

NEx – The Next Generation of Actuators



Contents



4 Rotary and part-turn actuator NEx   



14 Linear actuator NEx-K   

22 Linear actuator NEx-KA   

30 Linear actuator NEx-V   

37 General Terms and Conditions of Business

42 For your peace of mind



NEX

Rotary and part-turn actuator

Product features

- Ex-Zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$
- Wide torque range
- Wide range of positioning times
- Constant positioning times under fluctuating loads
- Large number of positioning switches possible
- Electronic position controller ESR-N (integrated in the actuator)
- Variety of motors available: BLDC, synchronous motor, DC motor
- Wide selection of output shafts
- Custom shafts possible
- Solid housing made of aluminium
- Maintenance-free gearbox
- Operates in any position

Overview

NEx series rotary and part-turn actuators fulfil the requirements of Ex zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$.

The actuators have the following registered IECEx and ATEX certificate numbers: IECEx EPS 15.0061X und EPS 15 ATEX 1 044 X. They are deployed primarily in industrial plants and systems, for example in machines operating in the chemical industry, in refineries, in fuel depots and in painting facilities.

The NEx is available with a synchronous motor as well as a DC version (BLDC) with a torque up to 500 Nm. Featuring a high holding torque and self-adapting wide-range input power pack the programmable BLDC motor supports almost all positioning times and torques within a range of 2-500 Nm.

The NEx is based on the extremely successful N series. That means it is possible to guarantee combination options with existing extensions such as supplementary gear trains and linear modules. Boasting a wide variety of options NEx offers the best-possible solution for applications in process plant engineering subject to IECEx and ATEX regulations.

The design of the housing made of die-cast aluminium in combination with permanently lubricated gearing made of steel with sintered-bronze bearing bushes ensure their suitability for use in a broad range of temperatures and harsh operating environments.

Product details

HOUSING

- Housing and hood made of corrosion-resistant gravity die-cast aluminium
- Coated with silicon-free paint
- Colour: RAL 7032 Pebble Grey
- The motor compartment is designed as a type "d" flameproof enclosure to DIN EN 60079-1.
- Protection class IP66/67
- Options:
 - Custom colours

SYNCHRONOUS MOTOR

- Single-phase AC synchronous motor with permanent magnets, reversible
- 230 V \pm 10%, 50/60 Hz \pm 5%
- ON time 100% duty cycle on request
- Short start/stop times
- Insulation class B to VDE 0530
- Synchronous motors maintain speed and constant positioning times irrespective of the load
- Options:
 - Custom voltages
 - Custom frequencies

BLDC MOTOR

- Brushless DC motor
- Constant positioning time thanks to electronic speed controller
- Wide-range input 90 V AC ... 264 V AC, 120 V DC ... 370 V DC
- High holding torque when operating voltage applied
- Manufacturer configured start-up and brake ramp
- ON time 100% duty cycle
- Insulation class E to VDE 0530

DC MOTOR

- DC commutator motor
- Voltage: 12 V DC or 24 V DC
- Insulation class E to VDE 0530

GEARBOX

- Spur gearing with straight-toothed steel gears
- Robust, maintenance-free
- Permanently lubricated gears
- Self-lubricating sintered bronze bearing
- Encapsulated version, operates in any position

OUTPUT SHAFT

NEx 1 - NEx 4

- \varnothing 14 mm, with \varnothing 6 mm cross-hole
- Options:
 - \varnothing 14 mm with feather key
 - \varnothing 12 mm, with \varnothing 5 mm cross-hole
 - \varnothing 12 mm with feather key
 - Drive shaft with square socket WAF 14 mm (F05 DIN ISO 5211)

NEx 5

- \varnothing 20 mm, with \varnothing 8 mm cross-hole
- Options:
 - \varnothing 20 mm with feather key
 - Output shaft with square socket WAF 17 mm (F07 DIN ISO 5211)

NEx 6

- \varnothing 25 mm, with \varnothing 10 mm cross-hole
- Options:
 - \varnothing 25 mm with feather key
 - Output shaft with square socket WAF 17 mm (F07 DIN ISO 5211)

NEx 8

- Square socket SW 22
- Optional:
 - \varnothing 30 or \varnothing 36 mm with feather key

ELECTRICAL CONNECTION

- Connection by means of 1 m cable end or Ex "e" rated terminal box with tension clamp terminals
- Customer-side wiring outside of the flameproof housing
- Electric anti-condensate heater
- Manual reset temperature switch 80 °C

CONTROLS

- **Open/closed signal**
- **Options:**
 - Additional potential-free contacts
 - Electronic position controller ESR-N with Profibus and USB interfaces for synchronous motors
 - Potentiometer 200 Ω ... 10 kΩ
 - Blocking protection by monitoring changes to the actual value of the potentiometer (only in conjunction with position controller ESR-N)

AMBIENT TEMPERATURE

- -20 °C to +60 °C

ANGLE OF ROTATION LIMITED BY SNAP-ACTION POSITION OFF SWITCH

- Two limit switches (standard)
- All travel-dependent switches actuated by infinitely adjustable control cams
- CO switches with silver-plated contacts
- Switch connections routed to terminals
- Max. switching capacity: 6 A, 250 VAC
- **Options:**
 - Switches with gold-plated contacts
 - Switches with positive-break contacts
 - Additional auxiliary position switches on request

POSITION SENSOR FOR EXTERNAL POSITION INDICATION (OPTIONAL)

- **With potentiometer**
 - Conductive plastic potentiometer (standard) or wire-wound potentiometer (including TUV approval)
 - Multiturn potentiometer up to 10 turns
 - Gearing facilitates adapting the electrical angle of rotation of the potentiometer to the desired angle of rotation of the actuator.
 - Special potentiometers with TUV-approved form-fit attachment solution are available for electronic fuel/air ratio control.
- **With 4 ... 20 mA transmitter**
 - Gearing facilitates adapting the electrical angle of rotation of the transmitter to the desired angle of rotation of the actuator.

- **With Hall sensor**

- The wear-free absolute encoder that makes use of the Hall effect is particularly suitable for continuous operation in potentially explosive atmospheres

MANUAL OPERATION (OPTIONAL)

- Using a handwheel it is possible to manually adjust the position of the output shaft and valves.
- Disengaging the gear train and motor reduces the amount of force required.
- Position switch-off settings are retained during manual operation.
- Handwheel remains motionless during electrically powered operation.

OPTIONS

- Other voltage/frequency
- Gear train disengages mechanically
- Handwheel
- Additional auxiliary position switches
- Custom control cams
- Electronic position controller ESR-N (in conjunction with synchronous motor)
- Position sensor
- Relay to switch several actuators in parallel
- Potentiometer
- Components to UL standard

ASSEMBLY

- Easy to mount thanks to stable angle bracket/ISO bracket
- **No fuss coupling to valve stem by means of:**
 - Hand-operated lever coupling
 - Lever arm, clamping lever, ball-and-socket joint, connecting rods, sprung connecting rods
 - Flexible shaft coupling
 - Rigid shaft coupling



Product details

SAFETY INSTRUCTIONS

- Ensure the device is isolated from the power supply before the hood of the flameproof encapsulated housing is opened by a skilled tradesperson in a hazardous area. It is imperative to observe the wait time stated on the rating plate!

TEMPERATURE CLASSES

Temperature class	Wait time	Actuator
T3	None	NEx 3, NEx 4, NEx 5, NEx 6, NEx 8
T4	None	NEx 1, NEx 2
T4	30 min	NEx 3, NEx 4, NEx 5, NEx 6, NEx 8
T5/T6	40 min	NEx 1, NEx 2
T5/T6	60 min	NEx 3, NEx 4, NEx 5, NEx 6, NEx 8

ORDER DETAILS

- Device type
- Torque
- Positioning time
- Output shaft type
- Motor type
- Operating voltage/frequency
- Desired options
- When ordering a potentiometer:
 - Resistance value
 - Desired angle of rotation of actuator
- Preset position switches and potentiometer
- Or order number
- Desired valve, where applicable

The page features a large grid of graph paper for taking notes. The grid consists of small squares and covers most of the page. At the bottom of the page, there is a section with horizontal lines for writing, consisting of approximately 10 lines.



Technical data

SERIES NEx 1 TO NEx 8 ACTUATORS WITH SYNCHRONOUS MOTOR, 230 V, 50(60) Hz (OPTIONS 115 V, 50(60) Hz UND 24 V, 50(60) Hz)

Type	Positioning time 90°	Torque	Power consumption (max.)	Temperature range	Shaft	Hood	Weight	Order Nr
NEx 1	25(21) s	6 Nm	7 VA	-20/+60 °C	ø14/6	156 mm	12 kg	147360
NEx 1	45(38) s	10 Nm	7 VA	-20/+60 °C	ø14/6	156 mm	12 kg	147370
NEx 1	65(54) s	15 Nm	7 VA	-20/+60 °C	ø14/6	156 mm	12 kg	147380
NEx 1	130(108) s	30 Nm	7 VA	-20/+60 °C	ø14/6	156 mm	12 kg	147390
Optionally up to 300 turns								
NEx 2	5(4) s	10 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147405
NEx 2	13(11) s	15 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147410
NEx 2	18(15) s	20 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147420
NEx 2	25(21) s	25 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147430
NEx 2	45(38) s	45 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147440
NEx 2	65(54) s	60 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147450
NEx 2	130(108) s	60 Nm	18 VA	-20/+60 °C	ø14/6	156 mm	12.2 kg	147460
Optionally up to 300 turns								
NEx 3	1.3(1.1) s	6 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147470
NEx 3	2(1.6) s	7 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147475
NEx 3	5(4) s	17 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147480
NEx 3	7(6) s	20 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147490
NEx 3	10(8) s	30 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147500
NEx 3	17(14) s	50 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147510
NEx 3	25(21) s	60 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147520
NEx 3	50(42) s	60 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147530
Optionally up to 300 turns								
NEx 4	1.3(1.1) s	10 Nm	35 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147540
NEx 4	2(1.6) s	13 Nm	32 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147545
NEx 4	5(4) s	35 Nm	32 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147550
NEx 4	7(6) s	45 Nm	32 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147560
NEx 4	10(8) s	60 Nm	32 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147570
NEx 4	17(14) s	60 Nm	24 VA	-20/+40 °C	ø14/6	156 mm	12.5 kg	147580
Optionally up to 300 turns								
NEx 5	15(13) s	110 Nm	32 VA	-20/+40 °C	ø20/8	156 mm	12.8 kg	147600
NEx 5	30(25) s	110 Nm	32 VA	-20/+40 °C	ø20/8	156 mm	12.8 kg	147610
NEx 5	50(42) s	110 Nm	24 VA	-20/+40 °C	ø20/8	156 mm	12.8 kg	147620
NEx 5	75(63) s	110 Nm	24 VA	-20/+40 °C	ø20/8	156 mm	12.8 kg	147630
Nex 5	130(108) s	110 Nm	18 VA	-20/+40 °C	ø20/8	156 mm	12.8 kg	147640
Optionally up to 100 turns								

