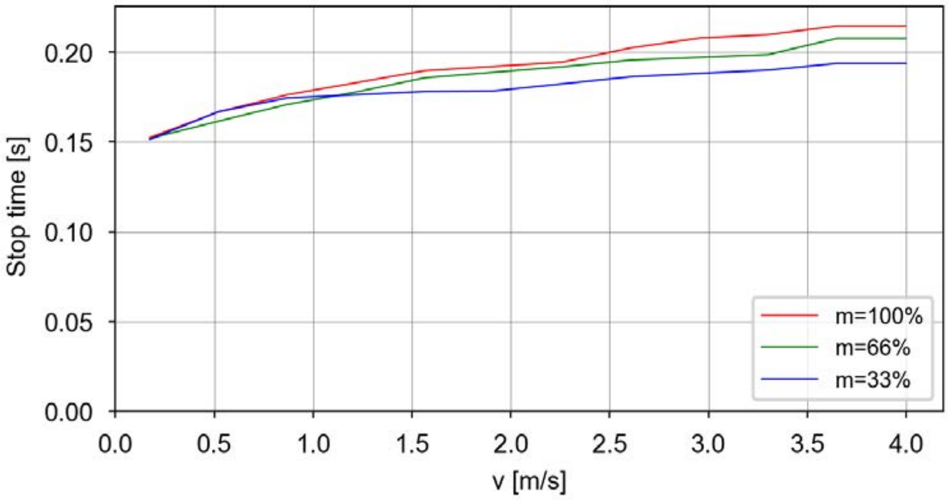
Category 1, Axis 1, Extension zone 1, stopping distance and stopping time





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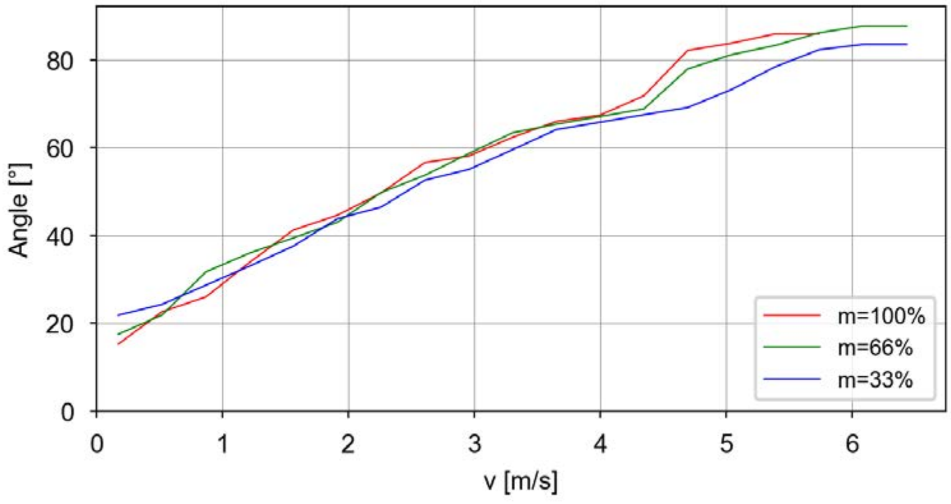
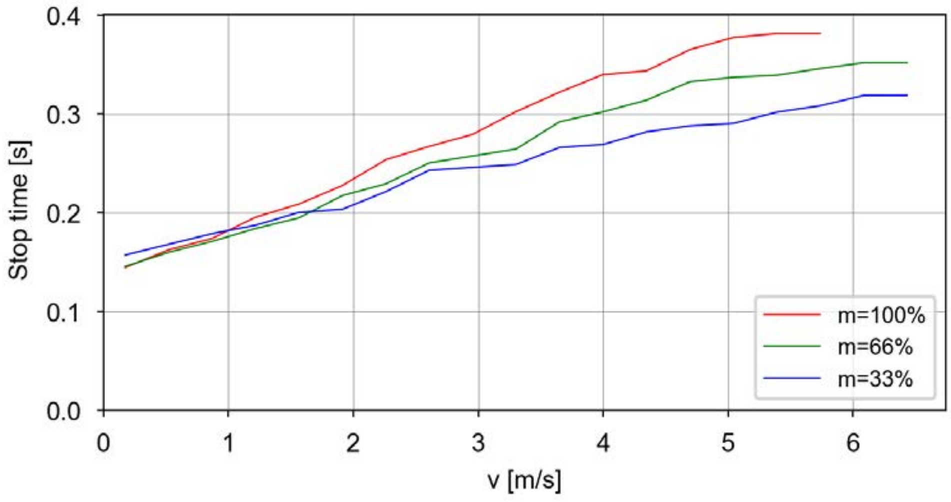
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time





