

ROBOTICS

Product specification

Motor Units and Gear Units



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Product specification

**MU 80, MU 100, MU 200, MU 250, MU 300, MU 400
MTD 250, MTD 500, MTD 750, MTD 2000, MTD 5000
MID 500, MID 1000**

OmniCore

Document ID: 3HAC090259-001

Revision: A

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Table of contents

Overview of this product specification	7
1 Description	9
1.1 Motor Units and Gear Units	9
1.2 Scenarios	12
1.3 Motor connection kit	15
1.4 Cables	21
1.5 Applicable standards	24
1.6 Installation	25
1.6.1 Installation	25
1.6.2 Operating requirements	26
1.6.3 On site installation	27
2 Technical data	29
2.1 Motor units	29
2.1.1 Introduction	29
2.1.2 Dimensions	30
2.1.3 Technical data	37
2.1.4 Performance diagrams	38
2.1.5 Permissible loads at motor shaft	43
2.1.6 Using the motor unit in direct contact with gearbox oil/grease	45
2.2 Gear units	46
2.2.1 Introduction	46
2.2.2 Dimensional drawings	47
2.2.3 Technical data	68
2.2.4 Load diagrams	70
2.2.5 Dimensioning gear units	74
3 Variants and options	75
3.1 Introduction to variants and options	75
3.2 Motor units and Gear units	76
3.3 Cables	80
3.4 User documentation	81
Index	83

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Overview of this product specification

About this product specification

This specification describes the performance of the motor units and the gear units in terms of:

- The structure and dimensional prints
- The fulfilment of applicable standards, safety, and operating requirements
- The load diagrams, mounting of additional equipment, the motion and reach
- Customer connections
- The specification of variants and options available

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

References

Reference	Document ID
<i>Product specification - OmniCore V line</i>	3HAC074671-001
<i>Product manual - Motor Units and Gear Units</i>	3HAC090254-001
<i>Circuit diagram - Motor Units and Gear Units</i>	3HAC039887-001

Revisions

Revision	Description
A	First edition.

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1 Description

1.1 Motor Units and Gear Units

Introduction

This specification provides the characteristics and performance for the Motor Units and Gear Units to be used during design phase. The units are power-operated and function as external axes. They are powered from ABB drive units mounted in the robot controller. These drive units are controlled from robot control software.

These motor units and gear units are to be used as building blocks to realize customer specific solution / mechanism for rotation / translation of workpiece or manipulator (positioners, track motions, etc.).

Article number used on delivery documents

The products described in this document are delivered with an article number (3HAC090279-001) that is a collective number used on the delivery documents.

For traceability reason, each component has a label with an article number. For variants and options see section [Variants and options on page 75](#).

Robot controller

The motor units and gear units are controlled by the robot controller and robot control software, RobotWare. The RobotWare supports every aspect of the robot, including the units, such as motion control, development and execution of application programs, communication and so on. For more information, see *Product specification - OmniCore V line*.

Safety for mechanical parts based on motor units and gear units, designed by the integrator needs to address associated hazards. This needs to be done by the integrator through for example ISO 12100, ISO 10218-1, ISO 10218-2, ISO 13849, EN 60204, and other application specific standards.

Motor connection box (MCB)

The motor connection box can be ordered together with the industrial robot and allows connection of 1-6 Motor Units and/or Gear Units to the robot controller.

The motor connection box can be located 7, 15, or 22 meters from the cabinet.

The motor connection box can be equipped with brake release buttons (optional), one for each unit.

Brakes

All motors, both in motor units and in gear units, are equipped with electromagnetic brakes. The brakes are "on" when they are not energized. They can be released with push buttons (optional) on the motor connection box or by customer installed button at the Motor Unit/Gear Unit.

Continues on next page

1 Description

1.1 Motor Units and Gear Units

Continued

Thermal supervision

For protection against overheating of motor units (except MU 100 and MU 80) and gear units, there is a thermal supervision model that shall be configured and tuned. For more information see the product manual.

When properly tuned, there will be a warning close to maximum temperature and complete stop when maximum temperature is exceeded.

Limitations

- Cannot be combined with IRP positioners (if needed contact Robotics Sales Support for a quotation).
- Robot controller without MCB box allows maximum one motor unit.
- Robot controller with MCB box allows maximum 3 or 6 motor units (depends on MCB variant and number of additional drives).

How to order

As a basic rule when adding Motor Units or Gear Units to already installed robots, always place a separate order for each robot, to secure that correct number of cables/contacts for the robot controllers are delivered. When adding Motor Units and Gear Units to a robot already equipped with external axes, contact your local ABB office.

The Motor Units and Gear Units described in this specification are not tested for compatibility by a configurator when ordering products, due to that these are components to be integrated into systems with a vast amount of possible combinations, both hardware and software-wise, which cannot be foreseen, allowing orders to contain non allowed/invalid configurations. This means, it is possible to place an order either manually or via ordering system containing units that cannot be connected together to obtain a fully functional robot.

The motor- and gear units cannot be combined with other standard products from the supplying unit without additional engineering.

The following scenarios will always require a quotation, contact your local ABB office:

- If flexible power- and signal cables are required between robot and robot controller.
- MU & GU combined with track motions (IRT) and positioner (IRP).
- MU & GU used in MultiMove systems.

Kinematic models are not included. Kinematic models for limited combinations of MU & GU can be set up by using the **External Axis Wizard**, which is a RobotStudio add-in.

Kinematic models can also be quoted on request, contact your local ABB office.

ABB will not take any functional responsibility for systems ordered.

Configuration files

Template configuration files are included in the delivery with the motor units and gear units. The configurations for motor units and gear units can be tuned before running in production to optimize performance.

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Acronyms

The following acronyms are used in this document.

Acronym	Description
MU	Motor unit
GU	Gear unit
MTD	Mechanical turning unit, gear unit 4th generation
MID	Mechanical interchange unit, gear unit 4th generation
MCB	Motor connection box
IRT	Track motion from ABB
IRP	Positioner from ABB

1 Description

1.2 Scenarios

1.2 Scenarios

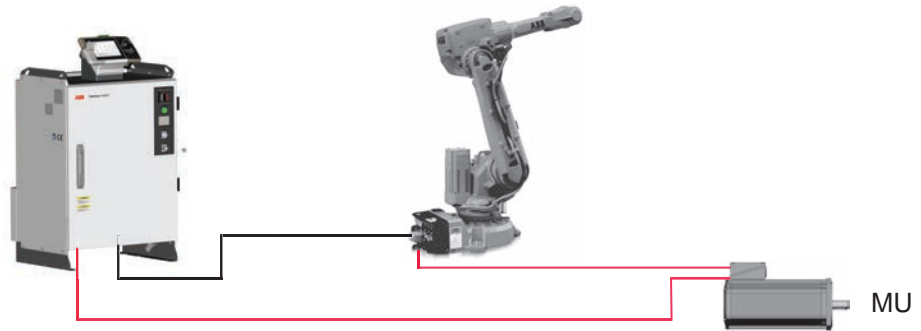
Introduction

Below are different scenarios described for installation of the units. The axis selector, available as an option inside the robot controller, allowing to cut the power to the motor units and gear units, will not be shown in the scenarios below.

Concepts

Scenario A, Lean concept:

- One motor unit
- No motor connection box (MCB)
- Motor power connected to the robot controller and resolver connected to FB7 at manipulator.

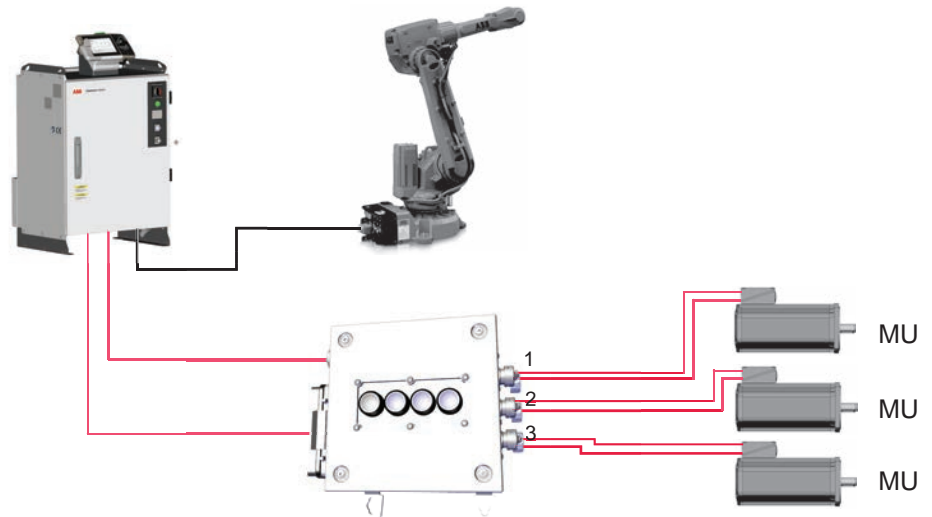


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Scenario B:

- 3-axis motor connection box (MCB) connected to the robot controller
- Up to three motor units or gear units motor units connected to one motor connection box (MCB)



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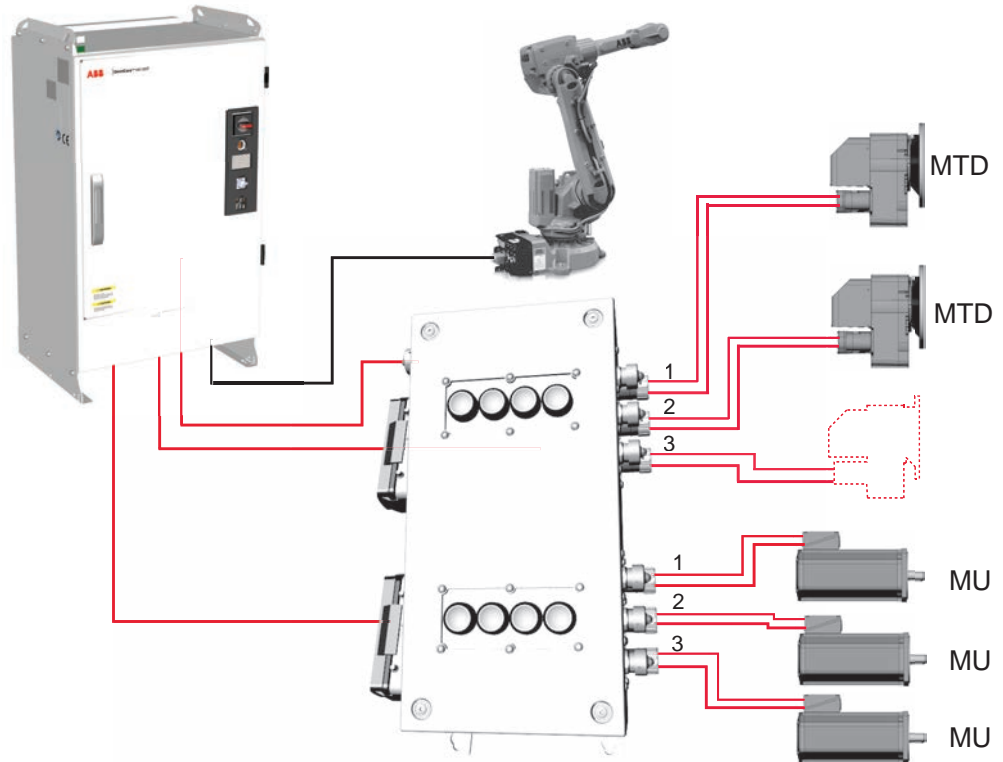
1 Description

1.2 Scenarios

Continued

Scenario C:

- 6-axis Motor connection box (MCB) connected to the robot controller
- Up to six motor units or gear units connected to the robot controller, through the motor connection box (MCB)



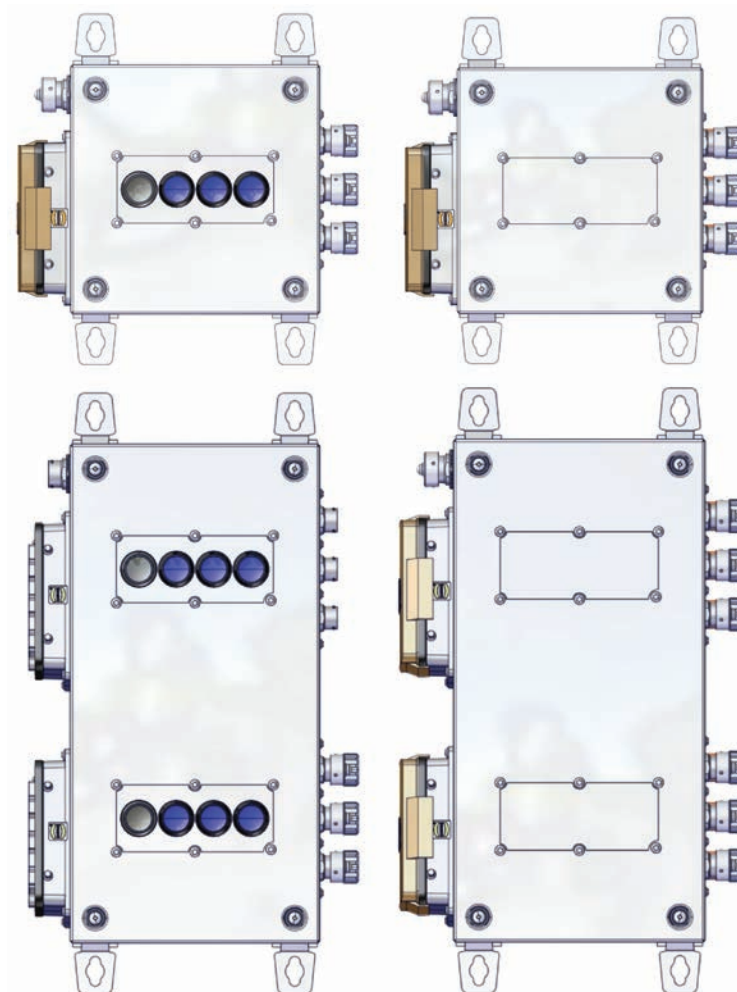
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1.3 Motor connection kit

General

The motor connection kit consists of the motor connection box and floor cables. Depending on the selected option, the motor connection box allows the connection of one to six motor units and/or gear units to the robot controller.

The motor connection box can be located 7, 15, or 22 meters from the cabinet. Motor units and gear units can be connected to the motor connection box through flexible cables with lengths of 7, 15, or 22 meters. The motor connection box can be equipped with brake release buttons, one for each motor unit.



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Installation requirements

- If third party motors are to be used, a quenching circuit must be installed.

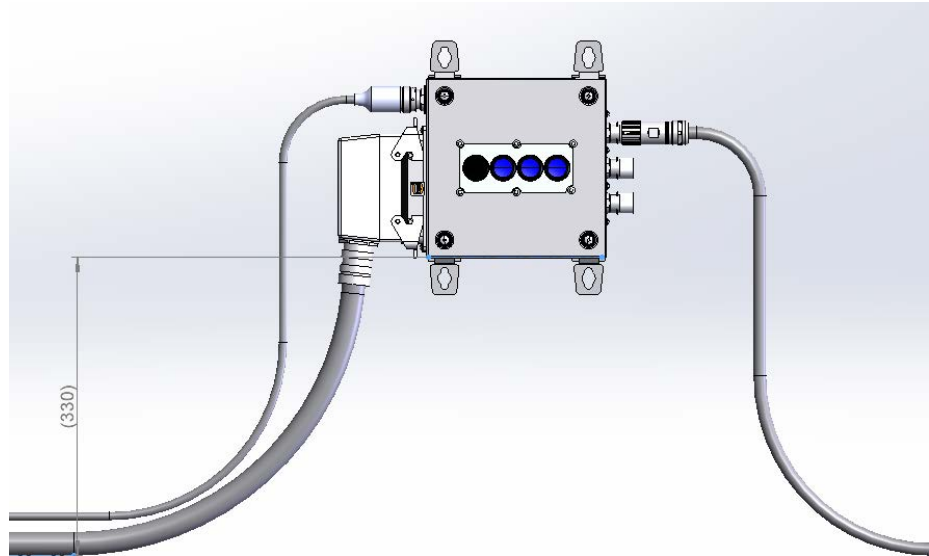
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1 Description

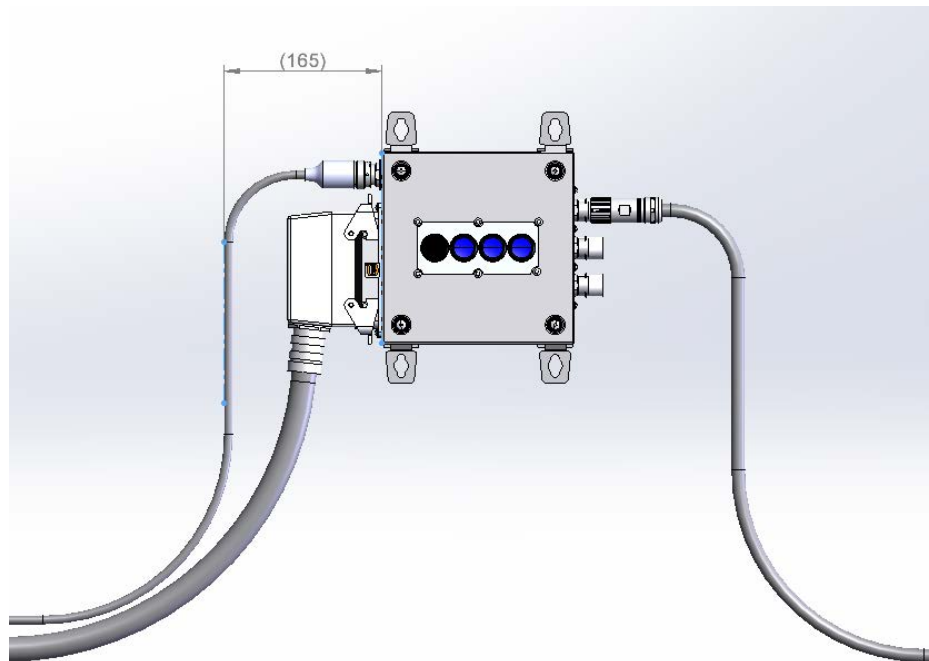
1.3 Motor connection kit

Continued

- The following minimum space is required beside the motor connection box due to stiffness of floor cables:



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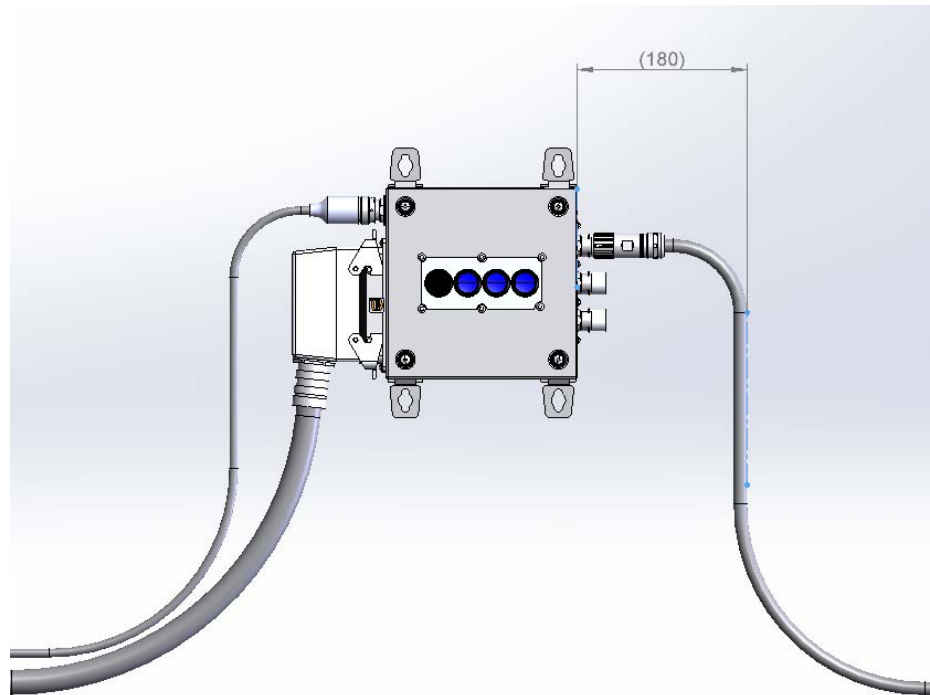
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1 Description

1.3 Motor connection kit

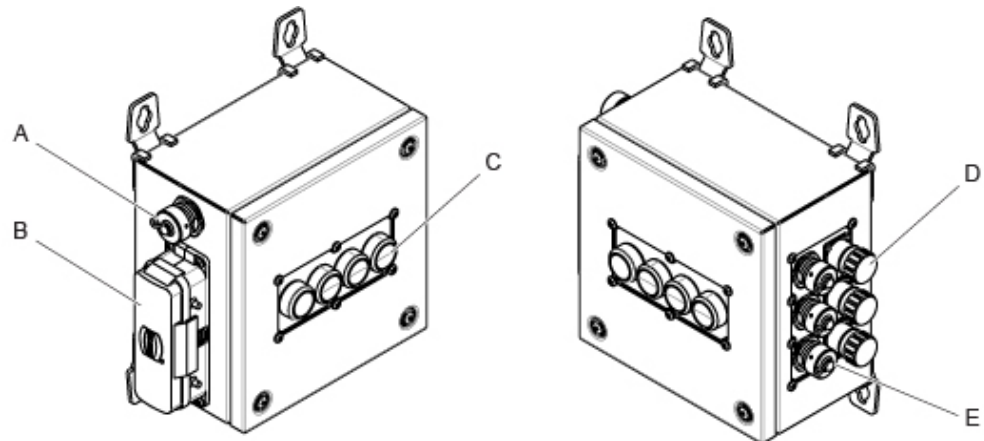
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Motor connection box, 3-axis [3069-1x]

Overview



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A	Cable harness resolver, bus
B	Cable harness power, axis 1-3
C	Brake release buttons (optional)
D	Cable harness motor power, axis 1-3
E	Resolver signal, axis 1-3

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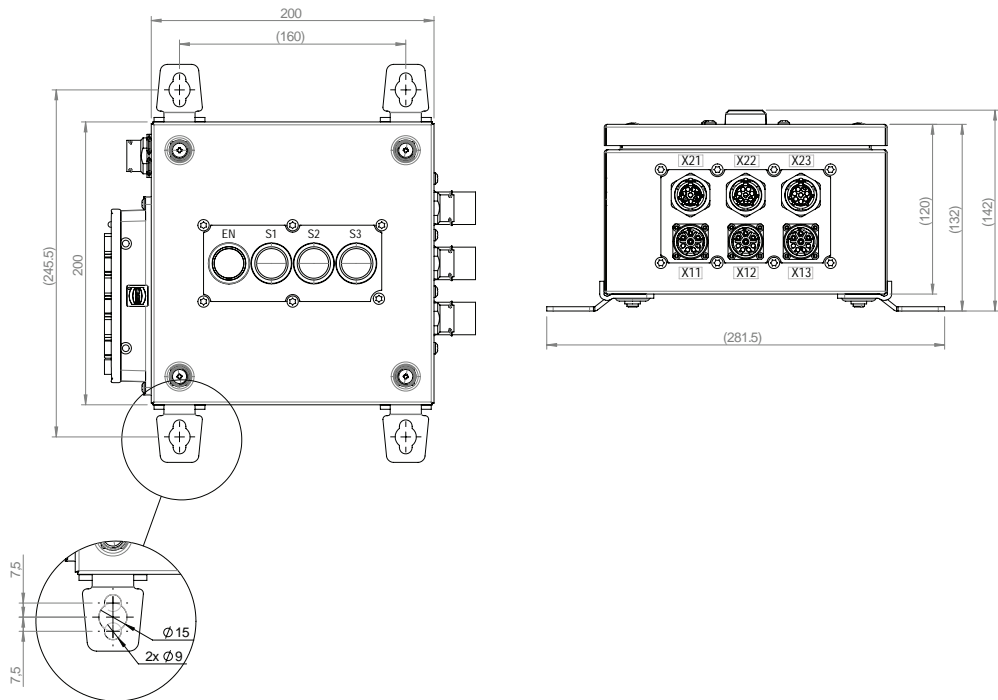
1 Description

1.3 Motor connection kit

Continued

Dimensions

The graphic below shows the dimensions of the motor connection box.