Type	Positioning time 90°	Torque	Power consumption (max.)	Temperature range	Shaft	Hood	Weight	Order Nr
NEx 6	20(17) s	180 Nm	35 VA	-20/+40 °C	ø25/10	156 mm	12.8 kg	147650
NEx 6	30(25) s	180 Nm	32 VA	-20/+40 °C	ø25/10	156 mm	12.8 kg	147660
NEx 6	50(42) s	180 Nm	32 VA	-20/+40 °C	ø25/10	156 mm	12.8 kg	147670
NEx 6	75(63) s	180 Nm	24 VA	-20/+40 °C	ø25/10	156 mm	12.8 kg	147680
NEx 6	130(108) s	180 Nm	18 VA	-20/+60 °C	ø25/10	156 mm	12.8 kg	147690

Optionally up to 100 turns

NEx 8	80(67)s	400 Nm	32 VA	-20/+60 °C	F10/SW22	156 mm	14 kg	147694
NEx 8	106(88)s	500 Nm	35 VA	-20/+60 °C	F10/SW22	156 mm	14 kg	147692
NEx 8	160(132)s	500 Nm	32 VA	-20/+60 °C	F10/SW22	156 mm	14 kg	147696

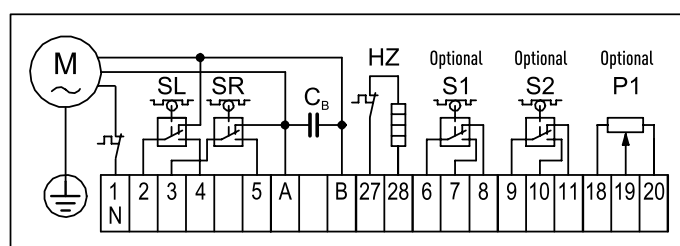
Optionally up to 2.5 turns

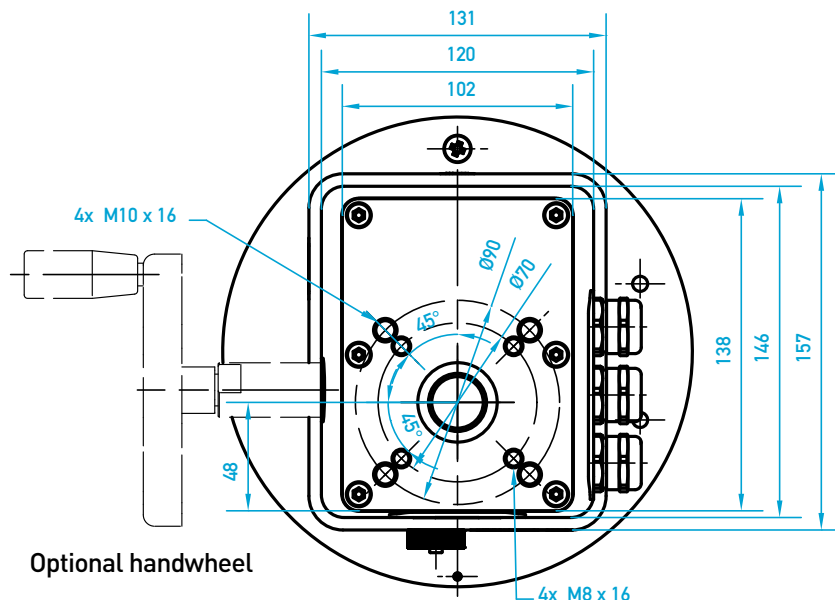
NEx-BLDC SERIES, MULTI-VOLTAGE 90-264 V AC , 120-370 V DC

Type	Positioning time 90°	Torque	Power consumption (max.)	Temperature range	Shaft	Hood	Weight	Order Nr
NEx 5-BLDC	10 s	60 Nm	60 W	-20/+60 °C	ø14/6	156 mm	12 kg	147700

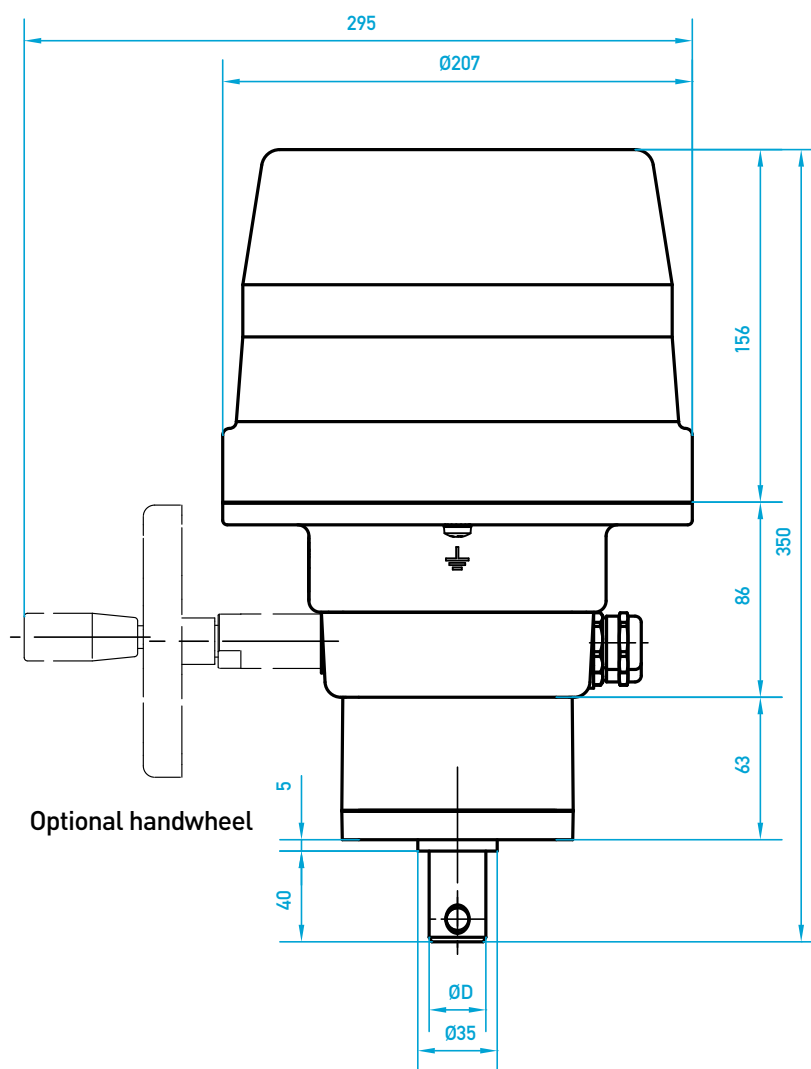
Wide range of positioning times and torques available on request - wide range of rotations possible.

CIRCUIT DIAGRAM SYNCHRONOUS MOTOR STANDARD AC

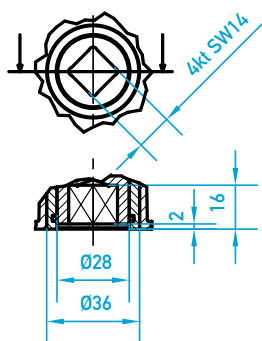




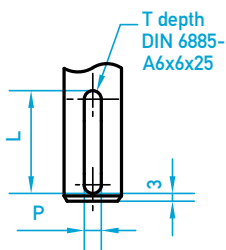
Optional handwheel



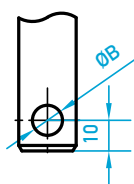
Optional handwheel



Optional ISO flange F05



Shaft type "B"



Shaft type "A"



NEX-K

Linear actuator

Product features

- Ex zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$
- Wide range of force outputs
- Large stroke range
- Wide range of positioning times
- Constant positioning times under fluctuating loads
- Solid metal housing
- Maintenance-free gearing
- Operates in any position

Overview

The NEX-K linear drive for Ex zone applications is a further development of the flameproof housing of the NEX rotary and part-turn actuator with Ex zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$, based on IECEx certification IECEx EPS 15.0061X and ATEX certification EPS 15 ATEX 1 044 X.

NEX-K series linear actuators are utilized to precisely adjust dampers installed in all systems in air-conditioning, ventilation and heating systems as well as in furnace installations, process plant engineering and other fields of industry. They are available with the following actuating forces: 600 N, 1200 N, 1800 N, 2500 N, 3000 N, 3500 N and 5000 N.

The stroke units are designed for stroke lengths of 150-750 mm. The technical construction mirrors that of NEX series actuators. Switch-off at limit is path dependent. The standard scope of supply includes a limit switch for each end position. These are designed as changeover switches and can also perform supplementary functions such as end position indication or sequential control tasks. Additional auxiliary position switches and potentiometers are also available. Fitting a relay makes it possible to control several actuators simultaneously via a common contact. A solid cast bracket as well as an angle section made of steel attached to the housing are provided to mount the actuator. A connecting pin is included to connect the actuator with the valve.

Product details

HOUSING

- Housing and hood made of corrosion-resistant gravity die-cast aluminium
- Coated with silicon-free paint
- Colour: RAL 7032 Pebble Grey
- The motor compartment is designed as a type "d" flameproof enclosure to DIN EN 60079-1.
- Protection class IP66/67
- Options:
 - Custom colours

SYNCHRONOUS MOTOR

- Single-phase AC synchronous motor with permanent magnets, reversible
- 230 V \pm 10%, 50/60 Hz \pm 5%
- ON time 100% duty cycle on request
- Short start/stop times
- Insulation class B to VDE 0530
- Synchronous motors maintain speed and constant positioning times irrespective of the load
- Options:
 - Custom voltages
 - Custom frequencies

BLDC MOTOR

- Brushless DC motor
- Constant positioning time thanks to electronic speed controller
- Wide-range input 90 V AC ... 264 V AC, 120 V DC ... 370 V DC
- High holding torque when operating voltage applied
- Manufacturer configured start-up and brake ramp
- ON time 100% duty cycle
- Insulation class E to VDE 0530

DC MOTOR

- DC commutator motor
- Voltage: 12 V DC or 24 V DC
- Insulation class E to VDE 0530

GEARBOX

- Spur gearing with straight-toothed steel gears
- Robust, maintenance-free
- Permanently lubricated gears
- Self-lubricating sintered bronze bearing
- Encapsulated version, operates in any position

STROKE UNIT

- Fixing bracket made of aluminium
- Spindle made of stainless steel
- Spindle self-locking
- Needle bearings to absorb axial forces
- Steel and bronze materials provide good anti-seizure properties

SPINDLE

- Self-locking
- "Open/Closed" markings indicate position
- Made of stainless steel

ELECTRICAL CONNECTION

- Connection by means of 1 m cable end or Ex "e" rated terminal box with tension clamp terminals
- Customer-side wiring outside of the flameproof housing
- Electric anti-condensate heater
- Manual reset temperature switch 80 °C

CONTROLS

- Open/closed signal
- Options:
 - Additional potential-free contacts
 - Electronic position controller ESR-N with Profibus and USB interfaces for synchronous motors
 - Potentiometer 200 Ω ... 10 k Ω
 - Blocking protection assured by monitoring changes to actual value of the potentiometer (only in conjunction with position controller ESR-N)

AMBIENT TEMPERATURE

- -20 °C to +60 °C

ANGLE OF ROTATION LIMITED BY SNAP-ACTION POSITION OFF SWITCH

- CO switches with silver-plated contacts
- Switch connections routed to terminals
- Max. switching capacity: 6 A, 250 V AC
- Options:
 - Switches with gold-plated contacts
 - Switches with positive-break contacts

POSITION SENSOR FOR EXTERNAL POSITION INDICATION (OPTIONAL)

- With potentiometer
 - Conductive plastic potentiometer (standard) or wire-wound potentiometer (including TUV approval)
 - Multiturn potentiometer up to 10 turns
 - Gearing facilitates adapting the electrical angle of rotation of the potentiometer to the desired linear regulating distance of the actuator.
- With 4 ... 20 mA transmitter
 - Gearing facilitates adapting the electrical angle of rotation of the transmitter to the desired linear regulating distance of the actuator.
- With Hall sensor
 - The wear-free, absolute encoder that makes use of the Hall effect is particularly suitable for continuous operation in potentially explosive atmospheres.

