

Intelligent compact drives



Exemption note

We expressly point out that the details, measurement values and tolerances provided in the drawings are not binding. They are subject to technology and design modifications. Their only objective is to illustrate the product. Please contact our sales and distribution team if you need a concrete offer with a binding drawing.

encoTRive

Progress – Decentralized and Intelligent

A wide variety of products, smaller batch sizes and the individualization of production are the main requirements of progressive machines. In order to fulfill these demands, while market prices are static or even shrinking, and personnel costs are rising, automation technology must be used exhaustively. It must go beyond the actual production process

and enter secondary functions such as setup and material supply tasks. encoTRive fills the gap between fieldbus and drive technology. It is a compact device containing motor, power electronics, fieldbus communication, closed-loop controller and an absolute measuring system as well as optional I/O and brake.

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Performance

Actuating Drive

As auxiliary drive for adjusting ...

- _ dimensions
- _ guide rails
- _ stops
- _ valves, dampers and sliders

To use in ...

- _ folding machines
- _ thermoforming machines
- _ cardboard gluing machines
- _ component mixing systems



MA 025



MA 055 – 130

page 20 ... 23

Positioning Drive

As auxiliary or main drive for ...

- _ cyclic format adjustments
- _ dynamic rough settings
- _ fine adjustments
- _ speed

To use in ...

- _ wood working machines
- _ package ejection machines
- _ profile measuring machines
- _ X-ray analyzing devices



MP 200



MP 060 – 180



page 16 ... 19

Processing Drive

As main drive for ...

- _ precise positioning
- _ a synchronized and cyclic transfer
- _ sensor coupled position measurement
- _ application optimized portal systems

To use in ...

- _ accurate grinding machines
- _ inspection machines
- _ tool controlling modules
- _ tire testing facilities



MD 300



MD 060 – 180



page 12 ... 15

from ... up to ...

P	Controller structure	PID
1.000 min ⁻¹ per s	Dynamics	10.000 min ⁻¹ per s
20 ms	Real time	2 ms
1 – 2°	Accuracy	20 arcmin
without	Inputs and outputs	programmable
1.000 h	Life time	30.000 h

TR-Electronic – Helps You to Face the Challenges of Market

TR-Electronic – Helps You to Face the Challenges of Knowing and reacting to the demands of the market is the key to success. Today, innovative drive technology has to transfer technology trends and specific user requirements into new products. Aspects like mechatronics, electronics and software must be custom-fit and industry-sector-specific. The challenges is to increase machine productivity, while simplifying the design and operation.

In combination with automation technology, the encoTRive intelligent positioning and actuating drives maximise the innovative potential of modern machinery or retrofiting. Our encoTRive integrates and tunes all important required electrical, electronic and mechanical components. encoTRive is a fully functional drive unit ready to be connected. The advantage of using decentralized drive technology is felt when realizing modular concepts, retrofits, making acquisitions or when used in machines and equipment where large measurements occur. Both aspects of innovation – automation and integration – enable progressive machine concepts. Besides the already automated main processes, the auxiliary

functions have to be electromotive automated. This demands new and integrated drive technology concepts. Standardization and fieldbus systems play a dominant role.

To create a perfect combination of innovation, increased performance and flexibility, you have to be able to choose from a variety of multiple drive configurations and you must be able to make optimal changes between those configurations. For this purpose, we designed and adapted the variety of the individual encoTRive models. The wide range of applications go from simple tasks for the actuating drives up to complex highly accurate tasks for positioning drives.

Decentralized Drive Technology with encoTRive

The name encoTRive is the brand for our complete drive technology product line. It is derived from the two components **absolute Encoder and DRive**, modified and exchanged with our company abbreviation **TR**.

Integration is the first trademark. Enclosed are the power and positioning electronics, zero voltage safe encoder, fieldbus technology and gear. It is also available with optional holding brake and different I/O.

Variety Diversity is the second trademark. This is due to the diverse electronic functionality, numerous gear ratios and a wide range of gear types. Further options include radial or axial shaft, solid or hollow shaft, a moderate backlash or backlash-free. This is accomplished by using a planetary, worm or special gears.

Cross-Range Compatibility is the third trademark. All series are based on a common software platform. Only the MD and MP series differ in their absolute encoder and electronics. However, they use an identical platform and use the same electric motor and gear box.

MD 300, Version PROFIBUS



Individual models are constructed for application categories. For automation tasks with different requirements we offer drives with optimal performance levels.

- _ **Actuating Drive MA** (Stellantriebe)
- _ **Positioning Drive MP** (Positionierantriebe)
- _ **Drive in Core Process MD** (Prozessantriebe)

This structure is supported by a standard platform in the implementation of firmware, interfaces and bus. In practice

this means, there is considerably less effort in engineering and maintenance. System costs and installation times decrease as well. Available bus systems are: PROFIBUS, PROFINET and CANopen, enhanced through busses based on newer EtherNet technologies.

The encoTRive series opens with its standard decentralized concept, a new level of automation technology that applies all mechanical engineering applications, in particular in industries like packaging, press, wood, glass, print, plastics, textile and machine tools.

Series Features

- _ design according to application classification
- _ implementing software platform
- _ position measurement with fail-safe multi turn absolute encoder
- _ integration into a mechatronic system
- _ variant diversity through modularity
- _ operating modes, positioning and speed control
- _ control completely decentralized within the drive

Working Features

- _ high resolution, 1.024 or 4.096 steps per revolution
- _ long range, 4.096 or 65.536 revolutions
- _ precise positioning up ± 2 increments
- _ smooth running even at low speed
- _ limitable with software limit switch
- _ set parameters according to bus standards

Design of MD, MP and MA series

Based on its standard products, TR also develops customer- and application-specific drives. The series range from simple modifications, for example in plug connectors, to drives with new drive motors and additional bus interfaces.

- 10 different electric motors
- 11 gear types (axial and rectangular shaft output)

Electronics and drives of the MD series

The absolute encoder and the electronics are arranged in extension of the motor axis and on the side of the motor.

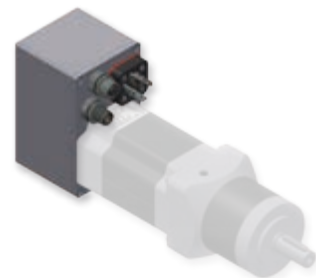
The connector cover accommodates not only the bus interface but also the application module for PROFIBUS and PROFINET. There is 1 standard M23 connector for power, logic and holding brake. In addition, there are 4 M12 connectors for bus IN/OUT and digital I/O. A sixth connector serves for communication with a PC featuring an RS-232 interface.



Electronics and drives of the MP series

The absolute encoder and the electronics are arranged in extension of the motor axis.

The electronics is simpler in its design and features less functionality than the MD series. The electronics housing is smaller as well. As a result, there is less output power during continuous operation. During intermittent operation or short-time operation, the same output and the same torque are available, but they are limited to shorter make and cycle times.



Electronics and drives of the MA series

The electronics is especially configured for short-time operation and moderate intermittent operation. The electric motors are brushed DC motors.

The absolute encoder and the electronics of the MA 025 are arranged in extension of the output shaft of the gear. The measurement involves the position of the gear shaft. The series features two defined types each with a driving torque of 2 and 4 Nm.

The absolute encoder and the electronics of the MA xxx (-055/ -100/ -130) are attached to the electric motor. This series features different power stages, torques and gear types.



Detachably mounted gears with coupling and clamping hub

Most of the precision gears are mounted to the electric motor such that they can be detached. This is the most flexible solution for project businesses, special machine building, and medium-size series.

Gear types range from economy planetary gears to low-backlash servo gears. Driving torques of up to 180 Nm are accessible for reinforced gears.



Non-detachably mounted gear with direct connection

All simple gears are permanently mounted to the electric motor. Coupling, clamping hub, gearbox flange and gearbox bearing are not applicable. For this purpose, the shaft of the electric motor features a pinion which couples directly to the first stage of the gear.

The gear types available are planetary gears and worm gears. The output direction of the gear shaft of drives with worm gear is set to one of the four possible directions.



Collection of drive series with possible component combinations

	Electronics			
	MA	MP	MD	
Technology: DC (brushed) PROFIBUS CANopen	 <p>MAxxx p. 20</p>			
EC (electronically commutated) PROFIBUS PROFINET CANopen		 <p>MP xxx p. 18</p>	 <p>MD xxx p. 14</p>	
EC (electronically commutated) PROFIBUS PROFINET CANopen		 <p>MP 200 p. 16</p>	 <p>MD 300 p. 12</p>	

	Motors	Gears	Options								
	 <p>055</p> <p>100</p> <p>130</p>	<p>Simple gears</p> <table border="1"> <thead> <tr> <th data-bbox="453 705 794 750">Standard</th> <th data-bbox="794 705 1136 750">Reinforced</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 750 794 996">  <p>PLG 52 p. 28</p> </td> <td data-bbox="794 750 1136 996">  <p>PLG 63 p. 30</p> </td> </tr> <tr> <td data-bbox="453 996 794 1310">  <p>SG 80 H p. 28</p> </td> <td data-bbox="794 996 1136 1310">  <p>SGF 120 H p. 30</p> </td> </tr> <tr> <td data-bbox="453 1310 794 1601">  <p>SG 80 WL1 p. 28</p> </td> <td data-bbox="794 1310 1136 1601">  <p>SGF 120 WL1 p. 30</p> </td> </tr> </tbody> </table>	Standard	Reinforced	 <p>PLG 52 p. 28</p>	 <p>PLG 63 p. 30</p>	 <p>SG 80 H p. 28</p>	 <p>SGF 120 H p. 30</p>	 <p>SG 80 WL1 p. 28</p>	 <p>SGF 120 WL1 p. 30</p>	
Standard	Reinforced										
 <p>PLG 52 p. 28</p>	 <p>PLG 63 p. 30</p>										
 <p>SG 80 H p. 28</p>	 <p>SGF 120 H p. 30</p>										
 <p>SG 80 WL1 p. 28</p>	 <p>SGF 120 WL1 p. 30</p>										
	 <p>060</p> <p>100</p> <p>140</p> <p>180</p>	<p>Precision gears</p> <table border="1"> <thead> <tr> <th data-bbox="453 1646 794 1691">Standard</th> <th data-bbox="794 1646 1136 1691">Reinforced</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1691 794 1892">  <p>PLE 60 p. 24</p> </td> <td data-bbox="794 1691 1136 1892">  <p>PLE 80 p. 26</p> </td> </tr> <tr> <td data-bbox="453 1892 794 2096">  <p>WPLE 60 p. 24</p> </td> <td data-bbox="794 1892 1136 2096">  <p>WPLE 80 p. 26</p> </td> </tr> </tbody> </table>	Standard	Reinforced	 <p>PLE 60 p. 24</p>	 <p>PLE 80 p. 26</p>	 <p>WPLE 60 p. 24</p>	 <p>WPLE 80 p. 26</p>	 <p>HFUC p. 24</p>  <p>Integrated holding brake</p>		
Standard	Reinforced										
 <p>PLE 60 p. 24</p>	 <p>PLE 80 p. 26</p>										
 <p>WPLE 60 p. 24</p>	 <p>WPLE 80 p. 26</p>										
	 <p>200/300 without brake</p> <p>200/300 with brake</p>	<p>Precision gears</p> <table border="1"> <thead> <tr> <th data-bbox="453 1646 794 1691">Standard</th> <th data-bbox="794 1646 1136 1691">Reinforced</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 1691 794 1892">  <p>PLE 60 p. 24</p> </td> <td data-bbox="794 1691 1136 1892">  <p>PLE 80 p. 26</p> </td> </tr> <tr> <td data-bbox="453 1892 794 2096">  <p>WPLE 60 p. 24</p> </td> <td data-bbox="794 1892 1136 2096">  <p>WPLE 80 p. 26</p> </td> </tr> </tbody> </table>	Standard	Reinforced	 <p>PLE 60 p. 24</p>	 <p>PLE 80 p. 26</p>	 <p>WPLE 60 p. 24</p>	 <p>WPLE 80 p. 26</p>	 <p>HFUC p. 24</p>  <p>Integrated holding brake</p>		
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 <p>PLE 60 p. 24</p>	 <p>PLE 80 p. 26</p>										
 <p>WPLE 60 p. 24</p>	 <p>WPLE 80 p. 26</p>										

Process drive MD 300

The MD 300 series features comprehensive electronic functions and high-quality gears. Various gear series are available in several overall sizes and reductions.

