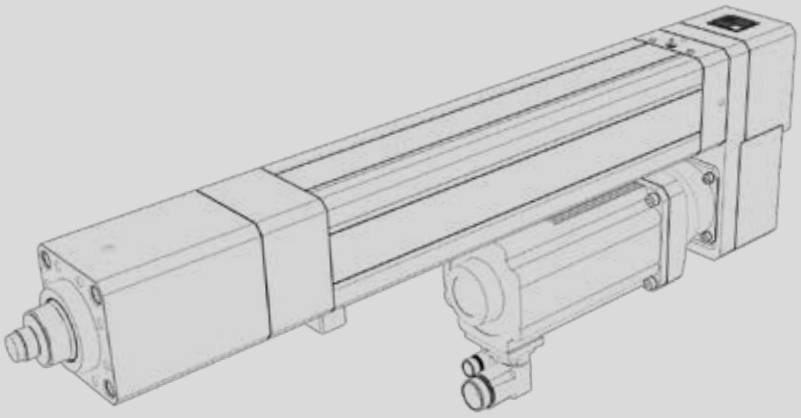
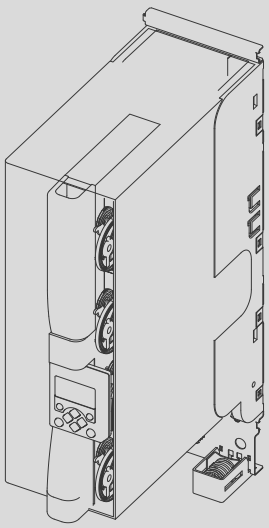
TOX® PRESSOTECHNIK

TOX®-ElectricDrive System & Components

Data sheet 40.18
2021/11





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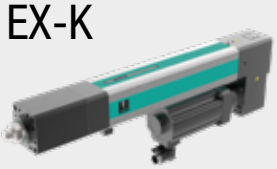
Product overview TOX®-ElectricDrive

Modular electro-mechanical servo drive systems with press forces of up to 1000 kN. From a single system to a complex drive solution in a special machine, we supply perfect concepts for a large number of applications. The scope of delivery is composed of the following components:

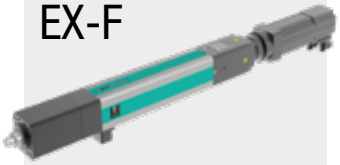
Drives

EQ-K

EX-K



EX-F



EPMR

EPMK

Default components

Integrated in the control cabinet:

Load / brake resistor
Transforms excess energy to heat.

Servo controller

The servo controller immediately processes the process data and responds directly to deviations.

Measuring amplifier
Amplifies the force measuring signal.

Cable set:

Cable set
For connecting the drive with the controller.

Software:

TOX®softWare
The TOX®softWare includes all required programs for fast and simple configuration, parameterization, visualization and diagnosis of the servo drive systems.

Options

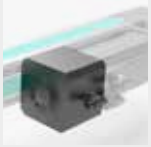
PLe-Kit
Type tested, fully integrated panel to achieve performance level E safety circuit.

External load / brake resistor
Outside the control cabinet for special joining modules.

Safety brake switch module
For controlling the external brake.

External brake
For the highest safety level e. g. for manual workstations.

Motor holding brake
For use with higher-weight tools.