MANUAL OPERATION (OPTIONAL)

- Using a handwheel it is possible to manually adjust the position of the output shaft and valves.
- Position switch-off settings are retained during manual operation.
- Handwheel remains motionless during electrically powered operation.

OPTIONS

- Other voltage/frequency
- Handwheel
- Additional auxiliary position switches
- Custom control cams
- Electronic position controller ESR-N (in conjunction with synchronous motor)
- Position sensor
- Relay to switch several actuators in parallel
- Potentiometer
- Components to UL standard
- Spindle protected by bellows
- Set collars serve as external travel stops

ASSEMBLY

- Easily mounted thanks to stable cast angle bracket and steel angle section attached to housing
- Connecting pin supplied to connect spindle with valve
- No fuss coupling to valve stem by means of:
 - Lever arm, clamping lever, ball-and-socket joint, connecting rods, sprung connecting rods

SAFETY INSTRUCTIONS

- Ensure the device is isolated from the power supply before the hood of the flameproof encapsulated housing is opened by a skilled tradesperson in a hazardous area. It is imperative to observe the wait time stated on the rating plate!

ORDER DETAILS

- Device type
- Positioning force
- Positioning time
- Motor type
- Operating voltage/frequency
- Desired options
- When ordering a potentiometer:
 - Resistance value
 - Desired linear regulating distance of actuator
- Preset position switches and potentiometer
- Or order number
- Desired valve, where applicable

Technical data

NEx-K SERIES ACTUATORS, WITH SYNCHRONOUS MOTOR 230 V, 50(60) Hz (OPTIONAL: 115 V, 50(60) Hz AND 24 V, 50(60) Hz)

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No.. Stroke unit
NEx-K ..06	1.7(2) mm/s	600 N	18 VA	150 - 750 mm	156 mm	12 kg	147940	See below
NEx-K ..06	2.3(2.7) mm/s	600 N	23 VA	150 - 750 mm	156 mm	12 kg	147950	See below
NEx-K ..06	4.5(5.4) mm/s	600 N	32 VA	150 - 750 mm	156 mm	12 kg	147960	See below
NEx-K ..06	6.7(8) mm/s	600 N	35 VA	150 - 750 mm	156 mm	12 kg	147970	See below
NEx-K ..12	1.5(1.7) mm/s	1200 N	24 VA	150 - 750 mm	156 mm	12 kg	147990	See below
NEx-K ..12	2.3(2.7) mm/s	1200 N	24 VA	150 - 750 mm	156 mm	12 kg	148000	See below
NEx-K ..12	3.5(4) mm/s	1200 N	24 VA	150 - 750 mm	156 mm	12 kg	148010	See below
NEx-K ..18	1.5(1.8) mm/s	1800 N	24 VA	150 - 750 mm	156 mm	12 kg	148040	See below
NEx-K ..18	2.3(2.7) mm/s	1800 N	24 VA	150 - 750 mm	156 mm	12 kg	148050	See below
NEx-K ..25	1.5(1.8) mm/s	2500 N	32 VA	150 - 750 mm	156 mm	12 kg	148060	See below
NEx-K ..25	2.3(2.7) mm/s	2500 N	35 VA	150 - 750 mm	156 mm	12 kg	148070	See below
NEx-K ..35	0.8(1) mm/s	3500 N	32 VA	150 - 750 mm	156 mm	12 kg	148090	See below
Stroke units for regulating distance 150 mm						5.3 kg		148340
Stroke units for regulating distance 300 mm						7.6 kg		148350
Stroke units for regulating distance 450 mm						9.6 kg		148360
Stroke units for regulating distance 600 mm						11.6 kg		148370
Stroke units for regulating distance 750 mm						13.6 kg		148380

The actuator designation NEx-K 1506 is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06

NEx-K-DC SERIES ACTUATORS, 24 V DC

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No.. Stroke unit
NEx-K ..06-DC	1.7 mm/s	600 N	11 W	150 - 750 mm	156 mm	12 kg	148180	See below
NEx-K ..06-DC	3.4 mm/s	600 N	21 W	150 - 750 mm	156 mm	12 kg	148190	See below
NEx-K ..06-DC	6 mm/s	600 N	21 W	150 - 750 mm	156 mm	12 kg	148200	See below
NEx-K ..12-DC	1.7 mm/s	1200 N	21 W	150 - 750 mm	156 mm	12 kg	148220	See below
NEx-K ..12-DC	3.4 mm/s	1200 N	21 W	150 - 750 mm	156 mm	12 kg	148230	See below
Stroke units for regulating distance 150 mm						5.3 kg		148340
Stroke units for regulating distance 300 mm						7.6 kg		148350
Stroke units for regulating distance 450 mm						9.6 kg		148360
Stroke units for regulating distance 600 mm						11.6 kg		148370
Stroke units for regulating distance 750 mm						13.6 kg		148380

The actuator designation NEx-K 1506-DC is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06



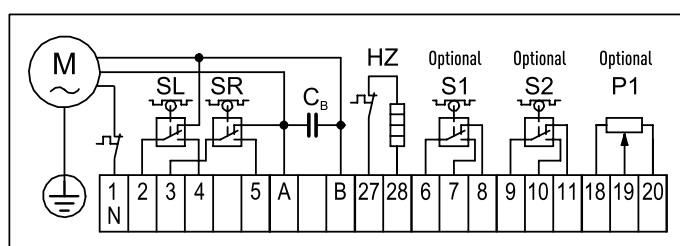
NEX-K-BLDC SERIES ACTUATORS, MULTI-VOLTAGE 90-264 V AC, 120-370 V DC

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No. Stroke unit
NEX-K ..12-BLDC	6 mm/s	1200 N	60 W	150 - 750 mm	156 mm	12 kg	148240	See below
NEX-K ..25-BLDC	1.7 mm/s	2500 N	60 W	150 - 750 mm	156 mm	12 kg	148260	See below
NEX-K ..25-BLDC	3.4 mm/s	2500 N	60 W	150 - 750 mm	156 mm	12 kg	148270	See below
NEX-K ..50-BLDC	1.7 mm/s	5000 N	60 W	150 - 750 mm	156 mm	12 kg	148280	See below
Stroke units for regulating distance 150 mm						5.3 kg		148340
Stroke units for regulating distance 300 mm						7.6 kg		148350
Stroke units for regulating distance 450 mm						9.6 kg		148360
Stroke units for regulating distance 600 mm						11.6 kg		148370
Stroke units for regulating distance 750 mm						13.6 kg		148380

The actuator designation NEX-K 1506-BLDC is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06

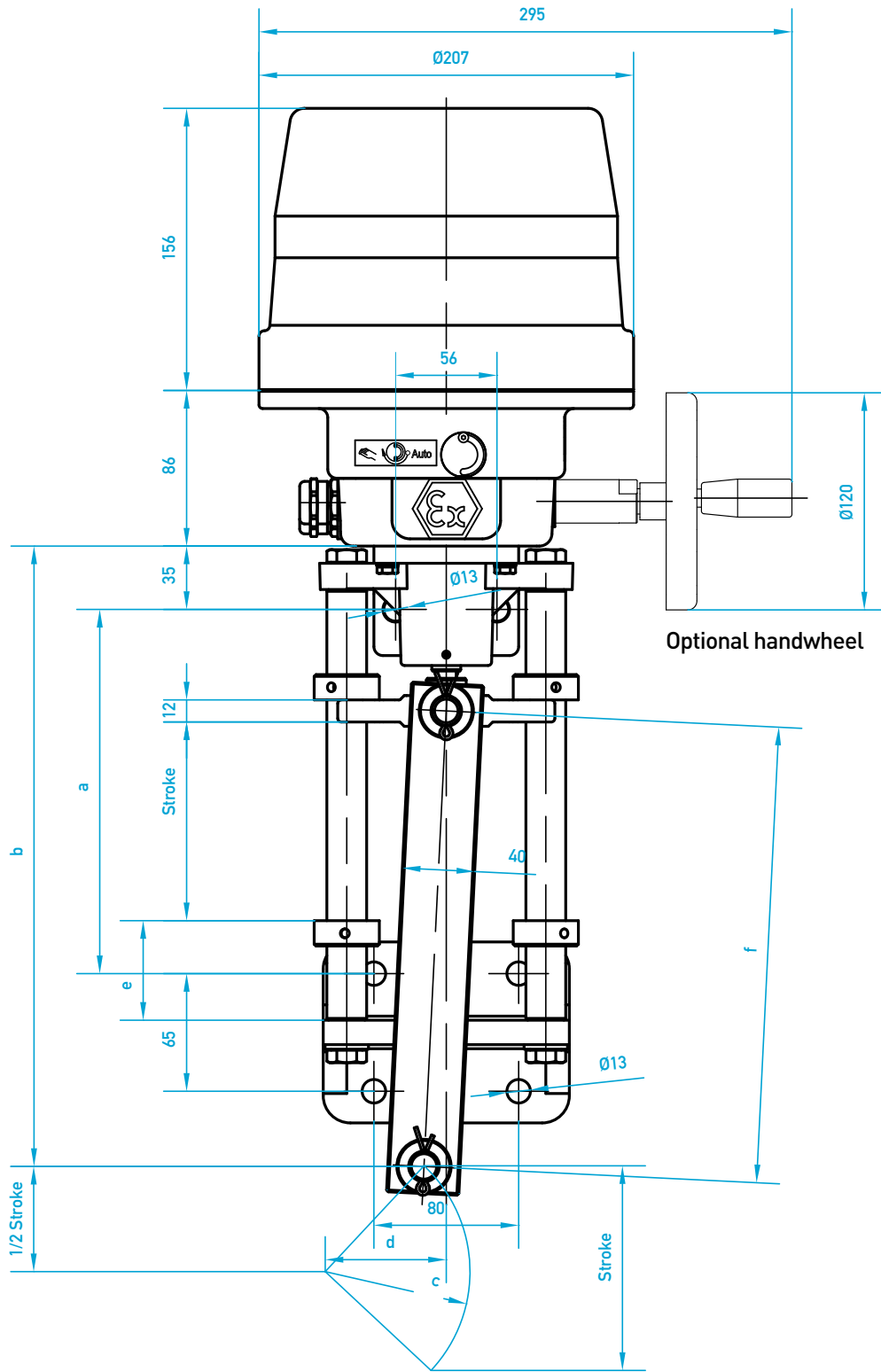
Wide range of positioning forces and positioning times available on request.

