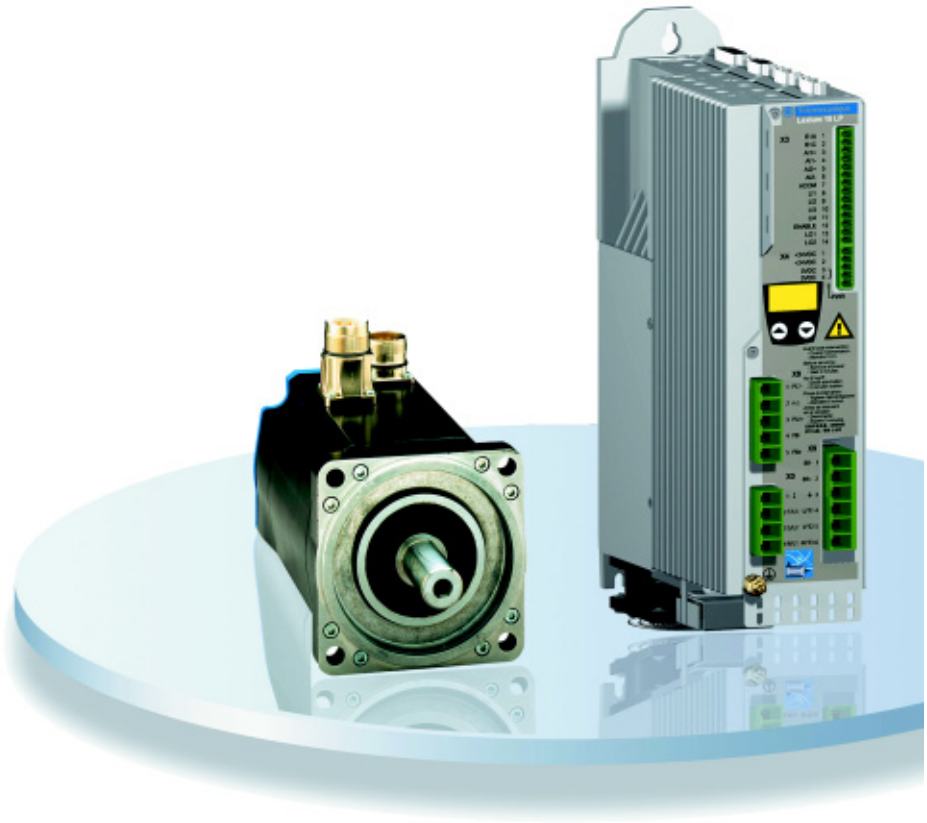
Motion control

Lexium 15

Catalogue
May
06



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To live automation solutions every day!

Flexibility

- Interchangeable modular functions, to better meet the requirements for extensions
- Software and accessories common to multiple product families

Ingenuity

- Auto-adapts to its environment, "plug & play"
- Application functions, control, communication and diagnostics embedded in the products
- User-friendly operation either directly on the product or remotely

Simplicity

- Cost effective “optimum” offers that make selection easy for most typical applications
- Products that are easy to understand for users, electricians and automation specialists
- User-friendly intuitive programming

Compactness

- High functionality in a minimum of space
- Freedom in implementation

Openness

- Compliance with field bus, connection, and software standards
- Enabling decentralised or remote surveillance via the web with Transparent Ready products

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Presentation

The compact dimensions of the Lexium 15 servo drive combined with the wide range of power ratings and power supplies available make it the ideal solution to meet the application requirements of all kinds of machinery.

This range is designed to control the torque, speed and/or position of BSH and BDH servo motors.

These motor-drive units are designed for high-performance applications requiring highly precise and dynamic position monitoring algorithms.

Lexium 15 servo drives

Applications

The Lexium 15 range of servo drives is designed to meet the requirements of the following types of application:
- Single axis:

The integrated position indexer in Lexium 15 servo drives makes it possible to control the operation of a single axis.
- Master/slave:

Operation in electrical shaft mode synchronizes the movement of several axes.

There are numerous communication bus and network connection possibilities available for both these types of application, including CANopen, Fipio, Modbus Plus and Profibus DP, all enabling integration into a distributed automation architecture.

For multi-axis applications, you can also add:
- A Motion Controller axis card (▲), which extends the operating capabilities of Lexium 15 servo drives to include applications requiring complex synchronization of several axes (cam profile, cut on-the-fly, etc.)
- A SERCOS option card, which, when connected to TSX CSY motion control modules on a Premium PLC, means that Lexium 15 servo drives can meet the performance requirements of complex applications.

Operating modes

Lexium 15 servo drives feature a large number of operating modes:
- Conventional adjustment modes:
  - Homing
  - Manual
- Position control operating modes:
  - Point-to-point mode
  - Motion tasks
  - Electronic gearing
- Speed operating mode:
  - Speed regulation
- Torque operating mode:
  - Torque control

Configuration and setup

Unilink setup software is used to configure and adjust the parameters of Lexium 15 servo drives.

▲ Available: 1st quarter 2007

Functions: pages 14, 82 and 148
Characteristics: pages 24, 84 and 150
References: pages 28, 130 and 178
Dimensions: pages 48, 134 and 182
Schemes: page 50

Lexium 15 motion control
Presentation

BSH 1001, BSH 1401 servo motors

BDH 0701, BDH 1882 servo motors

Lexium 15: A Telemecanique branded servo motor offer

BSH and BDH servo motors

BSH and BDH servo motors are synchronous three phase motors.

They feature an integrated sensor, which can be a Resolver (BDH servo motor only) or a Hiperface®SinCos absolute encoder.
They can be supplied with or without a parking brake.

Two ranges of motors are offered to meet specific application requirements:
- BSH servo motors satisfy the demands for dynamics and high-performance
- BDH servo motors satisfy the demands for compactness and adaptability

BSH servo motors: Dynamics and high-performance

Thanks to their new winding technology based on salient poles, BSH servo motors are compact and offer a high power density.
The rotor's low inertia and the slight notching effect make it possible to meet the demands of both precision and dynamics.

The dynamics are enhanced by the fast sampling time of the Lexium 15 servo drive control loops:
- 62.5 µs for the current loop
- 250 µs for the speed loop
- 250 µs for the position loop

BDH servo motors: Compactness and adaptability

The design of the windings based on salient poles has been optimized for BDH servo motors to achieve one of the best torque/size ratios available on the market.

This compactness is available across 7 different flange sizes and, when combined with various measuring systems, offers optimum adaptability when designing your machines.

Lexium 15 motion control

Lexium 15 LP servo drives

LP servo drive/servo motor combinations

Lexium 15 LP servo drive/BDH or BSH servo motor combinations

Servo motors			Lexium 15 LP servo drives					
			Supply voltage 200…240 V three-phase			Supply voltage 208…480 V three-phase		
								
BDH (IP 54 or IP 67)	**BSH** (IP 40 or IP 65)	**Max. speed**	**LXM 15LD13M3**	**LXM 15LD21M3**	**LXM 15LD28M3**	**LXM 15LU60N4**	**LXM 15LD10N4**	**LXM 15LD17N4**
			Continuous output current (RMS)					
		rpm	3 A	6 A	10 A	1.5 A	3 A	6 A
BDH 0401B		8000	0.18/0.61 Nm					
BDH 0402C		8000	0.31/1.08 Nm					
BDH 0403C		8000	0.41/1.46 Nm					
	BSH 0551P	6880	0.5/1.4 Nm			0.5/1.4 Nm		
	BSH 0551T	8000	0.5/1.4 Nm					
BDH 0582C		8000				0.84/2.34 Nm		
BDH 0582E		8000	0.87/2.42 Nm					
	BSH 0552M	6160				0.9/2.25 Nm		
	BSH 0552P	5920	0.9/2.7 Nm			0.9/2.26 Nm		
	BSH 0552T	8000	0.9/2.54 Nm					
BDH 0583C		8000				1.13/3.2 Nm		
BDH 0583D		8000	1.16/3.58 Nm				1.16/3.58 Nm	
BDH 0583F		8000		1.18/3.52 Nm				
	BSH 0553M	4880				1.3/3.5 Nm		
	BSH 0553P	8000	1.3/4.2 Nm				1.3/3.87 Nm	
BDH 0584C		8000				1.38/3.94 Nm		
	BSH 0701T	8000	1.4/3.19 Nm	1.4/3.19 Nm			1.4/2.91 Nm	
	BSH 0701P	4880	1.41/2.66 Nm			1.41/2.66 Nm		
BDH 0584D		8000	1.41/4.4 Nm				1.41/4.4 Nm	
BDH 0584F		8000		1.42/4.46 Nm				
BDH 0701C		8000				1.15/3.34 Nm		
BDH 0701E		8000	1.2/3.24 Nm					
BDH 0702C		5120				2.00/5.74 Nm		
BDH 0702D		7760	2.04/6.51 Nm				2.04/6.51 Nm	
BDH 0702H		8000		2.1/5.36 Nm				
BDH 0703C		3840				2.71/7.83 Nm		
BDH 0703E		6480	2.79/8.55 Nm				2.79/8.55 Nm	
BDH 0703H		6630		2.88/7.35 Nm				
BDH 0841C		5280				1.95/5.12 Nm		
BDH 0841E		6000	2.02/5.33 Nm				2.02/5.13 Nm	
BDH 0841H		6000		2.06/4.78 Nm				
	BSH 0702M	4960				2.12/5.63 Nm		
	BSH 0702P	8000	2.2/5.63 Nm				2.2/4.85 Nm	
	BSH 0702T	8000		2.12/5.45 Nm				2.12/4.47 Nm
	BSH 0703P	8000		2.83/9.28 Nm				2.83/7.71 Nm
	BSH 0703T	8000			2.83/7.38 Nm			

0.18/0.61 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0401B** *combined with servo drive* **LXM 15LD13M3** *meets the requirements of applications needing a maximum of 0.18 Nm continuous torque on stopping, 0.61 Nm peak torque on stopping and 8000 rpm mechanical speed.*

Functions: pages 14, 82 and 148 | Characteristics: pages 24, 84 and 150 | References: pages 28, 130 and 178 | Dimensions: pages 48, 134 and 182 | Schemes: page 50

Lexium 15 motion control

Lexium 15 LP servo drives

LP servo drive/servo motor combinations

Lexium 15 LP servo drive/BDH or BSH servo motor combinations (continued)

Servo motors			Lexium 15 LP servo drives					
			Supply voltage 200…240 V three-phase			Supply voltage 208…480 V three-phase		
								
BDH (IP 54 or IP 67)	**BSH** (IP 40 or IP 65)	**Max. speed**	**LXM 15LD13M3**	**LXM 15LD21M3**	**LXM 15LD28M3**	**LXM 15LU60N4**	**LXM 15LD10N4**	**LXM 15LD17N4**
			Continuous output current (RMS)					
		rpm	3 A	6 A	10 A	1.5 A	3 A	6 A
BDH 0842C		3000				3.35/9.37 Nm		
	BSH 1001P	3780		3.39/7.08 Nm			3.39/6.19 Nm	
	BSH 1001T	6000			3.39/8.5 Nm			
BDH 0842E		5640	3.42/9.72 Nm				3.42/9.41 Nm	
BDH 0842G		6000		3.53/9.56 Nm				3.53/8.66 Nm
BDH 0842J		6000			3.56/7.56 Nm			
BDH 0843E		4140					4.7/11.7 Nm	
BDH 0843G		6000		4.8/13.2 Nm				4.8/11.68 Nm
BDH 0843K		6000			4.9/9.02 Nm			
	BSH 1002P	6000		5.8/14.79 Nm				5.8/12.13 Nm
	BSH 1002T	5340			5.5/11.59 Nm			
BDH 0844E		3480					5.76/14.1 Nm	
BDH 0844G		6000		5.88/16.1 Nm				5.88/13.97 Nm
BDH 0844J		4980			6/12.18 Nm			
BDH 1081E		4200					4.7/10.71 Nm	
BDH 1081G		6000		4.75/10.82 Nm				4.75/10.82 Nm
BDH 1081K		6000			4.9/9.22 Nm			
	BSH 1003M	2640					7.76/15.19 Nm	7.76/22.95 Nm
	BSH 1003P	3060			7.8/19.69 Nm			
BDH 1082E		2580					8.34/18.08 Nm	
BDH 1082G		3960		8.43/19.51 Nm				8.43/19.51 Nm
BDH 1082K		3660			8.6/16.9 Nm			
	BSH 1004M	2400					9.31/19.8 Nm	9.31/29.87 Nm
BDH 1083G		3000						11.4/25.8 Nm
BDH 1083K		2820			11.6/22.9 Nm			
BDH 1084G		2460						14.3/31.7 Nm
BDH 1084K		2280			14.4/28.1 Nm			
BDH 1382G		2880						11.9/25.6 Nm
BDH 1382K		2700			12.2/22.7 Nm			
BDH 1383G		1920						16.5/38.4 Nm
BDH 1383K		2000			16.8/31 Nm			

3.35/9.37 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0842C** *combined with servo drive* **LXM 15LU60N4** *meets the requirements of applications needing a maximum of 3.35 Nm continuous torque on stopping, 9.37 Nm peak torque on stopping and 3000 rpm mechanical speed.*

Lexium 15 motion control

Lexium 15 MP servo drives

MP servo drive/servo motor combinations

Lexium 15 MP servo drive/BDH or BSH servo motor combinations

Servo motors	Lexium 15 MP servo drives
	Supply voltage 208...480 V three-phase

BDH (IP 54 or IP 67)	BSH (IP 40 or IP 65)	Max. speed	LXM 15MD28N4	LXM 15MD40N4	LXM 15MD56N4
			Continuous output current (RMS)		
		rpm	10 A	14 A	20 A
BDH 0842J		6000	3.56/7.56 Nm		
BDH 0843K		6000	4.9/9.02 Nm		
BDH 0844J		4980	6/12.18 Nm		
BDH 1081K		6000	4.9/9.22 Nm		
	BSH 1003P	6000	7.8/19.69 Nm	7.8/23.17 Nm	
BDH 1082K		3660	8.6/16.9 Nm		
BDH 1082M		5160		8.6/16.7 Nm	
	BSH 1004M	2400		9.31/34.17 Nm	
	BSH 1004P	4800	9.31/25.7 Nm	9.31/33.83 Nm	
	BSH 1004T	4080		9.31/21.04 Nm	
BDH 1083K		2820	11.6/22.9 Nm		
BDH 1083M		4000		11.4/22.1 Nm	
BDH 1083P		5700			11.4/22.2 Nm
	BSH 1401M	2360	11.1/26 Nm		
	BSH 1401P	4000	11.1/23.33 Nm	11.1/23.33 Nm	
	BSH 1401T	3920			11.1/23.33 Nm
BDH 1084K		2280	14.4/28.1 Nm		
BDH 1084L		3000		14.1/27.28 Nm	
BDH 1084N		4260			14.1/25.5 Nm
BDH 1382K		2700	12.2/22.7 Nm		
BDH 1382M		6000		12.2/22.8 Nm	
BDH 1382P		5220			12.3/23.2 Nm
BDH 1383K		2000	16.8/31 Nm		
BDH 1383M		5760		17/31.4 Nm	
BDH 1383N		6000			17/34.8 Nm
	BSH 1402M	2360		19.5/47.5 Nm	
	BSH 1402P	4000		19.5/39.33 Nm	19.5/47.5 Nm
BDH 1384K		3120	20.8/41.2 Nm		
BDH 1384L		4260		21/41.9 Nm	
BDH 1384P		6000			20.4/40.2 Nm
BDH 1385K		2820	24.8/46.8 Nm		
BDH 1385M		3840		25/47.6 Nm	
BDH 1385N		5160			24.3/50.2 Nm
	BSH 1403M	2200		27.8/71.67 Nm	
	BSH 1403P	4000			27.8/57.32 Nm
BDH 1882K		2220	29.7/59.4 Nm		
BDH 1882M		3060		30/59.8 Nm	
BDH 1882P		4500			29.4/58.4 Nm
	BSH 1404M	2040		33.4/82.32 Nm	33.4/95 Nm
	BSH 2051M	2200		36/68.33 Nm	36/68.33 Nm
BDH 1883M		2280		42/80.7 Nm	
BDH 1883P		3360			41.6/79.4 Nm
BDH 1884L		1740		53/108 Nm	
BDH 1884P		5520			52.5/106 Nm

3.56/7.75 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BDH 0842J** *combined with servo drive* **LXM 15MD28N4** *meets the requirements of applications needing a maximum of 3.56 Nm continuous torque on stopping, 7.56 Nm peak torque on stopping and 6000 rpm mechanical speed.*

Lexium 15 motion control

Lexium 15 HP servo drives

HP servo drive/servo motor combinations

Lexium 15 HP servo drive/BSH servo motor combinations

Servo motors		Lexium 15 HP servo drives	
		Supply voltage 208...480 V three-phase	
			
BSH (IP 40 or IP 65)	**Max. speed**	**LXM 15HC11N4X**	**LXM 15HC20N4X**
		Continuous output current (RMS)	
	rpm	**40 A**	**70 A**
BSH 2051M	2200	**36/68.33 Nm**	
BSH 2051P	3500	**36/82 Nm**	
BSH 2052M	2190	**65/200 Nm**	**65/200 Nm**
BSH 2052P	3000	**65/118.54 Nm**	**65/193.45 Nm**
BSH 2053M	2190	**90/227.18 Nm**	**90/300 Nm**
BSH 2053P	3000		**90/202.96 Nm**

36/68.33 Nm *The 1st value corresponds to the continuous torque on stopping. The 2nd value corresponds to the peak torque on stopping.*

Selection example:

The servo motor **BSH 2051M** *combined with servo drive* **LXM 15HC11N4X** *meets the requirements of applications needing a maximum of 36 Nm continuous torque on stopping, 68.33 Nm peak torque on stopping and 2200 rpm mechanical speed.*

Lexium 15 motion control
Lexium 15 LP, 15 MP and 15 HP servo drives

Lexium 15 LP, 15 MP and 15 HP servo drives

BSH 0701 servo motor

BSH 1401 servo motor

BDH 0701 servo motor

BDH 1081 servo motor

An offer tailored to your needs

The Lexium 15 range of servo drives combined with BSH and BDH servo motors constitutes an offer that is perfectly tailored to the requirements of your applications.

This offer covers a wide range of supply voltages and power ratings.
In order to keep costs down and ensure ease of adaptation to different applications, the Lexium 15 range of servo drives comprises 3 models:

- **Lexium 15 LP servo drives:**
  - 200…240 V single phase, 0.9 kW to 1.2 kW (LXM 15LD●●M3)
  - 200…240 V 3-phase, 1 kW to 3.4 kW (LXM 15LD●●M3)
  - 208…480 V 3-phase, 1.1 kW to 4.3 kW (LXM 15L●●●N4)
- **Lexium 15 MP servo drives:**
  - 208…480 V 3-phase, 5.7 kW to 11.4 kW (LXM 15MD●●N4)
- **Lexium 15 HP servo drives:**
  - 208…480 V 3-phase, 22.3 kW to 42.5 kW (LXM 15HC●●N4X)

Lexium servo motors:

- **BSH servo motors** (see pages 178 to 181):
  - Nominal torque: from 0.5 Nm to 90 Nm
  - Nominal speed: from 1500 to 8000 rpm
- **BDH servo motors** (see pages 130 to 133):
  - Nominal torque: from 0.18 Nm to 53 Nm
  - Nominal speed: from 1000 to 8000 rpm

The Lexium 15 motion control offer also includes GBX planetary gearboxes. Easy to mount and lubricated for life, these gearboxes are available in 12 reduction ratios, ranging from 3:1 to 40:1. GBX gearboxes are economical and are designed for high inertia applications.

Lexium 15 servo drives comply with EN 50178, IEC/EN 61439-1, IEC/EN 60204-1, EN 292 and IEC/EN 61800-3 international standards, and carry UL (USA) and cUL (Canada) approvals, and CE marking.

A complete unit

The Lexium 15 motion control offer integrates functions and components that are usually external. This enables users to maintain particularly compact dimensions and makes it easier to integrate the servo drive in enclosures or machines.

Electromagnetic compatibility, EMC

The incorporation of class A EMC filters in Lexium 15 LP and Lexium 15 MP servo drives makes it easier to install machines and render them compliant for CE marking, while being very economical.
Lexium 15 HP servo drives are designed without an EMC filter. Filters, available as an option, can be installed by the customer to reduce the level of emissions, see pages 44 and 45.

Safety

The Lexium 15 servo drive is incorporated in the safety system of installations. It integrates the “Power Removal” safety function which prevents accidental starting of the servo motor. This function complies with:

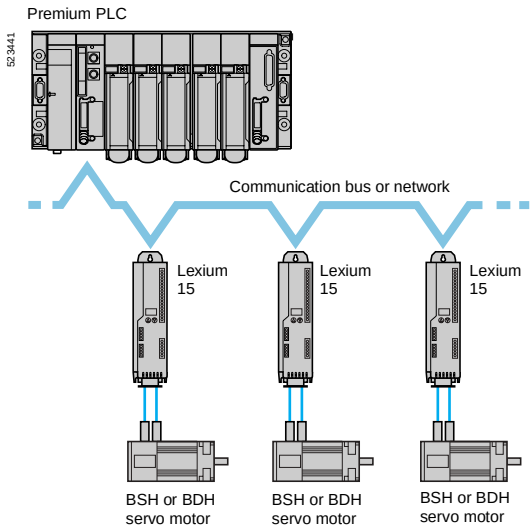
- Machinery standard EN 954-1 category 3 for Lexium 15 LP servo drives
- Machinery standard EN 954-1 category 1 for Lexium 15 MP and Lexium 15 HP servo drives

The “Power Removal” safety function describes the wiring of your safety circuits. The diagrams on pages 50 to 59 show wiring that complies with standard EN 954-1 categories 1, 2, 3 or 4.

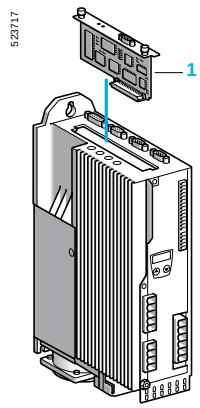
Braking

Lexium 15 LP and Lexium 15 MP servo drives integrate a resistor as standard, which does away with the need to use an external braking resistor in most applications.
Lexium 15 HP servo drives are designed without an integrated braking resistor. Braking resistors are available as an option.

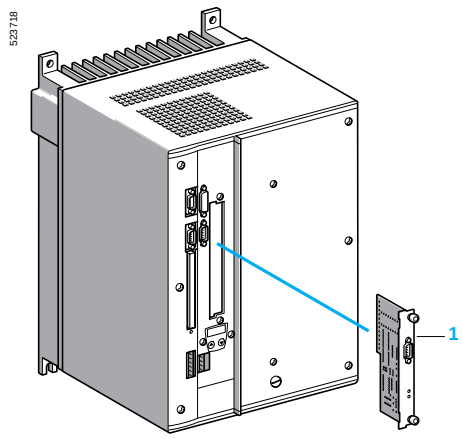
Lexium 15 motion control
Lexium 15 LP, 15 MP and 15 HP servo drives



Example of an architecture



Lexium 15 LP and 15 MP servo drives: mounting the option card



Lexium 15 HP servo drive: mounting the option card

Control and interfaces

The Lexium 15 multifunction servo drive range can be controlled in a number of ways:

- The programming of motion tasks in its integrated position indexer provides an economical, dynamic solution (10 ms response time and +/- 1 ms “jitter”) for your single axis applications
- A wide range of position feedback possibilities for Lexium 15 servo drives (A/B incremental encoder; SSI, EnDat®, Hiperface®, etc, absolute encoders) provides, with no additional option card, infinite openness for simple master/slave applications or those which require the use of an external encoder.

In addition to the above possibilities for controlling the Lexium 15 servo drive, there is a wide range of option cards. The additional I/O card and communication cards enable you to get the best from your machine.

The Lexium 15 servo drive also integrates more conventional control functions such as a pulse/direction input and two ± 10 V analog reference inputs in order to adapt to all types of axis control cards.

The SERCOS option card extends the control possibilities of the servo drive even further, enabling it to meet the requirements of complex multi-axis applications.

Simplicity

Integration

Its high level of integration, compact size and the ability to mount it side by side enable the size of enclosures to be reduced.

Setup

Using the SinCos Hiperface® encoder on BSH and BDH servo motors, the Lexium 15 servo drive automatically receives data from the servo motor. The parameters of the motor do not need to be set manually.

The Unilink software graphic interface guides you through the configuration of each of the parameters of your axes.

The ability to program motion tasks enables fast configuration of machines. Simply enter the data of the various sequences of the application and set the parameters of the movement sequencing.

With its Oscilloscope and Bode Diagram functions, the Unilink software can be used for accurate setting of the various servo drive filter parameters for optimum machine control.

Options

The Lexium 15 servo drive can take one of the following option cards 1:

- Communication cards, see pages 30 to 37
- SERCOS card, see page 38
- I/O extension card, see page 39

External options can be used with the Lexium 15 servo drive:

- Braking resistors, see pages 40 to 43
- Additional EMC input filters, see pages 44 and 45
- Line chokes, see page 46
- Motor chokes, see page 47

Lexium 15 motion control
Lexium 15 servo drives

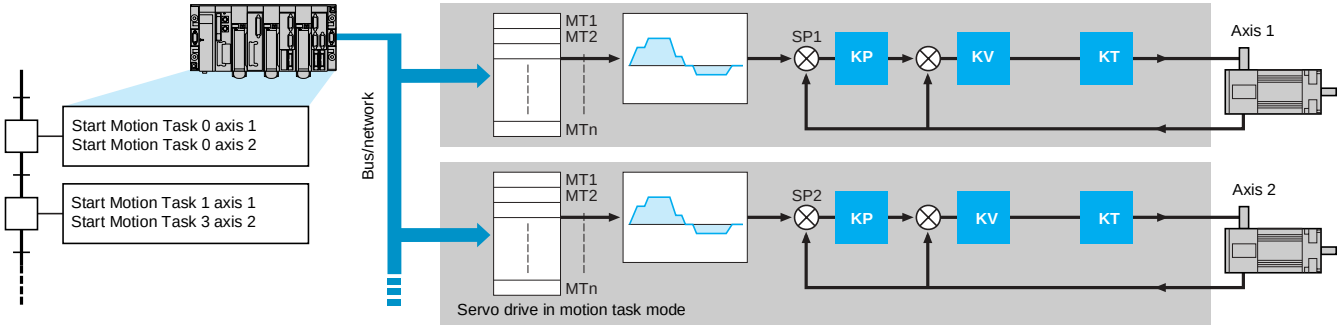
Motion control applications

The Lexium 15 servo drive integrates the CANopen protocol as standard.
It is also possible to connect to other communication buses and networks by adding an option card:
- Fipio
- Modbus Plus
- Profibus DP

For applications requiring fast synchronization of axes, the Lexium 15 servo drive can be connected to a SERCOS module using its option card.

This type of architecture provides a high-performance response to four types of application:
- Applications with independent servo drives
- Applications with independent axes controlled by controller
- Applications with master/slave operation
- Applications with coordinated axes

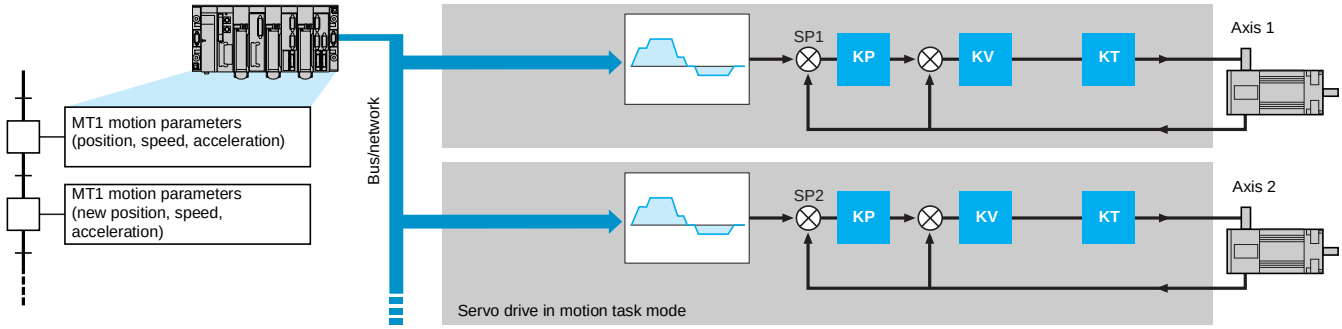
Applications with independent servo drives



The “Motion Tasks” (MT) for each Lexium 15 servo drive are managed using simple motion task activation/deactivation commands (start, stop, etc.) from the controller.

Note: *Typical number of servo drives controlled: 16*

Applications with independent axes controlled by controller

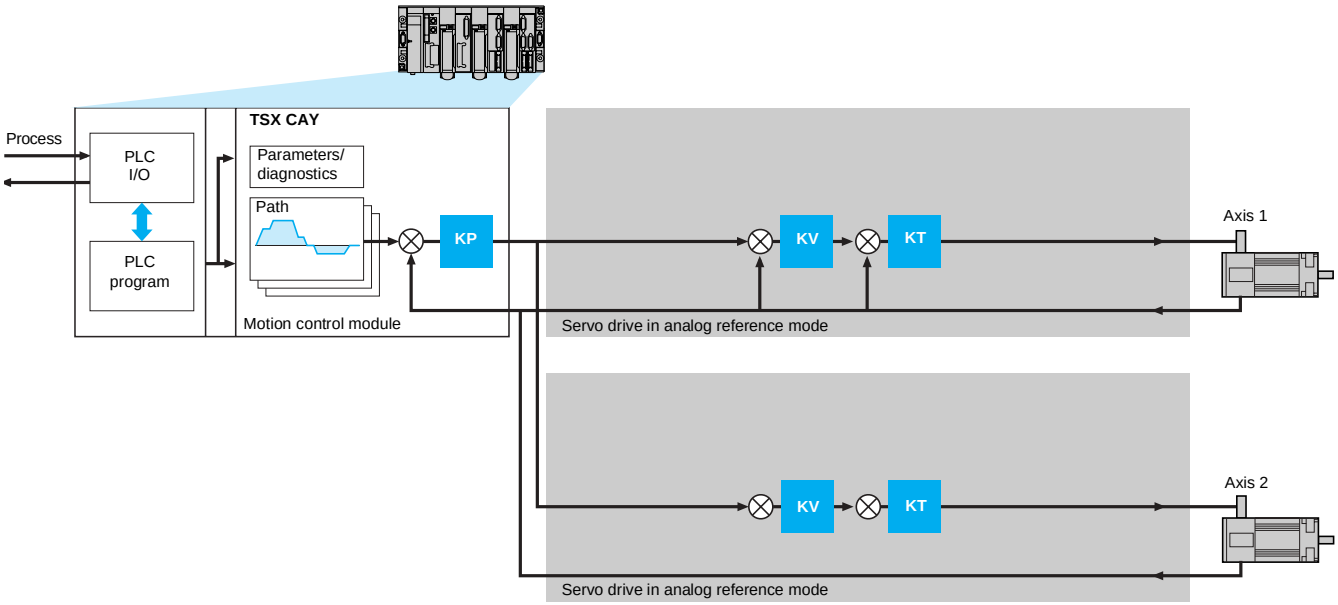


The controller synchronizes the “Motion Tasks” (MT) commands executed in each Lexium 15 servo drive.

Note: *Typical number of servo drives controlled: 4 to 8*

Motion control applications (continued)

Applications with master/slave operation



The Lexium 15 servo drive with analog reference is used with the TSX CAY 2●/33/4● motion control module (with Premium platform).

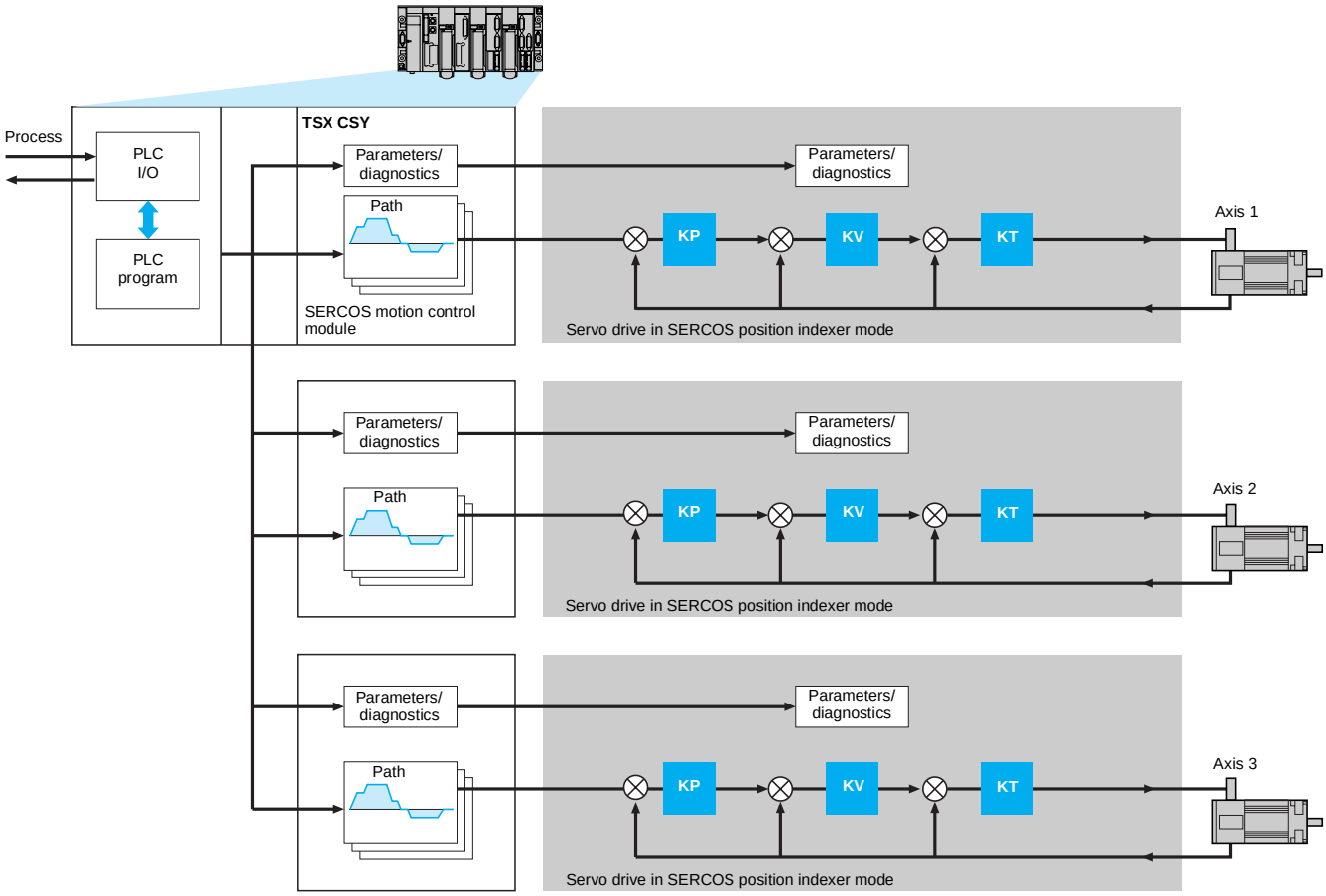
The KP position loop is executed in the automation platform TSX CAY control module. It is configured and adjusted using PL7 Junior/Pro or Unity Pro programming software. The KV speed loop and KT torque loop of the Lexium 15 are configured and adjusted using Unilink software.

The motion program, which defines the paths, is in the Premium platform application program. The position and speed setpoints are calculated by the motion control module.

Note: *Typical number of servo drives controlled: 2 to 4*

Motion control applications (continued)

Applications with coordinated axes



The Lexium 15 servo drive equipped with the AM0 SER 001V000 SERCOS option card is used with the TSX CSY 84/85 and TSX CSY 164 motion control modules (with Premium platform).

The KP position loop, KV speed loop and KT torque loop of the Lexium 15 servo drive are configured and adjusted using Unilink software.

The motion program, which defines the paths, is in the Premium platform application program. The position setpoints are calculated by the motion control module (position mode).
The motion control module can also calculate the speed reference (speed mode) or the current reference (torque mode). These two modes can be accessed with the assistance of Schneider Electric application services.

Note: *Typical number of servo drives controlled: 2 to 16*

Motion control applications (continued)

Debugging

Unilink, PL7 Junior/Pro and Unity Pro software provide simple solutions for debugging motion control applications.

In the context of programming applications with independent servo drives, Unilink software makes the programming of motion tasks and the configuration of your network architecture easier.
It can be used to adjust the following communication bus and network parameters:
- The address of each of the master controller's slave servo drives
- The transmission speed
- The network monitoring parameters

This software also provides access to the debugging and diagnostics screens specific to each communication bus and network.

On the PLC side, in addition to these services there are screens specific to the PL7 Junior/Pro and Unity Pro software for debugging and diagnostics of communication buses and networks:
- Access to CanOpen Motion Function Blocks under Unity Pro
- Fipio, Modbus Plus and Profibus DP service screens under PL7 Junior/Pro or Unity Pro.

In the context of programming applications with master/slave operation or applications with coordinated axes, the Unilink software can be used to adjust the control parameters of each of the axes.

On the PLC side, the position parameters are accessed via PL7 Junior/Pro or Unity Pro software using the parameter screens of the TSX CAY and TSX CSY motion control modules.

Lexium 15 motion control
Lexium 15 servo drives

Overview of the functions of Lexium 15 servo drives

Lexium 15 servo drives integrate numerous operating modes, enabling them to be used in a wide range of industrial applications.

These functions include:
- ■ Conventional adjustment modes:
- □ Homing
- □ Manual

- ■ Operating modes:
- □ Position control:
  - Point-to-point
  - Motion tasks
  - Electronic gearing
- □ Speed control:
  - Speed control according to an acceleration ramp
  - Instantaneous speed control
- □ Torque control:
  - Torque control

Each of these operating modes is available offline and/or via the communication buses and networks.

Offline
The servo drive parameters are defined using Unilink configuration software. Movements are then controlled by:
- ■ The position indexer integrated in the servo drive by programming motion tasks
- ■ Analog signals (± 10 V) (14 resolution bits)
- ■ RS 422/485 signals (pulse/direction or A/B signals)

In this mode, limit switches and homing switches are not managed by the servo drive.

Via communication buses and networks
All the servo drive parameters and those associated with the operating modes can be accessed via the communication buses and networks, in addition to access via the Unilink configuration software.
The following table shows, for each of the operating modes, the type of control and the available sources of setpoint values.

Operating mode	Control		Transmission of the setpoint value
	Via communication buses and networks	Offline	
Adjustment modes			
Homing	■	■	Communication buses and networks or Unilink software
Manual	■	■	Communication buses and networks, Unilink software, encoder signals, pulse/direction or A/B signals
Operating modes			
Point-to-point	■	□	Communication buses and networks
Motion tasks	■	■	Communication buses and networks or Unilink software
Electronic gearing	■	■	Encoder signals, pulse/direction or A/B signals
Speed control according to an acceleration ramp	■	□	Communication buses and networks
Instantaneous speed control	■	■	Analog input or communication buses and networks
Torque control	■	■	Analog input or communication buses and networks

■ Functions available
□ Functions not available

Homing mode

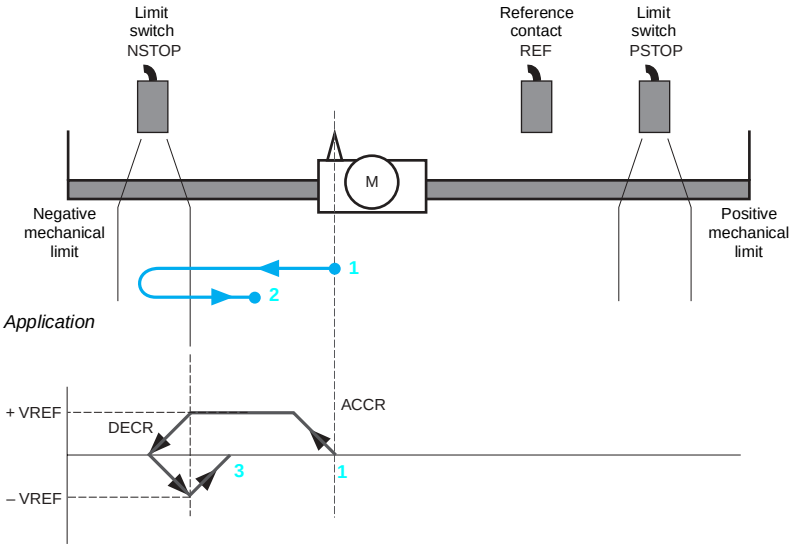
Before performing a movement, a homing operation must be carried out.
Homing consists of associating an axis position with a known mechanical position. This position then becomes the reference position for any subsequent movement of the axis.

Homing is carried out by:
- Either searching for a reference sensor
- Or one servo motor revolution with a “Zero marker”
- Or immediately writing the actual position register (forced homing)

Homing with search for reference sensor

There are 5 possible types of homing with search for reference sensor:
- Homing on - limit switch, “NSTOP”
- Homing on + limit switch, “PSTOP”
- Homing on reference contact “REF” with initial movement in negative direction of rotation
- Homing on reference contact “REF” with initial movement in positive direction of rotation
- Homing on the mechanical limit of the axis

These homing movements can be performed with or without taking the “Zero marker” pulse into account.



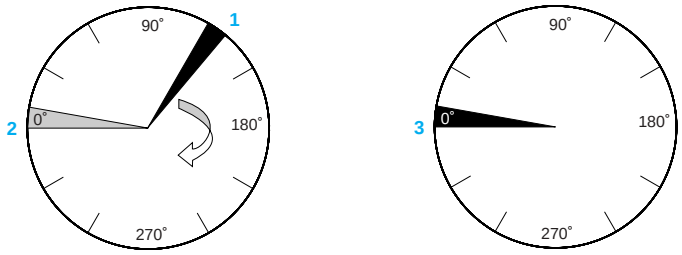
Example of a homing movement on “NSTOP” limit switch with “Zero marker”.

1 Start point of the homing movement
2 New homing point of the movement
3 Zero marker
ACCR: homing acceleration ramp
DECR: homing deceleration ramp
VREF: homing speed

Homing mode (continued)

Homing on one servo motor revolution with a “Zero marker”

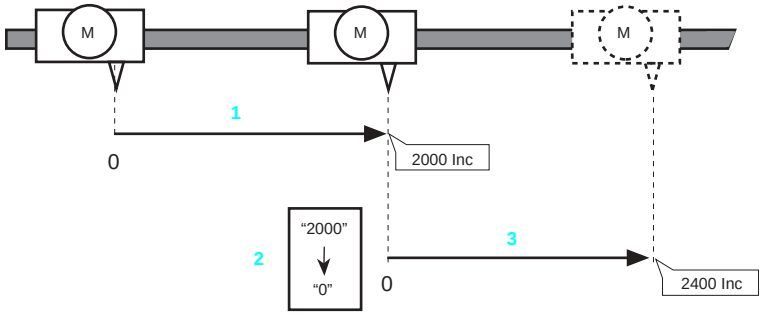
Homing on one revolution consists of setting the “Zero marker” point as the new reference point.



1 Start point of the homing movement
2 Zero marker
3 New homing point of the movement

Forced homing

Three types of forced homing are possible:
■ Simple forced homing: the current position of the servo motor is set as the new reference point, and the following error is lost
■ Forced homing without loss of following error: the actual position of the servo motor is set as the new reference point, and the following error is retained
■ Forced homing on SSI encoder: this is simple forced homing specific to SSI encoders. When the application is started, the position is read in the encoder and set as the new reference point.



Operating mode with forced homing

After power-up, the position value is 0.
1 Start towards the home point: the motor is positioned using a relative movement of 2000 increments.
2 Forced homing to value 0 by writing the actual position expressed in user units.
3 Initiation of a command to move 2400 increments to the absolute position. The final position is 2400 increments (4400 increments if forced homing has not been performed).

Lexium 15 motion control

Lexium 15 servo drives

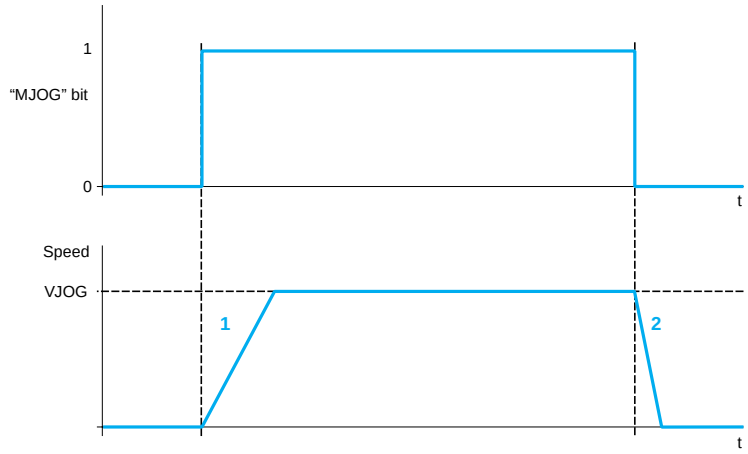
Adjustment modes

Manual mode

This mode enables an axis to be moved manually when the speed and motion tasks operating modes are selected. The movement is performed continuously at a constant speed as long as this mode is activated. Various parameters such as acceleration, movement speed and deceleration are used to configure manual mode.

This adjustment mode can be configured via communication buses and networks or via Unilink software.

Example



Adjustment of the machine in manual mode

1 The acceleration ramp can be configured via the "ACCR" parameter
2 The deceleration ramp can be configured via the "DECR" parameter

On a rising edge of the "MJOG" bit, a movement is made according to the acceleration ramp "ACCR" up to manual movement speed "VJOG".
On a falling edge of the "MJOG" bit, the movement speed decreases according to the deceleration ramp "DECR".

Lexium 15 motion control

Lexium 15 servo drives

Operating modes

Point-to-point mode

This mode, also referred to as PTP (Point To Point), is used to move the axis from a position A to a position B. The movement can be:

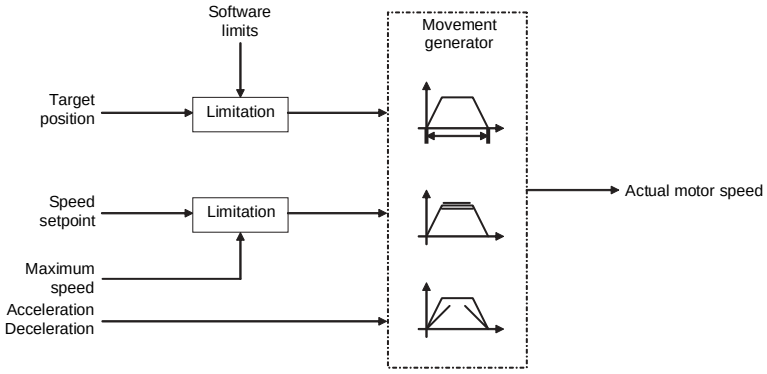
■ **Absolute:** this consists of expressing position B in relation to a home position. The axis must have previously been referenced.

■ **Relative:** in this case the movement is performed in relation to the current position of the axis (A).

The movement is performed according to acceleration, deceleration and speed parameters.

Setpoint value

The setpoint values are transmitted via the communication bus or network.



Point-to-point operating mode

Possible applications

A motion controller for coordinated axes or a PLC can manage several axes controlled via fieldbus. This mode is often used in material handling, automated inspection, etc.

Motion tasks mode

This mode is used for programming the parameters required for making rapid movements. It is used for absolute or relative axis movements, from a point A to a point B in accordance with a predefined movement (in this mode, point A can be entered on the fly). Then, from point B to another point C, in accordance with another movement.

The movement is performed according to selected acceleration, deceleration and speed parameters.

It is also possible to choose the type of sequencing for these two movements, as well as the required profile (Trapeze or Sinus^2).

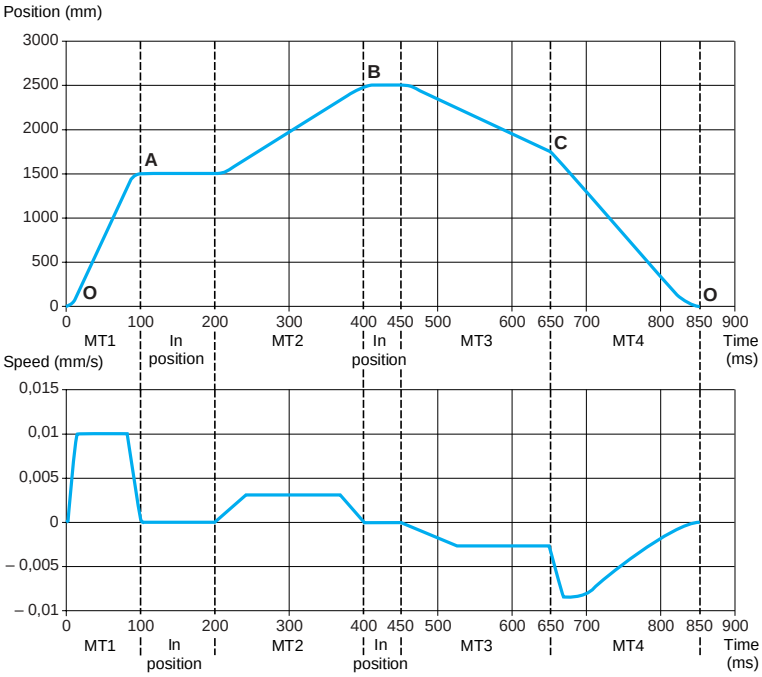
Presentation: pages 8 and 9
Characteristics: pages 24 to 27
References: pages 28 and 29
Dimensions: pages 48 and 49
Schemes: pages 50 to 61

Lexium 15 motion control
Lexium 15 servo drives
Operating modes

Motion tasks mode (continued)

Examples of motion tasks

The movement performed below is made up of 4 motion tasks:
- Motion task 1 is used to move from the home point **O** to point **A** in 100 ms following a Sinus^2 speed profile. The axis remains in position for 100 ms.
- Motion task 2 is used to move from the point **A** to point **B** in 200 ms following a trapezoid speed profile. The axis remains in position for 50 ms.
- Motion task 3 is used to move from point **B** to point **C** in 200 ms following a negative trapezoid speed profile. The movement is then linked directly to the next task.
- Motion task 4 moves the axis from point **C** to home point **O** in 200 ms following a Sinus^2 speed profile which has a very high deceleration component (smooth approach to home position **O**).



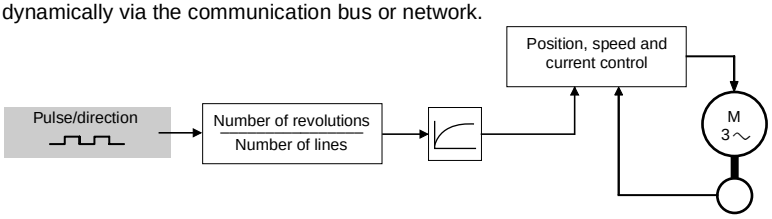
Example of a movement performed using 4 motion tasks

Electronic gearing mode

In this mode a master/slave relationship is established between a number of Lexium 15 servo drives or between a Lexium 15 servo drive (slave) and an external motion controller (master).

This mode can handle 5 types of control signal:
- External or simulated A/B encoder
- Pulse/direction signals
- EnDAT encoder
- Hiperface® encoder
- External or simulated SSI encoder

This relationship can be assigned a fixed or variable ratio. The ratio and direction of operation parameters can be accessed statically via Unilink software, and dynamically via the communication bus or network.



Electronic gearing operating mode

Possible applications

This mode is used in material handling, conveying or sectional production line applications, as well as in the fields of plastics and fibers.

Lexium 15 motion control

Lexium 15 servo drives

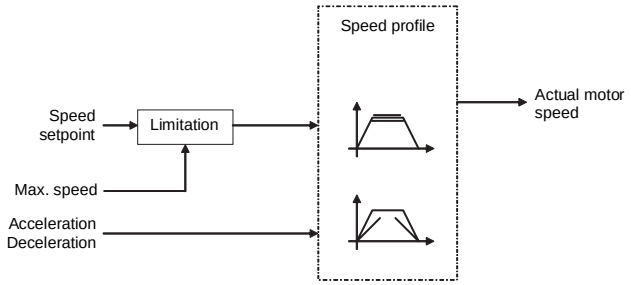
Operating modes

Speed control according to acceleration ramp mode

In this operating mode, the speed setpoint is applied according to an acceleration/deceleration ramp that can be adjusted using parameters. The speed setpoint can be modified during the movement. Torque limiting is also possible.

Setpoint value

The setpoint value is transmitted via the communication bus or network.



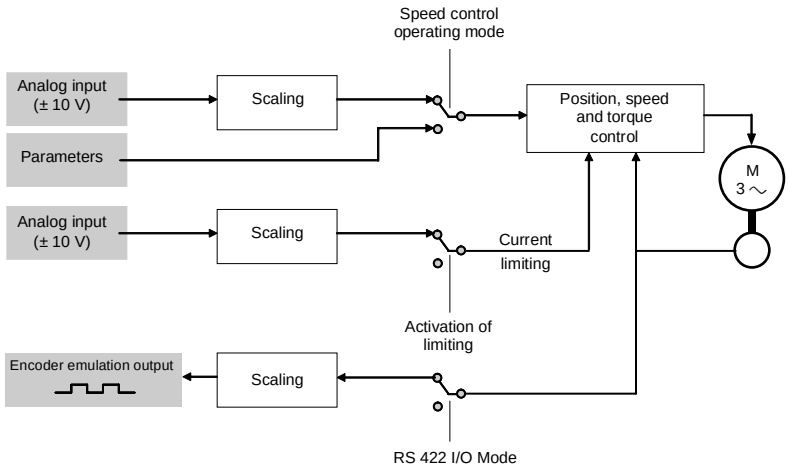
Speed control according to acceleration ramp operating mode

Instantaneous speed control

In this mode the Lexium 15 servo drive can be used with a motion controller with analog output. It is suitable for all other high performance speed control requirements.

Setpoint value

The setpoint value is transmitted via analog input 1 (AI1+/AI1-), the communication bus or the network. Analog input 2 (AI2+/AI2-) can be used to limit the torque or speed, or for precise adjustment of the setpoint.



Instantaneous speed control operating mode

Use with analog output motion controller

The axis position feedback can be provided to the motion controller by the Encoder emulation output (X5) on the Lexium 15 servo drive.

Possible applications

- Material handling
- Cutting to length
- Winding and unwinding applications

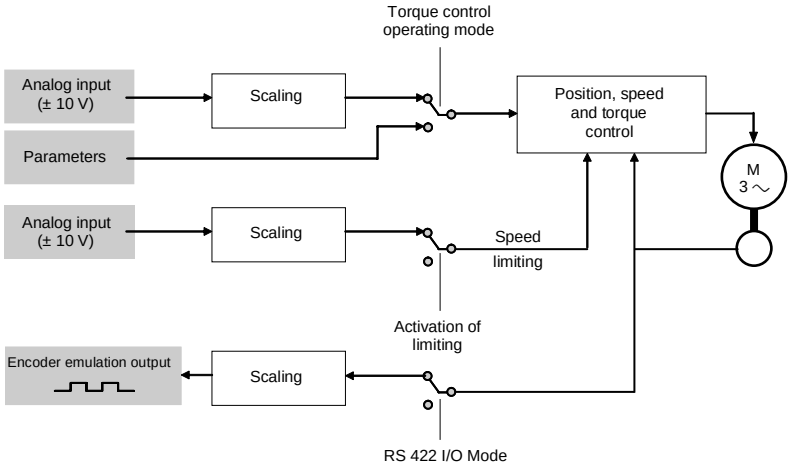
Lexium 15 motion control
Lexium 15 servo drives
Operating modes

Torque control mode

This mode, which can be added onto the other modes, is used in machine phases where torque control is crucial.

Setpoint value

The setpoint value is transmitted via analog input 1 (AI1+/AI1-), the communication bus or network. Analog input 2 (AI2+/AI2-) can be used to limit the current.
The position of the servo motor is transmitted to the motion controller by the encoder emulation output (X5) on the Lexium 15 servo drive.



Torque control operating mode

Possible applications

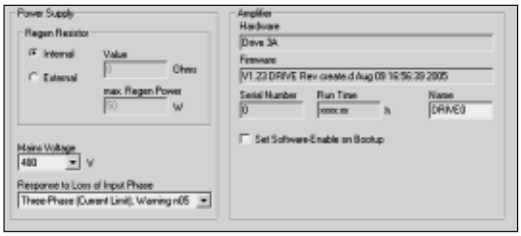
- Car assembly applications (tool fixing machine)
- Special machines

Other functions

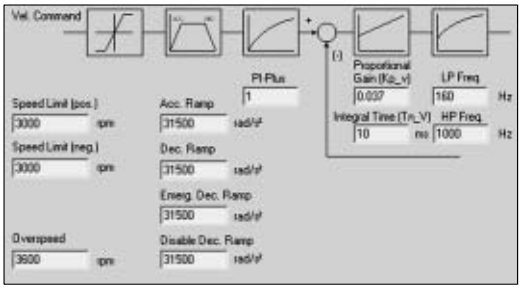
It is possible to activate other functions for setting operating parameters via logic I/O, the communication bus or network, or Unilink software.

- Automatic start
- Programming of emergency stop sequences (categories 0, 1 or 2)
- Position register for controlling logic outputs
- Switching commands on the fly
- Starting motion tasks
- Signaling the end of movement by logic inputs
- Starting a series of ASCII commands on a logic input edge

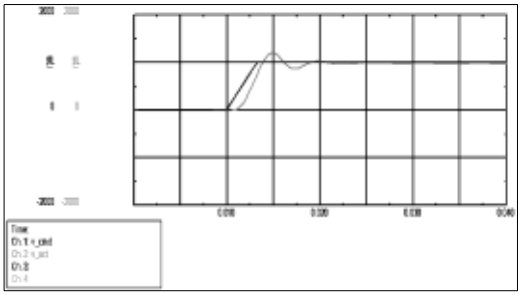
Lexium 15 motion control
Lexium 15 servo drives
Unilink software



Example of parameter setting with Unilink software



Example of adjusting the speed loop with Unilink software



Oscilloscope function

Presentation

Unilink software for PC is a tool for configuring Lexium 15 servo drive operating parameters.
Its simple, easy-to-follow graphic interface helps to reduce setup costs.

It incorporates various functions for the setup phases, such as:
- Parameter setting
- Advanced adjustment of the various control loops
- Programming motion tasks
- Supervision

This software is available in two versions, for configuring Lexium 15 LP servo drives (Unilink L) and Lexium 15 MP/15 HP servo drives (Unilink MH). It is supplied with the servo drive as standard.

Functions

Parameter setting

Unilink software can be used to configure:
- The servo drive parameters such as the supply voltage, the breaking resistance, the ID, the address of the drive on the network, etc
- BDH and BSH servo motors:
  - Automatically, using the motor parameters stored in the memory of the SinCos Hiperface® absolute encoder
  - Simply, using the Unilink software's motor database, which contains the parameters of all the servo motors sold by Schneider Electric
- The parameters of third party servo motors by simply entering motor parameters such as the type of position sensor, the maximum speed, the minimum and maximum motor currents, etc
- Operation in simple master/slave mode by setting the parameters of the incremental (A/B) or SSI absolute encoder emulation output, the encoder input and pulse/direction input
- The functions associated with the logic and analog I/O, such as capture of position registers, control of motion tasks or speed, torque and coupling ratio adjustment in the context of electronic gearing type applications.

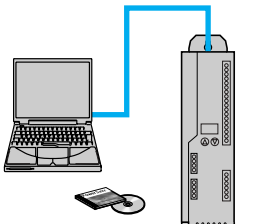
Sophisticated adjustment of the various control loops

Unilink software can be used to access the following control loop parameters:
- Torque control. The motor database that can be accessed via Unilink software is used to automatically configure the KT gain of the current loop for optimum regulation of the motor torque.
- Speed control. Provides access to the KV gain parameters of the speed loop, as well as to the parameters of the internal PID controller. Other service parameters such as maximum speed, overspeed threshold, acceleration and deceleration ramps and the emergency stop deceleration time can also be accessed.
- Position control. In integrated position indexer operating mode, the software can be used to optimize the adjustment of the KP gain of the position loop.

With its Oscilloscope and Bode Diagram functions, Unilink software simplifies the optimization of these control loops.

Presentation: pages 8 and 9 | Characteristics: pages 24 to 27 | References: pages 28 and 29 | Dimensions: pages 48 and 49 | Schemes: pages 50 to 61

Example of programming a motion task



PC/Lexium 15 servo drive connection

Functions (continued)

Programming of motion tasks

For each motion task, Unilink software can be used to set the parameters for the type of speed profile, the position to be reached and the setpoint speed.
These motion tasks can be absolute, relative in relation to a known position or relative in relation to a position register.
The sequencing of the motion tasks can be direct, delayed or triggered by a logic input.

Supervision

When the axis is set up, the Unilink software Monitor can be used to supervise the speed, temperature, current, voltage, position and following error parameters that allow the user to check that the application is operating correctly.

Setup and connection

Preparation of the configurations

Unilink software can be used on its own for configuring the Lexium 15 servo drive. The configurations can be saved, printed, etc.

Online mode

In online mode, it is possible, using the RS232 link, to load the parameters of the Lexium 15 servo drive in the PC and vice versa.
It is also possible to supervise the correct operation of the Lexium 15 servo drive and the communication buses and networks in offline mode.

PowerSuite

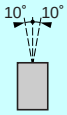
For easier setup of applications requiring other types of servo drives (Lexium 05) or variable speed drives (Altivar), Unilink can be launched via the PowerSuite software workshop *(1)*.

(1) This function is available from version 2.40 ▲ of PowerSuite.

▲ Available 4th quarter 2006

Lexium 15 motion control
Lexium 15 servo drives

Environmental characteristics

Conformity to standards				Lexium 15 servo drives have been developed to conform to the strictest levels of international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), including: ■ EN 50178, IEC/EN 61439-1, IEC/EN 60204-1 for low voltages ■ IEC/EN 60204-1, EN 292 for machine safety ■ IEC/EN 61800-3 for EMC immunity and conducted and radiated emissions
	EMC immunity			IEC/EN 61800-3, environment 2 IEC/EN 61000-6-1 level 3 IEC/EN 61000-6-2 level 3
	EMC conducted and radiated emissions			EN 61800-3, environments 1 and 2, categories C2 and C3
		LXM 15L●●●●●		EN 55011 class A group 1, IEC/EN 61800-3 category C2 for cable lengths < 10 m EN 55011 class A group 2, IEC/EN 61800-3 category C3 for cable lengths 10…50 m
		LXM 15MD●●N4		IEC/EN 61800-3 category C3
		LXM 15HC●●N4X		With additional EMC filter *(1)*: ■ EN 55011 class A group 1, IEC/EN 61800-3 category C3
CE marking				The servo drives are CE marked in accordance with the European low voltage (73/23/EEC) and EMC (89/336/EEC) directives
Product certification				UL (USA), cUL (Canada)
Degree of protection				IP 20
Vibration resistance				According to IEC/EN 60068-2-6: 1.5 mm peak to peak from 10…57 Hz 1 gn from 57…150 Hz
Shock resistance				4 gn for 22 ms according to IEC/EN 60028-2-27
Maximum ambient pollution		LXM 15L●●●●●		Degree 2 according to IEC 60664-1
		LXM 15MD●●N4 LXM 15HC●●N4X		Degree 2 according to EN 60204 and EN 50178
Environmental conditions				IEC 60721-3-3 class 3C1
Relative humidity				According to IEC 60721-3-3, class 3K3, 5…85%, without condensation
Ambient air temperature around the device	Operation	LXM 15L●●●●●	**°C**	0…40 without derating 40…55 with derating of the motor output current by 2.5% per additional °C
		LXM 15MD●●N4 LXM 15HC●●N4X	**°C**	0…45 without derating 45…55 with derating of the motor output current by 2.5% per additional °C
	Storage		**°C**	- 25…+ 70
Type of cooling		LXM 15LD13M3 LXM 15LU60N4		Natural convection
		LXM 15LD21M3, LD28M3 LXM 15LD10N4, LD17N4 LXM 15MD●●N4 LXM 15HC●●N4X		Fan
Maximum operating altitude			**m**	0…1000 without derating 1000…2500 with derating of the motor output current by 1.5% per additional 100 m
Operating position Maximum permanent angle in relation to the normal vertical mounting position				

(1) See page 45 to check the permitted cable lengths.