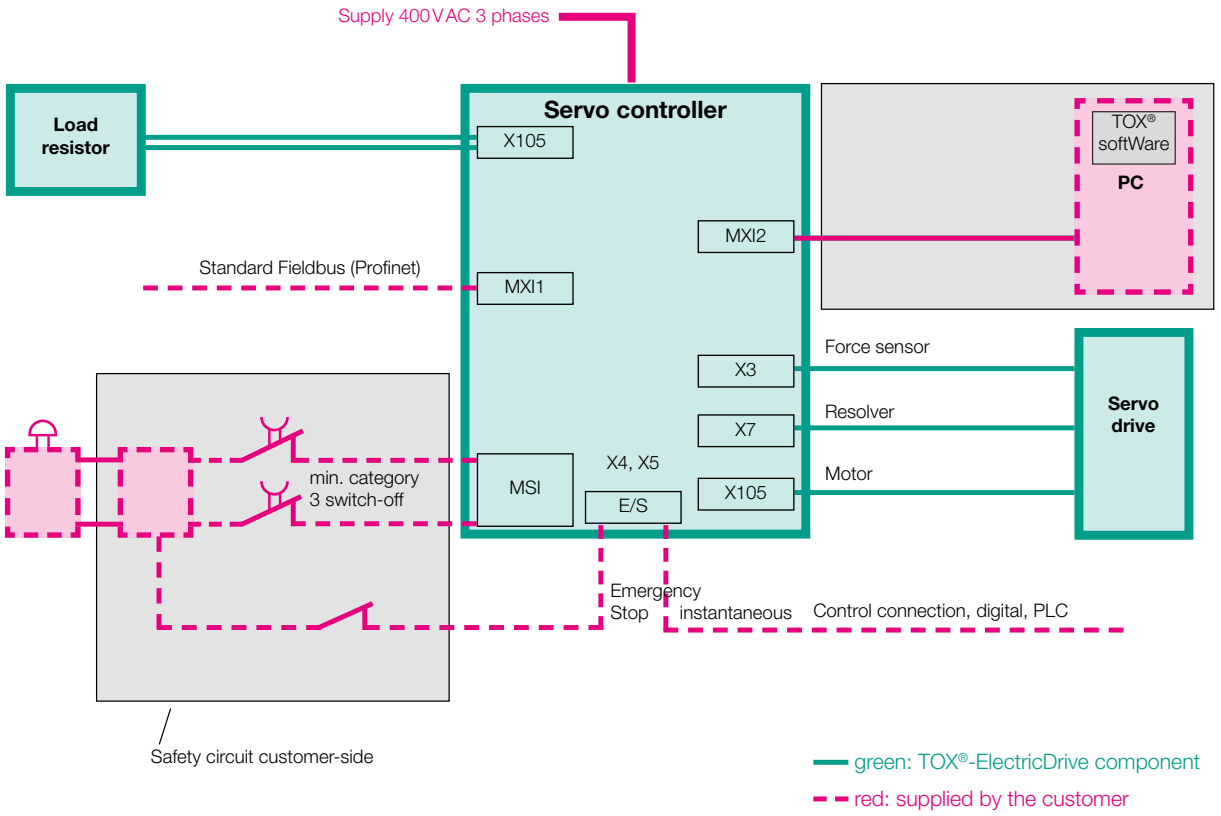


Fan
The servo drives EX and EPMR can be equipped with an external motor cooling fan. This enables higher duty cycles and faster operation.

IPC
For visualization of the TOX®softWare.

Block diagram

Schematic diagram of a TOX®-ElectricDrive System (simplified form)



Electromechanical drives

Type key

TOX®-ElectricDrive drives are available in many different versions. Applications can be realized using standard solutions, and custom versions can be used for special requirements.

The part numbers of the drives are composed of technical data. The following table is used for the interpretation of these numbers and explains the number combinations.

Information in the type key

TOX®-ElectricDrive type Design (version): **K** (compact) **F** (standard-fast) **R** (mounting flange tongs)	Press force	Version (brakes and others)	Total stroke in mm	Design version (internal version number)*
EQ-K	**002 – 100** (2 – 100 kN)	**003** Without brake **004** With safety brake **006** With motor holding brake	Standard: 150 / 300 / 450	
EX-K	**010 – 200** (10 - 200 kN)	**003** Without brake **004** With safety brake **006** With motor holding brake Additional versions can be found in data sheet 40.50	Standard: 150 / 300 / 450 (special stroke lengths up to 800 mm)	
EX-F	**005 – 100** (5 – 100 kN)	**003** Without brake **006** With motor holding brake Additional versions can be found in data sheet 40.60	Standard: 150 / 300 (special stroke lengths up to 800 mm)	
EPMK	**300 – 1000** (300 – 1000 kN)	**003** Without brake **006** With safety brake	Standard: 300 (special stroke lengths up to 800 mm)	
EPMR (55 / 80 / 100 kN)	**055 / 080 / 100** (55 / 80 / 100 kN)	**510** (without force sensor) Additional versions can be found in data sheet 40.80	Standard: 150 / 240	
EQ-K	**030.**	**006.**	**300.**	**002**
The example shows an EQ-K drive type in compact design with 30 kN press force, motor holding brake and a total stroke of 300 mm.				