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Option description

The option *Connection box [3069-1x]* includes the following:

- 1 Motor connection box, 3-axis
- 1 External axis power harness
- 1 SMB cable

Cable length

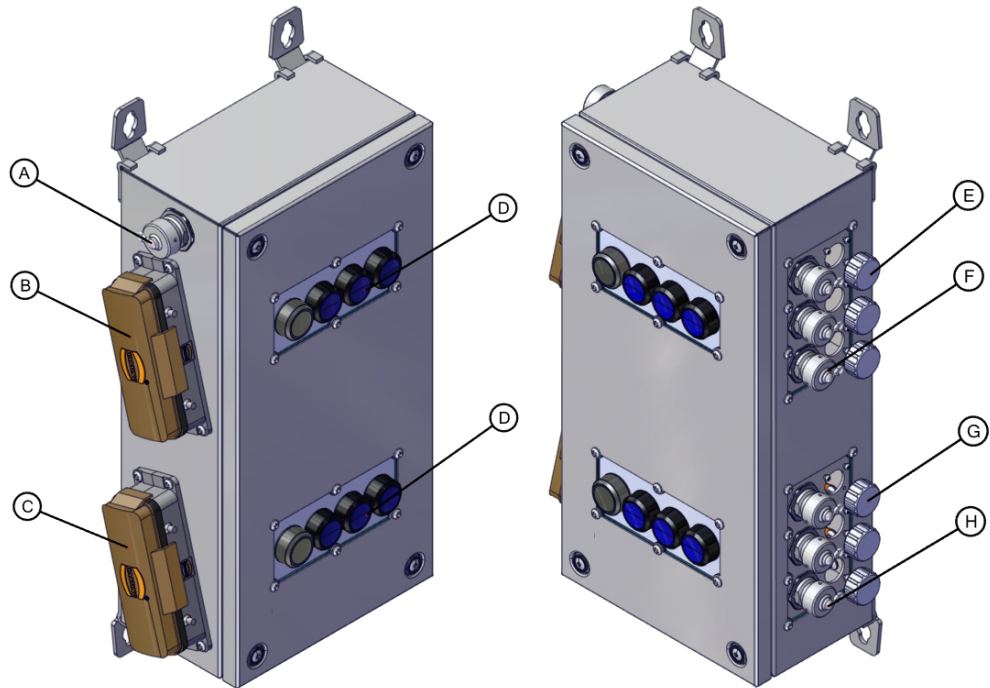
Length of cables is determined by the selected option, see below:

Option	Cable length
Connection box [3069-12]	7 m
Connection box [3069-13]	15 m
Connection box [3069-14]	22 m
Connection box [3069-15]	30 m

Continues on next page

Motor connection box, 6-axis [3069-2x]

Overview



xx2300001718

A	Cable harness resolver, bus
B	Cable harness power, axis 1-3
C	Cable harness power, axis 4-6
D	Brake release buttons (optional)
E	Cable harness motor power, axis 1-3
F	Resolver signal, axis 1-3
G	Cable harness motor power, axis 4-6
H	Resolver signal, axis 4-6

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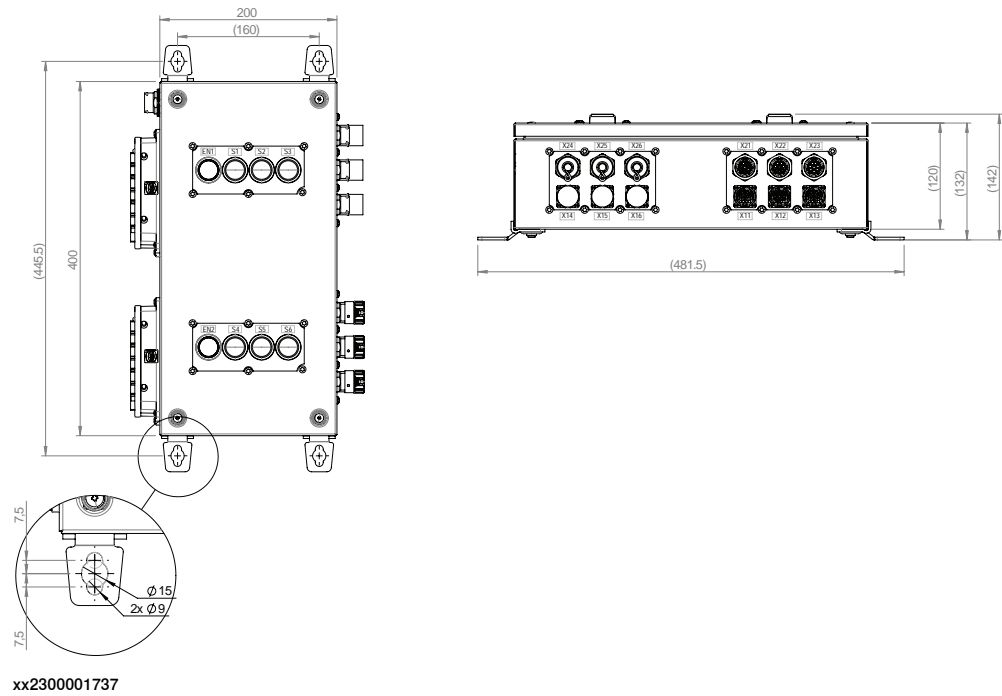
1 Description

1.3 Motor connection kit

Continued

Dimensions

The graphic below shows the dimensions of the motor connection box.



Option description

The option *Connection box [3069-2x]* includes the following:

- 1 Motor connection box, 3-axis
- 2 External axis power harnesses
- 1 SMB cable

Cable length

Length of cables is determined by the selected option, see below:

Option	Cable length
Connection box [3069-22]	7 m
Connection box [3069-23]	15 m
Connection box [3069-24]	22 m
Connection box [3069-25]	30 m

1.4 Cables

Introduction

Options	Cable	Name	Note
Part of <i>Motor connection kit</i> 3069-x	Motor cable	OmniCore - MCB Cable harness power	From robot controller to MCB.
4114-1, 4114-2, 4114-3	Motor cable	OmniCore - MU Cable harness power	Flex cable from robot controller to motor or gear unit.
Part of <i>Motor connection kit</i> 3069-x	SMB cable	OmniCore - MCB Cable harness resolver, bus	From robot controller to MCB.
4118-1, 4119-1, 4120-1	Resolver cable	MCB - MU/GU Signal	Flex cable from MCB to motor unit/gear unit or from IRB to motor unit.
4115-1, 4116-1, 4117-1	Motor cable	MCB - MU/GU Cable harness power	Flex cable from MCB to motor or gear unit.

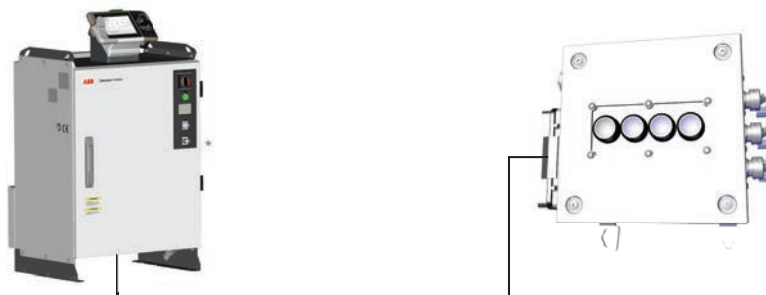
Illustrations below shows the routing of the cables.

For more details, see the circuit diagram.

OmniCore - MCB cable harness power

Part of *Motor connection kit* 3069-x.

Non-flexible cable. For cable lengths, see [Cables on page 80](#).



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OmniCore - MU Cable harness power

Option 4114-1, 4114-2, 4114-3. (Flexible cable). For cable lengths, see [Cables on page 80](#).



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1 Description

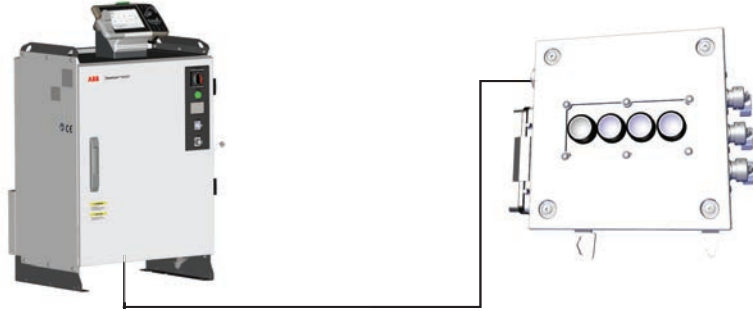
1.4 Cables

Continued

OmniCore - MCB Cable harness resolver, bus

Part of *Motor connection kit 3069-x*.

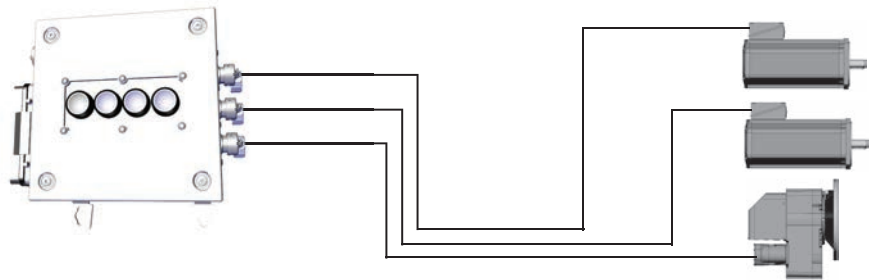
Non-flexible cable. For cable lengths, see [Cables on page 80](#).



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MCB - MU/GU Signal

Option 4118-1, 4119-1, 4120-1. (Flexible cable). For cable lengths, see [Cables on page 80](#).

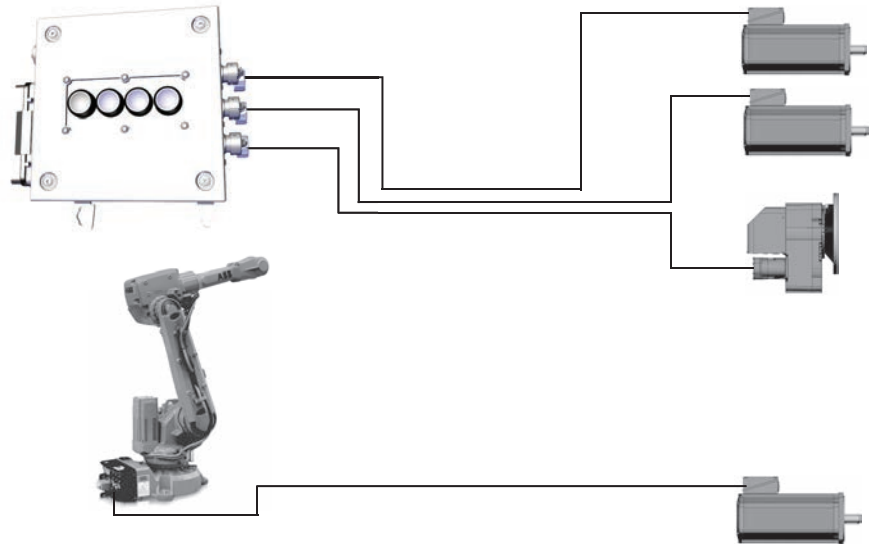


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MCB - MU/GU Cable harness power

Option 4115-1, 4116-1, 4117-1. (Flexible cable). For cable lengths, see [Cables on page 80](#).



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1 Description

1.5 Applicable standards

1.5 Applicable standards

General

Safety for mechanical parts based on motor units and gear units, designed by the integrator needs to address associated hazards. This needs to be done by the integrator through for example ISO 12100, ISO 10218-1, ISO 10218-2, ISO 13849, EN 60204, and other application specific standards.



Note

As this product is not delivered as a robot, it does not comply with ISO 10218-1.

Robot standards

Standard	Description
ISO 10218-1	Robots for industrial environments - Safety requirements - Part 1 Robots
ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration

Other standards to be considered

Standard	Description
ISO 12100	Safety of machinery – General principles for design - Risk assessment and risk reduction
IEC 60204-1	Safety of machinery – Electrical equipment of machines
ISO 13849	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
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

1.6 Installation

1.6.1 Installation

Introduction

Detailed information regarding mechanical installation can be found in *Product manual - Motor Units and Gear Units*.

The system parameter configuration files for the motor units and gear units are included in RobotWare Download package. The files suit the most common combinations of drive and measuring systems. The parameters can be loaded either via:

- FlexPendant
- RobotStudio

Select suitable files depending on the location of the drive unit and then depending on the size of motor. The parameters are a basis for continued work. It is therefore necessary to configure either the name or the acceleration data, transmission (gear ratio), etc.

1 Description

1.6.2 Operating requirements

1.6.2 Operating requirements

Protection standards

Product	Protection standard IEC60529
MU 100, MU 200, MU 250, MU 300, MU 400	IP67
MTD 250, MTD 500, MTD 750, MTD 2000, MTD 5000	IP65
MID 500, MID 1000	IP65

Explosive environments

The motor units and gear units must not be located or operated in an explosive environment.

Ambient temperature

Description	Standard/Option	Temperature
Motor unit during operation	Standard	+ 5°C (41°F) to + 52°C (126°F)
Gear unit during operation	Standard	+ 5°C ⁱ (41°F) to + 52°C (126°F)
For short periods (not exceeding 24 hours)	Standard	up to + 70°C (158°F)

ⁱ At low environmental temperature < 10 degrees C is, as with any other machine, a warm-up phase recommended to be run with the unit. Otherwise there is a risk that the unit stops or run with lower performance due to temperature dependent oil and grease viscosity.

Relative humidity

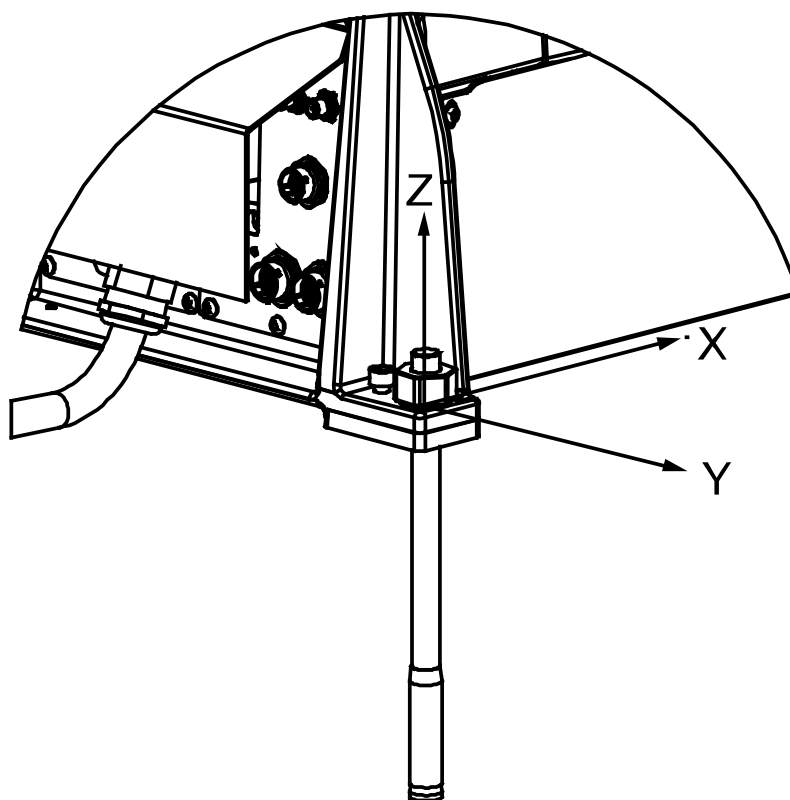
Description	Relative humidity
During transportation and storage	Max. 95% at constant temperature
During operation	Max. 95% at constant temperature

1.6.3 On site installation

Forces for MID units

Maximum floor loads in relation to the base coordination system for the MID 500 and MID 1000 units and indicated per each screw of the base on the unit. See graphic below.

Type	Endurance load in operation (kN)		Max. load at emergency stop (kN)	
	Fxy	Fz (±)	Fxy	Fz (±)
MID 500	1.5	6	3	8
MID 1000	2.7	15	6.4	22.3



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Installation of MID units

It is important to ensure that the floor withstand the forces stated above for MID units.

	MID 500	MID 1000
Recommended screws	4 x M16	4 x M20
Class	8.8	8.8

Continues on next page

1 Description

1.6.3 On site installation

Continued

Installation of MTD units

It is important to ensure that the frame carrying the MTD unit provides sufficient rigidity and strength to support the loads. For recommended min clamping thickness of frame see [Dimensional drawings on page 47](#).

	MTD 250	MTD 500	MTD 750	MTD 2000	MTD 5000
Recommended screws	4 x M12	4 x M20	4 x M20	8 x M20	12 x M24
Class	12.9	12.9	12.9	12.9	12.9
Tightening torque (Nm) ±10%	120	550	550	550	950
Min. used threads of screw in the gearbox (mm)	> 29	> 47	> 47	> 50	> 37

2 Technical data

2.1 Motor units

2.1.1 Introduction

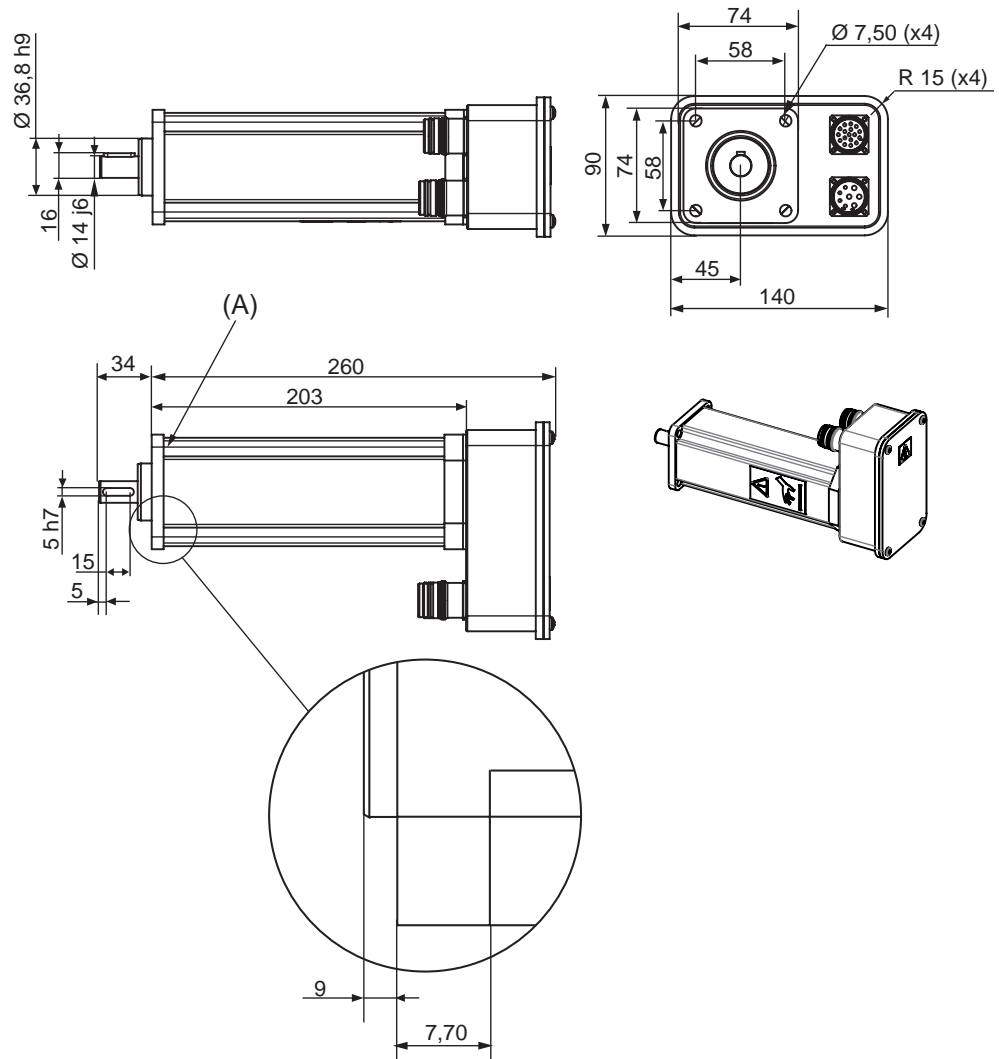
General

The motor units are intended to be used for peripheral equipment requiring power controlled motors synchronized with the robot movement.

