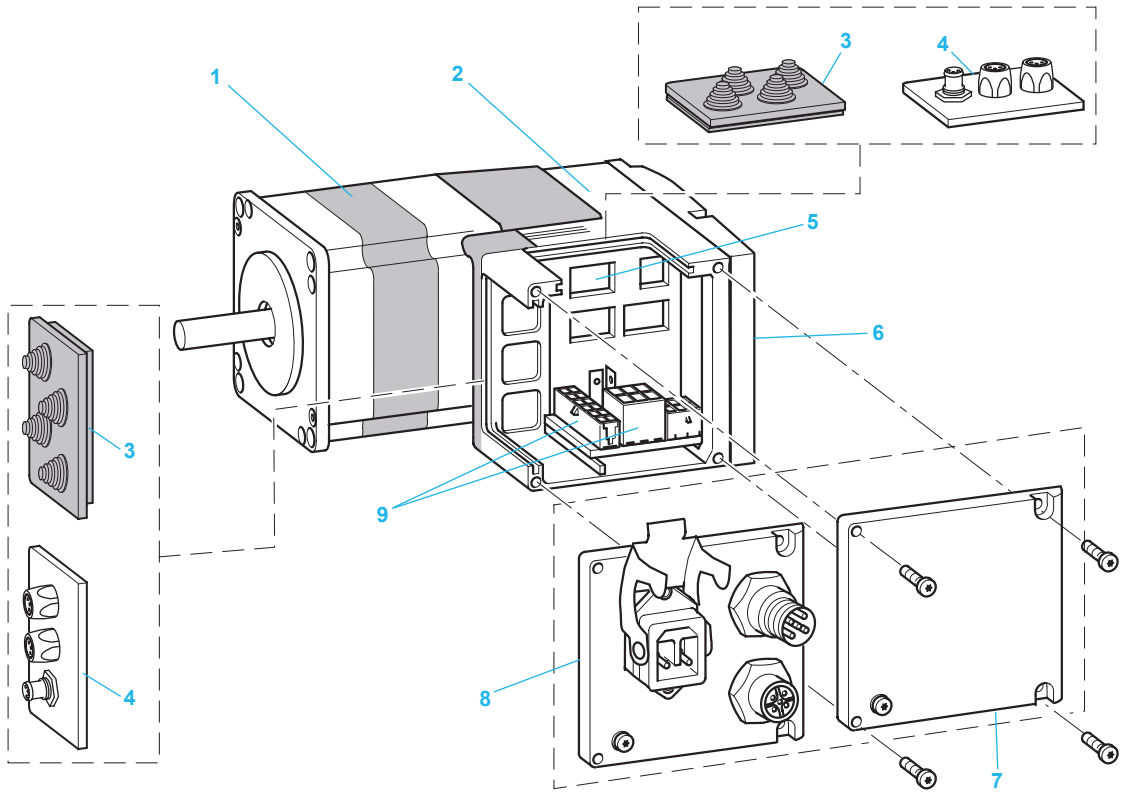
Lexium integrated drives
IL●1 for CANopen, PROFIBUS DP, RS 485
ILE1 with brushless DC motor

Description

ILE1 comprise control electronics with a fieldbus interface for CANopen DS301, PROFIBUS DP or RS 485 and a brushless DC motor. ILE1 is optionally available with straight teeth gear or worm gear and printed circuit board connectors or industrial connectors.



1 Brushless DC motor
2 Electronics housing
3 Insert cable entry (accessory)
4 I/O insert with industrial connectors (accessory)
5 Settings via parameter switches
6 Cover for electronics housing
7 Cover for Lexium integrated drives with option “PCB connector"
8 Cover for supply voltage ⎓ V and fieldbus connection for Lexium integrated drives with option “industrial connector”
9 Electrical interfaces