Drive characteristics

Switching frequency		**kHz**	8

Control loop characteristics

Torque		**µs**	62.5
Speed		**µs**	250
Position		**µs**	250

Electrical power characteristics

Power supply	Voltages	**V**	200 - 15%…240 + 10% single phase for LXM 15LD●●M3 200 - 15%…240 + 10% 3-phase for LXM 15LD●●M3 208 - 10%…480 + 10% 3-phase for LXM 15●●●●N4, LXM 15HC●●N4X
	Frequency	**Hz**	50 - 5%…60 + 5%
	Inrush current	**A**	Internal limitation
	Neutral connection		Compatible with TN and TT connection. For IT connection, an isolation transformer must be used on the power supply, see page 61
24 V⎓ external power supply *(1)*	Input voltage	**V**	24…28 20…30 for LXM 15D13M3, LXM 15LU60N4 used with a servo motor without brake
	Input current (no-load)	**A**	2.5 1 for LXM 15D13M3, LXM 15LU60N4 used with a servo motor without brake
	Ripple		⩽ 5%
Output voltage			Maximum 3-phase voltage equal to line supply voltage
Electrical isolation			Between power and control (inputs, outputs, sources)

Connection characteristics (power supply, braking resistor, DC bus and motor terminals)

Servo drive terminals		**R/L1, S/L2, T/L3 (power supply)**	**PA/+, PC/-, PBi, PBe (external braking resistor and DC bus)**	**U/T1, V/T2, W/T3 (motor)**
Maximum wire size and tightening torque of power supply, braking resistor, DC bus and motor terminals	LXM 15L●●●●●	1.5 mm² (AWG 14) 0.6 Nm	1.5 mm² (AWG 14) 0.6 Nm	See characteristics of VW3 M5 10● R●●● cables, pages 129 and 176
	LXM 15MD28N4	1.5 mm² (AWG 14) 0.5…0.6 Nm	1.5 mm² (AWG 14) 0.5…0.6 Nm	See characteristics of VW3 M5 20● R●●● cables, pages 129 and 177
	LXM 15MD40N4, MD56N4	4.0 mm² (AWG 12) 0.5…0.6 Nm	4.0 mm² (AWG 12) 0.5…0.6 Nm	
	LXM 15HC●●N4X	25 mm² (AWG 2) 6…8 Nm	25 mm² (AWG 2) 6…8 Nm	See characteristics of VW3 M5 10● R●●●, VW3 M5 30● R●●● cables, pages 176 and 177

(1) Please consult our "Interfaces, I/O splitter boxes and power supplies" specialist catalogue.

Control signal characteristics

Type of servo drive			LXM 15L●●●●●	LXM 15MD●●N4, LXM 15HC●●N4X
Protection	Inputs		Against reverse polarity	
	Outputs		Against short-circuits	
Electrical link			Presence of an electrical link on the 0 V ⎓	
Relay outputs				
Type			Relay output, 1 N/O contact	
Number			1 (R1A, R1C)	
Maximum switching capacity			On resistive load (cos φ = 1): 0.5 A for 125 V ∿ or 30 V ⎓	
Maximum response time		**ms**	4	
Logic inputs				
Type			Logic inputs conforming to standard IEC 61131-2 type 1	
Number			5 including one ENABLE input (LI1, LI2, LI3, LI4)	
Power supply		**V**	20…30 ⎓	
Sampling period		**ms**	0.25	1 in normal cycle, 0.05 in fast cycle
Positive logic (Sink)			State 0 if < 5 V or input not wired State 1 if > 11 V	State 0 if < 7 V or input not wired State 1 if > 12 V
Safety inputs				
Type			Inputs for the "Power Removal" safety function	
Number			1 (PWR)	2 (PWRI+, PWRI-)
Power supply		**V**	24 ⎓	
Response time		**ms**	1.5	20
Positive logic (Sink)			State 0 if < 5 V or input not wired State 1 if > 15 V	State 0 if < 7 V or input not wired State 1 if > 12 V
Logic outputs				
Type			Logic outputs 24 V ⎓ positive logic (Source)	Logic outputs 24 V ⎓ negative logic (Sink)
Number			2 (LO1, LO2)	
Output voltage		**V**	30 max.	
Sampling period		**ms**	0.25	1
Max. breaking current		**mA**	10	
Analog inputs				
Type			±10 V differential analog inputs	
Number			2 (AI1+/AI1-, AI2+/AI2-)	
Resolution			14 bits (AI1+/AI1-) 12 bits (AI2+/AI2-)	
Input resistance		**kΩ**	20	
Sampling period		**ms**	0.0625	0.25
Analog outputs				
Type			–	±10 V analog outputs
Number			0	2 (Analog Out 1, Analog Out 2)
Resolution		**bit**	–	10
Output impedance		**kΩ**	–	2.2
Response time		**ms**	–	5

Control signal characteristics (continued)

Type of servo drive			LXM 15L●●●●●	LXM 15MD●●N4, LXM 15HC●●N4X
Resolver feedback				
	Type		Resolver feedback input	
	Number		1; 9-way female SUB-D connector (X2)	
Voltages	Sensor power supply		4.75 V ∿, 35 mA max.	
	Resolver input signals		7 V ± 10%	
	Resolution		14 bits	
Input resistance		**kΩ**	24.5	
Motor encoder feedback signals				
Type			Encoder feedback input	
Number			1; 15-way female SUB-D connector (X1)	
Voltages	Encoder power supply		+ 10 V/100 mA	
	SinCos input signals		1 V_{SS} with 2.5 V offset 0.5 V_{SS} at 100 kHz	
Pulse/direction, A/B encoder signals				
Type			RS 422 and RS 485 link compatible input	
Number			1; 9-way male SUB-D connector (X5)	
Common mode range		**V**	- 7…+ 12	
Input frequency	Pulse/direction	**kHz**	⩽ 100	
	A/B signals	**MHz**	⩽ 1.5	
Output signals for encoder emulation				
Type			RS 422/485 link compatible output	
Number			1; 9-way male SUB-D connector (X5)	
Logic level			0 V or 5 V	
Output frequency		**MHz**	⩽ 1.5	

Connection characteristics of the control signal terminals

Servo drive terminals			+24 VDC, 0 VDC (power supply)	R1●, LI●, Enable, LO●, PWR●, AI● and Analog Out● (I/O)
Maximum wire size and tightening torque	LXM 15L●●●●●		2.5 mm² (AWG 14) - ; spring terminal	0.5 mm² (AWG 20) - ; spring terminal
	LXM 15MD●●N4		2.5 mm² (AWG 14) 0.5…0.6 Nm	0.5 mm² (AWG 20) 0.5…0.6 Nm
	LXM 15HC●●N4X		2.5 mm² (AWG 14) 0.3 Nm	0.5 mm² (AWG 20) 0.3 Nm

Operational safety characteristics

Machine protection	LXM 15L●●●●●		"Power Removal" (PWR) safety function, which forces stopping and/or prevents unintended restarting of the motor, conforming to EN 954-1 category 3
	LXM 15MD●●N4, LXM 15HC●●N4X		"Power Removal" (PWR) safety function, which forces stopping and/or prevents unintended restarting of the motor, conforming to EN 954-1 category 1

Characteristics of the communication port

CANopen protocol

Structure	Connector		9-way male SUB-D
	Network management		Slave
	Transmission speed		125 kbps to 1 Mbps
	Address (Node ID)		1 to 127, configurable via the terminal or the Unilink software
	Polarization		Impedance line terminators are integrated in the servo drive and are switchable
Services	PDO		Implicit exchange of PDO (Process Data Objects): - 3 PDO (position control and speed profile modes) - 1 configurable mapping PDO
	Emergency		Yes
	Profile		Position control and speed profile modes
	Communication monitoring		Node guarding, heartbeat
Description file			EDS files supplied on the documentation CD-ROM These files contain the description of the servo drive parameters

Lexium 15 motion control

Lexium 15 LP, 15 MP and 15 HP servo drives

105808

LXM 15LD13M3

Lexium 15 LP servo drives

Output currents *(1)*			Nominal power *(1)*	Line currents		Apparent power	Reference	Weight
Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)		at U1 *(2)*	at U2 *(2)*			
A	A	A	kW	A	A	kVA		kg
Single phase supply voltage: 200…240 V~ *(2)* 50/60 Hz, with integrated EMC filter								
3	9	13	0.9	7.7	7.6	1.1	**LXM 15LD13M3**	2.600
4	9	13	1.2	10.1	9.9	2.4	**LXM 15LD21M3**	2.600
4	9	13	1.2	10.4	10.1	4	**LXM 15LD28M3**	2.600
Three phase supply voltage: 200…240 V~ *(2)* 50/60 Hz, with integrated EMC filter								
3	9	13	1	4.7	4.6	1.1	**LXM 15LD13M3**	2.600
6	15	21	2.1	8.8	8.6	2.4	**LXM 15LD21M3**	2.600
10	20	28	3.4	14	13.7	4	**LXM 15LD28M3**	2.600
Three phase supply voltage: 208…480 V~ *(2)* 50/60 Hz, with integrated EMC filter								
1.5	4.5	6	1.1	2.8	2.5	1.2	**LXM 15LU60N4**	2.700
3	7.5	10	2.1	3.9	4.5	2.5	**LXM 15LD10N4**	2.700
6	12	17	4.3	6.9	8.2	5	**LXM 15LD17N4**	2.700

105810

LXM 15MD28N4

105812

LXM 15MD56N4

Lexium 15 MP servo drives

Output currents *(1)*			Nominal power *(1)*	Line currents		Apparent power	Reference	Weight
Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)		at U1 *(2)*	at U2 *(2)*			
A	A	A	kW	A	A	kVA		kg
Three phase supply voltage: 208…480 V~ *(2)* 50/60 Hz, with integrated EMC filter								
10	20	28	5.7	9.7	12.6	7	**LXM 15MD28N4**	4.000
14	28	40	7.9	15.4	17.7	10	**LXM 15MD40N4**	5.000
20	40	56	11.4	19.9	24.5	14	**LXM 15MD56N4**	7.500

105813

LXM 15HC20N4X

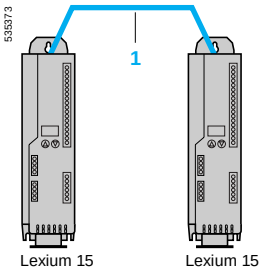
Lexium 15 HP servo drives

Output currents *(1)*			Nominal power *(1)*	Line currents *(3)*		Apparent power	Reference	Weight
Permanent (RMS)	Transient (RMS for 2 s)	Transient (peak current)		at U1 *(2)*	at U2 *(2)*			
A	A	A	kW	A	A	kVA		kg
Three phase supply voltage: 208…480 V~ *(2)* 50/60 Hz, without integrated EMC filter *(4)* *(5)*								
40	80	112	22.3	35	36.6	30	**LXM 15HC11N4X**	19.500
70	140	198	42.5	60.6	60.9	50	**LXM 15HC20N4X**	21.000

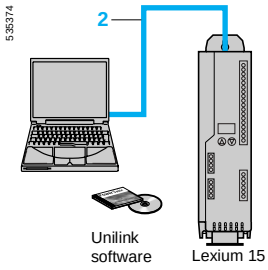
(1) These values are given for a nominal switching frequency of 8 kHz.
(2) Nominal supply voltage, min. U1, max. U2: 200 (U1)…240 V (U2) or 208 (U1)…480 V (U2).
(3) The line currents are given for a connection with line choke. For a connection without line choke, see page 46.
(4) EMC filters available as an option (see page 45).
(5) When the line supply has a TT or TN load system, a line choke MUST be used (see page 46). For an IT system, see page 61.

Lexium 15 motion control

Lexium 15 LP, 15 MP and 15 HP servo drives
Option: Accessories



Connection via extension cables



PC/Lexium 15 servo drive connection

Accessories

Designation	Use	Reference	Weight kg
Backup key One key needed per servo drive	Memory backup device Saves the servo drive working parameters Fast servo drive parameter setting without a PC	**VW3 M8 701**	–

Connection accessories

Connectors

Designation	Use	Reference	Weight kg
Sets of replacement connectors	Female screw connectors for terminals X0, X3, X4, X8 and X9 for LXM 15LD●●M3	**VW3 M4 501**	–
	Female screw connectors for terminals X0, X3, X4, X8 and X9 for LXM 15L●●●N4	**VW3 M4 502**	–
	Female screw connectors for terminals X3, X4, X7, X8, X0A and X0B for LXM 15MD●●N4	**VW3 M4 503**	–
	Female screw connectors for terminals X3, X4 and X10 for LXM 15HC●●N4X	**VW3 M4 504**	–

Cables

Designation	Use		Length	Item no.	Reference	Weight
	From	To				
			m			kg
Extension cables equipped with two 9-way female SUB-D connectors	Lexium 15	Lexium 15	0.5	1	**VW3 M8 501 R05**	–
			2	1	**VW3 M8 501 R20**	–
			6	1	**VW3 M8 501 R60**	–
Connection cable for PC serial port equipped with two 9-way female SUB-D connectors	PC serial port	Lexium 15	3	2	**VW3 M8 601 R30**	–

Documentation

Designation	Reference	Weight kg
Simplified installation manual and documentation CD-ROM supplied with the Lexium 15 servo drive	–	–

Note: *The manuals and quick reference guides for servo drives and servo motors are available on the website: www.telemecanique.com*

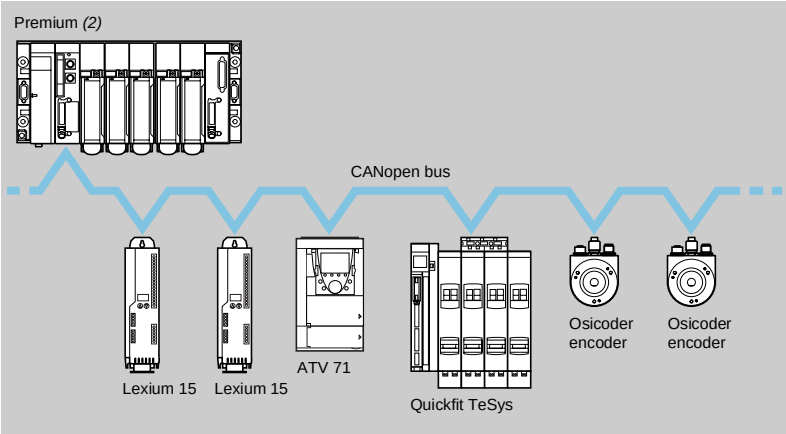
Lexium 15 motion control
Communication buses and networks

Presentation

The Lexium 15 servo drive integrates the CANopen communication protocol as standard *(1)*.
By adding one of the communication cards (available as options), the Lexium 15 servo drive can also be connected to the following communication buses and networks:

- Fipio bus
- Profibus DP fieldbus
- Modbus Plus network

CANopen machine bus



The CANopen machine bus is a fieldbus based on CAN lower layers and components. It complies with standard ISO 11898. With its standard communication profiles, the CANopen bus provides openness and interoperability with various devices (drives, motor starters, smart sensors, etc).

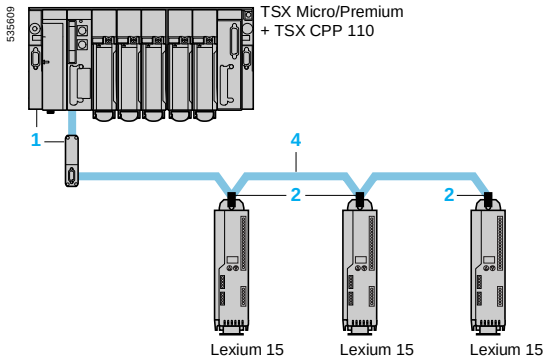
The CANopen bus is a multi-master bus, which provides secure, deterministic access to realtime automation device data. The CSMA/CA type protocol is based on broadcast exchanges, transmitted cyclically or on event, which ensure optimum use of the bandwidth. A messaging channel is also used to set the parameters of the slave devices.

The Lexium 15 servo drive is equipped with a CANopen bus compatible interface as standard.
The **AM0 2CA 001V000** adaptor provides a hardware interface which **complies strictly with the CANopen standard**. This adaptor (occupying the slot for the option card) also has a 9-way male SUB-D connector for connecting a PC terminal.

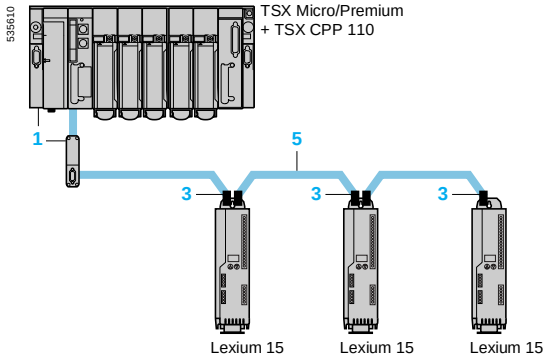
(1) See characteristics page 27.
(2) Please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue.

Characteristics:
page 27

Lexium 15 motion control
Communication buses and networks



Example of connection to CANopen bus



Example of connection to CANopen bus via adaptor AM0 2CA 001V000 3

AM0 2CA 001V000

CANopen machine bus connection components *(1)*

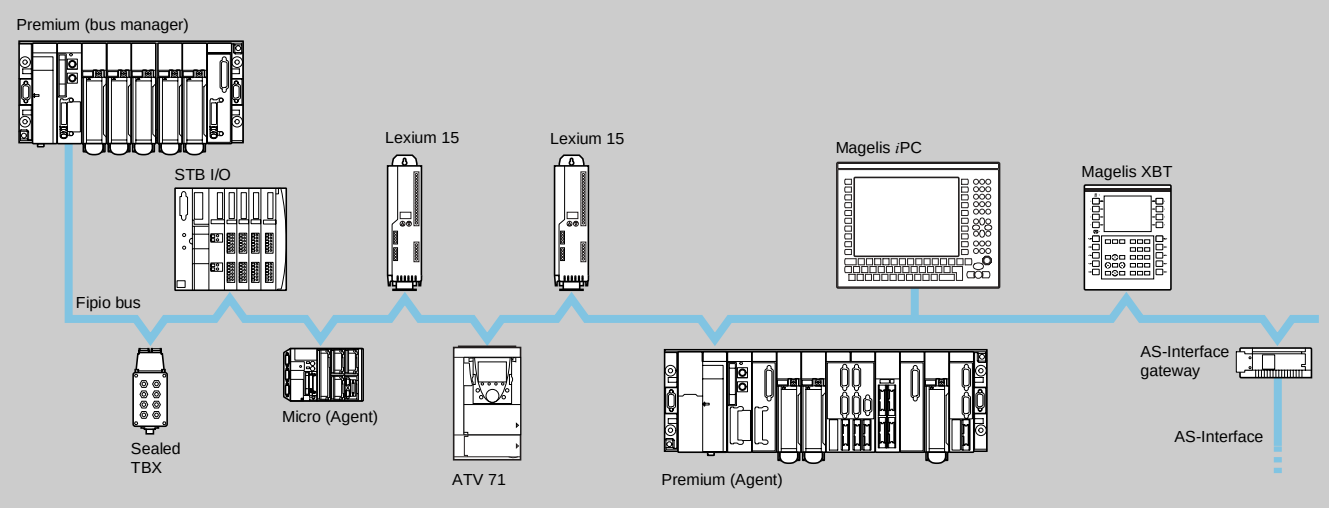
Description	Item no.	Length m	Reference	Weight kg
Connection accessories				
CANopen PCMCIA card Type III, supplied with cable and junction box with 9-way male SUB-D connector	1	0.5	**TSX CPP 110**	0.230
9-way female SUB-D connector not supplied. Provide a 120 Ω - 1/4 W line terminator	2	–	–	–
CANopen bus adaptor for Lexium 15 Hardware interface conforming to the CANopen standard + one 9-way male SUB-D connector for connecting PC Includes line terminator	3	–	**AM0 2CA 001V000**	0.110
Cables				
CANopen cables *(1)* Standard cables, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	4	50	**TSX CAN CA 50**	4.930
		100	**TSX CAN CA 100**	8.800
		300	**TSX CAN CA 300**	24.560
CANopen cables *(1)* UL certification, CE marking Flame retardant (IEC 60332-2)	4	50	**TSX CAN CB 50**	3.580
		100	**TSX CAN CB 100**	7.840
		300	**TSX CAN CB 300**	21.870
CANopen cables *(1)* Cable for harsh environments *(2)* or mobile installations, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	4	50	**TSX CAN CD 50**	3.510
		100	**TSX CAN CD 100**	7.770
		300	**TSX CAN CD 300**	21.700
CANopen cables equipped with two 9-way female SUB-D connectors Standard cable, CE marking Low smoke emission, halogen-free Flame retardant (IEC 60332-1)	5	0.3	**TSX CAN CADD 03**	0.091
		1	**TSX CAN CADD 1**	0.143
		3	**TSX CAN CADD 3**	0.295
		5	**TSX CAN CADD 5**	0.440
CANopen cables equipped with two 9-way female SUB-D connectors UL certification, CE marking Flame retardant (IEC 60332-2)	5	0.3	**TSX CAN CBDD 03**	0.086
		1	**TSX CAN CBDD 1**	0.131
		3	**TSX CAN CBDD 3**	0.268
		5	**TSX CAN CBDD 5**	0.400

(1) To order other components for connection to the CANopen bus, please consult our "Automation platform Modicon Premium and Unity - PL7 software", "Automation platform Modicon TSX Micro and PL7 software" and "Machines & installations with CANopen" specialist catalogues.
(2) Harsh environment:
- *Resistance to hydrocarbons, industrial oils, detergents, solder splashes*
- *Relative humidity up to 100%*
- *Saline atmosphere*
- *Significant temperature variations*
- *Operating temperature between - 10°C and + 70°C*

Characteristics:
page 27

Fipio bus

Presentation



The Fipio fieldbus is a standard means of communication between control system components, and conforms to the World FIP standard.
A Premium PLC (bus manager) can control 127 devices (agents) over a distance of 15 km.
The Fipio bus manager is integrated in the PLC processor.

The Lexium 15 servo drive is connected to the Fipio bus via the AM0 FIP 001V000 communication card.

Other devices can be connected to the Fipio bus such as TSX Micro *(1)* and Premium *(2)* PLCs, Magelis XBT terminals *(3)*, Magelis *i*PC industrial PCs *(3)*, Altivar variable speed drives *(4)* and partner products in the Collaborative Automation program.

Characteristics of the AM0 FIP 001V000 Fipio card

Structure	Connector	One 9-way male SUB-D connector
	Transmission speed	1 Mbps
	Address	1 to 62, configurable via the terminal or the Unilink software
Services	X-Way and Uni-Te services	Read/write access to all Lexium 15 servo drive parameters: ■ Operating mode and fault management status data ■ Operating mode data ■ “Motion Task” movement data (realtime modification of the acceleration, position and speed) ■ External position, speed and torque setpoints ■ Path status data ■ Uploading and downloading of servo drive parameters (128 bytes of data maximum)
	Setup service via Unity Pro or PL7 Junior/Pro software	□ Integrated setup screens (presymbolization of objects, handling of double length words, debugging and diagnostics screens) □ “FDR” (Faulty Device Replacement) service. Restoring the operating context if a drive is replaced.
Diagnostics	Using LEDs	2 LEDs on the card: “ERR” (fault), “COM” (data exchange)

(1) Please consult our “Automation platform Modicon TSX Micro and PL7 software” specialist catalogue.
(2) Please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(3) Please consult our “Human-Machine interfaces” specialist catalogue.
(4) Please consult our “Soft starters and variable speed drives” specialist catalogue.

***Note:** See also our “Distributed I/O Advantys STB” and “Momentum automation platform” specialist catalogues.*

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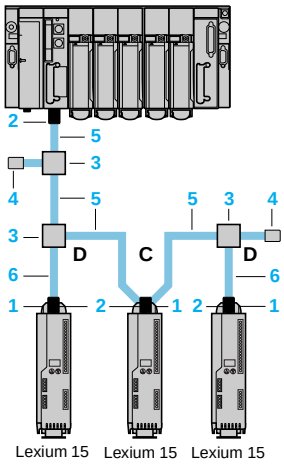


D: tap junction connection
C: daisy chain connection

Example of connection to the Fipio bus

108763

AM0 FIP 001V000

523711

TSX FP ACC3

Fipio bus connection components with Premium PLC *(1)*

Description	Use	Item no.	Reference	Weight kg
Card				
Fipio card	For Lexium 15, all ratings	1	**AM0 FIP 001V000**	0.140
Connection accessories				
9-way female SUB-D connector (zamak)	Connection by daisy chain or tap junction, for Premium PLC Connection of a number of Lexium 15 by daisy chain	2	**TSX FP ACC2**	0.080
9-way female SUB-D connector (polycarbonate, IP 20)	Connection by daisy-chain or tap junction, for Premium PLC Connection of a number of Lexium 15 by daisy chain	2	**TSX FP ACC12**	0.040
Junction box (polycarbonate, IP 20) Equipped with two 9-way female SUB-D connectors	Trunk cable tap link Also used to connect 2 devices via 9-way female SUB-D connectors	3	**TSX FP ACC3**	0.090
Junction box (zamak, IP 65) Equipped with one 9-way female SUB-D connector	Trunk cable tap link Also used to connect 1 device via a 9-way female SUB-D connector	3	**TSX FP ACC4**	0.660
Junction box (polycarbonate, IP 20)	Trunk cable tap link	3	**TSX FP ACC14**	0.120
Fipio line terminators (sold in lots of 2)	Fit at the end of each segment	4	**TSX FP ACC7**	0.020

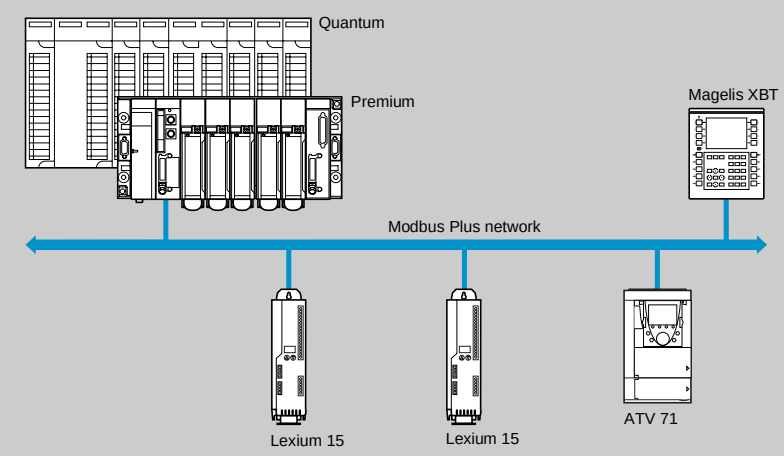
Cables

Description	Use		Item no.	Length m	Reference	Weight kg
	From	To				
Trunk cables 8 mm, 1 shielded twisted pair 150 Ω In standard environment *(2)* and indoors	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	5	100	**TSX FP CA100**	5.680
				200	**TSX FP CA200**	10.920
				500	**TSX FP CA500**	30.000
Trunk cables 9.5 mm, 1 shielded twisted pair 150 Ω In harsh environments *(3)*, outdoors, or in mobile installations *(4)*	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	Connectors TSX FP ACC2/ ACC12 Junction boxes TSX FP ACC3/ ACC4/ACC14	5	100	**TSX FP CR100**	7.680
				200	**TSX FP CR200**	14.920
				500	**TSX FP CR500**	40.000
Drop cables 8 mm, 2 shielded twisted pairs 150 Ω In standard environment *(2)* and indoors	Connectors TSX FP ACC2/ ACC12	Junction boxes TSX FP ACC3/ ACC4/ACC14	6	100	**TSX FP CC100**	5.680
				200	**TSX FP CC200**	10.920
				500	**TSX FP CC500**	30.000

(1) To order other components for connection to the Fipio bus, please consult our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon TSX Micro and PL7 software" specialist catalogues.
(2) Standard environment:
- No particular environmental restrictions
- Operating temperature between + 5°C and + 60°C
- Fixed installation
(3) Harsh environment:
- Resistance to hydrocarbons, industrial oils, detergents, solder splashes
- Relative humidity up to 100%
- Saline atmosphere
- Significant temperature variations
- Operating temperature between - 10°C and + 70°C
(4) Mobile installation: cables in accordance with VDE 472 part 603/H:
- Use on a cable-carrier mechanism (cable with minimum 75mm radius of curvature)
- Use on a gantry, provided that operating conditions such as acceleration, speed, length, etc. are adhered to: Please consult your Regional Sales Office.
- Use on robots or multi-axis applications not authorized

Modbus Plus network

Presentation



The Modbus Plus network is a high-performance industrial local area network which meets the needs of client/server type extended architectures, combining a high data rate (1 Mbps), simple, low cost transmission media and numerous messaging services.

The Lexium 15 servo drive is connected to the Modbus Plus network via the AM0 MBP 001V000 communication card.

Other devices can be connected to the Modbus Plus network such as Quantum *(1)* and Premium *(2)* PLCs, Magelis XBT terminals *(3)*, Altivar variable speed drives *(4)*, etc.

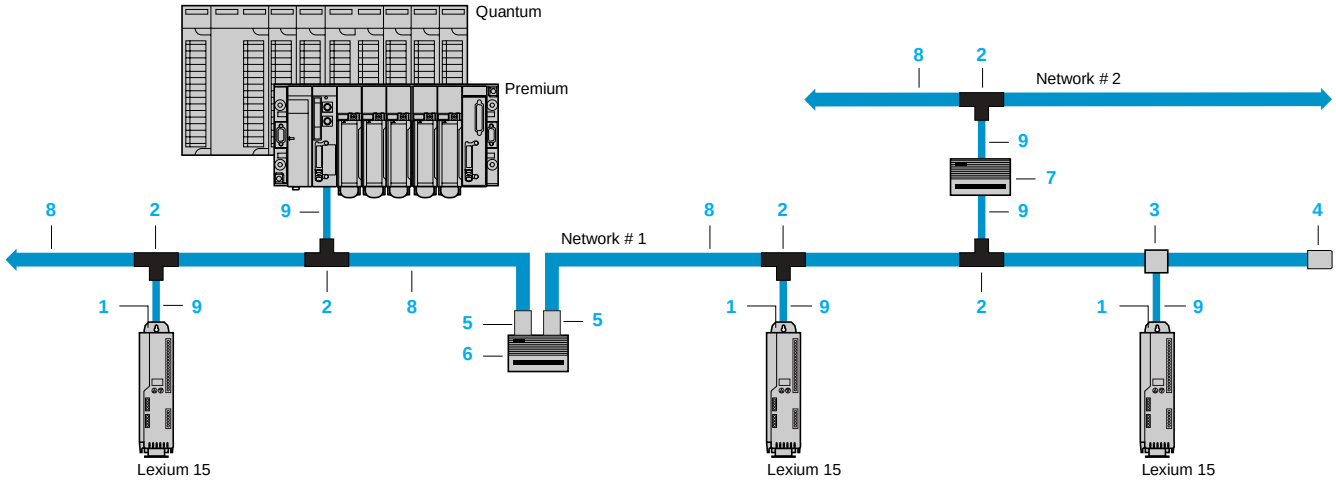
Characteristics of the AM0 MBP 001V000 Modbus Plus card

Structure	Connector	One 9-way female SUB-D connector
	Transmission speed	500…1000 kbps
	Address	1 to 63, configurable via the terminal or the Unilink software
Services	Messaging	Yes, Modbus; point-to-point requests with confirmation: 200 bytes maximum, compatible with all Modbus subscribers
	Periodic variables	“Peer Cop”: 9 registers “Global data”: 18 registers
	Communication monitoring	“Time out” adjustable from 0.01…60 s via the Unilink software
Diagnostics	Using LEDs	1 LED on the “COM” card (status)

(1) Please consult our “Automation platform Modicon Quantum and Unity” specialist catalogue.
(2) Please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(3) Please consult our “Human-Machine interfaces” specialist catalogue.
(4) Please consult our “Soft starters and variable speed drives” specialist catalogue.

Lexium 15 motion control
Communication buses and networks

Modbus Plus wiring system



Modbus Plus network connection components (1)

Description	Use	Item no.	Reference	Weight kg
Card				
Modbus Plus card	For Lexium 15, all ratings	1	**AM0 MBP 001V000**	0.140
Connection accessories				
Modbus Plus tap (IP 20)	Connection by tap junction Provides impedance matching when it is installed at the end of the line (requires wiring tool 043 509 383)	2	**990 NAD 230 00**	0.230
Modbus Plus junction box (zamak, IP 65)	Connection via tap (screw terminals) Equipped with an RJ45 connector for connecting a programming or maintenance terminal. Installed at the end of the line, it requires 990 NAD 230 11 line terminators	3	**990 NAD 230 10**	0.650
Line terminators (Sold in lots of 2)	Set of 2 line terminators for 990 NAD 230 10 junction box	4	**990 NAD 230 11**	–
Connectors with Modbus Plus terminator (sold in lots of 2)	Set of 2 connectors for bridge and repeater	5	**AS MBKT 185**	0.260
Modbus Plus electrical repeater	Extension beyond 450 m or up to 64 subscribers	6	**NW RR85 001**	2.677
Modbus Plus bridge with 4 ports	Connection of 4 networks maximum	7	**NW BP85 002**	2.813
Wiring tool	Inserting trunk and drop cables in 990 NAD 230 00 tap	–	**043 509 383**	3.000

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AM0 MBP 001V000

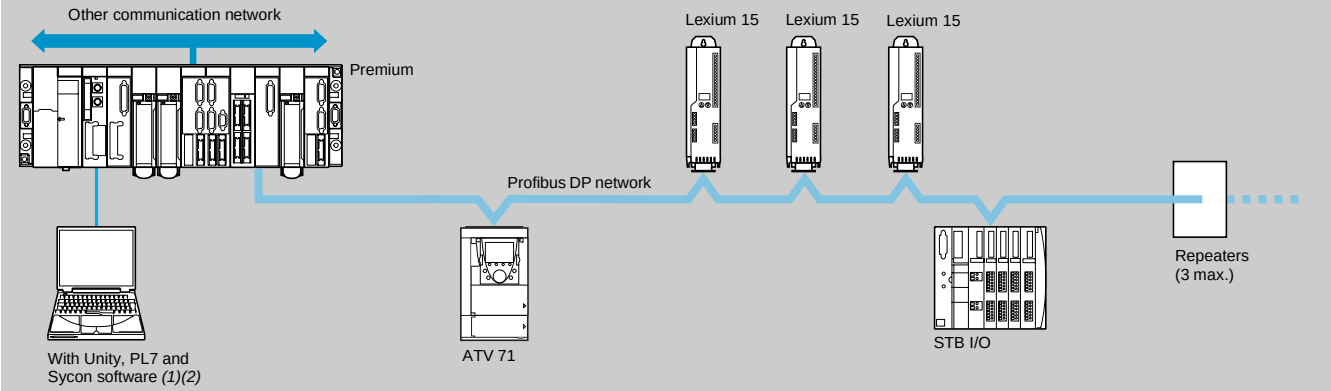
Cables

Description	Use		Item no.	Length m	Reference	Weight kg
	From	To				
Modbus Plus trunk cables Shielded twisted pair with shielding drain	Modbus Plus tap 990 NAD 230 00, Modbus Plus junction box 990 NAD 230 10	Modbus Plus 990 NAD 230 00 tap, connector with Modbus Plus terminator AS MBKT 185, Modbus Plus junction box 990 NAD 230 10	8	30.5	**490 NAA 271 01**	1.833
				152.5	**490 NAA 271 02**	10.135
				305	**490 NAA 271 03**	18.940
				457	**490 NAA 271 04**	30.000
				1525	**490 NAA 271 06**	112.950
Drop cables One 9-way male SUB-D connector and one stripped end	Premium and Quantum PLCs, Modbus Plus bridge with 4 ports NW BP85 002, Lexium 15 servo drive	Modbus Plus 990 NAD 230 00 tap	9	2.4	**990 NAD 211 10**	0.169
				6	**990 NAD 211 30**	0.459

(1) To order other components for connection to the Modbus Plus network, please consult our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon Quantum and Unity" specialist catalogues.

Profibus DP fieldbus

Presentation



Profibus DP is a fieldbus for industrial communication.
Profibus DP has a linear bus topology with a master/slave type centralized access procedure.
The physical link is a single shielded twisted pair, but optical interfaces are available for establishing star and ring tree structures.

The Lexium 15 servo drive is connected to the Profibus DP fieldbus via the VW3 M3 306 communication card.

Other devices can be connected to the Profibus DP bus such as Premium *(1)* and Quantum *(2)* PLCs, STB I/O *(3)*, Altivar variable speed drives *(4)*, etc.

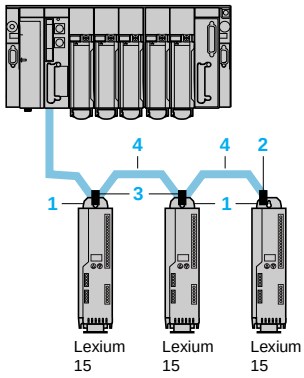
Characteristics of the VW3 M3 306 Profibus DP card

Structure	Connectors	Two 9-way female SUB-D connectors
	Transmission speed	9.6 kbps: 1200 m (4800 m with 3 repeaters) to 12 Mbps: 100 m (400 m with 3 repeaters)
	Address	1 to 62 (32 Lexium 15 servo drives max., without repeater)
Services	Periodic variables	Type 2 PPO: ■ Access to all the movement parameters and diagnostics parameters (4 PKW words) ■ Control and status words ■ Access to the various “Motion Task” control words ■ External position, speed and torque setpoints
Description file		A single gsd file for the whole range is supplied on the documentation CD-ROM or can be downloaded from the “www.telemecanique.com” website. This file does not contain descriptions of the servo drive parameters.

(1) Please consult our “Automation platform Modicon Premium and Unity - PL7 software” specialist catalogue.
(2) Please consult our “Automation platform Modicon Quantum and Unity” specialist catalogue.
(3) Please consult our “Distributed I/O Advantys STB” specialist catalogue.
(4) Please consult our “Soft starters and variable speed drives” specialist catalogue.

Premium

535572



106316

VW3 M3 306

522856

490 NAD 911 03

Profibus DP network connection components *(1)*

Description	Use	Item no.	Reference	Weight kg
Card				
Profibus DP card	For Lexium 15, all ratings	1	**VW3 M3 306**	0.140
Connection accessories				
Profibus connector One 9-way male SUB-D with line terminator output at 90°	Line terminator connection	2	**490 NAD 911 03**	–
Profibus connector One 9-way male SUB-D output at 90°	Intermediate connection	3	**490 NAD 911 04**	–
Profibus connector One 9-way male SUB-D and one 9-way female SUB-D, output at 90°	Intermediate connection with possibility of connecting a programming terminal on the 9-way female SUB-D connector	3	**490 NAD 911 05**	–

Description	Use		Item no.	Length	Reference	Weight
	From	To		m		kg
Cables						
Profibus DP trunk cables	Profibus DP connectors 490 NAD 911 04/05	Profibus DP connectors 490 NAD 911 03/04/05	4	100	**TSX PBS CA 100**	–
				400	**TSX PBS CA 400**	–

(1) To order other components for connection to the Profibus DP network, please consult our "Automation platform Modicon Premium and Unity - PL7 software" and "Automation platform Modicon Quantum and Unity" specialist catalogues.

Lexium 15 motion control
Option: SERCOS card

Presentation

108762

AM0 SER 001V000

SERCOS (SERIal COmmunication System) is a communication standard which defines both an exchange protocol between a motion control module and a number of servo drives and the connection media. This standard is defined in European standard IEC/EN 61491.

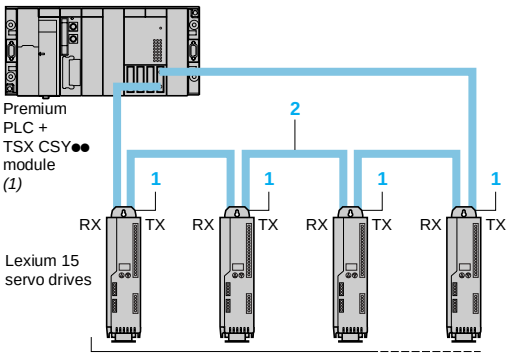
The SERCOS architecture is totally dedicated to the synchronization requirements of complex motion control applications. The ring topology of the SERCOS network is created using optical fibers that provide a very high speed (4 Mbps) and total immunity in disturbed industrial environments.

This bus also allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the servo drives, thus reducing connection costs.

Characteristics *(1)*

Topology	Industrial bus complying with standard EN 61491 Ring connection of servo drives
Rate	4 Mbps by default
Medium	Fiber optic cable
Cycle time	2…4 ms depending on the number of axes, see page 76
Maximum number of segments	9…17 depending on the motion control module used, see page 76
Segment length	38 m maximum with plastic fiber optic cable 150 m maximum with glass fiber optic cable

References



SERCOS network ring

Card

Description	Use for	Item no.	Reference	Weight kg
SERCOS card	Lexium 15, all ratings	1	**AM0 SER 001V000**	0.150

Cables

Description	Use	Item no.	Length m	Reference	Weight kg
Plastic fiber optic cables fitted with SMA connectors (radius of curvature: 25 mm min.)	Connecting Lexium 15 servo drives equipped with card AM0 SER 001V000	2	0.3	**990 MCO 000 01**	0.150
			0.9	**990 MCO 000 03**	0.180
			1.5	**990 MCO 000 05**	0.260
			4.5	**990 MCO 000 15**	0.770
			16.5	**990 MCO 000 55**	2.830
			22.5	**990 MCO 000 75**	4.070
			37.5	**990 MCO 001 25**	5.940

(1) Motion control module, see page 81.

Lexium 15 motion control
Option: I/O extension card

Presentation

105814

AM0 INE 001V000

Lexium 15 servo drives can be adapted for applications that require the possibility of control via extended logic I/O by installing an I/O extension card.

This card has 14 logic inputs that can be used for:
- Activating a motion task. The number of this task is coded on 8 bits (X11A-1…X11A-8). Each input represents one bit.
- Connecting a home position referencing sensor (X11A-9)
- Resetting errors to zero (X11A-10)
- Sequencing the next motion task (X11A-11)
- Activation of manual mode (X11A-12)
- Resumption of a previously interrupted motion task (X11B-1)
- Launching the motion task coded on the first 8 inputs (X11B-2).

It also has 8 logic outputs that can be used for:
- Sending the “In position” signal (X11B-3)
- Capturing 6 position registers (X11B-4, X11B-6…X11B10)
- Monitoring the following error (X11B-5)

Electrical characteristics

24 V ⎓ external power supply *(1)*	Voltage	**V**	18…36
	Current	**A**	4
Logic inputs			
Type			Logic inputs conforming to standard IEC 61131-2 type 1
Number			14 (X11A-1…X11A-12, X11B-1, X11B-2)
Power supply			24 V ⎓, 7 mA
Sampling period		**ms**	4
Response time		**ms**	2
Logic state		**A**	State 0 if < 7 V or input not wired State 1 if > 12 V
Logic outputs			
Type			24 V ⎓ logic outputs conforming to standard IEC 61131-2 type 1
Number			8 (X11B-3…X11B-10)
Output voltage		**V**	24
Response time		**ms**	10
Max. breaking current		**mA**	500

Connection characteristics

Type of terminal	**Power supply**	**Logic I/O**
Maximum wire size	1 mm² (AWG 17)	0.5 mm² (AWG 20)

References

Description	**Reference**	**Weight kg**
I/O extension card	**AM0 INE 001V000**	0.180

(1) Please consult our “Interfaces, I/O splitter boxes and power supplies” specialist catalogue.

Lexium 15 motion control
Lexium 15 servo drives
Option: Braking resistors

Presentation

Internal braking resistor

A braking resistor is integrated in Lexium 15 servo drives, except LXM 15HC●●N4X servo drives, to absorb the braking energy. If the DC bus voltage in the servo drive exceeds a specified value, this braking resistor is activated. The restored energy is converted into heat by the braking resistor.

External braking resistor

For LXM 15HC●●N4X servo drives or for applications requiring the servo motor to perform frequent braking operations, it may be necessary to add an external braking resistor.

If an external braking resistor is used, the internal braking resistor must be deactivated. To do this, the shunt between terminals PBe and PBi must be removed and the external braking resistor connected between terminals PA/+ and PBe.

Two or more external braking resistors can be connected in parallel. The servo drive monitors the power dissipated in the braking resistor.

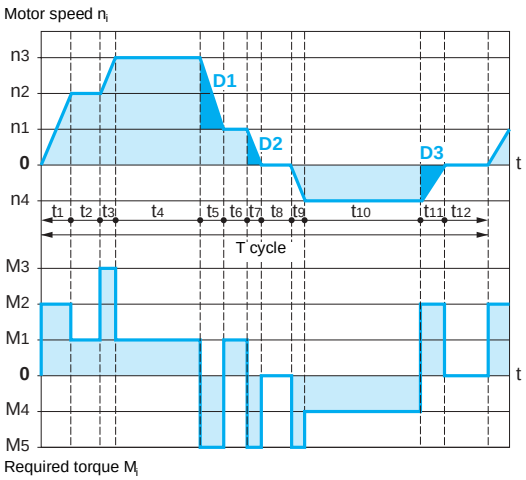
Sizing the braking resistor

During braking or deceleration requested by the servo drive, the kinetic energy of the moving load must be absorbed by the servo drive. The energy generated by deceleration charges the capacitors integrated in the servo drive.

When the voltage at the capacitor terminals exceeds the permitted threshold, the braking resistor (internal or external) will be activated automatically in order to dissipate this energy. In order to calculate the power to be dissipated by the braking resistor, the user needs a knowledge of the timing diagram giving the motor torques and speeds according to the time in order to identify the curve segments in which the servo drive decelerates the load.

Motor cycle timing diagram

These curves are those used in pages 146 and 192 for selecting the size of the servo motor. The curve segments to be taken into account, when the servo drive is decelerating, are marked in blue by D_i.



Sizing the braking resistor (continued)

Calculation of the constant deceleration energy

To do this, the user must know the total inertia, defined as follows:
J_t: total inertia
where:
J_t = Jm (motor inertia) + Jc (load inertia). For Jm, see pages 84 to 127 and 150 to 175.
The energy E_i of each segment is defined as follows:

$$E_i = \frac{1}{2} J_t \cdot \omega_i^2 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_i}{60}\right)^2$$

Which gives the following for the various segments:

$$E_1 = \frac{1}{2} J_t \cdot \left(\frac{2\pi [n_3 - n_1]}{60}\right)^2$$

$$E_2 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_1}{60}\right)^2$$

$$E_3 = \frac{1}{2} J_t \cdot \left(\frac{2\pi n_4}{60}\right)^2$$

where E_i is in joules, J_t in kgm^2, ω in radians and n_i in rpm.

Energy absorbed by the internal capacitor

The energy absorption capacity Edrive (without using an internal or external braking resistor) is given for each servo drive on page 42.
In the calculation, only take account of segments D_i for which the energy E_i is greater than the absorption capacities given in the table opposite.
This additional energy E_{Di} must be dissipated in the resistor (internal or external):
$E_{Di} = E_i$ - Edrive (in joules).

Calculation of the continuous power

The continuous power Pc is calculated for each machine cycle:

$$Pc = \frac{\Sigma E_{Di}}{T\ cycle}$$

where Pc is in W, E_{Di} in joules and **T cycle** in s.

Selecting the braking resistor (internal or external)

Note: *This is a simplified selection method. In extreme applications, for example with vertical axes, this method is inadequate. In this case, please consult your Regional Sales Office.*

The selection is carried out in two steps:

1. The maximum energy during a braking procedure must be less than the peak energy that can be absorbed by the internal braking resistor: E_{Di} < EPk and the internal braking resistor's continuous power must in turn not exceed: Pc < PPr. If these conditions are met, the internal braking resistor is adequate.
2. If one of the above conditions is not met, an external braking resistor must be used to satisfy these conditions.
   The value of the external braking resistor must be between the minimum and maximum values given in the table. Otherwise the servo drive may be subject to disturbance and the load can no longer be braked safely.

Lexium 15 motion control

Lexium 15 servo drives

Option: Braking resistors

Characteristics

Braking resistors used with Lexium 15 LP servo drives

Type of servo drive		LXM 15		LD13M3	LD21M3	LD28M3	LD13M3	LD21M3	LD28M3
Supply voltage			**V**	230					
Number of phases				Single phase			Three phase		
Load threshold			**V ⎓**	400					
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	6.2					
Internal resistor	Resistance		Ω	66					
	Continuous power	PPr	**W**	20	50		20	50	
	Peak energy	EPk	**Joule (Ws)**	3000					
External resistor	Minimum resistance		Ω	47	31	19	47	31	19
	Maximum resistance *(1)*		Ω	190	95	57	190	95	57
	Degree of protection			IP 65					

Type of servo drive		LXM 15		LU60N4			LD10N4			LD17N4		
Supply voltage			**V**	230	400	480	230	400	480	230	400	480
Number of phases				Three phase								
Load threshold			**V ⎓**	400	720	840	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	24.8	88.1	127.3	24.8	88.1	127.3	24.8	88.1	127.3
Internal resistor	Resistance		Ω	91								
	Continuous power	PPr	**W**	20			50					
	Peak energy	EPk	**Joule (Ws)**	2100	7000	9000	2100	7000	9000	2100	7000	9000
External resistor	Minimum resistance		Ω	47	85	99	38	68	79	31	56	66
	Maximum resistance *(1)*		Ω	285	768	803	114	265	401	95	177	201
	Degree of protection			IP 65								

Braking resistors used with Lexium 15 MP servo drives

Type of servo drive		LXM 15		MD28N4			MD40N4			MD56N4		
Supply voltage			**V**	230	400	480	230	400	480	230	400	480
Number of phases				Three phase								
Load threshold			**V ⎓**	400	720	840	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	6	23	28	12	46	57	12	46	57
Internal resistor	Resistance		Ω	33								
	Continuous power	PPr	**W**	200								
	Peak energy	EPk	**Joule (Ws)**	5000	16,000	21,000	5000	16,000	21,000	5000	16,000	21,000
External resistor	Minimum resistance		Ω	16	28	33	12	21	25	8	14	16
	Maximum resistance *(1)*		Ω	57	106	120	41	76	86	28	53	60
	Degree of protection			IP 65								

Braking resistors used with Lexium 15 HP servo drives

Type of servo drive		LXM 15		HC11N4X			HC20N4X		
Supply voltage			**V**	230	400	480	230	400	480
Number of phases				Three phase					
Load threshold			**V ⎓**	400	720	840	400	720	840
Energy absorption of the internal capacitors		Edrive	**Joule (Ws)**	60	150	180	120	300	360
External resistor	Minimum resistance		Ω	3	6	7	2	3	4
	Maximum resistance *(1)*		Ω	14	27	30	7	13	17
	Degree of protection			IP 20					

(1) Values given for braking at nominal motor torque (M_0)

Presentation: page 40 References: page 43 Dimensions: page 49

Lexium 15 motion control

Lexium 15 servo drives

Option: Braking resistors

General characteristics

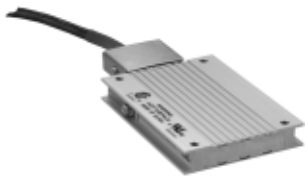
Type of braking resistor			VW3 A7 601 R●●...608 R●●	VW3 A7 705, 707
Ambient air temperature around the device	Operation	°C	0...+ 50	
	Storage	°C	- 25...+ 85	- 25...+ 70
Degree of protection of the casing			IP 65	IP 20
Thermal protection			Via the servo drive *(1)*	Via temperature-controlled switch *(2)* or via the servo drive *(1)*
Temperature-controlled switch	Activation temperature	°C	–	120
	Max. voltage - max. current		–	250 V ∿ - 1 A
	Min. voltage - min. current		–	24 V ⎓ - 0.1 A
	Maximum switch resistance	mΩ	–	60

Connection characteristics

Type of terminal		For servo drive	For temperature-controlled switch
Maximum wire size	VW3 A7 601 R●●...608 R●●	Supplied with connection cable	–
	VW3 A7 705, 707	Connected on a bar, M6	2.5 mm² (AWG 14)

External braking resistors

106005



VW3 A7 602 R●●

Value	Continuous power PPr	Peak energy EPk			Length of connection cable	Reference	Weight
		230 V	400 V	480 V			
Ω	W	Ws	Ws	Ws	m		kg
5	1000	45,000	45,000	45,000	–	**VW3 A7 707**	11.000
10	400	13,000	8600	7700	0.75	**VW3 A7 601 R07**	1.420
					2	**VW3 A7 601 R20**	1.470
					3	**VW3 A7 601 R30**	1.620
	1000	45,000	45,000	45,000	–	**VW3 A7 705**	11.000
27	100	3000	1900	1700	0.75	**VW3 A7 602 R07**	0.630
					2	**VW3 A7 602 R20**	0.780
					3	**VW3 A7 602 R30**	0.900
	200	7500	4800	4300	0.75	**VW3 A7 603 R07**	0.930
					2	**VW3 A7 603 R20**	1.080
					3	**VW3 A7 603 R30**	1.200
	400	26,000	17,500	15,500	0.75	**VW3 A7 604 R07**	1.420
					2	**VW3 A7 604 R20**	1.470
					3	**VW3 A7 604 R30**	1.620
72	100	4500	3000	2700	0.75	**VW3 A7 605 R07**	0.620
					2	**VW3 A7 605 R20**	0.750
					3	**VW3 A7 605 R30**	0.850
	200	10,300	6800	6000	0.75	**VW3 A7 606 R07**	0.930
					2	**VW3 A7 606 R20**	1.080
					3	**VW3 A7 606 R30**	1.200
	400	26,500	17,500	15,500	0.75	**VW3 A7 607 R07**	1.420
					2	**VW3 A7 607 R20**	1.470
					3	**VW3 A7 607 R30**	1.620
100	100	4500	3000	2700	0.75	**VW3 A7 608 R07**	0.410
					2	**VW3 A7 608 R20**	0.560
					3	**VW3 A7 608 R30**	0.760

(1) Thermal protection is provided by internal limitation of the servo drive braking power.
(2) The switch should be connected in sequence (used for signalling or controlling the line contactor).

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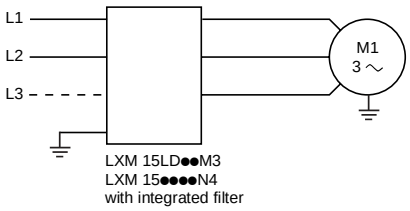
Lexium 15 motion control

Lexium 15 servo drives

Option: Additional EMC input filters

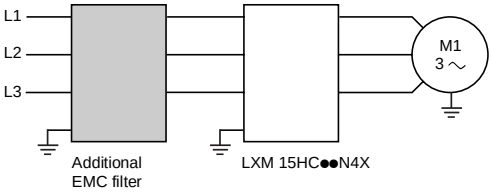


Integrated EMC filter

Function

LXM 15L●●●M3 and LXM 15●●●●N4 servo drives have built-in radio interference input filters to meet the EMC standard for variable speed electrical power drive “products” IEC/EN 61800-3, edition 2, category C2 or C3 in environment 1 or 2 and to comply with the European directive on EMC (electromagnetic compatibility).

For servo drive	Maximum motor cable length conforming to	
	EN 55011, class A, Gr1 IEC/EN 61800-3 category C2	EN 55011, class A, Gr2 IEC/EN 61800-3 category C3
	m	m
Single phase supply voltage: 200…240 V ~ 50/60 Hz		
LXM 15LD●●M3	10	25, 50 with motor choke
Three phase supply voltage: 200…240 V ~ 50/60 Hz		
LXM 15LD●●M3	10	25, 50 with motor choke
Three phase supply voltage: 208…480 V ~ 50/60 Hz		
LXM 15L●●●N4	10	25, 50 with motor choke
LXM 15MD●●N4	10	25, 100 with motor choke



Additional EMC input filters

Applications

An additional EMC filter must be provided for LXM 15HC●●N4X servo drives.

This additional input filter is used to meet the requirements of standard IEC 61800-3, edition 2, category C3 in environment 2.

Use according to the type of line supply

Use of these built-in or additional filters is only possible on TN (neutral connection) and TT (neutral to earth) type networks.

The filters must not be used on IT (impedance or isolated neutral) type networks. For a servo drive with integrated filter (LXM 15LD●●M3, LXM 15●●●●N4), the filter must be connected to an LV/LV transformer in order to recreate, on the secondary side, a TT system (see page 61).

Standard IEC 61800-3, appendix D2.1, states that on IT (isolated or impedance earthed neutral) type networks, filters can adversely affect the operation of the insulation monitors. In addition, the effectiveness of additional filters on this type of line supply depends on the type of impedance between neutral and earth, and therefore cannot be predicted.

Dimensions:
page 49

Lexium 15 motion control

Lexium 15 servo drives

Option: Additional EMC input filters

Characteristics of drive/additional EMC input filter mounting

Filter type			VW3 M4 101	VW3 M4 102
Conformity to standards			UL 1283	
Degree of protection			IP 20	
Losses		**W**	30	50
Maximum nominal voltage	3-phase 50/60 Hz	**V**	480 + 10%	
Max. nominal current		**A**	42	75
Application, category: EN 61800-3: 2001-02; IEC 61800-3, Ed. 2			**Description**	
Category C3 in environment 2			Use in industrial premises	

Connection characteristics

Maximum wire size		25 mm^2 (AWG 2)	

References

1058.16

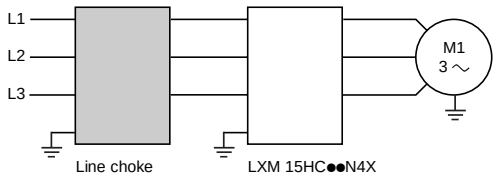
VW3 M4 101

For servo drive	Maximum motor cable length conforming to IEC/EN 61800-3, category C3	Reference	Weight
	m		**kg**
Three phase supply voltage: 208…480 V ∼ 50/60 Hz			
LXM 15HC11N4X	100	**VW3 M4 101**	0.600
LXM 15HC20N4X	100	**VW3 M4 102**	0.550

Dimensions:
page 49

Lexium 15 motion control
Lexium 15 servo drives
Option: Line chokes

Line chokes



A line choke can be used to provide improved protection against overvoltages on the line supply and to reduce harmonic distortion of the current produced by the servo drive.

The recommended chokes limit the line current. They have been developed in accordance with standards UL 506 and EN 61558-2-20 (VDE 0570).

The inductance values are defined for a voltage drop between 3% and 5% of the nominal line voltage. Values higher than this will cause loss of torque.

These chokes should be installed upstream of the servo drive.

Applications

In the context of a TT or TN supply system, it is compulsory to use a line choke with LXM 15HC●●N4X servo drives.

Nota : *Do not order if an isolation transformer is used with an IT system.*

General characteristics

Type of line choke			VW3 M4 301	VW3 M4 302
Conformity to standards			UL 506, EN 61558-2-20 (VDE 0570)	
Voltage drop			Between 3% and 5% of the nominal supply voltage. Values higher than this will cause loss of torque.	
Degree of protection	Choke		IP 00	
	Terminals		IP 20	
Inductance value		**mH**	0.5	0.4
Nominal current		**A**	60	75
Losses		**W**	145	150

Connection characteristics

Maximum wire size	VW3 M4 301, 302		25 mm^2 (AWG 2)

References

VW3 M4 301

For servo drives	Line current without choke		Line current with choke		Reference	Weight
	208 V	480 V	208 V	480 V		
	A	A	A	A		kg
Three phase supply voltage: 208...480 V ~ 50/60 Hz						
LXM 15HC11N4X	44	52	35	36.6	**VW3 M4 301**	9.000
LXM 15HC20N4X	84.4	83.5	60.6	60.9	**VW3 M4 302**	10.000

Dimensions:
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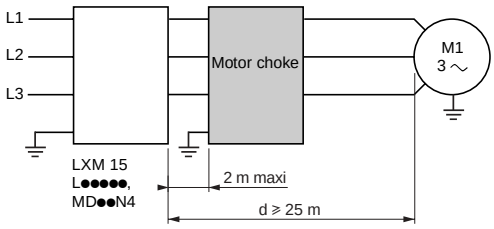
Lexium 15 motion control
Lexium 15 servo drives
Option: Motor chokes

Motor chokes



The motor choke is used to reduce current ripple generated along the power cable. It enables the servo motor to be operated for motor cable lengths greater than 25 m (limited to 50 or 100 m depending on the rating).
LXM 15HC●●N4X servo drives are designed to allow the use of motor cables up to 100 metres long without the addition of a motor choke.

The motor choke is also used to:
- Protect the servo drive power stage against overvoltages
- Limit ripple to 5% of the nominal current

Nota : *The servo drive/motor choke connection cable MUST be less than 2 metres long. Increasing the current absorption of the motor power circuit reduces the maximum rotation frequency, thus limiting the maximum rotation speed of the servo motor:*
- *For a 6-pole servo motor, it is limited to 3000 rpm*
- *For an 8-pole servo motor, it is limited to 2250 rpm*
- *For a 10-pole servo motor, it is limited to 1800 rpm*

In addition, the increase in the leakage current caused by the increase in the length of the cables makes it necessary to limit the output current to 1 A. It is advisable to use servo motors with a nominal current greater than 2 A.

General characteristics

Type of motor choke			VW3 M5 301	VW3 M5 302	VW3 M5 303	VW3 M5 304
Degree of protection	Choke		IP 00			
	Terminals		IP 20			
Inductance value		**mH**	0.9			0.45
Maximum current		**A**	1.5 x nominal current for 60 s			
Dielectric strength		**V**	Between earth and power terminals: 2700 V ⎓			
Losses		**W**	40			

Connection characteristics

Maximum wire size	VW3 M5 301…303		4 mm^2 (AWG 10)
	VW3 M5 304		6 mm^2 (AWG 8)

References

535556

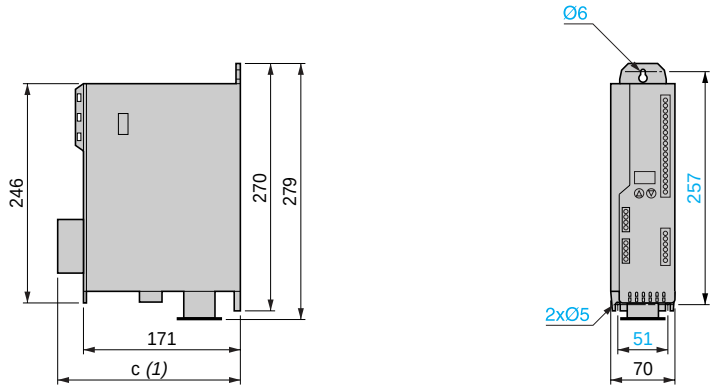
VW3 M5 304

For servo drive	Length of motor cable	Nominal current	Reference	Weight
	m	A		kg
LXM 15LD13M3, LD21M3 LXM 15L●●●N4	25…50	6	**VW3 M5 301**	4.500
LXM 15LD28M3	25…50	10	**VW3 M5 302**	5.500
LXM 15MD28N4	25…100	10	**VW3 M5 302**	5.500
LXM 15MD40N4	25…100	14	**VW3 M5 303**	10.000
LXM 15MD56N4	25…100	20	**VW3 M5 304**	10.000

Dimensions:
page 49

Lexium 15 motion control
Lexium 15 LP, 15 MP and 15 HP servo drives

LXM 15LD13M3…LD28M3, LU60N4…LD17N4 servo drives

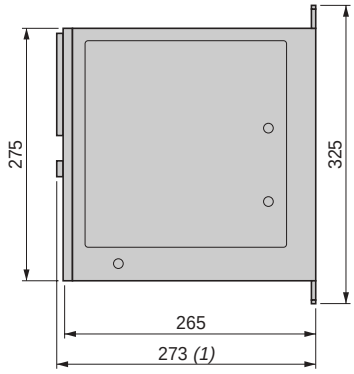


LXM 15	c
LD13M3…LD28M3	200
LU60N4…LD17N4	230

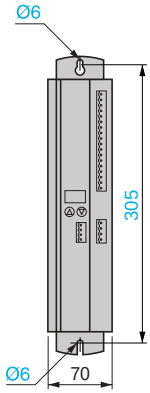
(1) With connectors

LXM 15MD28N4…MD56N4 servo drives

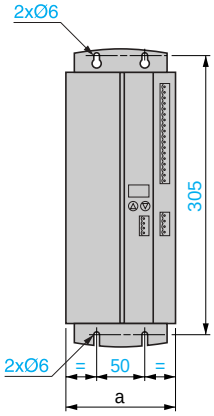
Common side view



LXM 15MD28N4



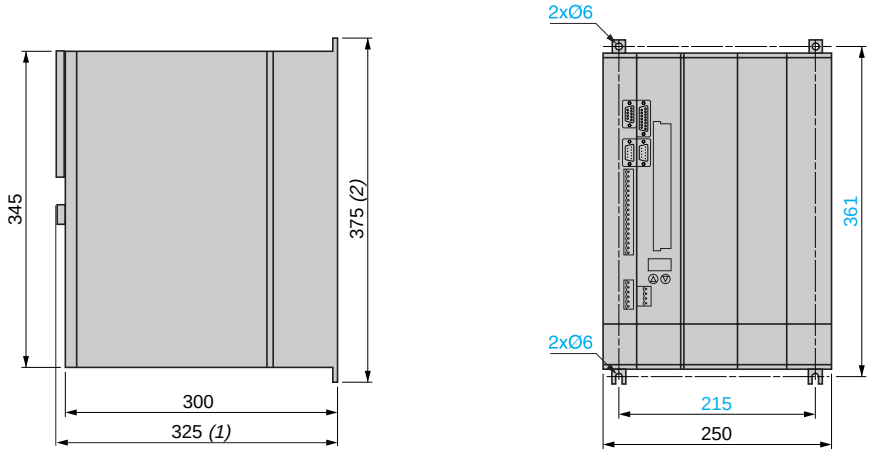
LXM 15MD40N4, MD56N4



LXM 15	a
MD40N4	100
MD56N4	120

(1) With connectors

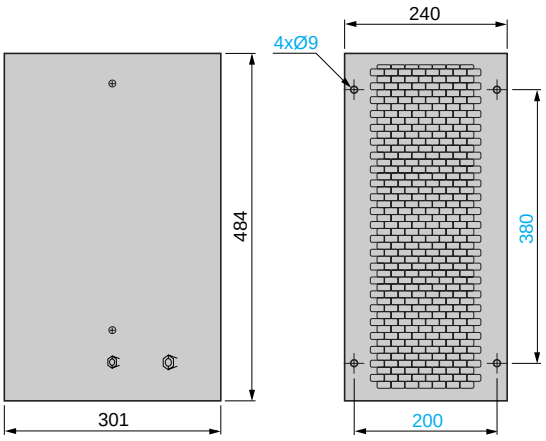
LXM 15HC11N4X, HC20N4X servo drives



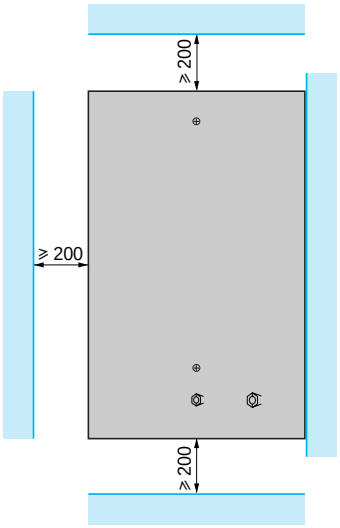
(1) With connectors
(2) 495, with earthing part

Options

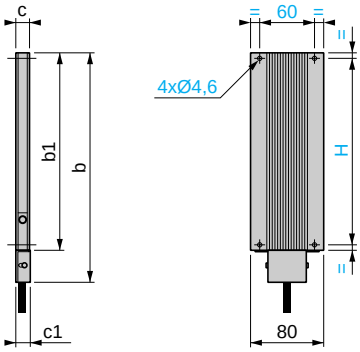
Braking resistors VW3 A7 705, 707



Mounting recommendations

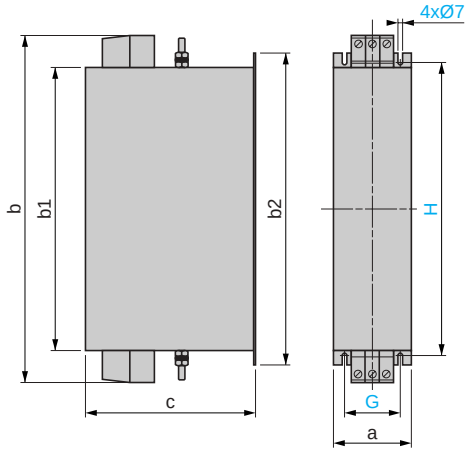


Braking resistors VW3 A7 601R●●...608R●●



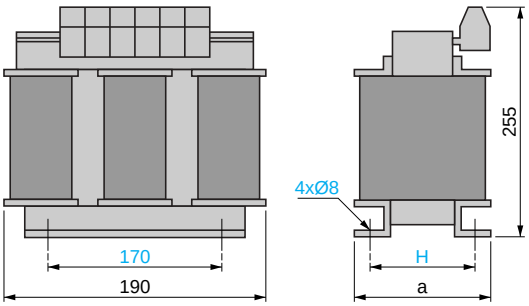
VW3	b	b1	c	c1	H
A7 602, 605, 608	145	110	15	15.5	98
A7 603, 606	251	216	15	15.5	204
A7 601, 604, 607	257	216	30	–	204

Additional EMC input filters VW3 M4 101, 102



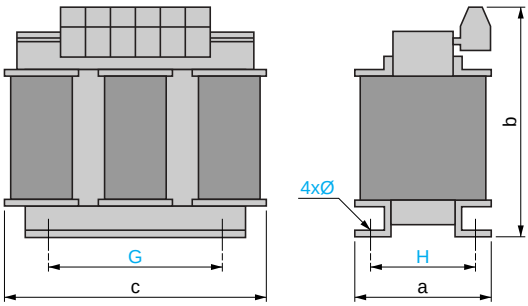
VW3	a	b	b1	b2	c	G	H
M4 101	60	355	305	335	150	35	320
M4 102	80	380	300	330	185	55	314

Line chokes VW3 M4 301, 302



VW3	a	H
M4 301	110	58
M4 302	120	68

Motor chokes VW3 M5 301...304



VW3	a	b	c	G	H	Ø
M5 301	70	190	155	130	55	5.5x8
M5 302	85	190	155	130	70	5.5x8
M5 303	115	220	190	170	75	6.5x10
M5 304	115	230	190	170	75	6.5x10

Presentation:
pages 40, 44, 46 and 47

Characteristics:
pages 42, 45, 46 and 47

References:
pages 43, 45, 46 and 47

Schemes:
pages 50 to 61

Lexium 15 motion control

Lexium 15 servo drives

Advice on use in accordance with the machinery safety directive

Categories relating to safety according to EN 954-1

The 5 categories of standard EN 954-1 are used to define the necessary system performance to meet safety requirements.