2 Technical data

2.1.2 Dimensions Continued

MU 100



xx1000001206

Rs	Description	Tightening torque [Nm] ±10%
A	Mounting screw M 6 (quality 8.8), max. washer Ø 11 mm.	10

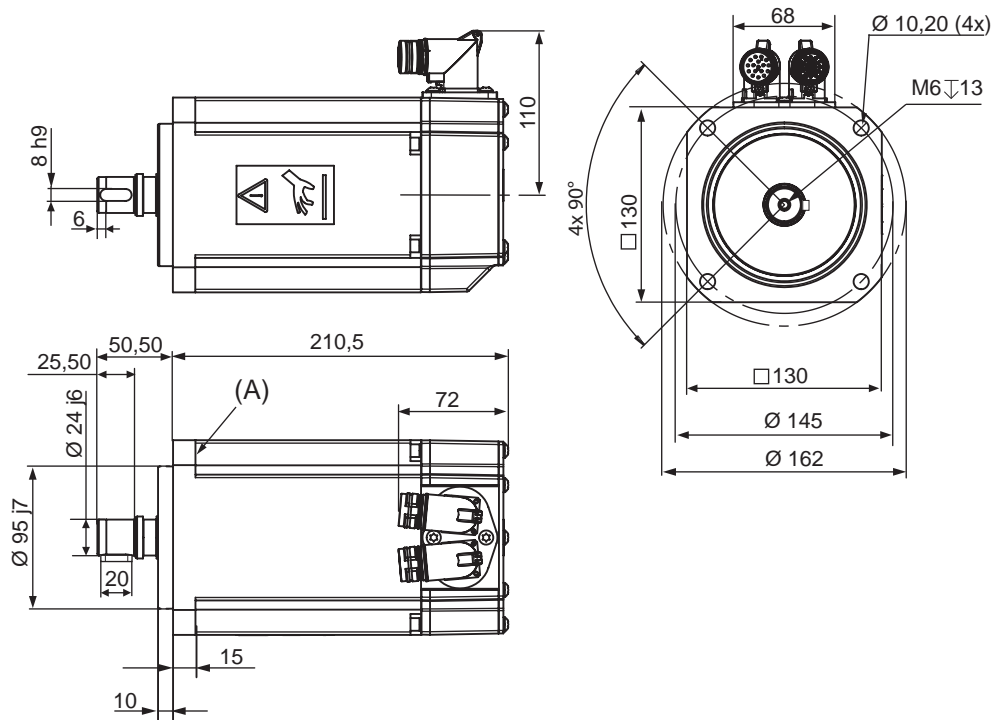
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2 Technical data

2.1.2 Dimensions

Continued

MU 200

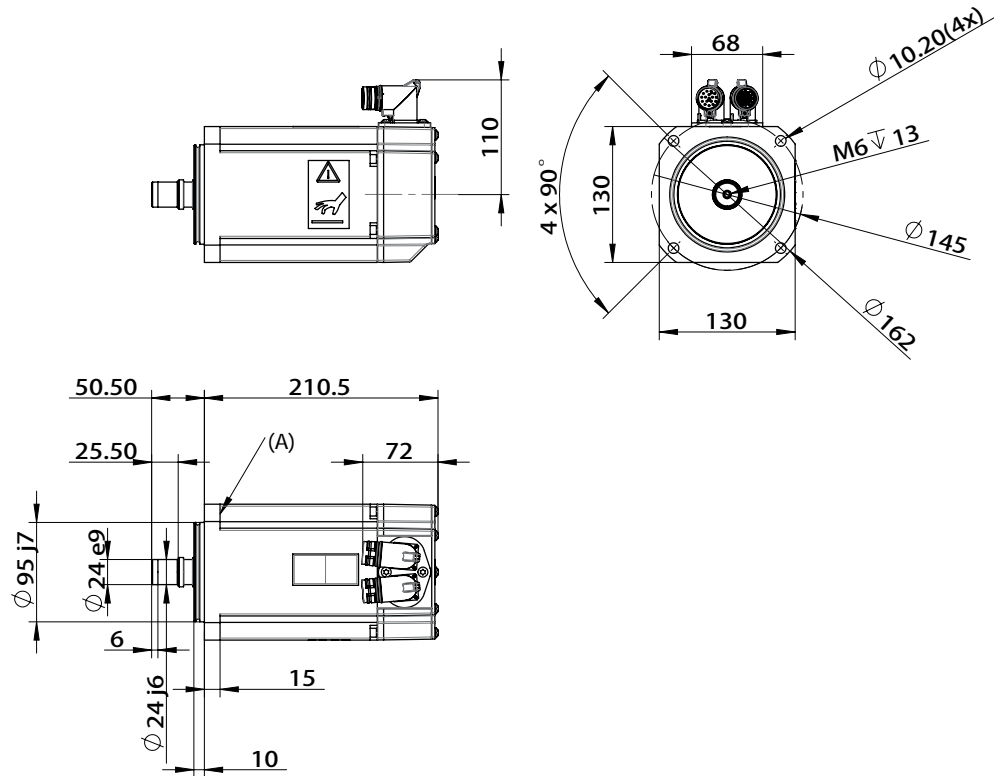


xx110000099

Rs	Description	Tightening torque [Nm] ±10%
A	<p>The thread in the mounting holes in the motor flange are intended for disassemble of the motor, by removing the fixing screws and inserting a screw to press the motor out. Holes in motor flange M 12, free diameter Ø 10.2 mm. Mounting screw M 8 (quality 8.8), max. washer Ø 17 mm.</p>	24

Continues on next page

Smooth shaft adaptor



xx170000812

Rs	Description	Tightening torque [Nm] ±10%
A	The smooth shaft adaptor has a smooth surface without a keyhole slot. The diameter and the length are the same as the standard shaft adaptor with keyhole slot. The purpose of removing the keyhole slot is to meet the requirements from some integrators who prefer this design. This option is for the moment only available for MU 200.	24

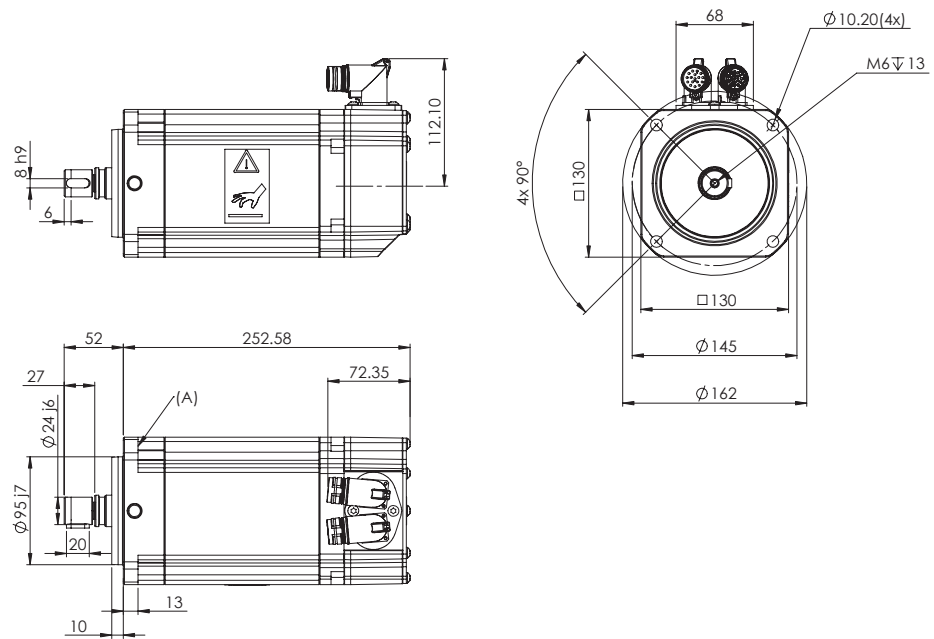
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2 Technical data

2.1.2 Dimensions

Continued

MU 250



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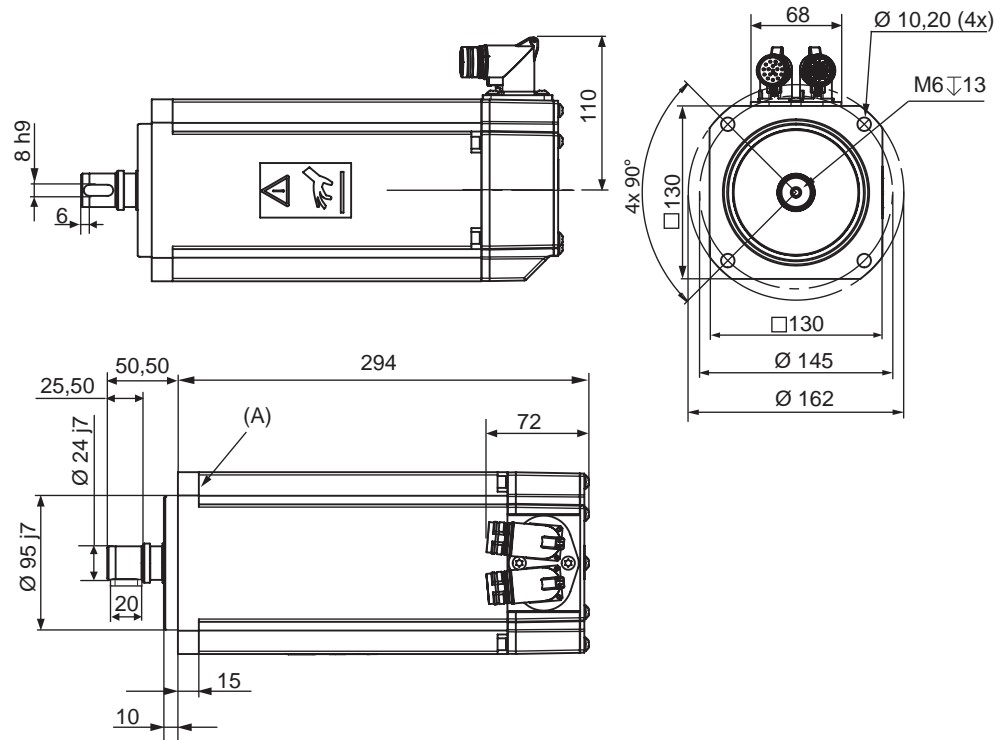
Rs	Description	Tightening torque [Nm] ±10%
A	The thread in the mounting holes in the motor flange are intended for disassemble of the motor, by removing the fixing screws and inserting a screw to press the motor out. Holes in motor flange M 12, free diameter Ø 10.2 mm. Mounting screw M 8 (quality 8.8), max. washer Ø 17 mm.	11.8

Continues on next page

2 Technical data

2.1.2 Dimensions Continued

MU 300



xx110000100

Rs	Description	Tightening torque [Nm] ±10%
A	<p>The thread in the mounting holes in the motor flange are intended for disassemble of the motor, by removing the fixing screws and inserting a screw to press the motor out. Holes in motor flange M 12, free diameter Ø 10.2 mm.</p> <p>Mounting screw M 8 (quality 8.8), max. washer Ø 17 mm.</p>	24

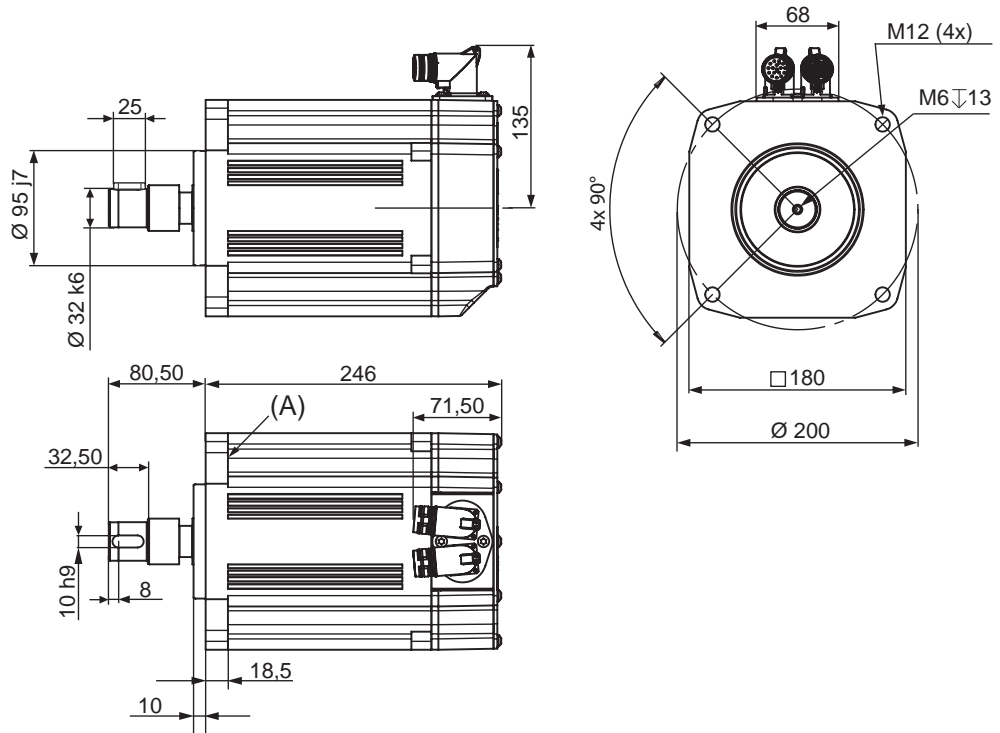
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2 Technical data

2.1.2 Dimensions

Continued

MU 400



xx1100000101

Rs	Description	Tightening torque [Nm] ±10%
A	The thread in the mounting holes in the motor flange are intended for disassemble of the motor, by removing the fixing screws and inserting a screw to press the motor out. Holes in motor flange M 12, max. washer Ø 21 mm.	47

2.1.3 Technical data

Technical data

Parameter	MU 80	MU 100	MU 200	MU 250	MU 300	MU 400
Minimum suitable bus voltage in robot controller (V DC) ⁱ	280	280/453	280/453	280/453	280/453	280/453
Nnom: nominal speed (rpm)	6,000	3,300	5,000	4,750	5,000	4,700
Nrms: speed @ rms torque (rpm)	3,000	1,650	2,000	1,800	2,000	1,880
T0: Low speed torque 0 to 10 rpm (Nm) ⁱⁱ	0.96	1.5	7	13	17	26
Trms: torque @ rms speed (Nm) ⁱⁱ	0.96	1.4	6.4	12	12.5	20
Tnom: torque @ nominal speed (Nm) ⁱⁱ	0.96	1.0	1.0	2	2.6	10
Tacc: max dynamic torque (Nm) (Torque absolute max)	2.5	4.3	14 ⁱⁱⁱ	28 ^{iv}	35 ^v	50 ^{vi}
Kt: torque constant (Nm/A) ^{vii}	0.39	0.453	0.76	1.11	0.967	1.17
iMax (A)	8.7	11	30.5	39.3	58	68.4
Temp max: max allowed average winding temperature (deg C)	140	140	140	140	140	140
Temp amb: allowed ambient temperature (deg C)	-5 to 55	0 to +52	0 to +52	0 to +52	0 to +52	0 to +52
Jtot: total inertia motor unit (kgm ²)	0.36x10 ⁻⁴	0.8x10 ⁻⁴	7.5x10 ⁻⁴	10.74x10 ⁻⁴	16.6x10 ⁻⁴	49.3x10 ⁻⁴
m: mass (kg)	1.37	4.4	10.3	13.2	15	27
Sealing class: IP rating acc. to IEC529	IP 40	IP 67	IP 67	IP 67	IP 67	IP 67

ⁱ The minimum suitable DC bus voltage affects the available torque at high speed.

ⁱⁱ During normal conditions. If ambient temperature > 40 degrees C, or poor cooling conditions, reductions may apply.

Conversion factor if the ambient temperature is higher than 40 degrees C:

- Ambient temperature = 45 degrees C => 0.97
- Ambient temperature = 52 degrees C => 0.94

ⁱⁱⁱ The value in the template configuration file is 7.5. See *Product manual - Motor Units and Gear Units*.

^{iv} The value in the template configuration file is 14. See *Product manual - Motor Units and Gear Units*.

^v The value in the template configuration file is 17.5. See *Product manual - Motor Units and Gear Units*.

^{vi} The value in the template configuration file is 25. See *Product manual - Motor Units and Gear Units*.

^{vii} Nominal value. Variations (from +5% to -20%) due to tolerances, winding temperature, and other factors may apply.

Brake data

Brake data	MU 80	MU 100	MU 200	MU 250	MU 300	MU 400
Tbrake min: minimum brake torque (Nm)	0.8	0.7	7.3	11.8	15	24
Tbrake max: maximum brake torque (Nm)	2	1.4	17	25	30	60
Brake voltage: brake voltage requirement (V DC)	24±10%	24±10%	24±10%	24±10%	24±10%	24±10%
Brake power consumption (W)	<12	8	<22	<28	<28	<34
Max inertia: max allowed load inertia at N _{nom} (kgm ²) ⁱ	0.64	0.0031	0.036	0.036	0.036	0.035

ⁱ Warning! This represents the maximum brake energy that the brake is tested for.

2 Technical data

2.1.4 Performance diagrams

2.1.4 Performance diagrams

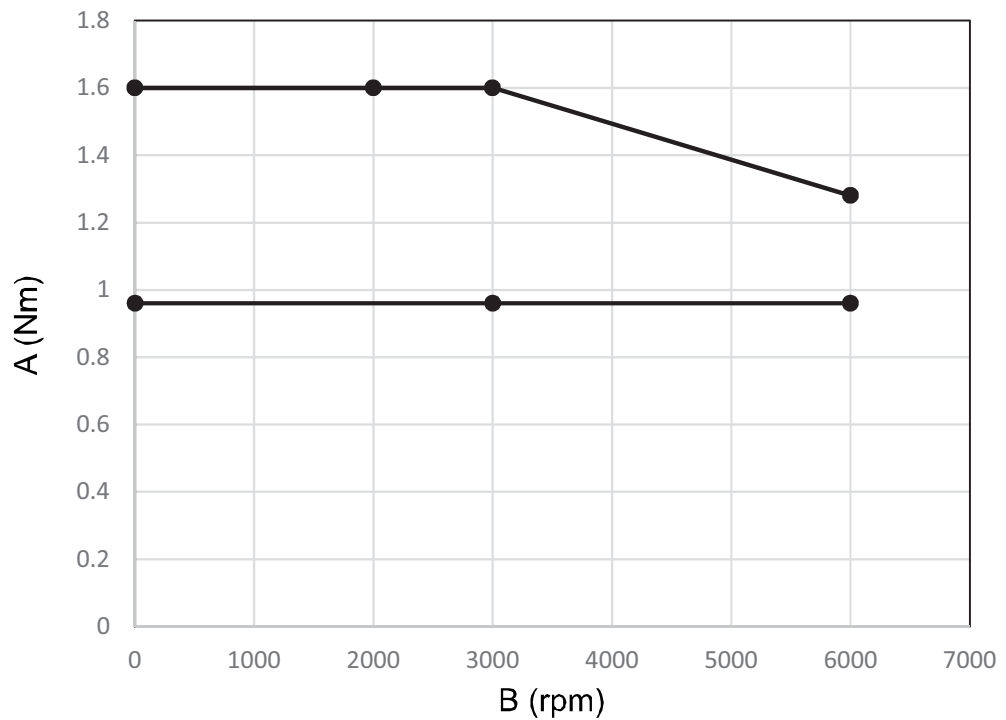
Introduction

The following diagrams shows the torque curve for the motor units.