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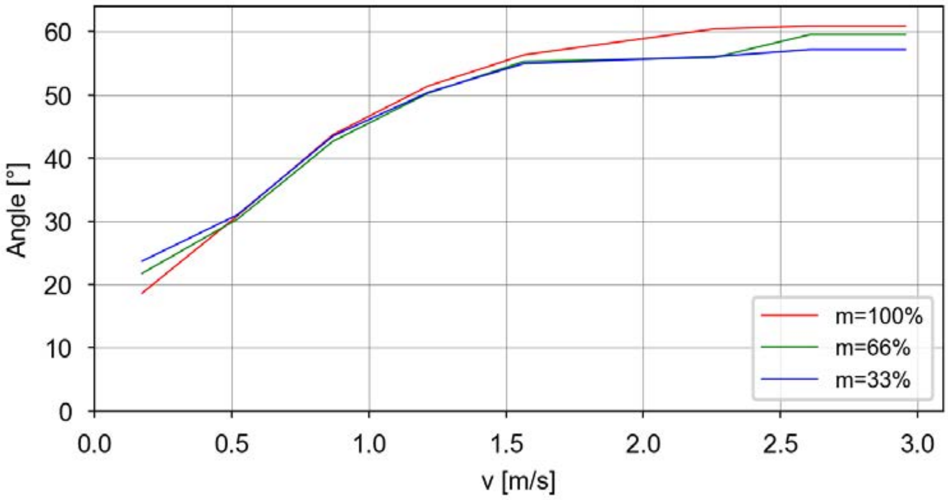
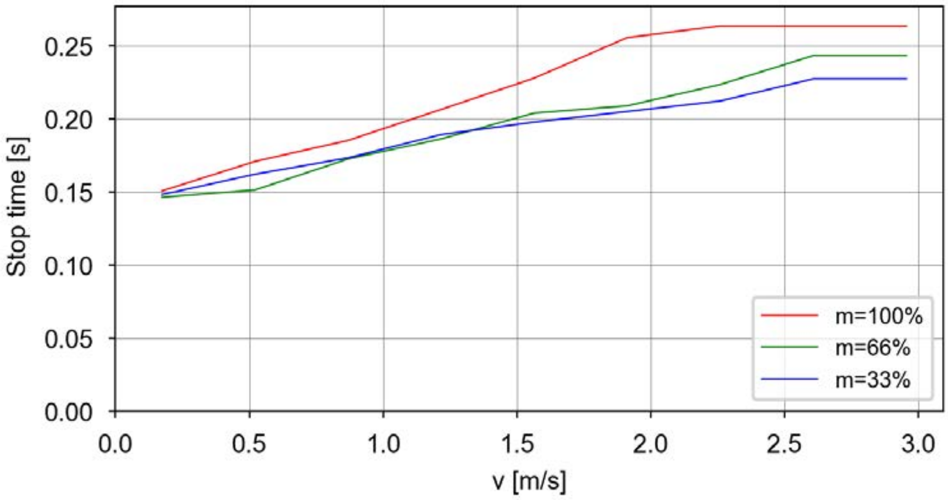
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time





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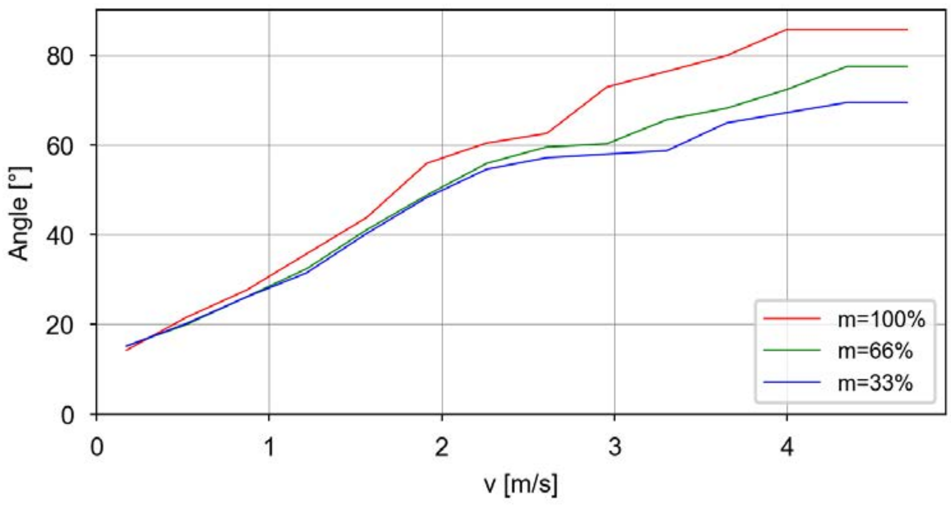
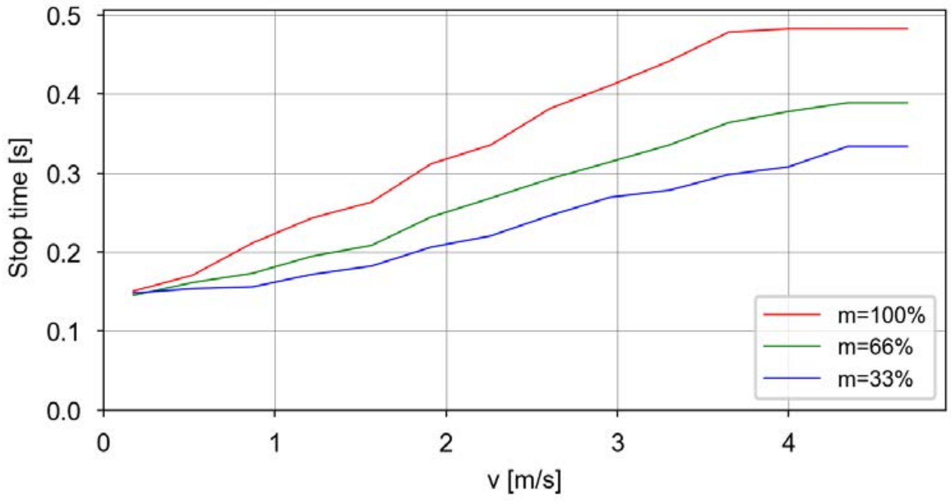
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time