The drives that can be configured based on these gears can be used as process drives or as auxiliary drives when special requirements must be met with regard to electronics, accuracy and mechanical flexibility.

This type series is particularly suited for special machine building where machine configurations are constantly changing, from quantities of 1 piece to medium-size series.



Optimal

- _ for precise positioning
- _ for cyclic and pulsed positioning
- _ for simultaneous use of decentralized I/Os
- _ in machine tools
- _ in inspection machines
- _ in special machines

Technical data		MD 300	
Nominal voltage	VDC	24	48
Nominal torque S1 (S3)	Nm	0.60 (1.10)	0.60 (1.10)
Nominal power S1 (S3)	W	136 (178)	273 (357)
Nominal speed S1 (S3)	min ⁻¹	2,175 (1,550)	4,350 (3,100)
Nominal current S1 (S3)	A	8.0	7.6
Inertia torque	g cm ²	512 (612 with holding brake)	
Electric motor		EC, electronically commutated motor	
_ Technology		IP 54, motor shaft IP 41	
_ Protection class			
Encoder		Absolute encoder, multi turn	
_ Technology		0.35° / 1,024 steps per revolution	
_ Positioning resolution		65,536 revolutions	
_ Positioning range		±0.7° / ±2 steps	
_ Positioning accuracy			
Gear		Planetary gear / angular planetary gear	
_ Type		3 ... 512	
_ Reductions		up to 44 (70) Nm, reinforced up to 120 (192) Nm	
_ Torques S1 (S3)			
Interfaces		(V0/V1) (IO) (402)	
		RS-232, logic I/O module, limit switch	
Options		Holding brake, hand-held operator panel	
Brake chopper		Power 50 W, pulse energy 35 Ws	

Definitions

S1

Continuous operation

S3

Intermittent operation

25 %, 10 min

Make time 2.5 min

Cycle time 10 min

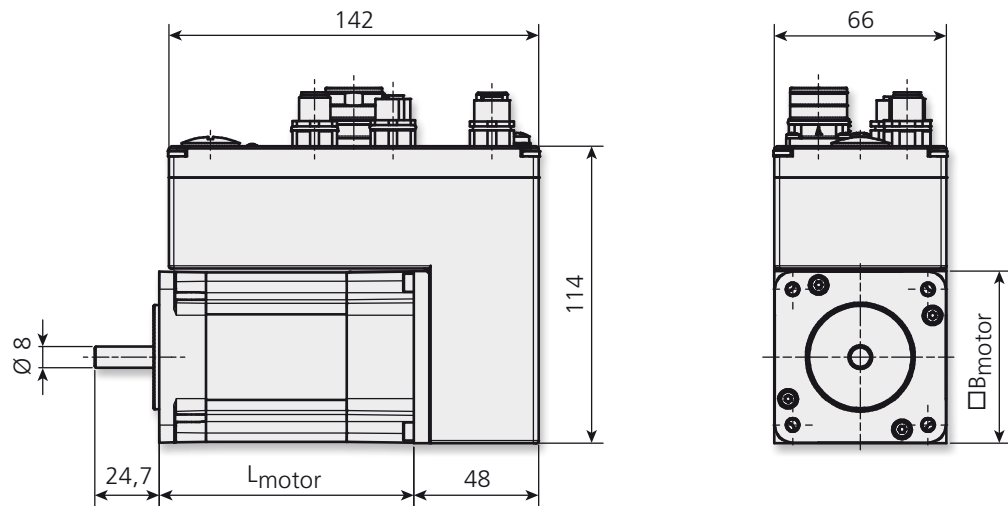
Max. torque 1.10 Nm

True absolute encoder

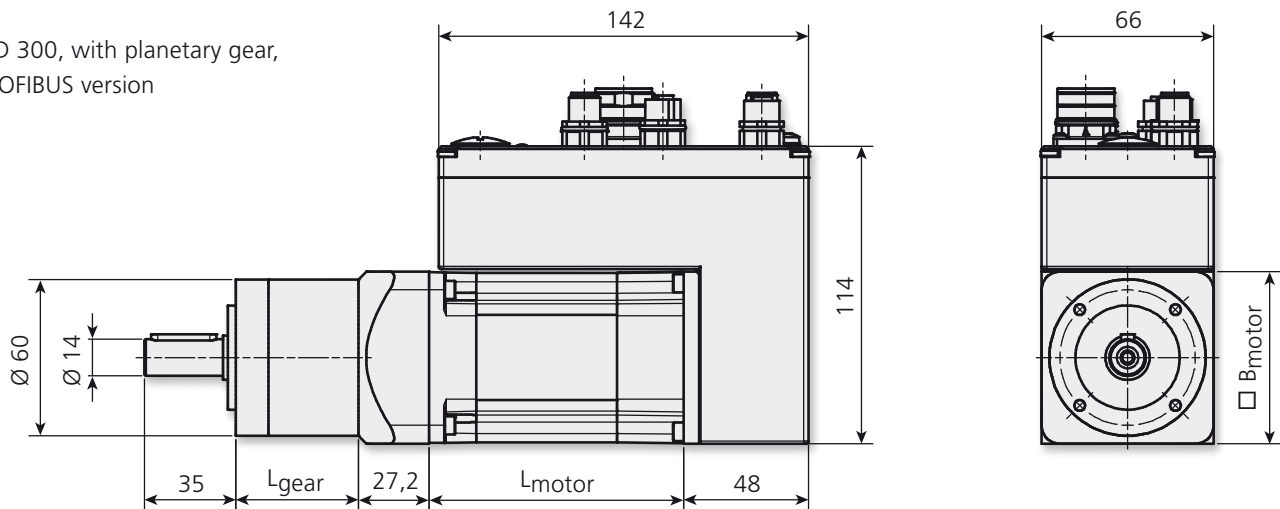
Fail-safe position information through electromechanical principle of measurement

Drawings

MD 300, without gear,
PROFIBUS version



MD 300, with planetary gear,
PROFIBUS version



Motor design

Brake	L _{motor}	B _{motor}
no	97,6 mm	□ 66 mm
yes	132 mm	□ 67 mm

PLE 60 gear design

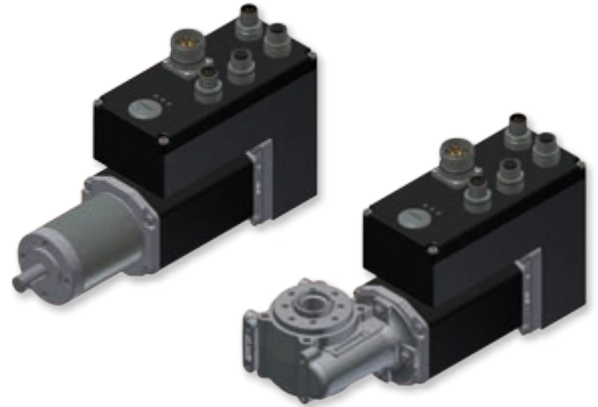
Gear stages	L _{gear}
1	47 mm
2	59,5 mm
3	72 mm

Process drive MD xxx (-060, -100, -140, -180)

The MD xxx series is characterized by comprehensive electronic functions and simple gears. The gears available are planetary and worm gears in several overall sizes and reductions.




The drives that can be configured based on these gears can be used as process drives or as auxiliary drives when special requirements must be met with regard to electronics.

This type series is particularly suited for mass production with defined drive configurations.



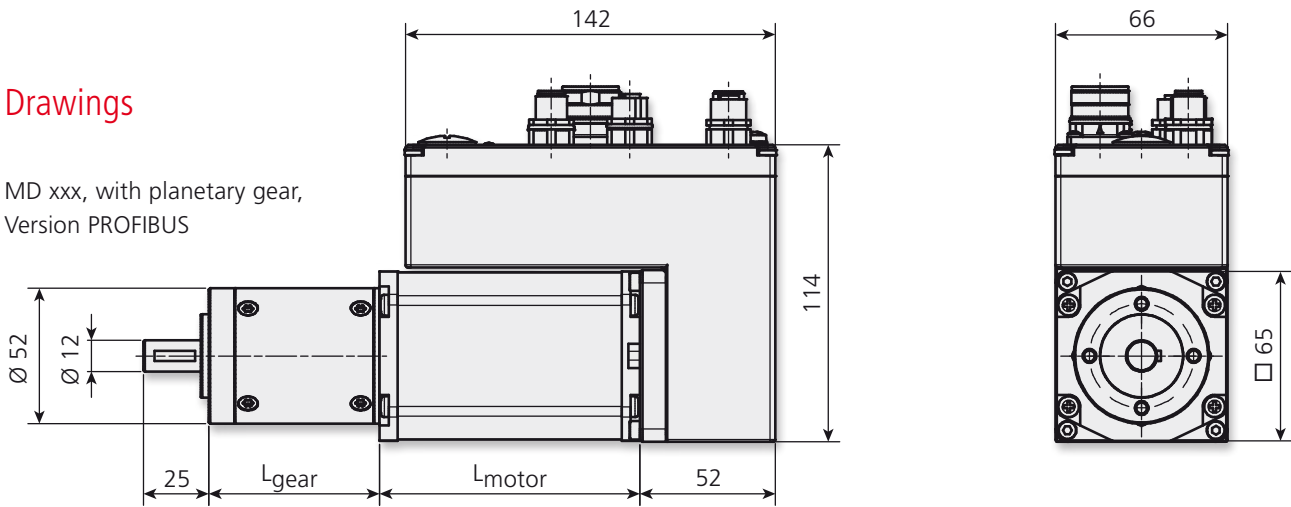
Optimal

- _ for easy positioning
 - _ for cyclic and pulsed positioning
 - _ for simultaneous use of decentralized I/Os
- _ in handling systems
 - _ in assembly devices
 - _ in special machines