Categories	Basic safety principle	Control system requirements	Behaviour in the event of a fault
B	Selection of components that comply with the relevant standards	Control according to good engineering practice	Possible loss of the safety function
1	Selection of components and safety principles	Use of tried and tested components and proven safety principles	Possible loss of the safety function with a lower probability than in **B**
2	Selection of components and safety principles	Test per cycle. The intervals between tests must be appropriate to both the machine and its application	Fault detected on each test
3	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected if this is reasonably possible	Safety function ensured, except in the event of an accumulation of faults
4	Structure of the safety circuits	A single fault must not result in loss of the safety function. The fault must be detected when or before the safety function is next invoked. An accumulation of faults must not result in loss of the safety function.	Safety function always assured

⚠ **The machine manufacturer is responsible for selecting the safety category. The category depends on the level of risk factors given in standard EN 954-1.**

Lexium 15 servo drives and standard EN 954-1

The table below shows the safety level obtained according to the type of servo drive, with the integrated “Power Removal” safety function and associated equipment (Preventa monitoring module, contactor, etc)

Safety level	Devices required	For Lexium 15 servo drives	Equipment to be added	Recommended wiring diagram, see page
Category B	–	All ratings	–	–
Category 1	1 breaking	All ratings	–	52 and 56
Category 2	1 breaking and 1 monitoring	All ratings	1 breaking device per PWR function with 1 Preventa monitoring module *(1)*	53 and 57
Category 3	2 breaking *(2)*	All ratings	1 breaking device per PWR function, 1 breaking device per contactor and 1 Preventa monitoring module *(1)*	54 and 58
Category 4	2 breaking and 1 monitoring *(2)*	All ratings	1 breaking device per PWR function, 1 breaking device per contactor and 1 Preventa monitoring module *(1)*	55 and 59

“Power Removal” safety function

The “Power Removal” (PWR) safety function makes it easier to achieve the safety levels defined above.

The “Power Removal” safety function integrated in Lexium 15 LP servo drives consists of a PWR logic input, accessed on the X4 connector. Deactivation of this input in particular initiates locking of the power stage of the servo drive supplying the servo motor, thus depriving the servo motor of energy *(3)*.

The “Power Removal” safety function integrated in Lexium 15 MP and Lexium 15 HP servo drives consists principally of an auxiliary relay that is accessed on the PWRI+ and PWRI- terminals of the X10 connector. When the relay coil is activated by the control system, this locks the servo drive power stage that supplies power to the servo motor, thus depriving the servo motor of energy *(3)*.
The anti-start relay contact, accessed on the PWRO1 and PWRO2 terminals on the X10 connector, enables the application to check the locking command. The state of the relay contact is monitored constantly by the control system, to check that the system is working correctly and ensure strict compliance with the machine stop and locking procedures.

This function is used primarily when the servo motor has to be kept stationary, for example when personnel need to have frequent access to protected areas in which machinery is running, for brief periods of time.

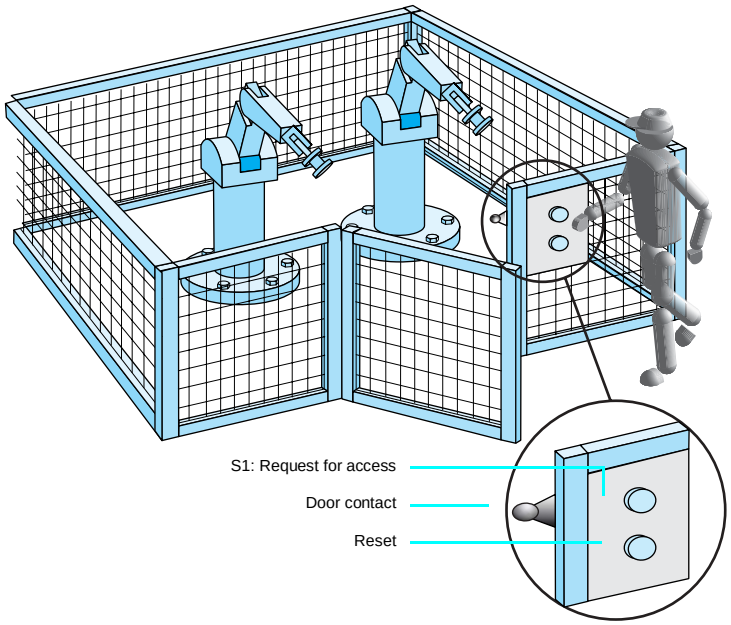
Note: *The use of Lexium 15 servo drives with the integral “Power Removal” safety function simplifies the connection diagrams required to comply with standard EN 954-1.*

(1) The category of the Preventa safety module must be ⩾ the required safety category.
(2) Where there are 2 breaking devices, see also the sections relating to Categories 3 and 4 on pages 54, 55, 58 and 59.
(3) Vertical axis immobilization can only be obtained by installing a mechanical locking system (holding brake) on the axes.

Lexium 15 motion control

Lexium 15 servo drives
Recommended wiring diagrams complying with standard EN 954-1

Application with requirement for access to a hazardous area



Presentation

The recommended wiring diagrams on pages 52 to 59 give an example of an application where access to a hazardous area needs to be protected (space inside and/or around a machine in which an operator is exposed to a hazard).
These diagrams apply to Lexium 15 LP, 15 MP and 15 HP servo drives with integrated “Power Removal” safety function.

Description of the application

Pressing the "Request for access to protected area" spring return pushbutton **S1** causes the axes to slow down and stop, and also opens the access door to the protected area (activation of the latch electromagnet).
Depending on the safety level, if all the safety conditions are not met:

- Either the line contactor drops out
- Or the access door to the area remains locked

After operator intervention, the door closes and pressing the “Reset” spring return pushbutton enables the axes to operate again.

Selection criteria for the positions of the breaking contactors

Note: *A contactor can be used to break the power either upstream or downstream of the Lexium 15 servo drive, without compromising safety. Mixed breaking, upstream and downstream, is also possible.*

The positions of the contactors should be selected according to how often access to the hazardous area is required.

Occasional access requests
Breaking via a contactor upstream of the servo drive is recommended.
This type of breaking eliminates any risk of disconnection of the servo drive/servo motor assembly, which can cause overvoltages (only in the event of malfunction of the “Enable control system” input).

Frequent access requests
Breaking via a contactor downstream of the servo drive is preferable.
This type of breaking allows the servo drive input power bridge to remain energized, which enhances the longevity of the servo drive rectifier-filtering stage.

The recommended wiring diagrams on the following pages illustrate the most severe case corresponding to **frequent access requests**.

Note: *As a general rule, the breaking command for upstream KM contactors is instantaneous. The command for downstream KM contactors is delayed to allow the axis to come to a controlled stop (in accordance with parameter “StopMode = 1”).*

Categories 3 and 4

The diagrams for categories 3 and 4 on pages 54, 55, 58 and 59 take account of the widest requirements and thus incorporate **double breaking** of the control circuit **and the power circuit**.

Note: *Following specific analysis of machine risks, this redundancy can be limited to the control circuit alone, and thus can be restricted to simply breaking the power circuit.*

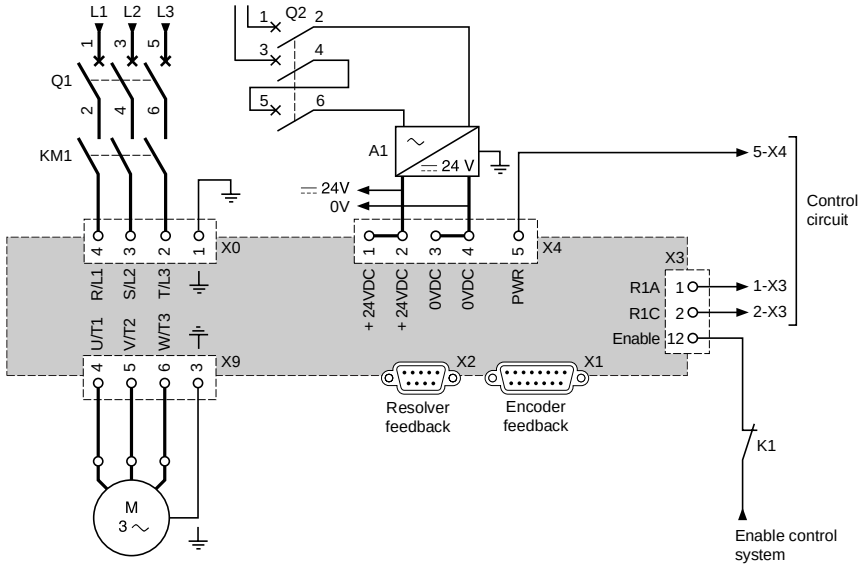
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

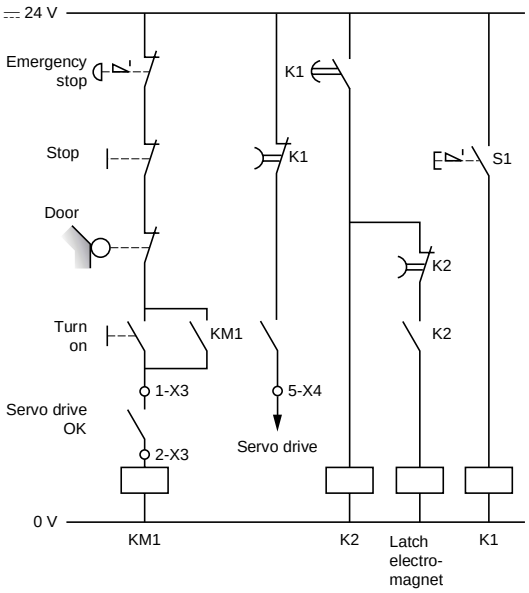
Category 1 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives

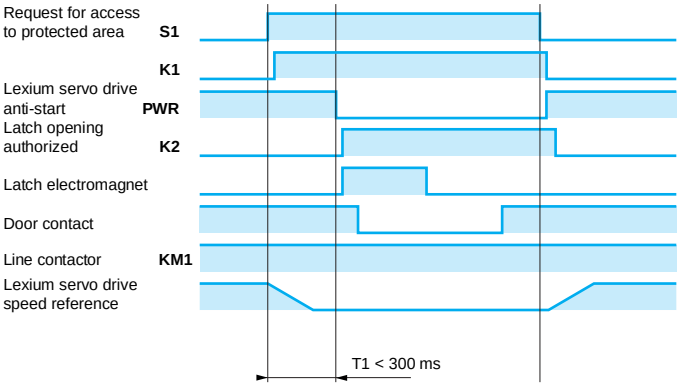


Q1: magnetic circuit breaker, see page 62
KM1: contactor, see page 62

Control circuit of LXM 15L●●●●● servo drives



Timing diagram



Comments

- Time delay T1 on the K1 relay must be long enough for the axis to come to a controlled stop.
- Lexium 15 LP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

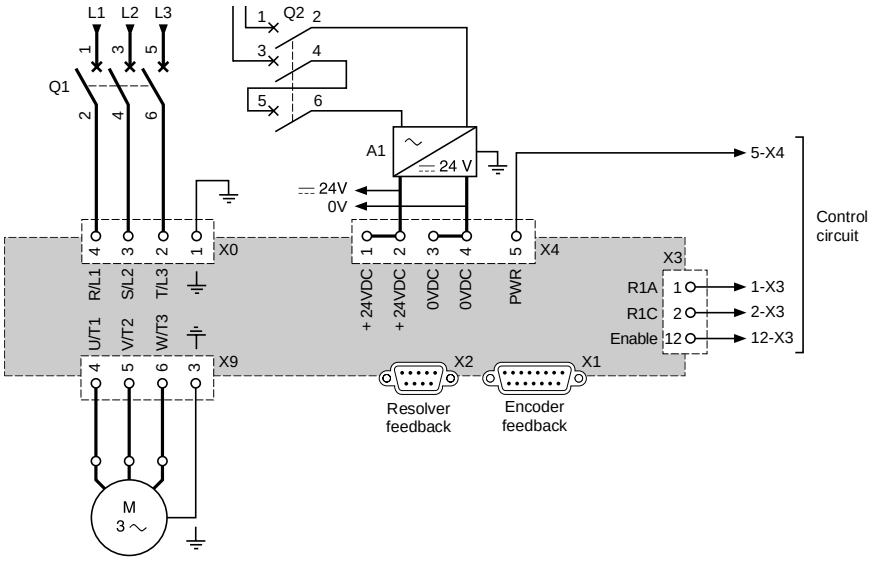
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

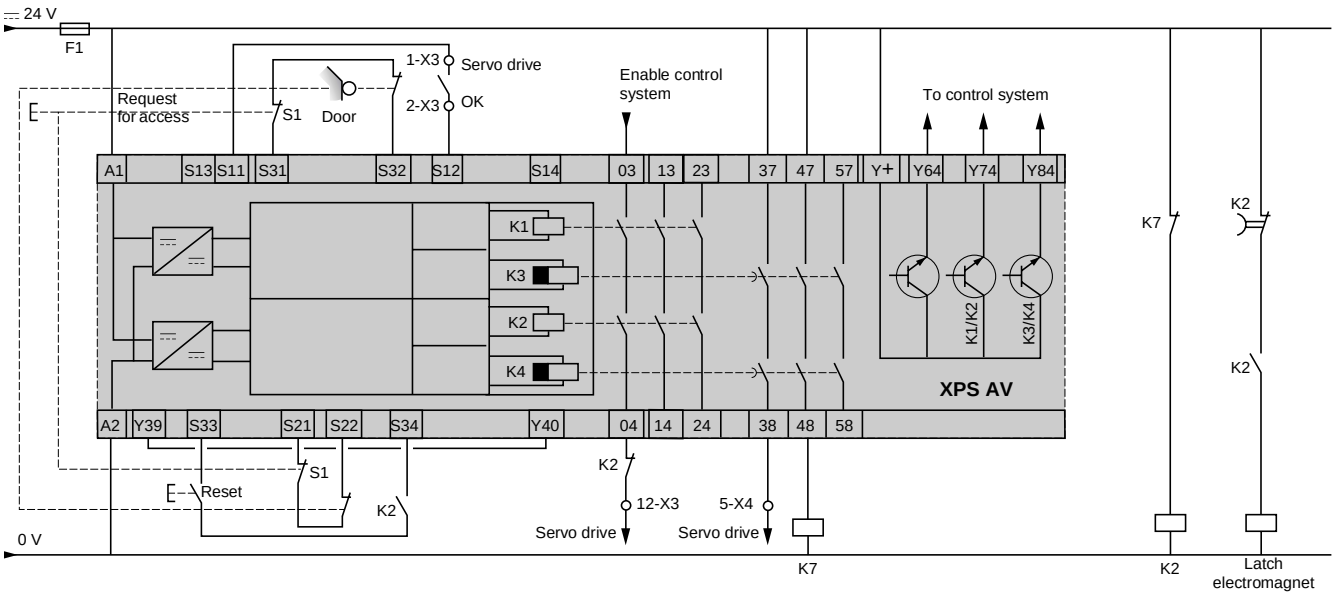
Category 2 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



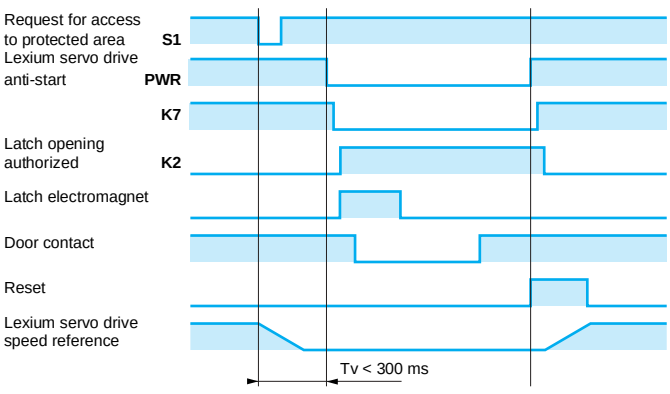
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- ■ Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.
- ■ Lexium 15 LP servo drive parameters:
- □ StopMode = 0: Axis performs a freewheel stop
- □ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

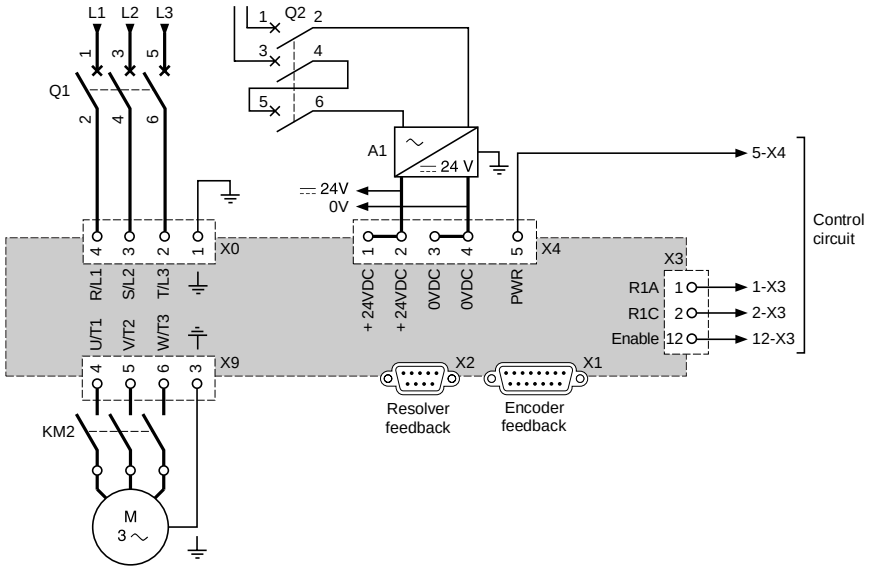
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

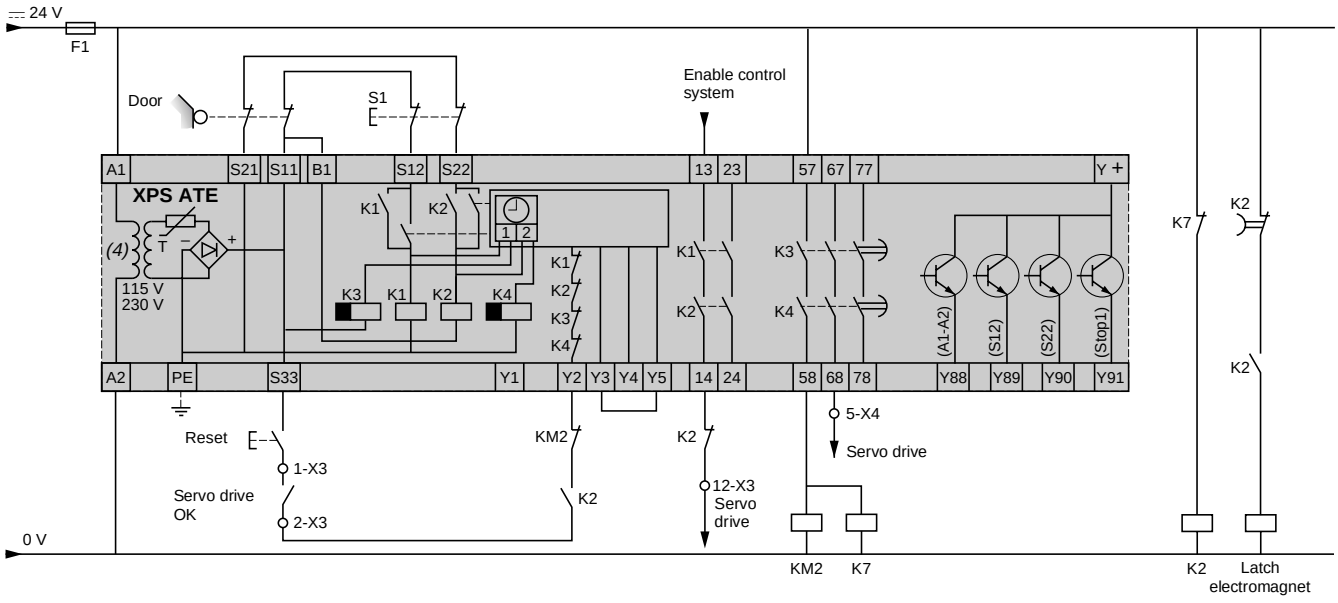
Category 3 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



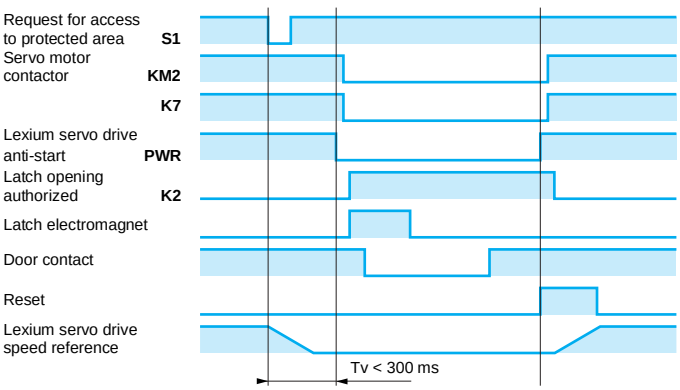
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS ATE: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS ATE monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 LP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

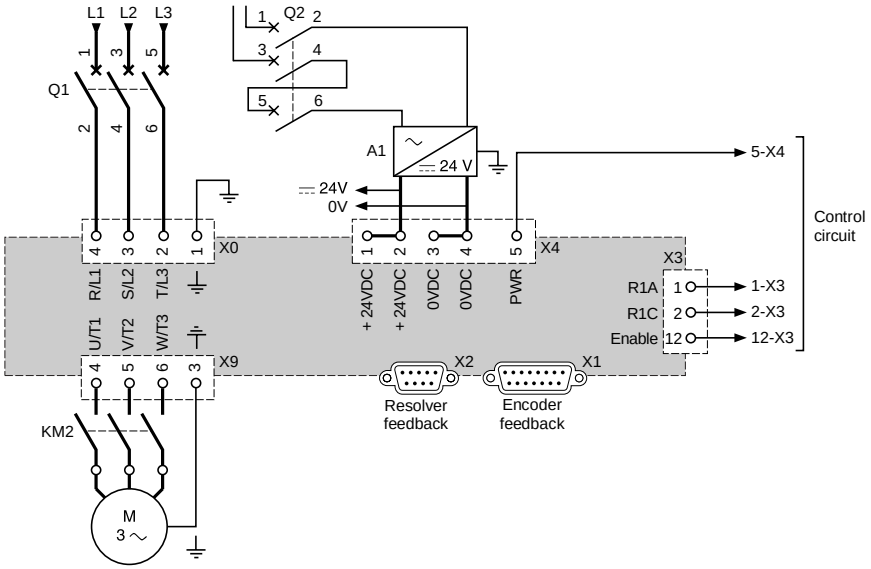
Lexium 15 motion control

Lexium 15 LP servo drives

Recommended wiring diagrams complying with standard EN 954-1

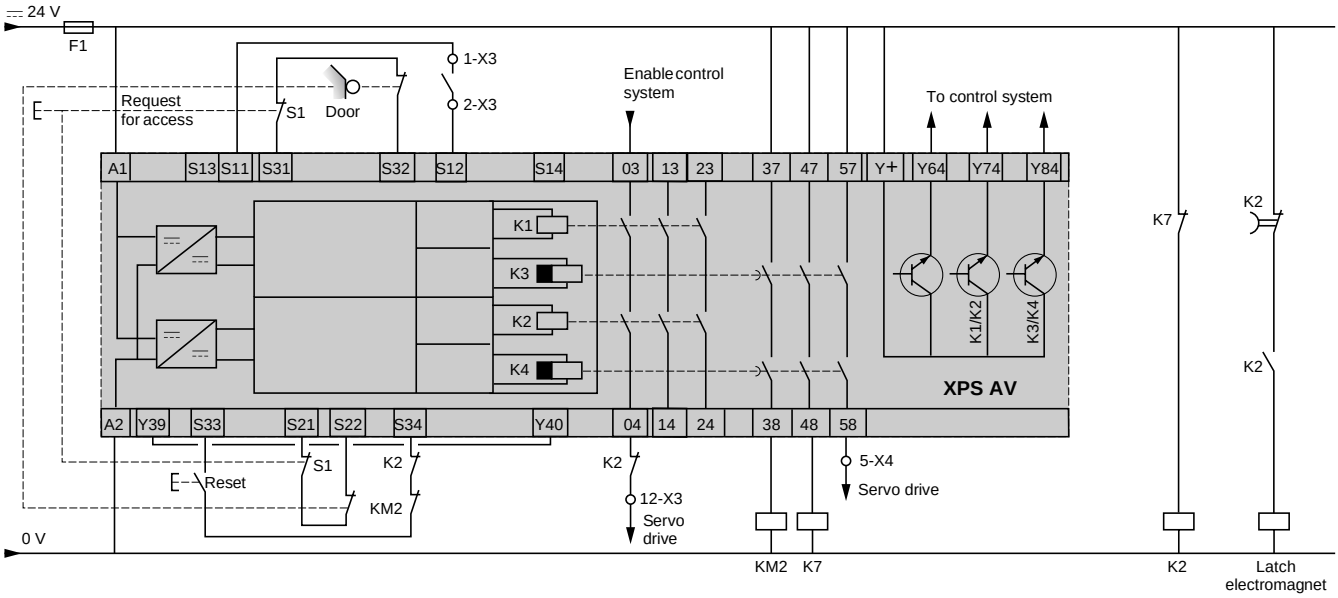
Category 4 safety level in accordance with EN 954-1

Power circuit of LXM 15L●●●●● servo drives



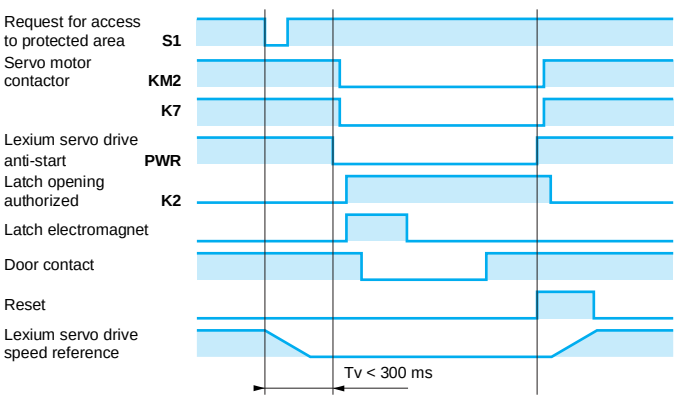
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15L●●●●● servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

■ Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.

■ Lexium 15 LP servo drive parameters:

□ StopMode = 0: Axis performs a freewheel stop

□ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

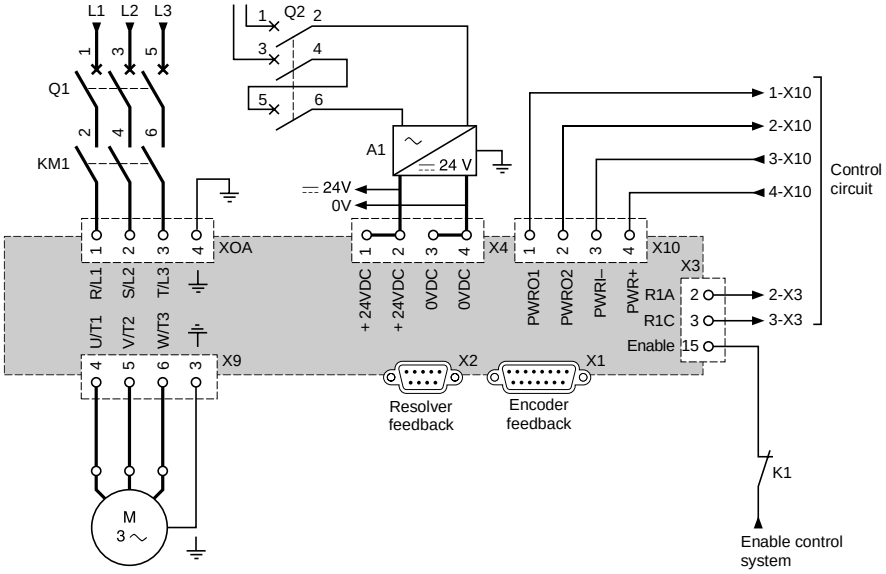
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

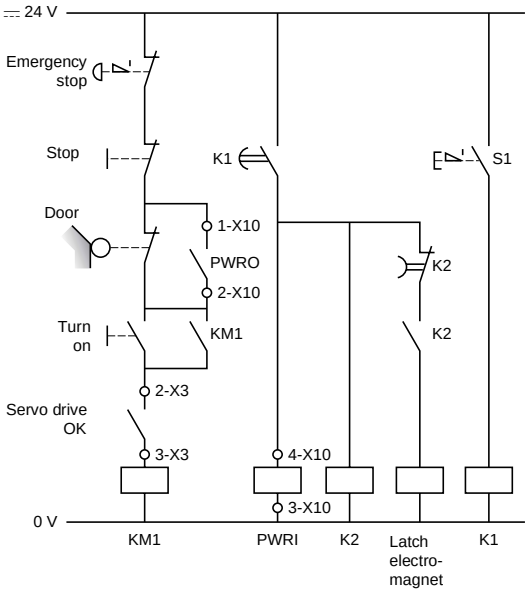
Category 1 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives

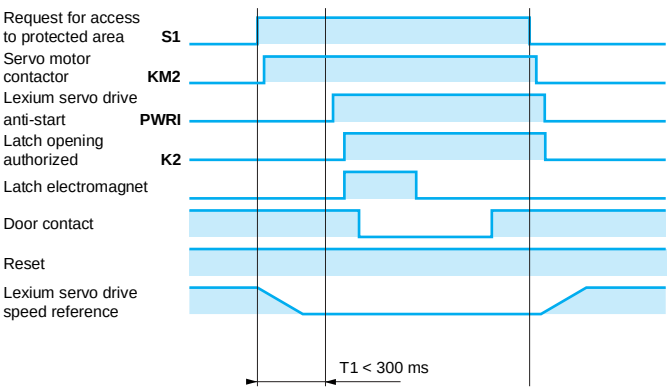


Q1: magnetic circuit breaker, see page 62
KM1: contactor, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



Timing diagram



Comments

■ Time delay T1 on the K1 relay must be long enough for the axis to come to a controlled stop.
■ Lexium 15 MP and 15 HP servo drive parameters:
□ StopMode = 0: Axis performs a freewheel stop
□ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

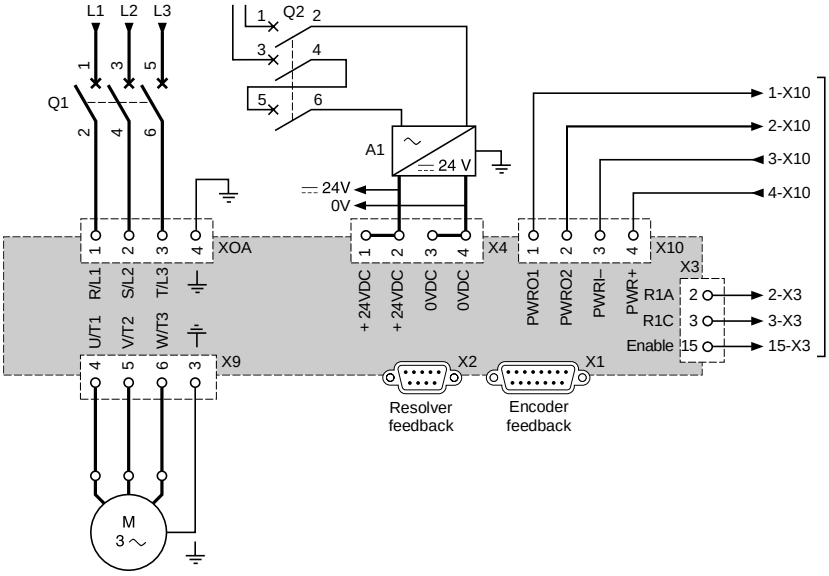
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

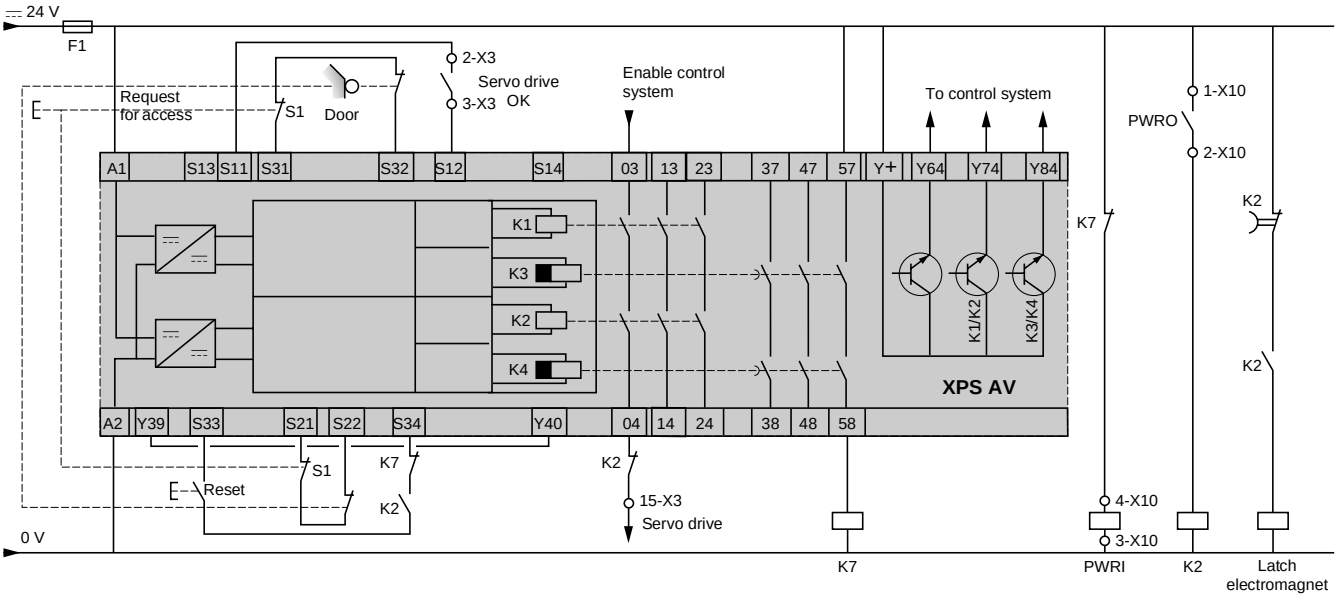
Category 2 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



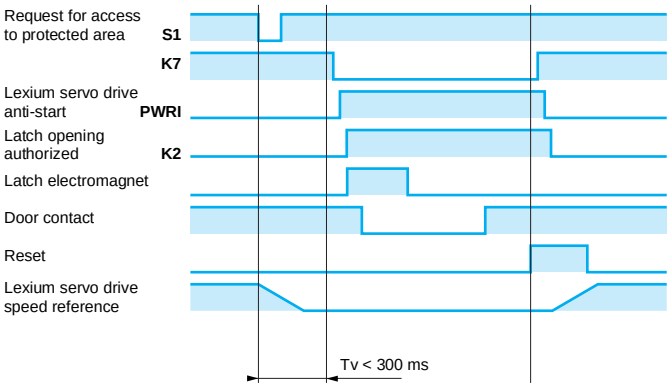
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 MP and 15 HP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

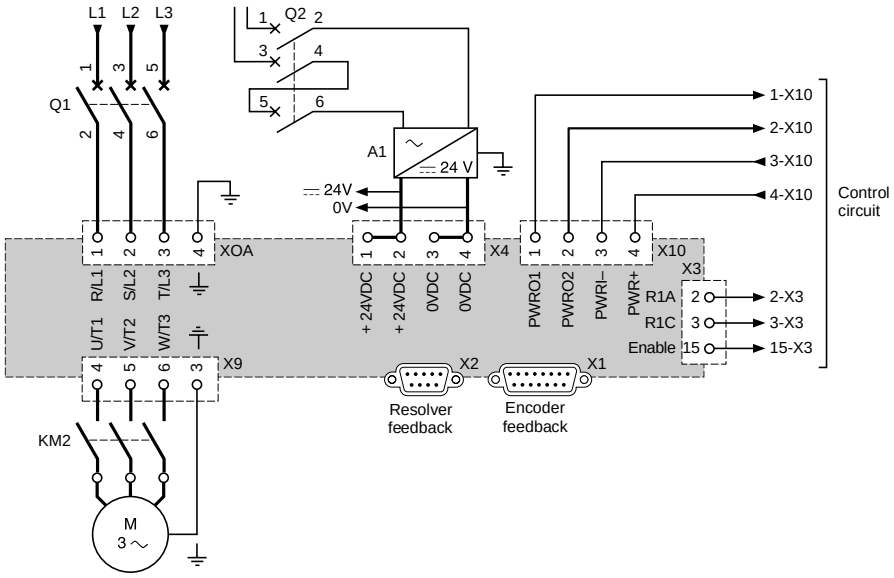
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

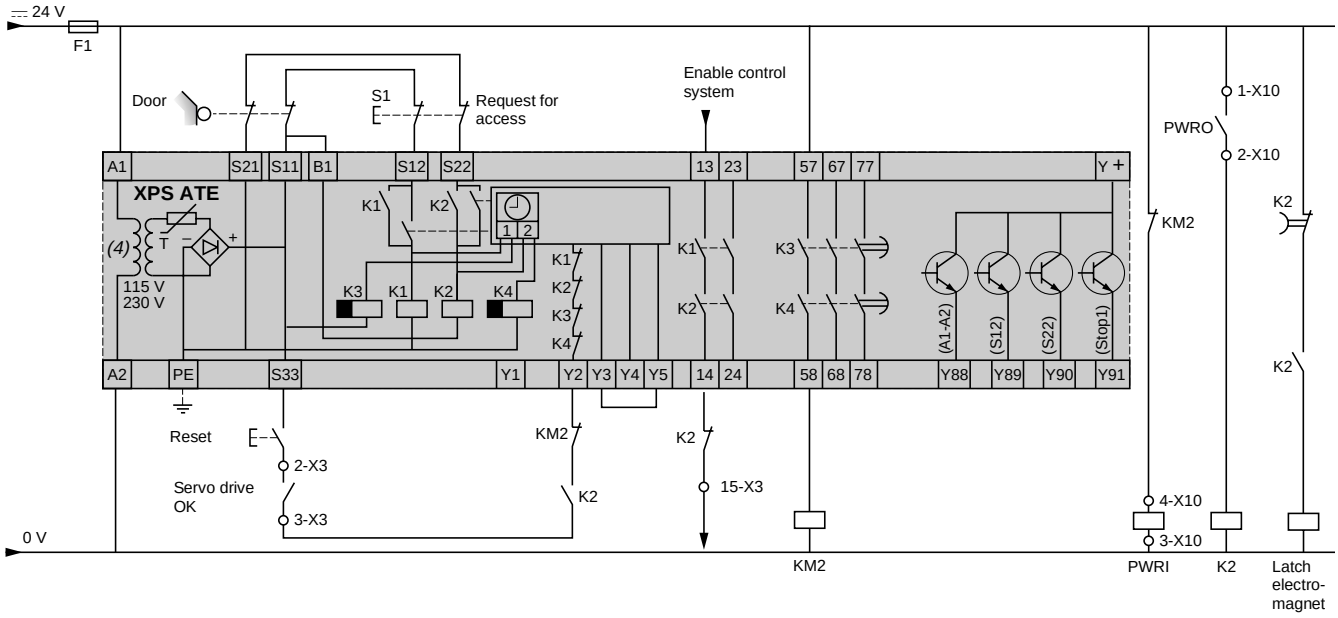
Category 3 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



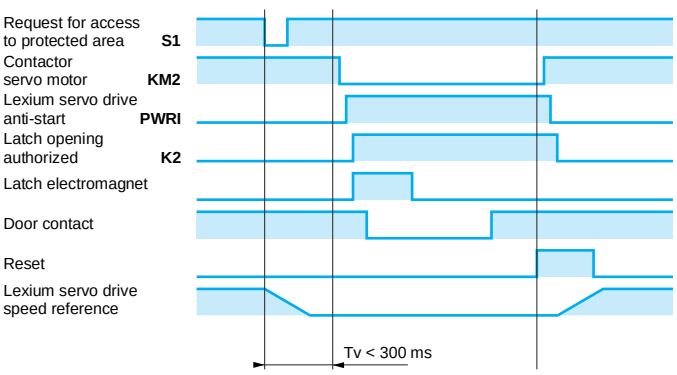
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS ATE: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

- Time delay Tv on the XPS ATE monitoring module must be long enough for the axis to come to a controlled stop.
- Lexium 15 MP and 15 HP servo drive parameters:
  - StopMode = 0: Axis performs a freewheel stop
  - StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

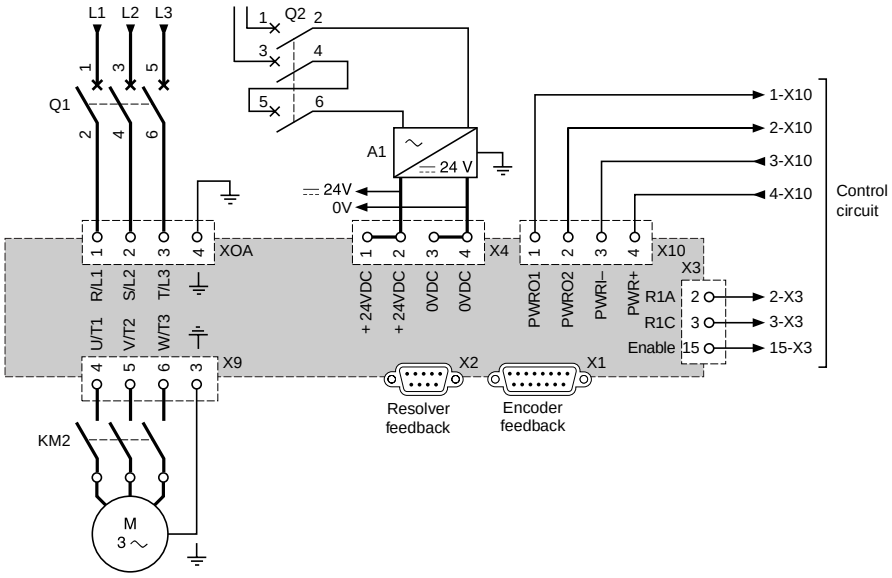
Lexium 15 motion control

Lexium 15 MP and 15 HP servo drives

Recommended wiring diagrams complying with standard EN 954-1

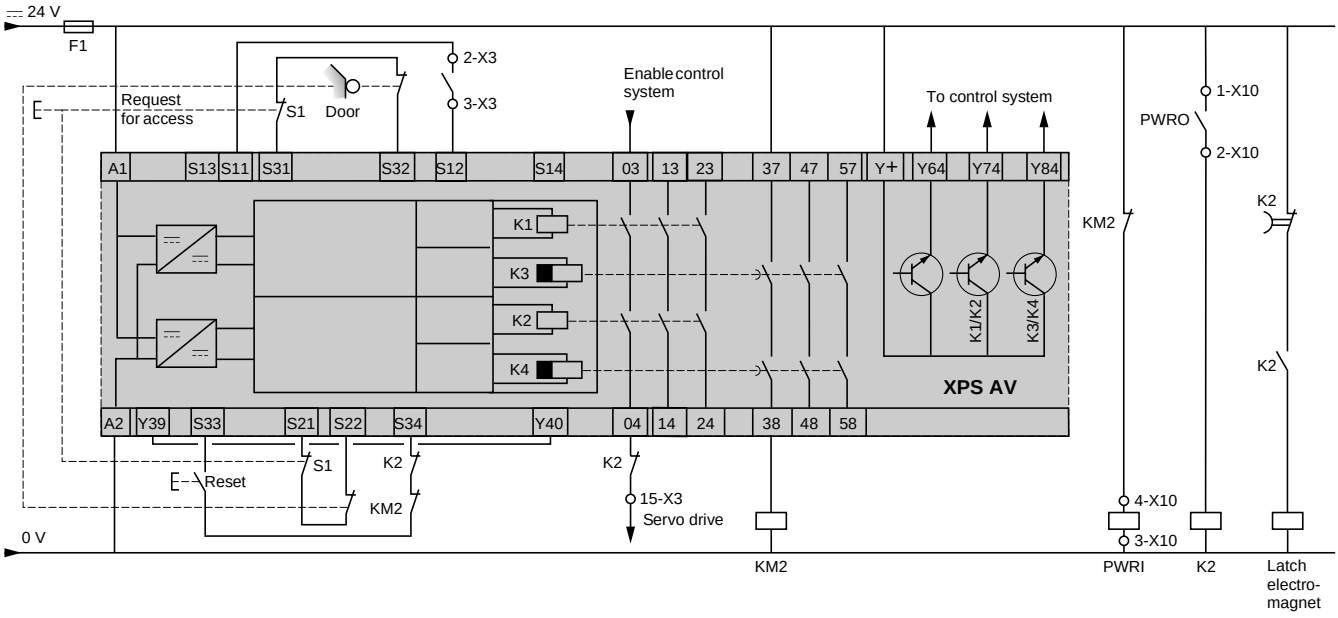
Category 4 safety level in accordance with EN 954-1

Power circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



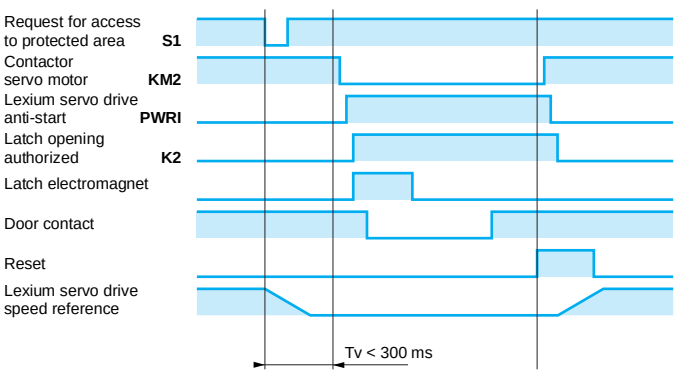
Q1: magnetic circuit breaker, see page 62

Control circuit of LXM 15MD●●N4, LXM 15HC●●N4X servo drives



XPS AV: Preventa safety module, please consult our “Safety solutions using Preventa” specialist catalogue

Timing diagram



Comments

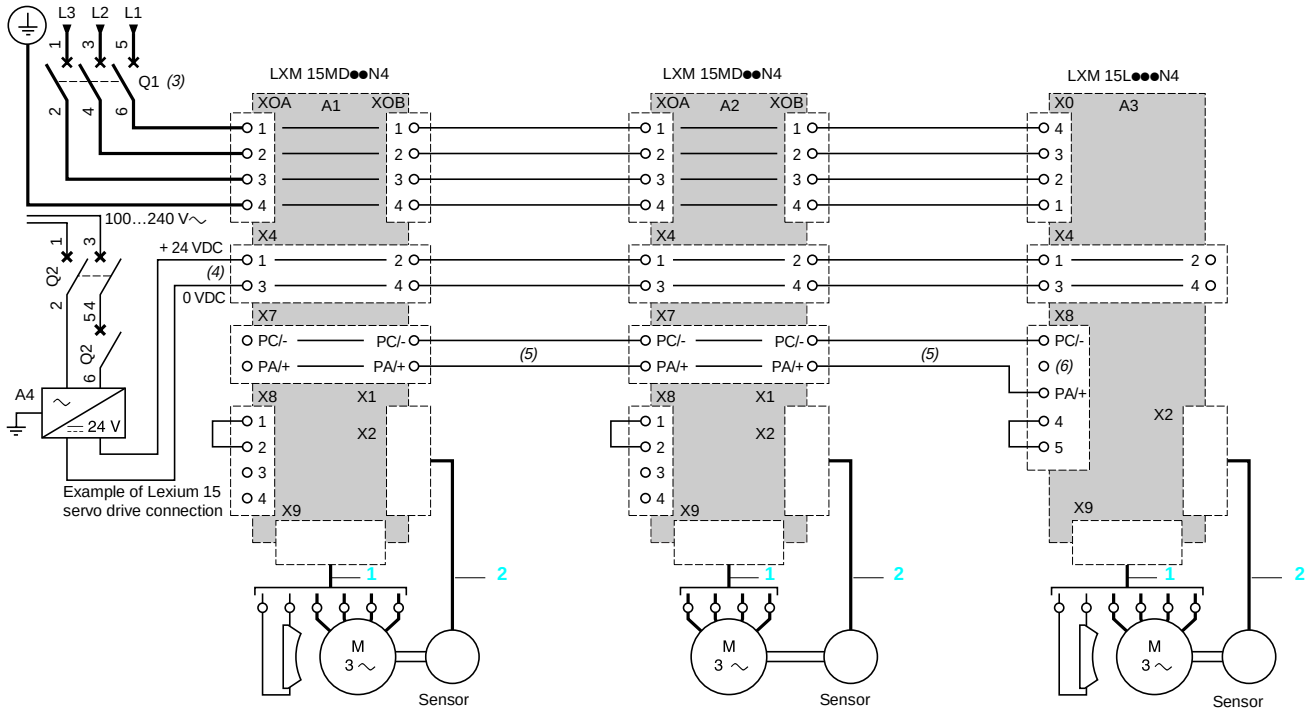
■ Time delay Tv on the XPS AV monitoring module must be long enough for the axis to come to a controlled stop.

■ Lexium 15 MP and 15 HP servo drive parameters:

□ StopMode = 0: Axis performs a freewheel stop

□ StopMode = 1: Axis comes to a controlled stop according to the emergency deceleration ramp

Example of connection of a set of two Lexium 15 MP servo drives and one Lexium 15 LP servo drive with distribution of braking energy (1) (2)

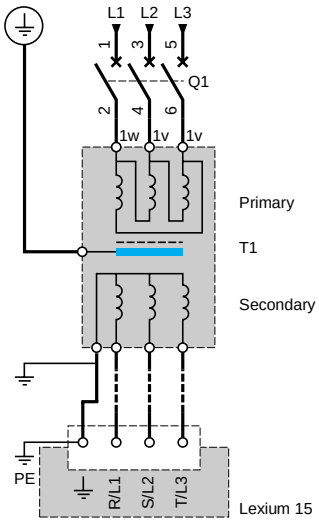


Additional components required (for the complete references, please consult our “Motor starter solutions - Control and protection components” specialist catalogue).

Item no.	Designation
A1, A2, A3	Lexium 15 servo drives, see page 28. For different power ratings, power A1 ⩾ power A2 ⩾ power A3
A4	Phaseo power supply, please consult our “Interfaces, I/O splitter boxes and power supplies” specialist catalogue.
Q1 *(3)*	Circuit breaker
Q2	GV2-L circuit breaker rated at twice the nominal current of supply A1
1	Servo motor/servo drive power connection cable, see pages 132 and 180
2	Servo motor/servo drive control connection cable, see pages 133 and 181

(1) The same connection principle is possible for connecting Lexium 15 HP servo drive DC buses in parallel. Please consult your Regional Sales Office.
(2) Only servo drives that have the same supply voltage can be connected on the same DC bus.
(3) Circuit breaker Q1 and the power supply cables must be of sufficient size to provide protection against overloads and short-circuits on each servo drive. Connectors X0, XOA, XOB limit the line current to 20 A rms. For line currents > 20 A rms, use separate power supplies and protection devices for the servo drives.
(4) On the X4 connector on the main servo drive (A1), check that the sum of the 24 V ⎓ power supply currents on the servo drives and the holding brakes (optional) is ⩽ 10 A.
(5) Connectors X7 and X8 limit the DC bus current to 20 A.
(6) Not connected

Connection of Lexium 15 servo drives to installation with IT netural system
(isolated or impedance earthed neutral)



Connection of a servo drive to an installation with an IT neutral system

In this type of installation, a 3-phase LV/LV transformer must be inserted in the supply circuit for the servo drives, which thus allows a TT load system to be recreated on the secondary side. This diagram, with a secondary star transformer, thus meets the following requirements:
- Protection of personnel
- Adaptation of the supply voltage

If a Lexium 15 HP servo drive is connected, inserting an isolation transformer eliminates the need for a line choke (VW3 M4 3●●).

Merlin Gerin or Square D 3-phase T1 transformer to be used

The size of the transformers is defined using the following formulae:

■ **Lexium servo drives with independent power supply** (one transformer per servo drive):

$$Pu = (\sqrt{3} \times Un \times In \times K) \times 1,5$$

where Pu: unit power (kVA), Un: nominal input voltage (V), In: continuous current (A), K = 0.9: reduction factor for the servo drive, and factor 1.5: factor taking account of the inrush and peak currents of the servo drives.

■ **Lexium servo drives with common power supply** (one transformer per n servo drives):

$$Pm = (\Sigma Pu)/2$$

If Pm < Pu of the largest servo drive, take Pm = Pu of the largest servo drive. Where Pm: usable power (kVA), and Pu: servo drive unit power (kVA). Formula not applicable for continuous operation (S1 mode).

Selection of Merlin Gerin transformer with 3 x 400 V rms primary voltage

Lexium 15 servo drives with independent power supply		LXM 15		LU60N4	LD10N4	LD17N4	MD28N4	MD40N4	MD56N4	HC11N4X	HC20N4X	
Required power Pu		400 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	13.1	19	38	66	
Merlin Gerin 3-phase LV/LV T1 transformer to be used	Nominal transformer power	400 V rms *(1)*	**kVA**	2.5	4	6.3	10	16	20	40	80	
	Reference	400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84037**	**84038**	**84041**	**84044**	
Lexium 15 servo drives with common power supply			**kVA**	**2.5**	**4**	**6.3**	**10**	**16**	**20**	**40**	**80**	**160**
Power required Pm	**Reference**	400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84037**	**84038**	**84041**	**84044**	**84047**

Selection of Square D transformer with 3 x 460 V rms primary voltage

Lexium 15 servo drives with independent power supply		LXM 15		LU60N4	LD10N4	LD17N4	MD28N4	MD40N4	MD56N4	HC11N4X	HC20N4X	
Required power Pu		460 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	13.1	19	38	66	
Square D 3-phase LV/LV T1 transformer to be used	Nominal transformer power	460 V rms *(1)*	**kVA**	–	–	7.5	11	15	20	40	75	
	Reference	460/460 V rms		**–**	**–**	**7T145 HDIT**	**11T145 HDIT**	**15T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**	
Lexium 15 servo drives with common power supply			**kVA**	**2.5**	**4**	**7.5**	**11**	**15**	**20**	**40**	**75**	**145**
Power required Pm	**Reference**	460/460 V rms		*(2)*	*(2)*	**7T145 HDIT**	**11T145 HDIT**	**15T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**	**145T145 HDIT**

(1) 3-phase secondary voltage
(2) Please consult your Regional Sales Office.

Note: *Unit equivalent: 1 kW = 0.746 HP*

Lexium 15 motion control
Motor starters
Protection by circuit breaker

535086

103279

105808

GV2 L14
+
LC1 D09●●
+
LXM 15LD21M3

535086

103283

105812

GV2 L22
+
LC1 D32●●
+
LXM 15MD56N4

Applications

The combinations listed below can be used to create a complete motor starter unit comprising a circuit breaker, a contactor and a Lexium 15 servo drive.
The circuit breaker provides protection against accidental short-circuits, disconnection and, if necessary, isolation.
The contactor turns on and manages any safety features, as well as isolating the servo motor on stopping.
The servo drive controls the servo motor, provides protection against short-circuits between the servo drive and the servo motor and protects the motor cable against overloads. The overload protection is provided by the motor thermal protection of the servo drive.

Motor starters for Lexium 15 LP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference	Rating	Reference *(1) (2)*
	kW		A	
Single phase supply voltage: 200…240 V ∿ 50/60 Hz				
LXM 15LD13M3	0.9	**GV2 L14**	10	**LC1 K0610●●**
LXM 15LD21M3	1.2	**GV2 L14**	10	**LC1 K0610●●**
LXM 15LD28M3	1.2	**GV2 L14**	10	**LC1 K0610●●**
Three phase supply voltage: 200…240 V ∿ 50/60 Hz				
LXM 15LD13M3	1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD21M3	2.1	**GV2 L14**	10	**LC1 D09●●**
LXM 15LD28M3	3.4	**GV2 L16**	14	**LC1 D12●●**
Three phase supply voltage: 208…480 V ∿ 50/60 Hz				
LXM 15LU60N4	1.1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD10N4	2.1	**GV2 L10**	6.3	**LC1 K0610●●**
LXM 15LD17N4	4.3	**GV2 L14**	10	**LC1 D09●●**

Motor starters for Lexium 15 MP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference	Rating	Reference *(1) (2)*
	kW		A	
Three phase supply voltage: 208…480 V ∿ 50/60 Hz				
LXM 15MD28N4	5.7	**GV2 L16**	14	**LC1 D12●●**
LXM 15MD40N4	7.9	**GV2 L22**	25	**LC1 D18●●**
LXM 15MD56N4	4.3	**GV2 L22**	25	**LC1 D32●●**

Motor starters for Lexium 15 HP servo drives

Servo drive		Circuit breaker		Contactor
Reference	Nominal power	Reference *(3)*	Rating	Reference *(1) (2)*
	kW		A	
Three phase supply voltage: 208…480 V ∿ 50/60 Hz				
LXM 15HC11N4X	22.3	**NS100HMA50**	50	**LC1 D50●●**
LXM 15HC20N4X	42.5	**NS100LMA100**	100	**LC1 D80●●**

(1) Composition of contactors:
LC1 K06: 3 poles + 1 N/O auxiliary contact
LC1 D●●: 3 poles + 1 N/O auxiliary contact + 1 N/C auxiliary contact
(2) Replace ●● with the control circuit voltage reference given in the table below:

AC control circuit

	Volts ∿	24	48	110	220	230	240
LC1 K	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**
	Volts ∿	**24**	**48**	**110**	**220/230**	**230**	**230/240**
LC1 D	50 Hz	**B5**	**E5**	**F5**	**M5**	**P5**	**U5**
	60 Hz	**B6**	**E6**	**F6**	**M6**	–	**U6**
	50/60 Hz	**B7**	**E7**	**F7**	**M7**	**P7**	**U7**

For other voltages between 24 V and 660 V, or a DC control circuit, please consult your Regional Sales Office.
(3) NS100●MA: Products sold under the Merlin Gerin brand.

Lexium 15 motion control

Motor starters

Protection using fuses

Protection of Lexium 15 LP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Single phase supply voltage: 200…240 V ∿ 50/60 Hz			
LXM 15LD13M3	0.9	aT	10
LXM 15LD21M3	1.2	aT	10
LXM 15LD28M3	1.2	aT	10
Three phase supply voltage: 200…240 V ∿ 50/60 Hz			
LXM 15LD13M3	1	aT	6
LXM 15LD21M3	2.1	aT	10
LXM 15LD28M3	3.4	aT	16
Three phase supply voltage: 208…480 V ∿ 50/60 Hz			
LXM 15LU60N4	1.1	aT	6
LXM 15LD10N4	2.1	aT	6
LXM 15LD17N4	4.3	aT	10

Protection of Lexium 15 MP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Three phase supply voltage: 208…480 V ∿ 50/60 Hz			
LXM 15MD28N4	5.7	aM	16
LXM 15MD40N4	7.9	aM	20
LXM 15MD56N4	11.4	aM	25

Protection of Lexium 15 HP servo drives using fuses

Servo drive		Fuse to be fitted upstream	
Reference	Nominal power	Type	Current
	kW		A
Three phase supply voltage: 208…480 V ∿ 50/60 Hz			
LXM 15HC11N4X	22.3	aM	40
LXM 15HC20N4X	42.5	aM	63

Mounting recommendations

LXM 15LD13M3 and LXM 15LU60N4 servo drives are cooled by natural convection.
The other servo drives, LXM 15LD21M3, LD28M3, LXM 15●D●●N4 and LXM 15HC●●N4X, have an integrated fan.

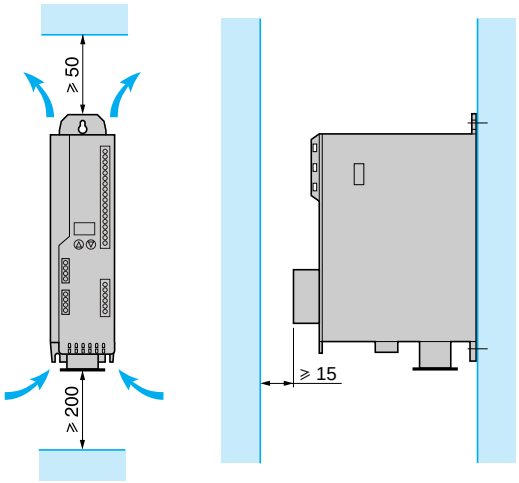
When the servo drive is installed in an enclosure, the following instructions should be followed with regard to the temperature and protection index:

- Provide sufficient cooling of the servo drive by complying with the minimum mounting distances
- Do not mount the servo drive near heat sources
- Do not mount the servo drive on flammable materials
- Do not heat the servo drive cooling air by currents of hot air from other equipment and components, for example from an external braking resistor
- If the servo drive is used above its thermal limits, the control stops due to overtemperature
- Mount the servo drive vertically (± 10%).