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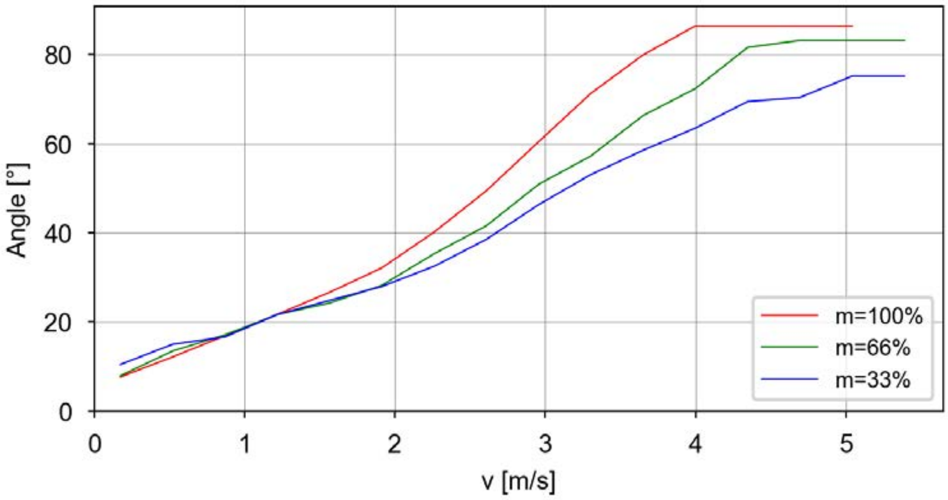
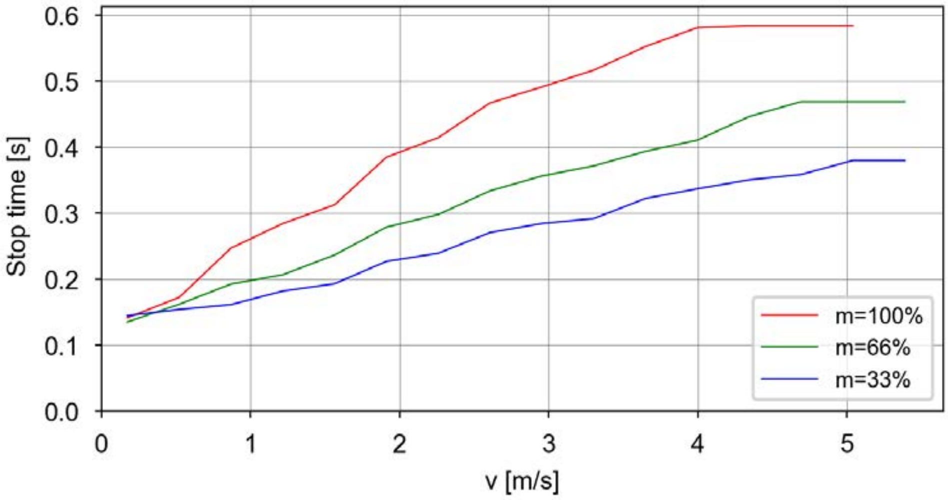
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time





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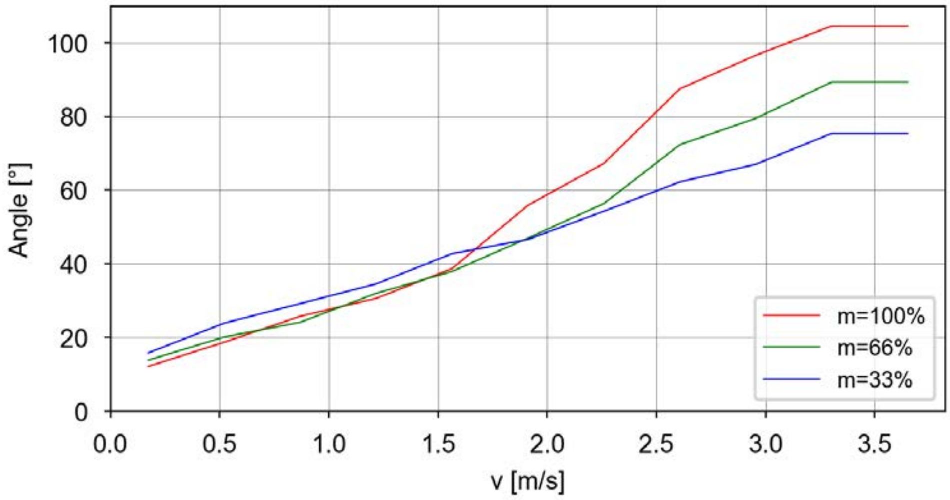
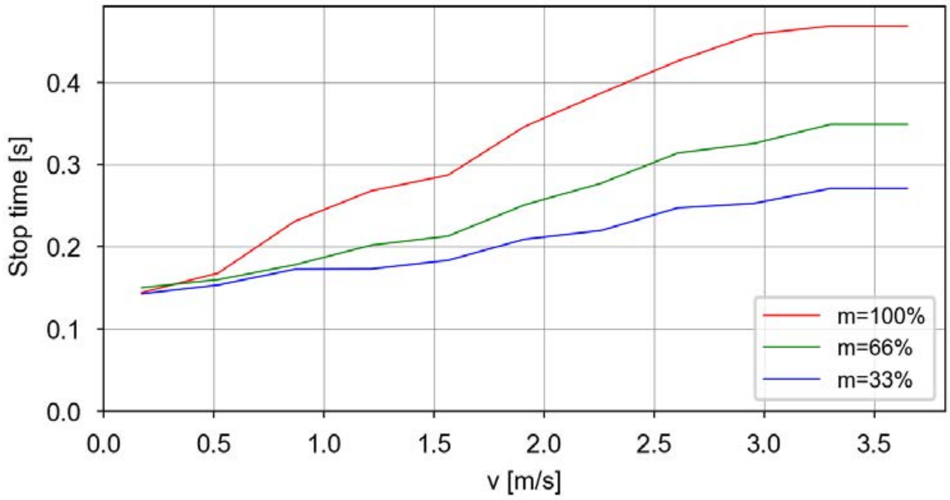
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





2.9.6 IRB 1200-8/0.9 Gen2

Used tooldata

```
PERS tooldata P100:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [8, [0, 0,
     91], [1, 0, 0, 0], 0.0110413, 0.011, 0.011]];
PERS tooldata P66:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [5.3, [0,
     0, 61], [1, 0, 0, 0], 0.00327151, 0.0033, 0.0033]];
PERS tooldata P33:= [ TRUE, [[0, 0, 0], [1, 0, 0 ,0]], [2.7, [0,
     0, 30], [1, 0, 0, 0], 0.000408938, 0.00041, 0.00041]];
```

Category 0

The following table describes the stopping distance and time for category 0 stop.

