Lexium
Motion control

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a brand of Schneider Electric

Telemecanique

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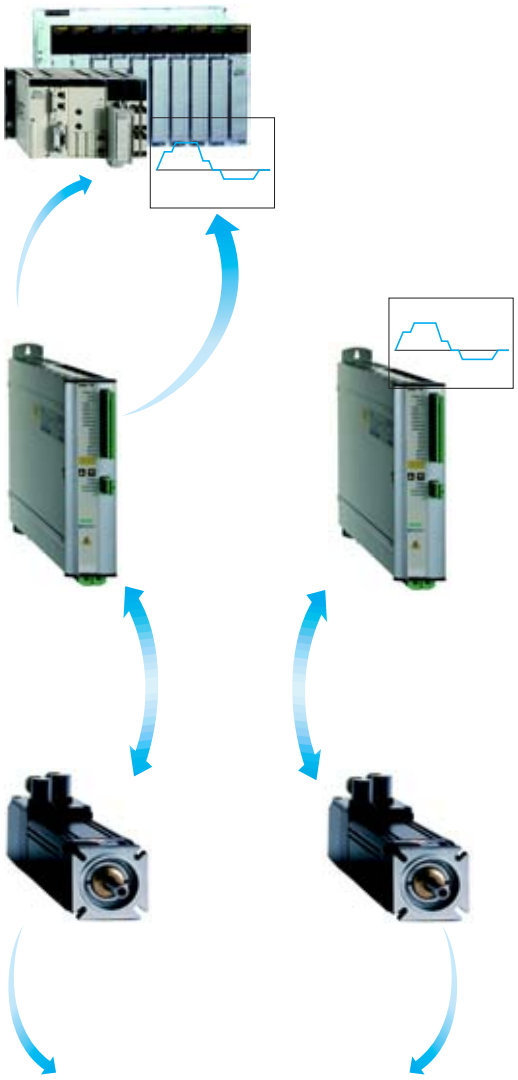
Presentation

Analog setpoint or digital link mode | **Stand alone mode with integral position indexer**



The axis control offer is intended for machines which simultaneously require high performance servo motion control, associated with PLC sequential control.

Position control system

Modicon Premium and Modicon Quantum automation platforms offer a range of interfaces including axis control modules providing a position control function. These modules are:

- Analog output modules:
  - TSX CAY, multi-axis control (2 to 4 axes) for Premium,
  - 140 MSB, single-axis control for Quantum
- Modules with SERCOS digital link:
  - TSX CSY, controls up to 16 servodrives for Premium,
  - 141 MMS, controls up to 22 servodrives for Quantum.

Lexium MHDA servodrive

Lexium servodrives provide solid state switching, current (or torque), speed and position control.
Three types of servodrive, each available in 7 current ratings (1.5, 3, 6, 10, 20, 40 and 70 A permanent rms), are available:
- ± 10 V analog setpoint, controlled by position control module of PLC.
- Stand alone mode with integral position indexer, controlled by:
  - discrete inputs/outputs *(1)*,
  - CANopen bus,
  - Modbus Plus network, Fipio bus or Profibus DP bus *(1)*.
- SERCOS high speed digital link *(1)* allows Lexium servodrives to be controlled by PLC position control module.

Lexium brushless motors

Brushless motors are synchronous, 3-phase motors. They are equipped with a built-in sensor which can be a resolver or a SinCos Hiperface absolute encoder. They are provided with or without holding brake. Two ranges of motors are available:

SER motors

They are equipped with Neodynium Iron Borium (NdFeB) magnets and provide a high power density within a confined space, as well as large velocity dynamic that meet all machine requirements. They have:
- IP 41 or IP 56 protection.
- With or without gearbox. These gearboxes are offered with three speed reduction ratios 3:1, 5:1 and 8:1.
- Smooth shaft end *(2)* (for the model without gearbox) or with key (for the model with gearbox).

BPH motors

Their design, with samarium cobalt permanent magnets, ensures perfect rotation even at low speed. Depending on the model, they have:
- IP 65 or IP 67 protection (IP 54 for BPH 055 motor).
- Keyed or smooth shaft ends.

Configuration and installation

Motion control applications are designed and installed using:
- PL7 Junior/Pro (for Premium PLCs) software.
- Concept (for Quantum PLCs) software.
- Unity Pro (for Premium or Quantum PLCs) software.

Unilink user software, in association with Lexium servodrives, provides configuration and adjustment of the parameters for these servodrives.

(1) Requires use of an optional card (one slot available per MHDA servodrive).
(2) Shaft end with key for the model without a gearbox, please contact our Regional Sales Office.

Lexium motion control

Association of brushless motors and Lexium servodrives

SER brushless motors (IP 41 or IP 56)		Digital Lexium MHDA servodrives							Lexium BPH brushless motors (IP 65 or IP 67)	
										
		MHDA 1004●00 1.5 A rms	MHDA 1008●00 3 A rms	MHDA 1017●00 6 A rms	MHDA 1028●00 10 A rms	MHDA 1056●00 20 A rms	MHDA 1112A00 40 A rms	MHDA 1198A00 70 A rms		
		0.4/1.1 Nm							8,000 rpm	BPH 0552 S
		0.9/1.9 Nm	1.3/3.4 Nm						6,000 rpm	BPH 0751 N
SER 39A 4L7S	6,000 rpm	1.1/2.5 Nm	1.1/4 Nm							
SER 39B 4L3S	6,000 rpm		2.2/4.4 Nm	2.2/8.0 Nm						
		1.3/2.5 Nm	2.3/4.8 Nm						6,000 rpm	BPH 0752 N
SER 39C 4L3S	6,000 rpm		2.9/4.7 Nm	2.9/9.4 Nm						
			3.7/7.2 Nm	4.3/13.4 Nm					6,000 rpm	BPH 0952 N
SER 3BA 4L3S	6,000 rpm			4.6/9.2 Nm	4.6/15.3 Nm					
SER 3BA 4L5S	6,000 rpm		4.6/8.2 Nm	4.6/15 Nm						
				6.0/13.4 Nm	6.0/20.3 Nm				6,000 rpm	BPH 0953 N
SER 3BB 4L3S	6,000 rpm			6.6/12 Nm	6.6/20 Nm					
SER 3BB 4L5S	6,000 rpm			6.6/15.8 Nm	6.6/25 Nm					
				7.4/13.6 Nm	7.4/19.3 Nm				6,000 rpm	BPH 1152 N
				6.8/13.5 Nm	10.5/19 Nm				6,000 rpm	BPH 1153 N
SER 3BC 4L5S	6,000 rpm			10/17 Nm	10/28 Nm					
SER 3BC 4L7S	3,000 rpm		10/16 Nm	10/32 Nm						
					11.4/18 Nm	12/30 Nm			4,000 rpm	BPH 1422 N
SER 3BD 4L5D	6,000 rpm				13.4/29 Nm					
SER 3BD 4L7S	3,000 rpm			13.4/24 Nm	13.4/38 Nm					
					14.5/24 Nm	17/42 Nm			4,000 rpm	BPH 1423 N
						25/37.5 Nm			4,000 rpm	BPH 1902 N
						36/57 Nm			4,000 rpm	BPH 1903 K
						46/76.2 Nm			4,000 rpm	BPH 1904 K
							75/157 Nm		4,000 rpm	BPH 1907 K
							90/163 Nm	100/230 Nm	4,000 rpm	BPH 190A K

1.1/2.5 Nm For a SER motor, the 1st value corresponds to continuous stall torque max., the 2nd value corresponds to peak stall torque max.

1.3/3.4 Nm For a SER/Lexium BPH motor, the 1st value corresponds to continuous stall torque max., the 2nd value corresponds to peak stall torque max.

Example: The **SER 3BB 4L3S** motor associated with the **MHDA1017** servodrive meets the requirements of applications requiring a **6.6 Nm** continuous stall torque max, **12 Nm** peak stall torque max. and **6,000 rpm** mechanical speed.

Lexium motion control
Counter and electronic cam modules

Applications		Counter modules	
			
Number of channels		2 channels	4 channels
Frequency per channel		40 kHz	40 kHz
Module cycle time		5 ms	10 ms
Counter/measurement input	Counting pulses ⎓ 24 V	Up to 40 kHz: - Proximity sensor type 2 - Mechanical contacts	
	Incremental encoder	Up to 40 kHz : - ⎓ 10…30 V - ⎓ 5 V RS 422 with zero marker	
	Absolute encoder	–	
Reflex inputs/outputs		Per channel: - 3 inputs ⎓ 24 V: enable, preset and read - 1 input ⎓ 24 V line check, incremental encoder power supply - 2 reflex outputs ⎓ 24 V	
Counting capacity		24 bits + sign (0 to + 16 777 215 points or ± 16 777 215 points)	
Functions		Downcounting with preset input, upcounting with reset to zero input Up/down counting with preset input, configurable upcounter input: - 1 upcounter input/1 downcounter input - 1 up/down counter input and 1 direction input - Incremental encoder with phase-shifted signals	
Processing		Inputs: counter enable, counter preset, read current value	
		Comparison: - Downcounting, to value 0 - Upcounting, 2 thresholds and 1 setpoint - Up/down counting, 2 thresholds and 2 setpoints	
		Reflex outputs: - Downcounting function, 1 passage through zero output - Upcounting function,1 passage through setpoint value output - Up/down counting function, 2 user-definable outputs - Up/down counting function, 2 user-definable outputs	
Events		User-definable activation of the event-triggered task (threshold crossing, setpoint crossing, preset or reset, enable, capture)	
Connection		- 15-way SUB-D connectors (1 per counter channel, direct or TSX TAP S15 ●● accessory) - HE 10 connector for auxiliary I/O and power supply - Telefast 2 system (ABE 7CPA01, ABE 7H08R10/16R20)	
Type of module		**TSX CTY 2A**	**TSX CTY 4A**
Page		Please consult our catalogue “Modicon Premium automation platform”	

Fast counter and measurement module	Electronic cam module
	
2 channels	1 channel
500 kHz	
1 ms	
Up to 1 MHz: - Proximity sensor type 2 - Mechanical contacts	–
500 kHz in multiplication by 1, 250 kHz in multiplication by 4: - ⎓ 10…30 V - ⎓ 5 V RS 422 with zero marker	
Power supply ⎓ 5 V ou ⎓ 10…30 V: - SSI absolute encoder up to 25 bits - Parallel absolute encoder up to 24 bits (with Telefast ABE 7CPA11 sub-base)	
Per channel : - 2 inputs ⎓ 24 V : preset and read - 1 enable input or ⎓ 24 V output, configurable - 2 reflex outputs ⎓ 24 V - 1 programmable frequency output 24 V - 1 encoder power supply input ⎓ 5 V/24 V	- 3 proximity sensor compatible inputs 24 V type I - 24 track outputs 24 V/0.5 A protected
24 bits + sign (0 to + 16 777 215, upcounting) or 24 bits + sign (- 16 777 215 to + 16 777 215, downcounting, up/down counting). Up to 25 bits for SSI absolute encoder	256 to 32 768 points per cycle and from 1 to 32 768 cycles,(absorbs play on reverse)
Up/down counting with preset input, configurable counter input: - 1 upcounter input/1 downcounter input - 1 up/down counter input and 1 direction input - Incremental encoder with phase-shifted signals Measurement 2: - SSI absolute encoder - Parallel output absolute encoder with ABE 7CPA11 sub-base	Processing of 128 cams/32 tracks (of which 24 with direct output) Output update cycle: - 50 µs for 16 cams - 100 µs for 64 cams - 200 µs for 128 cams Two capture registers Control/recalibration of axis slip
Inputs: counter enable, counter preset, read current value	Cam profiles: 3 basic types (position, monostable, brake)
Comparison: 2 thresholds	Associated functions: - Elimination of axis backlash, position recalibration - Measurement capture - Switching feedforward - Parts counter
Reflex outputs: 2 user-definable outputs Speed monitoring Special functions	
User-definable activation of the event-triggered task (crossing of thresholds or modulo value, preset, enable, capture)	User-definable activation of the event-triggered task (cams, track, adjustment, read, etc.)
- 15 way SUB-D connectors (1 per counter channel, direct or TSX TAP S15●● accessory) - HE 10 connector for reflex I/O and power supply - Telefast 2 system (ABE 7CPA01, ABE 7H16R20, ABE 7CPA11)	
TSX CTY 2C	**TSX CCY 1128**
Please consult our catalogue “Modicon Premium automation platform”	

Lexium motion control
Premium motion control modules

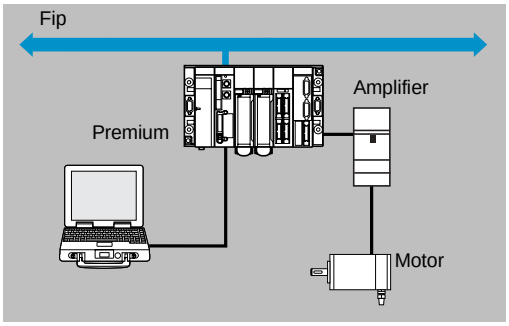
Applications	Motion control modules for stepper motor		Motion control modules for servomotors Compatible with: - Lexium MHDA servodrives with analog setpoint - Altivar ATV 38/58/68 variable speed drives	
				
Number of axes	1 axis	2 axes	2 axes	4 axes
Frequency per axis	187 kHz		Counter: 500 kHz with incremental encoder	
Counter input	Per axis: Translator inputs ⎓ 5 V, negative logic (translator loss of step checks)		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 Telefast 2 conversion sub-base (ABE 7CPA11)	
Control outputs	Per axis: RS 422 translator outputs, TTL 5 V compatible (+/- pulses, boost, enable, reset loss of step check)		Per axis: 1 analog output ± 10 V, 13 bits + sign,	
Auxiliairy input/output	Per axis: 6 discrete inputs ⎓ 24 V 1 output ⎓ 24 V (brake control)		Per axis: 4 discrete I/O ⎓ 24 V (homing cam, event, recalibration, 1 input/1 output for servodrive control 1 reflex output ⎓ 24 V	
Counter capacity	24 bits + sign (± 16 777 215 points)			
Functions			Servo Control on individual linear axis	
Processing	Open loop control of the position of a moving part on a limited linear axis according to motion control functions supplied by the PLC processor		Positioning of a moving part on an axis according	
	Axis parameter setting, adjustment and debugging using PL7 Junior/Pro and Unity Pro software		Axis parameter setting, adjustement and debugging using	
Events	User-definable activation of the event-triggered task			
Connection	- 15-way SUB-D connector for translator - 20-way HE 10 connector for auxiliary I/O - Telefast 2 system (ABE 7H16R20)		- 9 and 15-way SUB-D connectors for encoder input - HE 10 connector for auxiliary inputs - Telefast 2 system (ABE 7CPA01, ABE 7H16R20, - Specific accessories (TSX TAP MAS)	
Type of modules	**TSX CFY 11**	**TSX CFY 21**	**TSX CAY 21**	**TSX CAY 41**
Page	11		15	

			Motion control modules for servomotors Compatible with Lexium MHDA servodrives equipped with optional card SERCOS	
				
2 axes	4 axes	3 axes	8 axes	16 axes
Acquisition: 200 kHz with SSI serial absolute encoder or parallel output			SERCOS ring: 4 M bauds	
Per axis: - Incremental encoder ⎓ 5 V, RS 422/RS 485 or Totem pole, - SSI serial absolute encoder 12 to 25 bits Parallel output absolute encoder 12 to 24 bits ⎓ 5/10/30 V with Telefast 2 conversion sub-base (ABE 7CPA11)			Per SERCOS digital link	
servodrive setpoint			Per SERCOS digital link	
emergency stop)			Per SERCOS digital link	
Servo control on individual infinite axis Follower axes (dynamic ratio) Realtime correction of servodrive offset		Servo control on individual linear or infinite axis Linear interpolation on 2 or 3 axes Realtime correction of servodrive offset	Individual linear or infinite axis Linear interpolation on 2 to 8 axes Follower axes (6 slaves) by gearing or camming Manual mode (JOG and INC) *(1)* Special functions, see page 26	
Flying shear on position or event *(1)*	–			
to motion control functions supplied by the Premium PLC processor				
PL7 Junior/Pro and Unity Pro software *(2)*				Axis parameter setting, adjustment and debugging using PL7 Junior/Pro software
(direct or via TSX TAP S15●●), speed reference ABE 7CPA11),			2 SMA type connectors for plastic (or glass) fiber optic cable	
TSX CAY 22	**TSX CAY 42**	**TSX CAY 33**	**TSX CSY 84**	**TSX CSY 164**
			30	

(1) Function not available with Premium platform under Unity Pro software.
(2) The Unity Pro software is not compatible with the TSX CSY 164 module.

Lexium motion control

TSX CFY 11/21 modules for stepper motors



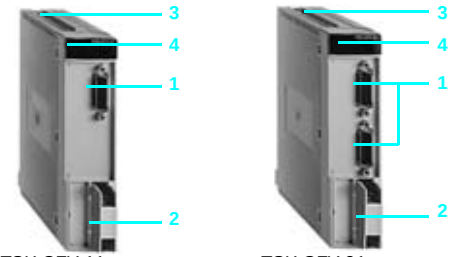
Presentation

The TSX CFY 11/21 stepper motor axis control range is intended for machines which simultaneously require motion control by stepper motor associated with sequential control by programmable controller.
The TSX CFY 11 module controls, via an amplifier for stepper motor, 1 axis (channel 0). The TSX CFY 21 module controls 2 axes (channels 0 and 1). They accept amplifiers with:

- RS 422 or TTL 5 V inputs (negative logic).
- RS 422 or ⎓ 5 V NPN open collector outputs.

In a Premium PLC configuration, the number of TSX CFY motion control modules should be added to the other application-specific modules (communication, counting, axis control and weighing).

Description



TSX CFY 11 *TSX CFY 21*

The front panel of TSX CFY 11/21 stepper control modules comprises:
1 One 15-way SUB-D connector per channel for connecting:
- Amplifier inputs.
- Amplifier outputs.
- Amplifier input power supply.

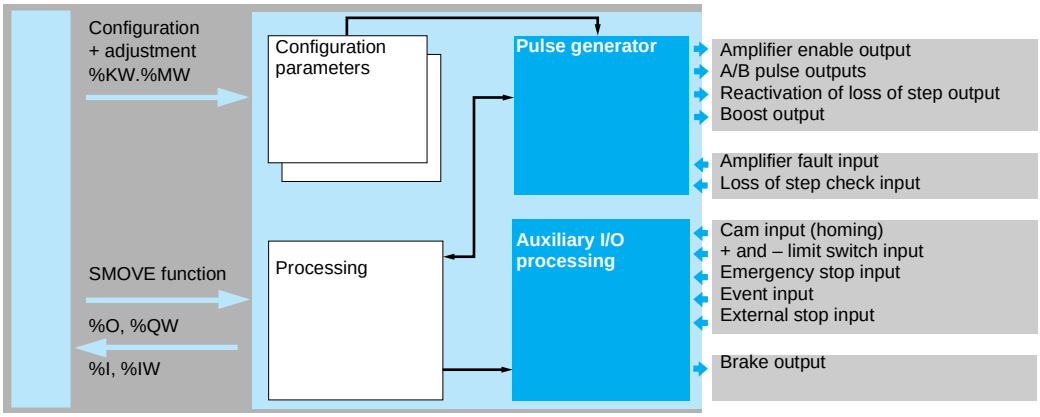
2 One 20-way HE 10 connector for connecting:
- Auxiliary inputs: per axis, homing cam, emergency stop, limit switches (+ and -), event, external stop.
- Brake outputs (1 per axis).
- External power supplies for sensors and preactuators.

3 Rigid casing which:
- Holds the electronic card.
- Locates and locks the module in its slot.

4 Module diagnostics lamps:
- Module diagnostics:
  - green RUN lamp: module operating,
  - red ERR lamp: internal fault, module failure,
  - red I/O lamp: external fault.
- Axis diagnostics:
  - 2 green CH● lamps: axis diagnostics available.

Operation block diagram

Operating characteristics are described on page 10. Stepper control modules are set up using PL7 Junior/Pro and Unity Pro software.



Characteristics: pages 9 and 10
References: page 11
Connection: page 10

Lexium motion control
TSX CFY 11/21 modules for stepper motors

Electrical characteristics

Type of module				TSX CFY 11	TSX CFY 21
Modularity				1 axis	2 axes
Maximum pulse frequency			**kHz**	187.316	187.316
Consumption		⎓ 5 V	**mA**	510	650
		⎓ 24 V	**mA**	50	100
Power dissipated in the module		Typical	**W**	3.8	5.6
Sensor power supply check				Yes	Yes

Input characteristics

Inputs				Amplifier inputs	Auxiliary inputs
Logic				Negative	Positive
Nominal values	Voltage		**V**	5	24
	Current		**mA**	4.5	7
Limit values	Voltage		**V**	–	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
	At state 1	Voltage	**V**	< 2	≥ 11
		Current	**mA**	–	> 6 (for U = 11 V)
	At state 0	Voltage	**V**	> 3.6	< 5
		Current	**mA**	–	< 2 (for U = 5 V)
Input impedance for nominal U			**kΩ**	–	3.4
Input immunity			**µs**	Loss of step input: 15 to 30:	–
			µs	–	Homing cam and event inputs: < 250
			ms	Amplifier fault input: 3 to 16	Limit switch, emergency stop and external stop inputs: 3 to 10
Monitoring of external power supply for sensors and preactuators	Voltage for OK state		**V**	–	> 18
	Voltage for fault state		**V**	–	< 14
	Immunity OK ➡ fault		**ms**	–	> 1
	Immunity fault ➡ OK		**ms**	–	< 30
Type of input				Resistive	Current sink
IEC 1131 conformity				–	Type 2
Sensor compatibility				–	2-wire/3-wire

Output characteristics

Outputs				Amplifier outputs	Brake outputs (1 per axis)
Type of output				RS 422, TTL 5 V open collector NPN compatible	Open collector, PNP
Output differential voltage			**V**	± 2 (load resistance ≤ 100 Ω)	–
Short-circuit current			**mA**	< 150	–
Permissible common mode voltage			**V**	≤ 7	–
Permissible differential voltage			**V**	≤ 12	–
Voltages		Nominal	**V**	–	⎓ 24
		Limit	**V**	–	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
Currents		Nominal	**mA**	–	500
		Leakage	**mA**	–	< 0.3
		Maxi	**mA**	–	625 (for U = 30 or 34 V)
Maximum voltage drop when ON			**V**	–	⎓ < 1
Switching time			**µs**	–	< 250
Compatibility with DC inputs				–	All positive logic inputs with input resistance < 15 kΩ
IEC 1131-2 compliance				–	Yes
Protection against overloads and short-circuits				–	Via current limiter and thermal tripping (reactivated via program or automatically)
Short-circuit check on each channel				–	One signalling bit per channel
Protection against channel overvoltage				–	Zener diode between outputs and ⎓ + 24 V
Protection against polarity inversions				–	By diode reverse-mounted on supply

References: page 11
Connection: page 10

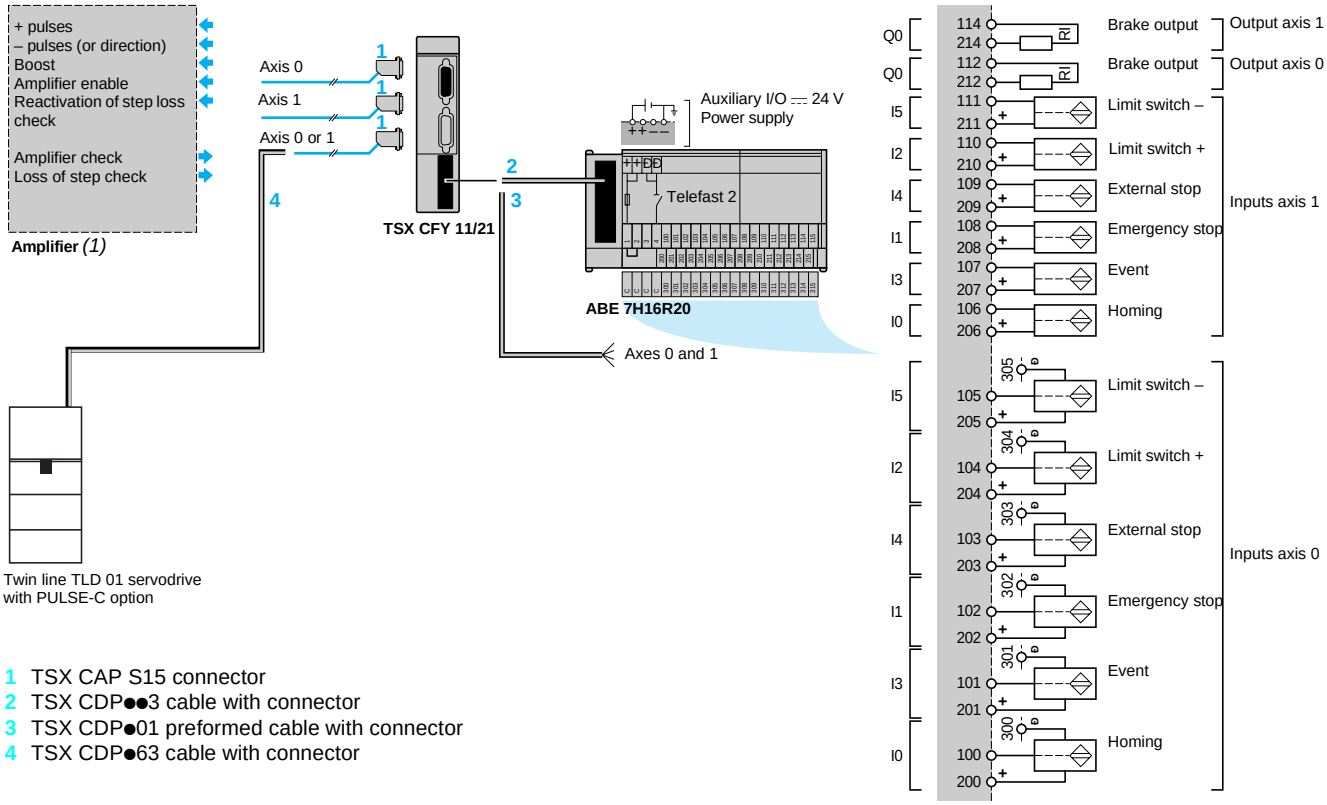
2

Operating characteristics

Control		Pulse, frequency from 0 to 187 kHz
		+ and - outputs or +/- outputs and direction
Paths		Trapezoidal speed profile with minimum movement frequency
Operating modes	OFF	Module inactive
	DIR DRIVE	Module operating as pulse generator
	MAN	Motion controlled by operator: □ visual control of movement □ incremental movement
	AUTO	Movement sequence controlled by PLC program. Movements are described using a syntax similar to that of ISO language. Movements may be expressed in absolute or relative terms (in relation to either the current position or a home point). Operation is possible in "step-by-step" mode.
Checks	Environment	Amplifier, limits switches, Emergency stop
	Motion	Check correct execution by software position limits, loss of step
	Control	Check consistency of commands
	Parameters	Check validity of parameters
Optional commands		Boost, brake

Connections

TSX CFY 11/21 stepper control module connections



1 TSX CAP S15 connector
2 TSX CDP●●3 cable with connector
3 TSX CDP●01 preformed cable with connector
4 TSX CDP●63 cable with connector

(1) Type of amplifier
■ *With RS 422 interface:*
□ *RS 422 compatible inputs,*
□ *RS 422 outputs.*
■ *With open collector, NPN interface:*
□ *TTL/5 V source compatible inputs,*
□ *Open collector, NPN outputs (5 V power supply from TSX CFY 11/21 module).*

Characteristics: pages 9 and 10
References: page 11

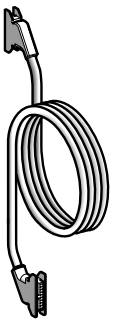
Lexium motion control
TSX CFY 11/21 modules for stepper motors

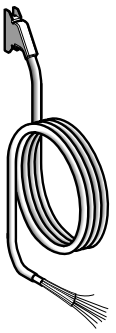
Motion control modules for stepper motors


TSX CFY 11


TSX CFY 21


ABE 7H16R20


TSX CDP ●03


TSX CDP ●01

Description	To control	Connections to connectors		No. of axes	Reference (1)	Weight kg
		SUB-D, 15-way	HE 10, 20-way			
Motion control modules for stepper motors	Amplifier with RS 422 I/O, ⎓ 5 V TTL and O ⎓ 5 V with open collector	Amplifier I/O	Auxiliary I/O, ⎓ 24 V power supply	1	**TSX CFY 11**	0.440
				2	**TSX CFY 21**	0.480

Connection accessories

Description	TSX CFY ●1 connector	Type of connector on TSX CFY ●1 module	N° (2)	Unit reference	Weight kg
SUB-D connectors	Amplifier	SUB-D, 15-way (1 per axis) Sold in lots of 2	**1**	**TSX CAP S15**	0.050
Telefast 2 connection sub-base	Auxiliary I/O for axes 0/1, ⎓ 24 V power supply	HE 10, 20-way (1 for 2 axes)		**ABE 7H16R20**	0.300
Additional terminal block	20 shunted terminals for ABE 7H16R20 sub-bases	Order in multiples of 5		**ABE 7BV20**	0.030

Connecting cables

Description	From module TSX CFY ●1	To	N° (2)	Length	Reference	Weight kg
Cables (cross-section 0.324 mm²)	20-way HE 10 connector	ABE 7H16R20 sub-base (20-way HE 10 molded connector)	**2**	0.5 m	**TSX CDP 053**	0.085
				1 m	**TSX CDP 103**	0.150
				2 m	**TSX CDP 203**	0.280
				3 m	**TSX CDP 303**	0.410
				5 m	**TSX CDP 503**	0.670
Preformed cables (cross-section 0.324 mm²)	20-way HE 10 connector	Auxiliary I/O for axes 0/1, 24 V ⎓ power supply (flying leads at I/O end)	**3**	3 m	**TSX CDP 301**	0.400
				5 m	**TSX CDP 501**	0.660
				10 m	**TSX CDP 1001**	1.310
Cables for Twin Line TLD 01● amplifier	15-way SUB-D connector	Twin Line TLD 01● amplifier with PULSE-C option (15-way female SUB-D connector)	**4**	2 m	**TSX CXP 263**	–
				6 m	**TSX CXP 663**	–

(1) Includes a bilingual Quick Reference Guide: French and English.
(2) For key, see page 10.

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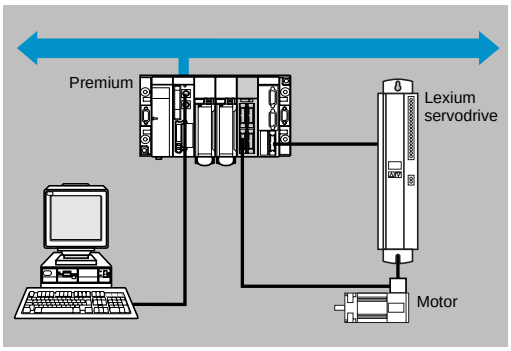
Lexium motion control
TSX CAY modules for servomotors



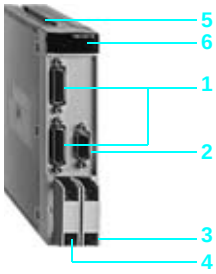
The TSX CAY ●● servo loop positioning axis control range is intended for machines which require simultaneous high performance motion control together with sequential control by programmable controller.

Depending on model:
- The TSX CAY 21/22 modules control 2 individual axes.
- The TSX CAY 41/42 modules control up to 4 individual axes.
- The TSX CAY 33 module control 3 interpolated linear axes.

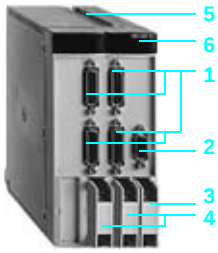
They can be used with ± 10 V analog input servodrives such as Lexium 17D/17D HP, and Twin Line TLD 13 servodrives.

TSX CAY ●● modules can be installed, like all application-specific modules, in any location on a Premium PLC rack.

Description



TSX CAY 21/22



TSX CAY 41/42

The front panel of TSX CAY ●● axis control modules comprises:
1 One 15-way SUB-D connector per axis for connecting an incremental or absolute encoder.
2 One 9-way SUB-D connector for all axes for connecting:
- 1 "speed reference" analog output for each axis.

3 One 20-way HE 10 connector for all axes for connecting:
- Auxiliary inputs for servodrive control,
- External power supply for servodrive I/O.

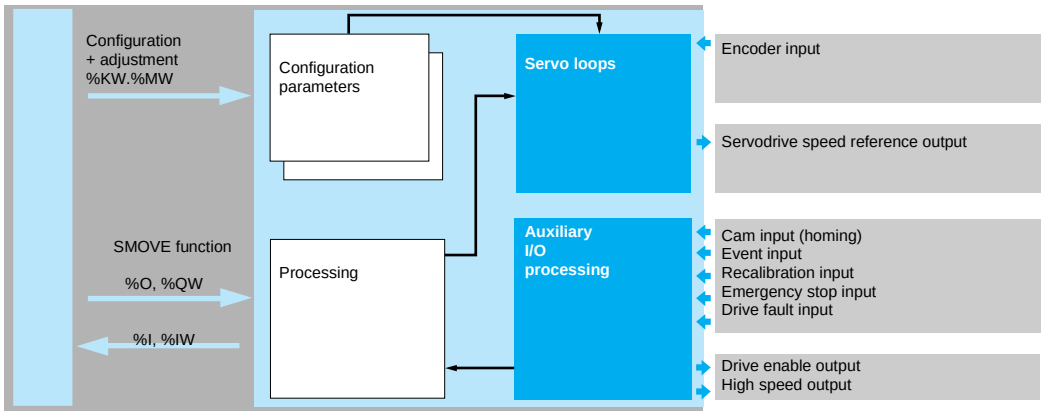
4 One 20-way HE 10 connector for 2 axes (0/1 or 2/3) for connecting:
- Auxiliary inputs: homing cam, Emergency stop, event, recalibration.
- High speed outputs.
- External power supplies for sensors and preactuators.

5 Rigid casing which:
- Holds the electronic card.
- Locates and locks the module in its slot.

6 Module diagnostic lamps:
- Module diagnostics:
  - green RUN lamp: module operating,
  - red ERR lamp: internal fault, module failure,
  - red I/O lamp: external fault.
- Axis diagnostics:
  - green CH● lamps: axis diagnostics available.

Operation

Block diagram of an axis



Axis control modules are set up using PL7 Junior/Pro or Unity Pro software (see page 22).
TSX CAY 22/42/33 modules require the use of TSX P57 ●●2M/3M/4M processors and Atrium TPCX57 ●●2M/3M coprocessors or TSX PCI 57●●4M.
Flying shear function of the TSX CAY 22 module requires the version ≥ 4.1 of PL7 Junior/Pro software (function not available with Unity Pro software, version 1.0).

Characteristics: pages 13 and 14
References: pages 15 and 16
Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors

Operating characteristics

Type of module			TSX CAY 21/22	TSX CAY 41/42	TSX CAY 33
Servo loop			Proportional with feedforward and gain switching		
	Period	**ms**	2	4	
Paths	Speed profile		Trapezoidal or parabolic		
Resolution	Minimum		0.5 position unit 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 (from 0 to VMAX)	Minimum	**s**	10		
	Maximum	**ms**	8	16	
Operating modes	OFF		Measurement mode, inhibition of servo loop The module operates in current speed and position acquisition mode		
	DIR DRIVE		Direct drive mode, inhibition of servo loop The module operates in analog output mode only		
	MAN		Motion controlled by operator: ■ visual control of movement ■ incremental movement		
	AUTO		Movement sequence controlled by PLC program. Movements are described using a syntax similar to that of ISO language. Movements can be expressed in absolute or relative terms (either in relation to current position, to a captured position or in relation to a home point). Operation is possible in "step by step" mode, by motion stop/start, by speed correction		
	FOLLOWER		The n axis of the module is governed by: ■ either the 0 axis of the same module ■ or a command profile transmitted by the application program		–
Checks	Environment		Encoder link, drive present, Emergency stop		
	Motion		Check correct execution of movements (following error, in-position band, software position limits)		
	Commands		Check consistency of commands		
	Parameters		Check validity of parameters		

Functions

Type of module		TSX CAY 21	TSX CAY 22	TSX CAY 41	TSX CAY 42	TSX CAY 33
Linear interpolation, 2/3 axes		–	–	–	–	Yes
Limited axes		Yes	Yes	Yes	Yes	Yes
Infinite axes		–	Yes	–	Yes	Yes
Follower axes	Static ratio	Yes	–	Yes	–	–
	Dynamic ratio	–	Yes	–	Yes	–
Correction of servodrive offset		–	Yes	–	Yes	Yes
Flying shear	On position or on event with infinite master axis and linear slave axis	–	Yes (see page 12)	–	–	–

Characteristics: pages 13 and 14
References: pages 15 and 16
Connections: pages 17 to 20

2

Electrical characteristics

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

Input characteristics

Type of input				**Counter inputs ⎓ 5 V** (IA/IB/IZ)	**Servodrive check inputs** (1 per axis)	**Auxiliary inputs** (homing, event, recalibration, Emergency stop)
Logic				Positive	Positive	Positive
Nominal values	Voltage		**V**	5	24	24
	Current		**mA**	18	8	8
Limit values	Voltage		**V**	≤ 5.5	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
	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 (fault state)	≤ 5
		Current	**mA**	< 1 (for U = 1.2 V)	< 1.5 (for U = 5 V)	< 2 (for U = 5 V)
Voltage/encoder feedback check				Presence check	–	–
Input impedance for nominal U			Ω	270	3000	3000
Type of input				Resistive	Resistive	Current sink
IEC 1131 compliance				–	Type 1	Type 2
2-wire sensor compatibility				–	–	Yes (all prox. sens. 24 V)
3-wire sensor compatibility				–	–	Yes (all prox. sens. 24 V)

Output characteristics

Type of output		**Analog outputs** (1 per axis)	**Drive enable** (1 relay output per axis)	**High speed outputs** (1 per axis)
Range	**V**	± 10.24	–	–
Resolution		13 bits + sign	–	–
Value of LSB	**mV**	1.25	–	–
Nominal voltage	**V**	–	⎓ 24	⎓ 24
Voltage limit	**V**	–	5…30	19...30 (up to 34 V possible, limited to 1 hr per 24 hr period)
Current	**mA**	–	–	500 nominal
Maximum current	**mA**	1.5	200 (resistive load at 30 V)	625 (for U = 30 or 34 V)
Minimum permitted load		–	1 V/1 mA	–
Maximum voltage drop when ON	**V**	–	–	< 1
Leakage current	**mA**	–	–	< 0.3
Switching time		–	< 5 ms	< 500 µs
Compatibility with DC inputs		–	–	All positive logic inputs with input resistance < 15 kΩ
IEC 1131 compliance		–	–	Yes
Protections against overload and short-circuits		–	–	Current limiter and thermal tripping
Protection against channel overvoltage		–	–	Zener diode between outputs and + 24 V supply
Protection against polarity inversions		–	–	Reverse-mounted diode on supply

References: pages 15 and 16
Connections: pages 17 to 20
Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors

Motion control modules for servomotors

TSX CAY 2●

TSX CAY 33

TSX CAY 4●

TSX TAP S15

TSX TAP MAS

ABE 7CPA01

ABE 7H16R20

Type of input	Characteristics	Functions	No. of axes *(1)*	Reference *(2)*	Weight kg
Incremental encoders ⎓ 5 V RS 422, ⎓ 10…30 V Totem Pole *(3)* **Absolute encoders** RS 485 serial or parallel *(4)*	500 kHz counter with incremental encoder, Acquisition 200 kHz with serial absolute encoder	Servo control on independent linear axis	2	**TSX CAY 21**	0.480
			4	**TSX CAY 41**	0.610
		Servo control on independent linear or infinite axis Follower axes Realtime correction of servodrive offset Flying shear *(5)*	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 Realtime correction of servodrive offset	3	**TSX CAY 33**	0.610

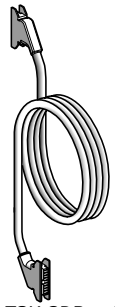
Connection accessories

Description	Connection	Type of connector on TSX CAY ●● module	No. *(6)*	Reference	Weight kg
SUB-D connectors (lot of 2)	Incremental/SSI absolute encoder	SUB-D, 15-way (1 per axis)	4	**TSX CAP S15**	0.050
	Speed references	SUB-D, 9-way (1 per TSX CAY module)	7	**TSX CAP S9**	0.050
Connection interface for incremental encoder	Incremental encoder ⎓ 5V RS 422/RS 485	SUB-D, 15-way (1 per axis)	6	**TSX TAP S15 05**	0.260
Splitter block	Speed references to servodrives	SUB-D, 9-way (1 per TSX CAY module)	–	**TSX TAP MAS**	0.590
Telefast 2 connection sub-bases	Speed references	SUB-D, 9-way (1 per TSX CAY module)	–	**ABE 7CPA01**	0.300
	Auxiliary inputs, High speed outputs, I/O power supply ⎓ 24 V, encoder power supplies ⎓ 5/24 V	HE 10, 20-way (1 for 2 axes)	–	**ABE 7H16R20**	0.300
	Servodrive control signals, I/O ⎓ 24 V power supply	HE 10, 20-way (1 per TSX CAY module)	–	**ABE 7H16R20**	0.300
Adaptor sub-base	Parallel output absolute encoders (16 to 24 bits) ⎓ 5 V, ⎓ 10…30 V	SUB-D, 15-way	–	**ABE 7CPA11**	0.300

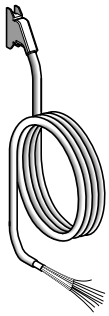
(1) TSX CAY 41/42/43 modules, double format.
(2) Product supplied with a bilingual Quick Reference Guide: English and French
(3) Totem Pole encoder with complementary Push/Pull outputs.
(4) Parallel output absolute encoders with ABE 7CPA11 adaptor interface.
(5) Flying shear function available with TSX CAY 22 module. Requires version ≥ 4.1. of PL7 Junior/Pro software. Function not available with Unity Pro software.
(6) For key, see pages 17 to 20.

Characteristics: pages 13 and 14
Connections: pages 1/7 to 20
Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors



TSX CDP ●●3



TSX CDP ●01

Cables with SUB-D connectors

From	To	No. (1)	Length	Reference	Weight kg
TSX CAY●● module, 15-way SUB-D connector	TSX TAP S15 05 interface, or ABE 7CPA11 adaptor sub-base (15-way SUB-D connector)	**5**	0.5 m	**TSX CCP S15 050**	0.110
			1 m	**TSX CCP S15 100**	0.160
			2.5 m	**TSX CCP S15**	0.220
TSX CAY●● module, 9-way SUB-D connector (speed reference)	ABE 7CPA01 sub-base or TSX TAP MAS block (15-way SUB-D connector)	**8**	2.5 m	**TSX CXP 213**	0.270
			6 m	**TSX CXP 613**	0.580

Preformed cables with SUB-D connector fitted at 1 end and 1 free end (servodrive side)

TSX CAY ●● module, or TSX TAP MAS block	Speed reference for servodrive: Lexium MHDA, Twin Line TLD 13 or other (cross-section 0.205 mm2)	**9**	6 m	**TSX CDP 611**	0.790

Connecting cables with HE 10 connector

TSX CAY ●● module, (20-way HE 10 connector)	ABE 7H16R20 sub-base (20-way HE 10 moulded connector) (500 mA max.)	**10**	0.5 m	**TSX CDP 053**	0.085
			1 m	**TSX CDP 103**	0.150
			2 m	**TSX CDP 203**	0.280
			3 m	**TSX CDP 303**	0.410
			5 m	**TSX CDP 503**	0.670

Preformed cables with HE 10 connector fitted at 1 end and 1 free end (servodrive side)

TSX CAY ●● module, (20-way HE 10 connector)	Auxiliary inputs, high speed outputs, control signals, power supplies (free end) 20-wire (500 mA max.)	**11**	3 m	**TSX CDP 301**	0.400
			5 m	**TSX CDP 501**	0.660

Connecting cables for Lexium MHDA servodrive

TSX CAY ●● module, 15 way SUB-D connector (encoder input)	Simulated incremental encoder feedback (9-way SUB-D connector)	**12**	2 m	**TSX CXP 235**	0.210
			6 m	**TSX CXP 635**	0.470
	Simulated absolute encoder feedback (9-way SUB-D connector)	**13**	2 m	**TSX CXP 245**	0.210
			6 m	**TSX CXP 645**	0.470

Connecting cables for Twin Line TLD 13 servodrive

TSX CAY ●● module, 15 way SUB-D connector (encoder input)	TLD 13 servodrive with ESIM1-C/2-C module Simulated incremental encoder feedback (15-way SUB-D connector)	**14**	2 m	**TSX CXP 243** *(1)*	–
			6 m	**TSX CXP 643** *(1)*	–
	TLD 13 servodrive with SSI-C module Simulated absolute encoder feedback (15-way SUB-D connector)	**15**	2 m	**TSX CXP 273**	–
			6 m	**TSX CXP 673**	–

Connecting cables for NUM MDLA servodrive *(2)*

TSX CAY ●● module, 15-way SUB-D connector (encoder input)	NUM MDLA modular speed drive (15-way, high density, SUB-D connector)	**16**	2.5 m	**TSX CXP 233**	0.220
			6 m	**TSX CXP 633**	0.470
TSX TAP MAS block, 9-way SUB-D connector	Speed reference on NUM MDLA modular speed drive (25-way SUB-D connector)	**17**	2.5 m	**TSX CXP 223**	0.340

Cables fitted with splitter block for Altivar AC drive

TSX CAY ●● module	Speed reference for ATV 38/58/58F AC drives for asynchronous motors	**18**	1 m	**VY1 X411CA15**	0.400

(1) For key, see pages 17 to 20.
(2) See page 122.