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Certifications

Conformity to standards			Lexium integrated drives have been developed to comply with the stringent international standards and with the recommendations for adjustable speed power drive systems, specifically: IEC/EN 61800-3 (noise immunity to conducted and radiated high-frequency signals) and IEC/EN 50178 (resistance of devices to vibration).
	EMC immunity		EN 61800-3:2001, second environment
	Conducted and radiated EMC emissions		EN 61800-3:2001-02; IEC 61800-3, Ed.2 ■ Power supplies without external mains filter: □ C3 up to 10 m supply cable length ■ Power supplies with external mains filter: □ C2 up to 20 m supply cable length □ C3 up to 50 m supply cable length
CE marking			The Lexium integrated drives are CE marked in accordance with the European Machinery Directive (98/37/EEC) and the European EMC Directive (2004/108/EEC).
Product certifications			UL (USA), cUL (Canada)
			TÜV certification: Lexium integrated drives are TÜV-certified for device safety and medical devices. The certification includes: ■ Functional safety of electrical/electronic/programmable safety-related electronic systems (IEC 61508:2000; SIL 2) ■ Safety of machinery – functional safety of safety-related electrical and electronic and programmable electronic control systems (IEC 62061:2005; SILcl2) ■ Safety of machinery – safety-related parts of control systems – Part 1: General principles for design (ISO 13849-1:2006; PL d (Category 3))

Ambient conditions

Ambient temperature *(1)*		**°C**	0 ... 65; power reduction by 2%/°C at 50 ... 65
Max. permissible temperature of the power amplifier		**°C**	105
Max. permissible temperature of the motor *(2)*		**°C**	110
Transport and storage temperature		**°C**	-25 ... +70
Installation height without power reduction		**m**	< 1000 m above mean sea level
Relative humidity		**%**	15 ... 85 (not condensing)
Vibration load during operation as per DIN EN 60068-2-6	Number of cycles		10
	Acceleration amplitude:	**m/s²**	20
	Frequency range	**Hz**	10 ... 500
Continuous shocks as per DIN EN 60068-2-29	Number of shocks		1000
	Peak acceleration	**m/s²**	150
Shaft wobble and perpendicularity			According to EN 50347 (IEC 60072-1)
Degree of protection as per DIN EN 60034-5			Total except shaft bushing IP54, shaft bushing IP41

Electrical data

Supply voltage (CN1)			Corresponds to PELV according to DIN 19240, not protected against reverse polarity
Supply voltage range (absolute limit values)		⎓ **V**	18 ... 40
Nominal supply voltage		⎓ **V**	24 ... 36
Ripple at nominal voltage		V_{PP}	≤ 3.6
Max. continuous current consumption		**A**	5,5
Peak current consumption		**A**	7
Inrush current			Charging current for capacitor C=1500 µF
External fuse		**A**	10
Fieldbus interfaces (CN2 and CN3)			
CANopen	Signal inputs/outputs		According to ISO 11898 standard, no galvanic isolation
	Transmission rate	**kBaud**	50 / 100 / 125 / 250 / 500 / 800 / 1000
	Transmission protocol		CANopen as per DS301
PROFIBUS DP	Signal inputs/outputs		According to RS 485, galvanic isolation, 2-wire
	Transmission rate	**kBaud**	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000
	Transmission protocol		PROFIBUS DP-V0 (data format as per Profidrive V2.0 PPO Type 2)
RS 485	Signal inputs/outputs		According to RS 485, no galvanic isolation, 2-wire
	Transmission rate	**kBaud**	9.6 / 19.2 / 38.4
	Transmission protocol		Manufacturer-specific

(1) Limit values with flanged motor mounted on a steel plate 300 x 300 x 10 mm
(2) Measured at the surface