CIRCUIT DIAGRAM SYNCHRONOUS MOTOR STANDARD AC



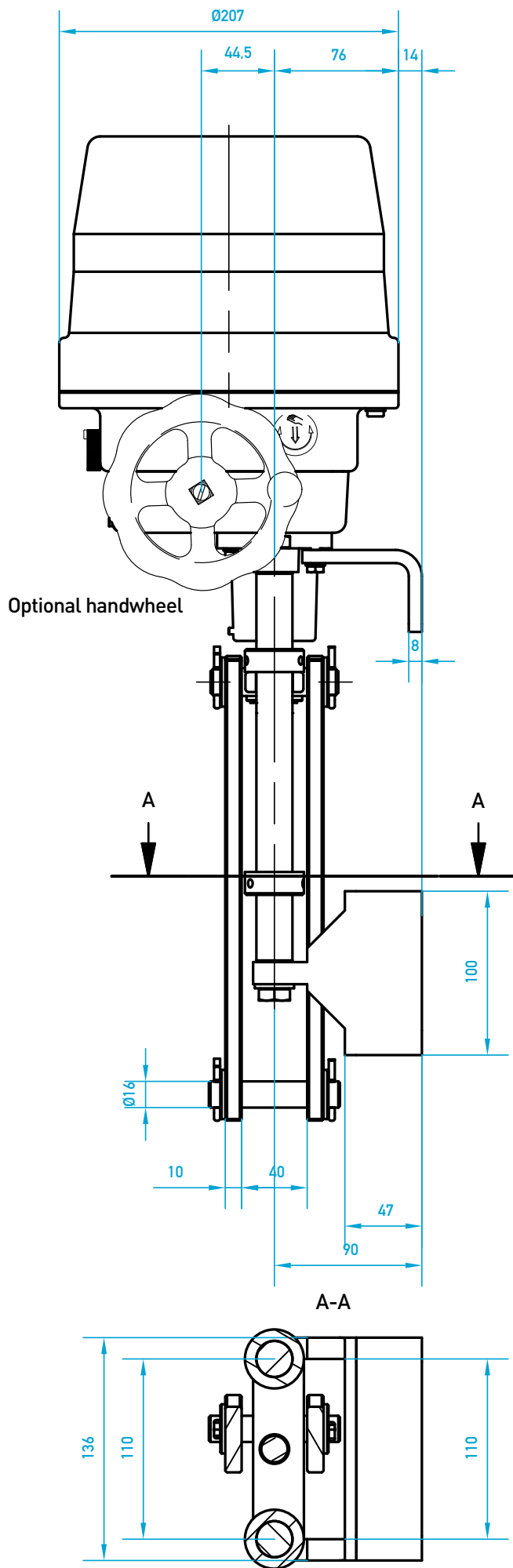


Dimensions



Type	Stroke	a	b	c	d	e	f
NEx-K	150	201	341	106	85	-	252
NEx-K + bellows	150	351	491	106	85	89	327
NEx-K	300	351	491	212	170	-	402
NEx-K + bellows	300	611	751	212	170	144	532
NEx-K	450	501	641	-	-	-	552
NEx-K	600	651	791	-	-	-	702
NEx-K	750	801	941	-	-	-	852

All dimensions in mm





NEX-KA

Linear actuator

Product features

- Ex zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$
- Wide range of force outputs
- Large stroke range
- Wide range of positioning times
- Constant positioning times under fluctuating loads
- Large number of auxiliary position switches possible
- Solid metal housing
- Maintenance-free gearing
- Operates in any position
- Protected spindle

Overview

The NEX-KA linear drive for Ex zone applications is a further development of the flameproof housing of the NEX rotary and part-turn actuator with Ex zone 1 marking $\text{CE}_{2004} \text{Ex II 2G Ex d IIC T6 Gb}$, based on IECEx certification IECEx EPS 15.0061X and ATEX certification EPS 15 ATEX 1 044 X and the linear module of the KA series actuator.

NEX-KA series linear actuators are utilized to precisely adjust dampers installed in all systems in air-conditioning, ventilation and heating systems as well as in furnace installations, process plant engineering and other fields of industry. They are available with the following actuating forces: 600 N, 1200 N, 1800 N, 2500 N, 3000 N, 3500 N and 5000 N. The stroke units are designed for stroke lengths of 150-1100 mm.

The technical construction mirrors that of NEX series actuators. Switch-off at limit is path dependent. The standard scope of supply includes a limit switch for each end position. These are designed as changeover switches and can also perform supplementary functions such as end position indication or sequential control tasks. Additional auxiliary position switches and potentiometers are also available. Fitting a relay makes it possible to control several actuators simultaneously via a common contact.

A solid cast bracket is available to mount the actuator. A connecting pin is included in the scope of supply to create the connection with the connecting rod. The spindle is protected by a protective tube.

HOUSING

- Housing and hood made of corrosion-resistant gravity die-cast aluminium
- Coated with silicon-free paint
- Colour: RAL 7032 Pebble Grey
- The motor compartment is designed as a type "d" flameproof enclosure to DIN EN 60079-1.
- Protection class IP66/67
- Options:
 - Custom colours

SYNCHRONOUS MOTOR

- Single-phase AC synchronous motor with permanent magnets, reversible
- 230 V \pm 10%, 50/60 Hz \pm 5%
- ON time 100% duty cycle on request
- Short start/stop times
- Insulation class B to VDE 0530
- Synchronous motors maintain speed and constant positioning times irrespective of the load
- Options:
 - Custom voltages
 - Custom frequencies

BLDC MOTOR

- Brushless DC motor
- Constant positioning time thanks to electronic speed controller
- Wide-range input 90 V AC ... 264 V AC, 120 V DC ... 370 V DC
- High holding torque when operating voltage applied
- Manufacturer configured start-up and brake ramp
- ON time 100% duty cycle
- Insulation class E to VDE 0530

DC MOTOR

- DC commutator motor
- Voltage: 12 V DC or 24 V DC
- Insulation class E to VDE 0530

GEARBOX

- Spur gearing with straight-toothed steel gears
- Robust, maintenance-free
- Permanently lubricated gears
- Self-lubricating sintered bronze bearing
- Encapsulated version, operates in any position

STROKE UNIT

- Fixing bracket made of aluminium
- Spindle and connecting rod made of stainless steel
- Spindle self-locking
- Needle bearings to absorb axial forces
- Steel / bronze materials provide good anti-seizure properties

ELECTRICAL CONNECTION

- Connection by means of 1 m cable end or Ex "e" rated terminal box with tension clamp terminals of the cable entry port
- Customer-side wiring outside of the flameproof housing
- Electric anti-condensate heater
- Manual reset temperature switch 80 °C

CONTROLS

- Open/closed signal
- Options:
 - Additional potential-free contacts
 - Electronic position controller ESR-N with Profibus and USB interfaces for synchronous motors
 - Potentiometer 200 Ω ... 10 k Ω
 - Blocking protection by monitoring changes to the actual value of the potentiometer (only in conjunction with position controller ESR-N)

AMBIENT TEMPERATURE

- -20 °C to +60 °C

ANGLE OF ROTATION LIMITED BY SNAP-ACTION POSITION OFF SWITCH

- CO switches with silver-plated contacts
- Switch connections routed to terminals
- Max. switching capacity: 6 A, 250 V AC
- Options:
 - Switches with gold-plated contacts
 - Switches with positive-break contacts

POSITION SENSOR FOR EXTERNAL POSITION INDICATION (OPTIONAL)

- **With potentiometer**
 - Conductive plastic potentiometer (standard) or wire-wound potentiometer (including TUV approval)
 - Multiturn potentiometer up to 10 turns
 - Gearing facilitates adapting the electrical angle of rotation of the potentiometer to the desired linear regulating distance of the actuator.
- **With 4 ... 20 mA transmitter**
 - Gearing facilitates adapting the electrical angle of rotation of the transmitter to the desired linear regulating distance of the actuator
- **With Hall sensor**
 - The wear-free absolute encoder that makes use of the Hall effect is particularly suitable for continuous operation in potentially explosive atmospheres.

MANUAL OPERATION (OPTIONAL)

- Using a handwheel it is possible to manually adjust the position of the output shaft and valves.
- Position switch-off settings are retained during manual operation.
- Handwheel remains motionless during electrically powered operation.

OPTIONS

- Other voltage/frequency
- Handwheel
- Additional auxiliary position switches
- Custom control cams
- Electronic position controller ESR-N (in conjunction with synchronous motor)
- Position sensor
- Relay to switch several actuators in parallel
- Potentiometer
- Components to UL standard
- Connecting rod protected by bellows
- Encapsulated stroke unit

ASSEMBLY

- Easily mounted thanks to stable cast angle bracket attached to housing
- Connecting pin supplied to connect connecting rod with valve
- **No fuss coupling to valve stem by means of:**
 - Lever arm, clamping lever, ball-and-socket joint, connecting rods, sprung connecting rods

SAFETY INSTRUCTIONS

- Ensure the device is isolated from the power supply before the hood of the flameproof encapsulated housing is opened by a skilled tradesperson in a hazardous area. It is imperative to observe the wait time stated on the rating plate!

ORDER DETAILS

- Device type
- Positioning force
- Positioning time
- Motor type
- Operating voltage/frequency
- Desired options
- When ordering a potentiometer:
 - Resistance value
 - Desired linear regulating distance of actuator
- Preset position switches and potentiometer
- Or order number
- Desired valve, where applicable

NEx-KA SERIES ACTUATORS WITH SYNCHRONOUS MOTOR, 230 V, 50(60) Hz (OPTIONS 115 V, 50(60) Hz AND 24 V, 50(60) Hz)

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No.. Stroke unit
NEx-KA ..06	1.7(2) mm/s	600 N	18 VA	150 - 1100 mm	156 mm	12 kg	147940	See below
NEx-KA ..06	2.3(2.7) mm/s	600 N	23 VA	150 - 1100 mm	156 mm	12 kg	147950	See below
NEx-KA ..06	4.5(5.4) mm/s	600 N	32 VA	150 - 1100 mm	156 mm	12 kg	147960	See below
NEx-KA ..06	6.7(8) mm/s	600 N	35 VA	150 - 1100 mm	156 mm	12 kg	147970	See below
NEx-KA ..12	1.5(1.7) mm/s	1200 N	24 VA	150 - 1100 mm	156 mm	12 kg	147990	See below
NEx-KA ..12	2.3(2.7) mm/s	1200 N	24 VA	150 - 1100 mm	156 mm	12 kg	148000	See below
NEx-KA ..12	3.5(4) mm/s	1200 N	24 VA	150 - 1100 mm	156 mm	12 kg	148010	See below
NEx-KA ..18	1.5(1.8) mm/s	1800 N	24 VA	150 - 1100 mm	156 mm	12 kg	148040	See below
NEx-KA ..18	2.3(2.7) mm/s	1800 N	24 VA	150 - 1100 mm	156 mm	12 kg	148050	See below
NEx-KA ..25	1.5(1.8) mm/s	2500 N	32 VA	150 - 1100 mm	156 mm	12 kg	148060	See below
NEx-KA ..25	2.3(2.7) mm/s	2500 N	35 VA	150 - 1100 mm	156 mm	12 kg	148070	See below
NEx-KA ..35	0.8(1) mm/s	3500 N	32 VA	150 - 1100 mm	156 mm	12 kg	148090	See below
Stroke units for regulating distance	150 mm					4 kg		148440
Stroke units for regulating distance	300 mm					5 kg		148450
Stroke units for regulating distance	450 mm					6.2 kg		148460
Stroke units for regulating distance	600 mm	Max. 4000 N in push direction				7.2 kg		148470
Stroke units for regulating distance	750 mm	Max. 2500 N in push direction				8.2 kg		148480
Stroke units for regulating distance	1100 mm	Max. 1800 N in push direction				10.5 kg		148490

The actuator designation NEx-KA 1506 is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06