Axis	Distance	Stop time
1	64.0°	0.35 s
2	51.3°	0.32 s
3	77.7°	0.52 s

Category 1, extension zones

For definitions of the zones, see *Extension zones on page 72*.

The zone border is the mounting interface location for axis 2 and axis 3.

Axis 1

Zone border	Axis 2	Axis 3
z0-z1	-42°	42°
z1-z2	6°	-6°

Axis 2

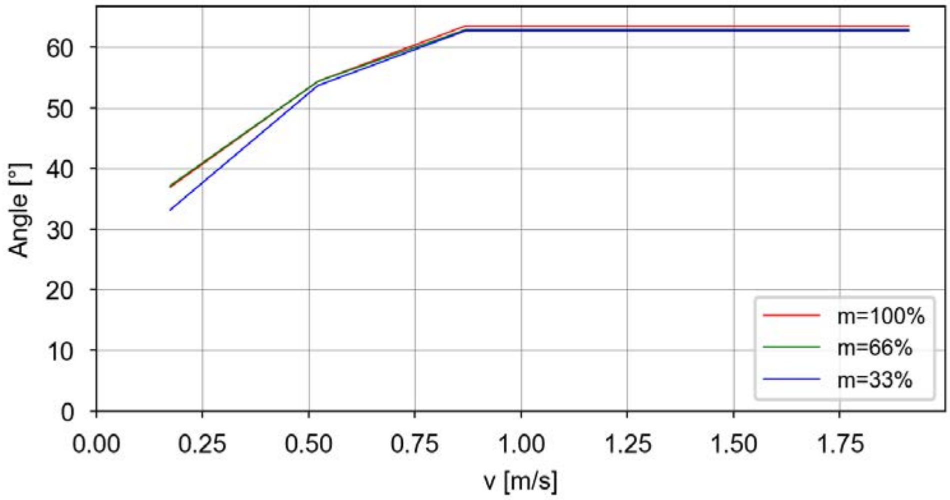
Zone border	Axis 2	Axis 3
z0-z1	48°	30°
z1-z2	90°	-30°

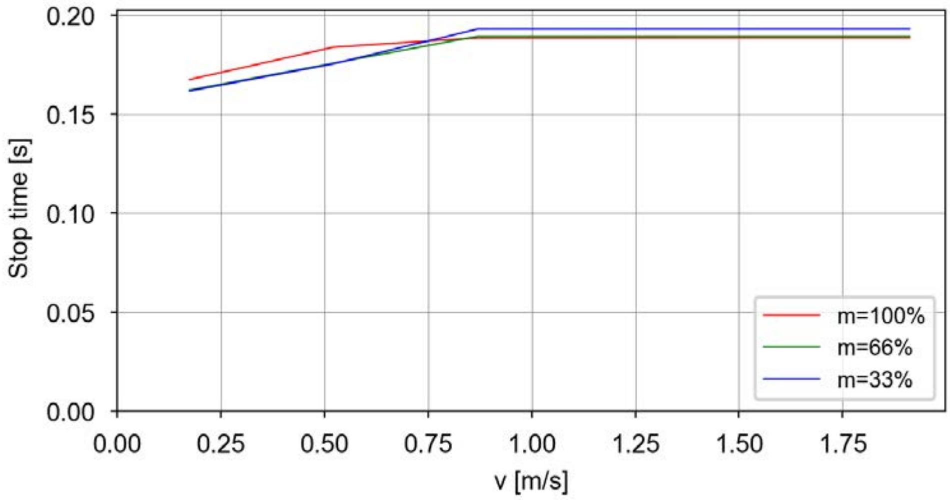
Axis 3

Only one zone exists.

Continues on next page

Category 1, Axis 1, Extension zone 0, stopping distance and stopping time





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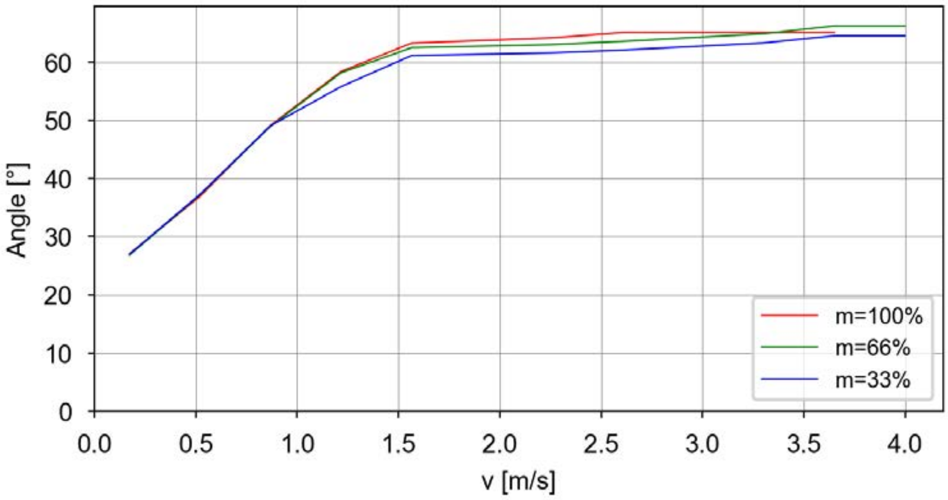
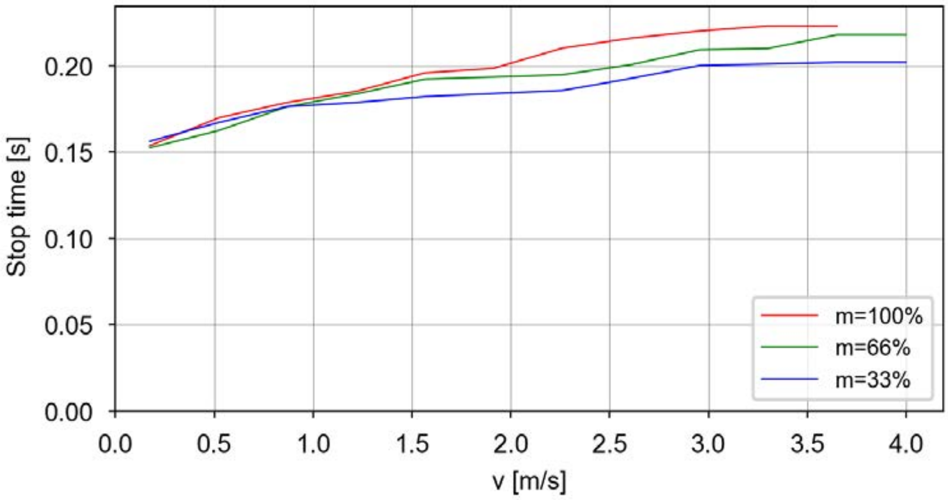
Category 1, Axis 1, Extension zone 1, stopping distance and stopping time