Electrical data

24 V signal interface (CN4)			4 signals, can each be used as input or output	
24 V signal inputs			Galvanically connected to 0VDC, protected against reverse polarity	
Logic 0 (U_{low})		**V**	-3 ... +4.5	
Logic 1 (U_{high})		**V**	+15 ... +30	
Input current (typical at 24 V)		**mA**	2	
Debounce time	IO0 and IO1	**ms**	0.1	
	IO2 and IO3	**ms**	0.01	
24 V signal outputs			Switching to plus, short-circuit protected, suitable for inductive load (1000 mH / 100 mA)	
Supply voltage range		**⎓ V**	23 ... 25	
Max. switching current (total)		**mA**	200	
Max. switching current per output		**mA**	100	
			The internal power supply unit is protected against: ■ Short circuit of the output voltage ■ Overload of output voltage (limited to 6 W output power)	
Interface for safety function "Safe Torque Off" ("Power Removal") (CN5)			No galvanic isolation; corresponds to RS 485 standard	
Logic 0 (U_{low})		**V**	-3 ... +4.5	
Logic 1 (U_{high})		**V**	+15 ... +30	
Input current (typical at 24 V)	$\overline{STO\_A}$	**mA**	⩽ 10	
	$\overline{STO\_B}$	**mA**	⩽ 3	
Debounce time		**ms**	1	
Response time (until shutdown of power amplifier)		**ms**	< 50	
Max. time offset until detection of signal differences between $\overline{STO\_A}$ and $\overline{STO\_B}$		**S**	< 1	

Safety function "Safe Torque Off" ("Power Removal")

Protection	Of machine		"Safe Torque Off" safety function which forces stopping and/or prevents unintended restarting of the motor, conforming to standard ISO 13849-1, performance level "d" (PL d) , and standard IEC/EN 61800-5-2
	Of the system process		"Safe Torque Off" safety function which forces stopping and/or prevents unintended restarting of the motor, conforming to standard IEC/EN 61508 level SIL2 and standard IEC/EN 61800-5-2

Mechanical data ILE1 without gear

Nominal supply voltage		**⎓ V**	24	36
Nominal current		**A**	4.7	5.1
Nominal speed of rotation		**rpm**	4000	4800
Nominal output power		**W**	74	117
Nominal torque		**Nm**	0.175	0.24
Max. torque	M_{max}	**Nm**	0.26	0.36
Max. current with power stage disabled		**A**	0.1	0.06
Detent torque (at zero current)		**Nm**	0.08	
Moment of inertia		**kg·cm²**	0.149	
Max. speed of rotation		**rpm**	5000	
Positioning resolution per revolution		**Inc.**	12	
Accuracy of positioning sensor		**°**	±1	
Mass		**kg**	1.4	
Shaft load	Max. radial force *(1)*	**N**	80	
	Max. axial tensile force	**N**	30	
	Max. axial force pressure	**N**	30	
	Nominal bearing service life *(2)*	**h**	20000	

(1) Point of application of radial force: 12.5 mm distance to flange
(2) Operating hours at a probability of failure of 10%

Mechanical data ILE1●661 with straight teeth gear

			G1		G2		G3		G4	
Ratio			18:1 (160:9)		38:1 (75:2)		54:1 (490:9)		115:1 (3675:32)	
Number of gear stages			3		3		4		4	
Nominal supply voltage		⎓ V	24	36	24	36	24	36	24	36
Nominal current		A	4.5	4	4	3.4	4.3	3.5	2.6	2.1
Nominal speed of rotation of motor		rpm	4000	4800	4000	4800	4000	4800	4000	4800
Nominal output speed of rotation		rpm	225	270	107	128	73	88	35	42
Nominal output torque		Nm	3.1	3.5	5.8	6.0	9.5	10.0	10.0	11.0
Nominal output power		W	74	98	65	81	73	88	38	48
Max. current with power stage disabled		A	0.1	0.06	0.1	0.06	0.1	0.06	0.1	0.06
Detent torque (at zero current)		Nm	1.1		3.0		3.3		8.0	
Moment of inertia output		kg·cm²	48		211		441		1962	
Max. speed of rotation		rpm	281		133		92		44	
Positioning resolution of motor per revolution		Inc.	12							
Positioning accuracy motor		Inc.	±1							
Positioning resolution of output		°	1.667		0.8		0.55		0.26	
Torsional backlash		°	≤ 1							
Mass		kg	1.85							
Shaft load (short-term operation)	Max. radial force *(1)*	N	200							
	Max. axial force	N	80							
	Nominal bearing service life *(2)*	h	2500							
Shaft load (long-term operation)	Max. radial force *(1)*	N	200							
	Max. axial force	N	10							
	Nominal bearing service life *(2)*	h	15000		15000		15000 *(3)*		15000 *(4)*	