Below is a list of required DC Link for each robot:

Type of DC Link	Robot
High voltage DC Link	IRB460, IRB660, IRB4600, IRB66X0, IRB6700, IRB7600
Low voltage DC Link	IRB120, IRB140, IRB360, IRB1200, IRB1400, IRB1520, IRB1600, IRB2400, IRB2600, IRB4400

MU 80

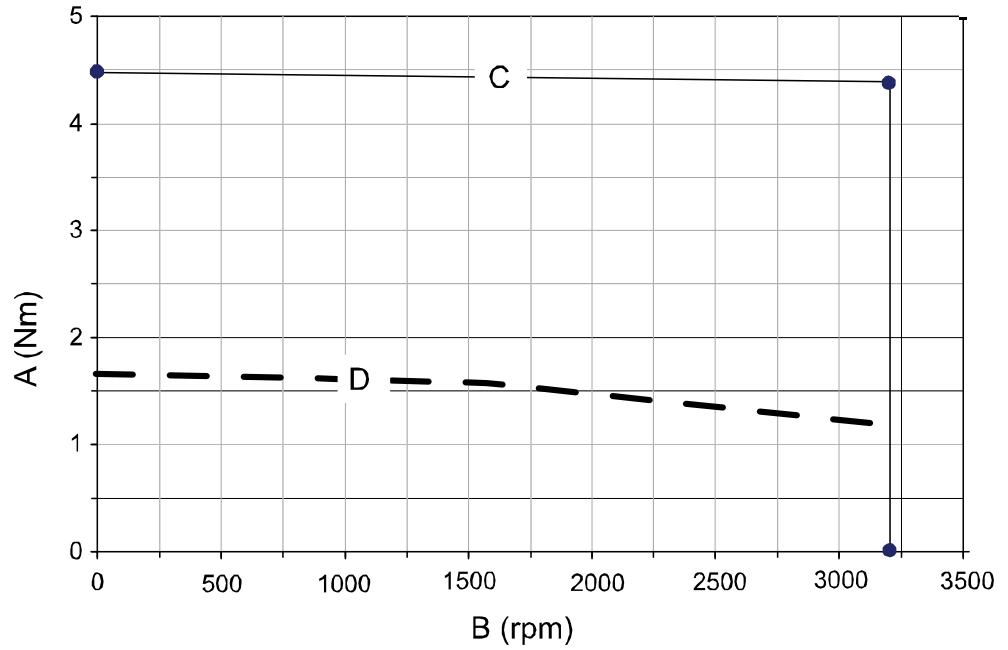


xx1700001336

Pos	Description
A	Motor torque
B	Motor speed
C	Acceleration Torque LV
D	Constant Torque

Continues on next page

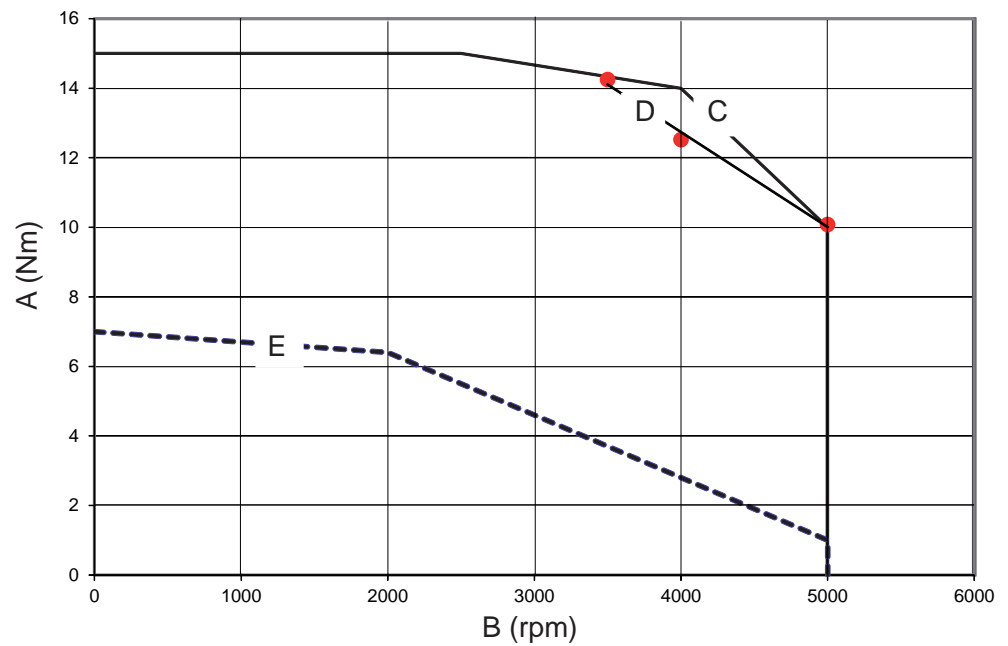
MU 100



xx1000001219

Pos	Description
A	Motor torque
B	Motor speed
C	T_{acc} = torque at acceleration
D	$T_{average}$ = average torque

MU 200



xx1000001220

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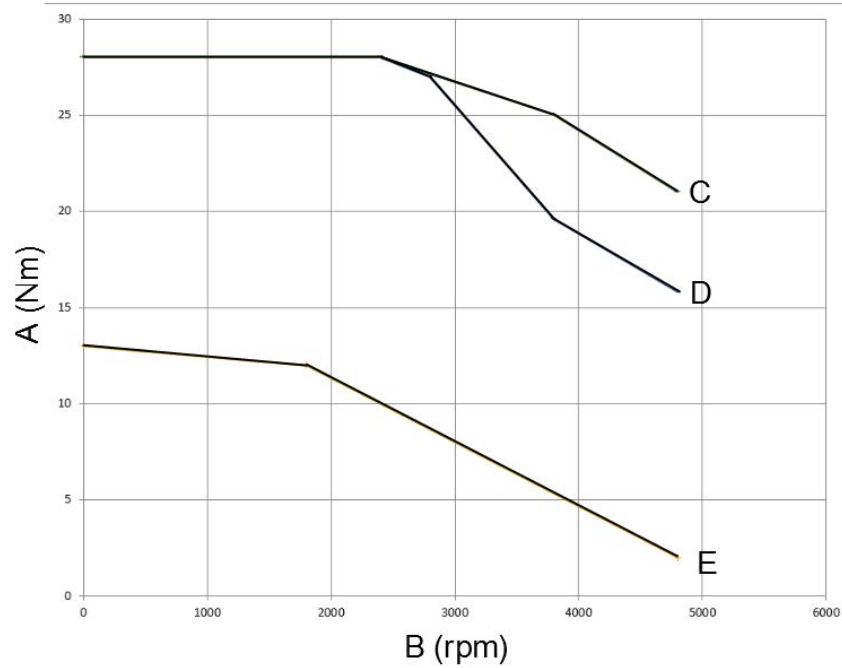
2 Technical data

2.1.4 Performance diagrams

Continued

Pos	Description
A	Motor torque
B	Motor speed
C	T_{acc} = torque at acceleration
D	T_{acc} = torque at acceleration for low voltage DC-link
E	$T_{average}$ = average torque

MU 250

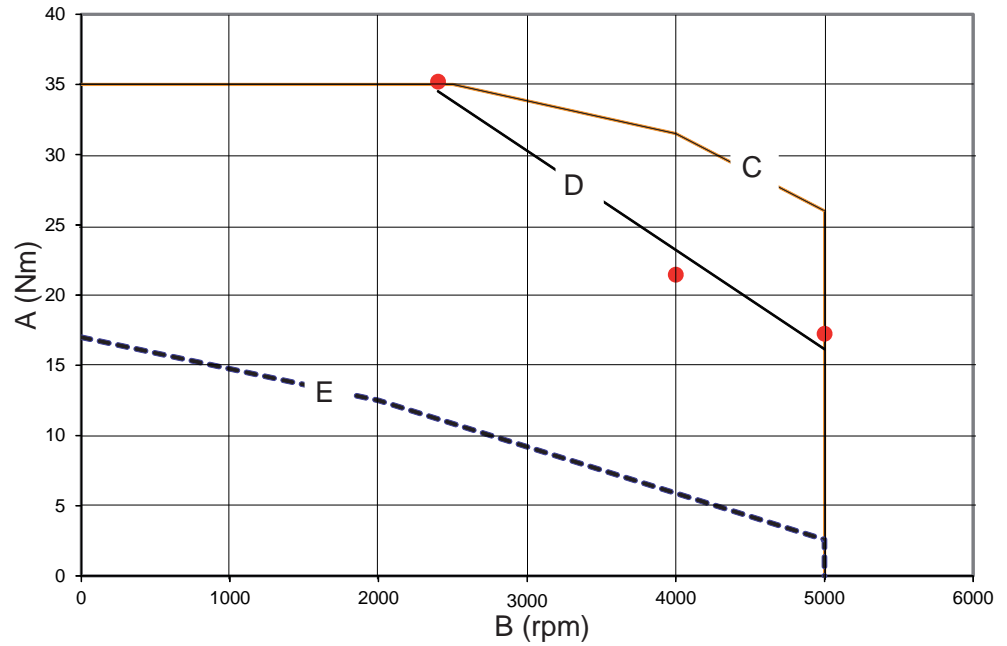


xx170000043

Pos	Description
A	Motor torque
B	Motor speed
C	Torque at acceleration for high voltage DC link
D	Torque at acceleration for low voltage DC link
E	Constant torque

Continues on next page

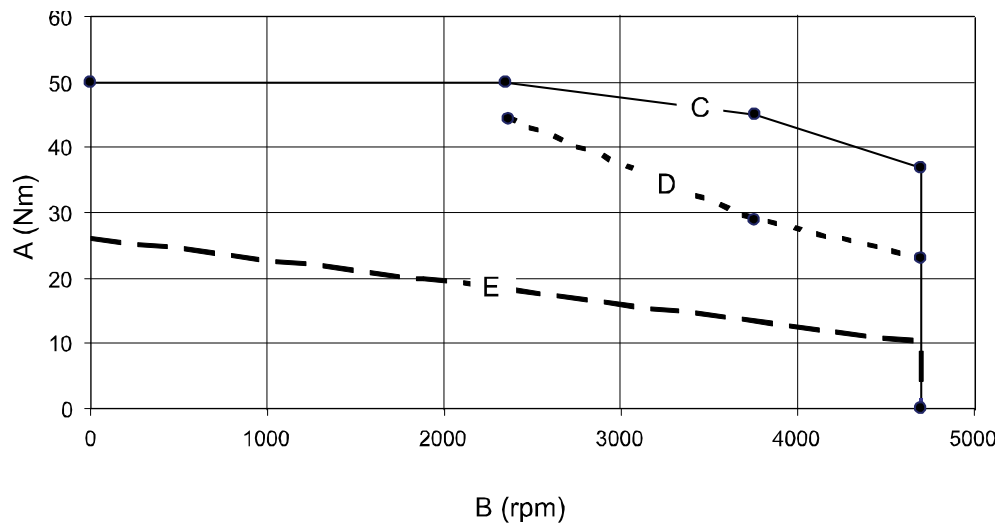
MU 300



xx1000001221

Pos	Description
A	Motor torque
B	Motor speed
C	T_{acc} = torque at acceleration
D	$T_{average}$ = average torque

MU 400



xx1000001222

Pos	Description
A	Motor torque

Continues on next page

2 Technical data

2.1.4 Performance diagrams

Continued

Pos	Description
B	Motor speed
C	T_{acc} = torque at acceleration
D	T_{acc} = torque at acceleration for low voltage DC-link
E	$T_{average}$ = average torque

2.1.5 Permissible loads at motor shaft

Introduction

The following section provides information regarding permissible loads on the output shaft of the motor units. The loads stated here do not apply to installation or assembly. See *Product manual - Motor Units and Gear Units* for instructions.

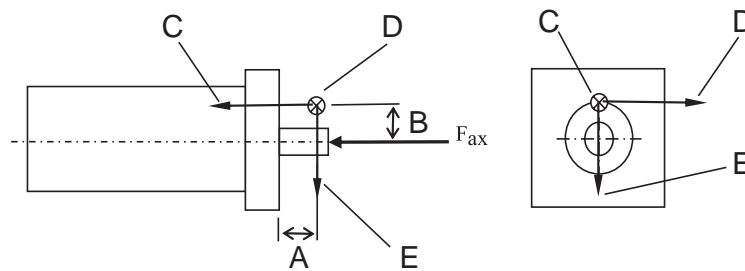


Note

Couplings, pulley, and motor pinion (transmission elements) must be assembled using adequate tools. Otherwise the motor shaft can be distorted which damage the resolver. Never use a hammer, as this will damage the equipment.
Grease the shaft after assembly to avoid oxidation.

Geometry

The graphic below shows the geometry of the motor.



xx170000044

Pos	Description
A	Axial distance between motor flange and load point
B	Radial distance between motor shaft center and load point
C	Axial force
D	Tangential force
E	Radial force

Motor	Load point		Design speed (rpm)	Lifetime (hour)
	Distance A (mm)	Distance B (mm)		
MU 80	40	30	3,000	16,000
MU 100	20	20	1,650	16,000
MU 200	41	8.08	2,000	12,000
MU 250	41	9.49	1,800	12,000
MU 300	43	10.8	1,800	12,000
MU 400	50	22	1,850	12,000

Continues on next page

2 Technical data

2.1.5 Permissible loads at motor shaft

Continued

Loads

Design load

The design load is calculated based on bearing life.

	Axial force (N)	Tangential force (N)	Radial force (N)
MU 80	78	32	123
MU 100	60	130	60
MU 200	321	871	400
MU 250	516	1,391	670
MU 300	539	1,454	700
MU 400	474	1,279	558

Peak load

The peak load is calculation of motor shaft.

	Axial force (N)	Tangential force (N)	Radial force (N)
80	122	50	126
MU 100	N/A	N/A	N/A
MU 200	616	1,671	766
MU 250	985	2,656	1,279
MU 300	1,077	2,910	1,382
MU 400	761	2,052	896

Maximum load

The maximum load is static calculation of shaft, bearing and joints.

	Axial force (N)	Tangential force (N)	Radial force (N)
MU 80	187	77	263
MU 100	125	250	125
MU 200	1,163	3,156	1,447
MU 250	1,759	4,742	2,285
MU 300	1,759	4,742	2,285
MU 400	1,648	4,446	1,940



Note

For load cases with combined axial and radial loads please contact your local ABB organization.

2.1.6 Using the motor unit in direct contact with gearbox oil/grease



WARNING

Oil leakage into motor unit will cause drastic reduction of brake torque. The rotational seal performance and lifetime must be assured in the customer application.

Sealing in the front flange

The motor units has a groove in the front flange for an O-ring sealing.

Recommended sealing:

Motor unit	O-ring inner diameter	Cross section diameter
MU 100	37 mm	3 mm
MU 200, MU 250, MU 300, MU 400	102 mm	3 mm

Sealing on motor shaft

The motor shaft on MU 200/MU 250/MU 300/MU 400 has a rotational sealing that is tested and designed for the following environment:

- Lifetime: 16,000 hours @ n_{rms} speed
- Oil temperature: $< 60^{\circ}\text{C}$
- Gearbox pressure: 0-0.2 bar
- Speed range: 0- n_{nom}
- Oil type: Mineral or Polyglycol based



Note

The MU 100 motor shaft has a rotational sealing, but should not be used in direct contact with gearbox oil/grease.

2 Technical data

2.2.1 Introduction

2.2 Gear units

2.2.1 Introduction

General

The gear units are available in two versions, MTD and MID, for handling loads of 250, 500, 750, 1,000, 2,000, and 5,000 kg (including possible fixture). There is a faceplate fitted on the outgoing shaft of the units. The faceplate has plain holes and guide holes for securing fixtures. The drive equipment for the units is placed in the robot controller.



WARNING

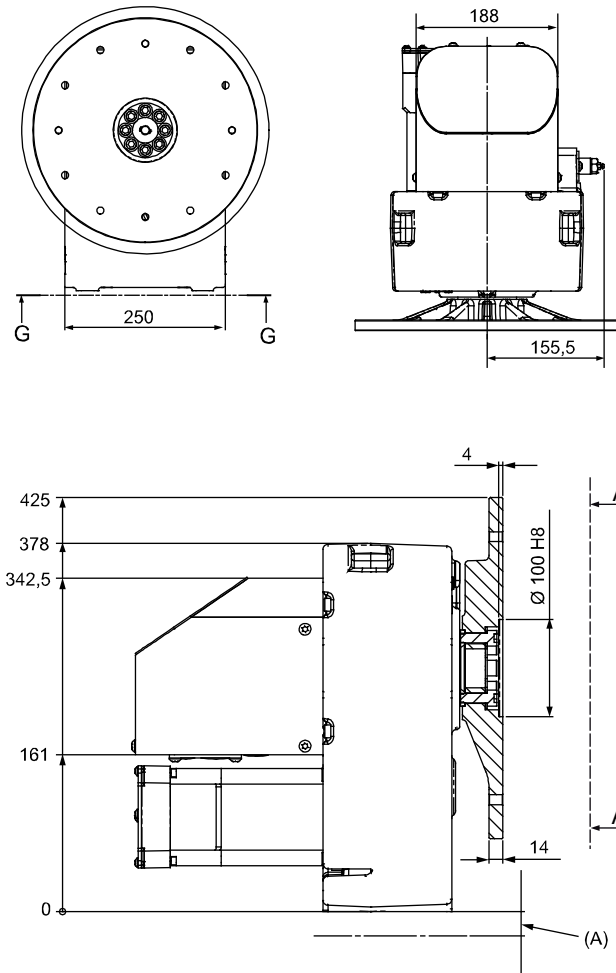
No current selector is available for gear units. Suitable arrangements for avoiding current through the gear units must be taken in installations for welding.

MID 500 and MID 1000

The MID 500 and MID 1000 gear units are equipped with a position indicator switch, that operates via a cam disc on the outgoing shaft. This gives the possibility to indicate the position of the outgoing shaft. The connection is done via a connection block in the robot controller. For detailed information, see *Product manual - Motor Units and Gear Units*.

2.2.2 Dimensional drawings

MTD 250



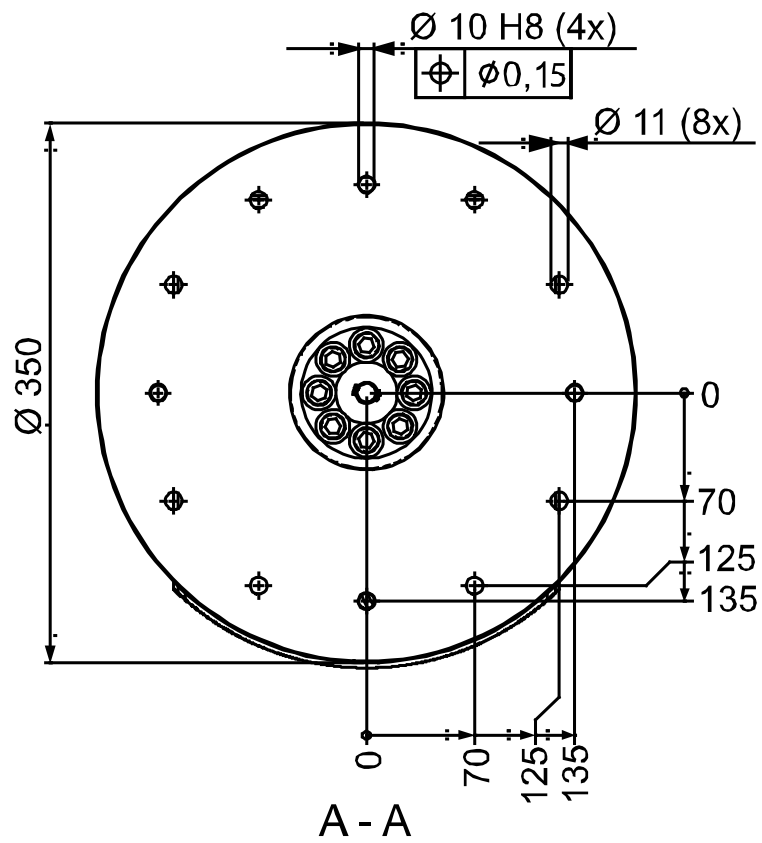
xx1000001244

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2 Technical data

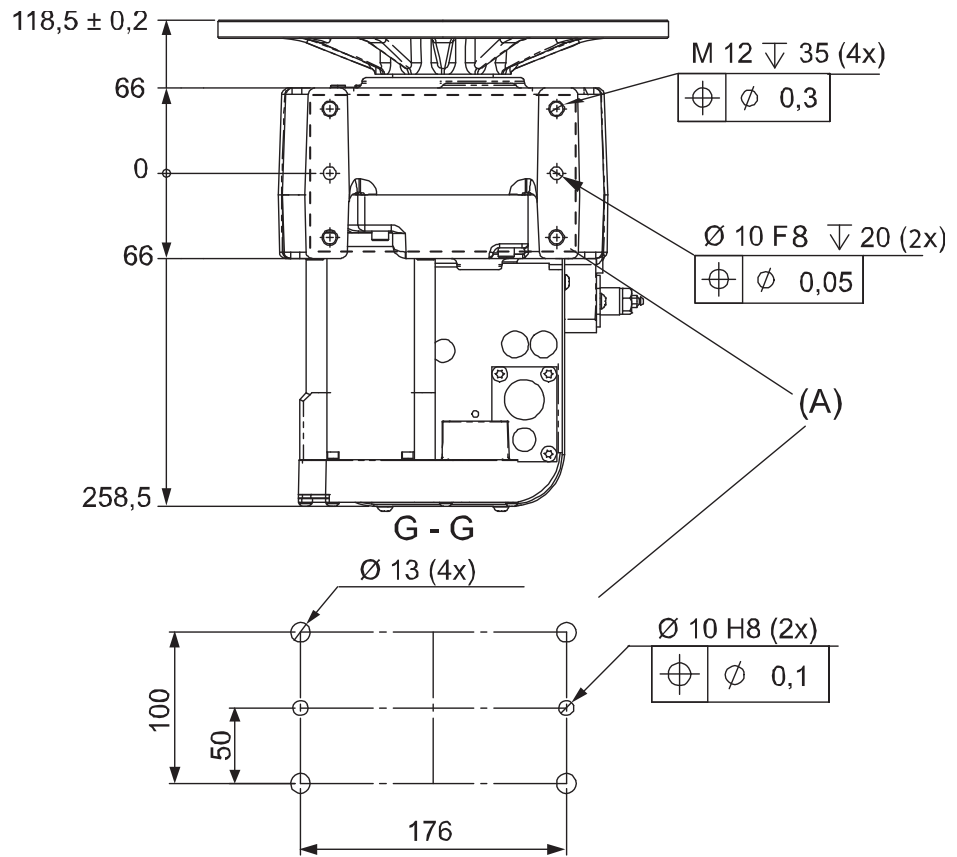
2.2.2 Dimensional drawings

Continued



xx1000001243

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xx100000730



Note

The support collar has the same hole configuration for mounting as the gear unit.