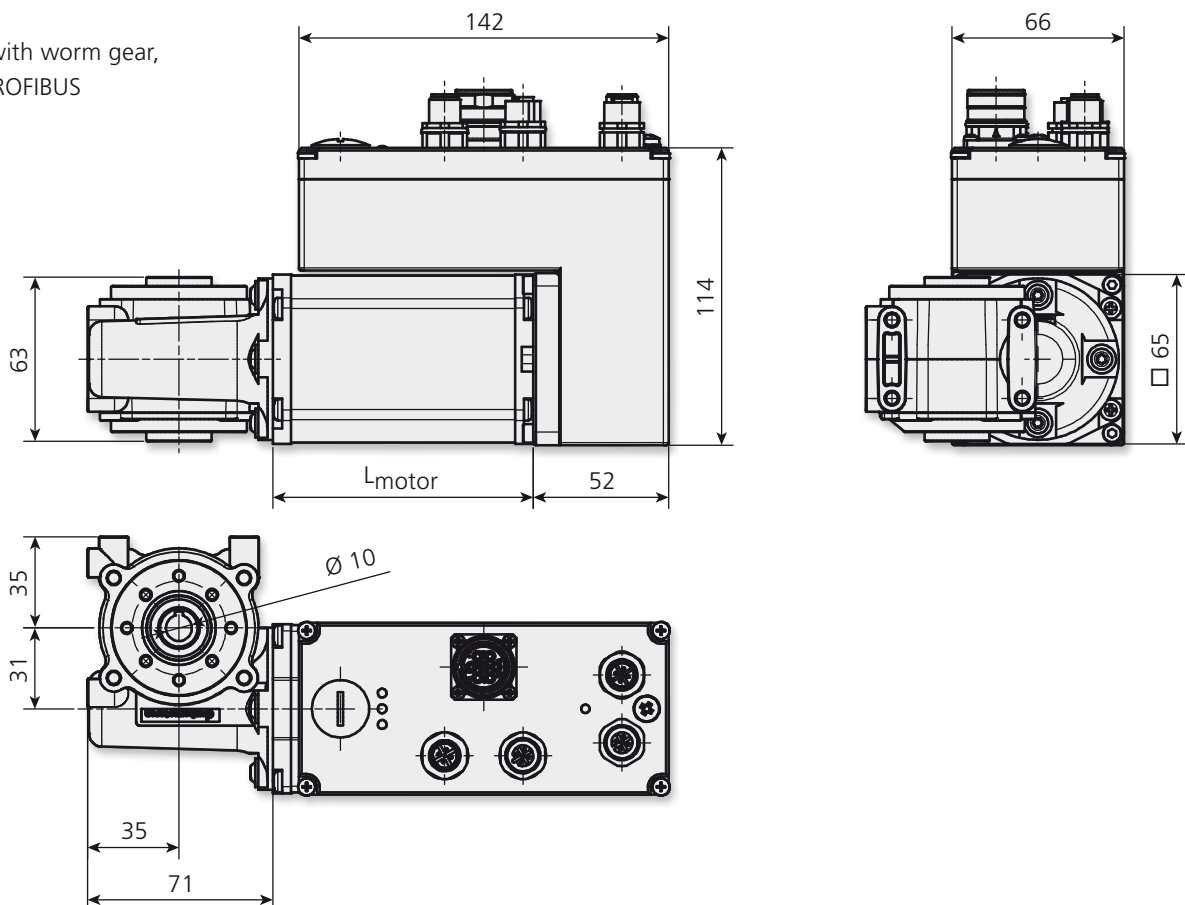
Technical data		MD 060	MD 100	MD 140	MD 180
Nominal voltage	VDC	24	24	42	24
Nominal torque S1	Nm	0.17	0.26	0.40	0.49
Nominal power S1	W	55	84	120	166
Nominal speed S1	min ⁻¹	3,080	3,090	2,860	3,240
Nominal current S1	A	4.0	5.6	4.5	9.0
Inertia torque	gcm ²	72	128	172	129
Electric motor		EC, electronically commutated motor with neodymium magnet IP 50			
_ Technology					
_ Protection class					
Encoder		Absolute encoder, multi turn 0.35° / 1,024 steps per revolution 65,536 revolutions ±0.7° / ±2 steps			
_ Technology					
_ Positioning resolution					
_ Positioning range					
_ Positioning accuracy					
Gear		Planetary gear / worm gear 4.5 ... 512/5 ... 75, reinforced 3 ... 710 / 8 ... 80 up to (24/10) Nm, reinforced up to (100/30) Nm			
_ Type					
_ Reductions					
_ Torques S1 (S3)					
Interfaces		 (V0/V1)  (IO)  (402)			
		RS-232, logic I/O module, limit switch			
Options		Hand-held operator panel			
Brake chopper		Power 50 W, pulse energy 35 Ws			

Drawings

MD xxx, with planetary gear,
Version PROFIBUS



MD xxx, with worm gear,
Version PROFIBUS



Motor design

Type series	L _{motor}
MD 060	75 mm
MD 100	100 mm
MD 140	125 mm
MD 180	118 mm

PLG 52 gear design

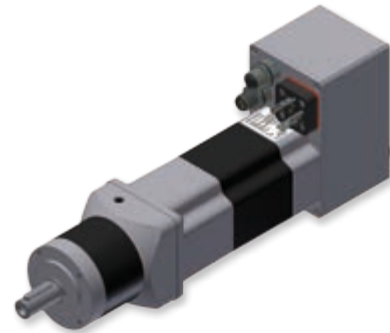
Gear stages	L _{gear}
1	50 mm
2	65,5 mm
3	80,5 mm

Positioning drive MP 200

The MP 200 series features numerous electronic functions and high-quality gears. Various gear series are available in several overall sizes and reductions.




The drives that can be configured based on these gears can be used as positioning drives or as auxiliary drives when special requirements must be met with regard to accuracy and mechanical flexibility.

This type series is particularly suited for special machine building where machine configurations are constantly changing, from quantities of 1 piece to medium-size series.



Optimal

- _ for demanding positioning
 - _ for precise format setting
 - _ for high-precision pulsed positioning
- _ in transfer lines
 - _ in testing devices
 - _ in special machines

Technical data		MP 200	
Nominal voltage	VDC	24	48
Nominal torque S1 (S3)	Nm	0.40 (1.10)	0.40 (1.10)
Nominal power S1 (S3)	W	91 (178)	182 (357)
Nominal speed S1 (S3)	min ⁻¹	2,175 (1,550)	4,350 (3,100)
Nominal current S1 (S3)	A	5.2	4.8
Inertia torque	g cm ²	512 (612 with holding brake)	
Electric motor		EC, electronically commutated motor	
_ Technology		IP 54, motor shaft IP 41	
_ Protection class			
Encoder		Absolute encoder, multi turn	
_ Technology		0.088° / 4,096 steps per revolution	
_ Positioning resolution		4,096 revolutions	
_ Positioning range		±0.7° / ±8 steps	
_ Positioning accuracy			
Gear		Planetary gear / angular planetary gear	
_ Type		3 ... 512	
_ Reductions		up to 44 (70) Nm, reinforced up to 120 (192) Nm	
_ Torques S1 (S3)			
Interfaces		 (V0/V1)  (IO)  (402)	
Options		Holding brake, hand-held operator panel	

Definitions

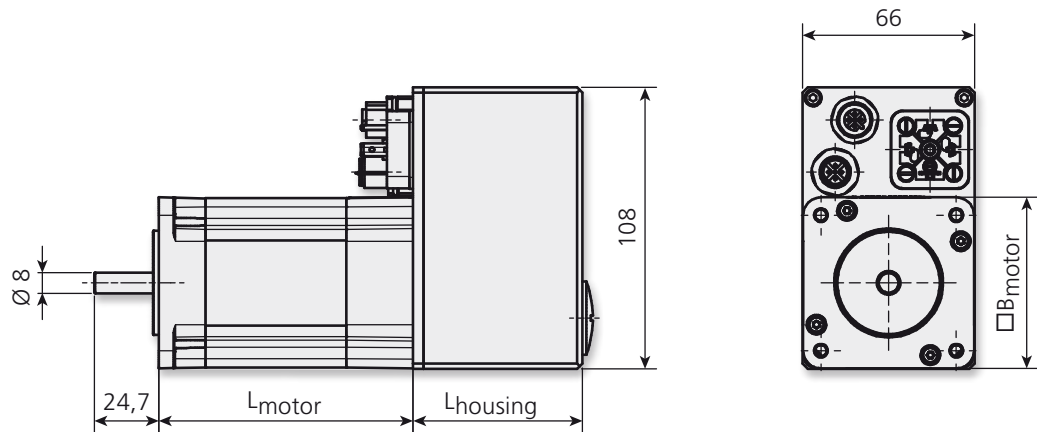
S1
Continuous operation

S3
Intermittent operation
25 %, 4 min
Make time 1 min
Cycle time 4 min
Max. torque 1.10 Nm

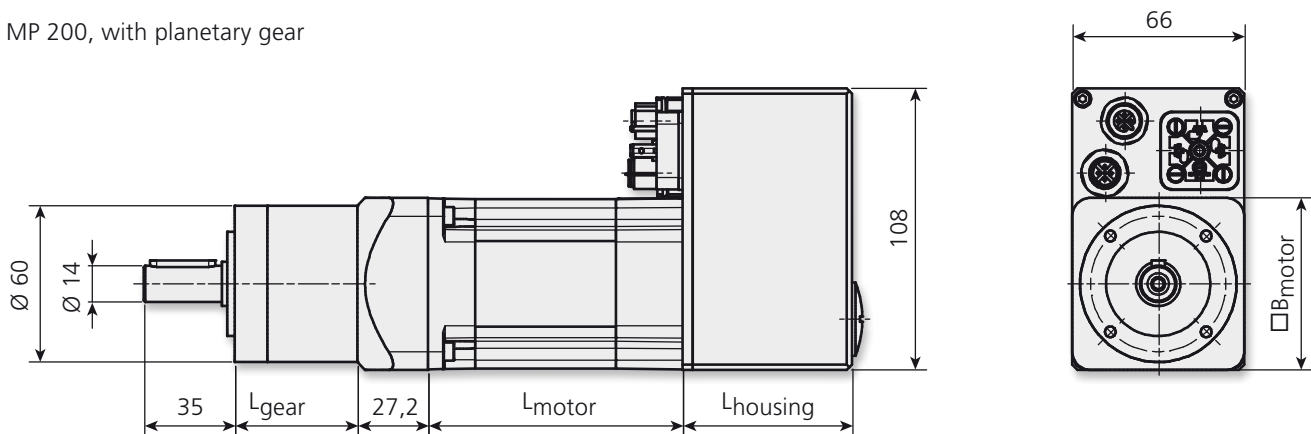
True absolute encoder
Fail-safe position information through electromechanical principle of measurement

Drawings

MP 200, without gear



MP 200, with planetary gear



Housing length

Bus	L _{housing}
CANopen	50 mm
PROFIBUS	65 mm
PROFINET	47 mm

Motor design

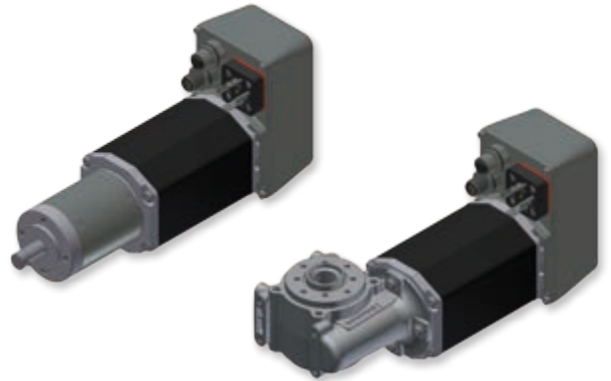
Type series	L _{motor}	B _{motor}
no	97,6 mm	□ 66 mm
yes	132 mm	□ 67 mm

PLE 60 gear design

Gear stages	L _{gear}
1	47 mm
2	59,5 mm
3	72 mm



Positioning drive MP xxx (-060, -100, -140, -180)

The MP xxx series is characterized by numerous electronic functions and simple gears. The gears available are planetary and worm gears in several overall sizes and reductions. The drives that can be configured based on these gears can be used as positioning drives or as auxiliary drives when simple requirements must be met with regard to electronics and mechanics. This type series is particularly suited for mass production with defined drive configurations.



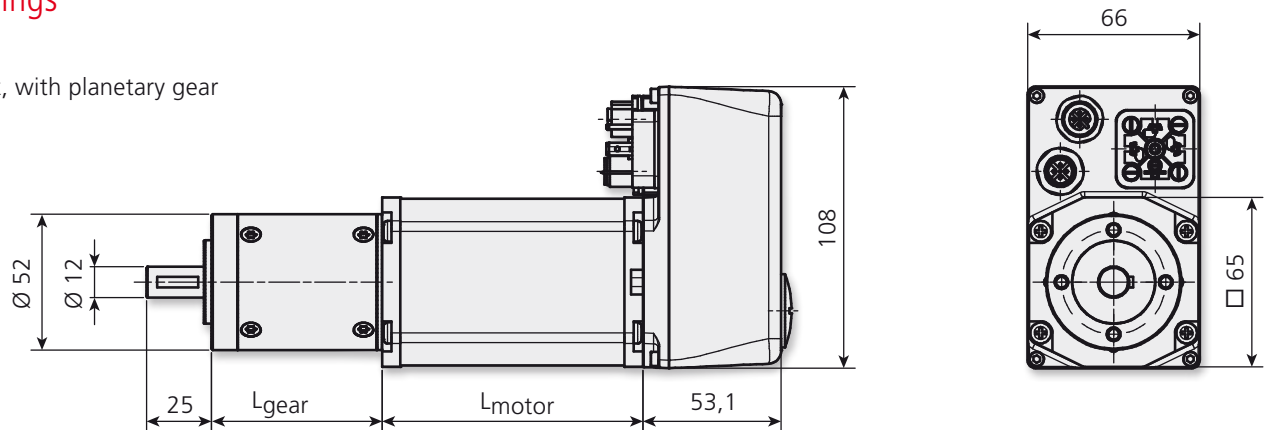
Optimal

- _ for easy positioning
 - _ for coarse format setting
 - _ for high-precision constant travel
- _ in handling systems
 - _ in assembly devices
 - _ in special machines