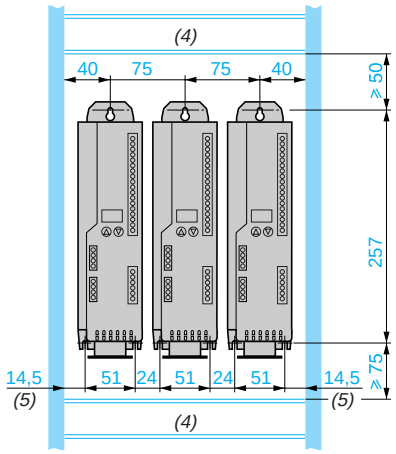
Note: *Do not use insulated enclosures, as they have a poor level of conductivity.*

Mounting

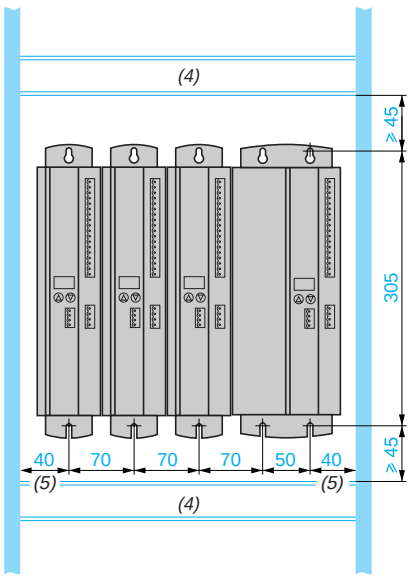
Cooling principle



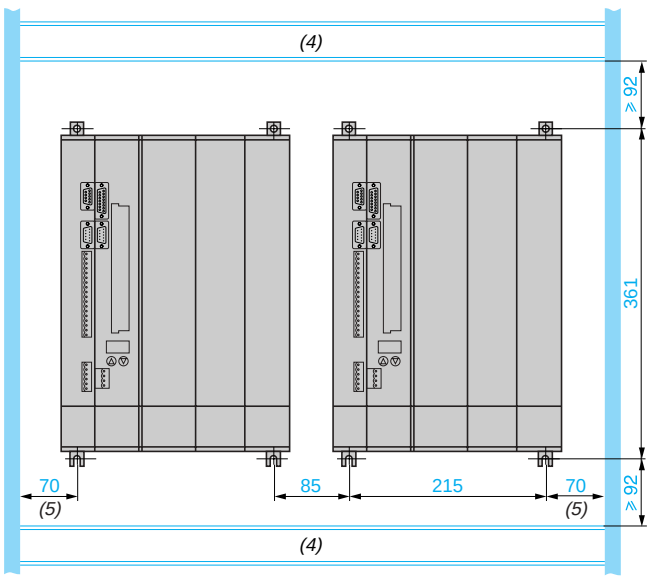
LXM 15L●●●●● servo drives *(1)*



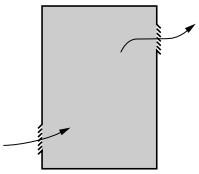
LXM 15MD●●N4 servo drives *(2) (3)*



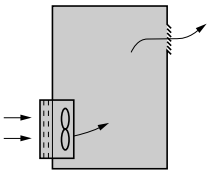
LXM 15HC●●N4X servo drives *(2) (3)*



(1) Ambient air temperature: 0…+ 40°C without derating. From + 40…+ 55°C with derating of the motor output current by 2.5% per additional °C.
(2) Ambient air temperature: 0…+ 45°C without derating. From + 45…+ 55°C with derating of the motor output current by 2.5% per additional °C.
(3) For easier connection of the power cables, leave a free space ⩾200 mm beneath the servo drive.
(4) Cable clip or ducting
(5) Minimum distance between the inside panel of the enclosure and the side of the servo drive.



Natural convection



Forced cooling

Recommendations for mounting in an enclosure

To ensure good air circulation in the servo drive:
- Fit ventilation grilles on the enclosure.
- Ensure that ventilation is adequate: if not install a forced ventilation unit with a filter.
- Any apertures and/or fans must provide a flow rate at least equal to that of the servo drive fans (see below).
- Use special filters with IP 54 protection.

Servo drive	Dissipated power W	Ventilation	Flow rate m^3/hour
LXM 15LD13M3	35	Natural convection	–
LXM 15LD21M3	60	Integrated fan	60
LXM 15LD28M3	90	Integrated fan	60
LXM 15LU60N4	40	Natural convection	–
LXM 15LD10N4	60	Integrated fan	60
LXM 15LD17N4	90	Integrated fan	60
LXM 15MD28N4	90	Integrated fan	60
LXM 15MD40N4	160	Integrated fan	110
LXM 15MD56N4	200	Integrated fan	160
LXM 15HC11N4X	400	Integrated fan	340
LXM 15HC20N4X	700	Integrated fan	470

Sealed metal enclosure (IP 54 degree of protection)

The servo drive must be mounted in a dust and damp proof enclosure in certain environmental conditions, such as dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.
In these cases, Lexium 15 servo drives can be installed in an enclosure where the internal temperature must not exceed 40°C.

Calculating the dimensions of the enclosure

Maximum thermal resistance Rth (°C/W)

The thermal resistance is defined by the following formula:

$$R_{th} = \frac{\theta^\circ - \theta e}{P}$$

θ = maximum temperature inside enclosure in °C
θe = maximum external temperature in °C
P = total power dissipated in the enclosure in W

Power dissipated by the servo drive: see table above.
Add the power dissipated by the other equipment components.

Useful heat exchange area of enclosure S (m^2)

For an enclosure fixed to the wall, the useful heat exchange area is defined as the sum of the areas of the 2 sides + top + front panel

$$S = \frac{k}{R_{th}}$$

k = thermal resistance per m^2 of the enclosure

For a metal enclosure:
- k = 0.12 with internal fan
- k = 0.15 without fan

Note: *Do not use insulated enclosures, as they have a poor level of conductivity.*

Lexium 15 motion control
Modicon Premium motion control modules

Application type	**Master/slave (cam profile, cut on the fly)**		
			
Number of axes	2/4 axes	2/4 axes	3 axes
Frequency per axis	Counting: 500 kHz with an incremental encoder	Acquisition: 200 kHz with a SSI series absolute encoder or an absolute encoder with parallel outputs	
Counter inputs	Per axis: - incremental encoder 5 V⎓, RS 422/RS 485 or Totem pole - SSI serial absolute encoder 16 to 25 bits,10…30 V⎓ - Parallel output absolute encoder 16 to 24 bits, 5/10/30 V⎓ with Advantys Telefast (ABE 7CPA11) conversion sub-base		
Command outputs	Per axis: - 1 analog output ± 10 V, 13 bits + sign, servo drive reference		
Auxiliary I/O	Per axis: - 4 "discrete" inputs 24 V⎓ (homing cam, event, recalibration, emergency stop) - 1 input/1 output for servo drive control - 1 reflex output 24 V⎓		
Functions	Servo control on independent linear axis	Servo control on independent infinite axis Follower axis (dynamic ratio) Realtime correction of servo drive offset	Servo control on independent linear or independent infinite axis Linear interpolation on 2 or 3 axes Realtime correction of servo drive offset
Processing	Positioning of a moving part on an axis following the motion control functions supplied by the Premium PLC processor		
	Parameter setting, adjustment and debugging of axes by Unity Pro and PL7 Junior/Pro software		
Events	User-definable activation of the event-triggered task		
Connections	9 and 15-way SUB-D type connectors for encoder input (direct or TSX TAP S15●● accessories), speed reference HE 10 connector for auxiliary inputs Advantys Telefast prewiring system (ABE 7CPA01, ABE 7H16R20, ABE 7CPA11) Specific accessories (TSX TAP MAS)		
Module type	**TSX CAY ●1** *(1)*	**TSX CAY ●2** *(1)*	**TSX CAY 33**
Pages	71		

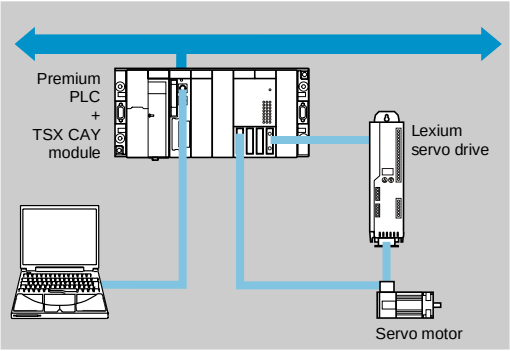
(1) ***TSX CAY ●1/●2****: substitute* ***2*** *for* ***2*** *axe module,* ***4*** *for* ***4*** *axe module.*

Synchronized multiaxis

8 axes	16 axes	8 axes
SERCOS network ring: 4 Mbps		
Per SERCOS digital link		
Per SERCOS digital link		
Per SERCOS digital link		
Independent linear or infinite axes Follower axes (6 slaves) by gearing or camming Manual mode (JOG and INC) Special functions, see page 76 4 groups of axes with simple 2 to 8 axes linear interpolation		
–		Path functions: 2 groups of 3 axes or 3 groups of 2 axes. With linear and circular interpolation with links via polynomial interpolation
Axis parameter setting, adjustment and debugging using Unity Pro and PL7 Junior/Pro software		
User-definable activation of the event-triggered task		
By 2 SMA type connectors for plastic (or glass) fibre optic cable		
TSX CSY 84	**TSX CSY 164**	**TSX CSY 85**
81		

Lexium 15 motion control
TSX CAY motion control modules for servo motors

Presentation



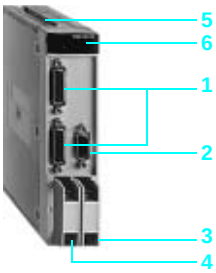
The servo-controlled TSX CAY●● positioning axis control offer is designed for machines requiring both high performance servo motion control in conjunction with PLC sequential control.

Depending on the model, the TSX CAY ●● modules make it possible to:
- Control 2 independent axes (TSX CAY 21/22)
- Control up to 4 independent axes (TSX CAY 41/42)
- Control 3 linearly interpolated axes (TSX CAY 33)

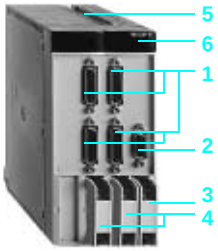
They accept servo drives with ±10 V analog inputs including Lexium 05, Lexium 15, Lexium 17D and Twin Line TLD 13 servo drives.

TSX CAY ●● modules can be inserted, like all application-specific modules, in all Premium PLC or Slot PLC Atrium slots.

Description



TSX CAY 21/22



TSX CAY 41/42

On the front panel of the TSX CAY ●● axis control modules there is:
1 A 15-way SUB-D connector per axis for connection of an incremental or absolute encoder
2 A 9-way SUB-D connector for all axes for connection of an analog output "speed reference" for each axis
3 An HE 10 to 20-way connector for all axes for connection:
- ◻ of auxiliary servo drive control inputs
- ◻ of external power supply of servo drive inputs/outputs

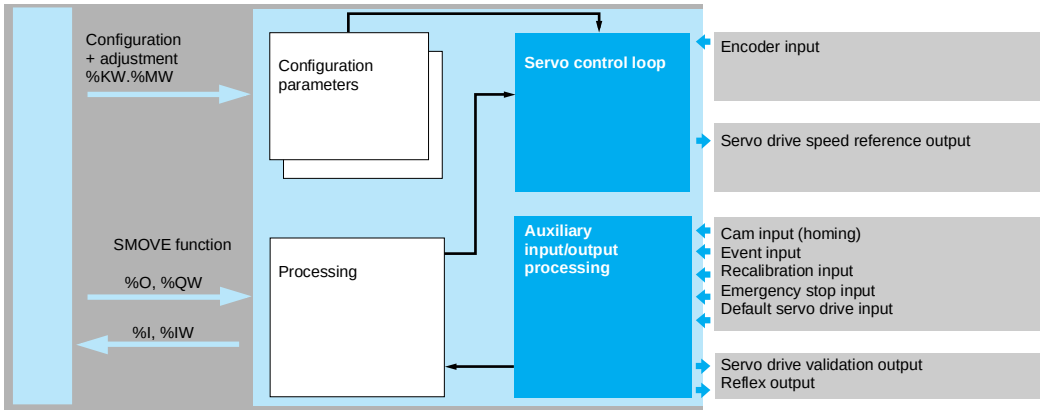
4 An HE 10 to 20-way connector for two axes (0/1 or 2/3) for connection:
- ◻ of auxiliary inputs: homing cam, emergency stop, event, recalibration,
- ◻ of reflex outputs
- ◻ external sensor and preactuator power supplies

5 rigid casing that performs the functions of:
- ◻ supporting electronic cards
- ◻ attaching and locking the module in its slot

6 LEDs for module diagnostics:
- ◻ diagnostics at module level:
  - Green RUN LED: module in operation
  - Red ERR LED: internal fault, module out of service
  - red I/O LED: external fault
- ◻ diagnostics at axis level:
  - Green CH● LED: axis diagnostics present

Operation

Diagram of an axis



Axis control modules are set up using Unity Pro or PL7 Junior/Pro software. Premium TSX P57 ●●3M/4M and Atrium TPCX57●●3M or TSX PCI 57●●4M slot PLCs are required for TSX CAY 22/42/33 modules.

Characteristics: pages 69 and 70
References: pages 71 and 72
Connections: page 73

Lexium 15 motion control
TSX CAY motion control modules for servo motors

Functional characteristics

Module type			TSX CAY 21/22	TSX CAY 41/42	TSX CAY 33
Servo control loop			Proportional to overshoot compensation and gain switching		
	Period	**ms**	2	4	
Paths	Speed profile		Trapezoid or parabolic		
Resolution	Minimum		0.5 position units per point		
	Maximum		1000 position units per point		
Length of axis	Minimum		**TSX CAY 21**: 32,000 points	**TSX CAY 41**: 32,000 points	**TSX CAY 33**: 256 points
			TSX CAY 22: 256 points	**TSX CAY 42**: 256 points	
	Maximum		32,000,000 points		
Speed	Minimum		54,000 points/min		
	Maximum		270,000 points/min		
Acceleration (Change from 0 to VMAX)	Minimum	**s**	10		
	Maximum	**ms**	8	16	
Operating modes	OFF		Measuring mode, disabling of the servo control loop		
			The module operates by acquiring the position and current speed		
	DIR DRIVE		Servo control is switched off, disabling of the servo control loop		
			The module operates only in analog output		
	MAN		Motion control by an operator: - movement by viewing - incremental movement		
	AUTO		Sequence of movements controlled by a PLC program. The movements are described by a syntax similar to ISO language. The movements can be expressed absolutely or relatively (in relation to the current position or the captured position). Possibility of "step by step" execution, suspension/resumption of movement, changes in speed		
	FOLLOWER		Axis n of the module is servo controlled: - either at the 0 axis of the same module - or at a control profile transmitted by application program		–
	Environment		Encoder coupling, servo drive present, emergency stop		
	Movements		Control of the proper execution of movements (following difference, operational window, software stops)		
	Control		Control consistency check		
	Parameters		Parameter validity check		

Functionalities

Module type		TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
2/3 axes linear interpolation		–				Yes
Limited axes		Yes				
Infinite axes		–	Yes	–	Yes	
Following axes	Static ratio	Yes	–	Yes	–	
	Dynamic ratio	–	Yes	–	Yes	–
Servo drive offset correction		–	Yes	–	Yes	
Cut on the fly	On position or on event with infinite master axis and linearly-limited slave axis	–	Yes *(1)*	–		

(1) The TSX CAY 22 module's cut on the fly function requires Unity Pro software version ⩾ 2.2 or PL7 Junior/Pro software version u 4.1.

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Lexium 15 motion control

TSX CAY motion control modules for servo motors

Electrical characteristics

Module type				TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
Modularity				2 axes		4 axes		3 axes
Maximum frequency on the counter inputs	SSI absolute encoder			16 to 25 bits	12 to 25 bits	16 to 25 bits	12 to 25 bits	
	CLK frequency	transmission	**kHz**	200				
	Incremental encoder	x 1	**kHz**	500				
		x 4	**kHz**	250 kHz in input or 1 MHz in counting				
Consumption		5 V⎓	**mA**	1100		1500		
		24 V⎓	**mA**	15		30		
Current consumed by module on the 10/30 V encoder at 24V (24 V absolute encoder)		Typical	**mA**	11 (20 max)		22 (40 max)		
Power dissipated inside the module		Typical	**W**	7.2 (11.5 max)		10 (17 max)		
Control of sensor power supplies				Yes				

Input characteristics

Type of input				**Counter inputs 5 V⎓** (IA/IB/IZ)	**Servo drive control inputs** (1 per axis)	**Auxiliary inputs** (homing, event, recalibration, emergency stop)
Logic				Positive		
Nominal values	Voltage		**V**	5	24	
	Current		**mA**	18	8	
Value limits	Voltage		**V**	⩽ 5.5	19...30 (possible up to 34 V, limited 1 hr per 24 hr)	
	At state 1	Voltage	**V**	⩾ 2.4	⩾ 11 (OK state)	⩾ 11
		Current	**mA**	> 3.7 (for U = 2.4 V)	> 3.5 (for U = 11 V)	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	⩽ 1.2	⩽ 5 (default state)	⩽ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 1.5 (for U = 5 V)	< 2 (for U = 5 V)
Control of voltage/sensor feedback				Presence check	–	
Input impedance for nominal U			Ω	270	3000	
Type of input				Resistive		Current sinks
Conforming to IEC 1131				–	Type 1	Type 2
2-wire compatibility detector:				–		Yes (all 24 V detectors)
3-wire compatibility detector				–		Yes (all 24 V detectors)

Output characteristics

Type of output			**Analog outputs** (1 per axis)	**Servo drive validation** (1 relay output per axis)	**Reflex outputs** (1 per axis)
Range		**V**	± 10, 24	–	
Resolution			13 bits + sign	–	
LSB value		**mV**	1.25	–	
Nominal voltage		**V**	–	⎓ 24	
Voltage limit		**V**	–	5…30	19...30 (possible up to 34 V, limited 1 hr per 24 hr)
Current		**mA**	–		500 nominal
Maximum current		**mA**	1.5	200 (resistive charge under 30 V)	625 (for U = 30 or 34 V)
Minimum permitted load			–	1 V/1mA	–
Max voltage drop ON		**V**	–		< 1
Leakage current		**mA**	–		< 0.3
Switching time			–	<5 ms	< 500 µs
Compatibility with d.c. inputs			–		All positive logic inputs for which the input resistance is < 15 kΩ
Conforming to IEC 1131			–		Yes
Short-circuit and overload protection			–		By current limiter and thermal release
Channel overvoltage protection			–		Zener diodes between the inputs and the + 24 V
Protection against reverse polarity			–		By diode in the opposite direction to the power supply

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Lexium 15 motion control
TSX CAY motion control modules for servo motors


TSX CAY 2●


TSX CAY 33


TSX CAY 4●


TSX TAP S15 05


TSX TAP MAS


ABE 7CPA01


ABE 7H16R20

Motion control modules for servo motors *(1)*

Type of input	Characteristics	Function	No. of axes *(2)*	Reference *(3)*	Weight kg
Incremental encoders 5 V⎓ RS 422, 10…30 V⎓ Totem pole *(4)* **Absolute encoders** RS 485 serial or parallel *(5)*	500 kHz counter with incremental encoder	Servo control on independent linear axis	2	**TSX CAY 21**	0.480
	200 kHz acquisition with absolute serial encoder		4	**TSX CAY 41**	0.610
		Servo control on independent linear or independent infinite axis Following axes Servo drive realtime offset correction Cut on the fly *(6)*	2	**TSX CAY 22**	0.480
			4	**TSX CAY 42**	0.610
		Servo control on linear or infinite axis Linear interpolation on 2 or 3 axes Servo drive realtime offset correction	3	**TSX CAY 33**	0.610

Connection elements

Connection accessories

Description	Connection	Type of connector on module TSX CAY ●●	Item no. *(7)*	Reference	Weight kg
SUB-D connectors (sold in lots of 2)	SSI absolute/ incremental encoder	15-way SUB-D (1 per axis)	–	**TSX CAP S15**	0.050
	Speed references	9-way SUB-D (1 per TSX CAY module)	–	**TSX CAP S9**	0.050
Connection interface for incremental encoder	Incremental encoder 5 V⎓ RS 422/RS 485	15-way SUB-D (1 per axis)	3	**TSX TAP S15 05**	0.260
Splitter unit	Speed references towards servo drives	9-way SUB-D (1 per TSX CAY module)	–	**TSX TAP MAS**	0.590
Telefast 2 connection bases	Speed references	9-way SUB-D (1 per TSX CAY module)	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, reflex outputs, I/O power supply 24 V⎓, encoder power supplies 5/24 V⎓	10, 20-way HE (1 for 2 axes)	–	**ABE 7H16R20**	0.300
	Servo drive control signals, I/O power supply 24 V⎓	10, 20-way HE (1 per TSX CAY module)	–	**ABE 7H16R20**	0.300
Adaptor base	Absolute encoders with parallel outputs (16 to 24 bit) 5 V⎓, 10…30 V⎓	15-way SUB-D	–	**ABE 7CPA11**	0.300

(1) To order other accessories please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue.
(2) Double format TSX CAY 41/42/33 modules.
(3) Supplied with a multilingual quick reference guide: in English and French.
(4) Totem pole encoder with supplementary Push/Pull outputs.
(5) Parallel output absolute encoders with ABE 7CPA11 adaptor interface.
(6) Cut on the fly function available with TSX CAY 22 module. Requires Unity Pro software version ≥ 2.2 or PL7 Junior/Pro software version u 4.1
(7) Item no. see page 73.

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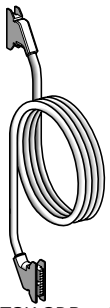
Lexium 15 motion control
TSX CAY motion control modules for servo motors

Connection elements (continued)

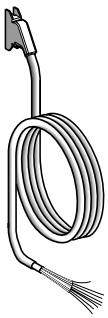
Cables

Description	Use		Item no.	Length	Reference	Weight
	From	To	(1)	m		kg
Cables fitted with SUB-D connectors	TSX CAY●● module, 15-way SUB-D connector	TSX TAP S15 05 interface or ABE 7CPA11 adaptor base (15-way SUB-D connector)	2	0.5	**TSX CCP S15 050**	0.110
				1	**TSX CCP S15 100**	0.160
				2.5	**TSX CCP S15**	0.220
	TSX CAY●● module, 9-way SUB-D connector (speed reference)	ABE 7CPA01 sub-base or TSX TAP MAS splitter unit (15-way SUB-D connector)	4	2.5	**TSX CXP 213**	0.270
				6	**TSX CXP 613**	0.580
Sectors equipped with a SUB-D connector and a free end (servo drive side)	TSX CAY ●● module, or TSX TAP MAS unit	Lexium 05/15/17D servo drive speed reference, Twin Line TLD 13 or other drives (section 0.205 mm²)	5	6	**TSX CDP 611**	0.790
Connection cables fitted with HE 10 connectors	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	ABE 7H16R20 sub-base (10, 20-way HE connector) 500 mA max cable	6	0.5	**TSX CDP 053**	0.085
				1	**TSX CDP 103**	0.150
				2	**TSX CDP 203**	0.280
				3	**TSX CDP 303**	0.410
				5	**TSX CDP 503**	0.670
Sectors equipped with an HE 10 connector and a free end (servo drive side)	TSX CAY ●● module, (cast mould 20-way HE 10 connector)	Auxiliary inputs, reflex output, control signals, power supplies (free end) 20 wire 500 mA max sectors	7	3	**TSX CDP 301**	0.400
				5	**TSX CDP 501**	0.660
Cables equipped for Lexium 15 servo drives	TSX CAY ●● module, 15-way SUB-D connector (encoder input)	Simulated incremental encoder feedback (9-way SUB-D connector)	8	2	**TSX CXP 235**	0.210
				6	**TSX CXP 635**	0.470
		Simulated absolute encoder feedback (9-way SUB-D connector)	9	2	**TSX CXP 245**	0.210
				6	**TSX CXP 645**	0.470

(1) Item no. see page 73.



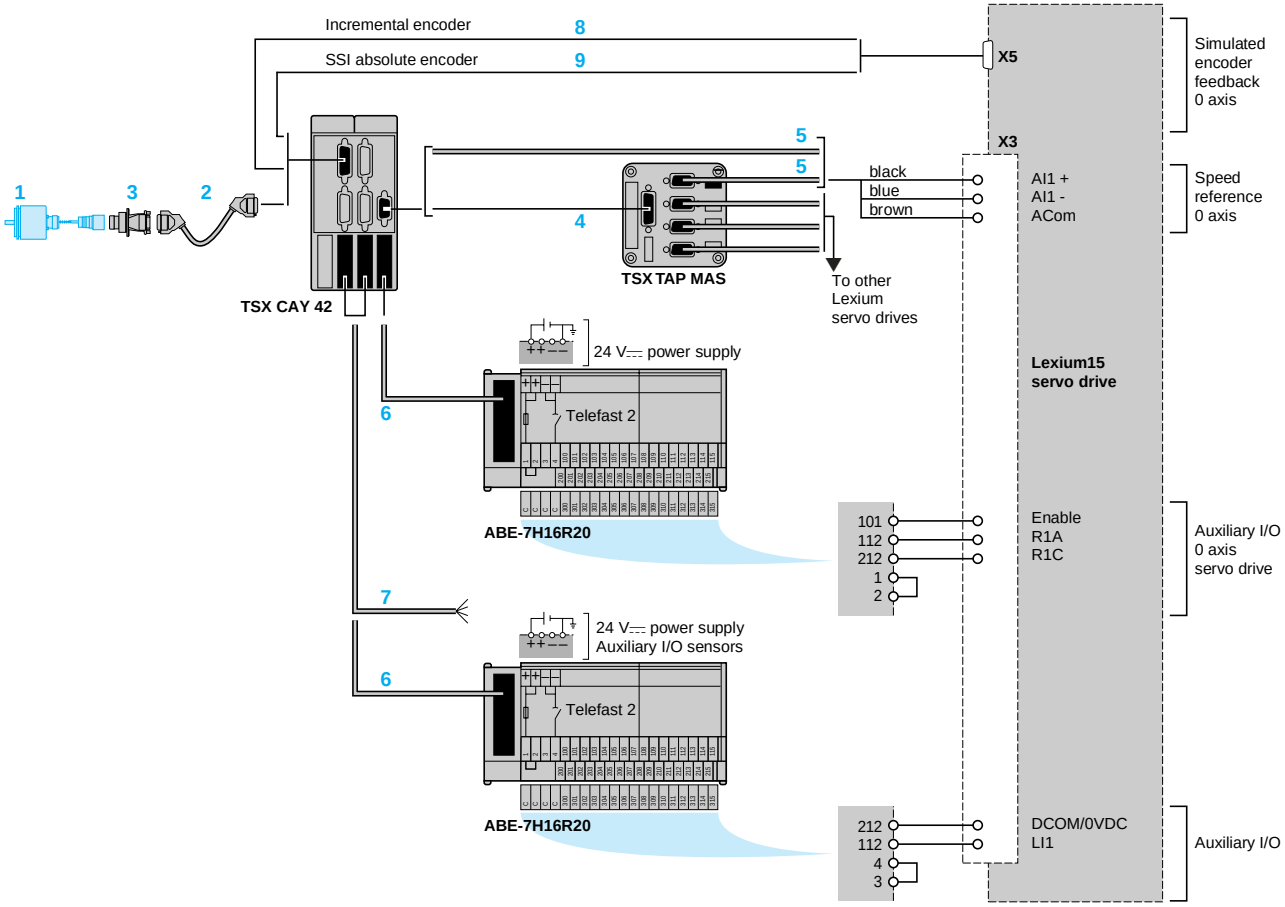
TSX CDP ●●3



TSX CDP ●01

Lexium 15 motion control
TSX CAY motion control modules for servo motors

Example of Lexium 15 servo drive connection for BDH/BSH servo motor



1 Absolute/incremental encoder
2 TSX CCP S15●●● fitted cable (encoder feedback)
3 TSX TAP S15 05 connector
4 TSX CXP 213/613 fitted cable
5 TSX CDP 611 fitted sector
6 TSX CDP●●3 fitted cable
7 TSX CDP●01 fitted sector
8 TSX CXP 235/635 fitted cable (simulated incremental encoder feedback)
9 TSX CXP 245/645 fitted cable (simulated SSI absolute encoder feedback)

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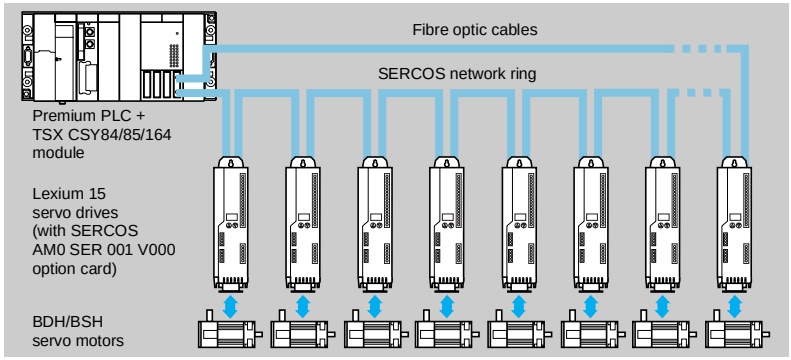
Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

Presentation



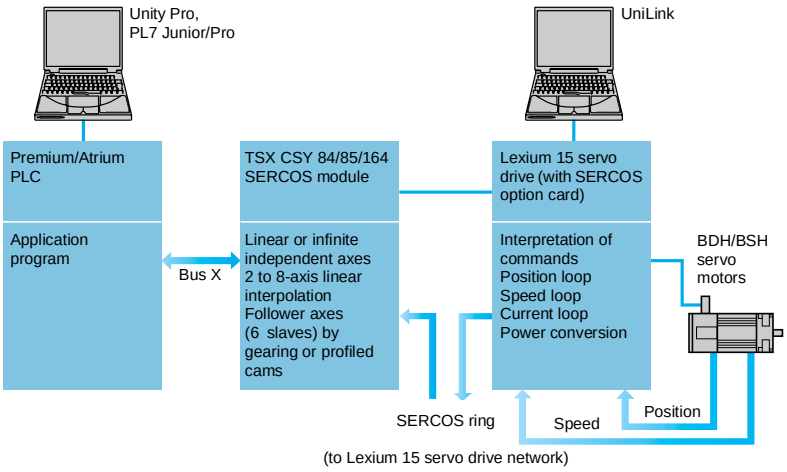
SERCOS (SERiaI COmmunication System) is a communication standard which defines the digital link (exchange protocol and medium) between a motion control module and servo drives. This is defined in European standard EN 61491.
The use of SERCOS distributed architecture allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the servo drives, thus reducing connection costs. The fibre optic digital link permits high speed exchanges (2 or 4 Mbps) while ensuring a high level of immunity in disturbed industrial environments.

The SERCOS range in the Premium automation platform consists of:
■ TSX CSY 84/85/164 axis control modules *(1)* which can each control up to 8 servo drives (TSX CSY 84/85) and 16 servo drives (TSX CSY 164) via a SERCOS ring. The module calculates the path and the interpolation for several axes (position mode). Access to the other modes (speed and torque) is possible with the assistance of Schneider Electric application services.
■ 1.5 A to 70 A permanent Lexium 15 servo drives (fitted with SERCOS option card). The servo drives manage the position loop, speed loop and torque loop, and ensure power conversion to control the servo motor. The sensor feedback information is sent to the servo drive (current position, current speed).
■ BDH and BSH servo motors. The motors feature permanent magnets delivering a high power-to-weight ratio, resulting in excellent dynamic speed response in a compact unit.
The Lexium 15 range offers all the accessories required (line chokes, braking resistors, etc.) as well as a full set of connectors.

(1) The TSX CSY 85 module also supports path functions using the TjE path editor software.

System overview

The system overview shows the various functions performed by the different parts of the multi-axis control system.



Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

System overview (continued)

PL7 Junior/Pro or Unity Pro software via the Premium platform terminal port can be used to:
- Declare SERCOS TSX CSY 84/85/164 modules in the PLC configuration.
- Configure the functions and define the parameters for the axes used.
- Program the movements in the PLC application.
- Adjust the parameters via the operating codes (parameters, TSX CSY module and Lexium 15 servo drive with SERCOS option card).
- Test and debug the application.

Unilink software, via the Lexium 15 servo drive's RS 232 terminal port (with SERCOS option card) can be used to:
- Define types of Lexium 15 servo drive (with SERCOS option card) and BDH/BSH servo motor.
- Adjust the parameters for Lexium 15 servo drives (with SERCOS option card), back them up in the servo drive EEprom memory and save them on a compatible PC.

Description

TSX CSY 84/164

TSX CSY 85

The SERCOS TSX CSY 84/85/164 axis control modules comprise:
1 An SMA-type connector, marked TX, for connecting the servo drives using the SERCOS ring fibre optic transmission cable.
2 An SMA-type connector, marked RX, for connecting the servo drives using the SERCOS ring fibre optic reception cable.
3 Double format rigid casing, in order to:
- Support electronic cards.
- Attach and lock the module in its slot.

4 Module diagnostics LEDs:
- RUN LED (green): LED ON indicates module operating correctly.
- SER LED (yellow): flashing LED indicates data transmission and reception on the SERCOS network.
- ERR LED (red):
  - LED ON indicates internal module fault.
  - flashing LED on module start up indicates communication fault, incompatible configuration or application missing.
- I/O LED (red): LED ON indicates external fault or application fault.
- INI LED (yellow): flashing LED indicates module reinitializing.

5 Channel diagnostic LEDs (green): LED ON indicates axis operating normally; OFF: configuration fault; flashing: serious error on axis:
- 1 to 8: display of 8 real axes *(1)*.
- 9 to 12: display of 4 imaginary axes *(1)*.
- 13 to 16: display of 4 remote axes *(1)*.
- 17 to 20: display of 4 coordinated sets.
- 21 to 24: display of 4 follower sets.

6 A pencil point button to reinitialize the module.
7 Two mini DIN type 8-way connectors for Schneider Electric use.

*(1) 1 to 16: display of 16 axes (real, imaginary or remote) with module **TSX CSY 164**.*

Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

Electrical characteristics

Module type			TSX CSY 84	TSX CSY 85	TSX CSY 164
SERCOS network:	Type		Industrial support complying with standard EN 61491		
	Topology		Ring		
	Medium		Fibre optic cable		
	Rate		4 Mbps by default		
	Cycle time *(1)* (independent axes)	**ms**	2 axes: 2	4 axes: 2	8 axes: 4 / 2/4/8 axes: 2 / 12 axes: 3 / 16 axes: 4
	Max. number of segments		9		17
	Length of segment	**m**	38 max. with plastic fibre optic cable, 150 max. with glass fibre optic cable		
Bus X	Distance	**m**	100 max. *(2)* between TSX CSY 84/85/164 axis control module and Premium processor		
SERCOS certification			TSX CSY 84/164 modules comply with SERCOS IEC/EN 61491 certification and with the tests defined by IGS (SERCOS Interest Group). Certification no. Z00030		
Power consumption for 5 V⎓ voltage		**A**	1.8		
Power dissipated in the module		**W**	9 (typical)		

Operating characteristics

Module type			TSX CSY 84	TSX CSY 85	TSX CSY 164
Number of channels			32 configurable channels (0 to 31), channel 0 used for SERCOS ring configuration		
Type of axes	Real axes (connected to a servo drive)		8 (channels 1 to 8)		16 (channels 1 to 16) may be dynamically configured as real axes, imaginary axes or external encoders
	Imaginary axes		4 (channels 9 to 12)		
	Remote axes *(3)*		4 (channels 13 to 16)		
Set of axes			4 coordinated (channels 17 to 20) Each set allows simple linear interpolation of 2 to 8 axes		
			4 followers (channels 21 to 24) Each set can have up to 7 axes: 1 master/6 slaves in gearing or camming mode		
Cam profile			7 (channels 25 to 31). Used to create the electronic cams with linear or cubic interpolation between profile points		
Path functions			Simple linear paths, following of auxiliary axes	Linear paths: - with 3° or 5° polynomial links. - with circular link on 2 axes. Circular path TjE path editor software for sets of 2 or 3 axes	Simple linear paths, following of auxiliary axes

(1) 4 ms default value. Values may be programmed according to the number of axes.
*(2) Without use of the **TSX REY 200** bus X remote module.*
(3) Determine external position using an encoder connected to the servo drive position input.

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Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

Main functions of TSX CSY 84/85/164 modules

Programming	Movements	Homing, absolute, relative or continuous Immediate movement, or queued, to a given position Speed override possible Acceleration and deceleration parameters may be set for each axis motion control Synchronization on start or desynchronization on stop for a slave axis on a master axis in a given position Rollover counter
	Special functions	Position capture and distance measurement between two edges on one or two logic inputs on the servo drive. This can be applied to the real or remote axis (position measurement via external sensor) Count probe: counts the edges on a logic input on the servo drive over a period of time Fast index: starts a movement on an event Registration move: position capture on an edge of the logic input on the servo drive Rotary knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a logic output on the servo drive
	Other special functions	It is possible to develop all other special functions with the assistance of our application services. Please consult our Regional Sales Offices.
	Stop/start functions	Fast stop, stop on configured deceleration profile Temporary stop Restart of stopped movement Choice of stop method: ■ on faulty slave: master is not stopped. Master stops normally according to pre-determined deceleration ramp or servo-driven master emergency stop ■ on faulty master: slave stops normally according to pre-determined deceleration ramp or servo-driven slave emergency stop On Emergency Stop: calculation of slave axis deceleration ramp alignment with master axis to obtain synchronized stopping of all axes in the set On Emergency Stop: axes may be allowed to "freewheel" or may be stopped according to a pre-determined ramp
Configuration and adjustment	SERCOS ring	Bus cycle time, traffic on the bus, optical power on the fibre, SERCOS loop diagnostics
	Acceleration/deceleration	Ramp values, ramp type (rectangular, triangular and trapezoid), choice of units, maximum acceleration adjustment
	Speed	Speed units, default speed, maximum speed, speed override
	Other settings	Target window, rollover, software limits
	Set of follower axes	Following of master axis by gearing or camming (cam profile), threshold position of master triggers the following, bias value when synchronizing an axis, monitoring of master/slave positions, master offset for follower axis
	Set of coordinated axes	Type of interpolation: linear
	Cam profile	Values of an existing point of a cam profile, number of points (5000 max.), type of interpolation, table addresses
	State of a movement or axis	Moving, accelerating, decelerating, homing, in position, faulty, etc.
	Diagnostics	Servo drive fault, axis currently reading data, following error, overvoltage, undervoltage, overcurrent, power supply fault Availability of follower axis fault information for a given axis set Multi-axis motion path control according to a common tolerance for all axes in the motion, with alarm feature. Only available with the TSX CSY 164 module

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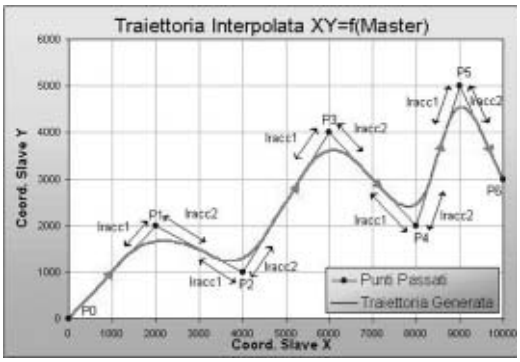
Lexium 15 motion control
SERCOS TSX CSY 84/85/164
motion control modules

Functions specific to the TSX CSY 85 module

Path creation using TjE editor



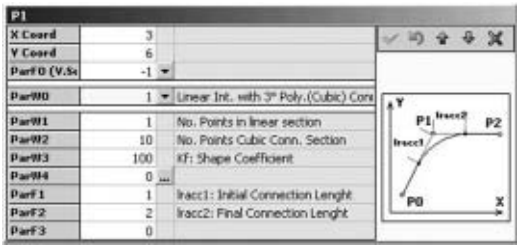
All paths, whether simple or complex, are divided into linear or circular segments linked by interpolation laws of 6 possible types. Each segment is characterized by:
- The X and Y coordinates of the point to be reached (in the example on the left, P6) or "tangented" (P1, P2,....P5)
- The movement speed, maximum or limited according to setpoint (parameter "ParF0", see screens below):
- The type of interpolation (parameter "ParW0", see screens below)
- The number of points in the linear segment (min. 1 point)
- The number of points in the cubic interpolation part of the segment
- Various other parameters depending on the type of interpolation

Linear interpolation

This type of interpolation is used to create a rectilinear path between the preceding point P_{i-1} and point P_i defining the segment. The various parameters below are used as follows:
- "ParW1" indicates the number of points in the linear segment. The number of points represents the number of intermediate points that the TSX CSY 85 motion control module must calculate to define the path on the segment (minimum 1).
- "ParW4" is used to indicate that the movement of a third axis will follow the path (here, a linear segment) using the tangential mode: positioning according to a constant angle with the path *(1)*.

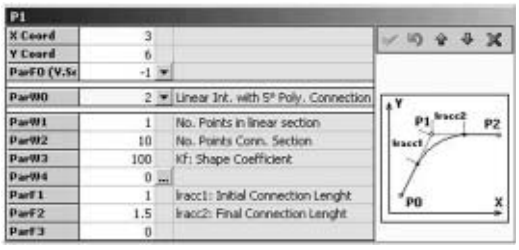
(1) Available in the future version of the TjE software.

Linear interpolation with 3° polynomial interpolation connection



This type of interpolation is used to create a curve between two linear segments in accordance with a 3° interpolation in order to smooth the transitions. The path no longer passes through the defined point P_i (in the example on the left, P1) but follows a curve defined by the following parameters:
- "ParW2" indicates the number of points in the cubic interpolation part (curve)
- "ParW3" defines the shape coefficient of the cubic interpolation enabling the curve to move closer to or further from the defined point P_i
- "Iracc1" and "Iracc2" correspond to the initial and final connection lengths. If these lengths are too great, maximum lengths are calculated by the TSX CSY 85 motion control module as a function of the previous section for Iracc1 and of the following section for Iracc2.

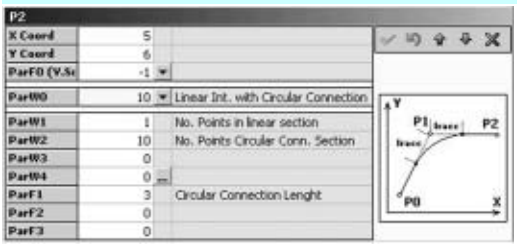
Linear interpolation with 5° polynomial interpolation connection



This type of 5° polynomial interpolation is used to define a path in the same way as that using 3° polynomial interpolation.

Nonetheless, compared to a 3° interpolation, 5° interpolation ensures more flexible movement.
If the acceleration limit in the segment in question is reached, however, the speed on the segment can be reduced for this type of connection.

Linear interpolation with circular interpolation connection



This type of interpolation is used to link segments via a circular path (circle arcs or full circles). The specific parameters defining this type of path are:
- "ParW2" indicates the number of points in the circular interpolation part
- "ParW4" defines whether the arc is greater or less than 180° (defining the arc direction)
- "ParF1" corresponds to the length of the circular interpolation segment

Circular interpolation is only possible for a movement in a plane involving only 2 axes.

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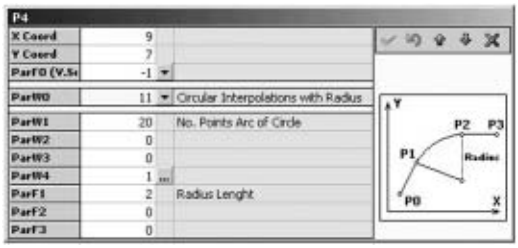
Functions specific to the TSX CSY 85 module (continued)

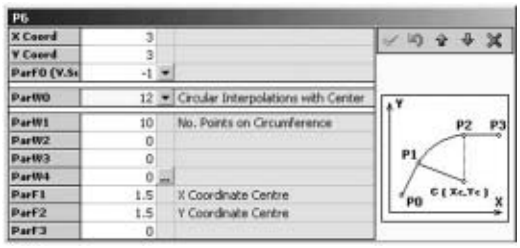
Circular interpolation according to radius



This type of interpolation is used to connect segments via a circular path (circle arcs) by specifying the start and end points, the circle radius and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:
- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" corresponds to the radius of the circle arc

Circular interpolation according to radius:
- Is only possible for a movement in a single plane (2 axes only)
- Cannot be used to create paths in a full circle (to do this, use linear interpolation with connection according to circular interpolation)

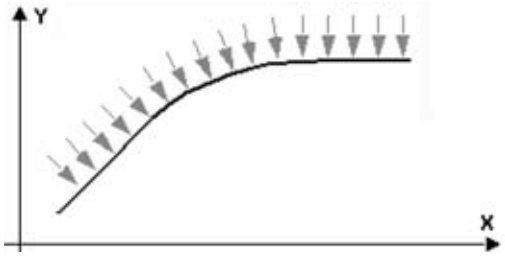
Circular interpolation according to centre



This type of interpolation is also used to connect segments by a circular path (circle arcs or full circles) by specifying the start and end points, the circle centre coordinates and the path direction (clockwise or counter-clockwise). The specific parameters defining this type of path are:
- "ParW1" indicates the number of points in the circle arc
- "ParW4" defines the path direction (clockwise or counter-clockwise)
- "ParF1" indicates the abscissa of the centre of the circle (X)
- "ParF2" indicates the ordinate of the centre of the circle (Y)

Full circular movement is defined as the end point being the same as the start point.
Circular interpolation is only possible for a movement in a single plane (2 axes only).

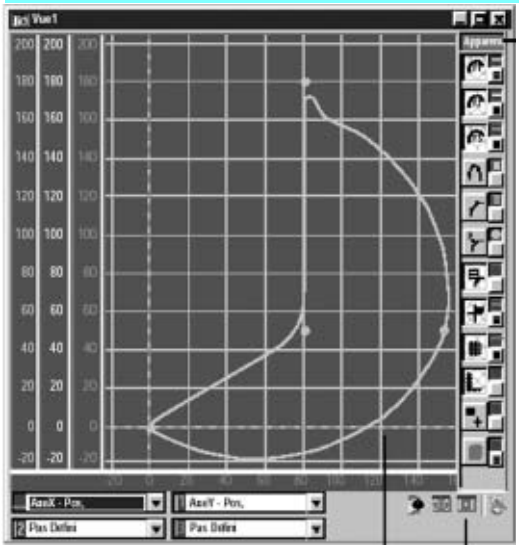
Tangential axis interpolation



Tangential axis interpolation applied to a third angular axis is used to enable it to follow the path defined by the first two axes according to a constant and controlled angle.
Tangential mode will be fully available in a future version.

This version V1.0 of the TSX CSY 85 module, however, offers functions for creating tangential mode using the PL7 application.

TjE path editor software



The TjE path editor software supplied with the SERCOS TSX CSY 85 motion control module is used in offline mode to:
- Create master/slave axes and axis sets for use in the paths with a maximum of 3 sets of 2 real axes or 2 sets of 3 axes.
- Each slave axis requires a cam profile selected from the 7 profiles available in the TSX CSY 85 module (with a limit of 10,000 cam points for all the profiles).
- Define paths by setting the parameters for each segment which are linked to the various possible interpolations described in pages 78 and 79.

The TjE software validates all the parameters and calculates the paths for each set of axes.

Path display

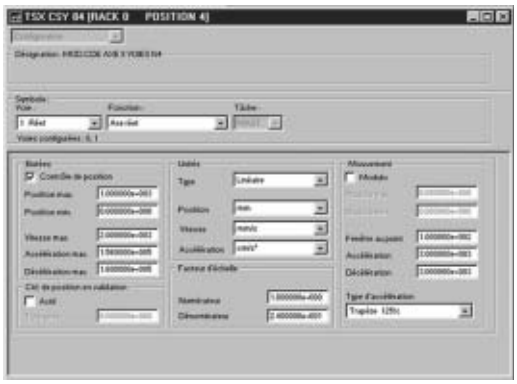
The TjE software integrates different graphic tools for displaying the previously created paths and the relevant data linked to the axes (making up the paths) with their positions, speeds and accelerations. The paths can be displayed with:
- A choice of curves, colours and scaling
- A choice of scales and offsets
- Display of segment reference points
- Display of points of the master, and calculated points of cam profiles

This display enables the user to validate the paths before transferring all the data thus generated to the PL7 Junior/Pro application managing the SERCOS TSX CSY 85 motion control module(s).

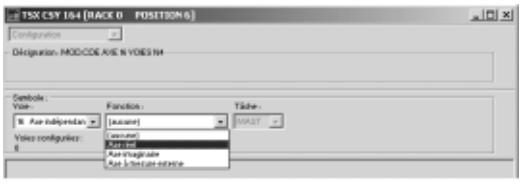
*(1) Maximum 8 real axes per **TSX CSY 85** module.*

Lexium 15 motion control
SERCOS TSX CSY 84/85/164
motion control modules

Software setup of TSX CSY 84/85/164 modules

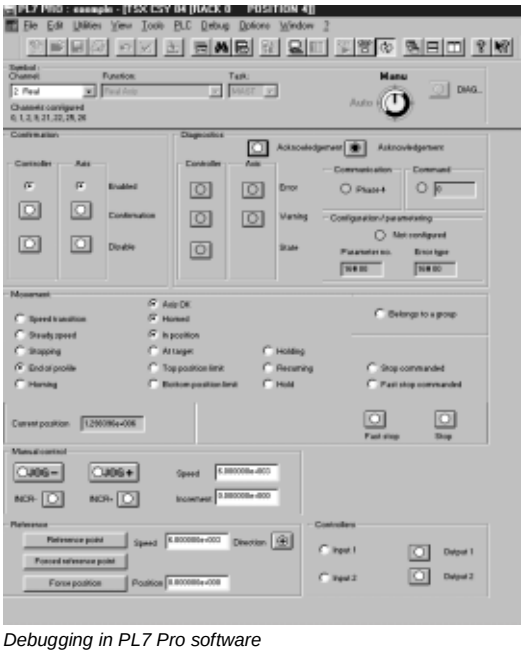


Module configuration



Declaring the axes of the TSX CSY 164 module

Setting the axis parameters



Debugging in PL7 Pro software

When setting up application-specific functions, screens specific to SERCOS motion control functions can be accessed via Unity Pro or PL7 Junior/Pro software, for configuration, adjustment, debugging and documentation of applications. These services are performed by editors which can be directly accessed from the basic screen using icons in the toolbars. Windows relating to the editors can be simultaneously displayed on one screen (example: it is possible to program using the program editor and to simultaneously define the symbols in the variables editor).

Declaring the SERCOS motion control modules
Parameter entry for application-specific functions is accessed via the configuration screen, by clicking on the slot occupied by the module.

Configuring the module
The configuration editor provides assistance with entering and modifying the values of the various axis configuration parameters. These parameters enable the operation of the axis control module to be adapted to the machine which is to be controlled.
The axes configuration parameters are:
- Units of measurement
- Resolution
- Maximum and minimum limit positions
- Maximum speed
- Accelerating/decelerating

This data relates to the machine and cannot be modified by the program.

The configuration screen as shown here can be used to declare the 16 axes as real, imaginary or remote measurement axes in the TSX CSY 164 module.

Adjusting the modules
These parameters are associated with operation of the axes. They generally require the operations on and movements of the moving part to be known. These parameters are adjusted in online mode (they are initialized during configuration, in offline mode). They include:
- Maximum speed
- Resolution
- Servo control parameters
- Accelerating/decelerating

Debugging the modules
In online mode, the debugging tool provides the user with a control panel screen, giving a quick display which can be used to control and observe the behaviour of the axis.

The TSX CSY 84/85/164 modules associated with the Unity Pro or PL7 Junior/Pro software provides manual mode for running continual (JOG) or incremental (INC) motion commands without prior programming.

Presentation: page 74 | Characteristics: pages 76 and 77 | References: page 81 | Connections: page 81

Lexium 15 motion control
SERCOS TSX CSY 84/85/164 motion control modules

References (1)

TSX CSY 84/164

TSX CSY 85

TSX CSY 84/85/164 multi-axis control modules have 32 application-specific channels which are only counted they are configured in the Premium PLC application (using PL7 Junior/Pro or Unity Pro software). The maximum number of application-specific channels allowed depends on the type of processor:

Type of processor or slot PLC	TSX 57 1●	TSX 57 2● PCX 57 20 PCI 57 20	TSX 57 3● PCX 57 35 PCI 57 35	TSX 57 4●	TSX 57 5●
Max. number of application-specific channels	8	24	32	64	64

Motion control modules

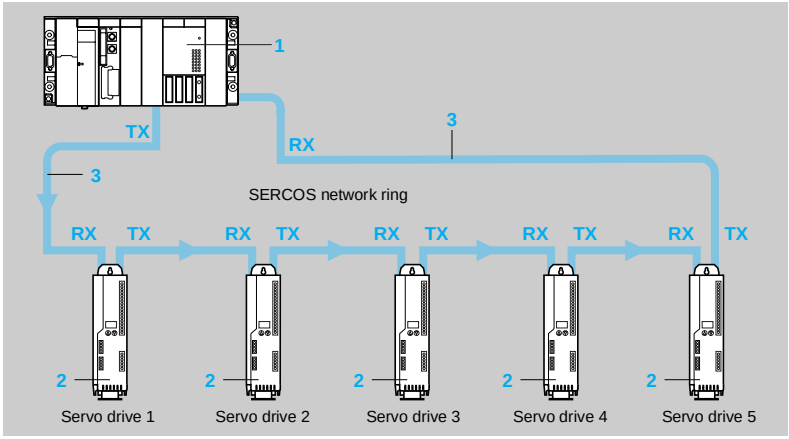
Description	Functions	Number of axes	Reference	Weight kg
Multi-axis control modules	SERCOS digital servo drives control	8 real axes 4 imaginary axes 4 remote axes	**TSX CSY 84**	0.520
		8 real axes 4 imaginary axes 4 remote axes TjE path creation function	**TSX CSY 85**	0.520
		16 axes (real, imaginary or remote)	**TSX CSY 164**	0.520

Fibre optic connection cables

Description	Connection	Length	Reference	Weight kg
Plastic fibre optic cables fitted with SMA-type connectors (curvature radius: 25 mm min.)	Lexium 15 servo drive (with SERCOS option card)	0.3 m	**990 MCO 000 01**	0.050
		0.9 m	**990 MCO 000 03**	0.180
		1.5 m	**990 MCO 000 05**	0.260
		4.5 m	**990 MCO 000 15**	0.770
		16.5 m	**990 MCO 000 55**	2.830
		22.5 m	**990 MCO 000 75**	4.070
		37.5 m	**990 MCO 001 25**	5.940

Connections

SERCOS ring with five Lexium 15 servo drives (example)



1 **TSX CSY 84/85/164**: multi-axis motion control module for Premium PLC.
2 **LXM 15●●M3/N4/N4X**: Lexium 15 servo drives fitted with the SERCOS AM SER 001V000 option card, see page 38.
3 **990 MCO 000 ●●**: plastic fibre optic cables fitted with SMA-type connectors.
TX Transmission
RX Reception

(1) To order other accessories please consult our "Automation platform Modicon Premium and Unity - PL7 software" specialist catalogue

Presentation: page 74
Characteristics: pages 76 and 77
Functions: pages 78 to 80

Lexium 15 motion control
BDH servo motors

105999

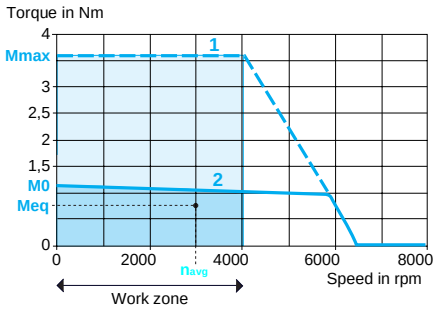
BDH servo motor

Presentation

Thanks to the advanced technology incorporated into their design, BDH servo motors represent a compact and high-performance solution for your machines, offering one of the best torque/size ratios available on the market.
7 flange sizes and multiple winding possibilities mean that these servo motors can be sized to match the requirements of each application. This product offer covers a torque range of between 0.18 Nm to 53 Nm for speeds from 10,000 to 8000 rpm.

The BDH servo motors come in 7 flange sizes available in IEC or NEMA mounting: 40, 58, 70, 88, 108, 138 and 188 mm. They are fitted as standard with angled connectors, with the exception of the 40 mm flange size which is supplied with remote straight connectors. Thermal protection is provided by a PTC probe integrated into the servo motor.
They are certified as "Recognized" by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BDH servo motors are available with the following variants:
- IP 54 or IP 67 degree of protection
- with or without holding brake
- resolver, SinCos Hiperface® single turn or multiturn encoder
- untapped or keyed shaft end
- IEC or NEMA mounting



Torque/speed characteristics

The BDH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed
- M_{max} (in Nm) represents the peak stall torque value
- M_{max} (in Nm) represents the continuous stall torque value

Principle for determining servo motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed
2 Verify, using the motor cycle diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 146)
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone

Note: *Sizing of servo motors, see page 146*

Functions

General functions

BDH servo motors have been developed to meet the following requirements:
- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: 5...40°C in compliance with EN 50178 climatic class 3K3. Maximum 50°C with derating from 40°C of 1 % per additional °C
- Relative humidity: 95% without condensation in compliance with EN 50178 climatic class 3K3
- Altitude: 1000m without derating, 2000m with k = 0.94 *(1)*, 3000m with k = 0.83
- Storage and transport temperature: - 25...55°C in compliance with EN 50178 climatic class 1K4
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN 57530
- Power and sensor connection using angled connectors (with the exception of the 40 mm flange size supplied with remote straight connectors)
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium 15 servo drive

(1) k: derating factor

Characteristics: pages 84 to 129
References: pages 130 to 133
Dimensions: pages 134 to 137

Functions (continued)

General functions (continued)

- Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
- Flange compliant with standard DIN 42948
- Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
- Opaque black lacquer paint RAL 9005
- Degree of protection:
  - of the frame: IP 65 in accordance with IEC/EN 60529
  - of the shaft end: IP 54 or IP 67 in accordance with IEC/EN 60529
- Integrated sensor: resolver, SinCos Hiperface® high resolution single turn or multiturn encoder
- Untapped or keyed shaft end in standard sizes (according to DIN 748)

Holding brake (depending on model)

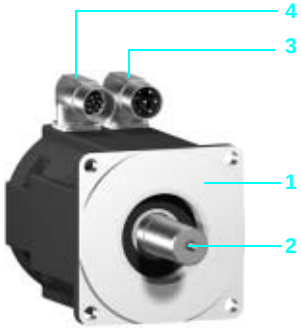
The integrated brake fitted to the BDH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in position sensor

The servo drive is fitted, depending on the model, with a position sensor which can be:
- A 2-pole resolver providing angular precision of the shaft position, accurate to less than ±30 arc minutes.
- A SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

These sensors perform the following functions:
- Give the angular position of the rotor in such a way that flows can be synchronized
- Measure the motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
- Measure the position information for the Lexium servo drive position controller, if necessary
- Measure and transmit position information in incremental or absolute format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive).



Description

BDH servo drives with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:

1. An axial flange with 4 fixing points in accordance with standard DIN 42948
2. Standard shaft end according to DIN 748, untapped or keyed (depending on the model)
3. An angled dust and damp-proof male screw connector for connecting the power cable (with the exception of the 40 mm flange size supplied with remote straight connectors)
4. An angled dust and damp-proof male screw connector for connecting the control (sensor) cable (with the exception of the 40 mm flange size supplied with remote straight connectors)

Connecting cables must be ordered separately, see pages 132 and 133.

Schneider Electric has taken particular care to ensure compatibility between BDH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 132 and 133).