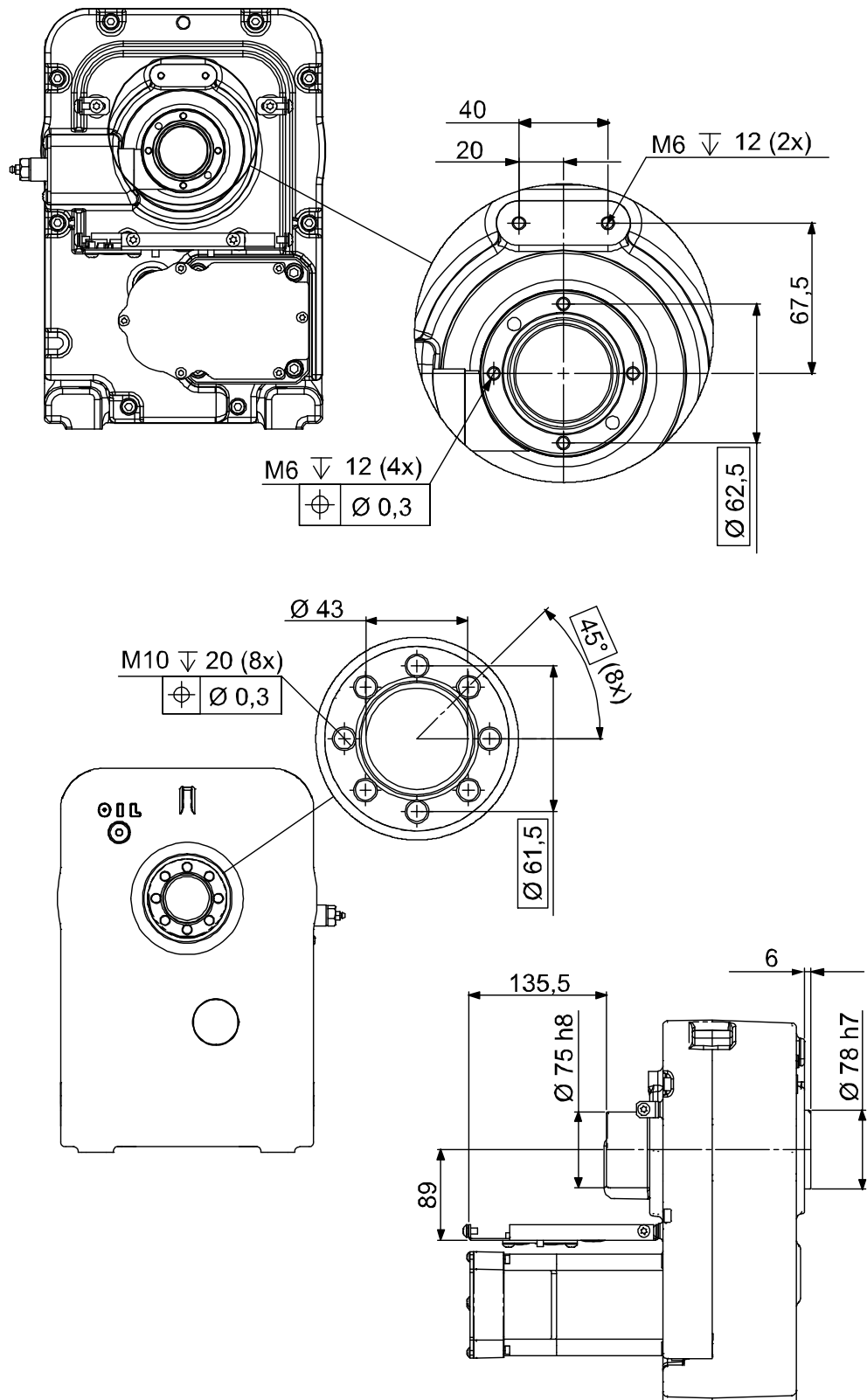
Pos	Description
A	Hole configuration for mounting base

Continues on next page

2 Technical data

2.2.2 Dimensional drawings

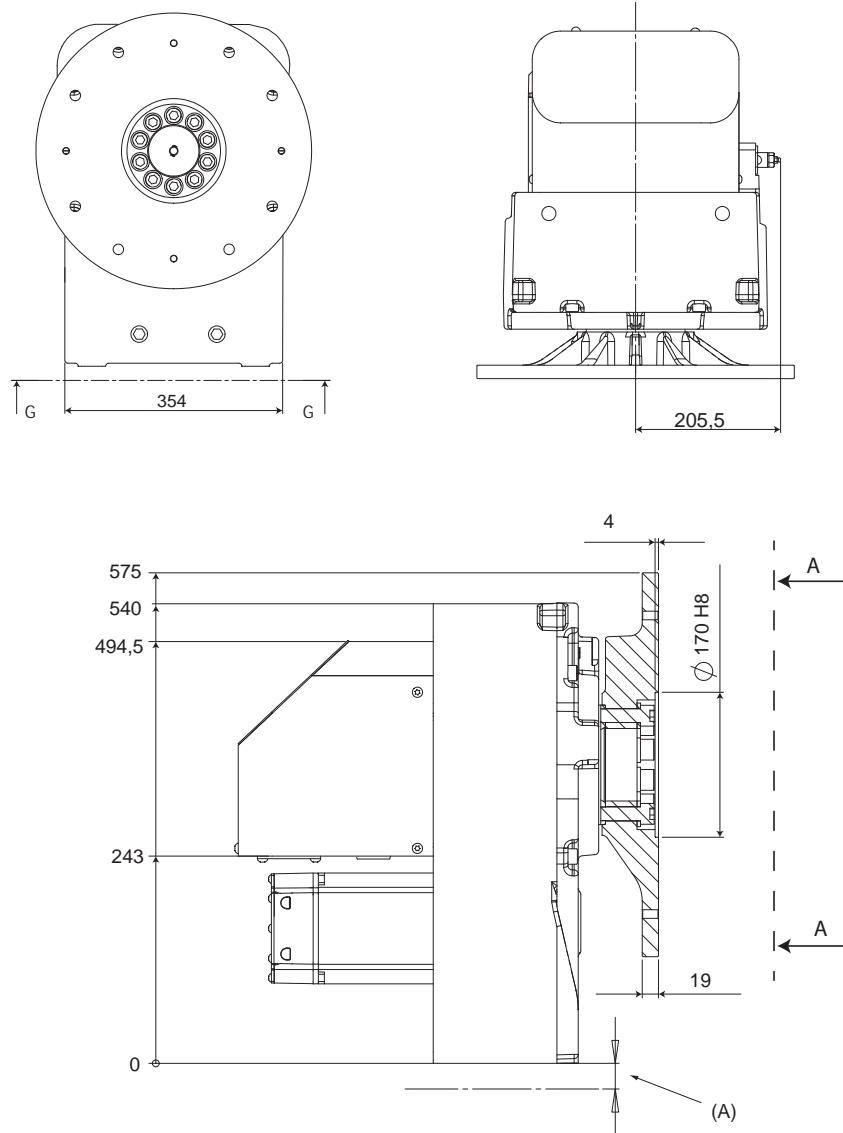
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MTD 500 and MTD 750



xx1000001246

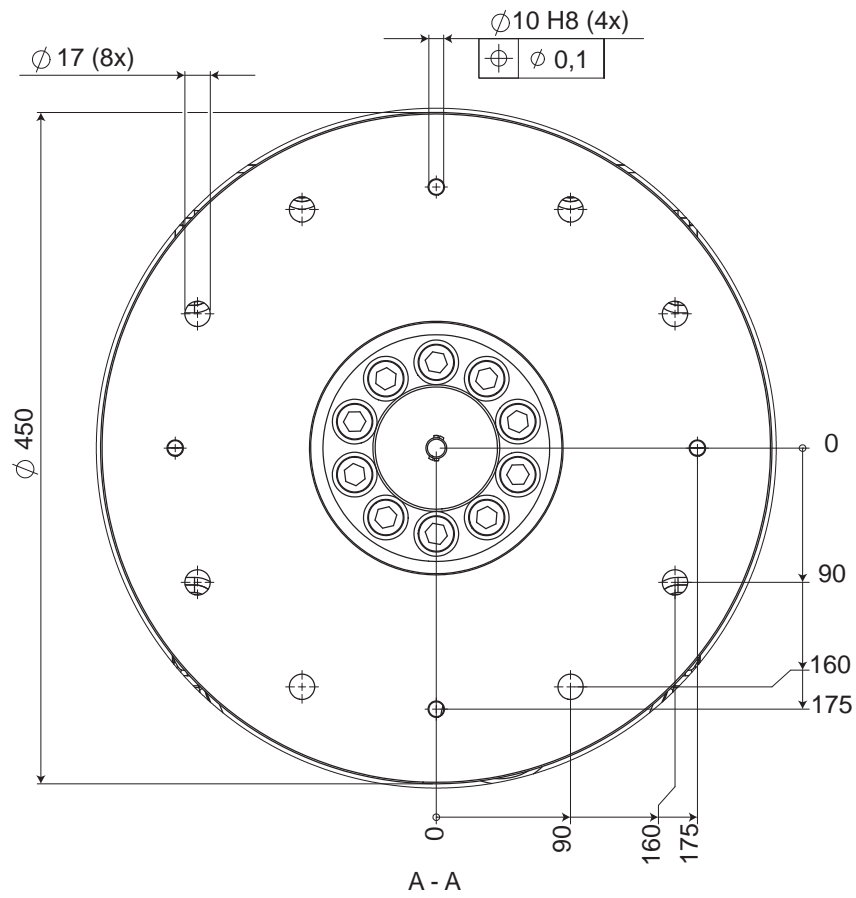
Pos	Description
A	30 mm recommended minimum clamping length

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2 Technical data

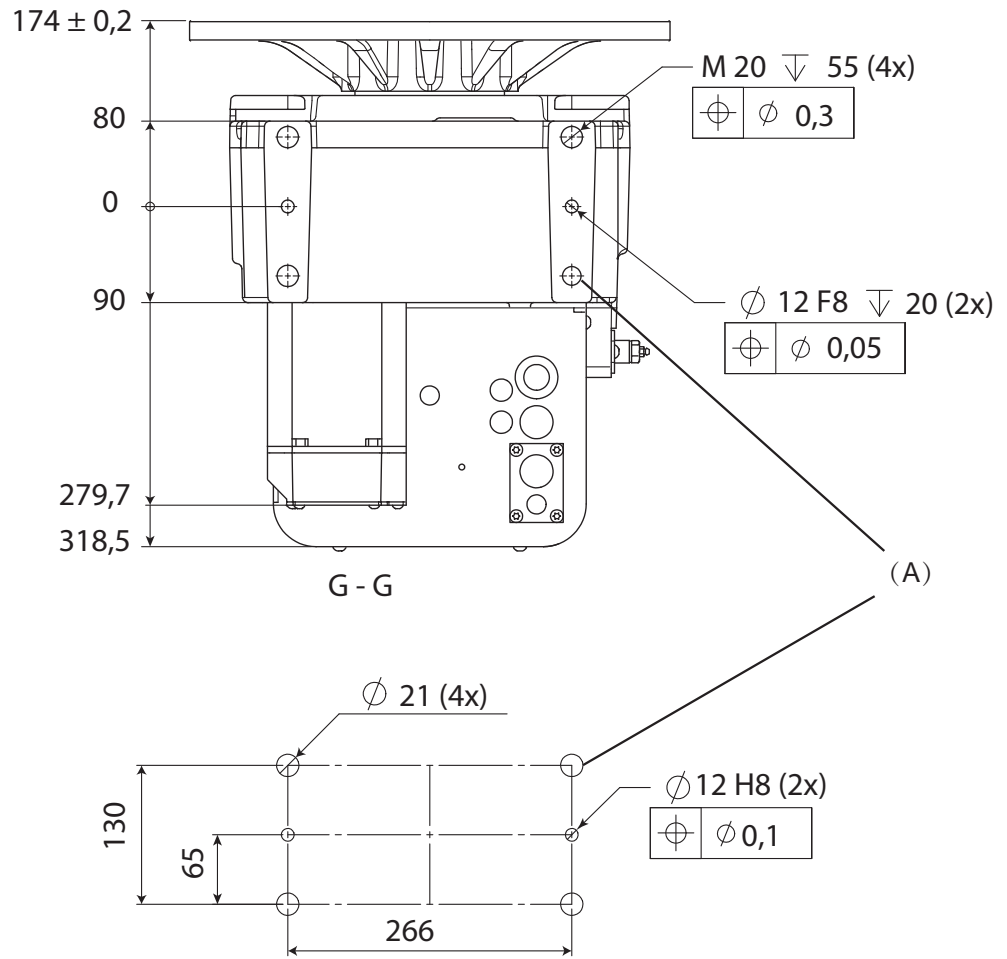
2.2.2 Dimensional drawings

Continued



xx1000001245

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xx100000735



Note

The support collar has the same hole configuration for mounting as the gear unit.

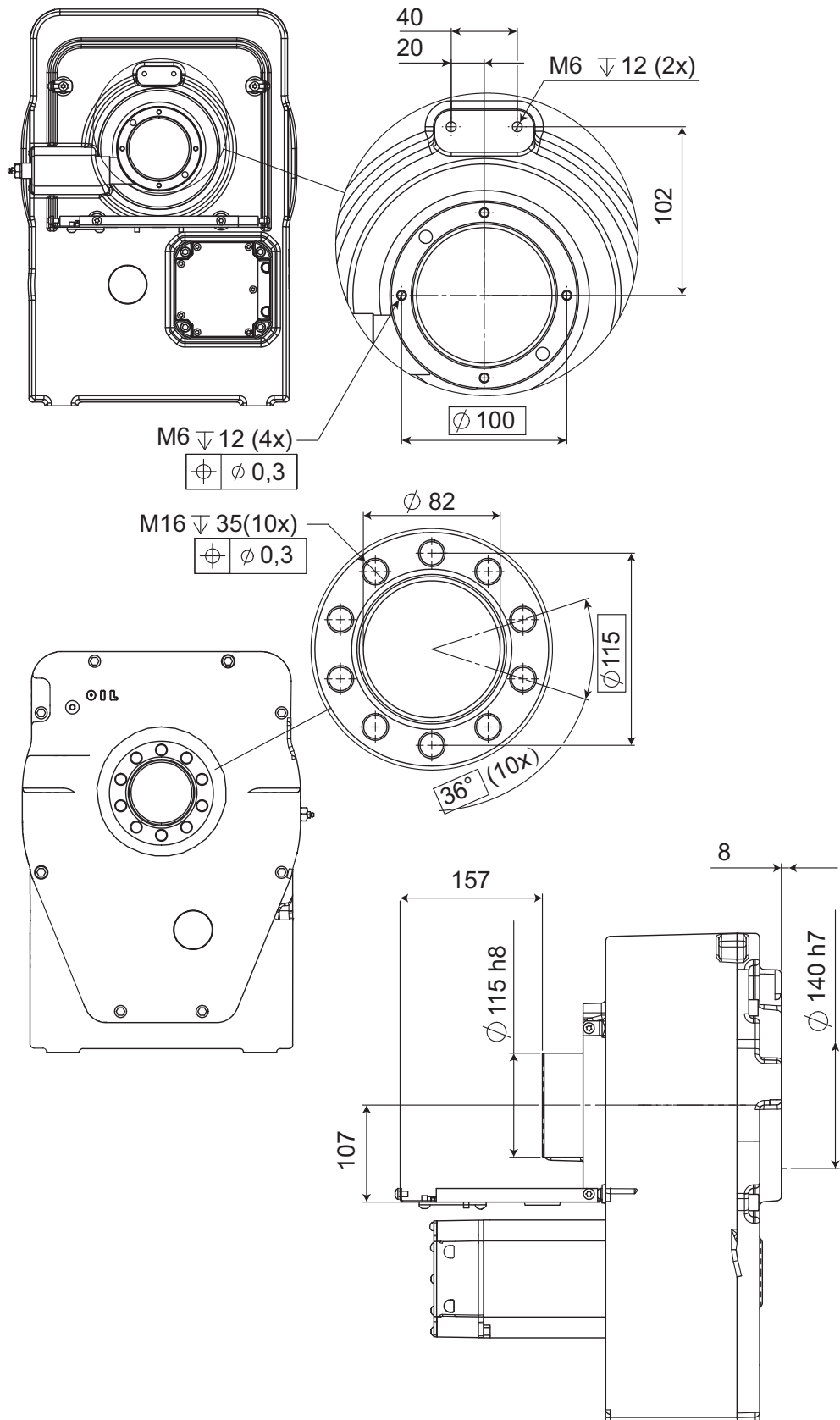
Pos	Description
A	Hole configuration for mounting hole

Continues on next page

2 Technical data

2.2.2 Dimensional drawings

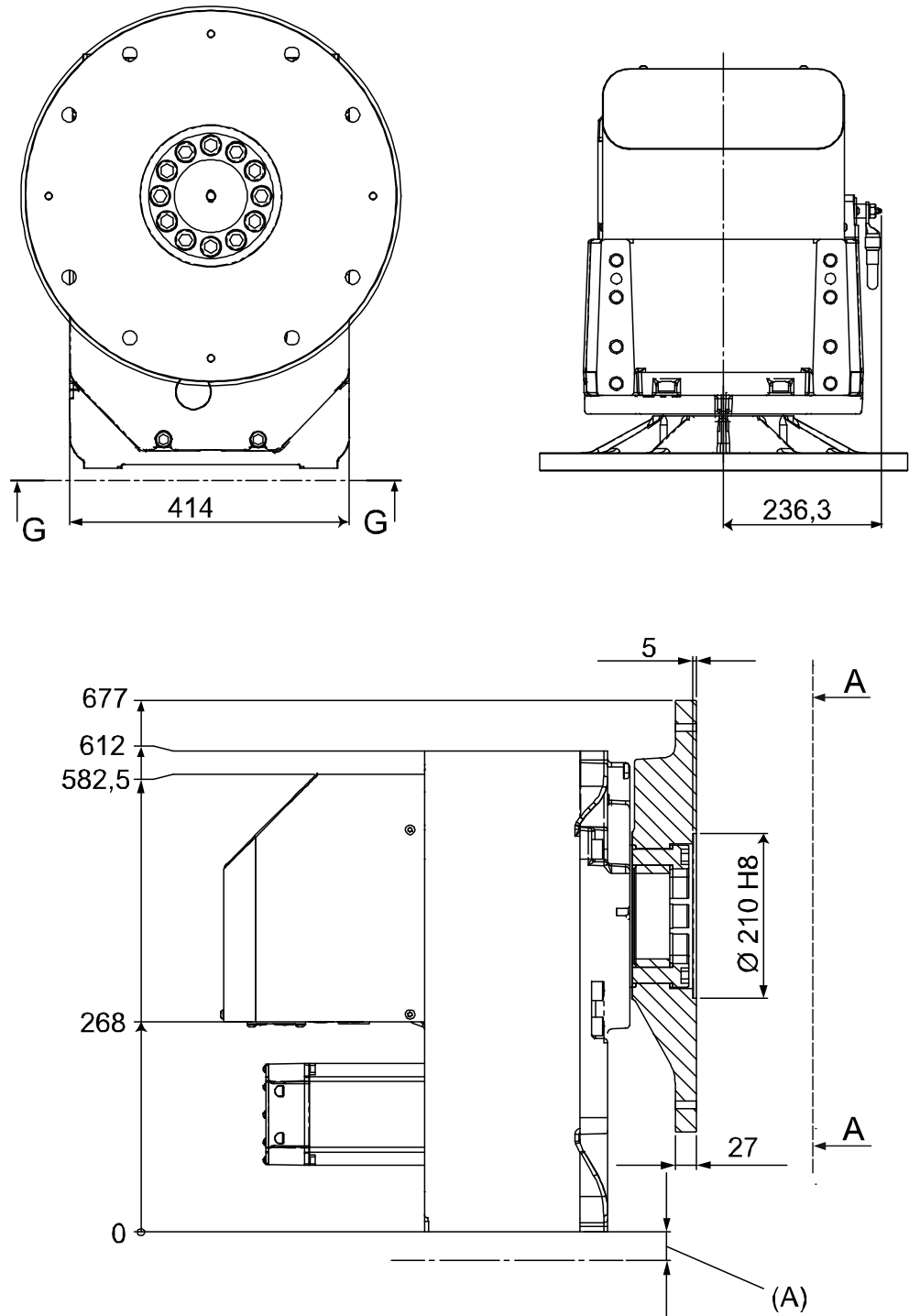
Continued



xx100000736

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MTD 2000



xx1000001248

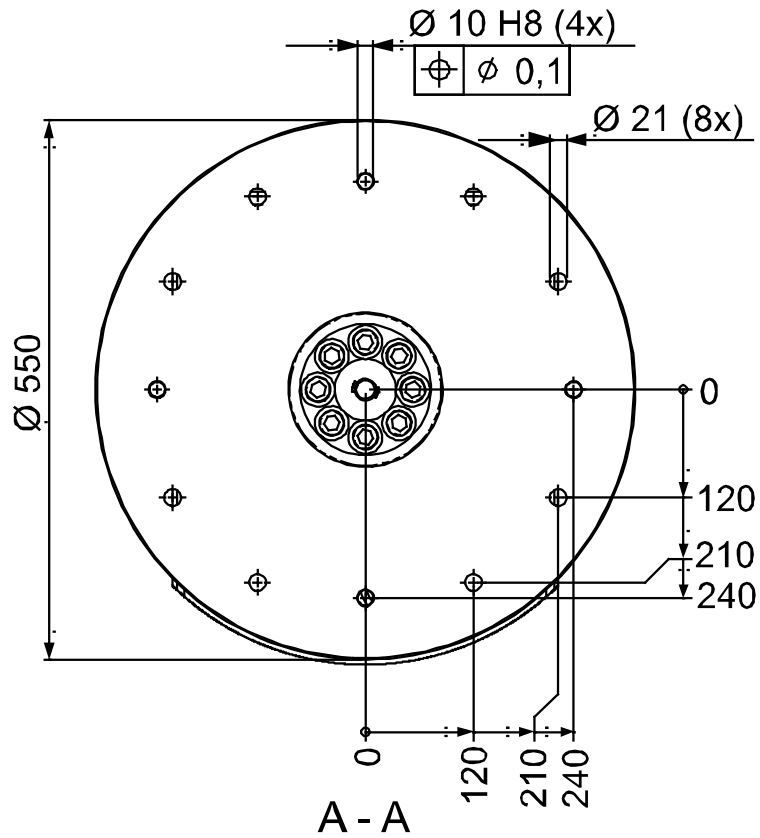
Pos	Description
A	36 mm recommended minimum clamping length