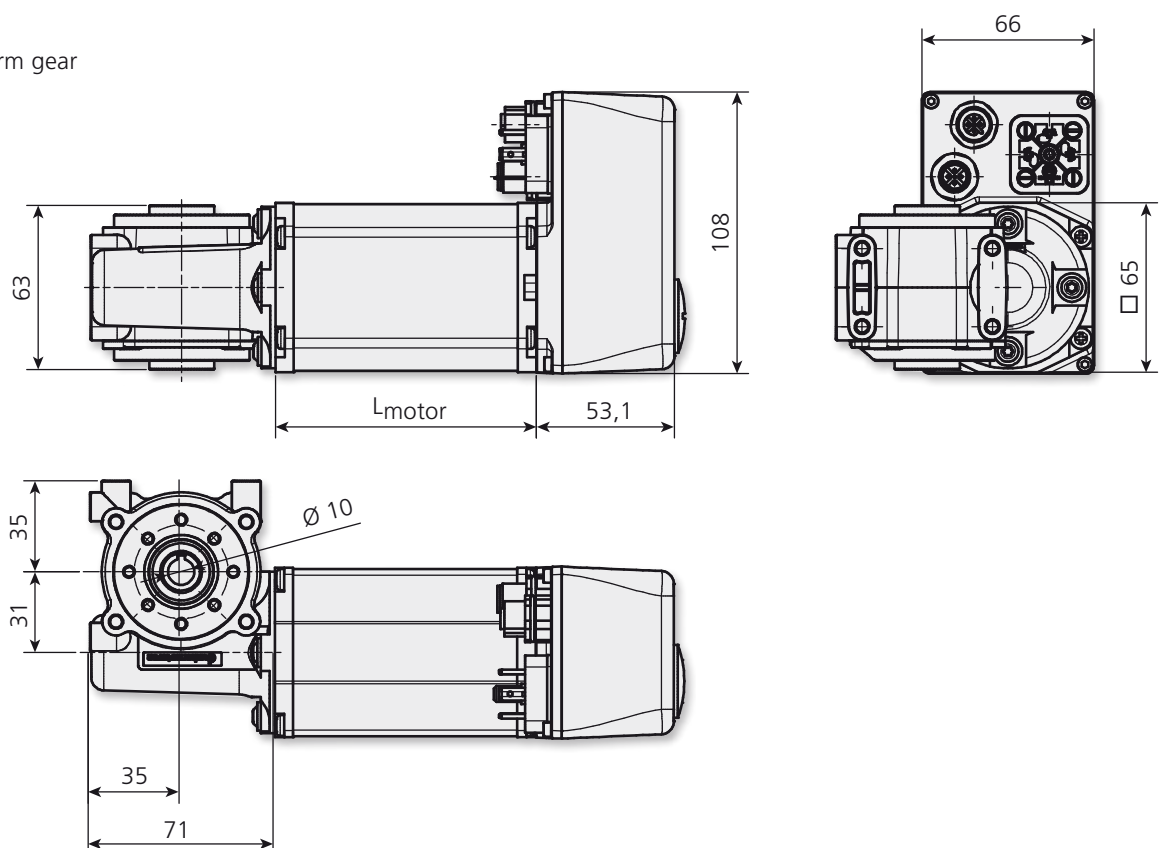
Technical data		MP 060	MP 100	MP 140	MP 180
Nominal voltage	VDC	24	24	42	24
Nominal torque S1	Nm	0.17	0.26	0.40	0.49
Nominal power S1	W	55	84	120	166
Nominal speed S1	min ⁻¹	3,080	3,090	2,860	3,240
Nominal current S1	A	4.0	5.6	4.5	9.5
Inertia torque	gcm ²	72	128	172	129
Electric motor		EC, electronically commutated motor with neodymium magnet IP 50			
_ Technology					
_ Protection class					
Encoder		Absolute encoder, multi turn 0.088° / 4,096 steps per revolution 4,096 revolutions ±0.7° / ±8 steps			
_ Technology					
_ Positioning resolution					
_ Positioning range					
_ Positioning accuracy					
Gear		Planetary gear / worm gear 4.5 ... 512/5 ... 75, reinforced 3 ... 710 / 8 ... 80 up to (24/10) Nm, reinforced up to (100/30) Nm			
_ Type					
_ Reductions					
_ Torques S1 (S3)					
Interfaces		 (V0/V1)  (IO) CANopen (402)			
Options		Special voltages for large production series			

Drawings

MP xxx, with planetary gear



MP xxx, with worm gear



Motor design

Type series	L_{motor}
MP 060	75 mm
MP 100	100 mm
MP 140	125 mm
MP 180	118 mm

PLG 52 gear design

Gear stages	L_{gear}
1	50 mm
2	65,5 mm
3	80,5 mm



Servo drive MA xxx (-055, -100, -130)

The MA xxx series is characterized by simple electronic functions and simple gears. The gears available are planetary and worm gears in several overall sizes and reductions. The drives are designed for occasional adjustment tasks when simple requirements must be met with regard to electronics, mechanics and service life. The MA xxx series is particularly suited for mass production with defined drive configurations.



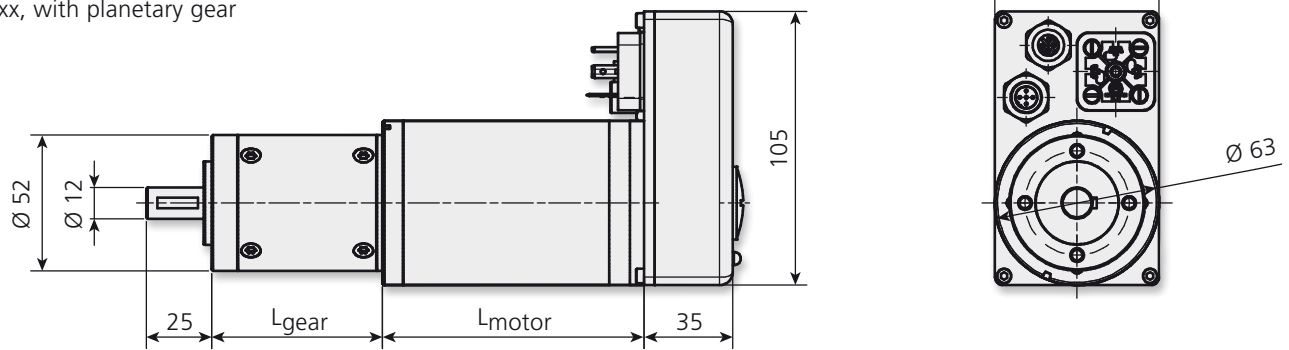
Optimal

- _ for setting stops
 - _ for positioning guide rails
 - _ for aligning spray nozzles
- _ in woodworking machines
 - _ in packaging machines
 - _ in coating machines

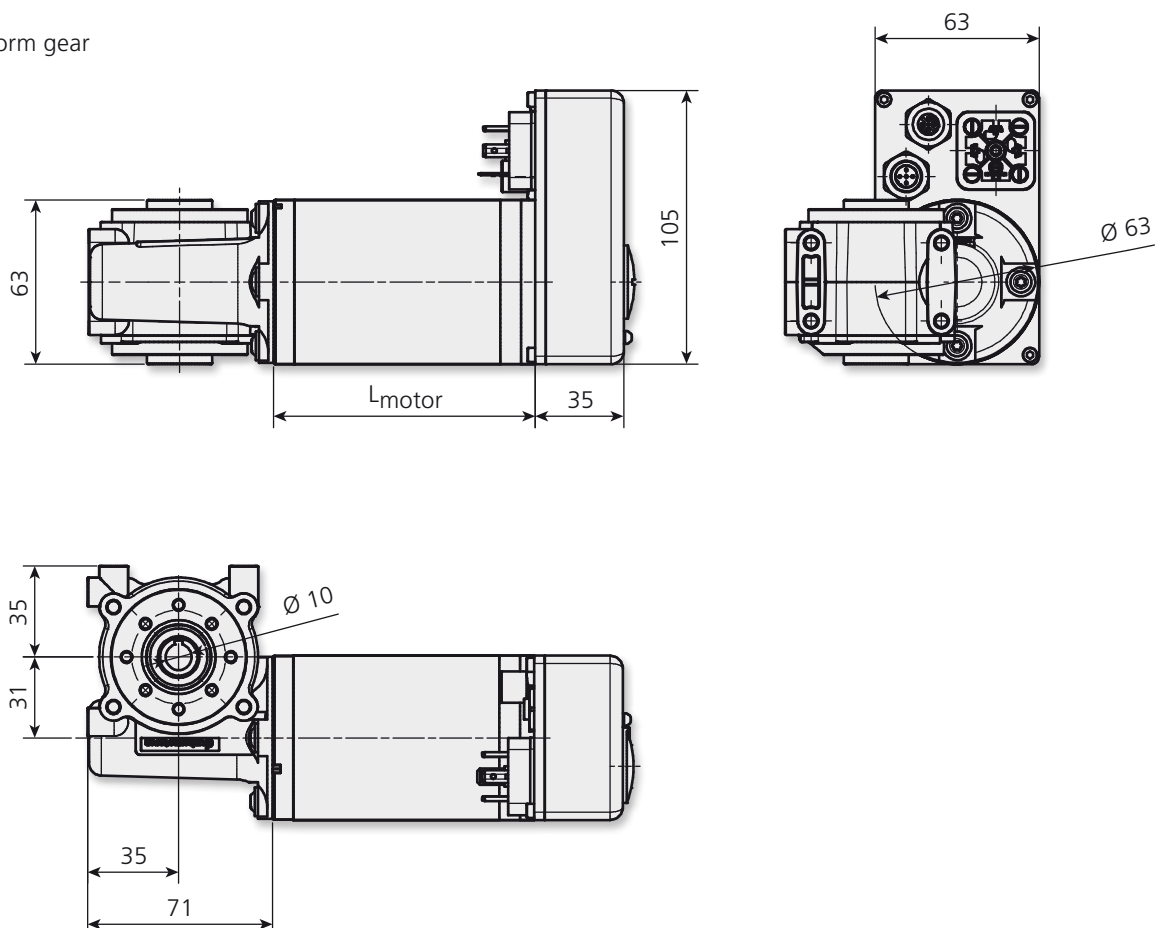
Technical data		MA 055	MA 100	MA 130
Nominal voltage	VDC	24	24	24
Nominal torque S1	Nm	0.14	0.27	0.32
Nominal power S1	W	44	86	107
Nominal speed S1	min ⁻¹	3,000	3,050	3,200
Nominal current S1	A	2.7	4.9	5.8
Inertia torque	gcm ²	400	750	750
Electric motor		DC, brushed motor IP 50		
_ Technology				
_ Protection class				
Encoder		Absolute encoder, multi turn 0.088° / 4,096 steps per revolution 65,536 revolutions ±0.7° / ±8 steps		
_ Technology				
_ Positioning resolution				
_ Positioning range				
_ Positioning accuracy				
Gear		Planetary gear / worm gear 4.5 ... 512/5 ... 75, reinforced 3 ... 710 / 8 ... 80 up to (24/10) Nm, reinforced up to (100/30) Nm		
_ Type				
_ Reductions				
_ Torques S1 (S3)				
Interfaces		 (V0/V1)  (402)		
Options		Special voltages for large production series		

Drawings

MA xxx, with planetary gear



MA xxx, with worm gear



Motor design

Type series	L _{motor}
MA 055	95 mm
MA 100	125 mm
MA 130	125 mm

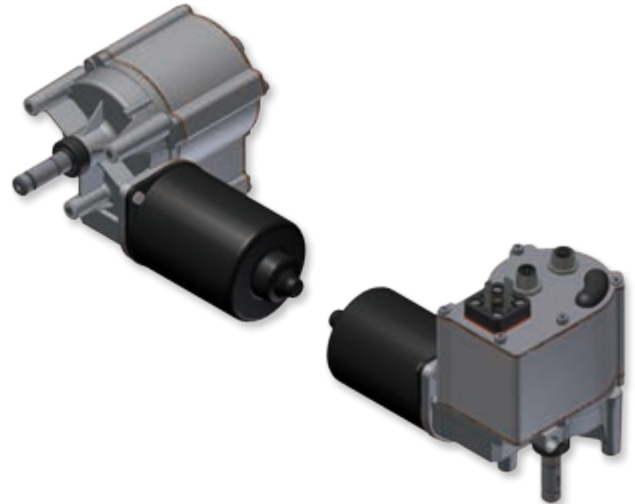
PLG 52 gear design

Gear stages	L _{gear}
1	50 mm
2	65,5 mm
3	80,5 mm

Servo drive MA 025

The MA 025 series is optimally suited for occasional adjustment tasks and for automation of adjustment tasks that were performed manually so far. In general, the series is suitable for auxiliary functions without special requirements to be met by dynamics, runtime or service life.