* TOX®-internal for special designs and special versions

More information can be found in the data sheet of each respective drive.

Motor holding brake and safety brake

The drive systems are available with two different brakes:

Motor holding brake (internal)
During a powerloss, the motor holding brake prevents the weight-loaded working piston from dropping. The maximum permissible tool weights can be found in the data sheets of the drives. The motor holding brake is connected by means of the motor cable included in the cable set.

Safety brake (attached to screw)
The safety brake for the drives EQ-K, EX-K and EPMK is designed as spring-loaded brake. This means that when switching off the power, the brake closes and stops rotation.

The safety brake can also be used as a holding brake. The brake type is configured in the TOX®softWare.

The parameters in the brake switch module are preset at the factory according to the size of the safety brake.

Performance data of the safety brakes

Drive	Brake	Nominal voltage	Rated power	Dimensions (H x W x D)
EQ-K 002	RSM 2	16 V	16 W	100 x 45 x 120 mm
EQ-K 005	RSM 2	16 V	16 W	
EQ-K 010	RSM 8	16 V	30,5 W	
EQ-K 030	RSM 16	16 V	42 W	
EQ-K 060	RSM 32	16 V	51 W	
EQ-K 100	RSM 60	16 V	66 W	
EX-K 010	RSM 2	16 V	16 W	
EX-K 030	RSM 8	16 V	30,5 W	
EX-K 060	RSM 16	16 V	42 W	
EX-K 100	RSM 32	16 V	51 W	
EX-K 200	RSM 60	16 V	66 W	
EPMK 300	RSM 250	24 V	116 W	100 x 250 x 200 mm
EPMK 400	RSM 250	24 V	116 W	
EPMK 500	RSM 500	24 V	143 W	
EPMK 700	RSM 500	24 V	143 W	
EPMK 1000	RSM 500	24 V	143 W	

Brake switch module for EQ-K, EX-K

Brake switch module for EPMK

Electrical controls

Type key

The suitable control unit must be chosen for each TOX®-ElectricDrive drive. The type key for the control unit comprises the drive type, the press force and specifies the size of the servo controller.

With regard to selecting the control unit, it is also crucial whether an internal or external brake is used. Furthermore, the fieldbus connection must be selected.

Information in the type key of the controls

TOX®-Control	Version	Drive size	Bus module
STE for all TOX®-ElectricDrive - EPMS - EPMK	**601** Drive without motor holding brake / External safety / holding brake configurable	**009** EPMx 300 - 700 kN **010** EPMx 1000 kN	**000** without bus **001** Profibus-DP **002** Profinet **003** Ethernet / IP **004** Interbus with Gateway **005** Interbus LWL **006** DeviceNet **007** CC-Link with Gateway **008** CANopen **009** EtherCAT **010** Interbus **015** ProfiSAFE

TOX®-Control	Version		EQ-K	EX-K	EX-F	EPMR	Bus module
STE 1 - for all TOX®-ElectricDrive - EQ-K - EX-K - EX-F - EPMR version ≥ 500	**601** Drive without motor holding brake / External safety / holding brake configurable* **602** Drive with motor holding brake	**003**	2-10 kN	–	–		**000** without bus **001** Profibus-DP **002** Profinet **003** Ethernet / IP **004** Interbus with Gateway **005** Interbus LWL **006** DeviceNet **007** CC-Link with Gateway **008** CANopen **009** EtherCAT **010** Interbus **015** ProfiSAFE
		004	30 kN	10 kN	5-10 kN		
		005	60 kN	30 kN			
		006		60 kN	30 kN	55 / 80 kN	
		007	100 kN	100 kN	60 kN	100 kN	
		008		200 kN	100 kN		

STE 1 -	601 -	003 -	000

The example shows a control unit for an EQ-K drive type without motor holding brake, press force of the drive 2 – 10 kN and without bus module.

*Not for EX-F, as this is only available with internal motor holding brake.

More information can be found in the data sheet of the respective drive.