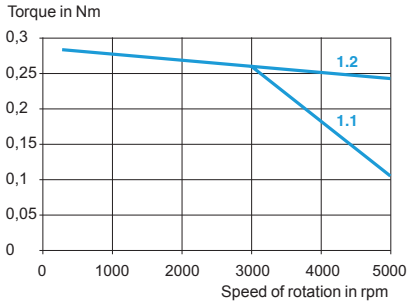
Mechanical data ILE1●661 with worm gear

			G5		G6		G7		G8	
Ratio			24:1 (525:22)		54:1 (1715:32)		92:1 (735:5)		115:1 (3675:32)	
Number of gear stages			2		3		3		3	
Nominal supply voltage		⎓ V	24	36	24	36	24	36	24	36
Nominal current		A	6.8	5.1	6.8	3.8	6.8	3.8	6.8	3.8
Nominal speed of rotation of motor		rpm	4000	4000	4000	4000	4000	4000	4000	4000
Nominal output speed of rotation		rpm	168		75		44		35	
Nominal output torque		Nm	2.5	3.5	5.8	6.0	9.0	9.2	10.2	10.6
Nominal output power		W	45	61	45	47	41	42	37	39
Max. current with power stage disabled		A	0.1							
Detent torque (at zero current)		Nm	2.9		6.5		12.3		16.7	
Moment of inertia output		kg·cm²	90		430		1270		1980	
Max. speed of rotation		rpm	186		93		54		44	
Positioning resolution of motor per revolution		Inc.	12							
Positioning accuracy motor		Inc.	±1							
Positioning resolution of output		°	1.26		0.56		0.33		0.26	
Torsional backlash		°	≤ 1.5		≤ 1.0		≤ 1.0		≤ 1.0	
Mass		kg	2.3							
Shaft load	Max. radial force *(1)*	N	200							
	Max. axial force	N	80							
	Nominal bearing service life *(2)*	h	3000		6000		9000		9000	

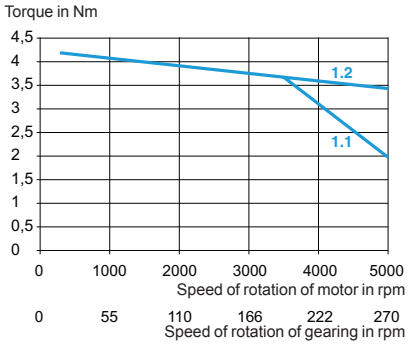
(1) Point of application of radial force: 12.5 mm distance to flange
(2) Operating hours at a probability of failure of 10%
(3) With reduced nominal output torque = 6 Nm; 2500 h at maximum torque
(4) With reduced nominal output torque = 8 Nm; 2500 h at maximum torque