The drive reaches its position by means of a fail-safe absolute encoder at the gear output and is capable of handling short-term high overloads. The type series features two defined types each with a driving torque of 2 and 4 Nm.



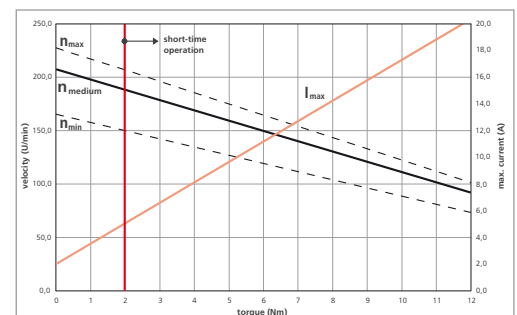
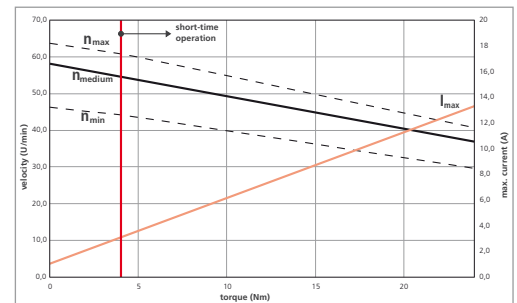
Optimal

- _ for setting stops
- _ for positioning guide rails
- _ for controlling valves, flaps and sliders

- _ in folding machines
- _ in thermoforming machines
- _ in component mixing systems

Technical data		2 Nm	4 Nm
Nominal voltage	VDC	24	24
Nominal torque S2 (10 min)	Nm	2.0	4.0
Nominal power S2 (10 min)	W	39	27
Nominal speed S2 (10 min)	min ⁻¹	187	54
Nominal current S2 (10 min)	A	5.5	4.0
Inertia torque	g cm ²	780	
Electric motor		DC, brushed motor	
_ Technology		IP 42	
_ Protection class			
Encoder		Absolute encoder, multi turn	
_ Technology		0.35°/4,096 steps per revolution	
_ Positioning resolution		256 revolutions (gear shaft)	
_ Positioning range		±8 steps	
_ Positioning accuracy			
Gear		Worm gear	
_ Type		17.5 at 2 Nm, 65 at 4 Nm	
_ Reductions			
Interfaces		 (V0/V1)  (402)	

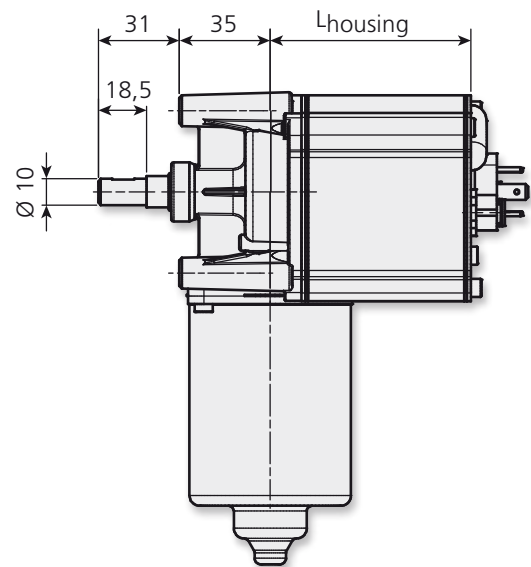
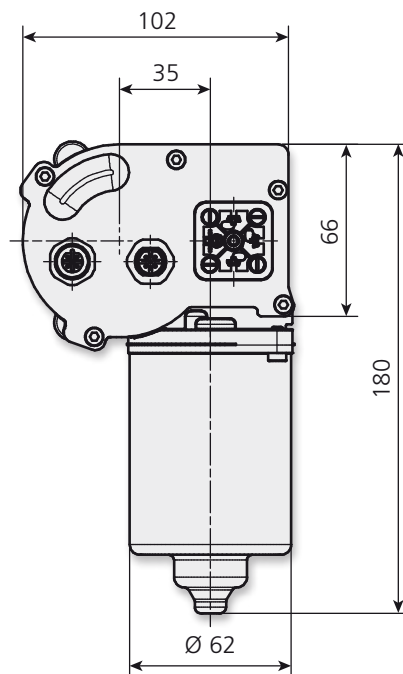
Characteristic curves



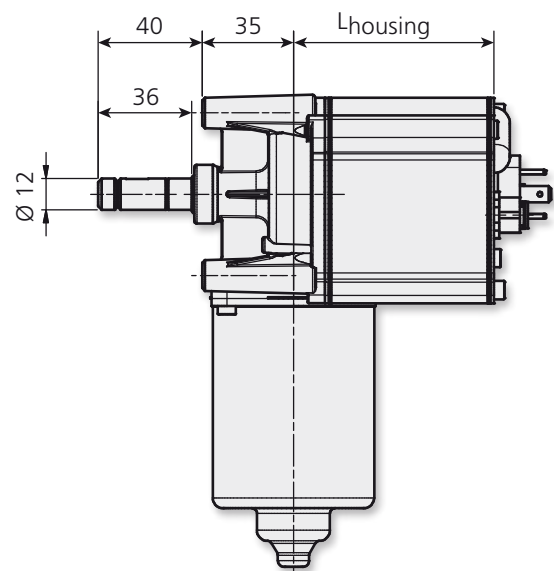
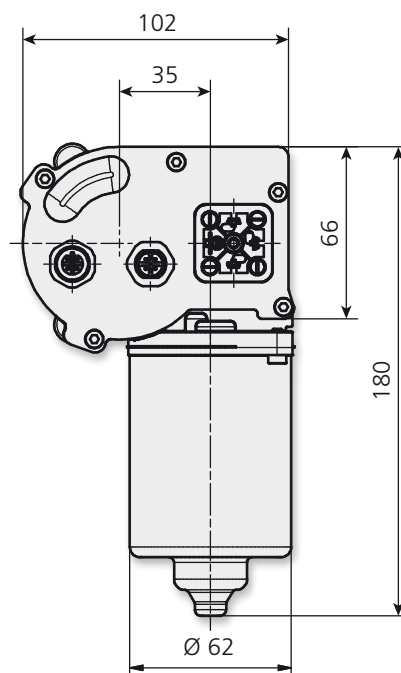
There is a minor difference between the speeds in the two directions of rotation of the output shaft. In the characteristic curve fields, this is illustrated by dashed boundary lines indicating the tolerance width. The values for the allowed shaft forces are standard values and should not be exceeded.

Drawings

MA 025, 2 Nm



MA 025, 4 Nm



Housing length

Bus	L _{housing}
CANopen	57 mm
PROFIBUS	77 mm

Precision Gears for MD 300, MP 200

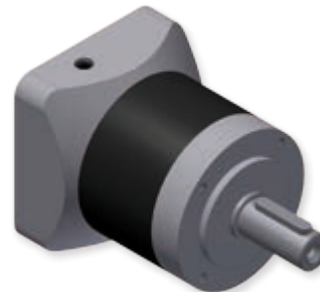
Planetary Gear PLE 60

Permanent Operation/Periodic Duty up to 44/70 Nm

The PLE 60 is the perfect economical alternative to servo planetary gears. The motor and gear are connected with a detachable coupling and clamping hub. Friction losses are negligible. The gear is suitable for all applications in where it is adequate to have a backlash of approximately 15 arcmin.

Features

- _ low backlash (10-12-15 arcmin), (1-2-3)-stage
- _ high level of efficiency (96-94-90 %), (1-2-3)-stage
- _ high admissible shaft forces (600/500) N, (axial/radial)



up to 44/70 Nm

- _ high short-term overload factor 1,60
- _ arbitrary mounting position
- _ lifetime lubrication

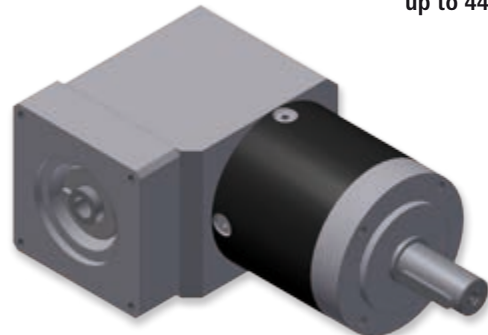
Angular Planetary Gear WPLE 60

Permanent Operation/Periodic Duty up to 44/70 Nm

The WPLE 60 is the 90° angle version to the PLE 60. The motor and gear are connected with a detachable coupling and clamping hub. Friction losses are negligible. A bevel gear 1:1 is in front of the PLE 60.

Features

- _ low backlash, (16-18-21 arcmin), (1-2-3)-stage
- _ high level of efficiency (94-92-88 %), (1-2-3)-stage
- _ high admissible shaft forces (600/500) N, (axial/radial)



up to 44/70 Nm

- _ high short term overload factor 1,60
- _ arbitrary mounting position
- _ lifetime lubrication

Harmonic Drive gear HFUC-14

Continuous / intermittent torque up to 7.8 / 28 Nm

The HFUC-14 is a backlash-free precision gear and is non-detachably connected to the motor. It is ideally suited for applications where the backlash of servo gears is insufficient. The angular tolerance is determined by the torsional stiffness.

Features

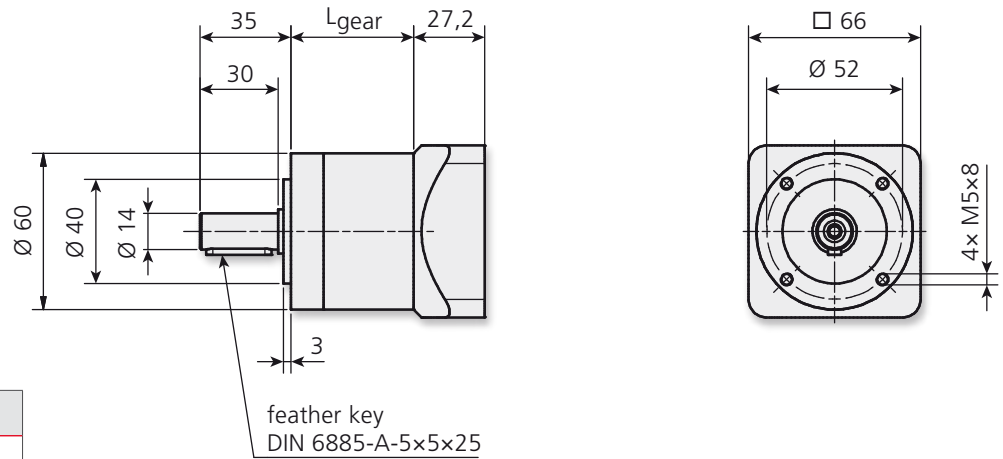
- _ 4 different reductions $i = (30 \dots 100)$
- _ high load-dependent efficiency
- _ high allowed radial force 1.500 N