Cable set

Type key

For each TOX®-ElectricDrive drive, different cable sets are available for connecting the peripheral devices. The following table shows the available versions and the information contained within the part number.

Information in the type key of the cable sets

TOX®-Cable Set	Cable set (motor, Resolver, force sensor) and cross section	Connector (controller-side)	Connector (motor-side)	Cable length
CBL for all TOX®-ElectricDrive - EPMS - EPMK - EPMR version < 500	**001** Highly flexible (cable track-compatible), 4.0 mm² **002** Robot connection (robot-compatible), 4.0 mm² **003** Highly flexible (cable track-compatible), 10.0 mm² **004** Highly flexible (cable track-compatible), halogen-free, 4.0 mm² **005** Highly flexible (cable track-compatible), halogen-free, 10.0 mm²	**001** Motor: flying leads end Resolver: D-SUB plug Force sensor: flying leads end Reference sensor: flying leads end	**051** Motor: 6 pol. M23 Intercontec SpeedTec Resolver: 12 pol. M23 Intercontec SpeedTec Force sensor: 5 pol. M12 Reference sensor: 3 pol. M8 From drive EPMK 200 with M40 plug	5 m 10 m 15 m 20 m 25 m
CBL 1 for all TOX®-ElectricDrive - EQ-K - EX-K - EX-F - EPMR version ≥ 500	**001** Highly flexible (cable track-compatible), 2.5 mm² **002** Robot connection (robot-compatible), 2.5 mm² **003** Highly flexible (cable track-compatible), 4.0 mm² **004** Highly flexible (cable track-compatible), halogen-free, 2.5 mm² **005** Highly flexible (cable track-compatible), halogen-free, 4.0 mm²	**001** Motor: flying leads end Resolver: D-SUB plug Force and reference sensor: flying leads end **002** Motor: flying leads end including wires for motor holding brake Resolver: D-SUB plug Force and reference sensor: flying leads end	**051** Motor: 6 pol. M23 Intercontec SpeedTec Resolver: 12 pol. M23 Intercontec SpeedTec Force and reference sensor: 8 pol. M12 A-coded **052** Motor: 6 pol. M23 Intercontec SpeedTec incl. wires for motor holding brake Resolver: 12 pol. M23 Intercontec SpeedTec Force and reference sensor: 8 pol. M12 A-coded **061** as 051 but Motor: 6 pol. M40 Intercontec SpeedTec **062** as 052 but Motor: 6 pol. M40 Intercontec SpeedTec	5 m 10 m 15 m 20 m 25 m

CBL 1 -	**001 -**	**001 -**	**051 -**	**10 m**

The example shows a cable set for an EQ, EX or EPMR drive type, highly flexible with 2.5 mm² cable cross-section, the connections 001 and 051 with 10 m length.

Cable set

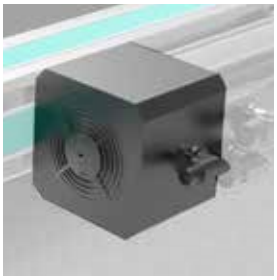
Assignment drive, control unit and cable set

TOX®-Drive	TOX®-Control	TOX®-Cable Set (without motor holding brake)	TOX®-Cable Set (with motor holding brake)
EQ-K 002	STE 1 xxx-003-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EQ-K 005	STE 1 xxx-003-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EQ-K 010	STE 1 xxx-003-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EQ-K 030	STE 1 xxx-004-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EQ-K 060	STE 1 xxx-005-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EQ-K 100	STE 1 xxx-007-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-K 010	STE 1 xxx-004-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-K 030	STE 1 xxx-005-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-K 060	STE 1 xxx-006-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-K 100	STE 1 xxx-007-xxx	CBL 1-003-001-051-x m	CBL 1-003-002-052-x m
EX-K 200	STE 1 xxx-008-xxx	CBL 1-003-001-051-x m	CBL 1-003-002-052-x m
EX-F 005	STE 1 xxx-004-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-F 010	STE 1 xxx-004-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-F 030	STE 1 xxx-006-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EX-F 060	STE 1 xxx-007-xxx	CBL 1-003-001-051-x m	CBL 1-003-002-052-x m
EX-F 100	STE 1 xxx-008xxx	CBL 1-003-001-051-x m	CBL 1-003-002-052-x m
EPMR 055 version > 500	STE 1 xxx-005-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EPMR 080 version > 500	STE 1 xxx-006-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EPMR 100 version > 500	STE 1 xxx-007-xxx	CBL 1-001-001-051-x m	CBL 1-001-002-052-x m
EPMK 300	STE 601-009-xxx	CBL 003-001-052-x m	–
EPMK 400	STE 601-009-xxx	CBL 003-001-052-x m	–
EPMK 500	STE 601-009-xxx	CBL 003-001-052-x m	–
EPMK 700	STE 601-009-xxx	CBL 003-001-052-x m	–
EPMK 1000	STE 601-010-xxx	CBL STE 601-010/MSK	–