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2 Technical data

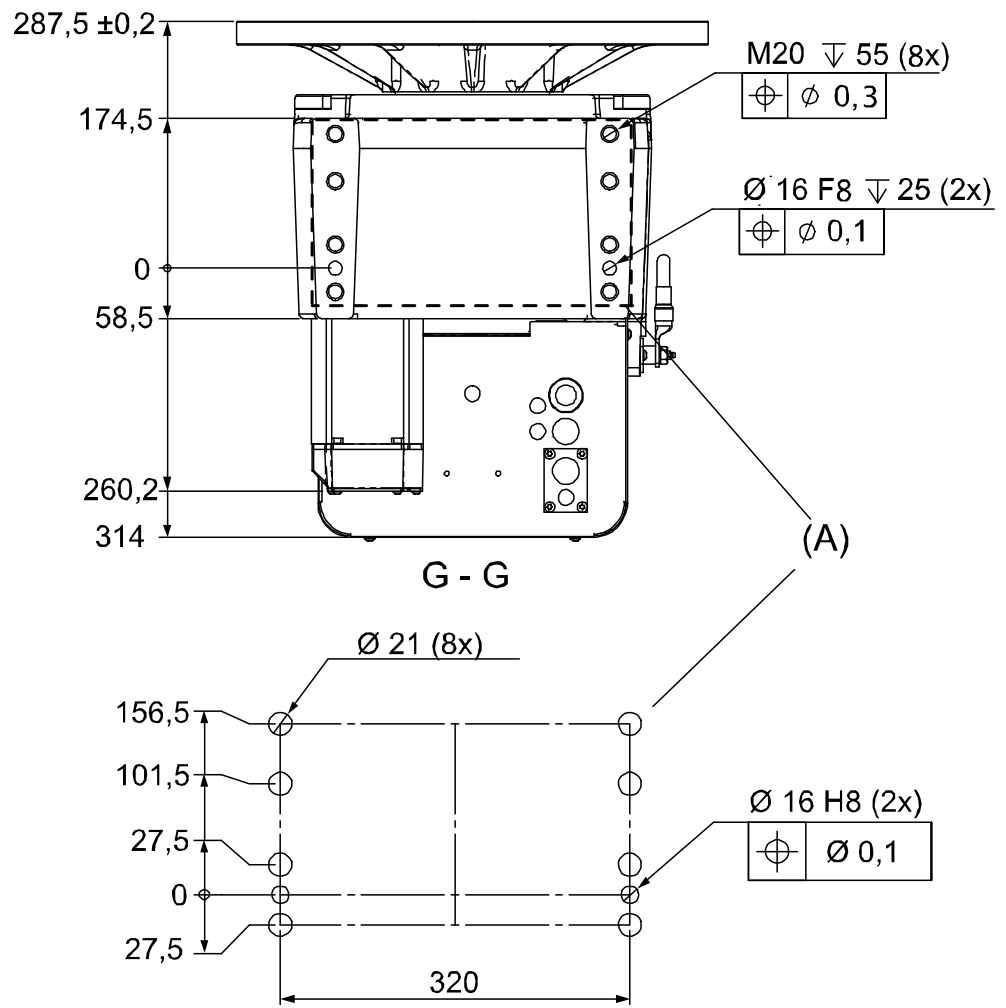
2.2.2 Dimensional drawings

Continued



xx1000001247

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xx100000740



Note

The support collar has the same hole configuration for mounting as the gear unit.

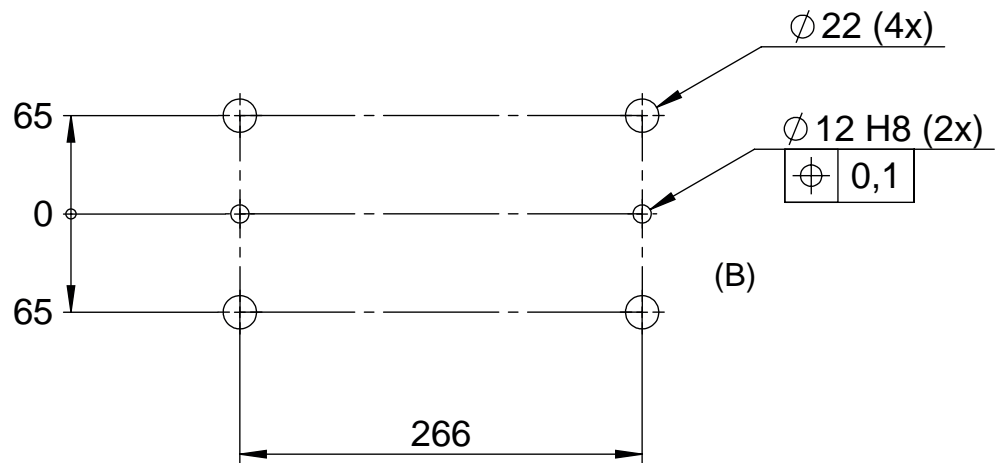
Pos	Description
A	Hole configuration for mounting base

Continues on next page

2 Technical data

2.2.2 Dimensional drawings

Continued



xx2000002065



Note

The support collar has the same hole configuration as the bearing house.

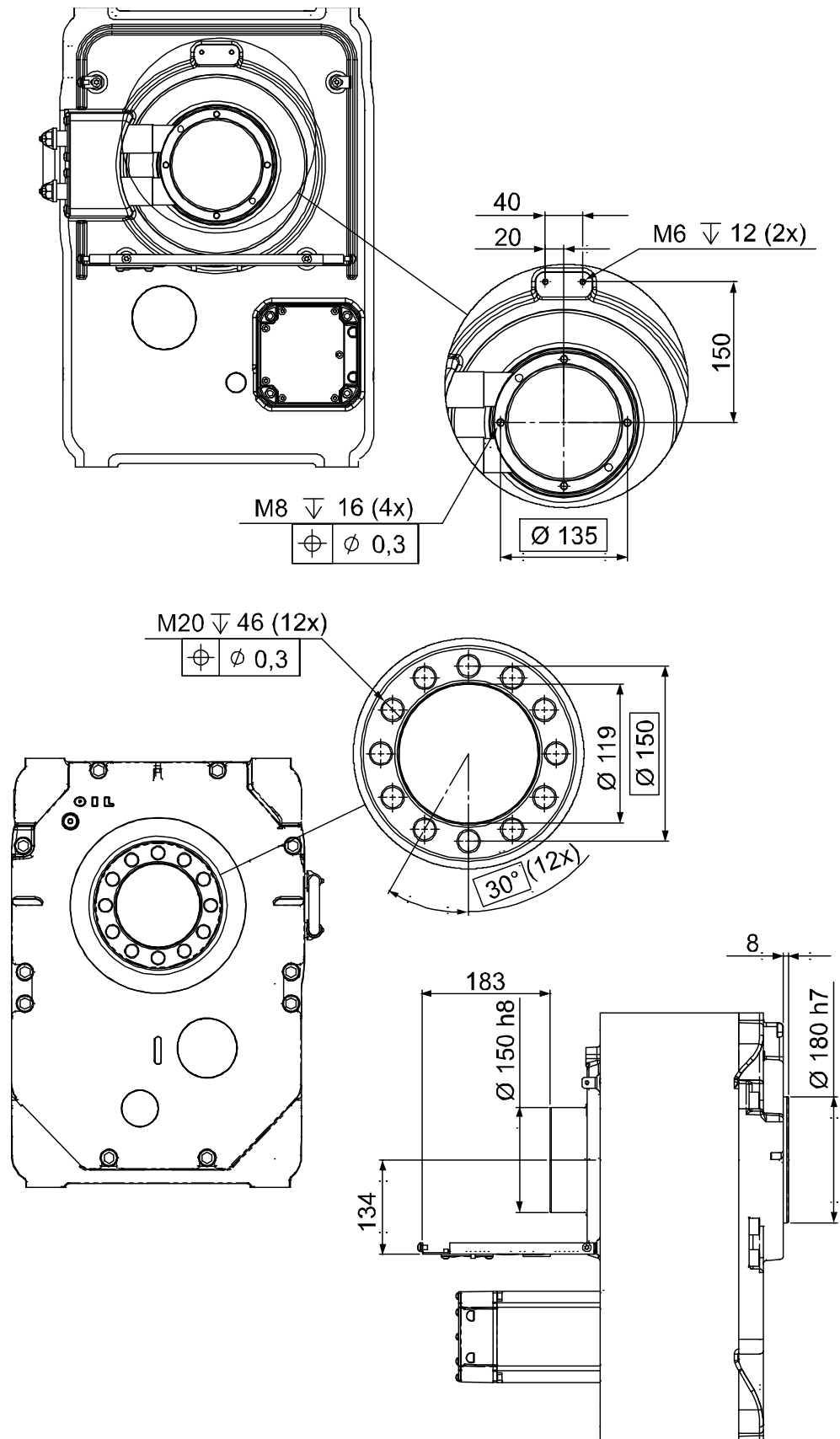
Pos	Description
B	Hole configuration for tailstock.

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2 Technical data

2.2.2 Dimensional drawings

Continued



xx100000741

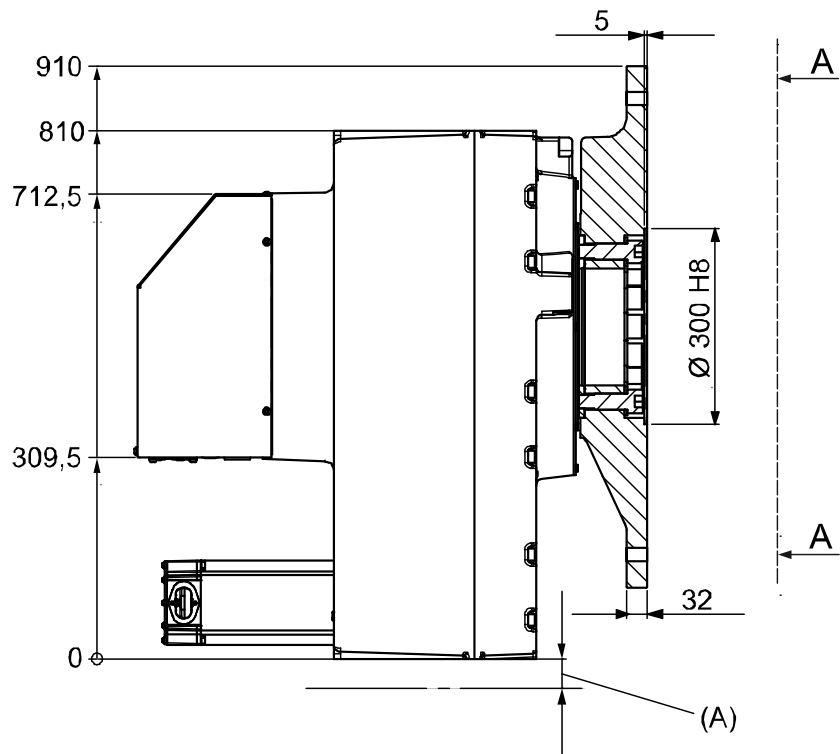
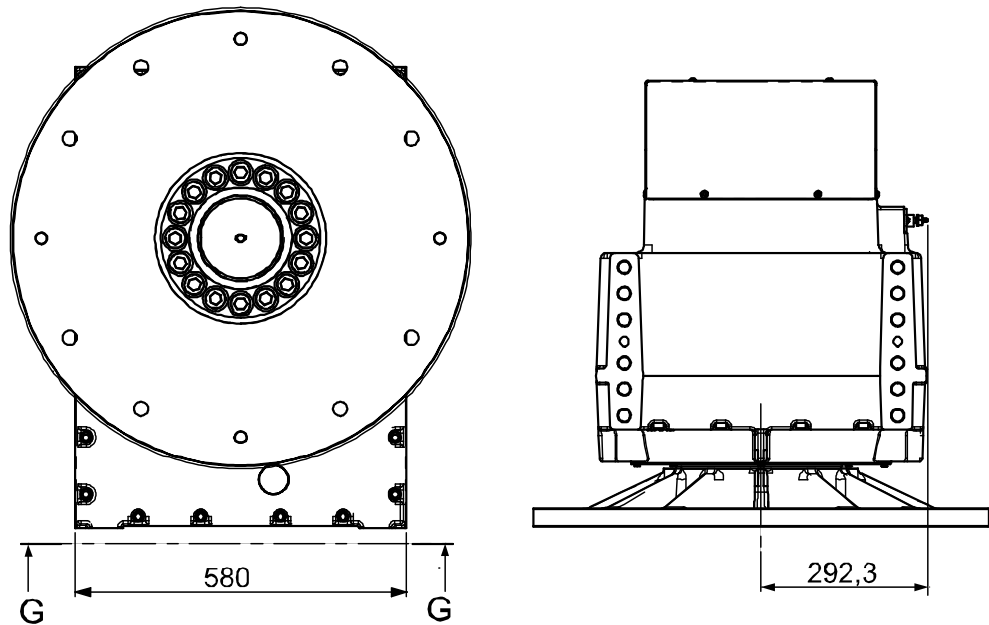
Continues on next page

2 Technical data

2.2.2 Dimensional drawings

Continued

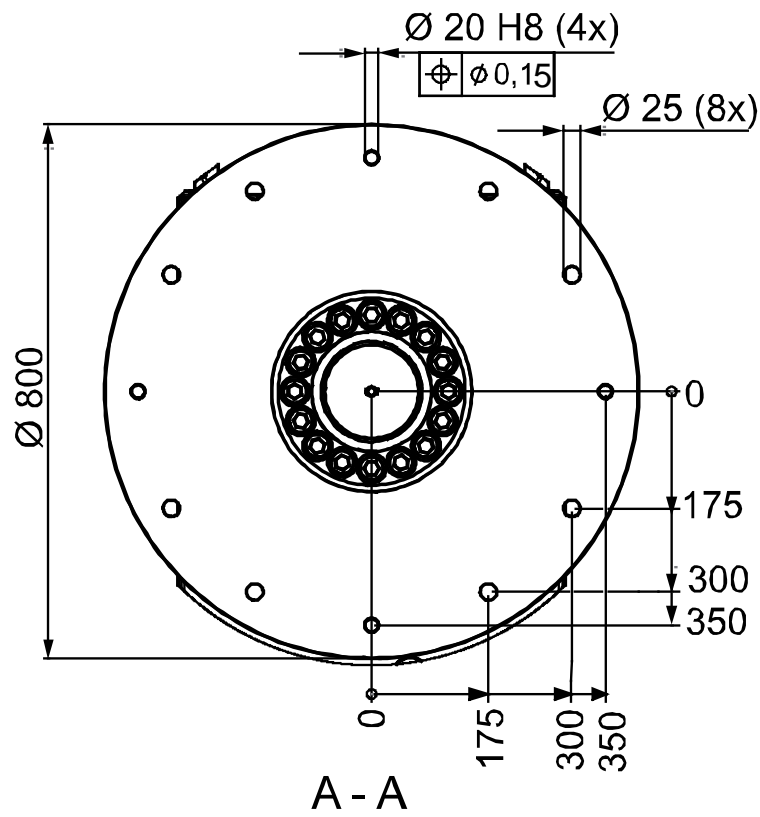
MTD 5000



xx1000001250

Pos	Description
A	46 mm recommended minimum clamping length

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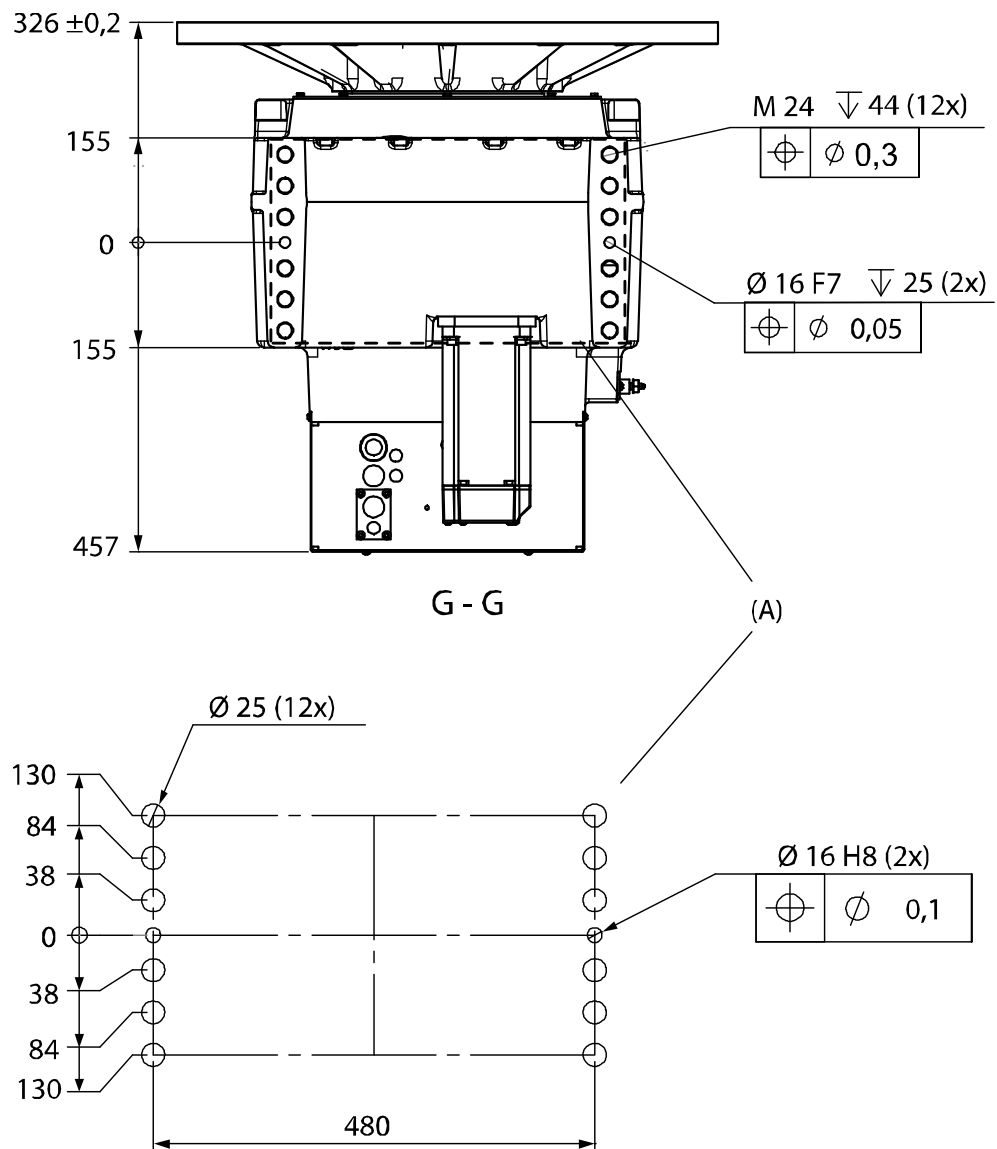
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2 Technical data

2.2.2 Dimensional drawings

Continued



xx100000745

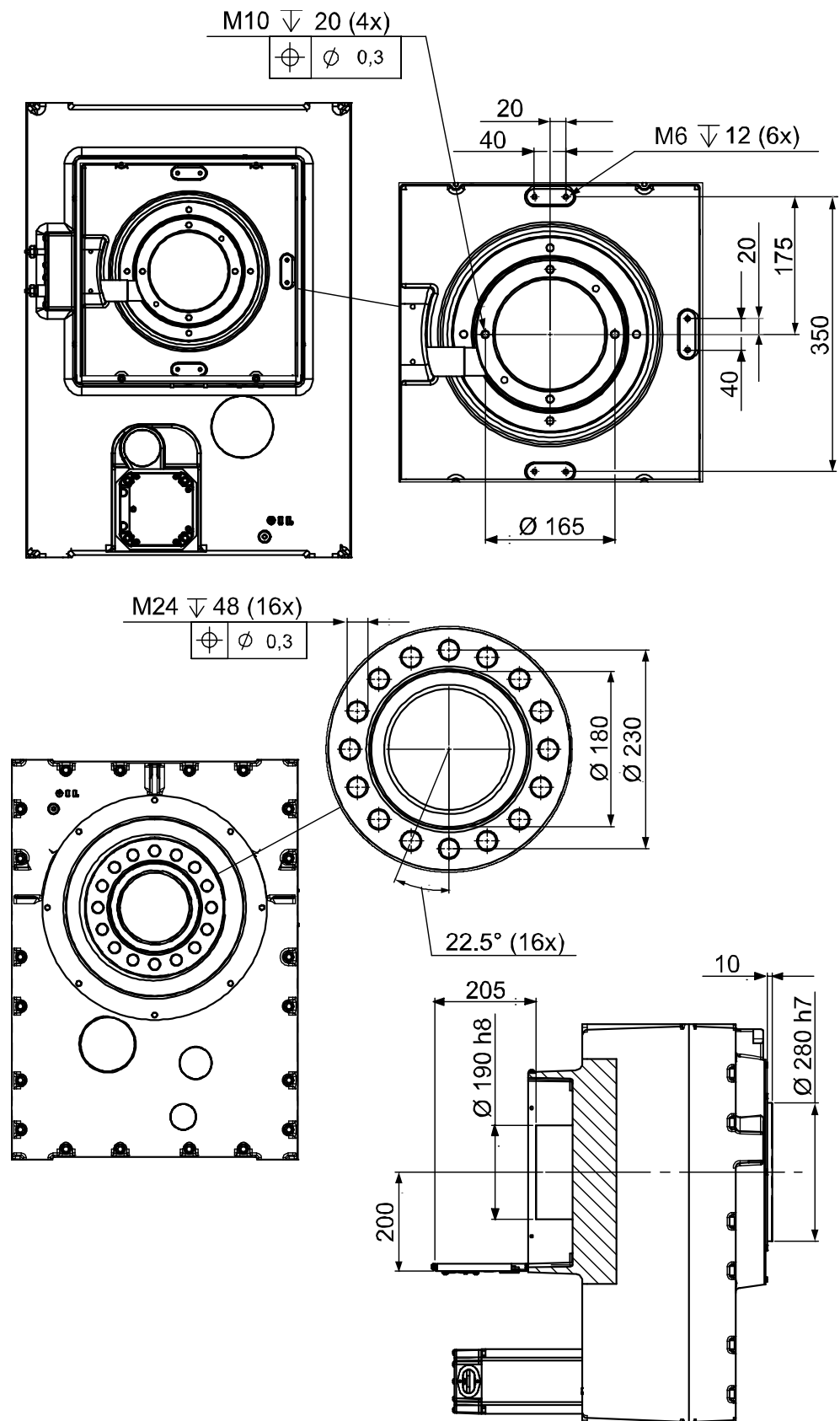
Pos	Description
A	Hole configuration for mounting base.