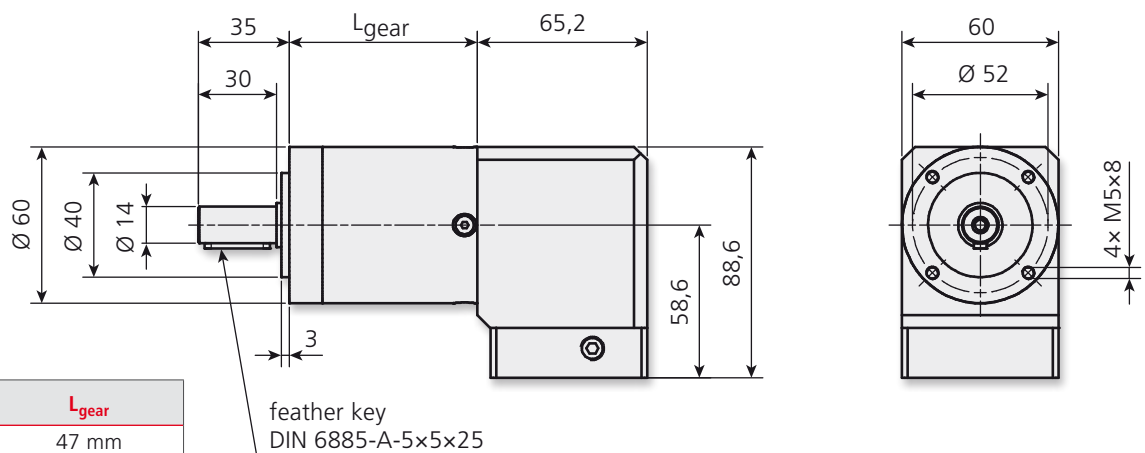
Backlash-free

- _ short-term overload 100 %
- _ any installation position
- _ lifetime lubrication

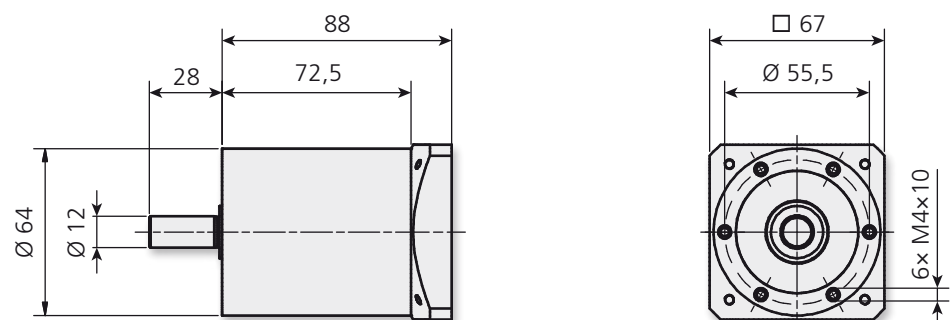
Drawings



Gear stages	L_{gear}
1	47 mm
2	59,5 mm
3	72 mm



Gear stages	L_{gear}
1	47 mm
2	59,5 mm
3	72 mm



Enhanced Precision Gears for MD 300, MP 200

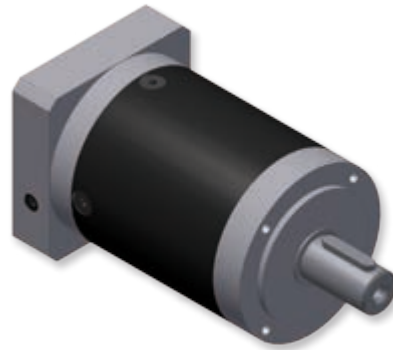
Planetary Gear PLE 80

Permanent Operation/Periodic Duty up to 130/208 Nm

The PLE 80 is the perfect economical alternative to servo planetary gears. The motor and gear are connected with a detachable coupling and clamping hub. Friction losses cannot be neglected. The gear is suitable for all applications where it is adequate to have a backlash of approximately 15 arcmin.

Features

- _ low backlash (7-9-11 arcmin), (1-2-3)-stage
- _ high level of efficiency (96-94-90 %), (1-2-3)-stage
- _ high admissible shaft forces, (1.200/950 N), (axial-radial)
- _ high short term overload factor 1,60
- _ arbitrary mounting position
- _ lifetime lubrication



130/208 Nm

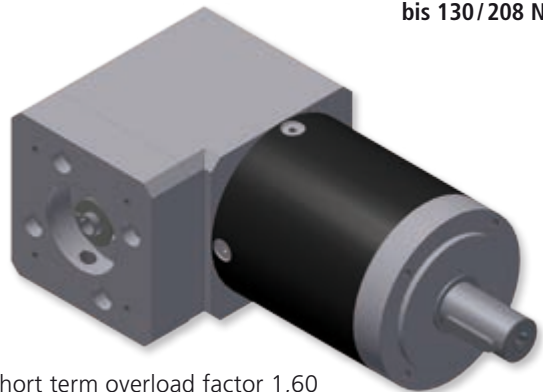
Angular Planetary gear WPLE 80

Permanent Operation/Periodic Duty up to 130/208 Nm

The WPLE 80 is the 90° angle version to the PLE 80. The motor and gear are connected with a detachable coupling and clamping hub. Friction losses can not be neglected. A bevel gear 1:1 is in front of the PLE 80. The gear backlash increases by an angle part of 6 arcmin.

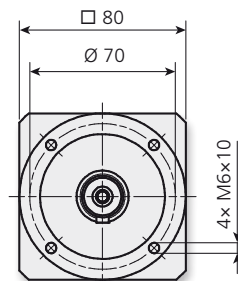
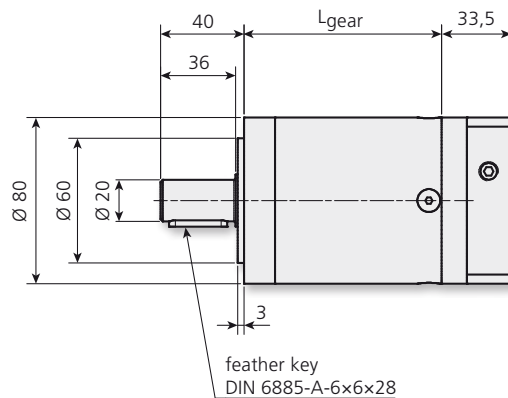
Features

- _ low backlash (13-15-17 arcmin), (1-2-3)-stage
- _ high level of efficiency (94-92-88 %), (1-2-3)-stage
- _ high admissible shaft forces, (1.200/950 N), (axial-radial)
- _ high short term overload factor 1,60
- _ arbitrary mounting position
- _ lifetime lubrication

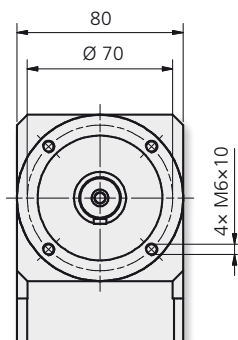
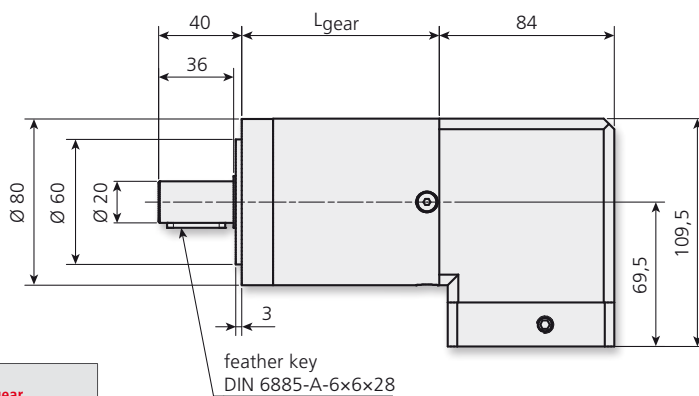


bis 130/208 Nm

Drawings



Gear stages	L_{gear}
1	60,5 mm
2	77,5 mm
3	95 mm



Gear stages	L_{gear}
1	60,5 mm
2	77,5 mm
3	95 mm

Simple gears for MD xxx, MP xxx, MA xxx

Planetary gear PLG 52

Continuous torque up to 24 Nm

The PLG 52 is a gear with simple circumferential backlash and is non-detachably connected to the motor. It is suitable for any application in which the circumferential backlash is approx. 1° and the startup frequency does not have to meet special requirements. Friction losses can be neglected.



up to 24 Nm

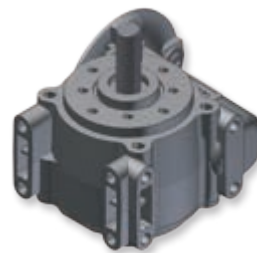
Features

- _ backlash (1-1-1,5)°, (1-2-3) -stage
- _ level of efficiency (90-81-73) %, (1-2-3) -stage
- _ admissible shaft forces, (300/350) N, (axial/radial)
- _ output shaft with double ball bearing
- _ arbitrary mounting position
- _ lifetime lubrication

Worm gear SG 80, with solid shaft

Continuous torque up to 10 Nm

The SG 80 is a worm gear with one-sided shaft and is non-detachably connected to the motor. It is suitable for applications with confined installation spaces and low circumferential backlash requirements. Friction losses can be neglected.



up to 10 Nm

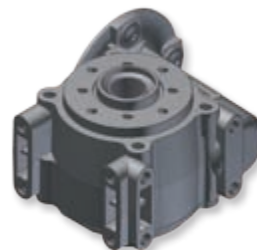
Features

- _ backlash 1°
- _ level of efficiency (70 ... 25) % bei 1.500 min^{-1}
- _ admissible shaft forces, (300/350) N, (axial/radial)
- _ output shaft offset by 31 mm
- _ arbitrary mounting position
- _ lifetime lubrication

Worm gear SG 80 H

Continuous torque up to 10 Nm

The SG 80 H is the hollow shaft version of the SG 80 and is non-detachably connected to the motor. It is push-fitted and excellently suitable for applications with highly confined installation spaces and low circumferential backlash requirements. Friction losses can be neglected.

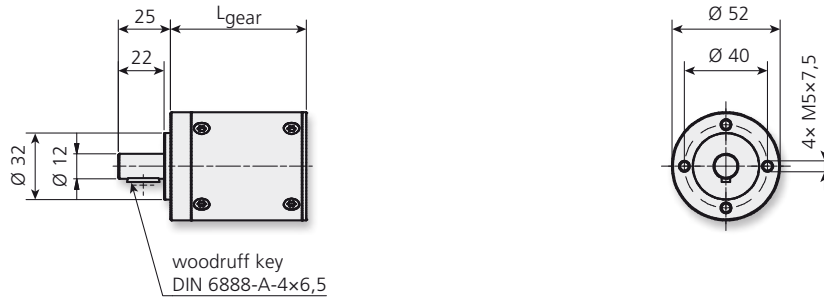


up to 10 Nm

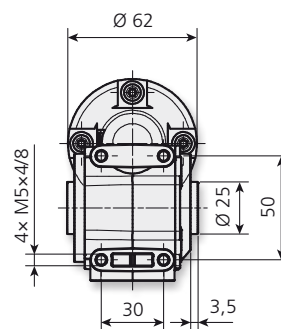
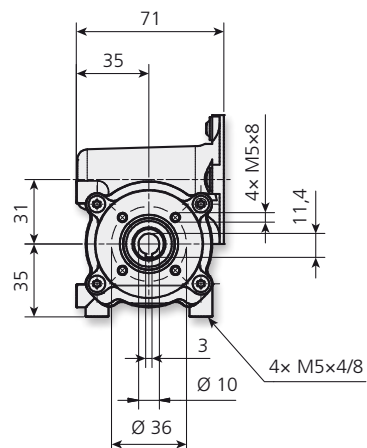
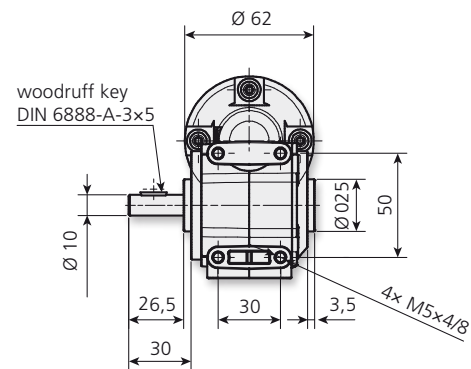
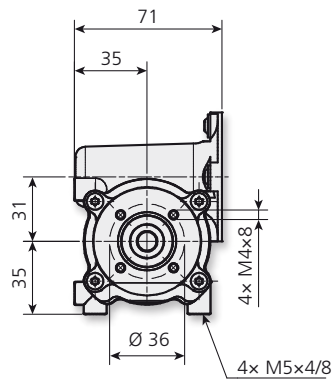
Features

- _ backlash 1°
- _ level of efficiency (70 ... 25) % bei 1.500 min^{-1}
- _ admissible shaft forces, (300/350) N, (axial/radial)
- _ output shaft offset by 31 mm
- _ arbitrary mounting position
- _ lifetime lubrication

Drawings



Gear stages	L _{Gear box}
1	50 mm
2	65,5 mm
3	80,5 mm



Reinforced simple gears for MD xxx, MP xxx, MA xxx

Planetary gear PLG 63

Continuous torque up to 100 Nm

The PLG 63 is a gear with simple circumferential backlash and is non-detachably connected to the motor. It is suitable for any application in which the circumferential backlash is approx. 1° and the startup frequency does not have to meet special requirements. Friction losses can be neglected.