NEx-KA-DC SERIES ACTUATORS, 24 V DC

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No.. Stroke unit
NEx-KA ..06-DC	1.7 mm/s	600 N	11 W	150 - 1100 mm	156 mm	12 kg	148180	See below
NEx-KA ..06-DC	3.4 mm/s	600 N	21 W	150 - 1100 mm	156 mm	12 kg	148190	See below
NEx-KA ..06-DC	6 mm/s	600 N	21 W	150 - 1100 mm	156 mm	12 kg	148200	See below
NEx-KA ..12-DC	1.7 mm/s	1200 N	21 W	150 - 1100 mm	156 mm	12 kg	148220	See below
NEx-KA ..12-DC	3.4 mm/s	1200 N	21 W	150 - 1100 mm	156 mm	12 kg	148230	See below
Stroke units for regulating distance	150 mm					4 kg		148440
Stroke units for regulating distance	300 mm					5 kg		148450
Stroke units for regulating distance	450 mm					6.2 kg		148460
Stroke units for regulating distance	600 mm	Max. 4000 N in push direction				7.2 kg		148470
Stroke units for regulating distance	750 mm	Max. 2500 N in push direction				8.2 kg		148480
Stroke units for regulating distance	1100 mm	Max. 1800 N in push direction				10.5 kg		148490

The actuator designation NEx-KA 1506-DC is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06



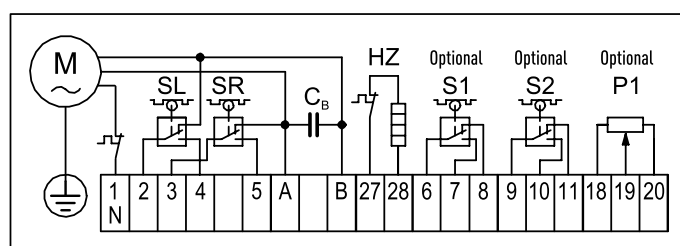
NEx-KA-BLDC SERIES ACTUATORS, MULTI-VOLTAGE 90-264 V AC, 120-370 V DC

Type	Positioning time	Positioning force	Power consumption (max)	Selectable regulating distance	Hood height	Weight	Order No.	Order No. Stroke unit
NEx-KA ..12	6 mm/s	1200 N	60 W	150 - 1100 mm	156 mm	12 kg	148240	See below
NEx-KA ..25	1.7 mm/s	2500 N	60 W	150 - 1100 mm	156 mm	12 kg	148260	See below
NEx-KA ..25	3.4 mm/s	2500 N	60 W	150 - 1100 mm	156 mm	12 kg	148270	See below
NEx-KA ..50	1.7 mm/s	5000 N	60 W	150 - 1100 mm	156 mm	12 kg	148280	See below
Stroke units for regulating distance	150 mm					4 kg		148440
Stroke units for regulating distance	300 mm					5 kg		148450
Stroke units for regulating distance	450 mm					6.2 kg		148460
Stroke units for regulating distance	600 mm		Max. 4000 N in push direction			7.2 kg		148470
Stroke units for regulating distance	750 mm		Max. 2500 N in push direction			8.2 kg		148480
Stroke units for regulating distance	1100 mm		Max. 1800 N in push direction			10.5 kg		148490

The actuator designation NEx-KA 1506-BLDC is created from the regulating distance (150 mm) = 15 and positioning force (600 N) = 06

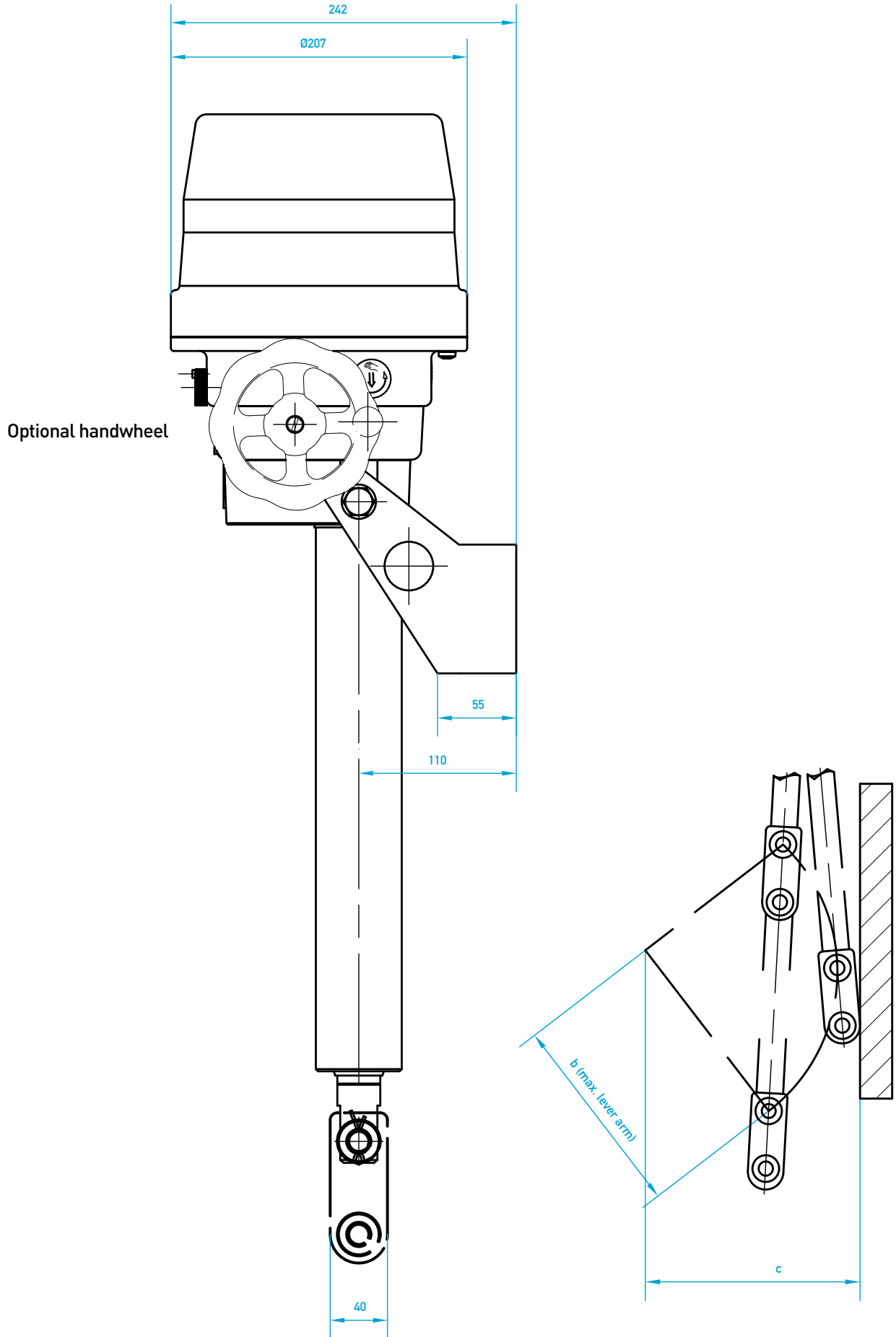
Wide range of positioning forces and positioning times available on request.

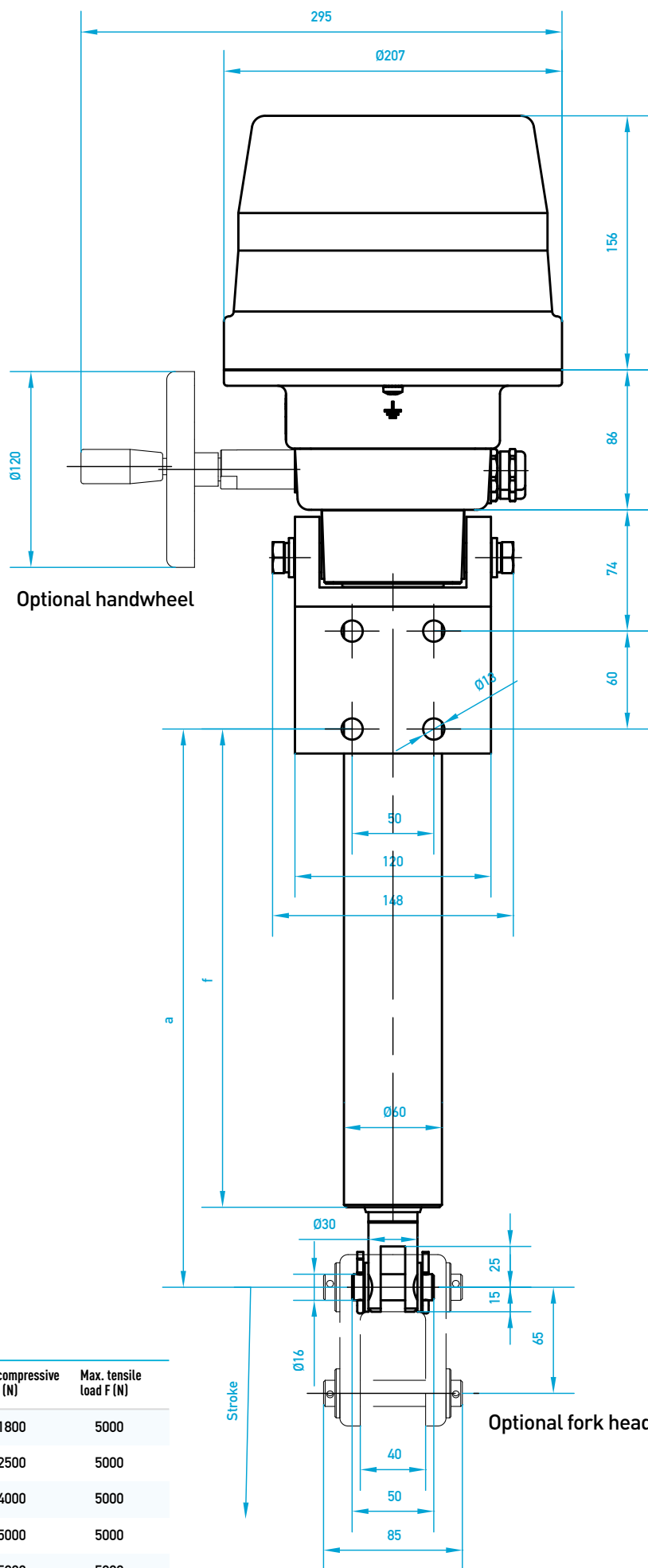
CIRCUIT DIAGRAM SYNCHRONOUS MOTOR STANDARD AC





Dimensions





Stroke	a	b	c	f	Max. compressive load F (N)	Max. tensile load F (N)
1100	1185	778	800	1138	1800	5000
750	820	530	560	773	2500	5000
600	670	424	455	623	4000	5000
450	520	318	350	473	5000	5000
300	340	212	245	293	5000	5000
150	190	106	140	143	5000	5000

All dimensions in mm



NEX-V

Linear actuator

Product features

- Ex zone 1 marking $\text{CE}_{2004} \text{Ex} \text{II} \text{2G} \text{Ex d IIC T6 Gb}$
- Wide range of force outputs
- Large stroke range
- Constant positioning times under fluctuating loads
- Four additional auxiliary position switches possible
- Wide selection of column adapters
- Wide selection of flanges
- Solid metal housing
- Maintenance-free gearing
- Operates in any position

Overview

The NEX-V linear drive for Ex zone applications is a further development of the flameproof housing of the NEX rotary and part-turn actuator with Ex zone 1 marking $\text{CE}_{2004} \text{Ex} \text{II} \text{2G} \text{Ex d IIC T6 Gb}$, based on IECEx certification IECEx EPS 15.0061X and ATEX certification EPS 15 ATEX 1 044 X and the linear module of the V-series actuator.