Continues on next page

2 Technical data

2.2.2 Dimensional drawings

Continued



xx100000746

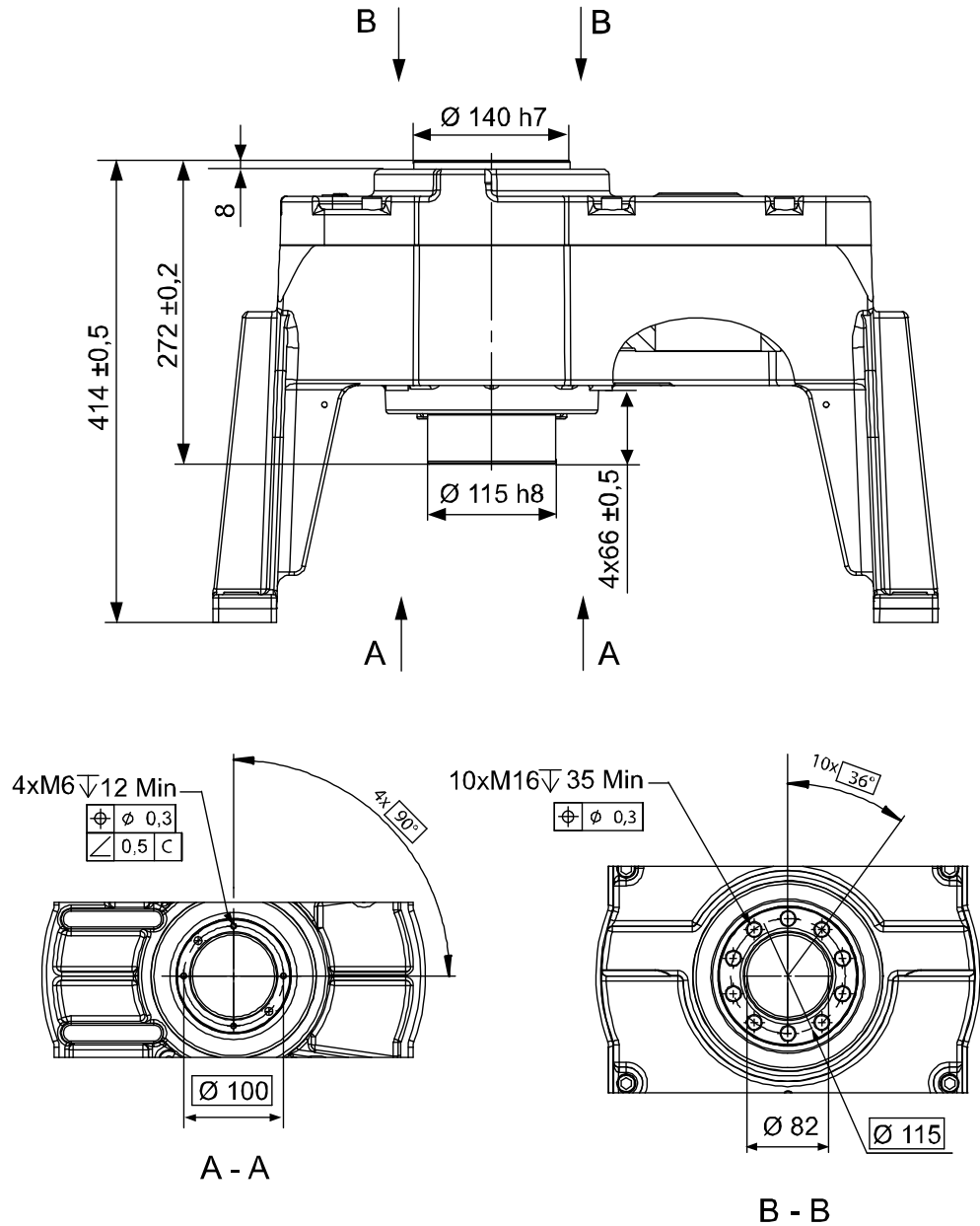
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2 Technical data

2.2.2 Dimensional drawings

Continued

MID 500



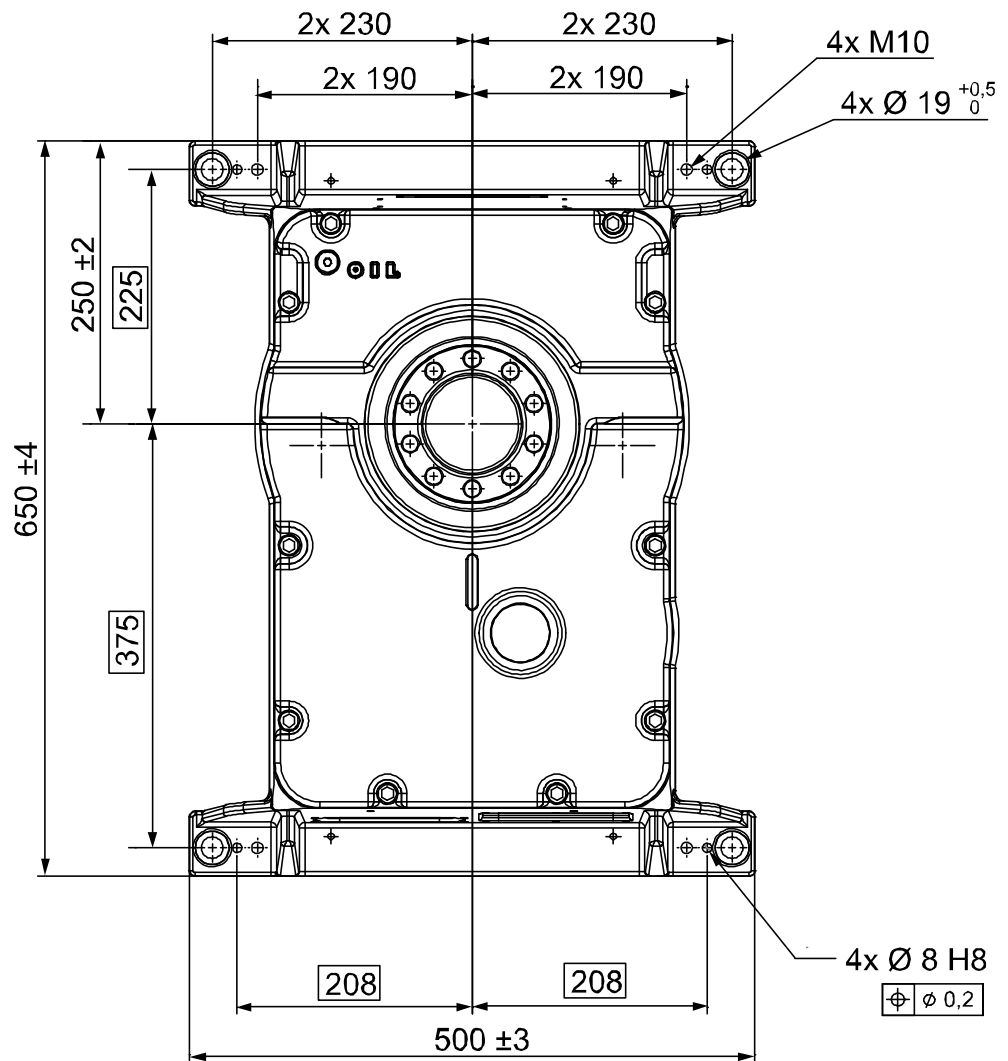
xx110000001

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2 Technical data

2.2.2 Dimensional drawings

Continued



xx110000002

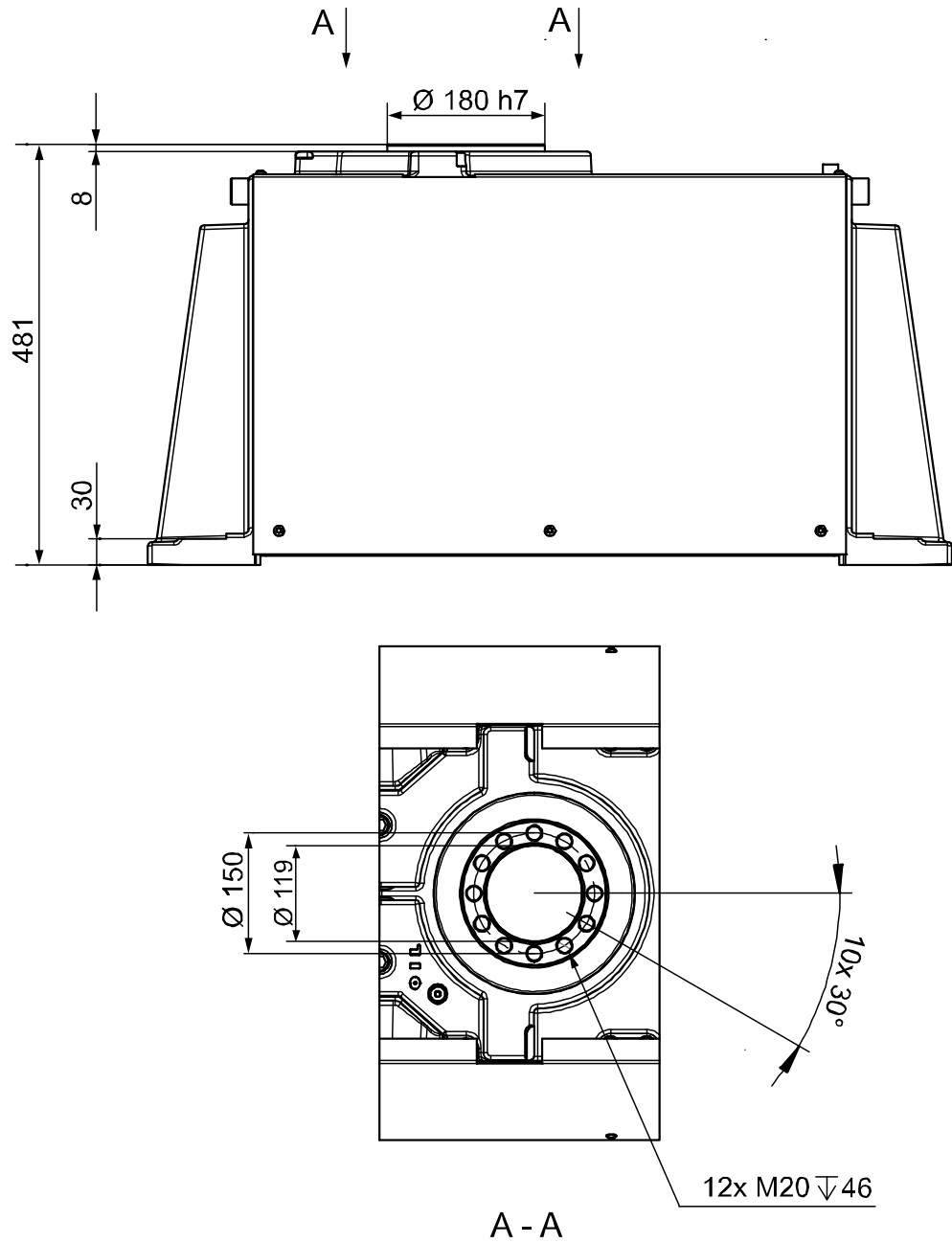
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2 Technical data

2.2.2 Dimensional drawings

Continued

MID 1000



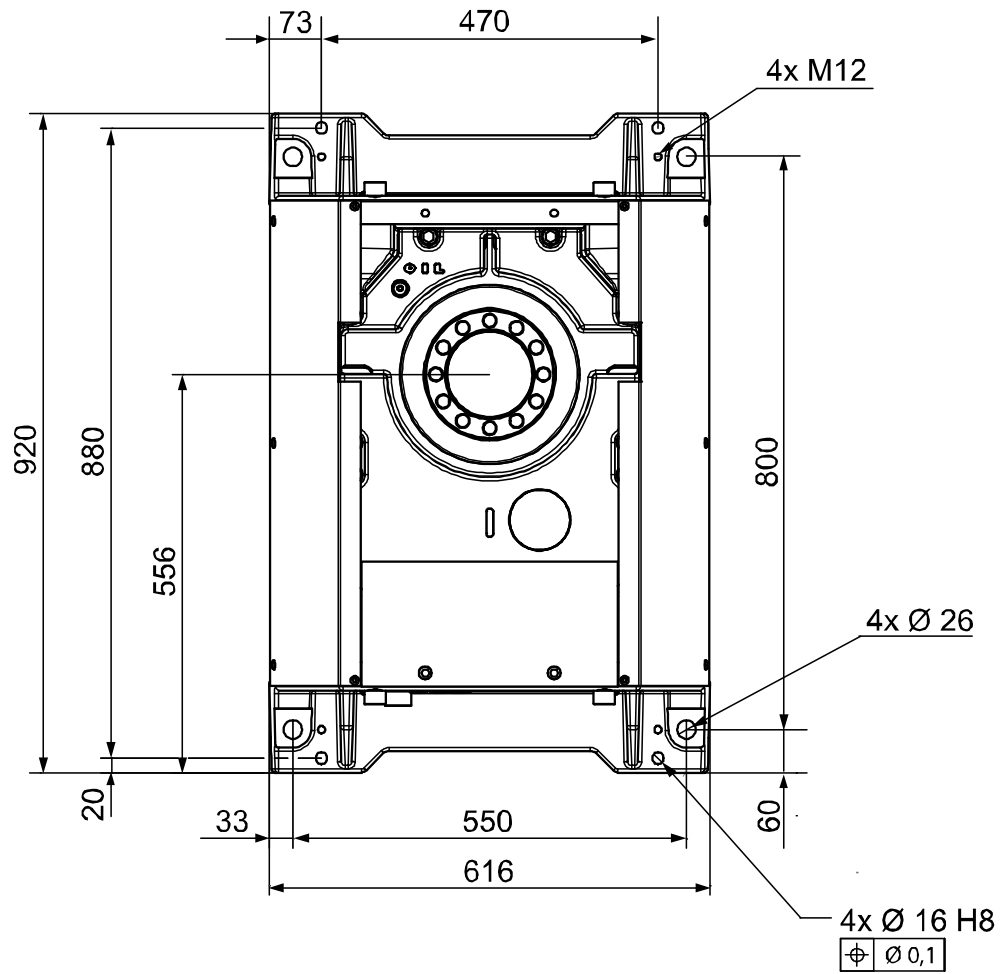
xx110000003

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2 Technical data

2.2.2 Dimensional drawings

Continued



xx110000004

2 Technical data

2.2.3 Technical data

2.2.3 Technical data

Introduction

The gear units are available in seven variants, see tables below for technical data.

MTD 250, MTD 500, MTD 750

Technical data	MTD 250	MTD 500	MTD 750
Max. handling capacity (see load diagram)	300 kg	600 kg	1,000 kg
Max. continuous torque	350 Nm	650 Nm	900 Nm
Center of gravity	See Load diagrams on page 70		
Max bending moment	650 Nm	3,300 Nm	5,000 Nm
Positioning time 90 degrees	1.25 s	1.45 s	1.45 s
Positioning time 180 degrees	1.79 s	2.07 s	2.07 s
Positioning time 360 degrees	2.79 s	3.27 s	3.27 s
Repetition accuracy with equal loads and radius 500 mm	±0.05 mm	±0.05 mm	±0.05 mm
Max. speed of rotation	180 deg/s	150 deg/s	150 deg/s
Nominal inertia	37 kg/m ²	260 kg/m ²	375 kg/m ²
Stop time with an emergency stop ⁱ	0.5 s	0.5 s	0.5 s
Max welding power, 60% duty cycle	600 Amp	600 Amp	600 Amp
Weight	70 kg	180 kg	180 kg

ⁱ The stop time is specified at the nominal inertia. The actual stop time depends on the actual load inertia and configuration of the gear unit.

MTD 2000, MTD 5000

Technical data	MTD 2000	MTD 5000
Max. handling capacity	2,000 kg	5,000 kg
Max continuous torque	3,800 Nm	9,000 Nm
Center of gravity	See Load diagrams on page 70	
Max bending moment	15,000 Nm	60,000 Nm
Positioning time 90 degrees	2.8 s	3.67 s
Positioning time 180 degrees	3.96 s	5.98 s
Positioning time 360 degrees	5.96 s	10.59 s
Repetition accuracy with equal loads and radius 500 mm	±0.05 mm	±0.05 mm
Max. speed of rotation	90 deg/s	39 deg/s
Nominal inertia	1250 kg/m ²	7000 kg/m ²
Stop time with an emergency stop ⁱ	0.5 s	0.9 s
Max welding power, 60% duty cycle	2 x 600 Amp	2 x 600 Amp

Continues on next page

2 Technical data

2.2.3 Technical data

Continued

Technical data	MTD 2000	MTD 5000
Weight	340 kg	770 kg

ⁱ The stop time is specified at the nominal inertia. The actual stop time depends on the actual load inertia and configuration of the gear unit.

MID 500, MID 1000

Technical data	MID 500	MID 1000
Max. handling capacity	1,300 kg	3,300 kg
Max continuous torque	1,400 Nm	3,800 Nm
Max acceleration torque	1,950 Nm	5,000 Nm
Center of gravity	See Load diagrams on page 70	
Max bending moment	5,000 Nm	15,000 Nm
Positioning time 90 degrees	1.65 s	2.43 s
Positioning time 180 degrees	2.65 s	3.43 s
Positioning time 360 degrees	4.65 s	5.43 s
Repetition accuracy with equal loads and radius 500 mm	±0.07 mm	±0.05 mm
Max. speed of rotation	90 deg/s	90 deg/s
Nominal inertia	450 kg/m ²	2000 kg/m ²
Stop time with an emergency stop ⁱ	0.6 s	<0.9 s
Weight	170 kg	395 kg

ⁱ The stop time is specified at the nominal inertia. The actual stop time depends on the actual load inertia and configuration of the gear unit.