Lexium 15 motion control
BDH servo motors

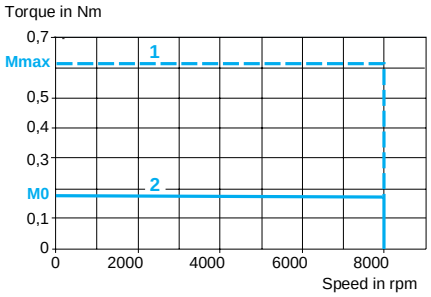
Characteristics of BDH 0401B/0402C servo motors

Type of servo motor				BDH 0401B		BDH 0402C	
Associated with Lexium 15 servo drive				LXM 15LD13M3		LXM 15LD13M3	
Line supply voltage			**V**	230 single phase	230 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.18		0.31	
	Peak stall	M_{max}	**Nm**	0.609		1.08	
Nominal operating point	Nominal torque		**Nm**	0.17		0.28	
	Nominal speed		**rpm**	8000			
Maximum current			**A rms**	0.82		1.06	
Servo motor characteristics							
Maximum mechanical speed			**rpm**	8000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.16		0.21	
	Back emf		**V_{rms}/krpm**	10.2		13.3	
Rotor	Number of poles			6			
	Inertia Without brake	J_m	**kgcm²**	0.017		0.031	
	With brake	J_m	**kgcm²**	–			
Stator (at 20°C)	Resistance (phase/phase)		Ω	20.2		12,4	
	Inductance (phase/phase)		**mH**	12,5		9.10	
	Electrical time constant		**ms**	0.62		0.73	
Holding brake (according to model)				See page 138			

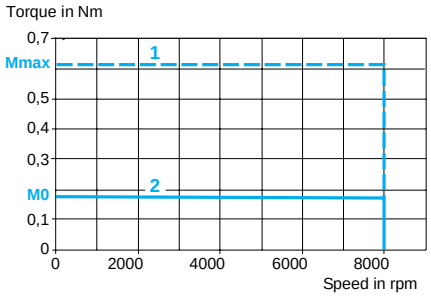
Torque/speed curves

BDH 0401B servo motor

With LXM 15LD13M3 servo drive
230 V single phase

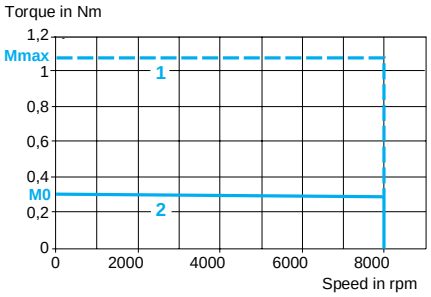


With LXM 15LD13M3 servo drive
230 V 3-phase

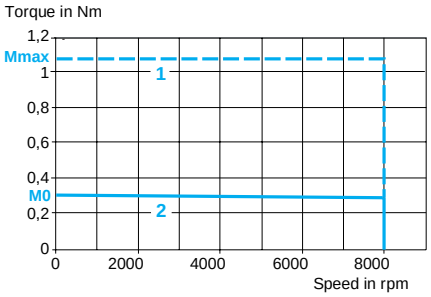


BDH 0402C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

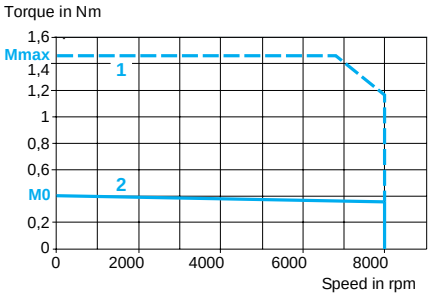
Characteristics of BDH 0403C servo motors

Type of servo motor				**BDH 0403C**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.41	
	Peak stall	M_{max}	**Nm**	1.46	
Nominal operating point	Nominal torque		**Nm**	0.36	
	Nominal speed		**rpm**	8000	
Maximum current			**A rms**	1.04	
Servo motor characteristics					
Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.28	
	Back emf		**V_{rms}/krpm**	17.9	
Rotor	Number of poles			6	
	Inertia Without brake	J_m	**kgcm²**	0.045	
	With brake	J_m	**kgcm²**	–	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	13.5	
	Inductance (phase/phase)		**mH**	10.3	
	Electrical time constant		**ms**	0.76	
Holding brake (according to model)				See page 138	

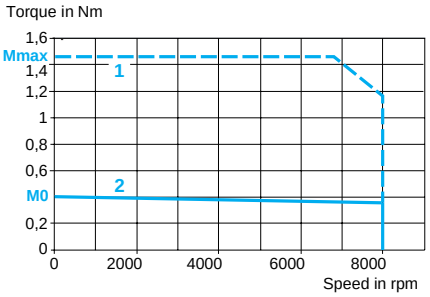
Torque/speed curves

BDH 0403C servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

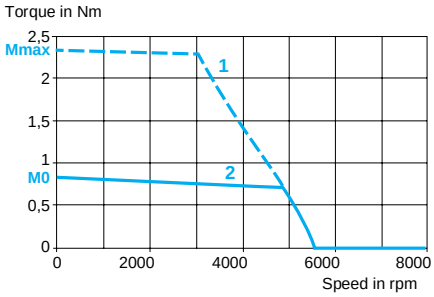
Characteristics of BDH 0582C/0582E servo motors

Type of servo motor				BDH 0582C			BDH 0582E	
Associated with Lexium 15 servo drive				LXM 15LU60N4			LXM 15LD13M3	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.84			0.87	
	Peak stall	M_{max}	**Nm**	2.34			2.42	
Nominal operating point	Nominal torque		**Nm**	0.78	0.72	0.69	0.71	
	Nominal speed		**rpm**	3120	6240	7680	6880	
Maximum current			**A rms**	3.95			7.7	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.61			0.32	
	Back emf		**V_{rms}/krpm**	39			20.4	
Rotor	Number of poles			6				
	Inertia	Without brake J_m	**kgcm²**	0.16				
		With brake J_m	**kgcm²**	0.171				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	19.4			5.09	
	Inductance (phase/phase)		**mH**	35.5			9.7	
	Electrical time constant		**ms**	1.83			1.91	
Holding brake (according to model)				See page 138				

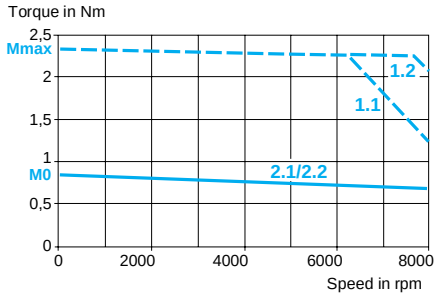
Torque/speed curves

BDH 0582C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

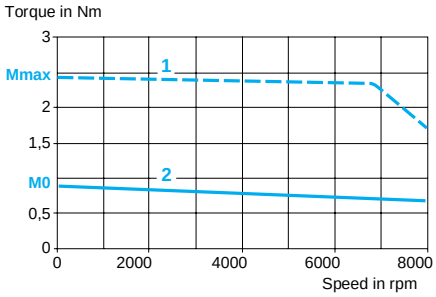


With LXM 15LU60N4 servo drive
400/480 V 3-phase

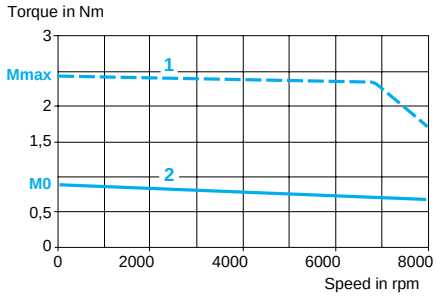


BDH 0582E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0583C servo motors

Type of servo motor				**BDH 0583C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.13		
	Peak stall	M_{max}	**Nm**	3.2		
Nominal operating point	Nominal torque		**Nm**	1	0.87	0.82
	Nominal speed		**rpm**	2400	4880	6000
Maximum current			**A rms**	3.95		

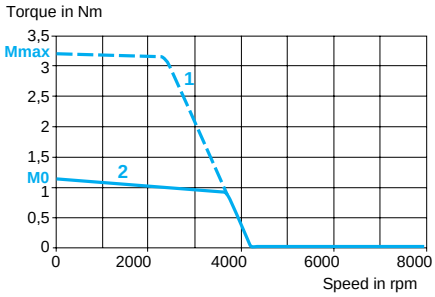
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.8
	Back emf		**V_{rms}/krpm**	51.8
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.22
		With brake J_m	**kgcm²**	0.231
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	20.3
	Inductance (phase/phase)		**mH**	40.7
	Electrical time constant		**ms**	2
Holding brake (according to model)				See page 138

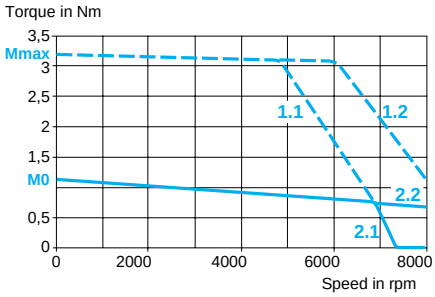
Torque/speed curves

BDH 0583C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0583D servo motors

Type of servo motor				**BDH 0583D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.16				
	Peak stall	M_{max}	**Nm**	3.58				
Nominal operating point	Nominal torque		**Nm**	1.06	1.05	1.06	0.94	
	Nominal speed		**rpm**	4080			7680	8000
Maximum current			**A rms**	6.22				

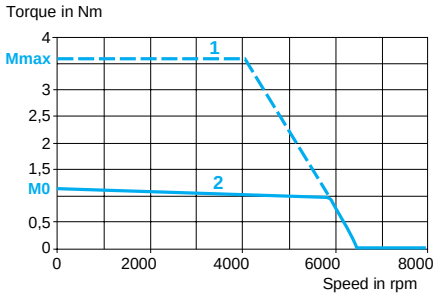
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.52
	Back emf		**V_{rms}/krpm**	33.8
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.22
		With brake J_m	**kgcm²**	0.231
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.36
	Inductance (phase/phase)		**mH**	17.3
	Electrical time constant		**ms**	2.07
Holding brake (according to model)				See page 138

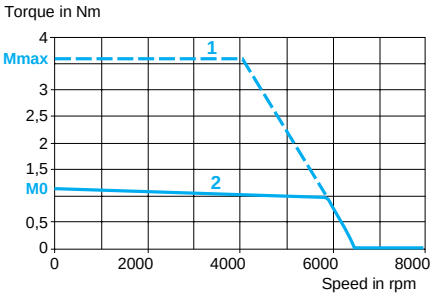
Torque/speed curves

BDH 0583D servo motor

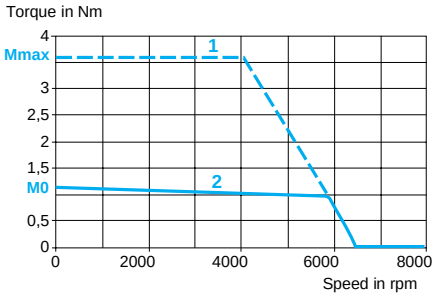
With LXM 15LD13M3 servo drive
230 V single phase



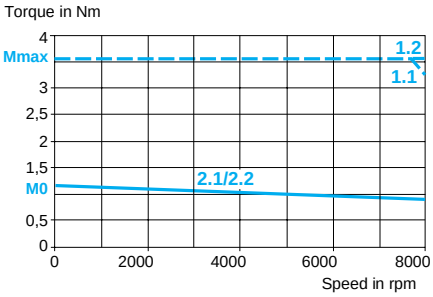
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

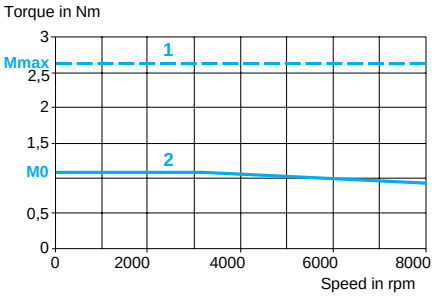
Characteristics of BDH 0583F/0584C servo motors

Type of servo motor				**BDH 0583F**		**BDH 0584C**		
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.08	1.18	1.38		
	Peak stall	M_{max}	**Nm**	2.62	3.52	3.94		
Nominal operating point	Nominal torque		**Nm**	0.92		1.28	1.18	1.13
	Nominal speed		**rpm**	8000		2000	4080	5120
Maximum current			**A rms**	12.16		4.03		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.27		0.97		
	Back emf		**V_{rms}/krpm**	17.6		62.4		
Rotor	Number of poles			6				
	Inertia Without brake	J_m	**kgcm²**	0.22		0.27		
	With brake	J_m	**kgcm²**	0.231		0.281		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.23		20.4		
	Inductance (phase/phase)		**mH**	4.68		43.8		
	Electrical time constant		**ms**	2.10		2.15		
Holding brake (according to model)				See page 138				

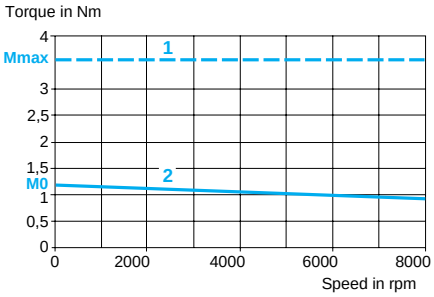
Torque/speed curves

BDH 0583F servo motor

With LXM 15LD21M3 servo drive
230 V single phase

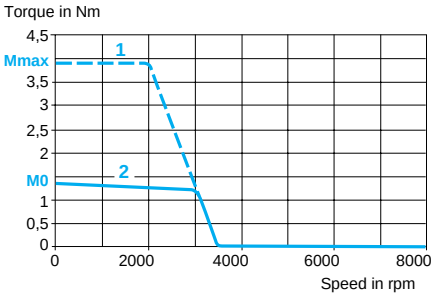


With LXM 15LD21M3 servo drive
230 V 3-phase

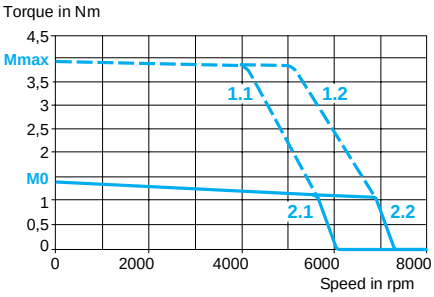


BDH 0584C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 0584D servo motors

Type of servo motor				**BDH 0584D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.41				
	Peak stall	M_{max}	**Nm**	4.4				
Nominal operating point	Nominal torque		**Nm**	1.18			1	0.92
	Nominal speed		**rpm**	3520			6640	8000
Maximum current			**A rms**	6.22				

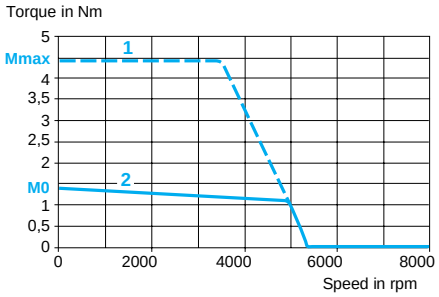
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	0.63
	Back emf		**V_{rms}/krpm**	40.8
Rotor	Number of poles			6
	Inertia	Without brake J_m	**kgcm²**	0.27
		With brake J_m	**kgcm²**	0.281
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.4
	Inductance (phase/phase)		**mH**	18.7
	Electrical time constant		**ms**	2.23
Holding brake (according to model)				See page 138

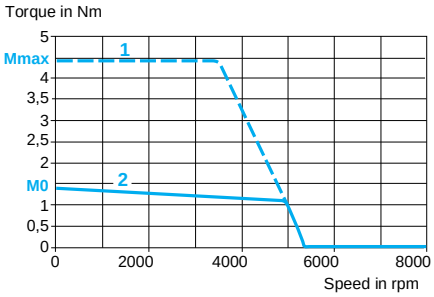
Torque/speed curves

BDH 0584D servo motor

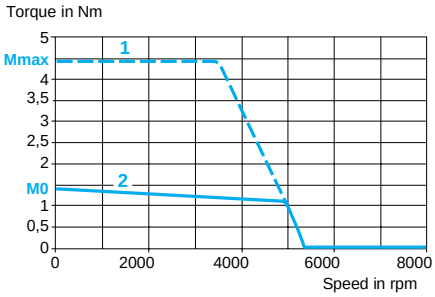
With LXM 15LD13M3 servo drive
230 V single phase



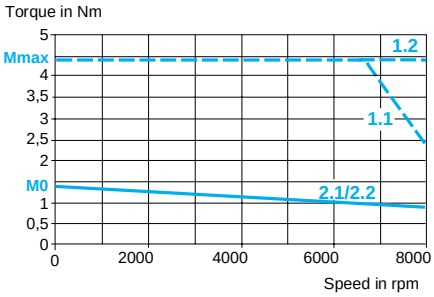
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0584F servo motors

Type of servo motor				**BDH 0584F**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.42	
	Peak stall	M_{max}	**Nm**	3.57	4.46
Nominal operating point	Nominal torque		**Nm**	1.06	1.03
	Nominal speed		**rpm**	6000	6560
Maximum current			**A rms**	11.03	

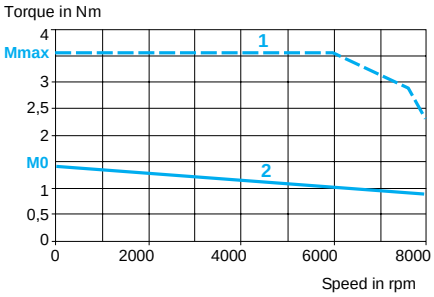
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.36	
	Back emf		**V_{rms}/krpm**	23.4	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.27	
		With brake J_m	**kgcm²**	0.281	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.77	
	Inductance (phase/phase)		**mH**	6.16	
	Electrical time constant		**ms**	2.22	
Holding brake (according to model)				See page 138	

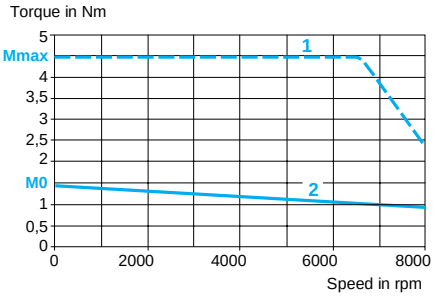
Torque/speed curves

BDH 0584F servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Lexium 15 motion control
BDH servo motors

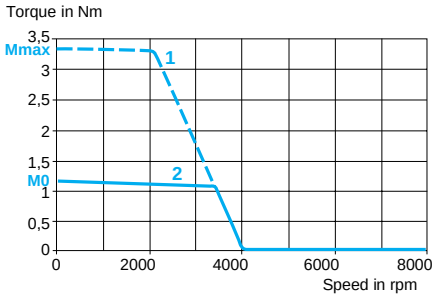
Characteristics of BDH 0701C/0701E servo motors

Type of servo motor				BDH 0701C			BDH 0701E	
Associated with Lexium 15 servo drive				LXM 15LU60N4			LXM 15LD13M3	
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 single phase	230 3-phase
Torque	Continuous stall	M_0	Nm	1.15			1.2	
	Peak stall	M_{max}	Nm	3.34			3.24	
Nominal operating point	Nominal torque		Nm	1.09	1.04	1	1.2	
	Nominal speed		rpm	2080	4320	5360		
Maximum current			A rms	3.89			8.48	
Servo motor characteristics								
Maximum mechanical speed			rpm	8000				
Constants (at 120°C)	Torque		Nm/A rms	0.85			0.41	
	Back emf		V_{rms}/krpm	54.5			26.1	
Rotor	Number of poles			8				
	Inertia	Without brake J_m	kgcm²	0.33				
		With brake J_m	kgcm²	0.341				
Stator (at 20°C)	Resistance (phase/phase)		Ω	21.4			4.58	
	Inductance (phase/phase)		mH	37.5			8.6	
	Electrical time constant		ms	1.75			1.88	
Holding brake (according to model)				See page 138				

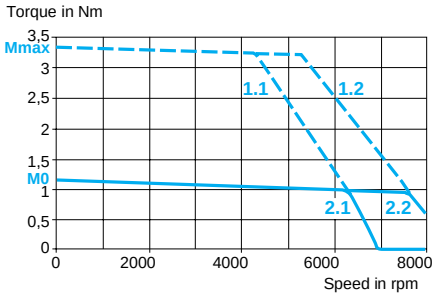
Torque/speed curves

BDH 0701C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase

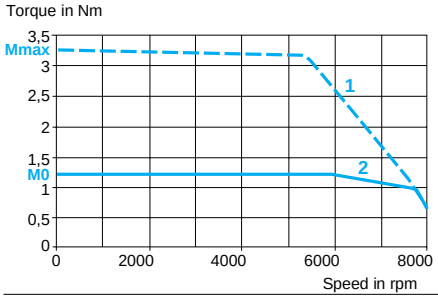


With LXM 15LU60N4 servo drive
400/480 V 3-phase

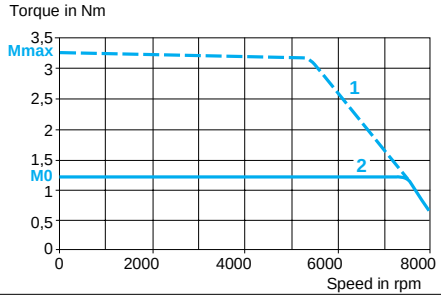


BDH 0701E servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0702C servo motors

Type of servo motor				**BDH 0702C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2		
	Peak stall	M_{max}	**Nm**	5.74		
Nominal operating point	Nominal torque		**Nm**	1.85	1.7	1.64
	Nominal speed		**rpm**	1280	2800	3440
Maximum current			**A rms**	4.03		

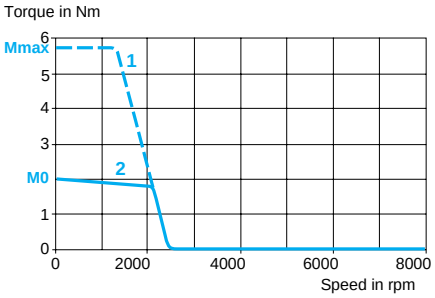
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.4
	Back emf		**V_{rms}/krpm**	89.8
Rotor	Number of poles			8
	Inertia	Without brake J_m	**kgcm²**	0.59
		With brake J_m	**kgcm²**	0.601
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	23
	Inductance (phase/phase)		**mH**	46.5
	Electrical time constant		**ms**	2.02
Holding brake (according to model)				See page 138

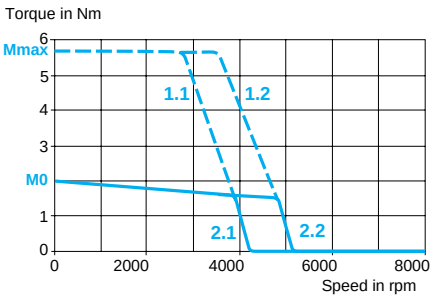
Torque/speed curves

BDH 0702C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

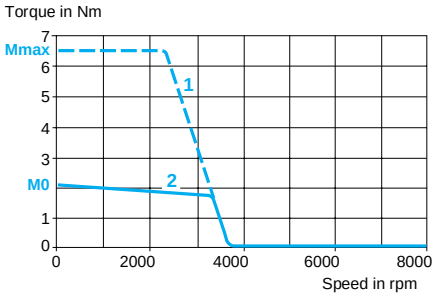
Characteristics of BDH 0702D servo motors

Type of servo motor				**BDH 0702D**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.04				
	Peak stall	M_{max}	**Nm**	6.51				
Nominal operating point	Nominal torque		**Nm**	1.82			1.6	1.51
	Nominal speed		**rpm**	2320			4480	5520
Maximum current			**A rms**	6.29				
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.92				
	Back emf		**V_{rms}/krpm**	59				
Rotor	Number of poles			8				
	Inertia	Without brake J_m	**kgcm²**	0.59				
		With brake J_m	**kgcm²**	0.601				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	9.57				
	Inductance (phase/phase)		**mH**	20.1				
	Electrical time constant		**ms**	2.10				
Holding brake (according to model)				See page 138				

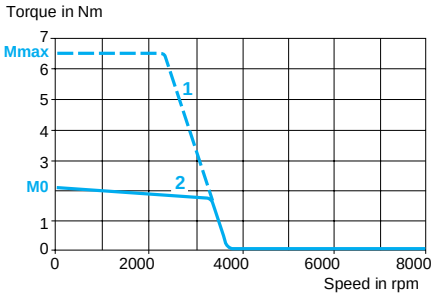
Torque/speed curves

BDH 0702D servo motor

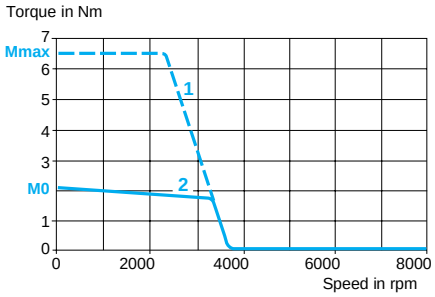
With LXM 15LD13M3 servo drive
230 V single phase



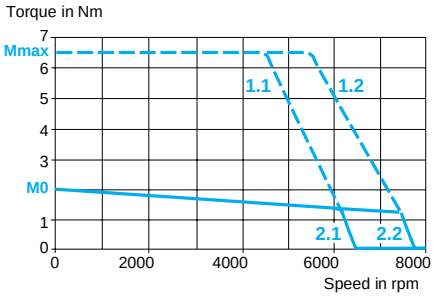
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0702H servo motors

Type of servo motor				**BDH 0702H**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.1	
	Peak stall	M_{max}	**Nm**	5.36	
Nominal operating point	Nominal torque		**Nm**	1.56	1.3
	Nominal speed		**rpm**	4320	6560
Maximum current			**A rms**	15.56	

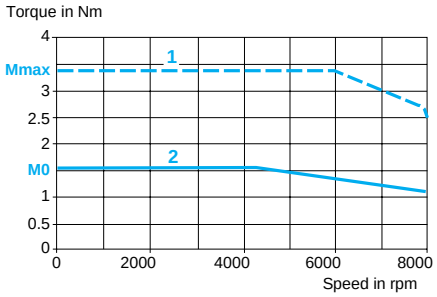
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.39	
	Back emf		**V_{rms}/krpm**	24.8	
Rotor	Number of poles			8	
	Inertia	Without brake J_m	**kgcm²**	0.59	
		With brake J_m	**kgcm²**	0.601	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.64	
	Inductance (phase/phase)		**mH**	3.55	
	Electrical time constant		**ms**	2.16	
Holding brake (according to model)				See page 138	

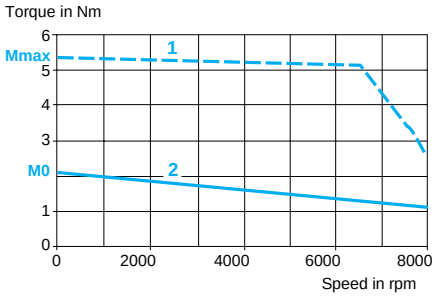
Torque/speed curves

BDH 0702H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Characteristics of BDH 0703C servo motors

Type of servo motor				**BDH 0703C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.71		
	Peak stall	M_{max}	**Nm**	7.83		
Nominal operating point	Nominal torque		**Nm**	2.6	2.55	2.51
	Nominal speed		**rpm**	880	2080	2560
Maximum current			**A rms**	4.17		

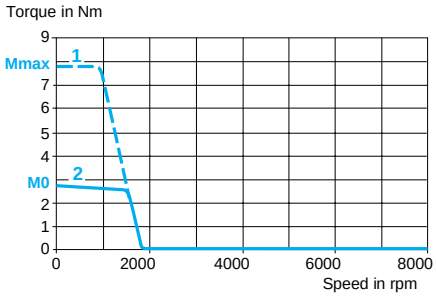
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.86
	Back emf		**V_{rms}/krpm**	120
Rotor	Number of poles			8
	Inertia Without brake	J_m	**kgcm²**	0.85
	With brake	J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)		Ω	25.4
	Inductance (phase/phase)		**mH**	53.6
	Electrical time constant		**ms**	2.11
Holding brake (according to model)				See page 138

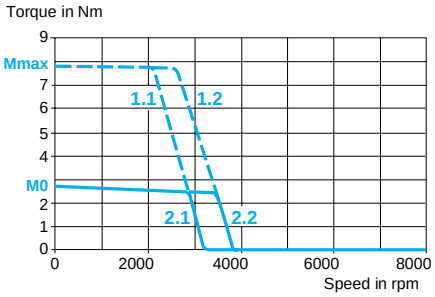
Torque/speed curves

BDH 0703C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0703E servo motors

Type of servo motor				**BDH 0703E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.79				
	Peak stall	M_{max}	**Nm**	8.55				
Nominal operating point	Nominal torque		**Nm**	2.55			2.4	2.3
	Nominal speed		**rpm**	2000			3920	4800
Maximum current			**A rms**	7.28				

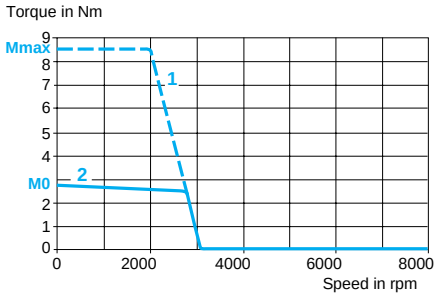
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000
Constants (at 120°C)	Torque		**Nm/A rms**	1.1
	Back emf		**V_{rms}/krpm**	70.6
Rotor	Number of poles			8
	Inertia	Without brake J_m	**kgcm²**	0.85
		With brake J_m	**kgcm²**	0.861
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.36
	Inductance (phase/phase)		**mH**	18.5
	Electrical time constant		**ms**	2.21
Holding brake (according to model)				See page 138

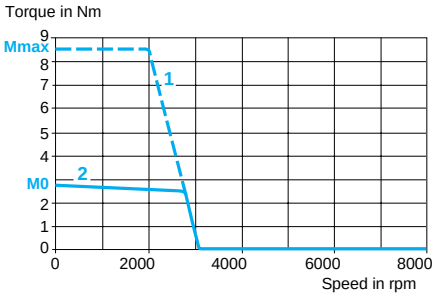
Torque/speed curves

BDH 0703E servo motor

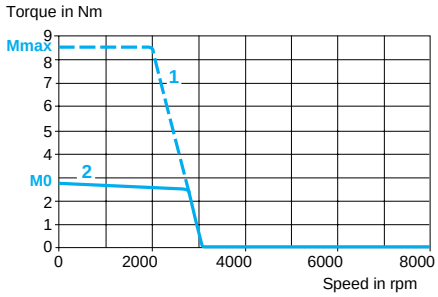
With LXM 15LD13M3 servo drive
230 V single phase



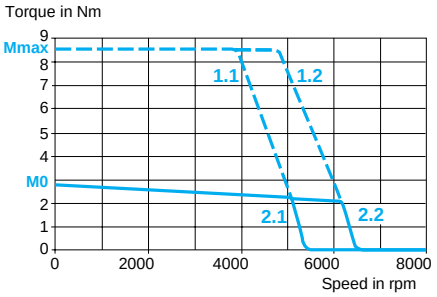
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

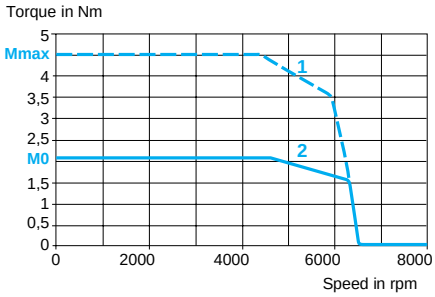
Characteristics of BDH 0703H servo motors

Type of servo motor				**BDH 0703H**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.08	2.88
	Peak stall	M_{max}	**Nm**	4.52	7.35
Nominal operating point	Nominal torque		**Nm**	2.08	1.64
	Nominal speed		**rpm**	4400	4960
Maximum current			**A rms**	15.91	
Servo motor characteristics					
Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.52	
	Back emf		**V_{rms}/krpm**	33.4	
Rotor	Number of poles			8	
	Inertia Without brake	J_m	**kgcm²**	0.85	
	With brake	J_m	**kgcm²**	0.861	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.82	
	Inductance (phase/phase)		**mH**	4.1	
	Electrical time constant		**ms**	2.25	
Holding brake (according to model)				See page 138	

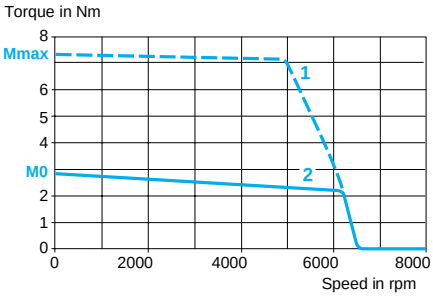
Torque/speed curves

BDH 0703H servo motor

With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0841C servo motors

Type of servo motor				**BDH 0841C**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.95		
	Peak stall	M_{max}	**Nm**	5.12		
Nominal operating point	Nominal torque		**Nm**	1.88	1.83	1.8
	Nominal speed		**rpm**	1140	2280	2820
Maximum current			**A rms**	4.1		

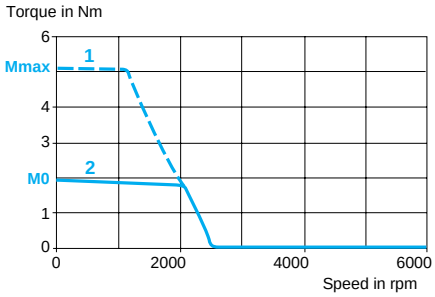
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.34
	Back emf		**V_{rms}/krpm**	86.3
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	0.81
		With brake J_m	**kgcm²**	0.878
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	21.7
	Inductance (phase/phase)		**mH**	66.1
	Electrical time constant		**ms**	3.05
Holding brake (according to model)				See page 138

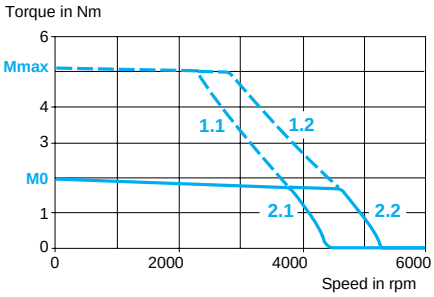
Torque/speed curves

Characteristics of BDH 0841C servo motors

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0841E servo motors

Type of servo motor				**BDH 0841E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.02				
	Peak stall	M_{max}	**Nm**	5.33		5.13		
Nominal operating point	Nominal torque		**Nm**	1.84			1.67	1.62
	Nominal speed		**rpm**	2460		2520	4620	5640
Maximum current			**A rms**	8.06				

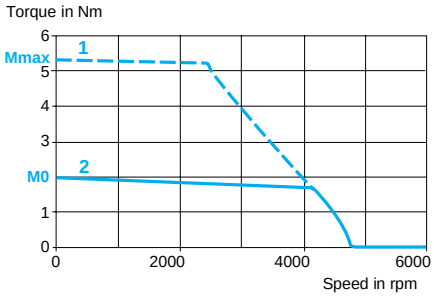
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	0.71
	Back emf		**V_{rms}/krpm**	45.6
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	0.81
		With brake J_m	**kgcm²**	0.878
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	5.7
	Inductance (phase/phase)		**mH**	18.4
	Electrical time constant		**ms**	3.23
Holding brake (according to model)				See page 138

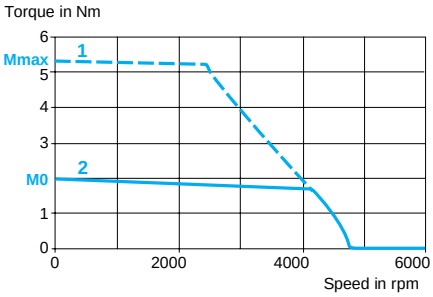
Torque/speed curves

BDH 0841E servo motor

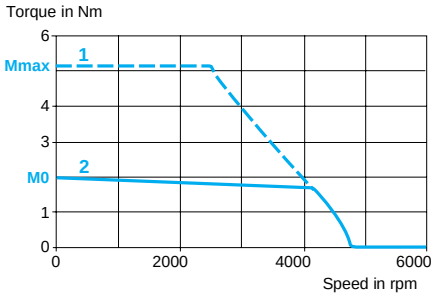
With LXM 15LD13M3 servo drive
230 V single phase



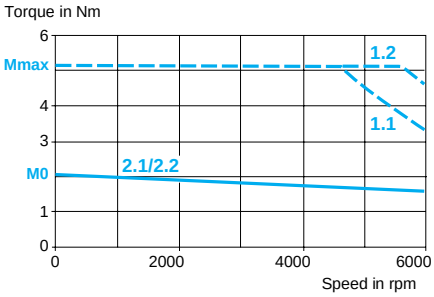
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

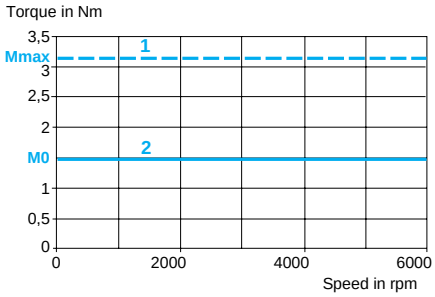
Characteristics of BDH 0841H/0842C servo motors

Type of servo motor				**BDH 0841H**		**BDH 0842C**		
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LU60N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	1.5	2.06	3.35		
	Peak stall	M_{max}	**Nm**	3.14	4.78	9.37		
Nominal operating point	Nominal torque		**Nm**	1.48	1.68	3.25	3.1	3
	Nominal speed		**rpm**	6000	5340	600	1320	1680
Maximum current			**A rms**	15.84		3.97		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.37		2.4		
	Back emf		**V_{rms}/krpm**	23.7		154		
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	0.81		1.5		
		With brake J_m	**kgcm²**	0.878		1.568		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.51		27.5		
	Inductance (phase/phase)		**mH**	5		97.4		
	Electrical time constant		**ms**	3.31		3.54		
Holding brake (according to model)				See page 138				

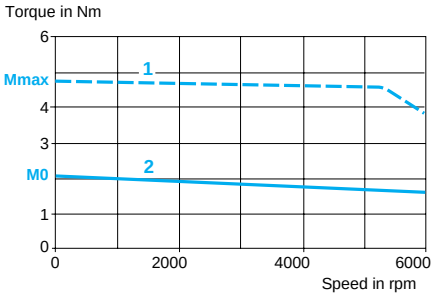
Torque/speed curves

BDH 0841H servo motor

With LXM 15LD21M3 servo drive
230 V single phase

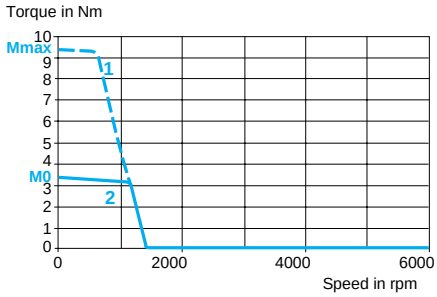


With LXM 15LD21M3 servo drive
230 V 3-phase

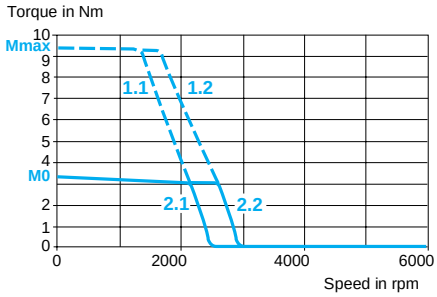


BDH 0842C servo motor

With LXM 15LU60N4 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

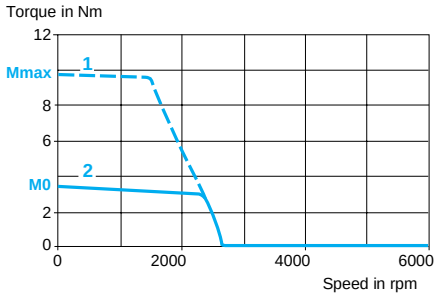
Characteristics of BDH 0842E servo motors

Type of servo motor				**BDH 0842E**				
Associated with Lexium 15 servo drive				**LXM 15LD13M3**		**LXM 15LD10N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.42				
	Peak stall	M_{max}	**Nm**	9.72		9.41		
Nominal operating point	Nominal torque		**Nm**	3.15			2.9	2.8
	Nominal speed		**rpm**	1500			2820	3480
Maximum current			**A rms**	7.78				
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	1.26				
	Back emf		**V_{rms}/krpm**	80.9				
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	1.5				
		With brake J_m	**kgcm²**	1.568				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	7.22				
	Inductance (phase/phase)		**mH**	26.8				
	Electrical time constant		**ms**	3.71				
Holding brake (according to model)				See page 138				

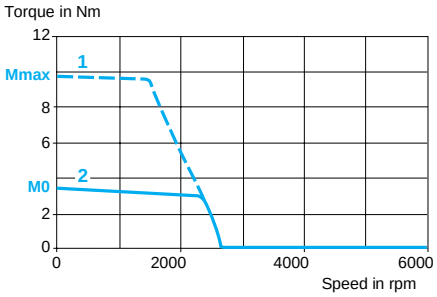
Torque/speed curves

BDH 0842E servo motor

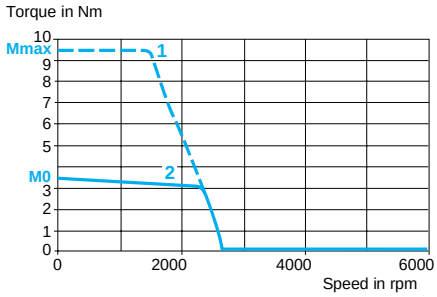
With LXM 15LD13M3 servo drive
230 V single phase



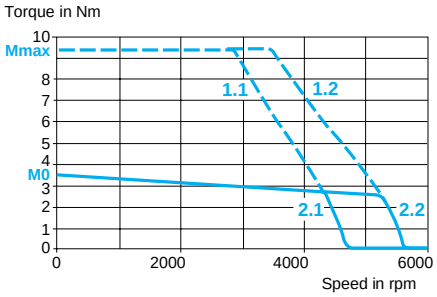
With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Characteristics of BDH 0842G servo motors

Type of servo motor				**BDH 0842G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	2.96	3.53			
	Peak stall	M_{max}	**Nm**	6.54	9.56	8.66		
Nominal operating point	Nominal torque		**Nm**	2.94	2.96		2.5	2.35
	Nominal speed		**rpm**	3000	2760	2880	5280	6000
Maximum current			**A rms**	13.58				

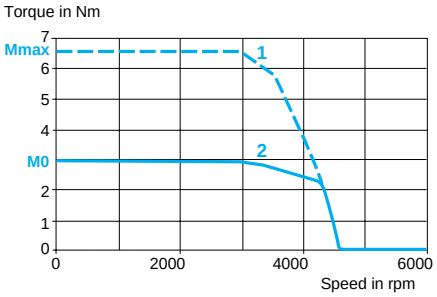
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	0.74
	Back emf		**V_{rms}/krpm**	47.5
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	1.5
		With brake J_m	**kgcm²**	1.568
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.38
	Inductance (phase/phase)		**mH**	9.2
	Electrical time constant		**ms**	3.87
Holding brake (according to model)				See page 138

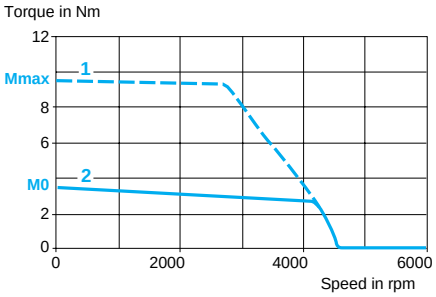
Torque/speed curves

BDH 0842G servo motor

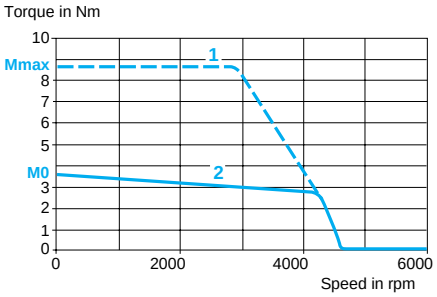
With LXM 15LD21M3 servo drive
230 V single phase



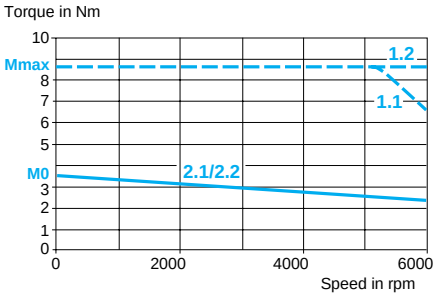
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

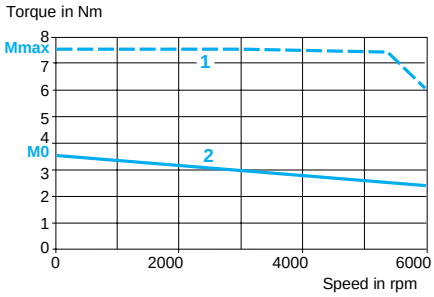
Characteristics of BDH 0842J/0843E servo motors

Type of servo motor				BDH 0842J		BDH 0843E		
Associated with Lexium 15 servo drive				LXM 15LD28M3	LXM 15MD28N4	LXM 15LD10N4		
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.56		4.7		
	Peak stall	M_{max}	**Nm**	7.56		11.7		
Nominal operating point	Nominal torque		**Nm**	2.5		4.35	4	3.85
	Nominal speed		**rpm**	5400		1140	2220	2700
Maximum current			**A rms**	23.83		7.78		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.43		1.72		
	Back emf		**V_{rms}/krpm**	27.5		111		
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	1.5		2.1		
		With brake J_m	**kgcm²**	1.568		2.168		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.8		8.04		
	Inductance (phase/phase)		**mH**	3.1		32.6		
	Electrical time constant		**ms**	3.88		4.05		
Holding brake (according to model)				See page 138				

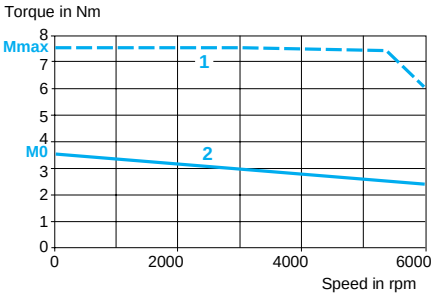
Torque/speed curves

BDH 0842J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

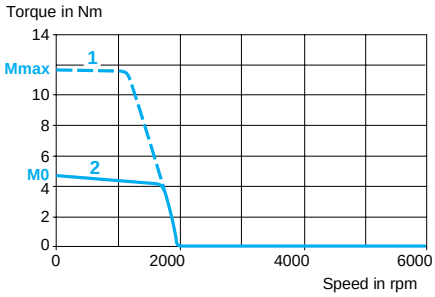


With LXM 15MD28N4 servo drive
230 V 3-phase

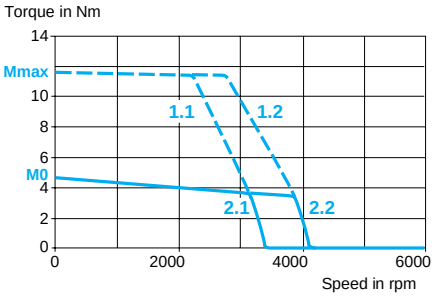


BDH 0843E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0843G servo motors

Type of servo motor				**BDH 0843G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.8			
	Peak stall	M_{max}	**Nm**	8.8	13.2	11.68		
Nominal operating point	Nominal torque		**Nm**	3.96	4	3.9	3.25	2.95
	Nominal speed		**rpm**	2220	2160	2280	4140	4980
Maximum current			**A rms**	13.79				

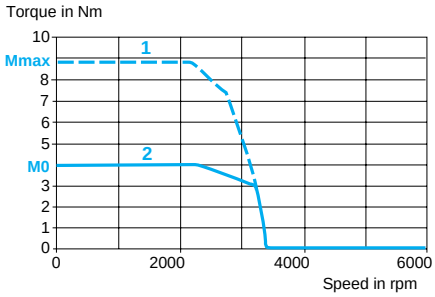
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	0.99
	Back emf		**V_{rms}/krpm**	63.9
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	2.1
		With brake J_m	**kgcm²**	2.168
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.61
	Inductance (phase/phase)		**mH**	10.8
	Electrical time constant		**ms**	4.14
Holding brake (according to model)				See page 138

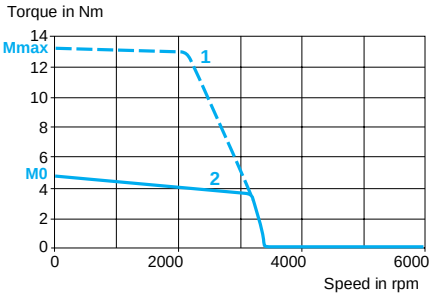
Torque/speed curves

BDH 0843G servo motor

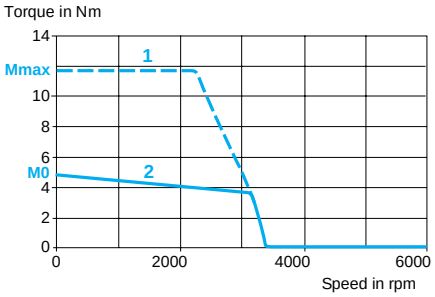
With LXM 15LD21M3 servo drive
230 V single phase



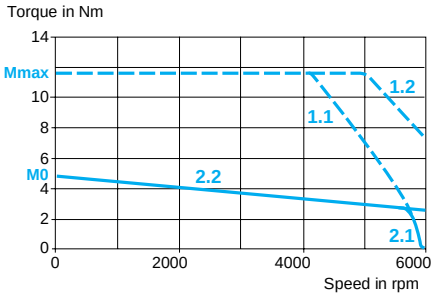
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

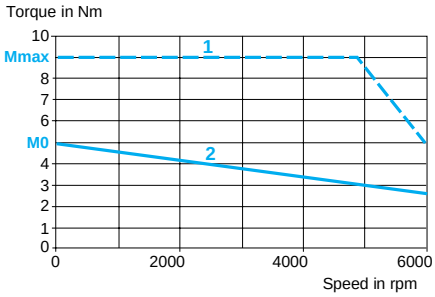
Characteristics of BDH 0843K/0844E servo motors

Type of servo motor				BDH 0843K		BDH 0844E		
Associated with Lexium 15 servo drive				LXM 15LD28M3	LXM 15MD28N4	LXM 15LD10N4		
Line supply voltage			V	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	4.9		5.76		
	Peak stall	M_{max}	Nm	9.02		14.1		
Nominal operating point	Nominal torque		Nm	3		5.25	4.85	4.6
	Nominal speed		rpm	4920		1020	1920	2400
Maximum current			A rms	27.08		8.06		
Servo motor characteristics								
Maximum mechanical speed			rpm	6000				
Constants (at 120°C)	Torque		Nm/A rms	0.52		2.04		
	Back emf		V_{rms}/krpm	33.2		132		
Rotor	Number of poles			10				
	Inertia	Without brake J_m	kgcm²	2.1		2.7		
		With brake J_m	kgcm²	2.168		2.768		
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.7		8.08		
	Inductance (phase/phase)		mH	2.9		33.9		
	Electrical time constant		ms	4.14		4.20		
Holding brake (according to model)				See page 138				

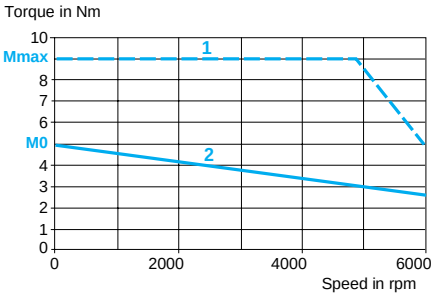
Torque/speed curves

BDH 0843K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

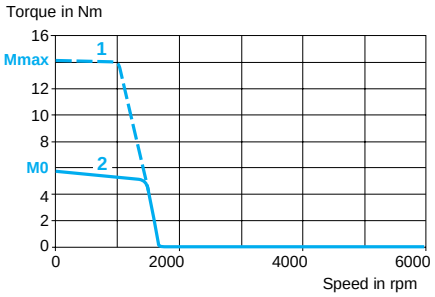


With LXM 15MD28N4 servo drive
230 V 3-phase

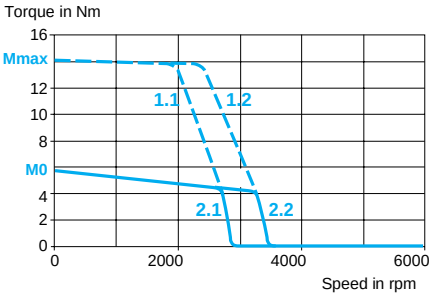


BDH 0844E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 0844G servo motors

Type of servo motor				**BDH 0844G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.76	5.88			
	Peak stall	M_{max}	**Nm**	10.55	16.1	13.97		
Nominal operating point	Nominal torque		**Nm**	4.76	4.9	4.85	3.95	3.5
	Nominal speed		**rpm**	1860		1960	3600	4380
Maximum current			**A rms**	14.14				

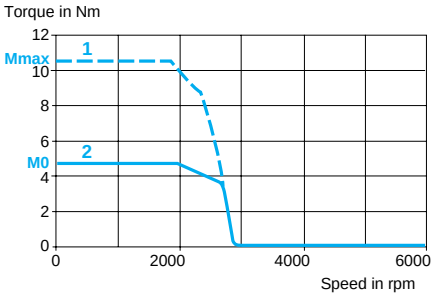
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.19
	Back emf		**V_{rms}/krpm**	76.6
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	2.7
		With brake J_m	**kgcm²**	2.768
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.65
	Inductance (phase/phase)		**mH**	11.5
	Electrical time constant		**ms**	4.34
Holding brake (according to model)				See page 138

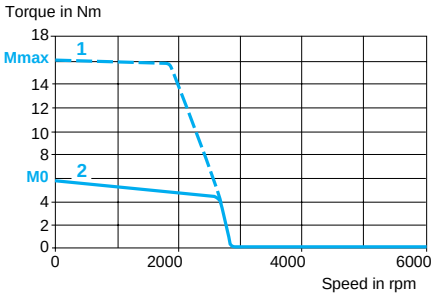
Torque/speed curves

BDH 0844G servo motor

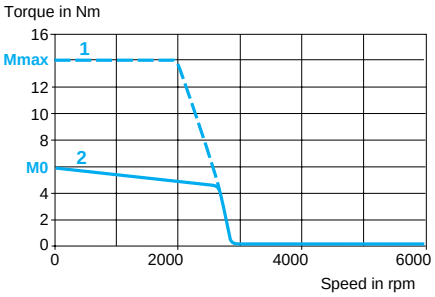
With LXM 15LD21M3 servo drive
230 V single phase



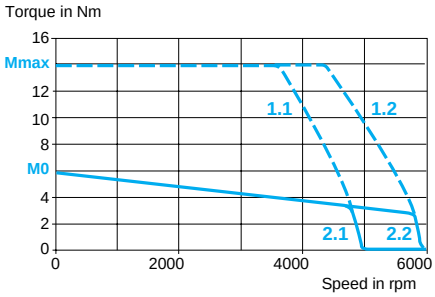
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

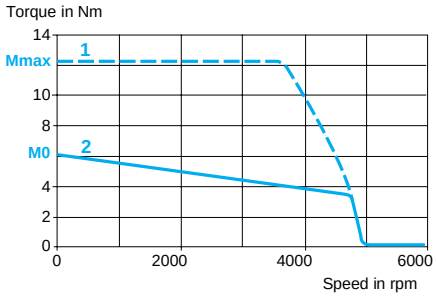
Characteristics of BDH 0844J servo motors

Type of servo motor				BDH 0844J	
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	6	
	Peak stall	M_{max}	**Nm**	12.18	
Nominal operating point	Nominal torque		**Nm**	4	
	Nominal speed		**rpm**	3660	
Maximum current			**A rms**	24.89	
Servo motor characteristics					
Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.69	
	Back emf		**V_{rms}/krpm**	44.2	
Rotor	Number of poles			10	
	Inertia Without brake	J_m	**kgcm²**	2.7	
	With brake	J_m	**kgcm²**	2.768	
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.88	
	Inductance (phase/phase)		**mH**	3.8	
	Electrical time constant		**ms**	4.32	
Holding brake (according to model)				See page 138	

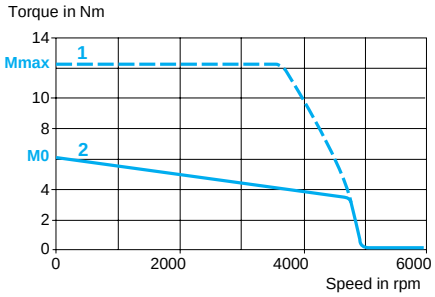
Speed/torque curves

BDH 0844J servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1081E servo motors

Type of servo motor				**BDH 1081E**		
Associated with Lexium 15 servo drive				**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.7		
	Peak stall	M_{max}	**Nm**	10.71		
Nominal operating point	Nominal torque		**Nm**	4.35	4	3.85
	Nominal speed		**rpm**	1260	2340	2880
Maximum current			**A rms**	5.83		

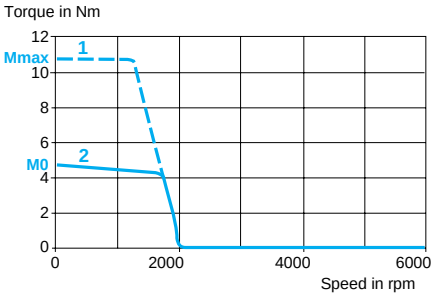
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.72
	Back emf		**V_{rms}/krpm**	110
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	3.4
		With brake J_m	**kgcm²**	3.573
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	8.47
	Inductance (phase/phase)		**mH**	36.6
	Electrical time constant		**ms**	4.32
Holding brake (according to model)				See page 138

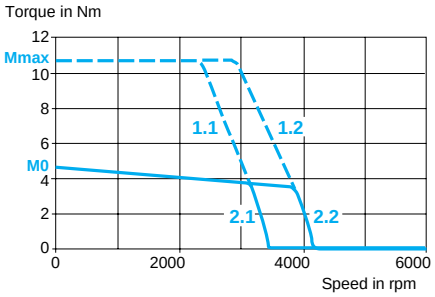
Torque/speed curves

BDH 1081E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

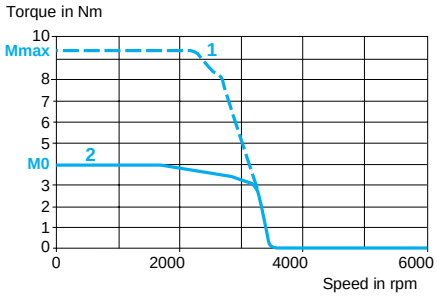
Characteristics of BDH 1081G servo motors

Type of servo motor				**BDH 1081G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	3.96	4.75			
	Peak stall	M_{max}	**Nm**	9.41	10.82			
Nominal operating point	Nominal torque		**Nm**	3.96	3.65		2.75	2.35
	Nominal speed		**rpm**	1680	2340		4260	5160
Maximum current			**A rms**	10.25				
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.99				
	Back emf		**V_{rms}/krpm**	63.6				
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	3.4				
		With brake J_m	**kgcm²**	3.573				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.75				
	Inductance (phase/phase)		**mH**	12.1				
	Electrical time constant		**ms**	4.4				
Holding brake (according to model)				See page 138				

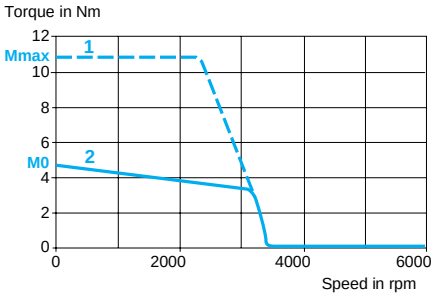
Torque/speed curves

BDH 1081G servo motor

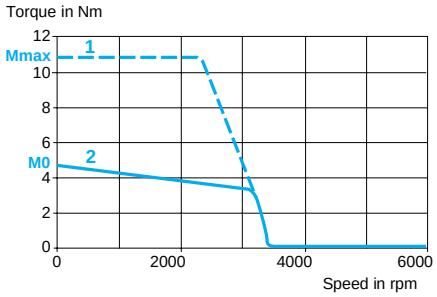
With LXM 15LD21M3 servo drive
230 V single phase



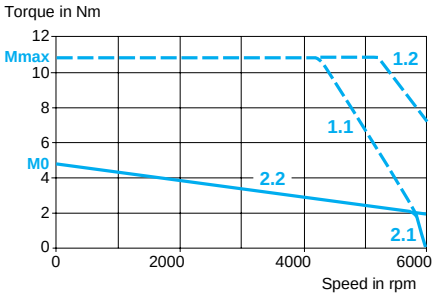
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

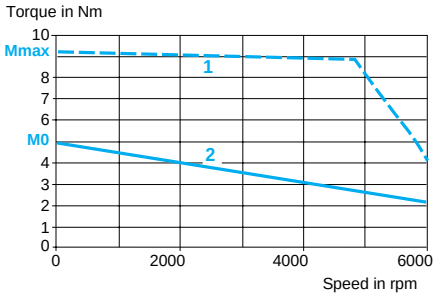
Characteristics of BDH 1081K/1082E servo motors

Type of servo motor				**BDH 1081K**		**BDH 1082E**		
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**	**LXM 15LD10N4**		
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	4.9		8.34		
	Peak stall	M_{max}	**Nm**	9.22		18.08		
Nominal operating point	Nominal torque		**Nm**	2.65		7.9	7.5	7.3
	Nominal speed		**rpm**	4800		780	1500	1860
Maximum current			**A rms**	20.01		6.36		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	0.52		2.79		
	Back emf		**V_{rms}/krpm**	33.5		179		
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	3.4		6.2		
		With brake J_m	**kgcm²**	3.573		6.373		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.75		8.59		
	Inductance (phase/phase)		**mH**	3.4		44.7		
	Electrical time constant		**ms**	4.53		5.2		
Holding brake (according to model)				See page 138				

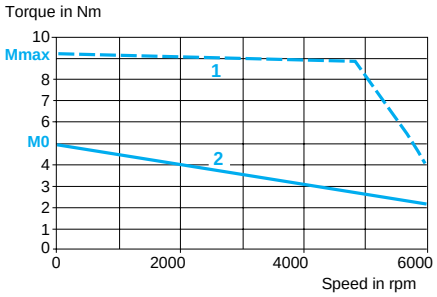
Torque/speed curves

BDH 1081K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

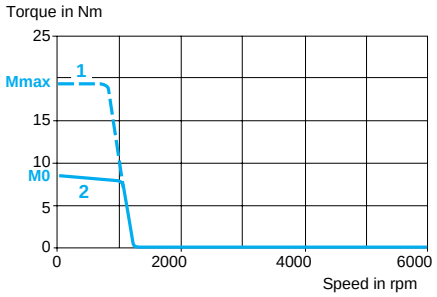


With LXM 15MD28N4 servo drive
230 V 3-phase

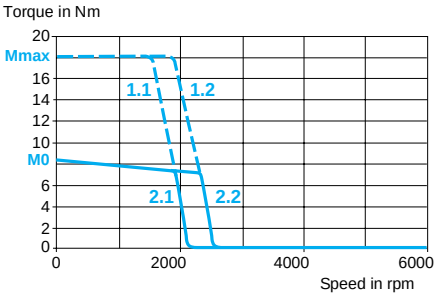


BDH 1082E servo motor

With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BDH 1082G servo motors

Type of servo motor				**BDH 1082G**				
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD17N4**		
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.16	8.43			
	Peak stall	M_{max}	**Nm**	17.31	19.51			
Nominal operating point	Nominal torque		**Nm**	7.16	7.65		7	6.66
	Nominal speed		**rpm**	1140	1320		2460	3000
Maximum current			**A rms**	10.04				

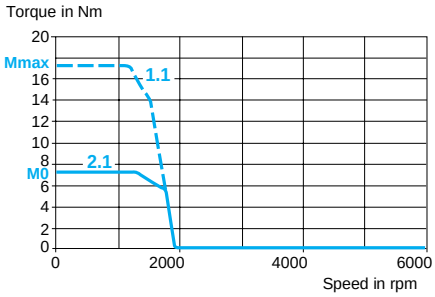
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	1.79
	Back emf		**V_{rms}/krpm**	115
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	6.2
		With brake J_m	**kgcm²**	6.373
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.47
	Inductance (phase/phase)		**mH**	18.5
	Electrical time constant		**ms**	5.33
Holding brake (according to model)				See page 138

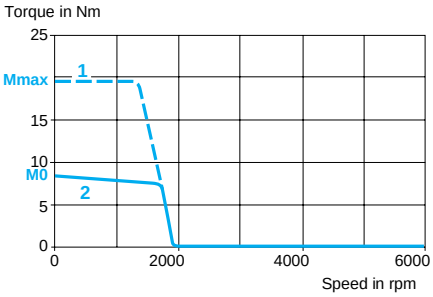
Torque/speed curves

BDH 1082G servo motor

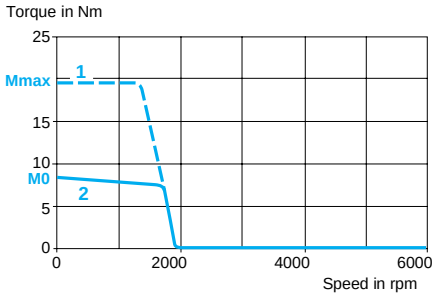
With LXM 15LD21M3 servo drive
230 V single phase



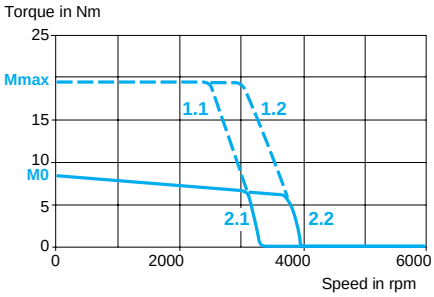
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

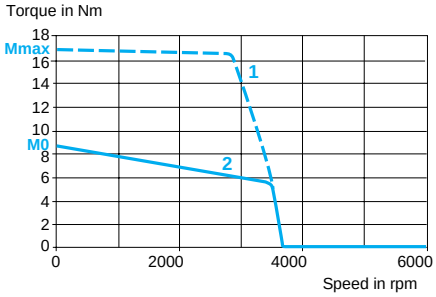
Characteristics of BDH 1082K/1082M/1083G servo motors

Type of servo motor				BDH 1082K		BDH 1082M	BDH 1083G		
Associated with Lexium 15 servo drive				LXM 15LD28M3	LXM 15MD28N4	LXM 15MD40N4	LXM 15LD17N4		
Line supply voltage			V	230 3-phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	8.6			11.4		
	Peak stall	M_{max}	Nm	16.9		16.7	25.83		
Nominal operating point	Nominal torque		Nm	6		5.5	10.6	9.8	9.5
	Nominal speed		rpm	2820		4080	1020	1920	2340
Maximum current			A rms	19.66		27.86	10.11		
Servo motor characteristics									
Maximum mechanical speed			rpm	6000					
Constants (at 120°C)	Torque		Nm/A rms	0.93		0.66	2.39		
	Back emf		V_{rms}/krpm	60.1		42.4	154		
Rotor	Number of poles			10					
	Inertia	Without brake J_m	kgcm²	6.2			9.273		
		With brake J_m	kgcm²	6.373					
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.93		0.48	3.75		
	Inductance (phase/phase)		mH	5		2.5	21.3		
	Electrical time constant		ms	5.38		5.21	5.68		
Holding brake (according to model)				See page 138					

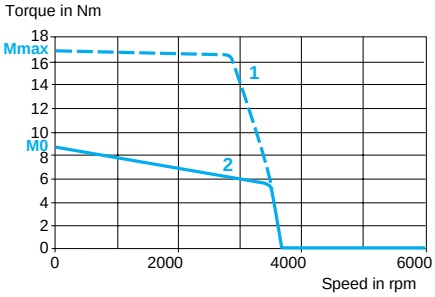
Torque/speed curves

BDH 1082K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

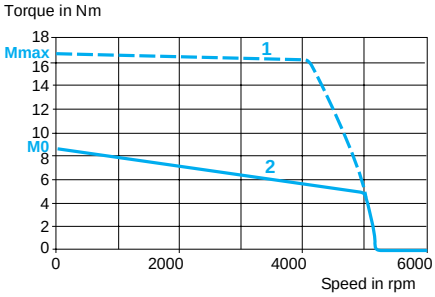


With LXM 15MD28N4 servo drive
230 V 3-phase



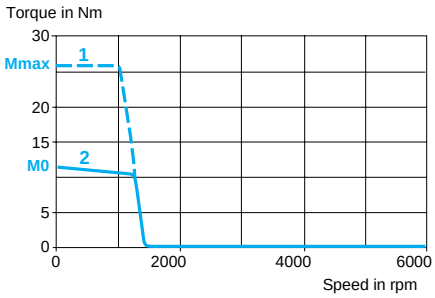
BDH 1082M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

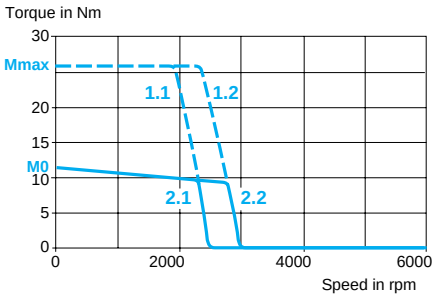


BDH 1083G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

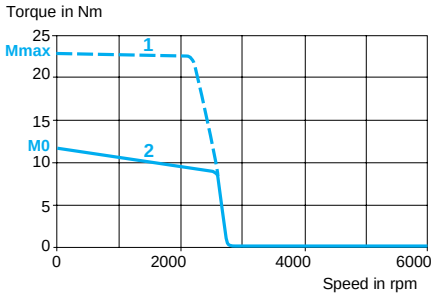
Characteristics of BDH 1083K/1083M/1083P servo motors

Type of servo motor				BDH 1083K		BDH 1083M	BDH 1083P
Associated with Lexium 15 servo drive				LXM 15LD28M3	LXM 15MD28N4	LXM 15MD40N4	LXM 15MD56N4
Line supply voltage			**V**	230 3-phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.6		11.4	
	Peak stall	M_{max}	**Nm**	22.9		22.1	22.2
Nominal operating point	Nominal torque		**Nm**	9.4		8.5	6.2
	Nominal speed		**rpm**	2100		3180	4740
Maximum current			**A rms**	19.87		28.5	40.59
Servo motor characteristics							
Maximum mechanical speed			**rpm**	6000			
Constants (at 120°C)	Torque		**Nm/A rms**	1.24		0.85	0.6
	Back emf		**V_{rms}/krpm**	79.8		54.7	38.4
Rotor	Number of poles			10			
	Inertia	Without brake J_m	**kgcm²**	9.1			
		With brake J_m	**kgcm²**	9.273			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1		0.51	0.27
	Inductance (phase/phase)		**mH**	5.7		2.7	1.3
	Electrical time constant		**ms**	5.7		5.29	4.81
Holding brake (according to model)				See page 138			