NEX-V series linear actuators are utilized when precision linear adjustments are required to control elements in heating, ventilation and air conditioning systems as well as in industrial applications. NEX-V series linear actuators are available with the following actuating forces: 1000 N, 2000 N, 3000 N, 4000 N and 5000 N as well as a maximum stroke of 85 mm.

The design of the housing made of die-cast aluminium and die-cast zinc in combination with a permanently lubricated gearing made of steel

with sintered-bronze bearing bushes ensure their suitability for use in a broad range of temperatures and harsh operating environments. The technical construction mirrors that of N series actuators. End position limit stop is path dependent. The standard scope of supply includes a limit switch for each end position. These are designed as changeover switches and can also perform supplementary functions such as end position indication or sequential control tasks. Additional auxiliary position switches and potentiometers are also available. Fitting a relay makes it possible to control several actuators simultaneously via a common contact.

The respective position of the valve is indicated by "Open/Closed" markings on one of the columns of the stroke unit in conjunction with the bearing surfaces of the spindle nut. A solid flange is available to mount the actuator. A driver pin is included to create the connection with the threaded spindle.

Product details

HOUSING

- Housing and hood made of corrosion-resistant gravity die-cast aluminium
- Coated with silicon-free paint
- Colour: RAL 7032 Pebble Grey
- The motor compartment is designed as a type "d" flameproof enclosure to DIN EN 60079-1.
- Protection class IP66/67
- Options:
 - Custom colours

SYNCHRONOUS MOTOR

- Single-phase AC synchronous motor with permanent magnets, reversible
- 230 V \pm 10%, 50/60 Hz \pm 5%
- ON time 100% duty cycle on request
- Short start/stop times
- Insulation class B to VDE 0530
- Synchronous motors maintain speed and constant positioning times irrespective of the load
- Options:
 - Custom voltages
 - Custom frequencies

BLDC MOTOR

- Brushless DC motor
- Constant positioning time thanks to electronic speed controller
- Wide-range input 90 V AC ... 264 V AC, 120 V DC ... 370 V DC
- High holding torque when operating voltage applied
- Manufacturer configured start-up and brake ramp
- ON time 100% duty cycle
- Insulation class B to VDE 0530

DC MOTOR

- DC commutator motor
- Voltage: 12 V DC or 24 V DC
- Insulation class E to VDE 0530

GEARBOX

- Spur gearing with straight-toothed steel gears
- Robust, maintenance-free
- Permanently lubricated gears
- Self-lubricating sintered bronze bearing
- Encapsulated version, operates in any position

SPINDLE

- Self-locking
- "Open/Closed" markings indicate position
- Made of stainless steel

ELEKTRICAL CONNECTION

- Connection by means of 1 m cable end or Ex "e" rated terminal box with tension clamp terminals
- Customer-side wiring outside of the flameproof housing
- Electric anti-condensate heater
- Manual reset temperature switch 80 °C

CONTROLS

- Open/closed signal
- Options:
 - Additional potential-free contacts
 - Electronic position controller ESR-N with Profibus and USB interfaces for synchronous motors
 - Potentiometer 200 Ω ... 10 k Ω
 - Blocking protection assured by monitoring changes to actual value of the potentiometer (only in conjunction with position controller ESR-N)

AMBIENT TEMPERATURE

- -20 °C to +60 °C

ANGLE OF ROTATION LIMITED BY SNAP-ACTION POSITION OFF SWITCH

- CO switches with silver-plated contacts
- Switch connections routed to terminals
- Max. switching capacity: 6 A, 250 V AC
- Options:
 - Switches with gold-plated contacts
 - Switches with positive-break contacts

POSITION SENSOR FOR EXTERNAL POSITION INDICATION (OPTIONAL)

- **With potentiometer**
 - Conductive plastic potentiometer (standard) or wire-wound potentiometer (including TUV approval)
 - Multiturn potentiometer up to 10 turns
 - Gearing facilitates adapting the electrical angle of rotation of the potentiometer to the desired linear regulating distance of the actuator.
- **With 4 ... 20 mA transmitter**
 - Gearing facilitates adapting the electrical angle of rotation of the transmitter to the desired linear regulating distance of the actuator.
- **With Hall sensor**
 - The wear-free absolute encoder that makes use of the Hall effect is particularly suitable for continuous operation in potentially explosive atmospheres.

MANUAL OPERATION (OPTIONAL)

- Using a handwheel it is possible to manually adjust the position of the output shaft and valves.
- Position switch-off settings are retained during manual operation.
- Handwheel remains motionless during electrically powered operation.

OPTIONS

- Other voltage/frequency
- Handwheel
- Additional auxiliary position switches
- Custom control cams
- Electronic position controller ESR-N (in conjunction with synchronous motor)
- Position sensor
- Relay to switch several actuators in parallel
- Potentiometer
- Components to UL standard
- Encapsulated stroke unit
- Set collars serve as external travel stops

ASSEMBLY

- Easy to mount thanks to modified column adapters/flanges
- Easily coupled to the spindle nut by means of a wide variety of threaded, through hole and split driving collars

SAFETY INSTRUCTIONS

- Ensure the device is isolated from the power supply before the hood of the flameproof encapsulated housing is opened by a skilled tradesperson in a hazardous area.
It is imperative to observe the wait time stated on the rating plate!

ORDER DETAILS

- Device type
- Positioning force
- Stroke
- Positioning time
- Column clearance/flange fitting dimensions
- Motor type
- Operating voltage/frequency
- Desired options
- When ordering a potentiometer:
 - Resistance value
 - Desired linear regulating distance of the actuator
 - Standard: regulating distance set to maximum, other regulating distances possible on request
- Preset position switches and potentiometer
- Or order number
- Desired valve, where applicable

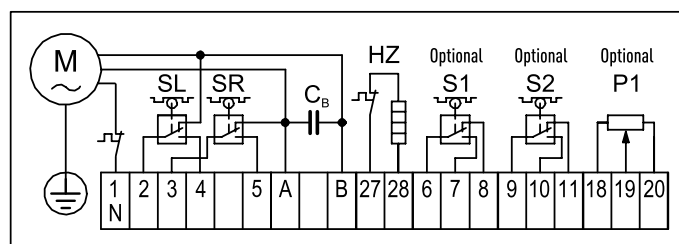
NEx-V SERIES ACTUATORS, 230 V, 50/60 Hz (OPTION 115 V, 50(60) Hz UND 24 V, 50(60) Hz)

Type	Positioning time	Positioning force	Power consumption (max.)	Hood	Weight	Order No.
NEx-V 1	0.1(0.12) mm/s	1000 N	7 VA	including stroke unit H85 universal 156 mm	18.4 kg	90110
NEx-V 1	0.3(0.4) mm/s	1000 N	7 VA	including stroke unit H85 universal 156 mm	18.4 kg	90111
NEx-V 1	0.6(0.7) mm/s	1000 N	18 VA	including stroke unit H85 universal 156 mm	18.4 kg	90112
NEx-V 2	0.3(0.4) mm/s	2000 N	18 VA	including stroke unit H85 universal 156 mm	18.4 kg	90120
NEx-V 2	0.6(0.7) mm/s	2000 N	18 VA	including stroke unit H85 universal 156 mm	18.4 kg	90121
NEx-V 3	0.3(0.4) mm/s	3000 N	18 VA	including stroke unit H85 universal 156 mm	18.4 kg	90130
NEx-V 3	0.8(1.0) mm/s	3000 N	24 VA	including stroke unit H85 universal 156 mm	18.4 kg	90131
NEx-V 4	0.3(0.4) mm/s	4000 N	31 VA	including stroke unit H85 universal 156 mm	18.4 kg	90140
NEx-V 4	0.8(1.0) mm/s	4000 N	32 VA	including stroke unit H85 universal 156 mm	18.4 kg	90141
NEx-V 5	0.4(0.5) mm/s	5000 N	32 VA	including stroke unit H85 universal 156 mm	18.4 kg	90150
NEx-V 5	0.8(1.0) mm/s	5000 N	32 VA	including stroke unit H85 universal 156 mm	18.4 kg	90151

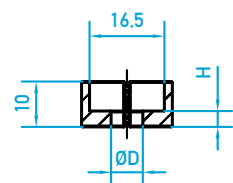
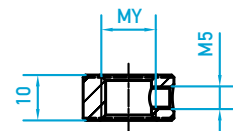
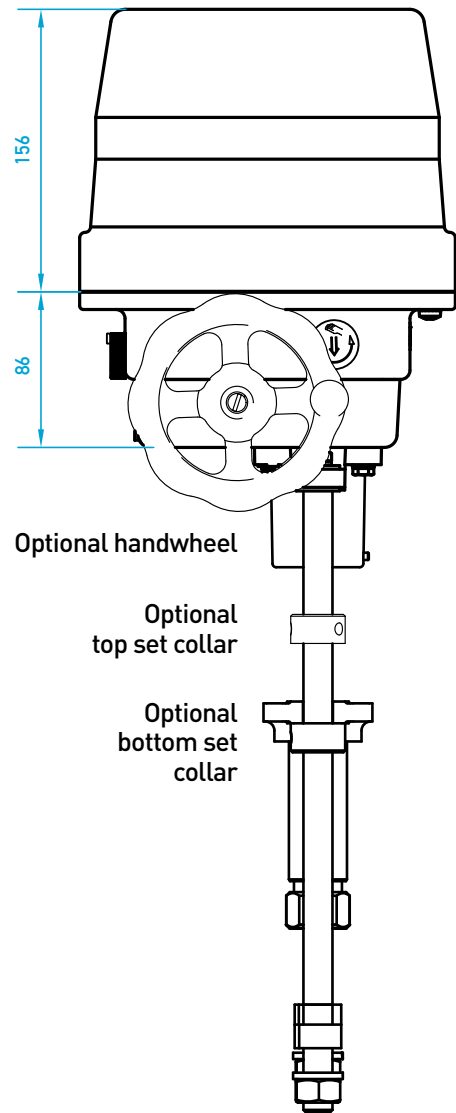
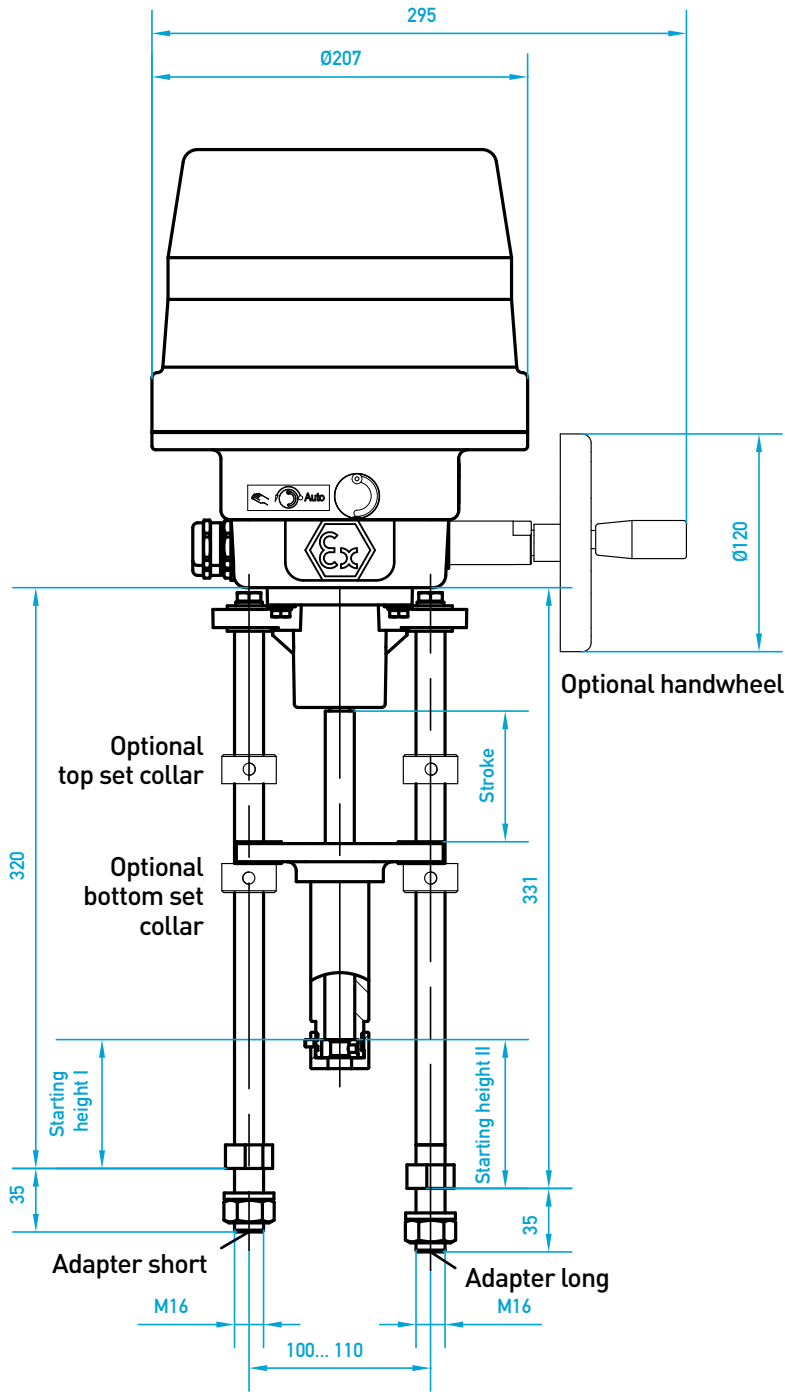
NEx-V-BLDC SERIES ACTUATORS, MULTI-VOLTAGE 90 V AC ... 264 V AC, 120 V DC ... 370 V DC