Torque characteristics

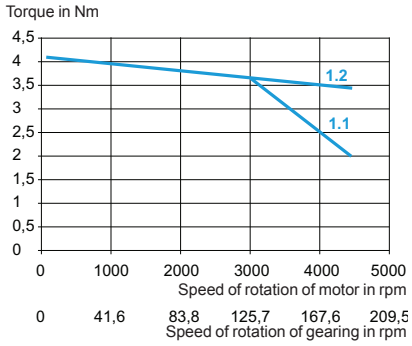
ILE1 without gearing



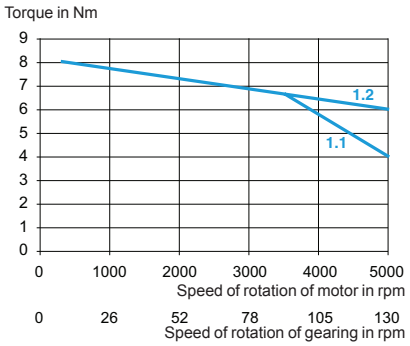
ILE1●661 with straight teeth gear G1



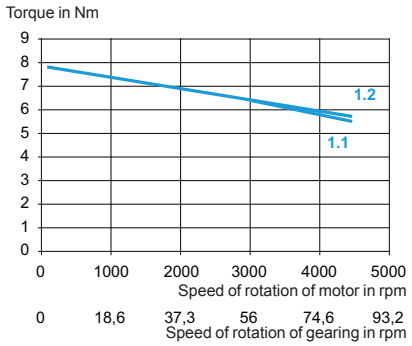
ILE1●661 with worm gear G5



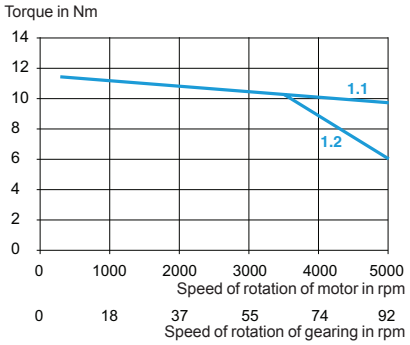
ILE1●661 with straight teeth gear G2



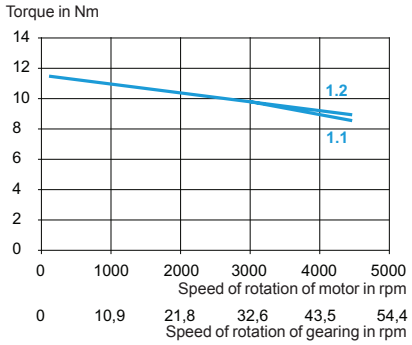
ILE1●661 with worm gear G6



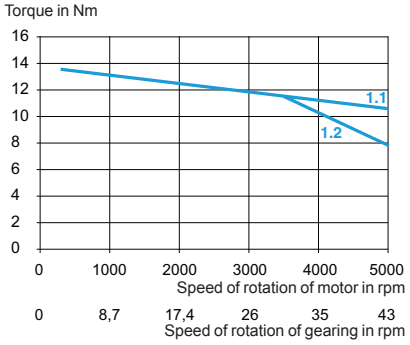
ILE1●661 with straight teeth gear G3



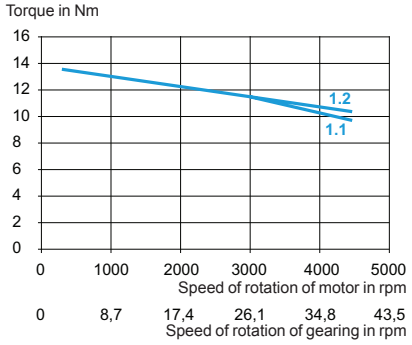
ILE1●661 with worm gear G7



ILE1●661 with straight teeth gear G4



ILE1●661 with worm gear G8



1.1 Max. torque at 24 V
1.2 Max. torque at 36 V

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References

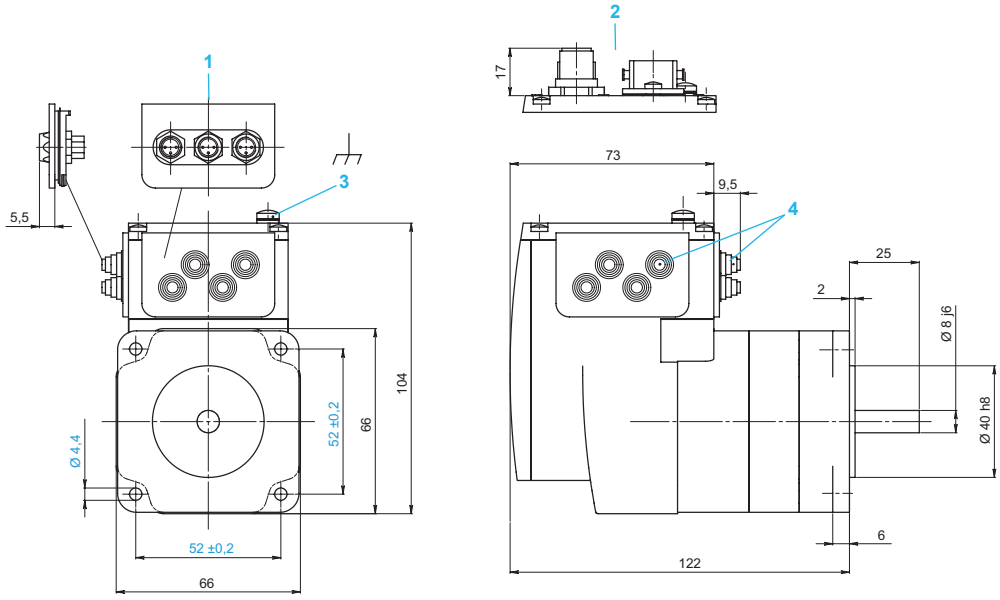
Example:	I	L	E	1	B	6	6	1	P	B	1	A	1
Motor type **E** = brushless DC motor	I	L	**E**	1	B	6	6	1	P	B	1	A	1
Supply voltage **1** = 24 ... 36 V	I	L	E	**1**	B	6	6	1	P	B	1	A	1