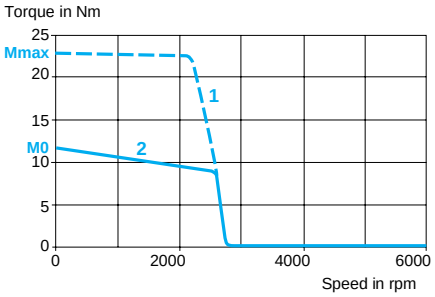
Torque/speed curves

BDH 1083K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase

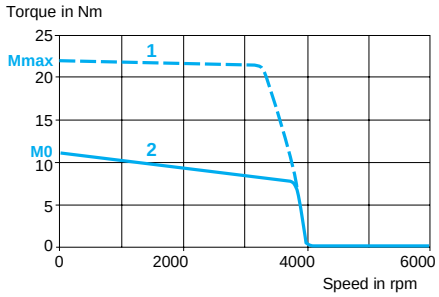


With LXM 15MD28N4 servo drive
230 V 3-phase



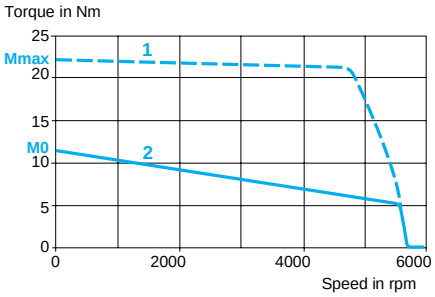
BDH 1083M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



BDH 1083P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

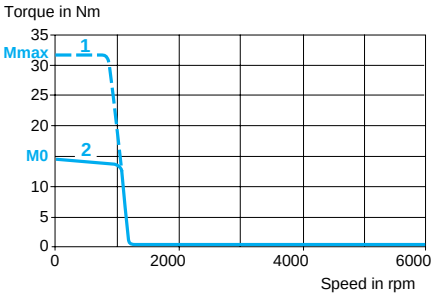
Characteristics of BDH 1084G/1084K servo motors

Type of servo motor				**BDH 1084G**			**BDH 1084K**	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	14.3			14.4	
	Peak stall	M_{max}	**Nm**	31.7			28.1	
Nominal operating point	Nominal torque		**Nm**	13.4	12.7	12.3	12.1	
	Nominal speed		**rpm**	840	1620	1980	1800	
Maximum current			**A rms**	10.54			20.65	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	2.88			1.5	
	Back emf		**V_{rms}/krpm**	185			96.6	
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	12				
		With brake J_m	**kgcm²**	12.173				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.8			1.02	
	Inductance (phase/phase)		**mH**	22.9			6.2	
	Electrical time constant		**ms**	6.03			6.08	
Holding brake (according to model)				See page 138				

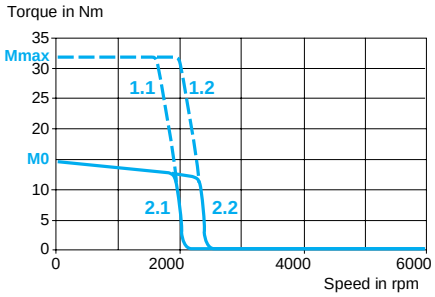
Torque/speed curves

BDH 1084G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

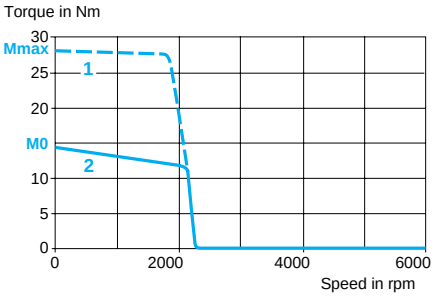


With LXM 15LD17N4 servo drive
400/480 V 3-phase

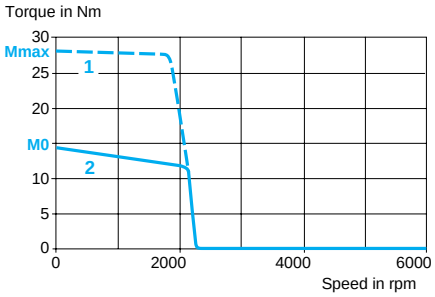


BDH 1084K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

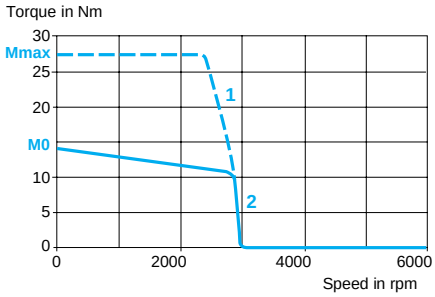
Characteristics of BDH 1084L/1084N servo motors

Type of servo motor				BDH 1084L		BDH 1084N
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD56N4
Line supply voltage			V	230 3-phase	400 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	14.1		
	Peak stall	M_{max}	Nm	27.28		25.5
Nominal operating point	Nominal torque		Nm	11.2	9	9.1
	Nominal speed		rpm	2400	4260	3780
Maximum current			A rms	37.76		26.52
Servo motor characteristics						
Maximum mechanical speed			rpm	6000		
Constants (at 120°C)	Torque		Nm/A rms	0.8		1.13
	Back emf		V_{rms}/krpm	51.3		72.9
Rotor	Number of poles			10		
	Inertia	Without brake J_m	kgcm²	12		
		With brake J_m	kgcm²	12.173		
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.33		0.63
	Inductance (phase/phase)		mH	1.8		3.5
	Electrical time constant		ms	5.45		5.56
Holding brake (according to model)				See page 138		

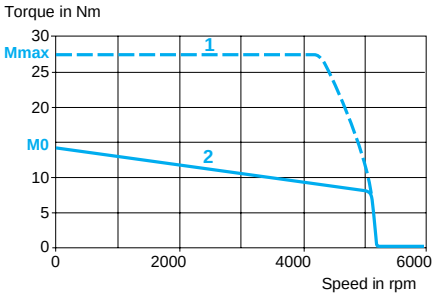
Torque/speed curves

BDH 1084L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

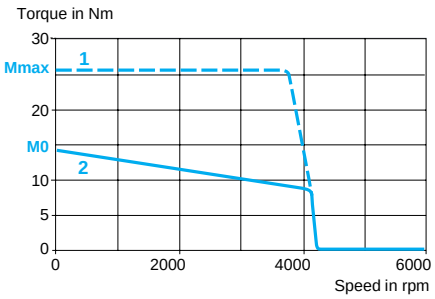


With LXM 15MD40N4 servo drive
400 V 3-phase



BDH 1084N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

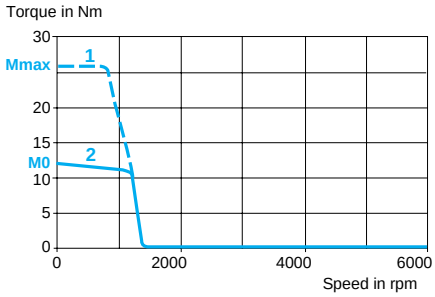
Characteristics of BDH 1382G/1382K servo motors

Type of servo motor				**BDH 1382G**			**BDH 1382K**	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.9			12.2	
	Peak stall	M_{max}	**Nm**	25.6			22.7	
Nominal operating point	Nominal torque		**Nm**	11.3	10.6	10.4		
	Nominal speed		**rpm**	780	1500	1800	1860	
Maximum current			**A rms**	10.32			20.29	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	2.47			1.28	
	Back emf		**V_{rms}/krpm**	159			82.1	
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	17				
		With brake J_m	**kgcm²**	17.61				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.94			1.05	
	Inductance (phase/phase)		**mH**	31.7			8.5	
	Electrical time constant		**ms**	8.05			8.10	
Holding brake (according to model)				See page 138				

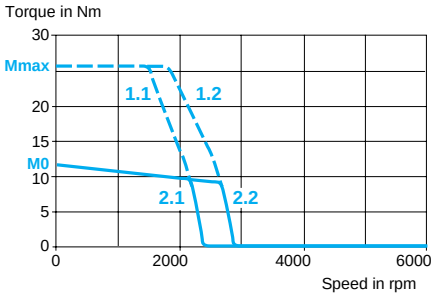
Torque/speed curves

BDH 1382G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

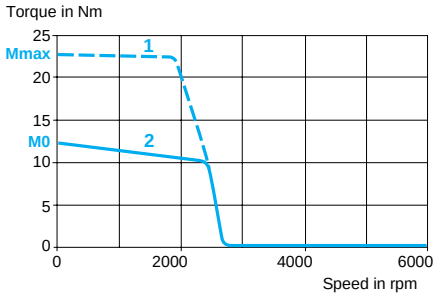


With LXM 15LD17N4 servo drive
400/480 V 3-phase

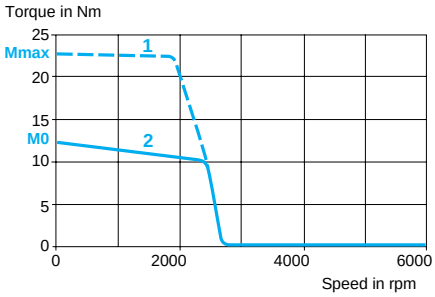


BDH 1382K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

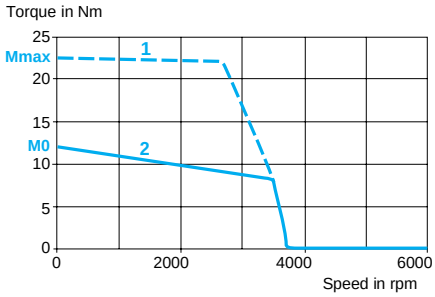
Characteristics of BDH 1382M/1382P servo motors

Type of servo motor				BDH 1382M			BDH 1382P
Associated with Lexium 15 servo drive				LXM 15MD40N4			LXM 15MD56N4
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	12.2			12.3
	Peak stall	M_{max}	Nm	22.8			23.2
Nominal operating point	Nominal torque		Nm	9.3	7	5.9	8.7
	Nominal speed		rpm	2640	4800	5820	3840
Maximum current			A rms	28.5			39.95
Servo motor characteristics							
Maximum mechanical speed			rpm	6000			
Constants (at 120°C)	Torque		Nm/A rms	0.91			0.66
	Back emf		V_{rms}/krpm	58.8			42.2
Rotor	Number of poles			10			
	Inertia	Without brake J_m	kgcm²	17			
		With brake J_m	kgcm²	17.61			
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.55			0.3
	Inductance (phase/phase)		mH	4.4			2.2
	Electrical time constant		ms	8			7.33
Holding brake (according to model)				See page 138			

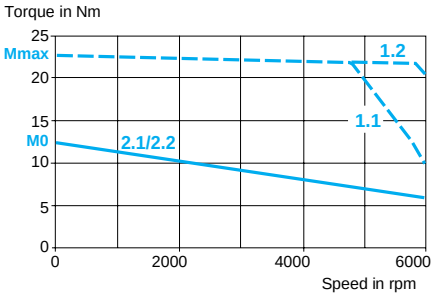
Torque/speed curves

BDH 1382M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

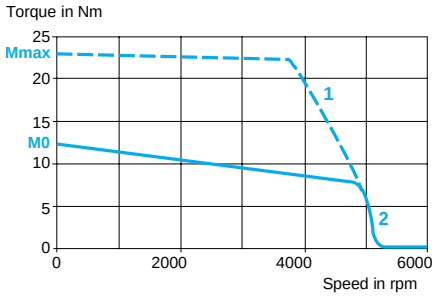


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BDH 1382P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

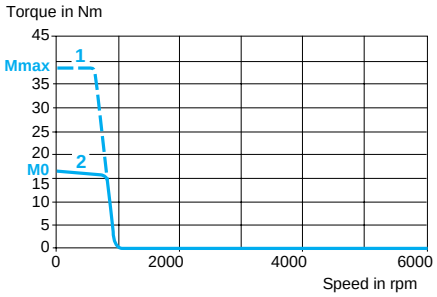
Characteristics of BDH 1383G/1383K servo motors

Type of servo motor				**BDH 1383G**			**BDH 1383K**	
Associated with Lexium 15 servo drive				**LXM 15LD17N4**			**LXM 15LD28M3**	**LXM 15MD28N4**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	16.5			16.8	
	Peak stall	M_{max}	**Nm**	38.4			31	
Nominal operating point	Nominal torque		**Nm**	15.7	15	14.6	14.8	
	Nominal speed		**rpm**	600	1140	1440	1500	
Maximum current			**A rms**	9.48			21	
Servo motor characteristics								
Maximum mechanical speed			**rpm**	6000				
Constants (at 120°C)	Torque		**Nm/A rms**	3.7			1.71	
	Back emf		**V_{rms}/krpm**	238			110	
Rotor	Number of poles			10				
	Inertia	Without brake J_m	**kgcm²**	24				
		With brake J_m	**kgcm²**	24.61				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	5.16			1.09	
	Inductance (phase/phase)		**mH**	43.5			9.3	
	Electrical time constant		**ms**	8.43			8.53	
Holding brake (according to model)				See page 138				

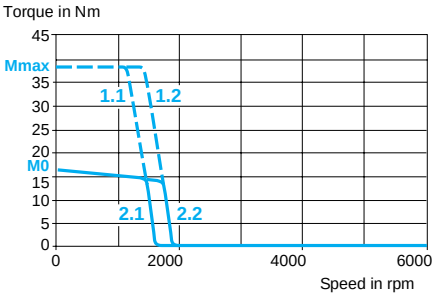
Torque/speed curves

BDH 1383G servo motor

With LXM 15LD17N4 servo drive
230 V 3-phase

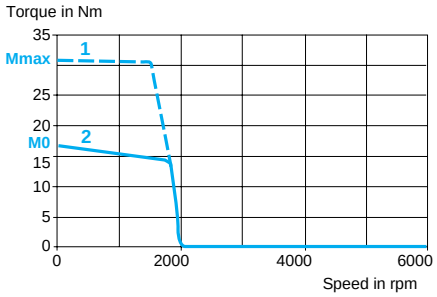


With LXM 15LD17N4 servo drive
400/480 V 3-phase

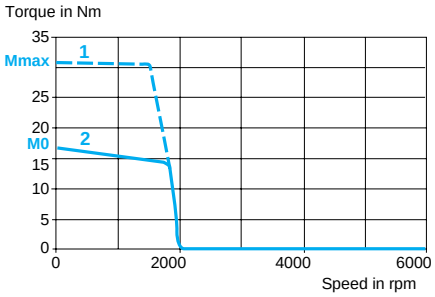


BDH 1383K servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

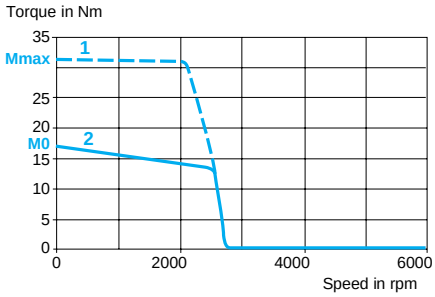
Characteristics of BDH 1383M/1383N servo motors

Type of servo motor				BDH 1383M			BDH 1383N		
Associated with Lexium 15 servo drive				LXM 15MD40N4			LXM 15MD56N4		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	17					
	Peak stall	M_{max}	Nm	31.4			34.8		
Nominal operating point	Nominal torque		Nm	14	11.7	10.5	12.7	9.4	7.6
	Nominal speed		rpm	2100	3720	4500	2580	4620	5580
Maximum current			A rms	29.27			36.91		
Servo motor characteristics									
Maximum mechanical speed			rpm	6000					
Constants (at 120°C)	Torque		Nm/A rms	1.24			0.98		
	Back emf		V_{rms}/krpm	79.9			63.3		
Rotor	Number of poles			10					
	Inertia	Without brake J_m	kgcm²	24					
		With brake J_m	kgcm²	24.61					
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.58			0.38		
	Inductance (phase/phase)		mH	4.9			3.1		
	Electrical time constant		ms	8.45			8.16		
Holding brake (according to model)				See page 138					

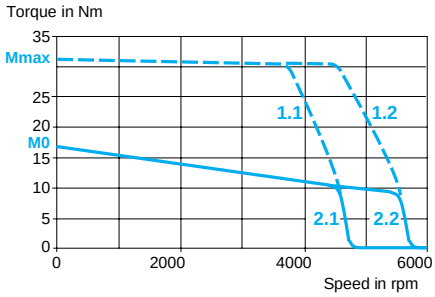
Torque/speed curves

BDH 1383M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

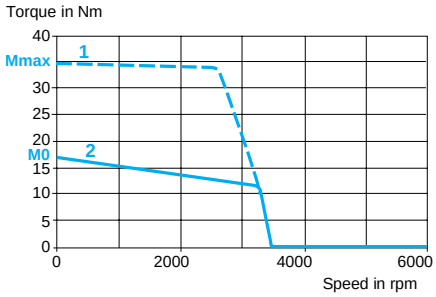


With LXM 15MD40N4 servo drive
400/480 V 3-phase

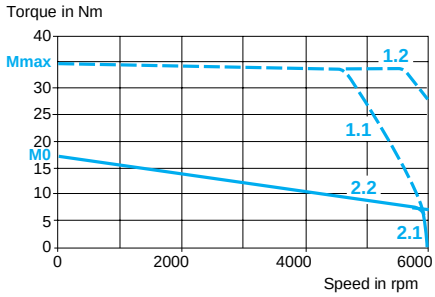


BDH 1383N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1384K/1384L servo motors

Type of servo motor				**BDH 1384K**			**BDH 1384L**		
Associated with Lexium 15 servo drive				**LXM 15MD28N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	20.8			21		
	Peak stall	M_{max}	**Nm**	41.2			41.9		
Nominal operating point	Nominal torque		**Nm**	18.8	17	16.5	18	15.6	14.6
	Nominal speed		**rpm**	1080	2040	2460	1560	2820	3420
Maximum current			**A rms**	19.45			27.15		

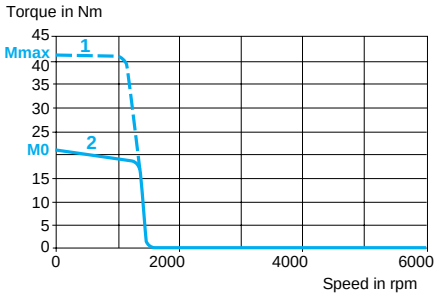
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	2.28	1.66
	Back emf		**V_{rms}/krpm**	147	107
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	32	
		With brake J_m	**kgcm²**	32.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.34	0.71
	Inductance (phase/phase)		**mH**	11.8	6.2
	Electrical time constant		**ms**	8.81	8.86
Holding brake (according to model)				See page 138	

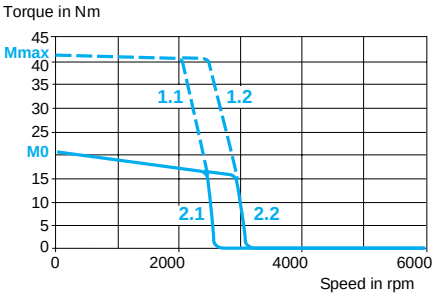
Torque/speed curves

BDH 1384K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

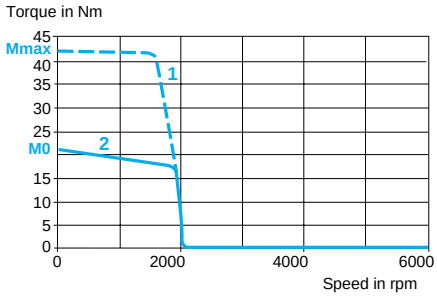


With LXM 15MD28N4 servo drive
400/480 V 3-phase

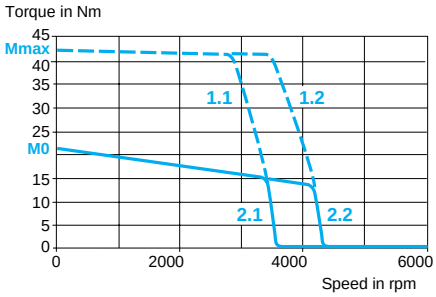


BDH 1384L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Lexium 15 motion control
BDH servo motors

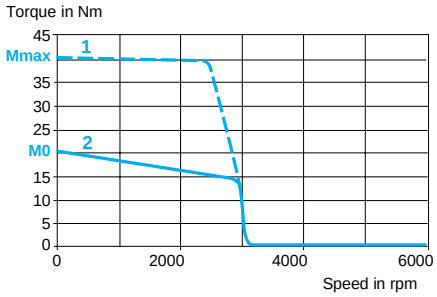
Characteristics of BDH 1384P/1385K servo motors

Type of servo motor				BDH 1384P			BDH 1385K		
Associated with Lexium 15 servo drive				LXM 15MD56N4			LXM 15MD28N4		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	20.4			24.8		
	Peak stall	M_{max}	Nm	40.2			46.8		
Nominal operating point	Nominal torque		Nm	15.3	11.3	9.4	19.4	20.5	22.5
	Nominal speed		rpm	2460	4380	5280	1020	1860	2280
Maximum current			A rms	39.53			20.79		
Servo motor characteristics									
Maximum mechanical speed			rpm	6000					
Constants (at 120°C)	Torque		Nm/A rms	1.1			2.54		
	Back emf		V_{rms}/krpm	71			164		
Rotor	Number of poles			10					
	Inertia	Without brake J_m	kgcm²	32			40		
		With brake J_m	kgcm²	32.61			40.61		
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.36			1.27		
	Inductance (phase/phase)		mH	2.8			11.4		
	Electrical time constant		ms	7.78			8.98		
Holding brake (according to model)				See page 138					

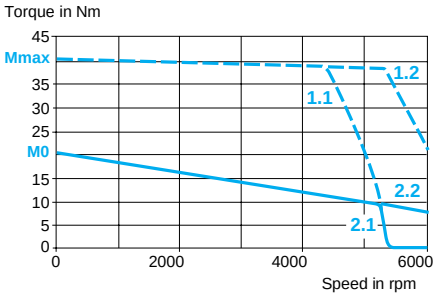
Torque/speed curves

BDH 1384P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

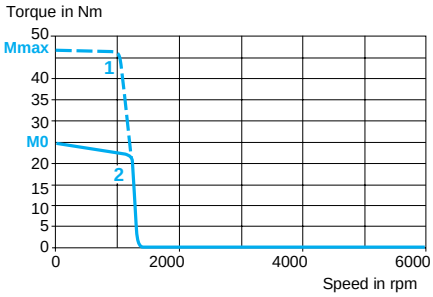


With LXM 15MD56N4 servo drive
400/480 V 3-phase

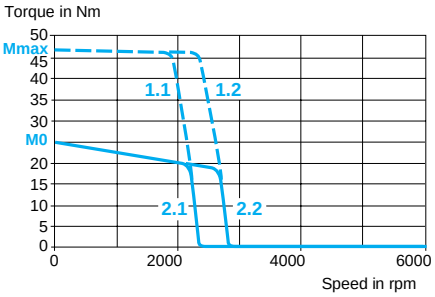


BDH 1385K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1385M/1385N servo motors

Type of servo motor				**BDH 1385M**			**BDH 1385N**		
Associated with Lexium 15 servo drive				**LXM 15MD40N4**			**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	25			24.3		
	Peak stall	M_{max}	**Nm**	47.6			50.2		
Nominal operating point	Nominal torque		**Nm**	21.7	19	17.55	19.4	16	14
	Nominal speed		**rpm**	1440	2640	3180	1980	3540	4260
Maximum current			**A rms**	28.92			37.69		

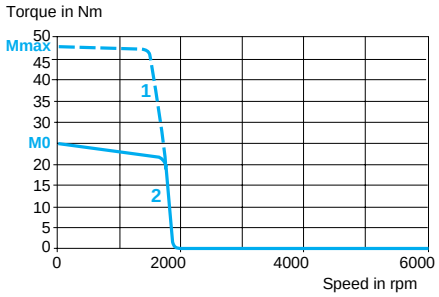
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.85	1.38
	Back emf		**V_{rms}/krpm**	119	88.8
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	40	
		With brake J_m	**kgcm²**	40.61	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.68	0.42
	Inductance (phase/phase)		**mH**	6.1	3.4
	Electrical time constant		**ms**	8.97	8.10
Holding brake (according to model)				See page 138	

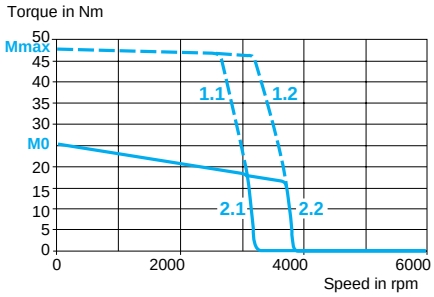
Torque/speed curves

BDH 1385M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase

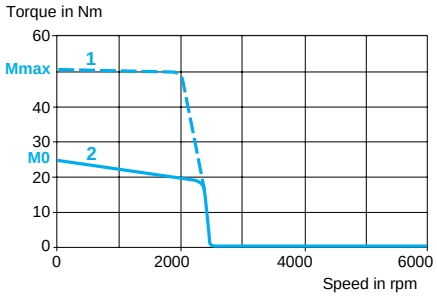


With LXM 15MD40N4 servo drive
400/480 V 3-phase

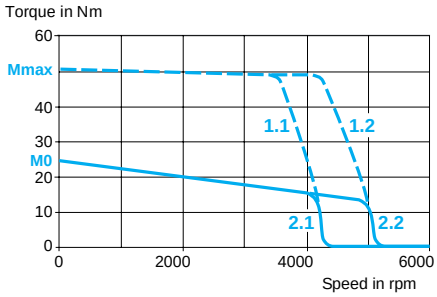


BDH 1385N servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Lexium 15 motion control
BDH servo motors

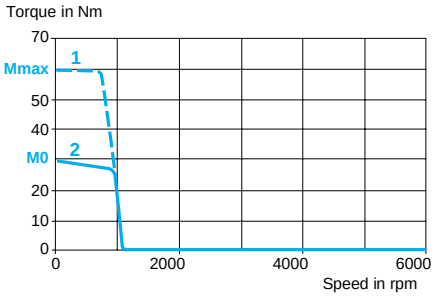
Characteristics of BDH 1882K/1882M servo motors

Type of servo motor				BDH 1882K			BDH 1882M		
Associated with Lexium 15 servo drive				LXM 15MD28N4			LXM 15MD40N4		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	29.7			30		
	Peak stall	M_{max}	**Nm**	59.4			59.8		
Nominal operating point	Nominal torque		**Nm**	27.5	25.7	24.5	27	24	23
	Nominal speed		**rpm**	720	1320	1620	1020	1860	2220
Maximum current			**A rms**	19.66			27.51		
Servo motor characteristics									
Maximum mechanical speed			**rpm**	6000					
Constants (at 120°C)	Torque		**Nm/A rms**	3.23			2.33		
	Back emf		**V_{rms}/krpm**	208			150		
Rotor	Number of poles			10					
	Inertia	Without brake J_m	**kgcm²**	65					
		With brake J_m	**kgcm²**	66.64					
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.22			0.64		
	Inductance (phase/phase)		**mH**	20.7			10.8		
	Electrical time constant		**ms**	16.97			16.88		
Holding brake (according to model)				See page 138					

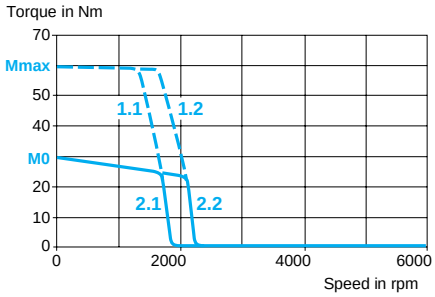
Torque/speed curves

BDH 1882K servo motor

With LXM 15MD28N4 servo drive
230 V 3-phase

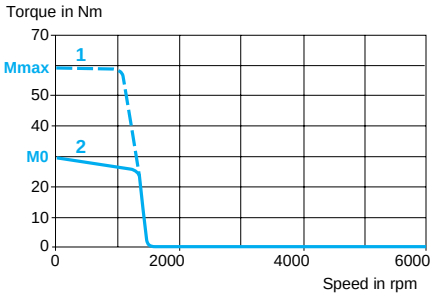


With LXM 15MD28N4 servo drive
400/480 V 3-phase

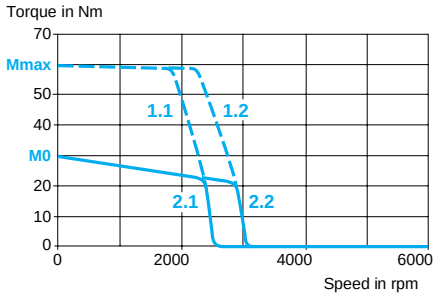


BDH 1882M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1882P/1883M servo motors

Type of servo motor				**BDH 1882P**			**BDH 1883M**		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**			**LXM 15MD40N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	29.4			42		
	Peak stall	M_{max}	**Nm**	58.4			80.7		
Nominal operating point	Nominal torque		**Nm**	24.5	20.5	18.5	37.5	34	32.5
	Nominal speed		**rpm**	1560	2820	3360	780	1440	1740
Maximum current			**A rms**	39.67			28.85		

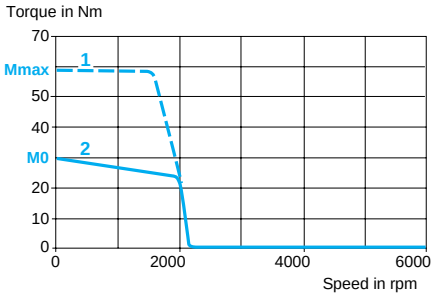
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000	
Constants (at 120°C)	Torque		**Nm/A rms**	1.58	3.1
	Back emf		**V_{rms}/krpm**	102	200
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	65	92
		With brake J_m	**kgcm²**	66.64	93.64
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.33	0.68
	Inductance (phase/phase)		**mH**	5	12.4
	Electrical time constant		**ms**	15.15	18.24
Holding brake (according to model)				See page 138	

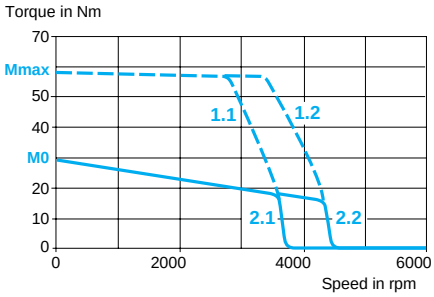
Torque/speed curves

BDH 1882P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

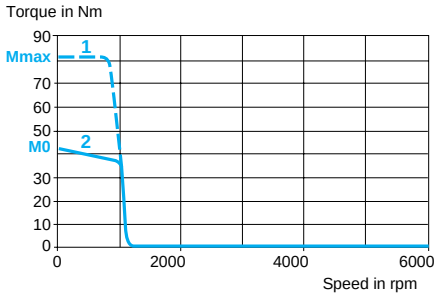


With LXM 15MD56N4 servo drive
400/480 V 3-phase

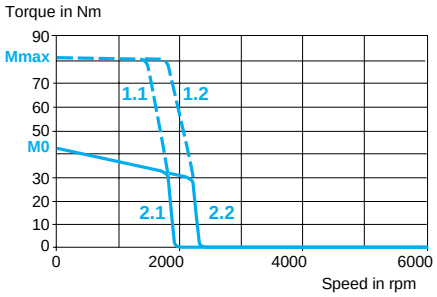


BDH 1883M servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Lexium 15 motion control
BDH servo motors

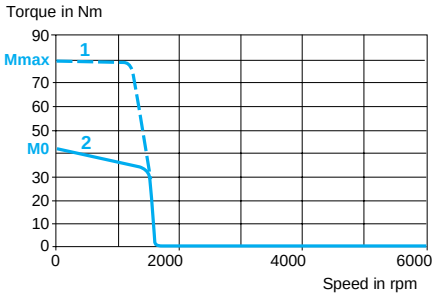
Characteristics of BDH 1883P/1884L servo motors

Type of servo motor				BDH 1883P			BDH 1884L		
Associated with Lexium 15 servo drive				LXM 15MD56N4			LXM 15MD40N4		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	41.6			53		
	Peak stall	M_{max}	Nm	79.4			108		
Nominal operating point	Nominal torque		Nm	35	29.5	27.5	48	44	42
	Nominal speed		rpm	1200	2160	2580	600	1080	1320
Maximum current			A rms	41.44			27.37		
Servo motor characteristics									
Maximum mechanical speed			rpm	6000					
Constants (at 120°C)	Torque		Nm/A rms	2.13			4.14		
	Back emf		V_{rms}/krpm	137			266		
Rotor	Number of poles			10					
	Inertia	Without brake J_m	kgcm²	92			120		
		With brake J_m	kgcm²	93.64			121.64		
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.35			0.85		
	Inductance (phase/phase)		mH	5.9			16.4		
	Electrical time constant		ms	16.86			19.29		
Holding brake (according to model)				See page 138					

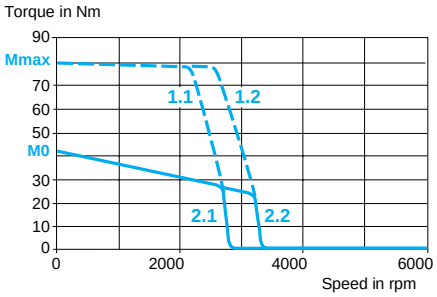
Torque/speed curves

BDH 1883P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase

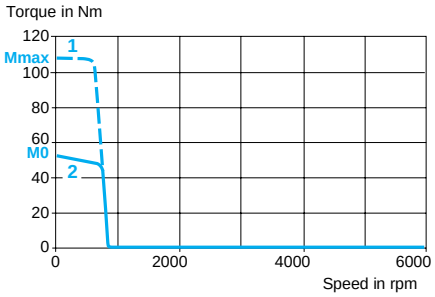


With LXM 15MD56N4 servo drive
400/480 V 3-phase

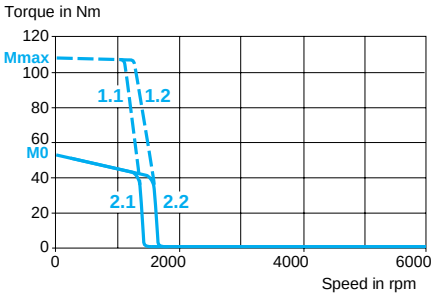


BDH 1884L servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of BDH 1884P servo motors

Type of servo motor				**BDH 1884P**		
Associated with Lexium 15 servo drive				**LXM 15MD56N4**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	52.5		
	Peak stall	M_{max}	**Nm**	106		
Nominal operating point	Nominal torque		**Nm**	45	39	36
	Nominal speed		**rpm**	900	1620	1980
Maximum current			**A rms**	39.24		

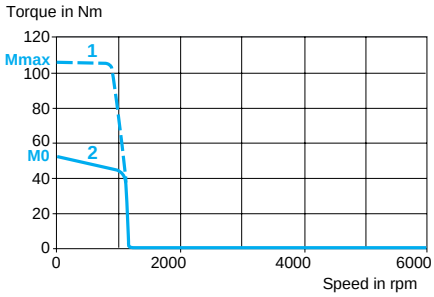
Servo motor characteristics

Maximum mechanical speed			**rpm**	6000
Constants (at 120°C)	Torque		**Nm/A rms**	2.84
	Back emf		**V_{rms}/krpm**	183
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	120
		With brake J_m	**kgcm²**	121.64
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.43
	Inductance (phase/phase)		**mH**	7.7
	Electrical time constant		**ms**	17.91
Holding brake (according to model)				See page 138

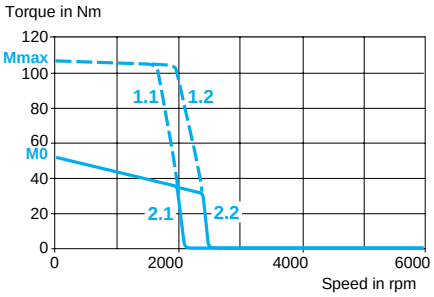
Torque/speed curves

BDH 1884P servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

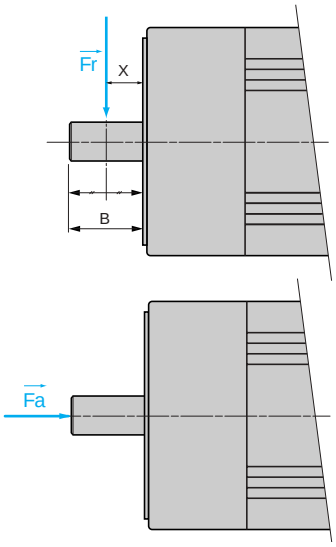
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 82 and 83

References:
pages 130 to 133

Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors



Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambient temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 134 to 137)

(1) Hours of service with a failure probability of 10%

The following conditions must be adhered to:

- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 54 or IP 67 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BDH 040	**N**	46	43	40	37	33	30	27	23
	BDH 058	**N**	138	137	135	133	132	130	128	127
	BDH 070	**N**	300	240	200	180	165	150	–	–
	BDH 084	**N**	460	430	400	370	340	310	–	–
	BDH 108	**N**	425	400	375	350	325	300	–	–
	BDH 138	**N**	1200	900	775	700	650	600	–	–
	BDH 188	**N**	1400	1100	800	–	–	–	–	–
			Maximum axial force: Fa = $\frac{Fr}{3}$							

Presentation: pages 82 and 83
References: pages 130 to 133
Dimensions: pages 134 to 137

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		VW3 M5 101 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 free wire end (Lexium 15 LP servo drive side)
External diameter	mm	12 ± 0.2
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system
Working voltage	V	600
Maximum usable length	m	50, for connection with a Lexium 15 LP servo drive
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1 mm²)]	[(4 x 2.5 mm²) + (2 x 1 mm²)]	[(4 x 4 mm²) + (2 x 1 mm²)]
Connector type		1 industrial connector (BDH servo motor side) and 1 removable 6-way connector (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable carrier system	110, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●	VW3 M8 401 R●●●
Sensor		SinCos Hiperface® encoder	Resolver
External sleeve, insulation		PUR green coloured RAL 6018, polyester	
Number of conductors (shielded)		5 x (2 x 0.25 mm²) + (2 x 0.5 mm²)	
External diameter	mm	8.8 ± 0.2	
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)	1 industrial connector (servo motor side) and 1 x 9-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable carrier system	
Working voltage	V	350 (0.25 mm²), 500 (0.5 mm²)	
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation:
pages 82 and 83

References:
pages 132 and 133

Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors

105995

BDH 0401●

105997

BDH 0701●

105999

BDH 1081●

BDH servo motors

The BDH servo motors shown below are supplied without a gearbox. For GBX gearboxes see page 143.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.18	0.61	8000	LD13M3	8000	**BDH 0401B ●5A2●**	0.350
0.31	1.08	8000	LD13M3	8000	**BDH 0402C ●5A2●**	0.490
0.41	1.46	8000	LD13M3	8000	**BDH 0403C ●5A2●**	0.630
0.84	2.34	8000	LU60N4	7680	**BDH 0582C ●●●2●**	1.100
0.87	2.42	8000	LD13M3	6880	**BDH 0582E ●●●2●**	1.100
1.08	2.62	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.13	3.2	8000	LU60N4	6000	**BDH 0583C ●●●2●**	1.380
1.15	3.34	8000	LU60N4	5360	**BDH 0701C ●●●2A**	1.550
1.16	3.58	8000	LD13M3	4080	**BDH 0583D ●●●2●**	1.380
			LD10N4	8000		
1.18	3.52	8000	LD21M3	8000	**BDH 0583F ●●●2●**	1.380
1.2	3.24	8000	LD13M3	5360	**BDH 0701E ●●●2A**	1.550
1.38	3.94	8000	LU60N4	5120	**BDH 0584C ●●●2●**	1.660
1.41	4.4	8000	LD13M3	3520	**BDH 0584D ●●●2●**	1.660
			LD10N4	8000		
1.42	3.57	8000	LD21M3	6000	**BDH 0584F ●●●2●**	1.660
	4.46	8000	LD21M3	6560		
1.5	3.14	6000	LD21M3	6000	**BDH 0841H ●●●2●**	2.440
1.95	5.12	6000	LU60N4	2820	**BDH 0841C ●●●2●**	2.440
2	5.74	8000	LU60N4	3440	**BDH 0702C ●●●2A**	2.230
2.02	5.13	6000	LD13M3	5640	**BDH 0841E ●●●2●**	2.440
	5.33	6000	LD10N4	2460		
2.04	6.51	8000	LD13M3	2320	**BDH 0702D ●●●2A**	2.230
			LD10N4	5520		
2.06	4.78	6000	LD21M3	5340	**BDH 0841H ●●●2●**	2.440
2.08	4.52	8000	LD21M3	4400	**BDH 0703H●●●2A**	2.900
2.1	5.36	8000	LD21M3	6560	**BDH 0702H ●●●2A**	2.230
2.71	7.83	8000	LU60N4	2560	**BDH 0703C ●●●2A**	2.900
2.79	8.55	8000	LD13M3	2000	**BDH 0703E ●●●2A**	2.900
			LD10N4	4800		
2.88	7.35	8000	LD21M3	4960	**BDH 0703H ●●●2A**	2.900
2.96	6.54	6000	LD21M3	3000	**BDH 0842G ●●●2●**	3.390
3.35	9.37	6000	LU60N4	1680	**BDH 0842C ●●●2●**	3.390
3.42	9.41	6000	LD10N4	3480	**BDH 0842E ●●●2●**	3.390
	9.72	6000	LD13M3	1500		
3.53	8.66	6000	LD17N4	6000	**BDH 0842G ●●●2●**	3.390
	9.56	6000	LD21M3	2760		
3.56	7.56	6000	LD28M3	5400	**BDH 0842J ●●●2●**	3.390
			MD28N4	5400		
3.96	8.8	6000	LD21M3	2220	**BDH 0843G ●●●2●**	4.350
	9.41	6000	LD21M3	1680	**BDH 1081G ●●●2●**	4.200
4.7	10.71	6000	LD10N4	2880	**BDH 1081E ●●●2●**	4.200
	11.7	6000	LD10N4	2700	**BDH 0843E ●●●2●**	4.350
4.75	10.82	6000	LD21M3	2340	**BDH 1081G ●●●2●**	4.200
			LD17N4	5160		
4.76	10.55	6000	LD21M3	1860	**BDH 0844G ●●●2●**	5.300
4.8	11.68	6000	LD17N4	4980	**BDH 0843G ●●●2●**	4.350
	13.2	6000	LD21M3	2160		
4.9	9.02	6000	LD28M3	4920	**BDH 0843K ●●●2●**	4.350
			MD28N4	4920		
	9.22	6000	LD28M3	4800	**BDH 1081K ●●●2●**	4.200
			MD28N4	4800		
5.76	14.1	6000	LD10N4	2400	**BDH 0844E ●●●2●**	5.300
5.88	13.97	6000	LD17N4	4380	**BDH 0844G ●●●2●**	5.300
	16.1	6000	LD21M3	1860		
6	12.8	6000	LD28M3	3660	**BDH 0844J ●●●2●**	5.300
			MD28N4	3660		
7.16	17.31	6000	LD21M3	1140	**BDH 1082G ●●●2●**	5.800

(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) Complete each reference based on the available options, see table page 131.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.

Lexium 15 motion control
BDH servo motors

106001

BDH 1882●

BDH servo motors (continued)

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
8.34	18.08	6000	LD10N4	1860	**BDH 1082E ●●●2●**	5.800
8.43	19.51	6000	LD21M3	1320	**BDH 1082G ●●●2●**	5.800
			LD17N4	3000		
8.6	16.7	6000	LD17N4	4080	**BDH 1082M ●●●2●**	5.800
	16.9	6000	LD28M3	2820	**BDH 1082K ●●●2●**	5.800
			MD28N4	2820		
11.4	22.1	6000	MD40N4	3180	**BDH 1083M ●●●2●**	7.400
	22.2	6000	MD56N4	4740	**BDH 1083P ●●●2●**	7.400
	25.83	6000	LD17N4	2340	**BDH 1083G ●●●2●**	7.400
11.6	22.9	6000	LD28M3	2100	**BDH 1083K ●●●2●**	7.400
			MD28N4	2100		
11.9	25.6	6000	LD17N4	1800	**BDH 1382G ●●●2●**	8.900
12.2	22.7	6000	LD28M3	1860	**BDH 1382K ●●●2●**	8.900
			MD28N4	1860		
	22.8	6000	MD40N4	5820	**BDH 1382M ●●●2●**	8.900
12.3	23.2	6000	MD56N4	3840	**BDH 1382P ●●●2●**	8.900
14.1	25.5	6000	MD56N4	3780	**BDH 1084N ●●●2●**	9.000
	27.28	6000	MD40N4	4260	**BDH 1084L ●●●2●**	9.000
14.3	31.7	6000	LD17N4	1980	**BDH 1084G ●●●2●**	9.000
14.4	28.1	6000	LD28M3	1800	**BDH 1084K ●●●2●**	9.000
16.5	38.4	6000	LD17N4	1440	**BDH 1383G ●●●2●**	11.100
16.8	31	6000	LD28M3	1500	**BDH 1383K ●●●2●**	11.100
			MD28N4	1500		
17	31.4	6000	MD40N4	4500	**BDH 1383M ●●●2●**	11.100
	34.8	6000	MD56N4	5580	**BDH 1383N ●●●2●**	11.100
20.4	40.2	6000	MD56N4	5280	**BDH 1384P ●●●2●**	13.300
20.8	41.2	6000	MD28N4	2460	**BDH 1384K ●●●2●**	13.300
21	41.9	6000	MD40N4	3420	**BDH 1384L ●●●2●**	13.300
24.3	50.2	6000	MD56N4	4260	**BDH 1385N ●●●2●**	15.400
24.8	46.8	6000	MD28N4	2280	**BDH 1385K ●●●2●**	15.400
25	47.6	6000	MD40N4	3180	**BDH 1385M ●●●2●**	15.400
29.4	58.4	6000	MD56N4	3360	**BDH 1882P ●●●2●**	19.700
29.7	59.4	6000	MD28N4	1620	**BDH 1882K ●●●2●**	19.700
30	59.8	6000	MD40N4	2220	**BDH 1882M ●●●2●**	19.700
41.6	79.4	6000	MD56N4	2580	**BDH 1883P ●●●2●**	26.700
42	80.7	6000	MD40N4	1740	**BDH 1883M ●●●2●**	26.700
52.5	106	6000	MD56N4	1980	**BDH 1884P ●●●2●**	33.600
53	108	6000	MD40N4	1320	**BDH 1884L ●●●2●**	33.600

To order a BDH servo motor complete each reference with:

		BDH 0583D	●	●	●	2	●
Shaft end	IP 54	Untapped *(4)*	**0**				
		Keyed *(6)* *(7)*	**1**				
	IP 67	Untapped *(4)*	**2**				
		Keyed *(6)* *(7)*	**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn *(5)*			**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns *(5)*			**2**			
	2-pole resolver			**5**			
Holding brake	None				**A**		
	With *(5)*				**F**		
Connection	Angled connectors that can be rotated through 90°					**2**	
Flange	International IEC standard *(7)*						**A**
	NEMA *(6)* *(7)* *(8)*						**B**

Note: *The example above is for a* ***BDH 0583D*** *servo motor. Replace* ***BDH 0583D*** *with the relevant reference for other servo motors.*

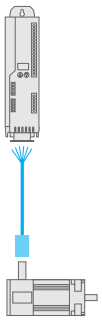
(1) Derating possible according to the power supply voltage, see characteristics pages 84 to 127.
(2) To complete each reference see the above table.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 138.
(4) Not available in NEMA mounting for BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●● servo motors.
(5) Not available for BDH 040●● servo motors.
(6) Not available in NEMA mounting for BDH 040●● servo motors and BDH 058●●.
(7) The type of key differs according to the type of mounting (IEC or NEMA) and the servo motor rating, see pages 134 to 137:
- *EMC mounting: BDH 040●●, open shaft key; other BDH servo motors, closed shaft key.*
- *NEMA mounting: BDH 084●●, BDH 108●●, BDH 138●● and BDH 188●●, open shaft key. Shaft key option not available for BDH 040●● and BDH 058●●.*

(8) Not available for BDH 070●● servo motors.

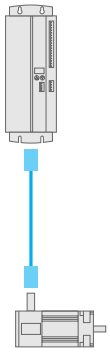
Presentation: pages 82 and 83
Characteristics: pages 84 to 128
Dimensions: pages 134 to 137

Lexium 15 motion control
BDH servo motors

Power supply connection cables



VW3 M5 101 R●●●



VW3 M5 201/202/203 R●●●

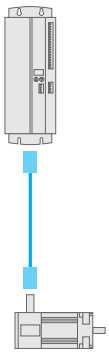
Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BDH 040●● BDH 058●● BDH 070●● BDH 084●● BDH 108●E BDH 108●G BDH 108●K BDH 138●G BDH 138●K	LXM 15L●●●●●	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	2.290
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
Cables fitted with two connectors	BDH 084●● BDH 108●K BDH 138●K BDH 188●K	LXM 15MD●●N4	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BDH 108●L BDH 108●M BDH 138●L BDH 138●M BDH 188●L BDH 188●M	LXM 15MD●●N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BDH 108●N BDH 108●P BDH 138●N BDH 138●P BDH 188●P	LXM 15MD●●N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20m, a motor choke is compulsory, see page 47.

Presentation:
pages 82 and 83

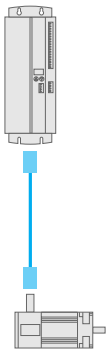
Characteristics:
page 129

Control connecting cables



VW3 M8 301 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–



VW3 M8 401 R●●●

Resolver cables fitted with two connectors	BDH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 401 R30**	–
				5	**VW3 M8 401 R50**	–
				10	**VW3 M8 401 R100**	–
				15	**VW3 M8 401 R150**	–
				20	**VW3 M8 401 R200**	–
				25	**VW3 M8 401 R250**	–
				50	**VW3 M8 401 R500**	–
				75	**VW3 M8 401 R750**	–

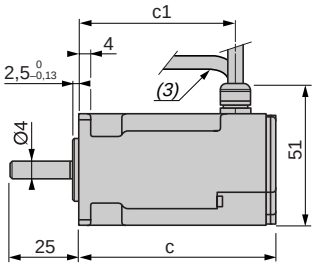
Presentation:
pages 82 and 83

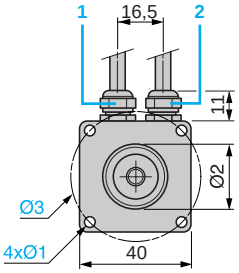
Characteristics:
page 129

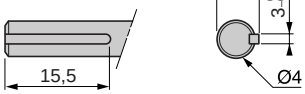
Lexium 15 motion control
BDH servo motors

BDH 040 (straight remote connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*

Keyed shaft end (optional) *(2)*





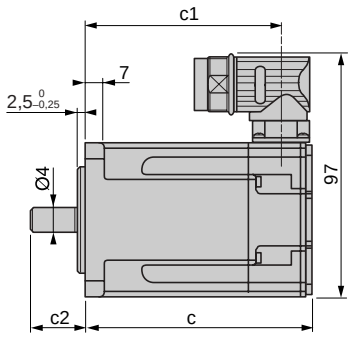


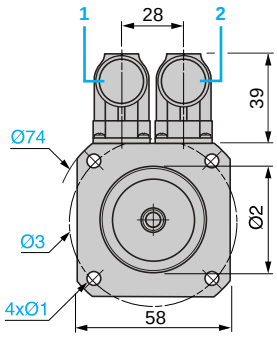
	With resolver		IEC mounting				NEMA mounting			
	c	c1	Ø1	Ø2	Ø3	Ø4	Ø1	Ø2	Ø3	Ø4
BDH 0401	69.6	56.1	4.3	30 h7	46	8 h7	3.56	20.015 +0.025 −0.025	46.69	6.35 0 −0.012
BDH 0402	88.6	75.1	4.3	30 h7	46	8 h7	3.56	20.015 +0.025 −0.025	46.69	6.35 0 −0.012
BDH 0403	107.6	94.1	4.3	30 h7	46	8 h7	3.56	20.015 +0.025 −0.025	46.69	6.35 0 −0.012

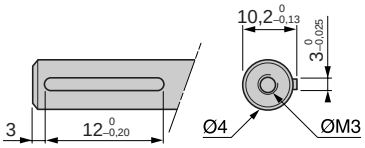
(1) SinCos Hiperface® encoder options and holding brake not available.
(2) Not available in NEMA mounting.
(3) Supplied with remote connectors, connection length: 500 mm

BDH 058 (angled connectors: power supply for servo motor/brake 2 and sensor 1)

Keyed shaft end (optional) *(1)*





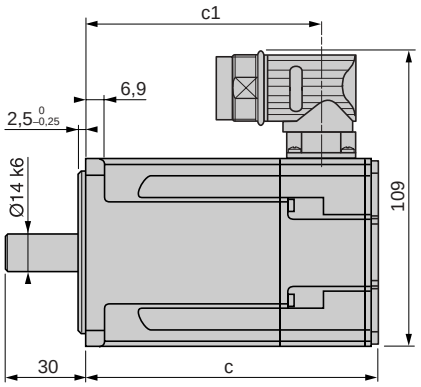


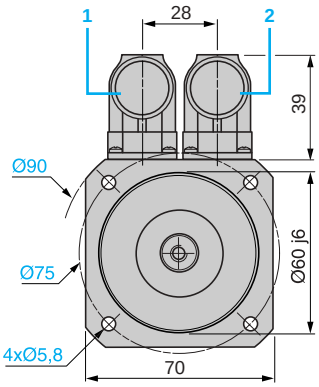
	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	c (with brake)	c (without brake)	c (with brake)	c1	c2	Ø1	Ø2	Ø3	Ø4	c2	Ø1	Ø2	Ø3	Ø4
BDH 0582	105.2	148.5	114.4	148.5	93.6	20	4.8	40 j6	63	9 k6	31.75 +0.79 −0.79	5.1	38.1 0 −0.005	66.68	9.525 0 −0.013
BDH 0583	124.2	167.5	133.4	167.5	112.6	20	4.8	40 j6	63	9 k6	31.75 +0.79 −0.79	5.1	38.1 0 −0.005	66.68	9.525 0 −0.013
BDH 0584	143.2	186.5	152.4	186.5	131.6	20	4.8	40 j6	63	9 k6	31.75 +0.79 −0.79	5.1	38.1 0 −0.005	66.68	9.525 0 −0.013

(1) Not available in NEMA mounting.

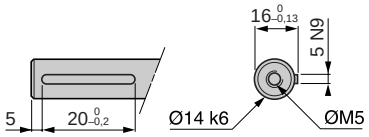
Presentation: pages 82 and 83
Characteristics: pages 84 to 129
References: pages 130 to 133

BDH 070 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*





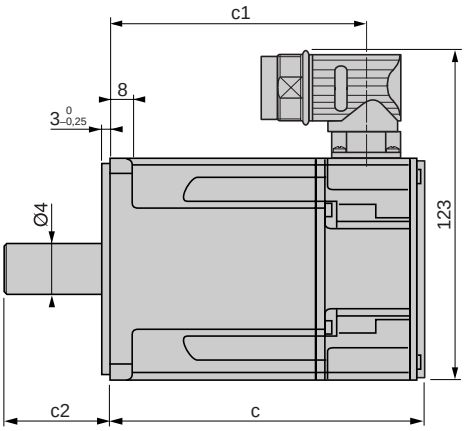
Keyed shaft end (optional)

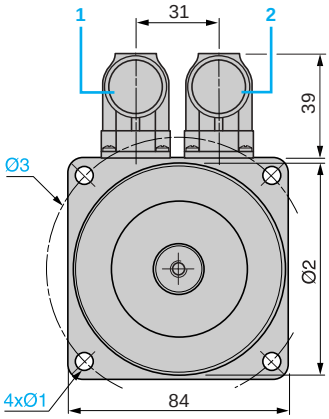


	With resolver or SinCos encoder		
	c (without brake)	**c** (with brake)	**c1**
BDH 0701	109.8	140.3	87.9
BDH 0702	140.8	171.3	118.9
BDH 0703	171.8	202.3	149.9

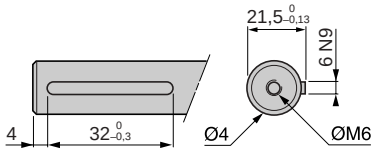
(1) Not available in NEMA mounting.

BDH 084 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*

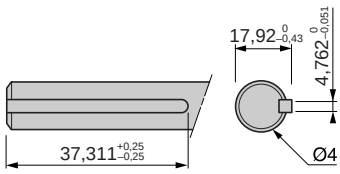




Keyed shaft end, IEC mounting (optional)



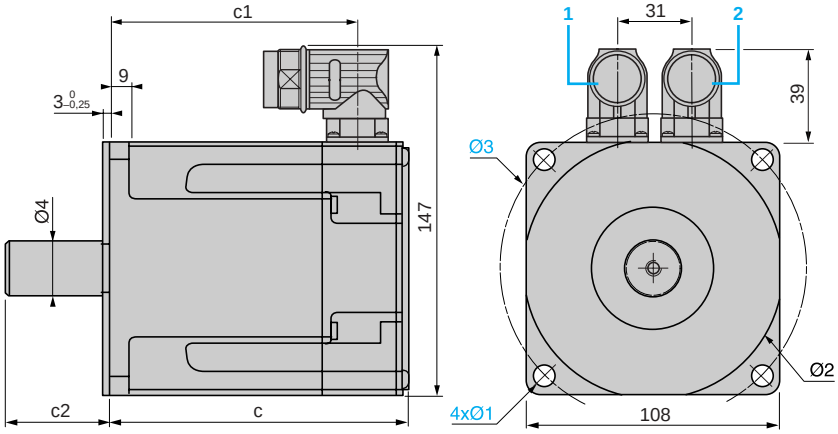
Keyed shaft end, NEMA mounting *(1)*



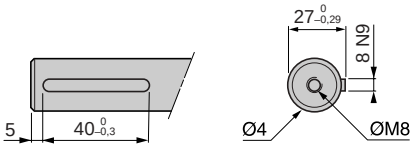
	With resolver or SinCos encoder		IEC mounting						NEMA mounting				
	c (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 0841	118.8	152.3	96.4	40	7	80 j6	100	19 k6	52.4 +0.79 -0.79	5.54	73.025 0 -0.051	98.43	15.875 0 -0.013
BDH 0842	147.8	181.3	125.5	40	7	80 j6	100	19 k6	52.4 +0.79 -0.79	5.54	73.025 0 -0.051	98.43	15.875 0 -0.013
BDH 0843	176.8	210.3	154.4	40	7	80 j6	100	19 k6	52.4 +0.79 -0.79	5.54	73.025 0 -0.051	98.43	15.875 0 -0.013
BDH 0844	205.8	239.3	183.4	40	7	80 j6	100	19 k6	52.4 +0.79 -0.79	5.54	73.025 0 -0.051	98.43	15.875 0 -0.013

(1) The untapped shaft end option is not available in NEMA mounting.

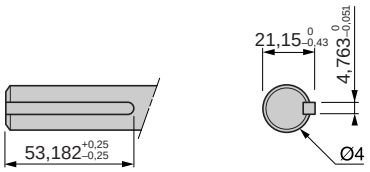
BDH 108 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



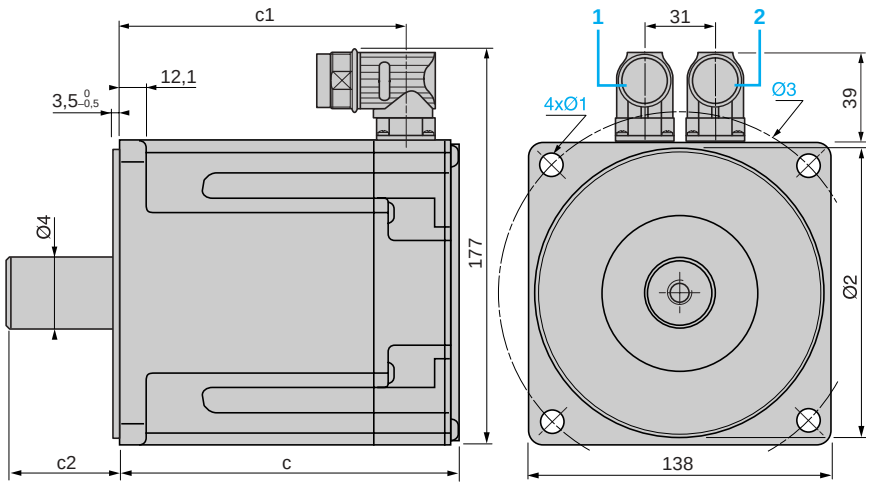
Keyed shaft end, NEMA mounting *(1)*



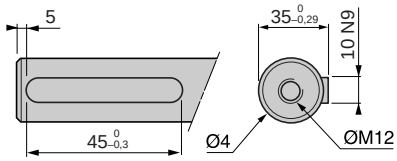
	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1081	127.5	172.5	146	189	105.3	50	9	110 j6	130	24 k6	57.15 +0.79 -0.79	8.33	55.563 0 -0.051	125.73	19.05 0 -0.013
BDH 1082	158.5	203.5	177	220	136.3	50	9	110 j6	130	24 k6	57.15 +0.79 -0.79	8.33	55.563 0 -0.051	125.73	19.05 0 -0.013
BDH 1083	189.5	234.5	208	251	167.3	50	9	110 j6	130	24 k6	57.15 +0.79 -0.79	8.33	55.563 0 -0.051	125.73	19.05 0 -0.013
BDH 1084	220.5	265.5	239	282	196.3	50	9	110 j6	130	24 k6	57.15 +0.79 -0.79	8.33	55.563 0 -0.051	125.73	19.05 0 -0.013

(1) The untapped shaft end option is not available in NEMA mounting.

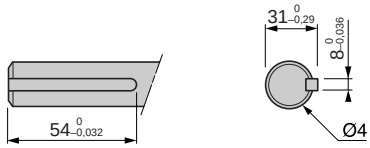
BDH 138 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*

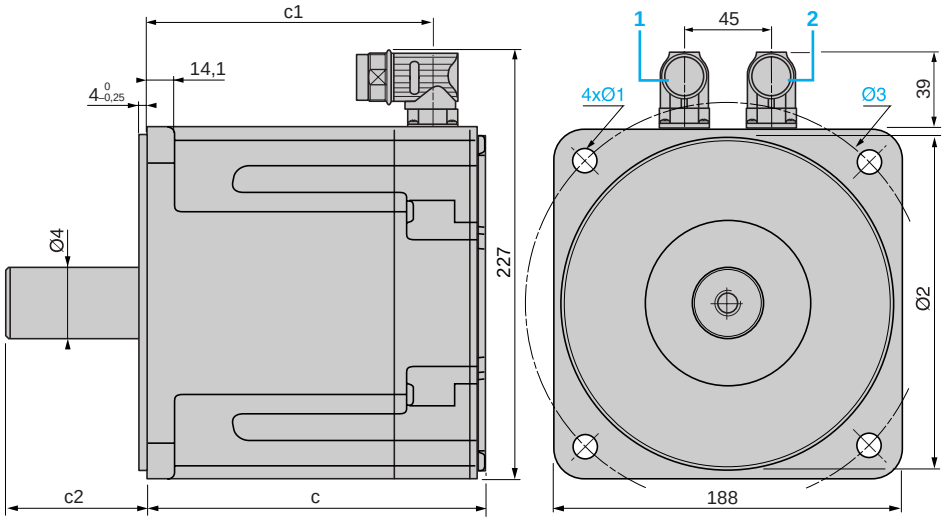


	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1382	153.7	200.7	172.2	218.7	130.5	58	11 +0.36 0	130 j6	165	32 k6	60	9 +0.36 0	110 h7	145	28 h6
BDH 1383	178.7	225.7	197.2	224.7	155.5	58	11 +0.36 0	130 j6	165	32 k6	60	9 +0.36 0	110 h7	145	28 h6
BDH 1384	203.7	250.7	222.2	268.7	180.5	58	11 +0.36 0	130 j6	165	32 k6	60	9 +0.36 0	110 h7	145	28 h6
BDH 1385	228.7	275.7	247.2	294.7	205.5	58	11 +0.36 0	130 j6	165	32 k6	60	9 +0.36 0	110 h7	145	28 h6

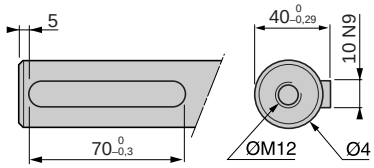
(1) The untapped shaft end option is not available in NEMA mounting.

Presentation: pages 82 and 83
Characteristics: pages 84 to 129
References: pages 130 to 133

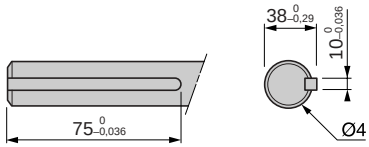
BDH 188 (angled connectors: power supply for servo motor/brake 2 and sensor 1) *(1)*



Keyed shaft end, IEC mounting (optional)



Keyed shaft end, NEMA mounting *(1)*



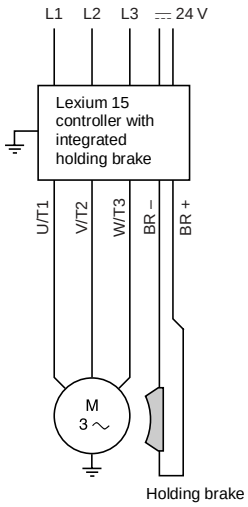
	With resolver		With SinCos encoder			IEC mounting					NEMA mounting				
	c (without brake)	**c** (with brake)	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**	**c2**	**Ø1**	**Ø2**	**Ø3**	**Ø4**
BDH 1882	192.5	234.5	201.7	253.3	164.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6
BDH 1883	226.5	268.5	235.7	287.3	198.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6
BDH 1884	260.5	302.5	269.7	321.3	232.5	80	13.5 $^{+0.43}_{0}$	180 j6	215	38 k6	79	13.5 $^{+0.43}_{0}$	114.3 $^{0}_{-0.025}$	200	35 h6

(1) The untapped shaft end option is not available in NEMA mounting.