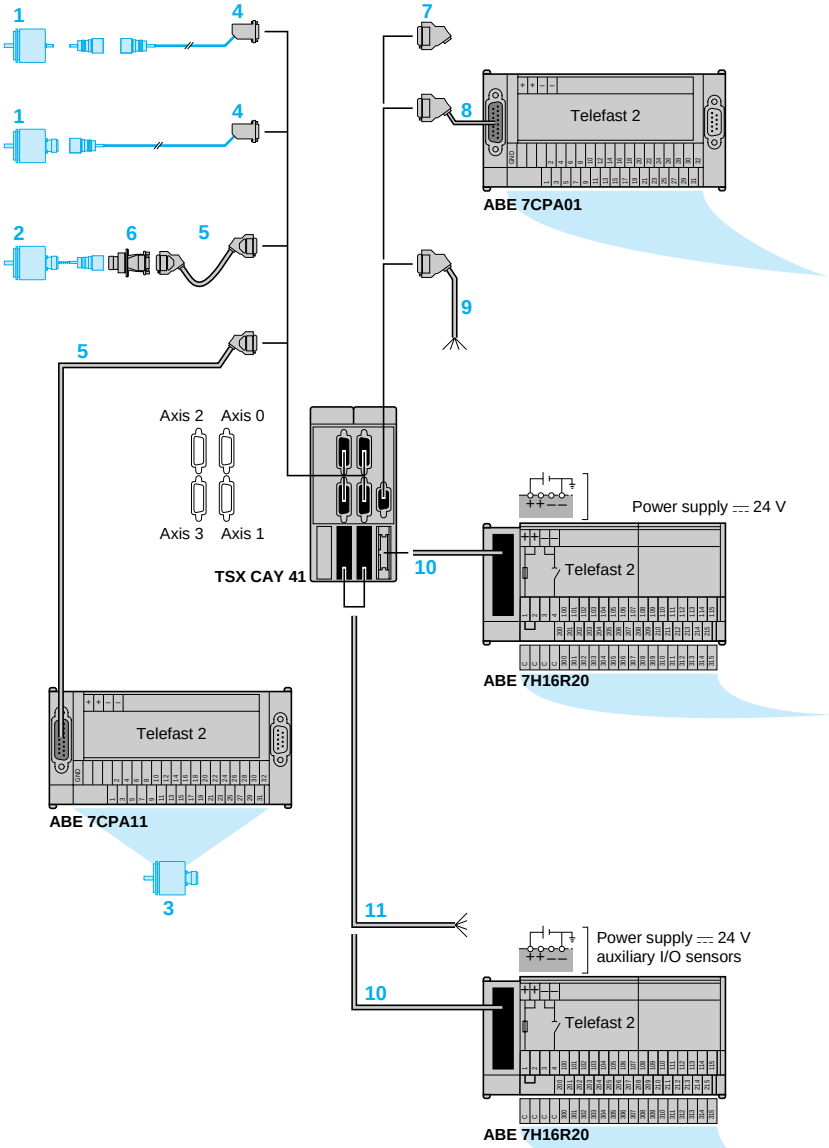
Characteristics: pages 13 and 14 Connections: pages 17 to 20 Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors

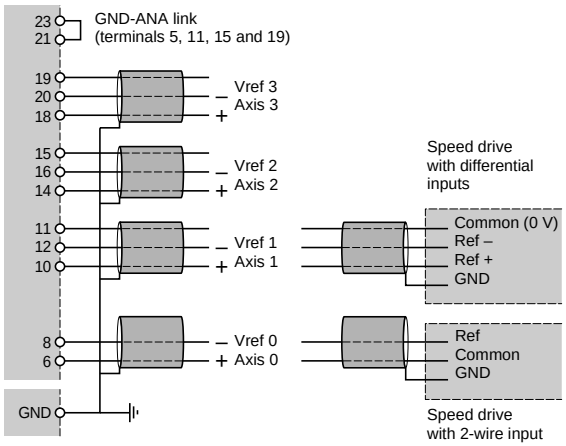
Connections for TSX CAY modules

General connections

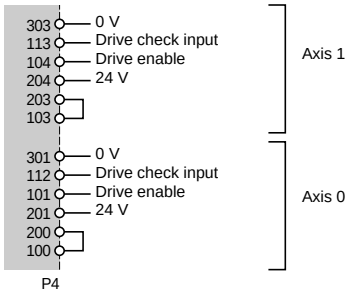
Examples of encoder connections



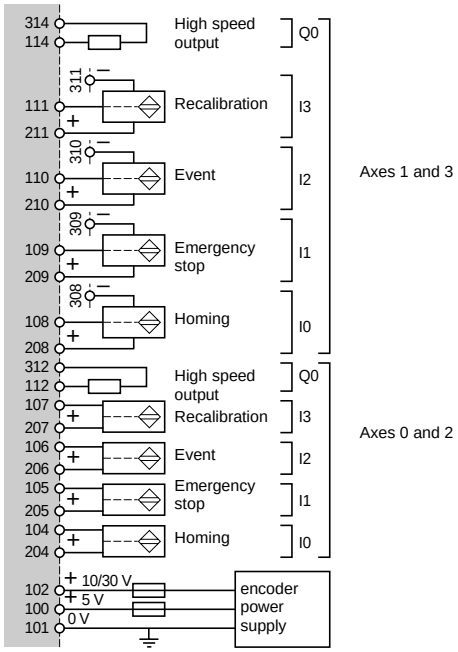
Examples of speed reference signal connections



Example of speed drive connection
(auxiliary I/O)



Example of auxiliary I/O connection



1 Incremental or absolute encoder
2 5 V RS 422 incremental encoder
3 Parallel output absolute encoder
4 TSX CAP S15 connector
5 TSX CCP S15●●● cable with connectors
6 TSX TAP S15 05 connector

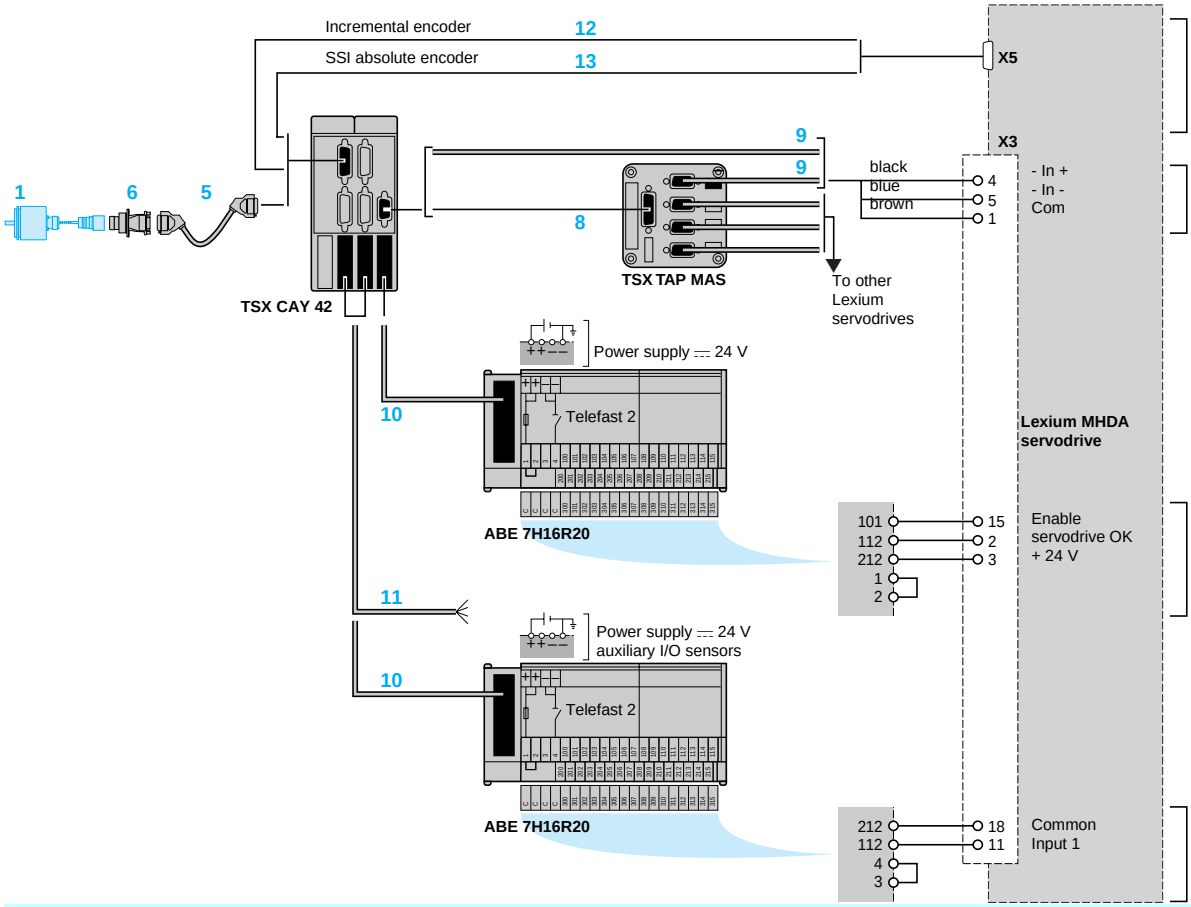
1	IB-	7	NC
2	Sup. Ret.	8	IB + 5 V
3	IZ + 5 V	9	NC
4	IZ -	10	0 V
5	IA + 5 V	11	NC
6	IA -	12	+5 V

7 TSX CAP S9 connector
8 TSX CXP 213/613 cable with connector
9 TSX CDP 611 preformed cable with connector
10 TSX CDP●●3 cable with connector
11 TSX CDP●01 preformed cable with connector

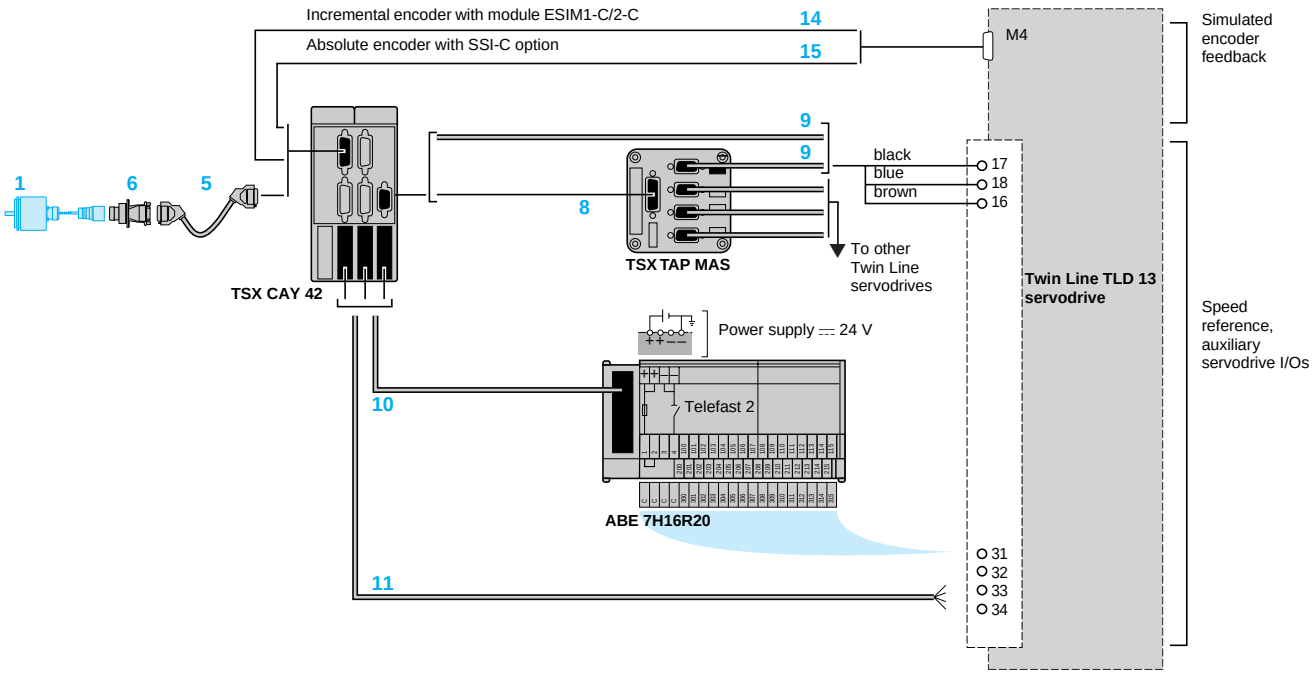
Characteristics: pages 13 and 14
References: pages 15 and 16
Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors

Connection example for Lexium MHDA servodrives



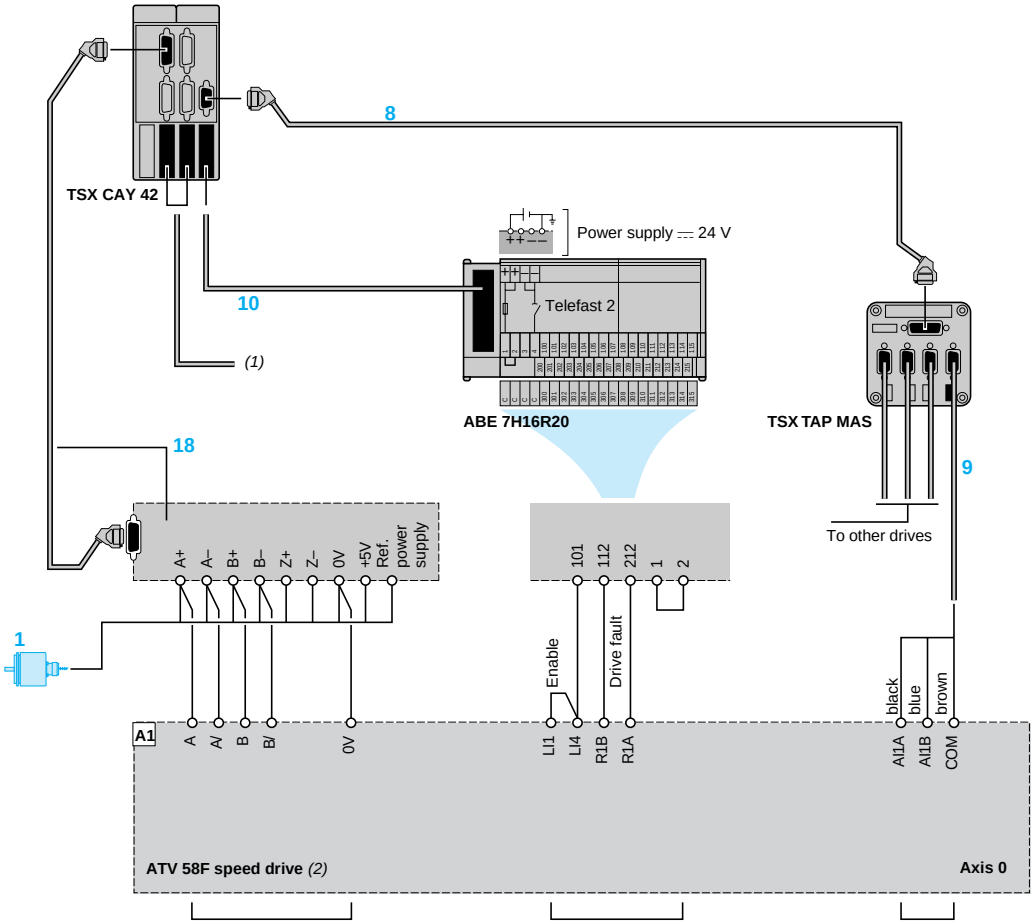
Connection example for Twin Line TLD 13 servodrives with ESIM 1-C/2-C option



1 Incremental or absolute encoder
5 TSX CCP S15●●● cable with connector (encoder feedback)
6 TSX TAP S15 05 connector
8 TSX CXP 213/613 cable with connector
9 TSX CDP 611 preformed cable with connector
10 TSX CDP●●3 cable with connector
11 TSX CDP●01 preformed cable with connector
12 TSX CXP 235/635 cable with connector (simulated incremental encoder feedback)
13 TSX CXP 245/645 cable with connector (simulated SSI absolute encoder feedback)
14 TSX CXP 243/643 cable with connector (simulated incremental encoder feedback)
15 TSX CXP 273/673 cable with connector (simulated SSI absolute encoder feedback)

Characteristics: pages 13 and 14
References: pages 15 and 16
Dimensions: page 21

Connection example for Altivar ATV-58F speed drive (for asynchronous motors)



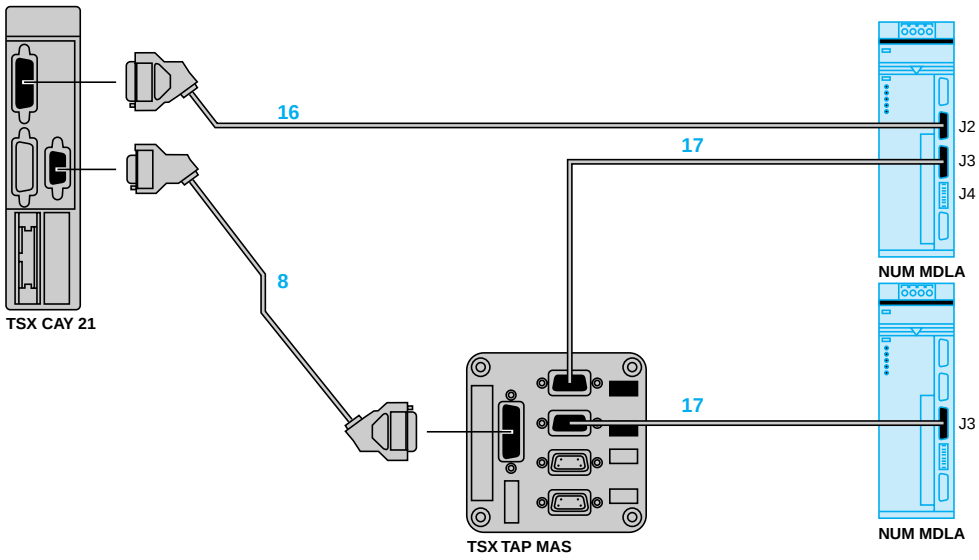
1 Incremental encoder
8 TSX CXP 213/613 cable with connector
9 TSX CDP 611 preformed cable with connector
10 TSX CDP●●3 cable with connector
18 VY1 X411CA15 cable with connector and adapter sub-base

(1) For auxiliary I/O connections (for example: Emergency stop, homing, etc), see the connections on page 17.
(2) The speed drive must be programmed as "Macro configuration General use". For other ATV 58F speed drive connections, please see our specialist catalog "Progressive starters and speed servodrives".

Characteristics: pages 13 and 14
References: pages 15 and 16
Dimensions: page 21

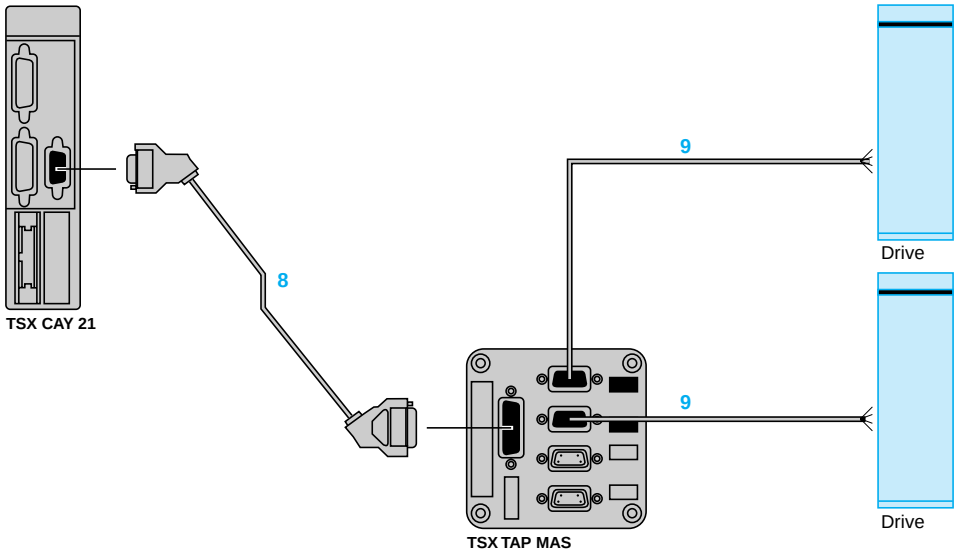
Lexium motion control
TSX CAY modules for servomotors

Connection example for NUM MDLA modular speed drives



8 TSX CXP 213/613 cable with connector
16 TSX CXP 233/633 cable with connector
17 TSX CXP 223 cable with connector

Connection example for distribution of speed references for speed drives



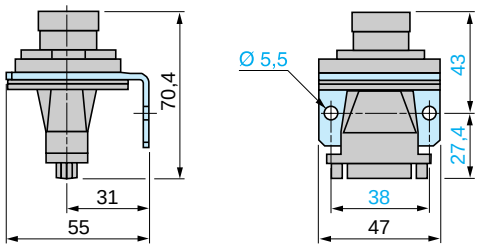
8 TSX CXP 213/613 cable with connector
9 TSX CDP 611 preformed cable with connector

Characteristics: pages 13 and 14
References: pages 15 and 16
Dimensions: page 21

Lexium motion control
TSX CAY modules for servomotors

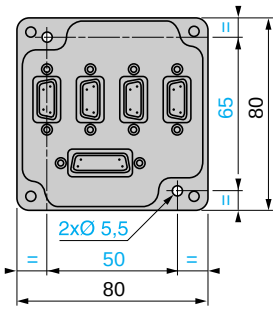
Dimensions

TSX TAP S15 05 connection interface for incremental encoder



Mounting in enclosure feedthrough (dust and damp proof)
- Ø 37 cut-out,
- Panel thickness 5 mm maximum

TSX TAP MAS speed reference splitter block for speed drives



Mounting on DIN rail with LA9-DC9976 accessory.

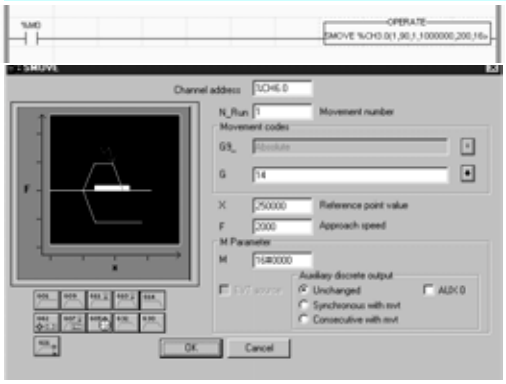
Characteristics:
pages 13 and 14

References:
pages 15 and 16

TSX CAY/CFY module software setup

PL7 Junior/Pro or Unity Pro setup software provides:
- SMOVE and XMOVE motion control functions for programming movements. These functions can be used in Ladder language, Instruction list language or Structured Text language.
- Specialized screens for configuring, adjusting and debugging axes.

Programming movements



A movement on an independent axis is initiated by executing an SMOVE control function in the application program.
Example: go to the absolute position 10 000 000 µm, at a speed of 200 mm/min, without stopping.
A screen enables the assisted entry of parameters in the SMOVE function in an operation block.

The XMOVE command enables movement to be initialized on interpolated axes (TSX CAY 33 only).

Instruction codes

The characteristics of movements are described using a syntax similar to that for a numerical controller program block written in ISO language.
TSX CAY and TSX CFY motion control modules use the following instructions:

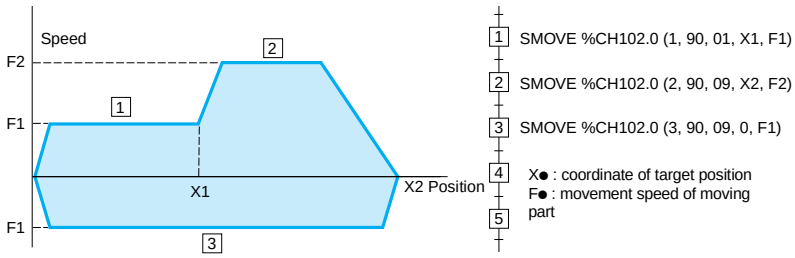
Code and type of instruction	Individual axes (SMOVE)			Interpol. axes (XMOVE)
	TSX CAY 21/41	TSX CAY 22/42/33	TSX CFY 11/21	TSX CAY 33
09 Move to the position and stop	■	■	■	■
01 Move to the position without stopping	■	■	■	■
10 Move until an event is detected and stop	■	■	■	■
11 Move until an event is detected without stopping	■	■	■	
14 Homing	■	■	■	
04 Stop command		■		
05 Await an event	■	■	■	■
07 Memorize the current position when an event occurs	■	■	■	
62 Forced homing	■	■	■	
30/32 Simple machining	■	■		
92 Initialization of memorized positions				■
21 Move without stopping, with homing on the fly		■		
22 Flying shear on two axes		*(1)*		
90/98 Cutting mode (on position or on event)		*(1)*		

■ Possible instruction

These instruction codes can be represented as symbols by the user in G code (for example: 09 can be represented by G09).
The instruction codes are preceded by another code indicating the type of target position:
- 90 : if the target position is absolute.
- 91 : if the target position is relative to the current position.
- 98 : if the target position is relative to a memorized position (index).
- 60 : if the target position is absolute and movement direction is fixed (TSX CAY 22/42/33 only).
- 68 : if the target position is relative to a memorized position and movement direction is fixed (TSX CAY 22/42/33 only).

Programming a path

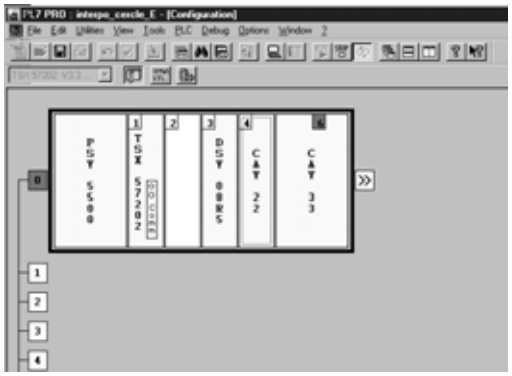
A complete path can be programmed by means of a series of SMOVE or XMOVE elementary motion control functions.
Grafcet language is ideal for this type of programming. An elementary movement is associated with each step.



(10)Only with TSX CAY 22 module. Requires the version > 4.1 of PL7 Junior/Pro software TLX CD/RCD PL7J/P P 41M. Not available with Unity Pro software.

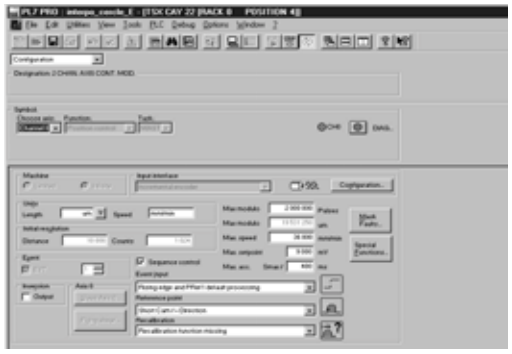
TSX CAY/CFY module software setup (continued)

When setting up application-specific functions, screens specific to axis control and stepper control functions can be accessed via 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 tool bars. Windows relating to the editors can be simultaneously displayed on one screen (example : it is possible to simultaneously program using the program editor and define the symbols in the variables editor).



Declaring the axis control modules and stepper control modules

Parameter entry screens for application-specific functions can be accessed via the configuration screen by clicking on the slot.
Example : modules TSX CAY 21 and TSX CFY 21 in which the module has been defined.



Configuring the modules

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 (module TSX CAY 21 for example) to be adapted to the machine which is to be controlled.
Axis configuration parameters are :
- Units of measurement.
- Resolution.
- Type of encoder.
- Maximum and minimum limits.
- Maximum speed.
- …

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

Adjusting the modules

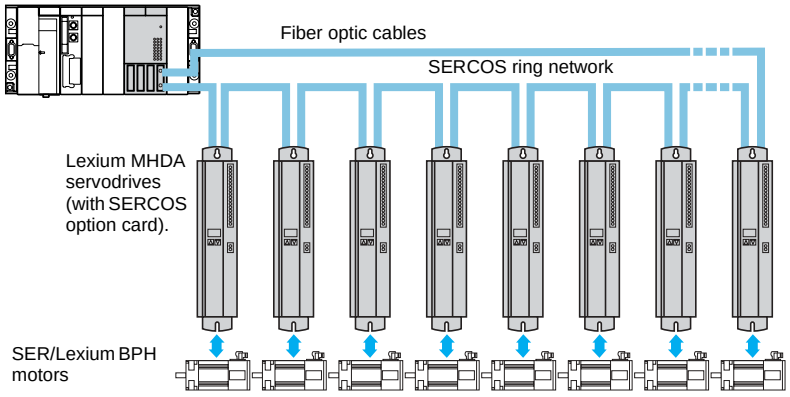
These parameters are associated with operation of the axes. They generally require the operations on and movements of the moving part to be known. These parameters are adjusted in online mode (they are initialized during configuration, in offline mode).
They concern:
- Encoder offset.
- Resolution.
- Servo control parameters.
- …

Debugging the modules

In online mode, the configuration editor also provides the user with a control panel screen, giving him a quick visual display which he can use to control and observe the behaviour of the axis.
The control panel provides different information and commands according to the selected operating mode :
- Automatic mode (Auto).
- Manual mode (Manu).
- Direct mode (Dir_Cde).
- Off mode (Off).

Lexium motion control
SERCOS TSX CSY 84/164 motion control module

Architecture



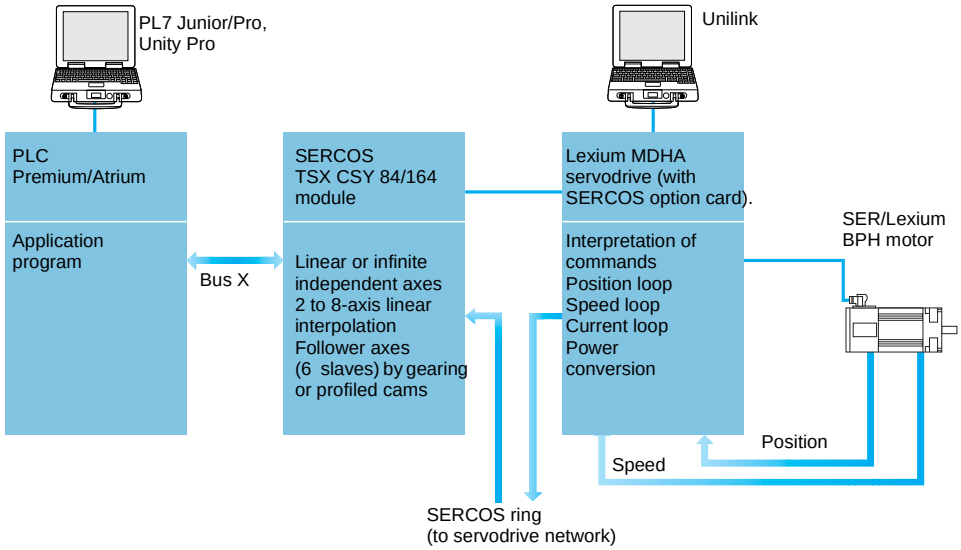
SERCOS (SERial COmmunication System) is a communication standard which defines the digital link (exchange protocol and medium) between a motion control module and intelligent servodrives. It is defined in European standard EN 61491. Using the SERCOS distributed architecture allows application I/O (position encoder, emergency stop, etc.) to be connected directly to the intelligent servodrives, reducing the cost of connection. The fiber optic digital link permits high speed exchanges (2 or 4 M bauds) while ensuring a high level of immunity in disturbed industrial environments.

The SERCOS range in the Premium control system platform comprises:
- Two TSX CSY 84/164 axis control modules which can each control up to 16 servodrives via a SERCOS ring. The module calculates the path and 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 Lexium MHDA servodrives with digital link (equipped with SERCOS option card). The servodrives manage the position loop, speed loop and torque loop, and ensure power conversion to control the motor. The encoder feedback information is sent to the servodrive (current position, current speed).
- SER/Lexium BPH brushless motors. These have permanent magnets delivering a high power-to-weight ratio, resulting in excellent dynamic speed response in a compact unit.

The Lexium range offers all the accessories required (filter choke, braking resistor, etc.) and a full set of connectors.

System overview

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



Characteristics: pages 26 and 26
Functions: pages 28 and 29
References: page 30
Connections: page 31

System overview (continued)

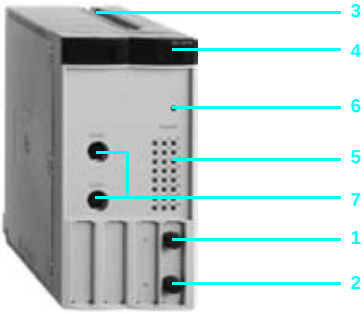
PL7 Junior/Pro or Unity software via the Premium platform terminal port can:

- Declare TSX CSY 84/164 SERCOS modules *(1)* 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 MHDA servodrives) *(2)*.
- Test and debug the application.

Unilink software, via the RS 232 terminal port for the Lexium MHDA servodrive *(2)* can:

- Define types of Lexium MHDA servodrives *(2)* and SER/Lexium BPH motors.
- Adjust the parameters for Lexium MHDA servodrives *(2)*, back them up to EEprom memory in the drive and save them on a compatible PC.

Description



The TSX CSY 84/164 SERCOS axis control modules comprise:

1 A SMA-type connector, marked Tx, for connecting the servodrives using the SERCOS ring fiber optic transmission cable.

2 A SMA-type connector, marked Rx, for connecting the servodrives using the SERCOS ring fiber optic reception cable.

3 Rigid cases, double format, in order to:
- Support electronic cards
- Attach and lock the module in its slot.

4 Module diagnostic lamps:
- 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 is 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 *(3)*.
- 9 to 12: display of 4 imaginary axes *(3)*.
- 13 to 16: display of 4 remote axes *(3)*.
- 17 to 20: display of 4 coordinated sets.
- 21 to 24: display of 4 follower sets.

6 A pencil point button to initialize the module.

7 Two mini DIN type 8-way connectors for Schneider Electric use.

(1) TSX CSY 164 module can not be implemented with Unity Pro V1.0 software.
(2) Lexium MHDA servodrive equipped with AM0 SER 001V000 SERCOS option card.
(3) 1 to 16: display the 16 axes (real, imaginary or remote) with module TSX CSY 164.

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Functions: pages 28 and 29
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Lexium motion control
SERCOS TSX CSY 84/164 motion control module

Characteristics

Electrical characteristics			TSX CSY 84			TSX CSY 164				
SERCOS ring network	Type		Industrial medium complying with standard EN 61491							
	Topology		Ring							
	Medium		Fiber optic cable							
	Baud rate	**M bauds**	4 by default							
	Cycle time *(1)* (independent axes)	**ms**	2 axes: 2	4 axes: 2	8 axes: 4	2 axes: 2	4 axes: 2	8 axes: 2	12 axes: 3	16 axes: 4
	Maximum number of segments		9			17				
	Length of segment	**m**	38 max. with plastic fiber optic cable, 150 max. with glass fiber optic cable							
Bus X	Distance	**m**	100 max. *(2)* between TSX CSY 84 axis control module and the Premium processor							
SERCOS certification *(3)*			TSX CSY 84/164 modules comply with SERCOS CEI/EN 61491 certification and with the tests determined by IGS (Interest Group SERCOS). Certification N° Z00030							
Power consumption for ⎓ 5V voltage		**mA**	1800							
Power dissipated in the module		**W**	9 (typical)							

Operating characteristics			TSX CSY 84	TSX CSY 164
Number of channels			32 configurable (0 to 31), channel 0 used for SERCOS ring configuration	
Type of axes	Real axes (connected to a servodrive)		8 (channels 1 to 8)	16 (channels 1 to 16) may be dynamically configured as real axes, imaginary axes or remote axis.
	Imaginary axes		4 (channels 9 to 12)	
	Remote axes *(4)*		4 (channels 13 to 16)	
Set of axes			4 coordinated (channels 17 to 20). Each set allows linear interpolation of 2 to 8 axes	
			4 followers (channels 21 to 24). Each set can comprise a maximum of 7 axes: 1 master/6 slaves in gearing or camming	
Cam profile			7 (channels 25 to 31). Used to create the electronic cams with linear or cubic interpolation between profile points	

(1) 4 ms default value. Values may be programmed according to number of axes.
(2) Without the use of a TSX REY 200 bus X remote module.
(3) For further certification details, see pages 118 and 119.
(4) Determine external position using an encoder connected to the servodrive position input.

Architectures pages 24 and 25 | Functions: pages 28 and 29 | References: page 30 | Connections: page 31

Characteristics (continued)

Main functions

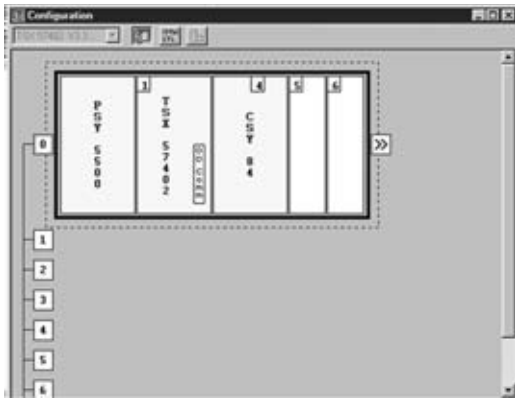
Programming	Movements		■ Homing, absolute, relative, or continuous ■ Immediate movement, or queued, to a given position ■ Speed override possible ■ Acceleration and deceleration parameters may be set for each axis motion control *(1)* ■ Synchronisation on start and desynchronisation on stop for a slave axis on a master axis, in a given position *(1)* ■ Rollover counter *(1)*
	Special functions		■ Capture position and distance measurement between two edges on one or two discrete inputs on the drive. This can be applied to a real or remote axis (position measurement via external encoder) ■ Count probe: counts the edges on a discrete input on the drive over a period of time ■ Fast index: starts a movement on an event ■ Registration move: position capture on an edge of the discrete input on the drive ■ Rotary Knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a discrete output on the drive
	Other special functions		The development of all other special function is possible 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 *(1)*: □ 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 so that obtains the synchronization stop of all set axes. *(1)* ■ Emergency Stop: axes may be allowed to "freewheel" or may be stopped according to pre-determined ramp *(1)*
Configuration /adjustment	SERCOS ring		Bus cycle time, traffic on the bus, optical power on the fiber, 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		Value 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		■ Drive fault, axis currently reading data, following error, overvoltage, undervoltage, overcurrent, power supply fault ■ Availability of master axis fault information for a given axis set *(1)* ■ Multiaxis motion path control according to common tolerance for all axes in the motion, with alarm feature. Access available only with TSX CSY 164 module

(1) Implementation of the TSX CSY 84, release ⩾1.3 requires the use of the PL7 Junior/Pro software, version ⩾4.4. Access available only with TSX CSY 164 module.

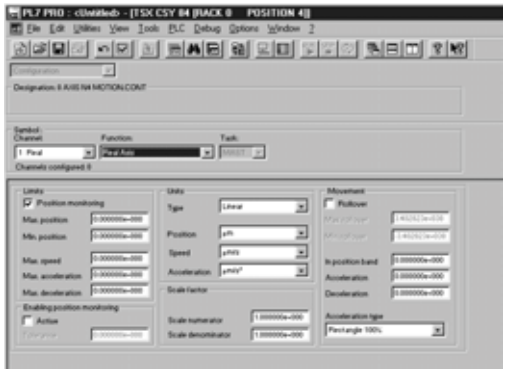
Lexium motion control
SERCOS TSX CSY 84/164 motion control modules

Software setup *(1)*

When setting up application-specific functions, screens specific to SERCOS axis control functions can be accessed via PL7 Junior/Pro or Unity 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 tool bars. Windows relating to the editors can be simultaneously displayed on one screen (example: it is possible to program using the program editor and simultaneously define the symbols in the variables editor).



Declaring the SERCOS motion control modules
Parameter entry screens for application-specific functions are accessed via the configuration screen by clicking on the slot.
Example: configuration in which a TSX CSY 84/164 module has been defined.



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.
Axis configuration parameters are:
- Units of measurement.
- Resolution.
- Maximum and minimum limit positions.
- Maximum speed.
- Accelerating/decelerating.

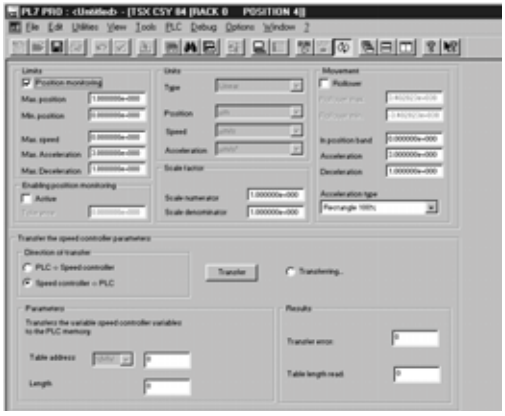
This data relates to the machine and cannot be modified by the program.

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

(1) The setting up screens require the version ≥ 4.1 of PL7 Junior/Pro software TLX CD/RCD PL7J/P P41M/42M/43M/44M or Unity Pro UNY SPU ●FU CD 10.

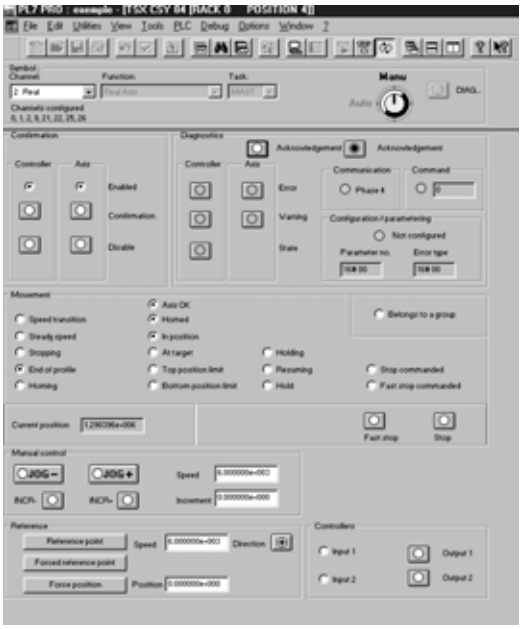
Architectures pages 24 and 25 | Characteristics: pages 26 and 27 | References: page 30 | Connections: page 31

Software setup (continued)



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 concern:
- Maximum speed.
- Resolution.
- Servocontrol parameters.
- Accelerating/decelerating.



Debugging the modules
In online mode, the configuration editor also provides the user with a control panel screen, giving a quick visual display which can be used to control and observe the behavior of the axis.

The TSX CSY 84/164 module associated with PL7 Junior/Pro software *(1)* provides manual mode for running continual (JOG) or incremental (INC) motion commands without prior programming.

(1) Mode not available with Unity Pro.

Architectures pages 24 and 25 | Characteristics: pages 26 and 27 | References: page 30 | Connections: page 31

Lexium motion control
SERCOS TSX CSY 84/164 motion control module

References

The TSX CSY 84/164 multiaxis control module has 32 application-specific channels which are only counted when they are configured in the Premium 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 processors	TSX/57 1●	TSX/57 2● PCX 57-20 PCI 57-20	TSX/57 3● PCX 57-35	TSX/57 4● PCI 57-45	TSX/57 5●
Maximum number of application-specific channels	8	24	32	64	64

TSX CSY 84 164:

Description	Functions	Number of axes	Reference	Weight kg
Multiaxis control modules	SERCOS digital servodrives control	8 real axes 4 imaginary axes 4 remote axes	**TSX CSY 84**	0.520
		16 axes (real axes, imaginary axes or remote axes)	**TSX CSY 164** *(1)*	–

Connection accessories

Description	Connection	Length	Reference	Weight kg
Plastic fiber optic cables fitted with SMA-type connectors (curvature radius: 25 mm min.)	Lexium MHDA servodrive 1●●●N00/A00 (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

Sets of plastic fiber optic connections

Description	Composition	Reference	Weight kg
Set of fiber optic cables and SMA-type connectors	12 SMA-type connectors 12 insulating sleeves Plastic fiber optic cable, length 30 m	**990 MCO KIT 01**	–
Fiber optic cable installation tool	Tools for making up cables to required length from a 990 MCO KIT 01 kit Includes stripping tool, crimping pliers, 25 W/110 V cutting tool, and instructions for use	**990 MCO KIT 00**	–

Separate item

Description	Use	Reference	Weight kg
PC to TSX CSY 84/164 connectors connection cable (length 2 m)	Used to download the servodrive operation configuration file for the servodrives present on the SERCOS ring *(2)* Used to download specific functions developed by our Industrial Applications Department.	**TSX CCT 200**	0.100

(1) The TSX CSY 164 module is compatible with version 4.3 of the PL7 Junior/Pro software application with the Motion software add-on update included on the TSX CSY 164 module CD-Rom. Version 4.4 of PL7 Junior/Pro includes this software add-on. The TSX CSY 164 module is not compatible with Unity Pro version 1.0 software.

(2) The add-on can be downloaded when the default configuration file is not adapted to the configuration required.

Architectures: pages 24 and 25
Characteristics: pages 26 and 27
Functions: pages 28 and 29
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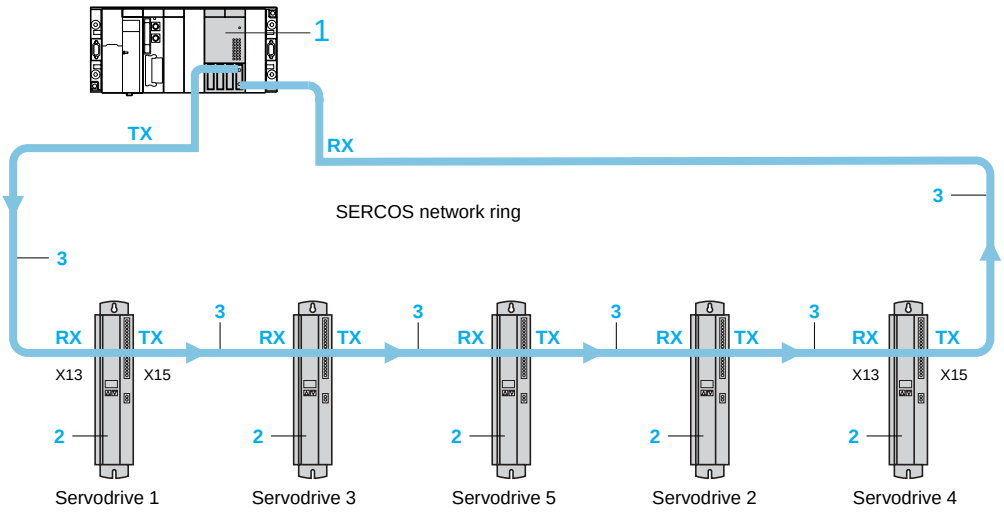
Lexium motion control
SERCOS TSX CSY 84/164
motion control module

Connections

SERCOS ring with 5 servodrives (example)



1 TSX CSY 84/164: multiaxis control module for Premium.

2 MHDA 1●●●N00/A00 Lexium servodrives fitted with the SERCOS AM0 SER 001 V000 option card.

3 990 MCO 000 ●●: plastic fiber optic cables fitted with SMA type connectors.

TX Transmission.

RX Reception.

Architectures: pages 24 and 25
Characteristics: pages 26 and 27
Functions: pages 28 and 29
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Lexium motion control
Quantum motion control modules

Applications	Single-axis Motion module for servomotors. Compatible with Lexium servodrive through an analog interface

Drive interface	Counter inputs: incremental encoder, ⎓ 5 V, (RS 422) 2 channels Encoder feedback : ± 10 V, 12 bits
Programming Methodology	Using MMDS motion configuration software, with Concept or ProWORX 32 software
Features	Multiplication of counter frequency (x4) Automatic brake control Configurable discrete I/O inputs (including one high-speed input) Configurable discrete/analog I/O outputs
Axis Count	1 real axis 1 remote axis (for master signal)
Special Functions	Master/slave position capture Synchronization of master/slave axes Point lock
Model	**140 MSB 101 00**
Page	36

Multi-axis Motion control modules for servomotors. Compatible with Lexium servodrive via SERCOS link

3

Via SERCOS link

Library of Motion Function Block under Concept software
The development of all other special function is possible with the assistance of our application services

Electronic gearing
Multi-axis interpolation
Cam profiles execution from Register Table

With MMF Start programmer's kit
- 8 real axes
- 4 imaginary axes
- 4 remote axes
- 4 coordinate sets (with linear interpolation of 8 axes maximum)
- 4 follower sets
- Cam profiles

The evolution, up to
- 16 real axes
- 22 axes/axis sets

is possible with the Motion Open C kit requiring the assistance of our Application Department

With MMF Start programmer's kit
- 8 real axes
- 4 imaginary axes
- 4 remote axes
- 4 coordinate sets (with linear interpolation of 8 axes maximum)
- 4 follower sets
- Cam profiles

The evolution, up to
- 22 real axes
- 32 axes/axis sets

is possible with the Motion Open C kit requiring the assistance of our Application Department

Point lock position and point lock time
Measure part
Count probe
Fast index
Registration move
Rotary knife

141 MMS 425 01

141 MMS 535 02

44

Lexium motion control

140 MSB 101 00 Quantum single-axis motion module for servomotors

Presentation

The 140 MSB 101 00 single-axis motion module is designed for applications with one axis requiring a strong integration with the sequential program of the machine. The analog output of this module can drive the speed reference of the Lexium MHDA servodrive, or any other servodrive with an analog interface. See characteristics on page 35.

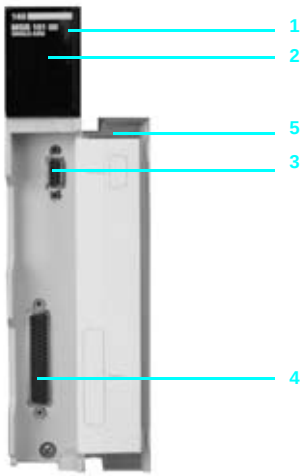
The module, using encoder feedback input, receives a signal from an incremental encoder which represents the position of the machine axis. After calculation, this information, depending on the movement driven by the application program, delivers a speed reference of ± 10 V to the servodrive.

The 140 MSB 101 00 module is designed as follows:
- 8 digital inputs of 24 VDC, configurable in stops or in motion-specific functions. The inputs not used in the axis control application can be used as standard inputs for the application program.
- 3 outputs of 24 VDC and one ± 10 V analog output, which can be programmed as a real-time image of the internal parameters of the axis under control.