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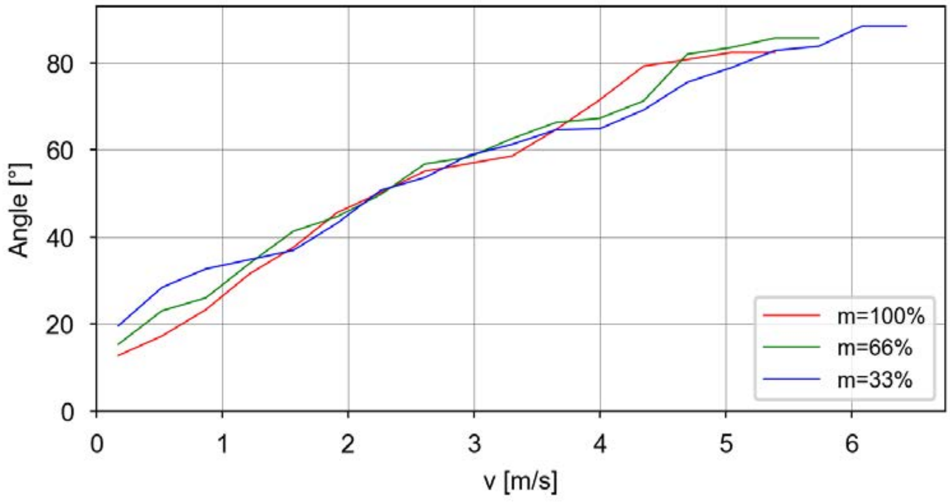
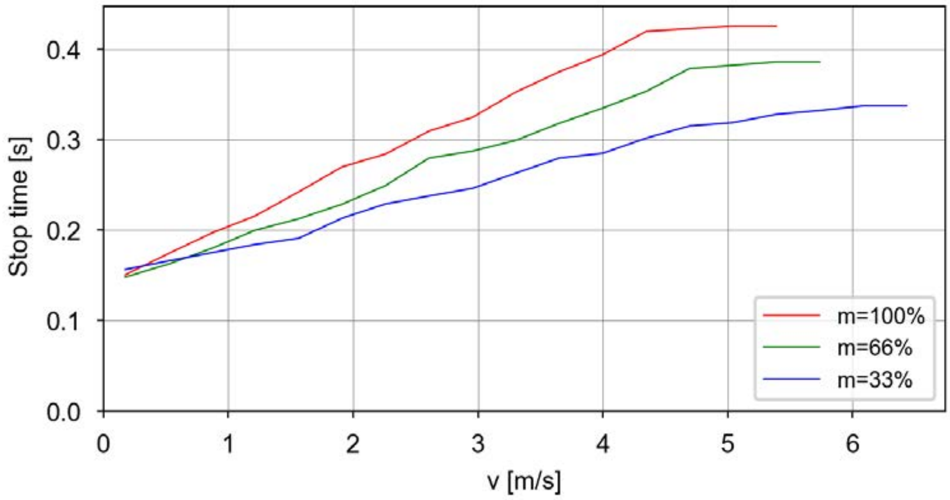
Category 1, Axis 1, Extension zone 2, stopping distance and stopping time