Cable for fan (optional)

The fan for the servo drives EX and EPMx cools the motor, thus enabling a higher duty cycle and faster operation. These versions require an additional cable supplying the fan with power.

For the EPMx drives, 230 VAC fans are used and with 24 VDC fans are used for the EX drives. The connecting cables can be used for either fan version and are available in lengths of 5 m, 10 m, 15 m, 20 m and 25 m.



Cable for brake switch module (optional)

For drives with external brake, the brake switch module is required as a part of the control. The scope of delivery includes a 25 m long connecting cable. It can be attached to the external brake on the press side with flying leads on the other end. This makes it easy to cut to the appropriate the length.

TOX®-Servo Controller

Program selection, communication, work piece data

The central intelligence: The easy to program servo controller is a single-axis motor amplifier with integrated motion logic. It controls and regulates the TOX®-ElectricDrive System with all required functions. Benefits are the immediate processing of process data and a direct response to their deviations. The process data can be viewed during and after production for a complete quality audit and documented accordingly.

Plug system with interchangeable modules

Fieldbus module (MXI1)

- Interface to the PLC / robot
- Control and status signal exchange, program selection and fault codes
- Press / move to parameters sent via PLC (data sets)
- End values, actual values (force/position) and quality data
- Part information (i. e. barcode scanner ASCII) from the PLC to the servo controller

Ethernet module (MXI2)

- Connection to TOX®-IPC / Line IPC (customer), here the non-licensed, non cost TOX®softWare can be installed
- The TOX®softWare does not need to be running, it can be used for one-time parameterization. The connected control unit (customer PLC / robot) can then be used for driving or adjusting process data
- The TOX®softWare is used to store the quality data on an IPC

Storage module (MMI)

- Application + process control
- The process control can be freely programmed by the customer.
- If the TOX®softWare is used there will always be a process backup on the PC. Backups can also be automatically created hourly, daily, weekly or monthly.

Safety module (MSI)

Safe shutdown of the energy supply for the servo controller output stage (STO) in PLe. This safety function prevents accidental system startup. Switch-off via 2 safety inputs (SM 100).

SM 301: Switch-off via Profisafe (ProfiBus, Profinet) or optionally via SS1, SOS

Further safety functions available on request!

TOX®-Servo Controller

The servo controller is required for operating the drive as well as for parameterization and visualization.

Amongst others, features include:

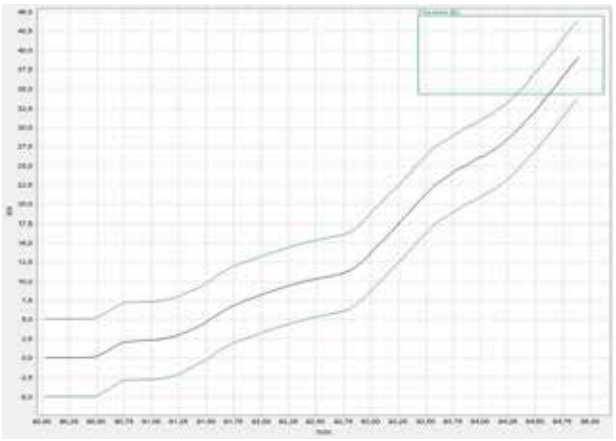
- Fast commissioning (Plug & Work)
- Freely parameterizable
- Comprehensive programming and diagnostic functions
- Programming / parameterization of the process parameters (online and offline)
- Integrated PLC functionalities, enabling the control of additional movement from the controller
- Definition of process jumps
- Configuration of multiple conditions
- Configuration, definition and querying of variables
- Maintenance-free
- Switch to external force sensors possible
- Special applications tailored to customer requirements on request
- Window and envelope monitoring

TOX®softWare

The TOX®softWare includes all required programs for fast and simple configuration, parameterization, visualization and diagnosis of the servo drive systems.