Communication interface **B** = PROFIBUS DP **F** = CANopen DS301 **R** = RS 485	I	L	E	1	**B**	6	6	1	P	B	1	A	1
Flange size **66** = 66 mm	I	L	E	1	B	**6**	**6**	1	P	B	1	A	1
Motor length **1** = motor length 1	I	L	E	1	B	6	6	**1**	P	B	1	A	1
Winding type **P** = medium speed of rotation, medium torque	I	L	E	1	B	6	6	1	**P**	B	1	A	1
Connection technology **B** = printed circuit board connector **C** = industrial connector	I	L	E	1	B	6	6	1	P	**B**	1	A	1
Measurement system **1** = BLDC encoder	I	L	E	1	B	6	6	1	P	B	**1**	A	1
Holding brake **A** = no holding brake	I	L	E	1	B	6	6	1	P	B	1	**A**	1
Gearing *(1)*	I	L	E	1	B	6	6	1	P	B	1	A	**1**

Straight teeth gear
1 = ratio 18:1 (160:9)
2 = ratio 38:1 (75:2)
3 = ratio 54:1 (490:9)
4 = ratio 115:1 (3675:32)

Worm gear
5 = ratio 24:1 (525:22)
6 = ratio 54:1 (1715:32)
7 = ratio 92:1 (735:5)
8 = ratio 115:1 (3675:32)

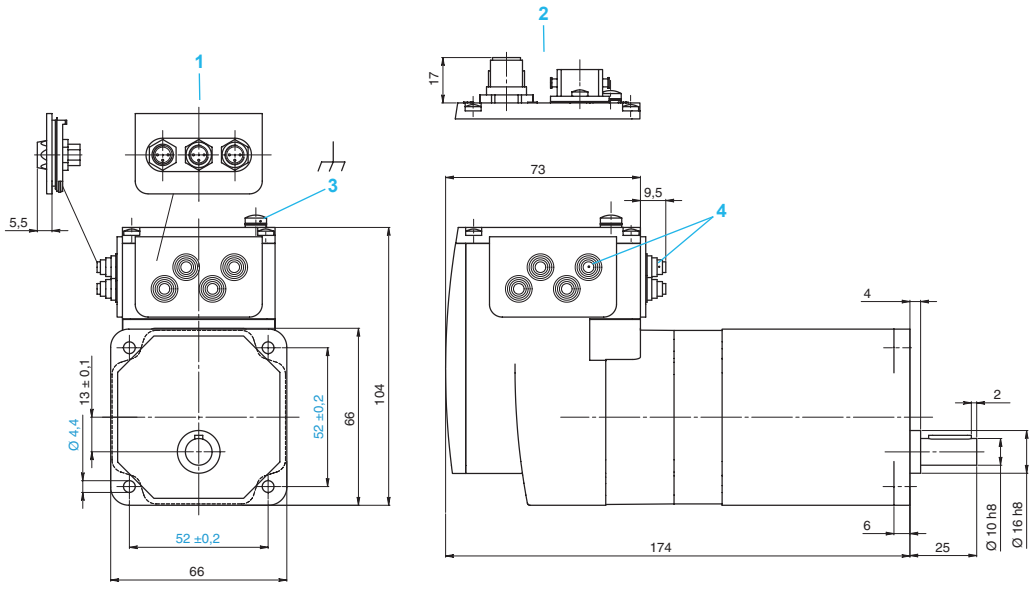
(1) Without gearing: leave out gearing identification in the reference (specify 12 characters only).