Wide range of positioning forces and positioning times available on request.

CIRCUIT DIAGRAM SYNCHRONOUS MOTOR STANDARD AC



Dimensions



Stroke = 138 - Starting height I	Stroke = 149 - Starting height II
Starting height I > 53 and Starting height I < 133	Starting height II > 64 and Starting height II < 144
With optional spindle adjusting nut	With optional spindle adjusting nut
Stroke = 128 - Starting height I Starting height I > 53 and Starting height I < 123	Stroke = 139 - Starting height II Starting height II > 64 and Starting height II < 134

MY Options	ØD	H
M6		
M10		
M12		
M12x1	7	3.5
M14x1.5	9	6.0
M16x1.5		

All dimensions in mm

Notes

The page contains a large grid of graph paper for taking notes. The grid is composed of small squares and covers most of the page. At the bottom of the page, there are several horizontal lines for writing, indicating a transition from graph paper to standard lined paper.

General Terms and Conditions

for the Supply of Products and Services of the Electrical and Electronics Industry ("Grüne Lieferbedingungen" - GL)*

for commercial transactions between businesses recommended by ZVEL- Zentral Verband Elektrotechnik und Elektronikindustrie as of June 2011

*The original German text shall be the governing version.

Article I: General Provisions

- 1 Legal relations between Supplier and Purchaser in connection with supplies and/or services of the Supplier (hereinafter referred to as "Supplies") shall be solely governed by the present GL. The Purchaser's general terms and conditions shall apply only if expressly accepted by the Supplier in writing. The scope of delivery shall be determined by the congruent mutual written declarations.
- 2 The Supplier herewith reserves any industrial property rights and/or copyrights pertaining to its cost estimates, drawings and other documents (hereinafter referred to as "Documents"). The Documents shall not be made accessible to third parties without the Supplier's prior consent and shall, upon request, be returned without undue delay to the Supplier if the contract is not awarded to the Supplier. Sentences 1 and 2 shall apply mutatis mutandis to the Purchaser's Documents; these may, however, be made accessible to those third parties to whom the Supplier has rightfully subcontracted Supplies.
- 3 The Purchaser has the non-exclusive right to use standard software and firmware, provided that it remains unchanged, is used within the agreed performance parameters, and on the agreed equipment. Without express agreement the Purchaser may make one back-up copy of standard software.
- 4 Partial deliveries are allowed, unless they are unreasonable to accept for the Purchaser.
- 5 The term "claim for damages" used in the present GL also includes claims for indemnification for useless expenditure.
- 2 For the duration of the retention of title, the Purchaser may not pledge the Retained Goods or use them as security, and resale shall be possible only for resellers in the ordinary course of their business and only on condition that the reseller receives payment from its customer or makes the transfer of to the customer dependent upon the customer fulfilling its obligation to effect payment.
- 3 Should Purchaser resell Retained Goods, it assigns to the Supplier, already today, all claims it will have against its customers out of the resale, including any collateral rights and all balance claims, as security, without any subsequent declarations to this effect being necessary. If the Retained Goods are sold on together with other items and no individual price has been agreed with respect to the Retained Goods, Purchaser shall assign to the Supplier such fraction of the total price claim as is attributable to the price of the Retained Goods invoiced by Supplier.
- 4 a) Purchaser may process, amalgamate or combine Retained Goods with other items. Processing is made for Supplier. Purchaser shall store the new item thus created for Supplier, exercising the due care of a diligent business person. The new items are considered as Retained Goods.
b) Already today, Supplier and Purchaser agree that if Retained Goods are combined or amalgamated with other items that are not the property of Supplier, Supplier shall acquire co-ownership in the new item in proportion of the value of the Retained Goods combined or amalgamated to the other items at the time of combination or amalgamation. In this respect, the new items are considered as Retained Goods.
c) The provisions on the assignment of claims according to No. 3 above shall also apply to the new item. The assignment, however, shall only apply to the amount corresponding to the value invoiced by Supplier for the Retained Goods that have been processed, combined or amalgamated.
d) Where Purchaser combines Retained Goods with real estate or movable goods, it shall, without any further declaration being necessary to this effect, also assign to Supplier as security its claim to consideration for the combination, including all collateral rights for the pro-rata amount of the value the combined Retained Goods have on the other combined items at the time of the combination.

Article II: Prices, Terms of Payment, and Set-Off

- 1 Prices are ex works and excluding packaging; value added tax shall be added at the then applicable rate.
- 2 If the Supplier is also responsible for assembly or erection and unless otherwise agreed, the Purchaser shall pay the agreed remuneration and any incidental costs required e. g. for traveling and transport as well as allowances.
- 3 Payments shall be made free Supplier's paying office.
- 4 The Purchaser may set off only those claims which are undisputed or non- appealable.
- 5 Until further notice, Purchaser may collect assigned claims relating to the resale. Supplier is entitled to withdraw Purchaser's permission to collect funds for good reason, including, but not limited to delayed payment, suspension of payments, start of insolvency proceedings, protest or justified indications for overindebtedness or pending insolvency of Purchaser. In addition, Supplier may, upon expiry of an adequate period of notice disclose the assignment, realize the claims assigned and demand that Purchaser informs its customer of the assignment.
- 6 The Purchaser shall inform the Supplier forthwith of any seizure or other act of intervention by third parties. If a reasonable

Article III: Retention of Title

- 1 The items pertaining to the Supplies ("Retained Goods") shall remain the Supplier's property until each and every claim the Supplier has against the Purchaser on account of the business relationship has been fulfilled. If the combined value of the Supplier's security interests exceeds the value of all secured claims by more than 20 %, the Supplier shall release a corresponding part of the security interest if so requested by the Purchaser; the Supplier shall be entitled to choose which security interest it wishes to release.

interest can be proven, Purchaser shall, without undue delay, provide Supplier with the information and/or Documents necessary to assert the claims it has against its customers

- 7 Where the Purchaser fails to fulfill its duties, fails to make payment due, or otherwise violates its obligations the Supplier shall be entitled to rescind the contract and take back the Retained Goods in the case of continued failure following expiry of a reasonable remedy period set by the Supplier; the statutory provisions providing that a remedy period is not needed shall be unaffected. The Purchaser shall be obliged to return the Retained Goods. The fact that the Supplier takes back Retained Goods and/or exercises the retention of title, or has the Retained Goods seized, shall not be construed to constitute a rescission of the contract, unless the Supplier so expressly declares.

Article IV: Time for Supplies; Delay

- 1 Times set for Supplies shall only be binding if all Documents to be furnished by the Purchaser, necessary permits and approvals, especially concerning plans, are received in time and if agreed terms of payment and other obligations of the Purchaser are fulfilled. If these conditions are not fulfilled in time, times set shall be extended reasonably; this shall not apply if the Supplier is responsible for the delay.
- 2 If non-observance of the times set is due to:
 - a) force majeure, such as mobilization, war, terror attacks, rebellion or similar events (e. g. strike or lockout);
 - b) virus attacks or other attacks on the Supplier's IT systems occurring despite protective measures were in place that complied with the principles of proper care;
 - c) hindrances attributable to German, US or otherwise applicable national, EU or international rules of foreign trade law or to other circumstances for which Supplier is not responsible; or
 - d) the fact that Supplier does not receive its own supplies in due time or in due formsuch times shall be extended accordingly.
- 3 If the Supplier is responsible for the delay (hereinafter referred to as "Delay") and the Purchaser has demonstrably suffered a loss therefrom, the Purchaser may claim a compensation as liquidated damages of 0.5 % for every completed week of Delay, but in no case more than a total of 5 % of the price of that part of the Supplies which due to the Delay could not be put to the intended use.
- 4 Purchaser's claims for damages due to delayed Supplies as well as claims for damages in lieu of performance exceeding the limits specified in No. 3 above are excluded in all cases of delayed Supplies, even upon expiry of a time set to the Supplier to effect the Supplies. This shall not apply in cases of liability based on intent, gross negligence, or due to loss of life, bodily injury or damage to health. Rescission of the contract by the Purchaser based on statute is limited to cases where the Supplier is responsible for the delay. The above provisions do not imply a change in the burden of proof to the detriment of the Purchaser.
- 5 At the Supplier's request, the Purchaser shall declare within a reasonable period of time whether it, due to the delayed Supplies, rescinds the contract or insists on the delivery of the Supplies.
- 6 If dispatch or delivery, due to Purchaser's request, is delayed by more than one month after notification of the readiness for dispatch was given, the Purchaser may be charged, for every additional month commenced, storage costs of 0.5 % of the price of the items of the Supplies, but in no case more than a total of 5 %. The parties to the contract may prove that higher or, as the case may be, lower storage costs have been incurred.