Brake data

Brake data	MTD 250	MTD 500	MTD 750	MTD 2000	MTD 5000	MID 500	MID 1000
T _{brake min} : minimum brake torque (Nm)	3.6	7.3	7.3	10.4	15	7.3	10.4

2 Technical data

2.2.4 Load diagrams

2.2.4 Load diagrams

Information



WARNING

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

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

- motors
- gearboxes
- mechanical structure



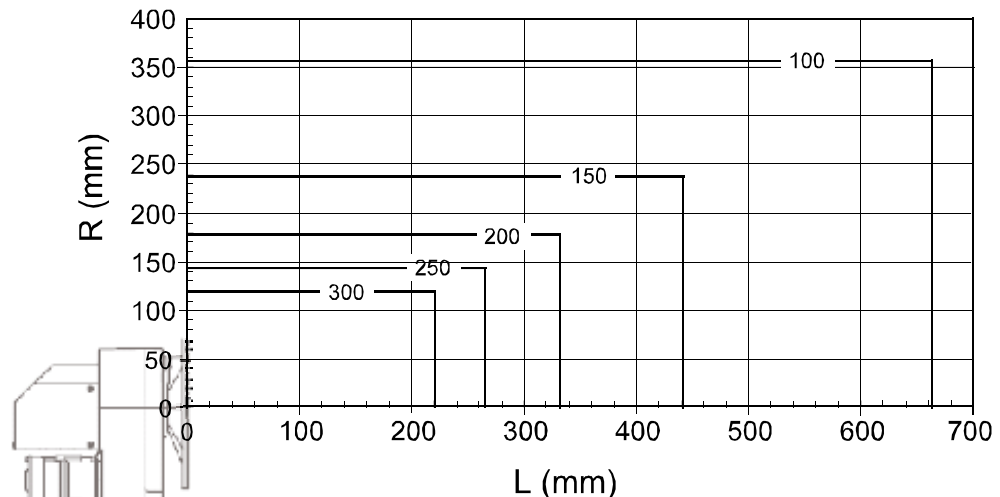
WARNING

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

Introduction

The following load diagrams show the maximum permitted center of gravity displacement from the center of rotation at different loads.

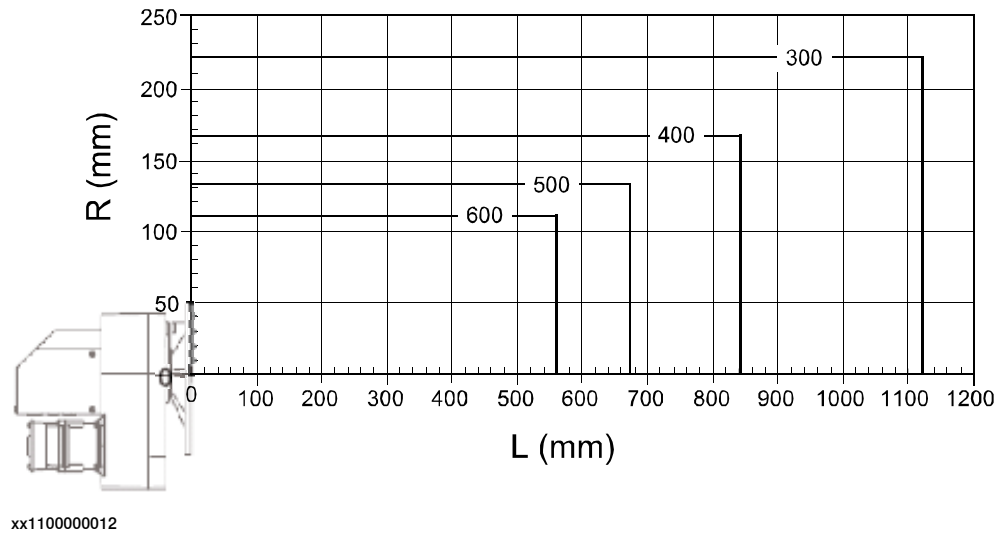
MTD 250



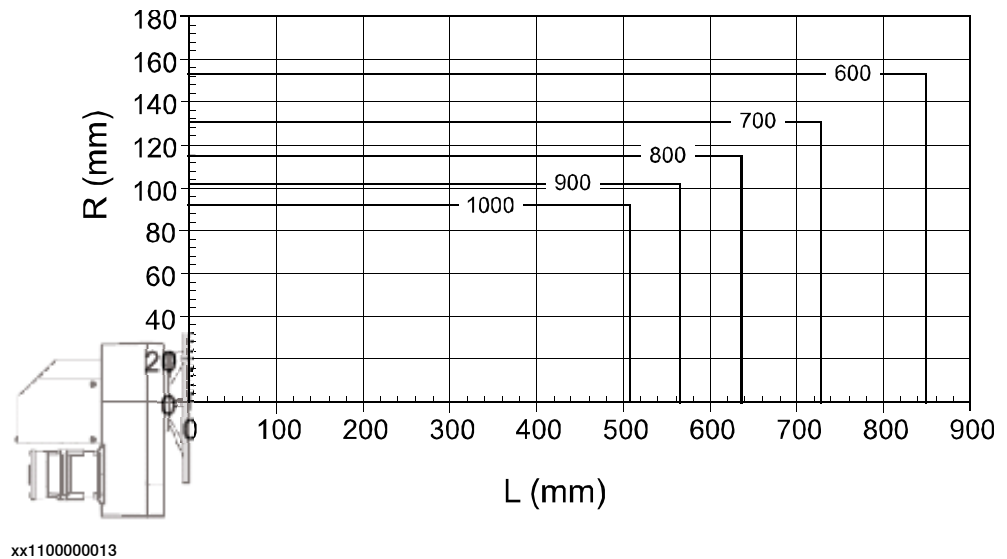
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MTD 500



MTD 750



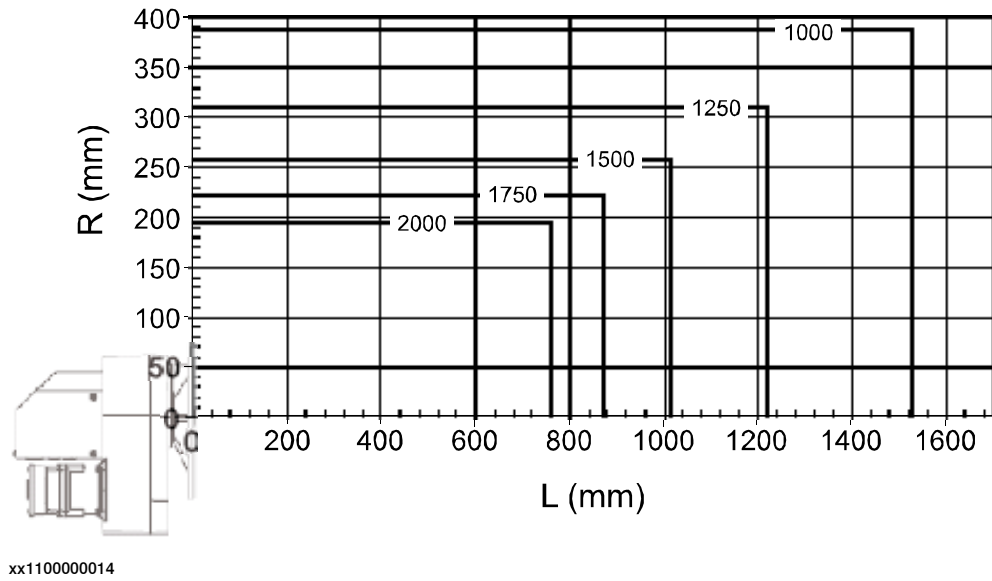
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2 Technical data

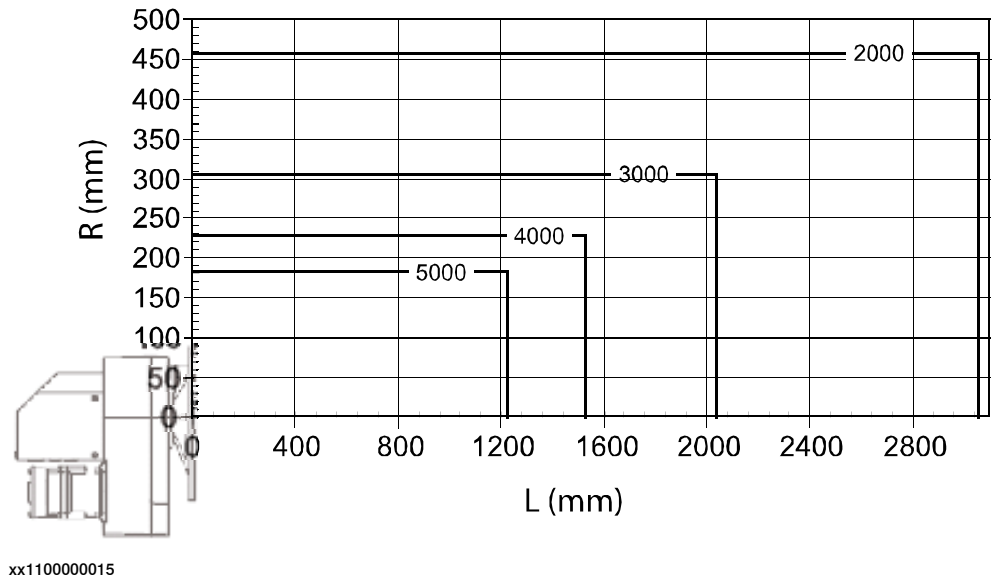
2.2.4 Load diagrams

Continued

MTD 2000

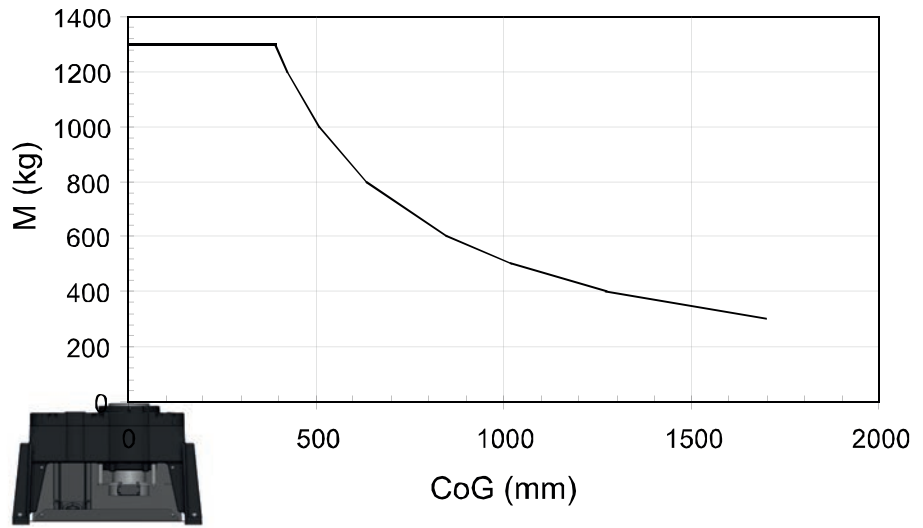


MTD 5000



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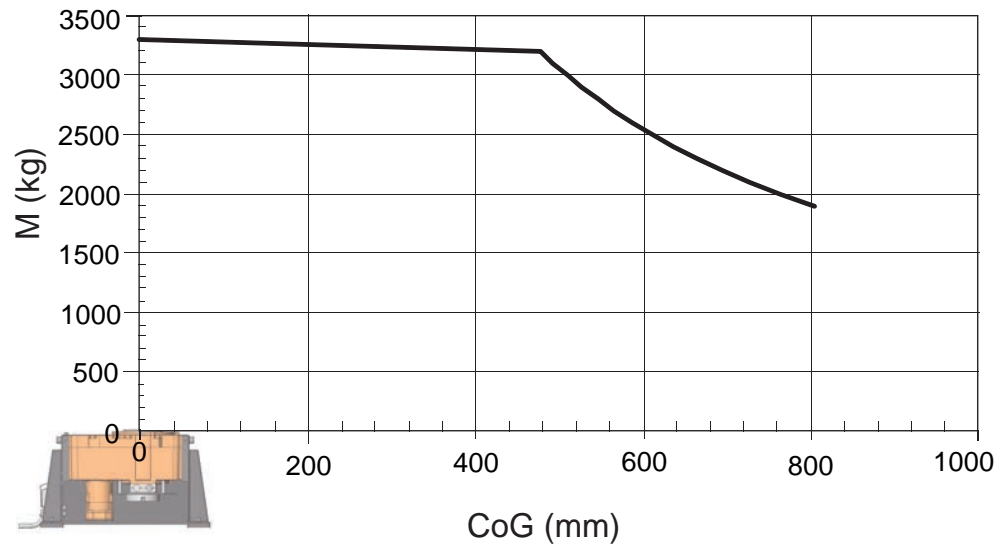
MID 500



xx1000001229

CoG	Center of gravity
-----	-------------------

MID 1000



xx1000001230

CoG	Center of gravity
-----	-------------------

2 Technical data

2.2.5 Dimensioning gear units

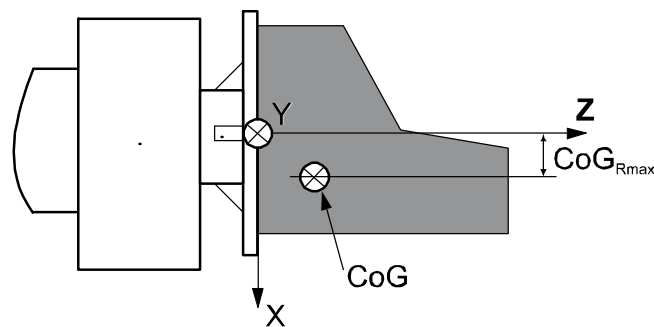
2.2.5 Dimensioning gear units

Acceleration and deceleration values

To secure that gear units will not run too hard and damage the gear box, the acceleration and deceleration of the axis on the arm side must be calculated.

This calculation will give a maximum value for the system parameters *Nominal Acceleration* and *Nominal Deceleration*. The value can be lowered if the acceleration is too fast, see *Application manual - Additional axes*. Do not use values higher than the recommended maximum acceleration, see [Maximum gearbox torques on page 74](#).

$$(T_{\max\text{gear}} - m * g * \text{CoG}_{\text{Rmax}}) / (m * \text{CoG}_{\text{Rmax}}^2 + J_{0z})$$



xx1100000104

J_{0z} is the moment of inertia around the Z axis at the center of gravity (CoG).

CoG_{Rmax} is the radial distance in X and Y directions between the Z axis and the center of gravity (CoG).

Define the system parameters *Nominal Acceleration* and *Nominal Deceleration* in the type *Acceleration Data* in the topic *Motion*, based on the calculations.

Maximum gearbox torques

Use the $T_{\max\text{gear}}$ values from the table for the calculation.

Gear unit	$T_{\max\text{gear}}$ (max torque on arm side) (Nm)	Recommended maximum acceleration and deceleration (rad/s ²)
MTD 250	480	4
MTD 500	1100	3
MTD 750	1950	3
MTD 2000	5000	0.8
MTD 5000	11400	0.5
MID 500	1950	2.4
MID 1000	5000	1.1

Related information

Dimensioning of motors is described in *Application manual - Additional axes*.

3 Variants and options

3.1 Introduction to variants and options

General

The different variants and options for the motor units and gear units 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 Variants and options

3.2 Motor units and Gear units

3.2 Motor units and Gear units

Motor units

Option	Description	Type
4100-1	(1-6) Choose quantity	MU 80
4101-1	(1-6) Choose quantity	MU 100
4102-1	(1-6) Choose quantity	MU 200
4104-1	(1-6) Choose quantity	MU 250
4105-1	(1-6) Choose quantity	MU 300
4106-1	(1-6) Choose quantity	MU 400

Details of MU 80



Note

Only available with low voltage (LV) power unit in the robot controller. For details, see *Product manual - OmniCore V250XT Type B* or *Product manual - OmniCore V400XT*.



Note

The black part of the motor should be unpainted.

Continues on next page

3 Variants and options

3.2 Motor units and Gear units *Continued*



Continues on next page

3 Variants and options

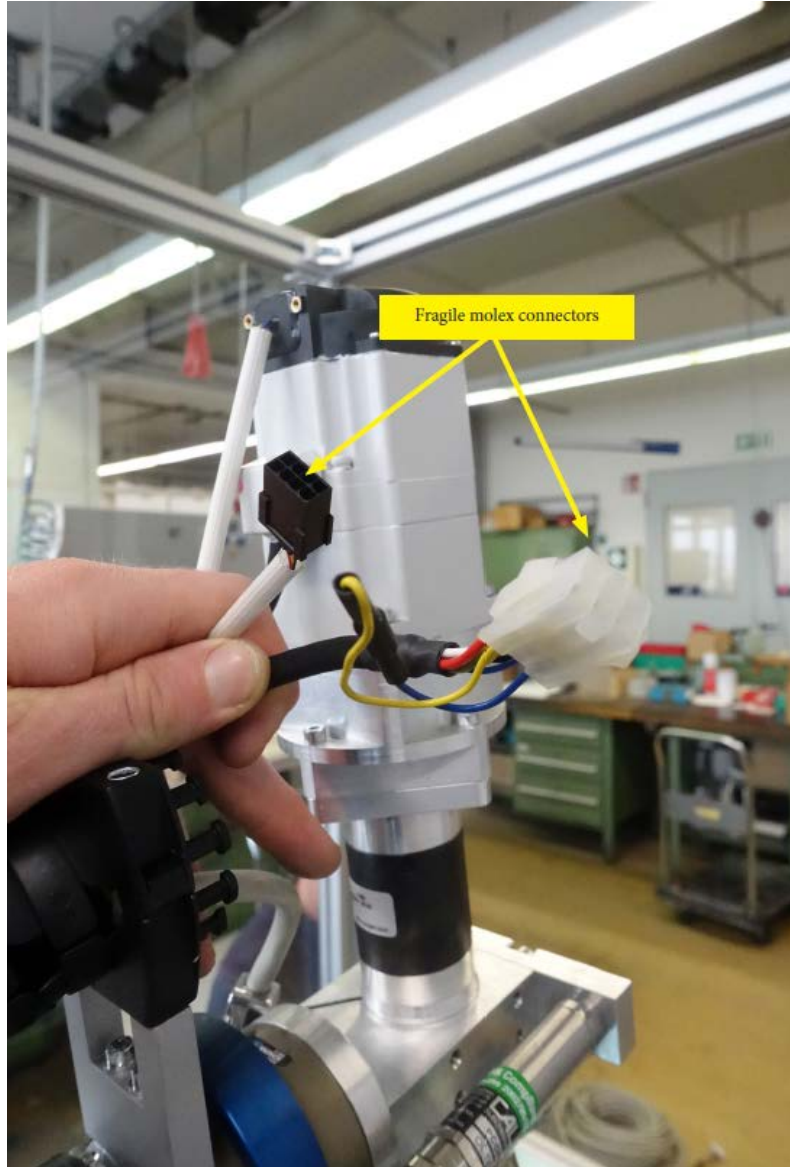
3.2 Motor units and Gear units

Continued



Note

The black part of the motor should be unpainted.



Gear units

Option	Description	Type
4107-1	(1-3) Choose quantity	MTD 250
4108-1	(1-3) Choose quantity	MTD 500
4109-1	(1-3) Choose quantity	MTD 750
4110-1	(1-3) Choose quantity	MTD 2000
4111-1	(1-3) Choose quantity	MTD 5000
4112-1	(1-3) Choose quantity	MID 500
4113-1	(1-3) Choose quantity	MID 1000

Continues on next page

Smooth shaft adaptor

Option	Description	Type
4103-1	(1-6) Choose quantity	Smooth shaft adaptor Only available for MU 200

Manipulator color

Option	Description	
209-202	ABB Graphite White Standard	Standard color



Note

MID 500 is only available in grey color.

3 Variants and options

3.3 Cables

3.3 Cables

Motor cables

Information regarding cables from the robot controller to the motor connection box is available in *Product manual - OmniCore V250XT Type B* or *Product manual - OmniCore V400XT*.

For further information, see [Cables on page 21](#).

Option	Description	Note
4114-1	OmniCore - MU/GU Power 7 m	Max. 1 Motor unit
4114-2	OmniCore - MU/GU Power 15 m	Max. 1 Motor unit
4114-3	OmniCore - MU/GU Power 30 m	Max. 1 Motor unit

For further information, see [Cables on page 21](#). Maximum total number of selectable cables are 6.

Option	Description	Note
4115-1	(1-6) Choose quantity	Motor connection box - MU/GU, power 3 m
4116-1	(1-6) Choose quantity	Motor connection box - MU/GU, power 7 m
4117-1	(1-6) Choose quantity	Motor connection box - MU/GU, power 15 m

Resolver cables

Information regarding cables from the robot controller to the motor connection box is available in *Product manual - OmniCore V250XT Type B* or *Product manual - OmniCore V400XT*.

Option	Description	Note
4118-1	(1-6) Choose quantity	Motor connection box - MU/GU, signal 3 m
4119-1	(1-6) Choose quantity	Motor connection box - MU/GU, signal 7 m
4120-1	(1-6) Choose quantity	Motor connection box - MU/GU, signal 15 m

3.4 User documentation

User documentation

The user documentation includes manuals that describe the robot in detail, including service and safety instructions.



Tip

All documents can be found via myABB Business Portal, www.abb.com/myABB.

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 *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 <i>Customer Delivery Date</i> or latest 18 months after <i>Factory Shipment Date</i> , 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.

3 Variants and options

3.4 User documentation

Continued

Option	Type	Description
438-8	Stock warranty	<p>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 <i>Factory Shipment Date</i> or from activation date of standard warranty in WebConfig.</p> <p> Note</p> <p>Special conditions are applicable, see <i>Robotics Warranty Directives</i>.</p>

Index

A

acceleration, 74
axial force
 motor units, 44

C

configuration files, 10

D

deceleration, 74
design load
 motor units, 44
documentation, 81

G

geometry
 motor units, 43

I

instructions, 81

M

manuals, 81
motor assembly, 43

N

nominal speed, 37

O

options, 75

P

peak load
 motor units, 44
permissible loads, 43

S

service instructions, 81
standard warranty, 81
stock warranty, 81

T

template files, 10
torques
 acceleration, deceleration, 74

U

user documentation, 81

V

variants, 75

W

warranty, 81



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