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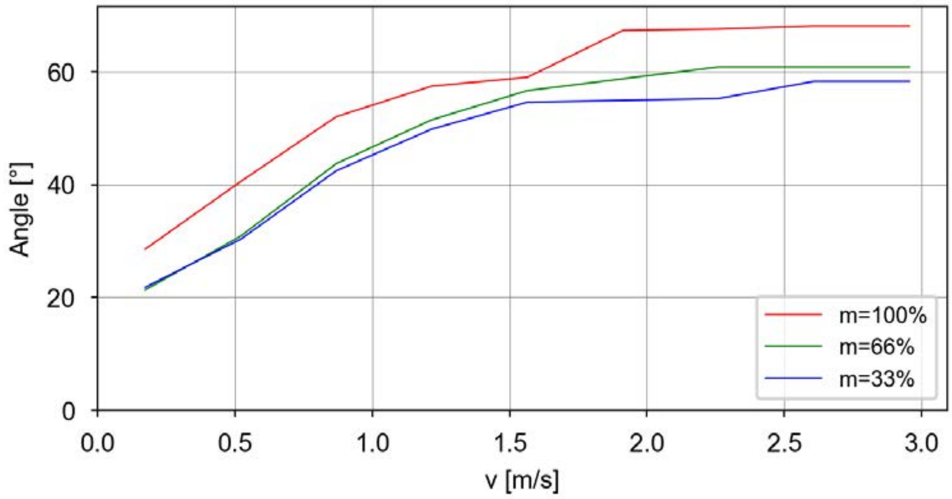
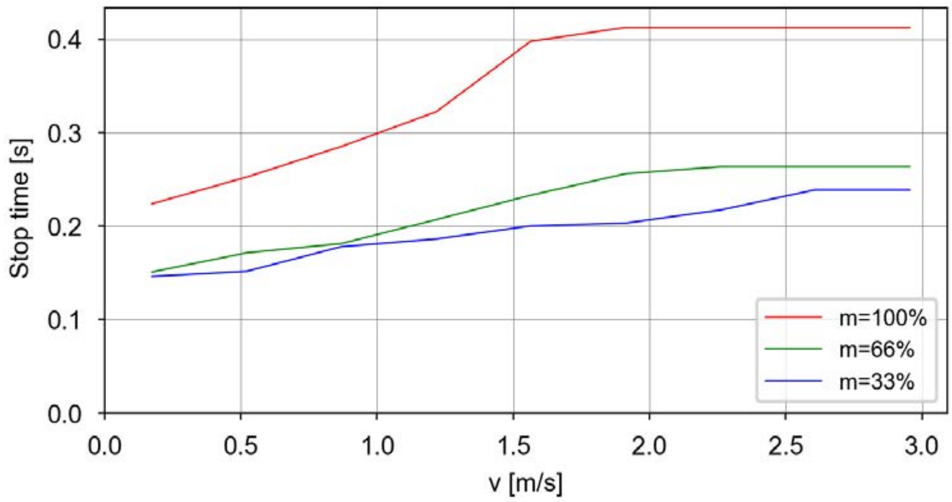
Category 1, Axis 2, Extension zone 0, stopping distance and stopping time





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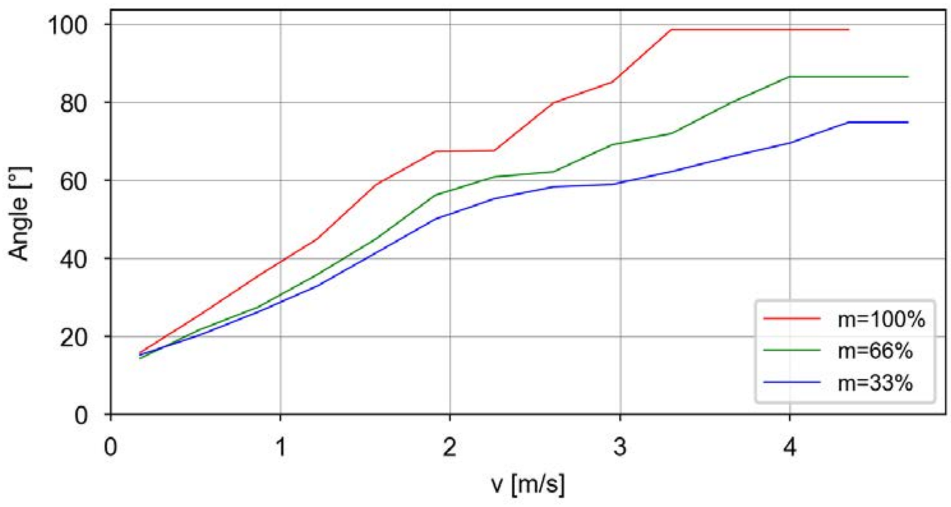
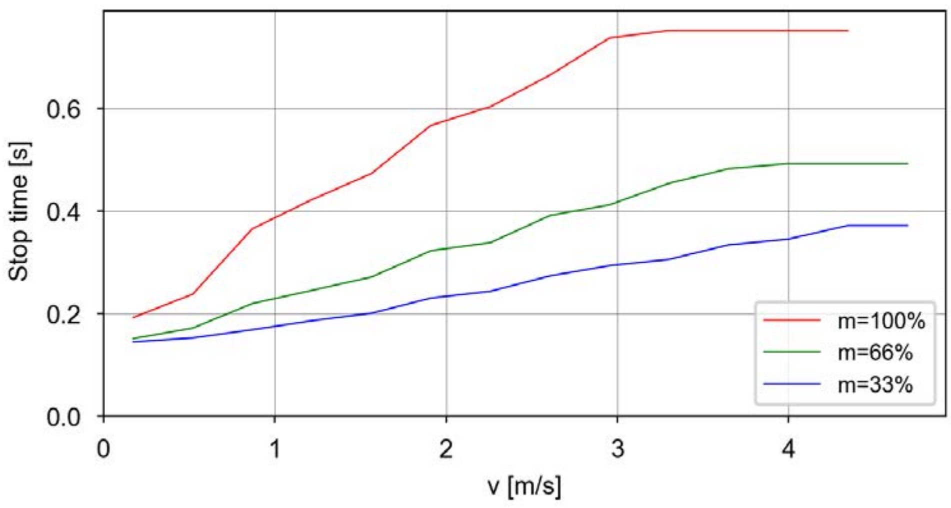
Category 1, Axis 2, Extension zone 1, stopping distance and stopping time