Properties:

- Developed specifically for TOX®-ElectricDrive
- Flexibly adaptable
- Intuitive operation
- Network-based (Ethernet TCP/IP)
- Integrated documentation
- Four authorization levels of security level 1 (operator) up to level 4 (reserved for TOX®)
- Powerful functions
- Adjustable to customer-specific requirements
- Backup
- Multilingual
- In-house engineering



Example: Power / stroke path with envelope and window monitoring.

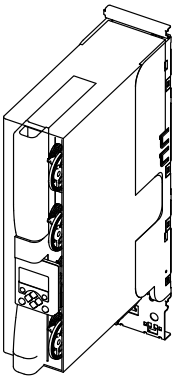
TOX®-Servo Controller

Overview of controller, power range and dimensions

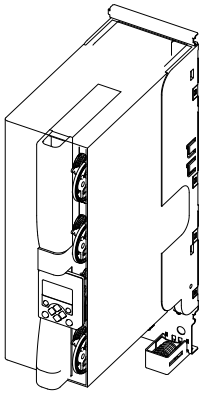
Voltage 180 – 550 V, maximum performance of the assigned drive starting at 400 VAC.

TOX®-Drive	TOX®-Control	Controller type	Power (kW) Rated current (A)	Back-up fuse	Size	Weight
EQ-K 002	STE 1 xxx-003-xxx	E94ASHE0044	0.8 kW / 1.2 A	10 A	2	5.3 kg
EQ-K 005	STE 1 xxx-003-xxx	E94ASHE0044	0.8 kW / 1.2 A	10 A	2	5.3 kg
EQ-K 010	STE 1 xxx-003-xxx	E94ASHE0044	1.5 kW / 2.1 A	10 A	2	5.3 kg
EQ-K 030	STE 1 xxx-004-xxx	E94ASHE0074	2.3 kW / 3.3 A	16 A	2	5.3 kg
EQ-K 060	STE 1 xxx-005-xxx	E94ASHE0134	3.4 kW / 4.8 A	20 A	3	8.1 kg
EQ-K 100	STE 1 xxx-007-xxx	E94ASHE0244	5.6 kW / 8.0 A	32 A	3	8.1 kg
EX-K 010	STE 1 xxx-004-xxx	E94ASHE0074	2.3 kW / 3.3 A	16 A	2	5.3 kg
EX-K 030	STE 1 xxx-005-xxx	E94ASHE0134	3.4 kW / 4.8 A	20 A	3	8.1 kg
EX-K 060	STE 1 xxx-006-xxx	E94ASHE0174	5.5 kW / 7.9 A	25 A	3	8.1 kg
EX-K 100	STE 1 xxx-007-xxx	E94ASHE0244	6.6 kW / 9.6 A	32 A	3	8.1 kg
EX-K 200	STE 1 xxx-008-xxx	E94ASHE0324	8.3 kW / 12 A	40 A	6	26.5 kg
EX-F 005	STE 1 xxx-004-xxx	E94ASHE0074	2.3 kW / 3.3 A	16 A	2	5.3 kg
EX-F 010	STE 1 xxx-004-xxx	E94ASHE0074	2.3 kW / 3.3 A	16 A	2	5.3 kg
EX-F 030	STE 1 xxx-006-xxx	E94ASHE0174	5.5 kW / 7.9 A	25 A	3	8.1 kg
EX-F 060	STE 1 xxx-007-xxx	E94ASHE0244	6.6 kW / 5.6 A	32 A	3	8.1 kg
EX-F 100	STE 1 xxx-008xxx	E94ASHE0324	8.3 kW / 12 A	40 A	6	26.5 kg
EPMR 055 version > 500	STE 1 xxx-005-xxx	E94ASHE0174	5.5 kW / 7.9 A	25 A	3	8.1 kg
EPMR 080 version > 500	STE 1 xxx-006-xxx	E94ASHE0174	5.5 kW / 7.9 A	25 A	3	8.1 kg
EPMR 100 version > 500	STE 1 xxx-007-xxx	E94ASHE0244	6.6 kW / 5.6 A	32 A	3	8.1 kg
EPMK 300	STE 601-009-xxx	E94ASHE0474	11.8 kW / 17 A	C63 A	6	26.5 kg
EPMK 400	STE 601-009-xxx	E94ASHE0474	11.8 kW / 17 A	C63 A	6	26.5 kg
EPMK 500	STE 601-009-xxx	E94ASHE0474	18 kW / 26 A	63 A	6	26.5 kg
EPMK 700	STE 601-009-xxx	E94ASHE0474	18 kW / 26 A	63 A	6	26.5 kg
EPMK 1000	STE 601-010-xxx	E94ASHE0864	24.2 kW / 35 A	100 A	7	42.0 kg