Features

- _ circumferential backlash $(1-1-1.5)^\circ$, (1-2-3) stages
- _ efficiency (90-81-73) %, (1-2-3) stages
- _ allowed shaft forces, (800/800) N, (axial/radial)

- _ output shaft with double ball bearing
- _ any installation position
- _ lifetime lubrication



up to 100 Nm

Worm gear SGF 120, with solid shaft

Continuous torque up to 30 Nm

The SGF 120 is a worm gear with one-sided shaft and is non-detachably connected to the motor. It is particularly suited for applications with confined installation spaces and low circumferential backlash requirements. Friction losses can be neglected.

Features

- _ circumferential backlash 1°
- _ efficiency (70 ... 25) % at 1.500 min^{-1}
- _ allowed shaft forces, 300/500 N, (axial/radial)

- _ output shaft offset by 31 mm
- _ any installation position
- _ lifetime lubrication



up to 30 Nm

Worm gear SGF 120 H

Continuous torque up to 30 Nm

The SGF 120 H is the hollow shaft version of the SGF 120 and is non-detachably connected to the motor. It is push-fitted and excellently suitable for applications with highly confined installation spaces and low circumferential backlash requirements. Friction losses can be neglected.

Features

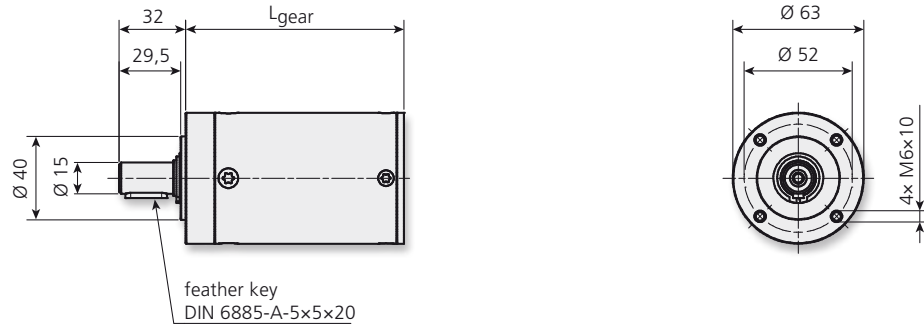
- _ circumferential backlash 1°
- _ efficiency (70 ... 25) % at 1.500 min^{-1}
- _ allowed shaft forces, 300/500 N, (axial/radial)

- _ output shaft offset by 31 mm
- _ any installation position
- _ lifetime lubrication

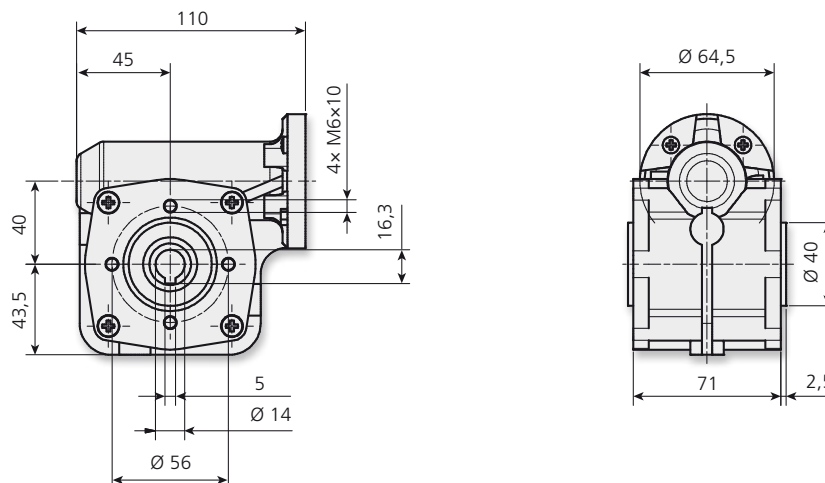
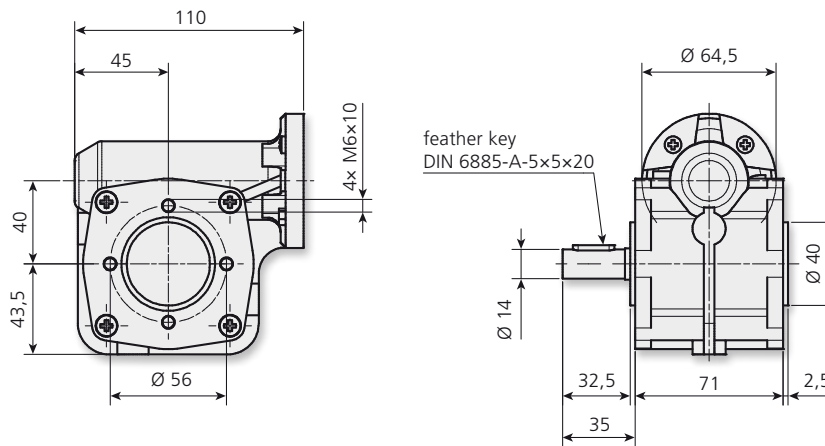


up to 30 Nm

Drawings



Gear stages	L _{gear}
1	62,5 mm
2	83 mm
3	105 mm



Interfaces

PROFIBUS



The drive version with PROFIBUS DP is based on the device profile PROFIdrive V3.0 and is assigned to application class 3 - position drive with decentralized positioning control (single axis point-to-point). The device profile V3.0 allows free configuration of process data telegrams as an essential enhancement to V2.0 with a fixed pre-defined telegram structure.

The appropriate communication profile is PROFIBUS DP VO/V1 with cyclic and acyclic data traffic. All common bit rates are accessible and get adjusted automatically based on a bus analysis. In the case a drive has a digital input, a handheld device can be connected. Simple processing operations are possible without any bus connection. If the bus is in operation, the input is for connecting hardware limit switches, or together with digital output, they serve as logical I/O module at the PROFIBUS.

Features

- _ positioning and speed control
- _ cyclic and acyclic communication according to PROFIBUS DP VO/V1
- _ free configurable process data telegrams according to device profile PROFIdrive V3.0
- _ voltage failure-safe update possibility

PROFINET



The encoTRive drives with PROFINET use the same device profile PROFIdrive V3.0 as PROFIBUS DP. When migrating from PROFIBUS to PROFINET, the control logic and the PZD configuration remain the same. Logical programming adjustments do not occur. The range of PROFIBUS functions is fully integrated into PROFINET. PROFINET offers some additional functions. There is an alarm telegram in case of trouble when the cycle times are too low and there are more addressable nodes.

The projecting is carried out with the same tools used for PROFIBUS. Together with the identical program and processing logic, the change from PROFIBUS to PROFINET is solely a matter of the communication technology.

Features

- _ no bus termination necessary
- _ address assignment via software
- _ the protocol analysis can be done with freely available Ethernet tools (for example with Wireshark™)
- _ the topology is simplified by star, lines, tree and ring structures as well as arbitrary hybrid forms

Technical Communication Data

Communication profile	PROFIBUS - DP	PROFINET-IO
Range of functions	DP-V0 and DP-V1	Conformance Class A, Real Time Class1
Device profile	Profidrive V3.0, Application Class 3	
Transfer	cyclic (process data), acyclic (alarm and time uncritical parameters)	
Process data configuration	free or over standard protocols	
Max. participants	max. 96	>1000
Terminating resistance	MD: internal, MP/MA: external	needless

Function blocks for PROFIBUS and PROFINET

The available demo function blocks allow commissioning any drive type without having to know the parameter features and the telegram sequences.

The interfaces of the individual function blocks are identical for Profibus and Profinet.

	Description
Parameter PIV	Function block for parameterizing individual parameters using the cyclic PIV channel (parameter identification value)
Parameter DPV1	Function block for parameterizing individual parameters using the acyclic data channel (DPV1)
Control PCD	Function block for commissioning and activating the drive using the cyclic PCD channel (processdata)
Demo Control PCD	Demo program for using the Control PCD function block to cyclically approach two positions in positioning mode

CANopen

CANopen

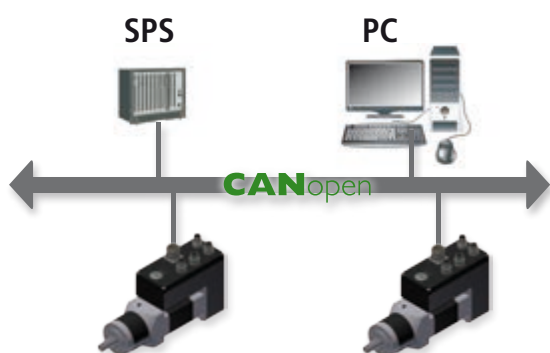
The drive version with CANopen is based on the device profile CiA DSP 402 – drives and motion control. The device profile permits a free configuration of process telegrams through PDO mapping of application objects. Available are 4 RxPDO and 4 TxPDO.

The associated communication profile is CiA DS 301 – CANopen application layer and communication profile.

CANopen defines, for distributed industrial automation systems, a standardized protocol based on CAN. All common bit rates are accessible and set over a DIP-switch. The fast exchange of process data uses a process data object (PDO), the access to the entries within the object directory happens over service data object (SDO). All drive specific information is summed up within the object directory.

Features

- _ installation of the GSD (ML) file within the projecting tool
- _ positioning and speed control
- _ cyclic and acyclic communication with PDO/SDO
- _ free configurable process data telegram according to the communication profile CiA DS 301
- _ each transmission direction with up to 4 PDOs



Technical Communication Data

Communication profile	CANopen
Device profile	CiA DS 301-DP
Geräteprofil	CiA DSP 402
Address range	0 ... 127
Address adjustment	hardware, DIP-switch
Bitrates	10/20/50/100/125/250/ 500/800/1.000 kBit/s
Process data configuration	free or over standard protocols
Terminating resistance	MD: internal, MP/MA: external
Transfer	cyclic (PDO), acyclic (SDO)

Electrical and mechanical accessories

EncoTRive-Control-Device-Tool (EDT)

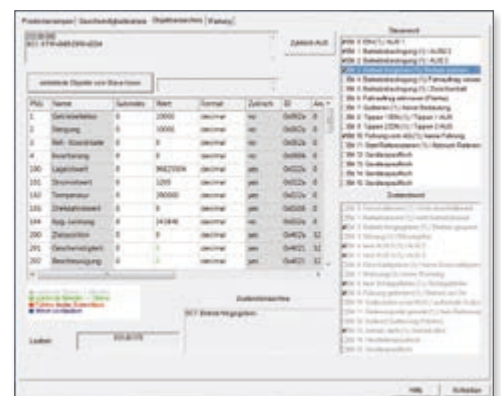
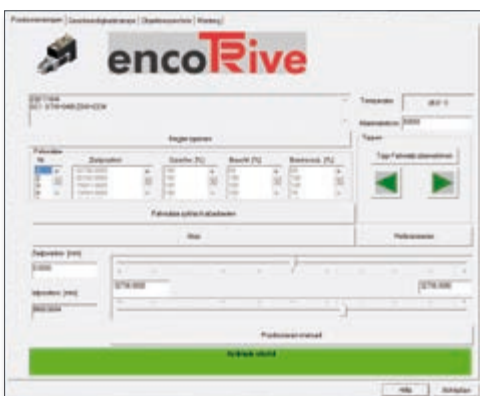
EDT is the parameterization and diagnosis tool for all drives of the EncoTRive product family. It is accessed via predefined interfaces. In case of PROFIBUS, these interfaces are the Hilscher Master Class 1/2, Siemens CP5xxx and other interface cards. In addition, a PC can be connected to the MD type series via an integrated interface converter (RS-232).