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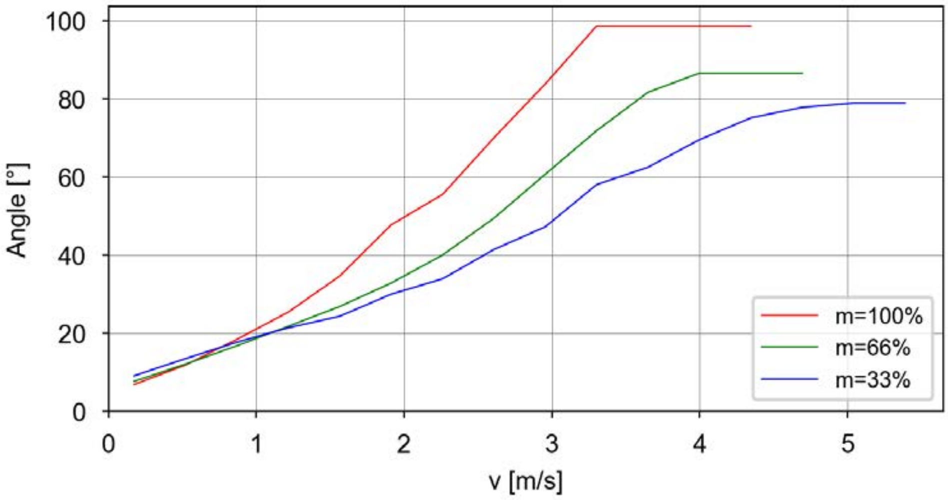
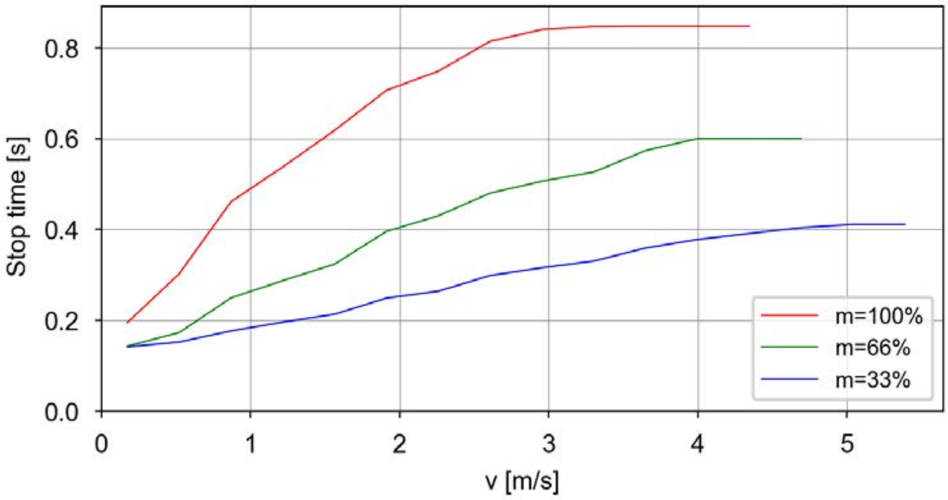
Category 1, Axis 2, Extension zone 2, stopping distance and stopping time





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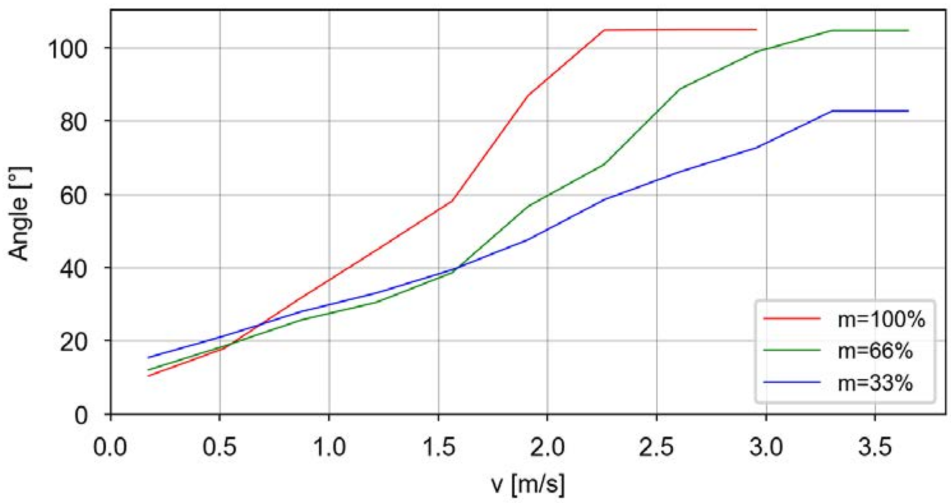
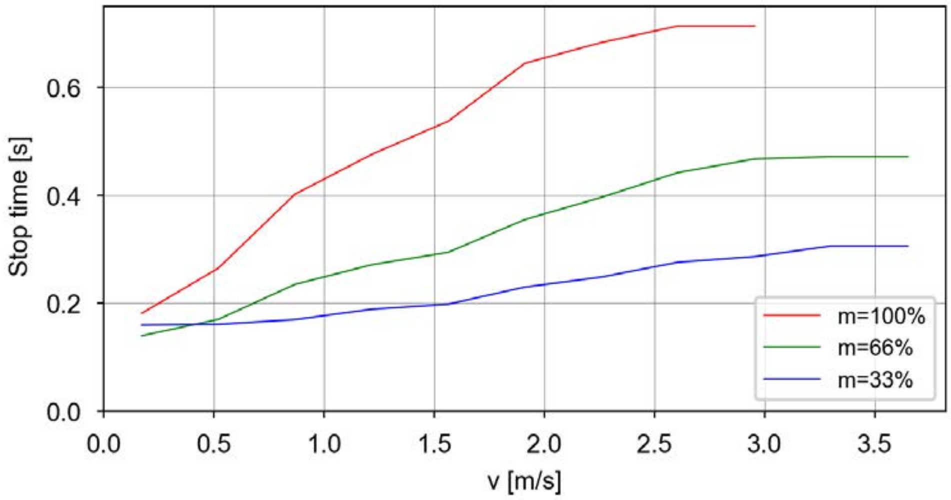
Category 1, Axis 3, Extension zone 0, stopping distance and stopping time





3 Specification of variants and options

3.1 Introduction to variants and options

General

The different variants and options for the IRB 1200 Gen2 are described in the following sections. The same option numbers are used here as in the specification form.

The variants and options related to the robot controller are described in the product specification for the controller.