ILE1 integrated drives without gearing



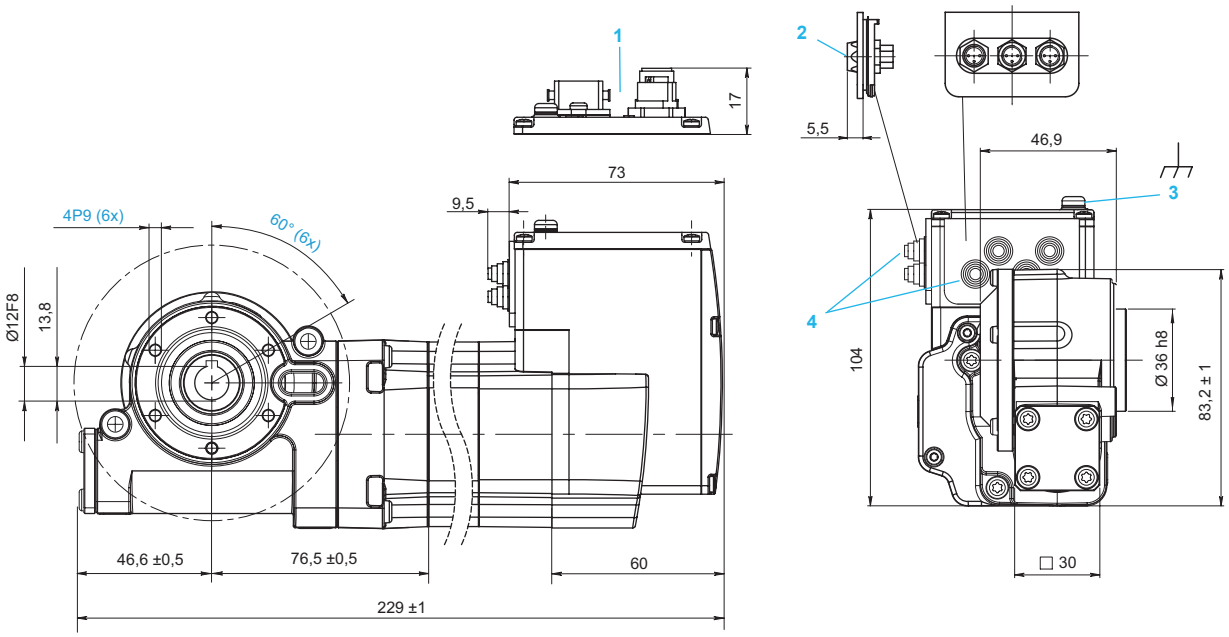
1 Accessories: I/O signal insert with industrial connectors
2 Option: industrial connectors
3 Earth (ground) terminal
4 Accessories: cable entries Ø = 3 ... 9 mm

ILE1 integrated drives with straight teeth gear



1 Accessories: I/O signal insert with industrial connectors
2 Option: industrial connectors
3 Earth (ground) terminal
4 Accessories: cable entries Ø = 3 ... 9 mm

ILE1 integrated drives with worm gear



1 Optional: industrial connectors
2 Accessories: I/O signal insert with industrial connectors
3 Earth (ground) terminal
4 Accessories: cable entries Ø = 3 ... 9 mm