These inputs and outputs require an external 24 V power supply. The module includes a ± 10 V analog input.

The incremental encoder's multiplication of impulses is integrated in the 140 MSB 101 00 module, which accepts a second auxiliary encoder feedback signal as an image of the master axis.
The 690 MCB 000 00 breakout box allows connection between the 141 MSB 101 00 motion module and the Lexium MHDA servodrive, to simplify the system cabling.

Description



The 140 MSB 101 00 is comprised of:

1 A rugged outer rugged shell ensures the following:
- PCB card support.
- closing and locking of module into position.

2 Module diagnostic LEDs, including a digital Modbus status indicator.

3 A SUB-D 9 connector for RS 232 Modbus link.

4 A SUB-D 50 port for connection to the servodrive.

5 A clear access door to hold the user label.

Characteristics: page 35
References: page 36
Connections: page 37

Lexium motion control

140 MSB 101 00 Quantum single-axis motion module for servomotors

Operating characteristics

Axe	Type			Automatic control of linear, rotary, or continuous axes Synchronization of master/slave speed and position
	Number			1 real axis, 1 remote axis
	Positioning range	Maximum		4 294 967 296 points (32 bits)
		Units		inches, mm or orther units
	Speed	Range		1...4 294 967 296 points (32 bits)
		Units		counts/s, inches/s, mm/s, rpm…
	Update	Position loop	**ms**	1
		Speed loop	**ms**	0.5
	Motion			Homing, absolute, relative, or continuous movement 28 traversing programs 650 flash memory commands
Controls	Environnement			Encoder interface, position captures (stops)
	Motion			Logical stops, loop position control, point window
Register words				3 input words and 4 output words

Electrical characteristics

Encoder feedback (2 channels)	Incremental encoder	Type		Differential
		Voltage	⎓ **V**	5 ± 20 %
		Impedance	**W**	> 500 at 5 V nominal
		Frequency x 1	**kHz**	200 nominal, 500 maximum
		Frequency x 4	**kHz**	2000 maximum (internal counting)
		Maximum system accuracy		0.5 arc/minute, encoder-dependent
Servo interface	Analogue outputs	Type		Bipolar
		Range	**V**	+ 10,24
		Resolution		11 bits + sign
	Drive-enable output	Voltage	**V**	24 nominal, 30 maximum
		Current	**mA**	500 (resistive maximum under 30 V)
	Drive-fault input			True high, 5 V TTL-compatible
I/O	Discrete inputs	Number		7
		Voltage	⎓ **V**	24 + 20 %
	Discrete outputs	Number		3
		Voltage	⎓ **V**	24 + 20 %
		Current	**mA**	150 maximum
	Analog inputs	Voltage	**V**	± 10.24
		Resolution		9 bits + sign
		Impedance	**kΩ**	30
	Analog outputs	Voltage	**V**	± 10.24
		Maximum current	**mA**	3
		Resolution		11 bits + sign
	High-speed input	Position capture time	**ms**	250
		Pulse width	**ms**	25
		Time between two captures	**ms**	20 minimum
	OT inputs			Dry contact
Communication ports	Serial ports	Type		RS 232 D
		Protocol		Modbus slave
		Baud rate	**Bits/s**	300...9600, software selectable
Power requirements	From the backplane			⎓ 5 V - 1000 mA
	External (power process)			⎓ 24 V + 20 % at - 500 mA max (for auxiliary I/O)

Description: page 34 References: page 36 Connections: page 37

Lexium motion control
140 MSB 101 00 Quantum single-axis motion module for servomotors

References

140 MSB 101 00

All types of Quantum CPUs support the 140 MSB 101 00 single-axis motion module. The module performs the same regardless of rack selected (primary, RI/O, or DI/O).

Designation	For	Encoder inputs	Functions	Reference	Weight kg
Motion module for one controlled axis	Servodrive via analog reference	2 encoder inputs ⎓ 5 V, 500 kHz	Closed-loop control of linear, rotary and continuous axes. Synchronization of master-slave axes.	**140 MSB 101 00**	0.450

Connection accessories

Designation	Use	No. *(1)*	Reference	Weight kg
Breakout box *(2)*	Connection between the 141 MSB 101 00 module and the servodrive: speed reference, auxiliary I/O, and simulated encoder feedback	3	**690 MCB 000 00**	–

Connector cables

Designation	Use	No. *(1)*	Length	Reference	Weight kg
Supplied cables	Connection between the 140 MSB 101 00 module and the 690 MCB 000 00 breakout box. Cable comes with SUB-D 50 connectors on each end.	4	0,3 m (1 ft)	**690 MCI 000 01**	–
			0,9 m (3 ft)	**690 MCI 000 03**	–
			1,8 m (6 ft)	**690 MCI 000 06**	–
	Connection between the breakout box 690 MCB 000 00 and Lexium MHDA servodrive (simulated encoder feedback). Cable comes with SUB-D 9 connector on one end	5	6 m (20 ft)	**690 MCI 002 06**	–

Configuration software

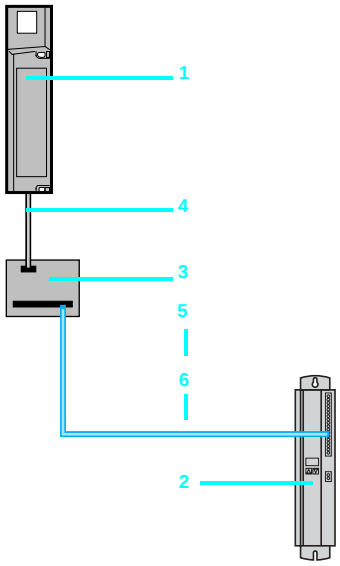
Designation	Description	Reference	Weight kg
MMDS configuration and programming software	Configuration and programming software for the 140 MSB 101 00 motion module Use with ProWORX 32 or Concept	**SW MMDS 1DB**	0.525

(1) See page 37 for key.
(2) For CE conformity, you must order the breakout box field wiring kit (690 MCB 101 00).

Description: page 34 Characteristics: page 35 Connections: page 37

Lexium motion control

140 MSB 101 00 Quantum single-axis motion module for servomotors



Connections

1 140 MSB 101 00: single-axis motion module 140 MSB 101 00.

2 MHDA 1●●●N00/A00: Lexium servodrive for Lexium SER or BPH motor.

3 690 MCB 000 00: breakout box (speed reference, auxiliary I/O, and simulated encoder feedback).

4 690 MCI 000 0●: breakout box cable (0● indicates cable length).

5 690 MCI 002 06: cable with connector for simulated encoder feedback.

6 Cable (not included; flying lead cable with connections to terminal strips on each end).

3

Description: page 34
Characteristics: page 35
References: page 36

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

Presentation

SERCOS MMS motion control modules are used to build a distributed automation solution, tightly integrating axis command applications with control applications, based on Quantum PLCs. The motion control modules and Quantum CPUs communicate either through the Quantum backplane or via the Modbus Plus network. The data transfer is transparent, and does not need any additional application program.
The physical interface between the motion control module and speed servodrives is provided by the SERCOS network, using fiber optic cable. This optic link is entirely digital, and provides communication parameters for the tuning, diagnostics and operation of both motion control modules and servodrives.

SERCOS offer

The SERCOS offer, based on the Quantum platform contains:
■ Two multi-axis modules, 141 MMS 425 01/535 02, that can drive up to 8 real axes *(1)*, each one connected to a Lexium servodrive using the SERCOS ring network.
All these modules perform the trajectory calculation, synchronization or interpolation of several axes.
■ Lexium MHDA (with optional SERCOS card) servodrives with a SERCOS digital link from 1.5 A to 70 A. These drives manage the position, speed and torque loops, and convert the power that drives the motor. Feedback from the motor sensors or external encoders (such as usual position and actual speed) are sent to the servodrive.
■ SER/Lexium BPH brushless motors. These devices are equipped with magnets which deliver a high power-to-weight ratio, resulting in a wide range of speed within low overall dimensions.
The Lexium range includes all necessary accessories (filter chokes, braking resistors, etc.) and connection elements.

Quantum motion modules

The 141 MMS SERCOS motion modules are double-width Quantum modules. They provide high-performance motion control functions, while being integrated with the Quantum PLC and via a real-time multi-task system.
In addition to communicating with the Quantum CPU via the internal bus, each 141 MMS module has a Modbus Plus communications port. The availability of program libraries simplifies configuration of the motion controls for high-performance applications requiring highly dynamic and high-precision position tracking algorithms.

SERCOS motion control built into Quantum PLCs

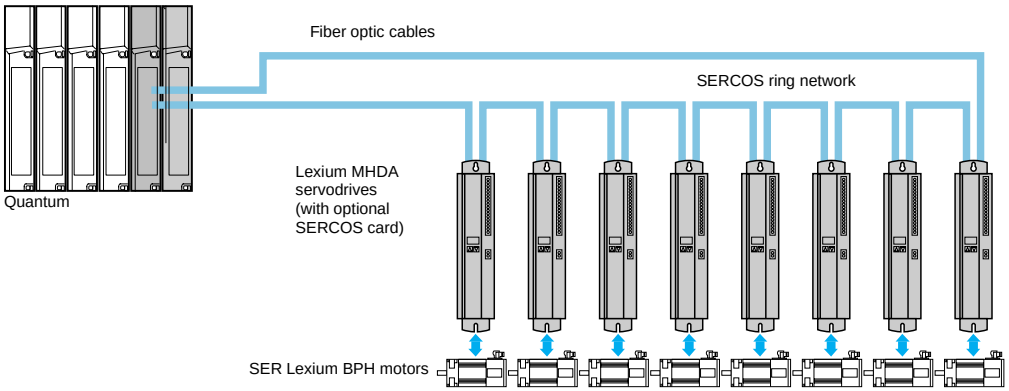
This integration is used to fulfill motion control applications requiring a large number and great diversity of inputs and outputs. The solution makes it possible to share a single database between the Quantum CPU and the SERCOS motion control module. The SERCOS ring network corresponds to
a widely developed standard used in closed-loop position and speed applications. It complies with the European standard EN 61491.
The SERCOS solution, compared to analog interface solutions, offers the following benefits:
■ Efficient diagnostics, supplied in the motion control modules and the Quantum CPU, can send feedback to the upper levels of the control hierarchy for action. This minimizes machine downtime.
■ The distributed architecture significantly reduces cabling costs and simplifies the installation.
■ The SERCOS digital network eliminates the low-resolution analog interface (12 or 14-bits) between the servodrive and the motion control module.
■ Fiber optic connections increase immunity from electromagnetic interference found in harsh industrial environments.
■ It is easy to expand the number of axes in one machine using the ring network.

(1) The use of the Motion Open C kit (requiring the assistance of our applications team) enables you to extend the capacities of these modules: 141 MMS 425 01, up to 16 real axes and 141 MMS 535 02, up to 22 real axes.

Descritpion: page 40 | Characteristics: pages 42 and 43 | References: pages 44 and 45 | Connections: page 45

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

SERCOS architecture



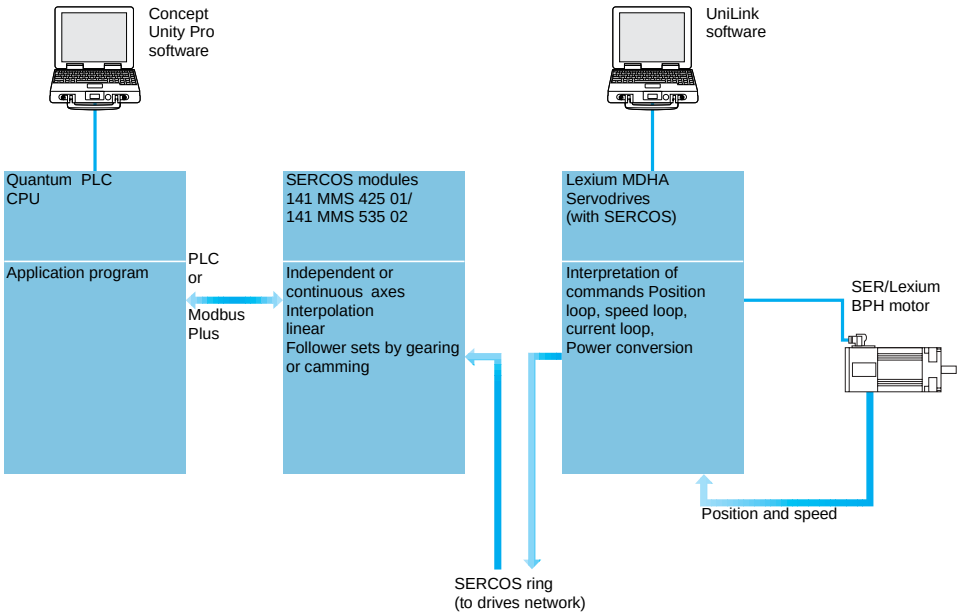
SERCOS (SERial COmmunication System) is a communication standard defining the digital link (medium and exchange protocol) between the motion control module and intelligent servodrives. It is defined by European standard EN 61491.

The use of SERCOS distributed architecture enables the connection of input/output devices (position encoder, Emergency stop, etc.) directly with the intelligent servodrives, thereby reducing connection costs.

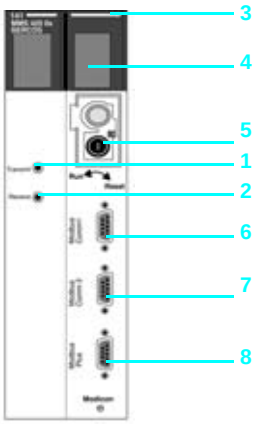
The fiber optic digital medium enables high-speed exchange (2 or 4 M bauds), yet provides a high level of noise immunity in high-interference industrial environments.

System overview

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



Lexium motion control
SERCOS 141 MMS Quantum motion control modules



System overview (continued)

Concept or Unity Pro software (via the Modbus Plus communications port) enable you to:

- Register the SERCOS 141 MMS module(s) in the Quantum module configuration table.
- Configure functions and parameterize used axes.
- Program activities in the PLC application.
- Adjust parameters through operating codes (parameters for 141 MMS module, and Lexium MHDA servodrives) *(1)*.
- Test and update the application.

The UniLink software via the PC port of the Lexium MHDA servodrive allows you to:

- Define the Lexium MHDA drive and SER/Lexium BPH motor types.
- Adjust the Lexium MHDA drive parameters, save them into the drive's EEprom memory and store them on a PC.

Description

The 141 MMS ●●5 0● double-width SERCOS axis modules are equipped with:

1 A SMA-type connector, marked Tx, for connecting the servodrives using the SERCOS ring fiber optic transmission cable.

2 A SMA-type connector, marked Rx, for connecting the servodrives using the SERCOS ring fiber optic reception cable.

3 Hard outer casing, performing the following functions:
- Electronic card support.
- Attachment and locking of the module in its slot.

4 Module diagnostics indicator lamps:
- READY: when lit, indicates the module as successfully passed power-up tests.
- RUN lamp:
  - Steady, indicates the motion controller is in run mode, the SERCOS ring is complete, and the motion controller is accepting commands from the PLC to control the servodrives.
  - Blinking, indicates that the motion controller is attempting to go into run mode, but the SERCOS ring has not been established due to a physical disconnection or an incorrect address setting.
  - Off, indicates the motion controller is stopped.
- MODBUS PLUS: normal Modbus Plus indicator codes.

5 A RUN/ RESET keyswitch.

6 COM 1 port with SUB-D 9 connectors - for Schneider Electric use only.

7 COM 2 port with SUB-D 9 connectors - for Schneider Electric use only.

8 Modbus Plus port with SUB-D 9 connectors.

(1) Lexium MHDA servodrive equipped with AM0 SER 001V000 SERCOS option card.

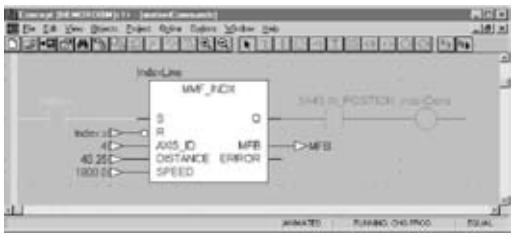
Characteristics: pages 42 and 43
References: pages 44 and 45
Connections: page 45

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

Software setup

The configuration of the multi-axis motion modules are carried out by Concept or Unity Pro software and the MMFStart Programmer's kit, 396 MMC 500 04. They are used to configure the multi-axis applications by the creation of a common database (between Quantum PLC and the 141 MMS motion control modules). It simplifies the access to a library of motion-specific function blocks.

Programming motion and special functions



Movements are initiated using function blocks in the Concept or Unity Pro application program (Quantum CPU).

The function blocks can be written in IEC Ladder or Function Block Diagrams.

Function blocks are available for each specific move type: incremental, absolute, or continuous. In addition, function blocks are available to set parameters and configure objects (axes, sets, cam profiles, and special application functions).

The sequence of events or movements can be controlled by using the Sequential Function Chart (Grafcet) defined by IEC standard 61131-3.

Application-specific functions, such as Continuous Registration, are set up using the MMF_SUB function block (see screen opposite).

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

Functional characteristics of modules 141 MMS 425 01/535 02

Type of module		141 MMS 425 01		141 MMS 535 02	
Software kit		396 MMC 500 04	With the assistance of our application services *(1)*	396 MMC 500 04	With the assistance of our application services *(1)*
Number of axes		–	22 max	–	32 max
Type of axes	Actual axes (connected to Lexium drives)	8	16	8	22
	Imaginary axes	4	Up to 22 axes/sets of axes	4	Up to 32 axes/sets of axes
	Remote axes	4, for interpretation of remote position by encoder	Up to 22 axes/sets of axes	4, for interpretation of remote position by encoder	Up to 32 axes/sets of axes
Set of axes	Coordinates	4 allowed in each group for the linear interpolation of up to 8 axes (max.)	Up to 22 axes/sets of axes	4 allowed in each group for the linear interpolation of up to 8 axes (max.)	Up to 32 axes/sets of axes
	Followers	4 groups up to 8 axes maximum	Up to 22 axes/sets of axes	4 groups up to 8 axes maximum	Up to 32 axes/sets of axes
Cam profile		8 profiles which can be changed from PLC registers	Any number up to the memory limitation of 64 K points on all cam profiles	8 profiles which can be changed from PLC registers	Any number up to the memory limitation of 64 K points on all cam profiles

Main functions

Programming	Movements	Homing, absolute, relative, or continuous Immediate movement, or queued, toward a given position Speed override possible
	Special functions	■ Point lock position and point lock time: synchronizes a Slave axis with a Slave position target and a Master position target using parameters ■ Measure part: measures the distance between two edges on a discrete input on the drive This can be applied to a real or auxiliary axis (position measurement via external encoder) ■ Count probe *(2)*: counts the edges on a discrete input on the drive within a period of time ■ Fast index *(2)*: starts a movement on an event. ■ Registration move *(2)*: position reading on the edge of a discrete input on the drive ■ Rotary knife: cuts using a rotary knife. Synchronizes a circular axis on a linear axis and controls a discrete output on the drive
	Other special functions	The development of all other special functions is possible with the use of a Motion Open C kit requiring the assistance of our application services *(1)*.
	Stop/start functions	Rapid stop, stop following configured deceleration profile Temporary stop Restart of stopped movement
Configuration/adjustment	SERCOS ring	Bus cycle time, traffic on the bus, optical power on the fiber, SERCOS loop diagnostics
	Acceleration/deceleration	Ramp values, ramp type (rectangular, triangular, and trapezoidal), unit choices, maximum acceleration adjustment
	Speed	Speed units, default speed, maximum speed, speed modulation coefficient
	Other setting	Target window, rollover, software limits
	Groups of Slave axes	Tracking of master axis by ratio or by cam (cam profile), threshold position of tracking master, value of the Bias during synchronization of an axis, monitoring of Master/Slave positions, master offset for a slave axis
	Groups of coordinate axes	Linear interpolation
	Cam profile	Values of a point existing from a cam profile, number of points (5,000 maximum), type of interpolation, table addresses
	State of an activity or axis	Movement in acceleration, in deceleration, in homing, servodrive fault…
	Diagnostics	Drive fault, tracking error, overvoltage, undervoltage, current overload, power supply fault

(1) Please consult our Regional Sales Offices.
(2) Special functions require version 1.2 of the MMFStart 396 MMC 500 04 multi-axis programming kit.

Descritpion: page 40
References: pages 44 and 45
Connections: page 45

Lexium motion control

SERCOS 141 MMS Quantum motion control modules

Electrical characteristics of modules 141 MMS 425 01/535 02

Type of module				141 MMS 425 01	141 MMS 535 02
Processor			**MHz**	66	133
PLC registers				10 000	60 000
Memory		Application	**Mb**	2	4
		Static RAM	**Mb**	2	4
		Dynamic RAM	**Mb**	8	8
SERCOS network		Nature		Industrial support complying with standard EN 61491	
		Topology		Ring	
		Medium		Fiber optic cable	
		Baud rate	**M bauds**	4	
		Cycle time	**ms**	2 to 4, configurable	
		Number of segments		9 max	23 max
		Length of segment	**m**	38 max with plastic fiber optic cable 150 max with glass fiber optic cable (230 µm)	
Communication ports	Serial links	Number		2 RS 232 D	
		Protocol		Modbus slave	
		Data rate	**Bit/s**	300…9600	
	Network interface			1 Modbus Plus	
Consumption			**mA**	2000 at ⎓ 5 V	2500 at ⎓ 5 V

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Descritpion: page 40 References: pages 44 and 45 Connections: page 45

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

141 MMS 425 01

141 MMS 535 02

References

Any of the Quantum PLC processors can be used with the SERCOS 141 MMS motion modules. To obtain optimum performances, the cycle time of the Quantum processor should not exceed 10 ms. The maximum number of 141 MMS modules in a configuration depends on the processor type:

Type of processors	140 CPU 113 02	140 CPU 113 03	140 CPU 434 12A	140 CPU 534 14A
Maximum number of MMS, NOE or NOM modules	2	2	6	6

Description	Functions	Number of axes with:		Reference	Weight kg
		396 MMC 500 04 Programmer's kit	**Motion Open C kit** *(1)*		
Multi-axis control modules	SERCOS digital servodrive control	8 real axes 4 imaginary axes 8 sets of axes	16 real axes 22 axes/sets of axes	**141 MMS 425 01**	0.520
		8 real axes 8 imaginary axes 8 sets of axes	22 real axes 32 axes/sets of axes	**141 MMS 535 02**	0.520

Connection accessories

Description	Connection	Length	Reference	Weight kg
Plastic fiber optic cables fitted with SMA-type connectors (curvature radius: 25 mm minimum)	Lexium MHDA 1●●●N00, MHDA 1●●●A00 servodrive	0.3 m (1 ft)	**990 MCO 000 01**	0.050
		0.9 m (3 ft)	**990 MCO 000 03**	0.180
		1.5 m (5 ft)	**990 MCO 000 05**	0.260
		4.5 m (15 ft)	**990 MCO 000 15**	0.770
		16.5 m (55 ft)	**990 MCO 000 55**	2.830
		22.5 m (75 ft)	**990 MCO 000 75**	4.070
		37.5 m (125 ft)	**990 MCO 001 25**	5.940

Set of plastic fiber optic connections

Description	Composition	Reference	Weight kg
Set of fiber optic cables and SMA-type connectors *(2)*	12 SMA-type connectors 12 insulating sleeves Plastic fiber optic cable, length 30 m	**990 MCO KIT 01**	–
Equipment for installation of fiber optic cables	Tools for making up cables to required length from a 990 MCO KIT 01 kit Includes stripping tool, crimping pliers, 25 W/110 V cutting tool, and instructions for use	**990 MCO KIT 00**	–

(1) The Motion Open C kit requires the assistance of our applications services. Consult our Regional Sales Offices.
(2) Connectors to be used exclusively for connecting SERCOS motion control modules in the same electrical cabinet.

Descritpion: page 40
Characteristics: pages 42 and 43
Connections: page 45

Lexium motion control
SERCOS 141 MMS Quantum motion control modules

References (continued)

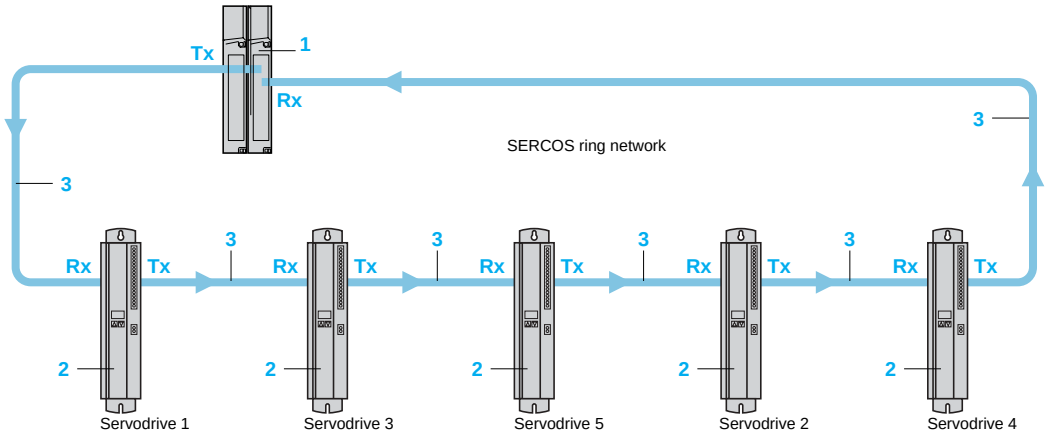
Concept programming and configuration software

Description	Type of user license	Reference	Weight kg
Concept packages Concept XL version 2.6	Single-user license	**372 SPU 474 01 V26**	–
	3-user license	**372 SPU 474 11 V26**	–
	10-user license	**372 SPU 474 21 V26**	–
	Network license	**372 SPU 474 31 V26**	–

SERCOS multi-axis motion control software

Designation	Description	Reference	Weight kg
Multi-Axis MMF start programmer's kit	Concept library and MMF Start Shared data base creation Backup and restoration functions for maintenance personnel. Configuration software.	**396 MMC 500 04**	–

Connections



1 141 MMS 425 01/535 02: Quantum multi-axis control module.

2 MHDA 1●●●N00/A00: Lexium drives (equipped with the optional SERCOS card AM0 SER 001V000) for SER/Lexium BPH motor.

3 990 MCO 000●●●: plastic fiber optic cables fitted with SMA-type connectors.

Tx Transmission.
Rx Reception.

Descritpion: page 40
Characteristics: pages 42 and 43

Lexium motion control
Lexium servodrives

Presentation

The Lexium MHDA servodrives are designed for the control of the torque, speed and/or position of the SER/Lexium BPH brushless motors. These servodrive units are designed for high performance applications, which require strong dynamics and high precision positionning.

Lexium MHDA servodrives, with 3-phase power supply, are supplied with 7 different current ratings: permanent current 1.5 A to 70 A rms. They must also be connected to an auxiliary power supply of ⎓ 24 V (from 0.75A to 3.5 A).

Some MHDA servodrives are equipped with an anti-start device designed to protect anyone working on the machines. High current rating servodrives (40 to 70 A) are all equipped with the anti-start device.

The Lexium servodrive/motor units are designed mainly to be controlled by the positioning modules on the Modicon Premium or Modicon Quantum automation platforms.

These Lexium MHDA servodrives are all equipped with standard ± 10 V analog setpoint.
If equipped with a SERCOS option card, they can be integrated in a SERCOS ring.

Furthermore, the Lexium MHDA servodrives have an integral position indexer, which can be used in cases where the simple applications do not require positioning modules. In this case, the numerous possibilities for connectivity (RS 232 serial link, CANopen bus, Fipio bus, Profibus DP bus, Modbus Plus network,) respond to the different automation structures.

4

Compatibility between Lexium servodrives and SER/Lexium BPH axis motors

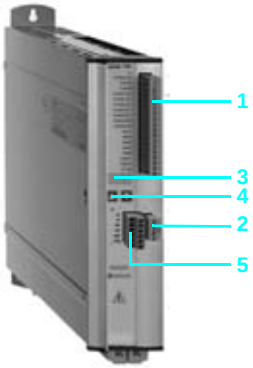
SER brushless motors	Lexium 17D servodrives MHDA					Lexium 17D HP servodrives MHDA		Lexium BPH brushless motors
	1004●00	1008●00	1017●00	1028●00	1056●00	1112A00	1198A00	
	Permanent rms current					Permanent rms current		
	1.5 A	3 A	6 A	10 A	20 A	40 A	70 A	
	0.4/1.1 Nm:							BPH 0552S
	0.9/1.9 Nm:	1.3/3.4 Nm:						BPH 0751N
SER 39A 4L7S	1.1/2.5 Nm	1.1/4 Nm						
SER 39B 4L3S		2.2/4.4 Nm	2.2/8.0 Nm:					
	1.3/2.5 Nm:	2.3/4.8 Nm:						BPH 0752N
SER 39C 4L3S		2.9/4.7 Nm:	2.9/9.4 Nm:					
		3.7/7.2 Nm:	4.3/13.4 Nm:					BPH 0952N
SER 3BA 4L3S			4.6/9.2 Nm:	4.6/15.3 Nm:				
SER 3BA 4L5S		4.6/8.2 Nm	4.8/15.0 Nm					
			6.0/13.4 Nm:	6.0/20.3 Nm:				BPH 0953N
SER 3BB 4L3S			6.6/12.0 Nm	6.6/20.0 Nm				
SER 3BB 4L5S			6.6/15.8 Nm	6.6/25.0 Nm				
			7.4/13.6 Nm:	7.4/19.3 Nm				BPH 1152N
			6.8/13.5 Nm:	10.5/19.0 Nm				BPH 1153N
SER 3BC 4L5S			10.0/17.0 Nm:	10.0/28.0 Nm:				
SER 3BA 4L7S		10.0/16.0 Nm:	10.0/32.0 Nm					
				11.4/18.0 Nm:	12.0/30.0 Nm:			BPH 1422N
SER 3BD 4L5D				13.4/29.0 Nm:				
SER 3BB 4L7S			13.4/24.0 Nm:	13.4/38.0 Nm				
				14.5/24.0 Nm:	17.0/42.0 Nm:			BPH 1423N
					25.0/37.5 Nm:			BPH 1902N
					36.0/57.0 Nm:			BPH 1903K
					46.0/76.3 Nm:			BPH 1904K
						75.0/157 Nm:		BPH 1907K
						90.0/163 Nm:	100/230 Nm:	BPH 190AK

1.1/2,5 Nm: For a SER motor, the 1st value corresponds to continuous stall torque max., and the 2nd value corresponds to peak stall torque max.
1.3/3.4 Nm: For a SER/Lexium BPH motor, the 1st value corresponds to continuous stall torque max., and the 2nd value corresponds to peak stall torque max.

Description: pages 47 and 48 | Characteristics: pages 62 and 65 | References: pages 66 and 67 | Dimensions: page 68 and 69 | Connections: pages 70 and 75

Lexium motion control
Lexium servodrives

Lexium 17D servodrives: overview



Front panel

17D servodrives are in RAL gray metal casings (degree of protection IP 20).

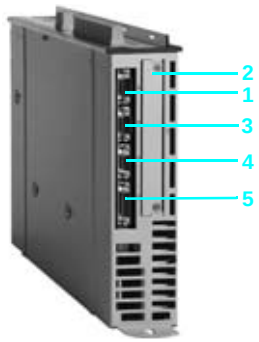
1 A 18-way male connector *(1)* (addr. X3) to connect:
- two configurable analog setpoint inputs ± 10 V,
- two configurable analog outputs ± 10 V,
- four configurable discrete inputs/two configurable discrete outputs ⎓ 24 V,
- one servodrive validation input ⎓ 24 V,
- one alarm relay contact.

2 A 4-way male connector *(1)* (addr. X4) terminal block for connection to the external ⎓ 24 V power supply. This connector distributes the power supply ⎓ 24 V to other Lexium servodrives.

3 A 3-digit display, which indicates the operating status of the servodrive, as well as error code messages.

4 Two control keys, which provide access to the various operating modes for the display.

5 A 4-way male connector *(2)* (addr. X10) for use with the anti-start function (AS function) Only available on MHDA 1●●●A00.servodrives



Top panel of MHDA servodrives (with analog setpoint ± 10V)

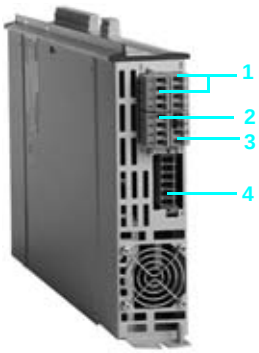
1 A 9-way SUB-D male connector (addr. X6) for connection to the CANopen field bus. (RS 232 integral serial link) This connector is also used to connect the PC compatible terminal, which supports the Unilink configuration software.

2 Slot for one of the following option cards:
- SERCOS digital link control card
- Fipio bus, Modbus Plus network, or Profibus DP bus connection card,
- Discrete I/O card for Lexium servodrive control with integral position indexer function.

3 A 9-way SUB-D male connector (addr. X5) to connect the simulated encoder feedback (incremental or SSI). This connector can also be used to interconnect with other Lexium servodrives (maximum 16) in Master/Slave operation *(2)*.

4 A 9-way SUB-D female connector (addr. X2) to connect the SER/Lexium BPH motor resolver (includes connection of the PTC probe).

5 A 15-way SUB-D female connector (addr. X1) to connect the SinCos encoder on the SER/ Lexium BHP motor (includes connection of the PTC probe).



Lower panel

1 Two 4-way unscrewable terminals (addr. X0A and X0B) to connect to the 3-phase power supply network ∿ 208...480 V (or single phase ∿ 230 V). The second connector distributes the network supply to other Lexium servodrives.

2 Two 4-way unscrewable terminal (addr. X7) to interconnect the Lexium servodrive power buses, when operating with the braking power distribution over a set of Lexium servodrives.

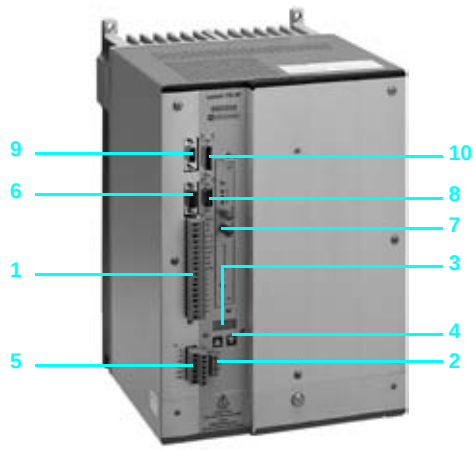
3 Two 4-way unscrewable terminal (addr. X8) to connect the external braking resistance. By default, braking is on the internal resistance (shunt fitted to the connector).

4 A 6-way male connector (addr. X9) to connect the SER/Lexium BPH motor power (includes connection to the holding brake - model dependant).

(1) Female screw connectors supplied with each servodrive.
(2) Please use TSX CXP ●83 servodrive interconnecting cables (see page 67)

4

Lexium 17D HP servodrives: overview



Front panel

Lexium 17 HP servodrives are in RAL gray metal casings (degree of protection IP 20).

1 A 18-way female connector *(1)* (addr. X3) to connect:
- two configurable analog setpoint inputs ±10 V,
- two configurable analog outputs ±10 V,
- four configurable discrete inputs/outputs ⎓ 24 V,
- one servodrive validation input ⎓ 24 V,
- one alarm relay contact.

2 A 6-way male connector *(2)* (addr. X4) to connect the auxiliary power supply ⎓ 24 V and the holding brake connection (depending on the model of SER/ Lexium BPH motor).
A EMC filter for this supply is built-in to the Lexium 17D HP servodrives.

3 A 3-digit display, which indicates the operating status of the servodrive, as well as error code messages.

4 Two control keys, which provide access to the various operating modes for the display.

5 A 4-way male connector *(2)* (addr. X10) for use with the anti-start function (AS function).

6 A 9-way SUB-D male connector (addr. X6) to connect the servodrive to the CANopen field bus. (RS 232 integral serial link) This connector is also used to connect the PC compatible terminal, which supports the Unilink configuration software.

7 Slot for one of the following option cards:
- SERCOS digital link control card
- Fipio bus, Modbus Plus network, or Profibus DP bus connection card,
- CANopen bus adapter to ensure conformity of link 6 above to the CANopen standard.
- Discrete I/O card for Lexium servodrive control with integral position indexer function.

8 A 9-way SUB-D male connector (addr. X5). Connects the simulated encoder feedback (incremental or SSI), for the ± 10 V analog setpoint servodrives.
This connector can also be used to interconnect with other Lexium servodrives (maximum 16) in Master/Slave operation *(3)*.

9 A 9-way SUB-D female connector (addr. X2) to connect the SER/Lexium BPH motor resolver (includes connection of the PTC probe).

10 A 15-way SUB-D female connector (addr. X1) to connect the SinCos encoder on the SER/ Lexium BHP motor (includes connection of the PTC probe).

Lower panel

1 11-way screw terminal (addr. X0) to connect :
- Connect to the 3-phase power supply network ∿ 208...480 V. An external choke must be inserted between the network supply and the 17D HP servodrive *(4)*. The EMC filter for the power input is not built-in, which means that it should be externally provided, when Class A is essential (non-propagation of electromagnetic disturbances).
- The power connection of the SER/Lexium BPH motor.
- The connection of the external braking resistance. The 17D HP servodrives do not have internal braking resistance.

(1) Male screw connectors supplied with each servodrive.
(2) Female screw connectors supplied with each servodrive.
(3) Please use TSX CXP ●83 servodrive interconnecting cables (see page 67)
(4) External input choke is not necessary when using isolation transformers 840●● shown on page 73

Functions: pages 56 and 61 | Characteristics: pages 62 and 65 | References: pages 66 and 67 | Dimensions: pages 68 and 69 | Connections: pages 70 and 75

Lexium motion control
Lexium servodrives

Functions

Power supplies

The Lexium servodrives can be directly connected to 3-phase mains supply, whose nominal value can be any voltage within the range ∿ 208…480 V, 50…60 Hz. If the motor's maximum speed and current rating are derated (see page 62), low current rating Lexium servodrives can be powered by a ∿ 230 V single phase supply.
■ Withstance of electromagnetic disturbances and non-propagation of electromagnetic disturbances is provided by the EMC filter integral to the Lexium 17D servodrives *(1)*, in compliance with EEC directives 89/336, 92/31 and 93/68.

■ Lexium servodrives are compatible with the TT or TN loads. When the load is IT (isolated neutral), it is necessary to provide an isolating transformer so that a TT load (neutral to ground) can be re-built on the secondary (servodrive side).

■ An auxiliary ⎓ 24 V SELV power supply is required for the internal electronic circuits and the input/output interfaces (isolation required for the motor power supply).

Internal braking resistance (for Lexium 17D servodrives only)

The servodrive is fitted with a braking (or ballast) resistance (80 or 200 W depending on the model). Depending on the required braking characteristics, internal braking can be disabled and an external 250, 500 or 1500 W braking resistance used instead, depending on the Lexium 17D servodrive used.
Placing the servodrive power buses in parallel shares the internal capacitors and braking resistances, thus making it possible to benefit from the cumulative absorption and dissipation capacities offered by the servodrives.
17D HP servodrives do not have internal braking resistance. See page 111 for external braking resistance selection.

Signal processing/motor control

■ Three programmable built-in digital regulators:
□ a current regulator (torque image) with a control loop period of 62.5 µs,
□ a speed regulator with proportional and integral gain with a control loop period of 250 µs,
□ a position regulator with a control loop period of 250 µs.

■ Processing of motor position feedback signals from the motor sensor (SinCos EnDAT® or SinCos Hiperface ®) type high resolution absolute encoder or resolver). Using this information, the servodrive can generate a simulated encoder feedback, which can be either incremental or absolute SSI. The simulated encoder feedback and external encoder functions can not be used concurrently.

■ Two discrete data bits control the automation system:
□ one servodrive validation input ⎓ 24 V,
□ one volt-free relay output, for servodrive faults.

■ Two analog inputs/outputs ± 10 V and four discrete inputs/two discrete outputs ⎓ 24 V, allowing Lexium servodrives to be integrated into sequential command systems controlled by programmable PLCs (e.g. Micro). The I/O functions can be configured.

■ Integral position indexer: In addition, Lexium MHDA servodrives have integral position indexing (243 program steps, of which 180 are stored). This positioning function performs simple automation operations, which permanently do not require motion control modules.

■ Connectivity: Lexium MHDA servodrives all have an RS 232 serial link or CANopen bus link. If an option card is added, they can also be connected to the Modbus Plus network, a Fipio bus or a Profibus DP bus (or a SERCOS network).

(1) With Lexium 17D HP servodrives, an AMO EMC ●1● external EMC input filter may be required on the power supply side.

4

AS anti-start function

The AS (anti-start) function found on all Lexium MHDA ●●●●A00 servodrive models should be used primarily when the motor has to be de-activated, as for instance when operators need to have access to the machines for brief periods of time.
The system consists of an additional auxiliary relay switch, accessible on the 4-way screw terminal (rep. X10). When the relay switch coil is automatically activated, this locks the servodrive power bridge, cutting out the motor power supply *(1)*.

The anti-start relay contact is used to check that the locking mechanism is activated. The state of the relay contact must be checked constantly by the control system: to ensure that the system is working and that emergency stop and locking procedures are strictly applied.

The AS (anti-start) function is standard in all Lexium MDHA ●●●●A00 servodrives and provides the following features:
- Servodrive power supply stays ON even when system is locked.
- Reduced cabling requirements.

Configuring the Lexium MHDA servodrives

MHDA servodrives must be configured using the Unilink software installed on a PC. This terminal is connected to the servodrives via a RS 232 C serial link.

Accessible parameters relate to:
- The type of motor, braking.
- The position loop.
- The speed loop.
- The current loop (torque).
- The power converter.
- The discrete and analog I/O.
- The integral position indexer.
- Modbus Plus, CANopen or SERCOS communication.

These parameters are backed up to the servodrive EEProm memory using Unilink software.

The multi-lingual Unilink software, compatible with Windows 95/98, 2000, NT 4.0 and XP, is supplied with the "Lexium motion tools" CD-Rom AM0 CSW 001 V300, also including the following multi-lingual (French, English, German, Spanish and Italian) documentation:
- Technical guide to SER/BPH motors.
- SER/BPH motor file library for CAD software (2D and 3D).
- Lexium 17D and 17D HP servodrives user guide
- List of ASCII commands for the Lexium 17D servodrives (English and German).
- Unilink software user guide.
- Graphic Motion Task for Unilink software.
- SERCOS ring communication.
- Fipio bus communication.
- CANopen bus communication.
- Modbus Plus network communication.
- Profibus DP communication.
- Example file for the installation of a CANopen bus application on a Premium platform.
- .esd files for configuring the CANopen bus with the SyCon configuration tool.
- .gsd files for configuring the Profibus DP bus with the SyCon configuration tool.
- .dib files, images of the Lexium servodrives.

(1) Vertical axis immobilization can only be obtained by installing a mechanical locking system (servo brake) on the axes.

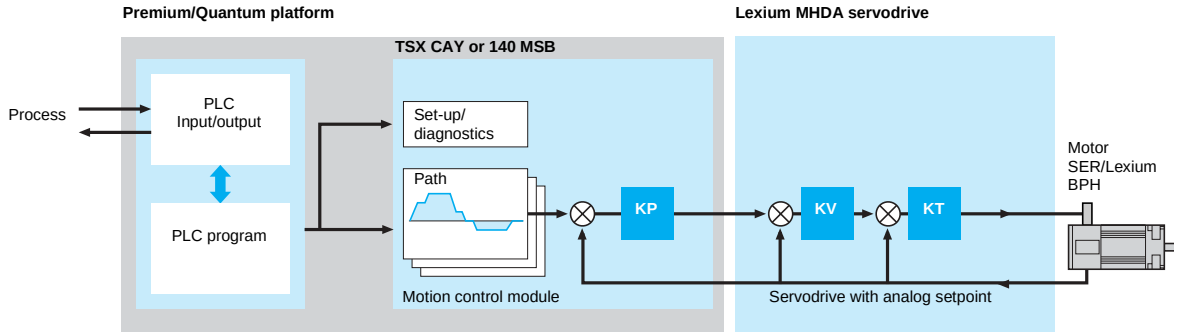
Description: pages 47 and 48
Characteristics: pages 62 and 65
References: pages 66 and 67
Dimensions: pages 68 and 69
Connections: pages 70 and 75

Presentation of Unilink software

Unilink software is used to configure and adjust Lexium MHDA servodrives according to the associated BPH axis motor and the application requirements. During these phases, the PC supporting Unilink software under Windows 95/98, 2000, NT 4.0 or XP, is connected to MHDA servodrives via a serial link (9 -way SUB-D connector, on X6).
Three types of configuration are possible:
- MHDA servodrive with analog setpoint, with Premium or Quantum motion control module.
- MHDA servodrive with SERCOS digital link option card; with Premium or Quantum motion control module.
- MHDA servodrive in independent position indexer mode with discrete input/output control or field bus control.

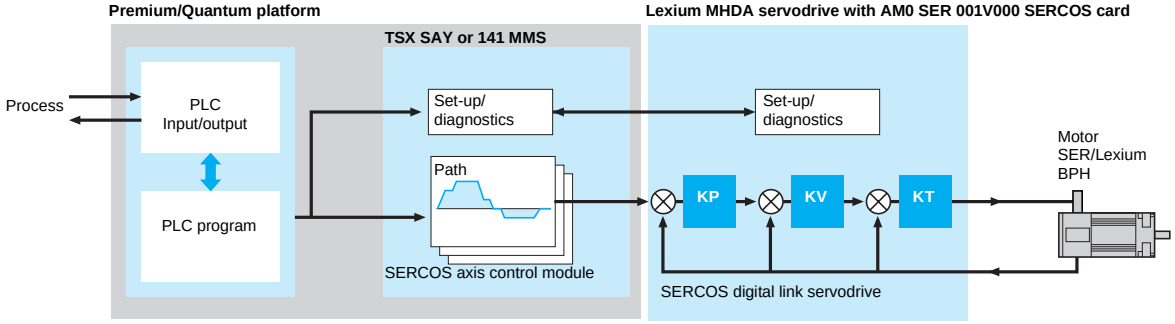
MHDA servodrive with analog setpoint

The MHDA servodrive with analog setpoint is associated with the TSX CAY 2●/33/4● (with Premium platform) or the 140 MSB 101 00 (with Quantum platform) motion control module. The KP position loop is executed in the automation platform control module. It is configured and adjusted using PL7 Junior/Pro (with TSX CAY module) or Concept (with 140 MSB module) programming software.
The closed KV speed loop and KT torque loop in the MHDA servodrive are configured and adjusted using Unilink software.
The motion program, which defines the paths, is in the Premium or Quantum platform application program. The position and speed setpoints are calculated by the motion control module.



MHDA servodrive with SERCOS digital link

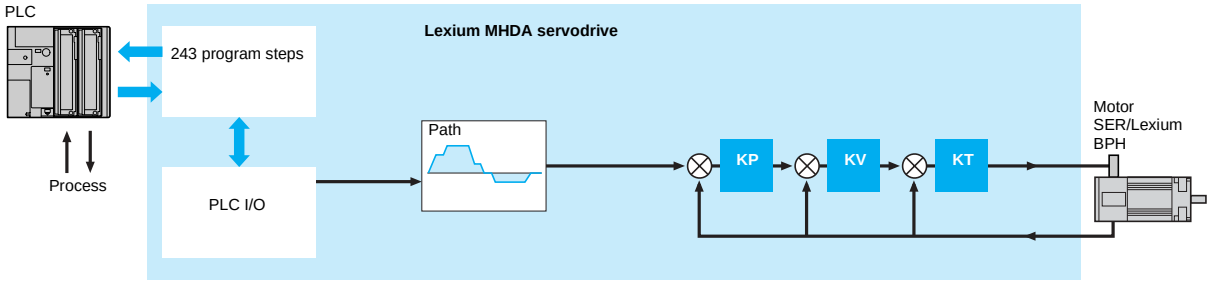
The MHDA servodrive with the SERCOS digital link option card is associated with the TSX CSY 84/164 (with Premium platform) or 141 MMS 425 01/535 02 (with Quantum platform) motion control modules. The closed KP position loops, KV speed loops and KT torque loops in the servodrive are configured and adjusted using Unilink software. The motion program, which defines the paths, is in the Premium or Quantum platform application program. The position setpoints are calculated by the motion control module (position mode). The motion control module can also work out the speed reference (speed mode) or the current reference (torque mode). The last two modes can be accessed with the assistance of Schneider application services.