The elements of the user interface are subdivided into logical subgroups. The user interface can therefore be controlled intuitively. There are two menu items for **positioning** and **speed control** modes which easily allow starting traveling operations. At the same time, current actual values are displayed, such as position and velocity.

A table consisting of the objects of the object directory lists the cyclic parameters in different colors. The control word and the status word are broken down to bit level. This allows free access to both the individual state transitions and the resulting states. The individual actions are directly performed at the level of the status machine. The command order can be defined as desired.

Technical data

- _ parameterization and diagnosis tool
- _ connection options to PC via RS-232 or interface cards
- _ intuitive user interface
- _ input of position and velocity
- _ freely accessible state transitions



Converter PC-USB to CANopen for the EDT

The PC-USB to CANopen converter enables the connection to CANopen networks via an USB interface. The converter is ideal for mobile use due to its compact plastic housing.



Technical Data

- _ transmission rate up to 1 Mbit/s
- _ connection to PC over USB 1.1, compatible to USB 2.0
- _ connection to CAN-Bus over D-Sub, 9-pole according to CiA[®] 102
- _ voltage supply over USB
- _ CAN specification 2.0A (11-Bit-ID) and 2.0B (29-Bit-ID)
- _ time-stamp resolution approx. 42 μ s

Electrical and mechanical accessories

PROFIBUS hand-held operator panel for MD drives

The hand-held operator panel is connected to the M12 plug connectors of the digital I/Os. It allows executing simple drive functions without bus connection, for example, on initial commissioning or during service work. It is designed as a portable component and features a 5 m long connecting cable.

When it is fitted without bus connection or when PROFIBUS communication is interrupted, the hand-held panel automatically obtains control change rights. Monitoring algorithms ensure that the control change rights are assigned either only to the hand-held operator panel or only to the PROFIBUS master.

The hand-held operator panel holds the control change rights until either an acknowledgement is made via the control or a restart is carried out.

Features

- _jog into positive or negative direction up to the software limit switch
- _Indicator for software limit min., max. and reference
- _setting a reference point
- _fault acknowledgement



Demo kit and function block for S7 (PROFIBUS, PROFINET)

The demo kits contain all components required for fast commissioning. For this purpose, the power supply unit and the drive are already pre-wired. Commissioning only requires that the bus lines be established by means of configurable plug connectors.



EncoTRive demo kit contents

- _ encoTRive as chosen
- _ wired power supply unit
230/110 VAC at 24/48 VDC
- _ configurable connector set
- _ RS-232 connecting cable
- _ Bus cable
- _ PC-USB to CANopen adapter,
including driver
- _ demo function blocks
- _ encoTRive Device Tool (EDT)
- _ documentation

TR-Electronic – your partner in automation

Rotary encoders

Absolute encoder, incremental rotary encoder, wire-actuated encoder

Rotary encoders with optical and magnetic scanning function register the precise position in a wide variety of applications and industries.

In medical engineering, miniature versions ensure correct positioning while SIL3-approved absolute rotary encoders provide the necessary safety. We offer not only high-quality rotary encoders (from Ø 22 to 160 mm) for almost any application but also comprehensive accessories.

Linear encoders

Linear absolute measuring systems, laser displacement measurement

Linear encoders register linear motions in machines, tools and systems according to specific requirements using different technologies.

Linear rotary encoders allow measuring distances of max. 20 m almost without any wear. This value is max. 240 m for laser measuring systems. Machines and systems can be precisely controlled to reach their desired positions.

Motion

Servo drives, compact drives, process drives

Intelligent encoTRive drives are available with the current field bus systems, such as PROFIBUS, PROFINET and CANopen, within a power range of up to 300 watts. The drives are configured to meet customer requirements and can be freely combined with precision gear, holding brake and I/O. Values of up to 4,350 rpm and powerful 200 Nm are available to cope with demanding applications.



Components

**Industrial PC, field bus I/O,
PLC, HMI controller**

Industrial PCs are available in numerous variants and offer customized calculation power for PC-assisted automation. Programmable logic controllers (PLC) are the traditional means for automation. HMI controllers establish the interface to the user. Field bus nodes, I/O modules and cam controllers complete the range of automation components.

Automation

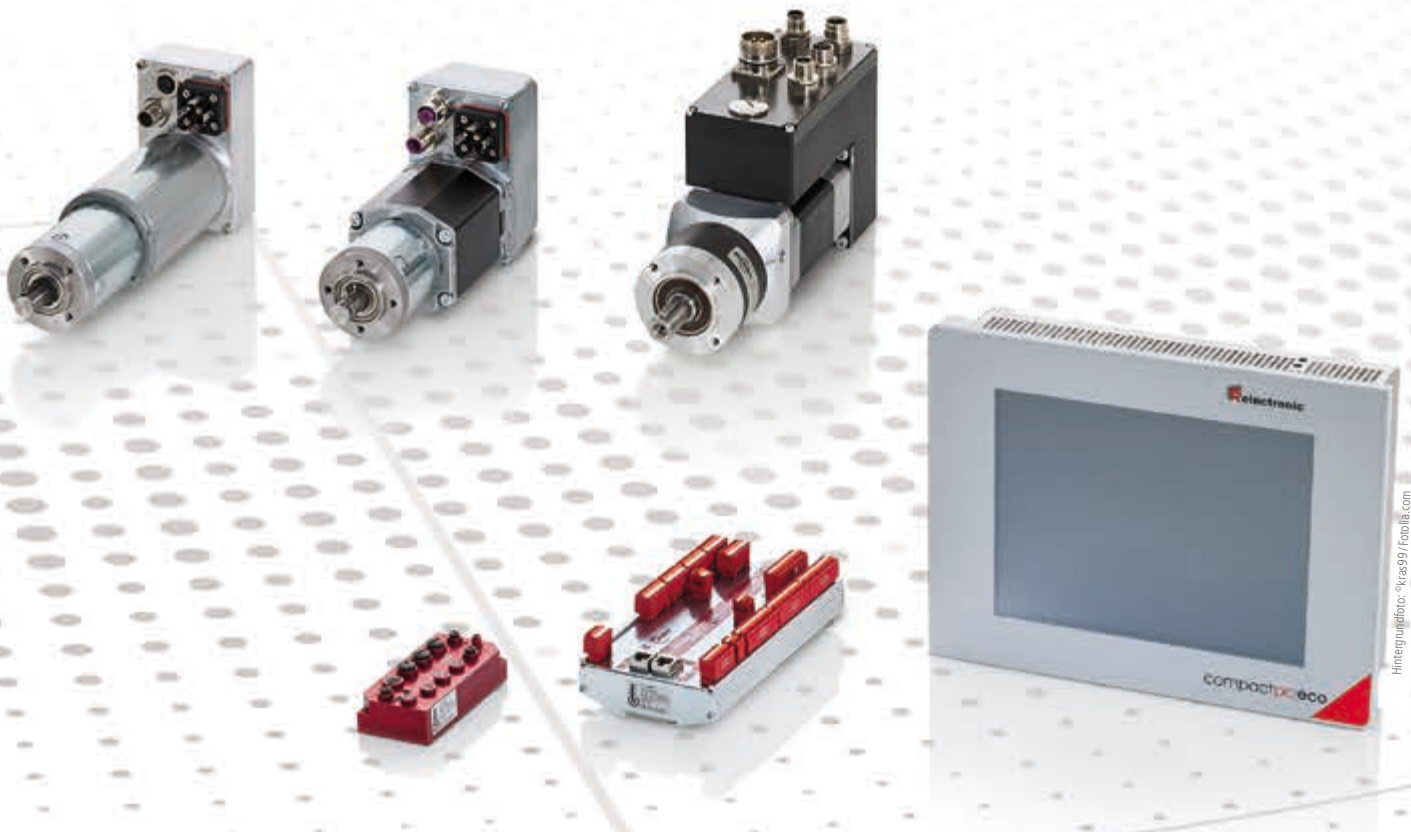
**Consulting and implementation
for new machines and retrofit**

You want to set up a largely automated new machine or retrofit and modernize your existing machine with automation systems? Then you just need our extensive expert knowledge and the more than 20 years of our experience.

Unidor

**Blanking and forming,
systems, controls and sensors**

Trendsetting blanking and forming technology for more than 30 years. We are your reliable partner in the world of blanking and pressing and can prove this with thousands of machines which we have successfully installed all over the world. Sensors, controls and systems ensure optimal results in machines, tools and retrofit projects.



TR-Electronic – the suitable solution for any industry

Printing technology and paper processing

Fast signal processing for printing machines allows high register control while decentralized compact drives provide for automated adjustment operations. Due to their stainless steel housings, our rotary encoders can even withstand aggressive media, such as groundwood in paper machines. Small-size absolute rotary encoders measure motions even in confined construction spaces.

- _ paper transfer between individual stations
- _ register control
- _ color density adjustment



Renewable energies

The adjustment of the blades and the nacelle of wind turbines is a safety-relevant task which can be solved with the rotary encoders by TR-Electronic – even according to tomorrow's safety standards.

Wind energy

- _ pitch and azimuth control
- _ rotor and generator speed control

Photovoltaics

- _ panel tracking

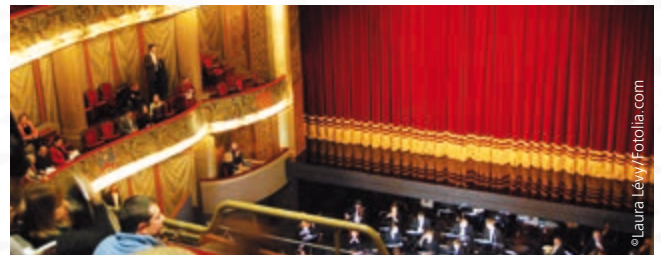
Solar heat

- _ inclination angle control for parabolic trough systems

Event technology

In the field of theater, musical, opera and ballet, people and automated stage machinery have to be accommodated in one and the same workroom. To ensure the safety of all those involved, the prime requirement is highest reliability in the detection of positions. We offer the solution that suits your customized concept, including our safety rotary encoder which is certified according to SIL3/PLe.

- _ stage curtain and flat pulls, stage portal and lighting bridges
- _ set wagons, lifting podiums, revolving stages
- _ flying gear for persons



Plastics processing

Plastics processing machines and systems are used for a great variety of measuring tasks which require fast signal processing and high precision. Such tasks include, for example, the monitoring of functions and belt travel velocities in hammer mills, fine grinding machines or washer systems.

- _ positioning of injection cylinders and dies
- _ monitoring of rotary motions of various applications in the field of materials handling and robotics
- _ early alerting to material loading
- _ distance measurement of profile cutting machines

Storage and logistics

In the field of modern storage equipment, such as rack feeders, transfer sections and crane systems, the technical measuring and controlling equipment must be particularly powerful and decentralized to ensure easy project planning. Storage and logistic systems can be commissioned as quickly as possible and are fully reliable at any time.

- _ rack feeders, transfer sections and crane systems
- _ powerful decentralized measuring & controlling technology
- _ automated guided transport systems, ground conveyors



Woodworking

Intelligent decentralized controls, powerful sensors which process signals on site, and components which are reliable despite strong temperature variations and vibrations form the basis for automation solutions in the woodworking industry. We specialize in the intelligent equipment and networking of transfer machines, machining centers and assembly cells, particularly if you need a platform for your special machine philosophy or special function.

- _ alignment of sawing and joining units
- _ EX rotary encoders for hazardous and dusty zones
- _ belt sanders, transport/process belts, etc.

Metal working

The world of presses and dies has been a special field of TR-Electronic for a long time. We develop our products for harsh environmental conditions from the very beginning. Our products withstand highest shock and vibration loads and are suitable for adverse conditions with strongly varying temperatures or chemical impacts.

- _ absorber modules hold off strongest vibrations
- _ particularly suited for harsh environments (high temperature)
- _ fill level monitoring in the cooling circuit, hydraulics, etc.



Packaging industry

Customized flexible automation solutions form the intelligent basis for successful machinery concepts. High processing speeds enable fast running times and high quantities. Our absolute measuring systems save complex reference motions, and our highly integrated intelligent sensor technology reduces the construction volume and relieves the higher-order controls. Particularly when increased precision is required, we offer solutions which could not be implemented before.

- _ format adjustment in packaging machines
- _ positioning of filling stations
- _ turntable control

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