Lexium 15 motion control
BDH servo motors
Option: integrated holding brake

Holding brake *(1)*

Presentation



The holding brake integrated into the BDH servo motor, depending on the model, is an electromagnetic pressure spring brake with that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BDH	058	070	084	108	138	188
Holding torque M_{Br}	**Nm**	1.42	2.5	6	14.5	25	53
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.011	0.011	0.068	0.173	0.61	1.64
Electrical clamping power P_{Br}	**W**	8.4	10.1	12.8	19.5	25.7	35.6
Supply voltage		24 V⎓ -10…+10 %					
Opening time	**ms**	20	27	35	80	105	110
Closing time	**ms**	18	10	15	15	20	35
Weight	**kg**	0.270	0.350	0.610	1.100	2.000	2.100

References

105998

BDH servo motor

Selection of BDH servo motor with **F** *(1)* or without **A** holding brake, see references page 131.

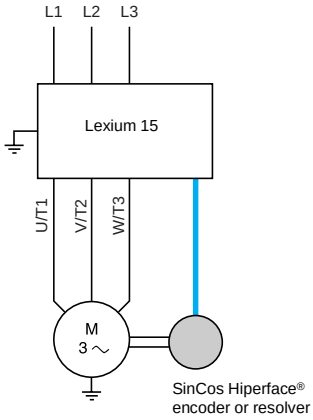
(1) Not available for BDH 040●● servo motors.

Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors
Option: integrated sensor

Sensor integrated into BDH servo motors

Presentation



BDH servo motors can be fitted with 2 types of sensor:
- 2-pole resolver
- SinCos high resolution Hiperface® *(1)* encoder:
  - single turn
  - multiturn

These measurement devices are perfectly adapted to the Lexium 15 range of servo drives.

The use of a resolver allows (at low cost):
- The angular position of the rotor to be identified
- The servo motor speed to be measured

The use of a SinCos Hiperface® *(1)* encoder also allows:
- The BDH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		Resolver	Single turn SinCos *(1)*	Multiturn SinCos *(1)*
Sinus periods per turn		1	128	128
Number of points		–	4096	4096 x 4096 turns
Encoder precision		± 30 arc minutes	± 1.3 arc minutes	
Measurement method		Electromagnetic demodulation	Optical high resolution	
Interface		–	Hiperface®	
Operating temperature	**°C**	+55…+155	+5…+110	

References

105998

BDH servo motor

Selection of resolver sensor **5**, type of SinCos Hiperface® encoder *(1)* integrated into the BDH servo motor (single turn **1** or multiturn **2**), see references page 131.

(1) Not available for BDH 040●● servo motors.

Dimensions:
pages 134 to 137

Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

Presentation

535526

GBX planetary gearboxes

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BDH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BDH servo motors has been fully qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 gear ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other combinations, see the servo motor data sheets.

BDH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 0401B	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60
BDH 0402C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60
BDH 0403C	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60**
BDH 0582C	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0582E	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0583C	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0583D	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0583F	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0584C	GBX 60	GBX 60	*GBX 60**	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0584D	GBX 60	GBX 60	*GBX 60**	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0584F	GBX 60	GBX 60	*GBX 60**	*GBX 60**	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**	*GBX 60**
BDH 0701C	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0701E	GBX 60	GBX 60	GBX 60	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BDH 0702C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702D	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0702H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0703C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	*GBX 120**
BDH 0703E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	*GBX 120**
BDH 0703H	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	*GBX 120**
BDH 0841C	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841E	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0841H	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BDH 0842C	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842E	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842G	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0842J	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160
BDH 0843E	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843G	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0843K	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 0844E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160
BDH 0844J	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160

*GBX 60** *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

Characteristics: page 142 References: page 143 Dimensions: page 145

Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

BDH servo motor/GBX gearbox associations (continued)

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BDH 1081E	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081G	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1081K	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BDH 1082E	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**
BDH 1082G	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**
BDH 1082K	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**
BDH 1082M	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**
BDH 1083G	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1083K	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1083M	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1083P	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1084G	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1084K	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1084L	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1084N	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1382G	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1382K	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1382M	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1382P	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1383G	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1383K	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1383M	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1383N	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1384K	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1384L	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1384P	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1385K	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1385M	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**
BDH 1385N	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**

*GBX 160** *For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 142.*

Characteristics: page 142 References: page 143 Dimensions: page 145

Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	**3:1...8:1**	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	**3:1...8:1**	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BDH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	**3:1...8:1**		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Inertia of gearbox	**3:1**	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.030	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.50	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.50	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.30	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.30	5.28
Continuous output torque *(1)* M_{2N}	**3:1**	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclic ratio = 1) on electrical machines and an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

Presentation: pages 140 and 141
References: page 143
Dimensions: page 145

Lexium 15 motion control

BDH servo motors

Option: GBX planetary gearboxes

535526

GBX●●●

References

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●D**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●D**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●D**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●D**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●D**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●D**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●D**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●D**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●D**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●D**	22.000

To order a GBX planetary gearbox, complete each reference with:

			GBX	●●●	●●●	●●●	●	B
Size	Junction box diameter (see associations table with BDH servo motor, pages 140 and 141)	40 mm		**040**				
		60 mm		**060**				
		80 mm		**080**				
		115 mm		**120**				
		160 mm		**160**				
Speed reduction ratio		3:1			**003**			
		4:1			**004**			
		5:1			**005**			
		8:1			**008**			
		9:1			**009**			
		12:1			**012**			
		15:1			**015**			
		16:1			**016**			
		20:1			**020**			
		25:1			**025**			
		32:1			**032**			
		40:1			**040**			
Associated BDH servo motor	Type	BDH 040				**040**		
		BDH 058				**058**		
		BDH 070				**070**		
		BDH 084				**084**		
		BDH 108				**108**		
		BDH 138				**138**		
	Model	BDH ●●●1					**1**	
		BDH ●●●2					**2**	
		BDH ●●●3					**3**	
		BDH ●●●4					**4**	
		BDH ●●●5					**5**	
BDH servo motor adaptation								**D**

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Characteristics: page 142
Dimensions: page 145

Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

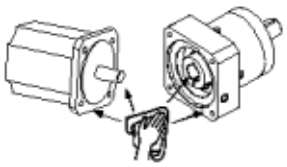
Mounting

No specialized tool is required to install the GBX planetary gearbox on the BDH servo motor. The general usage rules for mechanical mounting must be observed:

1 Clean support areas and joints.
2 Align the shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

For more information, consult the user instructions supplied with the products).

1



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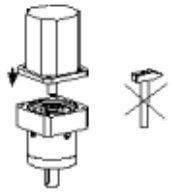
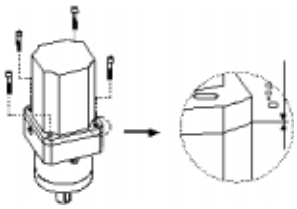
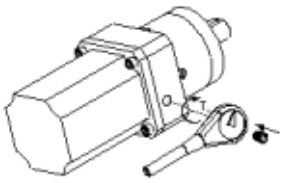


3



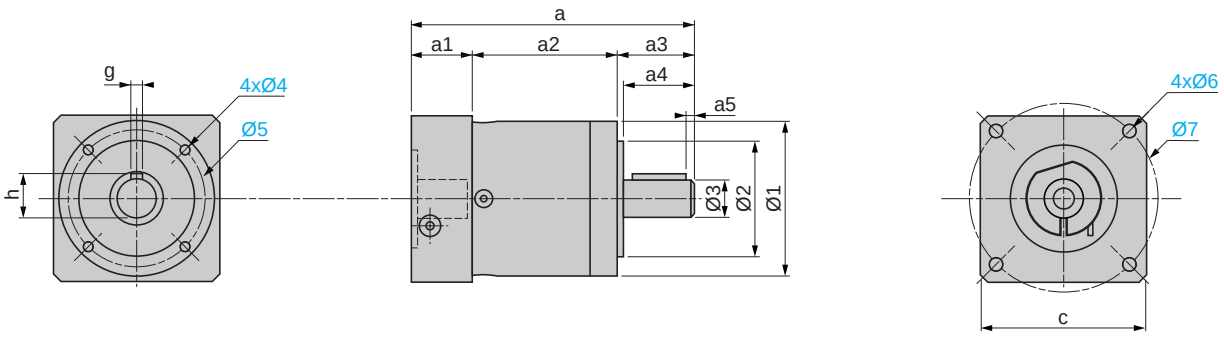
4



Lexium 15 motion control
BDH servo motors
Option: GBX planetary gearboxes

Dimensions

Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...032	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

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pages 140 and 141

Characteristics:
page 142

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Lexium 15 motion control
BDH servo motors

Sizing of BDH servo motors

To assist you in sizing your servo motor, the "**Lexium Sizer**" software tool is available on the website www.telemecanique.com

These 2 pages are to help you understand the method used for calculation.

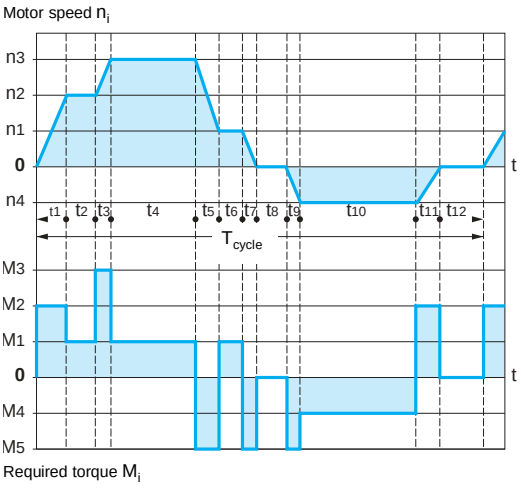
To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be used with the servo motor.
Both values are calculated using the motor cycle trend diagram and can be compared with the speed/torque curves given for each servo motor (see BDH servo motor curves, pages 84 to 127).

Motor cycle trend diagram

The motor cycle is made up of various sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown makes it possible to find out for each phase:
- The duration (t_j)
- The speed (n_i)
- The required torque value (M_i)

The curves on the left show the 4 phase types:
- Constant acceleration during t_1, t_3 and t_9
- At work during t_2, t_4, t_6 and t_{10}
- Constant deceleration during t_5, t_7 and t_{11}
- Motor stopped during t_8 and t_{12}

The total cycle duration is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$



Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite with: $n_{avg} = \frac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the various work speeds.
- $\frac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\|ni\|$	$\frac{\|n2\|}{2}$	$\|n2\|$	$\frac{\|n3\|+\|n2\|}{2}$	$\|n3\|$	$\frac{\|n3\|+\|n1\|}{2}$	$\|n1\|$	$\frac{\|n1\|}{2}$	0	$\frac{\|n4\|}{2}$	$\|n4\|$	$\frac{\|n4\|}{2}$	0

The average speed is calculated as follows:

$$n_{moy} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3+n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3+n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

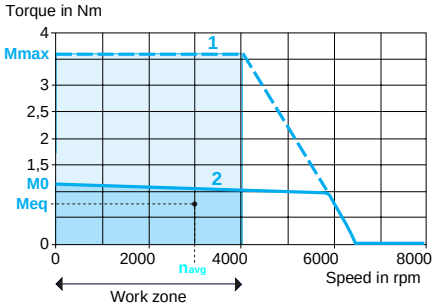
The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

Presentation: pages 82 and 83
Characteristics: pages 84 to 127
References: pages 130 to 133
Dimensions: pages 134 to 137



Sizing of BDH servo motors (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where:
- the horizontal axis represents the average speed n_{avg}
- the vertical axis represents the thermal torque M_{eq}

must be within the area bound by curve **2** and the work zone.

The motor cycle trend diagram must also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by curve **1** and the work zone.

1 Peak torque
2 Continuous torque

Lexium 15 motion control
BSH servo motors

BSH servo motor with straight connectors

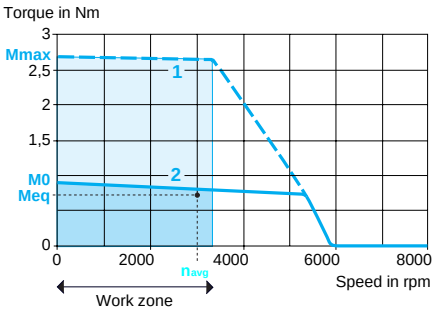
BSH servo motor with angled connectors

Presentation

BSH servo motors offer an excellent solution for dynamics and precision requirements. With five flange sizes and available in a variety of lengths, they are perfectly suited to most applications, covering a torque range of between 0.5 Nm to 90 Nm and speeds from 1250 to 8000 rpm.
Incorporating the latest technology in their windings, based on salient poles, BSH servo motors are far more compact than conventional servo motors.

BSH servo motors are available in five flange sizes: 55, 70, 100, 140 and 205 mm. Thermal protection is provided by a temperature probe integrated into the servo motor. They are certified as "Recognized" by the Underwriters Laboratories and conform to UL 1004 standards as well as to European directives (CE marking).

BSH servo motors are available with the following variants:
- IP 40 or IP 65 degree of protection
- with or without holding brake
- straight or angled connectors *(1)*
- SinCos Hiperface® single turn or multiturn encoders
- untapped or keyed shaft end



Torque/speed characteristics

BSH servo motors provide torque/speed curve profiles similar to the example shown on the left with:
1 Peak torque, depending on the servo drive model
2 Continuous torque, depending on the servo drive model
where:
- 8000 (in rpm) corresponds to the servo motor's maximum mechanical speed,
- M_{max} (in Nm) represents the peak stall torque value
- M_0 (in Nm) represents the continuous stall torque value

Principle for determining motor size according to the application

The torque/speed curves can be used to determine the correct servo motor size. For example, for a power supply voltage of 230 V single phase, the curves used are curves 1 and 2. Then:
1 Position the work zone of the application in relation to speed.
2 Verify, using the motor cycle trend diagram, that the torques required by the application during the different cycle phases are located within the area bound by curve 1 in the work zone.
3 Calculate the average speed n_{avg} and the equivalent thermal torque M_{eq} (see page 192).
4 The point defined by n_{avg} and M_{eq} must be located below curve 2 in the work zone.

Note: *Sizing of servo motors, see page 192*

Functions

General functions

BSH servo motors were developed to meet the following requirements:
- Functional characteristics, robustness, safety, ... in compliance with IEC/EN 60034-1
- Ambient operating temperature: - 20...40°C according to DIN 50019R14. Maximum 55°C with derating from 40°C of 1% per additional °C
- Relative humidity: Class F according to DIN 400
- Altitude: 1000 m without derating, 2000 m with k = 0.86 *(2)*, 3000 m with k = 0.8
- Storage and transport temperature: - 25...70°C
- Winding insulation class: F (threshold temperature for windings 155°C) in compliance with DIN VDE 0530
- Power and sensor connection using straight or angled connectors *(1)*
- Thermal protection via built-in PTC thermistor probes, controlled by the Lexium 15 servo drive

(1) BSH 2052 ● and BSH 2053 ● servo motors are supplied with a power connection terminal and an angled connector for sensor connection
(2) k: derating factor

Characteristics: pages 150 to 177
References: pages 178 to 181
Dimensions: pages 182 to 185

Functions (continued)

General functions (continued)

- Out-of-round, concentricity and perpendicularity between flange and shaft in accordance with DIN 42955, class N
- Flange compliant with standard DIN 42948
- Authorized mounting positions: no mounting restriction IMB5, IMV1 and IMV4 in accordance with DIN 42950
- Polyester resin-based paint: Opaque black paint RAL 9005
- Degree of protection:
  - of the frame: IP 65 in accordance with IEC/EN 60529
  - of the shaft end: IP 40 or IP 65 in accordance with IEC/EN 60529*(1)*
- Integrated sensor: SinCos Hiperface® high resolution single turn or multiturn encoder
- Standard sized untapped or keyed shaft end (according to DIN 42948)

Holding brake (depending on model)

The integrated brake fitted to the BSH servo motors (depending on the model) is a failsafe electro-magnetic holding brake.

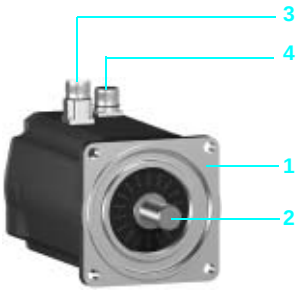
⚠ **Do not use the holding brake as a dynamic brake for deceleration, as this will rapidly damage the brake.**

Built-in sensor

The servo motor is fitted with a SinCos Hiperface® high resolution single turn (4096 points) or multiturn (4096 points x 4096 turns) absolute encoder providing angular precision of the shaft position, accurate to less than ±1.3 arc minutes.

This sensor performs the following functions:

- Gives the angular position of the rotor in such a way that flows can be synchronized
- Measures the servo motor speed via the associated Lexium servo drive. This information is used by the speed controller of the Lexium servo drive
- Measures the position information for the Lexium servo drive position controller
- Measures and transmits position information in incremental format for the position return of a motion control module (Encoder emulation output of the Lexium servo drive)



Description

BSH servo motors with a 3-phase stator and a 6- to 10-pole rotor (depending on model) with Neodymium Iron Borium (NdFeB) magnets consist of:

1. An axial flange with 4 fixing points in accordance with standard DIN 42948.
2. Standard shaft end according to DIN 42948, untapped or keyed (depending on model).
3. A straight dust and damp-proof male screw connector for connecting the power cable *(2)*.
4. A straight dust and damp-proof male screw connector for connecting the control (sensor) cable *(2)*.

Connecting cables must be ordered separately; for connection to Lexium 15 servo drives, see pages 180 and 181.

Schneider Electric has taken particular care to ensure compatibility between BSH servo motors and Lexium 15 servo drives. This compatibility can only be assured by using cables and connectors sold by Schneider Electric (see pages 180 and 181).

(1) IP 40 when motor is mounted in position IMV3 (vertical mounting, upper shaft end).
(2) Available in angled version for BSH 055●●, BSH 070●●, BSH 100●●, BSH 140●● and BSH 2051● servo motors. The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the sensor connection.

Characteristics: pages 150 to 177
References: pages 178 to 181
Dimensions: pages 182 to 185

Lexium 15 motion control
BSH servo motors

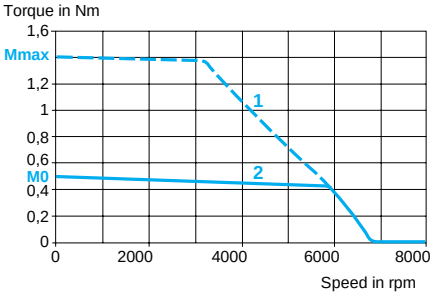
Characteristics of BSH 0551P/0551T servo motors

Type of servo motor				BSH 0551P		BSH 0551T
Associated with Lexium 15 servo drive				LXM 15LD13M3	LXM 15LU60N4	LXM 15LD13M3
Line supply voltage			V	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	0.5		
	Peak stall	M_{max}	Nm	1.4		
Nominal operating point	Nominal torque		Nm	0.46		0.41
	Nominal speed		rpm	3200		7040
Maximum current			A rms	3.5		6.2
Servo motor characteristics						
Maximum mechanical speed			rpm	8000		
Constants (at 120°C)	Torque		Nm/A rms	0.5		0.28
	Back emf		V_{rms}/krpm	32		18
Rotor	Number of poles			6		
	Inertia	Without brake J_m	kgcm²	0.09		
		With brake J_m	kgcm²	0.1113		
Stator (at 20°C)	Resistance (phase/phase)		Ω	33.8		11
	Inductance (phase/phase)		mH	37		12
	Electrical time constant		ms	1.09		
Holding brake (according to model)				See page 186		

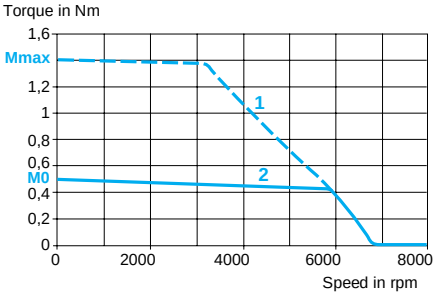
Torque/speed curves

BSH 0551P servo motor

With LXM 15LD13M3 servo drive
230 V single phase

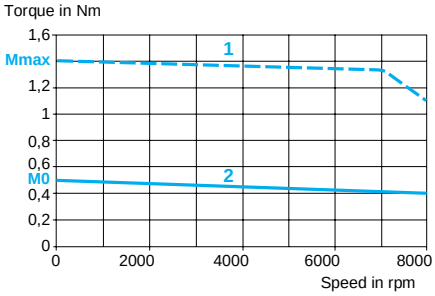


With LXM 15LU60N4 servo drive
230 V 3-phase



BSH 0551T servo motor

With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

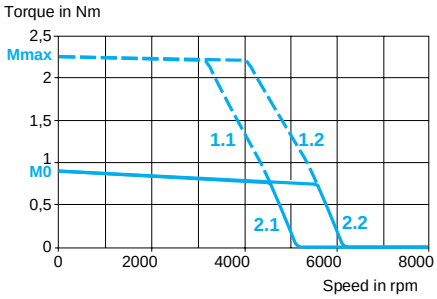
Characteristics of BSH 0552M/0552P servo motors

Type of servo motor				BSH 0552M		BSH 0552P		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		**LXM 15LD13M3**		**LXM 15LU60N4**
Line supply voltage			**V**	400 3-phase	480 3-phase	230 single phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.9		0.9		
	Peak stall	M_{max}	**Nm**	2.25		2.7		2.26
Nominal operating point	Nominal torque		**Nm**	0.8	0.77	0.8		0.78
	Nominal speed		**rpm**	3200	4080	3360		3760
Maximum current			**A rms**	2.4		5.9		
Servo motor characteristics								
Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	1.125		0.56		
	Back emf		**V_{rms}/krpm**	74		37		
Rotor	Number of poles			6				
	Inertia	Without brake J_m	**kgcm²**	0.14				
		With brake J_m	**kgcm²**	0.1613		0.1113		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	62.0		15.5		
	Inductance (phase/phase)		**mH**	76.8		19.2		
	Electrical time constant		**ms**	1.24				
Holding brake (according to model)				See page 186				

Torque/speed curves

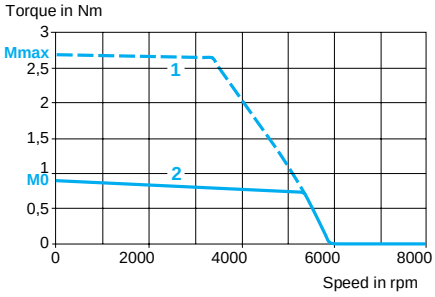
BSH 0552M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

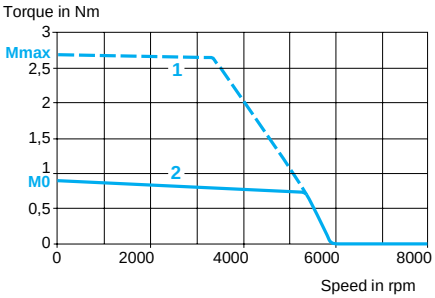


BSH 0552P servo motor

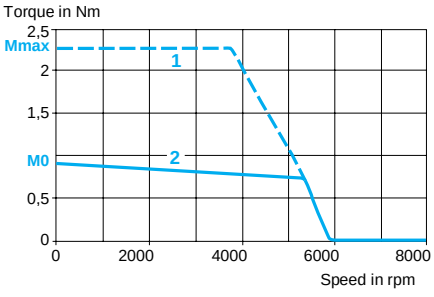
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

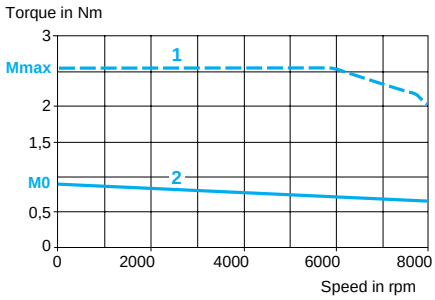
Characteristics of BSH 0552T servo motors

Type of servo motor				**BSH 0552T**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	0.9	
	Peak stall	M_{max}	**Nm**	2.54	
Nominal operating point	Nominal torque		**Nm**	0.72	0.68
	Nominal speed		**rpm**	5920	7120
Maximum current			**A rms**	10.3	
Servo motor characteristics					
Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.32	
	Back emf		**V_{rms}/krpm**	21	
Rotor	Number of poles			6	
	Inertia – Without brake	J_m	**kgcm²**	0.14	
	Inertia – With brake	J_m	**kgcm²**	0.1613	
Stator (at 20°C)	Resistance (phase/phase)		Ω	5	
	Inductance (phase/phase)		**mH**	6.2	
	Electrical time constant		**ms**	1.24	
Holding brake (according to model)				See page 186	

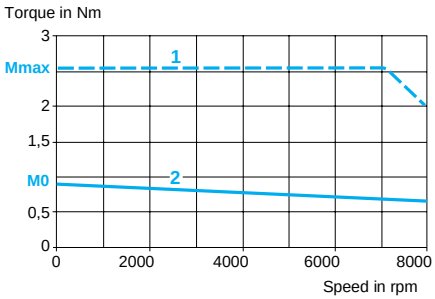
Torque/speed curves

BSH 0552T servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0553M/0553P servo motors

Type of servo motor				**BSH 0553M**		**BSH 0553P**		
Associated with Lexium 15 servo drive				**LXM 15LU60N4**		**LXM 15LD13M3**		**LXM 15LD10N4**
Line supply voltage			**V**	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase
Torque	Continuous stall	M_0	**Nm**	1.3				
	Peak stall	M_{max}	**Nm**	3.5		4.2		3.87
Nominal operating point	Nominal torque		**Nm**	1.07	1.01	1.08	1.05	0.8
	Nominal speed		**rpm**	3360	4240	3200	3600	7280
Maximum current			**A rms**	3.6		8.7		

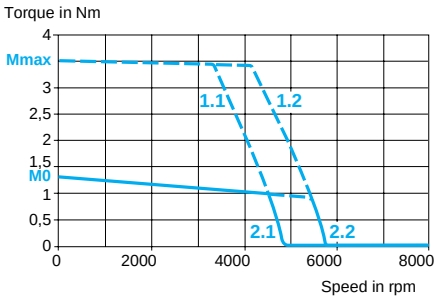
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000				
Constants (at 120°C)	Torque		**Nm/A rms**	1.18		0.59		
	Back emf		**V_{rms}/krpm**	78		39		
Rotor	Number of poles			6				
	Inertia	Without brake J_m	**kgcm²**	0.19				
		With brake J_m	**kgcm²**	0.2113				
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	32		8		
	Inductance (phase/phase)		**mH**	48		12		
	Electrical time constant		**ms**	1.5				
Holding brake (according to model)				See page 186				

Torque/speed curves

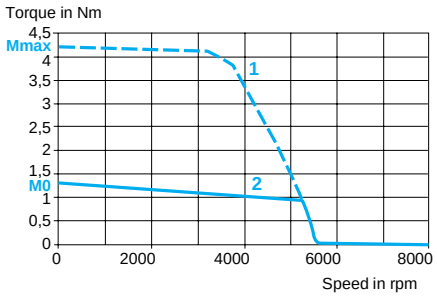
BSH 0553M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

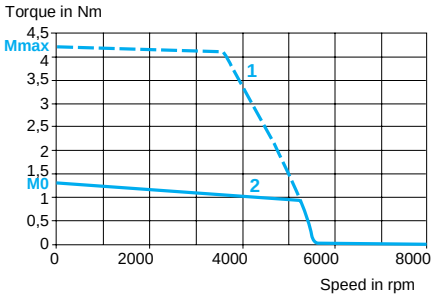


BSH 0553P servo motor

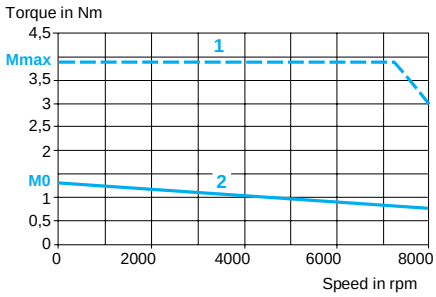
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD13M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Lexium 15 motion control
BSH servo motors

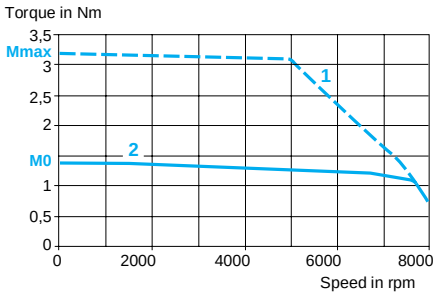
Characteristics of BSH 0701T servo motors

Type of servo motor				BSH 0701T					
Associated with Lexium 15 servo drive				LXM 15LD13M3		LXM 15LD21M3	LXM 15LD10N4		
Line supply voltage			V	230 single phase	230 3-phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	1.4					
	Peak stall	M_{max}	Nm	3.19			2.91		
Nominal operating point	Nominal torque		Nm	1.25				1.23	
	Nominal speed		rpm	5040			5200	6000	
Maximum current			A rms	9.9					
Servo motor characteristics									
Maximum mechanical speed			rpm	8000					
Constants (at 120°C)	Torque		Nm/A rms	0.45					
	Back emf		V_{rms}/krpm	26					
Rotor	Number of poles			6					
	Inertia	Without brake J_m	kgcm²	0.25					
		With brake J_m	kgcm²	0.322					
Stator (at 20°C)	Resistance (phase/phase)		Ω	3.4					
	Inductance (phase/phase)		mH	14.1					
	Electrical time constant		ms	4.15					
Holding brake (according to model)				See page 186					

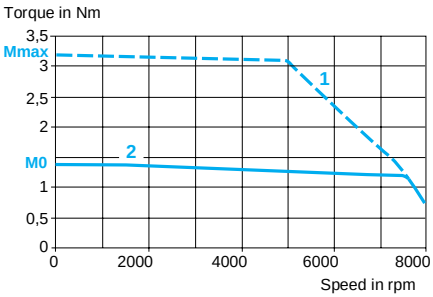
Torque/speed curves

BSH 0701T servo motor

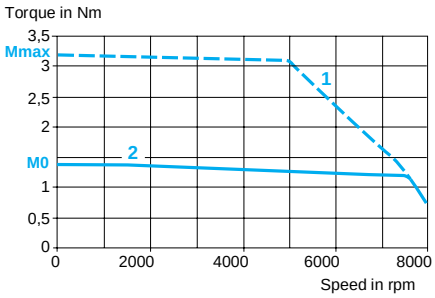
With LXM 15LD13M3 servo drive
230 V single phase



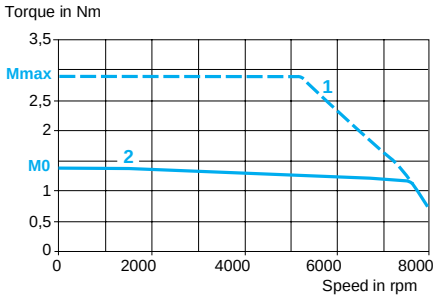
With LXM 15LD13M3 servo drive
230 V 3-phase



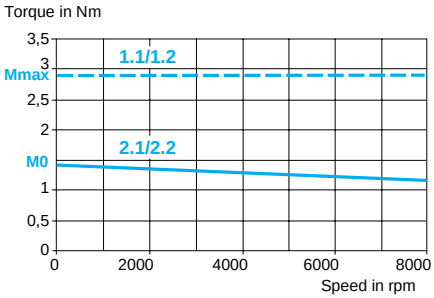
With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0701P servo motors

Type of servo motor				**BSH 0701P**	
Associated with Lexium 15 servo drive				**LXM 15LD13M3**	**LXM 15LU60N4**
Line supply voltage			**V**	230 single phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	1.41	
	Peak stall	M_{max}	**Nm**	2.66	
Nominal operating point	Nominal torque		**Nm**	1.31	1.32
	Nominal speed		**rpm**	2960	3040
Maximum current			**A rms**	5.3	

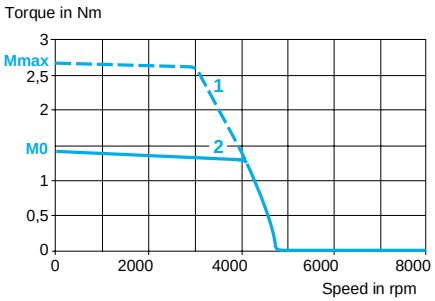
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.78	
	Back emf		**V_{rms}/krpm**	46	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.25	
		With brake J_m	**kgcm²**	0.322	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	10.4	
	Inductance (phase/phase)		**mH**	42.6	
	Electrical time constant		**ms**	4.1	
Holding brake (according to model)				See page 186	

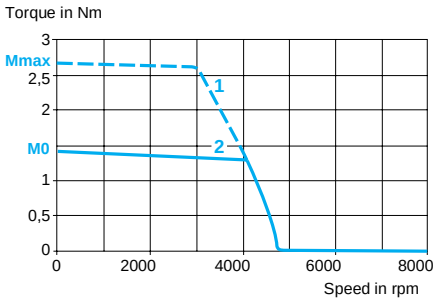
Torque/speed curves

BSH 0701P servo motor

With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LU60N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

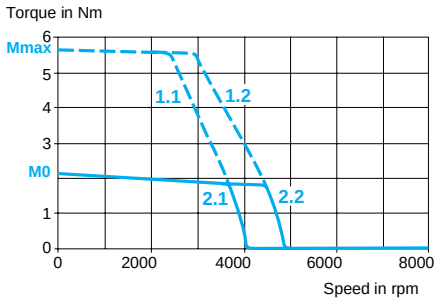
Characteristics of BSH 0702M/0702P servo motors

Type of servo motor				BSH 0702M		BSH 0702P			
Associated with Lexium 15 servo drive				LXM 15LU60N4		LXM 15LD13M3	LXM 15LD10N4		
Line supply voltage			V	400 3-phase	480 3-phase	230 single phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	2.12		2.2			
	Peak stall	M_{max}	Nm	5.63			4.85		
Nominal operating point	Nominal torque		Nm	1.93	1.89	1.9	1.88	1.68	1.59
	Nominal speed		rpm	2400	2960	2880	3120	5680	6880
Maximum current			A rms	5.9		11.8			
Servo motor characteristics									
Maximum mechanical speed			rpm	8000					
Constants (at 120°C)	Torque		Nm/A rms	1.46		0.77			
	Back emf		V_{rms}/krpm	93		48			
Rotor	Number of poles			6					
	Inertia	Without brake J_m	$kgcm^2$	0.41					
		With brake J_m	$kgcm^2$	0.482					
Stator (at 20°C)	Resistance (phase/phase)		Ω	17.3		4.2			
	Inductance (phase/phase)		mH	84.4		19			
	Electrical time constant		ms	4.88		4.52			
Holding brake (according to model)				See page 186					

Torque/speed curves

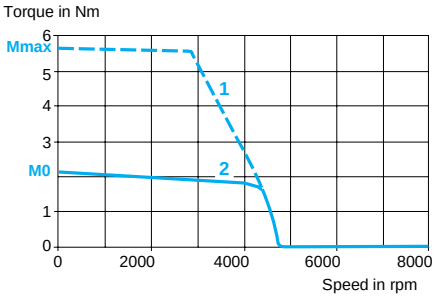
BSH 0702M servo motor

With LXM 15LU60N4 servo drive
400/480 V 3-phase

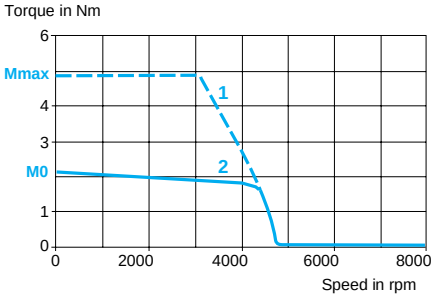


BSH 0702P servo motor

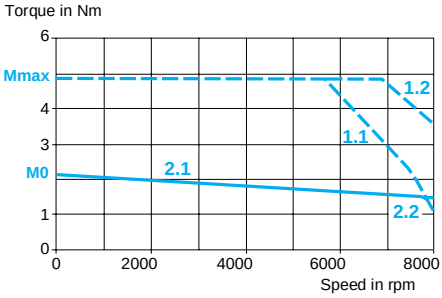
With LXM 15LD13M3 servo drive
230 V single phase



With LXM 15LD10N4 servo drive
230 V 3-phase



With LXM 15LD10N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 0702T servo motors

Type of servo motor				**BSH 0702T**	
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	**LXM 15LD17N4**
Line supply voltage			**V**	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	2.12	
	Peak stall	M_{max}	**Nm**	5.45	4.47
Nominal operating point	Nominal torque		**Nm**	1.71	1.66
	Nominal speed		**rpm**	5280	5920
Maximum current			**A rms**	20.6	

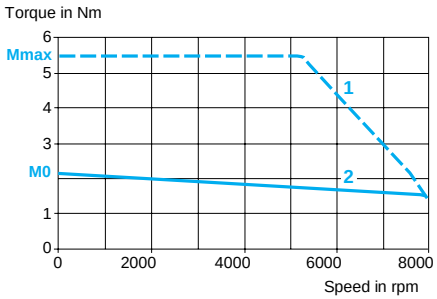
Servo motor characteristics

Maximum mechanical speed			**rpm**	8000	
Constants (at 120°C)	Torque		**Nm/A rms**	0.42	
	Back emf		**V_{rms}/krpm**	28	
Rotor	Number of poles			6	
	Inertia	Without brake J_m	**kgcm²**	0.41	
		With brake J_m	**kgcm²**	0.482	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.5	
	Inductance (phase/phase)		**mH**	6.6	
	Electrical time constant		**ms**	4.5	
Holding brake (according to model)				See page 186	

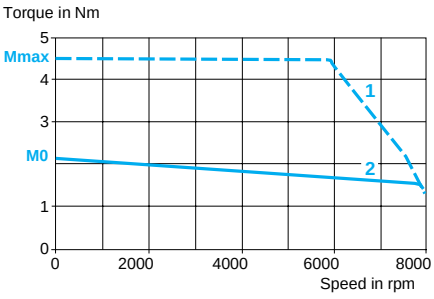
Torque/speed curves

BSH 0702T servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase



With LXM 15LD17N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Lexium 15 motion control
BSH servo motors

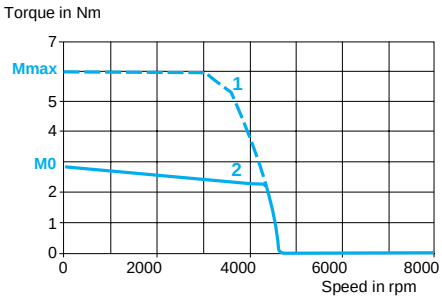
Characteristics of BSH 0703P/0703T servo motors

Type of servo motor				BSH 0703P					BSH 0703T
Associated with Lexium 15 servo drive				LXM 15LD21M3		LXM 15LD17N4			LXM 15LD28M3
Line supply voltage			V	230 single phase	230 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	2.83					
	Peak stall	M_{max}	Nm	5.99	9.28	7.71			7.38
Nominal operating point	Nominal torque		Nm	2.4	2.48	2.41	2.11	1.96	2.08
	Nominal speed		rpm	2960	2560	2960	5360	6480	5520
Maximum current			A rms	15.2					30.9
Servo motor characteristics									
Maximum mechanical speed			rpm	8000					
Constants (at 120°C)	Torque		Nm/A rms	0.78					0.42
	Back emf		V_{rms}/krpm	49					29
Rotor	Number of poles			6					
	Inertia	Without brake J_m	kgcm²	0.58					
		With brake J_m	kgcm²	0.81					
Stator (at 20°C)	Resistance (phase/phase)		Ω	2.7					0.9
	Inductance (phase/phase)		mH	14.6					5
	Electrical time constant		ms	5.41					5.55
Holding brake (according to model)				See page 186					

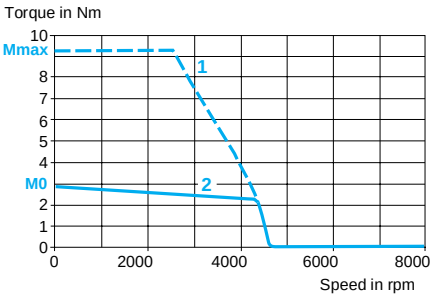
Torque/speed curves

BSH 0703P servo motor

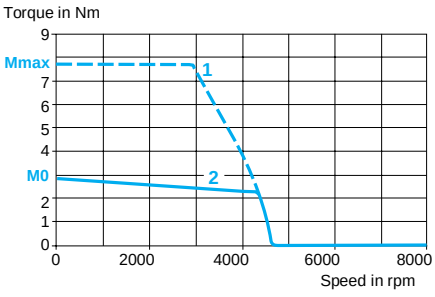
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

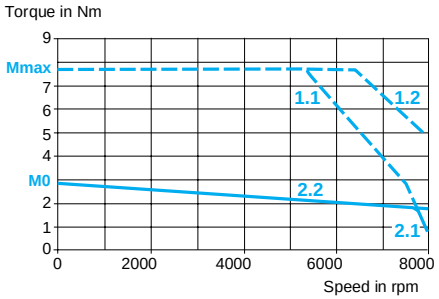


With LXM 15LD17N4 servo drive
230 V 3-phase



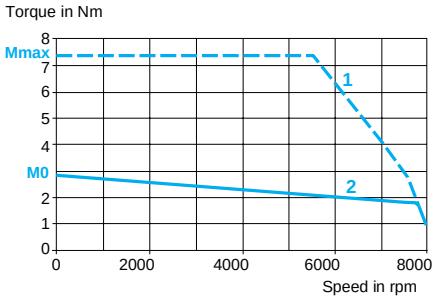
BSH 0703P servo motor

With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 0703T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

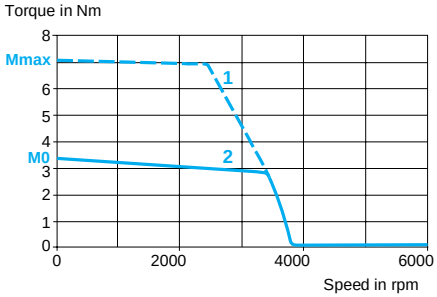
Characteristics of BSH 1001P/1001T servo motors

Type of servo motor				**BSH 1001P**			**BSH 1001T**
Associated with Lexium 15 servo drive				**LXM 15LD21M3**		**LXM 15LD10N4**	**LXM 15LD28M3**
Line supply voltage			**V**	230 single phase	230 3-phase	230 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	3.39			
	Peak stall	M_{max}	**Nm**	7.08		6.19	8.5
Nominal operating point	Nominal torque		**Nm**	3.01		2.99	2.77
	Nominal speed		**rpm**	2400		2580	3960
Maximum current			**A rms**	12			23
Servo motor characteristics							
Maximum mechanical speed			**rpm**	6000			
Constants (at 120°C)	Torque		**Nm/A rms**	0.89			0.51
	Back emf		**V_{rms}/krpm**	60			28
Rotor	Number of poles			8			
	Inertia	Without brake J_m	**kgcm²**	1.4			
		With brake J_m	**kgcm²**	2.018			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	3.8			0.9
	Inductance (phase/phase)		**mH**	19			4.3
	Electrical time constant		**ms**	5			4.78
Holding brake (according to model)				See page 186			

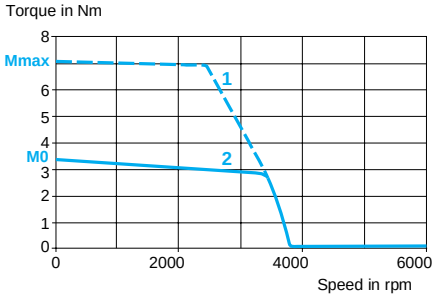
Torque/speed curves

BSH 1001P servo motor

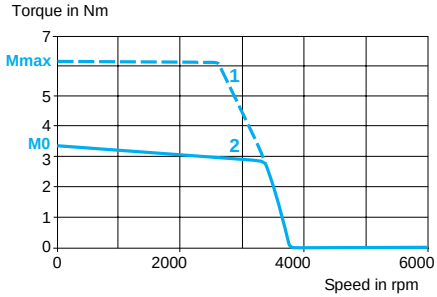
With LXM 15LD21M3 servo drive
230 V single phase



With LXM 15LD21M3 servo drive
230 V 3-phase

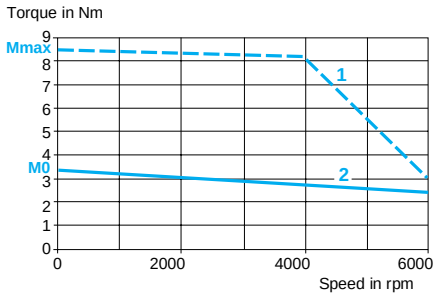


With LXM 15LD10N4 servo drive
230 V 3-phase



BSH 1001T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

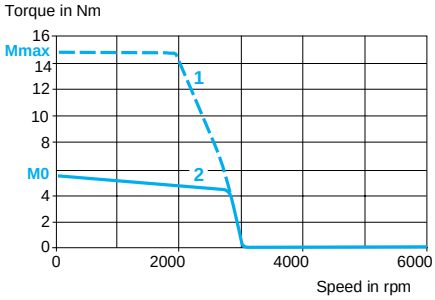
Characteristics of BSH 1002P/1002T servo motors

Type of servo motor				BSH 1002P			BSH 1002T
Associated with Lexium 15 servo drive				**LXM 15LD21M3**	**LXM 15LD17N4**		**LXM 15LD28M3**
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	**Nm**	5.8			5.5
	Peak stall	M_{max}	**Nm**	14.79	12.13		11.59
Nominal operating point	Nominal torque		**Nm**	4.8	4.06	3.75	4
	Nominal speed		**rpm**	1920	3900	4740	4080
Maximum current			**A rms**	17.1			31.2
Servo motor characteristics							
Maximum mechanical speed			**rpm**	6000			
Constants (at 120°C)	Torque		**Nm/A rms**	1.21			0.64
	Back emf		**V_{rms}/krpm**	77			33
Rotor	Number of poles			8			
	Inertia	Without brake J_m	**kgcm²**	2.31			
		With brake J_m	**kgcm²**	2.928			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	2.4			0.6
	Inductance (phase/phase)		**mH**	13.5			2.9
	Electrical time constant		**ms**	5.63			4.83
Holding brake (according to model)				See page 186			

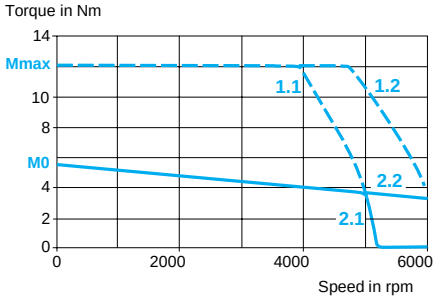
Torque/speed curves

BSH 1002P servo motor

With LXM 15LD21M3 servo drive
230 V 3-phase

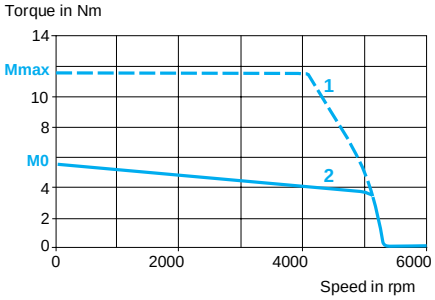


With LXM 15LD17N4 servo drive
400/480 V 3-phase



BSH 1002T servo motor

With LXM 15LD28M3 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque
1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

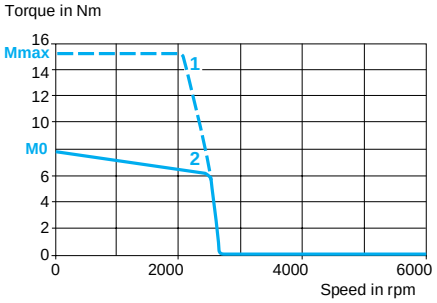
Characteristics of BSH 1003M servo motors

Type of servo motor				**BSH 1003M**		
Associated with Lexium 15 servo drive				**LXM 15LD10N4**	**LXM 15LD17N4**	
Line supply voltage			**V**	400 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.76		
	Peak stall	M_{max}	**Nm**	15.19	22.95	
Nominal operating point	Nominal torque		**Nm**	6.36	6.65	6.36
	Nominal speed		**rpm**	2040	1620	2040
Maximum current			**A rms**	15.6		
Servo motor characteristics						
Maximum mechanical speed			**rpm**	6000		
Constants (at 120°C)	Torque		**Nm/A rms**	2.22		
	Back emf		**V_{rms}/krpm**	144		
Rotor	Number of poles			8		
	Inertia Without brake	J_m	**kgcm²**	3.22		
	With brake	J_m	**kgcm²**	3.838		
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	5.3		
	Inductance (phase/phase)		**mH**	33.7		
	Electrical time constant		**ms**	6.36		
Holding brake (according to model)				See page 186		

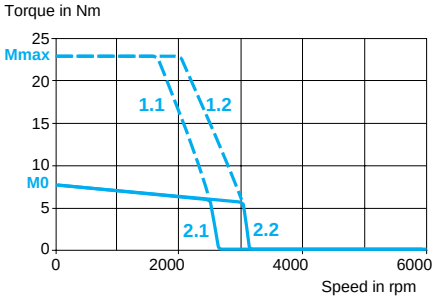
Torque/speed curves

BSH 1003M servo motor

With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Characteristics of BSH 1003P servo motors

Type of servo motor				BSH 1003P				
Associated with Lexium 15 servo drive				**LXM 15LD28M3**	**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	7.8				
	Peak stall	M_{max}	**Nm**	19.69			23.17	
Nominal operating point	Nominal torque		**Nm**	6.32	5.13	4.6	5.34	4.8
	Nominal speed		**rpm**	2100	3840	4620	3540	4320
Maximum current			**A rms**	28.3				

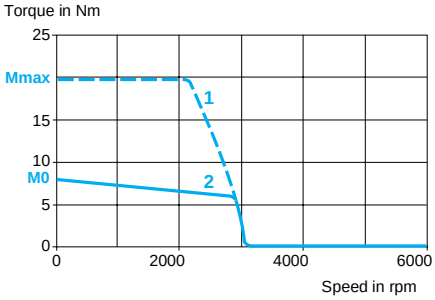
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000
Constants (at 120°C)	Torque	**Nm/A rms**	1.22
	Back emf	**V_{rms}/krpm**	77
Rotor	Number of poles		8
	Inertia — Without brake (J_m)	**kgcm²**	3.22
	Inertia — With brake (J_m)	**kgcm²**	3.838
Stator (at 20°C)	Resistance (phase/phase)	Ω	1.43
	Inductance (phase/phase)	**mH**	9.4
	Electrical time constant	**ms**	6.57
Holding brake (according to model)			See page 186

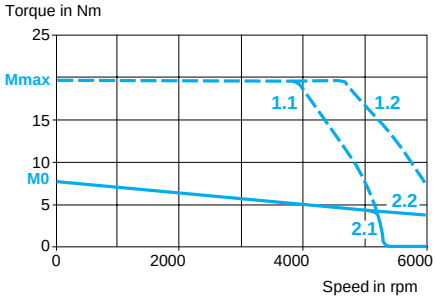
Torque/speed curves

BSH 1003P servo motor

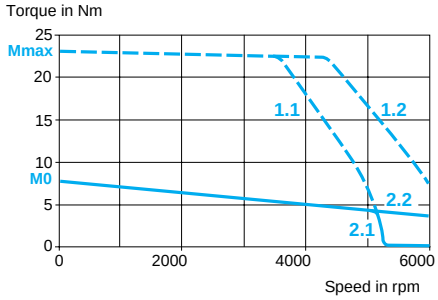
With LXM 15LD28M3 servo drive
230 V 3-phase



With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1004M servo motors

Type of servo motor				**BSH 1004M**				
Associated with Lexium 15 servo drive				**LXM 15LD10N4**	**LXM 15LD17N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	9.31				
	Peak stall	M_{max}	**Nm**	19.8	29.87		34.17	
Nominal operating point	Nominal torque		**Nm**	8.13	8.31	8.05	8.35	8.13
	Nominal speed		**rpm**	1620	1380	1740	1320	1620
Maximum current			**A rms**	17.4				

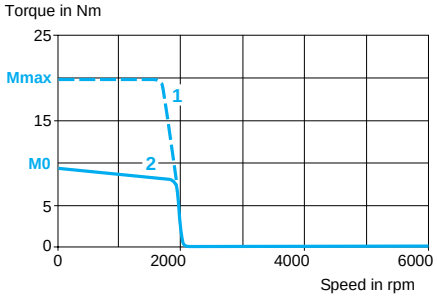
Servo motor characteristics

Maximum mechanical speed		**rpm**	6000
Constants (at 120°C)	Torque	**Nm/A rms**	3
	Back emf	**V_{rms}/krpm**	195
Rotor	Number of poles		8
	Inertia Without brake J_m	**kgcm²**	4.22
	Inertia With brake J_m	**kgcm²**	5.245
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	7.1
	Inductance (phase/phase)	**mH**	43.9
	Electrical time constant	**ms**	6.18
Holding brake (according to model)			See page 186

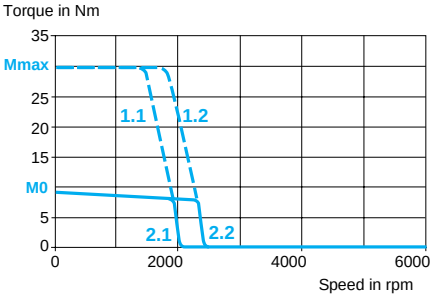
Torque/speed curves

BSH 1004M servo motor

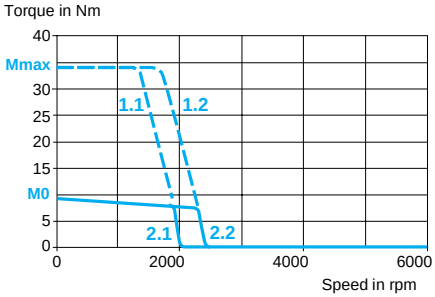
With LXM 15LD10N4 servo drive
400 V 3-phase



With LXM 15LD17N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

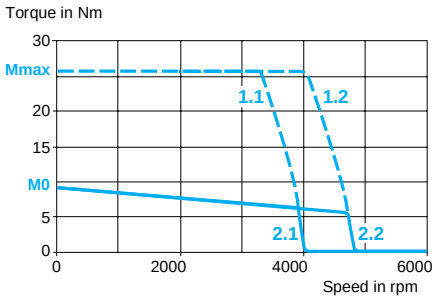
Characteristics of BSH 1004P/1004T servo motors

Type of servo motor				BSH 1004P					BSH 1004T
Associated with Lexium 15 servo drive				LXM 15MD28N4		LXM 15MD40N4			LXM 15MD40N4
Line supply voltage			V	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase	230 3-phase
Torque	Continuous stall	M_0	Nm	9.31					
	Peak stall	M_{max}	Nm	25.7		33.83			21.04
Nominal operating point	Nominal torque		Nm	6.91	6.5	8.18	7.17	6.69	6.8
	Nominal speed		rpm	3300	4020	1560	2940	3600	3480
Maximum current			A rms	34.8					61
Servo motor characteristics									
Maximum mechanical speed			rpm	6000					
Constants (at 120°C)	Torque		Nm/A rms	1.62					0.86
	Back emf		V_{rms}/krpm	103					50
Rotor	Number of poles			8					
	Inertia	Without brake J_m	kgcm²	4.22					
		With brake J_m	kgcm²	5.245					
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.81					0.45
	Inductance (phase/phase)		mH	13					2.9
	Electrical time constant		ms	7.18					6.44
Holding brake (according to model)				See page 186					

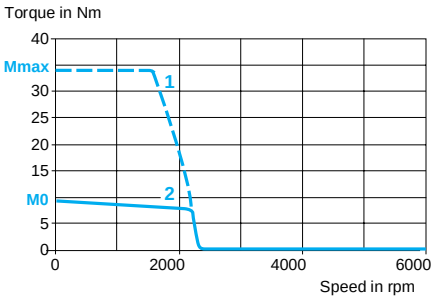
Torque/speed curves

BSH 1004P servo motor

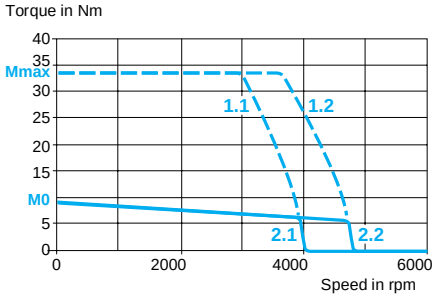
With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
230 V 3-phase

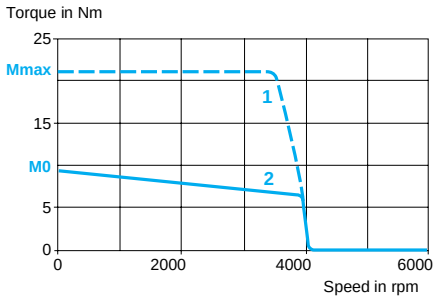


With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1004T servo motor

With LXM 15MD40N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1401M/1401P servo motors

Type of servo motor				**BSH 1401M**		**BSH 1401P**			
Associated with Lexium 15 servo drive				**LXM 15MD28N4**		**LXM 15MD28N4**		**LXM 15MD40N4**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	11.1					
	Peak stall	M_{max}	**Nm**	26		23.33			
Nominal operating point	Nominal torque		**Nm**	10.4	10.1	7.63	6.8	7.63	6.8
	Nominal speed		**rpm**	1080	1320	2520	3080	2520	3080
Maximum current			**A rms**	10.8		20.8			

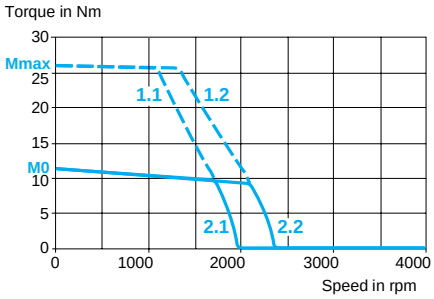
Servo motor characteristics

Maximum mechanical speed			**rpm**	4000					
Constants (at 120°C)	Torque		**Nm/A rms**	2.78		1.43			
	Back emf		**V_{rms}/krpm**	194		100			
Rotor	Number of poles			10					
	Inertia	Without brake J_m	**kgcm²**	7.41					
		With brake J_m	**kgcm²**	8.56					
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	5.3		1.41			
	Inductance (phase/phase)		**mH**	60.85		16.34			
	Electrical time constant		**ms**	11.59					
Holding brake (according to model)				See page 186					

Torque/speed curves

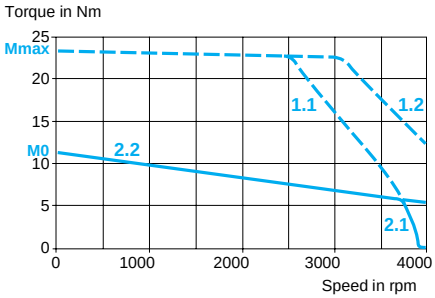
BSH 1401M servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase

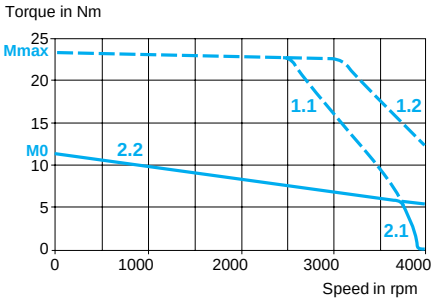


BSH 1401P servo motor

With LXM 15MD28N4 servo drive
400/480 V 3-phase



With LXM 15MD40N4 servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

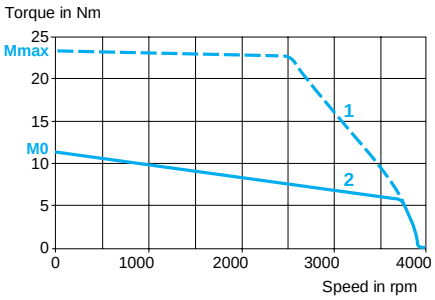
Characteristics of BSH 1401T servo motors

Type of servo motor				**BSH 1401T**
Associated with Lexium 15 servo drive				**LXM 15MD56N4**
Line supply voltage			**V**	230 3-phase
Torque	Continuous stall	M_0	**Nm**	11.1
	Peak stall	M_{max}	**Nm**	23.33
Nominal operating point	Nominal torque		**Nm**	7.63
	Nominal speed		**rpm**	2520
Maximum current			**A rms**	37.1
Servo motor characteristics				
Maximum mechanical speed			**rpm**	4000
Constants (at 120°C)	Torque		**Nm/A rms**	0.83
	Back emf		**V_{rms}/krpm**	56
Rotor	Number of poles			10
	Inertia Without brake	J_m	**kgcm²**	7.41
	With brake	J_m	**kgcm²**	8.56
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.4
	Inductance (phase/phase)		**mH**	5.15
	Electrical time constant		**ms**	12.88
Holding brake (according to model)				See page 186

Speed/torque curves

BSH 1401T servo motor

With LXM 15MD56N4 servo drive
230 V 3-phase



1 Peak torque
2 Continuous torque

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 1402M/1402P servo motors

Type of servo motor				BSH 1402M		BSH 1402P			
Associated with Lexium 15 servo drive				LXM 15MD40N4		LXM 15MD40N4		LXM 15MD56N4	
Line supply voltage			V	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	19.5					
	Peak stall	M_{max}	Nm	47.5		39.33		47.5	
Nominal operating point	Nominal torque		Nm	15.9	15	11.47	9.9	12.14	10.68
	Nominal speed		rpm	1200	1480	2760	3320	2520	3040
Maximum current			A rms	22.4		44.1			

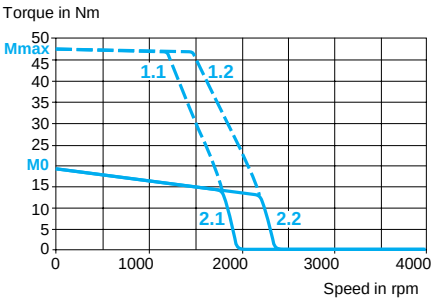
Servo motor characteristics

Maximum mechanical speed			rpm	4000					
Constants (at 120°C)	Torque		Nm/A rms	2.91		1.47			
	Back emf		V_{rms}/krpm	199		101			
Rotor	Number of poles			10					
	Inertia	Without brake J_m	kgcm²	12.68					
		With brake J_m	kgcm²	13.83					
Stator (at 20°C)	Resistance (phase/phase)		Ω	2.3		0.6			
	Inductance (phase/phase)		mH	29.79		7.71			
	Electrical time constant		ms	12.85					
Holding brake (according to model)				See page 186					

Torque/speed curves

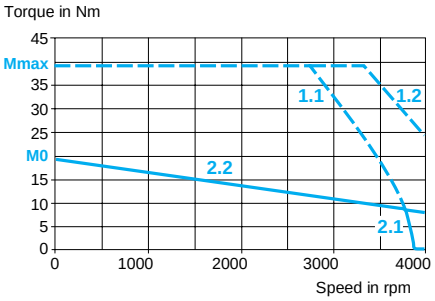
BSH 1402M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase

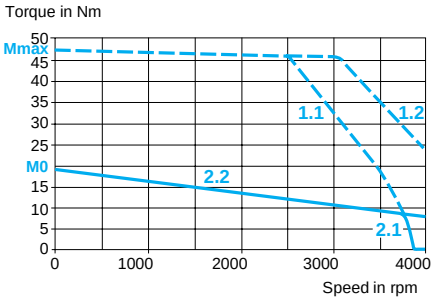


BSH 1402P servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

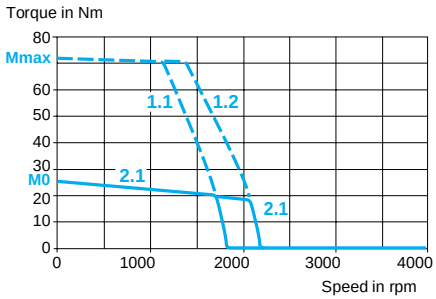
Characteristics of BSH 1403M/1403P servo motors

Type of servo motor				**BSH 1403M**		**BSH 1403P**	
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	27.8			
	Peak stall	M_{max}	**Nm**	71.76		57.32	
Nominal operating point	Nominal torque		**Nm**	21.48	20.67	13.81	11.39
	Nominal speed		**rpm**	1160	1400	2680	3240
Maximum current			**A rms**	31.3		61	
Servo motor characteristics							
Maximum mechanical speed			**rpm**	4000			
Constants (at 120°C)	Torque		**Nm/A rms**	3.09		1.59	
	Back emf		**V_{rms}/krpm**	205		105	
Rotor	Number of poles			10			
	Inertia	Without brake J_m	**kgcm²**	17.94			
		With brake J_m	**kgcm²**	23.44			
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.52		0.4	
	Inductance (phase/phase)		**mH**	20.3		5.32	
	Electrical time constant		**ms**	13.31		13.3	
Holding brake (according to model)				See page 186			

Torque/speed curves

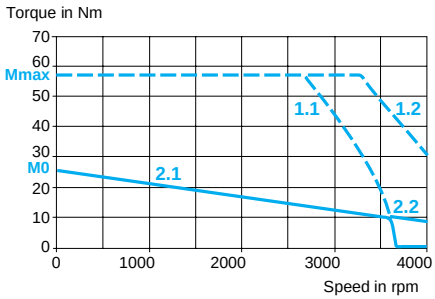
BSH 1403M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