Presentation of the Unilink software (continued)

MHDA servodrive with integral position indexer function

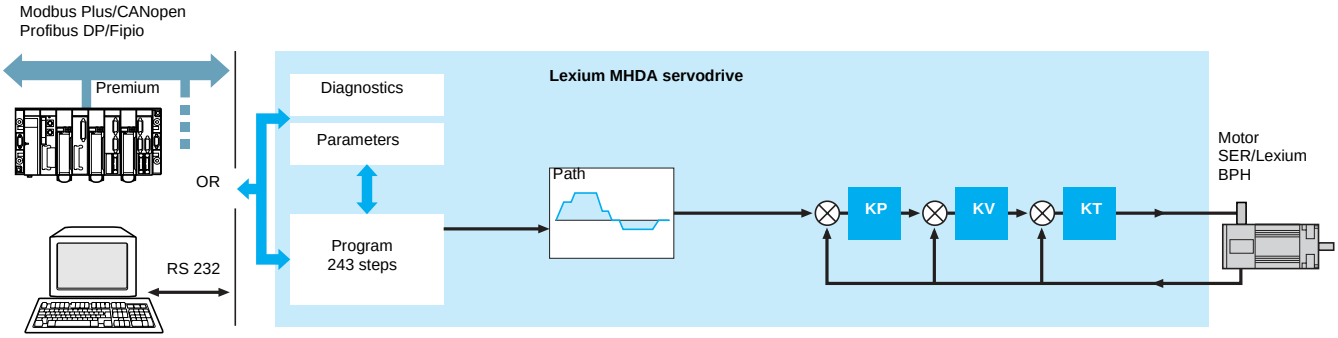
MHDA servodrives have an integral position indexer function. The servodrive is then controlled by its discrete input/outputs, which can be extended to 14 discrete inputs/8 discrete outputs, using extension card AMO INE 001V000. The closed KP position loops, KV speed loops and KT torque loops in the MHDA servodrive are configured and adjusted using Unilink software. The motion program (243 program steps, of which 180 are permanently stored in Flashmemory) and the calculation of the position setpoints are provided by the integral position indexer of the MHDA servodrive.



Connectivity of the MHDA servodrive with integral position indexer function

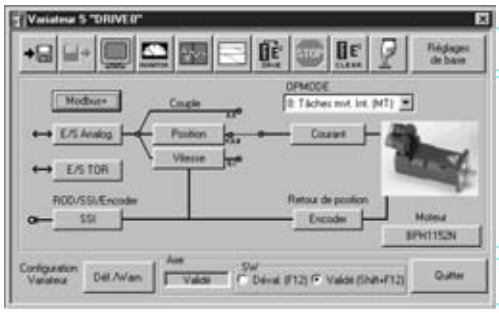
The MHDA servodrive can be remotely controlled by:
- The CANopen bus or the integral RS 232 C serial link, available as standard on the X6 connector.
- With the addition of an option card, they can be connected to the Fipio bus, the Modbus Plus network,or the Profibus DP bus.

These links download the motion program steps (servodrive in run mode for the 63 steps stored in the dynamic RAM memory). They also allow the set-up and diagnostics functions of the drive.



Unilink software functions

Basic screen



The basic screen providing access to the Unilink software services and functions is divided into three zones:

1 Top bar, for accessing the main functions.

2 Block diagram for accessing the configuration/adjust/set-up and the realtime display of the different drive values.

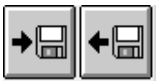
3 Lower zone indicating the drive status.

Main Unilink functions

Servodrive configuration

Used at servodrive level to select the power supply voltage and the braking resistance (internal/external for the Lexium 17D servodrive, external for 17D HP servodrives. Used to define the name of the servodrive.

Offline/online operation

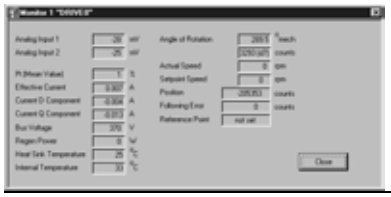


used to import or export drive parameters and data files as well as the motion task for the integral position indexer function.
These functions allow the servodrive application to be developed offline.

Hyperterminal mode

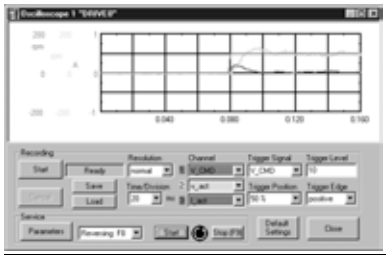
The set of drive parameters is accessible in read/write mode from a single terminal operating in ASCII mode

Monitor mode



Realtime display of 17 drive data items, for example, values for the following: analog setpoint inputs, instantaneous current, actual speed, drive power bus voltage (DC bus), braking power, angular position of the axis, following error, etc.

Oscilloscope mode



Storage and display, in the form of internal drive data curves, of values for the following: setpoint, actual speed and current, drive power bus voltage, image of following error. Activation of the speed increment generation service (up and down) for optimizing loop tuning

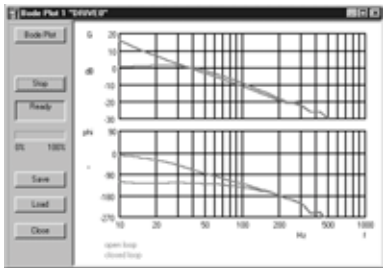
Stop command

Motion stop control (for safety reasons, this software control should not be substituted for the external Emergency stop command).

EEP memory access for the Lexium servodrive

E^2 Save saves the defined set of servodrive parameters in the EEProm memory
E^2 Clear clears the content of the EEProm memory

Bode diagram



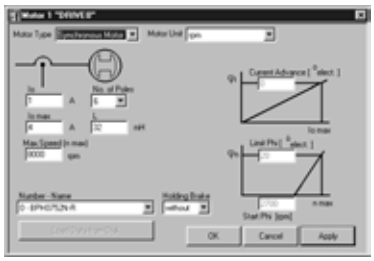
Acquires data (gain G and phase shift φ) in the frequential domain.
Graphically displays the responses in frequency.

4

Lexium servodrive parameters

Motor parameters

BPH1152N



Used to define the parameters for MHDA servodrives, according to the associated motor. Used to define motor with or without brake, maximum speed, and to adapt the min. and max. motor currents. When used with SER/BPH motors, which are referenced in the Unilink software, the selection of a motor causes its parameters to be set up by default. It is the responsibility of the user, should it be necessary, to adjust these values for another application.

Motor encoder selection

Resolver

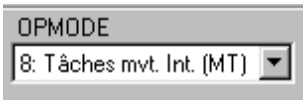
Defines the type and characteristics of motor encoder feedback (resolver, SinCos EnDAT/ Hiperface high resolution absolute encoder)

Electronic gearing command or encoder emulation

ROD

Defines the type and characteristics of the simulated, incremental or absolute SSI *(1)* encoder feedback or the type in electronic gearing mode (ROD)

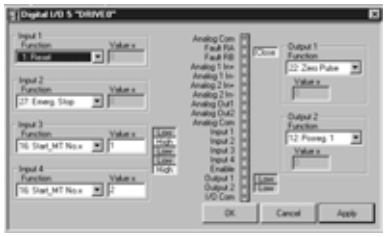
Servodrive operating mode



Specifies the servodrive operating mode:
- MHDA servodrive with analog setpoint, with TSX CAY ●● or 140 MSB 101 00 motion control module.
- MHDA servodrive with SERCOS digital link, with TSX CSY 84/164 or 141 MMS 425 01/435 02 motion control module
- MHDA servodrive with integral position indexer
- MHDA servodrive in independent mode in Master/Slave operation (electronic gearing)
- MHDA servodrive connected to a PLC via the CANopen/Fipio/Profibus DP bus or the Modbus Plus network

Functions associated to discrete inputs/ outputs

Digital I/O



Assigns:
- a specific function to 4 inputs (1 of 25, depending on the type of servodrive). For example, position limit sensor, speed reference analog input, deactivation of integral position check, homing, starting a motion sequence, brake control, etc.
- a specific function to 2 outputs (1 of 26, depending on the type of servodrive). For example, following error, actual position greater than a predefined value, target position reached, servodrive inhibited, etc.

Furthermore, this screen displays the state of the I/O in realtime.

Functions associated with the analog input/outputs (with MHDA servodrive)

Analog I/O

Assigns:
- a specific function to 2 analog inputs (1 of 6, depending on the type of servodrive). For example, control voltage on the first input, control current on the second input, setpoint corresponding to the sum of the 2 analog inputs, etc. The automatic offset compensation and scaling can be configured on these 2 inputs.
- a specific function to 2 analog outputs (1 of 5). For example, actual speed or current values, setpoint values for speed or current, following error image, etc.

Furthermore, this screen displays the values (mV) of the I/O in realtime. These I/O allow many possibilities for applications which require electrical shafts (for example, sending an analog output from the "Master" servodrive, current image and setpoint, to an analog input on the "Slave" servodrive in order to create a coupled electrical shafts).

Set-up of the current loop

Current

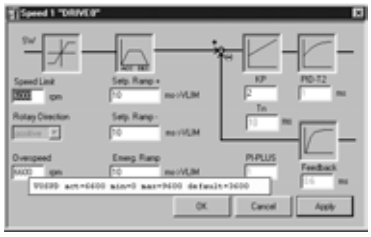
Adjusts the parameters of the KT current loop using the defined default values through the set-up operation of the "SET Motor" SER/BPH motor

(1) To use the encoder output in absolute SSI simulation mode, contact our Regional Sales Offices.

Description: pages 47 and 48
Characteristics: pages 62 and 65
References: pages 66 and 67
Dimensions: pages 68 and 69
Connections: pages 70 and 75

Lexium servodrives parameters (continued)

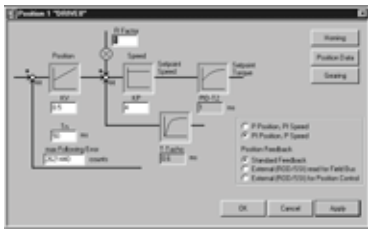
Speed loop settings



Speed

Adjusts the KV speed loop gain parameters using the default values defined by the SER/BPH motor set-up operation "SET Motor". For example, maximum speed, overspeed threshold, acceleration and deceleration ramps, Emergency stop deceleration time, etc.

Position loop parameter settings



Position

The position loop parameter settings are only effective with MHDA servodrives with a SERCOS link or with the MHDA servodrives in integral position indexer mode. Adjusts the KV speed loop and KP position loop gain parameters and defines the maximum following error.

The following additional functions can be accessed:

Homing

- Specifies the homing type and parameters (acceleration/deceleration ramps and speed). Also used to define motion speed in running continual manual (JOG) mode.

Gearing

- Used in follower mode to specify the type of motor position feedback and define the movement multiplier ratio

Position Data

- Provides access to the following definitions:

- axis type (linear or rotary),
- axis resolution,
- minimum acceleration/deceleration time, maximum speed, data relating to the target windows, position registers, upper/lower software limits, thresholds to compare the current position (determine discrete output status).

- Used to program the movement steps in integral position indexer operation, including for each step (243 steps max.):

- movement type (absolute or relative),
- target position and setpoint speed,
- speed profile (trapezoid or sinusoid),
- conditions for accessing the next step,
- definition of start conditions.

Lexium servodrive status display

Drive status

Status

The lower zone of the basic screen:

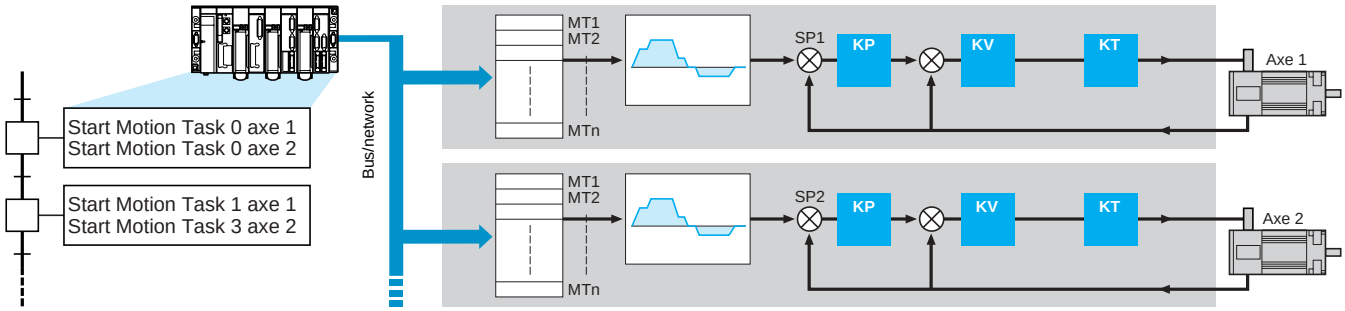
- indicates the servodrive status,
- provides access to a window, which displays the current alarm or fault in realtime, as well as its history and frequency.

Motion control applications

MHDA servodrives support connections using the CANopen bus, Modbus Plus network, Fipio bus or Profibus DP bus. The CANopen bus connection
- is standard on MHDA servodrives.
- The Modbus Plus network can be established by adding an option card.
- The Fipio bus can be established by adding an option card.
- The Profibus DP bus can be established by adding an option card.

This type of structure is used to respond to performances in three types of applications: applications with independent servodrives, PLC controlled independent axes and PLC controlled electronic gearing.

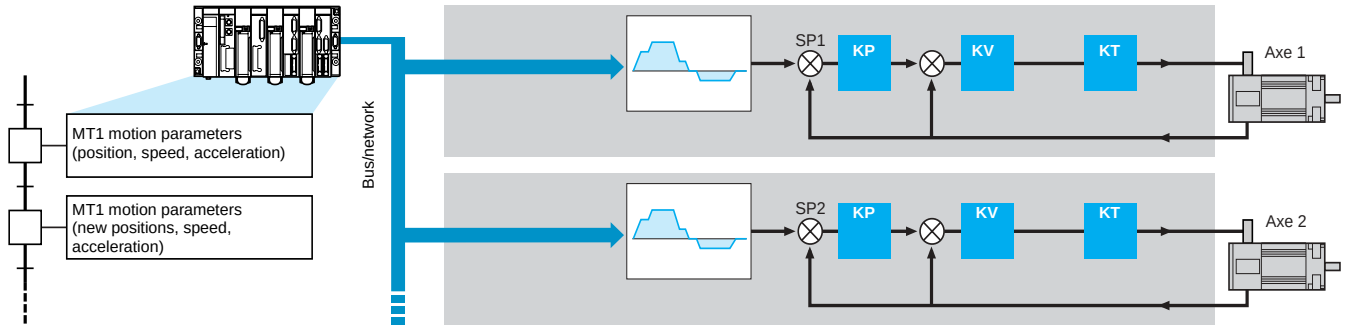
Applications with independent servodrives



The "Motion tasks" (MT) for each Lexium servodrive are managed using the basic activation/deactivation commands from the Premium or Quantum PLCs (i.e. start, stop, etc.).

Typical number of controlled servodrives: 16

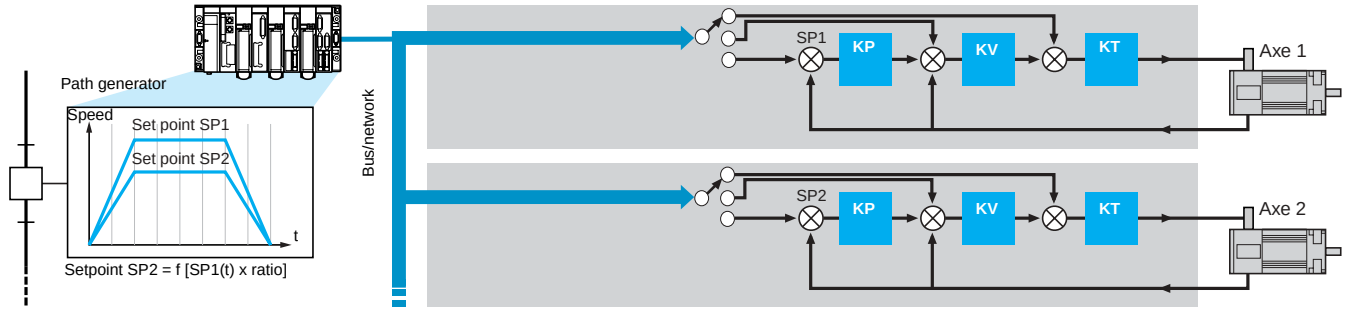
Independent axes controlled by PLC



The PLC application calculates and directly updates the parameters for a "Motion Task" (position/speed/acceleration) for each movement for each of the servodrives, which work out various paths from these parameters.

Typical number of controlled servodrives: 4 to 8

Electronic gearing controlled by PLC

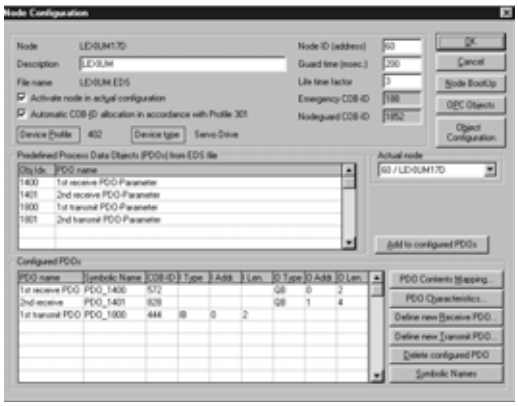


The path (position or speed or torque) of the virtual Master axis is worked out by the PLC. This path is used to determine the new positions of each of the Slave axes in each PLC cycle according to the formula SPn = [SP1 (t) x ratio].

Typical number of controlled servodrives: 2 to 4

Software configuration

Configuration example for Fipio with PL7 Junior/Pro



Configuration example for CANopen with the SyCon tool

Configuration example for Modbus Plus with Unilink

Communication and Parameterizing are integrated in the following software tools:

■ Configuration mode for PL7Junior/Pro or Concept, depending on the medium used:

□ CANopen and Profibus DP bus: the configuration mode of the PL7 Junior/Pro or Concept installation software is used to define the communication buffers (addresses and lengths of the %MW input and output word tables).

□ Modbus Plus network: the configuration mode of the PL7 Junior/Pro or Concept installation software is used to define the data exchanged.

□ Fipio bus: the configuration mode of the PL7 Junior/Pro installation software is used to define the numbers of the connection points from the Lexium MHDA servodrives to the Fipio bus.

□ Profibus DP bus: the configuration mode of the PL7 Junior/Pro installation software is used to define the numbers of the connection points from the Lexium MHDA to the Profibus DP bus.

■ The CANopen bus and Profibus DP bus are configured using a specific software (SyCon) to be ordered separately (reference SYS SPU LF● CD28M). This software is used to generate a configuration file to define the data exchanged on the bus. The file must be imported in the PL7 application via the PL7Junior/Pro installation software.

■ Unilink software: is used to define the address of the Lexium servodrive on which the user would like to communicate with. The transmission speed of the CANopen bus or the Modbus Plus network is also defined at this level.

Furthermore, with the Modbus Plus network, a function of the Unilink software can be used to define the configuration parameters and display the Modbus Plus communication status.

The Unlilink software is also used to define the parameters relating to the Fipio bus (time-out, etc.).

Debugging

The Unilink software and PL7 Junior/Pro installation software provide different debugging services:

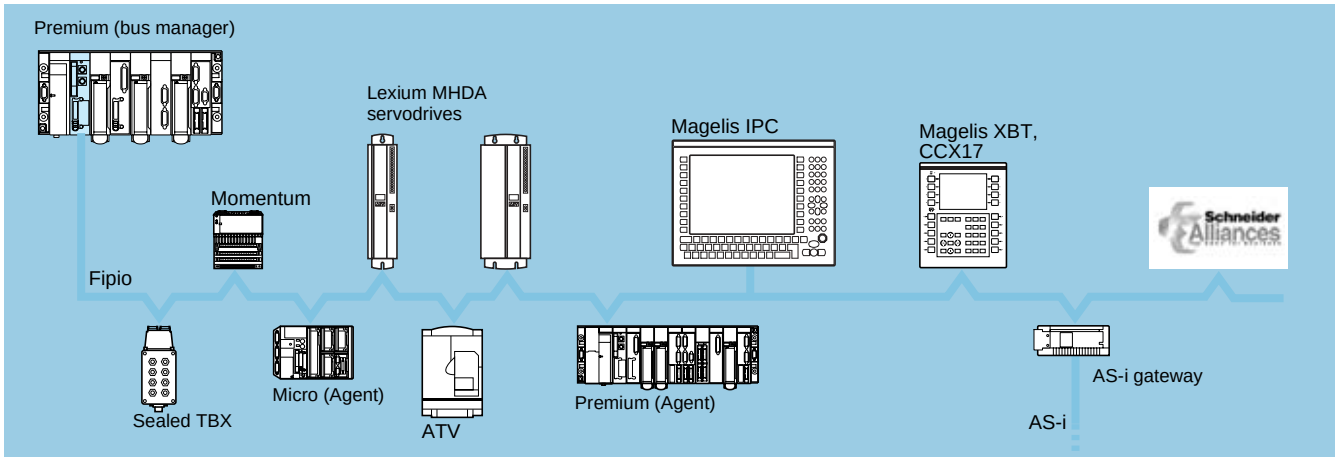
■ Unilink software: access to commands and statuses for managing DRIVECOM, including specific debugging screens with the Profibus bus.

■ PL7 Junior/Pro software: specific debugging and diagnostics screens with the Fipio bus (see left for example).

Description: pages 47 and 48 | Characteristics: pages 62 to 65 | References: pages 66 and 67 | Dimensions: pages 68 and 69 | Connections: pages 70 to 75

Fipio bus

Architecture



The Fipio field bus is an industrial standard for communication between different PLC components. This field bus complies with the WorldFip standard for production/consumption mechanisms. It is used for extending remote I/O to up to 15 km. Schneider Electric is a major promoter of Fipio bus technology, which supports the connectivity of PLCs, Lexium servodrives, Altivar starter motors, Magelis terminals and the partner products of the Schneider Alliances program.

Characteristics

Type of bus		Fipio bus
Compatibility Modicon automation platform		Premium (TSX P 57 153/253/2823/353/453/4823) or Atrium coprocessor (T PCX 57 353)
Profile		Open industrial medium complying with the World Fip standard
Transmission	Rate	1 Mbit/s
	Medium	150 W double twisted shielded pair
Length		Max. 1,000 m for an electrical segment Max. 3,000 m for an optical segment
Device addressing		1…62
Fipio utilities with Lexium MHDA servodrive	X-Way Uni-Te utilities	Access to all the parameters of the Lexium servodrives in read/write: □ "DRIVECOM" data for operating modes and fault management modes □ operating modes □ Motion Task movement data (realtime modification of acceleration, position and speed) □ external position, speed and torque setpoints □ servodrive status, path and fault data □ loading and downloading of the servodrive parameters (max. 128 bytes of data)
	Installation utility using PL7 Junior/Pro software	□ integrated installation screens (presymbolization of objects, management of double word length, debugging and diagnostics screens) □ "FDR" utility, operating context restoration for servodrive replacement
Configuration tool		Unilink software (version ⩾ 2.5)
Installation tool		PL7 Junior/Pro software (version 4.2, recommended 4.3)
Fipio communication card		Optional AM0 FIP 001V000 card
Cabling system	Wiring on MHDA servodrive	9-way SUB-D male connector
	T-Junction box	TSX FP ACC3/ACC4 block
	Derivation cable	TSX FP CC●00 cable
	Main cable	TSX FP CA/CR●00 cable

Description: pages 47 and 48
Characteristics: pages 62 to 65
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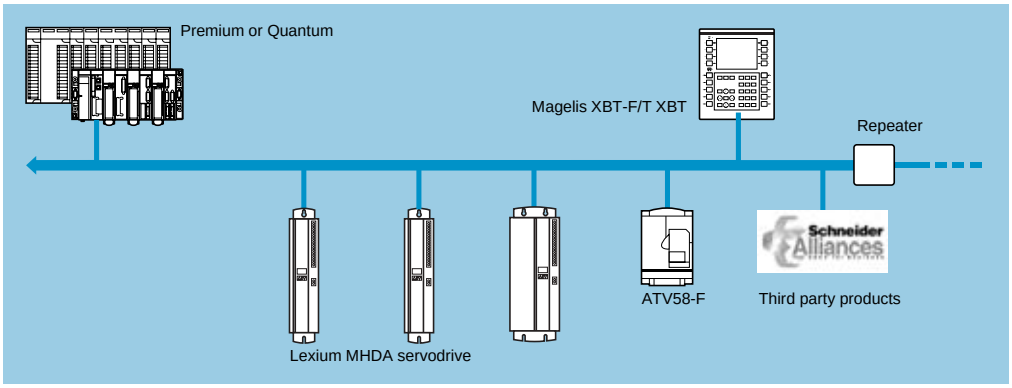
Modbus Plus network

Architecture



The Modbus Plus communication network is a high baud rate industrial network (up to 1 Mbit/s). It consists of a main segment and secondary segments concerning the use of accessories such as electric repeaters, optical repeaters or bridges.
The Modbus Plus network supports connectivity for Schneider products (PLCs, distributed I/O, ATV variable speeddrives, Magelis terminals with graphic screens etc. As part of the Schneider Alliances partnership, several third party products are compatible with the Modbus Plus network.

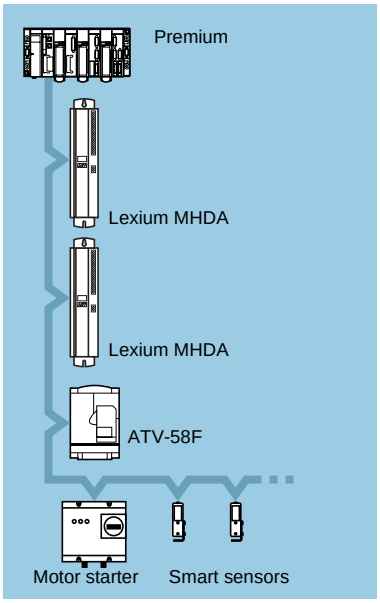
Characteristics

Type of network		Modbus Plus network
Compatibility Modicon automation platform		Premium, Quantum and Micro
Profile		Exchanges: □ Peer Cop 9 registers □ Global Data 18 registers □ Modbus Messaging
Transmission	Rate	500...1000 Kbit/s
	Medium	Twisted pair, optic fiber
Length		□ max. 450 m per segment □ max. 1,800 m with 3 repeaters
Device addressing		1...63
Modbus Plus utilities with Lexium MDHA servodrives	Peer Cop *(1)* Global data *(1)*	Read/write access to Lexium servodrive Status/Command data: □ "DRIVECOM" registers □ Setpoints (position, speed and torque) □ Run/Stop for Motion tasks □ "OPMODE" operating modes □ "STATCOD and ERRCOD" diagnostics, etc. The Global Data utility is only effective when transmitting data from Lexium servodrives
	Modbus Messaging	Access to all the above data as well as to the following parameters: □ Adjustment of torque, speed and position loops □ Monitoring (threshold, gap, etc.)
Configuration tool		□ PL7 Junior/Pro software with Premium platform □ Concept software with Quantum platform
Modbus Plus communication card		Optional AM0 MBP 001V000 card, requiring a Lexium 17D or 17D HP servodrive, version RL ≥ 08 (9-way SUB-D male connector)
Cabling system *(2)*	Junction boxes	□ IP 20 T-Junction box 990 NAD 230 00 Requires cabling tool ref. 043 509 383 □ IP 65 T-Junction box 990 NAD 230 10 (connection on screw terminals)
	Derivation cables	990 NAD 211 10/30 derivation cable (length 2, 4 or 6 m). Servodrive end of cable equipped with a 9-way SUB-D female connector and derivation end with free wires

(1) Utilities available only on the main segment of the Modbus Plus, and with Premium or Quantum platforms only.
(2) For other Modbus Plus network connection cables and accessories, consult our Premium platform and Quantum platform catalogs.

CANopen bus

Architecture



The CANopen bus is a field bus based on CAN low layers and components. It complies with standard ISO 11898 compliant. Thanks to its standard communication profiles, the CANopen bus can be used to ensure the opening and interoperability of various devices (servodrives, motor starters, smart sensors, etc.)

The CANopen bus is a multi-master bus, which guarantees a sure and deterministic access to realtime automation device data. The CSMA/CA type protocol is based on exchanges, transmitted cyclically or on event, which guarantee optimum use of the bandwidth. A messaging channel is also used to parameterize the slave devices.

Lexium MHDA servodrives are all equipped with a CANopen bus compatible interface (connector on X6, see pages 25 and 48).

Characteristics

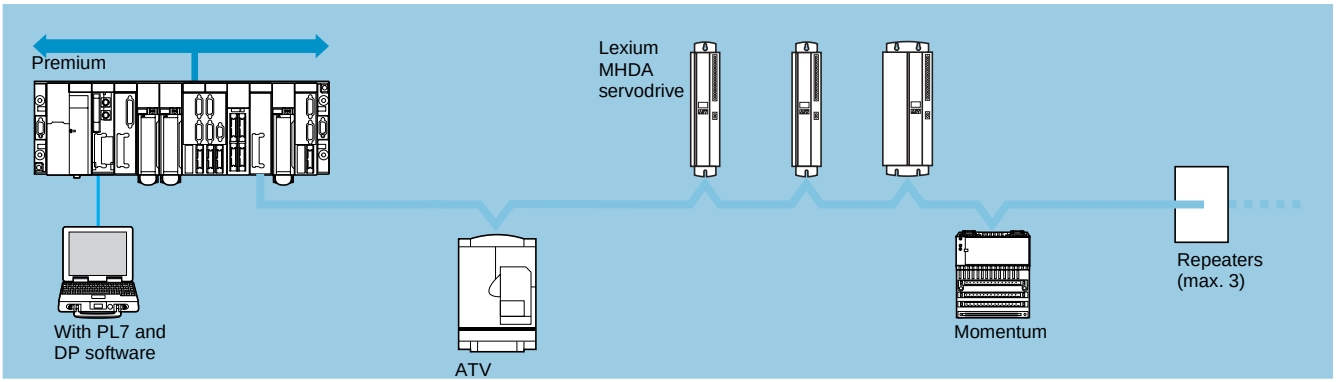
Type of bus		**CANopen bus**
CANopen communication		Integrated with the Lexium MHDA servodrive
Compatibility Modicon automation platform		Premium (with the PCMCIA card and SYS SPU LF● CD28M, SyCon CANopen configuration software)
Profile		CANopen DS with DSP 402 profile
Transmission	Rate	250...1000 Kbit/s
	Medium	Shielded twisted double pair
Length		Max. 20 m at 1 Mbit/s Max. 70 m at 500 Kbit/s Max. 115 m at 250 Kbit/s
Device addressing		0 to 63
CANopen utility with Lexium MHDA servodrive	PDO (Process Date Object) periodic exchange	Implicit read/write access to Lexium servodrive Status/Command data (using %MW words): □ Setpoints (position and torque) □ Stop/start "Motion Tasks" □ Command register/DRIVECOM status
	SDO messaging (Service Data Object)	Explicit access (by READ_VAR/WRITE_VAR function) to the following parameters: □ Adjustment of torque, speed and position loops □ Monitoring (threshold, gap, etc.) □ "OPMODE" operating modes □ "STATCOD and ERRCOD" diagnostics
	SYNC object	For applications requiring axis synchronization *(1)*
Configuration tool		SYS SPU LF● CD28M, SyCon configuration software
CANopen cabling system	Wiring on MHDA servodrive	A 9-way SUB-D male connector (addr. X6)
	T-Junction box	TSX CPP ACC1 (1 x 15-way SUB-D male connector on the device end and 2 9-way SUB-D male connectors on the bus end)
	Derivation cable	Client provision

(1) Function available with version SV≥4.51 MHDA servodrives.

Description: pages 47 and 48 | Characteristics: pages 62 to 65 | References: pages 66 and 67 | Dimensions: pages 68 and 69 | Connections: pages 69 to 75

Profibus DP bus

Architecture



The Profibus DP bus is a field bus that meets industrial communication requirements. Profibus DP has linear bus topology with a Master/Slave-type centralized access procedure.
The physical link is made by a single shielded twisted pair, although optical interfaces are available for establishing tree, star or ring structures.

4

Characteristics

Bus type		Profibus DP bus
Compatibility Modicon automation platform		Premium and Quantum
Profile		Industrial bus, line architecture with end of line resistance
Transmission/length	Baud rate/segment length	9.6 Kbit/s: 1,200m (4,800 m with 3 repeaters) at 12 Mbit/s 100 m (400 m with 3 repeaters)
	Medium	Twisted pair, optic fiber, infrared
Lexium servodrive addressing		1…62 (max. 32 Lexium servodrives, without repeater)
Profibus DP utilities with Lexium MDHA servodrives	PPO-type 2 profile	□ Access to all movement parameters and diagnostics parameters (4 words PKW) □ DRIVECOM command and status words □ Access to the different Motion Task command words (speed, torque, electronic gearing)
Configuration tool		SYS SPU LF● CD28M, SyCon configuration software
Installation tool		Unilink software (version ≥ 2.5)
Profibus DP communication card		Optional AM0 PBS 001V000 card
Cabling system	Wiring on Profibus DP communication card: AM0 PBS 001V000	9-way SUB-D female connectors 490 NAD 911 0●
	Daisy chaining cable	Profibus DP connection cable: TSX PBS CA 100/400 (length 100 m/400 m)

Description: pages 47 and 48 | Characteristics: pages 62 to 65 | References: pages 66 and 67 | Dimensions: pages 68 and 69 | Connections: pages 70 to 75

Characteristics of Lexium 17 D Servodrives

Lexium servodrives have been developed to comply with the main international standards which relate to electronic devices for international automation:

- Specific requirements : operating characteristics, immunity, ruggedness, safety, etc. EN 50178, EN 60139-1, EN 60204, UL 508C, IEC 1491 (for SERCOS cards).
- Conformity to the European directives on low voltage 73/23/EEC, electromagnetic compatibility 89/336/EEC and machinery 89/392/EEC.
- Conformity to the machine safety standard NF EN 292-1.
- Electrical quality of insulating materials (electrical equipment, printed circuit boards) UL 840.

Characteristics of Lexium 17 Servodrives

Type of module				MHDA 1004●00	MHDA 1008●00	MHDA 1017●00	MHDA 1028●00	MHDA 1056●00
Power supply	Voltage		**V rms**	∼ 208...480 V 3-phase ± 10%, 50/60 Hz (∼ 230 V authorized single-phase with derating)				
	Current		**A rms**	1.8	3.6	7.2	12	24
	Inrush current			Internal limitation				
	Neutral load			Compatible TN and TT loads. If the load is IT, it is necessary to use an isolation transformer on the power supply, see page 73.				
	External protection against overloads and short circuits	Via circuit-breaker Q1		**GV2-L10** (6.3 A)		**GV2-L14** (10 A)	**GV2-L16** (14 A)	**GV2-L22** (25 A)
		By fuse	**A**	6 type aM		10 type aM	16 type aM	25 type aM
Motor output	Permanent current		**A rms**	1.5/1.5 *(1)*	3/3 *(1)*	6/4 *(1)*	10/4 *(1)*	20/4 *(1)*
	Maximum current		**A rms**	3/3 *(1)*	6/4 *(1)*	12/4 *(1)*	20/4 *(1)*	40/4 *(1)*
	Motor choke		**mH**	16 min	8 min	4 min	3.5 min	1.5 min
	Cable length		**m**	max. 75 Use motor choke **AM0 FIL 001V056** for lengths ≥ 25 m				
Holding brake command	Nominal voltage		**V**	⎓ 24, supplied by the external power supply, see page 63				
	Current		**A**	1.7 max				
Resolver input	Frequency		**kHz**	8 ± 0.1 %				
	Voltage		**V rms**	4.75				
	Current		**mA rms**	35 max.				
	Transformation ratio			0.5				
	Resolution			14 bits *(2)*				
	Cable length		**m**	75 max				
SinCos absolute encoder input	Voltage		**V**	9 ± 5 %				
	Current		**mA**	200				
	Single-turn encoder			Resolution: 20 bits *(2)*				
	Multi-turn encoder			Resolution: 20 bits per revolution, number of revolutions: 12 bits *(2)*				
	Cable length		**m**	75 max. with Hiperface encoder, 50 m max. with EnDAT encoder				
Simulated encoder output	Type *(3)*			RS 485 differential, incremental format				
	Resolver resolution			512/1024 points				
	SinCos resolution			512/1024/2048/4096/8192/16384 points				
Master/Slave Interface				Use of the Master Lexium servodrive simulated encoder output to control up to 16 Slave Lexium servodrives (electric gearing function)				
Control loop performances				Adjustable with Unilink software				
	Torque		**µs**	62.5				
	Speed		**µs**	250				
	Position		**µs**	250				
	Speed scale		**rpm**	0…6000 (0...8000 with the BPH 055 motor)				
Discrete I/O	Number			5 isolated (1 drive enable input, 4 inputs configurable with Unilink software)				
	Voltage		**V**	⎓ 20…30				
	Current		**mA**	5 to 24 V				
	Limit values		**V**	At state 1: > 12, at state 0: < 7 status				
	Acquisition period		**ms**	1 in normal cycle, 0.050 in rapid cycle				
Discrete outputs	Number			2 isolated with current absorption (programmable with Unilink software)				
	Voltage		**V**	⎓ 20…30				
	Current		**mA**	10				
	Acquisition period		**ms**	1				

(1) The second value is provided for a power supply of ∼ 230 V single-phase
(2) Position precision depends on the associated SER/Lexium BPH motor, see pages 93 and 77.
(3) For use of the simulated encoder output in absolute SSI type, please consult our Regional Sales Offices.

Lexium 17D servodrive characteristics (continued)

Module type			MDHA 1004●00	MDHA 1008●00	MDHA 1017●00	MDHA 1028●00	MDHA 1056●00
Alarm output	Number		1 volt-free contact				
	Max voltage	**V**	⎓ 30, ∿ 42				
	Current	**mA**	500 (resistive load)				
Analog inputs	Number		2 non-isolated differentials (programmable with Unilink software)				
	Input range	**V**	± 10				
	Input impedance	**kΩ**	20				
	Resolution		14 bits channel 1, 12 bits channel 2				
	Common mode	**V**	± 10 between channels and ground				
	Acquisition period	**µs**	250				
Analog outputs (with MHDA servodrive)	Number		2 non-isolated (programmable with Unilink software)				
	Output range	**V**	± 10				
	Output impedance	**kΩ**	2.2				
	Resolution		10 bits				
	Conversion time	**ms**	5				
Asynchronous serial link	Type		RS 232 isolated				
	Rate	**bit/s**	9600				
	Transmission		8 data bits, 1 stop bit, no parity				
Dissipated internal power (at nominal current)		**W**	30	40	60	90	200
Braking power	3-phase servodrive power supply	**V**	230 / 400 / 480	230 / 400 / 480	230 / 400 / 480	230 / 400 / 480	230 / 400 / 480
	On internal resistor	Ω	66	66	33	33	33
	Max. continual PPr	**W**	80	80	200	200	200
	Peak (1s) PCr	**kW**	2.5 / 8 / 10.5	2.5 / 8 / 10.5	5 / 16 / 21	5 / 16 / 21	5 / 16 / 21
	Protection		Internal, electronic circuit-breaker				
	On external resistor	Ω	33				
	Continuous PPr	**kW**	0.25 / 0.40 / 0.50	0.25 / 0.40 / 0.50	0.75 / 1.2 / 1.5	0.75 / 1.2 / 1.5	0.75 / 1.2 / 1.5
	Peak (1s) PCr	**kW**	5 / 16 / 21	5 / 16 / 21	5 / 16 / 21	5 / 16 / 21	5 / 16 / 21
	Resistance to be associated		**AM0 RFE 001 V025** **AM0 RFE 001 V050**		**AM0 RFE 001 V150**		
	Protection by fuse F1		**GK1-DD + DF2-CN04** (2 x 4 A gC serial fuses)		**GK1-DD + DF2-CN06** (2 x 6 A gC serial fuses)		
Auxiliary power supply ⎓ 24 V (See page 115)	Limit values		For SER motors, see page 88 For BPH motors, see page 104				

Environment

Temperature	Operation	**C:**	0....45, 45...55 with derating of 2.5 %/°C (> 45 °C) of motor output current
	Storage	**C:**	- 25...+ 70
Relative humidity	Operation		85 % without condensation
	Storage		95 % without condensation
Pollution			Level 2 (EN 50178)
Altitude	Operation	**m**	0...1000, up to 2500 with derating of 1.5 %/100 m (above 1000 m) of motor output current
	Storage	**m**	0…4500
Withstand to vibrations	10…57 Hz	**mm**	Sinusoidal, amplitude of 0.075 during operation
	57…150 Hz		1 g during operation

Characteristics of Lexium 17D HP Servodrives

Lexium servodrives have been developed to comply with the main international standards which relate to electronic devices for international automation:

- Specific requirements: operating characteristics, immunity, ruggedness, safety, etc. EN 50178, EN 60439-1, EN 60204, UL 508C, IEC 1491 (for SERCOS cards).
- Conformity to the European directives on low voltage 73/23/EEC, electromagnetic compatibility 89/336/EEC and machinery 89/392/EEC.
- Compatibility with the machine safety standard NF EN 292-1.
- Electrical quality of insulating materials (electrical equipment, printed circuit boards) UL 840.

Lexium 17D HP servodrive characteristics

Module type				MDHA 1112A00	MDHA 1198A00
Power supply	Voltage		**V rms**	∼ 208...480 V 3-phase ± 10%, 50/60 Hz	
	Current		**A rms**	48	84
	Inrush current			Internal limitation	
	Neutral load			Compatible TN and TT loads. If the load is IT, it is necessary to use an isolation transformer on the power supply, see page 73.	
	External protection against overloads and short circuits	Via circuit-breaker Q1		**NS100LMA50** (50A)	**NS100LMA100** (100A)
		By fuse	**A**	50 type aM	80 type aM
Motor output	Permanent current		**A rms**	40	70
	Maximum current		**A rms**	80	140
	Motor choke		**mH**	0.75 min	0.38 min
	Cable length		**m**	75 max	
Holding brake command	Nominal voltage		**V**	⎓ 24, supplied by the external power supply, see page 63	
	Current		**A**	1.7 max	
Resolver input	Frequency		**kHz**	8 ± 0.1 %	
	Voltage		**V rms**	4.75	
	Current		**mA rms**	35	
	Transformation ratio			0.5	
	Resolution			14 bits *(1)*	
	Cable length		**m**	75 max	
SinCos absolute encoder input	Voltage		**V**	9 ± 5 %	
	Current		**mA**	200	
	Single-turn encoder			Resolution: 20 bits *(1)*	
	Multi-turn encoder			Resolution: 20 bits per revolution, number of revolutions: 12 bits *(1)*	
	Cable length		**m**	75 max. with Hiperface encoder, 50 m max. with EnDAT encoder	
Simulated encoder output	Type			RS 485 differential, incremental format	
	Resolver resolution			512/1024 points	
	SinCos resolution			512/1024/2048/4096/8192/16384 points	
Master/Slave Interface				Use of the Master Lexium servodrive simulated encoder output to control up to 16 Slave Lexium servodrives (electric gearing function)	
Control loop perfomances				Adjustable with Unilink software	
	Torque		**µs**	62.5	
	Speed		**µs**	250	
	Position		**µs**	250	
Discrete I/O	Number			5 isolated (1 drive enable input, 4 inputs configurable with Unilink software)	
	Voltage		**V**	⎓ 20…30	
	Current		**mA**	5 to 24 V	
	Limit values		**V**	At state 1: > 12, at state 0: < 7 status	
	Acquisition period		**ms**	1 in normal cycle, 0.050 in rapid cycle	
Discrete outputs	Number			2 isolated with current absorption (programmable with Unilink software)	
	Voltage		**V**	⎓ 20…30	
	Current		**mA**	10	
	Acquisition period		**ms**	1	

(1) Position precision depends on the associated SER/Lexium BPH motor, see page 93.