3.2 Manipulator

Manipulator variants

Option	IRB Type	Handling capacity (kg)	Reach (m)
3300-122	IRB 1200-7/0.7 Gen2	7	0.7
3300-123	IRB 1200-9/0.7 Gen2	9	0.7
3300-124	IRB 1200-5/0.9 Gen2	5	0.9
3300-125	IRB 1200-8/0.9 Gen2	8	0.9

Manipulator color

Option	Description	RAL code[i]
209-202	ABB Graphite White std Standard color	RAL 7035
209-2	ABB white standard	RAL 9003
209-1	ABB orange standard	NCS 2070-Y60R

i The colors can differ depending on supplier and the material on which the paint is applied.

Manipulator protection

Option	Description
3350-400	Base 40,IP40
3350-670	Base 67,IP67
3351-4	Clean Room 4, ISO Class 4
3352-10	Foundry Plus2 67, IP67

Note

Base 40 includes IP40, according to standard IEC 60529.

Base 67 includes IP67, according to standard IEC 60529.

Clean Room class 4 includes ISO class 4 standard, according to DIN EN ISO 14644-1, -14.

Robot cabling routing

Option	Description
3309-1	Under the base
3309-2	From side of base

Mechanical stop

Option	Description
3372-1	Axis 1 mechanical stop

Continues on next page

Media & Communication

When 3303-1 Parallel & Air is selected then 3304-1 and 3305-1 options are activated for selecting.

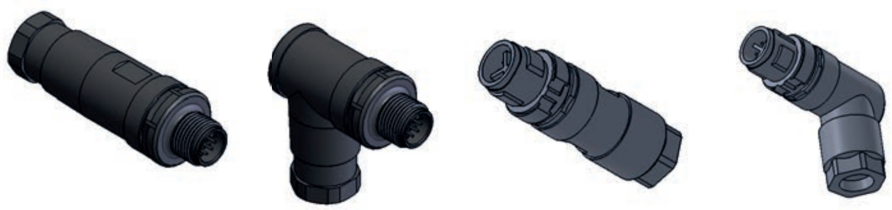
When 3303-2 Ethernet, Parallel, Air is selected then 3304-1, 3305-1, 3306-1 and 3307-1 are activated for selecting.

Option	Type	Description
3303-1	Parallel & Air	Includes CP/CS (C1) and air.
3303-2	Ethernet, Parallel, Air	Includes CP/CS (C1,C3) + Ethernet (C2), and air.

Connector kits manipulator

The kit consists of connectors, pins and sockets.

Option	Description
3304-1	Male-type, Straight arm connector kits REQUIRES: Media & Communication 3303-x
3305-1	Male-type, Angled arm connector kits REQUIRES: Media & Communication 3303-x
3306-1	Male-type, Straight arm Ethernet connector kits REQUIRES: 3303-2 Ethernet, Parallel, Air or 3303-3 Solenoid Valves Ext.
3307-1	Male-type, Angled arm Ethernet connector kits REQUIRES: 3303-2 Ethernet, Parallel, Air or 3303-3 Solenoid Valves Ext.



Straight connector kits Angled connector kits Straight Ethernet connector kits Angled Ethernet connector kits

xx1900000140

Note

The image shown here is indicative only. If there is inconsistency between the image and the actual product, the actual product shall govern.

The kits are designed and used for connectors on upper arm.

Warranty

For the selected period of time, ABB will provide spare parts and labor to repair or replace the non-conforming portion of the equipment without additional charges. During that period, it is required to have a yearly *Preventative Maintenance* according to ABB manuals to be performed by ABB. If due to customer restrains no data can be analyzed with ABB Connected Services for robots with OmniCore controllers, and ABB has to travel to site, travel expenses are not covered. The

Continues on next page

Extended Warranty period always starts on the day of warranty expiration. Warranty Conditions apply as defined in the *Terms & Conditions*.

Note

This description above is not applicable for option *Stock warranty* [438-8]

Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from *Customer Delivery Date* or latest 18 months after *Factory Shipment Date*, whichever occurs first. Warranty terms and conditions apply.
438-2	Standard warranty + 12 months	Standard warranty extended with 12 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-4	Standard warranty + 18 months	Standard warranty extended with 18 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-5	Standard warranty + 24 months	Standard warranty extended with 24 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.
438-7	Standard warranty + 30 months	Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply.
438-8	Stock warranty	Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from *Factory Shipment Date* or from activation date of standard warranty in WebConfig. **Note** Special conditions are applicable, see *Robotics Warranty Directives*.

3.3 Floor cables

Manipulator cable - Straight

Option	Lengths
3200-1	3 m
3200-2	7 m
3200-3	15 m
3200-4	22 m
3200-5	30 m

Note

When working with OmniCore V line controllers, only options 3200-4 and 3200-5 are available.

xx2100001122

Mains cable

Option	Lengths	Description
3203-1	EU mains cable, 3 m	Cable assembly with CEE7/VII line-side plug
3203-5	CN mains cable, 3 m	Cable assembly with CPCS-CCC line-side plug
3203-6	AU mains cable, 3 m	Cable assembly with AS/NZS 3112 line-side
3203-7	All regions cable, 5 m	Cable assembly without line-side plug

Tip

The option *Mains cable* requires option *3000-105 OmniCore E10* or *3000-130 OmniCore C30*.

Connection of parallel communication

Required 3303-1 Parallel & Air or 3303-2 Ethernet, Parallel, Air.

Option	Lengths
3201-1	3 m
3201-2	7 m
3201-3	15 m

Continues on next page

Option	Lengths
3201-4	22 m [i]
3201-5	30 m [i]

i When working with OmniCore V line controllers, only cable lengths 22m and 30m are available.

Connection of Ethernet

Required 3303-2 Ethernet, Parallel, Air and occupies 1 Ethernet port.

Option	Lengths
3202-2	7 m
3202-3	15 m
3202-4	22 m [i]
3202-5	30 m [i]

i When working with OmniCore V line controllers, only cable lengths 22m and 30m are available.

4 Accessories

General

There is a range of tools and equipment available.

Basic software and software options for robot and PC

For For more information, see the application manual for the controller software and the product specification for the robot controller.

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