BSH 1403P servo motor

With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

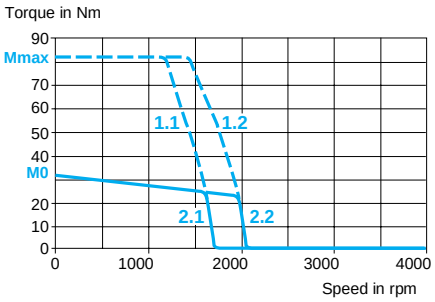
Characteristics of BSH 1404M servo motors

Type of servo motor				**BSH 1404M**			
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	33.4			
	Peak stall	M_{max}	**Nm**	82.32		95	
Nominal operating point	Nominal torque		**Nm**	26.5	25.4	26.92	25.5
	Nominal speed		**rpm**	1160	1400	1080	1320
Maximum current			**A rms**	47.8			
Servo motor characteristics							
Maximum mechanical speed			**rpm**	4000			
Constants (at 120°C)	Torque		**Nm/A rms**	3.12			
	Back emf		**V_{rms}/krpm**	208			
Rotor	Number of poles			10			
	Inertia	Without brake J_m	**kgcm²**	23.7			
		With brake J_m	**kgcm²**	29.2			
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	1.12			
	Inductance (phase/phase)		**mH**	16.28			
	Electrical time constant		**ms**	14.54			
Holding brake (according to model)				See page 186			

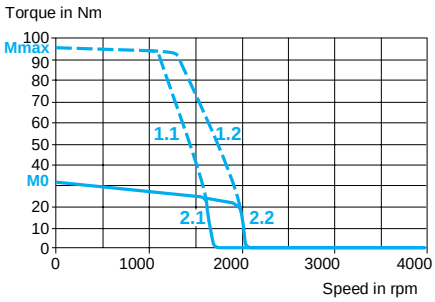
Torque/speed curves

BSH 1404M servo motor

With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Characteristics of BSH 2051M servo motors

Type of servo motor				**BSH 2051M**					
Associated with Lexium 15 servo drive				**LXM 15MD40N4**		**LXM 15MD56N4**		**LXM 15HC11N4X**	
Line supply voltage			**V**	400 3-phase	480 3-phase	400 3-phase	480 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	36					
	Peak stall	M_{max}	**Nm**	68.33					
Nominal operating point	Nominal torque		**Nm**	32	31.2	32	31.2	32.3	31.3
	Nominal speed		**rpm**	1500	1700	1500	1700	1500	1700
Maximum current			**A rms**	40.4					

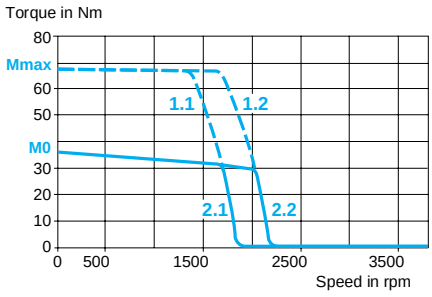
Servo motor characteristics

Maximum mechanical speed		**rpm**	3800
Constants (at 120°C)	Torque	**Nm/A rms**	3.1
	Back emf	**V_{rms}/krpm**	208
Rotor	Number of poles		10
	Inertia — Without brake (J_m)	**kgcm²**	77
	Inertia — With brake (J_m)	**kgcm²**	93
Stator (at 20°C)	Resistance (phase/phase)	**Ω**	1.1
	Inductance (phase/phase)	**mH**	21.3
	Electrical time constant	**ms**	19.4
Holding brake (according to model)			See page 186

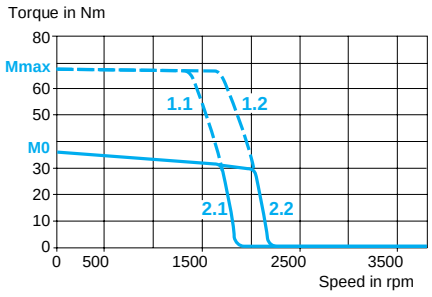
Torque/speed curves

BSH 2051M servo motor

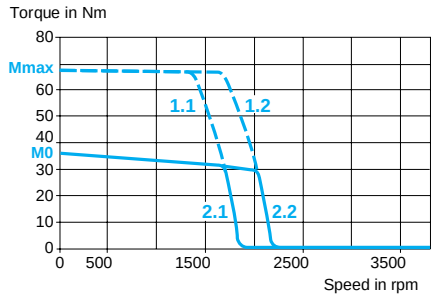
With LXM 15MD40N4 servo drive
400/480 V 3-phase



With LXM 15MD56N4 servo drive
400/480 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 2051P servo motors

Type of servo motor				**BSH 2051P**		
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	36		
	Peak stall	M_{max}	**Nm**	82		
Nominal operating point	Nominal torque		**Nm**	31.9	28.2	27
	Nominal speed		**rpm**	1444	2622	3192
Maximum current			**A rms**	78.1		

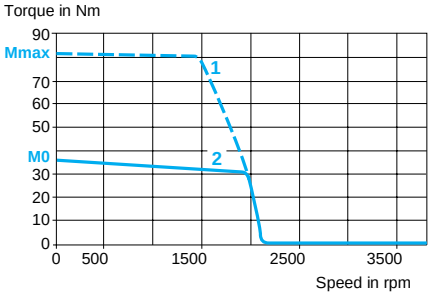
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	1.6
	Back emf		**V_{rms}/krpm**	104
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	77
		With brake J_m	**kgcm²**	93
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.3
	Inductance (phase/phase)		**mH**	5.7
	Electrical time constant		**ms**	19
Holding brake (according to model)				See page 186

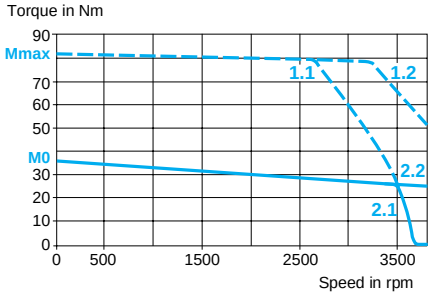
Torque/speed curves

BSH 2051P servo motor

With LXM 15HC11N4X servo drive
230 V 3-phase



With LXM 15HC11N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors

Characteristics of BSH 2052M servo motors

Type of servo motor				BSH 2052M					
Associated with Lexium 15 servo drive				LXM 15HC11N4X			LXM 15HC20N4X		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	65					
	Peak stall	M_{max}	Nm	200					
Nominal operating point	Nominal torque		Nm	56.5	49	45.6	56.5	49	45.6
	Nominal speed		rpm	500	1000	1300	500	1000	1300
Maximum current			A rms	49.6					

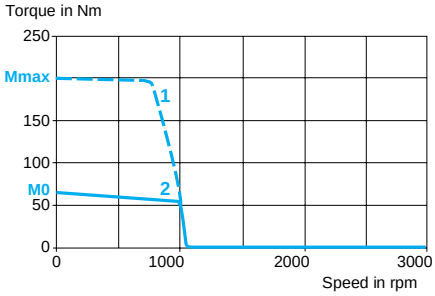
Servo motor characteristics

Maximum mechanical speed			rpm	3800
Constants (at 120°C)	Torque		Nm/A rms	5.04
	Back emf		V_{rms}/krpm	314
Rotor	Number of poles			10
	Inertia	Without brake J_m	kgcm²	129
		With brake J_m	kgcm²	145
Stator (at 20°C)	Resistance (phase/phase)		Ω	1.1
	Inductance (phase/phase)		mH	20.6
	Electrical time constant		ms	18.72
Holding brake (according to model)				See page 186

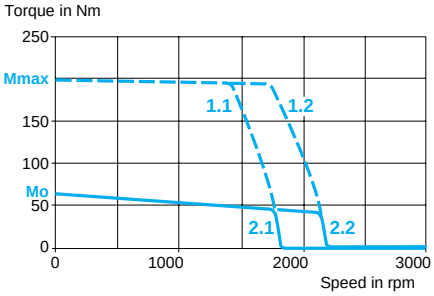
Torque/speed curves

BSH 2052M servo motor

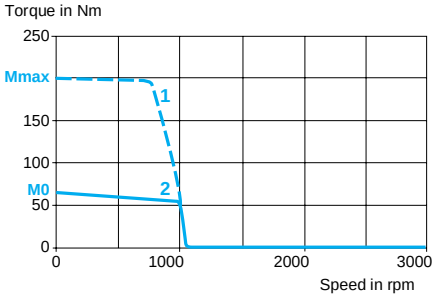
With LXM 15HC11N4X servo drive
230 V 3-phase



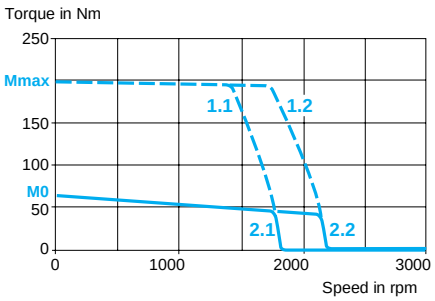
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 2052P servo motors

Type of servo motor				**BSH 2052P**					
Associated with Lexium 15 servo drive				**LXM 15HC11N4X**			**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	65					
	Peak stall	M_{max}	**Nm**	118.54			193.45		
Nominal operating point	Nominal torque		**Nm**	55	49		56	49.32	49
	Nominal speed		**rpm**	1000	2000		1000	2000	3000
Maximum current			**A rms**	96.8					

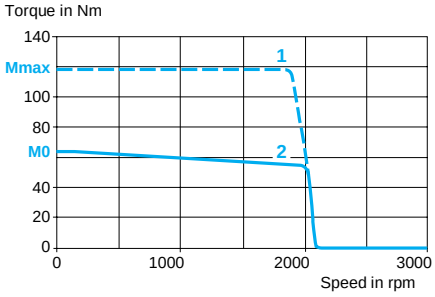
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800
Constants (at 120°C)	Torque		**Nm/A rms**	2.58
	Back emf		**V_{rms}/krpm**	161
Rotor	Number of poles			10
	Inertia	Without brake J_m	**kgcm²**	129
		With brake J_m	**kgcm²**	145
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.3
	Inductance (phase/phase)		**mH**	5.4
	Electrical time constant		**ms**	18
Holding brake (according to model)				See page 186

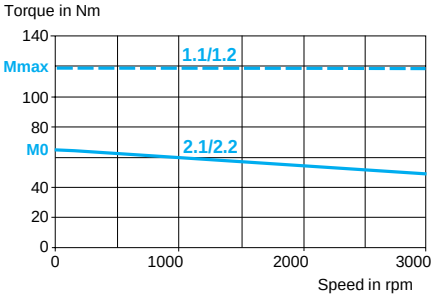
Torque/speed curves

BSH 2052P servo motor

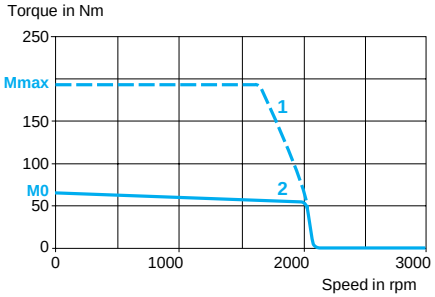
With LXM 15HC11N4X servo drive
230 V 3-phase



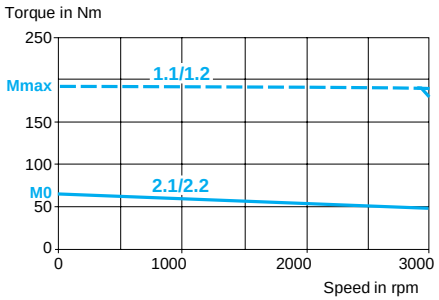
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors

Characteristics of BSH 2053M servo motors

Type of servo motor				BSH 2053M					
Associated with Lexium 15 servo drive				LXM 15HC11N4X			LXM 15HC20N4X		
Line supply voltage			V	230 3-phase	400 3-phase	480 3-phase	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	Nm	90					
	Peak stall	M_{max}	Nm	227.18			300		
Nominal operating point	Nominal torque		Nm	80.2	70.45	64.6	80.2	70.45	64.6
	Nominal speed		rpm	500	1000	1300	500	1000	1300
Maximum current			A rms	68					

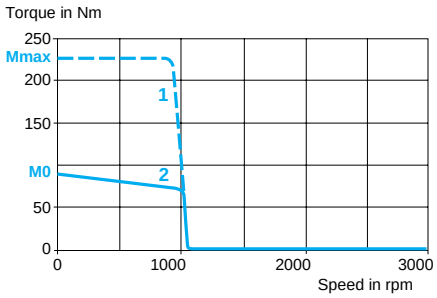
Servo motor characteristics

Maximum mechanical speed			rpm	3800
Constants (at 120°C)	Torque		Nm/A rms	5.5
	Back emf		V_{rms}/krpm	344
Rotor	Number of poles			10
	Inertia	Without brake J_m	kgcm²	182
		With brake J_m	kgcm²	196
Stator (at 20°C)	Resistance (phase/phase)		Ω	0.8
	Inductance (phase/phase)		mH	16.8
	Electrical time constant		ms	20
Holding brake (according to model)				See page 186

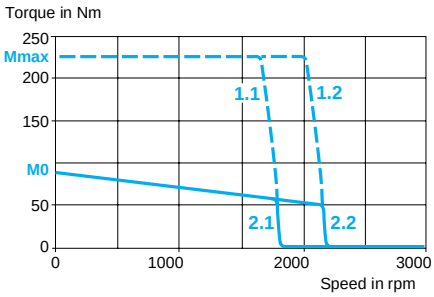
Torque/speed curves

BSH 2053M servo motor

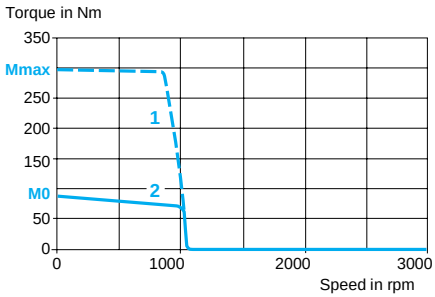
With LXM 15HC11N4X servo drive
230 V 3-phase



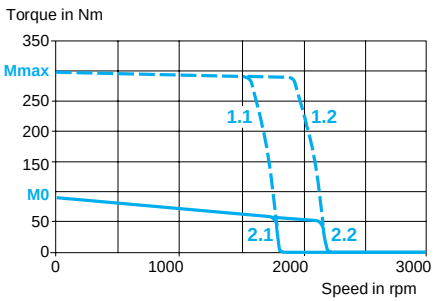
With LXM 15HC11N4X servo drive
400/480 V 3-phase



With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of BSH 2053P servo motors

Type of servo motor				**BSH 2053P**		
Associated with Lexium 15 servo drive				**LXM 15HC20N4X**		
Line supply voltage			**V**	230 3-phase	400 3-phase	480 3-phase
Torque	Continuous stall	M_0	**Nm**	90		
	Peak stall	M_{max}	**Nm**	202.96		
Nominal operating point	Nominal torque		**Nm**	70.45	37.37	
	Nominal speed		**rpm**	1000	2000	
Maximum current			**A rms**	136.1		

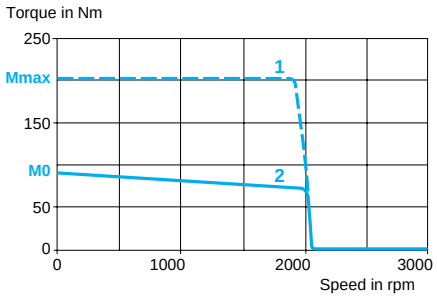
Servo motor characteristics

Maximum mechanical speed			**rpm**	3800	
Constants (at 120°C)	Torque		**Nm/A rms**	2.76	
	Back emf		**V_{rms}/krpm**	172	
Rotor	Number of poles			10	
	Inertia	Without brake J_m	**kgcm²**	182	
		With brake J_m	**kgcm²**	196	
Stator (at 20°C)	Resistance (phase/phase)		**Ω**	0.2	
	Inductance (phase/phase)		**mH**	4.2	
	Electrical time constant		**ms**	21	
Holding brake (according to model)				See page 186	

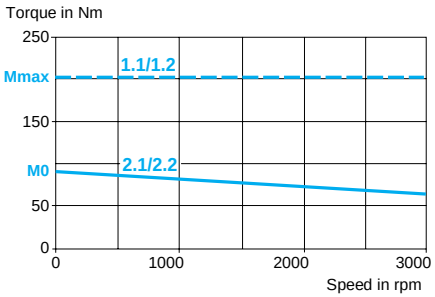
Torque/speed curves

BSH 2053P servo motor

With LXM 15HC20N4X servo drive
230 V 3-phase



With LXM 15HC20N4X servo drive
400/480 V 3-phase



1 Peak torque
2 Continuous torque

1.1 Peak torque at 400 V, 3-phase
2.1 Continuous torque at 400 V, 3-phase

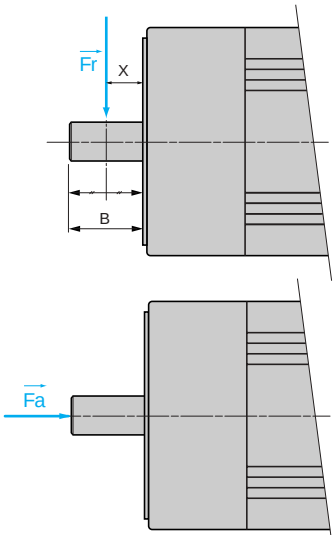
1.2 Peak torque at 480 V, 3-phase
2.2 Continuous torque at 480 V, 3-phase

Presentation:
pages 148 and 149

References:
pages 178 to 181

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors



Radial and axial forces permitted on the motor shaft

Even when the servo motors are used under optimum conditions, their service life is limited by that of the bearings.

Conditions	
Nominal service life of bearings *(1)*	L_{10h} = 20,000 hours
Ambiant temperature (temperature of bearings ~ 100°C)	40°C
Force application point	Fr applied at the middle point of the shaft end X = B/2 (dimension B, see pages 182 to 185)

(1) Hours of use with a failure probability of 10%

The following conditions must be adhered to:

- Radial and axial forces must not be applied simultaneously
- Shaft end with IP 40 or IP 65 degree of protection
- The bearings cannot be changed by the user as the built-in position sensor must be realigned if the unit is dismantled.

			Maximum radial force Fr							
Mechanical speed		**rpm**	**1000**	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**
Servo motor	BSH 0551	**N**	340	270	240	220	200	190	180	170
	BSH 0552	**N**	370	290	260	230	220	200	190	190
	BSH 0553	**N**	390	310	270	240	230	210	200	190
	BSH 0701	**N**	660	520	460	410	380	360	–	–
	BSH 0702	**N**	710	560	490	450	410	390	–	–
	BSH 0703	**N**	730	580	510	460	430	400	–	–
	BSH 1001	**N**	900	720	630	570	530	–	–	–
	BSH 1002	**N**	990	790	690	620	–	–	–	–
	BSH 1003	**N**	1050	830	730	660	–	–	–	–
	BSH 1004	**N**	1070	850	740	–	–	–	–	–
	BSH 1401	**N**	2210	1760	1530	–	–	–	–	–
	BSH 1402	**N**	2430	1930	1680	–	–	–	–	–
	BSH 1403	**N**	2560	2030	1780	–	–	–	–	–
	BSH 1404	**N**	2660	2110	1840	–	–	–	–	–
	BSH 2051	**N**	3730	2960	2580	–	–	–	–	–
	BSH 2052	**N**	4200	3330	2910	–	–	–	–	–
	BSH 2053	**N**	4500	3570	3120	–	–	–	–	–
			Maximum axial force: Fa = 0.2 x Fr							

Characteristics of servo motor/servo drive power connection cables

Cables fitted with a connector on servo motor side

Cable type		**VW3 M5 101 R●●●**	**VW3 M5 103 R●●●**
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE	
Capacity	**pF/m**	< 70 (conductors/shielding)	
Number of conductors (shielded)		[(4 x 1.5 mm^2) + (2 x 1 mm^2)]	[(4 x 4 mm^2) + (2 x 1 mm^2)]
Connector type		1 industrial connector (on BSH servo motor side) and 1 free wire end (on Lexium 15 LP and 15 HP servo drive side)	
External diameter	**mm**	12 ± 0.2	16.3 ± 0.3
Curvature radius	**mm**	90, suitable for daisy-chaining, cable carrier system	125, suitable for daisy-chaining, cable carrier system
Working voltage	**V**	600	
Maximum usable length	**m**	50, for connection with a Lexium 15 LP servo drive 100, for connection with a Lexium 15 HP servo drive	
Operating temperature	**°C**	- 40...+ 90 (fixed), - 20…+ 80 (mobile)	
Certification		UL, CSA, VDE, CE, DESINA	

Presentation: pages 148 and 149
References: pages 178 to 181
Dimensions: pages 182 to 185

Characteristics of servo motor/servo drive power connection cables (continued)

Cables fitted with a connector on both the servo motor and servo drive sides

Cable type		VW3 M5 201 R●●●	VW3 M5 202 R●●●	VW3 M5 203 R●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE		
Capacity	pF/m	< 70 (conductors/shielding)		
Number of conductors (shielded)		[(4 x 1.5 mm^2) + (2 x 1 mm^2)]	[(4 x 2.5 mm^2) + (2 x 1 mm^2)]	[(4 x 4 mm^2) + (2 x 1 mm^2)]
Connector type		1 industrial connector (BSH servo motor side) and 1 removable 6-way connecteur (Lexium 15 MP servo drives side)		
External diameter	mm	12 ± 0.2	14.3 ± 0.3	16.3 ± 0.3
Curvature radius	mm	90, suitable for daisy-chaining, cable-carrier system	110, suitable for daisy-chaining, cable-carrier system	125, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600		
Maximum usable length	m	100, for connection with a Lexium 15 MP servo drive		
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)		
Certification		UL, CSA, VDE, CE, DESINA		

Cables

Cable type		VW3 M5 304 R●●●●
External sleeve, insulation		PUR orange coloured RAL 2003, TPM or PP/PE
Capacity	pF/m	< 70 (conductors/shielding)
Number of conductors (shielded)		[(4 x 10 mm^2) + (2 x 1 mm^2)]
Connector type		Without connectors; cable for connection of BSH 2052 and BSH 2053 servo motors (terminal) with Lexium 15 HP servo drive (terminal)
External diameter	mm	18 ± 0.3
Curvature radius	mm	135, suitable for daisy-chaining, cable-carrier system
Working voltage	V	600
Maximum usable length	m	100
Operating temperature	°C	- 40...+ 90 (fixed), - 20…+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Characteristics of the servo motor/servo drive control connection cables

Cable type		VW3 M8 301 R●●●
Sensor		SinCos Hiperface® encoder
External sleeve, insulation		PUR green coloured RAL 6018, polyester
Number of conductors (shielded)		5 x (2 x 0.25 mm^2) + (2 x 0.5 mm^2)
External diameter	mm	8.8 ± 0.2
Connector type		1 industrial connector (servo motor side) and 1 x 15-way SUB-D male connector (servo drive side)
Min. curvature radius	mm	68, suitable for daisy-chaining, cable-carrier system
Working voltage	V	350 (0.25 mm^2), 500 (0.5 mm^2)
Operating temperature	°C	- 50…+ 90 (fixed), - 40...+ 80 (mobile)
Certification		UL, CSA, VDE, CE, DESINA

Presentation: pages 148 and 149
References: pages 180 and 181
Dimensions: pages 182 to 185

Lexium 15 motion control
BSH servo motors

BSH 055●●

BSH 070●●

BSH 100●●

BSH servo motors

The BSH servo motors shown below are not equipped with gearboxes.
For GBX gearboxes see page 190.

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal speed *(1)*	Reference *(2)*	Weight *(3)*
Nm	Nm	rpm		rpm		kg
0.5	1.4	8000	LD13M3	3200	**BSH 0551P ●●●●A**	0.800
			LU60N4	3200		
			LD13M3	7040	**BSH 0551T ●●●●A**	0.800
0.9	2.25	8000	LU60N4	4080	**BSH 0552M ●●●●A**	1.100
	2.26	8000	LU60N4	3760	**BSH 0552P ●●●●A**	1.100
	2.54	8000	LD13M3	7120	**BSH 0552T ●●●●A**	1.100
	2.7	8000	LD13M3	3360	**BSH 0552P ●●●●A**	1.100
1.3	3.5	8000	LU60N4	4240	**BSH 0553M ●●●●A**	1.400
	3.87	8000	LD10N4	7280	**BSH 0553P ●●●●A**	1.400
	4.2	8000	LD13M3	3600		
1.4	2.91	8000	LD10N4	6000	**BSH 0701T ●●●●A**	2.100
	3.19	8000	LD13M3	5040		
			LD21M3	5040		
1.41	2.66	8000	LD13M3	2960	**BSH 0701P ●●●●A**	2.100
			LU60N4	3040		
2.12	4.47	8000	LD17N4	5920	**BSH 0702T ●●●●A**	2.800
	5.45	8000	LD21M3	5280		
	5.63	8000	LU60N4	2960	**BSH 0702M ●●●●A**	2.800
2.2	4.85	8000	LD10N4	6880	**BSH 0702P ●●●●A**	2.800
	5.63	8000	LD13M3	2880		
2.83	5.99	8000	LD21M3	2960	**BSH 0703P ●●●●A**	3.600
	7.38	8000	LD28M3	5520	**BSH 0703T ●●●●A**	3.600
	7.71	8000	LD17N4	6480	**BSH 0703P ●●●●A**	3.600
	9.28	8000	LD21M3	2560		
3.39	6.19	6000	LD10N4	2580	**BSH 1001P ●●●●A**	4.300
	7.08	6000	LD21M3	2400		
	8.5	6000	LD28M3	3960	**BSH 1001T ●●●●A**	4.300
5.5	11.59	6000	LD28M3	4080	**BSH 1002T ●●●●A**	5.800
5.8	12.13	6000	LD17N4	4740	**BSH 1002P ●●●●A**	5.800
	14.79	6000	LD21M3	1920		
7.76	15.19	6000	LD10N4	2040	**BSH 1003M ●●●●A**	7.500
	22.95	6000	LD17N4	2040		
7.8	19.69	6000	LD28M3	2100	**BSH 1003P ●●●●A**	7.500
			MD28N4	4620		
	23.17	6000	MD40N4	4320		
9.31	19.8	6000	LD10N4	1620	**BSH 1004M ●●●●A**	9.200
	21.04	6000	MD40N4	3480	**BSH 1004T ●●●●A**	9.200
	25.7	6000	MD28N4	4020	**BSH 1004P ●●●●A**	9.200
	29.87	6000	LD17N4	1740	**BSH 1004M ●●●●A**	9.200
	33.83	6000	MD40N4	3600	**BSH 1004P ●●●●A**	9.200
	34.17	6000	MD40N4	1620	**BSH 1004M ●●●●A**	9.200

(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table on page 179.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.

Lexium 15 motion control
BSH servo motors

BSH servo motors (continued)

10599-4

BSH 2051●

Continuous stall torque	Peak stall torque	Maximum mechanical speed	Associated servo drive LXM 15	Maximum nominal power (1)	Reference (2)	Weight (3)
Nm	Nm	rpm		rpm		kg
11.1	23.33	4000	MD56N4	2520	**BSH 1401T ●●●●A**	11.900
			MD28N4	3080	**BSH 1401P ●●●●A**	11.900
			MD40N4	3080		
	26	4000	MD28N4	1320	**BSH 1401M ●●●●A**	11.900
19.5	39.33	4000	MD40N4	3320	**BSH 1402P ●●●●A**	16.600
	47.5	4000	MD40N4	1480	**BSH 1402M ●●●●A**	16.600
			MD56N4	3040	**BSH 1402P ●●●●A**	16.600
27.8	57.32	4000	MD56N4	3240	**BSH 1403P ●●●●A**	21.300
	71.76	4000	MD40N4	1400	**BSH 1403M ●●●●A**	21.300
33.4	82.32	4000	MD40N4	1400	**BSH 1404M ●●●●A**	26.000
	95	4000	MD56N4	1320		
36	68.33	3800	MD40N4	1672	**BSH 2051M ●●●●A**	33.000
			MD56N4	1672		
			HC11N4X	1672		
	82	3800	HC11N4X	3190	**BSH 2051P ●●●●A**	33.000
65	118.54	3800	HC11N4X	3000	**BSH 2052P ●●●3A** (4)	44.000
	193.45	3800	HC20N4X	3000		
	200	3800	HC11N4X	1710	**BSH 2052M ●●●3A** (4)	44.000
		3800	HC20N4X	1710		
90	202.96	3800	HC20N4X	3000	**BSH 2053P ●●●3A** (4)	56.000
	227.18	3800	HC11N4X	1980	**BSH 2053M ●●●3A** (4)	56.000
	300	3800	HC20N4X	1890		

To order a BSH servo motor complete each reference with:

			BSH 0701P	●	●	●	●	A
Shaft end	IP 40	Untapped		**0**				
		Keyed		**1**				
	IP 65	Untapped		**2**				
		Keyed		**3**				
Integrated sensor	Single turn, SinCos Hiperface® 4096 points/turn				**1**			
	Multiturn, SinCos Hiperface® 4096 points/turn, 4096 turns				**2**			
Holding brake	None					**A**		
	With					**F**		
Connection (4)	Straight connectors						**1**	
	Rotatable right-angled connectors						**2**	
Flange	International standard							**A**

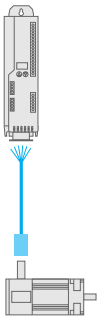
Note: *The example above is for a* ***BSH 0701P*** *servo motor. Replace* ***BSH 0701P*** *by the relevant reference for other servo motors.*

(1) Derating possible according to the power supply voltage, see characteristics pages 150 to 175.
(2) To complete each reference see the table above.
(3) Servo motor weight without brake. To obtain the weight of the servo motor with holding brake, see page 186.
(4) The BSH 2052 ● and BSH 2053● servo motors are supplied with a power connection terminal and an angled connector for the control connection (sensor), see page 185. The product reference is BSH 205●● ●●●3A.

Presentation: pages 148 and 149
Characteristics: pages 150 to 175
Dimensions: pages 182 to 185

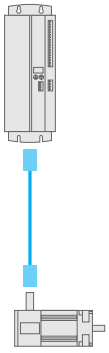
Lexium 15 motion control
BSH servo motors

Power connection cables



VW3 M5 101/103 R●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cables fitted with a connector on servo motor side	BSH 055●● BSH 070●● BSH 100●●	LXM 15L●●●●●	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 101 R30**	0.810
				5	**VW3 M5 101 R50**	1.210
				10	**VW3 M5 101 R100**	2.290
				15	**VW3 M5 101 R150**	3.400
				20	**VW3 M5 101 R200**	4.510
				25 *(1)*	**VW3 M5 101 R250**	6.200
				50 *(1)*	**VW3 M5 101 R500**	12.325
	BSH 2051M BSH 2051P	LXM 15HC●●N4X	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 103 R30**	1.330
				5	**VW3 M5 103 R50**	2.130
				10	**VW3 M5 103 R100**	4.130
				15	**VW3 M5 103 R150**	6.120
				20	**VW3 M5 103 R200**	8.090
				25	**VW3 M5 103 R250**	11.625
				50	**VW3 M5 103 R500**	23.175
				75	**VW3 M5 103 R750**	34.725



VW3 M5 201/202/203 R●●●

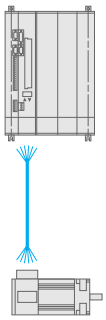
Cables fitted with two connectors	BSH 1003P BSH 1004● BSH 1401M BSH 1401P BSH 1402M BSH 1402P BSH 1403M BSH 1404M	LXM 15MD●●N4	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 201 R30**	0.885
				5	**VW3 M5 201 R50**	1.375
				10	**VW3 M5 201 R100**	2.600
				15	**VW3 M5 201 R150**	3.825
				20	**VW3 M5 201 R200**	5.050
				25 *(1)*	**VW3 M5 201 R250**	6.275
				50 *(1)*	**VW3 M5 201 R500**	12.400
				75 *(1)*	**VW3 M5 201 R750**	18.525
	BSH 1401T BSH 1402T BSH 1403P BSH 1404P	LXM 15MD●●N4	[(4 x 2.5 mm²) + (2 x 1 mm²)]	3	**VW3 M5 202 R30**	1.137
				5	**VW3 M5 202 R50**	1.795
				10	**VW3 M5 202 R100**	3.430
				15	**VW3 M5 202 R150**	5.085
				20	**VW3 M5 202 R200**	6.730
				25 *(1)*	**VW3 M5 202 R250**	8.375
				50 *(1)*	**VW3 M5 202 R500**	16.600
				75 *(1)*	**VW3 M5 202 R750**	24.825
	BSH 2051M	LXM 15MD●●N4	[(4 x 4 mm²) + (2 x 1 mm²)]	3	**VW3 M5 203 R30**	1.536
				5	**VW3 M5 203 R50**	2.460
				10	**VW3 M5 203 R100**	4.770
				15	**VW3 M5 203 R150**	7.080
				20	**VW3 M5 203 R200**	9.390
				25 *(1)*	**VW3 M5 203 R250**	11.700
				50 *(1)*	**VW3 M5 203 R500**	23.250
				75 *(1)*	**VW3 M5 203 R750**	34.800

(1) For cables longer than 20 m, a motor choke is compulsory, see page 47.

Presentation:
pages 148 and 149

Characteristics:
pages 176 and 177

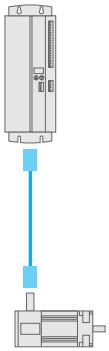
Power connection cables (continued)



VW3 M5 304 R●●●●

Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
Cable	BSH 2052M BSH 2052P BSH 2053M BSH 2053P	LXM 15HC●●N4X	[(4 x 10 mm²) + (2 x 1 mm²)]	10	**VW3 M5 304 R100**	8.530
				25	**VW3 M5 304 R250**	21.325
				50	**VW3 M5 304 R500**	42.650
				100	**VW3 M5 304 R1000**	85.300

Control connecting cables



VW3 M8 301 R●●●

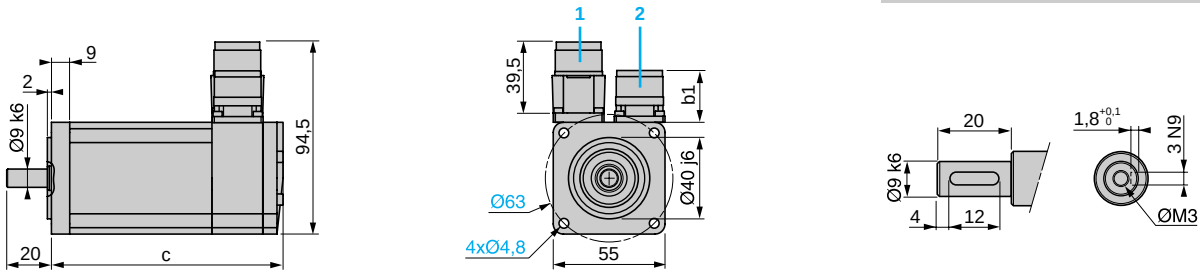
Description	From servo motor	To servo drive	Composition	Length m	Reference	Weight kg
SinCos Hiperface® encoder cables fitted with two connectors	BSH, all ratings	LXM 15, all ratings	5x(2 x 0.25 mm²) + (2 x 0.5 mm²)	3	**VW3 M8 301 R30**	–
				5	**VW3 M8 301 R50**	–
				10	**VW3 M8 301 R100**	–
				15	**VW3 M8 301 R150**	–
				20	**VW3 M8 301 R200**	–
				25	**VW3 M8 301 R250**	–
				50	**VW3 M8 301 R500**	–
				75	**VW3 M8 301 R750**	–

Presentation:
pages 148 and 149

Characteristics:
pages 176 and 177

BSH 055 (example with straight connectors: power supply for servo motor/brake **1** and encoder **2**)

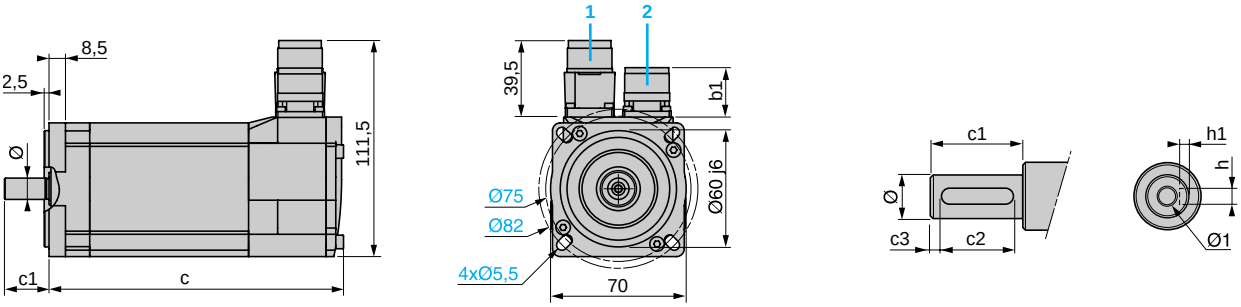
Shaft end, keyed slot (optional)



	Straight connectors	Rotary angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 0551	25.5	39.5	132.5	159
BSH 0552	25.5	39.5	154.5	181
BSH 0553	25.5	39.5	176.5	203

BSH 070 (example with straight connectors: power supply for servo motor/brake **1** and encoder **2**)

Shaft end, keyed slot (optional)



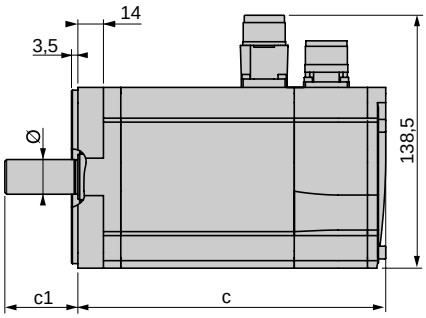
	Straight connectors	Rotary angled connectors									
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**c3**	**h**	**h1**	**Ø**	**Ø1**
BSH 0701	25.5	39.5	154	180	23	18	2.5	4 N9	2.5 +0.1 0	11 k6	M4
BSH 0702	25.5	39.5	187	213	23	18	2.5	4 N9	2.5 +0.1 0	11 k6	M4
BSH 0703	25.5	39.5	220	256	30	20	5	5 N9	3 +0.1 0	14 k6	M5

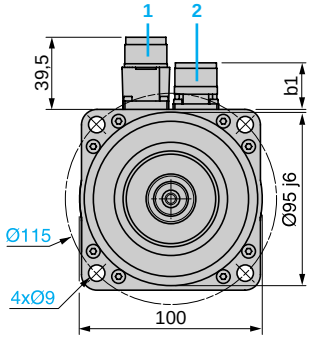
Presentation:
pages 148 and 149

Characteristics:
pages 150 to 177

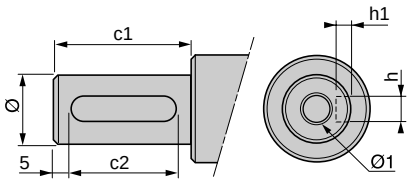
References:
pages 178 to 181

BSH 100 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)



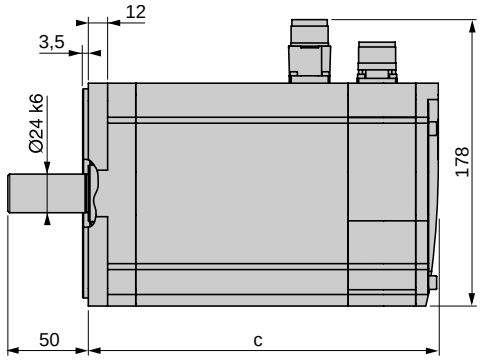


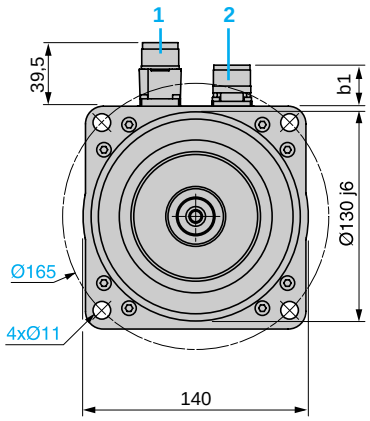
Shaft end, keyed slot (optional)



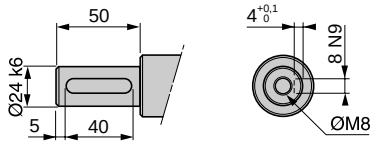
	Straight connectors	Rotary angled connectors								
	b1	**b1**	**c** (without brake)	**c** (with brake)	**c1**	**c2**	**h**	**h1**	**Ø**	**Ø1**
BSH 1001	25.5	39.5	169	200	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1002	25.5	39.5	205	236	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1003	25.5	39.5	241	272	40	30	6 N9	3.5 $^{+0.1}_{0}$	19 k6	M6
BSH 1004	25.5	39.5	277	308	50	40	8 N9	4 $^{+0.1}_{0}$	24 k6	M8

BSH 140 (example with straight connectors: power supply for servo motor/brake 1 and encoder 2)





Shaft end, keyed slot (optional)



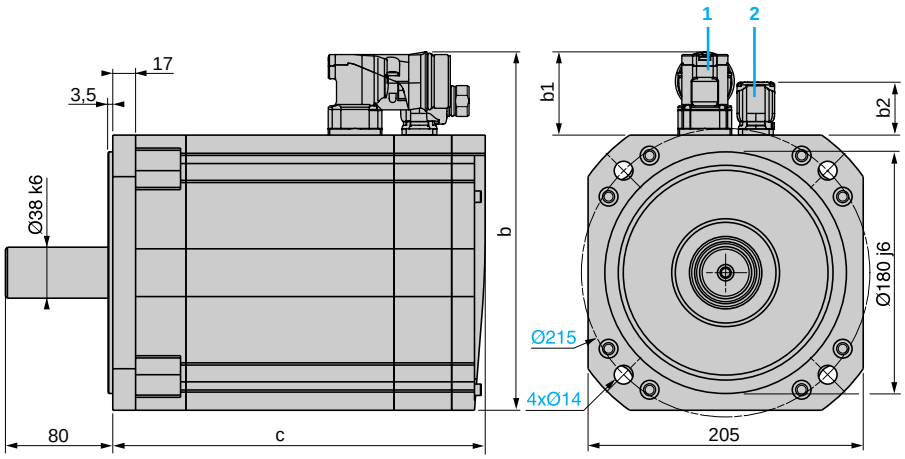
	Straight connectors	Rotary angled connectors		
	b1	**b1**	**c** (without brake)	**c** (with brake)
BSH 1401	25.5	39.5	218	256
BSH 1402	25.5	39.5	273	311
BSH 1403	25.5	39.5	328	366
BSH 1404	25.5	39.5	383	421

Presentation:
pages 148 and 149

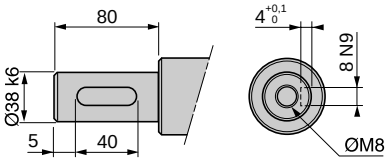
Characteristics:
pages 150 to 177

References:
pages 178 to 181

BSH 2051 (example with rotary angled connectors: power supply for servo motor/brake **1** and encoder **2**)



Shaft end, keyed slot (optional)



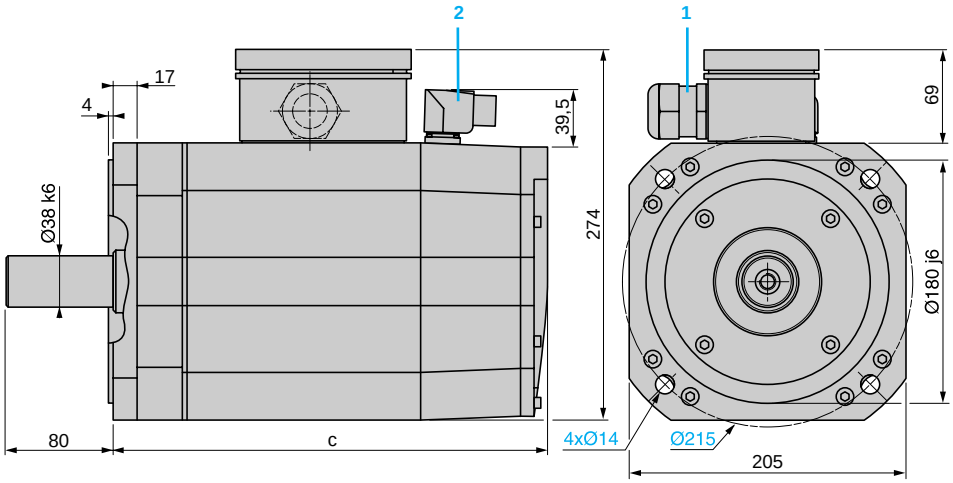
	Straight connectors			Rotary angled connectors				
	b	**b1**	**b2**	**b**	**b1**	**b2**	**c** (without brake)	**c** (with brake)
BSH 2051	259	54	25.5	267	70	39.5	321	370.5

Presentation:
pages 148 and 149

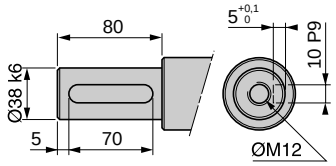
Characteristics:
pages 150 to 177

References:
pages 178 to 181

BSH 2052 and 2053 (example with angled connectors: power supply for servo motor/brake 1 and encoder 2) ***(1)***



Shaft end, keyed slot (optional)



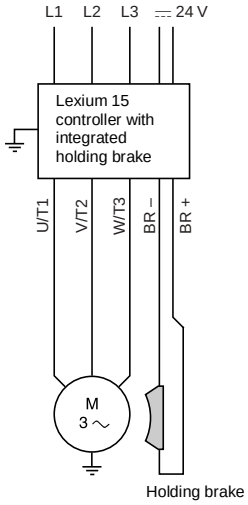
	c (without brake)	**c** (with brake)
BSH 2052	405	454.5
BSH 2053	489	538.5

(1) Not available with straight connectors. The power supply cable for servo motor/brake 1 is connected via a terminal.

Lexium 15 motion control
BSH servo motors
Option: integrated holding brake

Holding brake

Presentation



The holding brake integrated into the BSH servo motor, depending on the model, is an electromagnetic pressure spring brake that blocks the servo motor axis once the output current has been switched off. In the event of an emergency, such as a power outage or an emergency stop, the drive is immobilized, significantly increasing safety.
Blocking the servo motor axis is also necessary in cases of torque overload, such as in the event of vertical axis movement.

Activation of the holding brake is directly controlled by the Lexium 15 servo drive.

Characteristics

Type of servo motor	BSH	0551 0552 0553	0701 0702	0703	1001 1002 1003	1004	1401 1402	1403 1404	2051 2052 2053
Holding torque M_{Br}	**Nm**	0.8	2	3	9	12	23	36	80
Inertia of rotor (brake only) J_{Br}	**kgcm²**	0.0213	0.072	0.23	0.613	1.025	1.15	5.5	16
Electrical clamping power P_{Br}	**W**	10	11	12	18	20	24	26	40
Supply voltage		24 V⎓ -10…+6 %							
Opening time	**ms**	12	25	35	40	45	50	100	200
Closing time	**ms**	6	8	15	18	20	25	30	50
Weight (brake only)	**kg**	0.080	0.450	0.320	0.450	0.690	1.100	1.790	3.600

References

Selection of BSH servo motor with **F** or without **A** holding brake , see references page 179.

105892

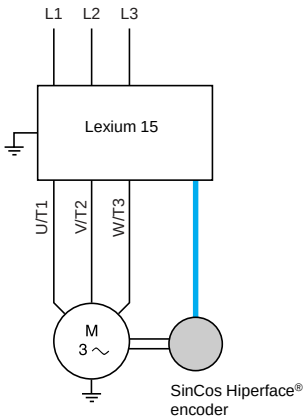
BSH servo motor

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors
Option: integrated sensor

Sensor integrated into BSH servo motors

Presentation



The standard measurement device is the SinCos Hiperface® single turn or multiturn encoder integrated into the BSH servo motors. This measurement device is perfectly adapted to the Lexium 15 range of servo drives.

Use of this encoder allows:
- The BSH servo motor data to be automatically identified by the servo drive
- The servo drive's control loops to be automatically initialized. These functions therefore simplify the installation of the motion control device.

Characteristics

Type of sensor		Single turn SinCos	Multiturn SinCos
Sinus periods per turn		128	128
Number of points		4096	4096 x 4096 turns
Encoder precision		± 1.3 arc minutes	
Measurement method		Optical high resolution	
Interface		Hiperface®	
Operating temperature	**°C**	+5…+110	

References

Selection of SinCos Hiperface® single turn **1** or multiturn **2** encoder integrated into the BSH servo motor, see references page 179.

105992

BSH servo motor

Dimensions:
pages 182 to 185

Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

535593

GBX planetary gearbox

Presentation

In many cases, motion control requires the use of planetary gearboxes to adapt speeds and torques, while ensuring the precision demanded by the application.

Schneider Electric has selected GBX gearboxes made by Neugart to be used in association with the BSH servo motor range. These gearboxes are lubricated for life and are designed for applications not requiring very low backlash. As their association with BSH servo motors has been thoroughly qualified and they are very easy to mount, the gearboxes are simple to put into operation and risk free.

Available in 5 sizes (GBX 40... GBX 160), the planetary gearboxes are offered in 12 speed reduction ratios (3:1...40:1), see table below.

Continuous stall torques and peak stall torques available from the gearbox are obtained by multiplying the characteristic values of the servo motor by the reduction ratio and gearbox efficiency (0.96 or 0.94 depending on the speed reduction ratio).

The table below shows the most suitable servo motor/gearbox combinations. For other associations consult the servo motor data sheets.

BSH servo motor/GBX gearbox associations

Type of servo motor	Speed reduction ratio											
	3:1	4:1	5:1	8:1	9:1	12:1	15:1	16:1	20:1	25:1	32:1	40:1
BSH 0551	GBX 40	GBX 40	GBX 40	GBX 60	GBX 40	GBX 40	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60**
BSH 0552	GBX 60	GBX 60	GBX 60	GBX 60	GBX 40	GBX 40	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BSH 0553	GBX 60	GBX 60	GBX 60	*GBX 60**	GBX 40	GBX 60	GBX 60	GBX 60	GBX 60	*GBX 60**	*GBX 60**	*GBX 60**
BSH 0701	GBX 60	GBX 60	GBX 80	GBX 80	GBX 60	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120
BSH 0702	GBX 80	GBX 80	GBX 80	GBX 80	GBX 60	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120
BSH 0703	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120
BSH 1001	GBX 80	GBX 80	GBX 80	GBX 120	GBX 80	GBX 80	GBX 80	GBX 80	GBX 120	GBX 120	GBX 120	GBX 160
BSH 1002	GBX 80	GBX 80	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1003	GBX 80	GBX 120	GBX 120	GBX 120	GBX 80	GBX 120	GBX 120	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160
BSH 1004	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1401	GBX 120	GBX 120	GBX 120	GBX 160	GBX 120	GBX 120	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1402	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1403	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 1404	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	GBX 160	GBX 160	GBX 160	GBX 160	*GBX 160**	*GBX 160**	*GBX 160**
BSH 2051	*GBX 160**	*GBX 160**	*GBX 160**	*GBX 160**	–	–	–	–	–	–	–	–
BSH 2052	–	–	–	–	–	–	–	–	–	–	–	–
BSH 2053	–	–	–	–	–	–	–	–	–	–	–	–

*GBX 60**

For associations in italics and marked with an asterisk, you must check that the application does not exceed the maximum continuous output torque of the gearbox, see values page 189.

Characteristics: page 189
References: page 190
Dimensions: page 191

Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Characteristics of GBX gearboxes

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Type of gearbox			Planetary gearbox with straight teeth, single reduction stage				
Backlash	3:1...8:1	**arc min**	< 30	< 20	< 12	< 8	< 6
	9:1...40:1		< 35	< 25	< 17	< 12	< 10
Torsion rigidity	3:1...8:1	**Nm/arc min**	1.0	2.3	6	12	38
	9:1...40:1		1.1	2.5	6.5	13	41
Noise level		**dB (A)**	55	58	60	65	70
Junction box			Black anodized aluminum				
Shaft material			C 45				
Shaft output dust and damp protection			IP 54				
Lubrification			Lubricated for life				
Average service life *(1)*		**hr**	30,000				
Mounting position			All positions				
Operating temperature		**°C**	- 25...+ 90				

Characteristics of BSH servo motor/GBX gearbox associations

Type of gearbox			GBX 40	GBX 60	GBX 80	GBX 120	GBX 160
Efficiency	3:1...8:1		0.96				
	9:1...40:1		0.94				
Maximum permitted radial force *(1) (2)*	L_{10h} = 10,000 hours	**N**	200	500	950	2000	6000
	L_{10h} = 30,000 hours		160	340	650	1500	4200
Maximum permitted axial force *(1)*	L_{10h} = 10,000 hours	**N**	200	600	1200	2800	8000
	L_{10h} = 30,000 hours		160	450	900	2100	6000
Moment of gearbox inertia	3:1	**kgcm²**	0.031	0.135	0.77	2.63	12.14
	4:1	**kgcm²**	0.022	0.093	0.52	1.79	7.78
	5:1	**kgcm²**	0.019	0.078	0.45	1.53	6.07
	8:1	**kgcm²**	0.017	0.065	0.39	1.32	4.63
	9:1	**kgcm²**	0.03	0.131	0.74	2.62	–
	12:1	**kgcm²**	0.029	0.127	0.72	2.56	12.37
	15:1	**kgcm²**	0.023	0.077	0.71	2.53	12.35
	16:1	**kgcm²**	0.022	0.088	0.5	1.75	7.47
	20:1	**kgcm²**	0.019	0.075	0.44	1.5	6.64
	25:1	**kgcm²**	0.019	0.075	0.44	1.49	5.81
	32:1	**kgcm²**	0.017	0.064	0.39	1.3	6.36
	40:1	**kgcm²**	0.016	0.064	0.39	1.3	5.28
Continuous output torque *(1)* M_{2N}	3:1	**Nm**	4.5	12	40	80	400
	4:1	**Nm**	6	16	50	100	450
	5:1	**Nm**	6	16	50	110	450
	8:1	**Nm**	5	15	50	120	450
	9:1	**Nm**	16.5	44	130	210	–
	12:1	**Nm**	20	44	120	260	800
	15:1	**Nm**	18	44	110	230	700
	16:1	**Nm**	20	44	120	260	800
	20:1	**Nm**	20	44	120	260	800
	25:1	**Nm**	18	40	110	230	700
	32:1	**Nm**	20	44	120	260	800
	40:1	**Nm**	18	40	110	230	700

(1) Values refer to an output shaft speed of 100 rpm in S1 mode (cyclical ratio = 1) on electrical machines for an ambient temperature of 30°C.
(2) Force applied at mid-distance from the output shaft.

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References: page 190
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Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

References

535593

GBX ●●●

Size	Speed reduction ratio	Reference (1)	Weight kg
GBX 40	3:1, 4:1, 5:1 and 8:1	**GBX 040 ●●● ●●● ●F**	0.350
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 040 ●●● ●●● ●F**	0.450
GBX 60	3:1, 4:1, 5:1 and 8:1	**GBX 060 ●●● ●●● ●F**	0.900
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 060 ●●● ●●● ●F**	1.100
GBX 80	3:1, 4:1, 5:1 and 8:1	**GBX 080 ●●● ●●● ●F**	2.100
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 080 ●●● ●●● ●F**	2.600
GBX 120	3:1, 4:1, 5:1 and 8:1	**GBX 120 ●●● ●●● ●F**	6.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 120 ●●● ●●● ●F**	8.000
GBX 160	3:1, 4:1, 5:1 and 8:1	**GBX 160 ●●● ●●● ●F**	18.000
	9:1, 12:1, 15:1, 16:1, 20:1, 25:1, 32:1 and 40:1	**GBX 160 ●●● ●●● ●F**	22.000

To order a GBX planetary gearbox, complete each reference with:

			GBX ●●●	●●●	●●●	●	F
Size	Junction box diameter (see associations table with BSH servo motor, page 188)	40 mm	**040**				
		60 mm	**060**				
		80 mm	**080**				
		115 mm	**120**				
		160 mm	**160**				
Speed reduction ratio		3:1		**003**			
		4:1		**004**			
		5:1		**005**			
		8:1		**008**			
		9:1		**009**			
		12:1		**012**			
		15:1		**015**			
		16:1		**016**			
		20:1		**020**			
		25:1		**025**			
		32:1		**032**			
		40:1		**040**			
Associated BSH servo motor	Type	BSH 055			**055**		
		BSH 070			**070**		
		BSH 100			**100**		
		BSH 140			**140**		
		BSH 205			**205**		
	Model	BSH ●●●1				**1**	
		BSH ●●●2				**2**	
		BSH ●●●3				**3**	
		BSH ●●●4				**4**	
BSH servo motor adaptation							**F**

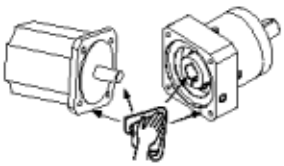
Mounting

No specialized tool is required to mount the GBX planetary gearbox on the BSH servo motor. The general usage rules for mechanical mounting must be observed:

1 Clean support areas and joints.
2 Align shafts to be linked and assemble in vertical position.
3 Join the servo motor flange to the gearbox flange in uniform manner, with cross tightening of the screws.
4 Using a torque wrench, tighten the TA ring following tightening torque (2...40 Nm according to the gearbox model).

For more information, consult the user instructions supplied with the products).

1



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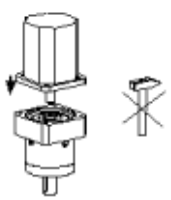

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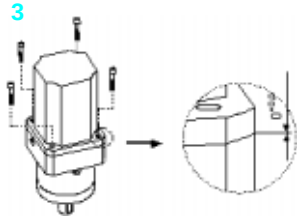

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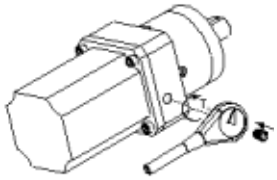
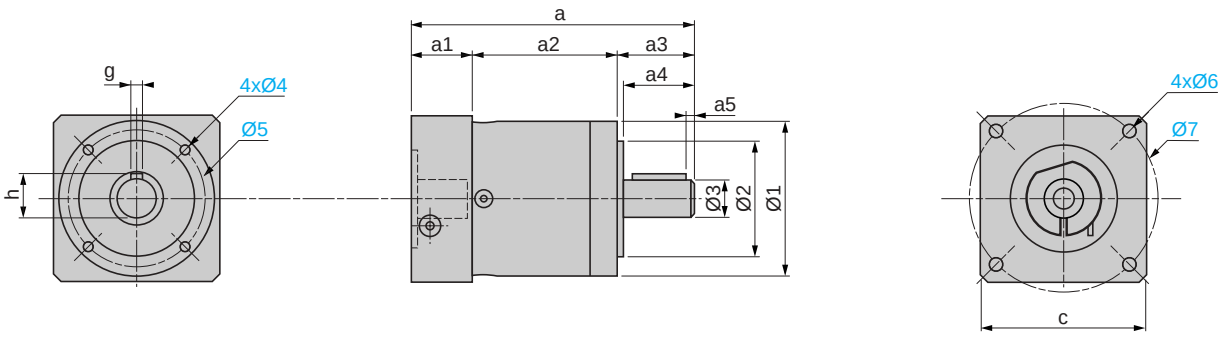


Lexium 15 motion control
BSH servo motors
Option: GBX planetary gearboxes

Dimensions

Servo motor assembly



GBX	c	a	a1	a2	a3	a4	a5	h	g	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
040 003...008	40	93.5	28.5	39	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
040 009...016	40	106.5	28.5	52	26	23	2.5	11.2	3	40	26 h7	10 h7	M4 x 6	34	M4 x 10	46
060 003...008	60	106.5	24.5	47	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
060 009...040	60	118.5	24.5	59	35	30	2.5	16	5	60	40 h7	14 h7	M5 x 8	52	M5 x 12	63
080 003...008	90	134	33.5	60.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
080 009...032	90	151	33.5	77.5	40	36	4	22.5	6	80	60 h7	20 h7	M6 x 10	70	M6 x 15	100
120 003...008	115	176.5	47.5	74	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
120 009...040	115	203.5	47.5	101	55	50	5	28	8	115	80 h7	25 h7	M10 x 16	100	M8 x 20	115
160 003...008	140	255.5	64.5	104	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165
160 009...040	140	305	64.5	153.5	87	80	8	43	12	160	130 h7	40 h7	M12 x 20	145	M10 x 25	165

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Characteristics: page 189
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Lexium 15 motion control
BSH servo motors

Sizing of BSH servo motor

To assist you in sizing the servo motor, the "**Lexium Sizer**" software tool is available on the website www.telemecanique.com

These 2 pages are to help you understand the method used for calculation.

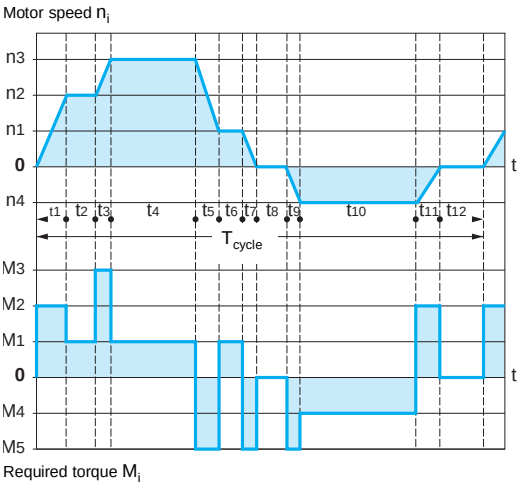
To size the servo motor you need to know the equivalent thermal torque and the average speed required by the mechanics to be associated with the servo motor. Both values are calculated using the motor cycle trend diagram and should be compared with the speed/torque curves given for each servo motor (see BSH servo motor curves, pages 150 to 175).

Motor cycle trend diagram

The motor cycle is made up of several sub-cycles for which the duration of each is known.
Each sub-cycle is broken down into phases which correspond to the periods of time during which the motor torque is constant (1 to 3 phases maximum per sub-cycle).
This breakdown can be used to calculate, for each phase:
- the duration (t_j)
- the speed (n_i)
- the required torque value (M_i)

The curves on the left show the 4 phase types:
- constant acceleration during t_1, t_3 and t_9
- at work during t_2, t_4, t_6 and t_{10}
- constant deceleration during t_5, t_7 and t_{11}
- motor stopped during t_8 and t_{12}

The total cycle duration is:
$T_{cycle} = t_1 + t_2 + t_3 + t_4 + t_5 + t_6 + t_7 + t_8 + t_9 + t_{10} + t_{11} + t_{12}$



Calculating the average speed n_{avg}

The average speed is calculated using the formula opposite where: $n_{avg} = \frac{\sum |ni| \cdot t_j}{\sum t_j}$

- n_i corresponds to the different work speeds.
- $\frac{ni}{2}$ corresponds to the average speeds during constant acceleration and deceleration phases.

In the above example:

Duration t_j	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}
Speed $\lvert ni \rvert$	$\frac{\lvert n2 \rvert}{2}$	$\lvert n2 \rvert$	$\frac{\lvert n3 \rvert + \lvert n2 \rvert}{2}$	$\lvert n3 \rvert$	$\frac{\lvert n3 \rvert + \lvert n1 \rvert}{2}$	$\lvert n1 \rvert$	$\frac{\lvert n1 \rvert}{2}$	0	$\frac{\lvert n4 \rvert}{2}$	$\lvert n4 \rvert$	$\frac{\lvert n4 \rvert}{2}$	0

The average speed is calculated as follows:

$$n_{avg} = \frac{\frac{n2}{2} \cdot t1 + n2 \cdot t2 + \frac{n3 + n2}{2} \cdot t3 + n3 \cdot t4 + \frac{n3 + n1}{2} \cdot t5 + n1 \cdot t6 + \frac{n1}{2} \cdot t7 + \frac{n4}{2} \cdot t9 + n4 \cdot t10 + \frac{n4}{2} \cdot t11}{Tcycle}$$

Calculating the equivalent thermal torque M_{eq}

The equivalent thermal torque is calculated using the following formula:

$$M_{eq} = \sqrt{\frac{\sum Mi^2 \cdot t_j}{Tcycle}}$$

In the above example, this formula gives the following calculation:

$$M_{eq} = \sqrt{\frac{M2^2 \cdot t1 + M1^2 \cdot t2 + M3^2 \cdot t3 + M1^2 \cdot t4 + M5^2 \cdot t5 + M1^2 \cdot t6 + M5^2 \cdot t7 + M5^2 \cdot t9 + M4^2 \cdot t10 + M2^2 \cdot t11}{Tcycle}}$$

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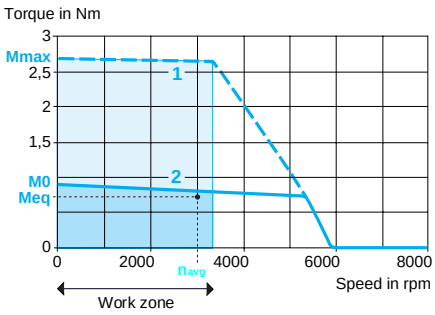

Sizing of BSH servo motor (continued)

Determining the size of the servo motor

The point defined by the 2 preceding calculations (average speed and equivalent thermal torque) where the:

- horizontal axis represents the average speed n_{avg}
- vertical axis represents the thermal torque M_{eq}

must be within the area bound by the curve **2** and the work zone.

The motor cycle trend diagram should also be used to ensure that all torques M_i required for the different speeds n_i during the various cycle phases are within the area bound by the curve **1** and the work zone.

1 Peak torque
2 Continuous torque

Product reference index

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