Description: pages 47 and 48 | Functions: pages 49 to 61 | References: pages 66 and 67 | Dimensions: pages 68 and 69 | Connections: pages 70 to 75

Lexium 17D HP servodrive characteristics (continued)

Module type			MHDA 1112A00			MHDA 1198A00		
Alarm output	Number		1 volt-free contact					
	Max voltage	**V**	⎓ 30, ∿ 42					
	Current	**mA**	500 (resistive load)					
Analog inputs	Number		2 non-isolated differential (programmable with Unilink software)					
	Input range	**V**	± 10					
	Input impedance	**kΩ**	20					
	Resolution		14 bits channel 1, 12 bits channel 2					
	Common mode	**V**	± 10 between channels and ground					
	Acquisition period	**µs**	250					
Analog outputs (with MHDA servodrive)	Number		2 non-isolated (programmable with Unilink software)					
	Output range	**V**	± 10					
	Output impedance	**kΩ**	2.2					
	Resolution		10 bits					
	Conversion time	**ms**	5					
Asynchronous serial link	Type		RS 232 isolated					
	Rate	**bit/s**	9600					
	Transmission		8 data bits, 1 stop bit, no parity					
Dissipated internal power (at nominal current)		**W**	400			700		
Braking power	3-phase servodrive power supply	**V**	230	400	480	230	400	480
	On external resistor	Ω	15			10		
	Max. continuity PPr	**kW**	6			6		
	Max. peak (1s) PCr	**kW**	10	35	45	16	50	70
	Resistor to be associated		**AM0 RFE 002 V086**			**AM0 RFE 002 V160**		
	Protection by fuse F1		**GK1-DD + DF2-CN16** (2 x 16 A gG serial fuses)			**GK1-DD + DF2-CN20** (2 x 20 A gG serial fuses)		
Auxiliary power supply ⎓ 24 V (See page 115)	Limit values		For BPH motors, see page 104					

Environment

Temperature	Operation	**C:**	0....45, 45...55 with derating of 2.5 %/°C (> 45 °C) of motor output current
	Storage	**C:**	- 25…+ 70
Relative humidity	Operation		85 % without condensation
	Storage		95 % without condensation
Pollution			Level 2 (EN 50178)
Altitude	Operation	**m**	0...1000, up to 2500 with derating of 1.5 %/100 m (above 1000 m) of motor output current
	Storage	**m**	0…4500
Withstand to vibrations	10…57 Hz	**mm**	Sinusoidal, amplitude of 0.075 during operation
	57…150 Hz		1 g during operation

Lexium motion control
Lexium Servodrives

MHDA 10 ●●N00A00

MHDA 10●●A00

MHDA 1056N00/A00

MHDA 1112/1198A00

Digital servodrives for brushless motor

Specific functions	Output current Permanent	Output current Discontinuous (5s)	Reference	Weight kg
Lexium 17D Servodrives				
No anti-start safety function				
Integral braking resistors, integral EMC filter	1.5 A rms	3 A rms	**MHDA 1004N00**	4.000
	3 A rms	6 A rms	**MHDA 1008N00**	4.000
	6 A rms	10 A rms	**MHDA 1017N00**	4.000
	10 A rms	20 A rms	**MHDA 1028N00**	4.000
	20 A rms	40 A rms	**MHDA 1056N00**	7.500
Integral anti-start safety function				
Integral braking resistors, integral EMC filter	1.5 A rms	3 A rms	**MHDA 1004A00**	4.000
	3 A rms	6 A rms	**MHDA 1008A00**	4.000
	6 A rms	10 A rms	**MHDA 1017A00**	4.000
	10 A rms	20 A rms	**MHDA 1028A00**	4.000
	20 A rms	40 A rms	**MHDA 1056A00**	7.500
Lexium 17D HP servodrives				
Integral anti-start safety function				
No integral braking resistors, no integral EMC filter, obligatory input choke *(1)* (to be ordered separately).	40 A rms	80 A rms	**MHDA 1112A00**	19.500
	70 A rms	140 A rms	**MHDA 1198A00**	21.000

Accessories for Lexium 17D Servodrives

Use	Functions	Reference	Weight kg
External braking resistors			
MDHA 1004/1008 servodrives	33 Ω, power 250 W	**AM0 RFE 001V025**	1.200
	33Ω, power 500 W	**AM0 RFE 001V050**	2.300
MDHA Servodrives 1017/1028/1056	33Ω, power 1,500 W	**AM0 RFE 001V150**	5.200
Motor choke			
Filter choke to be placed very close to the servodrive	For cable lengths between servodrive/motor of ≥ 25 m	**AM0 FIL 001V056**	–
Connecting cables			
Connection to	BPH motors	See page 107	–
	SER motors	See page 87	–
Documentation (not included with the MHDA servodrives)			
Lexium 17D User Guide		**890 USE 1200●** *(2)*	–
Servodrive replacement wiring			
Set of connectors for the Lexium 17D	Female screw connectors (X3, X4, X7, X8, X0A and X0B)	**AM0 SPA 001V000**	–

(1) Input choke is obligatory when the servodrive is not powered by an isolation transformer.
*(2) For the documentation, add to the end of the reference **0**: English, **1**: French, **2**: German, **3**: Spanish, **4**: Italian.*

Description: pages 47 and 48 | Functions: pages 49 to 61 | Characteristics: pages 62 to 65 | Dimensions: pages 68 and 69 | Connections: pages 70 to 75

Lexium motion control
Lexium servodrives

AM0 SER 001V000

AM0 FIP 001V000

AM0 MBP 001V000

AM0 PBS 001V000

Accessories for Lexium 17D HP servodrives

Use	Functions	Reference	Weight kg
External braking resistors			
MDHA 1112 Servodrives	15Ω, power 860 W	**AM0 RFE 002V086**	3.500
MDHA 1198 Servodrives	10Ω, power 1600 W	**AM0 RFE 002V160**	8.000
EMC input filters *(1)*			
MDHA 1112 Servodrives	42 A rms permanent	**AM0 EMC 118**	–
MDHA 1198 Servodrives	75 A rms permanent	**AM0 EMC 212**	–
Input chokes			
MDHA 1112 Servodrives	60 A rms permanent	**AM0 CHK 170** *(2)*	9.000
MDHA 1198 Servodrives	75 A rms permanent	**AM0 CHK 212** *(2)*	10.000
Connection cables			
Connection to BPH motors		See page 107	–
Documentation			
Lexium 17D HP user guide		**890 USE 1220●** *(3)*	–
Servodrive replacement wiring			
Set of connectors for the Lexium 17D HP	3 screw connectors (X3, X4 and X10)	**AM0 SPA 002V001**	–

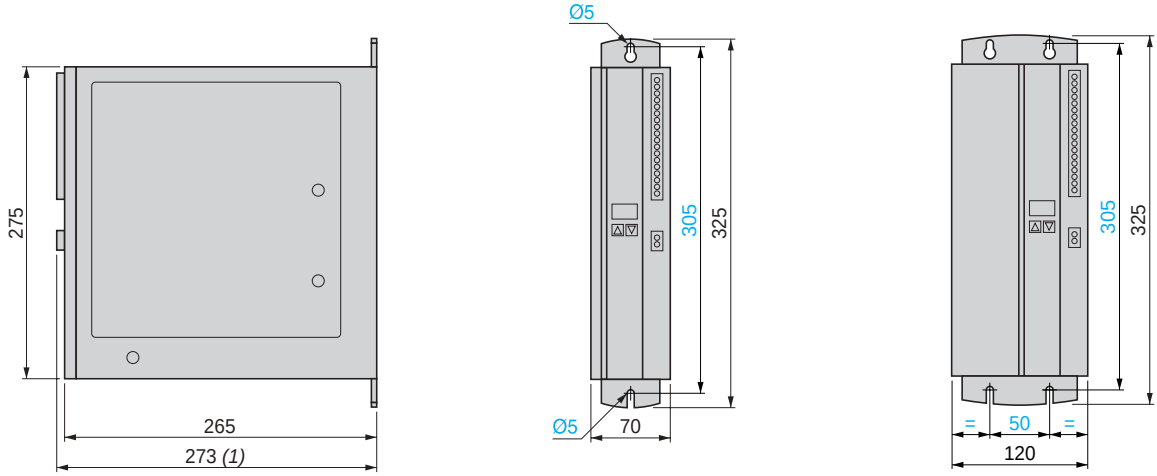
Shared accessories for Lexium servodrives

Use	Functions		Reference	Weight kg
"Lexium motion tools" CD-ROM containing the Unilink software and a set of documentation *(4)*				
Configuration and setting of the Lexium 17D servodrives from a PC terminal	Defines the type of servodrive and motor Sets the parameters for the servodrive and saves to the servodrive's EEProm memory		**AM0 CSW 001V300**	–
Connection cables				
Servodrive end connector (X5)	Master/Slave	2 m	**TSX CXP 283**	–
		6 m	**TSX CXP 683**	–
Connection to a compatible PC, equipped with Unilink software	SUB-D connector with 9 contacts at the PC end (3 m)		**AM0 CAV 001V003**	–
Connection to the CAY and CSY positioning modules	–		See pages 16 and 29	–
Optional items for MHDA servodrives (1 slot)				
SERCOS digital link card	SERCOS network		**AM0 SER 001V000**	0.150
Communication cards	Fipio bus *(5)* and *(6)*		**AM0 FIP 001V000**	0.140
	Modbus Plus network *(5)*		**AM0 MBP 001V000**	0.140
	Profibus DP bus *(5)* and *(6)*		**AM0 PBS 001V000**	0.140
Input/Output cards Discrete	14 discrete inputs/8 discrete outputs for controlling the MHDA servodrive integral position indexer		**AM0 INE 001V000**	0.180

(1) Radio interference filter element to be ordered when class A EMC (EN55011) resistance is necessary.
(2) Must be ordered with the servodrive. Do not order if an isolation transformer in IT load is used.
*(3) For the documentation, add to the end of the reference **0**: English, **1**: French, **2**: German, **3**: Spanish, **4**: Italian*
(4) For details, see page 50.
(5) Connection accessories, see wiring system pages 74 and 75.
(6) Requires Unilink software version ≥ V2.5, included in reference AM0 CSW 001V200.

Lexium 17D servodrives

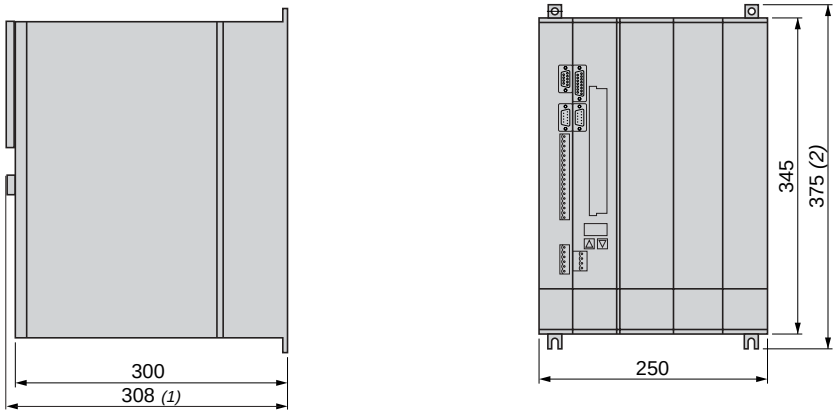
Common side view | **MHDA 1004/1008/1017/1028 ●00** | **MHDA 1056●00:**



(1) With connectors

Lexium 17D HP Servodrives

Common side view | **MHDA1112/1198 A00**

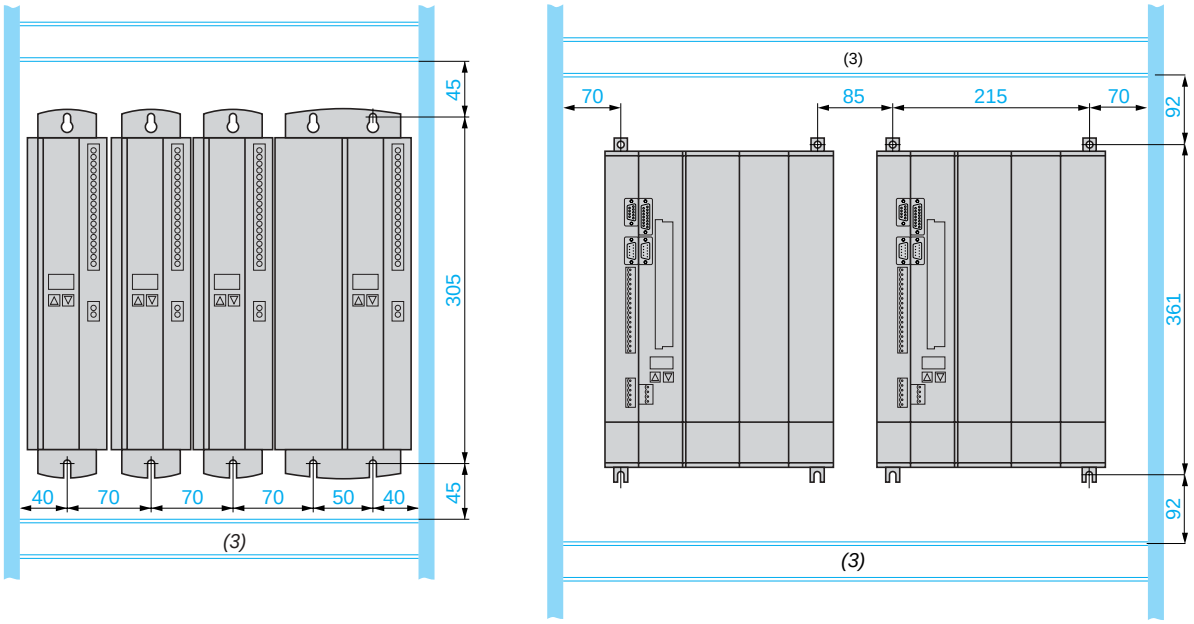


(1) With connectors

(2) 495 with grounding part

Mounting

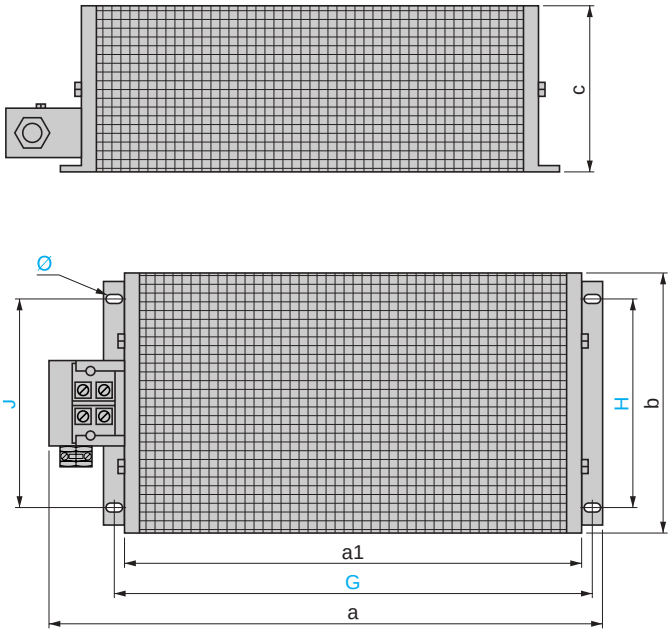
Lexium 17D servodrives | **Lexium 17D HP servodrives**



(3) Cable clip or ducting

Braking resistors

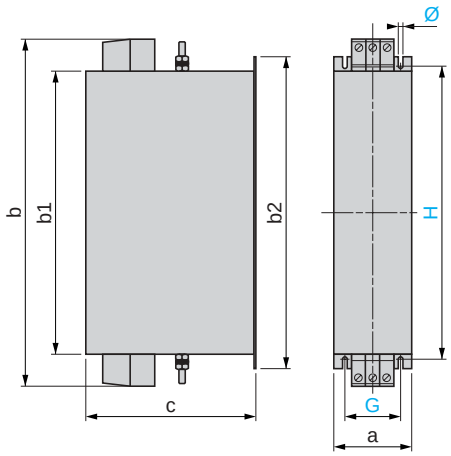
AM0 RFE 00●V●●●



AM0 RFE	a	a1	b	c	G	H	J	Ø
001 V025	412	330	66	77	390	44	35	4.5 x 9
001 V050	486	400	92	120	426	64	64	6.5 x 12
001 V150	586	500	185	120	526	150	150	6.5 x 12
002 V086	386	300	92	120	326	64	64	6.5 x 12
002 V160	570	500	182	130	526	150	150	5.5 x 8

EMC input filters (for Lexium 17D HP servodrives)

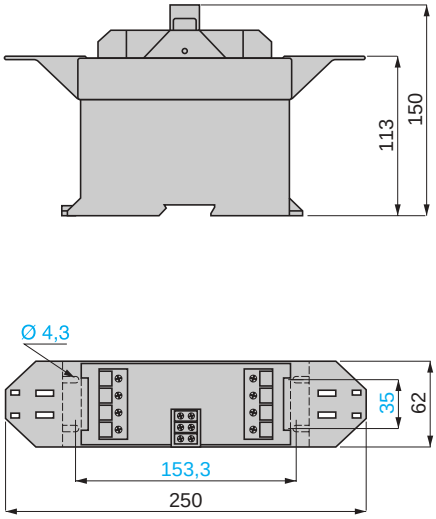
AM0 EMC ●●●



	a	b	b1	b2	c	G	H	Ø
AM0 EMC 118	60	355	305	335	150	35	320	7
AM0 EMC 212	80	380	300	330	185	55	314	7

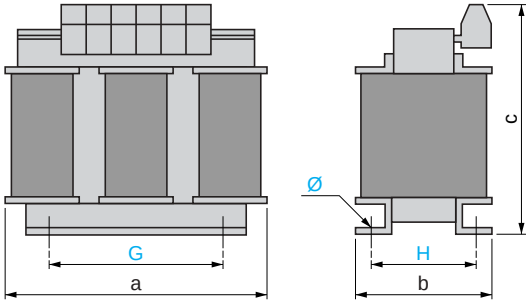
Motor choke (for Lexium 17D servodrives)

AM0 FIL 001V056



Input chokes (for Lexium 17D HP servodrives)

AM0 CHK ●●●



	a	b	c	G	H	Ø
AM0 CHK 170	190	110	255	170	58	8
AM0 CHK 212	190	120	255	170	68	8

Phaseo power supplies ⎓ 24 V

ABL/7RE 24●●

See page 117

Lexium motion control
Lexium servodrives

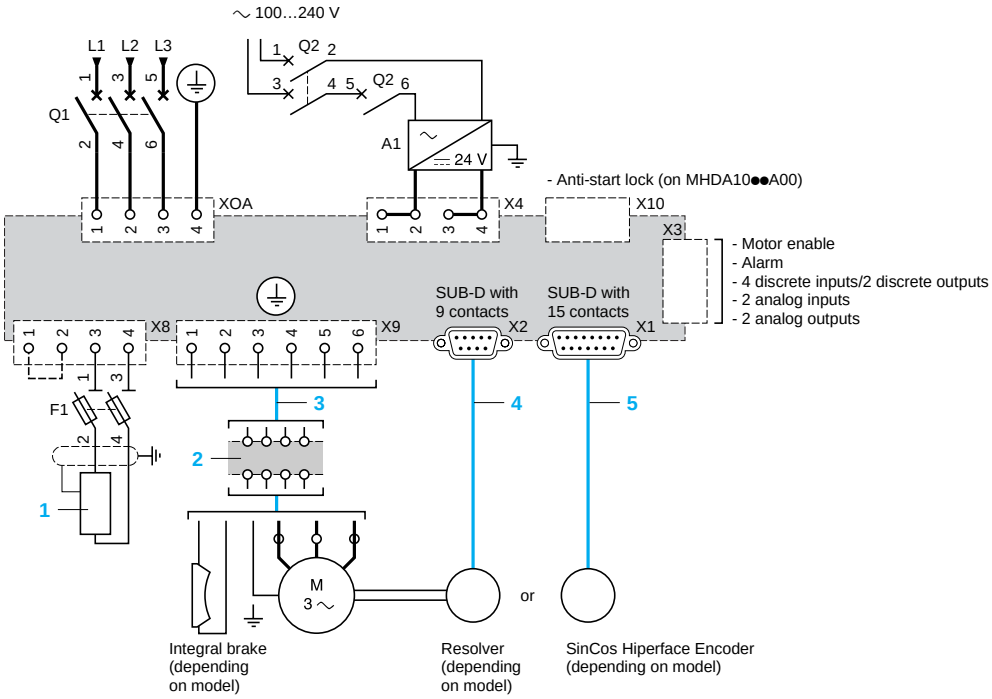
Connections for the Lexium 17D Servodrives

1 Braking resistor AM0 RFE 001V●●●.
2 Motor choke AM0 FIL 001V056 (required for servodrive/motor cable lengths ≥ 25 m). This inductance should be placed very closely to the servodrive (≤ 1 m).

Connection cables for SER or BPH motors:
3 Power cable.
4 Resolver cable.
5 SinCos Hiperface encoder cable.

The power, resolver or SinCos Hiperface cables offer two possibilities:
■ AGO FRU: Ready to use cables.
■ AGO KIT: extension cables (mounting of the connector on the servodrive end performed by the user).

For SER motors, see page 87
For BPH motors, see page 107



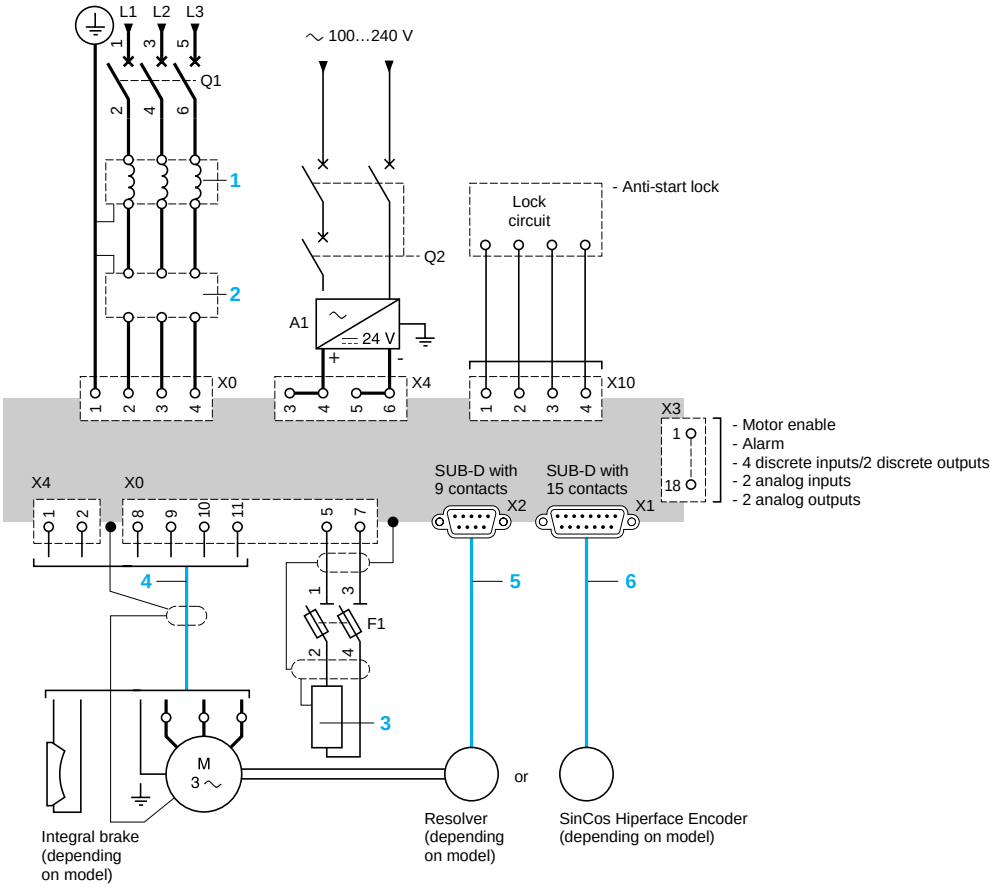
Additional components required

Address	Description
Q1	GV2-L magnetic circuit breaker, see page 62
Q2	GB2 or C60N thermal magnetic circuit breaker, see page 117
A1	Phaseo process power supply ⎓ 24 V ABL 7RE, see page 117
F1	GK1-DD bipolar fuse carrier (obligatory) with 10 x 38 DF2-CN04 (4 A) or DF2-CN06 (6 A) type gG cartridges, see page 63
	To connect the connectors X3 and X5 to the Premium motion control modules, see page 18, for X13 and X15, see page 31

(1) Max. length 1m.

Connections for the Lexium 17D HP servodrives

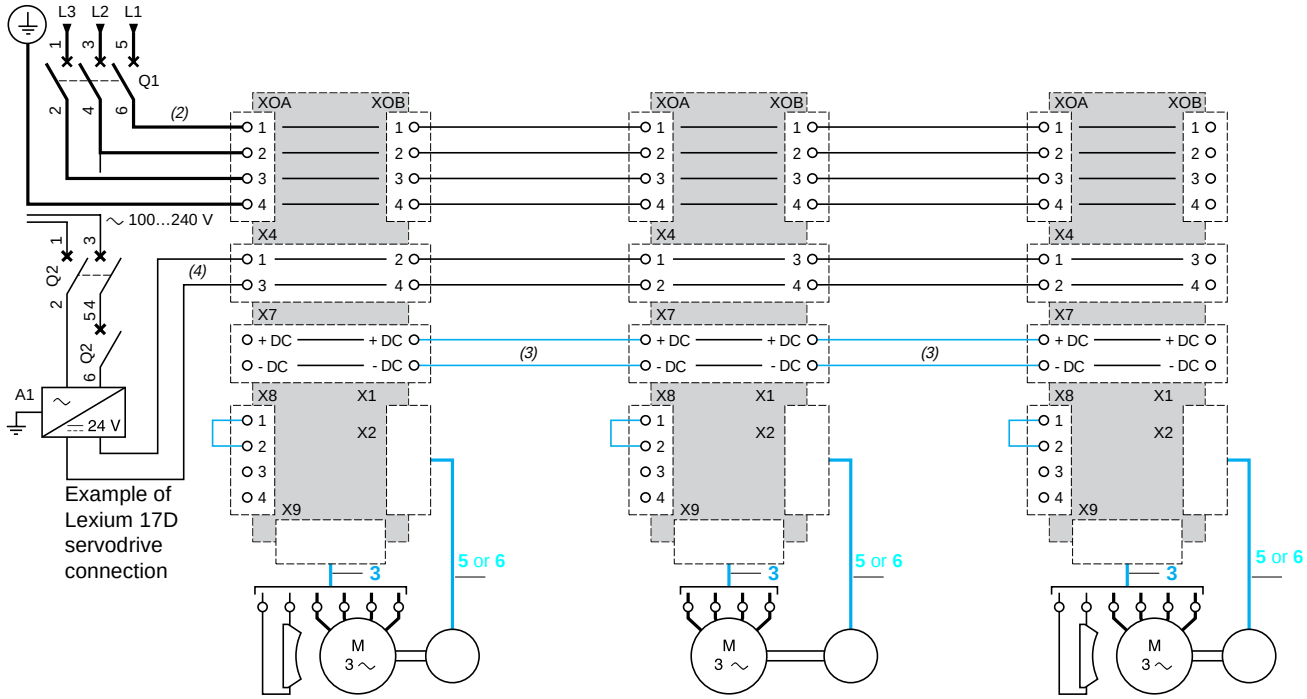
1 AM0 CHK 170/212 input choke (not to be used if power supply is via Schneider recommended insulation transformer, see page 73).
2 AM0 EMC 118/212 EMC input filter (if Class A is requested).
3 AM0 RFE 002V086/160 braking resistor.
Connection cables for SER/BPH motors:
4 Power cable.
5 Resolver cable.
6 SinCos Hiperface encoder cable.
The power, resolver or SinCos Hiperface cables offer two possibilities:
■ AGO FRU: Ready to use cables.
■ AGO KIT: extension cables (mounting of the connector on the servodrive end performed by the user for the resolver or SinCos encoder cable, connection on the screw terminal on the servodrive end for the power cable).
See page 107.



Additional components required

Address	Description
Q1	Magnetic circuit-breaker 50/100A NS100LMA 50/100, see page 64
Q2	GB2 or C60N thermal magnetic circuit breaker, see page 117
A1	Phaseo process power supply ⎓ 24 V ABL 7RE, see page 117
F1	GK1-DD bipolar fuse carrier (obligatory) with 10 x 38 DF2-CN16 (16 A) or DF2-CN20 (20 A) type gG cartridges, see page 63
	To connect the connectors X3 and X5 to the Premium motion control modules, see page 18, for X13 and X15, see page 31.

Example of connecting a set of Lexium 17D servodrives with a distribution of braking energy (links on X7 connectors) (1)

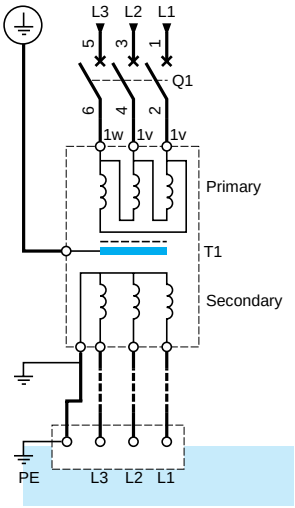


Example of Lexium 17D servodrive connection

For keys 3, 5 and 6: See page 70

(1) The same connection principle for connecting the Lexium 17D HP servodrive power buses in parallel is possible. Please consult our Regional Sales Offices.
(2) Circuit-breaker Q1 and the power supply cables must be of sufficient size to provide protection against overloads and short-circuits on each servodrive. The connectors (XOA, XOB) limit the line current to 20 A rms, therefore for line currents > 20 A rms use the separate power supplies and protection devices.
(3) Cables for connecting the power buses in parallel: using non-shielded cables for lengths ⩽20 cm. For lengths > 20 cm, use shielded cables (maximum length 10 meters). The connectors (X7) are limited to 20 A.
(4) On the X4 connectors for the main servodrive, check that the sum of ⎓ 24 V power supply currents for the servodrives and the holding brakes is ⩽ 10 A.

Connection of Lexium servodrives with installation in IT neutral load (insulated or impedance neutral)



In this type of installation, a 3-phase BT/BT transformer is inserted in the supply circuit for the servodrives, which also allows a TT load network to be re-built on the secondary side. This plan, with a secondary star transformer, also meets the following requirements:

■ Protection of personnel.

■ Adaptation of the supply voltage. In the case of associating a MHDA 1004 servodrive with a BPH 055 motor, use a 400/230 V transformer to obtain the optimum performances for the servodrive, see page 95.

Adding an insulation transformer dispenses of the use of a AM0 CHK●●● input choke.

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

The dimensions of the transformers are defined by the following formulae

■ Lexium servodrives with independent power supply (one transformer per servodrive):

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

where Pu: unitary power (KVA), Un: Nominal input voltage (V), In: permanent current (A), K = 0.9: reduction factor of the servodrive and 1.5 factor that takes into account the call and peak currents of the servodrive.

■ Lexium servodrives with common power supply (one transformer for n servodrives):

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

If Pm < Pu of the largest servodrive, take Pm = Pu of the largest servodrive.
where Pm: power used (KVA) and Pu: servodrive unitary power (KVA). Formula not applicable for permanent operation (S1 mode).

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

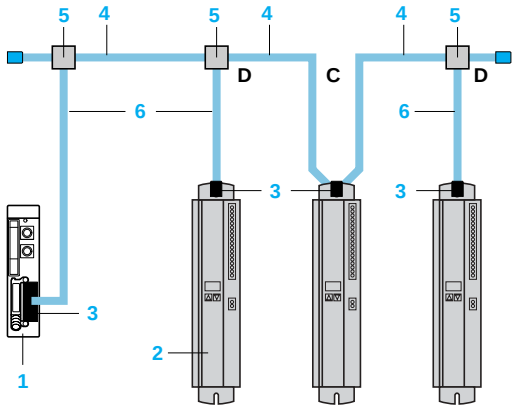
Lexium servodrives with independent power supply			**MHDA**	**1004**	**1008**	**1017**	**1028**	**1056**	**1112**	**1198**		
	Required power Pu	230 V rms *(1)*	**kVA**	0,81	–							
		400 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	19	38	66		
Merlin Gerin 3-phase T1 BT/BT transformer to be associated	Nominal transformer power	230 V rms *(1)*	**kVA**	2.5	–							
		400 V rms *(1)*	**kVA**	2.5	4	6.3	10	20	40	80		
	Reference	400/230 V rms		**84010**	**–**							
		400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84038**	**84041**	**84044**		
Lexium servodrives with common power supply			**kVA**	**2,5**	**4**	**6,3**	**10**	**20**	**40**	**80**	**160**	**250**
Power required Pm	**Reference**	400/230 V rms		**84010**	**84012**	**84013**	**–**					
		400/400 V rms		**84030**	**84032**	**84033**	**84035**	**84038**	**84041**	**84044**	**84047**	**84049**

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

Lexium servodrives with independent power supply			**MHDA●**	**1004**	**1008**	**1017**	**1028**	**1056**	**1112**	**1198**		
	Required power Pu	230 V rms *(1)*	**kVA**	0.81	–							
		460 V rms *(1)*	**kVA**	1.4	2.8	5.6	9.4	19	38	66		
Square D 3-phase T1 BT/BT transformer to be associated	Nominal transformer power	230 V rms *(1)*	**kVA**	–	–							
		460 V rms *(1)*	**kVA**	–	–	7.5	11	20	40	75		
	Reference	460/230 V rms		**–**	**–**							
		460/460 V rms		**–**	**–**	**7T145 HDIT**	**11T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**		
Lexium servodrives with common power supply			**kVA**	**2.5**	**4**	**7.5**	**11**	**20**	**40**	**75**	**145**	**220**
Power required Pm	**Reference**	460/230 V rms		*(2)*	*(2)*	**7T144 HDIT**	**11T144 HDIT**	**–**				
		460/460 V rms		*(2)*	*(2)*	**7T145 HDIT**	**11T145 HDIT**	**20T145 HDIT**	**40T145 HDIT**	**75T145 HDIT**	**145T145 HDIT**	**220T145 HDIT**

(1) For 3-phase secondary voltage,
(2) contact our Regional Sales Offices.
Unit equivalence: 1 kW = 0.746 HP.

Connecting Lexium MHDA servodrives to the Fipio bus



Premium bus manager

D: tap link connection
C: daisy-chain connection

1 **TSX P57●53M**: Premium processor with integrated Fipio bus link manager.

2 **MHDA 1●●●N00/A00**: Lexium 17D or 17D HP servodrives, equipped with an optional AM0 FIP 001V00 communication card.

3 **TSX FP ACC2/ACC12**: 9-way SUB-D female connector. Used to provide a tap link or daisy-chain connection (case of 2nd servodrive).

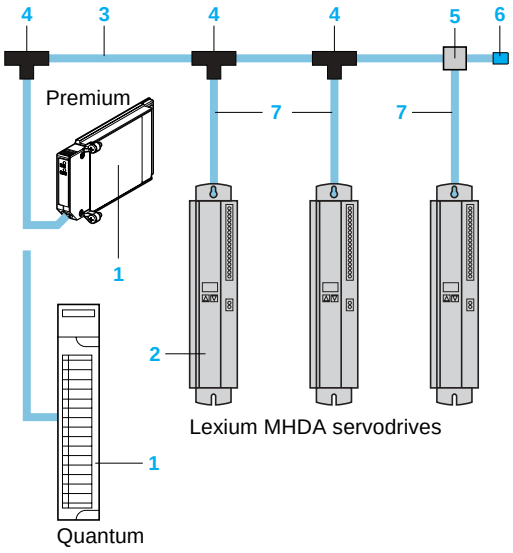
4 **TSX FP CA/CR●●00**: trunk cable, shielded twisted pair. In lengths of 100, 200 or 500 m.

5 **TSX FP ACC4/ACC3**: IP 65 (TSX FP ACC4) or IP 20 (TSX FP ACC3) T-junction box.

6 **TSX FP CC●00**: derivation cable, 2 shielded twisted pairs. In lengths of 100, 200 or 500 m.

Other connection elements: consult our “Premium automation platform” catalogue

Connecting Lexium MHDA servodrives to the Modbus Plus network



1 **TSX MBP 100**: Modbus Plus PCMCIA card to be placed in processor's type III slot on the Premium platform with the **TSX MBP CE 030/060** derivation cable (3 m or 6 m in length).
140 CPU ●●● ●● ●: Quantum platform processor.

2 **MHDA 1●●● N00/A00**: Lexium 17D or 17D HP servodrives, equipped with the optional AM0 MBP 001V000 Modbus Plus communication card.

3 **490 NAA 2710●**: main cable, shielded twisted pair with shielding drain (free wire end). In lengths of 0.25, 0.72, 3 or 10 m.

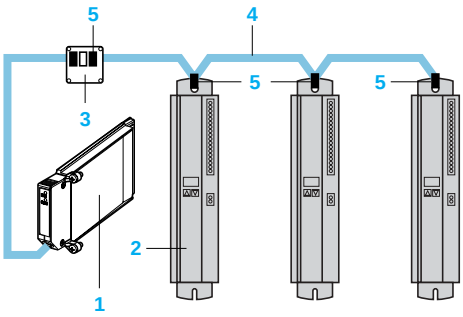
4 **990 NAD 230 10**: IP 20 T-junction box (in plastic) to connect one device. Adapts the impedance when installed at the end of the line (connecting the connectors requires the 043 509 383 cabling tool).

5 **990 NAD 230 10**: IP 65 T-junction box (in zamac) to connect one device (connection on screw terminals). Has an RJ 45 type connector to connect a programming and maintenance terminal.

6 **990 NAD 230 11**: lot of 2 impedance line terminators (990 NAD 230 11 adapter) for the 990 NAD 230 10 box, to be placed at the end of each segment.

7 **990 NAD 211 10/30**: derivation cable with a 9-way SUB-D male connector at the device end and a junction box with free wires. In lengths of 2.4 m or 6 m.

Connecting Lexium MHDA servodrives to the CANopen bus



Premium Lexium MHDA servodrives

The CANopen bus is integrated as standard in Lexium servodrive.

1 **TSX CPP 100**: CANopen card to be placed in the processor's type III slot on the Premium platform. Card supplied with 0.6 m length cable.

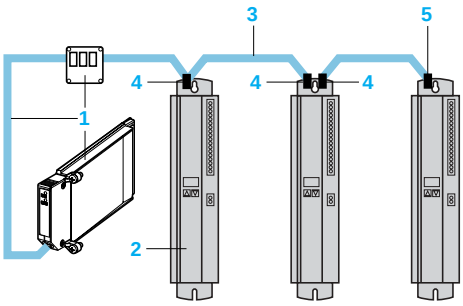
2 **MHDA 1●●● N00/A00**: Lexium 17D or 17D HP servodrives (connecting to the connector, add. X6).

3 **TSX CPP ACC1**: junction box equipped with SUB-D male connectors (one with 15 contacts and two with 9 contacts).

4 Cable: a shielded twisted pair (impedance 100/120 Ω, capacity 60 nF/km max., resistance 159.8 Ω/km).

5 9-way SUB-D female connector. 120 Ω 1/4 W resistor to be provided at the line end.

Connecting Lexium MHDA servodrives to the Profibus DP bus.



Premium Lexium MHDA servodrives

1 **TSX PBY 100**: Profibus DP module set (host module, PCMCIA card and junction box) to be placed in the Premium platform rack.
140 CRP 811 00: Profibus DP module set (host module, PCMCIA card and junction box) to be placed in the Quantum platform rack.

2 **MHDA 1●●● N00/A00**: Lexium 17D or 17D HP servodrives, equipped with an optional AM0 PBS 001V000 Profibus DP communication card.

3 **TSX PBS CA 100/200**: Profibus DP connection cable: In lengths of 100 or 400 m.

4 **490 NAD 911 04**: 9-way SUB-D male connector for intermediate connection (gray).

5 **490 NAD 911 03**: 9-way SUB-D male connector for end of line (yellow).

490 NAD 911 05: 9-way SUB-D male connector for intermediate connection. Has a 9-way SUB-D female connector (for example for connecting a programming terminal).

4

Lexium motion control
SER brushless motors

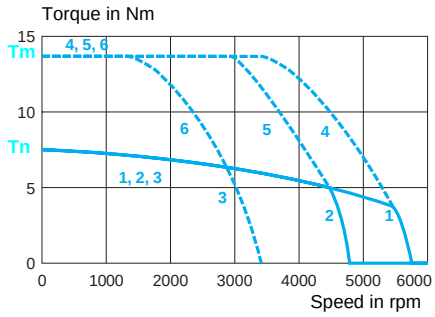
Presentation

SER AC brushless motors are equipped with Neodymium Iron Borium (NdFeB) magnets and provide a high level of density power within a confined space, as well as a dynamic velocity range that meets all machine requirements. Thermal protection is provided by an integral probe in the motor. These support high overloads without risk of demagnetization. SER motors are certified "Recognized" (*UR*) by the Underwriters Laboratories. They are compliant with standard UL1004 and with European directives (marking CE).

Depending on the model, SER motors are available with a holding brake and gearbox.

MHDA servodrives, which are associated with SER motors, deliver a sinusoidal wave allowing perfect rotation, even at low speed.

Speed/torque characteristics

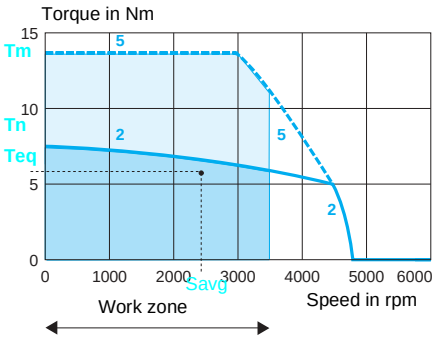


SER motors show torque/speed profiles similar to the example opposite with:

1 Continuous torque at 480 V, 3-phase.
2 Continuous torque at 400 V, 3-phase.
3 Continuous torque at 230 V, 3-phase.
4 Peak torque at 480 V, 3-phase.
5 Peak torque at 400 V, 3-phase.
6 Peak torque at 230 V, 3-phase.

where:
6000 (in rpm) corresponds to the motor's maximum mechanical speed.
Tn (in Nm) represents the continuous stall torque value.
Tm (in Nm) represents the peak stall torque value.

Principle for determining the size of the motor according to the application



Torque/speed curves enable the optimum size of a motor to be determined. For example, for a supply voltage of 400 V, 3-phase, the useful graphs are graphs 2 and 5. The time diagram of speeds and torques according to the motor cycle must also be defined (see page 110):

1 Locate the work zone of the application in speed.

2 Verify, using the motor cycle time diagram, (see page 110), that the torques required by the application during the different cycle phases are located within the area bounded by graph 5 in the work zone.

3 Calculate the average speed S_{avg} and the equivalent thermal torque T_{eq} (see page 110).

4 The point defined by S_{avg} and T_{eq} must be within the area bounded by graph 2 in the work zone.

Lexium motion control
SER brushless motors

Functions

General functions

SER brushless motors have been developed to meet to the following requirements:
- Functional characteristics, robustness, safety, etc. in compliance with IEC 34-1.
- Ambient operating temperature: - 25...40 °C according to DIN 50019R14.
- Relative humidity: ⩽ 75 % yearly average/95 % for 30 days without condensation.
- Storage and transport temperature: - 25...70 °C.
- Winding insulation class: F (threshold temperature for windings 150 °C) according to VDE 0530.
- Supply and sensor connections using angled connectors rotatable over 310 °.
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium servodrive.
- Out-of-round, concentricity and perpendicularity between flange and shaft as per DIN 42955, class N.
- Flange compliant with standard DIN 42948.
- Permitted mounting positions: no mounting restriction for IMB5 - IMV1 and IMV3 as per DIN 42950.
- Polyester resin based paint: opaque black RAL 9005.

Functions

- Degree of protection of the motor casing: IP 56 as per IEC 529.
- Degree of protection of the shaft end: IP 41 as per IEC 529, IP 56 as option.
- Degree of protection of the gearbox (depending on model): IP 54 as per IEC 529.
- Integrated sensor, 2 pole resolver or SinCos Hiperface high-resolution multi-revolution absolute encoder.
- Standard sized shaft end (as per DIN 42948):
  - for motors without gearbox: smooth shaft end *(1)*,
  - for motors with gearbox: shaft end with key.

Holding brake (depending on model)

The integral brake fitted on the SER motor (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ Use of the holding brake as a dynamic brake for deceleration purposes will rapidly cause damage to it.

Built-in encoder

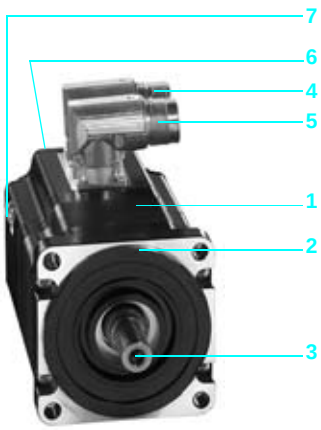
The motor has a position sensor which, depending on the model, can be:
- A 2-pole resolver providing a precision of the angular position of the shaft to less than ± 6 arc minutes.
- A SinCos Hiperface high-resolution absolute encoder, multi-revolution (4096 revolutions) making the angular position of the shaft precise to less than ± 45 arc seconds.

These sensors make it possible to:
- Give the angular position of the rotor in such a way that flows can be synchronized.
- Measure the motor speed via the associated Lexium servodrive. This information is used by the speed regulator of the Lexium servodrive.
- May measure position information for the position controller of the Lexium servodrive.
- Measure and transmit, if required, position information in incremental or absolute format, for the position return of a motion control module ("simulated encoder" output of the Lexium servodrive).

(1) For shaft end with key, consult our Regional Sales Offices.

Description: page 78
Characteristics: pages 79 to 84
References: pages 86 and 87
Dimensions: page 85

Lexium motion control
SER brushless motors



Description

SER brushless motors with a 3-phase stator and an 8 pole rotator with Neodymium Iron Borium magnets (NdFeB) comprising:

1 Housing with a square cross-section, protected by black opaque polyester resin paint RAL 9005.

2 Axial flange with 4 fixing points complying with DIN 42948.

3 A smooth shaft end of standard DIN 42948 *(1)*.

4 A dust and damp-proof male screw connector for connecting the power cable. The output of this connector is continuously rotatable over an arc of 310°.

5 A dust and damp-proof male screw connector for connecting the resolver or encoder cable. The output of this connector is continuously rotatable over an arc of 310°.

6 A manufacturer's data plate located on the side opposite the shaft end.

7 A ground terminal.

Connector to be ordered separately, for connecting to Lexium MHDA servodrives. See page 87.

Schneider Electric has taken great care to find the most appropriate match between SER motors and MHDA servodrives. This compatibility is only guaranteed when cables sold by Schneider Electric are used (see page 87).

(1) For shaft end with key, consult our Regional Sales Offices.

5

Lexium motion control
SER brushless motors

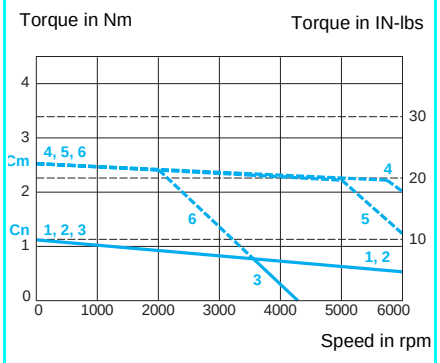
Characteristics of motors SER 39A/39B/39C

Type of motor				SER 39A 4L7S		SER 39B 4L3S		SER 39C 4L3S	
Torque (model without gearbox)	Associated with Lexium servodrive			**MHDA 1004●00**	**MHDA 1008●00**	**MHDA 1008●00**	**MHDA 1017●00**	**MHDA 1008●00**	**MHDA 1017●00**
	Continuous stall	Tn	**Nm**	1.1		2.2		2.4	2.9
	Peak stall	Tm	**Nm**	2.5	4.0	4.4	8.0	4.7	9.4
Current	Permanent		**A rms**	1.3	1.3	3	3	3	3.7
	Maximum		**A rms**	3	6	6	12	6	12
Demagnetization current			**A**	6		12		18	
Maximum speed			**rpm**	6000					
Constants (at 25 °C)	Torque		**Nm/A rms**	0.85		0.73		0.78	
	Back emf		**V rms s/ rad**	0.48		0.46		0.48	
Rotor	Number of poles			8					
	Inertia without brake	Jm	**gm²**	0.085		0.16		0.24	
	Inertia with brake	Jm	**gm²**	0.105		0.18		0.26	
Stator (at 25 °C)	Resistance (phase/phase)		Ω	13		5.4		3.3	
	Inductance (phase/phase)		**mH**	47.9		20.3		14.1	
	Electrical time constant		**ms**	3.68		3.76		4.27	
Holding brake (depending on model)				See page 88					
gearbox (depending on model)				See page 89					

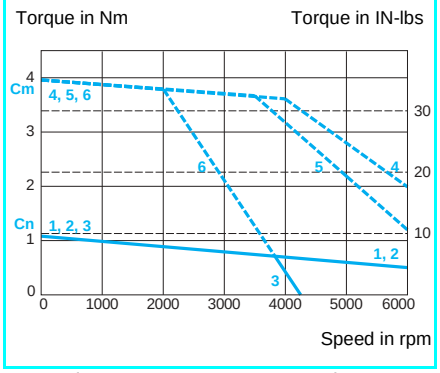
Speed/torque graphs *(1)*

SER 39A 4L7S motors

■ **with MHDA 1004●00 servodrives**

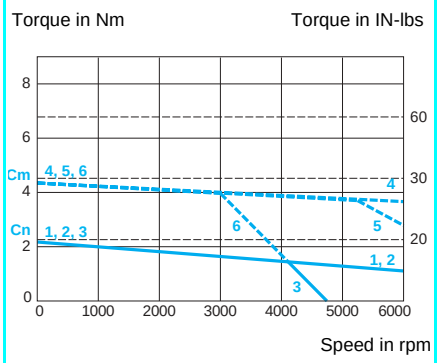


■ **with MHDA 1008●00 servodrives**

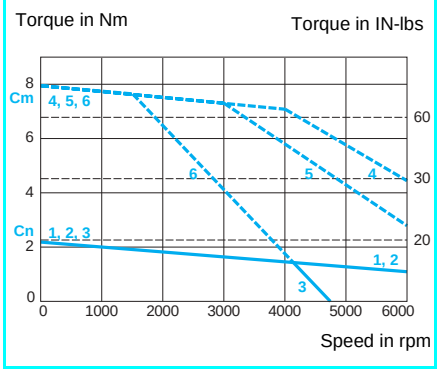


SER 39B 4L3S motors

■ **with MHDA 1008●00 servodrives**

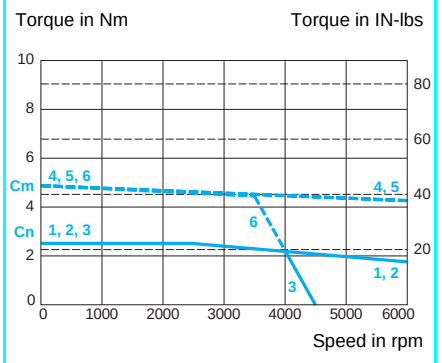


■ **with MHDA 1017●00 servodrives**

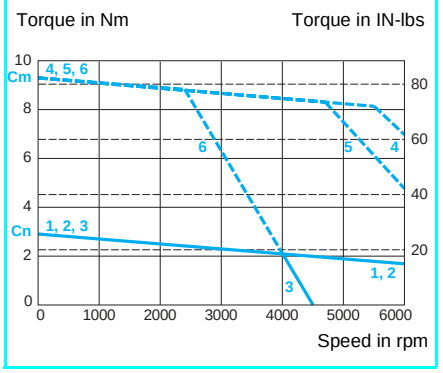


SER 39C 4L3S motors

■ **with MHDA 1008●00 servodrives**



■ **with MHDA 1017●00 servodrives**



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V, 3-phase
5 Peak torque at 400 V, 3-phase
6 Peak torque at 230 V, 3-phase

(1) The graphs above are given for an increase in motor temperature of 85 °C.