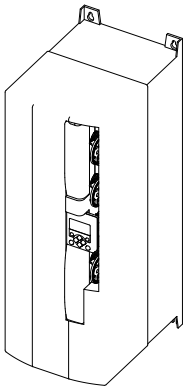
Size 2



Size 3



Size 6



Brake resistor

The brake resistor is a load resistor. It transforms excess energy to heat.

The resistor is installed in the control cabinet by default (internal brake resistor). The brake resistor can optionally also be installed outside of the control cabinet for improved heat dissipation (external brake resistor). Cooling of the control cabinet needs to be considered and might not be necessary under certain circumstances.

For the more powerful drives with the STE 1 xxx-008/009/010 controller types, only an external brake resistor is provided due to the high heat development.

Internal brake resistor

External brake resistor

Brake resistor	Internal brake resistor IP50 (included in standard scope of delivery)			External brake resistor IP65 (optional or standard for 008/009/010)		
Controller size or control unit	Size (H x W x D)	Resistor	Power	Size (H x W x D)	Resistor	Power
STE 1 xxx-003-xxx	335 x 30 x 60 mm	47 Ohm	270 W	1020 x 114 x 105 mm	18 Ohm	1200 W
STE 1 xxx-004-xxx	335 x 30 x 61 mm	47 Ohm	270 W	1020 x 114 x 105 mm	18 Ohm	1200 W
STE 1 xxx-005-xxx	335 x 30 x 62 mm	47 Ohm	270 W	1020 x 114 x 105 mm	18 Ohm	1200 W
STE 1 xxx-006-xxx	335 x 30 x 63 mm	47 Ohm	270 W	1020 x 114 x 105 mm	18 Ohm	1200 W
EX-F 30	no internal brake resistor			710 x 114 x 105 mm	18 Ohm	800 W
STE 1 xxx-007-xxx	335 x 30 x 64 mm	47 Ohm	270 W	1020 x 114 x 105 mm	18 Ohm	1200 W
EX-F 60	no internal brake resistor			710 x 114 x 105 mm	18 Ohm	800 W
STE 1 xxx-008-xxx	no internal brake resistor			1020 x 114 x 105 mm	18 Ohm	1200 W
STE 1 xxx-009-xxx	no internal brake resistor			825 x 200 x 105 mm	18 Ohm	1900 W
STE 1 xxx-010-xxx	no internal brake resistor			825 x 200 x 105 mm	18 Ohm	1900 W

Safety

Performance Level Kits

We provide Performance Level Kits for drives with safety brake to achieve an overall Performance Level e (PL e) of the system. This is an out of the box, wired and assembled kit where customers only need to provide incoming 400 V AC, control power 24 V DC and a safety signalling element (e-stop).

The PLe Kit itself consists of the mounting plate, terminals for the power supply and a safety PLC as well as additional inputs and outputs on the controller for evaluation. The kit contains the complete control unit and the matching cable set for the drive – all completely mounted on a mounting plate.

DGUV Test
HSM 19034
Sicherheit geprüft
tested safety
dguv.de/pruefzeichen

Advantages:

- No additional work for the customer
- Highest safety, Performance Level e
- Autonomous module – immediately ready for operation

Example set-up PLe Kit