Article V: Passing of Risk

- 1 Even where delivery has been agreed freight free, the risk shall pass to the Purchaser as follows:
 - a) if the delivery does not include assembly or erection, at the time when it is shipped or picked up by the carrier. Upon the Purchaser's request, the Supplier shall insure the delivery against the usual risks of transport at the Purchaser's expense;
 - b) if the delivery includes assembly or erection, at the day of taking over in the Purchaser's own works or, if so agreed, after a successful trial run.
- 2 The risk shall pass to the Purchaser if dispatch, delivery, the start or performance of assembly or erection, the taking over in the Purchaser's own works, or the trial run is delayed for reasons for which the Purchaser is responsible or if the Purchaser has otherwise failed to accept the Supplies.

Article VI: Assembly and Erection

Unless otherwise agreed in written form, assembly and erection shall be subject to the following provisions:

- 1 Purchaser shall provide at its own expense and in due time:
 - a) all earth and construction work and other ancillary work outside the Supplier's scope, including the necessary skilled and unskilled labor, construction materials and tools;
 - b) the equipment and materials necessary for assembly and commissioning such as scaffolds, lifting equipment and other devices as well as fuels and lubricants;
 - c) energy and water at the point of use including connections, heating and lighting;
 - d) suitable dry and lockable rooms of sufficient size adjacent to the site for the storage of machine parts, apparatus, materials, tools, etc. and adequate working and recreation rooms for the erection personnel, including sanitary facilities as are appropriate in the specific circumstances; furthermore, the Purchaser shall take all measures it would take for the protection of its own possessions to protect the possessions of the Supplier and of the erection personnel at the site;
 - e) protective clothing and protective devices needed due to particular conditions prevailing on the specific site.
- 2 Before the erection work starts, the Purchaser shall unsolicitedly make available any information required concerning the location of concealed electric power, gas and water lines or of similar installations as well as the necessary structural data.
- 3 Prior to assembly or erection, the materials and equipment necessary for the work to start must be available on the site of assembly or erection and any preparatory work must have advanced to such a degree that assembly or erection can be started as agreed and carried out without interruption. Access roads and the site of assembly or erection must be level and clear.
- 4 If assembly, erection or commissioning is delayed due to circumstances for which the Supplier is not responsible, the Purchaser shall bear the reasonable costs incurred for idle times and any additional traveling expenditure of the Supplier or the erection personnel.
- 5 The Purchaser shall attest to the hours worked by the erection personnel towards the Supplier at weekly intervals and the Purchaser shall immediately confirm in written form if assembly, erection or commissioning has been completed.

- 6 If, after completion, the Supplier demands acceptance of the Supplies, the Purchaser shall comply therewith within a period of two weeks. The same consequences as upon acceptance arise if and when the Purchaser lets the two-week period expire or the Supplies are put to use after completion of agreed test phases, if any.

Article VII: Receiving Supplies

The Purchaser shall not refuse to receive Supplies due to minor defects.

Article VIII: Defects as to Quality

The Supplier shall be liable for defects as to quality ("Sachmängel", hereinafter referred to as "Defects",) as follows:

- 1 Defective parts or defective services shall be, at the Supplier's discretion, repaired, replaced or provided again free of charge, provided that the reason for the Defect had already existed at the time when the risk passed.
- 2 Claims for repair or replacement are subject to a statute of limitations of 12 months calculated from the start of the statutory statute of limitations; the same shall apply mutatis mutandis in the case of rescission and reduction. This shall not apply where longer periods are prescribed by law according to Sec. 438 para. 1 No. 2 (buildings and things used for a building), Sec. 479 para. 1 (right of recourse), and Sec. 634a para. 1 No. 2 (defects of a building) German Civil Code ("Bürgerliches Gesetzbuch"), in the case of intent, fraudulent concealment of the Defect or non-compliance with guaranteed characteristics ("Beschaffensgarantie"). The legal provisions regarding suspension of the statute of limitations ("Ablaufhemmung", "Hemmung") and recommencement of limitation periods shall be unaffected.
- 3 Notifications of Defect by the Purchaser shall be given in written form without undue delay.
- 4 In the case of notification of a Defect, the Purchaser may withhold payments to an amount that is in a reasonable proportion to the Defect. The Purchaser, however, may withhold payments only if the subject-matter of the notification of the Defect involved is justified and incontestable. The Purchaser has no right to withhold payments to the extent that its claim of a Defect is time-barred. Unjustified notifications of Defect shall entitle the Supplier to demand reimbursement of its expenses by the Purchaser.
- 5 The Supplier shall be given the opportunity to repair or to replace the defective good ("Nacherfüllung") within a reasonable period of time.
- 6 If repair or replacement is unsuccessful, the Purchaser is entitled to rescind the contract or reduce the remuneration; any claims for damages the Purchaser may have according to No. 10) shall be unaffected.
- 7 There shall be no claims based on Defect in cases of insignificant deviations from the agreed quality, of only minor impairment of usability, of natural wear and tear, or damage arising after the passing of risk from faulty or negligent handling, excessive strain, unsuitable equipment, defective civil works, inappropriate foundation soil, or claims based on particular external influences not assumed under the contract, or from non-reproducible software errors. Claims based on defects attributable to improper modifications or repair work carried out by the Purchaser or third parties and the consequences thereof are likewise excluded.
- 8 The Purchaser shall have no claim with respect to expenses incurred in the course of supplementary performance, including costs of travel, transport, labor, and material, to the extent

that expenses are increased because the subject-matter of the Supplies has subsequently been brought to another location than the Purchaser's branch office, unless doing so complies with the normal use of the Supplies.

- 9 The Purchaser's right of recourse against the Supplier pursuant to Sec. 478 BGB is limited to cases where the Purchaser has not concluded an agreement with its customers exceeding the scope of the statutory provisions governing claims based on Defects. Moreover, No. 8 above shall apply mutatis mutandis to the scope of the right of recourse the Purchaser has against the Supplier pursuant to Sec. 478 para. 2 BGB.
- 10 The Purchaser shall have no claim for damages based on Defects. This shall not apply to the extent that a Defect has been fraudulently concealed, the guaranteed characteristics are not complied with, in the case of loss of life, bodily injury or damage to health, and/or intentionally or grossly negligent breach of contract on the part of the Supplier. The above provisions do not imply a change in the burden of proof to the detriment of the Purchaser. Any other or additional claims of the Purchaser exceeding the claims provided for in this Article VIII, based on a Defect, are excluded.

Article IX: Industrial Property Rights and Copyrights; Defects in Title

- 1 Unless otherwise agreed, the Supplier shall provide the Supplies free from third parties' industrial property rights and copyrights (hereinafter referred to as "IPR") with respect to the country of the place of delivery only. If a third party asserts a justified claim against the Purchaser based on an infringement of an IPR by the Supplies made by the Supplier and used in conformity with the contract, the Supplier shall be liable to the Purchaser within the time period stipulated in Article VIII No. 2 as follows:
 - a) The Supplier shall choose whether to acquire, at its own expense, the right to use the IPR with respect to the Supplies concerned or whether to modify the Supplies such that they no longer infringe the IPR or replace them. If this would be impossible for the Supplier under reasonable conditions, the Purchaser may rescind the contract or reduce the remuneration pursuant to the applicable statutory provisions;
 - b) The Supplier's liability to pay damages is governed by Article XII;
 - c) The above obligations of the Supplier shall apply only if the Purchaser (i) immediately notifies the Supplier of any such claim asserted by the third party in written form, (ii) does not concede the existence of an infringement and (iii) leaves any protective measures and settlement negotiations to the Supplier's discretion. If the Purchaser stops using the Supplies in order to reduce the damage or for other good reason, it shall be obliged to point out to the third party that no acknowledgment of the alleged infringement may be inferred from the fact that the use has been discontinued.
- 2 Claims of the Purchaser shall be excluded if it is responsible for the infringement of an IPR.
- 3 Claims of the Purchaser are also excluded if the infringement of the IPR is caused by specifications made by the Purchaser, by a type of use not foreseeable by the Supplier or by the Supplies being modified by the Purchaser or being used together with products not provided by the Supplier.
- 4 In addition, with respect to claims by the Purchaser pursuant to No. 1 a) above, Article VIII Nos. 4, 5, and 9 shall apply mutatis mutandis in the event of an infringement of an IPR.
- 5 Where other defects in title occur, Article VIII shall apply mutatis mutandis.

- 6 Any other claims of the Purchaser against the Supplier or its agents or any such claims exceeding the claims provided for in this Article IX, based on a defect in title, are excluded.

Article X: Conditional Performance

- 1 The performance of this contract is conditional upon that no hindrances attributable to German, US or otherwise applicable national, EU or international rules of foreign trade law or any embargos or other sanctions exist.
- 2 The Purchaser shall provide any information and Documents required for export, transport and import purposes.

Article XI: Impossibility; Adjustment of the Contract

- 1 To the extent that delivery is impossible, the Purchaser is entitled to claim damages, unless the Supplier is not responsible for the impossibility. The Purchaser's claim for damages is, however, limited to an amount of 10 % of the value of the part of the Supplies which, owing to the impossibility, cannot be put to the intended use. This limitation shall not apply in the case of liability based on intent, gross negligence or loss of life, bodily injury or damage to health; this does not imply a change in the burden of proof to the detriment of the Purchaser. The Purchaser's right to rescind the contract shall be unaffected.
- 2 Where events within the meaning of Article IV No. 2 (a) to (c) substantially change the economic importance or the contents of the Supplies or considerably affect the Supplier's business, the contract shall be adapted taking into account the principles of reasonableness and good faith. To the extent this is not justifiable for economic reasons, the Supplier shall have the right to rescind the contract. The same applies if required export permits are not granted or cannot be used. If the Supplier intends to exercise its right to rescind the contract, it shall notify the Purchaser thereof without undue delay after having realized the repercussions of the event; this shall also apply even where an extension of the delivery period has previously been agreed with the Purchaser.

Article XII: Other Claims for Damages

- 1 Unless otherwise provided for in the present GL, the Purchaser has no claim for damages based on whatever legal reason, including infringement of duties arising in connection with the contract or tort.
- 2 This does not apply if liability is based on:
- a) the German Product Liability Act ("Produkthaftungsgesetz");
 - b) intent;
 - c) gross negligence on the part of the owners, legal representatives or executives;
 - d) fraud;
 - e) failure to comply with a guarantee granted;
 - f) negligent injury to life, limb or health; or
 - g) negligent breach of a fundamental condition of contract ("wesentliche Vertragspflichten").

However, claims for damages arising from a breach of a fundamental condition of contract shall be limited to the foreseeable damage which is intrinsic to the contract, provided that no other of the above case applies.

- 3 The above provision does not imply a change in the burden of proof to the detriment of the Purchaser.

Article XIII: Venue and Applicable law

- 1 If the Purchaser is a businessman, sole venue for all disputes arising directly or indirectly out of the contract shall be the Supplier's place of business. However, the Supplier may also bring an action at the Purchaser's place of business.
- 2 This contract and its interpretation shall be governed by German law, to the exclusion of the United Nations Convention on contracts for the International Sale of Goods (CISG).

Article XIV: Severability Clause

The legal invalidity of one or more provisions of this Agreement in no way affects the validity of the remaining provisions. This shall not apply if it would be unreasonably onerous for one of the parties to be obligated to continue the contract.

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When asserting a claim under guarantee you will be required to return the actuator together with the original invoice and the Returns Material Authorisation number (RMA number). To ensure the repair process is carried out quickly and efficiently the customer is kindly requested to obtain an RMA number from the Agromatic Service department before making any returns.

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