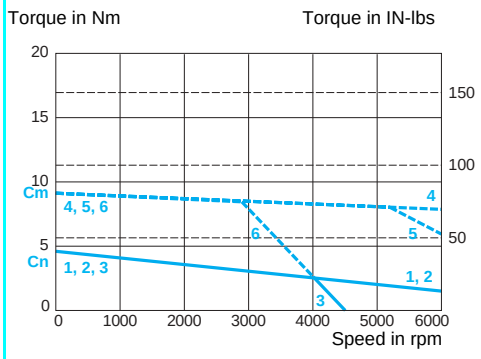
Characteristics of SER 3BA motors

Type of motor				SER 3BA 4L3S		SER 3BA 4L5S	
Torque (model without gearbox)	Associated with Lexium servodrive			**MHDA 1017●00**	**MHDA 1028●00**	**MHDA 1008●00**	**MHDA 1017●00**
	Continuous stall	Tn	**Nm**	4.6		4.2	4.5
	Peak stall	Tm	**Nm**	9.2	15.3	7.6	15.0
Current	Permanent		**A rms**	6		3	3.2
	Maximum		**A rms**	12	20	6	12
Demagnetization current			**A**	30		16.5	
Maximum speed			**rpm**	6000		5500	
Constants (at 25°C)	Torque		**Nm/A rms**	0.76		1.41	
	Back emf		**V rms s/ rad**	0.42		0.74	
Rotor	Number of poles			8			
	Inertia without brake	Jm	**gm²**	0.4			
	Inertia with brake	Jm	**gm²**	0.43			
Stator (at 25 °C)	Resistance (phase/phase)		Ω	1.5		4	
	Inductance (phase/phase)		**mH**	12.6		34.1	
	Electrical time constant		**ms**	8.40		8.53	
Holding brake (depending on model)				See page 88			
Gearbox (depending on model)				See page 89			

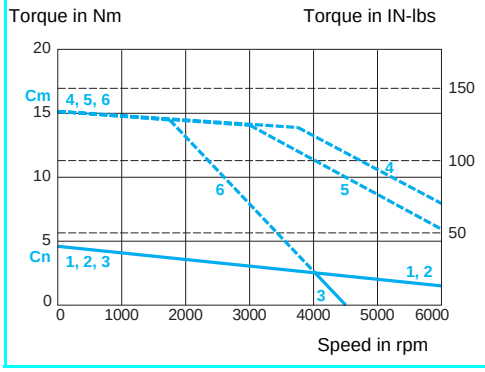
Speed/torque graphs *(1)*

SER 3BA 4L3S motors

■ **with MHDA 1017●00 servodrives**

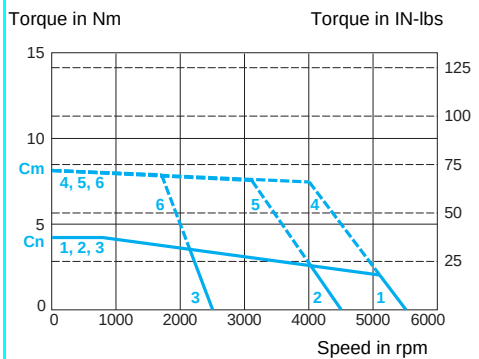


■ **with MHDA 1028●00 servodrives**

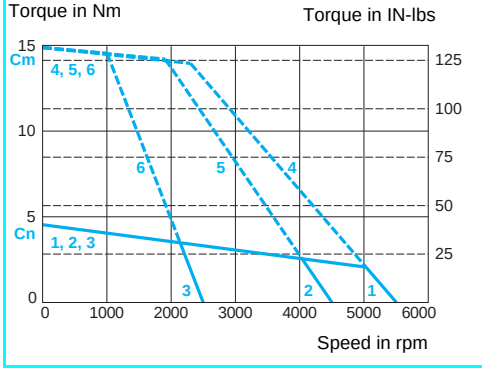


SER 3BA 4L5S motors

■ **with MHDA 1008●00 servodrives**



■ **with MHDA 1017●00 servodrives**



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The graphs above are given for an increase in motor temperature of 85 °C.

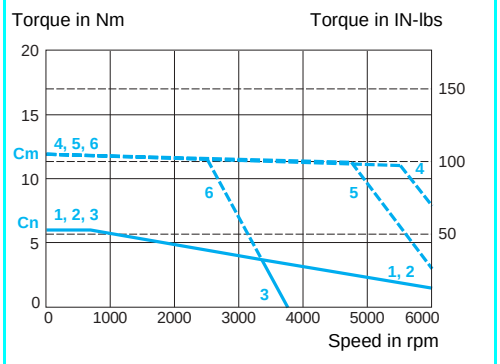
Characteristics of SER 3BB motors

Type of motor				SER 3BB 4L3S		SER 3BB 4L5S	
Torque (model without gearbox)	Associated with Lexium servodrive			**MHDA 1017●00**	**MHDA 1028●00**	**MHDA 1017●00**	**MHDA 1028●00**
	Continuous stall	Tn	**Nm**	6.0	6.6	6.6	
	Peak stall	Tm	**Nm**	12.0	20.0	15.8	25.0
Current	Permanent		**A rms**	6	6.6	5	5
	Maximum		**A rms**	12	20	12	20
Demagnetization current			**A**	32		24	
Maximum speed			**rpm**	6000		5800	
Constants (at 25 °C)	Torque		**Nm/A rms**	1.00		1.32	
	Back emf		**V rms s/ rad**	0.56		0.78	
Rotor	Number of poles			8			
	Inertia without brake	Jm	**gm²**	0.8			
	Inertia with brake	Jm	**gm²**	0.83			
Stator (at 25 °C)	Resistance (phase/phase)		Ω	1.2		2.3	
	Inductance (phase/phase)		**mH**	11.3		21.2	
	Electrical time constant		**ms**	9.42		9.22	
Holding brake (depending on model)				See page 88			
Gearbox (depending on model)				See page 89			

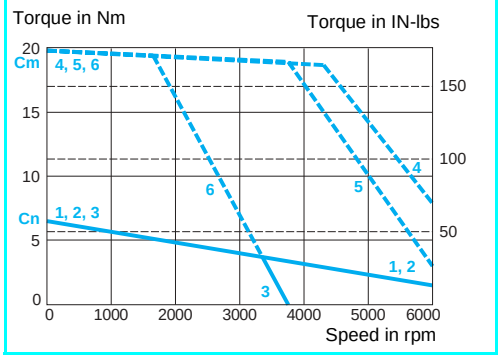
Speed/torque graphs *(1)*

SER 3BB 4L3S motors

■ with MHDA 1017●00 servodrives

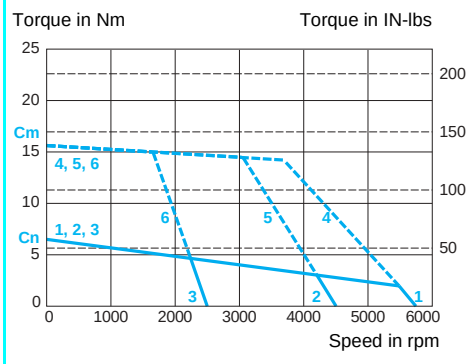


■ with MHDA 1028●00 servodrives

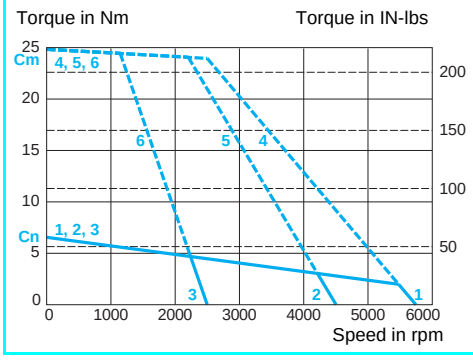


SER 3BB 4L5S motors

■ with MHDA 1017●00 servodrives



■ with MHDA 1028●00 servodrives



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The graphs above are given for an increase in motor temperature of 85 °C.

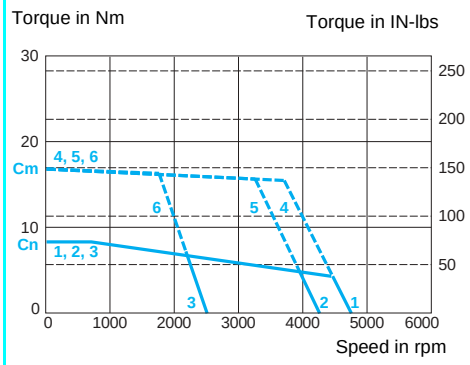
Characteristics of SER 3BC motors

Type of motor				SER 3BC 4L5S		SER 3BC 4L7S	
Torque (model without gearbox)	Associated with Lexium servodrive			**MHDA 1017●00**	**MHDA 1028●00**	**MHDA 1008●00**	**MHDA 1017●00**
	Continuous stall	Tn	**Nm**	8.6	10.0	8.3	10.0
	Peak stall	Tm	**Nm**	17.0	28.0	16.0	32.0
Current	Permanent		**A rms**	6	7	3	3.6
	Maximum		**A rms**	12	20	6	12
Demagnetization current			**A**	32		16.5	
Maximum speed			**rpm**	4800		2500	
Constants (at 25 °C)	Torque		**Nm/A rms**	1.43		2.78	
	Back emf		**V rms s/ rad**	0.87		1.69	
Rotor	Number of poles			8			
	Inertia without brake	Jm	**gm²**	1.14			
	Inertia with brake	Jm	**gm²**	1.17			
Stator (at 25 °C)	Resistance (phase/phase)		Ω	1.7		5.7	
	Inductance (phase/phase)		**mH**	17.2		62.5	
	Electrical time constant		**ms**	10.12		10.96	
Holding brake (depending on model)				See page 88			
Gearbox (depending on model)				See page 89			

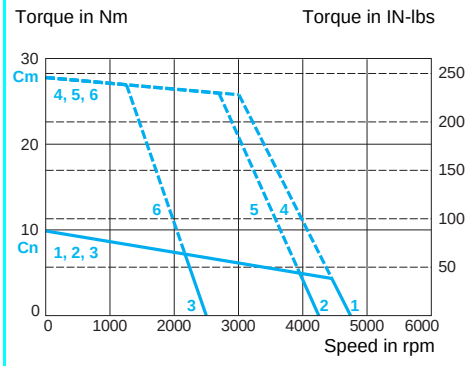
Speed/torque graphs *(1)*

SER 3BC 4L5S motors

■ with MHDA 1017●00 servodrives

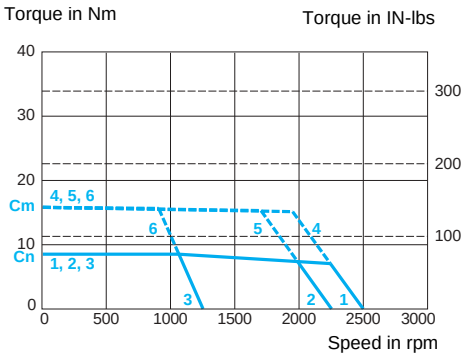


■ with MHDA 1028●00 servodrives

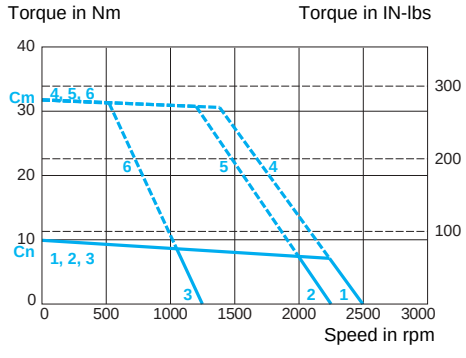


SER 3BC 4L7S motors

■ with MHDA 1008●00 servodrives



■ with MHDA 1017●00 servodrives



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The graphs above are given for an increase in motor temperature of 85 °C.

Presentation: page 76 | Functions: page 77 | Description: page 78 | References: pages 86 and 87 | Dimensions: page 85

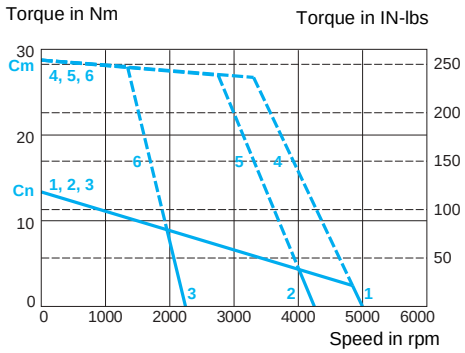
Characteristics of SER 3BD motors

Type of motor				SER 3BD 4L5D	SER 3BD 4L7S	
Torque (model without gearbox)	Associated with Lexium servodrive			MHDA 1028●00	MHDA 1017●00	MHDA 1028●00
	Continuous stall	Tn	Nm	13.4		
	Peak stall	Tm	Nm	29.0	24.0	38
Current	Permanent		A rms	9.2	5.1	
	Maximum		A rms	20	12	20
Demagnetization current			A	45	25	
Maximum speed			rpm	5000	2750	
Constants (at 25 °C)	Torque		Nm/A rms	1.46	2.63	
	Back emf		V rms s/ rad	0.84	1.53	
Rotor	Number of poles			8		
	Inertia without brake	Jm	gm^2	1.55		
	Inertia with brake	Jm	gm^2	1.58		
Stator (at 25 °C)	Resistance (phase/phase)		Ω	1.3	3.75	
	Inductance (phase/phase)		mH	14.5	41.5	
	Electrical time constant		ms	11.15	11.07	
Holding brake (depending on model)				See page 88		
Gearbox (depending on model)				See page 89		

Speed/torque graphs *(1)*

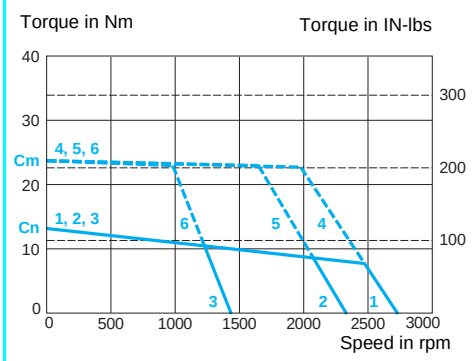
SER 3BD 4L5D motors

■ **with MHDA 1028●00 servodrives**

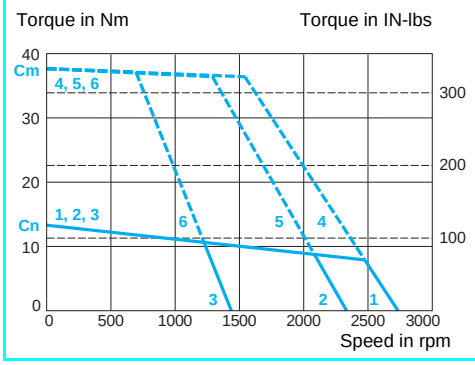


SER 3BD 4L7S motors

■ **with MHDA 1017●00 servodrives**

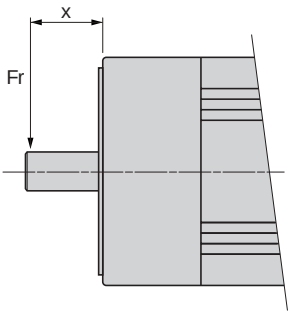


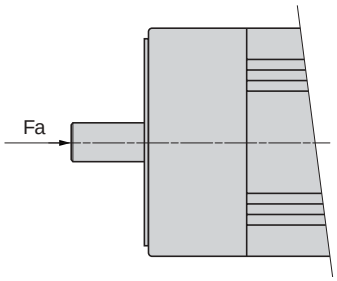
■ **with MHDA 1028●00 servodrives**



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The graphs above are given for an increase in motor temperature of 85 °C.





Radial and axial forces permissible on the motor shaft

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

Conditions:

■ Nominal lifetime of bearings *(1)*	L10h = 20,000 hours
■ Speed	N = 4,000 rpm
■ Ambient temperature (temperature of bearings ~ 100 °C)	40 °C
■ Peak torque	cyclic ratio of 10%
■ Continuous torque	permanent
■ Force application point	X = 15 mm with motors SER 39A X = 20 mm with motors SER 3B●

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

⚠ The following conditions must be respected:
- Radial and axial forces must not be applied simultaneously.
- The maximum pressure permissible on the shaft end is 1,800 N.
- Shaft end with IP 41 degree of protection, optional IP 56.
- Bearings cannot be changed by the user as the built-in position sensor must be realigned after disassembly of the apparatus.

5

Motors			SER 39A	SER 39B	SER 39C	SER 3BA	SER 3BB	SER 3BC	SER 3BD
Maximum radial force Fr	Cyclic ratio 10 %	**N**	600	520	500	1480	1550	1530	760
	Permanent	**N**	340	400	430	690	800	860	760
Maximum axial force Fa	Cyclic ratio 10 %	**N**	1240			1770			
	Permanent	**N**	450			1770			

Characteristics of motor-servodrive power connection cables

		LXA CP AAA ●●● 1	LXA CP AAB ●●● 1
External cover		PUR orange colored RAL 2003	
Insulation		TPM or PP/PE	
Capacity	**pF/m**	< 70 (conductors/shielding)	
Number of conductors (shielded)		[(4 x 1.5 mm²) + (2 x 1.0 mm²)]	[(4 x 2.5 mm²) + (2 x 1.0 mm²)]
External diameter	**mm**	11	13
Curvature radius	**mm**	110 (suitable for flexible cable carrier/tray)	130 (suitable for flexible cable carrier/tray)
Working voltage	**V**	600	
Maximum service length	**m**	75 (with Lexium MHD servodrives)	
Service temperature	**°C**	- 15...+ 85 (storage: - 40...+ 85)	
Certification		UL, CSA	

Characteristics of motor-servodrive encoder connection cables

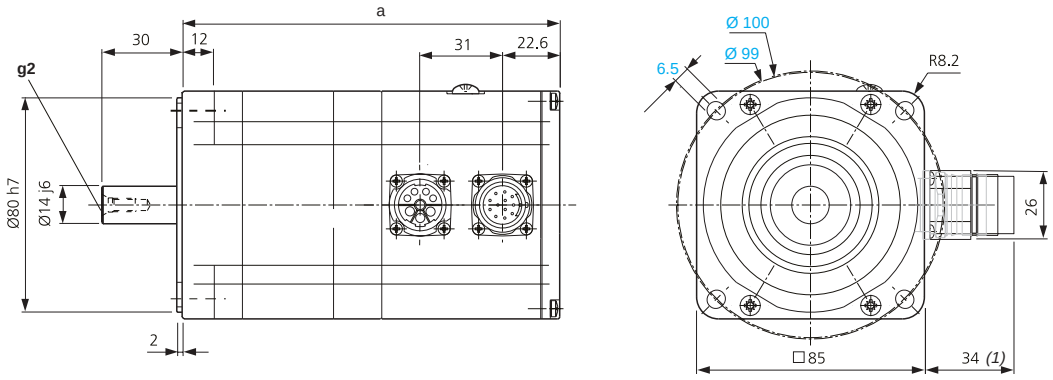
		LXA CF ACA ●●● 1	LXA CF ABA ●●● 1
Encoder type		**Resolver**	**SinCos Hiperface encoder**
External cover		PUR green colored RAL 6018	
Insulation		Polyester	
Number of conductors (shielded)		5 x (2 x 0.25 mm²)+(2 x 0.5 mm²)	
External diameter	**mm**	8.5 max	
Curvature radius	**mm**	85 (suitable for flexible cable carrier/tray)	
Working voltage	**V**	300	
Maximum length	**m**	75 (with Lexium MHD servodrives)	
Service temperature	**°C**	- 15...+ 85 (storage: - 40...+ 85)	
Certification		UL, CSA	

Presentation: page 76 | Functions: page 77 | Description: page 78 | References: pages 86 and 87 | Dimensions: page 85

SER motors (models without gearbox), for gearbox dimensions, see page 91

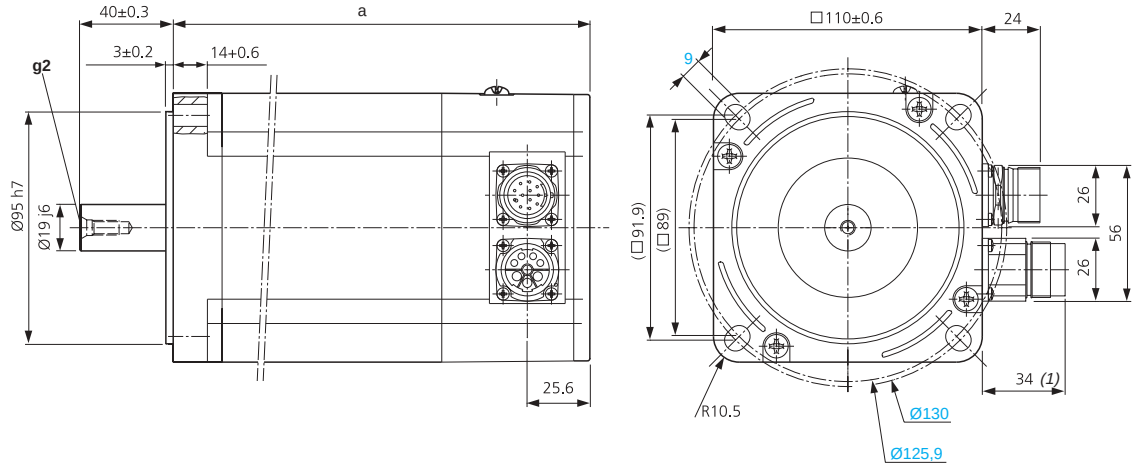
SER motors 39A/39B/39C

CA synchronous servo-motor, standard, size 90

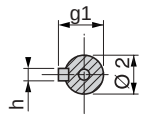


SER motors 3BA/3BB/3BC

CA synchronous servo-motor, standard, size 110



Shaft end with key



SER	a (without brake)	a (with brake)	g2 *(2)*	g1	h	Ø2
39A 4L7S	141	186.5	M5 x 12.5	16	5	14
39B 4L3S	171	216.5	M5 x 12.5	16	5	14
39C 4L3S	201	246.5	M5 x 12.5	16	5	14
3BA 4L3S	132	198	M6 x 16	21.5	6	19
3BA 4L5S	132	198	M6 x 16	21.5	6	19
3BB 4L3S	180	246	M6 x 16	21.5	6	19
3BB 4L5S	180	246	M6 x 16	21.5	6	19
3BC 4L5S	228	294	M6 x 16	21.5	6	19
3BC 4L7S	228	294	M6 x 16	21.5	6	19
3BD 4L5D	276	342	M6 x 16	21.5	6	19
3BD 4L7S	276	342	M6 x 16	21.5	6	19

(1) 39 with mounted connector
(2) according to DIN 332-DS

Lexium motion control
SER brushless motors

SER brushless motors

SER 39A 4L7SRA ●OO

SER 39B 4L3SRA ●OO

SER 3BA 4L3SRA ●OO

SER 3BD 4L5DRA ●OO

The SER motors shown below are not equipped with gearboxes. They are supplied with smooth shaft ends *(1)*.
The SER motors equipped with PLE gearboxes are given on page 89.

Continuous stall torque	Associated servodrive MHDA	Peak stall torque	Mechanical speed	Reference	Weight *(1)* kg
1.1 Nm	1004●00	2.5 Nm	6000 rpm	**SER 39A 4L7S●● ●OO**	2.200
	1008●00	4.0 Nm			
2.2 Nm	1008●00	4.4 Nm	6000 rpm	**SER 39B 4L3S●● ●OO**	3.300
	1017●00	8.0 Nm			
2.4 Nm	1008●00	4.7 Nm	6000 rpm	**SER 39C 4L3S●● ●OO**	4.400
2.9 Nm	1017●00	9.4 Nm			
4.6 Nm	1017●00	9.2 Nm	6000 rpm	**SER 3BA 4L3S●● ●OO**	5.000
	1028●00	15.3 Nm			
4.2 Nm	1008●00	8.2 Nm	5500 rpm	**SER 3BA 4L5S●● ●OO**	5.000
4.5 Nm	1017●00	15.0 Nm			
6.0 Nm	1017●00	12.0 Nm	6000 rpm	**SER 3BB 4L3S●● ●OO**	8.000
6.6 Nm	1028●00	20.0 Nm			
6.6 Nm	1017●00	15.8 Nm	5800 rpm	**SER 39BB 4L5S●● ●OO**	8.000
	1028●00	25 Nm			
8.6 Nm	1017●00	17.0 Nm	4800 rpm	**SER 39BC 4L5S●● ●OO**	11.000
10.0 Nm	1028●00	28.0 Nm			
8.3 Nm	1008●00	16.0 Nm	2500 rpm	**SER 3BC 4L7S●● ●OO**	11.000
10.0 Nm	1017●00	32.0Nm			
13.4 Nm	1028●00	29.0 Nm	5000 rpm	**SER 3BD 4L5D●● ●OO**	13.000
13.4 Nm	1017●00	24.0 Nm	2,750 rpm	**SER 3BD 4L7S●● ●OO**	13.000
	1028●00	38.0 Nm			

To order an SER motor, fill out each reference

			SER 39/3B	A/B/C/D	4L	3/5/7	S/D	●●	●	O/2/3/4	O/3/5/8
Sensor integrated in motor											
	Resolver with 1 pair of poles							**RA**			
	SinCos multiturn absolute encoder							**MO**			
Shaft tightness											
	IP 41	Without holding brake							**A**		
		With holding brake							**1**		
	IP 56	Without holding brake							**B**		
		With holding brake							**2**		
Gearbox (see page 89)											
	Without gearbox									**O**	
	Shaft end	Smooth									**O**
		With key *(2)*									**–**
	With gearbox (shaft end with key)										
	Type *(3)*	PLE80								**2**	
		PLE120								**3**	
		PLE160								**4**	
	Reduction ratio	Ratio 3:1									**3**
		Ratio 5:1									**5**
		Ratio 8:1									**8**

(1) Without brake, for weight of motor with brake see page 88.
(2) For motor without gearbox equipped with shaft end with key, consult our regional branch.
(3) For motor equipped with PLE gearbox, see page 89.

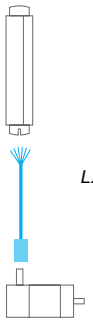
Lexium motion control
SER brushless motors

Choice of power cables, resolver and SinCos Hiperface encoder

		MHDA servodrive	Length = 3 m	3 m < length = 10 m	10 m ⩽ length ⩽ 30 m *(1)*	30 m < length ⩽ 75 m *(1)*
Cables supplied with a fitted connector (motor end) and a second connector for fitting (servodrive end)	Power	1004 ●00	**LXA CP AAA ●●● 1**			*(2)*
		1008 ●00				*(2)*
		1017 ●00		**LXA CP AAB ●●● 1**		*(2)*
		1028 ●00				*(2)*
Cables fitted with connectors at both ends	Resolver		**LXA CF ACA ●●● 1**			
	SinCos Hiperface encoder *(2)*		**LXA CF ABA ●●● 1**			

Connecting cables

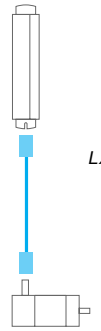
Cables fitted with a connector at the motor end (the servodrive end connector supplied with the cable has to be fitted)



LXA CP AAA/AAB 0●● 1

Description	From	To	Composition	Length	Reference	Weight kg
Power cables *(2)* For association with servodrives, see table above	Motors SER	Lexium MHDA 1●●● N00/A00 servodrives	[(4 x 1.5 mm²) + (2 x 1 mm²)]	3 m	**LXA CP AAA 003 1**	–
				5 m	**LXA CP AAA 005 1**	–
				10 m	**LXA CP AAA 010 1**	–
				20 m	**LXA CP AAA 020 1**	–
				30 m *(1)*	**LXA CP AAA 030 1**	–
			[(4 x 2.5 mm²) + (2 x 1 mm²)]	3 m	**LXA CP AAB 003 1**	–
				5 m	**LXA CP AAB 005 1**	–
				10 m	**LXA CP AAB 010 1**	–
				20 m	**LXA CP AAB 020 1**	–
				30 m *(1)*	**LXA CP AAB 030 1**	–

Cables fitted with connectors at both ends



LXA CF ACA/ABA 0●● 1

Description	From	To	Length	Reference	Weight kg
Resolver cables *(2)*	Lexium SER motors	Lexium MHDA 1●●● N00/A00 servodrives	3 m	**LXA CF ACA 003 1**	–
			5 m	**LXA CF ACA 005 1**	–
			10 m	**LXA CF ACA 010 1**	–
			20 m	**LXA CF ACA 020 1**	–
			30 m	**LXA CF ACA 030 1**	–
Sincos Hiperface encoder cables *(2)*	Lexium SER motors	Lexium MHDA 1●●● N00/A00 servodrives	3 m	**LXA CF ABA 003 1**	–
			5 m	**LXA CF ABA 005 1**	–
			10 m	**LXA CF ABA 010 1**	–
			20 m	**LXA CF ABA 020 1**	–
			30 m	**LXA CF ABA 030 1**	–

(1) For a cable length between the servodrive and motor ⩾ 25 m, it is essential to use a motor choke placed as close as possible to the servodrive. For information, see page 66.
(2) For a cable length of > 30 m, consult our Regional Sales Offices.

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Lexium motion control
SER brushless motor options
Holding brake

Presentation
Holding brake

The integral brake fitted on the SER motor (depending on the model) is a failsafe electro-magnetic holding brake.

⚠ Use of the holding brake as a dynamic brake for deceleration purposes will rapidly cause damage to it.

Characteristics
Holding brake

		SER 39● motor brake	SER 3B● motor brake
Holding torque M_{Br} *(1)*	**Nm**	6	16
Inertia of rotor (brake only) J_{Br}	**gm²**	0.02	0.035
Electrical clamping power P_{Br}	**W**	24	28
Supply voltage with Lexium servodrive	**V**	⎓ 22.8...26.2	
Current	**A**	1	1.2
Opening time	**ms**	40	60
Closing time	**ms**	20	30
Weight (brake only)	**kg**	1.8	3.0

(1) Holding torque for a motor temperature ⩽ 80 °C.
For a temperature of > 80 °C, apply a derating coefficient of 50 %.

Lexium motion control
SER brushless motor options
PLE gearboxes

Presentation

SER motors are also available with mounted PLE-type gearboxes. Schneider Electric has selected and standardized the following gearbox models, available in a choice of 3 speed reduction ratios 3:1, 5:1 and 8:1.

Type of motor	Associated servodrive	Gearbox 3:1	Gearbox 5:1	Gearbox 8:1
SER 39A 4L7S	MHDA 1004●	PLE 80	PLE 80	PLE 80
	MHDA 1008●	PLE 80	PLE 80	PLE 80
SER 39B 4L3S	MHDA 1008●	PLE 80	PLE 80	PLE 80
	MHDA 1017●	PLE 80	PLE 80	PLE 120
SER 39C 4L3S	MHDA 1008●	PLE 80	PLE 80	PLE 80
	MHDA 1017●	PLE 80	PLE 80	PLE 120
SER 3BA 4L3S	MHDA 1017●	PLE 80	PLE 80	PLE 120
	MHDA 1028●	PLE 80	PLE 120	PLE 120
SER 3BA 4L5S	MHDA 1008●	PLE 80	PLE 80	PLE 120
	MHDA 1017●	PLE 80	PLE 120	PLE 160
SER 3BB 4L3S	MHDA 1017●	PLE 80	PLE 80	PLE 120
	MHDA 1028●	PLE 120	PLE 120	PLE 160
SER 3BB 4L5S	MHDA 1017●	PLE 120	PLE 120	PLE 120
	MHDA 1028●	PLE 120	PLE 120	PLE 160
SER 3BC 4L5S	MHDA 1017●	PLE 120	PLE 120	PLE 120
	MHDA 1028●	PLE 120	PLE 160	PLE 160
SER 3BC 4L7S	MHDA 1008●	PLE 120	PLE 120	PLE 120
	MHDA 1017●	PLE 120	PLE 160	PLE 160
SER 3BD 4L5D	MHDA 1028●	PLE 120	PLE 160	PLE 160
SER 3BD 4L7S	MHDA 1017●	PLE 120	PLE 120	PLE 160
	MHDA 1028●	PLE 160	PLE 160	PLE 160

5

Characteristics

General characteristics

Type		PLE 80	PLE 120	PLE 160
Gearbox type		Planetary gearbox with single reduction level straight teeth		
Inversion play	**min arc**	< 12	< 8	< 6
Torsional rigidity	**Nm/ min arc**	4.5	11	32.5
Noise level	**dB (A)**	60	65	70
Junction box		Black anodized aluminum		
Shaft material		C 45		
Tightness of shaft output		IP 43		
Lubrication		No lubrication required		
Average lifetime *(1)*	**Hour**	10 000 : S1 mode (permanent service) and 100% continuous torque 20 000 : S1 mode (permanent service) and 85% continuous torque		
Mounting position		All positions		
Operating temperature	**°C**	- 25...+ 90 (+ 120 when operating impulsively)		
Weight (gearbox only)	**kg**	2.100	6.000	18.000

Combining an SER motor with a PLE gearbox

Gearbox type			PLE 80	PLE 120	PLE 160
Maximum permitted radial force *(2) (3)*		**N**	950	2000	6000
Maximum permitted axial force *(2)*		**N**	1200	2800	8000
Efficiency			0.96		
Inertia of gearbox	**3:1**	**gm²**	0.077	0.263	1.214
	5:1	**gm²**	0.045	0.153	0.607
	8:1	**gm²**	0.039	0.132	0.463
Continuous output torque T_{2N} *(3)*	**3:1**	**Nm**	40	80	400
	5:1	**Nm**	50	110	450
	8:1	**Nm**	50	120	450

(1) Data in operating hours for a 10% fault probability rating.
(2) Values given for a minimum lifetime of 10,000 hours at an output speed of 100 rpm for a cyclic ratio = 1 (S1 mode) on electrical machines.
(3) Force applied at mid-distance from the output shaft.

Lexium motion control
SER brushless motor options
PLE gearboxes

References of SER brushless motors and associated PLE gearboxes

The following table of references provides the different torque and speed values of shaft ends for the various possible motor configurations.

⚠ The continuous output torque of the gearbox T_{2N} must not be exceeded permanently. It is possible, for example in an emergency stop, to have a double torque over a short period. The motor's torque should be limited thereafter to avoid destroying the gearbox through excessive torque.

Associated Lexium servodrive	Gearbox type	Continuous stall torque	Peak stall torque	Maximum output speed of gearbox	Reference	Weight (1) kg
SER 39A 4L7S motors						
MHDA 1004●	Without	1.1 Nm	2.5 Nm	6000 rpm	**SER 39A 4L7S●● ●OO**	2.200
	PLE80, ratio 3:1	3.2 Nm	7.2 Nm	2000 rpm	**SER 39A 4L7S●● ●23**	4.300
	PLE80, ratio 5:1	5.3 Nm	12.0 Nm	1200 rpm	**SER 39A 4L7S●● ●25**	4.300
	PLE80, ratio 8:1	8.4 Nm	19.2 Nm	750 rpm	**SER 39A 4L7S●● ●28**	4.300
MHDA 1008●	Without	1.1 Nm	4.0 Nm	6000 rpm	**SER 39A 4L7S●● ●OO**	2.200
	PLE80, ratio 3:1	3.2 Nm	11.5 Nm	2000 rpm	**SER 39A 4L7S●● ●23**	4.300
	PLE80, ratio 5:1	5.3 Nm	19.2 Nm	1200 rpm	**SER 39A 4L7S●● ●25**	4.300
	PLE80, ratio 8:1	8.4 Nm	30.7 Nm	750 rpm	**SER 39A 4L7S●● ●28**	4.300
SER 39B 4L3S motors						
MHDA 1008●	Without	2.2 Nm	4.4 Nm	6000 rpm	**SER 39B 4L3S●● ●OO**	3.300
	PLE80, ratio 3:1	6.3 Nm	12.6 Nm	2000 rpm	**SER 39B 4L3S●● ●23**	5.400
	PLE80, ratio 5:1	10.6 Nm	21.1 Nm	1200 rpm	**SER 39B 4L3S●● ●25**	5.400
	PLE80, ratio 8:1	16.9 Nm	33.7 Nm	750 rpm	**SER 39B 4L3S●● ●28**	5.400
MHDA 1017●	Without	2.2 Nm	8.0 Nm	6000 rpm	**SER 39B 4L3S●● ●OO**	3.300
	PLE80, ratio 3:1	6.3 Nm	23.0 Nm	2000 rpm	**SER 39B 4L3S●● ●23**	5.400
	PLE80, ratio 5:1	10.6 Nm	38.4 Nm	1200 rpm	**SER 39B 4L3S●● ●25**	5.400
	PLE120, ratio 8:1	16.9 Nm	61.4 Nm	750 rpm	**SER 39B 4L3S●● ●28**	9.300
SER 39C 4L3S motors						
MHDA 1008●	Without	2.4 Nm	4.7 Nm	6000 rpm	**SER 39C 4L3S●● ●OO**	4.400
	PLE80, ratio 3:1	6.9 Nm	13.5 Nm	2000 rpm	**SER 39C 4L3S●● ●23**	6.500
	PLE80, ratio 5:1	11.5 Nm	22.5 Nm	1200 rpm	**SER 39C 4L3S●● ●25**	6.500
	PLE80, ratio 8:1	18.4 Nm	36.0 Nm	750 rpm	**SER 39C 4L3S●● ●28**	6.500
MHDA 1017●	Without	2.9 Nm	9.4 Nm	6000 rpm	**SER 39C 4L3S●● ●OO**	4.400
	PLE80, ratio 3:1	8.4 Nm	27.0 Nm	2000 rpm	**SER 39C 4L3S●● ●23**	6.500
	PLE80, ratio 5:1	13.9 Nm	45.1 Nm	1200 rpm	**SER 39C 4L3S●● ●25**	6.500
	PLE120, ratio 8:1	22.3 Nm	72.1 Nm	750 rpm	**SER 39C 4L3S●● ●38**	10.400
SER 3BA 4L3S motors						
MHDA 1017●	Without	4.6 Nm	9.2 Nm	6000 rpm	**SER 3BA 4L3S●● ●OO**	5.000
	PLE80, ratio 3:1	13.2 Nm	26.4 Nm	2000 rpm	**SER 3BA 4L3S●● ●23**	7.100
	PLE80, ratio 5:1	22.1 Nm	44.1 Nm	1200 rpm	**SER 3BA 4L3S●● ●25**	7.100
	PLE120, ratio 8:1	35.3 Nm	70.6 Nm	750 rpm	**SER 3BA 4L3S●● ●38**	11.000
MHDA 1028N	Without	4.6 Nm	15.3 Nm	6000 rpm	**SER 3BA 4L3S●● ●OO**	5.000
	PLE80, ratio 3:1	13.2 Nm	44.0 Nm	2000 rpm	**SER 3BA 4L3S●● ●23**	7.100
	PLE120, ratio 5:1	22.1 Nm	73.2 Nm	1200 rpm	**SER 3BA 4L3S●● ●35**	11.000
	PLE120, ratio 8:1	35.3 Nm	117.5 Nm	750 rpm	**SER 3BA 4L3S●● ●38**	11.000
SER 3BA 4L5S motors						
MHDA 1008●	Without	4.2 Nm	8.2 Nm	5500 rpm	**SER 3BA 4L5S●● ●OO**	5.000
	PLE80, ratio 3:1	12.0 Nm	23.6 Nm	1830 rpm	**SER 3BA 4L5S●● ●23**	7.100
	PLE80, ratio 5:1	20.0 Nm	39.3 Nm	1100 rpm	**SER 3BA 4L5S●● ●25**	7.100
	PLE120, ratio 8:1	31.9 Nm	62.9 Nm	680 rpm	**SER 3BA 4L5S●● ●38**	11.000
MHDA 1017●	Without	4.5 Nm	15.0 Nm	5500 rpm	**SER 3BA 4L5S●● ●OO**	5.000
	PLE80, ratio 3:1	12.9 Nm	43.2 Nm	1830 rpm	**SER 3BA 4L5S●● ●23**	7.100
	PLE120, ratio 5:1	21.5 Nm	72.0 Nm	1100 rpm	**SER 3BA 4L5S●● ●35**	7.100
	PLE160, ratio 8:1	34.2 Nm	115.2 Nm	680 rpm	**SER 3BA 4L5S●● ●48**	11.000
SER 3BB 4L3S motors						
MHDA 1017●	Without	6.0 Nm	12.0 Nm	6000 rpm	**SER 3BB 4L3S●● ●OO**	8.000
	PLE80, ratio 3:1	17.3 Nm	34.5 Nm	2000 rpm	**SER 3BB 4L3S●● ●23**	10.100
	PLE80, ratio 5:1	28.7 Nm	57.6 Nm	1200 rpm	**SER 3BB 4L3S●● ●25**	10.100
	PLE120, ratio 8:1	46.0 Nm	92.1 Nm	750 rpm	**SER 3BB 4L3S●● ●38**	14.000
MHDA 1028●	Without	6.6 Nm	20.0 Nm	6000 rpm	**SER 3BB 4L3S●● ●OO**	8.000
	PLE120, ratio 3:1	19.0 Nm	57.6 Nm	2000 rpm	**SER 3BB 4L3S●● ●33**	14.000
	PLE120, ratio 5:1	31.6 Nm	96.0 Nm	1200 rpm	**SER 3BB 4L3S●● ●35**	14.000
	PLE160, ratio 8:1	50.6 Nm	153.6 Nm	750 rpm	**SER 3BB 4L3S●● ●48**	26.000

(1) For weight of motor with or without brake, see page 88.

References of SER brushless motors and associated PLE gearboxes (continued)

Associated Lexium servodrive	Gearbox type	Continuous stall torque	Peak stall torque	Maximum output speed of gearbox	Reference (1)	Weight kg
SER 3BB 4L5S motors						
MHDA 1017●	Without	6.6 Nm	15.8 Nm	5800 rpm	**SER 3BB 4L5S●● ●OO**	8.000
	PLE120, ratio 3:1	19.0 Nm	45.5 Nm	1930 rpm	**SER 3BB 4L5S●● ●33**	14.000
	PLE120, ratio 5:1	31.6 Nm	75.8 Nm	1160 rpm	**SER 3BB 4L5S●● ●35**	14.000
	PLE120, ratio 8:1	50.6 Nm	121.3 Nm	725 rpm	**SER 3BB 4L5S●● ●38**	14.000
MHDA 1028●	Without	6.6 Nm	26.4 Nm	5800 rpm	**SER 3BB 4L5S●● ●OO**	8.000
	PLE120, ratio 3:1	19.0 Nm	76.0 Nm	1930 rpm	**SER 3BB 4L5S●● ●33**	14.000
	PLE120, ratio 5:1	31.6 Nm	126.7 Nm	1160 rpm	**SER 3BB 4L5S●● ●35**	14.000
	PLE160, ratio 8:1	50.6 Nm	202.7 Nm	725 rpm	**SER 3BB 4L5S●● ●38**	26.000
SER 3BC 4L5S motors						
MHDA 1017●	Without	8.6 Nm	17.0 Nm	4800 rpm	**SER 3BC 4L5S●● ●OO**	11.000
	PLE120, ratio 3:1	24.7 Nm	48.9 Nm	1600 rpm	**SER 3BC 4L5S●● ●33**	17.000
	PLE120, ratio 5:1	41.3 Nm	81.6 Nm	960 rpm	**SER 3BC 4L5S●● ●35**	17.000
	PLE120, ratio 8:1	66.0 Nm	130.5 Nm	600 rpm	**SER 3BC 4L5S●● ●38**	17.000
MHDA 1028●	Without	10.0 Nm	28.0 Nm	4800 rpm	**SER 3BC 4L5S●● ●OO**	11.000
	PLE120, ratio 3:1	28.8 Nm	80.6 Nm	21600 rpm	**SER 3BC 4L5S●● ●33**	17.000
	PLE160, ratio 5:1	48.0 Nm	134.4 Nm	960 rpm	**SER 3BC 4L5S●● ●45**	29.000
	PLE160, ratio 8:1	76.8 Nm	215.0 Nm	600 rpm	**SER 3BC 4L5S●● ●48**	29.000
SER 3BC 4L7S motors						
MHDA 1008●	Without	8.3 Nm	16.0 Nm	2500 rpm	**SER 3BC 4L7S●● ●OO**	11.000
	PLE120, ratio 3:1	23.9 Nm	46.0 Nm	830 rpm	**SER 3BC 4L7S●● ●33**	17.000
	PLE120, ratio 5:1	39.8 Nm	76.8 Nm	500 rpm	**SER 3BC 4L7S●● ●35**	17.000
	PLE120, ratio 8:1	63.7 Nm	122.8 Nm	310 rpm	**SER 3BC 4L7S●● ●38**	17.000
MHDA 1017●	Without	10.0 Nm	32.0 Nm	2500 rpm	**SER 3BC 4L7S●● ●OO**	11.000
	PLE120, ratio 3:1	28.8 Nm	92.1 Nm	830 rpm	**SER 3BC 4L7S●● ●33**	17.000
	PLE160, ratio 5:1	48.0 Nm	153.6 Nm	500 rpm	**SER 3BC 4L7S●● ●45**	29.000
	PLE160, ratio 8:1	76.8 Nm	245.7 Nm	310 rpm	**SER 3BC 4L7S●● ●48**	29.000
SER 3BD 4L5D motors						
MHDA 1028●	Without	13.4 Nm	29.0 Nm	5000 rpm	**SER 3BD 4L5D●● ●OO**	13.000
	PLE120, ratio 3:1	38.5 Nm	83.5 Nm	1660 rpm	**SER 3BD 4L5D●● ●33**	19.000
	PLE160, ratio 5:1	64.3 Nm	139.2 Nm	1000 rpm	**SER 3BD 4L5D●● ●45**	31.000
	PLE160, ratio 8:1	102.9 Nm	222.7 Nm	625 rpm	**SER 3BD 4L5D●● ●48**	31.000
SER 3BD 4L7S motors						
MHDA 1017●	Without	13.4 Nm	24.0 Nm	2,750 rpm	**SER 3BD 4L7S●● ●OO**	13.000
	PLE120, ratio 3:1	38.5 Nm	69.1 Nm	920 rpm	**SER 3BD 4L7S●● ●33**	19.000
	PLE120, ratio 5:1	64.3 Nm	115.2 Nm	550 rpm	**SER 3BD 4L7S●● ●35**	19.000
	PLE160, ratio 8:1	102.9 Nm	184.3 Nm	340 rpm	**SER 3BD 4L7S●● ●48**	31.000
MHDA 1028●	Without	13.4 Nm	38.0 Nm	2,750 rpm	**SER 3BD 4L7S●● ●OO**	13.000
	PLE160, ratio 3:1	38.5 Nm	109.4 Nm	920 rpm	**SER 3BD 4L7S●● ●43**	31.000
	PLE160, ratio 5:1	64.3 Nm	182.4 Nm	550 rpm	**SER 3BD 4L7S●● ●45**	31.000
	PLE160, ratio 8:1	102.9 Nm	291.8 Nm	340 rpm	**SER 3BD 4L7S●● ●48**	31.000

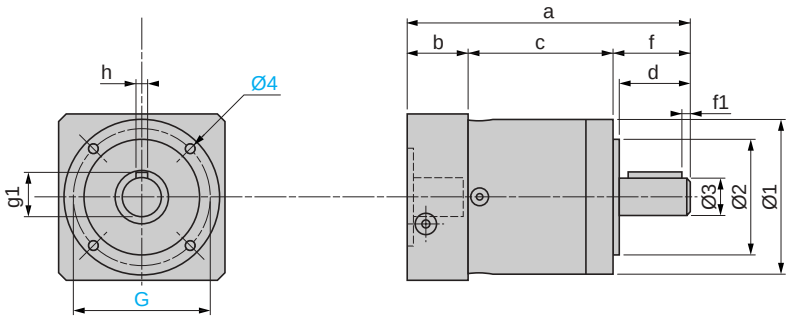
(1) Complete the reference by replacing:
●● *with* **RA***: Resolver with 1 pair of poles, with* **MO***: SinCos absolute encoder.*
● *with* **A, B, 1 2***: For tightness of shaft end and holding brake, see page* 86.

Dimensions

PLE planetary gearboxes

	PLE80	PLE120	PLE160
a	134	176.5	255.5
b	33.5	47.5	64.5
c	60.5	74	104
d	36	50	80
f	40	55	87
f1	4	5	8
g1	22.5	28	43
h	6	8	12
Ø1	80	115	160
Ø2 *(1)*	60	80	130
Ø3 *(1)*	20	25	40
G	70	100	145
Ø4	M6 x 10	M10 x 16	M12 x 20

(1) Tolerance H7



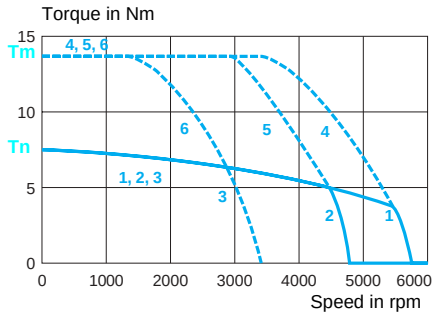
Lexium motion control
Lexium BPH brushless motors

Presentation

Lexium BPH AC brushless motors with samarium cobalt magnets provide greatly increased power and an excellent dynamic speed response in a compact unit. Thermal protection is provided by an integral probe in the motor. These motors support high temperature overloads without risk of demagnetization. Lexium BPH motors (except for motor BPH 055) are certified as Recognized (*RL*) and Listed (UL) by the Underwriters Laboratories. They comply with standards UL1004 and CSA 100 (except for motor BPH 055) as well as to European directives (marking CE).

Lexium MHDA servodrives, which are associated with Lexium BPH motors, deliver a sinusoidal wave allowing perfect rotation, even at low speed.

Speed/torque characteristics

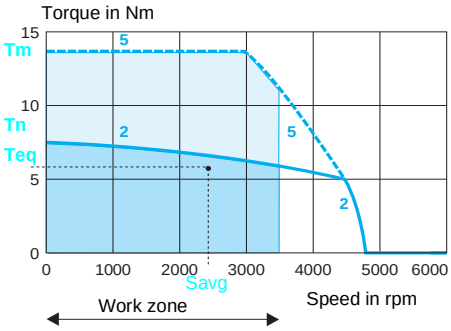


Lexium BPH motors show torque/speed profiles similar to the example displayed:

1 Continuous torque at 480 V, 3 phase.
2 Continuous torque at 400 V, 3 phase.
3 Continuous torque at 230 V, 3 phase.
4 Peak torque at 480 V, 3 phase.
5 Peak torque at 400 V, 3 phase.
6 Peak torque at 230 V, 3 phase.

where:
6000 (in rpm) corresponds to the motor's maximum mechanical speed.
Tn (in Nm) represents the continuous stall torque value.
Tm (in Nm) represents the peak stall torque value.

Principle for determining the size of the motor according to the application



Torque/speed curves enable the optimum size of a motor to be determined. For example, for a supply voltage of 400 V, 3-phase, the useful graphs are graphs 2 and 5. The time diagram of speeds and torques according to the motor cycle must also be defined (see page 110):

1 Locate the work zone of the application in speed.

2 Verify, using the motor cycle time diagram, (see page 110), that the torques required by the application during the different cycle phases are located within the area bounded by graph 5 in the work zone.

3 Calculate the average speed S_{avg} and the equivalent thermal torque T_{eq} (see page 110).

4 The point defined by S_{avg} and T_{eq} must be within the area bounded by graph 2 in the work zone.

Lexium motion control
Lexium BPH brushless motors

Functions
General functions

Lexium BPH AC brushless motors have been developed to respond to the following specifications:
- Functional characteristics, robustness, safety, etc. complying with IEC 34-1.
- Ambient operating temperature: 0 to 40 °C.
- Winding insulation class: H (limit temperature of windings: 180 °C) as per VDE 0530, class F, for motor BPH 055.
- Power and sensor connection via connector rotatable in increments of 90 °C.
- Thermal protection by built-in PTC thermistor probe, controlled by the Lexium servodrive.
- Out-of-round, concentricity, perpendicularity between flange and shaft as per DIN 42955 R, class N, for motor BPH 055.
- Class S balancing, complying with ISO 2373.
- European flange with smooth holes (complying with IEC 72-2).
- Permitted mounting positions: no mounting restriction for IMB5 - IMV1 and IMV3 as per DIN 42950.

Polyester resin based paint: opaque black RAL 9005.

Functions (depending on model)

- Degree of protection: IP 65 or IP 67 (IP 65 for the motor BPH 055) in accordance with IEC 529.
- Degree of protection at shaft end: IP 65 or IP 67 (IP 54 or IP 65 with end joint for motor BPH 055) in accordance with IEC 529.
- Integral sensor, 2-pole resolver or SinCos Hiperface interface 20-bit high-resolution absolute encoder.
- Standard size shaft end, smooth or with key (complying with IEC 72-1).

Holding brake (according to model)

The integral brake fitted on the Lexium BPH motor (depending on the model) is a failsafe electro-magnetic brake.
It is a holding brake (and not a dynamic brake which enables slow-down). However, it is capable of applying 1800 to 2000 brake operations in the event of emergencies or loss of power with an inertia equivalent to twice that of the rotor.
⚠ Do not use the holding brake as a dynamic brake.

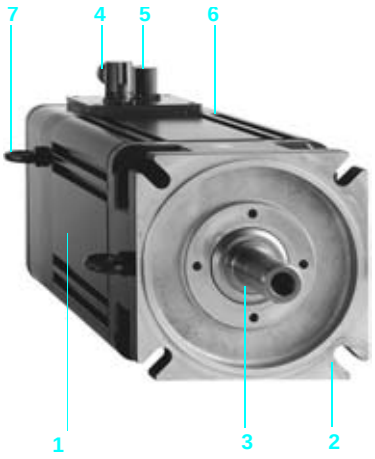
Integral sensor

The motor has a position sensor which, depending on the model, can be:
- A 2-pole resolver ensuring precision of the angular position of the shaft to less than ± 15 arc minutes.
- A high-resolution absolute encoder (20 bits per revolution), single turn or multiturn (4096 revolutions) making the angular position of the shaft precise to less than ± 40 arc seconds.

These sensors are compatible with 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 servodrive. This information is used by the speed regulator of the Lexium servodrive.
- May measure position information for the position controller of the Lexium servodrive.
- Measure and transmit, if required, position information in incremental or absolute format, for the position return of a motion control module (“simulated encoder” output of the Lexium servodrive).

Description: page 94
Characteristics: pages 95 to 104
References: pages 106 to 109
Dimensions: page 105

Lexium motion control
Lexium BPH brushless motors



Description

Lexium BPH brushless motors with a 3-phase stator and a 6-pole rotator (4-poles for the BPH 055 motor) with samarium cobalt magnets comprising:

1 Housing with a square cross-section, protected by black opaque polyester resin paint RAL 9005.

2 An axial flange with 4 mounting points complying with IEC 72-2.

3 IEC 72-2 standard shaft end, smooth or with key depending on the model.

4 A dust and damp-proof male screw connector for connecting the power cable. The output of this connector can be rotated in increments of 90° *(1)*.

5 A dust and damp-proof male screw connector for connecting the resolver or encoder cable. The output of this connector can be rotated in increments of 90° *(1)*.

6 A manufacturer's rating plate.

7 Two lifting rings which can be screwed to any 4 points on both sides of the motor (for model BPH 190).

Connector to be ordered separately, for connecting to Lexium MHDA servodrives. See pages 107 to 109.

Schneider Electric has taken great care to find the most appropriate match between Lexium motors and servodrives. This compatibility is only guaranteed when cables sold by Schneider Electric are used (see pages 107 and 108).

(1) By default, this connector is turned towards the motor shaft end.

6

Lexium motion control
Lexium BPH brushless motors

Characteristics of BPH 055 motors ⚠

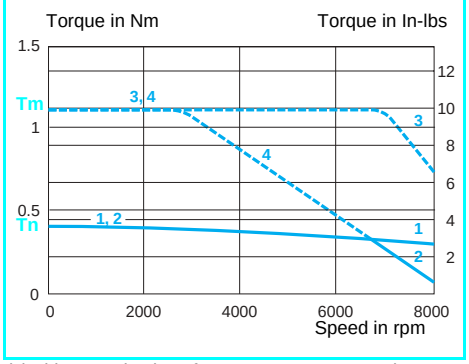
Type of motor				BPH 0552S
Torque	Associated with Lexium servodrive			**MHDA 1004●00**
	Continuous stall	Tn	**Nm**	0.4
	Peak stall	Tm	**Nm**	1.1
Current	Permanent		**A rms**	1.07
	Maximum		**A rms**	3
Demagnetization current			**A**	4.28
Maximum mechanical speed			**rpm**	8000
Constants (at 25 °C)	Torque		**Nm/A rms**	0.374
	Back emf		**V rms s/ rad**	0.216
Rotor	Number of poles			4
	Inertia without brake	Jm	**gm²**	0.024
	Inertia with brake	Jm	**gm²**	0.025
	Static friction		**Nm**	< 0.02
	Mechanical time constant		**ms**	4.9
Stator (at 25 °C)	Resistance		Ω	19
	Inductance		**mH**	17
	Electrical time constant		**ms**	0.9
Thermal time constant			**min**	20
Holding brake (depending on model)	Holding torque		**Nm**	1
	Voltage		**V**	⎓ 24 nominal, for limit values see page 104
	Current		**A**	0.33
	Opening time		**ms**	25
	Closing time		**ms**	20

⚠ *For this BPH 055 motor, the MHDA 1004 servodrive must not be supplied by a voltage greater than 3 x 230 V rms + 10 %. This motor is not UL/cUL listed.*

Speed/torque curves *(1)*

Motors BPH 0552S

■ **with MHDA 1004●00 servodrives**



1 Continuous torque at 230 V, 3-phase
2 Continuous torque at 230 V, single phase
3 Peak torque at 230 V 3-phase
4 Peak torque at 230 V single phase

(1) This curve is given for a motor temperature increase of 100 °C.

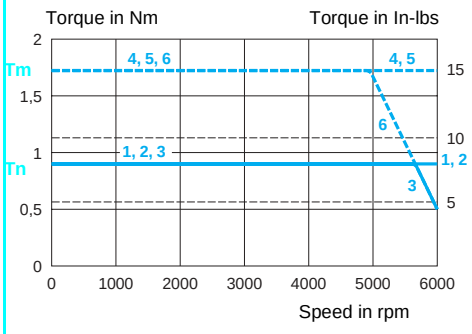
Characteristics of BPH 075 motors

Type of motor				BPH 0751 N		BPH 0752 N	
Torque	Associated with Lexium servodrive			**MHDA 1004●00**	**MHDA 1008●00**	**MHDA 1004●00**	**MHDA 1008●00**
	Continuous stall	Tn	**Nm**	0.9	1.3	1.3	2.3
	Peak stall	Tm	**Nm**	1.9	3.4	2.5	4.8
Current	Permanent		**A rms**	1.5	2.2	1.5	2.7
	Maximum		**A rms**	3	6	3	6
Demagnetization current			**A**	8.8		10.8	
Maximum mechanical speed			**rpm**	6000			
Constants (at 25 °C)	Torque		**Nm/A rms**	0.58		0.84	
	Back emf		**V rms s/ rad**	0.33		0.48	
Rotor	Number of poles			6			
	Inertia without brake	Jm	**gm²**	0.08		0.12	
	Inertia with brake	Jm	**gm²**	0.12		0.16	
	Static friction		**Nm**	< 0.11		< 0.14	
	Mechanical time constant		**ms**	4.6		2.5	
Stator (at 25 °C)	Resistance		Ω	11.7		8.9	
	Inductance		**mH**	19.5		20.3	
	Electrical time constant		**ms**	1.5		2	
Thermal time constant			**min**	20		23	
Holding brake (according to model)	Holding torque		**Nm**	2.5			
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104			
	Current		**A**	0.5			
	Opening time		**ms**	7			
	Closing time		**ms**	5			

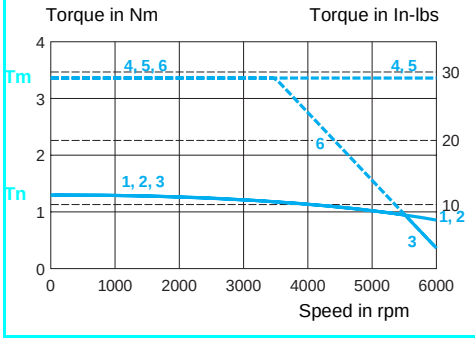
Speed/torque curves *(1)*

BPH 0751N motors

■ with MHDA 1004●00 servodrives

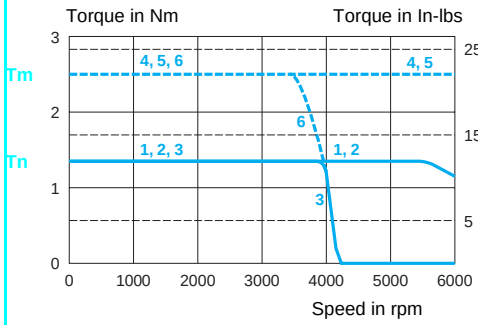


■ with MHDA 1008●00 servodrives

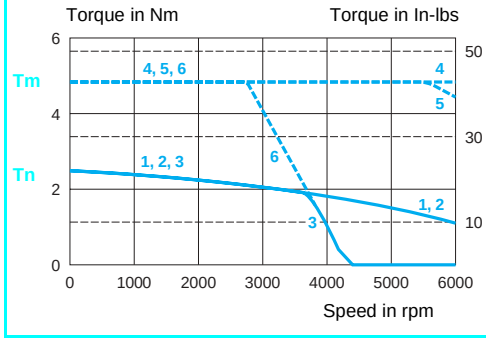


BPH 0752N motors

■ with MHDA 1004●00 servodrives



■ with MHDA 1008●00 servodrives



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The curves are given for a motor temperature increase of 100 °C.

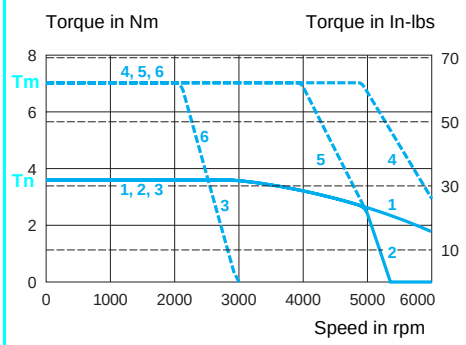
Characteristics of BPH 095 motors

Type of motor				BPH 0952 N		BPH 0953 N	
Torque	Associated with Lexium servodrive			**MHDA 1008●00**	**MHDA 1017●00**	**MHDA 1017●00**	**MHDA 1028●00**
	Continuous stall	Tn	**Nm**	3.7	4.3	6	
	Peak stall	Tm	**Nm**	7.2	13.4	13.4	20.3
Current	Permanent		**A rms**	3	3.5	5.2	5.2
	Maximum		**A rms**	6	12	12	20
Demagnetization current			**A**	14		20.8	
Maximum mechanical speed			**rpm**	6000			
Constants (at 25 °C)	Torque		**Nm/A rms**	1.21		1.12	
	Back emf		**V rms s/ rad**	0.7		0.65	
Rotor	Number of poles			6			
	Inertia without brake	Jm	**gm²**	0.3		0.41	
	Inertia with brake	Jm	**gm²**	0.41		0.52	
	Static friction		**Nm**	< 0.19		< 0.24	
	Mechanical time constant		**ms**	2.3		1.7	
Stator (at 25 °C)	Resistance		**Ω**	7		3.1	
	Inductance		**mH**	31		17.6	
	Electrical time constant		**ms**	4.1		4.9	
Thermal time constant			**min**	26		29	
Holding brake (according to model)	Holding torque		**Nm**	5			
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104			
	Current		**A**	0.7			
	Opening time		**ms**	15			
	Closing time		**ms**	7			

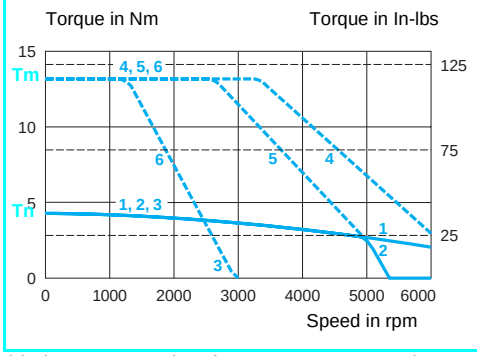
Speed/torque curves *(1)*

BPH 0952N motors

■ with MHDA 1008●00 servodrives

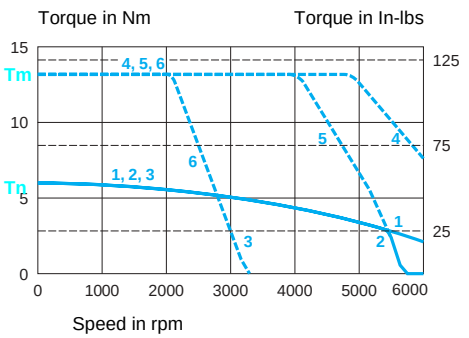


■ with MHDA 1017●00 servodrives

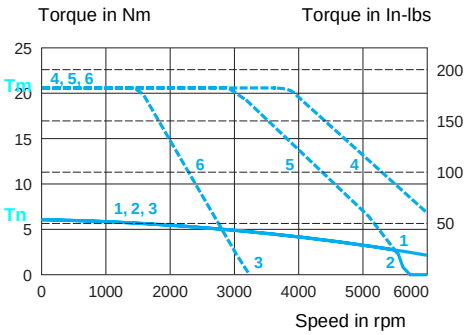


BPH 0953 N motors

■ with MHDA 1017●00 servodrives



■ with MHDA 1028●00 servodrives



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The curves are given for a motor temperature increase of 100 °C.

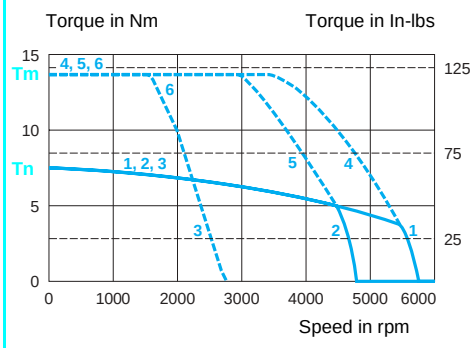
Characteristics of BPH 115 motors

Type of motor				BPH 1152 N		BPH 1153 N	
Torque	Associated with Lexium servodrive			**MHDA 1017●00**	**MHDA 1028●00**	**MHDA 1017●00**	**MHDA 1028●00**
	Continuous stall	Tn	**Nm**	7.4	7.4	6.8	10.5
	Peak stall	Tm	**Nm**	13.6	19.3	13.5	19.4
Current	Permanent		**A rms**	5.5	5.5	5	9.2
	Maximum		**A rms**	12	20	12	20
Demagnetization current			**A**	22		36.8	
Maximum mechanical speed			**rpm**	6000			
Constants (at 25 °C)	Torque		**Nm/A rms**	1.32		1.1	
	Back emf		**V rms s/ rad**	0.76		0.64	
Rotor	Number of poles			6			
	Inertia without brake	Jm	**gm²**	0.7		0.97	
	Inertia with brake	Jm	**gm²**	1.07		1.34	
	Static friction		**Nm**	< 0.27		< 0.33	
	Mechanical time constant		**ms**	2.4		1.9	
Stator (at 25 °C)	Resistance		Ω	3.75		1.37	
	Inductance		**mH**	27.7		12.8	
	Electrical time constant		**ms**	6.9		8	
Thermal time constant			**min**	29		33	
Holding brake (depending on model)	Holding torque		**Nm**	12			
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104			
	Current		**A**	0.8			
	Opening time		**ms**	30			
	Closing time		**ms**	13			

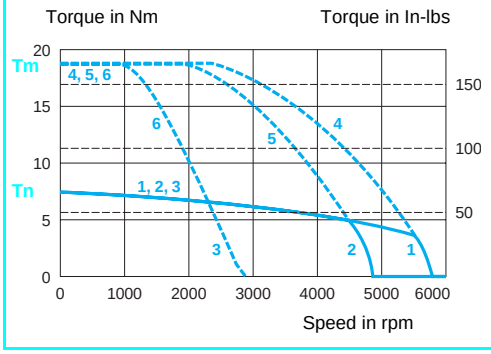
Speed/torque curves *(1)*

BPH 1152N motors

■ **with MHDA 1017●00 servodrives**

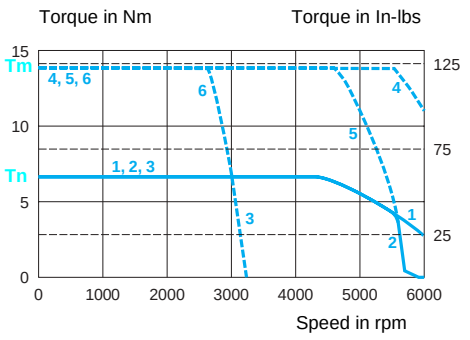


■ **with MHDA 1028●00 servodrives**

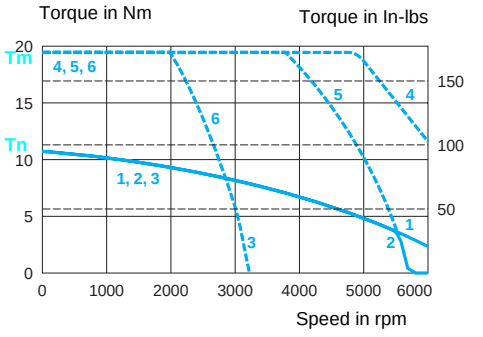


BPH1153 N motors

■ **with MHDA 1017●00 servodrives**



■ **with MHDA 1028●00 servodrives**



1 Continuous stall torque at 480 V, 3-phase
2 Continuous stall torque at 400 V, 3-phase
3 Continuous stall torque at 230 V, 3-phase
4 Peak stall torque at 480 V 3-phase
5 Peak stall torque at 400 V 3-phase
6 Peak stall torque at 230 V 3-phase

(1) The curves are given for a motor temperature increase of 100°C.

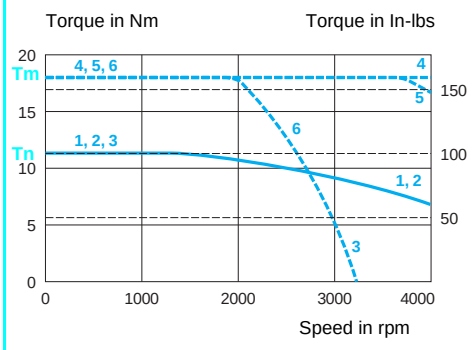
Characteristics of BPH 142 motors

Type of motor				BPH 1422 N		BPH 1423 N	
Torque	Associated with Lexium servodrive			**MHDA 1028●00**	**MHDA 1056●00**	**MHDA 1028●00**	**MHDA 1056●00**
	Continuous stall	Tn	**Nm**	11.4	12	14.5	17
	Peak stall	Tm	**Nm**	18	30	24.2	42
Current	Permanent		**A rms**	10	10.4	10	11.7
	Maximum		**A rms**	20	40	20	40
Demagnetization current			**A**	41.6		46.8	
Maximum mechanical speed			**rpm**	4000			
Constants (at 25 °C)	Torque		**Nm/A rms**	1.15		1.45	
	Back emf		**V rms s/ rad**	0.66		0.84	
Rotor	Number of poles			6			
	Inertia without brake	Jm	**gm²**	1.59		2.19	
	Inertia with brake	Jm	**gm²**	2.54		3.14	
	Static friction		**Nm**	< 0.41		< 0.51	
	Mechanical time constant		**ms**	2.6		2	
Stator (at 25 °C)	Resistance		**Ω**	1.25		1.1	
	Inductance		**mH**	14.3		15	
	Electrical time constant		**ms**	9.8		11.7	
Thermal time constant			**min**	30		34	
Holding brake (depending on model)	Holding torque		**Nm**	20			
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104			
	Current		**A**	1			
	Opening time		**ms**	55			
	Closing time		**ms**	18			

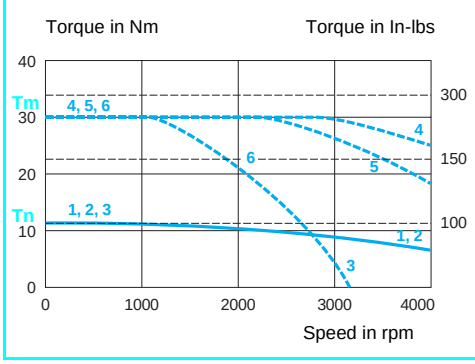
Speed/torque curves *(1)*

BPH 1422N motors

■ **with MHDA 1028●00 servodrives**

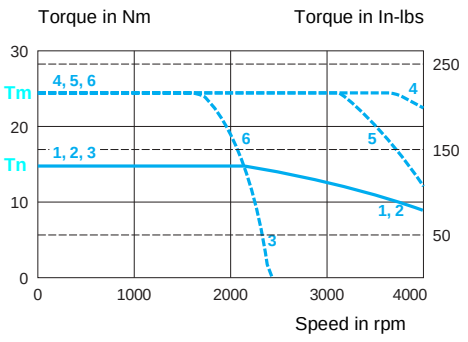


■ **with MHDA 1056●00 servodrives**

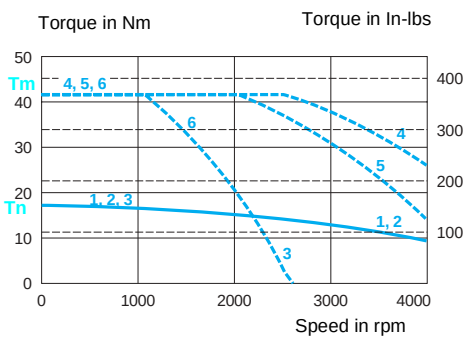


BPH1423 N motors

■ **with MHDA 1028●00 servodrives**



■ **with MHDA 1056●00 servodrives**



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) The curves are given for a motor temperature increase of 100 °C.

6

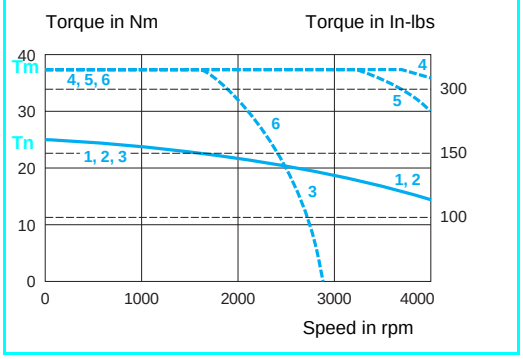
Characteristics of BPH 190 motors

Type of motor				BPH 1902 N	BPH 1903 K	BPH 1904 K
Torque	Associated with Lexium servodrive			**MHDA 1056●00**		
	Continuous stall	Tn	**Nm**	25	36	46
	Peak stall	Tm	**Nm**	37.5	57	76.2
Current	Permanent		**A rms**	19.9	19.7	20.6
	Maximum		**A rms**	40		
Demagnetization current			**A**	79.6	78.8	82.4
Maximum mechanical speed			**rpm**	4000		
Constants (at 25 °C)	Torque		**Nm/A rms**	1.24	1.79	2.18
	Back emf		**V rms s/ rad**	0.72	1.03	1.26
Rotor	Number of poles			6		
	Inertia without brake	Jm	**gm²**	5.14	7.1	9.04
	Inertia with brake	Jm	**gm²**	8.25	10.2	12.1
	Static friction		**Nm**	< 0.72	< 0.94	< 1.18
	Mechanical time constant		**ms**	2.6	1.9	1.7
Stator (at 25 °C)	Resistance		**Ω**	0.53	0.58	0.59
	Inductance		**mH**	8.5	11.4	11.6
	Electrical time constant		**ms**	16	19.6	19.6
Thermal time constant			**min**	38	43	48
Holding brake (depending on model)	Holding torque		**Nm**	40		
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104		
	Current		**A**	1.5		
	Opening time		**ms**	100		
	Closing time		**ms**	30		

Speed/torque curves *(1)*

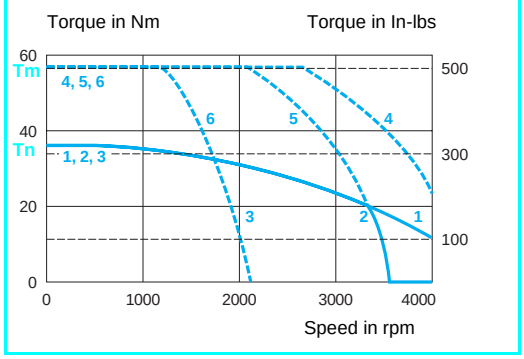
BPH 1902 N motors

■ **with MHDA 1056●00 servodrives**



BPH1903 K motors

■ **with MHDA 1056●00 servodrives**

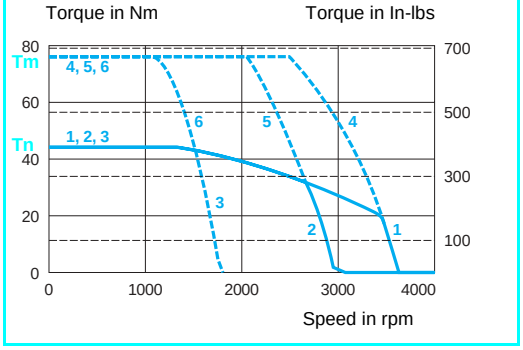


1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1)

BPH 1904 K motors

■ **with MHDA 1056●00 servodrives**



(1) The curves are given for a motor temperature increase of 100 °C.

Introduction: page 92
Functions: page 93
Description: page 94
References: pages 106 to 109
Dimensions: page 105

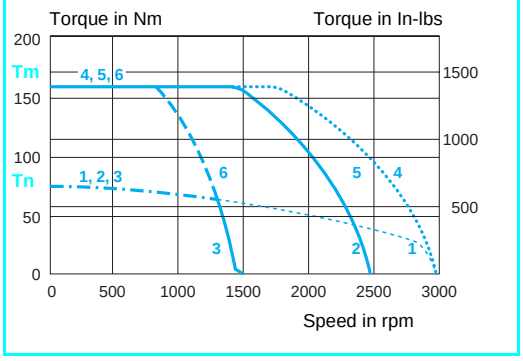
Characteristics of BPH 190 motors

Type of motor				BPH 1907 K	BPH 190A K	
Torque	Associated with Lexium servodrive			**MHDA 1112A00**	**MHDA 1112A00**	**MHDA 1198A00**
	Continuous stall	Tn	**Nm**	75	90	100 *(1)*
	Peak stall	Tm	**Nm**	157	163	230 *(1)*
Current	Permanent		**A rms**	27.9	40	44
	Maximum		**A rms**	80	80	140
Demagnetization current			**A**	111.6	176	
Maximum mechanical speed			**rpm**	4000		
Constants (at 25 °C)	Torque		**Nm/A rms**	2.61	2.24	
	Back emf		**V rms s/ rad**	1.51	1.3	
Rotor	Number of poles			6		
	Inertia without brake	Jm	**gm²**	14.9	20.75	
	Inertia with brake	Jm	**gm²**	18	23.8	
	Static friction		**Nm**	<1.7	< 2.2	
	Mechanical time constant		**ms**	1.2	1.05	
Stator (at 25 °C)	Resistance		**Ω**	0.37	0.17	
	Inductance		**mH**	9.6	5.4	
	Electrical time constant		**ms**	25.9	31.7	
Thermal time constant			**min**	61	65	
Holding brake (depending on model)	Holding torque		**Nm**	80		
	Voltage		**V**	⎓ 24 nominal, for threshold values see page 104		
	Current		**A**	1.5		
	Opening time		**ms**	97		
	Closing time		**ms**	53		

Speed/torque graphs *(2)*

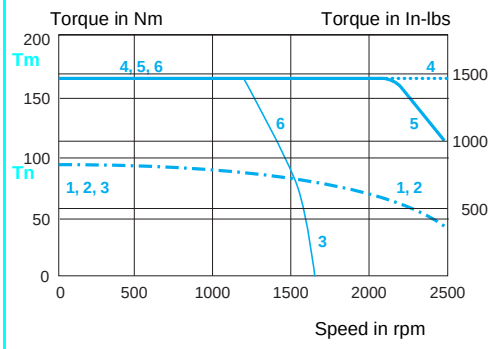
BPH 1907 K motors

■ **with MHDA 1112A00 servodrives**

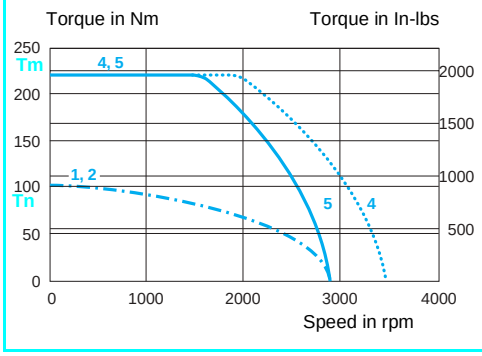


BPH190A K motors

■ **with MHDA 1112A00 servodrives**

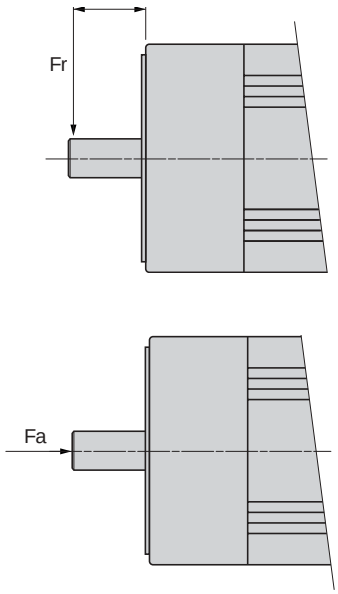


■ **with MHDA 1198A00 servodrives**



1 Continuous torque at 480 V, 3-phase
2 Continuous torque at 400 V, 3-phase
3 Continuous torque at 230 V, 3-phase
4 Peak torque at 480 V 3-phase
5 Peak torque at 400 V 3-phase
6 Peak torque at 230 V 3-phase

(1) For BPH motor with higher torque, please consult our Regional Sales Office.
(2) The curves are given for a motor temperature increase of 100 °C.



Radial and axial forces permissible on the motor shaft

Radial force
The permissible permanent radial force is limited by:
- The shaft end resistance.
- The desired life of the bearings.

The graphs on pages 102 and 104 characterize the permissible radial force on the axis according to:
- The rotation speed of the motor.
- The radial force application distance x in relation to the surface to which it is applied.

for a bearing life of **20,000 hours**.

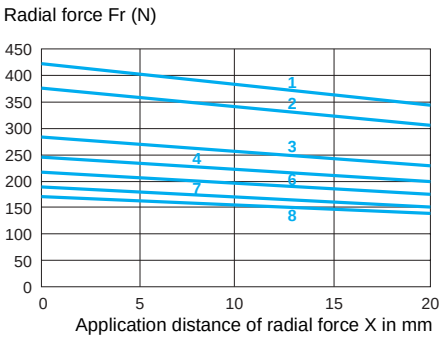
Axial force

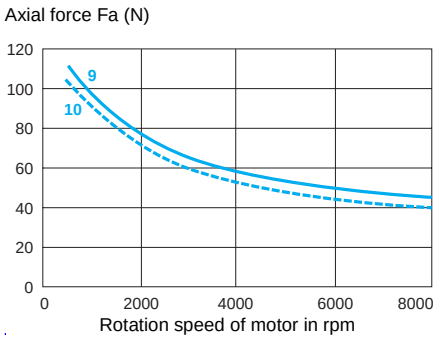
The axial force allowed is illustrated by the graphs on pages 102 and 104 according to:
- The rotation speed of the motor.
- The motor mounting position (horizontal or vertical).

for a bearing life of **20,000 hours**.

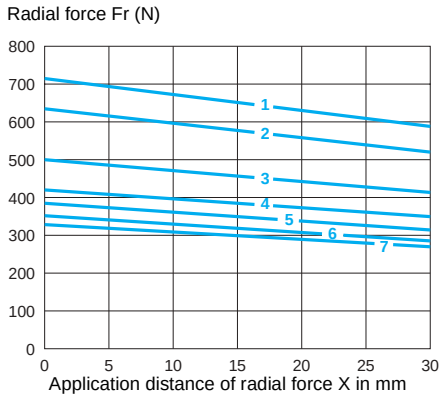
Graphs showing the forces applied to the motor shaft *(1)*

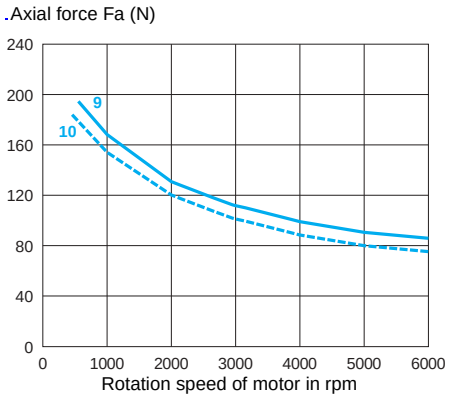
BPH 0552 S motors





BPH 0751 N/0752 N motors





Average motor speeds
1 500 rpm
2 1,000 rpm
3 2,000 rpm
4 3,000 rpm
5 4,000 rpm
6 5,000 rpm
7 6,000 rpm
8 8,000 rpm

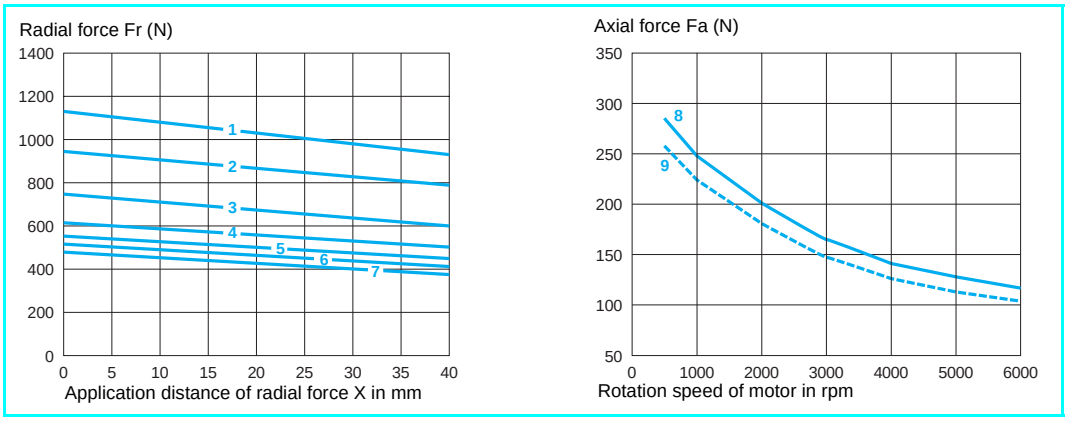
Motor mounting
9 Horizontal position
10 Vertical position

(1) The graphs above are given for an increase in motor temperature of 100 °C.

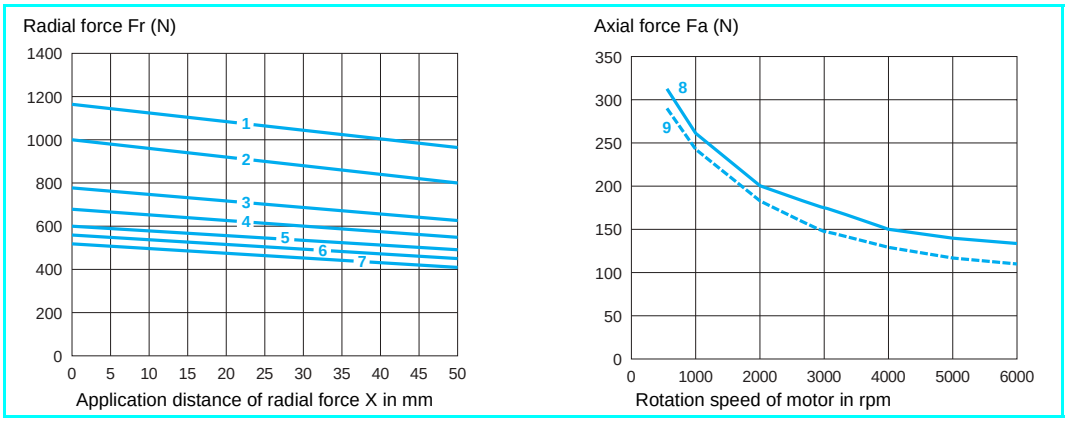
Radial and axial forces permissible on the motor shaft (continued)

Graphs showing the forces applied to motor shaft *(1)*

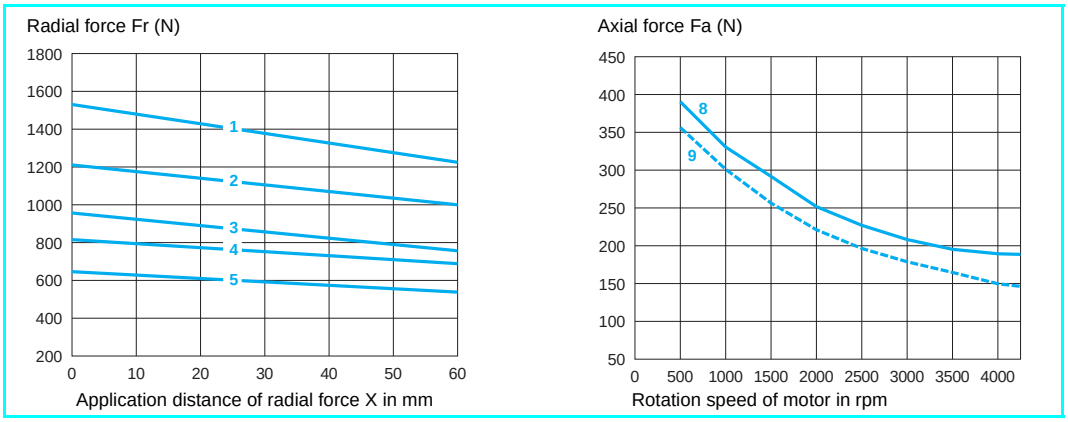
BHP 0952 N/0953 N motors



BPH 1152 N/1153 N motors



BPH 1422 N/1423 N motors



Average motor speeds
1 500 rpm
2 1,000 rpm
3 2,000 rpm
4 3,000 rpm
5 4,000 rpm
6 5,000 rpm
7 6,000 rpm

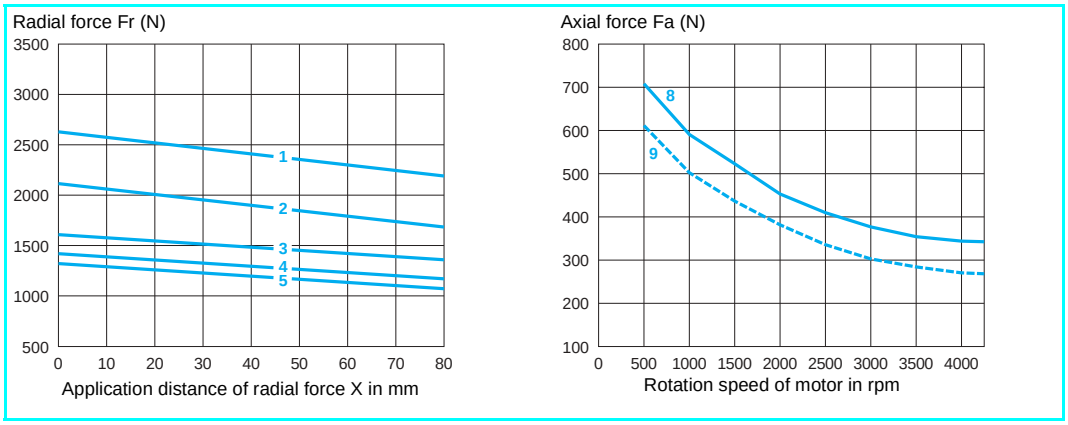
Motor mounting
8 Horizontal position
9 Vertical position

(1) The graphs above are given for an increase in motor temperature of 100 °C.

Radial and axial forces permissible on the motor shaft (continued)

Graphs showing the forces applied to motor shaft *(1)*

BPH 1902 N/1903 K/1904 K/1907 K/190A K motors



Average motor speeds
1 500 rpm
2 1,000 rpm
3 2,000 rpm
4 3,000 rpm
5 4,000 rpm
6 5,000 rpm
7 6,000 rpm

Motor mounting
8 Horizontal position
9 Vertical position

(1) The graphs above are given for an increase in motor temperature of 100 °C.

Characteristics of motor-servodrive power connection cables

		BPH 055	BPH 075/095/115	BPH 142/1902/3/4	BPH 1907/A
External cover		Polyurethane, color RAL5010	Polyester polyurethane PUR 11Y, VDE compliant, color RAL 5010		
Insulation		Polypropylene, polyester for brake	Polyolefin, TPE-E for signals		
Traction resistance	**N/mm²**	20 dynamic, 50 static			
Capacity	**pF/m**	< 150 (conductors/shielding)			
Number of conductors (shielded)		(4 x 1.5 mm² + 2 x 1 mm²)		(4 x 4 mm² + 2 x 1 mm²)	(4 x 10 mm²+ 2 x 1 mm²)
External diameter	**mm**	11	12.5	15.5	22.1
Curvature radius (bend)	**mm**	132	150	186	266
Working voltage	**V**	450	600		
Maximum length of operation	**m**	75			
Operating temperature	**°C**	0…80			

Characteristics of motor-servodrive encoder connection cables

		Resolver	SinCos Hiperface Encoder
External cover		Polyester polyurethane PUR 11Y, VDE compliant	
Insulation		Polyolefin TPE-E for signals	
Traction resistance	**N/mm²**	20 dynamic, 50 static	
Capacity	**pF/m**	< 120 (conductors/shielding)	
Number of conductors (shielded)		(4 x 2 x 0.25 mm²)	(4 x 2 x 0.38 mm² + 2 x 0.5 mm²)
External diameter	**mm**	7.5	9.4
Curvature radius (bend)	**mm**	90	112
Working voltage	**V**	300	
Maximum length	**m**	75	75
Service temperature	**°C**	0…80	

Limit supply values of the servodrive MHDA associated with a BPH motor with brake

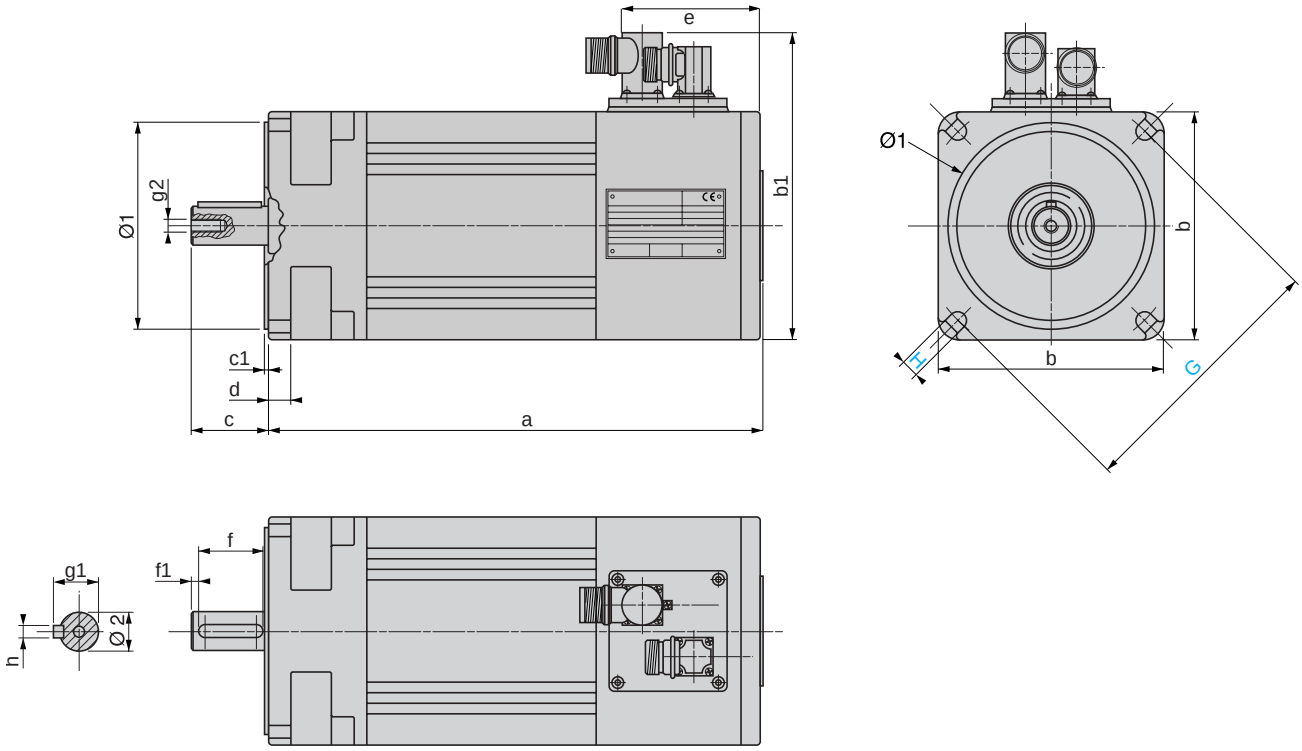
To take into account voltage drops caused by the Lexium MHDA servodrive and AGO FRU/AGO KIT supply cable connecting the servodrive to the motor, it is essential that the servodrive power connection supply the holding brake with a compatible voltage.

Power supply cable length		**5 m**	**10 m**	**15 m**	**25 m**	**40 m**	**50 m**	**75 m**
Voltage range ⎓ V servodrive power supply *(1)*	BPH0552 with brake	22.8…25.8	22.8…25.9	22.8…26.2	22.8…26.1	23…26.2	23.2…26.3	23.5…26.6
	BPH075● with brake	22.8…26.1	22.8…26.2	22.9…26.3	23.2…26.4	23.5…26.2	23.7…26.8	24.3…27.1
	BPH095● with brake	22.9…26.2	23.1…26.3	23.2…26.4	23.5…26.6	24…26.9	24.3…27.1	25…27.6
	BPH115● with brake	23…26.4	23.2…26.4	23.4…26.6	23.7…26.8	24.2…27.1	24.6…27.3	25.4…27.6
	BPH142● with brake	23.1…26.4	23.3…26.5	23.6…26.7	24…27	24.7…27.4	25.2…27.6	26.3…27.6
	BPH190● with brake	23.6…26.8	24…27	24.3…27.2	25…27.6	26…27.6	26.6…27.6	impossible

(1) Voltage measured on the ⎓ 24 V connector of the MHDA servodrive.

Introduction: page 92 | Functions: page 93 | Description: page 94 | References: pages 106 to 109 | Dimensions: page 105

Lexium BPH motors (all models)



BPH	a	b	b1	c	c1	d	e	Ø1 *(2)*	G	H
0552 S5	140/176 *(1)*	55	86	20	2.5	9	63	40	63	5.5
0751 N5	221	75	127	23	2.5	8	83	60	75	6
0752 N5	250	75	127	30	2.5	8	83	60	75	6
0952 N5	275	95	147	40	3	9	80	80	100	7
0953 N5	304	95	147	40	3	9	80	80	100	7
1152 N5	290	115	166	40	3	10	82	95	115	9
1153 N5	319	115	166	40	3	10	82	95	115	9
1422 N5	316	142	193	50	3	14	89	130	165	11
1423 N5	345	142	193	50	3	14	89	130	165	11
1902 N5	354	190	242	58	3	17	93	180	215	14
1903 K5	383	190	242	58	3	17	93	180	215	14
1904 K5	412	190	242	58	3	17	93	180	215	14
1907 K5	500	190	242	80	3	17	93	180	215	14
190A K5	605	190	242	80	3	17	93	180	215	14
Shaft end with key										
BPH	c	f	f1	g1	g2	h *(3)*	Ø2 *(4)*			
0552 S5	20	15	0	10.2	M3 x 10	3	9			
0751 N5	23	15	5	12.5	M4 x 10	4	11			
0752 N5	30	20	5	16	M5 x 12.5	5	14			
0952 N5	40	30	5	21.5	M6 x 16	6	19			
0953 N5	40	30	5	21.5	M6 x 16	6	19			
1152 N5	40	30	5	21.5	M6 x 16	6	19			
1153 N5	40	30	5	21.5	M6 x 16	6	19			
1422 N5	50	40	5	27	M8 x 19	8	24			
1423 N5	50	40	5	27	M8 x 19	8	24			
1902 N5	58	45	6.5	35	M12 x 28	10	32			
1903 K5	58	45	6.5	35	M12 x 28	10	32			
1904 K5	58	45	6.5	35	M12 x 28	10	32			
1907 K5	80	70	6.5	41	M12 x 28	10	38			
190A K5	80	70	6.5	41	M12 x 28	10	38			

(1) 140 for motor without holding brake / 176 for motor with holding brake
(2) Tolerance j6
(3) Tolerance h9
(4) Tolerance j6

Lexium motion control
Lexium BPH brushless motors

Lexium BPH brushless motors


BPH 0552●


BPH 075●


BPH 095●


BPH 115●


BPH 142●


BPH 190●

Continuous stall torque *(1)*	Associated servodrive MHDA	Peak stall torque	Maximum mechanical speed	Holding brake	Reference ⚠	Weight kg
0.4 Nm	1004N/A	1.1 Nm	8,000 rpm	Without brake *(2)*	**BPH 0552 S5● A2●0●**	1.400
				With brake *(2)*	**BPH 0552 S5● F2●0●**	1.650
0.9 Nm or	1004N/A	1.7 Nm	6,000 rpm	Without brake *(3)*	**BPH 0751 N5● A2●A●**	3.500
1.3 Nm	1008N/A	3.4 Nm	6,000 rpm	With brake *(3)*	**BPH 0751 N5● F2●A●**	3.850
1.3 Nm or	1004N/A	2.5 Nm	6,000 rpm	Without brake *(3)*	**BPH 0752 N5● A2●A●**	4.300
2.3 Nm	1008N/A	4.8 Nm	6,000 rpm	With brake *(3)*	**BPH 0752 N5● F2●A●**	4.650
3.7 Nm or	1008N/A	7.2 Nm	6,000 rpm	Without brake *(3)*	**BPH 0952 N5● A2●A●**	6.700
4.3 Nm	1017N/A	13.4 Nm	6,000 rpm	With brake *(3)*	**BPH 0952 N5● F2●A●**	7.500
6.0 Nm	1017N/A	13.4 Nm	6,000 rpm	Without brake *(3)*	**BPH 0953 N5● A2●A●**	8.000
	1028N/A	20.3 Nm	6,000 rpm	With brake *(3)*	**BPH 0953 N5● F2●A●**	8.800
7.4 Nm	1017N/A	13.6 Nm	6,000 rpm	Without brake *(3)*	**BPH 1152 N5● A2●A●**	9.600
	1028N/A	19.3 Nm	6,000 rpm	With brake *(3)*	**BPH 1152 N5● F2●A●**	10.900
6.8 Nm or	1017N/A	13.5 Nm	6,000 rpm	Without brake *(3)*	**BPH 1153 N5● A2●A●**	11.700
10.5 Nm	1028N/A	19.4 Nm	6,000 rpm	With brake *(3)*	**BPH 1153 N5● F2●A●**	13.000
11.4 Nm or	1028N/A	18.0 Nm	4000 rpm	Without brake *(3)*	**BPH 1422 N5● A2●A●**	17.200
12.0 Nm	1056N/A	30.0 Nm	4,000 rpm	With brake *(3)*	**BPH 1422 N5● F2●A●**	19.400
14.5 Nm or	1028N/A	24.2 Nm	4,000 rpm	Without brake *(3)*	**BPH 1423 N5● A2●A●**	20.100
17.0 Nm	1056N/A	42.0 Nm	4,000 rpm	With brake *(3)*	**BPH 1423 N5● F2●A●**	22.300
25.0 Nm	1056N/A	37.5 Nm	4,000 rpm	Without brake *(3)*	**BPH 1902 N5● A2●A●**	32.100
				With brake *(3)*	**BPH 1902 N5● F2●A●**	36.200
36.0 Nm	1056N/A	57.0 Nm	4,000 rpm	Without brake *(3)*	**BPH 1903 K5● A2●A●**	37.300
				With brake *(3)*	**BPH 1903 K5● F2●A●**	41.400
46.0 Nm	1056N/A	76.2 Nm	4,000 rpm	Without brake *(3)*	**BPH 1904 K5● A2●A●**	42.400
				With brake *(3)*	**BPH 1904 K5● F2●A●**	46.500
75.0 Nm	1112A	157.0 Nm	4,000 rpm	Without brake *(3)*	**BPH 1907 K5● A2●A●**	58.000
				With brake *(3)*	**BPH 1907 K5● F2●A●**	62.100
90.0 Nm or	1112A	163.0 Nm	4,000 rpm	Without brake *(3)*	**BPH 190A K5● A2●A●**	73.900
100 Nm	1198A	230.0 Nm	4,000 rpm	With brake *(3)*	**BPH 190A K5● F2●A●**	78.000

(1) Depending on the associated Lexium servodrive

(2) To order a BPH 0552 motor, fill out the reference

		BPH 0552 S5		A2/ F2		0 *(4)*	
Sensor integrated in motor	Resolver with 1 pair of poles	**U**					
Shaft end	Key			**C**			
	Smooth			**L**			
Degree of protection	IP 65 (housing), IP 54 (shaft end)					0 *(5)*	

(3) To order a BPH 075...190 motor, fill out each reference

		BPH 1422 N5		A2/ F2		A *(6)*	
Sensor integrated in motor	Resolver with 1 pair of poles	**M**					
	High resolution absolute encoder,						
	multiturn, SinCos Hiperface (no. of turns: 4096)	**A**					
	single turn, SinCos Hiperface	**B**					
Shaft end	Key			**C**			
	Smooth			**L**			
Degree of protection	IP 65 (housing and shaft end)					**1**	
	IP 67 (housing and shaft end)					**2**	

(4) This motor is compatible with the MHDA 1004 servo drive even though its reference ends in 0●. However, the servodrive's supply voltage must be limited to 3 x 230 V rms + 10 %.
(5) IP 64 with BMH Q101 end of shaft joint.
(6) The reference ending in A● refers to Lexium motors that are compatible with Lexium MHDA servodrives. Other BPH motors with 0● at the end of their reference are not compatible with MHDA servodrives.

⚠ To obtain the list of short delay BPH motors, contact our Regional Sales Offices.

References (continued)

Choice of power cables, resolver and SinCos Hiperface encoder

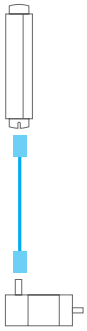
		Length	BPH 0552	BPH 0751N BPH 0752N	BPH 0952N BPH 0953N	BPH 1152N BPH 1153N	BPH 1422N BPH 1423N	BPH 1902N BPH 1903K BPH 1904K	BPH 1907K BPH 190AK
Cables with connectors fitted at both ends	Power	10 m	–	AGO FRU 015M 010			AGO FRU 016M 010		–
	Resolver	10 m	–	AGO FRU 014M 010					
	SinCos Hiperface Encoder	10 m	–	AGO FRU 013M 010					
Cables fitted with one connector (motor side) **and one connector to be mounted** (servodrive side)	Power	5 m	AGO KIT 001M 005	AGO KIT 018M 005			AGO KIT 019M 005		AGO FRU 020M 005
		10 m	–	–			–		AGO FRU 020M 010
		15 m	AGO KIT 001M 015	AGO KIT 018M 015			AGO KIT 019M 015		AGO FRU 020M 015
		25 m	AGO KIT 001M 025	AGO KIT 018M 025			AGO KIT 019M 025		AGO FRU 020M 025
		50 m	–	AGO KIT 018M 050			AGO KIT 019M 050		AGO FRU 020M 050
		75 m	–	AGO KIT 018M 075			AGO KIT 019M 075		AGO FRU 020M 075
	Resolver	5 m	AGO KIT 025M 005	AGO KIT 024M 005					
		15 m	AGO KIT 025M 015	AGO KIT 024M 015					
		25 m	AGO KIT 025M 025	AGO KIT 024M 025					
		50 m	–	AGO KIT 024M 050					
		75 m	–	AGO KIT 024M 075					
	SinCos Hiperface Encoder	5 m	–	AGO KIT 023M 005					
		15 m	–	AGO KIT 023M 015					
		25 m	–	AGO KIT 023M 025					
		50 m	–	AGO KIT 023M 050					
		75 m	–	AGO KIT 023M 075					
Cables sold by the meter	Power	Sold by the meter	RPC 305S *(2)*	–					
	Resolver	Sold by the meter	AGO CAV 003 *(2)*	–					

(1) AGO FRU 020M●●● cables are fitted with a connector (at the motor end) and a free wire termination (for connection to the screw terminal block at the servodrive end).

(2) The two lengths of cable, RPC 305S and AGO CAV 003, are fitted with all 4 AGO KIT 002CON shear connectors.

6

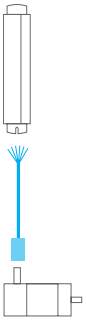
Connecting cables (1)



AGO FRU 013/014/015/016 M010

Cables fitted with connectors at both ends

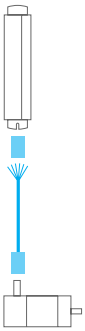
Description	From	To	Length	Reference	Weight kg
Cables power (2)	Lexium motors BPH 0751…1153	Lexium MHDA 1004/1008/ 1017/1028 servodrives	10 m	**AGO FRU 015M 010**	–
	Lexium motors BPH 1422…1904K	Lexium MHDA 1028/1056 servodrives	10 m	**AGO FRU 016M 010**	–
Cable resolver	Lexium motors BPH 0751…190AK	Lexium MHDA 1●●● servodrives	10 m	**AGO FRU 014M 010**	–
Encoder cable SinCos Hiperface	Lexium motors BPH 0751…190AK	Lexium MHDA 1●●● servodrives	10 m	**AGO FRU 013M 010**	–



AGO FRU 020M 0●●

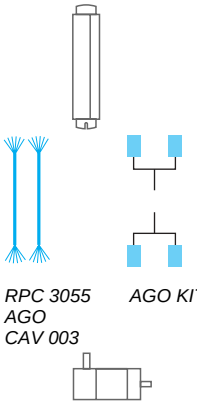
Cables fitted with a connector at the motor end (the servodrive end connector supplied with the cable has to be fitted)

Description	From	To	Length (3)	Reference	Weight kg
Power cables (2)	Lexium motors BPH 0552	Lexium MHDA 1004 servodrives	5 m	**AGO KIT 001M 005**	–
			15 m	**AGO KIT 001M 015**	–
			25 m (4)	**AGO KIT 001M 025**	–
	Lexium motors BPH 0751…1153	Lexium MHDA 1004/1008/1017/ 1028 servodrives	5 m	**AGO KIT 018M 005**	–
			15 m	**AGO KIT 018M 015**	–
			25 m (4)	**AGO KIT 018M 025**	–
			50 m (4)	**AGO KIT 018M 050**	–
			75 m (4)	**AGO KIT 018M 075**	–
	Lexium motors BPH 1422…1904	Lexium MHDA 1028/1056 servodrives	5 m	**AGO KIT 019M 005**	–
			15 m	**AGO KIT 019M 015**	–
			25 m (4)	**AGO KIT 019M 025**	–
			50 m (4)	**AGO KIT 019M 050**	–
			75 m (4)	**AGO KIT 019M 075**	–
	Lexium motors BPH 1907…190A	Lexium MHDA 1112/1198 servodrives	5 m (5)	**AGO FRU 020M 005**	–
			10 m (5)	**AGO FRU 020M 010**	
			15 m (5)	**AGO FRU 020M 015**	–
			25 m (5)	**AGO FRU 020M 025**	–
			50 m (5)	**AGO FRU 020M 050**	–
			75m (5)	**AGO FRU 020M 075**	–
Resolver cables	Lexium motors BPH 0552	Lexium MHDA 1004 servodrives	5 m	**AGO KIT 025M 005**	–
			15 m	**AGO KIT 025M 015**	–
			25 m	**AGO KIT 025M 025**	–
	Lexium motors BPH 0751…190A	Lexium MHDA 1●●● servodrives	5 m	**AGO KIT 024M 005**	–
			15 m	**AGO KIT 024M 015**	–
			25 m	**AGO KIT 024M 025**	–
			50 m	**AGO KIT 024M 050**	–
			75 m	**AGO KIT 024M 075**	–
SinCos encoder cables	Lexium motors BPH 0751…190A	Lexium MHDA 1●●● servodrives	5 m	**AGO KIT 023M 005**	–
			15 m	**AGO KIT 023M 015**	–
			25 m	**AGO KIT 023M 025**	–
			50 m	**AGO KIT 023M 050**	–
			75 m	**AGO KIT 023M 075**	–



AGO KIT 001/018/019/023/024/025M 0●●

(1) The properties of Lexium MHDA servodrives associated with Lexium BPH motors require the use of the AGO FRU/AGO KIT connection cables described above. (See paragraph on the characteristics of motor-servodrive power connection cables).
(2) The reference AGO KIT 00●M 0●● includes a cable silk-screened AGO FRU 0●●M 0●●. In the case you order a AGO KIT 024M 015, the cable will be silk-screened AGO FRU 024M 015.
(3) Conductors for supplying the holding brake integrated in the motor are included.
(4) If the connection distance between the BPH motor and the MHDA servodrive (1004....1056) is greater than or equal to 25 m, an AM0 FIL 001V056 choke must be inserted at the connection. This element must be placed as close as possible to the servodrive (a distance of less than one meter). See page 66.
(5) There is no connector at the servodrive end: connection to the servodrive is via a screw terminal.



RPC 3055
AGO
CAV 003

AGO KIT 002 CON

Connecting cables (continued)

Cables (sold by the meter) to be assembled from separate elements

Description	From	To	Length	Reference	Weight kg
Power cables	Lexium motors BPH 0552	Lexium MHDA 1004 servodrives	Sold by the meter *(1)*	**RPC 305S**	–
Resolver cables	Lexium motors BPH 0552	Lexium MHDA 1004 servodrives	Sold by the meter *(1)*	**AGO CAV 003**	–

Description	Type	Used for	Reference	Weight kg
Package with 4 connectors	Power and resolver (shear connectors)	Lexium BPH 0552 motors and Lexium MHDA 1004 servodrives with RPC 305S/ AGO CAV 003 cables	**AGO KIT 002 CON**	–

(1) The quantity ordered specifies the cable length in meters (maximum length 75m).
For example, ordering 6 RPC 305S corresponds to ordering one 6-meter long RPC 305S cable.

Documentation

Documentation A5 (English, French, German, Spanish and Italian)

Description	Reference	Weight kg
Lexium BPH technical guide	**AMO MAN 001U**	0.250

Separate parts

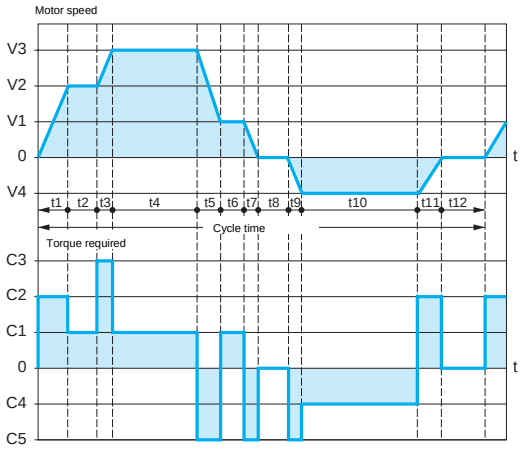
Description	Use	Reference	Weight kg
End joint for IP 64 shaft end	BPH 055 motors	**BMH Q101**	–
Hoisting eye	BPH 1902...190A motors	**AMO GOL 001 M8**	–

Replacement parts

Description	Use	Reference	Weight kg
Keys for motor shaft	Lexium BPH 0552 motors	**AMO CHI 00615X3**	–
	Lexium BPH 0751 motors	**AMO CHI 0014X4**	–
	Lexium BPH 0752 motors	**AMO CHI 0025X5**	–
	Lexium BPH 0952...1153 motors	**AMO CHI 0036X6**	–
	Lexium BPH 1422/1423 motors	**AMO CHI 0048X7**	–
	Lexium BPH 1902...1904 motors	**AMO CHI 0050X8**	–
	Lexium BPH 1907/190A motors	**AMO CHI 00770X10**	–

Sizing the brushless motor

To assist you in sizing the motor the Lexium Sizer utility is available on the site:www.schneiderautomation.com.
This page is to help you understand the method of calculation used.
In order to size a motor, you need to know the equivalent thermal torque and average speed required by the mechanics to be associated with the motor. Both these values are calculated using a motor cycle trend diagram and should be compared with the speed/torque curves given for each motor (see pages 95 to 101).



Motor cycle trend diagram

The motor cycle is made up of several sub-cycles, the duration of which is known. Each sub-cycle is split into phases which correspond to the periods of time during which the motor torque is constant (maximum 1 to 3 phases per sub-cycle).
This division can be used to calculate, for each phase :

- the duration (ti)
- the speed (Si)
- the required torque (Ti)

The trend diagrams opposite show the 4 phase types :

- constant acceleration during t1, t3 and t9
- at work during times t2, t4, t6, and t10
- constant deceleration during t5, t7 and t11
- motor stopped during t8 and t12

The total duration of the cycle is calculated as follows :
Cycle time = t1 + t2 + t3 + t4 + t5 + t6 + t7 + t8 + t9 + t10 + t11 + t12

Calculating the average speed

The average speed is calculated using the formula : $S_{avg} = \frac{\sum |Si| \cdot ti}{\sum ti}$

- Si corresponds to the various working speeds
- $\frac{Si}{2}$ corresponds to the average speeds during the constant acceleration and deceleration phases. In the example above :

Duration ti	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12
Speed $\lvert Si \rvert$	$\frac{\lvert S2 \rvert}{2}$	$\lvert S2 \rvert$	$\frac{\lvert S3 \rvert + \lvert S2 \rvert}{2}$	$\lvert S3 \rvert$	$\frac{\lvert S3 \rvert + \lvert S1 \rvert}{2}$	$\lvert S1 \rvert$	$\frac{\lvert S1 \rvert}{2}$	0	$\frac{\lvert S4 \rvert}{2}$	$\lvert S4 \rvert$	$\frac{\lvert S4 \rvert}{2}$	0

The average speed is calculated as follows :

$$S_{avg} = \frac{\frac{S2}{2} \cdot t1 + S2 \cdot t2 + \frac{S3+S2}{2} \cdot t3 + S3 \cdot t4 + \frac{S3+S1}{2} \cdot t5 + S1 \cdot t6 + \frac{S1}{2} \cdot t7 + \frac{S4}{2} \cdot t9 + S4 \cdot t10 + \frac{S4}{2} \cdot t11}{\text{Cycletime}}$$

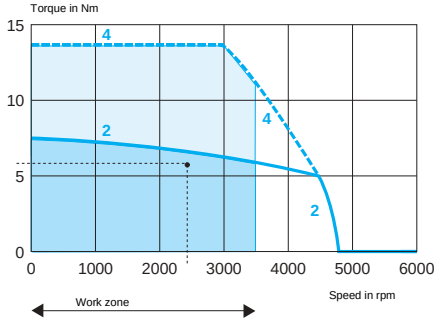
Calculating the equivalent thermal torque

The equivalent thermal torque is calculated using the formula :

$$T_{eq} = \sqrt{\frac{\sum Ti^2 \cdot ti}{\text{Cycletime}}}$$

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

$$T_{eq} = \sqrt{\frac{T2^2 \cdot t1 + T1^2 \cdot t2 + T3^2 \cdot t3 + T1^2 \cdot t4 + T5^2 \cdot t5 + T1^2 \cdot t6 + T5^2 \cdot t7 + T5^2 \cdot t9 + T4^2 \cdot t10 + T2^2 \cdot t11}{\text{Cycletime}}}$$



Determining the motor size

The point defined by the 2 calculations above, where the :

- vertical axis represents the average speed S_{avg}
- horizontal axis represents the thermal torque T_{eq}

must be within the area bounded by curve 2 and the work zone. The example time diagram opposite illustrates a BPH 1152N motor used with an MHDA 1017N/1017A servodrive, with a 3-phase 400 V supply.
The motor cycle time diagram should also be used to ensure that all torques Ti required for the different speeds Si during the various cycle phases are within the area bounded by curve 4 and the work zone.

2 Nominal stopping torque at 400 V, 3-phase.
4 Maximum torque at 400 V, 3-phase.

Sizing the braking resistor

When braking or deceleration is required, the kinetic energy of the load must be absorbed by the servodrive. The energy generated by deceleration loads the capacitors integrated in the servodrive. When the voltage at the capacitor terminals exceeds the permitted threshold, the braking resistor (internal or external) is automatically activated in order to dissipate this energy. Calculation of the power to be dissipated by the braking resistor requires an understanding of the trend diagram giving the motor torques and speeds according to time in order to identify the curve segments in which the servodrive decelerates the load.

Motor cycle trend diagram

These two curves are used on page 110 to size the motor. The segments of the curve to be taken into account, when the servodrive is decelerating, are marked in blue by Di.

Calculating the constant deceleration power

In order to do this you need to know the total inertia, defined as follows :
Jt : total inertia
where :
Jt = Jm (motor inertia, with or without brake) + Jc (load inertia). For Jm, see pages 79 to 83 (for SER motors) or 95 to 101 (for BPH motors).
The energy Ei of each deceleration segment is defined as follows :
$Ei = 1/2\ Jt.\ \omega i^2 = 1/2\ Jt.(2\pi Si/60)^2$
giving, for the different segments :
$E1 = 1/2\ Jt.\ (2\pi/60)^2.\ (S3^2-S1^2)$ for segment D1
$E2 = 1/2\ Jt.\ (2\pi\ S1/60)^2$ for segment D2
$E3 = 1/2\ Jt.\ (2\pi\ S4/60)^2$ for segment D3
where Ei is in joules, Jt in kgm^2, ω in radians and Si in rpm

Energy absorbed by the internal capacitors

The energy absorption capacity of the servodrive Edrive (without using an internal or external braking -resistor) is shown opposite.

In the calculation, only take into account segments Di whose energy Ei is greater than the absorption capacity given in the table opposite. The additional -energy values EDi are dissipated in the resistor (internal or external) :

EDi = Ei - Edrive (in joules)

Edrive

Power supply	V	230 single ph.	230 3-ph.	400 3-ph.	480 3-ph.
MHDA 1004●	Joules	5	5	19	23
MHDA 1008●	Joules	5	5	19	23
MHDA 1017●	Joules	–	5	19	23
MHDA 1028●	Joules	–	5	19	23
MHDA 1056●	Joules	–	10	38	47
MHDA 1112●	Joules	–	60	150	180
MHDA 1198●	Joules	–	120	300	360

Calculating pulsed and continuous power

Pulsed power : for each segment, the power Pli is defined as follows :
Pli = EDi / ti
where Pli is in W, EDi in joules and t in s and ti corresponds to the deceleration time of the segment concerned.
The continuous power Pc is calculated for each machine cycle as follows :
Pc = ∑ EDi / Cycle time
where Pc is in W, EDi in joules and Cycle time in s.

Selecting the braking resistor (internal or external)

There are two options :
The pulsed powersPli of the various segments are to be compared with the maximum peak braking power PCr given in the table below. Select **PCr > Pli**.
This selection is confirmed by comparing the continuous power calculatedPc with the continuous braking power PPr given in the table below. Select **PPr > Pc**.

Braking power of servodrive Lexium 17D HP et 17S HP				Lexium 17D MHDA 1004/1008N/A			Lexium 17D MHDA 1017/1028/1056N/A			Lexium 17D HP MHDA 1112/A00			MHDA 1198/A00		
3-phase servodrive supply			**V**	230	400	480	230	400	480	230	400	480	30	400	480
Internal resistor			Ω	66			33			–			–		
	Continuous	PPr	**W**	80			200			–			–		
	Peak (1s)	PCr	**W**	2500	8000	10500	5000	16000	21000	–			–		
External resistor			Ω	33			33			15			10		
	Continuous	PPr	**W**	250	400	500	750	1200	1500	6000			6000		
	Peak (1s)	PCr	**W**	5000	16000	21000	5000	16000	21000	10000	35000	45000	16000	50000	70000
	Resistor to associate			AM0 RFE 001 V025	AM0 RFE 001 V050		AM0 RFE 001 V150			AM0 RFE 002 V086			AM0 RFE 002 V150		

Lexium motion control
Phaseo regulated power supplies

2/3 A power supply

5 A power supply

10 A power supply

ABL 7 power supplies

The ABL 7 range of power supplies is designed to provide the d.c. voltage necessary for the control circuits of automation system equipment. Split into three families, this range meets all the needs encountered in industrial, commercial and residential applications. Single-phase or 3-phase *(1)*, of the electronic switch mode type, they provide a quality of output which is suitable for the loads supplied and compatible with the mains supply available in the equipment. Clear guidelines are given on selecting protection devices which are often used with them, and thus a comprehensive solution is provided which can be used in total safety.

Phaseo switch mode power supplies

These switch mode power supplies are totally electronic and regulated. The use of electronics makes it possible to significantly improve the performance of these power supplies which offer:
- compact size,
- integrated overload, short-circuit, overvoltage and undervoltage protection,
- a very wide range of permissible input voltages, without any adjustment,
- a high degree of output voltage stability,
- hight performance,
- LED indicators on the front panel.

Phaseo power supplies are available in single-phase and 3-phase versions *(1)*. They deliver a voltage which is precise to 3%, whatever the load and whatever the type of mains supply, within a range of 85 to 264 V for single-phase, or 360 to 550 V for 3-phase. Conforming to IEC standards, UL and CSA certified, they are suitable for universal use. The inclusion of overload and short-circuit protection makes downstream protection unnecessary if discrimination is not required.
ABL 7 RE supplies are also equipped with an output undervoltage control which causes the product to trip if the output voltage drops below 19 V, in order to ensure that the voltage delivered is always usable by the actuators being supplied. All the products are fitted with an output voltage adjustment potentiometer in order to be able to compensate for any line voltage drops in installations with long cable runs. Most of our power supplies are designed for direct mounting on 35 and 75 mm ⊔ rails.

The 24 AC single-phase power supplies ABL 7RE selected *(2)* in this catalogue are quite adapted to tie-up with the Lexium MHDA servodrives):
- power between 48 W (2 A) and 240 W (10 A),
- compact size,
- for all machine equipment,
- suitable for use in automation system environments based on the Modicon platforms of Telemecanique brand requiring ⎓ 24 V power supply.

(1) 3-phase power supplies, consult our catalogue "Phaseo Power Supplies and Transformers".
(2) ABL 7RP single-phase power supplies, consult our catalogue "Phaseo Power Supplies and Transformers".

Selection page 114 | Characteristics: pages 115 and 116 | References: page 117 | Dimensions: page 117

Using ⎓ 24 V

■ Using ⎓ 24 V enables so-called protection installations (PELV) to be built. Using PELV is a measure designed to protect people from direct and indirect contact. Measures relating to these installations are defined in publication NF C 12-201 and in standard IEC 364-4-41.

■ The application of these measures to the electrical equipment in machines is defined in standard NF EN 60204-1 and requires:
□ that the voltage used is below 60 V d.c. in dry environments and below 30 V in damp environments,
□ the connection of one side of the PELV circuit, or one point of the source, to the equipotential protection circuit associated with higher voltages.
□ the use of switchgear and control gear on which measures have been taken to ensure "safety separation" between power circuits and control circuits.

■ A safety separation is necessary between power circuits and control circuits in PELV circuits. Its aim is to warn of the appearance of dangerous voltages in ⎓ 24 V safety circuits.

■ The reference standards involved are:
□ IEC 61558-2-6 and EN 61558-2-6 (safety transformers),
□ IEC 664 (coordination of isolation).
Telemecanique power supplies meet these requirements.

■ Moreover, to ensure that these products will operate correctly in relation to the demands of their reinforced isolation, it is recommended that they be mounted and wired as indicated below:
□ they should be placed on an earthed mounting plate or rail,
□ they should be connected using flexible cables, with a maximum of two wires per connection, and tightened to the nominal torque,
□ conductors of the correct insulation class must be used.

■ If the d.c. circuit is not connected to an equipotential protection conductor, an earth leakage detector will indicate any accidental insulation faults (please consult your Regional Sales Office).

Operating voltage

■ The permissible tolerances for the operating voltage are listed in publications IEC 1131-2 and DIN 19240.

■ For nominal voltage Un = ⎓ 24 V, the extreme operating values are from - 15 % to + 20 % of Un, whatever the supply variations in the range - 10 % to + 6 % (defined by standard IEC 38) and load variations in the range 0-100 % of In.

All Telemecanique ⎓ 24 V power supplies are designed to provide a voltage within this range.

■ It may be necessary to use a voltage measurement relay to detect when the normal voltage limits are being surpassed and to deal with the consequences of this (please consult your Regional Sales Office).

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Lexium motion control
Phaseo regulated power supplies

The quality of the mains power supply

The Phaseo range is the solution because it guarantees precision to 3% of the output voltage, whatever the load current and the input voltage. In addition, the wide input voltage range of Phaseo power supplies allows them to be connected to all mains supplies within the nominal range, without any adjustment.

Harmonic pollution (power factor)

The current drawn by a power supply is not sinusoidal. This leads to the existence of harmonic currents which pollute the mains supply. European standard EN 61000-3-2 limits the harmonic currents produced by power supplies. This standard covers all devices between 75 W and 1000 W, drawing up to 16 A per phase, and connected directly to the public mains power supply. Devices connected downstream of a private, low voltage, general transformer are therefore excluded.

Regulated switch mode supplies always produce harmonic currents; a filter circuit (Power Factor Correction or PFC) must therefore be added to comply with standard EN 61000-3-2.

Electromagnetic compatibility

Levels of conducted and radiated emissions are defined in standards EN 55011 and EN 55022.
All products in the Phaseo range have class B certification and can be used without any restrictions due to their low emissions.

Behaviour in the event of short-circuits

Phaseo power supplies are equipped with an electronic protection device. This protection device resets itself automatically on elimination of the fault (around 1 second for ABL 7RE, which avoids having to take any action or change a fuse).

Presentation: pages 112 and 113
Characteristics: pages 115 and 116
References: page 117
Dimensions: page 117

Lexium motion control
Phaseo regulated power supplies

Technical characteristics

Type of power supply			ABL 7RE
Approvals			UL, CSA, TÜV, CTick
Conforming to standards	Safty		UL 508, CSA 22.2 n° 950
	EMC		EN 50081-1, IEC 61000-6-2 (EN 50082-2)
	Low frequency harmonic currents		–

Input circuit

LED indication			Orange LED
Input voltages	Rated values	**V**	∿ 100…240 single-phase
	Permissible values	**V**	∿ 85…264 single-phase
	Permissible frequencies	**Hz**	47…63
	Efficiency at nominal load		> 85 %
	Current consumption Ue = 240 V	**A**	0.6 (48 W)/0.83 (72 W) 1.2 (120 W)/2.5 (240 W)
	Ue = 100 V	**A**	1.2 (48 W)/1.46 (72 W) 1.9 (120 W)/3.6 (240 W)
	Current at switch-on	**A**	< 30
	Power factory		0.65 approx.

Output circuit

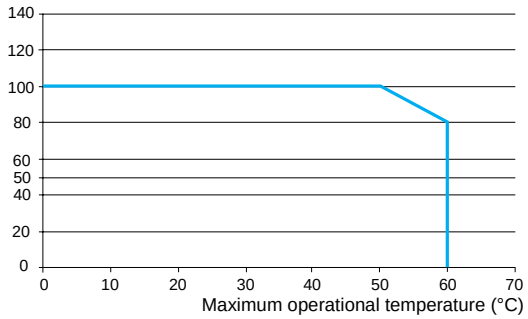
LED indication			Green LED
Nominal output voltage (U out)		**V**	⎓ 24
Nominal output current		**A**	2/3/5/10
Precision	Output voltage		Ajustable from 100 to 120 %
	Line and load regulation		± 3 %
	Residual ripple - interference	**mV**	< 200 (peak-peak)
Micro-breaks	Holding time at I max and Ve min	**ms**	> 10
Temporary overloads	Permissible inrush current (U out >19V)		See page 116
Protections	Short-circuits		Permanent/automatic restart
	Overload		1.1 In
	Overvoltage		Tripping if U > 1.5 Un
	Undervoltage		Tripping if U < 0.8 Un

Operational and environmental characteristics

Connections	Input	**mm²**	2 x 2.5 + earth
	Output	**mm²**	2 x 2.5 + earth, multiple output, depending on model
Ambient conditions	Storage temperature	**°C**	- 25… + 70
	Operating temperature	**°C**	0… + 60 (derating as from 50 °C, mounted vertically)
	Max. relative humidity		95 % without condensation
	Degree of protection		IP 20 conforming IEC 529
	Vibrations		Conforming EN 61131-2
Operating position			Vertical
MTBF at 40 °C			> 100 000 h
Connections	Series		Possible
	Parallel		Possible (max. temperature 50 °C)
Dielectric strength	Input/output		3000 V/50 and 60 Hz 1 minute
	Input/earth		3000 V/50 and 60 Hz 1 minute
	Ouput/earth (and output/output)		500 V/50 and 60 Hz 1 minute
Input fuse incoporated			Yes, not interchangeable
Disturbance			EN 50081-1
	Conducted		EN 55011/EN 55022 cl.B
	Radiated		EN 55011/EN 55022 cl.B
Immunity			IEC 61000-6-2 (generic)
	Electrostatic discharge		EN 61000-4-2 (4 kV contact/8 kV air)
	Electromagnetic		EN 61000-4-3 niv.3 (10 V/m)
	Conduced interference		EN 61000-4-4 niv.3 (2 kV) , EN 61000-4-5, EN 61000-4-6 niv.3, EN 61000-4-8 niv. 4.
	Mains interference		EN 1000-4-11 (voltage drops and cuts)

Presentation: pages 112 and 113
Selection: page 114
References: page 117
Dimensions: page 117

P/Pn (%)



Derating

The ambient temperature is a determining factor which limits the power that an electronic power supply can deliver continuously. If the temperature around the electronic components is too high, their life will be significantly reduced. Conversely, a power supply can deliver more than its nominal power if the ambient temperature remains largely below the rated operating temperature.
The rated ambient temperature for Phaseo power supplies is 50 °C. Above this, derating is necessary up to a maximum temperature of 60 °C.
The graph below shows the power P (in relation to the nominal power Pn) which the power supply can deliver continuously, according to the ambient temperature.
Derating should be considered in extreme operating conditions:

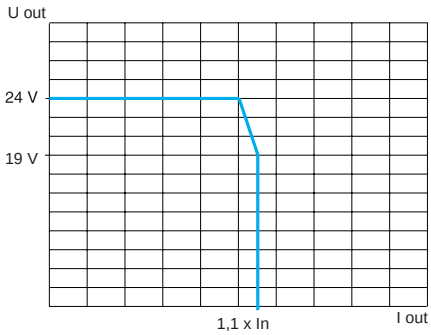
- Intensive operation (output current permanently close to the nominal current, combined with a high ambient temperature).
- Output voltage set above 24V (to compensate for line voltage drops, for example).
- Parallel connection to increase the total power.

General rules to be complied with

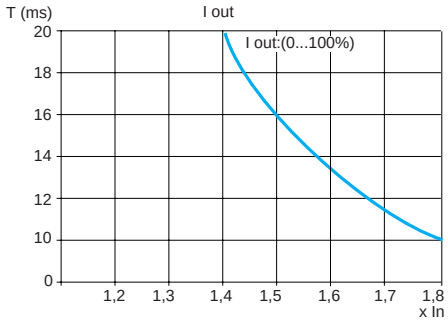
Intensive operation	See derating on above graph. Example for ABL 7RE: □ without derating, from 0 °C to 50 °C, □ derating of nominal current by 2%, per additional °C, up to 60 °C.
Rise in output	The nominal power is fixed. Increasing the output voltage means that the current delivered must be reduced.
Parallel connection to increase the power	The total power is equal to the sum of the power of the power supplies used, but the maximum ambient temperature for operation is 50 °C. To improve heat dissipation, the power supplies must not be in contact with each other.

In all cases, there must be adequate convection round the products to ensure easier cooling. There must be a clear space of 50 mm above and below Phaseo power supplies and of 15 mm at the sides.

Load limit



Temporary overloads



Lexium motion control
Phaseo regulated power supplies

ABL 7RE and ABL 7RP power supply: protection of the power supply line

Type of mains supply	∿ 115 V single-phase			∿ 230 V single-phase		
Type of protection	Thermal-magnetic circuit-breaker		gG fuse	Thermal-magnetic circuit-breaker		gG fuse
	GB2	C60N		GB2	C60N	
ABL 7RE2402	GB2 ●B07	MG24517 *(1)*	2 A	GB2-DB06	MG24516 *(1)*	2 A
ABL 7RE2403	GB2 ●B07	MG24517 *(1)*	2 A	GB2-DB06	MG24516 *(1)*	2 A
ABL 7RE2405	GB2 ●B08	MG24518 *(1)*	4 A	GB2-DB07	MG17453 *(1)*	2 A
ABL 7RE2410	GB2 ●B12	MG17454 *(1)*	6 A	GB2-DB08	MG24518 *(1)*	4 A

(1) Circuit-breaker certified UL.

Association of the single-phase power supplies Phaseo with Lexium MHDA servodrives

To define the size of the ABL 7RE power supply, it is necessary to add the other elements of the control system connected to this power supply to the consumption of the servodrive, giving a total Σ Ia.

The power supply is selected by applying a factor of 1.25 to take into account the dispersions and different inrush currents, thus:
Nominal output current TSX SUP > 1,25 Σ Ia.

A reminder of the ⎓ 24 V consumption for Lexium MHDA servodrives with SER/BPH motors is given below.

Lexium servodrive	MHDA 1004/1008●00			MHDA 1017●00		MHDA 1028●00			MHDA 1056●00		MHDA 1112/1198A00
Associated BPH motor	0552	075●	095●	095●	115●	095●	115●	142●	142●	1902/3/4	1907/190A
Current without brake (A)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.2	1.2	2
Current out brake (A) *(1)*	1.08	1.25	1.45	1.45	1.55	1.45	1.55	1.75	2.2	2.7	3.5
Associated SER motor	39●	3B●		39●	3B●	3B●			–		–
Current without brake (A)	0.75	0.75		0.75	0.75	0.75			–		–
Current out brake (A) *(1)*	1.75	1.95		1.75	1.95	1.95			–		–

(1) According to the length of power cable (between the servodrive and motor), check the output voltage range is compatible with the voltage ranges indicated on page 104 : limit supply values of the servodrive MHDA associated with a BPH motor with brake.

References *(1)*

ABL 7RE2405

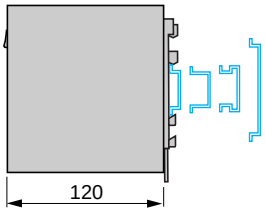
ABL 7RE single-phase regulated switch mode power supplies

Mains input voltage 47...63 Hz	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conforming to standard EN 61000-3-2	Reference	Weight
V	⎓ V	W	A				kg
∿ 100...240 single-phase wide range	24	48	2	auto	no	**ABL 7RE2402**	0.520
		72	3	auto	no	**ABL 7RE2403**	0.520
		120	5	auto	no	**ABL 7RE2405**	1.000
		240	10	auto	no	**ABL 7RE2410**	2.200

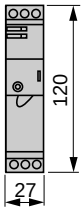
(1) Other Phaseo power supplies, consult our catalogue " Phaseo Power supply and Transformer".

Dimensions

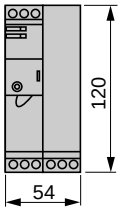
ABL 7RE24●●/ABL 7RP24●●
Common side view
Mounting on 35 and 75 mm rails



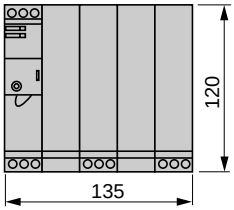
ABL 7RE2402/2403



ABL 7RE2405



ABL 7RE2410



In some countries, certification of certain electrical components is enforced by law. A standard conformity certificate is then issued by the official organization. Each certified product must carry approval symbols when enforced.
Use on board merchant navy vessels generally requires prior approval (= certification) of an electrical device by certain marine classification authorities.

Key	Certification body	Country
CSA	Canadian Standards Association	Canada
C-Tick	Australian Communication Authority	Australia
UL	Underwriters Laboratories	USA

Key	Classification authority	Country
ABS	American Bureau of Shipping	USA
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
GOST	Institut de recherche Scientifique Gost Standardt	C.I.S., Russia
LR	Lloyd's Register	United-Kingdom
RINA	Registro Italiano Navale	Italiy
RMRS	Register of Shipping	C.I.S.

The table below shows the situation as of the 01.01.2004 for certifications obtained or pending from organizations for base PLCs. An overview of certificates for Telemecanique products is available on our Internet web site :
www.telemecanique.com

Product certifications

Certifications

Certified
Pending certification

	UL	CSA	C-Tick ACA	SIMTARS	GOST	Hazardous locations Class 1 Div 2
	USA	Canada	Australia	Australia	CEI, Russia	US
Advantys STB	■					■
CCX 17	■					
Lexium MHD/BPH	■	■				
Magelis iPC	■					■
Magelis XBT-F/FC	■	■	■			
Magelis XBT-G/H/P/E/HM/PM	■	■				
Momentum	■	■	■			
Nano	■	■	■		■	
Premium	■	■	■	■	■	■
Quantum	■	■	■		■	■
TBX	■	■	■			
Telefast 2	■	■				
TSX Micro	■	■	■	■	■	■
TSX/PMX 47 à 107	■	■			■	■
Twido	*(1)*					
Twin Line	■					

(1) cULus north-american certification (Canada and US).

Local certifications		
BG	Germany	TSX DPZ 10D2A safety module (TSX Micro) TSX PAY 262/282 safety modules (Premium)
AS-Interface	Europe	TSX SAZ 10 master module (TSX Micro) TSX SAY 100/1000 master modules (Premium) TBX SAP 10 Fipio bus/AS-Interface bus gateway

Marine classification

	Marine classification des authorities						
Certified / *Pending certification*	ABS	BV	DNV	GL	LR	RINA	RMRS
	USA	France	Norway	Germany	Unit.-Kingdom	Italiy	C.I.S.
Advantys STB							
CCX 17							
Lexium MHD/BPH							
Magelis iPC							
Magelis XBT-F/FC							
Magelis XBT-H/P/E/HM/PM							
Momentum							
Nano							
Premium							*(1)*
Quantum							
TBX							
Telefast 2							
TSX Micro							
TSX/PMX 47 à 107							
Twido							
Twin Line							

(1) Unity processors, pending certification.

Community regulations

European directives

The opening of European markets implies a harmonization of regulations in the various European Union member states.
European Directives are documents used to remove obstacles to the free movement of goods and their application is compulsory in all states of the European Union.
Member states are obliged to transcribe each Directive into their national legislation and, at the same time, to withdraw any conflicting regulations.
The Directives, particularly those of a technical nature with which we are concerned, only set objectives, called “general requirements”.
The manufacturer must take all necessary measures to ensure that his products conform to the requirements of each Directive relating to his equipment.
As a general rule, the manufacturer affirms that his product conforms to the necessary requirements of the Directive(s) by applying the CE label to his product.
CE marking is applied to Telemecanique products where relevant.

The significance of CE marking

■ CE marking on a product means that the manufacturer certifies that his product conforms to the relevant European Directives ; it is necessary in order that a product which is subject to a Directive(s) can be marketed and freely moved within the European Union.
■ CE marking is intended solely for the national authorities responsible for market regulation.

For electrical equipment, only conformity of the product to standards indicates that it is suitable for use, and only a guarantee by a recognised manufacturer can ensure a high level of quality.
One or more Directives, as appropriate, may apply to our products, in particular :
■ The Low Voltage Directive 72/23/EEC amended by Directive 93/68/EEC : CE marking under the terms of this Directive is compulsory as of 1 January 1997.
■ The Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC : CE marking on the products covered by this Directive has been compulsory since 1 January 1996.

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